1.—REPORT UPON THE INVESTIGATIONS OF THE U. S. FISH COMMISSION STEAMER ALBATROSS FROM JULY 1, 1889, TO JUNE 30, 1891.

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THE FISCAL YEAR 1889-90.

SOUTHEASTERN ALASKA, JULY, 1889.

The *Albatross* was at Departure Bay, B. C., July 1, 1889, coaling ship, preparatory to a trip to southeastern Alaska with several members of the Committee on Indian Affairs of the United States Senate. On July 3 she proceeded to Victoria for supplies, and on the 4th to Port Townsend, Wash., where Capt. J. W. Keen, an Alaskan pilot, was engaged for the cruise. We were joined at Tacoma, on the 8th, by Senators H. L. Dawes, F. B. Stockbridge, C. F. Manderson, and J. K. Jones, together with several officers of the Senate and their attendants. The steamer left Tacoma the same day, and after touching at Port Townsend for mail proceeded northward through the inland passage. Night anchorages were made at Carter Bay and Cardena Bay on account of fog and tides, but no other stops were made until Fort Tongas was reached on the morning of the 11th. The senatorial committee landed, but, finding the place abandoned, soon returned on board, and we left for Port Chester, where we arrived the same evening. This beautiful bay lies on the west side of Annette Island and affords a secure harbor for all classes of vessels. The region has attracted much attention recently from having been selected as the site of the New Metlahcatlah, the home of Rev. Mr. Duncan's colony of Indians.

Mr. Duncan's labors among the Indians of British Columbia commenced about thirty years ago, and through his efforts a flourishing community had grown up at what is now called Old Metlahcatlah, near Port Simpson, B. C. The people were housed in comfortable cottages; churches and schools were in a flourishing condition; various industries were successfully prosecuted; and it was, in fact, considered the

NOTE.—All bearings are magnetic unless otherwise stated, and depths are expressed in fathoms.

ideal Indian community of the Pacific coast. Vexed questions of church discipline finally arose between the colonists and the bishop of the diocese, culminating about two years since in the abandonment of the settlement by the majority of the people, and removal to their present location. The site selected for the settlement was a densely wooded plain bordering on the bay, where many acres have been cleared and partially drained, and houses erected for the people. A steam sawmill and salmon cannery, and a large building for a general store have been built. The schoolhouse is the most imposing structure in the place, and compares favorably with many similar buildings in older communities. Boarding houses for boys and girls were in process of construction in connection with the school, all of this work being done by the Indians, under the general supervision of Mr. Duncan. The sawmill was burned shortly before our arrival. Mr. Duncan was absent, but the committee had several conferences with the leading men, obtaining from them the general condition of the settlement and their needs.

A dense fog prevailed until noon of the 12th, when we got under way for Karta Bay, via Clarence Straits. Arriving at 5:54 p. m., the committee visited the Indian village and cannery (the old Baronovitch fishery), which, in its day, was one of the most important in Alaska. Leaving Karta Bay at 7:55, we proceeded to Port Wrangell, where we arrived at 7:25 the following morning. The committee landed and visited the school and Indian village, returning at noon, when we went on our way. We entered Chatham Strait at 1 a. m., and at 5:30 came to with the stream anchor in 40 fathoms, near a rocky point off Kootznahoo Roads, for the double purpose of waiting for slack water at Peril Straits and to afford an opportunity for fishing. Many halibut and cultus-cod were caught with hand lines, and several salmon were captured by trolling. Leaving our fishing-ground at 7:50, we arrived in the harbor of Sitka at 4:20 p. m.

The next day, July 15, the committee were early on shore, visiting the Indian school, and other places of interest, while the vessel went to the Government wharf for coal. The wharf is a rickety affair, and the Government buildings, with few exceptions, are rapidly falling into decay. The Indian settlement occupies most of the water front, and, owing to strict sanitary measures and general supervision during the U. S. Naval regime, presents a very respectable appearance. Most of the men were away at the salmon fisheries, and the women and old men were busy in the manufacture of baskets and Indian curios, that being about the only industry prosecuted in the place. It was rainy and misty on the morning of the 16th, but partially cleared about noon. Through the courtesy of the governor, Mr. George Kastrometinoff joined us as interpreter for the northern trip, to facilitate communication with the native tribes.

We left Sitka at 4:35 p. m. for Peril Straits, through which we passed at slack water, and came to at 9:45 in Favorite Anchorage. A strong southeasterly wind sprang up during the night, with rain and mist, and on entering Chatham Strait the following morning, and finding that it would be impossible to land at Kootznahoo as intended, we turned to the northward, and ran into Pavloff Harbor, Freshwater Bay, for protection until the weather improved.

We found it a snug little anchorage, entirely protected from southerly winds. A salmon cannery was in operation on the western side of the bay, with the usual adjacent Indian village. Quite a large stream enters the head of the bay, over a fall of several feet, at the foot of which many trout were taken. Several salmon and a single halibut were caught by trolling. The senatorial party and others landed soon after our arrival, and visited the cannery, Indian village, and other points of interest. The following morning we went to Muir Inlet, reaching the great glacier at 2:40 p. m. The photographers and several of the senatorial party landed to get a nearer view of the glacier.

Leaving the glacier at 4 p. m., we worked our way down the bay through heavy masses of ice, which made navigation slow and intricate, until we reached the vicinity of Bartlett Bay. Soundings taken in Glacier Bay gave us 45 fathoms abreast of Willoughby Island, 48 at the entrance to Muir Inlet, and 57 about half a mile from the face of the glacier.

Steaming across Icy Straits, we anchored in the snug harbor of Hoonyah Bay, at 10:45 p. m., off a large village which the committee wished to visit; but it was found entirely abandoned by the Indians, who had gone on their summer hunting and fishing expeditions. The next day we went to the Indian village in Portage Bay. This village was also abandoned, but as the committee were anxious to meet the people, they went in the steam launch to the mouth of the river, up which they were rowed a mile or two in a skiff, and then walked a mile farther to the rapids, where the Indians were taking salmon. The senators were much pleased with their general appearance, and considered them superior to any native Alaskans they had previously met. Our anchorage at Portage Bay was in latitude 59° 09′ N., the highest point reached by the vessel during the season.

The committee having returned, we left at 7:36 p. m. for Chilkat, anchoring at 10:35 p. m., in Pyramid Harbor, in 21 fathoms. The committee visited the cannery and Indian village next morning. At 11 a. m. we proceeded to Juneau, where we arrived at 10:25 p. m., calling at Auk Village on the way, which was found abandoned.

The Senate committee held a conference with citizens and Indians of Juneau on the 22d, at which matters of interest to the Territory, and Juneau in particular, were discussed. We got under way at 3:30 p. m., and ran down the harbor to the great Treadwell Mine, the committee

and others visiting the works. Leaving the mine at 5:30, we steamed to the southward. On the 23d, at 3:55 p. m., cast the trawl in 322 fathoms, black sand and gravel bottom, Lemesurier Point bearing NE. ¾ E. (mag.), distant $2\frac{2}{10}$ miles. After dragging a short distance, the trawl entered a soft mud bottom, with which the net became filled, and it required several hours careful work to land it on board. Hundreds of sea-urchins were brought up, besides starfish, ophiurans, annelids, shells, etc. One hagfish and another small fish, species unknown, were taken. The absence of fish was notable, and would seem to indicate unusually barren ground. A line of dredgings through the channels would be exceedingly interesting, as the only means of determining the species and general distribution of fish, occupying the inland waters of southeastern Alaska in summer time. Continuing our course to the southward, Victoria was reached at 8:40 p. m., without stop or incident, on the 26th.

The senatorial committee visited the principal places of interest in the city the following morning, including the dockyard and new dry dock at Esquimalt. We were under way at 3:40 p. m., and with steam and sail ran across the straits to Port Townsend, arriving at 7:35 p. m. Seattle was reached at 3 p. m. the next day, and Tacoma at 7:30. The members of the Senate committee were landed immediately, and, with many expressions of gratification at the results of the trip and regrets at its termination, took their departure. Prof. C. H. Gilbert left also, with instructions to return to Washington.

WASHINGTON, OREGON, AND CALIFORNIA, AUGUST–OCTOBER, 1889.

Preparations for cruise to Bering Sea.—We started for Port Townsend at 8:57, arriving at 11:50 a. m. on the 29th, having been detained about eight hours by fog. Supplies were obtained at this place, and, after completing our preparations for sea, we left at 2:30 p. m., August 1, for Departure Bay, British Columbia, arriving at 5:10 the following morning. Coaling was finished on the morning of the 4th, and we left the harbor at 2 p. m. for Bering Sea via Unalaska, under one boiler, the coal consumption being limited to 10 tons per day. The sky was clear, but the smoke, which had the effect of fog, obscured everything at a distance. This was caused by forest fires which prevail throughout Oregon, Washington, and British Columbia during the dry season, when the smoke becomes so dense at times that it is more dreaded by mariners than fog, rendering navigation exceedingly difficult and dangerous. It is prevalent until dissipated by the autumn rains.

We passed Seymour Narrows at 4:15 a. m. on the 5th, an hour before low water, and, although the swirls were somewhat heavy, the tide had slackened sufficiently to enable us to keep control of the helm without undue strain. It was discovered soon after leaving Departure Bay that the coal on board was of an inferior quality, and the allowance was increased to 12 tons per day, but even then we could not

make our usual speed. At 8:05 p. m. we emerged from Goleta's Channel, steamed out into the Pacific, encountering light westerly winds and smooth sea. The weather was clear overhead, but misty about the horizon, obscuring the land.

Everything worked smoothly during the night and following day, and a gentle breeze from SW. enabled us to carry fore and aft sail. At 4:20 p. m., August 7, the port high-pressure piston broke, disabling that engine. The starboard one was uninjured and would drive the vessel between 4 and 5 knots per hour, dragging the port propeller; but it would be difficult to maneuver under favorable conditions, and in heavy weather the vessel would be nearly helpless. In view of the fact that there were no machine shops at Unalaska or any facilities for making repairs, the ship was immediately headed for Port Townsend, the nearest place affording the necessary appliances. The cylinder head was taken off as soon as practicable, and the broken piston was found lying in fragments at the bottom of the cylinder. The piston rod was bent, and there was a small scratch on the internal surface of the cylinder, but not of sufficient depth to do any damage. The low-pressure cylinder was uninjured, so the high-pressure engine was disconnected, and about three hours after the accident both propellers were working and, with the assistance of sail, the vessel was making nearly her usual speed. The accident happened in latitude 52° 45′ N. and longitude 136° 56′ W., 649 miles from Port Townsend. We encountered fog as soon as we approached the coast, but the sea remained comparatively smooth and we carried our fair wind into the Straits of Fuca, arriving at Port Townsend at 11:17 a. m., August 11.

Fog signal at Cape Flattery.—An incident in connection with the Cape Flattery fog signal is worthy of mention. A dense fog prevailed as we approached the Cape, and an anxious watch was kept for the sound of the whistle, which was finally heard distinctly at a distance of 5 or 6 miles. Our course led us in the direction of the sound, but it continued to grow fainter, until at Duncan Rock, 1 mile away, it ceased to be heard, except at long and irregular intervals, and then so faintly that it would hardly have been noticed. There can be no possible question as to our distance from the whistle, as we made Duncan Rock ahead not more than a quarter of a mile away. Going on up the straits, the sound increased in volume and regularity, and at a distance of 6 miles was still distinctly audible. We have observed this phenomenon on two previous occasions, but failing to sight Duncan Rock were not absolutely certain of our distance from it. Other vessels have met with the same experience, usually attributing it to a temporary lack of steam. There are two or three small rocky islets lying between the whistle and Duncan Rock, all less than a quarter of a mile from the former, and, although low and insignificant in appearance they may have something to do with the deflection of the sound of the whistle from the direction of the latter.

The erratic action of sound signals has been a fruitful theme of investigation for many years, and while we have learned in a general way that sounds may ricochet over the surface of land and sea by successive contacts with uneven surfaces, or air strata of different densities, we have not been able to lay down any rule by which the mariner can determine the existence of abnormal atmospheric conditions: hence his lack of confidence in sound signals in general and the necessity for great caution when approaching them. The peculiarity in this case is that the phenomenon has been observed only on, or near, the bearing of Duncan Rock, the critical point in entering the Straits of Fuca.

Port Townsend to coast of Oregon.—Work on the disabled engine commenced on the 12th. A new piston was made, the rod straightened, and other minor matters attended to. The job was completed on the morning of the 22d, and at noon we left for Departure Bay, where we arrived at 10:15 a. m. the following day. We commenced coaling at 1 p. m. and finished at 10:15 a. m. on the 24th, having taken on board 94½ tons. Leaving the harbor an hour later, we anchored for the night in Otter Bay, where we found a safe and convenient harbor. Large numbers of surf ducks and a few puffins were swimming leisurely about the bay when we entered, but soon disappeared. Fishing lines were put over the side, resulting in the capture of one flounder and a dogfish.

We were under way at 6 the following morning and anchored off Victoria at 10:15 a. m., where we called for supplies. We left there at 11:20 on the morning of the 27th, and, steaming out of the Straits of Fuca, passed Cape Flattery at 9 p. m. A course was then made for Tillamook Rock, which brought the vessel into the trough of a westerly swell, causing her to roll heavily. We were steaming with one boiler, as usual, the consumption of fuel being limited to 10 tons per day. The coal turned out even worse than the previous lot, reducing the speed nearly a knot and a half an hour.

Coast of Oregon.—At 11:47 a. m., August 28, we commenced sounding off Tillamook Rock, running lines from shore to a depth of 200 fathoms, occupying stations at intervals of about 5 miles and working to the southward. It is not an easy matter under the most favorable conditions to keep an accurate account of a vessel's position when using the beam trawl or hand lines, and it was particularly difficult to do so with the strong and irregular currents, smoky atmosphere, and boisterous weather prevailing on the coast of Oregon. Knowing that our soundings would be used for hydrographic purposes, the necessity for as great a degree of accuracy as practicable was so apparent that we decided to give our undivided attention to the determination of depths, character of bottom, and temperatures, to be followed later by the usual investigations with beam trawl, hand lines, and the various methods of biological research. The weather being exceptionally clear, we continued work night and day until, at midnight of the 31st, we were in the vicinity of Cape Gregory.

September 1 was an unusually clear day, and the sea was comparatively smooth. The time was spent on Heceta Bank and vicinity, many soundings being taken to determine the extent of the 40-fathom patch. The beam trawl was used successfully, although the bottom was rough, and when it was too rocky for the trawl the tangles were brought into requisition. Boats were lowered and hand lines used on different parts of the bank. The result of the day's operations may be stated as follows: The area of the 40-fathom patch on Heceta Bank is very small. Beam trawl and trawl-line fishing are impracticable on the rougher portions of the bank. Hand lines from boats will meet with the best results. Fishes and invertebrates were almost identical with those taken last season, but dogfish had not reached the bank in great numbers. The list of food-fishes will be found in the table of fishing stations.

An interesting haul of the beam trawl was made after dark in 93 fathoms, green mud, a few miles inshore of the bank. One hundred flounders were taken, representing four species; and also large numbers of rock-cod, one black-cod, one cultus cod, and several species of small fish. Holothurians and other invertebrates were found in large numbers. In a subsequent haul in 61 fathoms, green mud and sand, made between 8 and 9 p. m., 200 flounders were taken, besides other species. Considering the size of the trawl (11 feet beam) and the duration of the haul, which did not exceed 20 minutes, it must be conceded that the region is rich in the various species of flatfishes and rock-cod.

September 2 and 3 were spent in the examination of the region over which we had recently sounded. The beam trawl and hand lines were used, the different species of flatfish, rock-cod, etc., being found generally distributed along the coast. There was a uniform bottom of fine gray sand to a depth of about 40 fathoms, when green mud began to show, increasing in proportion until at 60 fathoms there was but little sand. One exception to the uniform character of bottom was a small bank or rocky patch lying SSW. $\frac{1}{4}$ W. magnetic, 19 miles from Yaquina light-house. The least water found was 42 fathoms, clay and mud bottom, with frequent rocky or stony patches, covering an area of about 40 square miles. Several specimens of the rocks were brought up in the beam trawl—water-worn bowlders of blue limestone, weighing from 50 to 200 pounds, bearing evidence of drift deposit. The entire surface of the stones was honeycombed by borers and covered with a mass of life, including small cup corals, sponges, trachiopods, annelids, mollusks, ophiurans, etc. The weather was very boisterous during our exploration of the bank, which prevented a satisfactory examination regarding its fish life, but the various species of rock-cod will doubtless be found there in large numbers.

Wind and sea increased during the 3d, until it became too rough to continue work, and as our coal was getting short we decided to go to Astoria for a supply. Slow progress was made during the night, steam-

ing head to wind and sea, but it moderated next morning, and we crossed the Columbia River Bar at 2 p. m., anchoring off Astoria an hour later. We received 50½ tons of coal on the 6th, and at 10:40 next morning got under way, crossed the bar at Meridian, and at 3:46 put the hand lines over in 40 fathoms, off Falcon Rocks. A fine salmon was taken on one of the lines.

The beam trawl and hand lines were used at various stations, working to the southward over ground previously sounded. The various species of rock-cod, flounders, etc., were found quite plentifully. A thick fog set in at 8 p. m., obliging us to lay to till daylight the following morning, when it partially lifted and we continued our investigations, working to the southward as before. Beam trawl and hand lines were used with good success, and Mr. Alexander made an examination of the shore line in the dory. There are many outlying rocks along this part of the coast, around which we expected to find rock-cod and other species, but we were disappointed. The presence of sea lions on nearly every rock may account for this scarcity of fish. Having reached Cape Lookout we anchored under its lee at 5:10 p. m., where we found smooth water and excellent protection from northerly winds.

Our attention having been called to a recently discovered bank off Nestuggah, Oregon, reported by Capt. Bell, of the steamer *A. B. Field*, we decided to give the region a careful examination. The report stated that 12 fathoms was found 10 miles from land. We sounded at intervals of 3 miles, extending the examination several miles north and south of Nestuggah, and found 15 fathoms about 1 mile from shore, the depth increasing regularly to 70 fathoms, 8 to 10 miles off, where the reported bank was said to be. The bottom was of fine gray sand, and the usual varieties of coast fishes were found, but no codfish. The report referred to is more circumstantial than usual, names being given, yet we found that a depth of 12 fathoms anywhere in the vicinity of Nestuggah would be but a fraction of a mile from shore and well within sound of the surf.

Having completed the examination of the reported bank we continued work along the coast, and although the weather was boisterous, it was usually clear, with bright moonlight nights, which enabled us to carry on the work continuously. Reaching the vicinity of Orford Reef on the afternoon of the 12th, Mr. Alexander went in with the dory and examined that locality, while the *Albatross* worked farther off shore. He reported sea lions on nearly every rock, and the total absence of fish in their immediate vicinity; but "spots" were found, a few hundred yards to the southward, where cultus-cod and the various species of rock-cod were taken in large numbers. We were equally successful with the hand lines on board ship at stations south and west of the reef.

Wind and sea increased during the afternoon, making boat work and line fishing from the ship so difficult that we sought shelter for the night

off Port Orford, where we found good anchorage in 7 fathoms, protected from the prevailing coast winds. A destructive forest fire was observed to the northward of Cape Orford, steadily working its way south and approaching the coast. It was just back of the first range of hills when we anchored, and soon after reached the sawmill, lumber yard, and buildings adjoining, quickly sweeping them away.

A dense fog and smoke prevailed until 7:35 the following morning, when it began to clear, and, getting under way, we carried the soundings to the vicinity of Cape Sebastian during the day, the last one being taken at 7:13 p. m. Owing to high winds and sea we laid a course to the northward, and, under moderate speed, faced the swell during the night. Reaching the vicinity of Koos Bay at 8:30 the following morning, we ran a line of soundings off shore, to fill in a space left on the former examination, then started for Astoria, arriving at 2 p. m., September 15.

Orders were received on the 16th to proceed to Portland, Oregon, and place the *Albatross* on exhibition for about ten days, in connection with the Northern Pacific Industrial Exposition. We coaled on the 19th, taking 94½ tons; cleaned and painted ship, and early on the morning of the 26th got under way for Portland, anchoring below the city at 6:20 p. m. There was a dense fog next morning, and while waiting for it to clear, the *Bonita*, a river steamer, collided with this vessel and received considerable damage. Our injury was slight and was repaired by the crew. The *Albatross* was opened to visitors at 10 a. m., September 28, and every day thereafter, between 10 a. m. and 4 p. m., until the evening of October 9. The decks and laboratories were literally packed with people, anxious to see the various specimens of marine life. Many of them showed great interest in the apparatus and methods of investigation. The navigator prepared a chart of the coasts of Washington and Oregon on a large scale, showing in graphic form the results of the *Albatross* explorations. It was placed under glass on one of the bulkheads in the laboratory, and proved of great interest generally, and a veritable revelation to fishermen and the seafaring community. Details of officers and men were constantly on duty explaining matters of interest. Between 25,000 and 30,000 people visited the ship during the twelve days she was open for inspection.

We left Portland at 6 a. m., October 10, arrived at Astoria at 3.50 p. m., where we remained until 9 a. m. the following day, when we got under way and proceeded to sea. Crossing the bar at 10:20 we steamed to the southward, and at meridian on the 12th took up our work off Cape Sebastian.

Coast of northern California.—We developed the 200-fathom line to the southward, until at 1:47 a. m., on the 14th, we had reached Cape Mendocino, where we were compelled to cease work on account of boisterous weather. As the indications were unfavorable we started for San Francisco, under steam and sail, arriving at the quarantine

station at 11:35 p. m. We came to for the night, moving up off Washington street the following morning. We remained at anchor until October 25, when, at 11:40 a. m., we left for the Mare Island navy-yard, arriving at 3 p. m. A general overhauling was commenced immediately, the work being done, as far as practicable, by our own crew.

Results of operations on the coasts of Washington, Oregon, and California.—Active operations for the season having been brought to a close with the practical completion of the examination of the coasts of Washington and Oregon, and a good beginning in northern California, it may not be out of place to give here a brief synopsis of the general results. A large part of our work has necessarily been hydrographic, as there were but few soundings on the charts and none outside of the 50-fathom curve. Lines of soundings were run off shore at intervals of 5 to 10 miles, defining the 200-fathom curve from Cape Flattery to the vicinity of Cape Mendocino. More detailed examinations were made in several localities hereafter mentioned. The fisheries will be prosecuted inside of 100 fathoms on the Pacific coast for years to come, and while for obvious reasons our investigations extended to the 200-fathom line, we will limit the discussion to areas within the former depth.

The soundings off Cape Flattery were irregular, and suggested the existence of submarine ridges lying parallel with the coast; and between the cape and Flattery Rocks, lying about 10 miles from shore, a semicircular depression was found having depths from 100 to nearly 200 fathoms; thence to Yaquina Head the depths increase regularly, with the exception of the rocky patch or bank off Grays Harbor and Shoalwater Bay, where elevations of a few fathoms were found. Between Yaquina Head and Umpquah River lies a submarine plateau, triangular in form, with depths less than 100 fathoms, Heceta Bank marking its southwestern extremity. Thence to Cape Mendocino the soundings were quite regular.

The 100-fathom curve forms an irregular line, at varying distances from shore, as shown by the following table:

Distance of the 100-fathom curve from shore.

Locality.	Miles.	Locality.	Miles.
Cape Flattery	40	Siuslaw River	40
Cape Johnson	18	Cape Gregory	12
Grays Harbor	30	Cape Orford	7
Shoalwater Bay	20	Cape Sebastian	10
Columbia River	18	Crescent City	10
Tillamook Rock	27	Klamath River	20
Cape Lookout	11	Trinidad Head	9
Yaquina Head	20	Cape Mendocino, about	9

These cover an area in round numbers of 3,700 square miles on the coast of Washington, 4,750 square miles on the Oregon coast, and 1,160 square miles in northern California, a total of 9,610 square miles.

Fishery investigations have been carried on from the vicinity of Cape Flattery to Cape Orford. The various species of fish were found generally distributed along the coast, occurring in greater numbers on the banks hereafter mentioned. There was a notable absence of fish in the immediate vicinity of rocks inhabited by sea lions and lying near the coast where the line fishermen would naturally expect to find employment. There were, however, exceptions to this rule, as good fishing was found on Orford Reef in close proximity to numbers of these animals. A table of fishing stations is appended, showing the species taken at each station, and for convenience of reference the work of last season is included.

The fishing-banks in the region under discussion are few and of small extent. Commencing with the most northern, Flattery Bank has an area of about 1,100 square miles, the least water, 27 fathoms, being found at its southeastern extremity, 11 miles W. by N. (magnetic) from Cape Flattery light-house. Halibut and other species of fish have been taken from this bank in large numbers for many years. The area over which they are found in greatest abundance is about 35 square miles, on an exceedingly rough, rocky bottom, near the southeast end. A small bank lies W. by S. (magnetic), 23 miles from Toke Point light-house, covering an area of 110 square miles, with a least depth of 42 fathoms, sand, mud, and rocky patches, over which the depths vary to the extent of a few fathoms. Another small bank or rocky patch lies SSW. ¼ W. (magnetic), 19 miles from Yaquina light-house. It covers an area of about 40 square miles, the least water found being 42 fathoms, clay and mud, with rough, rocky patches. Heceta Bank lies SW. ½ W. (magnetic), 35 miles from Heceta Head, and covers an area of about 600 square miles. The least water, 41 fathoms, is found near its southern end, over a rough, rocky bottom.

The following appliances were used by the *Albatross* for taking fish, viz: Seines, gill nets, beam trawls, trawl lines, and hand lines from the vessel and from small boats. The grains and harpoon were used also, and the submarine electric light was utilized in collecting minute forms. This was effective in attracting mackerel off the Revillagigedo Islands and in the Gulf of California.

Halibut were plentiful on Flattery Bank, and scattering specimens were taken off Flattery Rocks, Tillamook Rock, and on Heceta Bank. The various species of rock-cod were found generally along the coast, as well as on the banks. Flounders were found everywhere; most plentifully, however, between 50 and 100 fathoms. The plateau before mentioned is particularly rich in flatfish, and will be the favorite ground for the beam trawl when that method is introduced. Eight species of edible flounders, including the delicious deep-sea sole, were taken on this plateau. Cultus-cod were on all the banks and on Orford Reef; black-cod were in the deeper waters, and half-grown specimens, with ling, or Pacific whiting, were found in moderate depths. Large red

prawns of excellent quality were taken frequently in the beam trawl, and do not seem to be confined to any particular depth.

The sea fishermen have much to contend with on the coasts of Oregon and Washington. Gales are of rare occurrence during the summer months, yet the coast winds, blowing constantly from the northward, keep up a boisterous sea and strong currents. During the fall and winter, southeasterly gales are frequent, and there being none but bar harbors on the coast, they can not be entered in bad weather; hence the unfortunate fisherman is obliged to go to sea and lay it out. The distance from a market and the excessively high price of ice are other obstacles to be contended with by the fishermen.

Surface life was quite abundant, particularly during fair weather. Whales were seen nearly every day, and occasional schools of porpoises; while close in shore, sharks were of frequent occurrence. Gulls, gonies, and petrels were flying about, and huge flocks of black fulmars were observed on several occasions.

Mare Island Navy-Yard.—The work of overhauling and refitting proceeded without incident worthy of mention until the evening of December 23, when an accident occurred, resulting in the drowning of three members of our crew and a civilian. The night was exceedingly dark and stormy. At 7 p. m. a small boat containing 9 men left the side for Vallejo, and 5 minutes later swamped in midstream. Boats from the U. S. S. *Thetis* rescued 5 men, but nothing was seen of the others, although boats from the various ships were on the spot within a few minutes and the search continued well into the night. The names of the drowned were R. S. Padgett, machinist; J. Enright, seaman; W. W. Lee (colored), seaman; Walter Philippi, civilian. The latter was a cripple who was in the habit of visiting the ship to sell newspapers to the crew. The remains of John Enright and Walter Philippi were subsequently recovered. The former was buried in the naval cemetery at Mare Island and the grave marked by a neat headstone furnished by the Coast Seaman's Union, of which organization he was a member. Philippi was buried by his parents in San Rafael.

Ensign H. E. Parmenter was detached January 8, 1890, and ordered to the *Charleston*. Lieut. C. G. Calkins, U. S. Navy, reported for duty on the 9th, relieving Ensign Marbury Johnston as executive officer and navigator, the latter having performed those duties since the detachment of Lieut. Waring a year ago.

We coaled ship March 3 and 4, and at 9:40 the following morning left the yard and steamed out into San Pablo Bay to try the engines and dredging apparatus. Two hauls of the trawl were made near the Brothers, and at 2:40 p. m. we reached the navy-yard and moored to a buoy in the stream. Everything worked fairly well during the trial trip, a few minor matters only requiring adjustment.

COAST OF CALIFORNIA, MARCH AND APRIL, 1890.

We left the navy-yard at 9:40 a. m., March 10, and proceeded to sea. Crossing the bar at 2 p. m., we lowered the trawl ten minutes later in 20 fathoms, and notwithstanding a heavy westerly swell succeeded in running a line of dredgings to the South Farallones. There we hove to for the night, rolling and tumbling about in the heavy swell, to the great discomfort of all hands.

Resuming work at daylight the following morning, we extended our explorations to the southward in depths ranging between 391 fathoms, 16 miles S. ¼ E. from South Farallon light, and 20 fathoms, 3 miles NW. ⅞ W. from Pigeon Point. After the last haul was completed we ran off shore a few miles and lay to until 5:46 the following morning, when operations were resumed by casting the trawl in 296 fathoms, fine gray sand, Pigeon Point light bearing NE. by E. ¾ E., 18.8 miles. Working to the southward as before, twelve stations were occupied during the day, the last one being 6.8 miles WNW. ½ W. from Santa Cruz light-house. The weather moderated until at sunset the sea was quite smooth. We anchored at 5:55 p. m. off Santa Cruz, where good protection is afforded from the coast winds.

Mr. Alexander was landed at daylight on the 13th to continue his fisheries investigations. At 6 a. m. we got under way and made a line of soundings and dredgings across the outer extremity of Monterey Bay, finally anchoring off the old town of that name. The naturalists were employed in shore collecting until noon on the 14th, when we left the anchorage and made a series of dredgings across the bay in from 9 to 48 fathoms, following the general direction of the coast line, finally anchoring off Santa Cruz at 6:23 p. m.

Getting under way at 6:20 next morning, we examined a rocky area off Santa Cruz on which a number of fishing boats were employed. The Coast Survey chart gave no indications of rocky bottom, and our attention was called to it by the presence of fishermen. The center of the bank is 2 miles SSW. from the light-house and the bank has an area of about 14 square miles, the depths ranging from 8 to 20 fathoms. Having completed the examination of the bank, we ran a line of dredgings to the northward in moderate depths as far as Pigeon Point, the last haul being finished at 5:43 p. m., when we started for port, anchoring off Saucelito at 11:25 p. m. We were under way again at daylight on the 16th, and reached the navy-yard, Mare Island, at 8:20 a. m.

Thick rainy weather prevailed until the 19th, when we ran down to San Francisco, took on board 92 tons of coal on the 20th, and at 9:40 the following morning got under way and proceeded to sea. At 12:50 p. m. we cast the trawl in 21 fathoms, fine gray sand, Point Bonita bearing NE. by E. § E., distant 9.8 miles, and ran a line of dredgings to the westward until 3:50 p. m., when we swung ship under steam for compass errors. The dredgings were then continued in the direction

of Point Reyes, and at 6:15 we anchored in Drake Bay for the night. Getting under way at 6:15 the following morning, a line of dredgings was run to Noonday Rock, and the region examined with dredge, tangles, and hand lines. The beam trawl was used westward of the bank to depths exceeding 500 fathoms. Work continued until 8 p. m., when we steamed slowly inshore and lay to within the range of Point Reyes light. The weather was unsettled, with frequent showers, and the wind increased during the night. Work was resumed at daybreak next morning, however, and a line of dredgings run to the vicinity of Point Reyes. Wind and sea having increased until it was too boisterous to continue work, we came to in Drake Bay at 9:30 a. m. Seining and fishing parties went out, but the swell outside and the surf on the beach rendered operations exceedingly difficult.

The wind and sea moderated during the night, and at 6:10 on the morning of the 24th we got under way and steamed to Cordell Bank. A trawl line was set and a boat anchored, having mast and flag to serve as a central point from which soundings were taken at intervals of one mile, over a rough rocky bottom, and the tangles were hauled occasionally. Hand lines were used from time to time, but the swell and strong current made it difficult to keep them on the bottom. Rock-cod were taken at most of the stations, but not in great numbers. Our examination showed rocky patches extending somewhat farther than indicated by the chart, except in a westerly direction, where the depths increased rapidly with a bottom of green mud. The trawl lines brought up 45 rock-cod, averaging 6½ pounds, and 2 cultus-cod, weighing 25 pounds each.

Starting about 4 p. m., we ran a line of soundings to Point Arena, where we commenced to develop the 200-fathom line. Work was continued until 9:46 a. m. on the 25th, when bad weather forced us to cease operations; and, rather than lay out a gale, we ran for port, anchoring off Saucelito at 9:35 p. m., crossing over to San Francisco the following morning.

The weather clearing on the 27th, we left port at 6:20 p. m. and, steaming to the northward, took up our work off Wallalla Point, at 5:40 on the morning of the 28th, developing the 200-fathom line to the southward as far as Russian River, where a series of dredgings was made over smooth sand or mud bottom, quite rich in the various species of flatfish. The last haul was finished at 10 p. m., when we lay to for the night, the weather being overcast and rainy. Resuming work at daylight next morning, March 29, a line of dredgings was run to Point Reyes, and thence to the vicinity of Point Bonita. We then entered the Golden Gate, and, at 2:30 p. m., anchored in the harbor of San Francisco, where the ship was coaled.

At 4:10 p. m. on April 2, we got under way and proceeded to sea. Standing to the southward under steam and sail, we passed Pigeon Point light at 9:49, and at 11:40 cast the lead in 208 fathoms, the light

above mentioned bearing N. ¾ W., distant 14.5 miles. This was the first of a series of soundings extending across Monterey Bay to the vicinity of Cypress Point. The maximum depth was 958 fathoms. We cast the trawl at 7:40 a. m., April 3, off Point Carmel, and the work of sounding and dredging continued until 11:45 p. m., when, the weather becoming misty, we lay to till daylight, within sight of Piedras Blancas light.

Work was resumed at 5:10 on the morning of the 4th, and carried to the vicinity of San Simeon Bay, where we anchored at 12:35 p. m., the weather having become very boisterous. Seining and fishing parties were out during the afternoon, meeting with fair success. The wind was light from the northwest next morning, increasing to a stiff breeze in the afternoon, with a heavy swell. We were under way at 5:30, and, with the lead and beam trawl, extended our examination southward, defining the 100 and 200 fathom lines across the open bay of Esteros to Point Buchon, and thence to Point San Luis. Soundings were continued throughout the night, a full moon making it practicable to locate stations. A succession of heavy tide rips was encountered while at work off Esteros Bay, which were noticeable from the fact that there was but little wind or sea.

We were off Point Arguello at midnight with a fresh breeze and heavy swell, making it difficult to carry on our work, but soundings were continued to the southward to the vicinity of Point Conception, and a series of dredgings made during the day in the deep waters of Santa Barbara Channel. The subsidence of wind and sea after passing Point Conception and entering the channel was quite noticeable. Having finished work, we ran into Santa Barbara, and anchored at 5:07 p. m. The naturalists were engaged in shore collecting until noon the next day, the 7th, when we got under way for Santa Rosa Island. The wind was light when we left the anchorage, but a fresh breeze was encountered in midchannel, which soon increased to a moderate gale with a heavy head sea, until we got under the lee of the land. We anchored in Becher Bay at 4:05 p. m., and the vessel and rigging were soon covered with fine sand, blown from the island. The wind was too high to admit of landing, but having moderated during the night the collectors were out at daylight, returning at 9:30, when we left our anchorage and steamed to the northward against fresh coast winds and a heavy swell, which reduced the speed about 2 knots an hour. We passed Point Conception at 3:15, and made Piedras Blancas light at 1 a. m. on the 9th. The region between Point Sur and Lopez Point was passed at night going south, and the soundings intended to define the 200-fathom line ranged from 293 to 426 fathoms, though not more than 5 miles from shore. To define the line more accurately, we made another series of soundings from 2 to 3 miles from land, which still exceeded the depth.

The naturalists were anxious to make further examinations of the shores of Monterey Bay, and to give them an opportunity to do so we ran in and anchored off the town at 4:20 p. m., remaining until 8:40 on the 11th, the time being utilized in shore collecting, seining, etc. Leaving the harbor at the time mentioned, we sounded an hour later in 881 fathoms, rocky bottom, Point Pinos bearing ESE. ¼ E., distant 8¼ miles, with decreasing depths and soft mud bottom in every direction. Submarine currents must sweep across this station with sufficient force to expose the bedrock. Two hauls of the trawl were made in the submarine valley off Monterey Bay, and we then steamed into Santa Cruz, anchoring at 7:30 p. m. Getting under way at 4:45 next morning, April 12, we steamed out to the 200-fathom line and made a series of dredgings, working to the northward. The coast wind was blowing very fresh, with a heavy sea, which seriously interfered with our work. The results, however, were quite satisfactory. The last haul was finished at 5:37 p. m., when we started for port, arriving at the navy-yard, Mare Island, at 5:50 a. m., April 13. The return of the vessel to the yard completed the work on the California coast for the season, and preparations were at once begun for the northern cruise.

Results of operations on the coast of California.—Active operations off the California coast continued from March 10 to April 13, and while the total results can not be given until the scientific branches are worked up, we can state in a general way what has been accomplished. In hydrography, 236 soundings were taken, between Point Arena and the Santa Barbara Channel. Many of them were for the sole purpose of ascertaining ocean depths outside of soundings given on the Coast Survey charts, while others were preliminary to trawl or dredge hauls. It has been our purpose to establish the 200-fathom line as the maximum depth in which deep-sea fishing can be profitably prosecuted, and within which are located the fishing-grounds of the Pacific coast.

Commencing at Point Arena, the 200-fathom curve lies almost 12 miles from shore, and extends in nearly a straight line to 14 miles off Salt Point, 20 miles off Russian River, and 26 miles off Tomales Point. The bottom is composed of alternating patches of black sand and green mud, the latter extending almost invariably between 100 and 200 fathoms. The otherwise smooth bottom is obstructed by occasional stony patches, usually between depths of 40 to 70 fathoms, seldom indicated by the lead but encountered by the beam trawl. From Point Reyes to the 200-fathom curve outside of Cordell Bank, it is 21 miles. This same depth is found 3 miles outside of Noonday Rock, 4 miles from North Farallon and 5 miles from South Farallon, increasing abruptly from the 100-fathom line. The curve gradually approaches the coast to the southward of the Farallones, and from 25 miles off Pillar Point it narrows to 16 at Pigeon Point. The line sweeps inward abruptly at Año Nuevo, and at El Jarrow Point it is but 8 miles from shore, maintaining this distance until off Santa Cruz.

Six lines of soundings were made across Monterey Bay, three inside and three outside of a line drawn from Point Pinos to Santa Cruz, developing the great submarine valley which begins at the mouth of the Salinas River. It was supposed to lie in a west-southwesterly direction, as indicated by inshore soundings; but our observations, while not sufficiently extended to define it positively, show it to trend S. by W. off Cypress Point, with a depth of 950 fathoms 8 miles from land. Less water was found to the northward and westward farther off shore, where there is an elevation of about 200 fathoms. Further examination of this ridge or plateau is desirable.

From 245 fathoms less than 1.5 miles from Cypress Point, the line of equal depth gradually leaves the coast until west from Point Sur it is between 9 and 10 miles from shore. Drawing in abruptly, 293 fathoms was found 5 miles southwest from the point, with 36 fathoms little more than a mile inside of it. Thence to Lopez Rock the shore is exceedingly bold, the 200-fathom line approaching within 2 miles or less, then diverging slightly until off Piedras Blancas it is between 6 and 7 miles from the point. This stretch of coast from Carmel Point to Piedras Blancas is entirely open and exposed to the full power of the ocean swell, which causes a tremendous surf, even with the ordinary coast winds. Slight protection may be found under Point Sur, but even that can not be depended upon in bad weather. Southward from Piedras Blancas the character of the coast line changes materially, and there are various points where fairly good anchorage may be found. San Simeon Bay affords the best protection north of San Luis Obispo.

As the shore line becomes less abrupt, shoal water extends farther seaward, 200 fathoms being found 7 miles off San Simeon Point, about 10 miles off Point Esteros and Point Buchon, and between 13 and 14 miles off Point San Luis; then, sweeping a little seaward off Points Sal and Purisima, it approaches within about 8 miles of the bold headland of Point Arguello and 10 miles from Point Conception.

The character of the bottom is so uniform along the coast that it may, for our purpose, be treated in a general way. The area between the Golden Gate, Point Pillar, the Farallones, and Point Reyes is sandy and free from rocks and stony patches, except in the immediate vicinity of the islands or shore line. Southward from Pillar Point, rocky patches near the shore will be frequently found, with fine gray sand farther off, which finally merges into green mud at varying distances from the land. There are stony patches also, usually between 30 and 70 fathoms, on sand or mud bottom, apparently the result of drift. The green mud has a strong odor, which is occasionally offensive.

The results of the fishing trials will be discussed at length in the report of the Fishery Expert, yet it may not be out of place to give a brief summary of the same in this connection. One hundred and eleven dredging and fishing stations were occupied. The principal fishes found inside the 50-fathom curve are enumerated in the following table, and those taken both inside and outside of that line are given in the second table.

Principal fishes found inside of the 50-fathom line.

Common name.	Systematic name.	Abundance.
Flounders	Hippoglossoides exilis	Abundant.
Do	Citharichthys sordidus	Do.
Do	Parophrys vetulus	Do.
Long-fin sole	Glyptocephalus zachirus	Do.
Turbot	Pleuronichthys decurrens	Common.
San Francisco sole	Psettichthys melanostictus	Do.
Do	Eopsetta jordani	Do.
Halibut	Atheresthes stomias	Rare.
Deep-sea sole	Microstomus pacificus	Few small ones.
Flounder	Citharichthys stigmæus	Rare.
Anchovy	Stolephorus	Common.
Roncador	Genyonemus lineatus	Do.
Tomcod	Microgadus proximus	Few.
Smelts	Atherinopsis, and other species	Common.
Perches	Abeona, and other species	Do.
Ratfish	Chimæra collei	Do.
Midshipmen	Porichthys porosissimus	Very abundant.
Hag eel	Myxine glutinosa	Common.
	Zaniolepis latipinnis	Do.
	Related new species	Do.
Cultus-cod	Ophiodon elongatus	Few.
Red rockfish	Sebastodes ruber	Common.
Orange rockfish	Sebastodes pinniger	Do.
Yellow-tail rockfish	Sebastodes flavidus	Do.
Vermillion rockfish	Sebastodes miniatus	Do.
Rockfish	Sebastodes elongatus	Do.
Do	Sebastodes auriculatus	Do.
Do	Sebastodes goodei	Rare.
Do	Sebastodes chlorostictus	Do.
Do	Sebastodes, new species	Do.
Do	....do	Very abundant.
Do	....do	Do.
Do	....do	Do.

Also many small species not yet named.

Principal fishes found outside of the 50-fathom line.

Common name.	Systematic name.	Abundance.
Deep-sea sole	Microstomus pacificus	Abundant in 200 fathoms.
Halibut (flounder)	Atheresthes stomias	Rare.
Long-fin sole	Glyptocephalus zachirus	Common in 100 fathoms.
Black-cod	Anoplopoma fimbria	Common.
Redfish	Sebastolobus	Abundant.
Rockfish	Sebastodes, new species	Do.
Do	....do	Do.
Do	....do	Do.
	Macrurus, three species	Few.
	Chauliodus	Do.
	Careproctus	Do.
	Alepocephalus	Do.
	Myctophum townsendi	Common.
Eel pouts (six species)	Lycodes, rare species	Large specimens.
		Abundant.
	Sternoptyx	

Shoal-water species were regularly distributed, flounders being the principal feature of every haul. Small specimens of deep-sea sole, *Microstomus pacificus*, were found in 50 fathoms and less, probably the young of the species so plentiful in greater depths, and described by Lockington from immature specimens taken in shoal water. The long-finned sole, *Glyptocephalus zachirus*, was found from the shore to 100 fathoms, the finest specimens in the latter depth. These two flounders approach nearest in edible qualities to the European sole of any fish on the Pacific coast. The flesh of mature specimens is white, gelatinous, and exceedingly delicate in flavor. From experiments made on board this vessel, they were found, when kept on ice, to improve until the fourth day, but deteriorated after the seventh. They can be taken only with the beam trawl, or other form of drag net.

Invertebrates found along shore and to the 100-fathom line differ from those of corresponding depths on the Oregon and Washington coasts. The edible red prawns, so abundant north, entirely disappear in this region, and shrimps take their place to a limited extent. Large prawns, 6 or 8 inches in length, were obtained occasionally in depths of 50 fathoms or more.

The common edible crab, *Cancer magister*, is abundant, and grows larger than it does farther north. Smaller species, *Cancer antennarius* and *Cancer productus*, both edible, common along the shores, were not met with north of the California boundary. Very few sea-urchins were taken in shoal water. Cup corals, as well as hydrocorallinæ, were met with on rocky or stony bottoms. Several small species of alcyonarians and comatulæ were abundant. Ophiurans and astrophytons were found, but not in as great numbers or variety of species as in more northern waters. Gorgonian corals are common close in shore. Starfishes appear to be much the same as those found on the Oregon coast. Holothurians are numerous and are represented by a variety of species; squids and octopi are common and usually very small. Shells were almost invariably small, and of obscure species; several species of brachiopods were dredged, some of them very beautiful. Sponges are rather scarce, ascidians and bryozoans common, and annelids abundant and varied in species.

The invertebrates found between 100 and 600 fathoms were greater in number and in variety of species than in the shoaler waters above described. Sea-urchins were particularly abundant, and a large proportion of the average haul was composed of them, either a species of *Schizaster* not yet named, or a large pinkish urchin. Large and small specimens were found together, but the species were seldom mixed.

Many large alcyonarian corals resembling *Verrillia* were taken in moderate depths, and a very few rare pennatulas and umbellulas came from the deeper hauls. Another rare polyp, *Anthomastus*, of which we had previously taken but a single specimen, was found in 550 fathoms. Deep-water shells were not abundant, and ophiurans were sur-

prisingly scarce; but holothurians were common, a large brilliant-red species being the most abundant.

Crustacea were common, although the variety of species was rather limited, and annelids were also plentiful. A large crab, resembling *Lithodes*, and another very large, flat-legged species were most abundant. Annelids were common and the species quite varied.

The surface was practically barren of minute life, a few salpæ being about all that would be found in the tow net. This absence of surface life was due in great measure to the season of the year. Sea birds were about the ship constantly, and an occasional school of porpoises was seen. Sharks were not plentiful; in fact, there were but two or three observed during the season. Whales were very common, and were reported nearly every day, sometimes in large numbers. On one occasion we steamed slowly into a school that were so busily engaged in feeding that they paid little attention to us. Upon investigation it was ascertained that they were devouring a small globular jellyfish, half an inch in diameter, which could be seen in immense masses from 3 to 5 fathoms beneath the surface. Thousands of sea birds were hovering over or around the busy scene.

INVESTIGATIONS IN ALASKA WATERS, APRIL TO JUNE, 1890.

Preparations for the cruise.—The vessel was taken into the new stone dry-dock at the Mare Island navy-yard on April 16, her bottom scraped and painted, repairs made on one of the outboard connections, and the old tiller on the rudder blade replaced by a new one. We hauled out of the dock on the 28th. The commandant, rear-admiral A. E. K. Benham, and officers of the various departments in the navy-yard gave us every possible facility for making repairs and refitting generally, and tools and other appliances required in the shops were freely put at our disposal. The assistance rendered made it possible to give the vessel and her machinery a thorough overhauling at small expense. Ensign William W. Gilmer, U. S. Navy, reported for duty on the 30th.

The *Albatross* left the navy-yard May 1, at 11:20 a. m., and anchored off Washington street, San Francisco, at 2:10 p. m. The U. S. flagship *Charleston*, Acting Rear-Admiral George Brown; the U. S. S. *Marion*, revenue steamer *Bear*, and Coast Survey steamer *Hassler* were lying at anchor in the harbor. Prof. Charles H. Gilbert reported as chief naturalist.

San Francisco to Bering Sea.—We left San Francisco at 12:55 p. m., May 5, for Bering Sea, via Departure Bay, B. C., where we arrived safely at 8:50 p. m. on the 9th. The usual cloudy, misty weather was encountered with moderate northerly winds to the Columbia River, and southerly breezes thence to Cape Flattery. Whales were seen daily, and fur seals were observed off Cape Mendocino. An occasional school

of porpoises passed, always at a safe distance from the ship, and sea birds hovered about night and day. A solitary shark was reported off Mendocino.

We commenced coaling at 10:15 a. m., May 10, and finished at 9:15 a. m. on the 13th, having taken on board 192 tons, 25 tons being in bags on deck. At 3:15 p. m. the same day we left Departure Bay for Bering Sea.

Schools of herring were seen in the Gulf of Georgia during the evening, pursued by sharks and porpoises. Among the latter several were observed with peculiar markings, the head, back, and sides being black or very dark; belly, tips of fins, and tip of tail white. It may be a common species, but I do not remember to have seen it before. Passing Seymour Narrows at 5:20 the following morning, we steamed through Johnstone and Broughton straits, Queen Charlotte Sound, and Goletas Channel, entering the Pacific at 5 p. m. We were under one boiler, as usual, consuming about 12 tons of coal per day.

The customary foggy and misty weather was encountered, with light to moderate SE. to SW. winds. A plover was captured on the 18th in latitude 52° 45′ N., longitude 148° W. Whales were seen, and a couple of large white albatrosses were about the ship for an hour or more. Floating kelp was observed for the first time since leaving Vancouver Island. Light flurries of snow passed occasionally and many evidences of our northerly course were apparent. Gulls were first noticed on the 19th and little auks on the 20th.

The high land of Sannakh Island was sighted on the morning of the 21st, and a line of soundings and dredgings, commenced in 483 fathoms, was carried over the position assigned to Anderson Rock, and thence to the westward of the islands through Unimak Pass into Bering Sea. The weather was squally and misty at times while working in the region of Anderson Rock, but there were frequent intervals when it was quite clear, and from the masthead we commanded a view of the horizon for 10 miles or more in every direction, but without detecting any surface signs of rocks or shoals; neither did the soundings indicate anything of the kind. Our observations do not prove the non-existence of the danger referred to, but simply show that it does not lie in the position indicated. The evidence seems so conclusive as to the existence of rocks somewhere in that vicinity that I am inclined to the belief that they will eventually be found and located properly. Our investigations are gradually narrowing the limits in which they may be searched for.

Bering Sea.—From Unimak Pass we took the general direction of the 100-fathom curve, carrying our investigations about 80 miles to the northward and westward, when a gale sprang up from that direction, and to save fuel we turned from it and ran a line of soundings and dredgings in the direction of Unalaska, finally anchoring in Iliuliuk Harbor at 7:40 p. m., May 23. We went to the coal wharf as soon as it

was vacant and took on board 117 tons of coal during the 26th and 27th, filled up with fresh water, and made final preparations for departure.

Bristol Bay; Unalaska to the Nushagak River.—At 3:50 a. m., May 28, we cast off from the coal wharf and proceeded to sea en route for Bristol Bay. It was blowing a moderate gale from the southward, with fog and mist, which lifted at intervals, but was particularly disagreeable when crossing the several passes into the Pacific.

Reaching the northwest cape of Unimak about noon the next day, we found it too rough to use the trawl or hand lines, but ran a line of soundings along the land to Shaw Bay, where at 5:53 p. m. we anchored for the night. This bay is open to the northward, but affords protection from all winds to the southward of east or west. The approaches are clear, and the water shoals gradually to 6 fathoms, black sand, about three-quarters of a mile from shore. Our experience in coasting along the north shore of Unimak Island made it evident that very little dependence could be placed on the charts, except for a general, though inaccurate, marking of the coast line. They were totally devoid of topographical delineations near the shores, which are, as a rule, low, monotonous, and lacking in striking features to serve as landmarks. The mountain ranges and principal volcanic cones are indicated, it is true, but they are usually enveloped in fog or mist, and are, therefore, seldom available for navigating purpose. Overcast or foggy weather was so prevalent that we could not depend on making astronomical observations, and hence I decided to make a reconnaissance of the coast before attempting to explore the fishing-grounds.

Getting under way at daylight next morning, we ran as near the land as prudent, sounding frequently, angling on points, and locating features that might be useful as landmarks. This work was continued to the head of Bristol Bay, where we anchored off the Naknek River on the morning of the 31st. The naturalists and a surveying party spent the following day near the mouth of the river, the former in shore and shoal water collecting, the latter in making a reconnaissance of the entrance.

Nushagak River.—Leaving our anchorage on the morning of June 2, a line of dredgings and fishing stations was carried across the bay to the vicinity of Protection Point, where we arrived at 5:45 the same day. The charts of this dangerous region were of very little service; the land on both sides is low and without distinctive features; shoals extend off so far from the region of Etolin Point that we were frequently forced almost out of range; and the strong uncertain currents rendered compass courses entirely unreliable. The eye and lead are, in fact, the only safe guides. The Nushagak pilot, an aged Eskimo, boarded us at 1:30 a. m., and, getting under way at 8:53 with the flood tide, we steamed up to the anchorage above the native village of Ekuk,

and came to near the establishment of the Nushagak Canning Company. A reconnaissance of the lower river was commenced by the officers, and the naturalists explored the surrounding regions. Taking Mr. Alexander, the fishery expert, with me, I visited the four packing establishments, all of which seemed in good working order, waiting for the first run of salmon. A detailed account of these works and their methods will be found in the report of the fishery expert.

I inspected the site of the proposed trap on Wood River in company with Messrs. P. H. Johnson and J. W. Clark, the projectors of the enterprise. It is located about 40 miles from the Nushagak cannery and 20 above the mouth of Wood River, at which point the latter is a swift-running stream of clear cold water, between 700 and 800 feet in width and 10 to 14 feet deep. Nothing had been done yet to indicate the extent and character of the proposed work. Ten slender piles, driven about 300 feet from shore, were all that could be seen, but the contemplated plans were detailed by the projectors as follows: An open channel in midstream 100 feet in width; two traps 40 feet square, one on each side of the open channel, with wings extending to the shores. This arrangement they considered to be clearly within the limits of the law.

The west bank of Wood River is covered with forests of spruce, the larger trees having been cut for domestic purposes. It was from this region that the Russians procured logs for house-building. There was no wood on the east bank as far as we could see, the land on that side being very low and marshy. The timber line is seen on the west side of the Nushagak, 5 or 6 miles below the mouth of Wood River, and is a notable feature in the landscape. The forest gradually thins out, trees diminish in size until at the margin they are dwarfed to mere shrubs, beyond which there is nothing but alder bushes, a few stunted birches, willows, etc. There is no visible cause for this phenomenon, but the line is distinctly drawn. Driftwood along the shores of Bristol Bay, brought down the rivers by floods, indicates the existence of great forests in the interior and constitutes the sole fuel supply of the natives on the peninsula and at other places in Bering Sea.

Mr. Ivan Petroff, United States census agent for the Territory of Alaska, came on board on the morning of the 5th, having with him 2 kaiaks and 3 Eskimo boatmen, and reported an unsuccessful attempt to reach the Kuskokwim River via the inland route up the Nushagak and over the portage. After working laboriously up the river several days against strong currents, until in fact they were approaching the portage, his crew mutinied, refusing positively to go any further, thus forcing him to return. It was of vital importance, he said, that he should reach the former river without delay, and, as there was no other means of transportation, he earnestly requested to be landed anywhere in the vicinity of Cape Newenham, from which point he could reach the native settlements. I knew the importance of his work, as

well as the difficulty of procuring transportation along that unfrequented coast, and, while I was under no direct obligation to deviate from my course on his account, I did not hesitate a moment in extending the hospitalities of the ship to him and his people and assuring him of every practicable assistance in prosecuting his work.

Nushagak River to the Kuskokwim River.—We left the Nushagak on the morning of June 7 and ran a line of dredgings and fishing stations across the bay and back to the Walrus Islands. Fairly good cod banks were found outside of the extensive shoals surrounding Cape Constantine, but only scattering specimens of cod were taken between there and the head of the bay, and these were in poor condition. Reaching Round Island, the southernmost of the group, at 9:25 a. m. on the 8th, we came to for several hours to allow the naturalists to examine its shores. A dense fog prevailed during the night, but finally passed off, and we availed ourselves of the opportunity to locate the island astronomically. Getting under way at 2:25 p. m., we carried our investigations to the northward between the islands and the mainland, where the bottom proved exceedingly barren, with no signs of codfish. A black mud, which we frequently encountered, probably had something to do with their absence. A running survey was made in passing, which resulted in expunging two or three islands from the group and correcting the relative positions of others.

Having cleared the Walrus Islands we steamed to Hagemeister Channel, which lies between the island of that name and the mainland, anchoring at 7:30 p. m. to the westward of Tongue Point, a long gravel spit which makes out from the mainland. The tides were very strong, but our anchorage under the point was out of the strength of the current. Half a dozen Eskimos came off in their kaiaks ready to barter anything they had and drove quite a lively trade with the officers and men for a couple of hours.

We were delayed by fog next morning and lost several hours more by persistently attempting to follow the chart, which was very inaccurate and constantly leading us into shoal water; in fact, the day was nearly spent before we cleared the channel and off-lying banks. The bottom was still barren, with no sign of codfish. Work was carried on in a westerly direction until dark, when we lay to, intending to resume it at daylight, but a gale from SE. sprung up during the night and forced us to seek shelter under the lee of Cape Newenham, where we anchored at 3:45 a. m. June 10, in 7 fathoms, the extreme of the cape bearing SE. by S. magnetic. Furious squalls came down from the mountains and heavy tide rips surrounded us at times, but we rode them out safely and with little discomfort.

The disposal of our passengers became a serious problem. Two of the three Eskimos were quite ill, totally unable to handle a paddle or even help themselves. This not only rendered Mr. Petroff entirely helpless, as far as the management of his kaiaks was concerned, but

imposed upon him the additional burden of caring for his invalids. The necessity of landing the party among natives was too apparent to require second thought. The Kuskokwim is considered the most difficult and dangerous to navigate of any of the streams visited by the vessels of the Alaska Commercial Company in Bering Sea. We had no knowledge of the region, and our charts were not only inaccurate, but misleading; hence, I looked upon a trip up the river with no little anxiety. Getting under way at 9:15 a. m. on the 11th, we entered the Kuskokwim and reached a point 10 or 15 miles above Goodnews Bay without accident or detention, and were then supposed to be near a native village at which the party wished to land. Shoal water had already driven us so far from the low, monotonous coast that it was difficult to distinguish objects on the beach, and, fearing we might pass the settlement without recognizing it, we came to anchor and the party, with their baggage and kaiaks, was landed in boats at a camp of native beluga-hunters, about 10 miles from our own anchorage. These people received the party very kindly, assisted in pitching their tents, built a large fire, etc., and promised to see them safely to the village. They agreed also to furnish new men in place of those who were disabled. Having seen the party comfortably provided for, the officer in charge of the boats returned to the ship. We furnished Mr. Petroff with everything he wished or would accept, and, landing him among friendly natives, left him to prosecute his difficult and dangerous task.

Getting under way as soon as the boats were hoisted, we steamed down the river, but soon found shoal water where our chart gave from 10 to 15 fathoms. We followed the bank or shoal several miles without result, then anchored in 10 fathoms, as night was approaching and the tide falling. Another trial was made at daylight, but the same impassable barrier was found to seaward. The channel was open in the direction of Goodnews Bay, however, and we availed ourselves of it, but were soon enveloped in a dense fog and forced to anchor. We were under way again at 2:50 a. m. on the 13th, and steamed to Cape Newenham without difficulty or delay, but found a gale blowing outside and were glad to seek shelter under the lee of the land near our old anchorage. Thick misty weather prevented our obtaining observations, but we took such angles as we could to correct the chart in our immediate vicinity, for it was woefully out.

Cape Newenham to Unalaska.—The gale subsided about noon, and at 2 p. m. we got under way and commenced a line of dredging and fishing stations in the direction of Northwest Cape of Unimak, the lack of fuel preventing the extension of our investigations farther north. The beam trawl showed a rich and varied fauna, but no codfish were taken with the trial lines until we were about 30 miles from Cape Newenham, the great body of fresh water flowing from the Kuskokwim being sufficient, probably, to account for their absence. Soundings were continued throughout the short night, the beam trawl and trial

lines being brought into requisition at daylight, repeating our experience of the previous day, except that the bottom at the various stations was composed largely of black or green mud. Scattering specimens only of codfish were taken.

The sun came out during the afternoon, and we availed ourselves of the long-sought opportunity of swinging ship for the purpose of ascertaining compass errors. A dense fog shut down while we were taking the last azimuth, so we congratulated ourselves on the success of the evolution. Work was resumed until dark and sounding continued throughout the night, but a southeast gale sprung up suddenly on the morning of the 15th, which put a stop to our work and, in fact, drove us into port a day or two earlier than was intended. A heavy sea was encountered, particularly while crossing the several passes into the Pacific, and we were obliged to adopt measures never before considered necessary on board of this vessel, to protect skylights, windows, etc. Fog and mist obscured the land until we were within a few miles of Iliuliuk, Unalaska, where we arrived at 9 p. m. the same day.

The revenue cutter *Bear*, Alaska Commercial Company's steamers *Dora* and *Karluk*, and the North American Trading Company's steamer *Arago* were in the harbor, two of them requiring coal. The *Bear* left for the north at daylight on the 17th. The schooner *Mattie T. Dyer* arrived the same afternoon and was seized by the collector for illegal sealing in Alaskan waters. The deputy United States marshal made written application on the 18th for assistance in removing the captured schooner to a place of safety, and in compliance with his request she was taken to the inner harbor and securely moored by an officer and party of men from this ship.

The gale continued until the 19th. We coaled ship on the 20th and 21st, taking 100 tons, not enough to fill the bunkers, but all we could get, owing to a temporary scarcity at the station. The Alaska Commercial Company's steamer *St. Paul* arrived from San Francisco on the 23d, bringing us mail and supplies which were taken on board, and at 6:30 p. m. we got under way and proceeded to sea, bound for Bristol Bay. The weather was overcast with drizzling rain, mist, and fog, which frequently obscured the land.

Slime Bank.—Work was continued at daylight next morning off the Northwest Cape of Unimak, successive lines of dredging and fishing stations being run tangent to the coast. The beam trawl developed an abundance of life on the bottom and the use of the hand lines soon proved that we were on prolific codfish grounds. Fishermen have given it the name of Slime Bank, from the numbers of medusæ brought up on their gear. These jellyfishes are of a brownish or rusty color, from 6 to 18 inches in diameter, have long slender tentacles, and are well armed with stinging organs. They were not seen on the surface, but inhabit an intermediate space, probably near the bottom, for late in the season, when their numbers have greatly increased, the fisher-

men do not allow their hooks to reach the bottom, but fish over them, as they express it, in order to escape their sting, which soon makes their hands sore. An old codfisherman who has spent several seasons on this bank said the slime (medusæ) became so thick on the bottom late in the season that they had great trouble sometimes in lifting their dory anchors through it. Dread of handling the stinging cells had as much to do with the difficulty, probably, as the weight brought up by the rope and anchor.

We found the bank to extend from the Northwest Cape of Unimak to within 10 or 15 miles of Amak Island, embracing depths from 20 to 50 fathoms, scattering specimens being taken outside of this limit. It is about 85 miles in length, with an average width of 17 miles, covering an area of 1,445 square miles. The character of bottom as given by the lead was generally black sand and gravel, pebbles being frequently added, with rocks near shore and mud in the greater depths.

At 8:20 p. m., June 25, we anchored off Cape Glasenap, or Round Point, in 9 fathoms. The weather was foggy during the afternoon, with increasing wind, which induced us to seek protection under the land. An examination of the entrance to Izenbek Bay developed a bar extending from Cape Glasenap to the low island, over which not more than 2 fathoms could be carried at low water. A small vessel drawing from 8 to 10 feet might find a harbor inside of the cape, but its limits would be small, as most of the area is laid bare at low water. A school of walruses were playing outside of the surf for hours, but they did not come near the ship. Several being seen hauled out on a low protecting point of Cape Glasenap, Mr. Townsend landed and attempted to get within rifle range, but they were watchful and timid, and, as he was obliged to land to windward, soon scented him and took to the water. The fog continued next day, but lifted for a few minutes at a time, enabling us to see several miles. Being anxious to visit Amak Island, we got under way at 1:30 p. m., ran a line of dredging and fishing stations along the land for about 10 miles, then across to the island, where we anchored at 6 p. m. in 10 fathoms, the extremes of land bearing S. by E. ¾ E. and WSW. ¾ W. (magnetic). This is a fairly good anchorage, with SW. winds.

Amak Island is of volcanic origin, between 2 and 3 miles in length, and about 1,700 feet in height. There are plateaus from 30 to 150 feet above the sea, extending back 500 or 600 yards from the beach, covered with a thick coating of moss, through which rank grass was showing. Flowers were beginning to bloom, giving the surface quite a cheerful aspect. Near the center was a rugged precipitous mountain of dark-brown rock entirely void of vegetation. No life was seen on the island, except three or four migratory birds, and it did not prove a profitable region for the naturalists. The weather was generally overcast with fog and mist on the morning of the 27th, but the sun came out at intervals. We could not reconcile our runs with the position as-

signed to the island on the charts, and, knowing that observations had not been made on it, in modern times at least, we considered the chance worth waiting for, and fortunately obtained good sights for latitude and longitude. The island is the one distinctive and unmistakable landmark in the vicinity; hence our anxiety to locate it exactly. The Southeast Point was found to be in latitude 55° 25′ 05.6″ N. and longitude 163° 07′ 33.6″ W. There is foul ground off the northwest extremity of the island, some rocks awash; and between 2 and 3 miles distant is Sea Lion Rock, several hundred yards in extent and about 150 feet in height, on which is a large rookery of sea lions. We found the schooner *Olga* at anchor off Amak Island, waiting favorable weather to secure a sufficient number of these animals to supply her native sea-otter hunters with skins for bidarkas.

No codfish were taken within 10 miles of Amak Island, or between it and the mainland, except scattering specimens. Sea lions and walrus doubtless destroy and drive away fish from their immediate vicinity, but over this large area there must be some other cause, and it may, I think, be attributed to the lack of food, as we found the bottom exceedingly barren.

Baird Bank.—Getting under way at 1:53 p. m., we continued our explorations in a northerly direction, and soon found ourselves approaching excellent codfish grounds. The bottom fauna was abundant, and the fish captured were large and in good condition. Near the shore, in depths less than 20 fathoms, the bottom was covered with mussels, sponges, and large barnacles in clusters, adhering firmly to rocks and stones, their elevated cutting edges soon wrecking the nets. Conditions improved with each line of stations, and, arriving off Port Möller, we found ourselves on the best fishing-ground we had yet found in Bering Sea. It was evident that we were developing a great cod bank, the extent of which was not yet defined.

The schooner *Vanderbilt*, of San Francisco, was found at anchor off Port Möller with nearly a full fare of codfish, which she had taken in that vicinity.

Port Möller.—Leaving the schooner at 2 p. m., June 29, we anchored outside of Entrance Point, Port Möller, at 5:45 p. m. We were, as before stated, unable to procure a full coal supply at Unalaska, and, rather than wait the arrival of a cargo which could not be expected for a month at least, decided to extend our explorations to this place and take our chances of replenishing the bunkers from a recently opened coal mine in Herendeen Bay, a branch of Port Möller. The delay could be no greater, at least, and we might be able to procure sufficient fuel for the completion of the work in Bristol Bay. The region is unsurveyed, and the entrance guarded by banks and shoals over which the tide sweeps with great force, making the channel difficult and dangerous, its ill repute having, in fact, caused the great bay and its tributaries to remain almost a *terra incognita* to the navigator. The dis-

covery of coal will necessitate a survey, and with it many of the dangers will doubtless disappear.

It was blowing a moderate gale from the southeast when we anchored, and it had diminished but little in force next morning, but, the fog lifting, we got under way and picked our route carefully through narrow, intricate channels across Port Möller to the entrance to Herendeen Bay, and, two hours later, found a snug anchorage under Point Divide, where we were protected from the heavy southerly wind then blowing. I left the ship soon after anchoring, and, accompanied by Prof. Gilbert and Chief Engineer Roelker, visited the mine. Ten miles of the distance was made by boat, and about a mile and a half over a tramway recently constructed for transporting coal to the water front. A tunnel had been driven into the hillside about 200 feet, and between 70 and 100 tons of coal taken out. The superintendent estimated the average output for the mine for the next month at from 10 to 20 tons per day. A 40-ton lighter was in process of construction, and they only waited its completion to commence the delivery of coal.

The close of the fiscal year finds officers and crew in excellent health and the ship in good working order. The ship has maintained her usual reputation for excellent sanitary conditions during the entire year. There has not been a single case of sickness on board that was due to removable local causes, and no serious accident or serious illness has occurred.

Natural history results.—Work commenced south of the Sannak Islands on the 21st day of May, in 483 and 313 fathoms, extending to the westward of the group in gradually decreasing depths until 38 fathoms was reached. In the deeper waters several species of sea-urchins and shells were taken, and crinoids, shrimps, corals, alcyonarians, holothurians, and various species of fishes were marked features of the hauls, *Careproctus* and *Myctophum* being among them. Drawing shoreward, and changing the character of the bottom from mud to sand, the varieties of fish increased; *Bathymaster*, *Sebastodes*, and *Lycodes*, besides several species of flounders and sculpins, were abundant. Of invertebrates there were at least half a dozen species of sponges, an abundance of sand-dollars (*Echinarachnius*), shrimps, ophiurans, shells, and basket stars (*Astrophyton*).

The line of investigation was extended to Bering Sea, via Unimak Pass, in depths from 41 to 178 fathoms, and revealed a fauna of great abundance and variety of species, particularly in the pass and along the 100-fathom curve in the direction of the seal islands. Among the more conspicuous were many flounders, sculpins, skates, pollock, *Bathymasters*, and codfish, with small *Agonidæ*, eelpouts, etc. Invertebrates were abundant, ascidians, annelids, and miscellaneous crustacea occurring in addition to those before mentioned. A marked change in the fauna was found upon deepening the water to 225 fathoms north of Unalaska. The sandy bottom gave place to soft mud, the

shrimp or prawns were larger, *Sebastolobus* took the place of *Sebastodes*, and the various shoal-water flounders were replaced by those of deeper habitat.

Commencing at the head of Bristol Bay, off the Naknek River, in depth of 3 to 8 fathoms, sand, a variety of fish were taken, such as sea trout (*Hexagrammus*), flounders, young salmon, rock-cod, sculpins and a few specimens of *Liparis*, with scattering specimens of shrimp, shells, starfish and other invertebrates.

Off the entrance to the Nushagak River, in depths of 5 to 12 fathoms, sandy bottom, with occasional patches of gravel or pebbles, half a dozen species of starfish were found in great numbers; sea-urchins were taken by the bushel; and shrimps, crabs, sponges, annelids, mollusca, sea-anemones, hydroids, and bryozoa were abundant. The fishes were represented by *Hexagrammus*, *Murænoides*, pollock, several species of sculpins and flounders, besides a variety of small obscure species.

Scattering specimens of codfish were taken with the hand lines, but they were more plentiful off Cape Constantine in from 12 to 18 fathoms, sand or gravel bottom. Our route from the Nushagak to the Kuskokwim was inside of the Walrus Group and through Hagemeister Channel. Fine sand bottom was found from Cape Constantine to Round Island, muddy bottom thence to the vicinity of Hagemeister Island, and sandy thence to Cape Newenham. Investigations were confined to 20 fathoms or less, yielding an occasional codfish or young halibut, pollock, five or six species of flounders; Arctic tomcod and sculpins were quite plentiful. Alligator-fish, capelin, and a variety of *Agonidæ*, besides several other species of small size, were found, many of them undescribed. Shrimp and prawns were large and conspicuous in the hauls; many of them are doubtless undescribed. The bulk of most of the hauls was composed of starfish. There was a greater variety among the ascidians found at the different stations than among other invertebrates. Shells, sand-dollars, ophiurans, hermit-crabs, and astrophytons of about the same species were generally distributed over the region, while hydroids and bryozoa occasionally appeared.

From Cape Newenham toward the northwest cape of Unimak the depth increased to 25 fathoms, gravel bottom, 6 miles from land; shoaled to 13½ fathoms, fine gray sand, at 26 miles, then gradually increased to 26 fathoms, with the same character of bottom at about 60 miles from the cape. From this point mud began to appear, and soon became the principal ingredient of the bottom soil.

Scattering codfish were found on the gravel bottom; were fairly abundant on the rise from 13½ to 25 fathoms, and gradually disappeared as we approached muddy bottom. Several species of flounders and sculpins were taken; alligator-fish and other small species were common; and clusters of large barnacles, mussels, and a few other shells were taken, besides the common forms of invertebrates. As the character of the bottom changed, and mud became mixed with the sand,

great beds of ophiurans were found, 10 bushels or more having been brought up at a haul. Shells, such as *Trophon* and other forms, were abundant on the same ground, most of them being occupied by hermit-crabs. A number of large crabs were also taken. Large holothurians and astrophytons were common, and naked mollusks were conspicuous as we deepened the water. Flounders, sculpins, young pollock, alligator-fish, and the other small species were distributed generally over the ground; in fact, the contents of the net varied but little after the first few hauls.

From the Northwest Cape of Unimak to Port Möller, including the region called Slime Bank and a portion of Baird Bank, a uniform richness of life on the bottom was observed. The depths varied from 12 to 50 fathoms, with sand, or sand and gravel, bottom. Codfish were abundant, and the variety of fishes obtained exceeded anything seen in localities previously visited. While the great mass of invertebrates resemble those taken on other grounds in Bristol Bay, special attention was attached to the variety of sponges and the great numbers of medusæ. The latter float near the bottom in such masses as to become a serious detriment to the fishermen. Gorgonians of various kinds, and bryozoa were found near the shores.

There was one exception to the general richness of the fauna in this region, the vicinity of Amak Island being found exceedingly barren.

The following is a brief summary of the general movements and operations of the ship during the year:

Total number of days at sea		114
Total distance run by observation	miles	12,963
Total distance run by log	do	13,236
Total number of deep-sea soundings		1,025
Total number of dredging stations		275
Total number of deep-sea fishing stations		149

PERSONNEL.

The following officers were attached to the vessel at the end of the fiscal year: Lieut. Commander Z. L. Tanner, U. S. N., commanding; Lieut. C. G. Calkins, U. S. N., executive officer and navigator; Ensign Marbury Johnston, U. S. N.; Ensign E. W. Eberle, U. S. N.; Ensign C. M. McCormick, U. S. N.; Ensign Wm. W. Gilmer, U. S. N.; Passed Assistant Surgeon Jas. E. Gardner, U. S. N.; Passed Assistant Paymaster Charles S. Williams, U. S. N.; Passed Assistant Engineer C. R. Roelker, U. S. N.

The civilian staff was as follows: Prof. Charles H. Gilbert, naturalist in charge; Charles H. Townsend, resident naturalist; A. B. Alexander, fishery expert; N. B. Miller, assistant naturalist; H. C. Fassett, captain's clerk.

THE FISCAL YEAR 1890-91.

BERING SEA, JULY AND AUGUST, 1890.

Herendeen Bay.—The *Albatross* was at anchor under Point Divide, the entrance to Herendeen Bay, on June 30, 1890. We had called to ascertain if coal could be procured from a recently opened mine, and were informed by the superintendent that he could commence delivery in about a week, providing a lighter he was building could be completed. We sent a carpenter to assist in the work, and rendered all practicable aid in order to get a supply of fuel as quickly as possible. In the meantime we commenced a survey, which was continued during our stay, and resulted in a chart in sufficient detail for purposes of navigation. It includes the entrance to Port Möller; the channel from Entrance Point to Point Divide, called by us Hague Channel; the narrow and intricate channel from the last-mentioned point to Marble Point, which we named Johnston Channel, after the officer who surveyed it, and a general examination of the bay, including Mine Harbor, the shipping-point and headquarters of the company. On the morning of July 2 we moved about a mile inside of Point Divide and anchored in 15 fathoms. The tide ran ebb until 3 p. m., with a velocity of 3 or 4 knots per hour, with smooth water and nothing to indicate an insecure or undesirable anchorage. A few minutes later the flood tide came in with a bore between 2 and 3 feet in height, and when it struck the ship she picked up her anchor and started up the bay, but a second anchor with a long scope of chain brought her up. Heavy tide rips continued for hours, making it unsafe for a boat to approach the ship. The strength of current measured by the patent log was between 8 and 9 knots per hour.

It was evident that we could not remain in our new berth, so at slack water we worked our way through the narrow passage before mentioned between Point Divide and Marble Point, anchoring an hour later in the upper bay, within 3 miles of Mine Harbor. A small quantity of coal was procured on the 3d and tested in the steam gig. It burned freely, with a long flame and straw-colored smoke, to a white ash and cinder, but no clinker. This result was equally gratifying to us and the superintendent of the mine.

The 4th of July was celebrated by dressing ship with flags at the mastheads and peak, the first time the national holiday was ever observed in Herendeen Bay by a United States vessel.

We moved to Mine Harbor on the 5th, and moored in 17 fathoms, where we found good swinging room about a quarter of a mile from the coal dump on the beach. The lighter was launched on the evening of the 7th and brought alongside on the 9th, with the first load of 43 tons

of coal from the new mine. The work of coaling continued until the evening of the 15th, when we had taken 137 tons, which nearly filled the bunkers. The weather during our stay was generally overcast with mist and fog, but the sun usually came out for a short time each day. An effort was made to locate Point Divide astronomically, and sufficient observations were made for longitude, but no opportunity occurred, either day or night, to obtain the latitude. We were more fortunate, however, in Mine Harbor, Low Point having been accurately located by excellent observations. The naturalists made numerous additions to their collections during our detention, and the hunters brought in several bears, reindeer, and other game.

Baird Bank.—Getting under way on the morning of the 16th, we steamed out without difficulty and resumed work. Lines of soundings were run off and on shore, the beam trawl being frequently used, and trial lines put over at every station occupied during daylight. We found that Port Möller was near the center of the most important cod bank yet discovered in Bering Sea. Commencing at Amak Island, it extends to the vicinity of Cape Chichagof, a distance of 230 miles, with an average breadth of 40 miles, having an area of 9,200 square miles, with depths from 15 to 50 fathoms. The character of the bottom was usually fine gray sand, varied by black sand, black sand and gravel, and occasional rocky patches near shore. While codfish were found at nearly every station, numbers and quality varied with the locality. They were smaller and in poorer condition near the shores, the best fish being found between 25 and 40 fathoms, and they seemed to be most plentiful in the Port Möller region.

As this is the largest and most valuable of the fishing-grounds yet developed in Bering Sea, we have called it Baird Bank, after Prof. Spencer F. Baird, the first U. S. Commissioner of Fish and Fisheries, through whose efforts these investigations were inaugurated.

Baird Bank and Slime Bank, having an area of 10,645 square miles, extend for more than 300 miles along the northern shores of Unimak and the Alaska Peninsula, without a single harbor that the fishermen have hitherto availed themselves of, yet it is a favorite fishing-ground. The weather is usually pleasanter than in the Pacific; it has a weather shore with the prevailing summer winds, and a well-found vessel may anchor anywhere on the banks and ride out the usual summer gales without much risk or discomfort.

Our survey of Port Möller entrance and Herendeen Bay will render those harbors available hereafter, and there is an excellent beach at Mine Harbor for hauling a schooner out if necessary. The rise and fall exceeds 15 feet, and would give several hours each tide to examine or make repairs on a vessel's bottom. Should the coal mine be developed, as seems likely, the place would afford some facilities for repairing and refitting. Water is easily procured, and fuel can be had in any quantity,

Port Haiden.—Port Haiden is said to be a good harbor, but we did not examine it. Should a survey show it to be safe and easy of approach, it will prove a great convenience to vessels employed on the northern portion of the bank.

Ugashik River.—The Alaska Commercial Company's schooner *Pearl* enters the Ugashik River, but there is a wide bar to cross having intricate channels, strong currents, and usually a heavy swell. Once inside, there is a good harbor, but it could hardly be considered available for the ordinary purposes of a fisherman.

Head of Bristol Bay.—The head of the bay to the northward of a line drawn from the Ugaguk River to Cape Constantine has no value as a cod-fishing ground. The water is not only too fresh, but the enormous discharge from various streams in the vicinity, in conjunction with the naturally strong tidal streams, induces a current which holds in suspension sufficient sand and mud to account for the absence of codfish without looking for other causes. We took scattering specimens, it is true, but their emaciated condition was sufficient evidence of their having strayed from their usual feeding-grounds.

Naknek River.—Salmon are found in the Naknek River, and there are one or more firms engaged in that industry. Vessels of any size may reach an anchorage off the mouth of the river by keeping the eastern shore aboard, notwithstanding the inaccuracy of the charts. Shoal water will be found whenever the western side is approached.

Nushagak River.—The salmon fisheries of the Nushagak River have assumed important proportions, and will doubtless attract numbers of people to that region. It will have little interest for the cod fishermen except as a possible port of refuge, where wood and water and such supplies as they would be likely to need can be obtained. It has not been considered a desirable place to visit, and the defective charts, strong tides, numerous shoals, and liability to encounter thick weather all militate against it; but with the surveys made by this vessel and the assistance of native pilots, to be found at Protection Point, a fishing schooner should be able to enter and leave the river with comparatively little risk or delay.

Kulukak Ground.—Kulukak Bay occupies a large portion of the region between Capes Constantine and Newenham, including the Walrus Group, Hagemeister Island, and Cape Peirce. As codfish are found in various isolated spots hardly deserving the appellation of banks, we have, for convenience, included the region under the single title of the Kulukak Ground. There are extensive shoals outside of Hagemeister and the Walrus islands, 6 fathoms being found about 18 miles to the southward of the latter. The spots are outside of these shoals, as well as to the eastward and westward of them, in from 12 to 25 fathoms, where codfish may be taken at times quite plentifully, but they are smaller than those on Baird Bank.

Mine Harbor, Herendeen Bay.—Our fuel being nearly expended, we returned to Herendeen Bay July 23 for another supply. This bay has a large area with several arms, and to distinguish the shipping-point more definitely we have called it Mine Harbor.

Work had progressed favorably during our absence, and we found over 100 tons of coal on the beach awaiting our arrival. The method of transporting it to the ship may be described as follows: A single lighter, having a maximum capacity of 40 tons, was moored near the shore at high tide and the coal wheeled on board in barrows over a gang-plank supported on trestles. As the tide fell it would be left high and dry, the work proceeding until the next high tide, when we would tow it alongside with the steam cutter, discharge the coal as soon as possible, and moor it again near the beach, when the process would be repeated. The mine is about 1¼ miles from the landing, the coal being transported by a small steam motor over a light tramway. As the opening of this mine is an event of no little importance to all vessels visiting Bering Sea, the following report of Passed Assistant Engineer C. R. Roelker, U. S. N., chief engineer of this vessel, on the results obtained by the consumption of 80 tons of this coal, will be read with more than usual interest. It is dated July 24, 1890:

The following statement regarding the coal received from the mine recently opened at Herendeen Bay is based on the results obtained with some 80 tons of this coal consumed while this vessel was engaged in her usual work at sea, under average conditions. The quantities of coal consumed, and of refuse matter, were carefully measured, the behavior of the coal in the furnaces was closely observed, and the results obtained have been deduced from the entries in the steam log.

The average consumption of the coal was at the rate of 25 pounds per square foot of grate per hour. The boilers furnished the same amount of steam as when we have been using a fair quality of Wellington coal; but to obtain this result we had to burn from 20 to 25 per cent more of the Herendeen Bay coal. The coal ignites readily and burns with considerable flame, forming a closely cohering coke, which easily breaks up into small pieces; thus a considerable amount of small particles of coal is lost through the grates. There was a large proportion of fine stuff in the coal, which burned well, but contained an excessive amount of refuse matter.

The refuse amounted to 26 per cent of the total weight of fuel consumed; it consists of ash and cinders, no glassy clinkers being formed. The smoke produced is lighter in color than that of Wellington coal, and less soot is formed.

To form a correct estimate of the value of this coal for steaming purposes from the foregoing statement, the following facts should be taken into consideration, viz: The coal received by us was the first lot taken out from the newly opened mine; it came from one of the smaller veins, through which a tunnel had been driven then a distance of 200 feet in order to get access to the main veins; no proper facilities for screening the coal existed, and in order to supply the quantity required by us, a large amount of fine coal containing much dirt was delivered. It may be reasonably expected that as the mine becomes further developed and proper screening facilities are provided, the amount of refuse matter in the coal will be greatly diminished, and its steam-generating power correspondingly increased. It will be, however, absolutely necessary to store this coal under shelter, as it appears to absorb moisture readily, and the constant rains which have prevailed in this region during the present season would soon saturate it to such an extent as to greatly diminish its value as a fuel.

This report gives an accurate statement of the steaming qualities of the coal received from the mine compared with the Wellington coal, and, considering that it was taken from a vein near the surface, the extra amount required to furnish the same quantity of steam will not seem excessive. It is shown that the coal possesses merits, and it will doubtless improve with the development of the deeper veins.

Work was resumed on the survey as soon as the vessel came to anchor, and, although the weather was unfavorable, many soundings were taken, besides some further triangulation. Reindeer and bears were plentiful in the mountains surrounding Herendeen Bay, and several were brought in by the naturalists and officers. We finished coaling on the evening of the 27th, having taken aboard 128 tons, 25 tons being in bags on deck.

Boisterous winds with driving mist and fog detained us during the 28th, but we were under way early the following morning and steamed out by the rough chart of our recent survey, which was found quite accurate and sufficient for the present purposes of navigation, except at the entrance to Port Möller, where more soundings are required to properly develop the channel and the region between Entrance Point and Walrus Island.

Strong southerly winds and heavy head seas were encountered, which, in addition to a dense fog, made our progress exceedingly slow and uncomfortable, but we finally arrived safely in Iliuliuk, Unalaska, at 10:50 a. m., July 31. Arrangements were made for a supply of coal on our return, and at daylight August 2 we proceeded to sea. A line of soundings was commenced off Cape Cheerful and carried to Bogoslof, an active volcano in 53° 55′ N. and 168° 1′ W. The maximum depth was 885 fathoms about midway between Cape Makushin and Bogoslof.

Bogoslof Island and Volcano.—The first authentic account of this interesting locality is from Capt. Cook, who passed between the position of Bogoslof and Umnak in 1778, and discovering a rock which at a distance resembled a ship under sail, he named it Sail Rock. It must have been the only conspicuous object near by at the time or he would have mentioned that fact. Old Bogoslof, as it is now called, was thrown up about 400 yards from Sail Rock in 1796, after an earthquake, and, according to Baranoff's report, remained active until 1815 at least; I do not know how much longer. It must have undergone many remarkable changes during its period of activity. Capt. Wassilieff reported that at one time it attained an altitude of 2,240 feet, whereas it is now but 370 feet in height and greatly diminished in bulk. New Bogoslof is located on the opposite extremity of the same platform, the total length of the island, including the old and new cones, being about 1¼ miles NW. by N. and SE. by S. (magnetic), and a little less than a mile in width.

The natives of southern Unalaska reported that Bogoslof was smoking in 1882, but there is no report from the island until September 27,

1883, when Capt. Anderson, of the schooner *Matthew Turner*, passed near it and reported a new Bogoslof, with flame, smoke, and steam issuing from the crater and numerous fissures in its sides. The revenue cutter *Corwin* examined it in 1884, when it was still active, and a subsequent visit in 1885 developed no material change. Sail Rock was reported to be 86 feet in height.

The *Albatross* passed within three quarters of a mile of the island on the afternoon of August 2, 1890, but did not land. It was an unusually clear day, Makushin and the high lands of Umnak being distinctly visible. Sail Rock had fallen, its original position being marked by the débris. New Bogoslof was enveloped in smoke and steam so dense that its outlines could not be accurately determined, but its altitude was not far from 400 feet. There were no outlying dangers visible, and a couple of soundings taken 2 miles from the old cone on different bearings gave 649 and 578 fathoms, the latter being on the reef marked on old charts as extending from Bogoslof to the north end of Umnak. It is needless to say that this reef does not exist. Myriads of guillemots were seen on the island and for 15 miles or more around it, and a part of the beach was occupied by a rookery of very large sea lions. Old Bogoslof is rapidly crumbling away, and will, like Sail Rock, eventually disappear.

Bering Sea.—A westerly course was continued during the night, and at six the following morning the trawl was lowered in 1,033 fathoms, latitude 55° 53′ N., longitude 170° 50′ W., making a successful haul. The bottom was composed almost wholly of diatomaceous ooze, the absence of foraminifera being a marked feature in the waters of Bering Sea. The course was then changed to the northward, and soundings made at 50-mile intervals, which gave 1,745, 1,818, 1,625, and 69 fathoms, the latter in latitude 56° 50′ N., longitude 172° 30′ W., and near the 100-fathom line. Seals were frequently seen after we reached soundings, and, the fog lifting for a short time, two sealing schooners were sighted, with their boats out in the successful prosecution of their enterprise.

The line of soundings was extended to latitude 58° 43′ N., longitude 174° 43′ W., in 144 fathoms, giving the trend of the 100-fathom line about NW. ½ N., magnetic. A southerly gale sprang up during the evening of the 4th, and work was carried on the next day under many difficulties and unusual wear and tear of machinery. The rough weather told on our supply of fuel also, and finally induced us to turn to the southward during the afternoon of the 5th. Standing on all night under low speed and short sail, a sounding was made next morning in 1,887 fathoms, latitude 56° 50′ N., and longitude 175° 15′ W. Another one was taken during the afternoon in 1,998 fathoms, green ooze, in latitude 56° 02′ N., longitude 175° 35′ W. A bottom temperature and water specimen were taken in sounding, and subsequently serial temperatures and water specimens were taken to 1,000 fathoms, the temperatures ranging from 48° F. at the surface to 34.9° F. at the

bottom. The line was continued to the southward, with 50-mile intervals, the maximum depth, 2,145 fathoms, being found in latitude 54° 31′ N. and longitude 175° 32′ W. A very peculiar and irregular action was observed in the port engine during the 6th and 7th, which increased to such an extent that we stopped work and started for Unalaska. The trouble was traced to the port high-pressure valve, which was finally disconnected, and the low-pressure cylinder worked independently until our arrival in port.

Unalaska and vicinity.—We passed Bogoslof Volcano the morning of the 9th and arrived in Iliuliuk at 4:15 p. m. the same day. The revenue cutter *Rush* was in port, and the steamer *Arago* arrived from the seal islands on the 12th. Having made the necessary repairs to the machinery, we filled the bunkers with coal and left the harbor early on the morning of the 15th. Rumor placed valuable cod banks in the outer bay, but no one seemed to know their exact locality or extent. Such a resource at the doors of a populous settlement would be of inestimable value. Availing ourselves of the opportunity offered by a clear day, we ran several lines of soundings across the bay, making frequent hauls of the trawl and trials with the fishing lines, extending the examination to the 100-fathom line outside of Cape Kalekhta, or Priest Point, and Cape Cheerful, without finding indications of even ordinarily good fishing-ground. In fact, nearly every sounding inside of the capes gave muddy bottom. Spots were discovered, however, near the shore line, where cod were plentiful. An anchorage was found for the night in Wislow Bay, in 8 fathoms, near the small islet of that name, where there is good protection from southerly winds.

Work was resumed at daylight next morning and carried to Cape Makushin and thence to Makushin Bay, where we anchored for the night. The 100-fathom curve lies about 4 miles off shore at Cape Cheerful, but draws in abruptly to about a mile, and sometimes less, until up with Cape Makushin, and here, as in Unalaska Bay, codfish and halibut are found in spots along shore. From the cape a line of soundings was run to Makushin Bay, where we arrived at 5:50 p. m. A strong, southwest wind raised quite a swell in the bay, with an uninviting lee shore fronting the village, but we found a fair anchorage in 8 fathoms off the mouth of a glacial stream of yellow muddy water 3½ miles to the eastward of the settlement. The village of Makushin is composed of a small frame church painted white, a frame store belonging to the Alaska Commercial Company, and a dozen barabaras, or native earth huts, which were nearly buried beneath rank grass.

Unfavorable weather detained us during the 17th, but the seine was hauled with good results. Work was resumed on the morning of the 18th and continued with little interruption to the southwest end of Unalaska and north extremity of Umnak. From Cape Makushin to Umnak is about 60 miles, the 100-fathom curve extending from 12 to 23 miles from shore, giving an area of over 1,100 square miles on which

the lead showed favorable bottom, and the trawl developed a varied and abundant fauna, such as we usually found on cod banks in Bering Sea. Very few fish were taken, however, until we reached the vicinity of Chernoffsky, where cod and halibut were plentiful. Prospects were so favorable that I am inclined to think fish would be found there at certain seasons, if not the year round, and, should it ever become a fishing-ground, there will be no lack of safe and convenient harbors, for the west coast of Unalaska from Cape Makushin to Chernoffsky is a series of deep bays, some of them almost bisecting the island. Chernoffsky Bay is easy of approach and one of the most secure harbors in Bering Sea. The only direction necessary in entering is to keep a midchannel course. The village of the above name is situated on a narrow neck of land between the harbor and the sea, and is conspicuous when passing along the coast. The Greek church, store, and residence of the Alaska Commercial Company's agent are frame buildings, and the native population, 46 souls, live in barabaras. The men, like those of the other villages on the island, are hunters, and were away on their summer cruise at the time of our visit.

The examination having been completed to the northeast end of Umnak, a line of dredgings was run thence to the vicinity of Cape Cheerful in from 100 to 600 fathoms with satisfactory results, although the rough bottom was frequently destructive to the nets.

We returned to Iliuliuk on the evening of August 21 after an interesting and successful trip. The search for cod banks in Unalaska Bay was resumed the following day, which was unusually clear and pleasant. The region from Ulakhta Head to Elder Point was carefully examined, and the examination was extended to Broad and Nateekin bays without developing anything that could be called a fishing-bank Near the shores, however, particularly on the west side of the bay, cod were plentiful and halibut were fairly abundant. These shore fisheries will supply the local demand indefinitely, but nothing more. There was a large school of finback whales feeding in Broad Bay, during the day, which paid but little attention to us, simply moving out of the way or diving under the ship when we approached them. On one occasion the same school was seen playing around a whaler, but no attention was paid to them. Nothing but merchantable bone will tempt the modern whaleman. We returned to port the same evening.

Hydrographic information.—Bristol Bay may be said to include all that part of Bering Sea lying east of a line drawn from the Northwest Cape of Unimak to the Kuskokwim River. The island of Unimak and the Alaska Peninsula bound it on the east and separate it from the Pacific Ocean. The Naknek River is at the head of deep-water navigation, while the bay itself terminates in the Kvichak River, a few miles to the northward. The region about the Nushagak River, Kulukak Bay, and the Kuskokwim forms its northwest boundary.

The shore lines are usually low and without distinctive features, but high mountain ranges and volcanic cones extend along the central parts

of Unimak and the Alaska Peninsula. These rugged snow-covered mountains and lofty peaks would serve as unmistakable landmarks were they not obscured by the almost constant fogs which prevail in that region during the summer months. In fact they were so seldom visible during the season of 1890 that the officers of the *Albatross* made no pretense of using them as landmarks. The shore line and objects near the sea level were often visible beneath the fog when the higher lands were obscured, hence most of the available landmarks were found on or near the beach.

Unimak Pass to Port Möller.—The Northwest Cape of Unimak is low, with detached rocks, around which strong tidal currents sweep. The land falls away to the eastward in a gentle curve, forming an open bay about 4 miles in depth, between the cape and Cave Point, which lies NNE. ½ E., 16 miles from the former. It is a vertical rocky cliff about 150 feet in height, and takes its name from a cave on its face, inhabited by sea birds, which in summer time hover about it in thousands, making it conspicuous in clear weather by their numbers and in fogs by their constant cries. The snow-clad peak of Progrumnoi Volcano, rising to an altitude of 5,523 feet above the sea, forms a striking background to the low monotonous coast.

Passing Cape Lapin, a low bluff point 8 miles from Cave Point, the coast falls away slightly for 6 miles, when it turns abruptly to the eastward for about 5 miles, then takes a northerly direction, forming Shaw Bay. This bay is open to the northward, but affords protection from all winds from the southward of east or west. The approaches are clear and the water shoals gradually to 6 fathoms, black sand, about three-quarters of a mile from shore.

From Shaw Bay to Isanotski Strait the coast trends in a northeasterly direction, is very low and has several rocky patches extending from half a mile to a mile or more from shore, making navigation unsafe inside of the 12-fathom line. The volcano of Shishaldin rises 8,953 feet, about midway between the above points, and about 7 or 8 miles inland. Isanotski Strait is available only for vessels of the smallest class.

From the strait to Cape Glasenap, about 19 miles, the coast line retains the same general direction, and is very low until reaching the latter point, which is oval in form, about 150 feet in height, and has been called Round Point.

Izenbek Bay covers a large area at high tide, but much of it dries at low water; a small vessel may, however, find a secure harbor behind the cape. The channel follows close around the point and has from 10 to 12 feet depth on the bar.

Amak Island is of volcanic origin, about 2½ miles in length, 1½ in width, and 1,682 feet in height. It lies 11 miles northwest from Cape Glasenap. The beaches are mostly of huge water-worn bowlders, having vertical cliffs from 30 to 150 feet in height, with moss-covered plateaus, which in summer time are covered with a rank growth of grass

and wild flowers. The central peak is of dark-brown rock, exceedingly rugged and precipitous, and entirely devoid of vegetation. The southwest point was found to be in latitude 55° 25′ 05.6″ N., and longitude 163° 07′ 33.6″ W. There is foul ground off the northwest extremity of the island, several rocks awash or under water, and Sea Lion Rock between 2 and 3 miles distant. It is several hundred yards in extent, and about 150 feet high, its slopes being occupied by an extensive rookery of sea lions.

The Khudiakoff Islands extend about 19 miles NNE. ½ E. between Cape Glasenap and Moffett Point. They are but little above high water, and some of them are connected by narrow spits when the tide is out. From Moffett Point the low coast trends N. by E. 15 miles to Gerstle Bay; then to the northward and eastward about 55 miles to Wolf Point, on the west side of the entrance to Port Möller.

The Khudubine Islands occupy the last 23 miles of this distance. They are very low and it is difficult to distinguish them from the mainland, the only distinctive feature being a knob about 25 feet high on the east end of Kritskoi. The land between Herendeen Bay and Nelson Lagoon is very low. The snow-covered pinnacle of Aghileen, an extinct crater, and the still smoking cone of Pavloff Volcano, form an impressive background to the region north and east of Moffett Point.

Port Möller, Herendeen Bay, and vicinity.—Port Möller and Herendeen Bay have had no commercial importance until the recent opening of a coal mine in the latter, which has drawn attention to this almost unknown region. The *Albatross* visited the mine twice during the season of 1890 and made a survey which was found to be sufficiently accurate for purposes of navigation. The chart should be used with caution, however, until it is ascertained whether the extensive banks guarding the entrance are permanent or shifting.

To enter Port Möller from the southward, pass Walrus Island in from 10 to 12 fathoms and bring Entrance Point to bear ESE. It will then be about 8 miles distant, and have the appearance of being the southern extremity of a high and bold headland, the first that approaches the coast between that point and Cape Glasenap. Stand in, keeping the point on the above bearing until within 2 or 3 miles, when it will show as a low spit backed by a cluster of hillocks, the high land referred to being seen farther inland. Pass Entrance Point at a distance on 1 mile, steering about SSE. ½ E., and stand for Harbor Point, passing it within a quarter of a mile, where anchorage may be found. The point is low. A shoal makes off from Entrance Point about NW. by N., extending between 3 and 4 miles, and vessels making for the harbor from the northward are liable to run in behind it. Entrance Point should not be brought to bear to the southward of SE. after having approached within 4 miles of it.

To enter Herendeen Bay, bring Entrance Point to bear NE. ½ E., 1 mile distant, and Point Divide SSW. ⅜ W., 8¾ miles distant, then steer

for the latter, keeping it on that bearing until within 2½ miles, when the course may be changed to about SW. ¾ S., passing in midchannel between Point Divide and Doe Point. The least water is 4 fathoms at the entrance to the channel. Having cleared Hague Channel, bring Coal Bluff to bear SE. ¼ S., and stand in for it until Point Divide bears S. by E. ½ E., 1½ miles distant and about 400 yards open of Doe Point; then SSE. ¾ E., until Eagle Rock is abeam, keeping the above points a little open to clear Half-tide Rock. Then steer S. by E. ¼ E. until Shingle Point is abeam, when a course may be laid for Mine Harbor, giving Bluff Point a berth of about a quarter of a mile.

Mine Harbor is small but free from dangers, except Midway Rock, which shows at half tide. Anchor in from 12 to 15 fathoms, and if a vessel intends to remain any length of time it is advisable to moor. It is high water in Mine Harbor, full and change, at $8^h\ 0^m\ 0^s$, rise 15 feet, and it occurs at Entrance Point about two hours earlier, with a rise of 10 to 12 feet.

Hague Channel is 1 mile in width at its northern entrance, and is contracted to less than half a mile between Point Divide and Doe Point. The tidal streams are very strong, and near high water they sweep across the narrow channel and over the flats, making it impossible to steer a compass course. They are more regular near low tide, which is the best time to make the passage, as the channel is indicated by the flats showing above water on either hand.

Johnston Channel has from 7 to 15 fathoms of water, but is very narrow, with steep sides. It is difficult to find, but, once in, the navigation is comparatively simple, as the tides follow the general direction of deep water. The width of the northern entrance is a quarter of a mile, which it maintains with little variation until near the southern extremity, when it contracts to 250 yards. Having cleared the channel and entered the upper bay, there is ample room and depth of water in every direction, Crow Reef being the only outlying danger.

Anchorages may be found anywhere between Walrus Island and Entrance Point in case of fog, and a vessel may anchor in Hague Channel, but the tides are strong. There are fairly good anchorages under the north side of Point Divide and Doe Point, where near the bank a vessel will be out of the strength of the current. The *Albatross* anchored in midchannel a mile inside of the above points at the time of spring tides, and the flood came in with a bore between 2 and 3 feet in height, the patent log registering a 9-knot current for some time, with a swell which occasionally splashed into the scuppers. There is fairly good anchorage off the northern entrance to Johnston Channel, and an excellent one at its southern extremity off Marble Point, in fact, almost anywhere in the upper bay where the water is not too deep. The last quarter of flood tide is the best time to pass through this channel.

High land rises at the base of Harbor Point and extends to the northward and eastward near the center of the peninsula. Point Di-

vide is 50 feet high, and mountain ranges rise a few miles back. The coal measures are found between Mine Harbor and the head of Port Möller. Doe Point is 40 feet in height, while the rest of Deer Island and the mainland south and west of it is generally lower. The southern shores of Herendeen Bay are mountainous, with intervening valleys, the whole face of the country being covered with rank grass and wild flowers during the summer months; but there is no timber except occasional small poplars, alder bushes, and willows. Fresh winds with fog and mist blow across the low divides from the Pacific, obscuring the sun and greatly increasing the rainfall in Port Möller and vicinity.

The region is uninhabited except by men employed at the coal mine, yet bears and reindeer were plentiful and the waters teemed with salmon. There are no large fresh-water streams entering the bay, however, which probably accounts for the absence of Eskimos.

Port Möller to the Kuskokwim River.—The coast is low for 19 miles between Entrance Point and Cape Kutuzof, which rises in a rounded bluff to an elevation of 150 feet.

Cape Seniavin, 11 miles to the northward and eastward, is a rocky point 75 feet in height. Passing it, the low monotonous beach continues to the Seal Islands, a cluster of small hillocks near the beach, 12 miles from Cape Seniavin, being the only exception. The Seal Islands are composed of several small islets, but little above high water, strung along the coast for about 10 miles. Thence to Cape Strogonof the land continues very low.

Port Haiden is said to be a good harbor, but we did not examine it. Should a survey show it to be safe it will prove a great convenience to vessels employed on the northern part of Baird Bank. The approach to Port Haiden will be recognized by high, bold headlands which rise from its northern shore. Chestakof Island, low and crescent-shaped, forms the seaward side of the harbor, the channel lying between its northern extremity and a reef which makes out from the land. The same low coast extends to Cape Menchikof in nearly a direct line, the high land of Port Haiden gradually receding from the coast.

The Ugashik or Sulima River lies to the northward of Cape Menchikof and has been reported navigable for several miles by vessels of 14 feet draft. The schooner *Pearl* enters the river, but her captain reports a wide bar having intricate channels, strong currents, and usually a heavy swell. Ten feet is about all that can be carried in with safety. Once inside it is reported to be a good harbor, but it can hardly be considered available for the ordinary purposes of fishing vessels.

Cape Grey, a bluff 243 feet in height, and a peculiar-notched mountain some distance inland, are good landmarks for the river. The low coast continues from the cape to the Ugaguk River, and thence to the Naknek River, with hardly a distinguishing feature except Johnston Hill, a solitary elevation 5 miles from the beach and about 9½ miles S. ½ E. from the mouth of the Naknek. The coast sweeps in a graceful

curve to the northward between Cape Grey and the Ugaguk, and thence to the eastward to the Naknek River. A narrow gravel bank lines the coast in several places, behind which a strip of water is seen particularly at or near high tide.

The Naknek River may be considered at the head of deep-water navigation in Bristol Bay. The *Albatross* found anchorage in 6 fathoms about 6 miles southwest from Cape Suworof, the water shoaling rapidly to 3 fathoms toward the head of the bay. Vessels of moderate depth can pass the bar at high water, but there is hardly depth enough to float a ship's boat when the tide is out. It is deeper inside, however, and a small vessel may find anchorage with swinging room. There is a fishing station on the river which is visited periodically by a small steam tender. The South Head is in latitude 58° 42′ 04.3″ N., and longitude 157° 02′ 45.4″ W. High water, full and change, 1^{h} 05^{m}; rise 23 feet, approximate. Shoal ground makes off from the west shore, confining the channel in one place to about 3 miles in width. It may possibly be a middle ground with a channel on the other side, but the conditions off Etolin Point seem to discredit it.

The Nushagak River is assuming considerable importance as the location of a trading station and several large and well-equipped salmon-canning establishments. Protection Point, at the entrance to the river, is 50 miles SW. by W. from Naknek River, and, owing to swift currents and extensive shoals, it may be classed among the most intricate pieces of navigation in Bristol Bay. A 6-knot current is frequently encountered; hence the shifting of banks and shoals must be expected, and the necessity for the constant use of the hand lead becomes too obvious to require remark; indeed, the warning from a lead on each side will leave but a small margin of safety at times. The land on both sides of the entrance is very low and it is difficult to recognize Etolin Point, even under favorable conditions. A vessel from the westward would make the Walrus Group and follow the coast to Cape Constantine, and, having cleared the outlying shoals, stand in for Protection Point, which is difficult of recognition from a distance.

Nichols Hills, 280 feet in height, are a cluster of rounded elevations 5 miles northwest of the above point, and they are the first natural objects distinguishable on the peninsula. Bring them to bear WNW. and stand in, keeping them on that bearing until Protection Point bears about south, and anchor, making due allowance for falling tide.

There is a pilot station on the point with a small flagstaff, on which a flag will be hoisted if the pilot is at home. He is an Eskimo and speaks very little English, but he knows the channel. If he is not at the point when the vessel arrives, he will probably be at Ekuk and may be expected on board within a few hours if the weather is not too rough for his kaiak. A stranger should not attempt to go above Protection Point without a pilot. Clark Point is a bluff 200 feet in height, 18 miles N. by W. from Protection Point. The land begins to rise below Ekuk, reaches its greatest elevation at Clark Point, and varies

from 100 to 150 feet in height to Nushagak. The usual anchorage is from a mile to a mile and a half above Clark Point. Ekuk is an Eskimo village located on the bluff about 3 miles below the point. The west side is generally lower, but from Coffee Point to the northward bluffs rise from 50 to 200 feet.

The reconnaissance of the Lower Nushagak was made during the few days we were detained in the river. The principal points are located by triangulation and Clark Point by astronomical observations. The reduction of soundings to low water depended upon the tides during our stay. It is to be regretted that we were unable to extend the soundings to the west shore.

The Nushagak Packing Company have a cannery at Clark Point, and there are three others, also a trading station, on the river, the latter at Nushagak, formerly called Fort Alexander. Vessels of moderate draft can reach the canneries and with a little care find anchorage with sufficient water even during the lowest tides. The timber line is well defined about 3 miles below the mouth of Wood River and extends to the westward as far as the eye can reach. The weather was pleasant during our stay, and from all reports there is less fog in the Nushagak than in any other part of Bering Sea.

Clark Point, foot of bluff, is in latitude 58° 49′ 14″ N. and longitude 158° 31′ 43.9″ W. High water, full and change, $00^h\ 53^m\ 00^s$ (approximate); rise, 24 feet; variation, 23° 40′ E.

Cape Constantine, the southeast extremity of land at the entrance to the Nushagak, is very low, and shoals extend 10 or 12 miles to the southward and eastward, making its approach in thick weather very dangerous. There is said to be a channel between the cape and the first shoal, but the report requires verification. The coast increases in height to the westward of the cape, the headlands in Kulukak and Togiak bays reaching an altitude of 500 feet or more.

The Walrus Group is composed of three islands and three rocks, all above water, extending 16 miles east and west and about 6 miles north and south. Round Island, the easternmost of the group, lies W. ½ S., 86 miles from Cape Constantine. It is very nearly 2 miles in length, three-quarters of a mile wide, and about 800 feet high, its west end being in latitude 58° 36′ 09″ N. and longitude 159° 57′ 51.7″ W. Crooked Island is between 4 and 5 miles in length and 2 miles at its greatest width. The eastern part is rather low, but toward the western extremity the elevation is nearly equal to that of Round Island. There is quite a large bay on the northeast side, but we did not examine it. High Island, the westernmost of the group, is 4 miles in length, about a mile in width, and 900 feet or more in height.

The Twins, 4 miles to the southward of Crooked Island, are two isolated rocks the larger 300 and the smaller 100 feet in height. Black Rock, about 150 feet high, lies 1 mile to the northward of the south end of Crooked Island. No other outlying dangers were seen in passing between the islands and the mainland. From 6 to 10 fathoms were

found abreast of the group, the depth gradually decreasing to 3 fathoms off the north end of Hagemeister Island. We were near the shore, however, and would doubtless have found more water in midchannel.

Hagemeister Island lies 9 miles west of High Island, is 14 miles in length and 8 in width. It is mountainous except for about 5 miles at the north end. Shoal ground surrounds the island and extends from 20 to 25 miles to the eastward, including the area between Hagemeister and the Walrus Group.

Hagemeister Channel is about 16 miles in length and lies between the island of that name and the mainland. It is from 3 to 4 miles in width, but long shingle spits contract it in two places to less than 2 miles. The least water was 4½ fathoms. Good anchorage was found under Tongue Point, the shingle spit making out from the mainland about midway of the channel. From the above anchorage the *Albatross* stood directly to sea, passing within a mile of the southwest extremity of Hagemeister Island, thence S. ½ W., shoaling the water to 3 fathoms 7 miles from the island. Greater depths might possibly be found by taking a more westerly course. The tides are very strong through the channel. We were visited by a number of Eskimos while at anchor under Tongue Point.

Cape Peirce is of moderate height and symmetrical form, while Cape Newenham is high with sharp peaks and rugged lines. The *Albatross* found anchorage under the latter cape near Seal Rock during a southerly gale and rode it out very comfortably, notwithstanding swift currents and heavy tide rips.

The Kuskokwim River is much dreaded by navigators on account of its extensive shoals, strong currents, etc. The *Albatross* ascended it between 35 and 40 miles without difficulty or delay, but encountered extensive shoals on her return; thick weather and the lack of time prevented an extended examination. These shoals commenced about 9 miles WSW. from Good News Bay and extended in a westerly direction for 10 miles or more. There was a channel between the shoal and the land about 4 miles wide, having a depth of 5 fathoms. From a point 5 miles WSW. from the west head of Good News Bay we stood direct for Cape Newenham, the least depth being 4 fathoms. Great quantities of fresh water are borne down the Kŭskokwim by rapid currents, and, while there have been no surveys by which changes can be noted, there seems no reasonable doubt that great alterations have taken place since Cook ascended the river in the last century.

Meteorological conditions in Bering Sea.—The winds and weather in Bristol Bay and other parts of Bering Sea visited by the *Albatross* from the last of May to the 1st of September may be summarized in a few words. Southwest winds prevailed, but we had them from southeast to northwest. It was boisterous weather nearly half the time, but seldom rough enough to interfere with our work. We had several summer gales of moderate force, but no severe storms. Fog and mist

prevailed and a clear day was a rare exception. The tidal currents were strongest in the vicinity of Unimak Pass and the head of the bay; they were greatly affected, however, by the winds. The flood stream set to the northward and slightly inshore along the coasts of Unimak and the peninsula; the ebb, to the southward and slightly offshore. The former was invariably the stronger and probably found an outlet by sweeping past Cape Constantine in the direction of Cape Newenham. There has been no systematic study of Bering Sea currents and the almost constant fogs prevent the navigator from adding much to our meager knowledge concerning them.

Well-equipped fishing vessels can anchor anywhere on Baird or Slime Banks and lay out such winds as they would be likely to encounter during the summer months. The peninsula will afford a weather shore for southeast winds and Amak Island offers fairly good protection on its southeast and southwest sides. Port Möller and Herendeen Bay will be ports of call for fishermen when they become better known. Port Haiden may also prove available after it has been surveyed.

UNALASKA TO SAN FRANCISCO, AUGUST AND SEPTEMBER, 1890.

We coaled ship on the 25th, and at 1:15 p. m. the following day left in company with the revenue cutter *Rush*, the latter bound to the Seal Islands. The atmosphere was unusually clear, and, as we had never used Akutan Pass, we availed ourselves of the favorable opportunity of passing through and examining it. There is a clear channel 2 miles or more in width between Cape Morgan and four small islets lying off Unalga Island, free from dangers except near the shores, with 26 fathoms, rocky bottom, in the narrowest part of the pass. We steamed to the eastward during the night, and at 6:17 the following morning cast the trawl in 280 fathoms in latitude 53° 56′ N. and longitude 163° 25′ W., about 9 miles from the reported position of Lenard Rock, but saw no indications of shoal water, although the weather was clear and a lookout was kept at the masthead.

A line of soundings and dredgings was run outside of the 100-fathom curve, past the Sannaks and Shumagins, to the vicinity of the Trinity Islands, where, in 67 fathoms, latitude 56° 02′ N. and longitude 153° 52′ W., we took our departure. Running E. 3° S. true 11 miles, we found 207 fathoms; then E. true, with intervals of 20 miles, the following depths were found across the line of the great submarine trough which extends along the Aleutian Islands, viz: 1,152, 2,197, 2,620, 2,935, and 2,925 fathoms. Increasing the interval to 30 miles, we found 2,776 fathoms, and a further distance of 62 miles gave us 2,414. The maximum depth was found in latitude 56° 02′ N. and longitude 151° 12′ W. It will be observed that, while the depths are less than those found farther west, they are at least 800 fathoms greater than the normal, showing that the easterly extension of the depression reaches that point. The line of soundings was extended to the Queen Charlotte Islands, where a successful haul of the trawl was made in 1,588 fathoms.

The high land of the above group was sighted on the 3d of September and we passed the Scott Islands the following evening.

Entering the straits of Fuca at midnight of September 5, we reached Port Townsend at 12:20 p. m. the following day, where we found a large mail awaiting our arrival. Many improvements were observed in and about the city; blocks of buildings had been erected during the year; electric and steam-motor street railways were in operation; and 20 miles of the Port Townsend and Southern Railroad was officially opened on the 12th. Repairs on the machinery were completed on the 15th and we left the following morning for Departure Bay for coal. A dense fog and smoke made navigation very difficult, and, after feeling our way through Rosario Straits, we anchored at the Sucie Islands for the night, finally reaching our destination at 2:25 p. m. the following day. Taking on board 183 tons of coal, we returned to Port Townsend, reaching that port at 1:30 p. m. on the 20th.

Getting under way again at 3 p. m., we passed Race light at 8 p. m. and made Cape Flattery light at 1 a. m., the fog having lifted. Two hauls of the trawl were made during the 21st in 516 and 831 fathoms off the Washington coast; and, steaming to the southward during the night, three hauls were made next day off the coast of Oregon in 759, 786, and 345 fathoms. Standing to southward during the night, through dense fog and smoke, we crossed Heceta Bank, made Cape Orford at 1 p. m. on the 23d, passing Fox Rock an hour later. Nothing more was seen until we reached Cape Mendocino the next morning. The weather had somewhat improved and objects could be seen from 1 to 2 miles.

Commencing at the cape we defined the 200-fathom line as far south as Point Arena and made a series of dredgings from 455 fathoms to the coast. The bank was very steep near Cape Mendocino, but gradually extended until, off Point Arena, the 200-fathom line was 10 miles from shore. There are no fishing-banks proper in that region, but the usual coast fishes will be found in spots along the shore. The beam trawl may be used in the region about Point Arena, but stony spots occur at intervals which would be liable to damage the nets. The bottom seems smoother to the southward toward Point Reyes, and the ground will doubtless be fished with nets of some description as the demand for flatfish increases in the San Francisco market.

Having completed our work, we started for port at 4 p. m., September 25, arriving in San Francisco at 8 o'clock on the morning of the 26th.

NATURAL HISTORY OBSERVATIONS.

The fauna of Bristol Bay, other parts of Bering Sea, and the Pacific Ocean, developed by the use of the trawl and dredge during the season, will be reported upon by Prof. C. H. Gilbert, but it may not be out of place to add here a few general remarks upon this subject. A marked feature of the dredging on Slime Bank was the great numbers of medusæ or jellyfishes brought up in every haul of the net. The species

was not determined, but may be described as rusty-brown in color, from 6 to 18 inches in diameter, and with long, slender tentacles well provided with stinging cells. They inhabit an intermediate zone not far from the bottom, and their numbers increase with the advance of the season, until they become a great nuisance to the fishermen. Starfishes are abundant both in numbers and species. Sponges, sea-urchins, various species of crustaceans, shells, and other invertebrates, including many forms of hydroids, are generally found in large numbers.

The principal feature of the many hauls on Baird Bank was the great abundance of starfishes, of at least a dozen species, one large variety predominating. They composed the bulk of nearly every haul. Sponges, sea-urchins, shells, and other invertebrates were found in great numbers, about in the order mentioned as regards abundance. Much of Baird Bank is covered with hydroids, which were brought up in matted bunches containing many species. Sculpins, small alligator-fishes, flounders, and other species occurred in every haul, and an occasional large skate would appear among them. Codfish and halibut usually avoided the net, yet specimens were taken occasionally. Annelids were common in most hauls, and one haul in particular (No. 3287) contained fully 2 bushels, consisting mainly of one species, which probably furnished the chief food of codfish on that part of the bank. A variety of small crustaceans and naked mollusks may be added, as they were pretty evenly distributed over the bottom. It was observed that representatives of nearly every species found in similar depths on Slime Bank were included in each haul.

To the northward a marked change took place in the bottom fauna, ophiurans and astrophytons exceeding all other forms in abundance, while large bivalve shells resembling *Schizothærus* appeared for the first time. It will be observed that the bottom differed in character from that of Baird Bank, more or less mud entering into its composition.

In Herendeen Bay, during July and August, the streams were full of dog salmon. Excellent flounders and large edible prawns were taken in abundance at the anchorage in Mine Harbor. Later in the season dredging was carried to the deeper waters of Bering Sea, north and west of Unalaska, with very interesting results. It was new ground and most of the material obtained was so unfamiliar as to prevent identification. At station No. 3307 (1,103 fathoms), *Myctophum* (three species), *Macrurus*, *Antimora*, and several other genera of fishes were taken, while among invertebrates there were five species of starfishes, alcyonarians, sea-urchins, two species of large prawns, an octopus, etc. Increasing the depth to 1,600 fathoms at station No. 3308, there were, among fishes, *Synaphobranchus*, *Antimora*, *Notacanthus*, *Myctophum*, *Careproctus*, etc., and among the invertebrates, sea-anemones, holothurians, medusæ, starfishes, large crabs, crimson prawns, etc. Station No. 3311, in 85 fathoms, at the entrance to Captain Harbor, yielded several new fishes and sponges, besides some fine brachiopods and many

common forms. A rare, if not new, *Antedon* was the chief prize from station No. 3316, in 309 fathoms. Station No. 3317, in 165 fathoms, off Makushin Volcano, furnished a dozen or more species of oddly shaped sponges and pink cup-corals, while station No. 3319, in 59 fathoms, was remarkable for a quantity of large branching flesh-colored alcyonaria, of the shape and general appearance of a sea fan. Station No. 3321, in 54 fathoms, gave us a remarkable massive red alcyonarian not previously observed.

After leaving Bering Sea en route for San Francisco, a line of dredgings was run along the chain of islands lying off the Pacific shores of the Alaska Peninsula, the specimens corresponding generally with those taken in the same region during the season of 1888. The first notable exception was at station No. 3340, in 695 fathoms, muddy bottom. In addition to a large number of deep-sea fishes and invertebrates, there were about 50 specimens of *Macrurus*, representing four species, two individuals being of extraordinary size, weighing 14 and 19 pounds each. Still farther southward, on September 3, station No. 3342 was made with the beam trawl in 1,588 fathoms, gray ooze and coarse sand, off the coast of Queen Charlotte Island, and within sight of the high lands. Among the fishes were two species of *Macrurus*, several specimens of *Antimora*, and others not recognized. Among the invertebrates were an octopus, barnacles, shrimps, sea-anemones, amphipods, starfishes, two species of corals, hydroids, and several beautiful stalked crinoids, which were secured in the best of order.

INVESTIGATIONS OFF THE WEST COAST OF MEXICO AND CENTRAL AMERICA AND OFF GALAPAGOS ISLANDS, JANUARY TO MAY, 1891.

Preparations for the cruise.—Prof. Charles H. Gilbert left for the East on September 27 and Passed Assistant Surgeon J. E. Gardner was relieved by Passed Assistant Surgeon N. H. Drake the same day. The specimens collected during the summer were shipped to Washington on the 29th. We went to the navy-yard, Mare Island, on the 30th of September and commenced the work of repairing and refitting. The long cruise in Bering Sea resulted in unusual wear and tear to the machinery, sails, and rigging.

Ensign Marbury Johnston was detached from the *Albatross* November 9; Ensign C. M. McCormick, on the 14th; and Ensign E. W. Eberle, on the 27th. These gentlemen had served three years on board of this vessel, and the Commission is indebted to them for much valuable service. Ensign Johnston is deserving of special mention. He was ordered as watch officer, but acted as executive and navigator about a year, performing the duties in a very satisfactory manner. He made the surveys of Herendeen Bay and the Lower Nushagak and lent material aid in the general corrections to the Bristol Bay charts.

I was ordered to proceed to Washington to confer with the Commissioner regarding the work of the vessel, and left for that purpose on the 20th of October, returning December 11. The repairs were prac-

tically completed on the first of January, 1891, and it only remained to dock, clean, and paint the bottom and take on board coal and paymaster's stores, to fit the vessel for sea.

We had a dock trial of the engines on the afternoon of January 7, when everything was found to work satisfactorily. E. A. Anderson, ensign, U. S. Navy, reported for duty January 13, and J. H. L. Holcombe, lieutenant (junior grade), U. S. Navy, on the 15th. The vessel went into the naval dry dock on the 21st, when the work of scraping and painting commenced. The bottom was very foul, between 15 and 20 tons of foreign matter being scraped from it. Chief Engineer C. R. Roelker, U. S. Navy, was sent to the naval hospital on the 22d, with acute bronchitis, and Assistant Engineer J. R. Wilmer, U. S. Navy, reported for duty the following day, Mr. Roelker being detached. We came out of the dock on the 26th and steamed down to San Francisco, anchoring at 4:30 p. m. Commenced coaling from a lighter the following morning.

At 10:30 p. m., after the crew were in their hammocks, cries of distress were heard, and it was soon ascertained that a boat had swamped, leaving a number of men struggling in the water. A strong tide was running and there was quite a heavy swell in the bay. The dingey was manned as quickly as possible, and Lieut. Holcombe, officer of the deck, took charge and went to the rescue, finally picking up seven men belonging to the American ship *Reuce*, and a boatman belonging to the Sailors' Home, some of them in an exhausted condition. They were brought on board, and under the hands of the surgeon and others made comfortable for the night. Some time after the return of the dingey the small flatboat was discovered astern attempting to reach the ship, but was unable to stem the tide. Assistance was sent, and it was found that John Kiely, captain of the hold, had rescued two more men, making nine in all. It seems that after the departure of the dingey, Kiely discovered by the cries of the drowning men that the party was becoming separated, and, lowering the small flatboat, went to the rescue, with the result mentioned above.

San Francisco to Panama.—We finished coaling on the morning of the 30th, having received 199 tons; stores were received in the meantime, and vacancies in the crew filled by enlistment. We left San Francisco at 1:07 p. m. the same day for Panama, using one boiler and consuming 10 tons of coal per day. The vessel displaced 1,140 tons on her departure.

The weather was hazy and squally at times, with southwest and southeast winds after leaving port. Passed through Santa Cruz Channel at 3 a. m. February 1; made Santa Catalina Island at daylight on the morning of the 2d, about 90 miles distant; and a little before sunset the same evening Guadeloupe was seen between 60 and 70 miles. Passed Cerros Island next day, it being distinctly visible at a distance of 60 miles. Very little surface life was seen; a few gulls were about

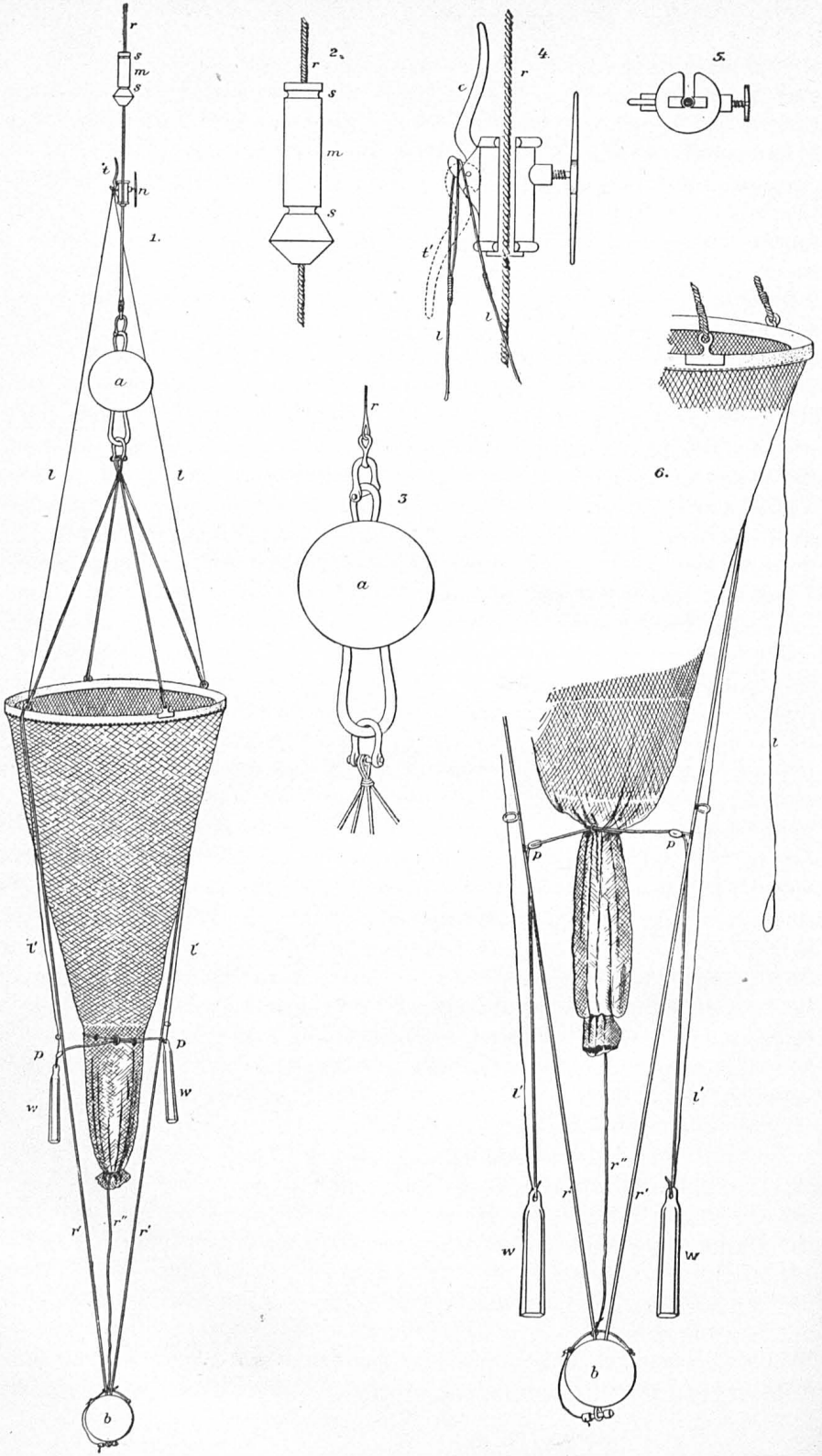
the ship while near the coast; flying fish were first observed on the 5th in latitude 22° 00′ N.; and two species of booby were noticed. Man-of-war hawks, petrels, and turtles were first seen on the 6th in latitude 20° 00′ N., and a school of young porpoises passed the vessel on the 7th.

Reaching the vicinity of Acapulco on the evening of the 8th, it was thick and hazy over the land, and, not caring to enter the port before daylight, we hove to at 10 p. m., finally anchoring in the harbor at 8 a. m. on the morning of the 9th. Thirty tons of coal were taken on board during the day, the usual visits were made to the authorities, and at 4:35 p. m. we proceeded to sea, en route to Panama. The naturalists were busy with the collecting seine while in port, and brought in no less than twenty species of fishes besides other forms.

Tropical heat was encountered before reaching Acapulco, and carried without intermission until we reached the Gulf of California on our return. Light variable winds and fine weather were the rule from Acapulco to Panama, but we had a short northeast gale off Tehuantepec, a stiff norther in passing the Gulf of Dulce, and a brisk northerly wind from Cape Mala to Panama, where we arrived the morning of the 17th. Prof. Alexander Agassiz, under whose direction the scientific work of the cruise was to be conducted, reached Colon the same evening.

Cape Mala to Cocos and Malpelo islands.—Coal and stores were taken on board, and at 3 p. m. February 22 we left port for the purpose of exploring the waters from Cape Mala to Cocos and Malpelo islands, etc. Several schools of anchovies were seen near the islands, in Panama Road, with the usual number of frigate-birds, pelicans, gulls, porpoises, etc., feeding upon them. The surface net was put over for a few minutes at 8 p. m., but there was very little life found. Work commenced the following morning, and was continued through the day between Morro Puercos and Marieto Point, in depths ranging from 182 fathoms, gravel and shells, to 695 fathoms, green mud. Vegetable matter and occasionally quite large sticks were found at every station. The beam-trawl and surface tow-net were used, and while the results from the latter were meager, the former developed a rich and varied fauna. Serial temperatures and specific gravities were carefully taken, but the action of the thermometers was not wholly satisfactory.

Rich working ground was found to the southward of Coiba Island on the 24th, the soundings developing an unexpected elevation of the sea bottom. A depth of 869 fathoms was found 20 miles south of Jicarita Island, 791 fathoms at 35 miles, and at 50 miles there was but 465 fathoms, with rocky bottom—1,672 fathoms being found 14 miles to the southward and westward. Rocky patches were frequently encountered, especially on the submarine elevation, which played havoc with the trawl nets, but rich hauls were made in spite of unfavorable conditions, and the naturalists were greatly elated over the capture of rare and valuable specimens, some of them entirely new to science. A course was steered in the direction of Cocos Island during the night, and at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7:30 a. m. on the 25th a sounding was made in 1,471 fathoms, green ooze. Serial temperatures and specific gravities were taken, and a successful haul of the trawl followed, the surface net being towed during the interval of dredging.

Submarine tow net.—Experiments with a new design of submarine tow net were made later in the day, with unsatisfactory results. In fact, it was a failure, owing, doubtless, to the large size of the net and its small mesh, which caused undue tension on the bridles while towing.

The frame is composed of rods and tubing of brass. There is a fine screw-thread on the upper half of the central shaft, which works in a nut in the upper middle part of the frame. The lower end of the shaft is plain and passes through two studs in the frame, which serve as stops for the bridles. A propeller on the middle of the shaft holds it down while the apparatus is being lowered and slowly raises it while the net is towed through the water. The jaws are of two sizes, 3 feet and 2½ feet in diameter, with hinges which permit them to open and shut. The net is 7 feet in length, half-inch mesh, lined with mosquito net for 5 feet, and inside of this lining is another of silk gauze, extending 3 feet from the lower end of the net. A weight is attached to the lower end of the net to prevent its floating up and fouling the jaws or bridles.

To use the apparatus, close the mouth of the net, attach both bridles by their terminal rings to the central shaft and lower to the desired depth, then steam slowly through the water, when the propeller will be brought into action, the central shaft slowly raised, and the first pair of bridles released, opening the jaws. After towing about half a mile the shaft will have reached its upper limit, when the remaining bridle will be released and the net again closed, ready to be hoisted to the surface. This apparatus could be made to act by reducing the size of the net and removing one of the linings, but the chances of accident or irregularity in the working of the propeller were so great that there would always be a doubt as to its having properly performed its functions. Prof. Agassiz was greatly disappointed at its failure, for he considered the examination of intermediate depths among the most important problems to be worked out during the cruise. I had thought little of the matter, as my confidence in the apparatus just described was explicit, but I now set to work to devise something that would do the work.

The Tanner tow net is designed for the collection of pelagic forms at intermediate depths, and was used successfully during the cruise. The net is the same as that previously described, except that the mosquito-net lining is reduced to about half the length of the bag. The upper bridle has four legs attached at equal distances around the ring and shackled to a sinker on the end of the steel-wire dredge rope, which serves as a tow-line. The lower bridle has two legs, 10 feet in length, attached to opposite sides of the ring; and a 60-pound sounding shot is toggled on the bight at the lower extremity to act as a sinker. The

lower end of the net being properly secured, the ends of the lashing are carried down to the sinker and made fast in order to keep the net in place while going down.

Four small brass rings are secured to the bag at equal distances, a few inches below the upper edge of the silk-gauze lining, and through them is rove a soft white tie line, which makes a complete round turn, the ends being passed through the same ring, then rove through small metal blocks on the lower bridle, and finally secured to leads weighing 14 pounds each. Two tripping lines, with eyes in their upper extremities, are hooked over a friction clamp on the tow rope, then rove through small eyes on the rim of the net, and through brass rings on the lower bridle, above the metal blocks before mentioned; the ends being hitched to the leads, support their weight, allowing the tie, or draw string, to hang loosely and the net to retain its natural form while sinking and being towed.

To use the apparatus, prepare it as in figure 1, plate 1, lower it vertically to the proper point, and tow it slowly through the water, veering and heaving in on the tow line in order to maintain the desired depth, which can be determined within a few fathoms by the dredging quadrant, an instrument in constant use on board of the *Albatross*. To recover it, stop and back until the tow rope is vertical, heaving in sufficient line during the operation to keep the net at the proper depth; then send the messenger (fig. 2, *m*) down to act on the friction clamp (fig. 4), release the tripping lines (*l*), and close the lower part of the net as shown in fig. 6. The net may be run up to the surface at any desired speed, the upper portion taking in anything it encounters en route, while the lower part remains closed against even the most minute forms. The messenger is in two parts, which, having been placed around the tow line, are seized together with marline(*s*). It sinks at the rate of about 650 feet per minute, and the impact can usually be distinctly felt by taking hold of the tow line.

To Cocos Island.—The course was continued towards Cocos Island during the night, and two hauls of the trawl made on the 26th in 1,175 and 978 fathoms. Rocky bottom was encountered in the first haul, which wrecked the net, but many valuable specimens were found in the remnants. Serial temperatures were taken at one station, but the results were not entirely satisfactory; it becomes more evident from day to day that our practice of using the dredge rope for a temperature line in the tropics, with the Negretti and Zambra thermometers, must be changed. The high temperature near the surface fills the bulbs so full that even the moderate jarring caused by the surging of the rope on the drum of the hoisting engine is liable to shake the mercury down into the catch reservoir, which, becoming filled, overflows into the tube, making it necessary to repeat many of the observations. The weather was overcast, with passing rain squalls during the day, and, toward evening, frequent flashes of distant lightning were observed, particu-

larly in the direction of land. There were occasional showers on the 25th, with lightning during the night.

Three hauls of the beam-trawl were made on the 27th, in 902 and 1,067 fathoms, mud and sand, without a trace of foraminifera, while an intermediate station was in 1,010 fathoms, globigerina ooze. Serial temperatures were taken at both stations, and the surface tow net was used. At the first station the net came up badly torn and the trawl-frame was bent, showing that it had been in contact with some obstruction on the bottom, either rocks or water-logged driftwood, which is frequently encountered in the Gulf of Panama and proves very destructive to dredging gear.

The depth of 902 fathoms at the first station on the morning of the 27th, 50 miles to the eastward of Cocos Island, indicated that we were near the summit of another submarine ridge, the water having shoaled 770 fathoms since the evening of the 24th, deepening again to 1,067 fathoms 12 miles from the island. It was on this area only that foraminifera were found in appreciable quantities in the bottom specimens taken between Panama and the island. Four hauls of the trawl and tangles were made on the 28th in from 52 to 134 fathoms, east and north of Cocos, over rough, rocky bottom, which afforded a variety of shoal-water life; yet it would be considered meager in comparison with the same depths in the Caribbean Sea.

A party of collectors was landed in the morning, the vessel continuing work until 10:37 a. m., when she anchored in Chatham Bay, near the northeast extremity of Cocos Island. A seining party, volunteer collectors, photographers, etc., were sent on shore, and the whole crew given an opportunity for a run on the beach and a dip in the surf during the day.

The name of the discoverer and the date of the discovery of Cocos Island are unknown. It was visited by Lionel Wafer and Dampier; two Spanish vessels called in 1791, and Capt. Colnett visited it in 1793; Vancouver described it in 1795, and in 1838 Sir Edward Belcher surveyed a portion of the island, and located a point in Chatham Bay, astronomically. Many names and dates are roughly carved on bowlders near the beach, noticeably such dates as 1798, 1809, 1819, etc.

The island is about 4½ miles long, north and south, including outlying rocks and islets; 3 miles in width, 1,700 feet in height, and is of volcanic origin. Its contour is rugged and mountainous; the valleys very narrow and limited in extent. Copious rains water its surface, and numerous mountain streams roll down the wooded heights, through steep and tortuous gorges, and over rocky cliffs, small sand beaches usually marking their outlet to the sea. A dense tropical jungle, strongly resembling the forests of Central America, covers the entire surface of the island, enveloping it in an unbroken mantle of rich and varied shades of green. Cocoanut trees were found in such abundance by the discoverers that they gave their name to the island, and they

are still conspicuous in the higher inaccessible localities, while on the lowlands near the shores they have been cut down by thoughtless visitors in order to procure their fruit without the labor of climbing. We found one vigorous young cocoanut tree on the beach in Chatham Bay at the time of our visit in the spring of 1891, the sole representative of the hundreds which formerly stood in the immediate vicinity, affording grateful refreshment to the exhausted or thirsty visitor. Tree-ferns were conspicuous; and every stump, rock, or trunk of tree was festooned with morning-glories. Pumpkin-vines, daisies, poke-berries, etc., gave a familiar air to the surroundings.

Tradition credits the buccaneers with having buried vast amounts of treasure on the island, which, for some reason, they were unable to recover, and that fortune awaits the lucky finder of this hidden wealth, The truth of this tradition has been so thoroughly impressed upon the minds of men that expeditions have been dispatched from time to time, at considerable expense, to search for the treasure. A few huts in various stages of dilapidation remain as evidence of the periodical visits of these parties, and the pigs, which run wild on the island, may have descended from those carried there for food by the gold-hunters. A solitary donkey, which we found passing a lonely existence on the shores of Chatham Bay, may owe his presence there to the same source.

Chatham Bay affords fairly good anchorage in fine weather, which is the rule, and is a convenient place to procure wood and water. Wafer Bay has the largest area of level land seen on the island, and several acres showed unmistakable evidence of having been cultivated. The anchorage, however, is open and exposed to heavy swells. We made a reconnaissance of the eastern shores of the island, which had not been charted, and sent a tracing to the U. S. Hydrographic Office.

To Malpelo Island and return to Panama.—Leaving Cocos Island on the morning of March 1, a line of dredging stations was run S. 54° E. true, about 300 miles, passing en route over the position of Rivadeneyra Shoal, the line of soundings crossing our line of 1888 without indicating shoal water or a decrease in the normal depth of the region. Turning to the northward and eastward from the extremity of the above line, observations were extended to Malpelo, the sea-bed being found remarkably level, shoaling regularly as the island was approached. We reached it on the morning of the 5th of March, made several hauls of the trawl in shoal water, and a little before noon lay to and sent a collecting party to the island, which succeeded in capturing a number of birds, lizards, etc., but could not land. Fish lines were used in 50 fathoms, but the waters were alive with sharks, which destroyed the gear as fast as it was put over. One large grouper represented the catch.

From observations taken on the deck of this vessel the highest peak of Malpelo is in 3° 59′ 07″ N. and 81° 34′ 27″ W. It is a double-peaked volcanic rock with vertical sides, 846 feet in height, a mile in length and about a fourth of a mile wide, surrounded by detached rocks,

which increase its length to a mile and a half. The rocks are all high and bold, except one or two, which are but a few feet above water. The island is covered with guano, the deposit of myriads of sea birds which cover its heights, where they find congenial quarters and safe breeding-grounds. It is entirely devoid of vegetation, except a few low leafless bushes. The only sign of vegetable life is a small patch of grass a few feet in extent on one of the outlying rocks.

A cave was discovered on the northwestern side of the island, into which one of the ship's boats proceeded between 100 and 200 yards. The arched roof was 15 feet or more in height at the entrance, increasing as the cave was penetrated, the surface of the walls being quite smooth. The water swarmed with fish.

From Malpelo the line was continued about N. 36° E. true, in the direction of the Gulf of Panama, where three normals were run from deep water to the 100-fathom line, extending over two degrees of longitude. The surface net was in constant use, and the Tanner net was operated on several occasions. Serial temperatures were taken frequently, the sounding wire being successfully used as a temperature line. Several instruments were lost the first day by the parting of the wire, but no losses occurred afterward, and the trouble arising from the mercury shaking down was entirely eliminated.

Reaching Panama for the second time on the morning of the 12th, the ship was painted outside while repairs were being made in the engineer's department. The bunkers were filled with coal between the 16th and 19th, and we sailed at 1:10 p. m. on the 20th of March, steaming across the gulf.

Panama to the Galapagos Islands.—Reaching the vicinity of Galera Point on the morning of the 23d, a series of soundings was made, feeling our way to deep water, as it was desirable to cast the trawl and make other investigations on the slope from 1,000 to 1,500 fathoms in depth. Strong northeasterly currents were found in the vicinity, showing a maximum of 51 miles in 24 hours, and continuing with varying force nearly to the Galapagos. We were crossing the great Humboldt Current, which sweeps along the coast of South America into the Gulf of Panama. During nine months of the year, while the trades are blowing steadily, the stream is divided, a portion entering the Gulf and a broader belt taking a northwesterly direction. This division is not usually apparent from January to May, while the trades are interrupted, and the western part then takes a northerly direction, with its velocity greatly diminished.

The following series of observations extended from the South American coast to the Galapagos, crossing one of the great currents of the Pacific Ocean at the point where its cooling waters pour into the Gulf of Panama and where the faunas of the Southern and Central Pacific meet. Great care was observed in all the work on this line and the observations were varied and complete. The depths and serial tem-

peratures were frequently obtained, the beam trawl and surface nets used at all the stations, and the Tanner net was frequently operated at intermediate depths, after getting well clear of the land, to ascertain the distribution of pelagic fauna.

The surface life was greater than we had found in the Gulf of Panama, and the results of the deep-sea hauls of the trawl were fairly good, but the southern approach to the Galapagos, where we anticipated a rich field, proved to be practically barren and did not compare favorably even with the northeast approach. The greatest depth, 1,832 fathoms, was found about 160 miles from the South American coast; thence to the vicinity of the islands it gradually decreased.

Galapagos Islands.—The highlands of Chatham Island were sighted at daylight, March 28, and after spending most of the day in running a line of dredging along its southern approach, we stood into Wreck Bay and anchored at 5:30 p. m. Señor Manuel A. Còbos came on board soon after our arrival to extend the hospitalities of the Hacienda del Prògreso, and Mr. Townsend returned with him that evening on a collecting trip. Prof. Agassiz, several officers, and myself went to the plantation next day, and were met and entertained by the proprietor, Señor Manuel J. Còbos. The rains had been unusually heavy during the season, and the fine carriage road from the port to the hacienda, which we admired so much three years ago, was a complete wreck.

At the time of our former visit cattle were the principal source of revenue, but that is changed now. A plant of modern sugar machinery has been installed, and the growing of cane and the manufacture of sugar is prosecuted with the greatest energy. The natural advantages of soil and climate, cheapness of labor, and the privileges of the McKinley bill insure large returns from this industry. The young coffee plantation, mentioned in my report of 1888, bids fair to realize the anticipations of the proprietor. I tested some of the product and found it excellent.

The settlement on Chatham Island was formerly a penal colony, the convicts performing all the labor on the plantation. This was the case at the time of our visit in 1888, but is no longer so, the criminals having been removed and free labor employed, greatly to the advantage of the estate. Supplies were procured from the hacienda and a fine young bullock was presented to the ship by Señor Còbos. The naturalists increased their list of specimens somewhat, besides procuring many duplicates. The weather was hot and rainy at Chatham Island, and during showers, when skylights, ports, etc., were closed, the interior of the vessel was as hot as an oven.

Leaving Wreck Bay at 10:25 a. m., March 31, we steamed to Charles Island direct, anchoring in Blackbeach Road at 8 p. m. The crew were given liberty the next day, when many of them went to the old plantation, where fruit was found in abundance, several bushels of oranges, limes, alligator pears, etc., being brought on board. The nat-

uralists were out as usual during the day, and a number of officers went on a hunting expedition to Post-Office Bay, returning with eighteen flamingos.

Leaving Charles Island at 1:05 a. m., April 2, we ran over to Duncan Island and sent parties into the mountains for tortoises. They were away nearly all day, and returned with a single specimen only, although they searched carefully over the ground where three years ago they were quite numerous. A few years more and they will probably become extinct. An anchorage was found for the night in Conway Bay, Indefatigable Island, where we arrived at 5 p. m., giving the collectors an hour or two ashore before dark. Getting under way again at 3:15 a. m., April 3, we steamed to the northward between James and Indefatigable islands, commencing work in 551 fathoms, about 7 miles N. by W. from the Seymour Islands, in prolongation of our line of 1888, extending it to Bindloe, Abingdon, and Wenman islands. Here we were met by another surprise; excellent results having been obtained from contiguous stations occupied three years previously, we naturally expected to find the same rich fauna in similar depths a few miles to the westward. We did not, however; on the contrary, the bottom was foul and contained comparatively little life, while the surface was almost barren. Eight stations were occupied between Indefatigable and Wenman islands in from 327 to 1,270 fathoms.

Galapagos Islands to Acapulco and Guaymas.—From the latter island a line was run to Acapulco, nineteen stations being occupied in depths ranging from 2,232 to 94 fathoms. The same general plan of investigation was continued and the results were satisfactory in the ocean basin, but upon approaching the Mexican coast the bottom became very barren. This condition may be attributed largely to the great amount of decayed and decaying vegetable matter covering the sea bed. Every haul of the trawl brought up quantities in every stage of decomposition, and occasionally the net was loaded with vegetable muck, which emitted a highly offensive odor. This deposit was not evenly distributed over the bottom, but it prevailed to a sufficient extent to drive animal life from the ground. The same effect was noticed between the Pearl Islands and the mainland in the Gulf of Panama in 1888, where the deposit was even greater and the odor so vile that the chief naturalist requested that no more of it be brought up. The Tanner net was used at several stations with satisfactory results.

Surface life between the Galapagos and the Mexican coast may be summarized as follows: An occasional whale, porpoises, dolphins, and flying fish frequently seen, and green turtles in sight almost constantly floating on the surface. Birds were not numerous, though petrels were seen daily; tropic birds and boobies were noticed occasionally, besides gulls and other species which appeared as we approached the coast.

We anchored in the harbor of Acapulco at 3:30 p. m., April 12, after a successful cruise of nine days between the Galapagos and that point.

Having filled up with coal and taken on board supplies, we sailed, April 15, for a cruise along the Mexican coast and Gulf of California. The surface tow net and the Tanner net were used frequently, and a line of dredging stations was commenced to the southward of the Tres Marias, in 2,022 fathoms, where serial temperatures were taken. The trawl was lowered a few hours later, in 676 fathoms, and the line continued to 80 fathoms near the land. Passing the islands the depths increased, the sounding cups showing green mud or black sand, but there was sufficient clay in it to prevent its washing freely through the meshes of the trawl net, thus resulting in the loss of gear from overloading. Frequent patches of shale rock were also encountered, which made the use of the trawl still more difficult. The currents of the gulf seem to extend to the bottom, even in depths exceeding 1,000 fathoms, scouring out the mud and ooze, and occasionally exposing the native rock. Sticks, leaves, and other kinds of vegetable matter were marked features of the hauls on the eastern side of the gulf as well as in the Pacific, but were not brought up in as great quantities. The bottom fauna from the Tres Marias to Guaymas was unexpectedly meager; indeed, it was a great disappointment to us, for we had consoled ourselves for the barren ground off Acapulco in anticipation of rich fields in the gulf.

The work of the cruise ended with our arrival at Guaymas on the afternoon of April 23, where Prof. Agassiz left us to return to the Atlantic coast by rail. The explorations during the cruise were conducted under his general direction, and his great knowledge and experience were apparent in all our operations. He was always ready in a most genial and kindly way to impart information, which was given so plainly that it was always comprehended, even by laymen. We took leave of him with much regret, and it is our fond hope that some time in the near future we may again have his active coöperation in deep-sea investigation.

Scientific results of the cruise.—The scientific report of the expedition will be made by Prof. Agassiz, yet it may not be out of place to state in a general way some of the results obtained. The fauna of the region examined was not as rich as in the Atlantic, Gulf of Mexico, and Caribbean Sea. Decayed vegetable matter was found to a greater or less extent on most of the bottom examined. Foraminifera was, as a rule, very sparsely represented in the bottom soil, and was found in considerable quantities at but few stations. Many forms were identical with those of the Caribbean Sea, and others were closely allied to them. The repeated use of the Tanner net, remote from land, showed that the surface life extended down about 300 fathoms, the bottom life reaching up between 100 and 200 fathoms, and the intermediate space being practically barren. On one occasion in the Gulf of California, in the vicinity of land, life was found from surface to bottom. The ocean temperatures of the region were very low, considering that

it lies within the tropics. The Humboldt current, the one great and constant movement of the waters from the southern polar regions into the Gulf of Panama, is a cold one, and its volume is so great in comparison with the warmer equatorial counter-current that the latter is soon absorbed and the whole mass reduced to a lower temperature than in any other oceanic area in the same latitudes. There are no coral reefs in the Gulf of Panama or about Malpelo, Cocos, and the Galapagos Islands; indeed, it is not until we reach Clipperton Island, in 10° north latitude and 109° west longitude, that the reef-builders find congenial temperatures for the prosecution of their work. These low temperatures doubtless exert a marked influence on the submarine fauna of the region.

We left Guaymas April 24, and arrived at San Diego May 1 without incident worthy of notice. Taking on board a supply of coal, we sailed the next evening for the navy-yard, Mare Island, arriving on the morning of the 5th.

The winds, weather, and currents encountered during the cruise may be summarized as follows:

Winds southwest to southeast from San Francisco to Santa Barbara Islands; light and variable with frequent calms to Acapulco. Light variable winds from the latter port to Panama, with the exception of a short sharp northeast gale off Tehuantepec; a stiff norther in passing the Gulf of Dulce, and a brisk northerly wind from Cape Mala to Panama. Light variable winds and frequent calms were experienced in the Gulf of Panama, and thence to Cocos Island, Malpego, and the Galapagos. The southeast trades were entirely interrupted, the prevailing winds being from southwest. There was very little wind among the islands of the archipelago or to the northward until we encountered the northeast trades in about 5° 00′ N. They were very strong for twenty-four hours, then moderate, dying out entirely in 11° 00′ N; thence to Acapulco, southwest airs prevailing. Along the Mexican coast to Cape Corrientes we had light to moderate northwest winds, thence to Guaymas, gentle westerly breezes. From the latter port to Cape San Lucas the same winds were found, and thence to San Diego light to moderate breezes from the northward and westward. From San Diego to San Francisco light southerly airs prevailed.

The sea was generally smooth during the cruise.

The weather was hazy and squally from San Francisco to the Santa Barbara Islands; mild and pleasant with passing clouds thence to Acapulco. There was a daily increase of temperature, but the full effect of tropical heat was not felt until the vessel was lying at anchor in the harbor. From Acapulco to Panama it was generally fair, with hazy or smoky atmosphere enveloping the land, as usual in the dry season. Three or four days of rainy, squally weather were encountered off the gulf between 6° 00′ and 7° 00′ N. latitude the latter part of February; thence to Cocos, Malpelo, and Panama the weather was invariably

pleasant but warm, the same conditions prevailing until we arrived at the Galapagos with one notable exception, March 23, when in 1° 00′ N. and 80° 00′ W. we had an overcast rainy day. It was the height of the rainy season in the archipelago and showers were of frequent occurrence every day, the sun coming out brightly between them. There was more or less rain after leaving the islands to 5° 00′ N. Thence to Acapulco, Guaymas, and Cape San Lucas it was invariably bright and clear. The mornings were hazy or foggy off the coast of Lower California, generally clearing between 10 a. m. and meridian. From San Diego to the bay of San Francisco it was misty, but not sufficiently thick to interfere with navigation.

The currents from San Francisco to Acapulco were neither strong nor constant in direction; the aggregate was 70 miles against us during the trip. They were stronger thence to Panama, amounting to about 100 miles adverse set. From Panama to Cocos Island, Malpelo, and return, the general set was south and southeast from 6 to 39 miles per day. From Panama toward Cape San Francisco, on the coast of Ecuador, the set was southwest to west from 7 to 24 miles per day.

The Humboldt current was encountered about 2° 00′ N. and 80° 00′ W. from 29 to 51 miles a day, setting to the northward and eastward, trending more to the eastward as we left the coast, until in 87° 00′ W. it was S. 83° E. 17 miles in twenty-four hours; thence to the Galapagos but little current was noticed. The general set through the archipelago is to the westward, except from January to April or May, when currents are mostly confined to tidal influence.

A light easterly drift was apparent from the islands to 6° 00′ N.; then a westerly set, reaching a maximum of 50 miles per day to about 9° 00′ N.; thence to Acapulco very light. From the latter port a light northwesterly current was felt, increasing as we approached Cape Corrientes, and ceasing entirely to the northward of the Tres Marias Islands, from which point to Guaymas the drift was light to the eastward. From the latter port to Cape San Lucas and San Diego the currents were very light and variable. Thence to San Francisco, where the coast was followed closely, the influence of Davidson's countercurrent from the southward and eastward was felt.

The general health of officers and crew was excellent considering the rapid and extreme climatic changes they were subjected to.

Mare Island Navy-yard and San Francisco.—Many of the crew were discharged soon after our arrival at Mare Island, their terms of service having expired, leaving us with barely force enough to care for the vessel. Ensign W. W. Gilmer, U. S. N., was detached on May 8, and on the 18th Passed Assistant Engineer J. R. Wilmer, U. S. N., was sent to the naval hospital for treatment for insomnia and nervous prostration. On the 28th of the same month telegraphic orders were received to commence repairs necessary for the contemplated summer's cruise. It soon became apparent that Mr. Wilmer woul. be unable to

rejoin the vessel, and Assistant Engineer A. M. Hunt, U. S. N., was ordered to relieve him, reporting June 9, at which time the former was detached.

June 25 orders were received from the Navy Department reducing the number of the crew from 67 to 53 men after June 30, 1891, and also giving new ratings. The proposed crew would be able simply to navigate the vessel, but could not carry on the work for which she is employed. Authority was subsequently received from the Commissioner, however, to employ the additional men required to make the vessel efficient, placing them on the Fish Commission rolls. The necessary changes were made immediately.

Engines and boilers were tested at a dock trial June 27 and, much to our gratification, everything worked smoothly and satisfactorily. We went to San Francisco on the 29th and docked at the Union Iron Works the following morning to scrape and paint the vessel's bottom, which had become exceedingly foul during her cruise in tropical waters. We expected to dock at the navy-yard, but the dry-dock was required very unexpectedly for a French frigate which arrived a few days previously, needing extensive repairs.

The *Albatross* was in dry-dock at the end of the fiscal year when this report should properly close, yet it seems advisable to state that we were preparing for a season's work in Bering Sea, and would have sailed early in July had the vessel not been diverted from her work to convey the United States commissioners to the Seal Islands. We left San Francisco on the evening of July 16, having on board Dr. Thomas C. Mendenhall and Dr. C. Hart Merriam, United States commissioners, en route for the Pribilof Islands, Bering Sea.

Summary of work and condition of equipment.—The following brief summary gives in a graphic form a résumé of the work of the *Albatross* for the fiscal year 1890–91:

Number of days at sea	135
Distance run by observation, in knots	15,314
Distance run by log, in knots	15,706
Number of deep-sea soundings	377
Number of dredging stations	153
Number of fishing stations	95
Number of specific-gravity stations	330
Number of serial-temperature stations	35
Number of submarine tow-net stations	19

Mr. Charles H. Townsend, resident naturalist, has prosecuted an extended investigation regarding the oyster industry of San Francisco Bay and adjacent waters, having performed the work while the vessel was in port. All practical aid has been rendered him.

The deep-sea sounding apparatus has worked satisfactorily, although we have met with some losses. Our heaviest reel was disabled during the winter's cruise, involving the loss of several thousand fathoms of

wire. The drum did not collapse, but the binding bolts gave way one by one, allowing the flanges to spring outward and the wire to find lodgment between them and the edges of the drum. The nip was so great that it ruined the wire even where it was possible to extricate it, but many of the parts were cut before they could be cleared. Fortunately, we had a heavy navy reel on board, which was mounted without causing delay in our work.

The dredging engine has continued to perform its work admirably. The service was particularly heavy during the winter in the greater depths, and near the end of the season the friction gear gave out, but it did not materially interfere with the working of the engine. The arms of the driving pinion and friction drum were lashed together, and the latter was operated directly by the engine in veering as well as hoisting. It was repaired at small cost.

The reeling engine still performs its work well without expense for repairs, further than the usual examination and adjustment. The dredge rope was subjected to unusual wear and tear during the southern cruise and parted several times, but there were no serious losses. The expenditure of trawls resulting from these breakages was of greater importance, but never resulted in the least delay, the apparatus in reserve being equal at all times to the demand.

The Negretti and Zambra thermometers have worked well except when used in series on the dredge rope, particularly in the tropics. After the substitution of the sounding wire as a temperature rope the instruments worked well, but several were lost by parting the wire, and this is liable to occur at any time, the margin of safety being very small. The expenditure of wire would be of little moment, but the loss of a dozen deep-sea thermometers is another matter and might bring that branch of work to an abrupt termination. We have now adopted the following plan: A sufficient amount of large strong wire is wound on a spare drum, and when serial temperatures are to be taken it is mounted on the sounding machine, arrangements having been made for the rapid interchange of reels.

PERSONNEL.

The following is the list of officers, June 30, 1891: Lieut. Commander Z. L. Tanner, U. S. Navy, commanding; Lieut. C. G. Calkins, U. S. Navy, executive officer and navigator; Lieut. (jr. grade) J. H. Lee Holcombe, U. S. Navy; Ensign E. A. Anderson, U. S. Navy; Passed Assistant Surgeon Nelson H. Drake, U. S. Navy; Passed Assistant Paymaster C. S. Willams, U. S. Navy; Assistant Engineer A. M. Hunt, U. S. Navy.

The civilian corps was as follows: Charles H. Townsend, resident naturalist; A. B. Alexander, fishery expert; N. B. Miller, assistant naturalist; Harry C. Fassett, clerk to commanding officer.

REPORT OF A. B. ALEXANDER, FISHERY EXPERT.

[Abstract.]

WASHINGTON, OREGON, AND CALIFORNIA.

On August 28, 1889, hydrographic operations were commenced off the coast of Washington, and were carried on thence southward along the coasts of Oregon and northern California as far as Cape Mendocino. The work of sounding, dredging, and fishing was assiduously carried on from the above date until October 13, with the exception of a short visit made to Portland, Oregon, and the time required for coaling. Off the coasts examined the fishing-grounds are entirely within the 100-fathom curve. Fishes are generally found in greatest numbers in depths of 15 to 30 fathoms and on rocky bottoms, but the numerous species of rockfish frequently congregate together on sandy patches, attracted, undoubtedly, by the quantity of food which they find there.

The greatest distance of the 100-fathom curve from the coast of Washington, between Cape Flattery and the Columbia River, is about 40 miles, the least distance about 18 miles, the average being about 25 miles. South of the Columbia River this curve takes an irregular course, but near the northern boundary line of California it rapidly approaches the shore, deep water being found only a short distance from the land. Heceta Bank is the largest and most important fishing-ground south of Cape Flattery.

The first trial for bottom fish was made on the afternoon of August 30 in 28 fathoms off Yaquina Head, Oregon, the catch consisting of 1 red rockfish and 2 ling or whiting. The wind was blowing fresh at the time, causing the ship to drift rapidly, and it was difficult to keep the hooks on the bottom. The following morning another trial was made some 30 miles south of the last locality in 29 fathoms of water, but no fish were taken. The bottom consisted of fine gray sand, and furnished no indications of a good fishing-ground.

On the morning of September 1 hand lines were used at hydrographic station No. 1958, latitude 44° 01′ N., longitude 124° 49′ 15″ W., depth 58 fathoms, both from the ship and from small boats. Nothing of importance was taken by the latter, and only 3 orange rockfish by the former. At hydrographic station No. 1978, later in the day, latitude 43° 58′ 30″ N., longitude 124° 44′ 20″ W., 61 fathoms, even poorer results were obtained, but at a few ship lengths from this berth 24 rockfish, of two species, were captured in the course of a few minutes. Undoubtedly at many places where we were unable to secure anything with hand lines excellent fishing could be obtained with the beam trawl. While flounders, soles, and some other edible species may occur in very

great numbers, their presence might not be indicated by hand lines, as was frequently demonstrated during the investigations along this coast.

Subsequent to the trials above mentioned, the beam trawl was cast at station No. 3080, latitude 43° 58′ N., longitude 124° 36′ W., 93 fathoms, securing 3 species of rockfish, 1 black-cod, 1 cultus-cod, and 100 flounders, representing several species. A short distance from this spot a similar catch was made with the beam trawl, and in three hauls with the same appliance after night fall, large quantities of flounders were captured. The following day another large lot of flounders was obtained at station No. 3082, latitude 43° 52′ N., longitude 124° 15′ W., 43 fathoms, while 9 red rockfish and 2 whiting were caught on hand lines in the same locality. A rich spot was found between the Siuslaw River and Heceta Head, where 52 black rockfish (*Sebastodes melanops*) were landed on the deck in the course of a few minutes. We commenced fishing in a depth of 18 fathoms, and drifted into 13½ fathoms. The depth was, therefore, very favorable for hand-line fishing. Small-boat fishing could be successfully prosecuted all along this part of the coast, but the market demand is not sufficient to warrant it at present.

At hydrographic station No. 1981, latitude 44° 01′ 30″ N., longitude 124° 11′ 30″ W., 24 fathoms, 8 orange rockfish and 3 black-cod were caught on hand lines. At dredging station No. 3084, latitude 44° 12′ 31″ N., longitude 124° 19′ W., 46 fathoms, the beam trawl and hand lines were both used, the entire catch amounting to 10 black-cod and 9 whiting. The edible qualities of the latter seem to be as good as those of the red rockfish, and the species is abundant in many places. The next trial was at hydrographic station No. 1982, latitude 44° 16′ N., longitude 124° 12′ W., 31 fathoms, and comparatively good fishing was obtained, 24 whiting, 14 orange rockfish, and 2 flounders having been captured in the space of 45 minutes. Several trials in the neighborhood of Cape Perpetua, Oregon, proved that black-cod, whiting, and red rockfish occur there in considerable numbers. The depth of water and character of the bottom are suitable for small-boat fishing. The last trial for the day was in 31 fathoms, Cape Perpetua bearing ENE. (magnetic) 4 miles, but only one red rockfish was secured there. The total catch of edible fishes for the day amounted to about 600 pounds. The black-cod in this locality is smaller than in more northern waters, and lacks the sweet flavor which it has at the north.

On September 3 hand-line fishing was prosecuted with much diligence, the day's catch amounting to 41 black-cod, 60 orange rockfish, 3 whiting, 1 dogfish, and 1 shark. Had the wind blown less violently more fish would undoubtedly have been secured. Thirty-seven of the black-cod were taken during the first drift, Yaquina Head bearing NE. ½ N., and distant 8 miles. The depth was 44 fathoms. From our experience the best fishing-spots seemed to lie from 6 to 8 miles off shore.

Fishing was next taken up off Cape Falcon, or False Tillamook, and was continued at short intervals down the coast. The results were not

as favorable as off Yaquina Head, but a strong tide was running at the time and may have had more or less effect on the distribution of the fish, as is known to be the case in other places. On many spots over which we were drifted the hand lines brought up flounders, and the beam trawl, put over just before dark, secured between 800 and 900 of these fishes.

The region about Cape Meares, 16½ miles south of Cape Falcon, was subsequently investigated, the beam trawl being first used at station No. 3091, latitude 45° 32′ N., longitude 124° 19′ 30″ W., depth 87 fathoms. Half a dozen squid, 100 flounders, 5 red rockfish, and about a peck of prawns composed the bulk of the catch. In 46 fathoms, Cape Meares bearing E. § S., 4 miles distant, only one red rockfish was taken on the hand lines. A berth nearer shore gave better results, as 14 red rockfish were quickly secured there. During the continuance of this drift a series of trials was also made about Arch Rocks by means of a dory. These rocks lie about 2 miles from Cape Meares and 5 miles from the entrance to Tillamook Bay. Our investigations, however, were not attended with success, although the search was made as thorough as the time permitted. Attention was first given to the northern side of the rock, but obtaining nothing there, we shifted to the south side, where we soon discovered the cause of the barren condition of the region. In all sheltered places where the warm rays of the sun could penetrate, hundreds of sea lions were hauled out upon the rocks. Sea birds also filled the air and covered the summits of the rocks. The latter likewise consume large quantities of surface fishes, such as herring and smelts, and although none of these species were observed, the presence of the birds indicated their occurrence.

Off the entrance to Tillamook Bay, 22 red rockfish, 2 orange rockfish, 1 black-cod, 4 cultus-cod, and 1 yellow-striped rockfish were captured. From about 3 miles north of Cape Lookout to some 3 or 4 miles below the cape a very thorough examination of the bottom was made close in shore. During fifteen trials none of the baits upon the hooks were disturbed, and it is probable that the sea lions occurring along this region have caused a scarcity of fish. While the inshore work was in progress, the ship ran 10 miles off the land and made trials with the beam trawl and hand lines. By means of the former a large quantity of flounders was secured, while with the latter 2 red rockfish, 1 salmon, and a flounder were taken.

Between Cape Lookout and Siletz Bay thirteen trials were made with hand lines. Fish seemed to be plentiful in a few places, but in the majority only a limited number were obtained. The bottom in this region is sandy. The true cod (*Gadus morrhua*) has been reported from time to time from this section of the coast, but it is very improbable that it occurs there, and none were taken by the *Albatross* south of the Strait of Juan de Fuca. A few vessels would have no trouble in obtaining good fares of red rockfish and black-cod between Tillamook Rock and Yaquina Head, but, as already mentioned, the latter species has not

the same quality here as off Cape Flattery and the Queen Charlotte Islands. The water is shallow and the bottom sufficiently smooth to render fishing easy, and while the tide runs rapidly at times, it is not strong enough to carry a trawl buoy below the surface.

Running down the coast 48 miles, work was resumed off Heceta Head. Between this point and Coquille River, a distance of 63 miles, trials were made with hand lines in 15 different places. The bottom is not unlike that found farther north, and on many spots and ridges red rockfish were fairly abundant. In other localities, however, the bottom seemed to be more or less destitute of life.

Some time was occupied in hand-line fishing off Tsiltcoos River, in 13 fathoms, the mouth of the river bearing SE. by E. (magnetic), distant 2.7 miles, but without success. Better results were obtained during a ten-minute trial off Umpqua River, 12 miles south of Tsiltcoos River, 27 red rockfish being taken. The character of the bottom in these two places did not differ materially.

The ground adjacent to Cape Gregory was carefully examined in depths of 11 to 40 fathoms. The best fishing was found in the last-mentioned depth, Cape Gregory light bearing S. ¾ E. (magnetic), 14.5 miles distant. The catch consisted of 22 red rockfish. In six subsequent trials nearer the shore, in depths of 11 to 25 fathoms, no bites were obtained, notwithstanding the fact that the same kind of bait was used. At times, however, fish may be more abundant in this locality.

At hydrographic station No. 2066, lat. 43° 03′ 30″ N., long. 124° 33′ 30″ W., 44 fathoms, the ship lay to, drifting for an hour and twenty minutes, with twelve hand lines in use, but not a single fish was taken. As we worked farther southward fish became exceedingly scarce, and the ground in the immediate vicinity of Cape Orford proved as unproductive as that off Cape Gregory. Not a fish was obtained in the course of seven trials, while with the beam trawl, 11 miles from the cape, only a few shells, 1 starfish, and a small crab were secured.

Many trials were made in the vicinity of Orford Reef by means of the dory, fitted with hand lines of different sizes. This reef consists of several rough ledges, rising abruptly and in some places perpendicularly from the sea, and is inhabited by many sea lions. Unlike other similar localities, however, where the presence of sea lions seems to cause a great scarcity of other aquatic life, food-fishes of several species are abundant here. By far the best fishing was obtained on the south side of the reef, in 6 to 8 fathoms of water, hard, irregular bottom. In the beginning an anchorage was made for each trial, but as it proved very difficult to raise the anchor at times, it was found expedient to lay to and drift with the wind and tide. The hooks frequently caught on the rocks, causing the dory to bring up suddenly, but notwithstanding these difficulties a very good collection of fishes was made. Among these were red, orange, and vermilion rockfishes, the cultus-cod, black-cod, and several large sculpins. The cultus-cod were unusually abundant.

During the progress of this investigation the ship was engaged in

dredging and fishing to the southward and westward of the reef. One haul with the beam trawl showed the bottom to be very rich in places. Only 1 cultus-cod, 1 rockfish, and 1 sculpin were taken with the hand lines.

This was the last fishing work carried on during the cruise, but after a trip to the Columbia River, soundings were begun off Cape Sebastian and were extended as far as Cape Mendocino, California. The character of the bottom along this part of the coast is not such as would lead one to expect the presence of fishes in large numbers, but some localities may be found where good fishing can be obtained.

The capture of halibut off Cape Mendocino has been reported on several occasions. The captain of the steam fishing schooner *George L. Chance*, of Portland, Oregon, states that in the latter part of July, 1889, he secured a number of halibut close to the cape, in a depth of 40 fathoms. As the feeding-ground in this locality covers only a very small area, it is not probable that many halibut need be looked for there. Heceta Bank is probably the only ground south of Cape Flattery where halibut may be expected to remain for any length of time. On the evening of August 7 the *George L. Chance* anchored on the southern part of that bank and put over hand lines. Several small halibut were caught in the course of a short time, and, thinking they must be abundant, a trawl line was set. The next morning, on hauling it, the heads of 11 halibut were found attached to the hooks, but sharks and dogfish had devoured the bodies. Further efforts also proved fruitless, and the vessel proceeded to Flattery Bank, where a fare was obtained.

POINT ARENA TO SANTA BARBARA, CAL. (MARCH AND APRIL, 1890).

The Italian and Greek fishermen of San Francisco fish the year round in various localities, both to the north and south of the Golden Gate. The most northern limit to their grounds is Point Arena, the most southern, Point Año Nuevo. Hand-line fishing is principally carried on between Point Reyes and Point Arena, in depths of 10 to 30 fathoms. Extra large red rockfish and cultus-cod are secured off Point Reyes, and as good fares may be obtained within 2 or 3 miles of the shore, attention is seldom paid to the adjacent deeper waters. Red rockfish are chiefly taken in this locality, but other species are also caught in smaller quantities. The red rockfish is also abundant in the vicinity of Bodega Head and Tomales Point. Fishing is carried on in Tomales Bay during the entire year, drag seines and three-mesh trammel nets being used for the capture of red rockfish, perch, flounders, smelt, sea bass, herring, and anchovies. From 30 to 40 fishermen confine their operations exclusively to this bay, making no attempts to try on any of the offshore grounds. The catch is marketed in San Francisco, being transported there by rail.

In Bodega Bay fishing is also prosecuted throughout the year, by means of hand lines and drag seines. The principal species obtained here are tomcod, red rockfish, and flounders.

The next important fishing-ground south of Point Reyes is Drake Bay. Drag seines are used exclusively, as the species which inhabit this locality are most readily captured by this method. Large boats engage in the fishery in this bay, from three to five going in company and each taking its turn in carrying the catch to market.

Ballenas Bay, not far from the Golden Gate, is a favorite locality for the use of the trammel net. Red rockfish, sea bass, and cultus-cod are the species chiefly taken.

Directly south of the Golden Gate, between Point Lobos and Point San Pedro, is a stretch of barren coast, about 11 miles long. The fishermen account for the scarcity of fish in this region by the presence of sea lions, which inhabit the ledges and all available places along the shore. From May to September trawl and hand-line fishing is carried on between Point San Pedro and Point Año Nuevo, mainly for red rockfish. As before mentioned, the San Francisco fishermen do not work farther south than Point Año Nuevo, but below that place other fishermen pursue their calling in close proximity to the coast.

About the Farallon Islands is located one of the chief fishing-grounds off the coast of California. Fishing is actively carried on in this region from September to May. The principal anchorage is off the south side of the South Farallon. The ground surrounding this island is, as a rule, more productive than that adjacent to either the Middle or North Farallones. The bottom is exceedingly rough and rocky, and much fishing gear is frequently lost upon it.

Fanny Shoal is a small spot of fishing-ground, on which large catches are sometimes made. The center of the shoal lies 3½ miles northwesterly from the North Farallon.

Cordell Bank is located some 16 miles northwest of Fanny Shoal, and during the winter months it is resorted to by a few of the large boats from San Francisco, which fish for cultus-cod and red rockfish. The fishermen, however, have very little knowledge respecting the size and characteristics of the bank, and take no pains to increase their stock of information regarding it.

The ground examined by the steamer *Albatross* during the early spring of 1890 extends from Point Arena to Santa Barbara. Time would not permit of an investigation of all the small bays and indentations, but attention was chiefly paid to localities of greatest importance. The fishing-grounds south of the Golden Gate, exclusive of the bays, do not differ greatly from those along the northern coast of California. The 30-fathom curve is about 1½ miles from the shore off Bodega Head, and at Point Reyes above 2½ miles. Its distance from the land increases rapidly from this point, and it turns abruptly seaward to inclose the Middle and South Farallones. At Pigeon Point, 38 miles south of the Golden Gate, it is again only about 2½ miles from shore, and thence to Santa Cruz it continues nearly parallel with the coast. The 100-fathom curve passes close to Cordell Bank and the Farallon Islands, and from the latter locality to off Point Año Nuevo it runs nearly parallel

with the 30-fathom curve. It enters Monterey Bay a little over 9 miles south of Santa Cruz, and leaves the southern side of the bay abruptly.

The bottom food-fishes inhabiting this extensive area do not differ much from those found farther north, either as to species, quantity, or quality. Many rich spots occur as feeding-grounds for the various kinds of rockfish and other important species, but there are abundant muddy depressions where nothing of commercial value can be found.

The fishermen all confine their efforts to depths much under 100 fathoms. Were more attention paid to deep-water fishing it would undoubtedly result in a material improvement in the size and quality of the boats. A large number of the fishing boats hailing from San Francisco, Santa Cruz, and Monterey have great stability and seaworthiness, and they are often good sailers, but very much could be done to increase the comfort of the crew, for which there are at present practically no accommodations.

On two occasions, while at anchor in Drake Bay, the bottom was tested with hand lines of different sizes, but nothing was captured, and the same negative results were obtained with the use of crab nets. A cod trawl, set for six hours across a rocky patch of ground on the northern side of the bay, afforded only 2 small flounders. Rockfish inhabit this ledge in summer, but they never occur there in large numbers. The principal edible fishes secured with the beam trawl about the Farallon Islands were flounders and soles, of several species, and red rockfish. Flounders, soles, anchovies, tomcod, crabs, and other invertebrates were taken by the same means in the vicinity of Noonday Rock, but only red rockfish were caught with hand lines.

A cod trawl was set for seven hours on the western part of Cordell Bank, in a depth of 30-odd fathoms, the catch consisting of 47 red rockfish, averaging 6½ pounds each, and 2 cultus-cod, weighing 18 and 20 pounds, respectively. One orange rockfish, 2 yellow-tails, and 2 cultus-cod were captured with hand lines during a drift which occupied about three-quarters of an hour. All subsequent trials with hand lines and trawls on grounds farther south proved less satisfactory. This, however, may have been partly due to a strong wind which prevailed during the greater part of the time.

Cordell Bank has not yet been fully explored. It covers approximately an area of 20 square miles, and its small extent precludes its being resorted to by many vessels at a time. A vessel operating with six to eight dories could, under favorable conditions, obtain from 4,000 to 5,000 pounds of fish a day, but whether this abundant supply would continue long can be only ascertained by experiment. The bottom consists of rocks, sands, and shelly patches, intermixed with mud.

On grounds contiguous to Point Reyes, Russian River, and Bodega Head, and off the entrance to Drake Bay edible fishes were taken in considerable quantities with the beam trawl, but nothing worthy of special mention was obtained in the immediate vicinity of Point Reyes. Hauls were made at short intervals along the coast southward, begin-

ning off Drake Bay. In the first haul 100 flounders, of several species, half a dozen anchovies, a few herring, red rockfish, and tomcod were collected. Off Ballenas Bay, 4 miles SW. by W. from Duxbury Point, 50 anchovies, 1 smelt, 3 tomcod, 20 flounders, half a dozen perch, and a large mass of other material, composed the catch. One mile WNW. from the northern end of Four Fathom Bank, in 11 fathoms of water, flounders, soles, anchovies, and shrimps were taken.

The sole obtained in this region are small compared with those found in deep water off Monterey Bay and to the westward of the Farallon Islands. This species is pronounced by epicures to excel in edible qualities nearly all the other deep-sea fishes of the Pacific coast. It seldom reaches the San Francisco market, however, as the fishermen do not push into sufficient depth of water to procure them. The steamer *U. S. Grant*, of San Francisco, has been engaged for some time in deep-water drag-net seining, but its operations have been restricted to water of too slight a depth to procure more than scattering specimens.

Trials with hand lines and beam-trawl were made off Cypress Point, but without much success. During the summer fish are said to be abundant in this locality, but in winter the fishermen spend no time upon this ground. In deep water off Monterey Bay very large deep-sea sole * were taken in considerable numbers, and in nearly all hauls made farther to the southward, in depths over 90 or 100 fathoms, the sole and black-cod were obtained in greater or less abundance. The edible qualities of the latter species are inferior, however, to what they are in the neighborhood of Cape Flattery.

A cod trawl was set off the northern entrance to San Simeon Bay, on a sharp, rocky patch of ground, but no edible fishes were caught, although starfishes were numerous. San Simeon Bay has been for many years one of the principal whaling stations on the Pacific coast, and very little attention has been paid to other kinds of fishing. During the past winter ten boxes of smelts, holding 160 pounds per box, were secured by one man, using gill nets. This is the largest amount of fish ever taken during a single season.

Seven whales were taken during each of the seasons 1888 and 1889. Those obtained in 1888 yielded 180 barrels of oil, while 260 barrels were taken from the catch of 1889. This difference was due to the larger size of the whales in the latter year. Whales frequent this region during the months of December, January, and February, but in some years a few are seen as late as the middle of March. It is during these months that the "down run" takes place. The "up run" is of shorter duration, lasting, as a rule, from four to six weeks. While

* The deep-sea sole taken here were by far the largest found by the *Albatross* in the North Pacific. The largest specimens weighed 8 pounds, while specimens of 4 to 6 pounds were common. It was found that they improved by being kept on ice, and a considerable number were carried to San Francisco for distribution. They were highly appreciated by those who received them.

moving south the whales are invariably fat, containing 50 per cent more oil than on the return north. Twenty-one men and nine boats are employed at this station during the whaling season. Only two men are retained in the summer, to look after the boats and buildings. The crew receives a lay of one-fiftieth, the harpooner or shooter (the harpoon being fired from a gun) one-sixteenth.

From San Simeon Bay to and beyond Point Conception, whiting, red rockfish, black-cod, and deep-sea sole were taken in nearly every haul of the beam trawl, but not many specimens at any one time. Windy weather prevented the hand lines from being used successfully. One morning was spent in seining on the beach at Santa Barbara; viviparous perch were the predominating species. Summer is the best season for fishing in this vicinity. Crab nets were set in various places for the purpose of capturing specimens of the salt-water crayfish, but none were obtained, as this species is rare in the immediate neighborhood of Santa Barbara. The fishermen obtain their supplies about 11 miles farther south and among the outlying islands.

Fishing was next resumed in Monterey Bay, on the return trip toward San Francisco, and the work was actively carried on with several kinds of apparatus. Perch and smelt were taken in considerable numbers in the drag seines. One small striped bass* was also captured by the same means, and it is thought that this is the most southern point from which this species has been recorded. Gill nets and a cod trawl were set about 1½ miles from the anchorage in the harbor. One barracuda was taken in the former, but no fishes were secured with the latter, although starfishes of several species were attached to the hooks. The winter fishing-ground is from 5 to 6 miles farther off shore, but in very fine weather red rockfish are frequently caught close to the head of the bay. The Monterey fishermen generally fish in winter on grounds contiguous to the southern entrance to the bay. Those at Santa Cruz resort to a small rocky bank which lies a short distance southerly from Santa Cruz light. This bank is also extensively fished on in the summer. Gill nets and drag seines are employed on sandy bottoms and smooth beaches in different parts of the bay.

Fish of all kinds were unusually scarce the past winter in Monterey Bay. This was supposed to be due to the very extensive rainfall which had taken place. This bay seems to be much affected by storms. Twenty-four hours after a heavy rain the surface becomes covered with muddy water, which has the effect of driving the fish away, but they return shortly after the storm has subsided. Continuously stormy weather has a tendency to keep the fish away for comparatively long periods, frequently for a week or ten days at a time. Notwithstanding this fact, however, Monterey Bay is one of the most productive fishing-grounds on the California coast.

* *Roccus lineatus*, introduced from the Atlantic and now becoming common.

BERING SEA, SUMMER OF 1890.

BRISTOL BAY.

Since 1882 from one to four vessels have fished each year in the shallow waters of Bristol Bay. The fish inhabiting this region do not run as large as in the North Atlantic Ocean, and vessels of large tonnage, therefore, find it impracticable to depend entirely upon these grounds for a season's work. Small vessels are more profitable, as they do not exhaust the bottom so quickly, and consequently have to change their berth less frequently.

The fishing vessels entering Bering Sea sometimes make trials in the vicinity of Unimak Pass and the Northwest Cape of Unimak Island, the latter being located near the western end of Slime Bank. It is not unusual in the spring that they find comparatively good fishing off Akutan, Akun, Tigaldi, and Avatanak islands, but full fares are never obtained in those places, and a large catch is never expected. The size and quality of these cod compare fairly well with those of Bristol Bay, but, finding them much less abundant, the vessels remain here only a few days. The natives of the region, however, find no difficulty in obtaining all the cod, flounders, etc., which they require for their own use.

Slime Bank has been so named by the fishermen on account of the great numbers of jellyfishes which occur upon it. It extends from the northwestern extremity of Unimak Island, parallel with the coast, to within about 10 miles of Amak Island, and has a total area of about 1,445 square miles; its average width is about 17 miles. The bottom consists of gray, yellow, and black sand, with occasional small rocky patches. The water is usually comparatively shallow, the greatest depth discovered being 75 fathoms.

After leaving the Akutan and Unimak grounds, the fishermen next anchor on the western part of Slime Bank, and thence work gradually to the eastward. Up to the middle or latter part of June the jellyfishes are not sufficiently abundant to be considered a nuisance, but immediately after that time they increase rapidly and soon become a serious obstacle to fishing operations. Their soft tentacles not only cover the baits on the hooks, making them unattractive to fish, but they also adhere so tenaciously to the lines that the latter can only be handled with difficulty. They also produce much irritation and at times cause severe sores to break out on the hands of the fishermen. By the 1st of July the mass of "slime" has become so thick and troublesome that it is almost useless to remain longer on the bank. Otherwise, Slime Bank is well adapted to fishing during the summer months, as cod are very abundant upon it. The largest and most thrifty fish are found some 6 or 8 miles off shore, a large percentage of those caught near the land being small and of inferior quality.

Although we had previously passed over Slime Bank, our first actual work upon it began on June 24. Eight trials with hand lines were made in the vicinity of Cape Lopin and the Northwest Cape, the catch

amounting to 139 cod, weighing 1,612 pounds. Their stomachs contained crabs, holothurians, sand-lances, and the remains of other fishes. These trials occupied from twelve to twenty minutes each and were made in depths of 13 to 62 fathoms, the bottom being sandy. On the following day hand-line fishing was continued in connection with the sounding and dredging operations. The same number of fishing trials was made as on the previous day, but the aggregate weight of the cod, 59 in number, was only 596 pounds, making the average weight slightly less.

In the immediate vicinity of Amak Island cod occur only in small numbers, their scarcity being probably due to the presence of sea lions. The quantity of fish consumed in this vicinity by these animals must be very large, especially in the winter, when their numbers are greatly augumented by visitors from the north.

The walrus has always been abundant in this region, and while at anchor off Izenbek Bay, between Amak Island and the mainland, we observed some 30 or 40 individuals swimming about in the water about three-quarters of a mile from the ship; 8 or 10 more were hauled out upon the sand-spit at the entrance to the bay. The stretch of coast adjacent to Slime Bank has no available harbors, and should winter fishing ever be carried on there, which is improbable, the vessels would be exposed to very severe storms without the means of shelter. During the summer heavy winds rarely occur, but moderate gales of short duration are cocasionally experienced; yet, as a rule, the vessels ride them out without difficulty.

Trawl lines are not used in Bering Sea, the depth of water and character of the bottom making it more convenient to fish with hand lines from dories. A few attempts have been made to employ the trawl lines on Slime Bank, but they soon become thickly covered with the so-called slime, making them difficult to handle, while the catch was also small. While these difficulties would not be encountered elsewhere, the water is generally so shallow and the fish, in suitable places, so abundant, that the hand lines can be operated more readily and economically.

The fishermen have no trouble in obtaining bait. On leaving port a small quantity of salt salmon and salt herring is placed on board, to use for the first trials, but this is soon replaced by fresh bait taken on the hooks, such as sculpins, flounders, and other small fish. Halibut are also frequently obtained in sufficient quantities to serve for this purpose, for which they are regarded as nearly equal to squid. All of the halibut taken in Bristol Bay by the *Albatross* were of small size, and it is said that large individuals are rarely obtained.

Baird Bank is much the largest fishing-ground in Bristol Bay. It extends from off Izenbek Bay to the Ugaguk River, a distance of 235 miles, and has an extreme width of 59 miles, its total area amounting to about 9,200 square miles. The depths range from 13 to 53 fathoms, and the fauna living upon it is rich and varied. It is well supplied with cod. The name Port Möller Bank, which has been given to it by the fishermen, has been changed to Baird Bank by Capt. Tanner.

Many trials were made on this bank, and while they were never of long duration, the examination was sufficiently thorough to disclose its principal features. As on Slime Bank, the best fish were found some distance from the shore, the most favorable localities being from 15 to 20 miles from land. Those caught within 4 or 5 miles of the beaches and headlands were small and many were inferior in quality.

During the progress of the inquiry only one cod-fishing vessel was seen, the schooner *Vanderbilt*, of San Francisco, commanded by Capt. A. W. Smith. She was anchored on the Port Möller ground, about 20 miles off shore, and had been on the bank a little over a month. Only one berth had been made, and 43,000 cod had been taken up to that time. We subsequently learned that the *Vanderbilt* completed her trip with 48,500 count fish, measuring 28 inches and over, and several thousand small fish. Capt. Smith informed us that heavy winds prevailed from June 11 to 21, preventing any fishing during that period. The same wind on the Grand or Western Bank would not have interfered with fishing, as the sea there takes a different shape, and is less liable to trip or break into a dory. On the south banks of the Alaska Peninsula the sea is also much more uniform than in Bering Sea. Stormy weather is said to scatter the cod on the banks in Bristol Bay or to drive them into deeper water.

The halibut on Baird Bank seldom exceed 25 pounds in weight. They are always used as bait when taken, and are sometimes very abundant. During the past season, however, they proved to be unusually scarce. Capt. Smith considers the Port Möller ground to be superior to all other fishing-grounds in Bering Sea. The cod are not larger or of better quality than on Slime Bank, but there are fewer obstacles to fishing.

Nearly all the cod in Bristol Bay and other parts of Alaskan waters have black napes, specimens with white napes being rarely taken.

As we proceeded to the northward and eastward from the Port Möller region the fish gradually decreased in size and abundance, but while the difference is not great it is sufficient to induce the fishermen to remain in that locality. However, so little is known about the habits of the cod in this region that no reliable deductions can yet be made regarding this general subject. Good fares can undoubtedly be obtained to the eastward of the Port Möller ground, but at the eastern extremity of the bank the fish become scattering and greatly reduced in numbers, due no doubt to the volume of fresh water which issues from the Ugashik, Ugaguk, Naknek, Kvichak, and Nushagak rivers. The cod which visit the head of the bay are probably attracted there by young salmon, the remains of which were found in the stomachs of cod examined from this locality. In this same region cod are said to be more abundant and to range farther east on the flood tide than on the ebb.

The only available harbors for shelter adjacent to Baird Bank are Port Möller and Herendeen Bay, but as these places are not yet buoyed, their tortuous channels are especially difficult of navigation by sailing

vessels. Southerly and westerly winds do not produce a heavy sea, but a very fresh breeze from the northwest or southwest is immediately followed by a choppy sea.

An examination of the stomachs of all the cod captured by the *Albatross* showed that they feed upon a wide range of both invertebrates and fishes. Pebbles, often of considerable size, seemed to occur more frequently in the cod of Bering Sea than in those of the North Atlantic. They are undoubtedly taken in with such articles of food as grow attached to hard objects, the sea-anemones, which are unusually abundant on the banks of Bristol Bay, being of this character.

That part of Bering Sea situated between Cape Constantine and Cape Newenham, and extending some 20 odd miles from the southern end of Hagemeister Island, has been named Kulukak Bank. The bottom and the fauna in this region do not differ materially in character from those of the other fishing-grounds in Bristol Bay. Sand is the predominant material, with an occasional mixture of mud and gravel. At the beginning of the Bristol Bay cod-fishery this ground was resorted to, but it was soon discovered that the fish were smaller and inferior in quality to those occurring on the more southern banks. One exception, however, is noted by the fishermen with respect to a small spot situated about 16 miles SSW. from the southern end of Hagemeister Island, called Gravel Bank, but its extent is slight; the depth of water ranges from 16 to 20 fathoms.

Small fish predominate among the islands of the Walrus Group. Larger individuals are reported from certain indentations and rocky patches, but they are not sufficiently abundant to attract fishermen.

Cod are plentiful in the vicinity of Cape Peirce, but the proportion of diseased individuals among them has led the fishermen to give the name Hospital Bank to these grounds. Nothing was obtained close to the rocky bluffs of Cape Newenham, and no success attended the trials made in the adjacent waters. The quantity of fresh water which issues from the Kuskokwim River probably accounts for this scarcity or absence of fish.

The total number of cod caught in the 113 trials made in Bristol Bay during the summer of 1890 was 946, having a combined weight of 9,919 pounds, an average of about 10½ pounds per fish. The highest average in any single catch was 15½ pounds on Slime Bank, and the next highest, 15¼ pounds, on the Port Möller ground of Baird Bank. The average weight of several catches on Slime and Baird banks was more than 15 pounds. The largest cod captured during the cruise weighed 27½ pounds, the smallest 1 pound. Practically nothing is known respecting the abundance or movements as well as the condition of the cod on the banks of Bristol Bay during the winter months, as no fishing is prosecuted there at that season.

Nearly all the fishing trials by the *Albatross* were conducted while the ship was hove to, and rapidly drifting through the influence of the tide or wind. The length of each trial, moreover, seldom exceeded

twenty minutes, and the tests were therefore insufficient to obtain a thorough knowledge of the bottom, yet it was satisfactorily demonstrated that the greater part of Bristol Bay affords good fishing-grounds. As a rule, vessels have better fishing after the lapse of two or three days, the bait which falls from the hooks or otherwise reaches the bottom tending to tole the fish from the surrounding area.

While all of the fish taken during the summer months were carefully examined, only one cod was secured in which the elements of reproduction were at all mature. It was a male containing ripe milt. The finding of occasional individuals thus sexually advanced outside of the breeding season has also been recorded with respect to the North Atlantic Ocean.

The investigations of the steamer *Albatross* probably covered all of the important cod banks on the eastern side of Bering Sea, as it is extremely doubtful if any rich banks will be found north of Cape Newenham. Certainly we have received no information of such areas up to the present time, although scattering specimens of cod have been reported from the vicinity of Nunivak Island and from along the coast as far north as St. Michaels. On the Siberian side the conditions are better suited to their occurrence in higher latitudes, and they are said to abound there farther north.

Salmon canneries of Bristol Bay.—The first salmon cannery was built on the Nushagak River by the Arctic Canning Company in 1884, having been the outgrowth of a salting station established there the previous year. Other canneries were soon afterwards constructed in the same vicinity. The buildings of the Arctic Canning Company are situated on the east bank of the river, some 12 or 15 miles above its mouth. The number of men and boats employed is as follows: One superintendent, Mr. H. C. Jeneen; 50 fishermen, 20 mechanics, including engineers, machinists, firemen, carpenters, coopers, cooks, and waiters; 92 Chinamen; 25 boats, and 1 steam launch 35 feet long, used for light towing and other purposes.

Each cannery has one large vessel to carry material to the field of labor—men, machinery, boxes, nets, boats, barrels, lumber, etc. As soon as she arrives at her destination she is immediately stripped of sails and running rigging, and moored for the summer. After the close of the salmon season she is again fitted up, receives the catch on board, and sets out on the home voyage. Scow lighters are used for discharging and loading the ships. They also serve as quarters to live in whenever fishing is carried on up the river a considerable distance from the cannery. The salmon are frequently most abundant 40 or 50 miles from the mouth of the river, at which time the entire force of fishermen repair to that place and work night and day until a change of location becomes desirable. When a scow is loaded with salmon it is generally taken in tow by the steam launch, but sometimes one or more will drop down the river on the ebb tide without this aid.

The cannery of the Nushagak Canning Company is also located on the east bank of the river, 9 miles below Fort Alexander. It was built in 1887, and is under the management of J. W. Clark and J. L. Wetherbee. The working force comprises 40 fishermen, 100 Chinamen, 1 engineer, 2 firemen, 1 carpenter, 1 box-maker, 1 cook, and 2 waiters. They use 1 steam launch, 20 boats, and 5 scows, of which one is sloop-rigged.

The Alaska Packing Company's cannery was established in 1886, and has paid a good interest on the investment. The men and boats employed are as follows: 50 fishermen, 95 Chinamen, several engineers and firemen, 2 carpenters, 1 box-maker, 1 cook, and 2 waiters; 25 boats, 8 scows, of which 1 is sloop-rigged, 1 steam launch 36 feet long, and 1 steamer of 40 tons burden.

The Bristol Bay Canning Company's establishment is on the west side of the river, nearly opposite Fort Alexander, in what is considered to be one of the best locations in the region; it was built in 1885. It employs 50 fishermen, 83 Chinamen, and 18 other persons, including engineers, carpenters, firemen, etc.; and is equipped with 25 boats, 5 scows, 1 sloop, and 1 steam launch.

All the canneries on the Nushagak River have adopted the same methods of fishing for salmon, namely, with gill nets, which yield the best results at all times. They are regarded as much superior to drag seines and traps. Two sizes of nets are employed, one for king salmon, the other for red and silver salmon. A king-salmon net is 100 fathoms long and 23¾ feet deep, or 30 meshes, measuring 9½ inches stretched. The nets for the red and silver salmon are 70 fathoms long and 13 feet or 24 meshes deep, the size of the mesh being 6½ inches. The floats are made of wood and are placed 3 feet apart; the leads on the foot line are 2½ feet apart. Attached to the lower corners of each net is a galvanized-iron ring, 1 foot in diameter, which prevents the net from fouling. Without their use the nets, when set in a strong current, tend to roll up into an inextricable ball. The nets seldom survive a season's fishing, for they are continually in the water, except when undergoing repairs. The fishermen generally regard the Barbour twine, manufactured in this country, as superior to that of Scotch manufacture, because it wears better, and some canneries have discarded the use of all foreign-made twine, notwithstanding its cheaper price. The fishermen rig and hang all nets and other gear used in the fishery, and also keep them in repair. When fish are abundant one or two men from each cannery are detailed to attend to the repairing.

The boats used by the Alaska Packing Company are of the Columbia River type, measuring 25 feet long, 8 feet beam, and 2 feet deep. They are provided with centerboard, and with a small half deck, both fore and aft, under which small articles can be stored. An 8-inch washrail affords some protection against a choppy sea in a stiff breeze. The sprit-sail rig is universally employed on the Nushagak as on the Columbia River, the sail area being from 40 to 60 square yards. All

other canneries on this river use flat-bottomed boats, measuring 24 feet over all, and 7 feet beam, with an 8-inch washrail. This style of boat costs less than the other, and is equally efficient, especially as sandbars and mudflats are scattered along the river.

The fishermen receive 10 cents each for catching king salmon and 3 cents each for red and silver salmon, besides $75 for assistance in handling the vessel on the passage to and from San Francisco. Previous to the present season the fishermen have been paid monthly wages, but the change is thought to be for the better, and all the canneries have agreed to the same terms.

Forty-five cents per case is paid for putting up salmon. This includes all the labor from the time the fish are taken from the fishermen until the cans are labeled and boxed for shipment. Each cannery employs one reliable Chinaman to attend to the mechanical part of the business, and he hires the remaining men of his class, who look to him for their pay. He is held rigidly to his agreement by the company.

The facilities for handling and putting up salmon are about the same at all the canneries on the Nushagak River. Twelve hundred is the largest number of cases that could be prepared in a day by each cannery, providing every effort was put forth, but the fish are not sufficiently abundant to attain that figure, and half the amount mentioned would be regarded as a fair day's work.

Salmon first make their appearance the first of June, and remain from 55 to 60 days. As the season is short all the needed preparations are made beforehand and from the middle of May until the first of June every man about the cannery is actively engaged in this work.

Formerly the machinery for manufacturing cans was sent out from San Francisco, but it has since been found more economical to ship them ready-made from the latter place. Another advantage is that the voyage is delayed until more settled weather generally prevails.

The first salmon were taken the past season on the morning of June 3 by boats belonging to the Bristol Bay Canning Company. The total catch on that date amounted to 660 fish, producing 250 cases. This small catch acted as an incentive and everybody rushed to the spot where they had been obtained, but several days elapsed before any more were taken.

The first species which enters the river is the king salmon. They remain about a fortnight, after which come the red salmon, followed closely by the silver salmon. The king salmon are first sought in the vicinity of Coffee Point, a high promontory situated on the west side of the river, where the fishermen are in the habit of coming together to drink their coffee after a hard night's fishing.

It is said that the ice has considerable effect upon the appearance of the salmon. It is sometimes unusually late in breaking up in the river, in which case the salmon remain outside until it has disappeared and the temperature of the water has somewhat increased. When the salmon are late in entering the river they immediately proceed up

stream to Nushagak and Aleknagik lakes, where they spawn. If the season be an open one, however, they frequently loiter on the way, spending considerable time on their upward passage. The latter conditions are, of course, most favorable for the fishermen. During the past spring the river was blockaded with ice until May 20, and the run was a late one in consequence.

The fishermen consider that the salmon spawn about a month after entering the river. The superintendent of the Bristol Bay Canning Company, who has had much experience in this part of Alaska, states that from the first of August until October young salmon pass down stream, and enter the sea daily by the million. It takes, on an average, about 6 red salmon to make a case of the preserved product, and about the same number of silver salmon. Two and one-half of the king salmon are equivalent to about 6 of either of the other two species.

Heretofore each cannery has had from one to five traps, but returns from them have not compared favorably with the cost of keeping them in repair. The original cost of a trap is $250. The main body is made of twine, but the leaders are constructed of galvanized-iron wire netting, which is superior to common twine netting, offering more resistance to the drift material which comes down the river in large quantities. Notwithstanding, however, that every precaution is taken to make them secure, they are frequently torn from their fastenings and swept away. The king salmon is said not to enter the traps like the other species.

The Arctic Canning Company has this year built a trap in the Naknek River, which it is expected will give good results.

VICINITY OF UNALASKA ISLAND.

Along the Aleutian group of islands the bottom differs materially in character from that of Bristol Bay. Instead of large areas of sand, intermixed with patches of mud and rocks, nearly one continuous rocky bottom is found, upon which cod are fairly abundant. The investigations of the *Albatross* among the Aleutian Islands were mainly confined to the continental platform along the Bering Sea side of Unalaska Island as far as Umnak Island. However, a line of soundings was run between Atka Island and Unalaska Island, nearly parallel with the coast trend, which indicated the existence of much bottom suited to cod and halibut, and good fishing-grounds for those species will undoubtedly be found in that region, as well as about the other islands lying to the westward of Atka. Information to the same effect has been derived from other sources, but the occurrence of large fishing-banks is precluded by the fact that deep water approaches to within a very short distance of the islands.

Unalaska harbor and vicinity.—The fishing-grounds in the neighborhood of Iliuliuk, Unalaska, extend only a short distance from the shore, 3 to 6 miles being the width of area on which cod are likely to be found. The bottom consists mainly of rocky and muddy patches, of small to large extent, on which sand, gravel, and shells also occur in small quan-

tities. The rocks have the appearance of being of volcanic origin, and are very rough and sharp. They would be very destructive to most kinds of fishing gear.

Cod are frequently caught from the wharf and beach in Iliuliuk Harbor, and native women may often be seen fishing for them from the rocks along the shore. Certain grounds in Captain's Harbor are sufficiently rich to supply the inhabitants of Iliuliuk during the entire year. The fish taken there, however, are not as good as those from the offshore grounds, but the Aleuts are not particular about their quality.

The cod in this locality will accept almost anything as bait, and among the articles used for this purpose may be mentioned seal meat, sculpins, flounders, pork, and bacon. Salmon being the principal diet of these people, a large stock of cod is never secured at one time, and the latter species is almost invariably eaten fresh. Such as are not immediately eaten, however, are cured in the same manner as salmon.

Considerable time was spent in testing the bottom in the vicinity of Priest Rock and Cape Cheerful, at the entrance of Iliuliuk Harbor. Trials were made with hand-lines in depths of from 22 to 58 fathoms. In close proximity to the cape, cod were found abundant, the average weight of those captured being 11 pounds. A halibut weighing 6½ pounds was caught in a depth of 40 fathoms, sandy bottom. This species has never been regarded as common in this region, but, as no one ever fishes for them, the real facts in the case have not yet been ascertained.

In approaching Priest Rock we met with less success, the scarcity of cod being due, no doubt, to the extent of muddy bottom which occurs there. By a careful series of trials productive spots could probably be found in that vicinity.

This part of Unalaska Island offers many inducements for the establishment of fishing stations, such as occur on the Sannak and Shumagin islands, and a profitable industry of this character could undoubtedly be built up at this place. Good bait can readily be obtained in the fishing season, such as herring, smelt, sculpins, flounders, and salmon, and the cost of catching the same would be slight.

Cape Cheerful to Makushin Bay.—Between these two points the bottom differs but little from that above described. A well-defined platform, from 5 to 6 miles wide, and with depths of 20 to 60 fathoms, runs parallel with the coast. At its outer edge the bottom drops off suddenly into deep water. In many places cod were fairly abundant, and small vessels could probably fish in this region with profit. Owing to the force of the wind, which interfered greatly with operations, nothing was obtained in many of the trials made by the *Albatross*. Had an anchorage been made in each instance it is reasonable to suppose that better results would have been secured. By far the greatest number of cod were found near the shore, but the best fish, as to size and quality, were taken some distance off the land. At other seasons, however, the conditions may be more favorable inshore.

Excellent fishing was obtained at the mouth of a small indentation

or bay 11 miles east of Cape Makushin, both cod and halibut being captured. Three specimens of the latter species were secured, weighing 6½, 8, and 15 pounds, respectively. Two trials were made off the mouth of Makushin Bay, but a strong wind prevented satisfactory work.

Makushin Bay to Umnak Island.—The bottom in this region differs from that farther to the eastward chiefly in being better adapted to cod and halibut, especially the latter. The beam trawl and hand lines were used in the vicinity of Makushin Bay and Cape Hague. A rich bottom was disclosed by the former, but only five cod were taken in as many trials with the latter. They may, however, be more abundant here at other times. The bottom was found to be largely made up of sandy, muddy, and coral patches. With the latter were large quantities of sponges and other rich material, the combination suggesting the deep-water localities on the Grand Bank, where halibut are plentiful. This species is sometimes caught here by the natives, but whether they can be obtained in paying quantities or not has yet to be determined. Small vessels might probably engage in their capture with some show of success, but many years would elapse before all the good fishing-spots could be located, and at present there is no particular inducement to establish a commercial fishery in this region, as the halibut grounds south of the Alaska Peninsula and off the southeastern coast of the Territory offer better opportunities.

Chernoffsky and vicinity.—Near the harbor of Chernoffsky there is an excellent ground for both cod and halibut. Fifty-three cod and 5 halibut were captured on one trial lasting only thirty minutes. This would be a good fishing-place for a fleet of small vessels. Mr. Rankin, agent of the Alaska Commercial Company, who has lived at Chernoffsky seven years, states that the best halibut ground along this section of the coast is located in a small bay some 6 or 8 miles to the west of Chernoffsky. During the summer halibut are plentiful inshore, but on the approach of winter they invariably seek deeper water. They are sufficiently abundant to maintain a small fishery, providing there were convenient markets for the catch. From 10 to 12 pounds is the average size of those caught on the grounds near Chernoffsky and Umnak Pass.

Few halibut are found near the outer edge of the platform; the bottom a few miles nearer shore seems to be better adapted to them. All the halibut observed by the *Albatross* were white. Gray halibut are said to be seldom taken in Alaskan waters or off the Queen Charlotte Islands and on Flattery Bank.

Excellent cod-fishing was obtained at nearly every trial made off Chernoffsky, but as we approached Umnak Pass less success was met with. Fewer fish were found on the western side of the pass than on the eastern side, but it is probable that at some other season of the year cod may be more plentiful in the former locality, as the character of the bottom seems to be the same in both places. In fact the difference in their abundance may have been due to the state of the tide at the time the trials were made. Fishing was carried on in Umnak Pass in 30 to 60

fathoms. Trawl lines were not set, as the bottom was rough and rocky, and it was possible to cover the ground more rapidly by means of hand lines.

Bait is as abundant and varied at Chernoffsky as at Iliuliuk. Herring and other migratory fishes school about this part of the island in considerable numbers. There is a fine, smooth beach at Chernoffsky, well suited to the use of seines, and gill nets could also be set to good advantage in this locality, but the former method is preferable.

Makushin Bay and Chernoffsky are the best harbors on the north side of Unalaska, west of Cape Cheerful. They are accessible in most weather when fishing vessels would be likely to seek shelter on a coast unprovided with lights or buoys. Chernoffsky is landlocked and large enough to accommodate a good-sized fleet of small vessels.

But little profit could be realized by San Francisco merchants in the employment of the small vessels hitherto described to fish on banks so far from any market, yet vessels of this size would have a decided advantage in fishing here over the larger ones which visit the Okhotsk Sea. This is owing to the frequent change in position which would be necessary, the nearness of the grounds to the coast making it also possible readily to seek shelter. Should an extensive fishery grow up in this region, it would probably be conducted from local stations by means of small boats and small vessels, employing hand lines; and, after the preliminary curing of the cod, shipments could be made to market in vessels of large tonnage.

Miscellaneous.—In Makushin Bay large quantities of humpback salmon, trout, young cod, and flounders were captured by means of the drag seine. The beaches are smooth and comparatively free from rocks and other obstacles to seining. Two small streams enter the bay not far from the settlement. The larger one brings down considerable quantities of mud, which is deposited in the bay at half tide, discoloring the water for about 2 miles along the shore. The muddy water, however, has no apparent effect upon the salmon, as they run up this stream to the same extent as up the clearer one.

The humpback salmon enter the streams first, followed by the silver salmon. The same is true of the streams at Iliuliuk, Captain Harbor, and Chernoffsky. Considerable collecting was done at each of these places by means of drag seines and other appliances, with good results.

The harbors, bays, and streams of Unalaska are well supplied with salmon in their season, but the run is not sufficiently large to support extensive canning operations.

From the statement of fishing stations, which accompanies this report, it will be seen that 37 trials with hand lines were made between Priest Rock and Umnak Island. In 14 of these trials nothing was taken, but in the other 23 the combined catch amounted to 163 cod and 21 halibut. The total weight of the cod was 1,834 pounds, an average of something over 11 pounds each; and the total weight of the halibut 292½ pounds, an average of nearly 14 pounds to each fish.

TABLES.

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross from July 1, 1889, to June 30, 1891.

Serial No.	Date.	Time of day.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Instrument used.	Weight of sinker.
	1889.		° ′ ″	° ′ ″	*Fms.*		° F.	° F.	° F.		*Lbs.*
1858	Aug. 28	11:50 p. m.	45 52 00	124 10 30	53	fne. gy. S	60	59	45.6	Tanner	25
1859	Aug. 29	12:47 a. m.	45 51 30	124 17 00	73	fne. gy. s. bk. Sp.	60	58	45.6	do	25
1860	do	1:47 a. m.	45 50 45	124 23 30	83	fne. gy. S. M	60	58	45.8	do	25
1861	do	2:45 a. m.	45 50 15	124 29 30	87	fne. gy. S. M	59	58	45.3	do	25
1862	do	3:42 a. m.	45 49 45	124 36 00	81	C	59	58	45.1	do	25
1863	do	4:44 a. m.	45 49 15	124 43 00	120	fne. gy. S	59	59	44.6	do	25
1864	do	6:15 a. m.	45 39 00	124 40 00	186	M	59	59	43.5	do	25
1865	do	7:02 a. m.	45 38 30	124 32 30	123	M	60	59	45.0	do	25
1866	do	7:45 a. m.	45 38 30	124 25 00	91	M	60	59	45 3	do	25
1867	do	8:31 a. m.	45 38 00	124 17 30	81	M. and fne. gy. S.	60	60	45.2	do	25
1868	do	9:14 a. m.	45 38 00	124 10 00	58	fne. gy. S	61	60	45.7	do	25
1869	do	9:55 a. m.	45 37 30	124 04 00	42	fne. gy. S. and Sh.	61	60	47.4	do	25
1870	do	10:40 a. m.	45 33 30	124 03 30	45	fne. gy. S	61	60	47.2	do	25
1871	do	11:23 a. m.	45 29 00	124 04 00	48	fne. gy. S	60	60	46.7	do	25
1872	do	12:03 p. m.	45 28 30	124 10 45	73	fne. gy. S	61	62	45.6	do	25
1873	do	12:48 p. m.	45 28 30	124 17 30	94	gn. M	62	62	45.3	do	25
1874	do	1:32 p. m.	45 28 30	124 25 00	120	gy. S. bk. Sp	62	61	45.1	do	25
1875	do	2:20 p. m.	45 28 30	124 32 00	259	gn. M	62	61	42.4	do	25
1876	do	3:05 p. m.	45 23 45	124 32 00	216	gn. M	63	62	42.8	do	25
1877	do	3:50 p. m.	45 18 30	124 32 15	238	yl. M	64	66	42.6	do	25
1878	do	4:35 p. m.	45 18 00	124 25 15	217	M	64	66	42.8	do	25
1879	do	5:18 p. m.	45 17 30	124 17 30	130	M	67	66	44.4	do	25
1880	do	6:01 p. m.	45 17 30	124 12 00	88	gn. M	68	64	45.6	do	25
1881	do	6:43 p. m.	45 17 30	124 05 00	52	fne. gy. S	68	64	46.1	do	25
1882	do	7:33 p. m.	45 12 30	124 05 45	49	fne. gy. S	63	61	45.9	do	25
1883	do	8:22 p. m.	45 07 30	124 06 00	48	fne. gy. S	62	61	46.8	do	25
1884	do	9:16 p. m.	45 07 00	124 13 00	85	gy. S. bk. Sp	62	61	45.6	do	25
1885	do	10:07 p. m.	45 06 45	124 19 45	119	gn. M	62	60	44.8	do	25
1886	do	11:00 p. m.	45 06 30	124 27 15	190	gn. M	62	60	43.4	do	25
1887	do	11:55 p. m.	45 06 15	124 34 30	191	gn. M	62	60	43.4	do	25
1888	Aug. 30	12:43 a. m.	45 01 00	124 35 00	245	M	62	62	42.6	do	25
1889	do	1:37 a. m.	44 55 00	124 36 00	203	M	62	62	43.5	do	25
1890	do	2:25 a. m.	44 54 30	124 29 15	100	M	62	62	45.4	do	25
1891	do	3:13 a. m.	44 54 00	124 22 30	79	M	62	61		do	25
1892	do	4:00 a. m.	44 53 30	124 15 30	63	M and S	62	61	45.7	do	25
1893	do	4:44 a. m.	44 53 00	124 09 00	35	fne. gy. S	62	61	47.7	do	25
1894	do	5:30 a. m.	44 47 30	124 08 15	33	fne. gy. S	62	61	48.0	do	25
1895	do	6:02 a. m.	44 43 15	124 09 00	33	fne. gy. S	62	61	47.9	do	25
1896	do	6:46 a. m.	44 43 00	124 16 30	46	fne. gy. S	60	61	47.7	do	25
1897	do	7:29 a. m.	44 43 00	124 23 45	61	fne. gy. S	60	60	45.8	do	25
1898	do	8:14 a. m.	44 43 00	124 30 30	87	fne. gy. S	60	60	45.5	do	25
1899	do	8:56 a. m.	44 43 00	124 43 00	156	fne. gy. S. bk. Sp	60	60	44.2	do	25
1900	do	9:39 a. m.	44 43 00	124 46 00	217	yl. M	61	61	41.7	do	25
1901	do	10:27 a. m.	44 38 00	124 46 30	139	bk. S	62	61	44.7	do	25
1902	do	11:15 a. m.	44 38 00	124 54 00	311	gn. M	62	61	40.9	do	25
1903	do	12:08 p. m.	44 33 00	124 54 30	340	fne. bk. S	61	61	40.9	do	25
1904	do	12.56 p. m.	44 33 30	124 48 00	185	gn. M	61	61	44.5	do	25
1905	do	1:42 p. m.	44 33 45	123 41 30	123	M	60	61	44.8	do	25
1906	do	2:31 p. m.	44 34 00	124 35 15	94	M	57	59	45.1	do	25
1907	do	3:16 p. m.	44 34 15	124 28 30	60	fne. bk. S	56	59	46.1	do	25
1908	do	4:01 p. m.	44 34 15	124 23 30	60	crs. S. brk. Sh	56	59		do	25
1909	do	4:45 p. m.	44 34 30	124 17 00	43	fne. gy. S	56	59	46.7	do	25
1910	do	5:27 p. m.	44 30 30	124 10 00	28	fne. gy. S	56	56	48.5	do	25
1911	do	7:30 p. m.	44 30 00	124 11 00	28	fne. gy. S. bk. Sp	56	56	47.5	do	25
1912	do	8:13 p. m.	44 25 30	124 12 30	28	fne. gy. S	57	56	46.7	do	25
1913	do	9:07 p. m.	44 26 00	124 19 30	43	fne. gy. S	56	56	45.8	do	25
1914	do	9:58 p. m.	44 26 30	124 26 15	42	rky	56	56	44.8	do	25
1915	do	10:46 p. m.	44 27 00	124 34 00	56	crs. bk. S	56	56	45.2	do	25
1916	do	11:32 p. m.	44 27 30	124 41 00	79	fne. gy. S	55	58	45.1	do	25
1917	Aug. 31	12.24 a. m.	44 28 00	124 48 00	167	G	55	58	43.1	do	25
1918	do	1:24 a. m.	44 28 30	124 54 45	265	M	56	57	41.3	do	25
1919	do	2:20 a. m.	44 23 15	124 54 45	293	M	56	57	40.9	do	25
1920	do	3:10 a. m.	44 18 00	124 54 45	282	M	56	58	41.3	do	25
1921	do	4:02 a. m.	44 18 00	124 47 30	84	bk. S	59	58	45.7	do	25
1922	do	4:57 a. m.	44 18 00	124 41 00	51	C	56	57	46.4	do	25
1923	do	5:43 a. m.	44 18 15	124 34 00	56	bk. S. and G	56	57	46.2	do	25
1924	do	6:29 a. m.	44 18 15	124 28 00	54	gy. S. bk. Sp	55	56	45.7	do	25
1925	do	7:09 a. m.	44 18 30	124 21 00	45	gy. S. bk. Sp	56	56	46.5	do	25

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross from July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time of day.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Instrument used.	Weight of sinker.
	1889.		° ′ ″	° ′ ″	*Fms.*		° F.	° F.	° F.		*Lbs.*
1926	Aug. 31	7:49 a. m.	44 18 30	124 15 00	35	gy. S. bk. Sp....	57	56	47.2	Tanner ..	25
1927	...do ...	8:05 a. m.	44 18 30	124 12 30	31	yl. S. bk. Sp	57	56	47.7	...do	25
1928	...do ...	9:00 a. m.	44 13 30	124 12 30	31	fne. gy. S.....	57	56	48.9	...do	25
1929	...do ...	9:40 a. m.	44 07 30	124 11 00	29	fne. gy. S.....	58	57	47.7	...do	25
1930	...do ...	10:36 a. m.	44 07 00	124 18 00	45	fne. gy. S.....	57	57	46.9	...do	25
1931	...do ...	11:21 a. m.	44 06 30	124 25 00	60	M	57	57	46.2	...do	25
1932	...do ...	12:06 p. m.	44 06 00	124 31 30	69	gn. M	57	57	45.9	...do	25
1933	...do ...	12:56 p. m.	44 06 00	124 37 30	70	gn. M	59	59	45.7	...do	25
1934	...do ...	1:45 p. m.	44 05 30	124 44 15	63	gn. M.....	59	59	46.1	...do	25
1935	...do ...	2:30 p. m.	44 05 30	124 51 30	51	br. C. and P	59	59	47.1	...do	25
1936	...do ...	3:10 p. m.	44 05 00	124 56 00	346	M	59	59	40.9	...do	25
1937	...do ...	4:06 p. m.	43 59 30	124 59 00	326	fne.gy.S.bk.Sp.	59	59	41.8	...do	25
1938	...do ...	5:06 p. m.	43 53 00	124 59 00	602	gn. M.....	59	59	40.2	Sigsbee ..	35
1939	...do ...	5:40 p. m.	43 53 00	124 56 00	365	gn. M.....	68	63	40.4	...do	35
1940	...do ...	6:07 p. m.	43 52 45	124 53 00	284	gn. M.....	68	63	41.4	Tanner ..	25
1941	...do ...	6:32 p. m.	43 52 30	124 50 00	175	fne. bk. S	68	63	42.8	...do	25
1942	...do ...	6:55 p. m.	43 52 15	124 47 00	159	M. and bk. S....	61	61	43.7	...do	25
1943	...do ...	7:17 p. m.	43 52 00	124 44 00	159	M	61	61	43.7	...do	25
1944	...do ...	7:40 p. m.	43 52 00	124 40 30	159	M	60	60	43.7	...do	25
1945	...do ...	8:30 p. m.	43 47 45	124 37 00	185	gn. M.....	60	60	43.7	...do	25
1946	...do ...	9:20 p. m.	43 43 30	124 34 30	127	gn. M.....	60	60	45.1	...do	25
1947	...do ...	10:07 p. m.	43 39 15	124 30 30	97	gn. M.....	60	60	45.7	...do	25
1948	...do ...	10:56 p. m.	43 35 30	124 26 30	80	gn. M.....	59	59	45.7	...do	25
1949	...do ...	11:45 p. m.	43 31 00	124 24 15	66	fne. gy. S	59	59	45.8	...do	25
1950	Sept. 1	12:45 a. m.	43 36 00	124 22 30	65	gn. M.....	59	59	45.2	...do	25
1951	...do ...	1:44 a. m.	43 40 15	124 21 00	62	gn. M.....	56	56	45.7	...do	25
1952	...do ...	2:45 a. m.	43 45 30	124 19 00	57	gn. M.....	55	55	46.4	...do	25
1953	...do ...	3:31 a. m.	43 38 00	124 24 15	62	bk. S. and M....	56	55	46.2	...do	25
1954	...do ...	4:18 a. m.	43 50 30	124 29 00	72	M	56	55	46.1	...do	25
1955	...do ...	5:05 a. m.	43 53 00	124 34 00	92	gn. M.....	56	55	45.7	...do	25
1956	...do ...	5:50 a. m.	43 55 30	124 38 30	120	gn. M.....	59	59	45.1	...do	25
1957	...do ...	6:40 a. m.	43 58 00	124 44 00	87	bk. S. and M....	59	59	45.5	...do	25
1958	...do ...	8:10 a. m.	44 01 00	124 49 15	58	R	61	59	.....	...do	25
1959	...do ...	8:49 a. m.	44 02 00	124 50 15	58	R	61	59	46.2	...do	25
1960	...do ...	9:42 a. m.	43 59 30	124 49 30	77	C	60	59	45.7	...do	25
1961	...do ...	10:04 a. m.	43 59 30	124 47 00	74	C	60	59	45.8	...do	25
1962	...do ...	10:40 a. m.	44 00 15	124 49 30	75	C	60	59	45.7	...do	25
1963	...do ...	11:03 a. m.	44 01 00	124 52 00	61	R	59	59	45.7	...do	25
1964	...do ...	11:25 a. m.	44 01 30	124 54 30	74	P	59	59	45.8	...do	25
1965	...do ...	12:09 p. m.	43 59 15	124 54 30	79	Rky	60	60	45.6	...do	25
1966	...do ...	12. 22 p. m.	43 58 00	124 54 15	174	gn.M.fne.gy. S.	60	60	43.6	...do	25
1967	...do ...	12:37 p. m.	43 57 45	124 52 30	88	rky	60	60	45.5	...do	25
1968	...do ...	12:50 p. m.	43 57 30	124 50 30	92	No bottom specimen.	60	60	45.2	...do	25
1969	...do ...	1:07 p. m.	43 58 30	124 50 00	79	gn. M. and S	62	59	45.7	...do	25
1970	...do ...	1:38 p. m.	43 54 20	124 49 15	155	bk. S	62	60	43.7	...do	25
1971	...do ...	1:52 p. m.	43 54 10	124 47 30	139	bk. S. and M	62	62	43.9	...do	25
1972	...do ...	2:05 p. m.	43 54 00	124 46 00	124	bk. S. and M	62	62	44.7	...do	25
1973	...do ...	2:21 p. m.	43 54 45	124 46 40	90	gn. M. and G	62	62	45.5	...do	25
1974	...do ...	2:34 p. m.	43 55 30	124 45 20	78	bk. S. and G....	62	62	45.7	...do	25
1975	...do ...	2:50 p. m.	43 56 15	124 45 00	70	C. and G	60	59	45.7	...do	25
1976	...do ...	3:04 p. m.	43 57 00	124 44 30	70	C	60	59	45.7	...do	25
1977	...do ...	3:17 p. m.	43 57 45	124 44 00	67	gn. M. and G....	60	59	45.7	...do	25
1978	...do ...	3:41 p. m.	43 58 30	124 44 20	61	Rky. brk. Sh..	60	59	45.7	...do	25
1979	...do ...	4:20 p. m.	44 00 00	124 45 00	52	Co	60	59	47.2	...do	25
1980	Sept. 2	8:16 a. m.	44 00 00	124 11 30	18	fne. gy. S.....	56	56	.....	Hand lead	14
1981	...do ...	9:40 a. m.	44 01 30	124 11 30	24	yl. S	58	59	48.8	Tanner ..	25
1982	...do ...	2:25 p. m.	44 16 00	124 12 00	31	fne. gy. S.....	60	59	47.7	...do	25
1983	...do ...	3:45 p. m.	44 16 30	124 09 00	19	fne. gy. S.....	62	57	.....	Hand lead	14
1984	...do ...	4:28 p. m.	44 18 00	124 08 30	12	fne. gy. S.....	62	56	.....	...do	14
1985	...do ...	5:38 p. m.	44 20 00	124 13 00	31	Wh. S. bk. Sp. Sh.	57	54	47.8	Tanner ..	20
1986	Sept. 3	5:43 a. m.	44 37 00	124 15 00	44	gy. S	56	54	47.5	...do	20
1987	...do ...	6:41 a. m.	44 35 00	124 13 00	43	fne. gy. S. and gn. M.	55	55	46.2	...do	20
1988	...do ...	7:23 a. m.	44 33 00	124 11 00	32	bk. S	56	55	46.7	...do	20
1989	...do ...	9:31 a. m.	44 28 30	124 23 00	45	C. and P	56	56	46.5	...do	20
1990	...do ...	9:50 a. m.	44 27 00	124 24 30	44	C	56	56	46.5	...do	20
1991	...do ...	10:40 a. m.	44 26 30	124 26 00	48	C	56	56	46.3	...do	20
1992	...do ...	11:52 a. m.	44 28 00	124 24 30	43	Rky	59	56	47.2	...do	20
1993	...do ...	4.40 p. m.	44 39 00	124 08 30	29	fne. gy. S. bk. Sp.	57	56	48.2	...do	20
1994	...do ...	5:47 p. m.	44 41 00	124 09 00	28	fne. gy. S. bk. Sp.	55	52	46.9	...do	20
1995	Sept. 7	3:27 p. m.	45 46 15	124 04 45	46	fne. gy. S. and G.	63	60	45.1	...do	20

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross, from July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time of day.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Instrument used.	Weight of sinker.
	1889.		° ′ ″	° ′ ″	*Fms.*		°F.	°F.	°F.		*Lbs.*
1996	Sept. 7	3:46 p. m.	45 45 30	124 02 30	40	fne. gy. S.....	60	56	45.3	Tanner ..	20
1997	...do ...	4:35 p. m.	45 44 30	123 59 30	22	fne. gy. S.....	60	56	.....	Hand lead	14
1998	...do ...	5:12 p. m.	45 43 00	123 58 15	15	fne. gy. S.....	62	56	.....	...do	14
1999	Sept. 8	9:00 a. m.	45 31 15	124 00 45	25	fne. gy. S.....	57	52	47.2	Tanner ..	20
2000	...do ...	10:10 a. m.	45 35 00	123 58 15	18	gy. S. rd. Sp ...	57	52	48.4	...do	20
2001	...do ...	11:26 a. m.	45 30 00	123 59 45	18	fne. gy. S.....	57	51	48.5	...do	20
2002	...do ...	11:51 a. m.	45 28 30	124 00 00	16	fne. gy. S.....	57	53	48.2	...do	20
2003	...do ...	12:20 p. m.	45 26 30	124 00 15	21	Rky	57	56	48.0	...do	20
2004	...do ...	1:20 p. m.	45 23 00	124 00 30	18	fne. gy. S.....	54	50	.....	Hand lead	14
2005	...do ...	3:27 p. m.	45 19 00	124 02 30	39	fne. gy. S.....	54	50	46.7	Tanner ..	20
2006	...do ...	4:29 p. m.	45 19 00	124 00 30	23	fne. bk. S.....	57	51	47.2	...do	20
2007	Sept. 9	7:04 a. m.	45 17 30	124 00 30	19	fne. gy. S. bk. Sp.	51	48	47.7	...do	20
2008	...do ...	7:46 a. m.	45 13 00	124 00 30	27	fne. gy. S.....	51	48	47.7	...do	20
2009	...do ...	8:23 a. m.	45 11 30	124 00 00	19	fne. gy. S. yl. M	51	49	.....	Hand lead	14
2010	...do ...	8:50 a. m.	45 10 30	123 59 45	15	fne. bk. S.....	52	48	.....	...do	14
2011	...do ...	9:30 a. m.	45 11 00	124 03 30	34	fne. gy. S. bk. Sp.	52	48	45.8	Tanner ..	20
2012	...do ...	10:18 a. m.	45 12 00	124 07 00	52	fne. gy. S. bk. Sp.	52	48	45.9	...do	20
2013	...do ...	10:46 a. m.	45 13 00	124 10 30	69	fne. gy. S.....	52	48	45.6	...do	20
2014	...do ...	11:16 a. m.	45 09 30	124 10 45	69	fne. gy. S.....	55	50	45.4	...do	20
2015	...do ...	11:44 a. m.	45 07 30	124 06 00	49	crs. S.....	55	50	45.9	...do	20
2016	...do ...	12:04 p. m.	45 07 15	124 03 00	33	fne. gy. S.....	55	50	46.2	...do	20
2017	...do ...	12:52 p. m.	45 07 00	124 00 30	15	fne. gy. S.....	55	50	.....	Hand lead	14
2018	...do ...	1:45 p. m.	45 04 00	124 02 30	23	fne. gy. S.....	55	50	.....	...do	14
2019	...do ...	2:32 p. m.	45 04 00	124 06 15	51	fne. gy. S.....	52	48	46.0	Tanner ..	20
2020	...do ...	3:20 p. m.	45 04 00	124 11 00	68	fne. gy. S.....	52	48	45.5	...do	20
2021	...do ...	3:45 p. m.	45 02 00	124 13 00	71	fne. gy. S. bk. Sp.	54	57	45.2	...do	20
2022	...do ...	4:21 p. m.	45 01 15	124 07 00	52	bk. S	55	50	46.2	...do	20
2023	...do ...	5:01 p. m.	45 00 45	124 03 45	27	fne. gy. S.....	55	50	.....	Hand lead	14
2024	...do ...	5:28 p. m.	45 00 30	124 02 15	16	fne. gy. S. bk. Sp. brk. Sh.	55	51	.....	...do	14
2025	...do ...	6:16 p. m.	44 58 30	124 04 00	19	R. and Sh.....	55	49	47.7	Tanner ..	20
2026	Sept. 10	5:35 a. m.	44 03 45	124 12 00	30	fne. gy. S	49	51	.....	...do	20
2027	...do ...	6:33 a. m.	44 03 15	124 16 30	42	fne. gy. S. and Sh.	49	51	46.0	...do	20
2028	...do ...	8:03 a. m.	43 54 00	124 11 00	13	fne. gy. S	49	51	47.1	...do	20
2029	...do ...	9:00 a. m.	43 49 00	124 14 00	36	fne. gy. S	50	49	46.7	...do	20
2030	...do ...	9:46 a. m.	43 47 00	124 12 00	13	fne. gy. S	52	49	.....	Hand lead	14
2031	...do ...	10:45 a. m.	43 42 30	124 14 30	28	fne. gy. S	52	49	.....	...do	14
2032	...do ...	11:30 a. m.	43 40 30	124 15 00	28	fne. gy. S	57	50	.....	...do	14
2033	...do ...	12:14 p. m.	43 37 00	124 16 00	53	fne. gy. S	52	51	45.9	Tanner ..	20
2034	...do ...	12:57 p. m.	43 34 00	124 16 30	40	fne. gy. S	53	49	46.7	...do	20
2035	...do ...	1:40 p. m.	43 31 00	124 16 00	11	fne. gy. S	53	49	.....	Hand lead	14
2036	...do ...	2:30 p. m.	43 27 30	124 18 00	23	fne. gy. S	52	50	48.2	Tanner ..	20
2037	...do ...	3:13 p. m.	43 23 30	124 21 30	17	fne. gy. S	54	52	.....	Hand lead	14
2038	...do ...	3:50 p. m.	43 19 00	124 25 30	28	fne. gy. S	54	52	48.7	Tanner ..	20
2039	...do ...	4:28 p. m.	43 13 00	124 26 00	27	fne. gy. S	55	52	47.7	...do	20
2040	...do ...	5:31 p. m.	43 08 30	124 28 00	25	Rky. Co.....	55	52	46.1	...do	20
2041	...do ...	6:44 p. m.	43 09 00	124 35 00	64	P.....	57	50	45.8	...do	20
2042	...do ...	7:40 p. m.	43 09 30	124 42 00	134	fne. gy. S	55	51	44.7	...do	20
2043	...do ...	8:38 p. m.	43 10 00	124 49 00	165	bk. S	54	52	44.7	...do	20
2044	...do ...	10:16 p. m.	43 14 15	124 52 00	234	bk. S	54	54	42.2	...do	20
2045	Sept. 11	12:37 a. m.	43 17 30	124 55 30	384	gn. M	56	57	40.1	Sigsbee ..	35
2046	...do ...	2:54 a. m.	43 17 00	124 42 00	116	gn. M	59	59	44.9	Tanner ..	20
2047	...do ...	3:54 a. m.	43 17 00	124 34 30	64	C.....	55	59	46.0	...do	20
2048	...do ...	6:17 a. m.	43 21 00	124 27 00	46	fne. gy. S.....	51	51	45.8	...do	20
2049	...do ...	7:11 a. m.	43 23 00	124 35 00	68	C.....	51	51	45.7	...do	20
2050	...do ...	7:51 a. m.	43 24 00	124 42 00	113	gn. M	51	51	45.3	...do	20
2051	...do ...	8:41 a. m.	43 25 30	124 48 30	326	gn. M	53	54	41.1	...do	20
2052	...do ...	9:22 a. m.	43 20 30	124 49 00	306	bk. S. and M...	53	54	41.7	Sigsbee ..	35
2053	...do ...	10:03 a. m.	43 16 00	124 48 00	233	gn. M	55	54	42.7	...do	35
2054	...do ...	10:40 a. m.	43 12 00	124 47 30	188	gn. M	56	54	44.2	...do	35
2055	...do ...	11:17 a. m.	43 06 30	124 47 00	141	fne. bk. S.....	56	54	45.2	...do	35
2056	...do ...	12:05 p. m.	43 06 30	124 40 00	91	gn. M	56	53	45.7	Tanner ..	20
2057	...do ...	12:47 p. m.	43 06 30	124 32 00	58	gn. M	56	53	45.9	...do	20
2058	...do ...	1:45 p. m.	42 59 00	124 36 00	49	fne. gy. S.....	56	53	45.9	...do	20
2059	...do ...	2:25 p. m.	42 58 30	124 44 00	76	gn. M	55	49	45.9	...do	20
2060	...do ...	3:00 p. m.	42 58 00	124 52 30	120	gn. M	53	51	45.5	...do	20
2061	...do ...	4:00 p. m.	42 58 00	124 00 00	407	gn. M	53	51	40.9	Sigsbee ..	35
2062	...do ...	4:46 p. m.	42 49 30	124 00 00	382	gn. M. and P...	53	51	39.9	...do	35
2063	...do ...	5:38 p. m.	42 48 30	124 53 00	140	Rky	53	51	44.8	Tanner ..	20
2064	...do ...	6:27 p. m.	42 49 00	124 46 00	114	fne. gy. S	54	50	45.7	...do	20
2065	...do ...	7:15 p. m.	42 59 30	124 40 30	47	fne. gy. S. bk. Sp.	53	49	46.7	...do	20

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross from July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time of day.	Position.		Depth.	Character of bottom.	Temperature.			Instrument used.	Weight of sinker.
			Lat. N.	Long. W.			Air.	Surface.	Bottom.		
	1889.		° ′ ″	° ′ ″	*Fms.*		° F.	° F.	° F.		*Lbs.*
2066	Sept. 12	5:30 a. m.	43 03 30	124 33 30	44	G	50	48	45.8	Tanner	20
2067	do	6:20 a. m.	43 04 30	124 26 30	21	fne. gy. S	50	47	46.2	do	25
2068	do	7:57 a. m.	43 08 00	124 27 30	25	Rky	50	48		Hand lead	14
2069	do	10:12 a. m.	43 00 00	124 27 30	17	fne. gy. S	50	48	47.2	Tanner	25
2070	do	11:11 a. m.	42 55 00	124 32 30	28	fne. gy. S	50	48	46.1	do	25
2071	do	11:45 a. m.	42 53 00	124 34 00	17	fne. gy. S	52	47		Hand lead	14
2072	do	12:23 p. m.	42 51 15	124 37 00	34	fne. gy. S	52	47	47.7	Tanner	25
2073	do	1:00 p. m.	42 48 15	124 37 45	29	fne. gy. S	51	47		Hand lead	14
2074	do	1:27 p. m	42 46 45	124 38 00	44	R. and brk. Sh	53	48		Sigsbee	35
2075	do	1:43 p. m.	42 45 30	124 38 15	34	St. and brk. Sh	53	48	46.8	Tanner	25
2076	do	3:40 p. m.	42 44 15	124 33 00	23	fne. gy. S	54	48	47.5	do	25
2077	Sept. 13	7:51 a. m.	42 42 30	124 30 30	26	bk. S	56	48	47.7	do	25
2078	do	8:35 a. m.	42 43 00	124 37 00	62	fne. gy. S	56	48	45.7	do	25
2079	do	9:18 a. m.	42 43 00	124 42 00	161	fne. gy. S	50	48	44.7	do	25
2080	do	10:02 a. m.	42 42 00	124 50 00	329	gn. M	50	48	40.8	Sigsbee	35
2081	do	10:57 a. m.	42 35 30	124 50 00	492	gn. M	53	49	39.3	do	35
2082	do	11:49 a. m.	42 35 30	124 42 30	151	gn. M	53	49	45.7	do	35
2083	do	12:34 p. m.	42 35 00	124 35 30	61	br. M	53	49	46.7	Tanner	25
2084	do	1:15 p. m.	42 34 30	124 29 00	34	fne. gy. S	52	49	46.5	do	25
2085	do	1:55 p. m.	42 28 30	124 33 00	35	fne. gy. S	51	49	46.8	do	25
2086	do	2:52 p. m.	42 29 00	124 40 00	63	fne. gy. S	51	49	46.9	do	25
2087	do	3:55 p. m.	42 29 00	124 46 30	206	C	51	48	43.8	Sigsbee	35
2088	do	4:57 p. m.	42 22 00	124 51 00	505	bk. S G	52	48	39.2	do	35
2089	do	5:52 p. m.	42 21 00	124 44 00	236	bk. S	52	48	42.7	Tanner	25
2090	do	6:42 p. m.	42 21 00	124 36 00	79	gn. M	52	48	45.4	do	25
2091	do	7:09 p. m.	42 21 00	124 33 00	62	gn. M	52	48	45.5	do	25
2092	Sept. 14	8:56 a. m.	43 23 30	124 24 00	40	fne. gy. S	53	51	46.8	do	25
2093	do	9:25 a. m.	43 25 00	124 27 00	59	fne. gy. S	53	51	46.2	do	25
2094	do	10:07 a. m.	43 28 30	124 32 30	79	fne. gy. S	54	52	45.7	do	25
2095	do	10:50 a. m.	43 32 00	124 37 30	157	gn. M	55	53	44.2	do	25
2096	do	11:33 a. m.	43 35 30	124 42 30	277	gn. M	56	56	41.2	do	25
2097	Oct. 12	11:25 a. m.	42 25 00	124 32 30	39	fne. gy. S	58	57	51.8	do	25
2098	do	11:59 a. m.	42 22 30	124 32 30	44	fne. gy. S	58	57	51.8	do	25
2099	do	1:06 p. m.	42 13 30	124 27 30	51	bk. S	61	59	52.0	do	25
2100	do	1:48 p. m.	42 14 00	124 34 00	94	fne. gy. S	61	59	47.7	do	25
2101	do	2:28 p. m.	42 14 00	124 41 00	273	M	58	59	42.0	do	25
2102	do	3:16 p. m.	42 05 30	124 37 30	244	No bottom obtained.	60	59		do	25
2103	do	3:56 p. m.	42 04 30	124 31 00	65	bk S. & M	60	59	49.5	Sigsbee	35
2104	do	4:28 p. m.	42 03 30	124 23 00	46	fne. gy. S. & M	61	60	51.8	Tanner	26
2105	do	5:12 p. m.	42 00 30	124 20 00	21	fne. dk. gy. S	66	62	54.2	do	26
2106	do	5:28 p. m.	41 58 30	124 17 00	18	fne. dk. gy. S	67	61	53.8	do	26
2107	do	6:10 p. m.	41 58 00	124 22 30	43	gn. M	64	60	51.8	do	26
2108	do	6:48 p. m.	41 58 00	124 29 00	68	gn. M	58	59	48.9	do	26
2109	do	7:27 p. m.	41 58 00	124 36 00	261	gn. M	58	59	42.2	do	26
2110	do	8:20 p. m.	41 52 00	124 36 00	336	gn. M	58	59	40.9	do	26
2111	do	9:06 p. m.	41 50 30	124 30 00	120	gn. M	59	59	46.7	do	26
2112	do	9:34 p. m.	41 50 00	124 26 00	59	bk. S	59	59	50.7	do	26
2113	do	10:20 p. m.	41 44 30	124 26 00	80	gn. M	58	57	47 7	do	26
2114	do	10:47 p. m.	41 45 00	124 32 00	256	gn. M	58	57	42.2	do	26
2115	do	11:40 p. m.	41 38 30	124 31 30	277	gn. M	58	57	42.7	do	26
2116	Oct. 13	12:22 a. m.	41 38 00	124 25 00	70	gn. M	58	57	49.3	do	26
2117	do	12:51 a. m.	41 38 00	124 17 30	38	M	57	56	52.3	do	26
2118	do	1:30 a. m.	41 38 00	124 12 30	25	M	57	56	54.0	do	26
2119	do	2:10 a. m.	41 32 00	124 13 30	27	dk. gy. S	57	55	53.8	do	26
2120	do	2:40 a. m.	41 32 00	124 19 00	42	M	57	55	51.9	do	26
2121	do	3:15 a. m.	41 32 00	124 24 00	58	M	57	55	49.3	do	26
2122	do	3:40 a. m.	41 32 00	124 30 00	94	M	56	55	47.9	do	26
2123	do	4:28 a. m.	41 32 00	124 35 00	412	C	56	55	39.6	Sigsbee	25
2124	do	5:26 a. m.	41 26 15	124 33 30	488	gn. M	56	55	39.1	do	35
2125	do	6:16 a. m.	41 26 15	124 27 00	80	gn. M	56	56	48.7	Tanner	26
2126	do	6:52 a. m.	41 26 15	124 20 00	49	gn. M	56	56	50.7	do	26
2127	do	7:28 a. m.	41 26 15	124 13 30	38	gn. M	56	56	51.8	do	26
2128	do	8:05 a. m.	41 26 30	124 07 00	18	fne. gy. S	56	56	54.3	do	26
2129	do	8:56 a. m.	41 20 00	124 11 00	36	brk. Sh. & P	56	56	51.2	do	26
2130	do	9:34 a. m.	41 20 00	124 17 30	52	gn. M	56	56	49.9	do	26
2131	do	10:12 a. m.	41 20 00	124 24 30	86	gn. M	56	56	48.7	do	26
2132	do	10:55 a. m.	41 20 00	124 31 30	373	gn. M	58	58	39.8	Sigsbee	35
2133	do	11:50 a. m.	41 13 00	124 31 00	465	gn. M	58	58	39.4	do	35
2134	do	12:36 p. m.	41 12 30	124 23 30	167	gn. M	58	58	45.3	Tanner	26
2135	do	1:13 p. m.	41 12 00	124 17 00	58	gn. M	58	58	49.7	do	26
2136	do	1:47 p. m.	41 12 30	124 11 00	29	fne. gy. S. & P	57	56	54.6	do	26
2137	do	2:42 p. m.	41 05 30	124 13 00	26	fne. dk. gy. S	57	56	52.4	do	26
2138	do	3:21 p. m.	41 04 30	124 19 00	75	gn. M	57	56	53.8	do	26

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross from July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time of day.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Instrument used.	Weight of sinker.
	1889.		° ′ ″	° ′ ″	*Fms.*		° F.	° F.	° F.		*Lbs.*
2139	Oct. 13	4:03 p. m.	41 03 30	124 26 00	268	gn. M	57	56	42.7	Sigsbee	35
2140	do	4:50 p. m.	40 57 15	124 25 30	182	gn. M	57	56	44.1	do	35
2141	do	5:31 p.m.	40 57 00	124 20 00	65	gn. M	57	56	49.0	Tanner	26
2142	do	6:11 p. m.	40 56 00	124 14 00	30	fne. gy. S	57	56	53.8	do	26
2143	do	6:53 p. m.	40 59 15	124 15 00	36	gn. M	57	52	50.2	do	26
2144	do	7:38 p. m.	40 50 00	124 22 00	70	gn. M	56	52	48.2	do	26
2145	do	8:25 p. m.	40 50 00	124 28 00	254	M	55	52	42.1	Sigsbee	35
2146	do	9:17 p. m.	40 44 30	124 35 30	294	M	56	56	41.7	Tanner	26
2147	do	10:03 p. m.	40 43 00	124 27 00	50	M	56	56	49.2	do	26
2148	do	10:40 p. m.	40 43 00	124 22 00	27	M	56	56	53.3	do	26
2149	do	11:26 p. m.	40 37 30	124 25 00	23	fne. dk. gy. S	56	55		do	26
2150	Oct. 14	12:09 a. m.	40 39 00	124 31 00	356	M	56	55	41.7	do	26
2151	do	1:02 a. m.	40 32 00	124 34 00	65	bk. S. & M	56	55	48.9	Sigsbee	35
2152	do	1:48 a. m.	40 29 00	124 40 00	627	gn. M	56	55	38.7	do	35
	1890.										
2153	Mar. 11	3:52 p. m.	37 18 50	122 28 30	21	fine. bk. S	55	53	52.8	Tanner	20
2154	do	4:30 p. m.	37 16 00	122 25 50	10	brk. Sh. R	60	53		Hand lead	14
2155	Mar. 12	11:45 a. m.	37 05 00	122 19 00	17	Rky. Sh	55	54		do	12
2156	do	2:17 p. m.	36 55 00	122 17 00	122	bk. S. M	56	55	47.8	Tanner	25
2157	Mar. 15	1:19 p. m.	36 58 00	122 21 00	97	crs. bk. S. M	57	55	47.6	do	25
2158	Mar. 22	10:00 a. m.	37 47 55	123 10 00	37	Sh	53	53	52.0	do	25
2159	do	10.07 a. m.	37 47 50	123 16 50	30	Rky	53	53	51.3	do	25
2160	do	10.14 a. m.	37 47 45	123 11 10	45	Sh. & Rky	53	53	50.8	do	25
2161	do	10.26 a. m.	37 47 35	123 11 00	29	Rky	53	53	51.4	do	25
2162	do	1:00 p. m.	37 47 30	123 19 00	324	R. & C	52	53	42.0	do	25
2163	do	3:32 p. m.	37 48 30	123 30 20	900	gn. M	52	53	36.8	Sigsbee No. 2.	38
2164	Mar. 24	9:09 a. m.	38 00 00	123 22 20	60	S. Sh	51	51	49.7	Tanner	25
2165	do	9:28 a. m.	38 01 00	123 24 18	39	R	51	51	51.2	do	25
2166	do	9:35 a. m.	38 01 05	123 24 55	35	Rky	51	51		do	25
2167	do	9:42 a. m.	38 01 10	123 25 40	37	Rky	52	52	51.3	do	25
2168	do	9:51 a. m.	38 01 15	123 26 15	30	Rky. Co	52	52	51.3	do	25
2169	do	11:00 a. m.	38 01 35	123 26 50	40	Rky	52	52		do	25
2170	do	11:16 a. m.	38 01 45	123 28 00	55	crs. bk. S. brk. Sh	52	52		do	25
2171	do	11:26 a. m.	38 03 45	123 28 30	65	gy. S. G. brk. Sh.	52	52		do	25
2172	do	11:38 a. m.	37 59 40	123 28 55	139	G. brk. Sh	52	52		do	25
2173	do	11:50 a. m.	37 59 20	123 27 45	73	R	55	55		do	25
2174	do	12:01 p. m.	37 58 55	123 26 35	56	brk. Sh	55	55		do	25
2175	do	12.13 p. m.	37 58 50	123 26 10	34	R. Co	55	55		do	25
2176	do	12:27 p. m.	38 00 40	123 25 55	33	Rky	54	55		do	25
2177	do	1:00 p. m.	38 02 45	123 27 35	44	R. Co	54	55		do	25
2178	do	1:13 p. m.	38 02 25	123 26 20	42	R. Co	54	55		do	25
2179	do	1:25 p. m.	38 02 00	123 25 05	47	Rky	54	55		do	25
2180	do	1:38 p. m.	38 01 40	123 23 50	57	yl. S	54	55		do	25
2181	do	1:59 p. m.	37 59 45	123 24 25	41	yl. S	54	55		do	25
2182	do	2:11 p. m.	37 58 45	123 25 00	39	R. Co. & S	57	55		do	25
2183	do	2:21 p. m.	37 57 45	123 25 15	45	Yl. S	57	55		do	25
2184	do	2:35 p. m.	37 58 00	123 26 35	67	R. yl. S	57	55		do	25
2185	do	2:47 p. m.	37 58 20	123 27 45	231	M	57	56		do	25
2186	do	3:09 p. m.	38 00 10	123 27 00	36	R. Co	54	55		do	25
2187	do	4:42 p. m.	38 02 15	123 27 30	47	Rky	52	55		do	25
2188	do	5:01 p. m.	38 04 25	123 28 00	84	G	52	52		do	25
2189	do	5.21 p. m.	38 00 15	123 29 00	180	fne. gy. S. bk. Sp.	52	52		do	25
2190	do	6,09 p. m.	38 17 00	123 30 00	269	gn. M	51	52	42.5	Sigsbee No. 2.	38
2191	do	7.02 p. m.	38 15 40	123 31 30	246	gn. M	51	52	42.9	do	38
2192	do	7:53 p. m.	38 20 30	123 32 50	180	M	51	52	44.9	do	38
2193	do	8:40 p. m.	38 25 10	123 34 25	134	M	50	52	47.9	do	38
2194	do	9:32 p. m.	38 30 00	123 35 40	121	M	50	52	47.1	do	38
2195	do	10:21 p. m.	38 34 50	123 37 00	88	M	50	52	46.7	Tanner	25
2196	do	11:04 p. m.	38 39 10	123 38 30	78	M	50	52		do	25
2197	do	11:48 p. m.	38 44 00	123 40 00	66	M	50	52	47 4	do	25
2198	Mar. 25	12:32 a. m	38 48 30	123 42 00	58	gn. M	50	52	47.9	do	25
2199	do	1:17 a. m.	38 52 50	123 46 00	51	Rky	49	52	47.9	do	25
2200	do	1:57 a. m.	38 57 10	123 48 30	55	bk. S	49	52	48.0	do	25
2201	do	2:29 a. m.	38 55 50	123 52 00	67	bk. S	49	51	47.9	Sigsbee No. 2.	38
2202	do	3:18 a. m.	38 53 30	123 57 35	189	br. M	49	51	44.9	do	38
2203	do	4:21 a. m.	38 48 00	123 55 50	486	M	49	50	39.5	do	38
2204	do	4:59 a. m.	38 49 30	123 52 20	91	bk. S	49	51	47.3	do	38
2205	do	5:27 a. m.	38 51 00	123 49 00	69	M	49	51	49.4	Tanner	25
2206	do	5:51 a. m.	38 52 25	123 45 30	49	brd. M	49	50		do	25
2207	do	6:40 a. m.	38 47 15	123 40 30	55	R. gn. M	50	51	48.3	do	25
2208	do	7:05 a. m.	38 46 00	123 44 00	69	gn. M. sh	50	51	47.1	do	25
2209	do	7:34 a. m.	38 44 39	123 47 10	90	bk. S	50	51	46.7	do	25

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross from July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time of day.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Instrument used.	Weight of sinker.
	1890.		° ′ ″	° ′ ″	*Fms.*		°F.	°F.	°F.		*Lbs.*
2210	Mar. 25	7:49 a. m.	38 41 00	123 49 00	143	M	50	51	45.4	Sigsbee No. 2.	38
2211	...do...	8:09 a. m.	38 43 20	123 51 00	249	M	50	51	42.9	...do...	38
2212	...do...	9:15 a. m.	38 38 40	123 46 30	314	bk. S	51	51	.....	...do...	38
2213	...do...	9:46 a. m.	38 39 30	123 44 00	103	bk. S	50	51	46.6	Tanner	25
2214	Mar. 28	5:42 a. m.	38 37 45	123 30 00	58	gn. M	48	51	.....	...do...	25
2215	...do...	6:33 a. m.	38 35 45	123 34 15	82	gn. M	48	50	.....	...do...	25
2216	...do...	7:14 a. m.	38 32 45	123 39 30	128	bk. S	49	50	46.0	...do...	25
2217	...do...	7:38 a. m.	38 31 30	123 42 00	314	gn. M	49	50	41.6	...do...	25
2218	...do...	8:37 a. m.	38 26 00	123 37 00	273	gn. M	51	51	43.0	Sigsbee No. 2.	38
2219	...do...	9:05 a. m.	38 27 00	123 35 00	113	bk. S	51	51	46.2	...do...	38
2220	...do...	9:49 a. m.	38 29 40	123 29 45	82	gy. S	51	51	48.4	Tanner	18
2221	...do...	10:25 a. m.	38 32 00	123 25 30	67	br. M	51	51	47.5	...do...	18
2222	...do...	10:37 a. m.	38 32 50	123 24 30	60	br. M. R	51	51	48.0	...do...	18
2223	...do...	11:17 a. m.	38 28 30	123 19 00	54	br. M	52	52	48.5	...do...	18
2224	...do...	11:47 a. m.	38 25 40	123 24 00	74	bk. S	52	52	48.5	...do...	18
2225	...do...	12:27 p. m.	38 23 00	123 29 00	107	M	52	52	47.5	...do...	18
2226	...do...	1:08 p. m.	38 20 00	123 34 00	242	M	51	52	42.8	...do...	18
2227	...do...	2:02 p. m.	38 14 00	123 36 00	518	gn. M	52	52	39.3	Sigsbee No. 2.	38
2228	...do...	5:16 p. m.	38 18 15	123 25 50	124	gn. M	52	52	45.6	Tanner	26
2229	Apr. 2	11:45 p. m.	36 56 30	122 24 40	208	gn. M	51	52	43.6	Sigsbee No. 2.	38
2230	Apr. 3	12:45 a. m.	36 51 40	122 24 00	921	br. M	51	52	36.9	...do...	38
2231	...do...	2:20 a. m.	36 47 30	122 20 10	860	br. M	51	52	37.0	...do...	38
2232	...do...	3:22 a. m.	36 43 20	122 16 25	620	br. M	51	52	38.1	...do...	38
2233	...do...	4:14 a. m.	36 39 20	122 12 50	739	M	51	52	37.9	...do...	38
2234	...do...	5:08 a. m.	36 34 00	122 07 30	958	gn. M	51	52	37.4	...do...	38
2235	...do...	6:06 a. m.	36 33 30	122 04 00	575	gn. M	51	52	39.0	...do...	38
2236	...do...	6:36 a. m.	36 32 35	122 02 00	450	M	51	52	39.9	...do...	38
2237	...do...	7:04 a. m.	36 32 30	122 00 00	246	gn. M	51	52	42.9	Tanner	26
2238	...do...	9:22 a. m.	36 27 20	121 58 00	59	fne. gy. S	52	51	46.9	...do...	26
2239	...do...	11:58 a. m.	36 19 00	122 00 00	62	crs. S	53	52	46.5	...do...	26
2240	...do...	12:14 p. m.	36 19 20	122 05 00	99	G	53	52	47.2	Sigsbee No. 2.	38
2241	...do...	8:14 p. m.	36 04 00	121 45 20	426	br. M	53	53	40.1	...do...	38
2242	...do...	9:06 p. m.	35 59 00	121 40 20	426	br. M	52	53	40.1	...do...	38
2243	...do...	9:59 p. m.	35 55 15	121 37 20	342	br. M	52	53	41.7	...do...	38
2244	...do...	11:31 p. m.	35 50 50	121 33 05	240	br. M	53	54	43.5	...do...	38
2245	Apr. 4	6:55 a. m.	35 39 30	121 28 00	271	gn. M	53	54	42.5	...do...	38
2246	...do...	8:40 a. m.	35 36 05	121 22 00	144	gy. S	54	53	46.2	Tanner	26
2247	...do...	10:35 a. m.	35 32 15	121 16 00	198	gn. M	55	52	44.2	Sigsbee No. 2.	38
2248	Apr. 5	6:38 a. m.	35 30 50	121 11 00	113	M	51	51	.....	Tanner	25
2249	...do...	7:06 a. m.	35 29 20	121 13 20	191	gn. M	50	51	43.9	Sigsbee No. 2.	38
2250	...do...	11:12 a. m.	35 18 50	121 05 00	146	gn. M	53	52	44.9	...do...	38
2251	...do...	1:54 p. m.	35 08 40	121 02 00	224	gn. M	56	54	43.0	...do...	38
2252	...do...	2:27 p. m.	35 09 50	120 58 00	119	gn. M. Rky	56	54	45.0	Tanner	25
2253	...do...	3:15 p. m.	35 04 00	120 57 30	143	gn. M	55	54	45.0	Sigsbee No. 2.	38
2254	...do...	7:36 p. m.	34 58 30	120 58 00	182	gn. M	54	53	44.7	...do...	38
2255	...do...	8:26 p. m.	34 51 40	120 54 30	142	gn. M	54	53	45.9	...do...	38
2256	...do...	9:11 p. m.	34 45 30	120 55 00	133	gn. M	54	54	46.0	...do...	38
2257	...do...	9:55 p. m.	34 46 00	120 49 50	62	R. M	54	54	47.9	Tanner	25
2258	...do...	10:22 p. m.	34 46 15	120 45 35	47	gn. M. R	54	54	48.0	...do...	25
2259	...do...	11:19 p. m.	34 37 30	120 45 00	44	R. and M	54	54	49.0	...do...	25
2260	Apr. 6	12.07 a. m.	34 36 00	120 50 40	158	.....	54	54	45.6	...do...	25
2261	...do...	12:38 a. m.	34 34 50	120 50 05	274	M. and S	54	54	42.3	Sigsbee No. 2.	38
2262	...do...	1:35 a. m.	34 29 25	120 50 00	312	gn. M	54	54	41.9	...do...	38
2263	...do...	2:17 a. m.	34 30 00	120 47 25	242	gn. M	54	54	42.2	...do...	38
2264	...do...	2:45 a. m.	34 30 40	120 44 55	139	M	54	54	46.4	Tanner	25
2265	...do...	3:01 a. m.	34 31 10	120 43 20	67	bk. S. M	53	52	48.0	...do...	25
2266	...do...	3:21 a. m.	34 31 50	120 42 00	53	bk. S. M	52	53	48.7	...do...	25
2267	...do...	4:48 a. m.	34 26 55	120 40 20	174	gn. M	53	52	46	Sigsbee No. 2.	38
2268	...do...	7:55 a. m.	36 00 00	121 38 10	299	gn. M. R	67	61	41.8	Tanner	25
2269	...do...	8:43 a. m.	36 02 30	121 41 00	346	M	67	61	43.8	...do...	25
2270	...do...	9:40 a. m.	36 07 10	121 43 00	228	M. and G	63	56	42.9	...do...	25
2271	...do...	10:17 a. m.	36 09 40	121 45 30	356	M	61	54	41.1	...do...	25
2272	...do...	10:45 a. m.	36 11 00	121 47 00	183	S. M	61	54	44.7	...do...	25
2273	...do...	11:40 a. m.	36 13 05	121 52 15	101	fne. gy. S	61	55	46.7	...do...	25
2274	...do...	12:23 p. m.	36 15 00	121 57 50	36	Rky	60	54	49.3	...do...	25

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross, from July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time of day.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Instrument used.	Weight of sinker.
	1890.		° ′ ″	° ′ ″	*Fms.*		°F.	°F.	°F.		*Lbs.*
2275	Apr. 11	0:30 a. m.	36 42 50	122 04 10	881	Rky	55	53	38.1	Sigsbee, No. 2.	38
2276	do	11:26 a. m.	36 45 45	122 04 40	519	gn. M	54	52	39.3	do	38
2277	do	2:25 p. m.	36 45 40	121 53 05	66	bk. S. R	54	53	47.7	Tanner	25
2278	May 21	1:35 p. m.	54 02 25	162 50 30	271	M. S. P	44	44	39	Sigsbee	35
2279	May 22	9:00 a. m.	54 15 00	164 53 00	42	R. brk. Sh	41	42	38.5	Tanner	25
2280	do	6:17 p. m.	54 34 00	165 37 00	178	bk. S	39	43	38.5	do	25
2281	do	11:43 p. m.	54 55 40	166 06 00	80	yl. M	38	42	38.2	do	25
2282	May 23	1:22 a. m.	54 58 30	166 24 30	81		39	43		do	25
2283	do	3:03 a. m.	55 00 50	166 41 30	80	M	38	41		do	25
2284	do	5:17 a. m.	55 00 00	166 59 00	88	Sh	36	41		do	25
2285	do	6:33 a. m.	54 59 00	167 17 00	117	S. Sh	36	41	38	do	25
2286	do	10:03 a. m.	54 49 20	167 10 00	180	gn. M	38	43	38.6	Sigsbee	35
2287	do	2:54 p. m.	54 23 45	166 38 30	320	gn. M	38	43	38.2	do	35
2288	do	4:49 p. m.	54 09 20	166 28 00	593	gn. M	38	42	37	do	35
2289	May 28	11:25 a. m.	54 27 00	165 18 00	99	bk. S	42	44		Tanner	28
2290	do	12:08 p. m.	54 29 30	165 10 00	47	bk. S	42	43	38	do	28
2291	do	12:48 p. m.	54 28 20	165 08 00	45	gy. S	42	45	39	do	28
2292	do	1:14 p. m.	54 31 40	165 09 00	32	bk. S. brk. Sh	42	43		do	28
2293	do	2:11 p. m.	54 34 30	164 55 45	24	bk. S	41	42		do	28
2294	do	2:49 p. m.	54 39 00	164 51 00	30	bk. S	41	42		do	28
2295	do	3:11 p. m.	54 41 15	164 48 30	28	crs. S. G	41	42		do	28
2296	do	3:55 p. m.	54 47 30	164 46 00	34	G	41	42	40	do	28
2297	do	4:45 p. m.	54 57 40	164 36 50	31	bk. P	41	42	41	do	28
2298	do	5:23 p. m.	54 57 30	164 31 20	18	fne. bk. S	40	44	41.5	do	28
2299	May 29	6:58 a. m.	54 54 45	164 19 30	16	bk. S	45	44		do	28
2300	do	8:16 a. m.	54 59 00	164 05 35	12	Rky	44	44	39.3	do	28
2301	do	9:49 a. m.	55 03 10	163 49 30	15	fne. G	44	44	41	do	28
2302	do	10:40 a. m.	55 03 50	163 37 30	16	fne. bk. S	44	44	41	do	28
2303	do	11:06 a. m.	55 04 15	163 30 45	11	fne. bk. S	44	44	41	do	28
2304	do	12:16 p. m.	55 10 00	163 13 45	15	S	42	44		Hand lead	12
2305	do	2:00 p. m.	55 16 10	163 01 30	14	fne. gy. S	44	46		do	12
2306	do	2:46 p. m.	55 22 00	162 53 30	13	bk. G	44	46		do	12
2307	do	3:10 p. m.	55 27 40	162 44 15	16	fne. gy. S. bk. Sp.	44	45		do	12
2308	do	4:21 p. m.	55 32 30	162 38 00	22	fne. gy. S	44	45		do	12
2309	do	5:02 p. m.	55 36 40	162 30 20	23	Rky. brk. Sh	44	47		do	12
2310	do	5:40 p. m.	55 39 45	162 24 00	22	G. brk. Sh	44	45		do	12
2311	do	6:20 p. m.	55 42 45	162 18 00	20	fne. bk. S	44	45		do	12
2312	do	7:02 p. m.	55 46 15	162 12 00	16	Rky. Sh	45	45	41	Tanner	28
2313	do	7:35 p. m.	55 48 15	162 07 15	17	P. bk. S	44	45		Hand lead	12
2314	do	8:16 p. m.	55 51 00	162 01 00	15½	G	45	45		do	12
2315	do	8:36 p. m.	55 52 00	161 58 00	13	R	45	45		do	12
2316	May 30	4:25 a. m.	55 54 40	161 51 40	16	bk. S. brk. Sh	41	42		do	12
2317	do	5:12 a. m.	55 57 00	161 45 00	16	G. brk. Sh	42	43		do	12
2318	do	5:30 a. m.	55 59 40	161 35 45	22	bk. S	41	42		do	12
2319	do	6:53 a. m.	56 01 00	161 26 00	16	bk. S	41	42		do	12
2320	do	7:25 a. m.	56 01 30	161 16 45	14	bk. S	43	43		do	12
2321	do	8:00 a. m.	56 01 40	161 12 30	12	bk. S	43	43		do	12
2322	do	8:53 a. m.	56 02 45	161 03 30	12	crs. bk. S	43	43		do	12
2323	do	9:30 a. m.	56 04 15	160 55 20	13	fne. br. S	43	44		do	12
2324	do	10:20 a. m.	56 04 15	160 46 00	11	crs. S. and G	43	44		do	12
2325	do	10:40 a. m.	56 04 00	160 43 45	12	fne. G	44	43		do	12
2326	do	12:00 m.	56 09 15	160 30 30	14	fne. gy. S	44	45		do	12
2327	do	12:40 p. m.	56 12 00	160 23 15	13	fne. bk. S	44	45		do	12
2328	do	12:58 p. m.	56 14 15	160 21 15	13	crs. bk. S	48	46		do	12
2329	do	1:30 p. m.	56 18 00	160 18 00	11	bk. S. G	46	48		do	12
2330	do	2:44 p. m.	56 25 40	160 06 20	13	G	47	46	39	Tanner	28
2331	do	4:07 p. m.	56 33 20	159 49 30	16	bk. G	47	42		Hand lead	12
2332	do	5:51 p. m.	56 42 20	159 25 20	18	bk. G	45	41		do	12
2333	do	7:03 p. m.	56 46 30	159 08 30	14	bk. G	45	44		Tanner	28
2334	do	7:53 p. m.	56 48 30	158 58 30	12	gy. S	45	44		Hand lead	12
2335	do	8:39 p. m.	56 52 00	158 51 00	9	fne. gy. S	44	43		do	12
2336	do	8:58 p. m.	56 54 00	158 48 30	11	fne. bk. S	44	43		do	12
2337	do	10:15 p. m.	57 02 45	158 40 30	10	fne. gy. S. bk. Sp.	44	42		do	12
2338	do	10:32 p. m.	57 05 00	158 39 00	12	fne. gy. S. bk. Sp.	44	42		do	12
2339	May 31	4:06 a. m.	57 08 30	158 36 15	13	fne. bk. S	44	43		do	12
2340	do	4:46 a. m.	57 13 30	158 32 00	19	bk. S. G	44	43		do	12
2341	do	5:27 a. m.	57 19 00	158 25 30	19	bk. S. G	44	43		Tanner	28
2342	do	6:22 a. m.	57 24 30	158 19 30	16	bk. S. G	43	43		do	28
2343	do	7:07 a. m.	57 29 30	158 13 30	15	fne. gy. S. G	42	43		Hand lead	12
2344	do	7:31 a. m.	57 32 00	158 09 00	14¾	fne. gy. S. G	43	43		do	12
2345	do	7:47 a. m.	57 24 50	158 06 00	13	fne. gy. S. G	42	43		do	12
2346	do	8:40 a. m.	57 38 00	157 57 00	10	gy. S	43	42		do	12
2347	do	9:10 a. m.	57 40 00	157 53 00	7½	gy. S	43	43		do	12

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross from July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time of day.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Instrument used.	Weight of sinker.
	1890.		° ′ ″	° ′ ″	*Fms.*		°F.	°F.	°F.		*Lbs.*
2348	May 31	9:42 a. m.	57 44 00	157 52 30	10	gy. S	44	44	.....	Hand lead	12
2349	...do ...	10:14 a. m.	57 48 40	157 49 00	8	crs. bk. S	44	44	.....	...do	12
2350	...do ...	10:40 a. m.	57 52 40	157 46 30	10	gy. S	44	44	.....	...do	12
2351	...do ...	11:12 a. m.	57 57 00	157 43 00	7	gy. S	46	45	.....	...do	12
2352	...do ...	11:36 a. m.	58 00 40	157 41 00	7	gy. S	45	44	.....	...do	12
2353	...do ...	11:57 a. m.	58 03 40	157 40 00	5¼	gy. S	46	45	.....	...do	12
2354	May 31	12:20 p. m.	58 07 00	157 41 30	7	gy. S	46	45	.....	...do	12
2355	...do ...	12:28 p. m.	58 08 40	157 42 00	5	fne. gy. S	45	41	.....	...do	12
2356	...do ...	1:15 p. m.	58 14 00	157 44 00	4½	G	45	44	.....	...do	12
2357	...do ...	2:20 p. m.	58 22 20	157 42 00	4½	P	45	44	.....	...do	12
2358	...do ...	3:00 p. m.	58 27 10	157 39 00	5	P	46	45	.....	...do	12
2359	...do ...	3:45 p. m.	58 32 00	157 33 00	5¼	G	46	45	.....	...do	12
2360	...do ...	4:00 p. m.	58 34 00	157 31 00	6½	bk. S	45	44	.....	...do	12
2361	...do ...	4:17 p. m.	58 35 00	157 28 30	4	S	48	49	.....	...do	12
2362	...do ...	5:17 p. m.	58 39 00	157 19 30	7½	P	48	49	.....	...do	12
2363	June 2	6:25 a. m.	58 40 45	157 16 20	4½	bk. S	43	45	.....	...do	12
2364	...do ...	6:50 a. m.	58 40 30	157 21 30	4½	fne. gy. S	44	45	.....	...do	12
2365	...do ...	6:52 a. m.	58 40 30	157 22 30	5 feet.	fne. gy. S	44	45	.....	...do	12
2366	...do ...	7:24 a. m.	58 39 00	157 24 00	5½	fne.gy.S.bk.Sp.	45	45	.....	...do	12
2367	...do ...	7:42 a. m.	58 37 45	157 26 30	12	fne.gy.S.bk Sp.	45	45	.....	...do	28
2368	June 7	11:15 p. m.	58 07 00	158 54 00	22½	fne. gy. S	35	40	.....	Tanner	12
2369	June 8	12:39 a. m.	58 12 00	159 06 15	21½	fne.gy.S. and R.	38	41	.....	Hand lead	12
2370	...do ...	3:02 a. m.	58 18 40	159 17 30	10½	fne. gy. S	40	41	.....	...do	12
2371	...do ...	2:52 p. m.	58 40 00	160 00 00	8	.....	46	48	.....	...do	12
2372	...do ...	3:15 p. m.	58 42 15	160 04 00	8½	.....	43	45	.....	...do	12
2373	...do ...	3:32 p. m.	58 44 15	160 07 30	11½	.....	45	46	.....	...do	28
2374	June 9	10:01 p. m.	58 28 30	161 53 00	12½	G	39	38	35	Tanner	28
2375	...do ...	11:03 p. m.	58 35 30	162 11 00	25	G	39	38	37	...do	28
2376	June 13	7:40 p. m.	58 18 30	162 50 00	16½	fne. gy. S	38	39	35.5	...do	28
2377	June 14	12:16 a. m.	58 00 00	163 24 30	23	fne. gy. S	38	39	.....	...do	28
2378	...do ...	2:17 a. m.	57 49 50	163 44 00	24	fne. gy. S	38	39	37	...do	28
2379	...do ...	10:30 p. m.	56 05 00	164 38 00	51	gn. M	43	44	36	...do	28
2380	June 15	12:35 a. m.	55 52 30	164 47 00	46	bk. S. and M	42	43	35	...do	28
2381	...do ...	2:52 a. m.	55 37 30	164 51 00	58	bk. S. and M	42	43	39	...do	28
2382	June 24	2:48 a. m.	54 40 30	165 41 00	148	M. & fne. S	43	44	38.5	...do	28
2383	...do ...	10:06 a. m.	54 37 40	164 58 00	30	bk. G	42	44	40.8	...do	28
2384	...do ...	1:32 p. m.	54 46 00	164 55 30	37	crs. S. G. and P.	45	45	40.2	...do	28
2385	...do ...	4:35 p. m.	54 56 30	165 15 30	62	bk. M	43	45	40	...do	28
2386	...do ...	9:43 p. m.	54 51 00	164 36 00	40	bk. G	43	45	41.3	...do	28
2387	...do ...	10:14 p. m.	54 53 15	164 33 00	24	bk. G	42	44	41.4	...do	28
2388	...do ...	11:36 p. m.	54 59 00	164 13 00	25	crs. S. G	43	44	41.2	...do	28
2389	June 25	1:16 a. m.	55 08 45	164 18 00	46	bk. G	42	44	40	...do	28
2390	...do ...	2:48 a. m.	55 18 30	164 23 15	56	bk. M. and G	42	44	39	...do	28
2391	...do ...	4:15 a. m.	55 25 00	164 05 20	53	bk. S. and G	42	45	38.8	...do	28
2392	...do ...	9:59 a. m.	55 14 00	163 21 30	26	bk. S	44	46	42.6	...do	28
2393	...do ...	1:43 p. m.	55 34 30	163 37 00	44	gy. S	45	46	40	...do	28
2394	...do ...	3:34 p. m.	55 38 00	163 20 45	42	gy. S	49	48	39.5	...do	28
2395	...do ...	4:17 p. m.	55 33 30	163 16 15	36	bk. S	45	47	40	...do	28
2396	...do ...	6:34 p. m.	55 23 40	163 07 30	20	bk. G	42	45	42.6	...do	28
2397	June 26	2:16 p. m.	55 21 30	162 56 00	16	crs. bk. S. Sh	43	47	43.8	...do	28
2398	June 27	3:08 p. m.	55 36 15	163 03 00	35	fne. gy. S	43	45	39	...do	28
2399	...do ...	6:28 p. m.	55 37 45	162 40 30	26	fne. gy. S	42	46	41	...do	28
2400	...do ...	10:37 p. m.	55 51 10	162 30 30	34	fne. gy. S	42	44	.....	...do	28
2401	June 28	12:03 a. m.	55 57 45	162 43 00	46	fne. gy. S	42	44	.....	...do	28
2402	...do ...	1:29 a. m.	56 05 15	162 31 00	41	fne. gy. S	42	45	37	...do	28
2403	...do ...	2:50 a. m.	55 58 30	162 18 00	40	fne.gy.S.bk.Sp.	42	45	37	...do	28
2404	...do ...	8:11 a. m.	56 06 15	161 58 00	34	bk. S	42	44	40.6	...do	28
2405	...do ...	11:58 a. m.	56 19 00	162 26 00	40	fne.gy.S.and G.	43	45	38	...do	28
2406	...do ...	3:46 p. m.	56 33 45	162 26 00	41	fne. gy. S	44	45	39	...do	28
2407	...do ...	7:12 p. m.	56 20 30	161 54 45	48	fne.gy.S.bk.Sp.	42	45	38.2	...do	28
2408	...do ...	10:42 p. m.	56 06 30	161 25 30	21	P	42	45	43	...do	28
2409	...do ...	11:58 p. m.	56 10 45	161 09 15	21	gy. S	42	44	43.5	...do	28
2410	June 29	1:35 a. m.	56 17 20	161 22 00	30	bk. S. G	43	46	41	...do	28
2411	...do ...	2:58 a. m.	56 24 10	161 37 00	37	gy. S	42	45	40	...do	28
2412	...do ...	6:34 a. m.	56 38 30	161 38 00	46	fne. gy. S	44	45	38.8	...do	28
2413	...do ...	9:59 a. m.	56 21 15	161 03 00	35	fne.gy.S.bk.Sp.	42	44	41	...do	28
2414	...do ...	3:11 p. m.	56 10 15	160 42 30	15	fne. gy. S	45	46	.....	...do	12
2415	July 16	4:30 p. m.	56 04 30	160 39 30	8½	fne. gy. S	50	54	.....	Hand lead	12
2416	...do ...	5:59 p. m.	56 09 45	160 33 00	14½	crs. bk. S	48	54	.....	...do	12
2417	...do ...	6:57 p. m.	56 14 15	160 26 45	12	bk. G	48	49	.....	...do	28
2418	...do ...	8:55 p. m.	56 22 00	160 37 30	28	fne. gy. S	47	48	44	Tanner	28
2419	...do ...	10:35 p. m.	56 29 30	160 49 00	37	fne. gy. S	45	47	.....	...do	28
2420	July 17	12:16 a. m.	56 36 30	161 00 30	38	fne. gy. S	45	46	41	...do	28
2421	...do ...	2:06 a. m.	56 44 15	161 12 30	38	fne. gy. S	44	46	40.5	...do	28
2422	...do ...	3:29 a. m.	56 52 15	160 58 00	40	fne. gy. S	44	46	40	...do	28

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross from July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time of day.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Instrument used.	Weight of sinker.
	1890.		° ′ ″	° ′ ″	*Fms.*		° F.	° F.	° F.		*Lbs.*
2423	July 17	1:20 p. m.	56 33 20	159 43 30	15	bk. S. G	44	45	.....	Hand lead	12
2424	...do ...	3:08 p. m.	56 40 40	159 54 30	30	fne. gy. S. G	43	45	.....	Tanner	28
2425	...do ...	4:55 p. m.	56 48 00	160 05 30	35	crs. bk. S	42	42	.....	...do	28
2426	...do ...	6:56 p. m.	56 55 30	160 17 30	36	gy. S	42	43	38	...do	28
2427	...do ...	8:54 p. m.	57 03 20	160 29 00	39	bk. S	41	43	.....	...do	28
2428	...do ...	10:25 p. m.	57 10 30	160 15 00	38	bk. S	41	43	38	...do	28
2429	...do ...	11:50 p. m.	57 04 20	160 00 00	34	fne. gy. S. bk. Sp	41	43	38.5	...do	28
2430	July 18	1:34 a. m.	56 57 45	159 46 00	34	gy. S	40	42	.....	...do	28
2431	...do ...	3:10 a. m.	56 57 00	159 31 00	30	bk. g	40	43	41	...do	28
2432	...do ...	11:29 a. m.	57 06 20	159 23 00	31	gy. S. G	42	46	40	...do	28
2433	...do ...	3:21 p. m.	57 21 30	159 46 30	32	bk. S. G	43	44	40	...do	28
2434	...do ...	7:02 p. m.	57 23 15	159 17 00	31	fne. gy. S	43	44	40	...do	28
2435	...do ...	10:39 p. m.	57 10 15	158 49 00	25	gy. S	41	43	41.6	...do	28
2436	...do ...	11:28 p. m.	57 07 30	158 42 30	20	S	41	43	.....	Hand lead	12
2437	...do ...	11:58 p. m.	57 05 45	158 39 00	17	S	41	44	.....	...do	12
2438	July 19	12:31 a. m.	57 05 30	158 37 30	123	bk. S	41	44	.....	...do	12
2439	...do ...	5:52 p. m.	57 48 30	158 48 00	24	gy. S	45	48	43.5	Tanner	28
2440	...do ...	11:22 p. m.	57 45 15	157 56 00	13	fne. gy. S	46	50	.....	Hand lead	12
2441	July 20	6:38 a. m.	57 56 45	158 17 00	20	gy. S. bk. sp	47	50	40.4	Tanner	28
2442	...do ...	12:18 p. m.	58 00 30	159 13 30	21	bk. S	51	55	44.2	...do	28
2443	...do ...	2:34 p. m.	58 01 00	159 33 15	23	gy. S	49	55	45	...do	28
2444	...do ...	7:16 p. m.	58 24 00	160 17 30	64	gy. S. G	49	53	.....	Hand lead	12
2445	July 21	6:01 a. m.	57 59 00	160 24 45	20	fne. gy. S	49	50	40.1	Tanner	28
2446	...do ...	10:36 a. m.	57 32 40	160 00 00	29	fne. gy. S	48	47	41	...do	28
2447	...do ...	3:33 p. m.	57 39 00	160 39 30	31	fne. gy. S	50	52	39.5	...do	28
2448	...do ...	5:51 p. m.	57 50 40	160 57 00	27	fne. gy. S	50	52	39.8	...do	28
2449	...do ...	10:00 p. m.	58 10 20	161 24 30	23	fne bk. S	47	49	40.6	...do	28
2450	...do ...	10:46 p. m.	58 14 20	161 30 30	22	fne. gy. S. G	47	49	40.2	...do	28
2451	July 22	6:29 a. m.	58 05 00	161 52 15	31	fne. gy. S	46	49	41	...do	28
2452	...do ...	11:03 a. m.	57 38 15	161 28 30	30	fne. gy. S	47	50	41.2	...do	28
2453	...do ...	12:20 p. m.	57 31 20	161 23 00	32	gy. S	47	51	.....	Tanner	28
2454	...do ...	3:47 p. m.	57 11 15	161 05 00	29	dk. S	45	50	41.8	...do	28
2455	...do ...	5:52 p. m.	56 57 30	160 52 30	38	fne. gy. S	45	48	41	...do	28
2456	...do ...	9:48 p. m.	56 31 15	160 23 30	32	gy. S. G	45	49	.....	...do	28
2457	...do ...	10:15 p. m.	56 27 45	160 25 30	30	fne. gy. S	46	49	.....	...do	28
2458	...do ...	10:43 p. m.	56 25 20	160 23 30	22	G	46	50	.....	...do	28
2459	...do ...	11:05 p. m.	56 22 45	160 21 30	20	fne. gy. S	46	50	.....	Hand lead	12
2460	July 29	12:03 p. m.	56 05 30	161 02 00	18	G	53	51	.....	Tanner	28
2461	...do ...	5:30 p. m.	55 55 15	161 15 00	14	G	49	51	.....	...do	28
2462	Aug. 2	7:22 a. m.	54 02 45	166 33 00	61	bk. S. G	47	50	.....	...do	28
2463	...do ...	9:37 a. m.	54 03 00	166 52 30	365	gn. M	48	48	43	Sigsbee	38
2464	...do ...	11:51 a. m.	54 01 40	167 09 00	802	gn. M	48	48	36.2	...do	38
2465	...do ...	2:10 p. m.	53 58 40	167 35 00	885	M	48	50	35.8	...do	38
2466	...do ...	4:02 p. m.	53 54 10	167 52 00	643	bk. S. G	48	51	36.7	...do	38
2467	...do ...	4:41 p. m.	53 53 00	167 56 00	578	fne. bk. S	48	51	37	...do	38
2468	Aug. 3	2:35 p. m.	54 43 00	171 16 00	1745	gn. Oz	50	52	35	...do	35
2469	...do ...	9:52 p. m.	55 31 00	171 42 00	1818	gn. Oz	48	51	35	...do	35
2470	Aug. 4	3:13 p. m.	56 51 00	172 28 00	69	gn. M	46	50	38.5	...do	38
2471	...do ...	8:03 p. m.	57 00 30	173 25 00	314	gn. M	46	50	38.2	...do	38
2472	...do ...	11:30 p. m.	57 19 30	174 07 00	445	gn. M	45	50	37.5	...do	38
2473	Aug. 5	3:45 a. m.	57 46 00	174 35 00	1740	gn. Oz	47	50	35	...do	38
2474	...do ...	8:18 a. m.	58 14 00	174 35 00	977	fne. dk. S	47	50	35.8	...do	38
2475	...do ...	12:10 p. m.	58 43 00	174 33 00	144	fne. dk. S	47	50	38	...do	35
2476	Aug. 6	7:35 a. m.	56 50 00	175 15 00	1887	gn. Oz	46	50	35	...do	35
2477	...do ...	3:23 p. m.	56 02 10	175 35 00	1998	gn. Oz	48	50	34.9	...do	35
2478	Aug. 7	12:45 a. m.	55 17 00	175 32 00	2036	gn. Oz	46	50	35	...do	60
2479	...do ...	8:06 a. m.	54 30 30	175 32 00	2147	gn. Oz	48	49	35	...do	35
2480	...do ...	3:12 p. m.	53 42 00	175 33 00	2053	bn. Oz	49	50	35	...do	60
2481	Aug. 15	6:56 a. m.	53 56 02	166 27 05	25	fne. gy. S	50	54	.....	Tanner	28
2482	...do ...	7:46 a. m.	53 57 32	166 30 20	79	fne. S. sh. M	50	54	41	...do	28
2483	...do ...	7:58 a. m.	53 58 06	166 31 26	95	fne. S. M	50	54	40.8	...do	28
2484	...do ...	8:06 a. m.	53 58 50	166 33 10	118	fne. S. bn. M	50	54	41.6	...do	28
2485	...do ...	8:18 a. m.	53 59 18	166 34 27	53	fne. dk. S	50	54	42.3	...do	28
2486	...do ...	8:50 a. m.	53 59 42	166 35 20	22	rd. and bk. G	56	54	45.8	...do	28
2487	...do ...	9:21 a. m.	53 59 47	166 33 48	71	fne. S. M	56	52	41.3	...do	28
2488	...do ...	9:36 a. m.	53 59 42	166 31 44	99	fne. S. M	56	52	40.6	...do	28
2489	...do ...	10:21 a. m.	53 59 26	166 28 00	66	fne. S. M	56	56	41.3	...do	28
2490	...do ...	11:31 a. m.	54 00 08	166 24 14	37	G. sh. P	57	55	44.3	...do	28
2491	...do ...	11:56 a. m.	54 01 23	166 23 37	40	fne. G	60	55	44.5	...do	28
2492	...do ...	12:26 p. m.	54 01 29	166 25 08	57	fne. S. G	60	55	42.5	...do	28
2493	...do ...	1:35 p. m.	54 01 59	166 29 32	103	fne. bk. S	55	55	40.9	...do	28
2494	...do ...	1:48 p. m.	54 02 13	166 30 50	97	bk. S	55	55	40.9	...do	28
2495	...do ...	2:51 p. m.	54 02 24	166 35 19	77	bk. S. Sh	56	55	40	...do	28
2496	...do ...	3:16 p. m.	54 02 50	166 37 00	58	bk. S. G. Sh	56	55	42.1	...do	28
2497	...do ...	3:52 p. m.	54 04 30	166 40 00	322	bk. S	56	55	38.3	...do	28

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross from July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time of day.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Instrument used.	Weight of sinker.
	1890.		° ′ ″	° ′ ″	Fms.		° F.	° F.	° F.		Lbs.
2498	Aug. 15	5:18 p. m.	54 02 00	166 42 00	148	bk. S	53	54	.....	Tanner	28
2499	...do...	5:36 p. m.	54 00 45	166 40 30	37	bk. S	53	54	44.5	...do	28
2500	Aug. 16	5:34 a. m.	54 00 25	166 46 00	52	bk. S. G	62	53	44	...do	28
2501	...do...	7:34 a. m.	54 00 25	166 48 00	179	bk. S	59	54	39	...do	28
2502	...do...	7:50 a. m.	53 59 30	166 48 30	50	bk. S	60	54	43.5	...do	28
2503	...do...	8:34 a. m.	53 58 50	166 51 30	22	Sh	60	54	44.1	...do	28
2504	...do...	9:28 a. m.	54 00 00	166 58 00	316	gn. M	60	52	38.2	...do	28
2505	...do...	10:56 a. m.	53 56 30	167 03 00	36	fne. rd. and bk. S.	60	54	46	...do	28
2506	...do...	11:33 a. m.	53 55 40	167 06 20	97	bk. S. Sh. G	60	54	40.9	...do	28
2507	...do...	12:12 p. m.	53 52 35	167 09 00	22	gy. S	60	54	46	...do	28
2508	...do...	12:53 p. m.	53 52 00	167 12 15	40	R. G	54	53	44	...do	28
2509	...do...	1:13 p. m.	53 52 00	167 14 00	166	bk. M	59	52	39	...do	28
2510	...do...	1:50 p. m.	53 50 25	167 13 00	55	bk. G	59	52	43	...do	28
2511	...do...	2:03 p. m.	53 50 15	167 15 00	59	bk. G	59	52	42	...do	28
2512	...do...	2:17 p. m.	53 50 05	167 16 15	106	bk. S. G	59	52	38.8	...do	28
2513	...do...	4:06 p. m.	53 50 05	167 07 20	47	bk. S. G	54	52	44.1	...do	28
2514	Aug. 18	9:32 a. m.	53 43 50	167 00 00	103	bk. M	50	52	.....	...do	28
2515	...do...	9:55 a. m.	53 43 05	167 02 30	109	dk. gn. M	49	50	40.3	...do	28
2516	...do...	10:25 a. m.	53 43 00	167 09 00	62	bk. S. M	49	50	.....	...do	28
2517	...do...	10:57 a. m.	53 41 45	167 16 00	54	S. G	49	48	43	...do	28
2518	...do...	11:50 a. m.	53 42 00	167 21 30	58	bk. S. M	49	48	.....	...do	28
2519	...do...	12:21 p. m.	53 41 45	167 27 20	69	bk. S	49	50	40	...do	28
2520	...do...	1:08 p. m.	53 41 00	167 33 25	394	gn. M	51	52	38	Sigsbee	38
2521	...do...	2:56 p. m.	53 36 30	167 23 25	43	crs. bk. S	50	50	42.4	Tanner	28
2522	...do...	5:01 p. m.	53 30 40	167 11 40	32	bk. S	51	50	43.9	...do	28
2523	...do...	5:51 p. m.	53 30 25	167 17 30	37	bk. S	51	50	42.9	...do	28
2524	...do...	8:00 p. m.	53 30 55	167 31 10	44	bk. S	50	50	41.5	...do	28
2525	...do...	8:40 p. m.	53 32 55	167 36 50	136	bk. S. M	48	47	39.5	...do	28
2526	...do...	11:01 p. m.	53 37 00	167 41 50	524	gn. M	47	47	37	Sigsbee	38
2527	Aug. 19	5:10 a. m.	53 37 30	167 43 50	247	gn. M	45	45	38.5	Tanner	28
2528	...do...	5:40 a. m.	53 30 55	167 36 20	49	bk. S. M	45	45	41.5	...do	28
2229	...do...	6:20 a. m.	53 28 25	167 33 40	43	bk. S	45	45	41.8	...do	28
2530	...do...	8:05 a. m.	53 24 30	167 34 05	42	bk. S. Sh	46	46	42	...do	28
2531	...do...	8:50 a. m.	53 23 15	167 32 50	15	bk. S. G	48	50	44.4	...do	28
2532	Aug. 20	7:53 a. m.	53 24 20	167 37 05	60	bk. S. G	48	48	42	...do	28
2533	...do...	8:31 a. m.	53 23 30	167 39 25	47	G. Sh	48	48	42.3	...do	28
2534	...do...	9:11 a. m.	53 23 30	167 42 40	39	bk. G. Sh	48	48	42.1	...do	28
2535	...do...	9:46 a. m.	53 24 00	167 46 10	30	bk. S	47	48	42.9	...do	28
2536	...do...	10:24 a. m.	53 25 20	167 48 20	37	bk. S	47	48	42.1	...do	28
2537	...do...	11:10 a. m.	53 28 15	167 45 50	35	bk. S. G	47	48	42.2	...do	28
2538	...do...	11:53 a. m.	53 31 45	167 43 45	43	bk. S	47	48	41.5	...do	28
2539	...do...	10:55 p. m.	53 48 00	167 24 00	624	bn. M	48	47	38	Sigsbee	12
2540	Aug. 22	6:35 a. m.	53 53 45	166 30 05	19	M	46	48	.....	Hand lead	12
2541	...do...	6:50 a. m.	53 54 00	166 29 30	17	gn. M	46	48	.....	...do	12
2542	...do...	7:10 a. m.	53 55 35	166 27 45	19	S. M	46	48	.....	...do	12
2543	...do...	7:21 a. m.	53 56 00	166 28 30	35	fne. gy. S	47	48	43.3	Tanner	28
2544	...do...	7:56 a. m.	53 56 45	166 30 15	63	fne. S. M	47	48	41.8	...do	28
2545	...do...	8:16 a. m.	53 57 30	166 32 15	65	fne. S. M	47	47	41.1	...do	28
2546	...do...	9:21 a. m.	53 58 45	166 34 25	23	bk. G	47	48	.....	Hand lead	12
2547	...do...	9:53 a. m.	53 58 20	166 34 45	17	bk. S	50	50	.....	...do	12
2548	...do...	10:12 a. m.	53 58 05	166 34 10	54	fne. bk. S	50	50	41.8	Tanner	28
2549	...do...	11:10 a. m.	53 55 55	166 33 55	45	fne. bk. S	50	52	42.4	...do	28
2550	...do...	11:40 a. m.	53 55 05	166 34 35	47	bn. M	54	54	43.3	...do	28
2551	...do...	12:03 p. m.	53 54 15	166 35 35	58	bn. M	54	54	42.1	...do	28
2552	...do...	12:22 p. m.	53 53 20	166 36 20	13	crs. bk. S	54	54	.....	Hand lead	12
2553	Aug. 26	4:01 p. m.	54 02 15	166 11 20	41	R	46	47	34.3	Tanner	28
2554	...do...	4:30 p. m.	54 00 25	166 05 40	26	sh. R	46	47	45.7	...do	28
2555	...do...	5:17 p. m.	53 59 00	165 57 20	48	G	54	46	44.9	...do	38
2556	Aug. 27	11:58 a. m.	53 58 00	162 37 00	619	gn. M	60	55	37.8	Sigsbee	38
2557	...do...	5:03 p. m.	54 01 00	161 42 30	542	R	59	53	38.1	...do	38
2558	...do...	11:04 p. m.	54 11 00	160 37 00	756	gn. M	52	52	36.6	...do	38
2559	Aug. 29	12:03 p. m.	55 41 00	154 48 00	494	gn. M. S	54	51	37.9	...do	38
2560	...do...	7:50 p. m.	56 00 00	153 30 00	207	M	53	52	39.5	...do	60
2561	...do...	10:45 p. m.	56 00 00	152 56 00	1,152	gn. M	54	52	35.5	...do	60
2562	Aug. 30	2:08 a. m.	56 00 30	152 26 00	2,197	bl. M	55	54	34.9	...do	60
2563	...do...	5:52 a. m.	56 01 00	152 26 00	2,620	gn. M	55	54	34.5	...do	60
2564	...do...	9:29 a. m.	56 01 00	151 00 00	2,935	bn. M. S. Oz	54	53	35.1	...do	60
2565	...do...	1:55 p. m.	56 02 00	150 38 00	2,925	gy. Oz	54	54	35.3	...do	60
2566	...do...	7:11 p. m.	55 59 30	149 44 00	2,776	gy. Oz	54	54	34.9	...do	60
2567	Aug. 31	4:16 a. m.	55 54 00	147 57 00	2,414	bn. M	54	54	35.1	Sigsbee	60
2568	...do...	7:42 p. m.	55 49 00	144 57 00	2,132	gy. oz	55	54	35.1	...do	60
2569	Sept. 1	4:46 p. m.	54 53 00	141 06 00	1,963	gy. oz. bk. S	57	56	35.1	...do	

Record of hydrographic soundings by the U. S. Fish Commission steamer Albatross from July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time of day.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Instrument used.	Weight of sinker.
	1890.		° ′ ″	° ′ ″	*Fms.*		° F.	° F.	° F.		*Lbs.*
2570	Sept. 2	1:15 p. m.	54 22 00	137 24 00	1,655	lt. bn. oz	56	56	35.3	Sigsbee	60
2571	Sept. 3	8:29 a. m.	53 06 30	133 53 30	1,566	oz. bn. M. S	57	57	35.3	do	60
2572	Sept. 24	9:05 a. m.	40 26 00	124 29 45	26	bk. G. P	53	51	50.4	Tanner	28
2573	do	10:00 a. m.	40 27 40	124 33 00	52	dk. M. S	53	52	49.6	Sigsbee	38
2574	do	10:33 a. m.	40 27 45	124 36 55	226	bk. S. M	53	52	44.8	do	38
2575	do	11:10 a. m.	40 24 35	124 37 40	489	gn. M	53	52	39.8	do	38
2576	do	11:54 a. m.	40 23 50	124 33 30	337	gn. M. S	55	54	42.6	do	38
2577	do	1:43 p. m.	40 13 30	124 25 45	55	lt. G. Sh	58	52	49.6	Tanner	28
2578	do	4:20 p. m.	40 00 30	124 06 30	23	fne. gy. S	56	52	52.7	do	28
2579	do	5:18 p. m.	39 55 45	124 10 45	184	gn. M	55	52		do	28
2580	do	6:05 p. m.	39 51 25	124 07 50	159	fne. gy. S	55	53	47.6	do	28
2581	do	6:23 p. m.	39 52 05	124 06 00	80	crs. g	55	53	48	do	28
2582	do	7:08 p. m.	39 47 30	124 03 00	110	bk. S. M	55	54	47.6	do	28
2583	do	7:34 p. m.	39 46 25	124 05 50	263	gn. M	55	54	43.6	do	28
2584	do	8:25 p. m.	39 42 00	124 03 00	270	gn. M	54	54	43.4	do	28
2585	do	9:05 p. m.	39 43 25	123 59 10	93	gn. M	55	53		do	28
2586	do	9:25 p. m.	39 44 00	123 57 40	81	gn. M	55	53		do	28
2587	do	10:20 p. m.	39 38 05	123 58 30	102	gn. M	55	53	47.6	do	28
2588	do	10:45 p. m.	39 37 15	124 00 55	246	gn. M	55	53	44.1	do	28
2589	do	11:40 p. m.	39 32 15	123 59 00	226	gn. M	55	53	44.6	do	28
2590	Sept. 25	12:05 a. m.	39 32 05	123 56 50	140	S. M	55	53	46.4	do	28
2591	do	12:55 a. m.	39 27 00	123 57 25	82	fne. S. bk. G	54	53	48	do	28
2592	do	1:09 a. m.	39 27 00	123 58 30	157	M	54	53	46.4	do	28
2593	do	1:21 a. m.	39 27 00	124 00 00	234	M	54	53	44.3	do	28
2594	do	2:12 a. m.	39 22 00	124 00 00	238	M	54	53	43.7	do	28
2595	do	2:35 a. m.	39 22 00	123 58 00	132	fne. S. M	54	53	47	do	28
2596	do	2:55 a. m.	39 22 00	123 56 05	77	M	54	53	48.4	do	28
2597	do	3:38 a. m.	39 17 15	123 55 55	77	fne. S. M	54	53	48.5	do	28
2598	do	3:53 a. m.	39 16 50	123 57 45	86	M	54	53	47.6	do	28
2599	do	4:10 a. m.	39 16 10	123 58 35	161	gn. M	54	55	47.6	do	28
2600	do	5:00 a. m.	39 11 05	123 59 00	183	gn. M	54	55	46.4	do	28
2601	do	5:28 a. m.	39 12 20	123 56 00	77	gn. M	54	54	47.6	do	28
2602	do	5:45 a. m.	39 13 10	123 54 00	69	gn. M	54	54	48.1	do	28
2603	do	6:00 a. m.	39 13 50	123 52 30	64	gn. M	54	54	44.6	do	28
2604	do	6:27 a. m.	39 12 10	123 50 50	60	gn. M	53	54	49.4	do	28
2605	do	6:51 a. m.	39 09 30	123 49 00	54	gn. M	53	54	49.6	do	28
2606	do	7:18 a. m.	39 08 10	123 52 30	59	gn. M	53	54	46.1	do	28
2607	do	7:45 a. m.	39 07 50	123 56 00	71	gn. M	53	54	48.6	do	28
2608	do	8:15 a. m.	39 06 30	123 59 30	199	gn. M	53	54	45.5	do	28
2609	1891.										
2610	Feb. 23	3:50 p. m.	7 12 30	80 56 00	127	G. S. Sh	79	81	57.7	Sigsbee	38
2611	Feb. 28	5:07 a. m.	5 29 30	86 49 30	1,009	glob. oz	81	82	37.2	do	35
2612	do	9:22 a. m.	5 35 10	86 57 10	82	lt	84	83.6	58.2	do	38
2613	Mar. 1	6:58 a. m.	5 28 20	86 55 30	94	fne. wh. S	78	82	57.2	do	38
2614	Mar. 5	5:04 a. m.	3 50 00	81 44 20	1,181	bn. glob. oz	77	77	36.5	do	35
2615	Mar. 8	5:55 p. m.	7 34 35	79 18 20	226	S. Sh	76	74	49.8	Tanner	26
2616	do	6:22 p. m.	7 36 20	79 18 10	191	crs. gy. S	76	74	53.8	do	26
2617	do	6:51 p. m.	7 38 10	79 18 00	151	gy. S	77	74	50.3	do	26
2618	Mar. 11	3:25 a. m.	7 26 40	78 52 40	1,681	lt	72	70	36	Sigsbee	38
2619	do	5:19 a. m.	7 27 10	78 46 40	1,708	gn. glob. oz	71	69	36	do	35
2620	do	7:06 a. m.	7 31 00	78 42 30	1,100	gn. glob. oz	72	68	36.5	do	35
2621	do	12:03 p. m.	7 29 00	78 43 30	1,482	gn. glob. oz	76	70	36	do	35
2622	do	1:20 p. m.	7 30 00	78 40 30	1,104	gn. M	77	70	36.5	do	38
2623	Mar. 23	4:21 a. m.	1 27 10	80 02 10	809	sft. M	78	79	40.1	do	38
2624	do	6:00 a. m.	1 21 30	80 01 40	750	gn. oz	78	78	39.2	do	38
2625	do	7:05 a. m.	1 18 00	80 01 00	724	gn. oz	77	80	39	do	38
2626	do	9:18 a. m.	1 11 00	79 59 30	536	gn. M	78	80	41.2	do	38
2627	do	10:25 a. m.	1 07 00	79 59 00	90	gn. M. S	79	80	57.3	do	38
2628	Mar. 25	5:09 a. m.	0 36 00	82 45 00	1,832	gn. glob. oz	80	81	36	do	35
2629	Mar. 26	9:14 a. m.	*South.* 0 13 00	84 52 00			81	81		do	
2630	do	1:15 p. m.	0 20 00	85 08 00	1,488	glob. oz	85	83	36	do	38
2631	Apr. 4	4:10 p. m.	*North.* 1 24 30	91 38 00	1,270	glob. oz	82	83	36.2	do	35
2632	Apr. 11	5:24 a. m.	16 20 00	99 41 30	1,823	yl. S. bk. sp	77	80	35.8	do	35
2633	Apr. 12	6:05 a. m.	16 42 00	100 11 00	838	gn. M	79	80	38.5	do	38
2634	do	9:42 a. m.	16 45 00	100 06 00	912	dk. gn. M	82	82	37	do	38
2635	do	10:42 a. m.	16 46 30	100 02 30	602	dk. gn. M	81	82	40	do	38
2636	Apr. 18	5:05 a. m.	20 47 15	106 15 30	2,022	dk. gn. M	72	74	36	do	60
2637	do	8:49 a. m.	21 03 00	106 21 30	2,102	gn. oz. bk. sp	73	74	35.8	do	35
2638	Apr. 22	7:02 p. m.	27 20 00	110 54 00	773	bn. M. bk. sp	72	71	38	do	38
	Apr. 23	7:06 a. m.	27 38 00	111 04 00	622	bn. M. bk. sp	72	72	39.2	do	38

Record of dredging and trawling stations of the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891.

Serial No.	Date.	Time.	Position.		Temperatures.			Depth.	Character of bottom.	Wind.		Drift (mag.).		Instrument used.
			Latitude N.	Longitude W.	Air.	Surface.	Bottom.			Direction.	Force.	Direction.	Distance.	
	1889.		° ′ ″	° ′ ″	° F.	° F.	° F.	*Fms.*					*Miles.*	
3077	July 23	4:00 p.m.	55 46 00	132 24 00	63	60	42.4	322	gn. M. G	North	2	SE. by S	0.75	L. B. T.
3078	Sept. 1	7:44 a.m.	43 59 15	124 46 00	62	60	45.7	68	G. M	NW	2	W. ½ S	0.75	S. B. T.
3079	...do	4:00 p.m.	43 59 15	124 44 40	60	59	46.7	55	bky	NW	2	NW. by W. ½ W.	1.0	Tangles.
3080	...do	6:47 p.m.	43 58 00	124 36 00	64	60	45.6	93	gn. M	NNW	2	NE. ½ N	1.5	L. B. T.
3081	...do	8:55 p.m.	43 59 00	124 20 00	60	58	45.8	61	gn. M. S	NNW	2	NE. ½ N	1.25	L. B. T.
3082	Sept. 2	5:26 a.m.	43 52 00	124 15 00	59	57	46.2	43	fne. gy S	NW	1	NNW	0.75	L. B. T.
3083	...do	7:06 a.m.	43 59 00	124 14 30	59	56	47.6	32	fne. gy S. bk. Sp	ESE	1	N. by W. ½ W.	0.7	L. B. T.
3084	...do	12:17 p.m.	44 12 30	124 19 00	59	58	46.9	46	fne. gy. S. bk. Sp	NW	4	NE	1.5	L. B. T.
3085	...do	8:28 p.m.	44 29 30	124 17 00	58	56	45.7	42	fne gy S	NW	4	N. ½ W	0.5	L. B. T.
3086	Sept. 3	5:03 a.m.	44 36 00	124 18 30	56	54	46.2	46	fne. gy S. bk. Sp	North	2	NE. ½ E	1.25	L. B. T.
3087	...do	11:04 a.m.	44 28 00	124 26 00	56	56	45.9	46	C. and P	NW	4.5	NE. ½ N	1.0	Tangles.
3088	...do	11:22 a.m.	44 28 00	124 25 30	56	56	46.3	46	C. P	NW	4.5	NE. ½ N	1.0	S. B. T.
3089	Sept. 7	6:34 p.m.	45 40 30	123 58 45	62	56	.....	20	fne. gy S	NW	2	West	1.25	L. B. T.
3090	...do	8:22 p.m.	45 43 00	124 12 00	58	57	45.8	62	fne. gy S	NW	2	WSW	1.5	L. B. T.
3091	Sept. 8	5:35 a.m.	45 32 00	124 19 30	57	56	.....	87	gn. M	NW	3	East	2.25	L. B. T.
3092	...do	8:02 a.m.	45 31 15	124 05 00	57	56	45.9	46	bk. S	N. by W	2	ESE	1.5	L. B. T.
3093	...do	2:28 p.m.	45 20 30	124 06 30	54	50	44.9	57	fne gy S	NW	3	SE. by E. ½ E	2.0	L. B. T.
3094	Sept. 12	9:36 a.m.	43 01 00	124 30 30	50	48	46.7	35	crs. S. Sh	NNW	1	ENE	1.0	S. Dr.
3095	...do	2:08 p.m.	42 44 45	124 38 10	53	48	47.0	42	R. St. brk. Sh	North	5	E. by S	0.5	Tangles.
3096	...do	2:55 p.m.	42 45 00	124 36 15	53	48	46.7	33	St. brk. Sh	North	6	East	0.3	Tangles.
	1890.													
3097	Mar. 5	11:43 a.m.	37 59 08	122 25 45	56	51	.....	12	bu. M	SSE	1	South	0.75	L. B. T.
3098	...do	12:18 p.m.	37 58 25	122 26 30	56	51	.....	13	bu. M	South	1	South	0.75	L. B. T.
3099	Mar. 10	2:14 p.m.	37 44 50	122 43 00	50	51	50.3	20	fne. gy S	WNW	4	WSW	0.5	L. B. T.
3100	...do	3:22 p.m.	37 43 20	122 43 00	50	51	50.4	29	cra. G	WNW	4	WSW	0.7	L. B. T.
3101	...do	4:29 p.m.	37 42 00	122 53 20	49	51	50.8	33	yl. S	WNW	4	S. by W. ½ W	1.1	L. B. T.
3102	...do	5:43 p.m.	37 40 40	122 59 00	49	51	51.8	27	C. brk. Sh	WNW	4	S. ½ W	1.0	L. B. T.
3103	...do	6:49 p.m.	37 38 00	123 02 30	49	49	57.9	67	fne. dk. S	WNW	4	West	2.0	L. B. T.
3104	Mar. 11	6:38 a.m.	37 23 00	123 08 00	47	49	40.8	391	C	WNW	4	SE. by E. ½ E	1.5	L. B. T.
3105	...do	9:02 a.m.	37 21 00	123 00 00	52	51	44.2	217	fne. gy. S	NNE	2	SE. by E	1.2	L. B. T.
3106	...do	10:52 a.m.	37 21 00	122 51 00	52	51	.....	77	fne. gy. S	NNE	2	SE. by S	1.0	L. B. T.
3107	...do	12:12 p.m.	37 20 00	122 44 00	52	52	.....	51	fne. gy. S	NNE	2	E. ½ N	1.0	L. B. T.
3108	...do	1:26 p.m.	37 19 00	122 36 00	53	53	50.8	43	R. brk. Sh	WNW	3	ESE	0.5	L. B. T.
3109	...do	1:50 p.m.	37 18 30	122 35 00	53	53	50.8	40	Rky	WNW	3	NW. by W	1.2	Tangles.
3110	...do	3:02 p.m.	37 19 00	122 32 00	53	53	51.0	39	Rky	WNW	3	NE. ½ N	0.7	Tangles.
3111	...do	5:27 p.m.	37 13 30	122 26 00	60	53	52.8	20	gy. S	NW	3	S. by E. ½ E	0.25	Tangles.
3112	Mar. 12	6:00 a.m.	37 08 00	122 47 00	51	52	41.8	296	fne. gy. S	NNW	2	SE. by E	2.0	L. B. T.
3113	...do	7:50 a.m.	37 06 40	122 37 30	54	52	48.8	70	fne. gy. S	NNW	2	ENE	1.0	L. B. T.
3114	...do	9:12 a.m.	37 06 00	122 32 00	56	52	.....	62	M	ESE	2	E. ½ N	1.3	L. B. T.
3115	...do	10:17 a.m.	37 05 00	122 24 00	53	52	.....	43	fne. bk. S	ESE	2	E. ½ N	1.3	L. B. T.
3116	...do	11:37 a.m.	37 05 30	122 19 00	55	54	.....	16	Rky	ESE	2	SE. by E	0.3	S. Dr.

3117	...do....	12:28 p.m.	37	01	20	122	18	20	53	52	50.7	43	bk. S.M.	ESE.	1	S. by E. ½ E.	1.0	L. B. T.
3118	...do....	1:22 p.m.	36	57	10	122	18	00	58	55	50.9	54	Rky. Co.	NW.	1	S. by E. ½ E.	0.75	S. Dr.
3119	...do....	1:54 p.m.	36	56	30	122	17	40	56	55	50.9	54	Rky. Co.	NW.	1	.....	.....	Tangles.
3120	...do....	2:43 p.m.	36	55	40	122	15	10	56	54	49.7	54	gn. M. S. R.	NW.	1	NNW. ½ W.	0.5	Tangles.
3121	...do....	3:16 p.m.	36	57	20	122	15	00	55	53	49.8	48	gn. M. S.	NW.	1	NNW. ½ W.	0.25	Tangles.
3122	...do....	3:42 p.m.	36	59	00	122	15	00	55	52	52.3	38	gy. S. M.	NW.	1	N. by W.	0.25	Tangles.
3123	...do....	4:44 p.m.	36	57	00	122	10	00	56	54	52.8	37	fne. gy. S. M.	NW.	2	.....	.....	Tangles.
3124	Mar. 13	6:42 a.m.	36	55	10	122	04	00	45	51	52.3	21	Rky.	NE.	2	.....	.....	L. B. T.
3125	...do....	7:41 a.m.	36	52	00	122	11	00	49	52	48.4	65	fne. gy. S. Sh.	ENE.	3	SE. by E.	0.8	L. B. T. and mud bag.
3126	...do....	9:00 a.m.	36	49	20	122	12	30	54	53	52.8	456	gn. M.	East.	4	SE. by E. ½ E.	1.0	L. B. T.
3127	...do....	11:15 a.m.	36	45	00	122	10	20	56	53	40.5	418	gn. M. S.	East.	3	SE. by S.	0.5	L. B. T. and mud bag.
3128	...do....	1:00 p.m.	36	41	50	122	07	30	56	53	38.9	627	bu. M.	Calm.	0	ESE. ½ E.	2.6	L. B. T. and mud bag.
3129	...do....	3:33 p.m.	36	39	40	122	01	00	66	57	43.7	204	S. and M.	Calm.	0	.....	.....	L. B. T. and mud bag.
3130	Mar. 14	12:20 p.m.	36	36	40	121	58	00	67	58	.....	9	S.	North.	1	.....	.....	S. B. T.
3131	...do....	1:34 p.m.	36	41	30	121	54	10	67	58	50.8	48	br. M. R.	North.	2	NE. by N.	0.5	S. B. T.
3132	...do....	2:30 p.m.	36	44	00	121	51	00	62	55	52.1	33	br. M.	NW.	2	NW.	0.4	S. B. T.
3133	...do....	3:23 p.m.	36	47	50	121	49	00	59	55	52.3	37	br. M.	NW.	2	NNE. ½ E.	0.5	S. B. T.
3134	...do....	4:24 p.m.	36	51	40	121	51	20	59	54	54.5	13	fne. S. M.	NW.	2	W. ½ N.	0.5	L. B. T.
3135	...do....	5:15 p.m.	36	54	10	121	55	00	59	54	54.7	15	fne. gy. S.	West.	2	W. ½ S.	0.5	L. B. T.
3136	Mar. 15	6:26 a.m.	36	57	00	122	01	00	49	32	.....	7	gy. S.	NNW.	1	S. ½ W.	1.0	S. B. T.
3137	...do....	6:44 a.m.	36	56	00	122	01	20	50	52	.....	11	S. P.	NNW.	1	S. ½ W.	2.0	S. B. T.
3138	...do....	7:10 a.m.	36	55	30	122	02	00	52	52	55.4	19	fne. S. M. St.	North.	1	SSW.	0.2	S. Dr.
3139	...do....	7:32 a.m.	36	54	10	122	03	00	52	52	52.9	27	gn. M.	North.	1	WSW. ½ W.	0.2	S. Dr.
3140	...do....	8:01 a.m.	36	54	30	122	05	00	53	52	52.3	30	M.	NNE.	1	NW.	0.2	S. Dr.
3141	...do....	8:25 a.m.	36	56	00	122	06	00	53	52	53.0	24	fne. gy. S. M.	NNE.	1	NE. by N.	0.2	S. Dr.
3142	...do....	8:43 a.m.	36	56	20	122	03	20	53	52	.....	13	fne. S. rky.	NNE.	1	East.	0.2	S. Dr.
3143	...do....	9:04 a.m.	36	56	10	122	02	40	57	53	.....	9	Rky.	NNE.	1	E. ½ N.	0.2	S. Dr.
3144	...do....	9:38 a.m.	36	55	40	122	03	10	57	54	.....	20	S. G. R. M.	NNE.	1	S. ½ E.	0.2	S. Dr.
3145	...do....	10:36 a.m.	36	51	05	122	05	30	57	54	49.5	56	fne. gy. S.	NNE.	1	W. ½ N.	1.0	L. B. T.
3146	...do....	11:53 a.m.	36	53	30	122	12	00	57	54	49.5	62	gn. M. R.	NW.	1	.....	.....	S. B. T.
3147	...do....	2:05 p.m.	37	00	00	122	20	00	57	55	49.2	56	br. M.	West.	1	WNW.	0.5	S. B. T.
3148	...do....	4:03 p.m.	37	08	00	122	28	10	56	54	51.3	47	br. M.	WNW.	2	.....	.....	S. B. T.
3149	...do....	5:10 p.m.	37	13	50	122	32	30	55	54	51.1	45	gn. M.	NW.	2	.....	.....	S. B. T.
3150	Mar. 21	12:24 p.m.	37	47	00	122	44	10	51	55	52.3	21	fne. gy. S.	West.	1	NW. by W.	1.2	L. B. T.
3151	...do....	2:05 p.m.	37	49	00	122	55	30	52	55	51.6	37	crs. S. rd. Sp.	West.	1	SE.	1.5	L. B. T.
3152	...do....	3:23 p.m.	37	53	30	122	56	30	52	55	50.6	36	fne. gy. S.	West.	1	.....	.....	L. B. T.
3153	...do....	5:06 p.m.	37	57	10	122	56	20	52	52	51.3	32	gn. M.	West.	1	North.	0.5	L. B. T.
3154	...do....	5:46 p.m.	37	59	20	122	55	30	51	52	51.8	20	bk. S. M.	West.	1	NW. by W. ½ W.	0.3	L. B. T.
3155	Mar. 22	6:42 a.m.	37	57	30	122	39	00	51	52	.....	35	gn. M.	SW.	1	SSW.	0.75	L. B. T.
3156	...do....	7:46 a.m.	37	53	30	123	04	00	51	52	45.3	50	S.	SE.	1	.....	.....	L. B. T.
3157	...do....	9:02 a.m.	37	49	30	123	06	00	51	53	50.6	47	fne. gy. S.	S.	2	S. ½ E.	1.5	T. B. T.
3158	...do....	10:55 a.m.	37	47	30	123	10	40	53	53	51.4	29	Rky.	S.	2	.....	.....	Tangles.
3159	...do....	11:22 a.m.	37	47	20	123	10	00	53	53	.....	27	Rky.	S.	2	.....	.....	Tangles.
3160	...do....	12:05 p.m.	37	48	35	123	12	40	52	52	51.8	39	Rky.	SSW.	2	.....	.....	Tangles.
3161	...do....	2:01 p.m.	37	49	30	123	23	40	52	52	44.5	191	fne. gy. S.	SSW.	2	NW. by W. ½ W.	1.5	L. B. T. and mud bag.
3162	...do....	4:50 p.m.	37	54	10	123	30	00	52	53	39.0	552	gn. M.	W.	3	N. by W.	2.5	L. B. T.
3163	...do....	7:13 p.m.	37	56	40	123	25	30	50	52	48.5	69	fne. gy. S.	WSW.	2	NE. by N.	2.0	L. B. T.

Record of dredging and trawling stations of the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time.	Position. Latitude N.	Position. Longitude W.	Temperatures. Air.	Temperatures. Surface.	Temperatures. Bottom.	Depth.	Character of bottom.	Wind. Direction.	Wind. Force.	Drift (mag). Direction.	Drift (mag). Distance.	Instrument used.
	1890.		° ′ ″	° ′ ″	°F	°F	°F	*Fms.*					*Miles.*	
3164	Mar. 23	5:37 a. m.	37 59 40	123 14 25	49	50	48.5	61	Rky	NW. by N	4	ENE. ½ E	1.0	S. Dr.
3165	do	6:32 a. m.	37 59 45	123 08 25	49	50	49.0	50	gn. M	NW. by N	4	NE. by E	0.7	S. Dr.
3166	do	7:23 a. m.	37 57 30	123 04 30	52	52	50.3	47	gn. M	NW. by N	5	E. ½ N	1.5	S. B. T.
3167	do	8:25 a. m.	37 57 30	122 59 30	53	52	49.5	33	gn. M	NW	5	E. ½ S	1.5	S. B. T.
3168	Mar. 24	10:36 a. m.	38 01 25	123 26 55	52	52	.....	34	Rky. Co	Calm	0	NNW	0.5	Tangles.
3169	Mar. 28	3:41 p. m.	38 16 30	123 30 00	53	52	44.0	202	M	WNW	2	NE. by N	1.0	L. B. T.
3170	do	4:17 p. m.	38 17 00	123 29 00	53	52	.....	167	M	WNW	3	NE. by N	1.25	L. B. T.
3171	do	6:01 p. m.	38 20 30	123 20 00	52	52	48.0	76	Rky. S	WNW	3	NNE	1.0	L. B. T.
3172	do	7:00 p. m.	38 23 35	123 14 00	52	52	48.0	62	bk. S	SW	1	NNE	1.0	L. B. T.
3173	do	8:10 p. m.	38 19 25	123 14 30	51	52	48.2	62	M	SW	1	SE. by E	1.0	S. B. T. and mud bag.
3174	do	9:14 p. m.	38 15 30	123 14 15	50	53	49.5	65	gn. M	NW	1	SE. by E	1.5	L. B. T.
3175	Mar. 29	5:48 a. m.	38 07 35	123 13 30	49	49	.....	57	br. M	West	2	SE. by E. ½ E	1.0	L. B. T.
3176	do	7:09 a. m.	38 01 30	123 06 00	49	49	.....	37	gr. S	West	2	SE. by E. ½ E	1.0	L. B. T.
3177	do	7:52 a. m.	37 59 30	123 03 05	49	50	.....	25	crs. S. G	West	2	.....	.....	S. B. T.
3178	do	8:45 a. m.	37 57 00	122 57 25	49	50	49.0	32	S	West	2	E. by S	1.0	L. B. T.
3179	do	9:52 a. m.	37 53 30	122 52 00	50	53	50.0	30	fne. gr. S	NW	2	E. by S	1.0	L. B. T.
3180	do	10:53 a. m.	37 50 00	122 47 00	53	53	50.7	24	fne. gy. S	NW	1	ESE	1.5	L. B. T. and mud bag
3181	do	11:45 a. m.	37 50 10	123 41 30	53	53	51.0	16	fne. gr S	NW	1	E. by S	1.0	L. B. T.
3182	do	12:20 p. m.	37 49 50	122 37 10	55	54	52.2	11	fne. gy S	NW	1	.....	.....	L. B. T.
3183	Apr. 3	7:54 p. m.	36 31 00	121 59 00	51	52	44.5	162	gy S. R	NNW	1	E. SE	0.25	S. B. T.
3184	do	8:33 p. m.	36 26 40	122 00 05	52	51	46.4	77	S. G	NNW	2	S. E	2.0	S. B. T.
3185	do	10:17 p. m.	36 27 10	121 57 00	52	51	48.4	41	crs. S	NNW	1	S. by E	1.0	S. B. T.
3186	do	12:57 p. m.	36 18 50	122 06 00	53	52	41.3	328	bk. S. M	NW	3	SE. by E	1.0	L. B. T.
3187	do	3:10 p. m.	36 14 00	121 58 40	53	54	41.1	208	yl. S. M	NW	3	NE. ½ N	1.5	L. B. T.
3188	do	5:55 p. m.	36 08 15	121 49 40	54	54	45.0	316	gn. M	NW	3	ESE	3.0	L. B. T.
3189	Apr. 4	5:35 a. m.	35 45 30	121 29 00	53	54	43.2	218	M	NW	4	SE	2.5	L. B. T.
3190	do	7:47 a. m.	35 40 30	121 22 40	53	54	49.0	53	fne. gy S	NW	4	SE	1.5	L. B. T.
3191	do	9:06 a. m.	35 35 15	121 23 00	54	53	44.0	211	br. M	NW	4	E. ½ S	1.5	L. B. T.
3192	do	11:03 a. m.	35 33 40	121 15 00	55	52	47.2	101	bk. S. M	NW	5	NE. by N	0.75	L. B. T.
3193	Apr. 5	8:05 a. m.	35 25 50	121 09 10	51	51	44.4	160	gn. M	West	1	ENE	2.0	L. B. T.
3194	do	9:42 a. m.	35 23 30	121 02 30	52	53	45.9	92	gy. S	NW	2	SE	1.0	L. B. T.
3195	do	12:11 p. m.	35 14 00	121 07 00	57	54	43.2	252	gn. M	NW	4	SE. by E	0.8	L. B. T.
3196	do	4:07 p. m.	35 02 55	120 50 40	54	54	44.1	200	gn. M	WNW	5	E. by N	3.5	L. B. T.
3197	do	5:40 p. m.	35 01 30	120 50 30	54	53	48.4	77	gn. M	NW. by W.	5	E. ½ N	1.5	L. B. T.
3198	Apr. 6	6:44 a. m.	34 19 25	120 38 30	52	53	42.1	278	gn. M	NW	3	ENE	2.6	L. B. T. and mud bag.
3199	do	9:16 a. m.	34 16 45	120 25 30	56	52	43.9	233	gn. M	WNW	2	ENE	1.5	L. B. T.
3200	do	11:24 a. m.	34 15 00	120 14 30	56	52	43.1	265	gn. M	WNW	2	NE. ½ N	1.0	L. B. T.
3201	do	2:37 p. m.	34 14 45	119 54 00	60	55	42.9	280	gn. M	West	4	NE	2.0	L. B. T.

3202	Apr. 11	12:20 p. m.	36 46 10	121 58 45	54	52	41.1	382	gn. M	NW	4	NE	0.5	L. B. T
3203	...do	3:01 p. m.	36 48 00	121 53 50	55	54	44.7	138	br. M	W. by N	4	N. by W	0.2	L. B. T
3204	Apr. 12	7:30 a. m.	36 54 45	122 20 15	48	55	44.1	202	bk. S	NW	4	NW. by N	1.5	L. B. T
3205	...do	9:40 a. m.	36 55 10	122 23 50	50	51	43.7	240	bk. S. R	NW	5	NW. ½ N	0.5	L. B. T
3206	...do	11:31 a. m.	36 57 30	122 27 30	50	51	......	169	......	NW	6	NW	0.8	L. B. T
3207	...do	2:01 p. m.	37 00 30	122 35 30	43	50	45.8	108	fne. gy S	NW	5	NNW	1.5	L. B. T
3208	...do	3:38 p. m.	37 01 10	122 39 45	49	50	44.3	203	fne. gy S	NW	5	NW	1.4	L. B. T
3209	...do	5:46 p. m.	37 05 15	122 42 05	50	50	45.4	141	gn. M	NW	5	NW	0.7	L. B. T
3210	May 21	9:04 a. m.	54 00 00	162 40 30	42	43	38.5	483	S. gn. M	NE	2	SW. by S	1.5	L. B. T
3211	...do	11:34 a. m.	54 02 00	162 52 00	41	44	38.7	313	gn. M	NE	4	SSW. ½ W	3.0	L. B. T
3212	...do	2:26 p. m.	54 05 30	162 54 00	39	43	38.0	49	gy. S. bk. Sp	NE	4	NNW	0.5	L. B. T
3213	...do	3:45 p. m.	54 10 00	162 57 30	39	40	......	41	bk. S	NE	5	NNW. ¼ W	1.0	L. B. T
3214	...do	5:27 p. m.	54 13 00	163 06 00	39	40	......	38	gy. S. G	ENE	5	NNW	1.0	L. B. T
3215	...do	7:24 p. m.	54 14 40	163 24 00	39	43	38.5	43	G	N. by E	5	NW. ½ W	1.5	L. B. T
3216	...do	9:08 p. m.	54 20 30	163 37 00	39	43	......	61	bk. S. M	N. by E	4	NW. ½ N	2.0	L. B. T
3217	May 22	3:33 a. m.	54 14 50	164 06 00	39	42	......	42	bk. G	WNW	1	SW. ¾ W	0.75	L. B. T
3218	...do	5:08 a. m.	54 15 40	164 21 00	39	42	37.7	41	bk. S	WNW	3	W. by S	1.0	L. B. T
3219	...do	6:49 a. m.	54 14 00	164 35 00	39	42	38.0	59	bk. S. G	West	1	SW. by W	1.0	L. B. T
3220	...do	11:12 a. m.	54 15 00	165 06 00	41	42	......	34	G. brk. Sh	W. by N	5	WSW	0.8	L. B. T
3221	...do	1:44 p. m.	54 15 20	165 23 30	40	42	39.1	66	bk. S. Sh	W. by N	4	WNW. ⅜ W	2.0	L. B. T
3222	...do	3:07 p. m.	54 20 00	165 30 00	40	40	39.7	50	bk. S. P. Sh	NW. by W	4	WSW. ½ W	1.5	L. B. T
3223	...do	4:42 p. m.	54 26 15	165 32 00	40	42	39.0	56	bk. P	WNW	4	SW. by W. ¼ W.	1.0	L. B. T
3224	...do	7:36 p. m.	54 42 50	165 37 00	39	43	38.7	121	bk. S. G	WNW	3	WNW	1.0	L. B. T
3225	...do	9:28 p. m.	54 48 30	165 49 00	39	41	38.6	85	bk. S	SW	4	NW. ¼ N	1.0	L. B. T
3226	May 23	7:30 a. m.	55 01 00	167 25 00	37	42	38.5	128	M. S. Sh	West	5	N. by E	0.75	S. B. T
3227	...do	12:01 p. m.	54 36 30	166 54 00	37	42	38.6	225	gn. M	NW	4	NE. by E	1.0	L. B. T
3228	May 31	5:57 p. m.	58 39 20	157 17 30	48	49	......	8	gy. S. P	East	3	NE. ¾ E	1.0	S. B. T
3229	...do	6:24 p. m.	58 40 00	157 15 00	50	50	......	8	gy. S. P	East	2	NE. ¾ E	1.0	S. B. T
3230	...do	6:42 p. m.	58 31 30	157 13 30	50	50	......	3¼	gy. S. P	East	2	NE. ¾ E	0.1	S. B. T
3231	June 2	8:09 a. m.	58 35 00	157 28 50	45	47	......	12	S	East	2	S. by E	1.0	L. B. T
3232	...do	9:35 a. m.	58 31 30	157 34 15	45	47	......	10½	P. St	SW	2	SE. by S	0.75	L. B. T
3233	...do	11:17 a. m.	58 23 45	157 42 45	44	45	44.5	7¼	S. P	SW	1	WSW	0.6	L. B. T
3234	...do	12:40 p. m.	58 27 00	157 52 00	48	47	......	5	gy. S	Calm	......	......	......	L. B. T
3235	June 7	3:40 p. m.	88 16 30	158 13 00	44	44	......	11	bk. S	SW	3	SE. by S	1.0	L. B. T
3236	...do	5:10 p. m.	58 11 00	158 05 30	37	42	39.0	14½	G. S. Sh	SW	3	S. ½ E	1.0	L. B. T
3237	...do	7:04 p. m.	58 08 00	158 19 00	36	41	......	19	gy. S. G. Sh	S. by W	4	S. ¼ W	1.25	L. B. T
3238	...do	9:21 p. m.	58 03 40	158 37 30	35	39	......	18	fne. gy. S	S	3	South	1.0	L. B. T
3239	June 8	4:34 a. m.	58 22 20	159 23 15	40	44	......	11½	fne. gy. S	SW	2	West	1.0	L. B. T
3240	...do	6:17 a. m.	58 30 00	159 35 50	42	43	......	14½	fne. bk. S	SSW	2	WNW	1.0	L. B. T
3241	...do	8:46 a. m.	58 38 30	159 33 30	48	47	38.0	14	bk. M	SSW	2	W. ½ S	1.0	L. B. T
3242	...do	3:45 p. m.	58 44 30	160 08 45	43	45	......	11	bk. M	S	2	WSW	0.8	L. B. T
3243	...do	5:32 p. m.	58 45 10	160 28 00	45	46	......	4½	fne. gy. S	SE	2	WSW	0.8	L. B. T
3244	June 9	5:19 p. m.	58 37 20	161 05 00	40	43	......	4½	fne. gy. S	ESE	2	S. by W	1.0	L. B. T
3245	...do	7:05 p. m.	58 31 20	161 13 00	41	44	......	11½	S. and P	SE	2	SSE	0.75	L. B. T
3246	...do	8:45 p. m.	58 26 30	161 36 00	41	40	38	17½	G	NE	2	S by W.	1.0	L. B. T
3247	June 13	2:00 p. m.	56 40 45	162 08 30	41	43	40.6	17	P. St	ESE	4	S. by W	0.25	L. B. T
3248	...do	3:41 p. m.	58 34 15	162 22 00	40	41	43	21	fne. gy. S. G	ESE	3	S. by W	0.75	L. B. T
3249	...do	5:54 p. m.	58 27 30	162 36 00	39	39	37	13½	fne. gy. S. bk. Sp	ESE	2	ESE	1.5	L. B. T
3250	...do	9:40 p. m.	58 11 30	163 02 45	38	40	40.2	17½	gy. S	SE	3	S. by W	1.5	L. B. T
3251	June 14	4:39 a. m.	57 35 50	164 05 00	38	39	37.5	25½	fne. gy. S	SE	2	S. by W	0.75	L. B. T
3252	...do	7:16 a. m.	57 22 20	164 24 40	39	40	44.8	29½	bk. M	SSE	2	SSW	1.0	L. B. T
3253	...do	10:07 a. m.	57 05 50	164 27 15	40	42	35	36	M. S	S	2	S. by W	1.5	L. B. T

Record of dredging and trawling stations of the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time.	Position. Latitude N.	Position. Longitude W.	Temperatures. Air.	Temperatures. Surface.	Temperatures. Bottom.	Depth.	Character of bottom.	Wind. Direction.	Wind. Force.	Drift (mag.). Direction.	Drift (mag.). Distance.	Instrument used.
	1890.		° ′ ″	° ′ ″	°F.	°F.	°F.	*Fms.*					*Miles.*	
3254	June 14	12:33 p.m.	56 30 00	164 27 50	41	43	36.2	46	gn. M. S.	S	2	3¼ W	1.0	L. B. T.
3255	...do....	3:34 p.m.	56 33 30	164 31 40	42	44	37	43	gn. M. S.	SE.	2	SSW. ½ W	0.5	L. B. T. and surface tow net.
3256	...do....	8:03 p.m.	56 13 00	164 34 10	42	45	35	40	gn. M. bk. Sh.	E. by N.	1	SW. by S	0.5	L. B. T.
3257	June 24	4:21 a.m.	54 49 00	165 32 00	43	45	39	81	gy. S. G.	SSW.	1	N. by E. ½ E.	0.75	L. B. T.
3258	...do....	6:33 a.m.	54 48 00	165 13 30	43	44	39	70	bk. S. G.	SSE.	1	N. ½ E.	0.75	L. B. T.
3259	...do....	8:56 a.m.	54 40 30	165 05 30	42	44	40.6	41	bk. S. G.	S.	1	ESE.	0.8	L. B. T.
3260	...do....	11:05 a.m.	54 38 15	164 52 00	42	44	42	13	fne. bk. S.	W.	1	N. ½ W.	0.5	L. B. T.
3261	...do....	12:21 p.m.	54 42 15	164 49 15	44	45	41.2	27	bk. G. P.	W.	1	N. by E.	0.75	L. B. T.
3262	...do....	2:51 p.m.	54 49 30	165 02 00	44	45	40.7	43	bk. S. R.	SW.	2	W. ½ N.	0.5	L. B. T.
3263	...do....	6:20 p.m.	55 04 00	165 04 00	43	45	39.5	61	bk. m.	NW.	1	E. by N.	1.0	L. B. T.
3264	...do....	8:39 p.m.	54 57 00	164 48 00	43	45	40.5	40	crs. S. G.	W.	2	SE.	0.5	L. B. T.
3265	June 25	6:01 a.m.	55 16 30	163 52 45	42	45	39.8	38	bk. S.	W.	2	SE. ½ S.	0.8	L. B. T.
3266	...do....	8:01 a.m.	55 08 30	163 30 30	42	45	42	24	bk. S.	W.	2	SE. ½ S.	0.8	L. B. T.
3267	...do....	12:01 p.m.	55 23 30	163 29 00	44	46	41	32	bk. S.	W.	2	NW. by W. ½ W.	1.0	L. B. T.
3268	...do....	5:28 p.m.	55 29 00	163 13 00	45	47	41.2	26	bk. S. G.	SW.	3	SSE. ½ E.	1.0	L. B. T.
3269	...do....	7:36 p.m.	55 19 00	163 04 30	42	44	42.3	16	fne. gy. S. bk. sh.	SW.	3	SE.	0.75	L. B. T.
3270	June 26	3:13 p.m.	55 26 30	162 52 00	43	47	43.5	16	bk. S.	SW.	2	WNW.	0.8	L. B. T.
3271	...do....	4:37 p.m.	55 29 15	162 58 00	43	47	41.9	25	bk. S.	SW.	2	W. ½ S.	0.5	L. B. T.
3272	June 27	2:11 p.m.	55 31 40	163 07 00	43	45	42	31	bk. & rd. S.	SW.	3	NW. ½ W.	0.5	L. B. T.
3273	...do....	4:56 p.m.	55 44 30	162 56 00	44	45	38.5	39	gy. S. M.	WSW.	3	SSE.	1.0	L. B. T.
3274	...do....	7:33 p.m.	55 34 30	162 31 45	42	45	.....	19	bk. S. Sh.	SW.	3	ESE.	0.3	L. B. T.
3275	...do....	8:59 p.m.	55 44 20	162 17 30	42	45	42.8	22	fne. bk. S.	SSW.	3	W. ½ S.	1.5	L. B. T.
3276	June 28	4:38 a.m.	55 51 15	162 03 00	41	43	42	18	G. S. R.	W.	3	SE. by S.	0.5	S. B. T.
3277	...do....	6:32 a.m.	55 58 45	161 46 30	45	46	43.2	18	G. S. R.	SW. by S.	3	W. ½ S.	1.0	Tangles.
3278	...do....	10:19 a.m.	56 12 30	162 13 00	42	44	38.8	47	fne. gy. S.	SW. by S.	3	W. ½ S.	0.75	L. B. T.
3279	...do....	2:06 p.m.	56 25 40	162 39 15	43	55	37	41	fne. gy. S.	SW.	3	NE. by E. ½ E.	0.5	L. B. T.
3280	...do....	5:53 p.m.	56 27 00	162 08 00	44	55	41	36	fne. gy. S.	SW.	2	ESE.	0.75	L. B. T.
3281	...do....	8:58 p.m.	56 14 00	161 41 15	42	55	.....	36	gy. S. bk. Sp.	SW.	3	SE.	0.75	L. B. T.
3282	June 29	5:04 a.m.	56 30 45	161 50 15	42	55	38.2	53	fne. S. gn. M.	SW. by S.	3	NE. ½ N.	1.25	L. B. T.
3283	...do....	8:18 a.m.	56 28 00	161 16 30	41	44	40.3	39	fne. gy. S.	SW. by S.	3	ESE.	1.0	L. B. T.
3284	...do....	12:15 p.m.	56 16 30	160 53 00	44	47	43	25	fne. G.	S.	2	E. by S.	1.5	L. B. T.
3285	July 17	5:24 a.m.	56 45 45	160 42 45	43	44	41	35	gy. S. bk. Sp.	SW.	4	ESE.	0.8	L. B. T.
3286	...do....	7:29 a.m.	56 39 30	160 29 00	43	45	41.5	37	fne. gy. S. bk. G.	SW.	5	ESE.	1.5	L. B. T.
3287	...do....	9:35 a.m.	56 33 00	160 14 00	44	46	42	30	crs. bk. S.	SW.	5	SE. ½ E.	1.0	L. B. T.
3288	...do....	11:35 a.m.	56 26 30	160 00 00	44	46	45.5	15	bk. G.	SW.	5	SE. ½ E.	1.0	L. B. T.
3289	July 18	5:04 a.m.	56 44 30	159 16 00	42	45	.....	16	bk. S.	WSW.	2	SE. ½ E.	1.0	L. B. T.
3290	...do....	7:07 a.m.	56 50 30	159 01 00	43	47	.....	16	gy. S. G.	WSW.	2	SSE.	1.25	L. B. T.
3291	...do....	9:37 a.m.	56 58 30	159 11 00	42	45	41.2	28	bk. S. G.	WSW.	2	WNW.	0.6	L. B. T.
3292	...do....	1:3. p.m.	57 14 00	159 35 00	44	45	.....	22	bk. S. G.	SW.	2	WNW.	0.8	L. B. T.

3293	...do	5:26 p. m.	57	30	00	159	33	00	43	44	40	30	fne. gy. S	SW.......	2	SE.½ E	1.5	L. B. T.
3294	...do	8:53 p. m.	57	16	45	159	03	30	42	45	41	30	bk. G	W........	2	ESE...........	0.75	L. B. T.
3295	July 19	9:57 a. m.	57	14	30	158	20	30	47	50	....	11½	fne. gy. S	SSW......	3	WNW..........	1.0	L. B. T.
3296	...do	12:33 p. m.	57	26	30	158	46	00	45	47	43	24	gy. S. bk. Sp	SW.......	3	W.½ S..........	1.3	L. B. T.
3297	...do	3:25 p. m.	57	38	00	159	07	30	46	47	41.5	26	gy. S................	SSW	2	NE.¾ N.........	1.0	L. B. T.
3298	...do	8:52 p. m.	57	38	30	158	22	30	45	48	43.8	20	fne. gy. S	WSW	3	SE. by S.........	1.7	L. B. T.
3299	July 20	9.37 a. m.	57	59	00	158	44	00	49	54	44	20	fne. gy. S. yl. Sp.....	S.........	2	West	0.5	L. B. T.
3300	...do	5:04 p. m.	58	12	30	159	55	00	50	51	42.2	15	P....................	SSW	2	WNW...........	0.5	L. B. T.
3301	...do	9:56 p. m.	58	12	45	160	37	30	48	52	....	17	fne. gy. S	SSW	2	WNW..........	0.7	L. B. T.
3302	July 21	8:32 a. m.	57	45	45	160	12	15	48	51	40.2	30	fne. gy. S	SW. by W	3	SE.½ E	1.0	L. B. T.
3303	...do	1:15 p. m.	57	27	00	160	23	30	48	50	39.5	33	bk. S	SW.......	2	NW. by W.½ W	0.6	L. B. T.
3304	...do	8:21 p. m.	58	02	30	161	13	45	47	49	....	28	fne. gy. S	SW. by W	2	NW. by W.½ W	1.0	C. R. D.
3305	July 22	9:03 a. m.	57	51	30	161	40	00	47	56	41.8	23	fne. gy. S...........	SW. by W	2	SE.............	0.5	C. R. D.
3306	...do	1:39 p. m.	57	24	30	161	17	00	46	52	38.9	33	fne. gy. S	SW. by W	2	SE.............	1.0	C. R. D.
3307	Aug. 3	6:27 a. m.	53	55	00	170	50	00	47	50	35.4	1,033	gn. oz...............	S. by E....	5	NW. by W	4.5	D. S. T.
3308	Aug. 4	6:07 a. m.	56	12	00	172	07	00	47	50	35	1,625	gn. oz...............	NNE	3	NW. by N......	6.5	D. S. T.
3309	...do	5:17 p. m.	56	56	00	172	55	00	46	50	37.9	71	gn. M................	S.........	3	SW. by W......	1.0	L. B. T.
3310	Aug. 15	7:14 a. m.	53	56	51	166	28	53	50	54	41.5	58	fne. dk. S. M	E	1	W.¾ S..........	0.75	S. B. T.
3311	...do	9:55 a. m.	53	59	36	166	29	43	56	52	41	85	gn. M................	SE........	1	ENE.½ E	1.0	S. B. T.
3312	...do	10:50 a. m.	53	59	11	166	25	09	57	55	43.0	45	fne. S. M	SE........	1	N.½ W..........	0.5	S. B. T.
3313	...do	12:53 p. m.	54	01	51	166	27	38	55	55	42.7	68	fne. bk. s............	NE. by E .	2	W	0.3	S. B. T.
3314	...do	2:05 p. m.	54	02	24	166	32	47	55	55	42.5	74	bk. S.................	NE. by N .	2	S. by W.½ W ...	1.1	S. B. T.
3315	...do	4.29 p. m.	54	02	40	166	42	00	56	55	38.5	277	gn. M. S.............	NE. by N .	3	SE.½ E	0.5	S. B. T.
3316	Aug. 16	6:25 a. m.	54	01	00	166	48	45	62	56	38.2	309	bk. S. G	SE........	3	SW. by W.½W..	0.8	S. B. T.
3317	...do	10:04 a. m.	53	57	40	166	59	00	60	54	39.5	165	crs. S. G. R..........	SW. by S .	3	S. by W.¾W	0.25	S. B. T.
3318	...do	2:55 p. m.	53	47	40	167	14	00	54	52	42.0	61	bk. S. G. Sh	SE........	4	ESE...........	1.0	S. B. T.
3319	Aug. 18	1:38 p. m.	53	40	30	167	30	00	51	52	40.8	59	bk. S.................	W	2	SE. by E........	0.5	L. B. T.
3320	...do	2:03 p. m.	53	40	00	167	29	45	51	52	40.8	59	bk. S. Co	W	2	SE. by E........	0.8	Tangles.
3321	...do	4:13 p. m.	53	33	30	167	15	40	50	50	41.5	54	dk. M................	NNE	1	....		L. B. T.
3322	...do	6:58 p. m.	53	28	45	167	23	50	51	50	42.4	35	bk. S.................	W	1	SW. by W	0.5	L. B. T.
3323	Aug. 19	7:18 a. m.	53	26	00	167	31	10	46	46	42.0	51	fne. bk. S	S.........	1	....		L. B. T
3324	Aug. 20	12:47 p. m.	53	33	50	167	46	50	47	47	....	109	crs. bk. S. G. R	S.........	2	WSW.½ W	1.5	L. B. T.
3325	...do	2:10 p. m.	53	37	10	167	50	10	50	49	38.0	284	gn. M................	WNW......	2	ENE	2.0	L. B. T.
3326	...do	4:58 p. m.	53	40	25	167	41	40	50	49	37.5	576	M....................	S.........	2	SE. by E.½ E	2.0	L. B. T.
3327	...do	7:59 p. m.	53	43	40	167	29	30	48	49	38.2	322	bk. S.................	NW	1	NE. by N	2.5	S. B. T.
3328	Aug. 21	6:25 a. m.	53	51	45	167	19	25	47	48	37.0	578	M	S.........	2	NNE...........	1.0	L. B. T.
3329	...do	9:45 a. m.	53	56	50	167	08	15	52	51	37.7	399	fne. bk. S	NW	2	NE.½ N.........	1.0	L. B. T.
3330	...do	11:57 a. m	54	00	45	166	53	50	52	51	37.8	351	bk. S. M	NW	2	NE. by E.½ E....	0.7	L. B. T.
3331	...do	1:30 p. m.	54	01	40	166	48	50	51	52	....	350	M	NW	2	NE. by E.½ E....	0.7	L. B. T.
3332	...do	3.25 p. m.	54	02	50	166	45	00	52	52	....	406	Rky. S...............	NW	2	NE.½ E..........	1.2	L. B. T.
3333	Aug. 22	6:33 a. m.	53	53	35	166	30	15	46	48	43.9	19	gn. M................	WNW......	1	NNE...........	0.7	S. B. T
3334	...do	7:33 a. m.	53	56	20	166	29	15	47	48	42.6	50	M. S	SSW......	1	WNW.½ W.....	0.7	S. B. T.
3335	...do	8:34 a. m.	53	58	05	166	33	25	47	47	40.8	93	M....................	SSW......	1	WNW...........	0.25	S. B. T.
3336	...do	10:46 a. m.	53	56	55	166	33	35	50	50	41.6	55	fne. bk. S	Calm	0	S...............	0.3	S. B. T.
3337	Aug. 27	6:17 a. m.	53	55	30	163	26	00	50	51	39.3	280	gn. M. R	W. by S ..	2	ENE	1.0	L. B. T.
3338	Aug. 28	5:32 a. m.	54	19	00	159	40	00	52	51	37.3	625	gn. M. S.............	SE. by S ..	2	NE. by E	3.5	L. B. T.
3339	...do	5:13 p. m.	54	46	00	157	43	30	53	52	37.4	138	M. G.................	SSE	4	ENE	2.0	L. B. T.
3340	Aug. 29	6:25 a. m.	55	26	00	155	26	00	54	52	36.8	695	M	SSE	4	ENE	2.0	L. B. T.
3341	...do	5:53 p. m.	56	01	30	153	52	00	55	54	41.1	67	fne. gy. S............	SE. by S ..	4	NE. by N	1.0	L. B. T.
3342	Sept. 3	4:37 p. m.	52	39	30	132	38	00	56	57	35.3	1,588	gy. oz. crs. S	NW	4	SE. by E........	1.0	L. B. T.
3343	Sept. 21	9:27 a. m.	47	40	40	125	20	00	53	54	38.2	516	gn. M................	NW	2	SE. by S........	2.0	L. B. T.
3344	...do	1:24 p. m.	47	20	00	125	07	30	55	52	36.8	831	gn. M................	NNW	2	....		L. B. T.

Record of dredging and trawling stations of the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time.	Position.		Temperatures.			Depth.	Character of bottom.	Wind.		Drift (mag.).		Instrument used.
			Latitude N.	Longitude W.	Air.	Surface.	Bottom.			Direction.	Force.	Direction.	Distance.	
	1890.		° ′ ″	° ′ ″	°F.	°F.	°F.	*Fms.*					*Miles.*	
3345	Sept. 22	5:51 a.m.	45 39 00	124 53 00	56	57	57.3	759	gn. M	ESE	1	SW. ½ S	3.3	L. B. T.
3346	...do	9:27 a.m.	45 30 00	124 52 00	55	54	57.3	786	gn. M	SE. by S	2			L. B. T.
3347	...do	3:19 p.m.	45 09 35	124 45 00	54	54	40.9	345	M	SSE	3	SSW	2.5	L. B. T.
3348	Sept. 25	9:31 a.m.	39 02 40	124 06 15	53	54	47.6	455	fne. gy. S	NNW	2	SE.	1.5	L. B. T.
3349	...do	11:27 a.m.	38 57 45	124 03 05	55	54	44.1	239	bk. S	NNW	2	NE.	1.5	L. B. T.
3350	...do	1:00 p.m.	38 58 10	123 57 05	55	54	48.4	75	fne. S. M	NNW	1	NE.	0.7	L. B. T.
3351	...do	2:10 p.m.	38 59 40	123 50 50	55	54	50.0	51	M	NNW	2	NE.	0.5	S. B. T.
3352	...do	3:13 p.m.	39 01 10	123 44 00	55	54	51.5	26	fne. br. S	NNW	1	S. ½ E	0.3	S. B. T.
	1891.													
3353	Feb. 23	8:56 a.m.	7 06 15	80 34 00	75	73	39	685	gn. M	Calm	0			L. B. T.
3354	...do	1:25 p.m.	7 09 45	80 50 00	80	78	46	322	gn. M	SE.	1	NNW. ½ W	3.0	L. B. T.
3355	...do	3:01 p.m.	7 12 20	80 55 00	80	81	54.1	182	bk. C. Sh	ESE	1	NW. ½ W	0.5	L. B. T.
3356	...do	7.30 p.m.	7 09 30	81 08 30	80	83	40.1	546	sft. bl. M	SE.	1	SW. ½ S	1.4	L. B. T.
3357	Feb. 24	6:17 a.m.	6 35 00	81 44 00	80	83	38.5	782	gn. S	E.	1	W. by S	0.8	L. B. T.
3358	...do	10:38 a.m.	6 30 00	81 44 00	83	83	40.2	555	gn. S	E.	1	SW. by W. ½ W.	1.0	L. B. T.
3359	...do	2:04 p.m.	6 22 20	81 52 00	82	83	42	465	rky	ENE	2	SSE	1.2	Tangles.
3360	...do	5:20 p.m.	6 17 00	82 05 00	81	83	38.4	1,672	fne. bk. & gn. S	SE.	1	W. by S	1.0	L. B. T.
3361	Feb. 25	7:33 a.m.	6 10 00	83 06 00	81	82	36.6	1,471	gn. Oz	SE.	1	WSW	2.0	L. B. T.
3362	Feb. 26	7:20 a.m.	5 56 00	85 10 30	80	84	36.8	1,175	gn. M. S. R	SSW	2	SSW	1.8	L. B. T.
3363	...do	4:37 p.m.	5 43 00	85 50 00	79	83	37.5	978	wh. glob. Oz	SW.	1	SSW	2.0	L. B. T.
3364	Feb. 27	6:58 a.m.	5 30 00	86 08 30	79	81	38	902	yl. glob. Oz	NW.	1	W. ½ S	1.3	L. B. T.
3365	...do	1:30 p.m.	5 31 00	86 31 00	82	85	37	1,010	yl. glob. Oz	NNE	1	W. by S	0.2	Agassiz, B. T.
3366	...do	8:04 p.m.	5 30 00	86 45 00	83	84	37	1,067	yl. glob. Oz	Calm	0	W	0.5	L. B. T.
3367	Feb. 28	6:38 a.m.	5 31 30	86 52 30	81	82	57	100	rky	SE.	1	WNW	0.5	S. B. T.
3368	...do	7:21 a.m.	5 32 45	86 54 30	81	82	58.4	66	rky	SE.	1	WNW	0.8	S. B. T.
3369	...do	8:07 a.m.	5 32 45	86 55 20	86	82	62.2	52	rky	SSE	1	WNW	0.2	L. B. T.
3370	...do	10:03 a.m.	5 36 40	86 56 50	85	84	54.8	134	R. Sh	SSE	1	N. by E	0.5	Tangles.
3371	Mar. 1	7:49 a.m.	5 26 20	86 55 00	78	82	39	770	glob. Oz	E.	1	W. by S	0.5	Agassiz, B. T.
3372	...do	5:51 p.m.	4 49 00	86 11 20	85	84	38.8	761	gy. glob. Oz	E. by N.	2	NE. by E.	1.5	Agassiz, B. T.
3373	Mar. 2	10:33 a.m.	4 02 00	84 58 00	83	82	36.6	1,877	bn. M. bk. Sp	NE. by E.	2	SE. ½ E	3.7	Agassiz, B. T.
3374	Mar. 3	10:35 a.m.	2 35 00	83 53 00	81	80	36.4	1,823	gn. Oz	E. by N.		E.	2.5	L. B. T.
3375	Mar. 4	6:36 a.m.	2 34 00	82 29 00	76	77	36.6	1,201	gy. glob. Oz	ENE.	2	NE	1.0	L. B. T. and mud bag.
3376	...do	4:27 p.m.	3 09 00	82 08 00	79	78	36.3	1,132	gy. glob. Oz	NE. by N.	3	NNE	1.0	Do.
3377	Mar. 5	8:38 a.m.	3 56 00	81 40 15	79	77	38.0	764	M	NE. by E.	3	NE. by N	1.5	Do.
3378	...do	11:45 a.m.	3 58 20	81 36 00	79	78	55.9	112	brk. Sh	NE.	3	N. by E	0.8	S. B. T.
3379	...do	2:15 p.m.	3 59 40	81 35 00	79	78		52	R	NE.	3			Tangles.
3380	...do	4:51 p.m.	4 03 00	81 31 00	79	79	37.2	899	R	NNE	3	ESE	1.0	L. B. T.
3381	Mar. 6	8:38 a.m.	4 56 00	80 52 30	78	77	35.8	1,772	gn. M	NE.	2	ENE	1.0	L. B. T.
3382	Mar. 7	10:46 a.m.	6 21 00	80 41 00	77	75	35.8	1,793	gn. M	N.	3	ENE	2.0	L. B. T. †
3383	Mar. 8	6:51 a.m.	7 21 00	79 02 00	75	74	36.0	1,832	gn. glob. Oz	N.	1	NW. by N	2.5	L. B. T.

3384	...do....	1:20 p.m.	7 31 30	79 14 00	79	74	42.0	458	gn. S	NNW	1	NW	0.5	L.B.T.
3385	...do....	3:07 p.m.	7 32 36	79 16 00	75	72	45.9	286	gn. M	N	1	NW	1.0	L.B.T.
3386	...do....	4:54 p.m.	7 33 12	79 17 15	76	73	48.0	242	fne. gy. S	N	1	NNW	0.5	L.B.T.
3387	...do....	7:21 p.m.	7 40 00	79 17 50	77	74	56.2	127	fne. gy. S.	N	2	NNW	0.8	L.B.T.
3388	Mar. 9	6:41 a.m.	7 06 00	79 48 00	75	73	36.2	1,168	gn. glob. Oz	N	3	NW. ½ N.	2.3	L.B.T.‡
3389	...do....	2:10 p.m.	7 16 45	79 56 30	77	74	48.8	210	gn. M	N. by E	2	N. ½ E.	0.7	L.B.T.
3390	...do....	4:25 p.m.	7 26 10	79 53 50	77	74	62.6	56	fne. gy. S. G.	N. by E	2	N. by E	2.0	L.B.T.
3391	...do....	7:15 p.m.	7 33 40	79 43 20	77	73	55.8	153	gn. M	N. by E	3	W. ½ N	0.7	L.B.T.
3392	Mar. 10	6:30 a.m.	7 05 30	79 40 00	76	73	36.4	1,270	hrd	N	4	NNE	1.5	L.B.T.
3393	...do....	1:21 p.m.	7 15 00	79 36 00	77	74	36.8	1,020	gn. M	N	5	NNW	1.5	L.B.T.
3394	...do....	5:43 p.m.	7 21 00	79 35 00	76	73	41.8	511	dk. gn. M	N	4	NNW	1.0	L.B.T.
3395	Mar. 11	2:20 p.m.	7 30 36	78 39 00	77	70	38.5	730	rky	NW	2	NE	1.0	L.B.T.
3396	...do....	5:15 p.m.	7 32 00	78 36 30	77	70	47.4	259	hrd. gy. M. S	E	1	E. by N	0.5	L.B.T.
3397	...do....	6:32 p.m.	7 33 00	78 34 20	76	71	57.3	85	sft. gn. M. brk. Sh	NE	1	N. by W	0.7	L.B.T.
3398	Mar. 23	3:16 p.m.	1 07 00	80 21 00	84	84	36.0	1,573	gn. Oz	Calm	0	SW	2.3	Blake B. T.
3399	Mar. 24	6:37 a.m.	1 07 00	81 04 00	79	80	36.0	1,740	gn. Oz	Calm	0	SW	2.0	L.B.T.
			South.											
3400	Mar. 27	6:10 a.m.	0 36 00	86 46 00	81	81	36.1	1,322	lt. gy. glob. Oz	SE	1	SW	1.5	L.B.T.
3401	Mar. 28	4:45 a.m.	0 59 00	88 58 30	81	82	43.8	395	glob. Oz	S. by E	2	SW. by W	0.2	L.B.T.
3402	...do....	7:13 a.m.	0 57 30	89 03 30	81	82	42.3	421	R. glob. Oz	S. by E	2	W. by S	1.2	S.B.T.
3403	...do....	10:19 a.m.	0 58 30	89 17 00	82	82	43.3	384	fne. gy. S. bk. Sp	S. by E	2	SW. ½ S.	1.3	S.B.T.
3404	...do....	1:16 p.m.	1 03 00	89 28 00	84	83	43.2	385	R	S. by E	2	N. by W	0.3	S.B.T.
3405	...do....	3:42 p.m.	0 57 00	89 38 00	84	83	59.9	53	P. Co. Sh	SSW	2	WNW	0.2	Tangles.
3406	Apr. 3	6:47 a.m.	0 16 00	90 21 30	79	81	41.3	551	R	S	1	NW	0.5	S.B.T.
3407	...do....	10:48 a.m.	0 04 00	90 24 30	80	81	37.2	885	glob. Oz	N	2	NW. by W	1.5	L.B.T.
			North.											
3408	...do....	4:07 p.m.	0 12 30	90 32 30	83	83	39.5	684	glob. Oz	Calm	0	NNW. ½ W	0.5	L.B.T.
3409	...do....	7:24 p.m.	0 18 40	90 34 00	80	82	42.3	327	bk. S	N	1	NW. ½ W	1.5	S.B.T.
3410	...do....	8:48 p.m.	0 19 00	90 34 00	79	82	44.0	331	bk. S	NW	1	NW	1.0	S.B.T.
3411	Apr. 4	7:35 a.m.	0 54 00	91 09 00	79	82	36.2	1,189	yl. glob. Oz	WSW	2	NW. ½ W	1.3	L.B.T.
3412	...do....	6:11 p.m.	1 23 00	91 43 00	81	82	38.0	918	R	W. by S	3	SW	1.8	L.B.T.
3413	Apr. 5	8:34 a.m.	2 34 00	92 06 00	79	82	36.0	1,360	glob. Oz. dk. Sp	NW	1	NW. by N	1.7	L.B.T.
3414	Apr. 8	11:14 a.m.	10 14 00	96 28 00	81	82	35.8	2,232	gn. M	ENE	3	NE	2.5	L.B.T.†
3415	Apr. 10	9:39 a.m.	14 46 00	98 40 00	84	83	36.0	1,879	bn. M. glob. Oz	Calm	0	N. by W	1.5	L.B.T.
3416	Apr. 11	9:46 a.m.	16 32 30	99 42 40	82	81	40.5	419	bn. M	WSW	1	NW	0.3	L.B.T.
3417	...do....	11:44 a.m.	16 32 00	99 48 00	83	82	40.6	493	gn. M	WSW	1	SE. by E.	0.4	S.B.T.
3418	...do....	2:57 p.m.	16 33 00	99 52 30	82	82	39.0	660	bn. S. bk. Sp	SW. by W	2	WSW. ½ W	1.5	S.B.T.
3419	...do....	5:59 p.m.	16 34 30	100 03 00	82	81	39.0	772	gn. M. bk. Sp	WSW	2	W. by S.	1.0	S.B.T.
3420	Apr. 12	7:48 a.m.	16 46 00	100 08 20	81	82	39.6	664	dk. gn. M	WNW	3	E. by S	0.7	S.B.T.
3421	...do....	11:32 a.m.	16 47 20	100 00 10	82	82	42.9	388	dk. gn. M	WNW	2	NE. by E. ½ E.	0.5	S.B.T.
3422	...do....	12:35 p.m.	16 47 30	99 59 30	84	83	53.3	141	gn. M	WSW	2	....	....	S.B.T.
3423	...do....	1:31 p.m.	16 47 30	99 59 20	84	83	55.8	94	gn. M	WSW	2	....	....	S.B.T.
3424	Apr. 18	11:18 a.m.	21 15 00	106 23 00	76	76	38.0	676	gy. S. bk Sp	NW	2	NW	0.5	S.B.T.
3425	...do....	2:14 p.m.	21 19 00	106 24 00	75	76	39.0	680	gn. M. S	W	1	NNW	0.5	S.B.T.
3426	...do....	3:45 p.m.	21 21 00	106 25 00	75	76	51.2	146	rky	W	1	....	....	S.B.T.
3427	...do....	4:03 p.m.	21 22 15	106 25 00	75	76	51.2	80	rky	W	1	N	0.4	Tangles.
3428	...do....	6:40 p.m.	21 36 30	106 25 00	75	76	48.1	238	dk. gy. S	SW	2	NNW	0.6	S.B.T.
3429	Apr. 19	5:39 a.m.	22 30 30	107 01 00	73	73	37.5	919	gn. Oz. rky	SE. by S	1	NW. by W	1.2	S.B.T.
3430	...do....	3:27 p.m.	23 16 00	107 31 00	74	73	37.9	852	bk. S	W	2	NW	0.5	S.B.T.

* Bottom also known as Nullipore. † Three trials submarine tow net. ‡ Lowered submarine tow net.

Record of dredging and trawling stations of the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Serial No.	Date.	Time.	Position.		Temperatures.			Depth.	Character of bottom.	Wind.		Drift (mag.).		Instrument used.
			Latitude N.	Longitude W.	Air.	Surface.	Bottom.			Direction.	Force.	Direction.	Distance.	
	1891.		° ′ ″	° ′ ″	°F	°F	°F	*Fms.*					*Miles.*	
3431	Apr. 20	6:33 a. m.	23 59 00	108 40 00	69	70	37.0	985	lt. bn. M	W. by N.	2	NNW. ¼ W	1.0	S. B. T.
3432	...do....	2:38 p. m.	24 22 30	109 03 20	72	70	37.8	1,421	bn. M. bk. Sp.	WNW.	2			L. B. T.
3433	Apr. 21	6:34 a. m.	25 26 15	109 48 00	73	69	36.5	1,218	bn. M. bk. Sp.	WNW.	2	NW	1.5	S. B. T.
3434	...do....	10:14 a. m.	25 29 30	109 48 00	71	70	36.4	1,588	bn. M. bk. Sp.	WNW.	2	NW	1.0	S. B. T.
3435	Apr. 22	8:56 a. m.	26 48 00	110 45 20	72	70	37.3	859	bn. M. bk. Sp.	WNW.	1	NW. ¼ N.	1.0	S. B. T.
3436	...do....	3:10 p. m.	27 03 40	110 53 40	75	72	37.2	905	bn. M. bk. Sp.	WNW.	1	WNW	1.0	S. B. T.*
3437	Apr. 23	5:31 a. m.	27 39 40	111 00 30	71	70	40.0	628	bn. M. bk. Sp.	E.	1			Submarine tow net.

* Lowered submarine tow net.

Table of fishing stations, coasts of Oregon and Washington, season of 1888.

Date.	Serial number.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Bottom temp.	Instrument used.	Length of time.	Food fishes taken.
1888.		° ′ ″	° ′ ″	Fms.		°		hrs. m.	
Sept. 6	Dredge	2864	48 22 00	122 51 00	48	M, brk. Sh. & S.	47.7	Beam trawl	0 11	Nothing.
6	do	2865	48 13 00	122 49 00	40	P	51.7	do	0 08	Do.
20	do	2866	48 09 00	125 03 00	171	gy. S	43.2	do	0 17	Rose-fish, 3 species, prawns.
20	do	2867	48 07 00	124 55 00	37	fne. gy. S		do	0 12	Tomcod, flounders, prawns.
20	do	2867						Trawl lines		1 halibut.
21	do	2868	47 52 00	124 44 00	31	gy. S	46.9	Beam trawl	0 18	Tomcod, black cod, red rock-cod.
21	do	2868						6 hand lines	0 10	Nothing.
21	do	2868						Trawl lines	0 30	Do.
21	do	2869	47 38 00	124 39 00	32	bk. S	48.4	Beam trawl	0 20	Flounders, halibut, tomcod, prawns.
23	do	2870	46 44 00	124 32 00	58	rky	46.5	do	0 20	Tomcod, red rock-cod, black-cod, prawns.
23	do	2870						Trawl lines	0 30	2 black-cod, 10 red rock-cod.
23	do	2870						8 hand lines	0 15	3 red rock-cod.
23	do	2871	46 55 00	125 11 00	559	br. Oz	38.4	Beam trawl	0 32	Rose-fish, grenadier.
24	do	2872	48 17 00	124 52 00	38	gy. S	45.5	do	0 17	2 species flounders.
24	do	2872						Trawl lines	0 30	Nothing.
24	do	2872						3 hand lines	0 15	2 red rock-cod.
24	do	2873	48 30 00	124 57 00	40	rky	47.8	Beam trawl	0 08	2 species rock-cod, halibut, prawns.
24	do	2873						Trawl lines	0 30	4 halibut, 4 red rock-cod.
25	do	2876	48 33 00	124 53 00	59	bk. S. & M	45.5	Beam trawl	0 10	Red rock-cod, halibut.
25	do	2876						Trawl lines	0 30	2 halibut, 1 red rock-cod.
25	do	2876						3 hand lines	0 15	1 red rock-cod.
25	do	2878	48 37 00	125 32 00	66	P	45.5	Ship's dredge	0 09	Black-cod.
25	do	2878						Trawl lines	0 40	3 black-cod.
29	Hyd	1575	48 27 00	125 09 00	60	S & R	45.2	do	0 30	3 halibut, 2 black-cod.
Oct. 10	do	1576	48 16 00	123 40 00	101	S & G	45.2	do	1 00	Nothing.
11	do	1577	46 34 00	124 12 30	20	gy. S	52.9	8 hand lines	0 15	Do.
13	Dredge	2882	46 09 00	124 22 30	68	gy. S	46.9	Beam trawl	0 27	Flounders, red rock-cod, black-cod.
13	do	2882						Trawl lines	0 35	1 black-cod.
18	do	2883	45 56 00	124 01 30	29	fne. gy. S	50.2	Ship's dredge	0 09	Nothing.
18	do	2883						Trawl lines	0 30	Do.
18	do	2884	45 55 00	124 02 00	29	fne. gy. S	50.2	Ship's dredge	0 16	Do.
18	do	2885	45 56 00	124 02 30	30	fne. gy. S	49.1	do	0 22	Do.
18	do	2885						8 hand lines	0 10	1 red rock-cod.
19	do	2886	43 59 00	124 56 30	50	rky	48.1	Ship's dredge	0 06	Nothing.
19	do	2886						Trawl lines	2 00	1 halibut.
19	do	2886						8 hand lines	0 20	Nothing.
19	do	2887	43 58 00	124 57 00	42	C. & P	47.1	Beam trawl	0 15	Halibut, black-cod, red rock-cod, orange rock-cod, rosy rock-cod, yellow-tail rock-cod, reina rock-cod, sea trout.
19	do	2888	43 58 00	124 57 30	41	C. & P	47.6	do	0 05	Nothing.
19	do	2889	43 59 00	124 56 30	46	C. & St	47.7	do	0 16	Do.
19	do	2890	43 46 00	124 57 00	277	gy. C	42.2	do	0 37	Grenadier.

Table of fishing stations, coasts of Oregon and Washington, season of 1889.

Date.	Serial number.	Position. Lat. N.	Position. Long. W.	Depth.	Character of bottom.	Bottom temp.	Instrument used.	Length of time.	Food-fishes taken.
1889.		° ′ ″	° ′ ″	*Fms.*		°		*hrs. m.*	
June 7	Dredge	3046	46 48 30	124 26 00	48	fne. gy. S	46.1	Beam trawl	0 28	Flounders, tomcod, shrimps.
7	...do	3047	46 47 00	124 30 15	50	...do	45.9	...do	0 35	Do.
7	...do	3048	46 45 30	124 33 00	52	rky	45.1	...do	0 30	Do.
7	Hyd	1835	46 44 45	124 32 45	52	...do	45.1	7 hand lines		3 orange rock-cod, 1 black rock-cod.
7	Dredge	3049	44 31 00	124 22 00	43	fne. bk. S	46.7	Beam trawl	0 24	Flounders, tomcod, shrimps.
8	...do	3050	43 01 15	124 57 00	46	Co. brk. Sh	56.1	Trawl lines	3 15	12 red rock-cod, 1 sea trout.
8	...do	3050			46	...do	56.1	9 hand lines	0 37	2 orange rock-cod, 5 red rock-cod.
8	...do	3052	43 00 00	124 57 00	48	Co. brk. Sh. rky	49.0	...do	1 05	21 red rock-cod, 2 orange rock-cod, 1 cutter's cod, 4 yellow-tail rock-cod.
8	Hyd	1839	44 59 30	124 50 30	43	M. & G	52.1	10 hand lines	1 10	34 red rock-cod, 1 yellow-tail rock-cod.
8	Dredge	3054	44 13 00	124 44 30	53	rky	48.0	11 hand lines		1 yellow-tail rock-cod.
9	...do	3055	44 41 30	124 09 15	28	fne. gy. S	47.4	Beam trawl	0 24	Flounders, crabs, shrimps.
9	...do	3055			26	...do	47.4	Trawl lines	0 55	Nothing.
9	...do	3056	44 41 30	124 09 15	28	...do	47.4	Beam trawl	0 22	Flounders, crabs, shrimps.
9	...do	3057	44 43 30	124 15 45	43	crs. gy. S	45.7	...do	0 33	Flounders, red rock-cod, shrimps.
9	...do	3057			43	...do	45.7	3 hand lines	1 15	20 orange rock-cod.
9	...do	3058	44 48 00	124 10 00	38	crs. gy. S. Sh	45.8	Beam trawl	0 16	Several species flounders.
9	...do	3058			38	...do	45.8	8 hand lines	0 22	Nothing.
9	...do	3059	44 56 00	124 12 30	77	M	45.1	Beam trawl	0 30	Flounders.
9	...do	3060	45 56 15	124 01 30	28	br. M		...do	0 14	Flounders, tomcod, crabs, shrimps.
13	...do	3060			28	...do		Trawl lines	0 50	Nothing.
13	...do	3061	45 55 30	124 01 00	23	fne. bk. S	48.4	Beam trawl	0 22	Flounders, tomcod, smelt, crabs, shrimps.
13	...do	3062	46 53 45	124 05 00	44	...do	45.2	...do	0 13	Flounders, shrimps.
13	...do	3062			44	...do	45.2	9 hand lines	0 25	1 orange rock-cod.
13	...do	3063	46 55 15	124 04 30	42	fne. gy. S	45.8	Beam trawl	0 21	Flounders, shrimps.
13	...do	3063			42	...do	45.8	9 hand lines	0 15	Nothing.
13	...do	3063			42	...do	45.8	Trawl lines	1 05	1 halibut.
13	Hyd	1854	45 55 30	124 01 15	25	...do	48.6	10 hand lines	0 35	Nothing.
13	Dredge	3064	46 03 15	124 09 00	46	fne. gy. S. & G	45.6	Beam trawl	0 18	Flounders, tomcod, shrimps.
13	Dredge	3064	46 03 15	124 09 00	46	fne. gy. S. and G	45.6	9 hand lines	0 15	Nothing.
13	...do	3065	46 14 30	124 13 00	27	fne. bk. S		Beam trawl	0 14	6 species flounders, tomcod, shrimps.
13	...do	3065						7 hand lines	0 15	Nothing.
13	...do	3066	46 26 30	124 26 00	55	S. and M	45.6	Beam trawl	0 17	4 species flounders, shrimps.
13	...do	3066						9 hand lines	0 13	Nothing.
13	Hyd	1856	46 29 30	124 56 30	31	G. and brk. Sh	47.1	8 hand lines	1 10	1 halibut, 4 red rock-cod.
13	...do	1856						Trawl lines	3 25	8 halibut, 1 cultus-cod, 10 red rock-cod, 2 orange rock-cod, 1 sea trout.
18	Dredge	3067	47 36 00	122 23 15	82	gn. M		Beam trawl	0 20	2 species flounders, shrimps.
18	...do	3068	47 35 30	122 27 00	135	...do	51.1	...do	0 22	3 species flounders, shrimps.
28	...do	3069	47 25 30	125 42 00	760	...do	37.6	...do	0 38	Shrimps.
28	...do	3070	47 29 30	125 43 00	636	...do	37.9	...do	0 38	Norway haddock, macrurus, shrimps.
28	...do	3071	47 29 00	125 33 30	685	...do	38.0	...do	0 35	Do.
28	...do	3072	47 28 30	125 24 00	584	...do	36.2	...do	0 42	Small fishes, undetermined.

	28	...do....	3073	47	28	00	125	15	00	477	.....do.....	49.2	....do.....	0	45	Sole, Norway haddock, macrurus, shrimps.
	29	...do....	3074	47	22	00	125	48	30	877	.....do.....	36.6	....do.....	0	28	Macrurus, shrimps.
	29	...do....	3075	47	22	00	125	41	00	859	.....do.....	36.6	....do.....	0	44	Black-cod, Norway haddock, macrurus, shrimps.
	29	...do....	3076	47	46	00	125	10	00	178	.....do.....	43.4	....do.....	0	20	Red rock-cod, Norway haddock, flounders, shrimps.
Aug.	30	Hyd....	1010	44	34	30	124	10	00	28	fne. gy. S.....	48.5	9 hand lines.....	0	40	1 orange rock-cod, 3 whiting.
	31	...do....	1929	44	07	30	124	11	00	29	.....do.....	47.7	11 hand lines.....	0	12	Nothing.
Sept.	1	Dredge.	3078	43	59	15	124	46	00	68	G. and M.....	45.7	Beam trawl.....	0	10	Shrimps, prawns.
	1	Hyd....	1956	44	01	00	124	49	15	58	rky.....		7 hand lines.....	0	20	3 orange rock-cod.
	1	...do....	1958										Hand lines, ...	1	00	1 red rock-cod, 1 whiting.
	1	Dredge.	3079	43	59	15	124	44	40	55	rky.....	46.7	3 hand lines.....	1	15	3 yellow-tail rock-cod.
	1	Hyd....	1979	44	00	00	124	45	00	52	.....do.....	47.2	8 hand lines.....	0	35	13 orange rock-cod, 6 red rock-cod, 6 yellow-tail rock-cod.
	1	Dredge.	3080	43	58	00	124	36	00	93	gn. M.....	45.6	Beam trawl.....	0	30	4 species flounders, 1 black-cod, 3 species rockfish, 6 cultus-cod, small fish.
	1	...do....	3081	43	59	00	124	20	00	61	gn. M. & S.....	45.8	....do.....	0	25	6 species flounders, 2 black-cod, 4 species rockfish, crabs, prawns.
	2	...do....	3082	43	52	00	124	15	00	43	fne. gy. S.....	46.2	....do.....	0	12	3 species flounders.
	2	Dredge.	3082	43	52	00	124	15	00	43	fne. gy. S.....	46.2	8 hand lines.....	0	11	Nothing.
	2	...do....	3083	43	59	00	124	14	30	32	fne. gy. S. bk. Sp.....	47.8	Beam trawl.....	0	16	7 species flounders.
	2	...do....	3083										11 hand lines.....	0	22	9 red rock-cod, 2 whiting.
	2	Hyd....	1980	44	00	00	124	11	30	18	fne. gy. S.....		....do.....	1	00	52 black rock-cod.
	2	...do....	1981	44	01	30	124	11	30	24	yl. S.....	48.8	10 hand lines.....	0	30	5 black rock-cod, 8 orange rock-cod.
	2	Dredge.	3084	44	12	20	124	19	00	46	fne. gy. S. bk. Sp.....	46.9	Beam trawl.....	0	18	4 species flounders.
	2	...do....	3084										11 hand lines.....	0	45	10 black-cod, 9 whiting.
	2	Hyd....	1982	44	16	00	124	12	00	31	fne. gy. S.....	47.7	....do.....	0	53	2 flounders, 24 whiting, 14 red rock-cod.
	2	...do....	1983	44	16	30	124	09	00	19	.....do.....		....do.....	0	35	3 whiting, 3 black-cod, 2 red rock-cod.
	2	...do....	1984	44	18	00	124	08	30	12	.....do.....		7 hand lines.....	0	25	3 black rock-cod.
	2	...do....	1985	44	20	00	124	13	00	31	wh. S. bk. Sp. Sh.	47.8	9 hand lines.....	0	20	1 orange rock-cod,
	2	Dredge.	3085	44	29	30	124	17	00	42	rky.....	45.7	Beam trawl.....	0	16	1 flounder, prawns.
	3	...do....	3086	44	36	00	124	18	30	46	fne. gy. S. bk. Sp.....	46.2	....do.....	0	22	1 species flounder.
	3	Hyd....	1986	44	37	00	124	15	00	44	gy. S.....	47.5	8 hand lines.....	0	28	37 black-cod.
	3	...do....	1987	44	35	00	124	13	00	43	fne. gy. S. gn. M.....	46.2	9 hand lines.....	0	10	3 orange rock-cod, 1 black-cod.
	3	...do....	1988	44	33	00	124	11	00	32	bk. S.....	46.7	7 hand lines.....	0	30	45 orange rock-cod, 2 whiting, 1 black-cod.
	3	...do....	1990	44	27	00	124	24	30	44	C.....	46.5	11 hand lines.....	0	21	3 red rock-cod, 1 flounder.
	3	Dredge.	3088	44	28	00	124	25	30	46	Co. and R.....	46.3	Beam trawl.....	0	10	Nothing.
	3	Hyd....	1992	44	28	00	124	24	30	43	rky.....	47.2	11 hand lines.....	0	28	6 orange rock-cod.
	3	...do....	1993	44	39	00	124	08	30	29	fne. gy. S. bk. Sp.....	48.2	9 hand lines.....	0	35	2 orange rock-cod, 1 black-cod, 1 whiting.
	3	...do....	1994	44	41	00	124	09	00	28	.....do.....	46.9	10 hand lines.....	0	30	1 orange rock-cod.
	7	...do....	1996	45	45	30	124	02	30	40	fne. gy. S.....	45.3	12 hand lines.....	0	26	1 salmon.
	7	...do....	1997	45	44	30	123	59	30	22	.....do.....		....do.....	0	15	1 orange rock-cod.
	7	...do....	1998	45	43	00	123	58	15	15	.....do.....		11 hand lines.....	0	12	Do.
	7	Dredge.	3089	45	40	30	123	58	45	20	.....do.....		Beam trawl.....	0	19	12 tomcod, flounders, shrimps.
	7	...do....	3089										10 hand lines.....	0	30	11 orange rock-cod, 2 flounders.
	7	...do....	3090	45	43	00	124	12	00	62	fne. gy. S.....	45.8	Beam trawl.....	0	26	1 species rock-cod, 3 species flounders, whiting, shrimps.
	8	...do....	3091	45	32	00	124	19	30	87	gn. M.....		....do.....	0	28	Red rock-cod, 4 species flounders, small fish, prawns.
	8	Dredge.	3092	45	31	15	124	05	00	46	bk. S.....	45.9	Beam trawl.....	0	15	4 species flounders, crabs.
	8	...do....	3092										11 hand lines.....	0	32	1 red rock-cod.
	8	Hyd....	1999	45	31	15	123	00	45	25	fne. gy. S.....	47.2	10 hand lines.....	0	20	14 orange rock-cod.
	8	...do....	2000	45	35	00	123	58	15	18	gy. S. rd. Sp.....	48.4	....do.....	0	35	21 red rock-cod, 1 orange rock-cod, 1 black rock-cod, 1 yellow-striped rock-cod, 1 cultus-cod.

Table of fishing stations, coasts of Oregon and Washington, season of 1889—Continued.

Date.	Serial number.		Position. Lat. N.			Position. Long. W.			Depth.	Character of bottom.	Bottom temp.	Instrument used.	Length of time.	Food-fishes taken.
1889.			°	′	″	°	′	″	*Fms.*		°		*hrs.* *m.*	
Sept. 8	Hyd	2001	45	30	00	124	59	45	18	fne. gy. S	48.5	7 hand lines	1 10	Nothing.
8	do	2002	45	28	30	124	00	00	16	do	48.2	10 hand lines	0 15	1 orange rock-cod.
8	do	2003	45	26	30	124	00	15	21	rky	48.0	8 hand lines	0 23	1 red rock-cod, 1 cultus-cod.
8	do	2004	45	23	00	124	00	30	18	fne. gy. S		9 hand lines	0 14	1 flounder.
8	Dredge	3093	45	20	30	124	00	30	57	do	44.9	Beam trawl	0 11	Nothing.
8	do	3093										9 hand lines	0 18	Do.
8	Hyd	2005	45	19	00	124	02	30	39	fne. gy. S	46.7	do	0 22	2 orange rock-cod, 1 salmon.
8	do	2006	45	19	00	124	00	30	23	fne. bk. S	47.2	10 hand lines	0 15	Nothing.
9	do	2007	45	17	30	124	00	30	19	fne. gy. S. bk. Sp	47.7	do	0 07	Do.
9	do	2008	45	13	00	124	00	30	27	fne. gy. S	47.7	do	0 08	Do.
9	do	2009	45	11	30	124	00	00	19	fne. gy. S. yl. M		9 hand lines	0 10	1 orange rock-cod.
9	do	2010	45	10	30	123	59	45	15	fne. bk. S		do	0 17	1 orange rock-cod, 1 black rock-cod.
9	do	2011	45	11	00	124	03	30	34	fne. gy. S. bk. Sp	45.8	10 hand lines	0 20	8 black-cod, 2 orange rock-cod.
9	do	2016	45	07	15	124	03	00	33	fne. gy. S	46.2	9 hand lines	0 24	2 black-cod, 12 orange rock-cod.
9	do	2017	45	07	00	124	00	30	15	do		11 hand lines	0 22	2 orange rock-cod, 1 flounder.
9	do	2018	45	04	00	124	02	30	23	do		do	0 14	3 orange rock-cod.
9	do	2019	45	04	00	124	06	15	51	do	46.0	10 hand lines	0 17	7 black-cod.
9	do	2022	45	01	15	124	07	00	52	bk. S	46.2	do	0 10	1 black-cod.
9	do	2023	45	00	45	124	03	45	27	fne. gy. S		12 hand lines	0 13	4 orange rock-cod.
9	do	2024	45	00	30	124	02	15	16	fne. gy. S. bk.; sp. brk. Sh.		10 hand lines	0 20	Nothing.
9	do	2025	44	58	30	124	04	00	19	rky. and Sh	47.7	8 hand lines	0 12	Do.
10	do	2026	44	03	45	124	12	00	30	fne. gy. S		do	0 15	5 orange rock-cod.
10	do	2027	44	03	15	124	16	30	42	fne. gy. S. and Sh	46.0	7 hand lines	0 15	3 orange rock-cod.
10	do	2028	43	54	00	124	11	00	13	fne. gy. S	47.1	10 hand lines	0 10	Nothing.
10	Hyd	2029	43	49	00	124	14	00	36	fne. gy. S	46.7	10 hand lines	0 10	1 red rock-cod.
10	do	2030	43	47	00	124	12	00	13	do		8 hand lines	0 08	Nothing.
10	do	2031	43	42	30	124	14	30	28	do		11 hand lines	0 29	27 orange rock-cod.
10	do	2032	43	40	30	124	15	00	28	do		do	0 12	1 orange rock-cod.
10	do	2033	43	37	00	124	16	00	53	do	45.9	10 hand lines	0 15	1 black rock-cod; 3 orange rock-cod.
10	do	2034	43	34	00	124	15	30	40	do	46.7	11 hand lines	0 25	22 orange rock-cod.
10	do	2035	43	31	00	124	16	00	11	do		10 hand lines	0 10	Nothing.
10	do	2036	43	27	30	124	18	00	23	do	48.2	9 hand lines	0 10	Do.
10	do	2037	43	23	30	124	21	30	17	do		do	0 10	Do.
10	do	2038	43	19	00	124	25	30	26	do	48.7	8 hand lines	0 10	Do.
10	do	2039	43	13	00	124	26	00	27	do	47.7	do	0 20	Do.
10	do	2040	43	08	30	124	28	00	25	rky. and Co	46.1	do	0 10	Do.
12	do	2066	43	03	30	124	33	30	44	G	45.8	6 hand lines	0 20	Do.
12	do	2067	43	04	30	124	26	30	21	fne. gy. S	46.2	8 hand lines	0 15	Do.
12	do	2068	43	08	00	124	27	30	25	rky		9 hand lines	0 20	1 orange rock-cod; 1 cultus-cod.
12	Dredge	3094	43	01	00	124	30	30	35	crs. S. and Sh	46.7	Ship's dredge	0 11	Crabs.
12	do	3094										8 hand lines	0 15	Nothing.

12	Hyd	2069	43	00	00	124	27	30	17	fne. gy. S	47.2	do	0	17	Do.
12	do	2070	42	55	00	124	32	30	28	do	46.1	do	0	18	Do.
12	do	2071	42	53	00	124	34	00	17	do		5 hand lines	0	14	Do.
12	do	2072	42	51	15	124	37	00	34	do	47.7	7 hand lines	0	13	Do.
12	do	2073	42	48	15	124	37	45	29	do		do	0	10	Do.
12	do	2073										Dory hand lines	2	22	2 vermilion rock-cod; 7 red rock-cod; 1 black rock cod; 5 cultus-cod; 1 orange rock-cod.
12	do	2075	42	45	30	124	38	15	34	St. and brk. Sh	46.8	10 hand lines	0	20	14 red rock-cod; 1 brown rock-cod; 1 cultus-cod.
12	Dredge	3096	42	45	00	124	36	15	33	do	46.7	9 hand lines	0	15	1 orange rock-cod; 1 red rock-cod.
12	Hyd	2076	42	44	15	124	33	00	23	fne. gy. S	47.5	8 hand lines	0	10	Nothing.

Table of fishing stations for cod, Alaskan cruise of 1890, chiefly in Bristol Bay and off the north side of Unalaska Island.

Date.	Serial number.	Position. Lat. N.	Position. Long. W.	Depth.	Nature of bottom.	Length of trial.	No. of lines used.	No. of cod taken.	Range in weight.	Average weight.	Range in length.	Average length.	Bait used.
1890.		° ′ ″	° ′ ″	*Fathoms.*		Min.			*Pounds.*	*Pounds.*	*Inches.*	*Inches.*	
May 21	Dredge. 3213	54 10 00	162 57 30	41	bk. S	20	10	1		10			Salt salmon.
21	Dredge. 3213	54 10 00	162 57 30	41	do		Beam trawl.	3	1 to 6	2⅔	13 to 26	16	
21	Dredge. 3214	54 13 00	163 06 00	38	gy. S. G	33	10	12	7 to 18½	13¼	26 to 36	32½	Do.
22	Hyd. 2279	54 15 00	164 53 00	42	rocky	20	12	5	6 to 13	11	25 to 32	28½	Fresh salmon, sculpins.
22	Dredge. 3224	54 42 50	165 37 00	121	bk. S. G		Beam trawl.	1		7⅛			
23	Dredge. 3226	55 01 00	167 25 00	128	M. S. Sh		Beam trawl.	1		10			
28		Shaw Bay, at anchor		6	bk. S	60	12	19	6 to 9½	8⅓	26 to 31	27	Salt salmon.
29		Vicinity of Nelson Lagoon.		9	do	40	3	4	10 to 14	11⅓	28 to 32		Do.
June 2	Dredge. 3233	58 23 45	157 42 45	7½	S. P	10	10	1		11			Do.
7	Dredge. 3235	58 16 30	158 13 00	11	bk. S	10	10	*12	7 to 14	11⅛	29 to 33	31⅛	Do.
7	Dredge. 3236	58 11 00	158 05 30	14⅜	G. S. Sh	10	10	3	7 to 12	9	26 to 31	28⅝	Do.
7	Dredge. 3238	58 03 40	158 37 30	18	fne. gy. S	10	Beam trawl.	1		7			
8	Dredge. 3239	58 22 20	159 23 15	11½	do	10	10	1		17			Do.
8	Dredge. 3240	58 30 00	159 35 50	14½	fne. bk. S	10	10	None.					Salt salmon and capelins.
8	Dredge. 3241	58 38 30	159 33 30	14	bk. M	10	10	None.					Do.
8		East side of Walrus Islands.		6	S. M	180	6	8	8 to 18½	13	31 to 36	33½	Salmon and flounders.
9	Dredge. 3244	58 37 20	161 05 00	4⅜	fne. gy. S	5	10	None.					Do.
9	Dredge. 3245	58 31 20	161 13 00	11⅜	S. P	8	10	None.					Do.
9	Dredge. 3246	58 26 30	161 36 00	17⅛	G	10	10	None.					Do.
13	Dredge. 3247	58 40 45	162 08 30	17	P. St	10	10	None.					Salmon.
13	Dredge. 3248	58 34 15	162 22 00	21	fne. gy. S. G	10	10	2	8 to 12	10	29 to 32	30½	Do.
13	Dredge. 3249	58 27 30	162 36 00	13⅜	fne. gy. S. bk. sp	11	10	None.					Do.
13	Dredge. 3250	58 11 30	163 02 45	17⅜	gy. S	10	9	2	6 to 9	7⅜	26 to 27	26½	Do.
13	Hyd. 2376	58 18 30	162 50 00	16⅜	fne. gy. S	12	11	15	5 to 10	7⅛	24 to 30	27⅔	Do.
14	Hyd. 2378	57 49 50	163 44 00	24	do	10	7	1		11			Do.
14	Dredge. 3251	57 35 50	164 05 00	25⅜	do	10	10	2	6 to 8	7	26 to 30	27⅓	Do.
14	Dredge. 3252	57 22 20	164 24 40	29⅜	bk. M	10	10	1		13			Do.
14	Dredge. 3255	56 33 30	164 31 40	43	gn. M. S	15	9	3	5 to 13	10⅓	23 to 31	28	Do.
14	Dredge. 3256	56 18 00	164 34 10	49	gn. M. br. Sh	10	10	1		16			Do.
24	Dredge. 3259	54 40 53	165 05 30	41	bk. S. G	10	11	18	9 to 21	15	29 to 35	32	Salt herring.
24	Hyd. 2383	54 37 40	164 58 00	30	bk. G	14	12	18	9 to 20	15⅔	26 to 36	32⅓	Do.
24	Dredge. 3260	54 36 15	164 52 00	13	fne. bk. S	15	12	42	4½ to 18	10⅓	23 to 34	28⅔	Do.
24	Dredge. 3261	54 42 15	164 49 15	27	bk. S. P	12	12	11	6 to 23	14	25 to 36	30⅝	Do.
24	Hyd. 2384	54 46 00	164 55 30	37	crs. S. G. P	15	12	16	7 to 22½	10⅞	27 to 37	30⅝	Do.

24	Dredge .	3262	54	49	30	165	02	00	43	bk. S. R.	15	12	26	4 to 15	7⅓	23 to 33	26⅝	Do.
24	Hyd	2385	54	56	30	165	15	30	62	bk. M	16	11	7	9 to 21⅜	12	28 to 37	30¾	Do.
24	Dredge .	3264	54	57	00	164	48	00	40	crs. S. G	15	9	1	....	16	....	....	Do.
25	Dredge .	3265	55	16	30	163	52	45	38	bk. S	10	8	2	....	15	31 to 32	31½	Do.
25	Dredge .	3266	55	08	30	163	30	30	24	......do	10	8	6	14 to 19	....	20⅔ to 36	24⅗	Do.
25	Hyd	2392	55	14	00	163	21	30	26	......do	17	9	14	4 to 14	8	21 to 33	28	Do.
25	Dredge .	3267	55	23	30	163	29	00	32	......do	17	10	18	4 to 21	12¼	22 to 36	31	Do.
25	Hyd	2393	55	34	30	163	37	00	44	gy. S	25	10	13	4 to 17	10⅔	23 to 32	29	Salmon.
25	Dredge .	3268	55	29	00	163	13	00	26	bk. S. G	10	11	None.	....	....	....	....	Do.
25	Hyd	2396	55	23	40	163	07	30	20	bk. G	8	10	1	....	4	....	....	Do.
25	Dredge .	3269	55	19	00	163	04	30	16	fne. gy. S. brk. Shs	9	9	4	6 to 8	6¼	25 to 27	26¼	Herring.
26	....	......	Off Izenbek Bay (at anchor).						16	S	45	3	3	....	7	....	....	Do.
26	Dredge .	3270	55	26	30	162	52	00	16	bk. S	5	8	None.	....	....	....	....	Do.
26	Dredge .	3271	55	29	15	162	58	00	25	......do	17	8	13	4 to 17½	9	21 to 34	27	Do.
27	....	......	Off Amak Island (at anchor).						10	gy. S	10	3	5	2½ to 9	5	18 to 29	23	Do.
27	Dredge .	3272	55	31	40	163	07	00	31	bk. ord. S	9	11	4	8 to 11	9¼	24 to 28	26¾	Do.
27	Hyd	2398	55	36	15	163	09	00	35	fne. gy. S	11	11	3	6 to 12	9⅔	27 to 30	29⅔	Herring and flounders.
27	Dredge .	3273	55	44	30	162	56	00	39	gy. S. M	10	10	8*	3 to 16	10	16 to 35	27	Do.
27	Hyd	2399	55	37	45	162	40	30	26	fne. gy. S	8	9	1	....	12	....	....	Do.
27	Dredge .	3274	55	34	30	162	31	45	19	bk. S. Sh	10	10	3	10 to 12½	11⅓	28 to 32	29⅗	Do.
28	Dredge .	3276	55	51	15	162	03	00	18	G. S. R	8	5	None.	....	....	....	....	Herring.
28	Dredge .	3277	55	58	45	161	46	30	18	......do	18	8	5	5½ to 12½	8½	24 to 31	27	Do.
28	Hyd	2404	56	06	15	161	58	00	34	bk. S	18	10	13	5 to 16	11	24 to 32	30	Do.
28	Dredge .	3278	56	12	30	162	13	00	47	fne. gy. S	17	9	3	2½ to 3	2⅔	16 to 18	16⅔	Do.
28	Hyd	2405	56	19	00	162	26	00	40	gy. S. G	14	9	4	3 to 16	8¼	9 to 32	25	Do.
28	Dredge .	3279	56	25	40	162	39	15	41	fne. gy. S	16	9	4	14 to 19	12½	14 to 33	27¾	Do.
28	Hyd	2406	56	33	45	162	26	00	41	......do	12	11	2	12 to 13	12½	31 to 32	31½	Do.
28	Dredge .	3280	56	27	00	162	08	00	36	......do	14	11	None.	....	....	....	....	Do.
28	Hyd	2407	56	20	30	161	54	45	48	......do	8	11	4	5 to 20	9½	22 to 35	27½	Do.
28	Dredge .	3281	56	14	00	161	41	15	36	gy. S. bk. Sp	14	9	11	4 to 19	6½	21 to 33	25	Do.
29	Hyd	2411	56	24	10	161	37	00	37	gy. S	20	7	6	5 to 15	9⅔	22 to 33	28	Do.
29	Dredge .	3282	56	30	45	161	50	15	53	S. M	15	5	1	....	18	....	....	Do.
29	Dredge .	3283	56	28	00	161	16	30	39	fne. gy. S	15	9	9	3 to 18	13	20 to 33	31½	Do.
29	Hyd	2413	56	21	15	161	03	00	35	......do	27	9	29	3 to 27½	15⅓	19 to 39	32	Do.
29	Dredge .	3284	56	16	30	160	53	00	25	fne. G	19†	9	27	3½ to 22½	11	22 to 35	29	Do.
July 16	Hyd	2415	56	04	30	160	39	30	8½	fne. gy. S	10	7	None.	....	....	....	....	Salt salmon.
16	Hyd	2416	56	09	45	160	33	00	10¾	crs. bk. S	14	8	None.	....	....	....	....	Do.
16	Hyd	2417	56	14	15	160	26	45	12	bk. G	20	8	10	7 to 14	10	26 to 32	28½	Do.
17	Dredge .	3285	56	45	45	160	42	45	35	gy. S. bk. Sp	10	9	None.	....	....	....	....	Do.
17	Dredge .	3286	56	39	30	160	29	00	37	fne. gy. S. Sp. G	15	9	6	10 to 21	14	29 to 35	30½	Do.
17	Dredge .	3287	56	33	00	160	14	00	30	crs. bk. S	15	9	1	....	5½	....	....	Do.
17	Dredge .	3288	56	26	30	160	00	00	15	bk. G	12	5	None.	....	....	....	....	Do.
17	Hyd	2424	56	40	40	159	54	30	30	fne. gy. S. G	11	9	33	5 to 18	11½	26 to 35	31	Do.
17	Hyd	2425	56	48	00	160	05	30	35	crs. bk. S	20	10	9	5 to 25	12	24 to 36	30	Do.
17	Hyd	2426	56	55	30	160	17	30	36	gy. S	15	9	9	5 to 13	9⅔	22 to 32	27½	Do.
17	Hyd	2427	57	03	20	160	29	00	30	bk. S	11	9	1	....	10	....	....	Do.
18	Dredge .	3289	56	44	30	159	16	00	16	bk. S	51	8	5	8 to 13	10	28 to 33	30½	Do.

* Eight of these cod were taken in beam trawl.

† Wind fresh, which caused the ship to drift rapidly.

Table of fishing stations for cod, Alaskan cruise of 1890, chiefly in Bristol Bay and off the north side of Unalaska Island—Continued.

Date.	Serial number.	Position.		Depth.	Nature of bottom.	Length of trial.	No. of lines used.	No. of cod taken.	Range in weight.	Average weight.	Range in length.	Average length.	Bait used.
		Lat. N.	Long. W.										
1890.		° ′ ″	° ′ ″	*Fathoms.*		*Min.*			*Pounds.*	*Pounds.*	*Inches.*	*Inches.*	
July 18	Dredge	3290	56 50 30	159 01 00	16	gy. S. G	15	8	None.				Salt salmon.
18	Dredge	3291	56 58 30	159 11 00	26	bk. S. G	12	10	25	7 to 15	11	29 to 34	29½	Do.
18	Hyd	2432	57 06 20	159 23 00	31	bk. S. G	15	10	39	4 to 17	8	24 to 35	29	Do.
18	Dredge	3292	57 14 00	159 35 00	32	bk. S. G	15	10	34	8 to 18	12¼	26 to 34	30	Do.
18	Hyd	2433	57 21 30	159 46 30	31	bk. S. G	15	9	7	6 to 17	11	23 to 36	28½	Do.
18	Dredge	3293	57 30 00	159 33 00	30	fne. gr. S	18	10	7	8 to 14	9½	26 to 31	29	Do.
18	Hyd	2434	57 23 15	159 17 00	31	fne. gy. S	14	8	15	6 to 19	11	23 to 34	29½	Do.
18	Dredge	3294	57 16 45	159 03 30	30	bk. G	13	9	2	11 to 12	11½	28 to 29	28½	Do.
19	Dredge	3295	57 14 30	158 26 30	1½	fne. gy. S	5	8	None.					Do.
19	Dredge	3296	57 26 30	158 46 00	24	gy. S. bk. sp	15	8	22	9 to 18	12½	28 to 33	31	Do.
19	Dredge	3297	57 38 00	159 37 30	26	gy. S	15	10	37	6 to 20	12	26 to 33	30	Do.
19	Hyd	2439	57 48 30	158 48 00	24	gy. S	14	10	4	10 to 13	10¾	29 to 32	30½	Do.
19	Dredge	3298	57 38 30	158 22 30	26	fne. gy. S	15	10	21	9 to 17	12½	29 to 34	29½	Do.
20	Hyd	2441	57 56 45	158 17 00	20	gy. S	17	9	3	12 to 12	12	31 to 32½	31½	Do.
20	Dredge	3299	57 59 00	158 44 00	20	fne. gy. S	15	10	12	8 to 18	12½	28 to 33	30½	Do.
20	Hyd	2442	57 00 30	159 13 30	21	bk. S	13	9	20	7 to 20	12½	26 to 34	31	Do.
20	Hyd	2443	58 01 00	159 33 15	23	gy. S	15	10	3	5 to 10	7	23 to 31	27	Do.
20	Dredge	3300	58 12 30	159 55 00	15	P	15	10	10	8 to 16	11	27 to 30	29½	Do.
20	Hyd	2444	58 24 00	160 17 30	6½	gy. S. G	15	10	None.					Do.
20	Dredge	3301	58 12 45	160 37 30	17	fne. gy. S	20	8	13	6 to 17	10	28 to 34	31	Do.
21	Hyd	2445	57 59 00	160 24 45	26	fne. gy. S	15	9	7	8 to 14	11	26 to 30	28½	Do.
21	Dredge	3302	57 45 45	160 12 16	30	fne. gy. S	17	9	13	4 to 20	10	21 to 33	27½	Do.
21	Hyd	2446	57 32 40	160 00 00	29	fne. gy. S	17	10	19	8 to 16½	11	26 to 32	30	Do.
21	Dredge	3303	57 27 00	160 23 30	33	bk. S	11	10	3	2½ to 16	9	18 to 33	26½	Do.
21	Hyd	2447	57 39 00	160 39 30	31	fne. gy. S	12	10	None.					Do.
21	Hyd	2448	57 50 40	160 57 00	27	fne. gy. S	13	10	5	6 to 15	10	26 to 30	29	Do.
21	Dredge	3304	58 02 30	161 13 45	28	fne. gy. S	15	10	8	8 to 13	9½	28 to 30	28½	Do.
22	Hyd	2450	58 14 20	161 30 30	22	fne. gy. S. G	15	7	17	9 to 17	13¼	28 to 36	31½	Do.
22	Hyd	2451	58 05 00	161 52 15	31	fne. gy. S	31	8	4	9 to 16	13	28 to 32	30½	Do.
22	Dredge	3305	57 51 36	161 40 00	23	fne. gy. S	15	10	7	7 to 12	10¾	26 to 33	29	Do.
22	Hyd	2452	57 38 15	161 28 30	20	fne. gy. S	15	10	4	8 to 10	9	28 to 30	27½	Do.
22	Dredge	3306	57 24 30	161 17 00	33	fne. gy. S	18	10	5	7½ to 12½	8½	29 to 31		Do.
22	Hyd	2454	57 11 15	161 05 00	29	dk. S	15	10	5	5 to 14	10	25 to 31	28½	Do.
22	Hyd	2455	56 57 30	160 52 30	38	fne. gy. S	15	10	2	10 to 11	10½	29 to 30	29½	Do.
23	Hyd	2459	56 22 45	160 21 30	20	fne. gy. S	150	4	41	5 to 16	9	20 to 33	27½	Do.
Aug. 15	Hyd	2485	Between Priest Rock and Cape Cheerful.		53	fne. dk. S	17	8	9	7 to 14	11	27 to 32	29	Do.
15	Hyd	2486	....do....		22	red & bk. G	10	8	10	8 to 14	10 7/10	27 to 33	29½	Do.
15	Dredge	3312	....do....		45	S. M	7	10	None.					Do.
15	Hyd	2490	....do....		37	G. Sh. P	10	10	None.					Do.
15	Hyd	2491	....do....		40	fne. G	15	7	None.					Do.
15	Hyd	2492	....do....		57	fne. S. G	10	8	1		10			Do.

15	Hyd....	2496	.....do.....						58	bk. S. G. Sh.....	10	8	None.												Do.
16	Hyd....	2500	Near western side of Cape Cheerful.						52	bk. S. G.....	20	6	None.												Do.
16	Hyd....	2502	.....do.....						50	bk. S.....	11	7	None.												Do.
16	Hyd....	2503	11 miles E. of Cape Makushin.						22	Sh.....	15	9	13	7 to 15½		9¾	26 to 33		29						Do.
16	Hyd....	2505	53	56	30	167	03	00	36	fne. S.....	7	10	None.												Do.
16	Hyd....	2507	53	52	35	167	09	00	22	Gy. S.....	15	9	6	8 to 15		10	27 to 33		30						Do.
16	Hyd....	*2508	53	52	00	167	12	15	40	R. G.....	15	9	None.												Do.
16	Hyd....	2518	Off mouth of Makushin Bay.						58	bk. S. M.....	10	10	None.												Do.
16	Hyd....	2519	In mouth of Makushin Bay.						69	bk. S.....	10	10	None.												Herring.
18	Hyd....	2517	Cape Odd Fellow, E. 5¾ miles.						54	S. G.....	10	10	None.												Do.
18	Hyd....	2521	Sprog Cape, E. by N. 5.8 miles.						43	Crs. bk. S.....	15	10	5	3 to 11		7¾	19½ to 30		25¾						Herring and salmon.
18	Dredge.	3321	High Cape, SE. by S. 3¾ miles.						34	M.....	10	10	None.												Do.
18	Hyd....	2522	High Cape, NE. ½ N. 1.3 miles.						32	bk. S.....	9	10	None.												Do.
18	Dredge.	3322	Off Cape Hague.....						35	bk. S.....	10	10	None.												Do.
19	Hyd....	2528	53	30	55	167	36	20	49	bk. S. M.....	15	7	7	8 to 16		11	27 to 33		29						Herring.
19	Hyd....	2529	53	28	25	167	33	40	43	bk. S.....	15	8	None.												Do.
19	Dredge.	3323	53	26	00	167	31	10	51	fne. bk. S.....	10	9	None.												Do.
19	Hyd....	2530	53	24	30	167	34	05	42	bk. S. Sh.....	30	10	53	7 to 16		9½	25 to 34		29¼						Do.
20	Hyd....	2532	53	24	20	167	37	05	60	bk. S. G.....	19	9	None.												Do.
20	Hyd....	2533	53	23	30	167	39	25	47	G. Sh.....	15	10	7	8 to 22		15	28 to 37		33½						Do.
20	Hyd....	2534	53	23	30	167	42	40	39	bk. G. Sh.....	12	9	10	9 to 15		11¾	29 to 33		30						Do.
20	Hyd....	2535	53	24	00	167	46	10	30	bk. S.....	15	9	28	6 to 18		10	24 to 34		28¼						Do.
20	Hyd....	2536	53	25	20	167	48	20	37	bk. S.....	15	10	1	.....		10	.....		.....						Do.
20	Hyd....	2537	53	28	15	167	45	50	35	bk. S. G.....	7	9	None.												Do.
20	Hyd....	2538	53	31	45	167	43	45	43	bk. S.....	16	10	1												Do.
22	Hyd....	2546	53	58	45	166	34	25	28 †	bk. G.....	20	10	22	6 to 16		10¾	24 to 33		29½						Herring and salmon.
22	Hyd....	2547	Eider Point, S. ½ E. ⅝ mile.						17	bk. S.....	8	10	None.												Do.
22	Hyd....	2548	Near Eider Point.....						54	fne. bk. S.....	14	10	None.												Do.
22	Hyd....	2549	North end Hog Island, 1 mile.						45	fne. bk. S.....	15	7	3	4 to 13		9½	22 to 31		27						Do.
22	Hyd....	2550	53	55	05	166	34	35	47	bn. M.....	15	7	2	4½ to 21		13¾	23 to 36		29						Do.
26	Hyd....	2554	54	02	15	166	11	20	28	Sh. R.....	10	6	None.												Do.

The fractional parts of pounds and inches of cod are approximate. * Strong flood tide; ship drifted rapidly. † Suddenly drifted from 40 into 160 fathoms.

Record of Tanner intermediate tow-net stations of the U. S. Fish Commission steamer Albatross.

Serial No.	Date.	Time.	Position. Lat. N.	Position. Long. W.	Temperatures. Air.	Temperatures. Surface.	Temperatures. Bottom.	Depth.	Character of bottom.	Wind. Direction.	Wind. Force.	Drift. Towed at a depth.	Drift. Time towing.	Mean depth.	Remarks.
	1891.		° ′ ″	° ′ ″				*Fath.*				*Fath.*	*Min.*	*Fath.*	
3382 Dr.	Mar. 7	8:50 a.m.	6 21 00	80 41 00	77	75	35.8	1,793	gn. M.....	N	3	200	15		
3382 Dr.	...do....	9:53 a.m.	6 21 00	80 41 00	77	75	35.8	1,793	gn. M.....	N.....	3	200	.....	.....	Hauled direct from 200 fathoms in 10 minutes; ship stationary.
3382 Dr.	...do....	10:23 a.m.	6 21 00	80 41 00	77	75	35.8	1,793	gn. M.....	N.....	3	100	.....	.....	Hauled direct from 100 fathoms in 5 minutes; ship stationary.
3388 Dr.	Mar. 9	10:31 a.m.	7 06 00	79 48 00	75	73	36.2	1,168	gn. glob. Oz.	N.....	2	400	17		
2619 Hyd.	Mar. 11	8:25 a.m.	7 31 00	78 42 30	72	68	36.5	1,100	gn. glob. Oz.	N.....	2	300	19		
2619 Hyd.	...do....	9:44 a.m.	7 31 00	78 42 30	72	68	36.5	1,100	gn. glob. Oz.	N.....	2	1,000	16	.....	Sounded at 7:06 a.m. in 1,100 fms. Took second trial of net at 9:44 a. m., and finished at 11:56 a. m., having drifted into deeper water, as shown by soundings taken at 12:03 p.m. in 1,482 fms. Greatest amount of wire out while towing, 1,100 fms., the angle equaling depth of 1,000 fms.
2627 Hyd.	Mar. 25	6:49 a.m.	0 36 00	82 45 00	80	81	36.0	1,832	gy. glob. Oz.	WNW.	1	1,773 / 1,739	20	1,756	Fathoms=mean depth at which towed net. Net was lowered to 1,740 fms. vertically, and veered to 1,800 fathoms at an angle between 10° and 15°, equaling a depth varying between 1,773 and 1,739 fms.
			South lat.												
2628 Hyd.	Mar. 26	9:14 a.m.	0 13 00	84 32 00	81	81	.....	.....	.....	Calm ..	0	214 / 234	20	224	Fathoms=mean depth at which towed net. Towed 14 minutes between 200 fathoms and surface to fill upper bag.
			North lat.												
3414 Dr.	Apr. 8	6:57 a.m.	10 14 00	96 28 00	81	82	35.8	2,232	gn. M.....	ENE ..	2	85 / 105	14	95	Fathoms=mean depth at which towed net.
3414 Dr.	...do....	7:47 a.m.	10 14 00	96 28 00	81	82	35.8	2,232	gn. M.....	ENE ..	2	195 / 200	10	198	
3414 Dr.	...do....	8:49 a.m.	10 14 00	96 28 00	81	82	35.8	2,232	gn. M.....	ENE ..	3	300	15		
3414 Dr.	...do....	10:00 a.m.	10 14 00	96 28 00	81	82	35.8	2,232	gn. M.....	ENE ..	3	300	15		
3414 Dr.	Apr. 9	10:04 a.m.	12 34 00	97 21 00	84	82	.....	.....	.....	NNW .	1	175	8	.....	No soundings taken; depth estimated approximately as over 2,000 fathoms.
3414 Dr.	...do....	8:03 p.m.	13 33 30	97 57 30	82	83	.....	.....	.....	Calm ..	0	175	10	.....	
3414 Dr.	Apr. 11	8:45 a.m.	16 32 00	99 42 00	79	80	.....	.....	.....	WSW .	1	300	10	.....	
3414 Dr.	Apr. 16	10:10 a.m.	17 39 30	102 11 30	77	76	.....	.....	.....	W	2	175	15	.....	
3436 Dr.	Apr. 22	1:22 p.m.	27 03 40	110 53 40	75	72	37.2	905	bn. M. bk. Sp.	WNW .	1	800	15	.....	Net dragged on bottom.
2637 Hyd.	...do....	7:21 p.m.	27 20 00	110 54 00	72	71	38.0	773	bn. M. bk. Sp.	WNW .	1	700	15		
3437 Dr.	Apr. 23	5:31 a.m.	27 39 40	111 00 30	71	70	40.0	628	bn. M. bk. Sp.	E.....	1	600	15	.....	Do.
2638 Hyd.	...do....	7:26 a.m.	27 38 00	111 04 00	72	72	39.2	622	bn. M. bk. Sp.	ENE...	2	500	15		

Record of ocean temperatures and specific gravities by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891.

Date.	Time of day.	Station.	Lat. N.	Long. W.	Depth.	Temperature by attached thermometer.	Temperature of the air.	Temp. of specimen at time specific gravity was taken.	Specific gravity.	Specific gravity reduced to 15° C. with pure water at 4° C. as standard.
1889.			° ′ ″	° ′ ″	*Fms.*	°	°	°		
July 8	4 p. m.	Seymour Narrows			Surface.	54	70	67	1.0220	1.022167
9	11 a. m.	Queen Charlotte Sound			do	58	61	67	1.0164	1.016567
9	6 p. m.	Millbank Sound			do	61	65	66	1.0180	1.018020
9	11 p. m.	Carter Bay			do	59	61	66	1.0160	1.016020
10	12 m	Wright Sound			do	54	60	66	1.0206	1.020620
10	9 p. m.	Kennedy Island			do	56	57	66	1.0182	1.018220
11	10 a. m.	Tongas Narrows			do	58	59	66	1.0182	1.018220
12	10 a. m.	Port Chester			do	60	63	66	1.0206	1.020620
13	10 a. m.	Fort Wrangell			do	57	61	66	1.0200	1.020020
13	4 p. m.	Wrangell Narrows			do	57	65	67	1.0196	1.019767
14	6 a. m.	Killsinoo Bay			do	54	56	67	1.0202	1.020367
14	12 m	Sitka Narrows			do	59	62	67	1.0220	1.022167
15	12 m	Sitka Harbor			do	57	56	67	1.0228	1.022967
17	12 m	Freshwater Bay			do	54	56	67	1.0206	1.020767
18	1 p. m.	Glacier Bay			do	40	45	67	1.0162	1.016367
19	3 p. m.	Chilkat			do	56	61	67	1.0040	1.004167
22	3 p. m.	Juneau			do	54	58	67	1.0080	1.008167
Aug. 6	12 m		51 34 00	131 16 00	do	58	58	68	1.0234	1.023716
7	12 m		52 35 00	136 02 00	do	57	57	68	1.0236	1.023916
8	12 m		51 44 50	133 24 00	do	58	59	68	1.0234	1.023716
9	12 m		50 15 00	128 57 00	do	62	63	68	1.0234	1.023716
28	12 m		47 05 00	124 19 30	do	56	58	68	1.0236	1.023916
29	12 m		45 29 30	124 11 00	do	62	61	68	1.0236	1.023916
30	12 m		44 34 00	124 54 30	do	61	61	68	1.0234	1.023716
31	12 m		44 08 00	124 32 00	do	57	57	68	1.0236	1.023916
Sept. 1	12 m		44 00 30	124 55 30	do	60	60	68	1.0236	1.023916
2	12 m		44 12 00	124 19 00	do	58	59	68	1.0236	1.023916
8	6 p. m.	Cape Lookout, Oregon			do	51	56	68	1.0242	1.024516
11	12 m		43 07 00	124 41 00	do	53	56	68	1.0240	1.024316
1890.										
Mar. 10	2 p. m.		37 44 50	122 43 00	do	51	50	69	1.0236	1.024067
11	12 m		37 27 20	122 44 00	do	52	52	69	1.0240	1.024467
12	6 p. m.	Santa Cruz, Cal			do	53	58	69	1.0212	1.021067
13	6 p. m.	Monterey Bay			do	55	69	69	1.0236	1.024067
21	7 p. m.	Drake Bay			do	53	52	69	1.0220	1.022467
22	12 m	Off Farallones			do	52	52	69	1.0222	1.022667
24	12 m	Cordell Bank			do	55	55	69	1.0236	1.024067
Apr. 3	9 a. m.	Cedar Point			do	51	52	69	1.0244	1.024867
4	4 p. m.	San Simeon Bay			do	53	55	69	1.0244	1.024867
5	12 m		35 14 00	121 07 00	do	52	53	69	1.0242	1.024667
6	4 a. m.	Point Conception			do	52	53	69	1.0242	1.024667
6	12 m	Santa Barbara Channel			do	58	60	69	1.0244	1.024867
7	12 m	Santa Barbara			do	56	57	69	1.0244	1.024867
7	6 p. m.	Santa Rosa Island			do	54	55	69	1.0244	1.024867
12	12 m		36 59 00	122 27 00	do	50	49	69	1.0240	1.024467
May 14	7 p. m.	Off Cape Scott, Van Island			do	55	55	67	1.0236	1.023767
15	12 m		51 00 00	132 35 00	do	52	49	66	1.0238	1.023820
16	12 m		51 52 00	137 27 00	do	54	46	65	1.0240	1.023870
17	12 m		52 25 30	142 41 30	do	46	44	65	1.0244	1.024270
18	8 a. m.		52 36 50	146 51 10	do	44	39	65	1.0244	1.024270
18	12 m		52 43 30	147 44 00	do	44	39	65	1.0244	1.024270
18	8 p. m.		52 48 00	149 14 00	do	44	41	66	1.0242	1.024220
19	8 a. m.		53 07 35	151 43 57	do	44	40	66	1.0242	1.024220
19	12 m		53 13 00	152 48 17	do	43	40	66	1.0242	1.024220
19	8 p. m.		53 21 54	154 48 17	do	44	41	66	1.0242	1.024220
20	8 a. m.		53 50 00	157 08 30	do	43	41	66	1.0242	1.024220
20	12 m		53 55 00	158 04 10	do	44	42	66	1.0242	1.024220
20	8 p. m.		53 57 34	159 46 40	do	44	42	66	1.0236	1.023020
21	8 a. m.		54 00 00	162 33 00	do	43	42	66	1.0236	1.023620
21	12 m		54 00 40	162 57 00	do	44	44	66	1.0236	1.023620
21	8 p. m.		54 16 00	163 26 00	do	42	39	66	1.0236	1.023620
22	8 a. m.	Unimak Pass, Alaska			do	43	42	66	1.0236	1.023620
22	12 m		54 16 00	165 13 00	do	42	40	66	1.0236	1.023020
22	8 p. m.		54 44 00	165 39 00	do	42	39	66	1.0230	1.023020
23	8 a. m.		55 01 50	167 24 00	do	42	37	66	1.0222	1.022220
23	12 m		54 36 30	166 53 00	do	43	39	66	1.0222	1.022220
24	12 m	Unalaska Harbor, Alaska			do	46	43	66	1.0220	1.022020

Record of ocean temperatures and specific gravities by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Time of day.	Station.	Lat. N.	Long. W.	Depth.	Temperature by attached thermometer.	Temperature of the air.	Temp. of specimen at time specific gravity was taken.	Specific gravity.	Specific gravity reduced to 15° C., with pure water at 4° C. as standard.
1890.			° ′ ″	° ′ ″	*Fms.*	°	°	°		
May 28	12 m		54 29 00	165 10 20	Surface.	43	42	66	1.0232	1.023220
28	8 p. m.	Shaw Bay, Unimak Island			do	45	44	66	1.0232	1.023220
29	12 m		55 11 30	163 17 00	do	44	42	66	1.0232	1.023220
29	10 p. m.	Cape Lapin, Unimak Island			do	44	42	66	1.0226	1.022620
30	12 m		56 10 00	160 31 30	do	45	44	66	1.0220	1.022020
30	9 p. m.	Cape Strogonof, Alaska Peninsula.			do	43	44	66	1.0214	1.021420
31	12 m		58 03 30	157 46 00	do	46	45	66	1.0186	1.018020
31	6 p. m.	Head of Bristol Bay, Alaska			do	50	50	66	1.0130	1.013020
June 2	12 m		58 28 10	157 36 00	do	45	46	66	1.0130	1.013020
2	6 p. m.	Protection Point, Alaska			do	50	52	66	1.0132	2.013220
3	1 p. m.	Nushagak River, high water			do	50	51	66	1.0080	1.008020
3	8 p. m.	Nushagak River, low water			do	52	52	66	1.0000	1.008020
7	7 p. m.	Off Cape Constantine			do	41	36	63	1.0208	1.020391
8	12 m	Round Island, Walrus group			do	48	40	63	1.0204	1.019991
8	8 p. m.	Hagemeister Island			do	48	45	63	1.0202	1.019701
10	12 m	Cape Newenham, Alaska			do	44	44	63	1.0222	1.021791
11	12 m	Kuskokwim River, Alaska			do	41	41	63	1.0226	1.022191
14	12 m		56 55 30	164 30 00	do	43	41	63	1.0242	1.023791
15	12 m		54 43 00	166 01 00	do	44	43	63	1.0242	1.023791
24	12 m		54 41 30	164 51 00	do	45	44	63	1.0240	1.023591
25	12 m		55 23 00	163 10 00	do	46	44	63	1.0238	1.023391
25	9 p. m.	Cape Glasenap, Alaska Peninsula.			Surface.	46	42	63	1.0236	1.023191
26	8 p. m.	Amak Island, Bristol Bay			do	46	43	63	1.0238	1.023391
27	9 p. m.		55 44 20	162 17 30	do	44	42	63	1.0234	1.022991
28	12 m		56 29 50	162 26 00	do	45	43	63	1.0234	1.022991
29	12 m		56 18 30	160 53 00	do	47	44	63	1.0228	1.022391
30	12 m	Port Möller, Alaska Peninsula.			do	50	48	63	1.0220	1.021591
July 6	12 m	Herendeen Bay			do	51	42	63	1.0204	1.019991
16	3:30 p. m.	Entrance Port Möller			do	54	50	68	1.0212	1.021516
17	7:30 a. m.		56 39 30	160 29 00	do	45	43	67	1.0230	1.023167
17	12 m		56 22 00	160 13 00	do	49	45	67	1.0230	1.023167
18	7:30 a. m.		56 50 30	159 01 00	do	48	43	67	1.0230	1.023167
18	12 m		57 08 45	159 23 00	do	46	42	67	1.0230	1.023167
19	12 m		57 25 00	158 44 00	do	46	45	67	1.0226	1.022767
20	12 m		58 00 10	159 01 00	do	55	51	67	1.0106	1.010767
20	7 p. m.		58 24 00	160 17 30	do	43	49	67	1.0200	1.020167
21	12 m		57 30 00	160 12 00	do	45	45	67	1.0220	1.022167
21	6 p. m.		57 50 40	160 57 00	do	52	50	67	1.0208	1.020967
22	12 m		57 34 00	161 25 30	do	51	47	67	1.0224	1.022567
Aug. 2	12 m		54 02 00	167 14 00	do	48	48	64	1.0246	1.024328
2	6 p. m.	Bogoslof Island			do	57	48	64	1.0246	1.024328
3	6 a. m.		53 55 00	170 50 00	do	50	48	64	1.0246	1.024328
3	12 m		54 20 00	171 03 15	do	50	48	64	1.0246	1.024328
3	10 p. m.		55 31 00	171 42 00	do	51	48	64	1.0246	1.024328
4	6 a. m.		56 12 00	172 07 00	do	50	47	64	1.0242	1.023928
4	12 m		56 27 30	174 14 30	do	50	46	64	1.0242	1.023928
4	5:30 p. m.		56 56 00	172 55 00	do	50	47	64	1.0242	1.023928
5	8 a. m.		58 14 00	174 35 00	do	50	47	64	1.0242	1.023928
5	12 m		58 43 00	174 43 00	do	50	47	64	1.0242	1.023928
6	7 a. m.		56 50 00	175 15 00	do	50	46	64	1.0242	1.023928
6	12 m		56 25 30	175 27 10	do	50	47	64	1.0242	1.023928
6	4:20 p. m.		56 02 10	175 35 00	do	50	48	64	1.0242	1.023928
6	4:20 p. m.		56 02 10	175 35 00	25	42.5	48	64	1.0242	1.023928
6	4:20 p. m.		56 02 10	175 35 00	50	37	48	64	1.0242	1.023928
6	4:20 p. m.		56 02 10	175 35 00	100	38.2	48	64	1.0244	1.024128
6	4:20 p. m.		56 02 10	175 35 00	200	38.8	48	64	1.0248	1.024528
6	4:20 p. m.		56 02 10	175 35 00	300	38.7	48	64	1.0252	1.024928
6	4:20 p. m.		56 02 10	175 35 00	400	37.6	48	64	1.0254	1.025128
6	4:20 p. m.		56 02 10	175 35 00	500	36.9	48	64	1.0256	1.025328
6	4:20 p. m.		56 02 10	175 35 00	600	36.5	48	64	1.0256	1.025328
6	4:20 p. m.		56 02 10	175 35 00	700	36.3	48	64	1.0256	1.025328
6	4:20 p. m.		56 02 10	175 35 00	800	35.5	48	64	1.0258	1.025528
6	4:20 p. m.		56 02 10	175 35 00	900	36	48	64	1.0258	1.025528
6	4:20 p. m.		56 02 10	175 35 00	1,000	35.4	48	64	1.0260	1.025728
6	4:20 p. m.		56 02 10	175 35 00	1,998	34.9	48	64	1.0264	1.026125
7	8 a. m.		54 30 30	175 32 00	Surface.	49	48	64	1.0242	1.023928

Record of ocean temperatures and specific gravities by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Time of day.	Station.	Lat. N.	Long. W.	Depth.	Temperature by attached thermometer.	Temperature of the air.	Temp. of specimen at time specific gravity was taken.	Specific gravity.	Specific gravity reduced to 15° C., with pure water at 4° C. as standard.
1890.			° ′ ″	° ′ ″	*Fms.*	°	°	°		
Aug. 7	12 m		54 06 00	175 32 00	Surface	51	48	64	1.0242	1.023928
8	12 m		54 08 00	171 55 00	do	57	50	64	1.0242	1.023928
15	12 m		54 01 23	166 23 37	do	55	60	70	1.0236	1.024230
15	6 p. m.	Wislow Island			do	54	53	70	1.0234	1.024030
16	12 m		53 56 00	167 00 00	do	52	60	70	1.0234	1.024030
17	12 m	Makushin Bay			do	55	60	70	1.0226	1.023230
18	12 m		53 41 23	167 16 00	do	50	49	70	1.0234	1.024030
19	12 m	Chernofisky Bay			do	49	48	70	1.0232	1.023830
20	12 m	Umnak Pass			do	48	47	70	1.0234	1.024030
21	12 m		54 01 00	166 52 30	do	52	49	70	1.0234	1.024030
22	12 m	Off Hogg Island			do	54	54	70	1.0230	1.023630
26	4 p. m.	Akutan Pass			do	47	56	70	1.0234	1.024030
27	6 a. m.		53 55 30	163 26 00	do	50	50	70	1.0230	1.023630
27	12 m		53 58 00	162 37 00	do	55	60	70	1.0230	1.023630
27	11 p. m.		54 11 00	160 37 00	do	52	50	70	1.0232	1.023830
28	6 a. m.		54 19 00	159 40 00	do	51	52	70	1.0232	1.023830
28	12 m		54 34 00	158 47 00	do	52	52	70	1.0232	1.023830
28	6 p. m.		54 46 00	157 43 30	do	51	53	70	1.0230	1.023630
29	6 a. m.		55 26 00	155 26 00	do	53	54	70	1.0230	1.023630
29	12 m		55 41 00	154 48 00	do	51	54	70	1.0232	1.023830
29	6 p. m.		56 01 30	153 52 00	do	53	54	70	1.0232	1.023830
30	12 m		55 49 00	150 41 00	do	53	54	70	1.0232	1.023830
31	12 m		55 19 00	147 16 30	do	52	53	70	1.0232	1.023830
Sept. 1	12 m		55 49 00	141 58 00	do	55	70	70	1.0232	1.023830
2	12 m		54 27 00	137 37 00	do	56	56	70	1.0232	1.023830
3	12 m		52 55 30	132 25 30	do	58	59	64	1.0240	1.023728
3	5 p. m.		52 39 30	132 38 00	do	58	65	64	1.0238	1.023528
4	12 m		51 09 30	130 12 45	do	58	59	64	1.0232	1.022928
5	12 m		49 05 00	126 24 00	do	54	58	64	1.0232	1.022928
5	10 p. m.	Entrance Straits Fuca			do	56	56	64	1.0230	1.022728
21	12 m		47 27 20	125 17 00	do	54	57	64	1.0230	1.022728
22	12 m		45 22 00	125 05 00	do	57	55	64	1.0240	1.023728
23	12 m		43 00 00	124 36 00	do	52	53	64	1.0242	1.023928
24	12 m		40 24 20	124 33 30	do	53	54	64	1.0242	1.023928
25	12 m		38 58 30	124 01 20	do	54	55	64	1.0242	1.023928
1891.										
Feb. 1	12 m		33 11 00	118 58 00	do	59	55	80	1.0230	1.025340
1	6 p. m.		32 30 00	118 32 00	do	57	57	80	1.0226	1.024940
1	12 p. m.		31 40 00	118 02 00	do	59	56	80	1.0230	1.025340
2	6 a. m.		31 06 00	117 34 00	do	60	55	80	1.0230	1.025340
2	12 m		30 18 30	116 57 00	do	61	60	80	1.0230	1.025340
2	6 p. m.		29 30 30	116 37 00	do	61	65	80	1.0232	1.025540
2	12 p. m.		28 49 00	116 18 00	do	60	59	80	1.0234	1.025740
3	6 a. m.		28 05 00	116 02 00	do	62	61	80	1.0232	1.025540
3	12 m		27 06 30	115 47 00	do	61	64	80	1.0234	1.025740
3	6 p. m.		26 30 00	115 20 00	do	66	66	80	1.0234	1.025740
3	12 p. m.		25 45 00	114 42 00	do	66	66	80	1.0236	1.025940
4	6 a. m.		25 07 00	114 06 00	do	65	65	80	1.0236	1.025940
4	12 m		24 25 00	113 25 00	do	68	66	80	1.0238	1.026140
4	6 p. m.		23 49 00	112 52 00	do	70	80	80	1.0238	1.026140
4	12 p. m.		23 10 00	112 11 30	do	70	69	80	1.0238	1.026140
5	6 a. m.		22 33 00	111 35 00	do	69	67	80	1.0238	1.026140
5	12 m		21 57 00	110 57 00	do	72	74	80	1.0238	1.026140
5	6 p. m.		21 30 00	110 17 00	do	72	79	80	1.0240	1.026340
5	12 p. m.		20 52 00	109 40 00	do	72	71	80	1.0240	1.026340
6	6 a. m.		20 20 00	108 55 00	do	75	72	80	1.0234	1.025740
6	12 m		19 52 00	108 18 00	do	76	76	80	1.0230	1.025340
6	6 p. m.		19 25 00	107 30 00	do	76	76	80	1.0230	1.025340
6	12 p. m.		19 02 00	106 45 00	do	75	75	80	1.0230	1.025340
7	6 a. m.		18 36 00	105 58 00	do	75	74	80	1.0232	1.025540
7	12 m		18 14 00	105 06 00	do	79	81	80	1.0230	1.025340
7	6 p. m.		17 58 00	104 15 00	do	81	90	82	1.0232	1.025000
7	12 p. m.		17 42 00	103 22 00	do	78	77	82	1.0230	1.025700
8	6 a. m.		17 26 00	102 30 00	do	79	77	82	1.0230	1.025700
8	12 m		17 14 00	101 38 00	do	81	81	82	1.0226	1.025300
8	6 p. m.		16 59 00	100 43 00	do	80	84	82	1.0226	1.025300
8	12 p. m.	Off Acapulco			do	75	77	82	1.0228	1.025500
9	4 p. m.	Acapulco, Mexico			do	80	76	82	1.0230	1.025700

Record of ocean temperatures and specific gravities by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Time of day.	Station.	Lat. N.	Long. W.	Depth.	Temperature by attached thermometer.	Temperature of the air.	Temp. of specimen at time specific gravity was taken.	Specific gravity.	Specific gravity reduced to 15° C., with pure water at 4° C. as standard.
1891.			° ′ ″	° ′ ″	*Fms.*	°	°	°		
Feb. 9	12 p. m.		16 22 00	99 05 00	Surface.	79	78	82	1.0228	1.025500
10	6 a. m.		15 55 00	98 22 00	...do....	79	77	82	1.0228	1.025500
10	12 m		15 39 00	97 37 00	...do....	80	81	82	1.0228	1.025500
10	6 p. m.		15 15 00	96 50 00	...do....	79	81	82	1.0228	1.025500
10	12 p. m.		14 53 00	96 05 00	...do....	77	79	82	1.0230	1.025700
11	6 a. m.		14 28 00	95 22 00	...do....	79	77	82	1.0228	1.025500
11	12 m		14 05 00	94 41 40	...do....	79	79	82	1.0228	1.025500
11	6 p. m.		13 47 00	93 57 00	...do....	78	81	82	1.0228	1.025500
11	12 p. m.		13 28 00	93 15 00	...do....	79	78	82	1.0228	1.025500
12	6 a. m.		13 17 00	92 35 00	...do....	79	78	82	1.0226	1.025300
12	12 m		13 00 00	91 51 00	...do....	80	81	82	1.0226	1.025300
12	6 p. m.		12 30 00	91 10 00	...do....	81	83	82	1.0224	1.025100
12	12 p. m.		12 05 00	90 32 00	...do....	80	80	82	1.0224	1.025100
13	6 a. m.		11 41 00	89 55 00	...do....	80	80	82	1.0222	1.024900
13	12 m		11 17 00	89 16 00	...do....	79	80	82	1.0222	1.024900
13	6 p. m.		10 45 00	88 43 00	...do....	78	82	82	1.0222	1.024900
13	12 p. m.		10 20 00	88 12 00	...do....	77	79	82	1.0226	1.025300
14	6 a. m.		9 55 00	87 35 00	...do....	78	77	82	1.0228	1.025500
14	12 m		9 34 00	87 01 00	...do....	80	80	82	1.0226	1.025300
14	6 p. m.		9 10 00	86 17 00	...do....	82	85	82	1.0226	1.025300
14	12 p. m.		8 48 00	85 26 00	...do....	81	82	85	1.0204	1.023680
15	6 a. m.		8 25 00	84 37 00	...do....	82	81	85	1.0212	1.024480
15	12 m		8 17 00	83 55 00	...do....	85	86	85	1.0204	1.023680
15	6 p. m.		7 54 00	83 10 00	...do....	85	85	85	1.0206	1.023880
15	12 p. m.		7 25 00	82 33 00	...do....	83	83	85	1.0205	1.023780
16	6 a. m.		7 18 30	81 52 00	...do....	81	81	85	1.0205	1.023780
16	12 m		7 05 00	81 06 00	...do....	80	83	85	1.0212	1.024480
16	6 p. m.		7 06 00	80 23 00	...do....	73	79	85	1.0224	1.025680
16	12 p. m.		7 28 00	79 45 00	...do....	70	75	85	1.0220	1.025280
17	6 a. m.		8 06 00	79 32 00	...do....	72	74	85	1.0222	1.025480
18	12 m	Panama, U. S. C.			...do....	74	74	85	1.0222	1.025480
23	12 m		7 07 00	80 43 00	...do....	76	79	85	1.0222	1.025480
23	7 p. m.		7 09 30	81 05 30	...do....	83	79	85	1.0216	1.024880
23	...do		7 09 30	81 05 30	25	68.4	79	85	1.0220	1.025280
23	...do		7 09 30	81 05 30	50	65.9	79	85	1.0224	1.025680
23	...do		7 09 30	81 05 30	100	58.5	79	85	1.0228	1.026080
23	...do		7 09 30	81 05 30	200	52.9	79	85	1.0230	1.026280
23	...do		7 09 30	81 05 30	300	44.9	79	85	1.0230	1.026280
23	...do		7 09 30	81 05 30	400	48.7	79	85	1.0230	1.026280
23	...do		7 09 30	81 05 30	546	40.1	79	85	1.0232	1.026480
23	12 p. m.		6 59 30	81 15 00	Surface.	81	79	85	1.0220	1.025280
24	9 a. m.		6 35 00	81 44 00	...do....	83	83	85	1.0206	1.023880
24	...do		6 35 00	81 44 00	25	74.4	83	84	1.0216	1.024892
24	...do		6 35 00	81 44 00	50	76	83	84	1.0228	1.025892
24	...do		6 35 00	81 44 00	100	.....	83	84	1.0230	1.026092
24	...do		6 35 00	81 44 00	200	51.8	83	84	1.0230	1.026092
24	...do		6 35 00	81 44 00	300	46	83	84	1.0232	1.026292
24	...do		6 35 00	81 44 00	400	43	83	84	1.0230	1.026092
24	...do		6 35 00	81 44 00	500	41	83	84	1.0230	1.026092
24	...do		6 35 00	81 44 00	600	.....	83	84	1.0230	1.026092
24	6 p. m.		6 17 00	82 05 00	Surface.	83	81	84	1.0210	1.024092
24	12 p. m.		6 16 00	82 23 00	...do....	83	81	84	1.0210	1.024092
25	6 a. m.		6 10 00	83 06 00	...do....	82	81	84	1.0208	1.023692
25	...do		6 10 00	83 06 00	25	76.9	81	84	1.0220	1.025092
25	...do		6 10 00	83 06 00	50	59	81	84	1.0222	1.025292
25	...do		6 10 00	83 06 00	100	55.7	81	84	1.0226	1.025692
25	...do		6 10 00	83 06 00	200	50.5	81	84	1.0230	1.026092
25	...do		6 10 00	83 06 00	300	46.8	81	84	1.0232	1.026292
25	...do		6 10 00	83 06 00	400	43.6	81	84	1.0232	1.026292
25	...do		6 10 00	83 06 00	500	41.9	81	84	1.0232	1.026292
25	...do		6 10 00	83 06 00	600	40.2	81	84	1.0232	1.026292
25	...do		6 10 00	83 06 00	700	38.3	81	84	1.0232	1.026292
25	...do		6 10 00	83 06 00	800	38.9	81	84	1.0232	1.026492
25	...do		6 10 00	83 06 00	900	37.5	81	84	1.0234	1.026692
25	...do		6 10 00	83 06 00	1,000	36.5	81	84	1.0236	1.026892
25	12 m		6 11 00	83 16 30	Surface.	84	84	84	1.0210	1.024092
25	6 p. m.		6 05 00	83 55 00	...do....	84	84	84	1.0208	1.023892

Record of ocean temperatures and specific gravities by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Time of day.	Station.	Lat. N.	Long. W.	Depth.	Temperature by attached thermometer.	Temperature of the air.	Temp. of specimen at time specific gravity was taken.	Specific gravity.	Specific gravity reduced to 15° C., with pure water at 4° C. as standard.
1891.			° ′ ″	° ′ ″	*Fms.*	°	°	°		
Feb. 26	6 a. m.		5 56 00	85 10 30	Surface.	84	80	83	1.0216	1.023906
26	...do		5 56 00	85 10 30	50	.....	80	83	1.0228	1.025706
26	...do		5 56 00	85 10 30	100	55.8	80	83	1.0232	1.026106
26	...do		5 56 00	85 10 30	200	51.3	80	83	1.0232	1.026106
26	...do		5 56 00	85 10 30	300	46.7	80	83	1.0234	1.026306
26	...do		5 56 00	85 10 30	400	.....	80	82	1.0234	1.026100
26	...do		5 56 00	85 10 30	500	49.3	80	82	1.0234	1.026100
26	...do		5 56 00	85 10 30	600	.....	80	82	1.0234	1.026100
26	...do		5 56 00	85 10 30	700	39.1	80	82	1.0234	1.026100
26	...do		5 56 00	85 10 30	800	.....	80	82	1.0236	1.026300
26	...do		5 56 00	85 10 30	900	37.3	80	82	1.0236	1.026300
26	...do		5 56 00	85 10 30	1,000	36.8	80	82	1.0236	1.026300
26	12 m		5 51 00	85 23 30	Surface.	83	80	82	1.0212	1.023920
26	6 p. m		5 50 00	85 41 00	...do	84	79	82	1.0210	1.023720
27	6 a. m		5 30 00	86 08 30	...do	81	79	85	1.0208	1.024080
27	...do		5 30 00	86 08 30	25	76.4	79	85	1.0214	1.024680
27	...do		5 30 00	86 08 30	50	58.9	79	85	1.0222	1.025480
27	...do		5 30 00	86 08 30	150	54.4	79	85	1.0224	1.025680
27	...do		5 30 00	86 08 30	250	48.8	79	85	1.0226	1.025880
27	...do		5 30 00	86 08 30	350	44.9	79	85	1.0226	1.025880
27	...do		5 30 00	86 08 30	450	42.8	79	85	1.0226	1.025880
27	...do		5 30 00	86 08 30	550	41	79	85	1.0226	1.025880
27	...do		5 30 00	86 08 30	650	.....	79	85	1.0228	1.026080
27	...do		5 30 00	86 08 30	900	38	79	85	1.0230	1.026280
27	12 m		5 30 00	86 23 00	Surface.	85	82	85	1.0205	1.023780
27	6 p. m		5 30 00	86 45 00	...do	84	83	85	1.0205	1.023780
27	...do		5 30 00	86 45 00	25	73.7	83	85	1.0208	1.023980
27	...do		5 30 00	86 45 00	50	58.9	83	85	1.0220	1.025280
27	...do		5 30 00	86 45 00	100	55.8	83	85	1.0222	1.025480
27	...do		5 30 00	86 45 00	200	50.9	83	85	1.0224	1.025680
27	...do		5 30 00	86 45 00	300	45.9	83	85	1.0224	1.025680
27	...do		5 30 00	86 45 00	400	44.7	83	85	1.0226	1.025880
27	...do		5 30 00	86 45 00	500	41.5	83	85	1.0226	1.025880
27	...do		5 30 00	86 45 00	600	40.4	83	85	1.0226	1.025880
27	...do		5 30 00	86 45 00	700	38.8	83	85	1.0228	1.026080
28	12 m		5 33 20	86 58 20	Surface.	84	84	85	1.0205	1.023780
Mar. 23	6 p. m		5 32 45	86 54 30	...do	84	85	85	1.0205	1.023780
1	12 m		5 11 00	86 40 00	...do	83	84	80	1.0214	1.023740
1	6 p. m		4 49 00	86 11 20	...do	82	85	80	1.0214	1.023740
2	12 m		4 01 00	84 55 00	...do	82	84	80	1.0220	1.024340
2	6 p. m		3 50 00	84 45 00	...do	81	83	80	1.0220	1.024340
3	12 m		2 32 00	83 55 00	...do	80	82	80	1.0220	1.024340
3	6 p. m		2 33 00	83 29 00	...do	80	82	80	1.0224	1.024740
3	12 p. m		2 34 30	83 03 00	...do	79	78	80	1.0226	1.024940
4	6 a. m		2 34 00	82 29 00	...do	77	77	80	1.0230	1.025340
4	12 m		2 49 00	82 23 30	...do	78	80	80	1.0228	1.025140
4	6 p. m		3 09 00	82 10 30	...do	77	79	80	1.0228	1.025140
4	12 p. m		3 30 00	81 57 30	...do	77	77	80	1.0228	1.025140
5	6 a. m		3 50 00	81 44 20	...do	77	77	80	1.0226	1.024940
5	12 m	Malpelo Island			...do	78	79	80	1.0228	1.025140
5	6 p. m		4 03 00	81 31 00	...do	78	83	80	1.0228	1.025140
5	12 p. m		4 30 00	81 12 00	...do	77	78	80	1.0230	1.025340
6	7 a. m		4 56 00	80 52 30	...do	77	78	80	1.0228	1.025140
6	12 m		4 58 30	80 52 00	...do	77	80	80	1.0228	1.025140
6	6 p. m		5 08 30	80 34 00	...do	77	78	80	1.0230	1.025340
6	12 p. m		5 29 00	80 16 00	...do	76	77	80	1.0230	1.025340
7	6 a. m		5 48 00	79 58 00	...do	75	76	80	1.0230	1.025340
7	12 m		6 19 20	79 37 40	...do	76	79	80	1.0230	1.025340
7	6 p. m		6 40 00	79 25 30	...do	75	78	83	1.0230	1.025906
7	12 p. m		6 59 00	79 13 00	...do	75	77	83	1.0232	1.026106
8	6 a. m		7 21 00	79 02 00	...do	74	75	83	1.0232	1.026106
8	12 m		7 26 00	79 07 00	...do	74	79	83	1.0233	1.026206
8	7 p. m		7 40 00	79 17 50	...do	74	77	83	1.0232	1.026106
9	12 m		7 00 00	79 55 00	...do	73	77	83	1.0232	1.026106
10	...do		7 13 30	79 39 00	...do	73	77	83	1.0232	1.026106
11	...do		7 29 00	78 43 30	...do	70	76	83	1.0234	1.026306
20	6 p. m		8 34 00	79 35 00	...do	75	82	83	1.0232	1.026106

Record of ocean temperatures and specific gravities by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Time of day.	Station.	Lat. N.	Long. W.	Depth.	Temperature by attached thermometer.	Temperature of the air.	Temp. of specimen at time specific gravity was taken.	Specific gravity.	Specific gravity reduced to 15° C., with pure water at 4° C. as standard.
1891.			° ′ ″	° ′ ″	*Fms.*	°	°	°		
Mar. 20	12 p. m.		7 42 00	79 52 00	Surface	73	78	83	1.0234	1.026306
21	6 a. m.		6 50 00	80 09 00	do	74	75	83	1.0232	1.026106
21	12 m		5 56 10	80 28 00	do	74	78	83	1.0232	1.026106
21	6 p. m.		5 13 00	80 32 00	do	75	81	83	1.0230	1.025906
21	12 p. m.		4 32 00	80 30 00	do	75	76	83	1.0228	1.025706
22	6 a. m.		3 51 00	80 28 30	do	78	77	83	1.0228	1.025706
22	12 m		3 00 30	80 30 30	do	79	81	83	1.0226	1.025506
22	6 p. m.		2 31 00	80 24 00	do	80	82	83	1.0226	1.025506
22	12 p. m.		2 02 00	80 19 00	do	80	80	83	1.0226	1.025506
23	6 a. m.		1 33 00	80 12 00	do	79	78	83	1.0225	1.025406
23	12 m		1 07 30	80 05 00	do	80	80	83	1.0225	1.025406
23	6 p. m.		1 05 00	80 21 00	do	84	83	83	1.0225	1.025406
23	12 p. m.		1 05 30	80 37 00	do	80	80	83	1.0223	1.025206
24	6 a. m.		1 04 00	80 53 00	do	80	79	83	1.0223	1.025206
24	12 m		1 04 30	81 14 30	do	82	82	83	1.0226	1.025506
24	6 p. m.		0 56 30	81 40 00	do	84	83	83	1.0226	1.025506
24	12 p. m.		0 47 00	82 06 00	do	80	80	83	1.0226	1.025506
25	6 a. m.		0 41 00	82 32 00	do	81	80	83	1.0228	1.025706
25	12 m		0 31 00	82 59 00	do	82	81	83	1.0226	1.025506
25	6 p. m.		0 19 00	83 20 00	do	82	81	83	1.0226	1.025506
25	12 p. m.		0 07 00 South.	83 56 00	do	82	81	83	1.0224	1.025306
26	6 a. m.		0 05 00	84 23 00	do	81	80	83	1.0224	1.025306
26	12 m		0 18 00	85 03 00	do	83	83	83	1.0218	1.024706
26	6 p. m.		0 23 00	85 34 00	do	83	83	83	1.0216	1.024506
26	12 p. m.		0 27 00	86 05 00	do	82	81	83	1.0218	1.024706
27	6 a. m.		0 35 00	86 36 00	do	83	81	83	1.0218	1.024706
27	12 m		0 40 00	87 06 30	do	82	82	83	1.0216	1.024506
27	6 p. m.		0 45 00	87 40 00	do	83	83	83	1.0220	1.024906
27	12 p. m.		0 51 00	88 14 00	do	82	81	83	1.0220	1.024906
28	6 a. m.	Off Chatham Island			do	82	81	83	1.0220	1.024906
28	12 m		1 01 00	89 22 00	do	82	83	83	1.0220	1.024906
29	12 m	Wreck Bay			do	81	82	83	1.0222	1.025106
Apr. 1	12 m	Charles Island			do	80	83	83	1.0224	1.025306
2	12 m	Duncan Island			do	81	83	83	1.0224	1.025306
2	6 p. m.	Indefatigable Island			do	82	82	83	1.0222	1.025106
3	12 m		0 01 00 North.	90 23 00	do	81	80	83	1.0220	1.524906
4	12 m		1 05 00	91 17 00	do	82	81	83	1.0222	1.025106
4	6 p. m.		1 23 00	91 30 00	do	82	81	83	1.0222	1.025106
4	12 p. m.		1 51 00	91 43 00	do	81	79	84	1.0222	1.025292
5	6 a. m.		2 14 00	91 56 00	do	82	78	84	1.0221	1.025192
5	12 m		2 39 00	92 09 00	do	83	84	84	1.0222	1.025292
5	6 p. m.		3 17 00	92 31 00	do	84	83	84	1.0224	1.025492
5	12 p. m.		3 55 00	92 51 00	do	83	81	84	1.0226	1.025692
6	6 a. m.		4 34 00	93 14 00	do	82	81	84	1.0226	1.025692
6	12 m		5 13 00	93 35 00	do	83	82	84	1.0230	1.026092
6	6 p. m.		5 53 00	94 03 00	do	82	82	84	1.0230	1.026092
7	6 a. m.		7 10 00	94 59 00	do	81	81	84	1.0230	1.026092
7	12 m		7 54 00	95 27 00	do	82	83	84	1.0226	1.025692
7	6 p. m.		8 31 00	95 43 00	do	81	82	84	1.0224	1.025492
7	12 p. m.		9 08 00	95 59 00	do	82	82	84	1.0224	1.025492
8	6 a. m.		9 45 00	96 15 00	do	82	81	84	1.0224	1.025492
8	12 m		10 23 00	96 30 30	do	83	83	84	1.0222	1.025292
8	6 p. m.		10 58 00	96 44 00	do	83	83	84	1.0222	1.025292
8	12 p. m.		11 33 00	96 58 00	do	82	81	84	1.0222	1.025292
9	6 a. m.		12 08 00	97 12 00	do	81	80	84	1.0222	1.025292
9	12 m		12 45 00	97 26 00	do	83	84	84	1.0224	1.025492
9	6 p. m.		13 33 30	97 57 30	do	83	83	84	1.0224	1.025492
9	12 p. m.		14 09 00	98 18 00	do	83	82	84	1.0224	1.025492
10	8 a. m.		14 46 00	98 40 00	do	82	83	84	1.0226	1.025692
10	6 p. m.		15 28 00	98 19 00	do	84	83	84	1.0226	1.025692
10	12 p. m.		15 49 00	98 09 00	do	82	81	84	1.0228	1.025892
11	6 a. m.		16 10 00	97 58 00	do	80	79	84	1.0228	1.025892
11	12 m		16 32 00	97 48 40	do	82	83	84	1.0228	1.025892
15	6 p. m.		16 50 00	100 20 00	do	80	79	67	1.0256	1.025767
15	12 p. m.		17 05 00	100 58 00	do	80	78	66	1.0258	1.025820

Record of ocean temperatures and specific gravities by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1889—Continued.

Date.	Time of day.	Station.	Lat. N.	Long. W.	Depth.	Temperature by attached thermometer.	Temperature of the air.	Temp. of specimen at time specific gravity was taken.	Specific gravity.	Specific gravity reduced to 15° C., with pure water at 4° C. as standard.
1891.			° ′ ″	° ′ ″	*Fms.*	°	°	°		
Apr. 15	6 a. m.		17 20 00	101 34 00	Surface.	78	76	66	1.0258	1.025820
16	12 m.		17 43 00	102 19 30	...do....	80	79	66	1.0256	1.025620
16	6 p. m.		18 12 00	102 58 00	...do....	80	77	66	1.0256	1.025620
16	12 p. m.		18 41 00	103 37 00	...do....	76	76	66	1.0256	1.025620
17	6 a. m.		19 10 00	104 16 00	...do....	77	74	66	1.0256	1.025620
17	12 m.		19 44 40	104 56 30	...do....	74	75	66	1.0256	1.025620
17	6 p. m.		20 02 00	105 17 00	...do....	72	74	66	1.0256	1.025620
18	6 a. m.		20 46 00	105 59 00	...do....	74	72	66	1.0256	1.025620
18	12 m.		21 07 30	106 21 30	...do....	75	77	66	1.0260	1.026020
19	12 m.		22 58 00	107 20 00	...do....	73	75	66	1.0258	1.025820
20	12 m.		24 20 30	108 34 30	...do....	71	70	66	1.0254	1.025420
21	12 m.		25 33 00	109 50 00	...do....	71	73	66	1.0256	1.025620
22	12 m.		26 58 00	110 49 30	...do....	71	74	66	1.0260	1.026020
23	12 m.	Guaymas, Mexico			...do....	71	72	66	1.0262	1.026220
24	12 m.		27 33 00	110 02 00	...do....	71	73	66	1.0262	1.026220
25	12 m.		25 06 00	109 51 00	...do....	72	72	66	1.0256	1.025620
26	12 m.		23 07 00	110 08 00	...do....	65	75	66	1.0254	1.025420
27	12 m.		24 41 30	112 16 30	...do....	62	67	66	1.0250	1.025020
28	12 m.		26 40 00	114 06 30	...do....	64	66	66	1.0250	1.025020
29	12 m.		28 51 30	115 06 30	...do....	57	57	66	1.0248	1.024820
30	12 m.		30 44 30	116 13 45	...do....	57	57	66	1.0250	1.025020
May 2	12 m.	San Diego, Cal			...do....	65	65	66	1.0248	1.024820
3	12 m.		33 55 40	118 54 20	...do....	60	60	66	1.0250	1.025020
4	12 m.		35 49 30	121 36 00	...do....	58	62	66	1.0250	1.025020

Record of serial temperatures by the U. S. Fish Commission steamer Albatross, February, March, and April, 1891.

Date.	Serial number.	Position. Lat. N.	Position. Long. W.	Air.	Surf.	25 faths.	50 faths.	100 faths.	200 faths.	300 faths.	400 faths.	500 faths.	600 faths.	700 faths.	800 faths.	900 faths.	1,000 faths.	Bottom.	Depth.
1891.		° ′ ″	° ′ ″	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	*Fms.*
Feb. 23	Hy. 2609	7 12 30	80 56 00	79	81	67.2	63.2											57.7	127
23	Dr. 3356	7 09 30	81 08 00	80	83	68.4	65.9	58.5	52.9	44.9	48.7							40.1	546
24	Dr. 3357	6 35 00	81 44 00	80	83	74.4	76.0		51.8	46.1	43.0	41.0						38.5	782
25	Dr. 3361	6 10 00	83 06 00	81	82	76.9	59.0	55.7	50.5	46.8	43.6	41.9	40.2	38.3	38.9	37.5	36.5	36.6	1,471
26	Dr. 3362	5 56 00	85 10 30	80	84	71.8		55.8	51.3	46.7		59.3		39.1		37.3	36.8	36.8	1,175
27	Dr. 3364	5 30 00	86 08 30	79	81	68.9	71.4	54.4	48.8	44.9	42.8	41.0						38	902
27	Dr. 3366	5 30 00	86 45 00	83	84	73.7	58.9	55.8	50.9	45.9	44.7	41.5	40.4	38.8				37	1,067
28	Dr. 3367	5 31 30	86 52 30	81	82	72.4	69.0											57.1	100
Mar. 1	Dr. 3372	4 49 00	86 11 26	85	84	74.4	58.8	55.0	49.1	44.9	42.5	41.0						36.8	761
2	Dr. 3373	4 02 00	84 58 00	83	82	77.7	60.9	55.9	49.7	44.4	41.9		38.9	38.0	37.5	37.1	37.0	36.6	1,877
3	Dr. 3374	2 35 00	84 33 00	81	80	74.8	61.1	56.6	51.3	45.8	42.3	40.9	39.4					36.4	1,823
4	Dr. 3375	2 34 00	82 29 00	76	77	66.7		58.0	54.2	46.6	43.8	40.9	39.9	38.9	38.0	37.6	37.2	36.6	1,201
5	Hy. 2613	3 50 00	81 44 20	77	77	69.9	59.9	57.7	50.8	45.6	43.3	40.9	39.7	38.8		37.3		36.5	1,181
6	Dr. 3381	4 56 00	80 52 30	78	77	70.9	59.3	55.4	51.5	46.7	42.8	40.5	39.4	38.6	37.7	37.4	36.6	35.8	1,772
7	Dr. 3382	6 21 00	81 41 00	77	75	67.7	61.1	55.3	49.9	45.8	42.8	41.1	39.4	38.8	38.1	36.7	36.3	35.8	1,793
8	Dr. 3383	7 21 00	79 02 00	75	74	63.2	63.4	56.4	49.1	45.0	43.3	41.3	39.6	39.4	39.0	37.4	37.0	36	1,832
8	Dr. 3387	7 40 00	79 17 50	77	74	65.8	64.0											56	127
9	Dr. 3388	7 06 00	79 48 00	75	73	64.0	60.9	56.1	49.0	45.5	43.4	43.1	39.6	39.2	38.1	37.7	37.2	36.2	1,168
10	Dr. 3392	7 05 30	79 40 00	76	73	63.0		55.9	49.8	45.0	43.2	40.5	39.7	38.6	39.5	37.3	36.8	36.4	1,270
11	Hy. 2619	7 31 00	78 42 30	72	66	65.0	61.8	61.3	48.9	45.5	42.6	41.1	40.2	38.7	37.8			36.5	1,100
11	Dr. 3396	7 32 00	78 36 30	77	70	64.5	62.4	55.9										47.4	259
23	Hy. 2624	1 18 00	80 01 00	77	80		59.1	58.1	56.4	45.6	43.1	41.9	41.0					39	724
23	Hy. 2626	1 07 00	79 59 00	79	80	68.9	60.7											57.3	90
23	Dr. 3398	1 07 00	80 21 00	84	84	68.8	64.4	59.0	53.8	45.1	42.9	42.0	40.3	39.5	38.4	38.0	37.0	36	1,573
24	Dr. 3399	1 07 00	81 04 00	79	80	72.7	65.7	56.1	50.0	44.9	43.0	41.4	40.1	38.9	38.0	37.6	36.7	36	1,740
25	Hy. 2627	0 36 00 South.	82 45 00	80	81	71.4	64.3	56.8	49.2	44.8	42.5	41.9	40.2	38.7	38.2	37.7	37.1	36	1,832
26	Hy. 2629	0 20 00	85 08 00	85	83	69.9	63.7	56.2	50.1	45.0	42.4	41.8	40.3	39.2	38.6	37.8	36.8	36	1,488
28	Dr. 3401	0 59 00	88 38 30	81	82	70.1	63.7	56.6	50.0	46.1								43.8	395
Apr. 3	Dr. 3406	0 16 00 North.	90 21 30	79	81	73.5	59.9	57.9	53.9	45.0	42.3							41.3	551
4	Dr. 3411	0 54 00	91 09 00	79	82	71.8	67.8	61.5	54.0	46.8	43.0	41.3	40.8	39.8	38.9	38.1	37.5	36.2	1,189
8	Dr. 3414	10 14 00	96 28 00	81	82	81.9	72.1	59.5	51.8	47.8	44.4	42.0	40.8	39.6	38.8	38.1	37.3	35.8	2,232

Record of meteorological observations by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891.

Date.	Position at meridian.		Barometer.		Temperature.						Weather.	Direction and force of winds.	Rainfall.
					Air: Dry bulb.		Air: Wet bulb.		Water at surface.				
	Lat. N.	Long. W.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
1889.	° ′ ″	° ′ ″	°	°	°	°	°	°	°	°			
July 1	Departure Bay, B. C.		30.44	30.26	74	51	69	50	68	52	Clear and pleasant	Calm, W. 1, N. 1, NNW. 1, calm	None.
2	....do		30.48	30.12	75	53	67	52	69	56	....do	Calm, NE. 2, W. 1, calm	Do.
3	48 34 00	123 14 00	30.12	30.04	68	55	64	53	59	52	....do	Calm, WNW. 1-2, S. 2, SSW. 4-5	Do.
4	48 23 30	123 20 00	30.20	30.10	58	53	55	52	56	51	Clear and pleasant; squally; pleasant.	SSW. 4, SW. 4-5, WSW. 4	Do.
5	Port Townsend, Wash.		30.14	30.08	74	55	64	52	63	51	Cloudy and squally to clear and pleasant.	WSW. 4-3, calm, E. 1, calm	Do.
6	Tacoma, Wash		30.20	30.08	70	53	65	52	68	54	Misty to clear and pleasant	SE. 1 to SW. 1, W. 1, calm	Light mist.
7	47 30 00	122 25 00	30.16	30.04	68	55	63	54	62	56	Clear and pleasant	Calm, NW. 1-2, W. 2, calm	None.
8	49 38 00	124 40 50	30.16	30.00	73	56	68	55	68	53	....do	WNW. 0-1, calm, WSW. 2	Do.
9	51 32 45	128 53 00	30.10	29.92	65	52	63	51	61	51	Foggy and misty weather	Variable winds, 2-1	Light mist.
10	53 24 00	129 23 00	30.06	29.98	61	57	65	56	66	54	Overcast, foggy and misty	Calm and variable winds, 1	Do.
11	54 46 15	130 54 00	30.12	30.04	75	54	67	53	67	53	Overcast and foggy to clear and fair.	....do	None.
12	Port Chester, Alaska		30.14	29.96	76	59	70	58	68	58	....do	Calm and light W'ly airs	Do.
13	Fort Wrangel, Alaska		30.10	29.94	68	56	63	56	62	52	Clear and pleasant	Light W'ly airs, calm light S'ly airs.	Do.
14	57 31 00	135 27 00	30.14	30.00	69	56	65	54	62	54	....do	Gentle W'ly breezes	Do.
15	Sitka, Alaska		30.14	30.04	57	54	55	52	58	55	Overcast and drizzly	Light W'ly airs and calm	Light drizzle.
16	....do		30.22	30.04	58	53	56	52	58	51	Overcast and rainy	Light W'ly airs	Light.
17	Freshwater Bay, Alaska.		30.22	30.10	57	52	55	51	57	51	Overcast, squally and drizzly	Moderate SE'ly breezes	Do.
18	58 40 30	136 06 00	30.34	30.22	55	43	54	42	54	35	Clear and pleasant	Light W'ly airs	None.
19	58 39 00	135 17 00	30.34	30.26	63	49	61	48	58	50	....do	Calm, NE. 1, ENE. 1, calm	Do.
20	59 01 00	135 19 00	30.36	30.30	61	55	57	53	58	52	....do	Calm, light variable breezes	Do.
21	Juneau, Alaska		30.34	30.30	60	55	59	53	54	52	Overcast and fair	W. 1, WSW. 3, W. 1	Do.
22	....do		30.32	30.20	60	55	58	53	54	51	....do	WSW. 1, and variable, 1	Do.
23	56 14 00	132 56 00	30.20	30.12	65	51	63	50	63	50	Fair and pleasant	Light, variable airs	Do.
24	53 52 00	130 03 00	30.18	30.06	70	58	67	57	64	56	Cloudy to fair and pleasant	....do	Do.
25	51 21 00	127 52 00	30.20	30.12	64	56	63	55	62	52	Foggy to fair	Gentle breezes from S'd. and W'd	Do.
26	49 18 00	123 55 00	30.18	30.10	74	58	71	56	68	54	Clear and pleasant	Gentle breezes from W'd	Do.
27	Victoria, B. C		30.24	30.16	64	56	64	55	60	55	Fair to hazy	Calm, S. 1, SSW. 2, W. 3, NE. 1	Do.
28	Port Townsend, Wash.		30.26	30.10	73	54	71	52	65	52	Foggy and hazy	Calm, variable 1	Do.
29	....do		30.22	30.04	65	53	62	52	58	52	Foggy and misty	Calm, NW. 1, calm	Do.
30	....do		30.26	30.04	67	55	64	53	57	52	....do	Calm, SSE. 1, W. 1, calm	Do.
31	....do		30.30	30.16	66	53	65	52	61	52	....do	Calm, N. 1, W. 2, calm	Do.
Aug. 1	....do		30.22	30.10	64	53	60	52	64	54	....do	Calm, variable 1	Do.
2	Departure Bay, B. C.		30.22	30.12	69	61	68	59	68	59	Foggy, clear and pleasant, and misty.	ENE. 1, NE. 1, calm	Do.

Record of meteorological observations by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Position at meridian.		Barometer.		Temperature.						Weather.	Direction and force of winds.	Rainfall.
					Air: Dry bulb.		Air: Wet bulb.		Water at surface.				
	Lat. N.	Long. W.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
1889.	° ′ ″	° ′ ″	°	°	°	°	°	°	°	°			
Aug. 3	Departure Bay, B. C.		30.26	30.12	68	57	67	56	65	62	Fair and foggy	Calm, E. 1, calm	None.
4	do		30.28	30.20	65	58	62	54	64	57	Fair and pleasant	Calm, W. 1, W'ly 2-4	Do.
5	50 30 00	126 29 00	30.40	30.30	58	55	55	52	58	53	Clear and pleasant	WNW. 3-4, W. 3, WSW. 3	Do.
6	51 34 00	131 16 00	30.40	30.18	59	56	58	54	58	54	Drizzly and foggy	S'ly 2-3	Light drizzle.
7	52 34 24	136 20 36	30.18	30.04	58	56	57	55	58	56	do	S'ly 3	Do.
8	51 23 00	133 27 30	30.12	30.04	60	58	60	58	60	58	do	S'ly 4-2	Do.
9	50 04 45	129 02 00	30.18	30.12	68	59	65	57	63	59	Foggy to clear and pleasant	SW'ly 2 to SW'ly 3	None.
10	48 24 00	124 55 00	30.18	30.10	61	53	59	52	58	52	Thick and foggy	WNW. 4 to SW. 3	Do.
11	Port Townsend, Wash.		30.18	30.02	67	54	61	53	58	52	Overcast and foggy	Calm, WSW. 2, calm	Do.
12	do		30.18	30.10	62	55	61	54	56	53	do	Calm, variable 1	Do.
13	do		30.18	30.00	69	52	65	53	59	51	do	do	Do.
14	do		30.12	30.06	66	54	61	52	57	52	do	Calm, W. 1, WSW. 2, W. 2	Do.
15	do		30.20	30.06	64	57	61	56	55	52	do	W'ly 1	Do.
16	do		30.10	30.04	63	57	60	56	56	52	do	Calm, SE. 2, WNW. 2, calm	Do.
17	do		30.02	29.90	62	55	60	55	54	53	Overcast and foggy and rainy	Calm, variable 1, calm	Light.
18	do		30.20	30.02	64	55	62	55	56	53	Overcast and foggy	Calm, ENE. 1, calm, SW. 1	None.
19	do		30.30	30.20	62	56	60	55	57	53	Foggy and misty to clear and pleasant.	Variable 1	Do.
20	do		30.24	30.08	66	54	63	53	59	53	Foggy and misty	Calm, W. 1, calm	Do.
21	do		30.20	30.06	70	54	64	53	56	53	Foggy, overcast, and squally	Calm, W. 1	Do.
22	do		30.26	29.94	62	58	60	56	55	53	Fair and smoky	Calm, SE. 1, calm, variable 1	Do.
23	Departure Bay, B. C.		30.12	29.94	67	57	65	57	62	53	Squally and rainy to clear and pleasant.	Calm, SW. by W. 3, NE'ly 1, calm	Light.
24	49 13 00	123 49 00	30.16	30.00	60	56	58	55	59	53	Clear and pleasant to overcast and cloudy.	Calm, ESE. 2, NE. 1	None.
25	Victoria, B. C.		30.00	29.84	61	56	59	54	54	52	Misty, squally, and rainy	S. E'ly 1 to SW. 3	Light.
26	do		29.90	29.60	59	54	57	52	55	52	Cloudy, foggy, and rainy	Calm, SE'ly 1, calm	Do.
27	48 21 00	123 26 00	30.02	29.60	56	53	55	51	54	51	Clear and pleasant to squally and rainy.	SW. 3, S. 2	Do.
28	46 51 00	124 20 00	30.14	30.02	69	56	63	55	65	52	Fair; overcast and misty to clear and pleasant.	SE. 2, S. 2, SSW. 2, NW. 1, N. 2	None.
29	45 20 00	124 11 00	30.04	29.96	68	59	64	58	66	59	do	Variable 1	Do.
30	44 50 00	124 51 00	29.96	29.90	62	55	60	54	62	56	Cloudy, squally and rainy	SE'ly 2, N. by E. 3, N. 4, NNW. 3	Light.
31	44 08 00	124 32 00	30.28	29.98	71	56	66	54	63	56	Rainy to fair and pleasant	N'ly 4-2	Do.
Sept. 1	44 00 30	124 55 30	30.28	30.02	64	55	62	53	62	55	Clear and pleasant	NW'ly 2	None.
2	44 12 00	124 19 00	30.24	30.06	62	57	59	55	59	54	Drizzly and thick to fair and pleasant.	NW'ly 3-4	Light drizzle.
3	44 29 00	124 25 00	30.32	30.24	59	55	57	53	58	52	Clear and pleasant	N. 3, NW'ly 3-4	None.
4	46 06 00	124 03 30	30.26	30.10	67	54	63	52	62	52	do	NW'ly 2-3, SE. 2	Do.

	5	Astoria, Oregon		30.12	30.00	75	58	69	57	66	57	......do	Variable 1	Do.
	6	......do		30.20	30.10	68	56	67	55	66	58	Foggy, to clear and pleasant	SW. 2, SE. 1, W. 1, WSW. 3, W. 3	Do.
	7	46 16 00	124 02 00	30.26	30.20	63	57	61	55	63	54	Cloudy to fair to misty and rainy	NNW. 3, W. 1, NW. 2	Light.
	8	45 30 00	124 00 00	30.28	30.20	57	54	56	51	57	50	Fair and pleasant	NW'ly 2-4	None.
	9	45 07 00	124 03 15	30.30	30.18	55	50	53	47	57	48	Fair, to drizzly and rainy	SE'ly 2, and calm	Light.
	10	43 38 00	124 15 30	30.46	30.30	60	48	59	47	57	48	Fair and pleasant	SE. 1, WSW. 1-3, NW. 5-7, N. 6	None.
	11	43 07 00	124 41 00	30.36	30.26	60	50	58	49	59	48	Clear and pleasant	N'ly 5	Do.
	12	42 53 00	124 34 00	30.38	30.30	55	50	52	47	49	46	Foggy to fair and pleasant	N. 2, NNW. 1-4, N. 7-2	Do.
	13	42 36 00	124 41 00	30.30	30.16	58	49	57	47	51	47	Fair, and smoky and pleasant	N. 2-5, NW'ly 5-8-5	Do.
	14	43 38 00	124 41 00	30.30	30.20	58	50	56	49	57	48	......do	NW'ly 4-3, N. 3	Do.
	15	46 10 00	124 06 00	30.38	30.30	67	58	64	53	63	56	Fair to foggy, then clear and pleasant.	NNW. 3, W. 3, SW. by W. 2, WSW. 1.	Do.
	16	Astoria, Oregon		30.30	30.00	70	59	68	58	65	59	Clear and pleasant	NE'ly 1-2	Do.
	17	......do		30.02	29.80	84	65	74	61	64	61	......do	NE. 3, NNE. 4-2, N. 1	Do.
	18	......do		30.00	29.92	73	63	68	61	63	59	Foggy and smoky	Calm, variable 1, calm	Do.
	19	......do		30.06	30.00	61	58	60	56	61	57	......do	Calm, W. 1, SW. 1	Do.
	20	......do		30.10	30.04	68	53	64	52	61	56	Drizzly and overcast, to fair and pleasant.	Calm, S. 1, SW. 2	Light drizzle.
	21	......do		30.02	29.80	59	52	56	51	59	56	Fair and cloudy, to rainy	Calm, variable, 1-4	Light.
	22	......do		30.20	29.88	58	50	56	50	58	56	Rainy	SW'ly 1-3, SE'ly 3, S. 2	Moderate.
	23	......do		30.52	30.24	70	56	63	54	60	57	Rainy to fair and pleasant	SW. 2, SSW. 2, N. 1, W. 1, calm	Light.
	24	......do		30.54	30.36	73	54	70	54	61	56	Thick to clear and pleasant	NE. 2, NNE. 2, ENE. 3, N. 4	None.
	25	......do		30.34	30.12	75	57	67	57	67	58	Clear and pleasant	N. 3, NNE. 3-1, calm	Do.
	26	......do		30.20	30.04	75	57	70	56	64	59	......do	NNE. 1, NE. 2, calm	Do.
	27	Portland, Oregon		30.14	29.94	63	54	63	53	62	58	Thick and smoky	Calm, W. 1, calm	Do.
	28	......do		30.02	29.88	66	60	65	60	63	60	Thick and drizzly to fair to rainy.	Calm, SSE. 1	Light.
	29	......do		30.10	29.90	63	59	62	58	63	61	Rainy	SSE. 2, SE. 3, S. 1, calm, SE. 1	Moderate.
	30	......do		30.06	29.82	70	59	68	58	63	61	......do	SE. 1-2, SSE. 3-1, calm	Light.
Oct.	1	......do		30.22	29.88	64	57	63	56	63	58	Rainy to clearing and fair	SSE. 2, S. 1, SSE. 1, calm	Do.
	2	......do		30.30	30.20	65	53	61	51	61	58	Fair and pleasant	Calm	None.
	3	......do		30.30	30.02	65	53	65	52	63	58	Foggy to clear and pleasant	......do	Do.
	4	......do		30.10	29.98	68	55	64	53	63	59	Fair and pleasant	......do	Do.
	5	......do		30.10	29.94	68	52	66	51	63	58	Foggy to fair and pleasant to overcast.	......do	Do.
	6	......do		29.96	29.70	67	58	65	57	63	58	Misty and rainy	......do	Light.
	7	......do		29.78	29.70	62	57	61	56	62	59	Rainy	......do	Moderate.
	8	......do		30.04	29.76	59	55	58	55	60	59	......do	Calm, SSE. 1	Do.
	9	......do		30.22	30.06	57	53	56	51	60	57	......do	S. E. 1, 2, calm	Light.
	10	......do		30.26	30.14	60	51	58	51	59	55	Rainy to clearing	Calm, SE. 1, NE. 1, WSW. 2, SW. 1	Do.
	11	46 04 00	124 04 00	30.28	30.20	62	53	60	52	59	55	Fair and pleasant	Calm, variable 1, 2	None.
	12	42 21 00	124 31 00	30.20	30.04	69	54	66	54	62	57	Clear and pleasant	N. 2, NW. 1	Do.
	13	41 15 00	124 31 00	30.14	30.02	58	56	58	54	58	55	Thick and drizzly to fair and clearing.	NNW. 2, NW. 2-5	Do.
	14	39 05 00	124 02 00	30.22	30.10	65	56	64	55	57	56	Clear and pleasant	NNW. 6-5, NW. 3-1, S. 1	Do.
	15	San Francisco, Cal		30.26	30.12	62	55	60	55	61	56	Foggy to fair and pleasant	S'ly 1-2, calm	Do.
	16	......do		30.16	30.00	65	56	61	55	61	58	Fair and pleasant	Calm, ESE. 1, SW. 2	Do.
	17	......do		30.00	29.92	60	57	59	56	61	58	Fair to rainy	ESE. 3, SE. 4, SSE. 5	Light.
	18	......do		30.12	29.98	63	58	60	57	61	59	Rainy to fair	SSE. 3, SSW. 2, SW. 1, calm	Do.
	19	......do		30.08	29.74	63	58	61	57	61	59	Clear and pleasant to overcast and rainy.	Calm, ENE. 1, E. 2, SE. 1	Do.
	20	......do		29.76	29.54	60	58	59	57	61	59	Rainy and squally	SE. 1, E. 3, ESE. 4, 6	Do.

Record of meteorological observations by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Position at meridian.		Barometer.		Temperature.						Weather.	Direction and force of winds.	Rainfall.
					Air: Dry bulb.		Air: Wet bulb.		Water at surface.				
	Lat. N.	Long., W.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
1889.	° ′ ″	° ′ ″	°	°	°	°	°	°	°	°			
Oct. 21	San Francisco, Cal		29.84	29.74	62	58	60	58	60	58	Squally and rainy	SE. 3-6, S. 4, SE'ly 3	Light.
22	do		29.94	29.84	63	59	61	58	61	59	do	SE. 4, veering to S. 2	Do.
23	do		30.20	29.94	67	59	65	59	62	59	Clear and pleasant	S. 2, SSE. 3, S. 2-1	None.
24	do		30.20	30.06	66	60	63	59	61	59	do	Calm, E. 1, calm, W. 1-2	Do.
25	do		30.10	30.04	64	62	63	61	62	60	Rainy	Variable, 2 and 1	Light.
26	Navy-yard, Mare Island, California.		30.08	29.90	62	60	62	60	61	60	do	ENE. 2, ESE. 1, SSE. 2, SE. 1	Do.
27	do		30.26	30.08	69	57	67	56	62	59	Fair and pleasant	SE. 1, calm, S. 1, WSW. 1	None.
28	do		30.34	30.20	67	52	65	49	61	54	Clear and pleasant	WSW. 1, NW. 1, calm	Do.
29	do		30.30	30.20	62	49	61	48	60	56	do	Calm, SW. 1, SSW. 1, S. 2	Do.
30	do		30.30	30.18	65	51	62	51	61	55	do	WSW. 1, W. 1, calm	Do.
31	do		30.30	30.22	69	57	65	57	61	56	do	WSW. 2, NW. 3-4, calm	Do.
Nov. 1	do		30.40	30.28	67	54	65	53	61	55	do	Calm, E. 1, ENE. 2, calm	Do.
2	do		30.40	30.20	66	57	64	51	61	55	do	Calm, ENE. 1, E. 2, SE. 1, calm	Do.
3	do		30.22	30.10	73	56	69	55	64	57	do	Calm, NW. 4-3	Do.
4	do		30.12	29.92	73	60	70	58	63	56	do	NW. 1-2, WNW. 2	Do.
5	do		30.34	30.12	66	53	64	52	60	55	do	NE. 2, ESE. 1, ENE. 2, calm	Do.
6	do		30.48	30.28	62	46	61	45	59	52	do	Calm, E. 1, S. 1, SW. 1	Do.
7	do		30.36	30.14	62	48	60	48	59	55	do	Calm, ENE. 1, calm	Do.
8	do		30.36	30.24	65	50	64	49	61	53	do	Calm, E. 2, ENE. 1, calm	Do.
9	do		30.46	30.30	63	49	61	49	59	51	do	Calm, ENE. 1, WSW. 1, calm	Do.
10	do		30.32	30.08	63	50	62	50	59	54	do	Calm	Do.
11	do		30.14	29.98	69	57	67	56	61	55	do	NW'ly 3-1, calm	Do.
12	do		30.16	30.08	63	51	62	50	58	51	do	Calm, SSW. 1, calm	Do.
13	do		30.20	30.04	61	48	58	47	58	52	do	Calm, W. 1, calm	Do.
14	do		30.28	30.16	61	49	60	42	57	51	do	Calm, ENE. 2, calm	Do.
15	do		30.28	30.16	63	48	62	47	58	51	do	Calm, E. 2, ENE. 2	Do.
16	do		30.28	30.12	60	49	59	48	57	51	Fair and pleasant	Calm, ENE. 1, calm	Do.
17	do		30.12	30.06	60	55	60	55	58	53	Fair to overcast and rainy	Calm, E. 2, SE'ly 3, calm, SSE. 2	Light.
18	do		30.08	29.98	61	53	61	53	58	54	Rainy and squally	E. 1, SE. 2, S. 3-5	Heavy.
19	do		30.18	30.06	60	55	60	55	57	54	Rainy	S. 2-3, SSW. 4-5, W. 3-2	Do.
20	do		30.28	30.18	60	57	60	57	58	55	do	W. 1, calm	Moderate.
21	do		30.30	30.14	61	57	61	57	58	55	Overcast to clearing and fair	Calm	None.
22	do		30.16	30.00	59	49	58	49	57	50	Overcast and rainy to clear and pleasant.	Calm, S. 2, WSW. 2	Light.
23	do		30.26	30.18	57	47	56	46	56	50	Fair and pleasant	WSW. 1, calm, W. 1, calm	None.
24	do		30.36	30.26	55	46	54	45	55	50	do	Calm, SW. 1	Do.
25	do		30.44	30.26	59	48	59	47	56	49	Clear and pleasant	Calm, W'ly 1, calm	Do.
26	do		30.40	30.14	57	50	56	49	55	51	do	E 2	Do.

	27	....do....	30.12	30.00	54	50	54	50	54	51	Fair and overcast	E 3	Do.
	28	....do....	30.00	29.92	57	52	56	51	58	52	Fair to rainy	....do....	Light.
	29	....do....	30.06	30.00	56	53	56	52	54	51	....do....	E. 1, ENE. 2-4	Do.
	30	....do....	30.10	29.94	59	52	59	52	56	53	Fair to clear and pleasant	Calm, NE. 2, E. 1	None.
Dec.	1	....do....	30.08	29.88	59	53	59	53	57	53	Drizzly and rainy to fair and pleasant.	Calm, E. 1, WSW. 2	Light.
	2	....do....	30.20	30.06	61	51	59	51	55	52	Clear and pleasant to rainy	Calm, SE. 2	Do.
	3	....do....	30.10	30.02	60	53	59	53	55	52	Rainy to fair to rainy	SE. 2, SSE. 2	Do.
	4	....do....	30.02	29.90	56	51	55	51	55	52	Rainy and squally	SSW. 1, S. 3, SE. 2	Moderate.
	5	....do....	29.96	29.92	52	50	53	50	54	50	Rainy	SE. 3, ESE. 2, ENE. 3	Do.
	6	....do....	29.94	29.88	54	50	54	49	52	51	....do....	ESE. 3, E. 2	Do.
	7	....do....	30.14	29.92	59	51	58	51	52	50	Rainy to fair and clearing to rainy	E. 1, SE. 1, S. 2, SE'ly 3	Light.
	8	....do....	30.14	29.92	56	53	56	53	53	51	Rainy to fair and clearing	SE. 3, SW'ly 3-2	Do.
	9	....do....	30.26	30.14	58	53	57	53	54	52	Overcast, misty and rainy	SE'ly. 1, S. 1, SE. 1	Do.
	10	....do....	30.18	29.82	58	51	57	50	54	51	Rainy	SSE. 2, S. 2-4	Moderate.
	11	....do....	29.96	29.88	55	49	54	49	53	49	Fair to drizzly and rainy	Calm, variable 1	Light.
	12	....do....	30.14	29.86	54	47	54	47	52	48	Rainy to clear	NE. 3-1, SE. 1 calm	Do.
	13	....do....	30.26	30.14	52	45	50	45	51	48	Clear and pleasant	Calm, E. 1, calm	None.
	14	....do....	30.30	30.18	52	43	51	43	51	48	....do....	Calm, NE. 1-2, calm	Do.
	15	....do....	30.34	30.20	52	43	52	42	51	47	Foggy to clear and pleasant	Calm, SW. 2, calm	Do.
	16	....do....	30.34	30.10	51	42	50	42	50	45	Clear and pleasant to rainy	Calm, E. 3-1	Light.
	17	....do....	30.22	30.10	54	47	54	47	51	46	Rainy to clear and pleasant	S'ly 3-1, SW. 1, calm	Do.
	18	....do....	30.30	30.02	53	47	53	47	50	47	Rainy	E. 3, S. 1, ESE. 1	Do.
	19	....do....	30.30	30.18	56	49	56	49	51	47	....do....	ESE. 2, SE. 2, S. 2, SW. 4	Do.
	20	....do....	30.32	30.20	57	47	56	47	50	47	Drizzly to clear and pleasant	S. 2, SW. 1, calm	None.
	21	....do....	30.24	29.84	52	45	52	45	50	45	Fair to rainy and squally	SE. 2-6, SW. 5-3, calm	Moderate.
	22	....do....	29.96	29.82	47	44	47	44	48	44	Rainy to fair	E. 2, calm	Light.
	23	....do....	29.84	29.68	53	43	49	42	49	44	Rainy to fair to rainy	Calm, ENE. 2, SSE. 2-4	Do.
	24	....do....	29.86	29.72	50	45	50	45	48	45	Rainy	NE. 2, ENE. 4, E. 2-1	Do.
	25	....do....	30.20	29.86	54	47	53	47	49	46	Rainy to clearing and fair	SE. 2, NNW. 2	Do.
	26	....do....	30.28	30.20	48	46	48	45	47	45	Drizzly to clear and pleasant	Calm, ENE. 1-2	Light drizzle.
	27	....do....	30.30	30.20	49	42	49	42	48	43	Foggy to fair and pleasant	Calm, SSW. 1-2	None.
	28	....do....	30.44	30.24	52	43	51	42	48	42	Drizzly and rainy to fair	Calm, NW. 1, calm	Light.
	29	....do....	30.52	30.44	50	39	49	39	46	42	Clear and pleasant	Calm, E. 1, calm	None.
	30	....do....	30.42	30.18	54	45	53	45	48	44	Rainy to fair and pleasant	Calm, WSW. 2	Light.
	31	....do....	30.26	30.10	52	42	51	41	48	42	Clear and pleasant to drizzly	WSW. 1, W. 1	Light drizzle.
1890.													
Jan.	1	....do....	30.14	30.06	59	46	54	46	48	46	Fair	Calm, SSW. 1, WSW. 1, calm	None.
	2	....do....	30.14	29.88	51	46	51	46	47	45	Rainy and overcast	Calm, S. 1-2	Moderate.
	3	....do....	29.90	29.78	47	41	47	40	46	42	Rainy	SW. 3, variable 2, SSW. 1, calm	Do.
	4	....do....	29.96	29.84	45	39	44	39	45	38	....do....	Calm, E'ly 1-3	Light.
	5	....do....	30.18	29.96	47	37	46	37	45	38	Overcast and rainy to clear and pleasant.	Variable 0-1, calm	Do.
	6	....do....	30.30	30.20	46	36	45	36	44	38	Clear to rainy to clear and pleasant.	Calm, NNE. 1-2	Do.
	7	....do....	30.46	30.38	45	36	43	35	44	40	Clear and pleasant	Calm, E'ly 1, calm	None.
	8	....do....	30.46	30.30	45	36	45	35	43	38	Clear and pleasant to overcast and rainy.	Calm, E. 1, calm	Light.
	9	....do....	30.42	30.08	44	34	44	34	42	36	....do....	....do....	Do.
	10	....do....	30.20	30.10	48	38	49	37	43	39	Clear and pleasant	Calm, W. 1, calm	None.
	11	....do....	30.44	30.24	49	36	48	36	43	38	Clear and pleasant to overcast and drizzly.	Calm, NNW. 2-1, calm	Light drizzle.

Record of meteorological observations by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Position at meridian.		Barometer.		Temperature.						Weather.	Direction and force of winds.	Rainfall.
					Air: Dry bulb.		Air: Wet bulb.		Water at surface.				
	Lat. N.	Long. W.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
1890.	° ′ ″	° ′ ″	°	°	°	°	°	°	°	°			
Jan. 12	Navy-yard, Mare Island, California.		30.46	30.16	51	41	51	41	47	40	Drizzly and rainy to fair	Calm, E. 1-2, S. 2	Moderate.
13	....do		30.42	30.26	54	42	51	42	45	40	Clear and pleasant	N. 4, NW. 1, W. 2	None.
14	....do		30.44	30.32	49	38	49	37	43	40	....do	Calm, E. 1	Do.
15	....do		30.32	29.90	52	41	51	42	45	41	Fair and pleasant to overcast and rainy.	Calm, SE. 1-5, calm	Light.
16	....do		30.02	29.88	54	46	53	46	45	42	Overcast and rainy	Variable 1, S. 2-1	Do.
17	....do		29.96	29.90	53	46	52	46	46	43	....do	Calm, S'ly 1-3, calm	Do.
18	....do		30.30	29.96	50	42	49	42	46	40	Overcast and rainy to clear and pleasant.	SW'ly 1, calm	Do.
19	....do		30.40	30.26	50	37	48	37	45	40	Clear and pleasant to rainy and overcast.	Calm, E. 1	Do.
20	....do		30.46	30.20	45	38	44	37	44	40	Rainy to fair and pleasant	Variable 1, calm	Do.
21	....do		30.20	30.10	45	38	44	39	44	40	Overcast and rainy	SE'ly 3	Do.
22	....do		30.20	30.12	51	44	50	43	46	42	....do	SE'ly 3-2	Do.
23	....do		30.18	30.08	55	49	53	48	46	44	....do	....do	Moderate.
24	....do		30.06	29.84	58	50	57	49	50	45	....do	SE'ly 3-5	Do.
25	....do		30.20	29.84	50	44	50	43	48	40	Overcast and rainy to clear and pleasant.	Calm, WSW. 1, calm	Do.
26	....do		30.32	30.18	51	40	50	39	48	45	Clear and pleasant	Calm, E. 1	Light.
27	....do		30.38	30.28	49	40	46	39	46	42	....do	Calm, E. 1, calm	None.
28	....do		30.40	30.30	56	43	53	42	49	43	....do	Calm, E. 1, ESE. 1, calm	Do.
29	....do		30.34	30.18	60	51	58	50	51	47	Overcast and drizzly	Calm, SE. 1-2, SW. 1	Do.
30	....do		30.38	30.30	57	48	55	46	50	44	Fair to clearing	SW. 1, calm, SW. 1, calm	Light drizzle.
31	....do		30.40	30.32	55	41	54	40	50	44	Clear to fair and pleasant	Calm	None.
Feb. 1	....do		30.42	30.30	55	48	54	47	50	46	Fair to cloudy	Calm, SW. 1, calm	Do.
2	....do		30.34	30.20	60	48	59	47	51	45	Foggy and cloudy	Calm, SE. 1, calm	Do.
3	....do		30.30	30.20	62	53	60	52	52	45	Fair to overcast and drizzly	Calm, S'ly 1, calm	Light drizzle.
4	....do		30.40	30.30	61	53	59	52	52	49	Overcast and drizzly	SW. 1, SSW. 1, calm	Do.
5	....do		30.42	30.32	58	50	57	49	52	49	Overcast and drizzly to clear and pleasant.	Calm, S. 1, SW. 1	Do.
6	....do		30.42	30.26	59	46	56	45	54	49	Clear and pleasant	Calm	None.
7	....do		30.34	30.24	58	47	56	47	53	49	....do	E. 2, NE. 2, calm	Do.
8	....do		30.30	40.16	59	46	58	46	53	49	Foggy to clear and pleasant	Calm	Do.
9	....do		30.38	30.22	56	48	55	47	52	50	....do	SW. 1, S. 1, E. 1	Do.
10	....do		30.44	30.34	62	48	55	44	53	49	Clear and pleasant	N. 2, NW. 1, calm	Do.
11	....do		30.56	30.46	58	45	53	42	52	49	....do	E. 1-3, NE. 2, calm	Do.
12	....do		30.54	30.20	59	45	57	44	52	48	Clear and pleasant to fair and cloudy.	Calm, SW. 1-4, NW. 3	Do.

	13	....do		30.28	30.12	54	42	53	40	50	40	Clear and pleasant	NW. 3, N. 3-2, calm	Do.
	14	....do		30.26	30.16	56	40	54	39	50	48	....do	Calm	Do.
	15	....do		30.16	29.80	55	48	53	47	49	47	Overcast, drizzly, and squally	Calm, SE. 1, ESE. 2-5	Light drizzle, rain.
	16	....do		29.94	29.64	52	46	51	44	49	47	Overcast and rainy	SE. 4-6, S. 5, W. 3, SW. 1	Moderate.
	17	....do		29.98	29.78	53	42	52	41	49	45	....do	S'ly 1	Do.
	18	....do		30.00	29.76	47	42	46	42	47	44	....do	S. 1, SW'ly 2-4-2	Do.
	19	....do		30.04	29.90	45	41	44	40	47	44	....do	SE'ly 2-1, E. 1	Do.
	20	....do		30.00	29.86	51	43	51	42	47	44	Clearing to overcast and rainy	E. SE. 2-3, S. 3, SW. 2, calm	Light.
	21	....do		30.12	29.96	47	40	46	39	46	44	Cloudy and rainy	Calm, variable 1, calm	Do.
	22	....do		30.32	30.16	50	40	49	39	47	45	Rainy to clear and pleasant	Calm, SW'ly 1, calm	Do.
	23	....do		30.32	30.16	50	38	49	38	47	44	Clear and pleasant	Calm, S. 1, SW'ly 1	None.
	24	....do		30.16	30.02	54	42	52	41	47	45	Clear to drizzly and overcast	Calm, SW. 1, W. 1	Light drizzle.
	25	....do		30.02	29.92	51	40	50	38	47	40	Fair and pleasant	SW. 1, WSW. 2, W. 2-3	Light mist.
	26	....do		30.26	30.04	49	38	46	36	46	44	Clear and pleasant	W. 3, variable 1, calm	None.
	27	....do		30.42	30.28	51	36	46	36	47	42	....do	Calm, variable 1, calm	Do.
	28	....do		30.50	30.40	50	38	47	37	47	40	Clear and pleasant to overcast and misty.	Calm, easterly 1-4-1, calm	Light mist.
Mar.	1	....do		30.46	30.30	55	45	51	43	49	45	Overcast and misty to fair and pleasant.	Easterly 1-2, calm	Do.
	2	....do		30.32	30.16	59	46	57	45	58	45	Clear and pleasant to overcast and drizzly.	Easterly 1-2	Light drizzle.
	3	....do		30.30	30.22	59	50	56	50	50	47	Fair and cloudy	Calm, easterly 1	Do.
	4	....do		30.26	30.16	58	53	58	52	50	49	Overcast, drizzly, and rainy	E. 1, variable 1	Rain, light.
	5	37	58 30	122	26 00	30.18	30.08	60	51	59	50	52	48	Overcast and rainy, fair and pleasant, and overcast.	Southerly 1	Do.
	6	Navy-yard, Mare Island, California.				30.08	29.82	55	50	55	50	52	49	Foggy and rainy	Calm, S. 1-4	Do.
	7	....do				30.08	29.86	58	52	57	50	54	50	Overcast and rainy	S. 3-2, SW. 2-1	Do.
	8	....do				30.10	29.76	52	44	52	43	51	46	....do	Variable 1-6, SE. hauling to NW.	Moderate.
	9	....do				30.30	30.10	52	44	50	43	51	46	Fair and cloudy	Variable 5-2, S. 4-1	None.
	10	San Francisco Bay, California.				30.30	30.30	71	43	62	42	54	45	Clear and pleasant	WNW. 1-4	Do.
	11	37	27 20	122	44 00	30.36	30.44	60	48	55	45	53	49	....do	WNW. 4, NNE. 2, NW. 3	Do.
	12	37	03 30	122	18 00	30.36	30.48	58	47	57	45	55	50	....do	NNW. 1-2, NW. 1	Do.
	13	36	44 26	122	11 00	30.60	30.52	65	43	65	43	59	49	....do	NW. 1, E. 2-3, variable 1	Do.
	14	Monterey Harbor, California.				30.50	30.30	67	47	65	47	58	53	....do	Calm, northerly 2, E. 1	Do.
	15	36	55 00	122	12 00	30.32	30.18	58	49	57	49	55	52	....do	NNW. 2, NW'ly 1-2	Do.
	16	Navy-yard, Mare Island, California.				30.18	30.02	64	53	62	53	56	52	Foggy and cloudy, fair	Calm, E. 1, calm, SSW. 1	Do.
	17	....do				30.08	30.00	59	53	59	52	55	52	Fair to overcast and rainy	SW. 1, SSE. 1-2	Light.
	18	....do				30.00	29.92	56	50	55	49	54	52	Overcast and rainy	SE. 3-4, calm, NW. 1	Moderate.
	19	....do				30.10	29.96	51	46	50	45	54	51	Rainy to clear and pleasant	NW. 1, W. 2-3	Light.
	20	San Francisco, Harbor, California.				30.20	30.10	58	48	56	47	54	51	Clear and pleasant	NW. 2, W. 1-3	None.
	21	37	42 30	125	41 00	30.24	30.12	51	49	53	49	55	51	Foggy to fair and pleasant	Calm, variable 1, W. 1, calm	Do.
	22	37	48 35	123	12 40	30.18	30.08	53	51	53	51	53	52	Overcast, drizzly and rainy	SE. 1, hauling to NW. 3	Light.
	23	Drake Bay, California				30.26	30.18	52	49	52	48	53	50	Fair and pleasant to clear	NNW'ly 4-1	None.
	24	38	01 00	123	28 00	30.20	30.12	57	48	55	48	55	51	Clear and pleasant to cloudy and misty.	NNW. 1, W. 2-1, calm	Light mist, rain.
	25	38	32 30	123	25 00	30.18	30.06	52	49	50	48	53	50	Overcast, rainy, and squally	S. 2, SSW. 4-5	Light.

Record of meteorological observations by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Position at meridian.		Barometer.		Temperature.						Weather.	Direction and force of winds.	Rainfall.
					Air: Dry bulb.		Air: Wet bulb.		Water at surface.				
	Lat. N.	Long. W.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
1890.	° ′ ″	° ′ ″	°	°	°	°	°	°	°	°			
Mar. 26	San Francisco Harbor		30.42	30.20	52	49	50	48	53	50	Rainy and squally to fair	SW. 3-5, NW. 2, W. 2	Light.
27	do		30.42	30.22	58	49	56	48	55	53	Clear and pleasant	W. 2, NW. 2-1, WSW. 4, W. 4	None.
28	38 24 00	123 26 30	30.22	30.06	53	48	51	47	53	50	Clear and pleasant to overcast and rainy.	WNW'ly 2-3	Light.
29	37 50 00	122 41 30	30.22	30.04	55	49	54	47	53	49	Overcast and rainy to fair	WNW. 2, NW. 1, SW. 1-3	Do.
30	San Francisco Harbor		30.28	30.14	52	49	52	47	54	53	Overcast and rainy to fair and pleasant.	WSW. 2, W. 4-3	Do.
31	do		30.22	30.08	64	48	58	46	56	52	Clear and pleasant	NW. 3, W. 3	None.
Apr. 1	do		30.12	30.00	66	53	59	52	57	54	do	Calm, SW. 2	Do.
2	do		30.28	30.12	55	50	52	49	54	42	Overcast, drizzly, and cloudy	S. 2-1, SW. 2-3, WNW. 1	Light drizzle.
3	36 19 00	122 00 30	30.30	30.22	56	51	54	50	54	51	Clear and pleasant	NW. 2, NNW. 3, NW. 3	None.
4	35 37 00	121 13 30	30.22	30.12	56	50	55	49	54	52	Fair and pleasant	NW. 4-5-2	Do.
5	35 14 00	121 07 00	30.26	30.18	57	50	56	50	54	51	do	NW'ly 2-5	Do.
6	34 15 30	119 52 30	30.26	30.16	61	53	59	53	58	52	do	NW. 4, WNW. 2, W. 4-1	Do.
7	Santa Barbara Harbor		30.30	30.18	58	52	57	52	57	52	do	Calm, WSW. 1-6, W. 7-8	Do.
8	34 11 15	120 10 30	30.20	30.08	60	53	59	53	55	52	Clear and pleasant	WSW. 5-2, W. 2, N'ly 1	Do.
9	36 13 50	121 14 00	30.20	30.10	73	54	67	54	62	51	do	NW'ly 1, calm	Do.
10	Monterey Harbor		30.14	29.96	66	54	65	54	60	54	do	Calm, NW. 2, W. 1	Do.
11	36 46 10	121 59 40	30.12	30.00	55	49	55	48	58	52	Foggy and misty to fair and pleasant.	Calm, NW. 2, W. by N. 4, NE. 1	Do.
12	36 59 00	122 27 00	30.28	30.16	50	47	49	46	55	50	Fair and pleasant	NW. 1-4	Do.
13	Navy-yard, Mare Island, California.		30.32	30.20	62	47	60	47	60	48	Clear and pleasant	Calm, SW'ly 1-2	Do.
14	do		30.26	30.12	66	51	63	50	62	59	do	Calm, W. 1	Do.
15	do		30.26	30.20	65	52	63	52	64	53	do	W. 1, SW'ly 1, W. 2	Do.
16	do		30.22	30.22	63	52	61	51	61	59	Fair and cloudy	Calm, SSW. 1-2	Do.
17	do		30.22	29.86	64	53	63	52	In dry dock		Fair to overcast, drizzly, and rainy	S. 1, SW'ly 1, S. 1, SE. 1	Light.
18	do		30.02	29.86	57	51	56	51	do		Overcast and rainy	S'ly and W'ly 1-2, varying	Do.
19	do		30.16	30.02	62	50	60	50	do		Cloudy to fair	Calm, SW'ly 1	None.
20	do		30.20	30.14	64	51	61	50	do		do	Calm, W. 1, S. 1, W. 1	Do.
21	do		30.22	30.10	67	51	65	50	do		Fair and pleasant	Calm, SW'ly 1-2	Do.
22	do		30.18	30.06	67	50	64	49	do		do	SW. 2, SSW. 1	Do.
23	do		30.20	30.12	65	52	63	51	do		Fair to clear and pleasant	SSW. 1, SW. 1, S.	Do.
24	do		30.22	30.10	72	50	69	49	do		Clear and pleasant	Calm, S'ly 0-1	Do.
25	do		30.20	30.10	69	54	65	52	do		do	S. 1, SW. 2, W. 1	Do.
26	do		30.18	30.04	70	51	69	51	do		do	SSW. 1, S. 1	Do.
27	do		30.18	30.00	60	52	65	51	do		do	S. 1, SSW. 1	Do.
28	do		30.10	30.02	60	51	53	51	61	57	Fair and pleasant	SSW. 1-2, SW'ly 3-1	Do.
29	do		30.12	30.02	62	52	60	50	62	55	Cloudy and pleasant to drizzly	SW. 1-2, SSW. 1	Light drizzle.

	30	......do						30.18	30.12	64	52	62	51	62	59	Cloudy to fair	SW'ly 1	None.
May	1	......do						30.20	30.04	63	52	60	52	62	55	Clear and pleasant	W'ly 1, W. 2	Do
	2	San Francisco Harbor, California.						30.18	30.10	65	54	63	52	62	56	Fair and pleasant	SE. 0-1, SW. 3	Do
	3	......do						30.22	30.10	68	58	68	58	62	58	......do	E'ly 1, W. 3	Do.
	4	......do						30.12	30.04	67	57	65	56	60	52	......do	Calm, W. 1-4	Do.
	5	......do						30.14	30.10	64	51	61	51	60	52	......do	W'ly 3-4	Do.
	6	40	07	00	124	38	00	30.12	30.06	54	51	54	51	54	51	Cloudy and misty	WNW'ly 2-4	Do.
	7	43	17	00	124	51	00	30.12	30.04	55	53	55	53	54	52	Overcast with passing showers	NW. 4, WNW. 2-3	Light.
	8	46	20	30	124	09	00	30.12	30.04	53	49	53	49	55	50	......do	W'ly 3-2	Do.
	9	48	24	20	123	13	00	30.12	30.00	54	46	53	46	55	48	Fair and pleasant	Variable 0-1, calm	None.
	10	Departure Bay, British Columbia.						29.98	29.76	53	49	55	49	56	52	Overcast and rainy	Calm	Moderate.
	11	......do						30.42	29.86	54	50	54	50	57	55	......do	......do	Do.
	12	......do						30.58	30.42	58	48	58	47	60	53	Cloudy to fair and pleasant	Calm, E. 1-2, calm	None.
	13	......do						30.58	30.30	60	52	59	50	63	53	Fair and pleasant	Variable 0-2	Do.
	14	50	33	50	126	52	40	30.32	30.18	58	51	58	52	56	51	......do	Calm, SW'ly 2-1	Do.
	15	51	09	00	132	35	00	30.18	29.86	52	45	52	45	53	47	Overcast and misty	SE'ly 2-4, S. 2	Light.
	16	51	52	00	137	27	00	30.10	29.94	47	45	46	45	54	42	Overcast, squally, and rainy	S. 5-3, SSE. 5-6	Do.
	17	52	25	30	142	41	30	29.96	29.80	45	40	45	40	47	44	Rainy to misty and cloudy	S. 4, SSE. 3	Do.
	18	52	43	30	147	44	00	29.78	29.68	41	38	41	38	45	43	Overcast, rainy, and misty	S. 2, SW. by W. 3, SW. 3	Do.
	19	53	13	00	152	48	17	29.76	29.48	42	39	42	39	44	43	......do	SW'ly 2, S. 3, SE'ly 2	Do.
	20	53	55	00	158	04	40	29.46	29.32	44	41	44	41	46	43	......do	SE'ly 1-3, variable 0-1	Do.
	21	54	00	40	162	57	00	29.42	29.14	44	39	44	39	44	40	......do	NE'ly 1-5	Do.
	22	54	16	00	165	13	00	29.74	29.24	42	38	42	38	43	40	Clearing to fair, then squally	NW. 1 to SW. 5	None.
	23	54	36	30	166	53	00	30.22	29.76	39	36	39	36	45	40	Squally, with rain, snow, sleet; overcast.	W. 4-5, NW. 3	Moderate.
	24	Iliuliuk Harbor, Unalaska Island.						30.34	30.16	45	38	43	37	46	42	Overcast and cloudy	Variable 0-1	None.
	25	......do						30.12	29.75	51	39	49	39	54	42	Overcast and rainy	Variable 2-1	Light.
	26	......do						30.14	29.72	44	42	44	42	46	43	......do	SSW. 4, SW. 4-2	Do.
	27	......do						30.22	30.14	55	42	50	42	50	45	Clearing to fair	SE'ly 2-1	None.
	28	54	29	00	165	10	20	30.36	30.18	45	41	45	41	46	42	Squally, overcast, and rainy	ESE. 4, SE. 3, S. 7	Light.
	29	55	11	30	163	17	09	30.36	30.28	45	42	44	42	46	44	Rainy to overcast and cloudy	S. 7, SE'ly 4-6	Do.
	30	56	10	00	160	31	30	30.20	30.08	48	41	47	41	46	41	Overcast, squally, and rainy	E'ly 3-5, S'ly 4	Do.
	31	58	03	30	157	46	00	30.14	29.90	50	42	50	42	50	41	......do	E'ly 5-2	Do.
June	1	58	41	00	157	12	00	29.92	29.82	52	43	50	42	51	46	Overcast to fair	E. by S. 3, SE. 5	None.
	2	58	28	10	157	36	00	30.02	29.92	64	41	58	41	59	45	Fair and pleasant	ESE. 3 to WNW. 1	Do.
	3	58	50	00	158	31	40	30.10	30.02	53	46	52	46	52	47	Cloudy and pleasant	N. by W. 1 to S. 1	Do.
	4	Clark Point, Nushagak River, Alaska.						30.30	30.12	53	46	53	46	52	48	Cloudy and thick	NE'ly 1-2	Do.
	5	......do						30.32	30.24	63	45	60	44	58	48	Fair weather	WSW. 1-2	Do.
	6	......do						30.32	30.08	62	44	61	44	55	49	Foggy to clear and pleasant	SW. 1, S. 2	Do.
	7	58	31	00	158	35	00	30.06	29.92	55	35	54	35	53	39	Clear and pleasant to thick and foggy.	SSW. 1-3	Do.
	8	58	37	00	159	56	00	29.90	29.80	50	36	45	36	49	41	Fair and pleasant	SW. 2, S. 2	Do.
	9	58	43	00	161	02	20	29.86	29.60	47	39	47	38	49	38	Overcast and misty	S. 3-1, SE. 2	Do.
	10	58	40	00	162	06	00	29.58	29.40	44	40	43	39	44	40	Thick, rainy, and squally	ESE. 7-4	Light.
	11	58	57	00	162	05	00	29.52	29.40	47	40	46	39	48	41	Squally and rainy to fair	SE. 4 to E. and S. 1	Do.
	12	59	06	00	161	59	00	29.66	29.52	44	42	45	40	46	43	Misty and rainy	ESE. 2-4	Do.
	13	58	40	30	162	06	00	29.88	29.66	43	38	42	38	44	39	......do	ESE. 4, SE. 3	Do.
	14	56	55	30	164	30	00	30.16	29.90	46	38	45	38	47	39	Overcast and cloudy	SE. 2, E. and N. 2	None.

Record of meteorological observations by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Position at meridian.		Barometer.		Temperature.						Weather.	Direction and force of winds.	Rainfall.
					Air: Dry bulb.		Air: Wet bulb.		Water at surface.				
	Lat. N.	Long. W.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
1890.	° ′ ″	° ′ ″			°	°	°	°	°	°			
June 15	54 43 00	166 01 00	30.12	29.56	45	41	44	41	45	44	Squally, rainy, and misty	E'ly 4-7	Light.
16	Iliuliuk Harbor, Unalaska Island.		30.06	29.82	47	42	45	41	50	46	Misty and rainy	SE. 2	Do.
17	....do		30.06	29.50	48	39	46	39	49	44	....do	S. 1 to E. 4	Do.
18	....do		29.58	29.22	45	39	44	39	47	43	Squally and rainy	SE. 4, S. 4, SW. 7	Do.
19	....do		30.00	29.60	44	41	43	40	45	44	....do	SW. 4-8, WSW. 6-1	Do.
20	....do		30.06	29.98	50	41	49	41	52	44	Overcast and rainy	Calm, NE'ly airs 1	Do.
21	....do		30.14	30.04	51	44	50	43	52	44	Overcast and cloudy	Calm, variable 1	None.
22	....do		30.18	29.94	50	43	49	42	50	46	Overcast and rainy	SW. 1, NNE. 1, E. 2	Light.
23	....do		29.88	29.36	48	42	47	42	49	45	....do	E. 3, SE. 4	Do.
24	54 41 30	164 51 00	29.40	29.34	45	42	44	41	45	44	Misty and foggy	SSW. 1 to W. 2	None.
25	55 23 10	163 20 00	29.70	29.38	49	42	49	41	48	44	Thick, drizzly, and misty	W. 2, SW. 3	Light.
26	55 16 30	163 02 00	29.78	29.68	44	42	44	42	47	44	....do	SW. 2	Do.
27	55 25 50	163 08 00	30.10	29.80	44	42	44	41	46	44	Misty and foggy	W'ly 2-3	None.
28	56 29 50	162 26 00	30.24	30.10	45	41	45	40	46	44	Overcast and cloudy	SW. by S. 3, SW. 3	Do.
29	56 18 30	160 53 00	30.22	29.70	46	41	44	41	50	44	Cloudy and misty	SW. by S. 3, S. 4, SE. 6-8	Do.
30	55 53 10	160 46 20	29.66	29.46	49	43	48	42	51	46	Thick, rainy, and misty	ESE. 4-6, SSE. 1	Light.
July 1	55 53 10	160 46 18	29.92	29.66	54	45	54	45	54	50	Overcast and showery	SE. 1 to WNW. 2	Do.
2	55 53 10	160 48 58	29.88	29.62	51	45	51	44	52	45	Overcast, occasionally clearing	NE. 1 to NW. 1, calms	None.
3	55 46 40	160 47 45	29.82	29.64	53	46	52	46	53	48	Overcast to fair and pleasant	Variable 2, calms	Do.
4	55 46 40	160 47 45	30.02	29.86	50	46	50	46	52	50	Misty and squally, occasionally clearing.	WSW. 2 to NW. 3	Do.
5	55 46 40	160 47 45	30.20	30.02	46	44	46	44	51	49	Foggy and misty to rainy	W. 2-4	Light.
6	55 45 20	160 42 10	30.34	30.22	46	41	45	41	51	48	Overcast and misty	W. 4, NW. 3, calms	None.
7	55 45 20	160 42 10	30.26	29.54	51	41	50	41	52	48	Misty, squally, and rainy	Calms, W'ly 6-9	Light.
8	55 45 20	160 42 10	29.80	29.46	52	45	51	45	53	49	Rainy and foggy	SE. 4, W. 6	Do.
9	55 45 20	160 42 10	30.06	29.80	45	41	45	41	50	45	Overcast and rainy	W'ly 3-4	Do.
10	55 45 20	160 42 10	30.32	30.06	47	44	47	44	51	48	Overcast, misty, and rainy	W. 3-4	Do.
11	55 45 20	160 42 10	30.47	30.32	49	43	48	43	51	48	Overcast, foggy, and misty	WNW. 1, W. 3	None.
12	55 45 20	160 42 10	30.50	30.44	52	45	51	44	53	49	Overcast to clear to foggy and misty.	SW. 1-3	Do.
13	55 45 20	160 42 10	30.46	30.40	50	45	39	44	58	52	Foggy to fair and pleasant	Variable 1, calms	Do.
14	55 45 20	160 42 10	30.40	30.22	54	46	51	45	56	50	Fair and pleasant to rainy	SE. 3-8	Light.
15	55 45 20	160 42 10	30.20	30.10	56	46	55	45	55	50	Squally, misty, and rainy	SE. 6-8	Do.
16	55 53 15	160 46 25	30.16	30.10	52	44	50	44	54	46	Overcast, misty, and rainy	SE. 4-7, SW. 6, S. 6	Do.
17	56 22 00	160 13 00	30.16	30.12	47	41	47	41	49	42	Foggy, misty, and rainy	SSW. 4 to WSW. 6	Do.
18	57 08 45	159 23 00	30.18	30.08	45	40	45	40	48	41	Overcast, misty, and foggy	SW. 2, W. 3	None.
19	57 25 00	158 44 00	30.34	30.14	49	42	49	42	52	46	Foggy to fair and pleasant	S. 2, W. 3	Do.
20	58 00 10	159 01 00	30.44	30.34	51	45	50	45	55	49	Fair and pleasant	S. 2, SSW. 3	Do.

21	57 30 00	160 12 00	30.48	30.40	50	45	49	45	52	45	Overcast and foggy, occasionally clearing.	SSW. 2, SW. by W. 3	Do.
22	57 34 00	161 25 30	30.46	30.44	47	45	47	45	52	48	Foggy and misty, clearing at intervals.	SSW. 2 to W. by S. 6	Do.
23	56 01 20	160 37 20	30.46	30.40	49	46	49	46	52	48	Overcast, misty, and rainy	SSW. 2 to WNW. 3	Light.
24	55 45 15	162 42 10	30.42	30.38	50	47	50	46	54	49	......do	W. 2-3	Do.
25	55 45 15	162 42 10	30.50	30.44	51	47	51	47	55	50	......do	W. 3-4	Do.
26	55 45 15	162 42 10	30.50	30.44	50	46	50	46	54	52	......do	......do	Do.
27	55 45 15	162 42 10	30.44	30.24	57	50	56	50	58	53	......do	WNW. 2, NW. 4	Do.
28	55 45 15	162 42 10	30.34	30.24	50	46	50	45	54	52	......do	W. 2-6	Do.
29	56 05 45	161 02 30	30.44	30.36	49	45	48	45	53	50	Cloudy and misty	W. 3, S. by W. 4	None.
30	55 03 30	164 00 10	30.52	30.44	50	40	49	46	54	47	Overcast, foggy, and rainy	W. by S. 2 to SSW. 4	Light.
31	Iliuliuk Harbor, Unalaska Island, Alaska.		30.52	30.38	66	46	63	46	64	50	Foggy to fair and pleasant	SE. 2 to W. 4	None.
Aug. 1	......do		30.44	30.32	64	50	62	50	61	53	Fair to rainy, misty and squally	S. 1, SSW., squalls 5	Light.
2	54 02 00	167 14 00	30.56	30.40	51	47	50	46	54	48	Fair and pleasant to overcast	SW. 1, S. 2	None.
3	54 20 00	171 03 15	30.34	30.10	50	47	50	47	51	50	Rainy, with lightning and overcast.	SE. by S. 4, veering to NW. 6	Heavy.
4	56 27 30	172 14 30	30.28	29.92	47	45	47	44	51	49	Rainy and squally, sun appearing at intervals.	NNE. 2, calm, SSE. 7	Light.
5	58 43 00	174 43 00	29.86	29.74	47	45	47	45	50	47	Rainy and overcast	SE. 5, WSW. 8	Moderate.
6	56 25 30	175 27 10	30.18	29.88	52	45	49	45	51	48	Overcast and misty	WSW. 6 to NNE. 2	None.
7	54 06 00	175 32 00	30.36	30.16	49	46	49	45	51	49	Fair and pleasant	NW. 1, NE. by N. 2	Do.
8	54 08 00	171 55 00	30.36	30.26	52	46	50	45	52	50	......do	NE. by N. 2 to SW. 2	Do.
9	53 57 00	167 05 00	30.24	30.20	49	46	48	46	52	50	Overcast and rainy to fair	WSW. 4, W. 3, variable 1, calms.	Light.
10	Iliuliuk Harbor, Unalaska Island, Alaska.		30.20	30.18	52	47	50	46	53	50	Overcast, with occasional mist, squally.	SE. 1 to SW. 3, calms	None.
11	......do		30.40	30.20	52	49	50	48	53	51	Foggy to clear and pleasant	Variable airs and calms	Do.
12	......do		30.42	30.34	65	46	65	46	57	52	Fair to overcast and misty	SE. 2, ENE. 3	Do.
13	......do		30.36	30.10	59	48	58	46	56	52	Overcast and misty to fair and pleasant.	Variable airs and calms	Do.
14	......do		30.08	29.96	57	52	55	50	57	52	Fair weather to rainy to fair	Variable airs and calms to S. 4	Light.
15	54 01 23	166 23 37	29.98	29.94	64	50	61	50	56	53	Cloudy and squally	S. 4, ESE. 6	None.
16	53 56 00	167 00 00	30.02	29.94	61	54	59	52	54	52	Foggy and rainy to cloudy and pleasant.	ESE. 4-6, SW. 3-2	Light.
17	53 46 00	166 53 00	30.12	29.98	61	57	59	56	57	53	Overcast and foggy to fair and pleasant.	Variable 2	None.
18	53 41 23	167 16 00	30.48	30.12	56	46	55	46	55	47	Foggy and misty to fair and pleasant.	Variable 2-1	Do.
19	53 23 30	167 30 00	30.48	30.36	50	45	50	44	50	45	Fair and pleasant	Variable 2-3	Do.
20	53 31 30	167 35 00	30.42	30.02	50	46	50	45	49	45	Foggy and misty, occasionally clearing.	Variable 1, calms	Do.
21	54 01 00	166 52 30	30.06	29.98	52	46	52	45	52	45	Overcast and foggy to fair	S. 2, NW. 4	Do.
22	53 54 00	166 35 35	30.06	29.82	54	46	53	45	54	47	Overcast and pleasant	Variable 1, calms	Do.
23	53 52 40	166 32 00	30.00	29.80	52	48	51	46	52	50	Overcast, misty, and squally	Calms, NNW. 4	Do.
24	Iliuliuk Harbor, Unalaska Island, Alaska.		30.10	29.96	65	47	65	46	60	50	Cloudy, but pleasant	NW. 4, NE. 3	Do.
25	......do		29.96	29.88	52	47	50	46	51	54	Cloudy and pleasant to rainy	Northerly 2-3, calms	Light.
26	......do		29.98	29.92	50	47	53	46	50	45	Rainy to fair and pleasant	NWly 1-3, calms	Do.
27	53 58 00	162 37 00	30.02	29.94	60	49	59	48	55	50	Fair and pleasant	WNW. 3, veering to S. 3	None.

Record of meteorological observations by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Position at meridian.		Barometer.		Temperature.						Weather.	Direction and force of winds.	Rainfall.
					Air: Dry bulb.		Air: Wet bulb.		Water at surface.				
	Lat. N.	Long. W.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
1890.	° ′ ″	° ′ ″	°	°	°	°	°	°	°	°			
Aug. 28	54 34 00	138 47 40	30.19	30.02	53	52	53	51	53	51	Fair and pleasant to overcast and misty	SE'ly 3-4	None.
29	55 41 00	134 48 00	30.18	30.10	55	53	55	53	55	51	Overcast, misty, and foggy	SE'ly 4-6	Do.
30	56 01 00	130 52 00	30.14	30.08	55	54	55	54	55	53	Overcast, foggy, and rainy	SE. 4, S. 6	Light.
31	55 49 00	146 33 00	30.08	29.84	55	53	54	52	55	52	Foggy, misty, and rainy	SE. 2, S. by W. 5	Heavy.
Sept. 1	55 49 00	141 58 00	30.20	29.92	58	54	56	53	56	54	Misty and rainy to fair and pleasant	S. 6 to SW. by W. 3	Light.
2	54 27 00	137 37 00	30.28	30.23	57	55	57	53	56	55	Fair to misty and rainy	S. 3, SE. 4, S. by W. 4	Do.
3	53 55 30	132 25 30	30.42	30.30	65	57	61	55	59	55	Rainy to fair and pleasant	SW. 3-4, veering to NW. 4	Do.
4	51 09 30	130 12 45	30.42	30.30	76	56	67	55	60	55	Fair and pleasant	NW. 4-5	None.
5	49 05 00	126 24 00	30.28	30.20	82	54	71	52	58	51	do	NW'ly 5-2	Do.
6	Port Townsend, Wash.		30.32	30.16	65	52	60	51	55	50	Clear and pleasant	Variable 1	Do.
7	do		30.18	29.96	70	51	66	50	57	50	do	Variable 2, calms	Do.
8	do		30.08	29.98	66	57	65	56	55	52	Fair and pleasant	do	Do.
9	do		30.10	29.92	70	56	66	54	56	52	Clear and pleasant	W'ly 1, calms	Do.
10	do		30.10	29.94	59	52	57	51	56	50	Clear and pleasant, smoky horizon	do	Do.
11	do		30.30	30.16	61	52	55	50	54	50	Fair, smoky, and pleasant	W'ly 3, calms	Do.
12	do		30.32	30.18	70	50	65	49	55	49	Fair, pleasant, and smoky	W'ly 1, calms	Do.
13	do		30.30	30.26	62	50	60	49	55	50	Thick smoke and fog; pleasant	Variable 1, calms	Do.
14	do		30.34	30.24	61	52	59	51	54	50	do	Variable 2-3	Do.
15	do		30.20	30.04	65	50	64	49	53	50	do	Variable 2-3, calms	Do.
16	48 22 15	122 49 00	30.10	30.04	59	53	53	53	53	50	do	S'ly 1, calms	Do.
17	49 11 00	123 52 00	30.28	30.10	62	56	59	51	57	52	Rainy to fair and pleasant	SW. 2, NW. 4	Light.
18	Deperture Bay, B. C.		30.30	30.10	60	52	59	51	57	51	Pleasant weather	Variable 1, calms	None.
19	49 13 10	123 57 90	30.28	30.10	76	52	72	50	60	51	Fair and pleasant	SE'ly 2, calms	Do.
20	48 13 00	122 52 00	30.36	30.28	58	48	57	48	53	49	Clear and pleasant, smoky, hazy horizon	W'ly 1, calms	Do.
21	47 27 20	125 17 00	30.32	30.04	60	49	60	49	55	49	Foggy to fair and pleasant	NW'ly 2-4	Do.
22	45 22 00	125 05 00	30.12	30.02	57	50	56	49	57	49	Foggy	N. 2-3 to SE'd 3	Do.
23	43 00 00	124 36 00	30.16	30.10	57	50	56	50	52	50	Foggy to clear, with hazy horizon	Variable 2, calms	Do.
24	40 24 20	124 33 30	30.14	30.06	58	52	57	52	54	52	Fair and pleasant, thick, smoky horizon	NW'ly 2-3, E'ly 3, calms	Do.
25	38 58 00	124 01 20	30.16	30.06	55	53	55	53	54	53	Overcast and foggy	NW'ly 2-3	Do.
26	San Francisco Harbor		30.10	29.98	67	54	66	53	64	53	Clear overhead, thick, foggy horizon	Variable 1, calms	Do.
27	do		30.22	30.14	70	60	66	59	62	59	Overcast, with drizzling rain	W'ly 2-4	Light.
28	do		30.16	30.06	71	63	68	60	64	59	Cloudy to drizzly and rainy	Variable 1, calms	Do.
29	do		30.12	30.04	63	59	62	59	62	60	Overcast, foggy, and rainy	do	Do.
30	do		30.18	30.10	64	59	64	58	63	60	Overcast and misty to clearing	SW'ly 1	None.
Oct. 1	Navy yard, Mare Island.		30.16	30.04	67	58	66	57	64	61	Foggy to fair and pleasant	SW. 1	Do.
2	do		30.12	30.00	77	57	68	57	60	55	Fair and pleasant	SW. 1 to NW. 3	Do.
3	do		30.12	30.02	82	55	70	54	65	56	Fair weather	SW'ly 1, calm	Do.
4	do		30.16	30.02	75	55	72	54	65	60	do	SW. 2 to SE. 4	Do.
5	do		30.16	30.00	83	59	75	58	66	59	do	SE. 2-3	Do.

6	......do	30.14	30.00	78	60	75	60	66	62	......do	NW. 2, SW. 3	Do.
7	......do	30.06	29.88	75	61	70	60	67	63	Clear and pleasant	S'ly 1, calm	Do.
8	......do	29.90	29.68	69	56	68	52	66	60	Fair and pleasant	SW. 4-6, calm	Do.
9	......do	30.00	29.72	66	56	64	52	63	60	......do	NW. 8, NW. 2, SE. 3	Do.
10	......do	30.12	30.02	70	52	65	50	62	58	Clear and pleasant	Variable, 1	Do.
11	......do	30.24	30.08	58	50	57	49	62	57	......do	SW'd. 1-3	Do.
12	......do	30.34	30.20	62	49	60	49	62	57	......do	WSW. 1 to SSW. 1	Do.
13	......do	30.26	30.10	64	49	61	48	62	55	......do	Calm, SW'd 1	Do.
14	......do	30.18	29.96	67	51	64	50	63	56	......do	Calm, S'd 1	Do.
15	......do	30.04	29.88	68	49	63	49	62	56	......do	Calm, SW. 1	Do.
16	......do	30.02	29.88	68	50	63	49	62	58	......do	SW. 1, south 1	Do.
17	......do	30.10	29.96	69	51	65	50	62	57	......do	Calm. SE. 1	Do.
18	......do	30.20	30.10	68	53	62	52	61	54	......do	Calm, SW'd 1	Do.
19	......do	30.24	30.14	74	54	71	52	62	56	Fair and pleasant	SE. 2 to S. 1	Do.
20	......do	30.16	29.94	72	53	67	52	62	58	Clear and pleant	Calm, SW'd 1	Do.
21	......do	30.04	29.84	75	55	66	54	65	55	......do	Calm, East 1	Do.
22	......do	30.00	29.88	72	56	68	55	64	57	Fair and pleasant	Calm, W'ly. 1	Do.
23	......do	30.10	30.00	72	54	68	53	64	58	Clear and pleasant	SW. 1, SSW. 1	Do.
24	......do	30.20	30.00	71	56	69	55	64	60	......do	Calm, W'd 1	Do.
25	......do	30.14	29.96	76	55	71	55	63	56	......do	E'ly 1	Do.
26	......do	30.12	29.98	77	59	68	57	65	58	Fair and pleasant	Calm, east 2	Do.
27	......do	30.20	30.02	76	56	70	55	63	56	Clear and pleasant	Calm, east 1	Do.
28	......do	30.20	29.98	78	56	70	54	65	60	......do	Calm, NW. 1, E. 1	Do.
29	......do	30.14	29.96	75	57	68	54	64	55	......do	Calm, E. 1	Do.
30	......do	30.20	30.08	68	57	68	56	63	57	......do	Calm. S'ly 1	Do.
31	......do	30.26	30.14	62	54	61	53	61	54	Fair and pleasant	W. 1 to SSW. 1	Do.
Nov. 1	......do	30.28	30.18	59	52	58	51	61	57	Foggy to fair and pleasant	W. 1, SSW. 1	Do.
2	......do	30.28	30.18	61	50	60	49	59	55	Clear and pleasant	NW. 1, veering to S. 1	Do.
3	......do	30.34	30.14	70	49	65	49	64	55	Calm, clear, and pleasant	Calm, E. 1	Do.
4	......do	30.20	30.00	61	51	60	50	60	56	Clear and pleasant	Calm, S. 1	Do.
5	......do	30.00	29.78	61	52	59	49	60	56	Fair and pleasant	W. 1-3	Do.
6	......do	29.90	29.80	57	48	54	48	58	50	......do	W. 2, NNE. 2, calm	Do.
7	......do	29.96	29.84	65	46	63	45	59	50	Clear and pleasant	Calm, SSW. 1, SW. 1	Do.
8	......do	30.16	30.00	59	46	57	45	58	55	......do	E. 1	Do.
9	......do	30.28	30.16	61	46	59	45	57	54	......do	Calm, NE. 1	Do.
10	......do	30.40	30.24	62	46	62	45	59	50	......do	Calm	Do.
11	......do	30.44	30.28	64	46	61	46	59	54	......do	ESE. 1, SW. 1, NW. 1	Do.
12	......do	30.32	30.22	73	56	72	55	20	55	......do	Variable 1, calms	Do.
13	......do	30.24	30.08	65	47	63	46	58	53	......do	Variable 1, calms	Do.
14	......do	30.20	30.10	69	49	65	48	57	53	......do	NE. 1 to SE. 4	Do.
15	......do	30.28	30.20	65	48	63	48	59	50	Fair and pleasant	E. 1, calms	Do.
16	......do	30.24	30.18	61	46	60	45	57	51	Clear and pleasant	Calm, SW. 1	Do.
17	......do	30.24	30.14	61	46	60	46	56	52	......do	Calm, E. 1	Do.
18	......do	30.18	30.10	65	45	61	45	56	49	......do	E. 1	Do.
19	......do	30.30	30.10	64	47	60	47	56	48	......do	E. 1	Do.
20	......do	30.36	30.18	64	49	61	47	56	50	......do	E. 1	Do.
21	......do	30.30	30.22	63	49	60	48	56	52	Fair and pleasant	E. 1 to NE. 2	Do.
22	......do	30.40	30.24	64	51	61	50	59	51	Clear and pleasant	NE. 1 to E. 1, calm	Do.
23	......do	30.30	30.12	64	50	61	48	56	50	......do	E. 1	Do.
24	......do	30.18	30.08	61	52	59	51	56	52	Fair and pleasant	E. 1 to SW. 1	Do.
25	......do	30.26	30.14	62	53	61	52	58	53	......do	Calm	Do.
26	......do	30.32	30.22	60	50	59	50	58	52	......do	Calm	Do.

Record of meteorological observations by the U. S. Fish Commission steamer Albatross, July 1, 1889, to June 30, 1891—Continued.

Date.	Position at meridian.		Barometer.		Temperature.						Weather.	Direction and force of winds.	Rainfall.
					Air: Dry bulb.		Air: Wet bulb.		Water at surface.				
	Lat. N.	Long. W.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.			
1890.	° ′ ″	° ′ ″	°	°	°	°	°	°	°	°			
Nov. 27	Navy-yard, Mare Island.		30.34	30.16	64	48	61	47	54	49	Clear and pleasant	NE. 1	None.
28	do		30.30	30.18	65	47	61	46	57	52	do	Calm, E. 1	Do.
29	do		30.34	30.18	63	49	60	48	55	51	do	ENE. 1, E. 1	Do.
30	do		30.30	30.16	60	48	57	47	55	49	do	ENE. 1, calms	Do.
Dec. 1	do		30.24	30.16	57	45	56	45	54	50	Fair and pleasant	Calm, SSW. 1	Do.
2	do		30.18	29.80	59	50	58	50	56	51	Overcast and cloudy to rainy	SSW. 1 to SW. and S. 4	Light.
3	do		29.70	29.50	57	54	57	53	58	53	Squally and rainy	SSE. 2-5; S. 3-6	Moderate.
4	do		29.98	29.58	57	49	56	48	53	50	Squally and rainy to clearing	S. 4, to SW. 1	Light.
5	do		30.26	29.98	56	45	55	44	54	46	Clear and pleasant	SW. 1, S. 1	Do.
6	do		30.38	30.26	53	46	52	46	52	50	Fair and pleasant	NW. 1, E. 1	Do.
7	do		30.46	30.34	55	45	54	44	53	47	do	Calm, SW. 1, calm	Do.
8	do		30.50	30.38	49	43	48	42	50	45	Clear and pleasant	E. 1	Do.
9	do		30.40	30.28	47	42	46	41	51	45	Fair and pleasant	NE. 2	Do.
10	do		30.32	30.16	48	37	47	36	49	47	do	NE. 2-1	Do.
11	do		30.46	30.22	44	37	43	37	48	43	Clear and pleasant	NE. 2-3	Do.
12	do		30.52	30.40	41	37	41	37	47	42	Cloudy and disagreeable	NE. 3-2	Do.
13	do		30.40	30.28	49	40	48	39	49	45	Fair and chilly	NE. 1	Do.
14	do		30.44	30.34	46	42	45	42	47	40	Clear and cool	Calm, NE. 1	Do.
15	do		30.48	30.34	46	40	46	39	47	43	Cloudy and chilly	NE. 1-2	Do.
16	do		30.38	30.24	43	40	43	40	47	40	Raw, chilly, and cloudy	ENE. 4	Do.
17	do		30.36	30.22	43	39	42	39	46	42	Raw and cloudy	NE. 3 to E. 2	Do.
18	do		30.26	30.14	49	43	49	42	50	44	Overcast; passing rain showers	E. 2-1	Light.
19	do		30.42	30.22	54	47	54	46	52	46	Fair and pleasant	Calm, SW. 1	None.
20	do		30.52	30.42	51	42	51	41	50	44	Clear and pleasant	Calm	Do.
21	do		30.54	30.42	47	41	46	41	47	43	do	Calm, E. 1	Do.
22	do		30.42	30.30	44	41	43	41	46	43	Cloudy and pleasant	E. 3, NE. 3	Do.
23	do		30.30	30.18	49	41	48	40	48	41	Fair and pleasant	E. 3, ENE. 3	Do.
24	do		30.18	30.14	47	41	46	40	47	45	do	E. 1 to NE. 1	Do.
25	do		30.32	30.14	45	41	44	41	46	44	Overcast and hazy	ENE. 2, E. 1	Do.
26	do		30.32	30.22	45	41	44	40	46	44	Overcast and cloudy	Calm, E. 2	Do.
27	do		30.36	30.24	45	39	45	39	47	45	Cloudy, but pleasant	E. 3, ENE. 3	Do.
28	do		30.30	30.14	45	41	44	40	46	44	do	E. 1-2, ENE. 1-2	Do.
29	do		30.16	30.02	51	40	50	40	48	45	Rainy to overcast and cloudy	ENE. 1, calms	Light.
30	do		30.36	30.00	54	45	53	44	50	46	do	S. 1, veering to NW. 1	Do.
31	do		30.54	30.36	51	41	49	40	47	45	Clear and pleasant to overcast and rainy.	Calms, W'ly. 1	Do.