# REPORT OF OCEANOGRAPHIC CRUISE

## UNITED STATES COAST GUARD CUTTER CHELAN

## BERING SEA AND BERING STRAIT

## 1934

## AND OTHER RELATED DATA

THE CARNEGIE
MUSEUM OF
NATURAL HISTORY

25 April 1996

Mr. Steve Gegg
Data Library & Archives
McLean Lab
WHOI
Woods Hole, MA 02543

Dear Steve,

Per our phone conversation, enclosed please find the typescript report:

Report of Oceanographic Cruise United States Coast Guard Cutter Chelan Bering Sea and Bering Strait 1934 and Other Related Data.

As I mentioned, I have no idea how Carnegie Museum of Natural History acquired this report, especially since we never had a scientific section dealing with oceanography or any related topics. Having been a Marine Policy and Ocean Management Post-doctoral Fellow at WHOI in the early 1980s, I realized this report might be of use to WHOI. Dr. David Aubrey in Geology & Geophysics provided me with your name.

This report is an unrestricted donation to WHOI and may be used for whatever purposes you see fit.

Sincerely,

David R. Watters
Curator of Anthropology

enc.

cc: Dave Aubrey

Edward O'Neil Research Center
FAX 412 665-2751

5800 Baum Boulevard
Pittsburgh, PA 15206-3706

# REPORT OF OCEANOGRAPHIC CRUISE

# UNITED STATES COAST GUARD CUTTER CHELAN

# BERING SEA AND BERING STRAIT,

# 1934.

U.S. Coast Guard Headquarters,
Washington, D.C.,
1 June, 1936.

This report covers the oceanographic activities of the U.S. Coast Guard Cutter CHELAN during the summer season of 1934. It is approved and prepared for dissemination to all interested departments.

H. G. HAMLET

PREFACE

The oceanographic cruise covered by this report was planned with the assistance of Dr. Thomas G. Thompson of the oceanographic laboratories of the University of Washington. Through his efforts two very efficient observers, Dr. Phifer and Mr. C. Barnes, also of the University of Washington were detailed to the Cutter CHELAN for duty. These men brought with them all the necessary equipment to outfit the sick bay of the cutter into an actively functioning laboratory. Accompanying them was Professor J. L. Alexander of the Forestry Section of the University of Washington, who assisted in the research and who also investigated the tree life of those sections of Alaska visited and who planted seeds and seedlings on many of the islands of that country.

To Dr. Thompson, Dr. Phifer and Mr. Barnes belong the credit for making the chemical analysis of water, marine life and marine growth. Further credit is given for their assistance in making many of the calculations and summarizing much of the data without which great difficulty would have been encountered in compiling this report.

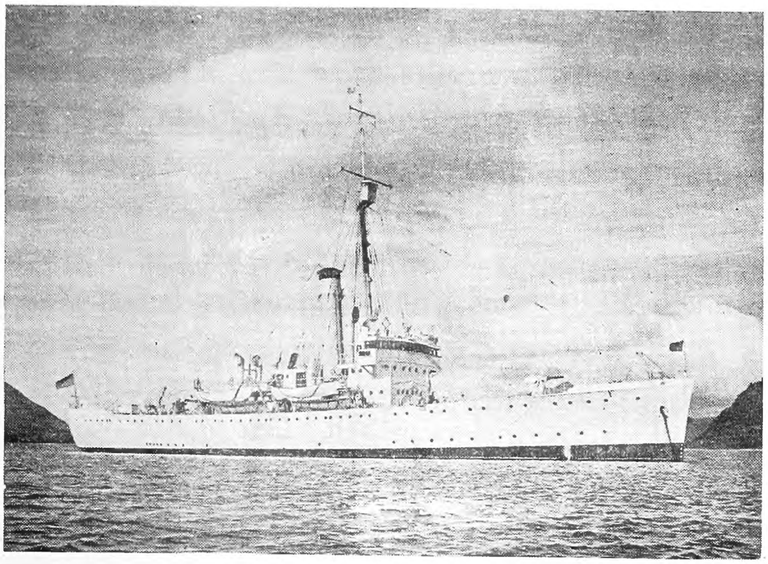
The officers and crew of the CHELAN deserve much credit for their untiring efforts to make the cruise a success. Their interest and wholehearted cooperation made the season of 1934 a productive and interesting one, both from the view point of the Coast Guard Patrol duties and also from the angle of scientific research.

The stenographic force and the drafting room personnel of the Communication Office, Coast Guard Headquarters, are thanked for their able assistance in assembling the data.

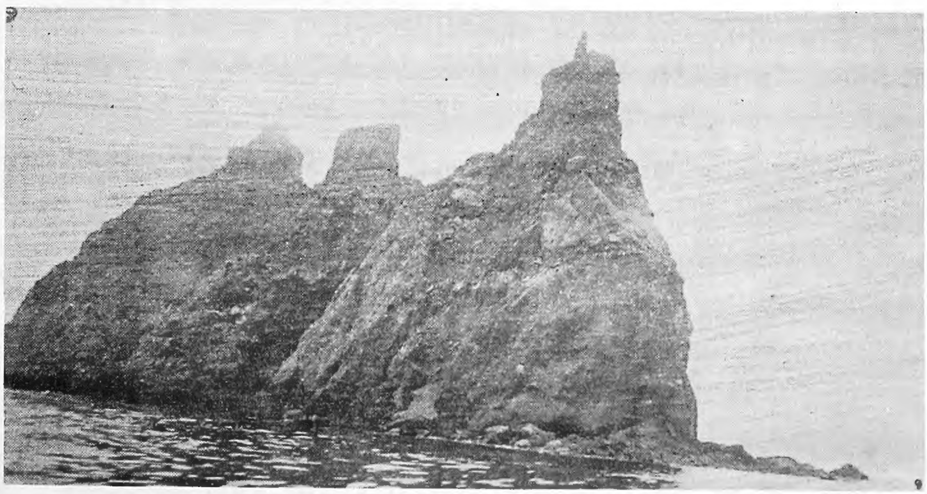
This report summarizes the physical investigation. The results of the chemical investigation will not be ready until March 1937 at which time they will be published as an addenda.

F. A. Zeusler

F. A. ZEUSLER.



COAST GUARD CUTTER CHELAN.



FIRE ISLAND, BOGOSLOF.

## THE CRUISE (CHRONOLOGICAL).

The cruise of the CHELAN in 1934 was in accordance with the policy of the government in assigning Coast Guard cutters to the Bering Sea for patrol duty. The Coast Guard has played an integral part in the development of Alaska. The logbooks of its cutters contain the early history of that country. Southern and southeastern Alaska are constantly associated with the service as ships are stationed in Ketchikan, Juneau, Cordova and Seward but western and northwestern Alaska greets the cutters in the spring and bids them adieu in the Fall. As surely as in each Spring the sun returns to break the ice fetters that shackle the lakes, the rivers and the sea, so the Coast Guard Cutter NORTHLAND wends its way from its base in Seattle toward the Arctic to take up its summer base off Nome. And so as the salmon return each Spring toward the streams of their nativity, as the many migrant birds each year again seek their nesting grounds in the marshes and in the waters of the million streams of Alaska and as the seals begin their annual trek to their summer home on the Pribilof Islands in the Bering Sea so the patrol cutters, especially the CHELAN class, point their bows toward their base at Unalaska to take up the seal and fishery patrol, law enforcement, assistance and lifesaving duties around the Pribilof Islands and along the Aleutian Islands.

Alaska is a large country. If its map were placed on the map of the United States a portion of its northern border would touch on the Canadian border, its eastern edge would touch the Atlantic ocean, its southern boundary would rest on the Mexican division line and its western most islands would touch the Pacific ocean. Its coast line is about 26,000 miles. Its area is 13 times as large as New York; 500 times as large as Rhode Island; one fifth the size of the United States, covering generally the areas of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, West Virginia, North Carolina, South Carolina, Georgia, Florida, Mississippi and Tennessee.

In the Bering Sea and the waters surrounding Alaska are found codfish, Halibut, salmon, mackerel, herring, crabs and other shell fish, whale, seals (fur and hair), sea lion and walrus. Its islands are the homes of foxes, caribou, reindeer and sheep.

The CHELAN was based at Unalaska, the largest city in the Aleutian Islands situated 55 miles from Unimak Pass, the gateway to the Bering Sea, about 150 miles from the transpacific steamer lanes and about 1750 miles from Seattle. The Aleutian Islands, discovered by Chirikof and Bering in 1741, jut out boldly from the coast of Alaska extending far into the Pacific Ocean for a distance of about 900 miles to the westward.

Unalaska is one of the prettiest places in the North. The first Greek Russian church erected in the territory is found here. It is filled with paintings and ornate tapestries. Dutch Harbor being at the head of a landlocked bay and surrounded by rounded fertile hills is a half a mile from Unalaska. This combination makes it one of the most strategic points in Alaska. The Coast Guard has its base at Unalaska and the Alaska Commercial Company has a store and a coaling station there. The Navy has a radio station at Dutch Harbor. There is also located one of the most active industries in the Islands, herring packing. A few stunted spruce trees comprise the only growing timber on the island but the grass grows waist high and on the fields are millions of violets and other fragrant flowers. In former years thousands of caribou subsisted on the island but with the importation of rifles the herds were soon exterminated. The deer placed there in 1914 by the Coast Guard have also disappeared.

After leaving Unalaska on patrol, the first point of contact of the cutter was the summer home of the famed Alaskan fur seals, the Pribilof Islands. These are located about 200 miles north northeast of Unalaska. They consist of four islands, St. Paul Island, St. George Island, Walrus Island and Otter Island. They were discovered by Gerassium Pribilof a Russian navigator in the summer of 1786. He was in the employ of the Lebedoff Company, one of the many trading companies which at that time were levying tribute upon the Aleutian natives and fighting among themselves for the control of the fur industry. Sailing a clumsily-constructed craft through a Bering Sea fog, he heard a strange, bellowing sound, similar to the barking of a band of dogs. He anchored, and when the fog cleared, he saw the islands which bear his name. It did not take him long to discover that the barking emanated from fur seals, the skins of which, at that time, were very highly prized by the Orientals. Pribilof named the southernmost island St. George, after the ship in which he sailed.

During the first season Pribilof's hunters killed more than 2,000 sea otters, more than 40,000 seals and accumlated much walrus ivory. The invading horde of hunters recklessly and wastefully killed hundreds of pup seals and young otters during the years that followed.

In 1867 the United States purchased Alaska. In 1868 American financiers purchased the buildings of the Russian Companies. In 1869 the Congress passed a law declaring the islands to be a reservation and prohibiting anyone from killing fur seals except under certain restrictions. The following year on July 1, 1870, the islands of St. Paul and St. George were leased to the Alaska Commercial Company for a period of twenty years. In 1895 this was renewed but awarded to the North American Commercial Company. In 1910 the Government undertook to manage the seal rookeries itself. The seal herd had been depleted. Many rocks on the islands once worn smooth and round by the continual movement were now covered with moss and buried in vegetation. This gradual reduction was due to the pernicious activity of pelagic or open sea sealing which was a disgraceful butchery.

In 1911 the United States as a result of this held a conference with representatives of Russia, Great Britian and Japan, and it was agreed they jointly should patrol the Bering Sea and that no sealing of any kind should be permitted within sixty miles of the shore of any territory controlled by any of these countries. Under this treaty each nation was permitted to kill seal in its own territory. A law providing that a certain number of the bachelor seals on the Pribilof Islands be killed each year under government supervision and the skins sold and the proceeds divided between the signatory powers, and that every ship of whatever flag, carrying sealing gear, found within sixty miles of any port of either America, British, Japanese or Russian territory, immediately be confiscated and the crew and officers punished by fine and imprisonment, or both, was passed. Under this system the depleted herd of 235,000 in 1910 has now increased to more than 3,000,000 seals. The Coast Guard cutters maintain a patrol and strictly enforce these treaties.

Upon completion of the duties at the Pribilofs and in the vicinity, the CHELAN proceeded northward to Nome. Nome is a seacoast town located on the mainland about 600 miles north of Unalaska. It is built along the shore, being without a harbor. The roadstead is open to navigation from about June 5 till November 15 each year and the balance of the year it is frozen in. The residents are then cut off from the outside world by boat but they can be reached by trail or by aeroplane when the weather permits.

In the autumn, generally about November 1, Bering Sea begins to take on a covering of slush ice. Sometime later the Arctic ice pack, a solid field begins forming and, hundreds of square miles in extent, soon covers the sea. In the Spring these immense fields of ice float gently out to sea and are carried northward by the currents. The field passes through Bering Strait, the narrow strip of water between the easternmost point of Asia and the westernmost point of Alaska Mainland. The creaking, crushing noise can be heard for a great distance.

On days when the Arctic sun is shining, after the ice has left, the land-scape and the sea-scape present a pretty view. The tundra on the shore is brown and green, and the air is filled with summer heat, while pretty wildflowers adorn the foot hills. But quite often, without notice, the scene changes. Black lowering clouds obscure the sun, heavy winds lash the sea and large, white-capped waves crash on the beach. The thunder of the surf can be heard for miles. The ships in the roadstead must veer more chain on their anchors and for a while try to ride out the storm, but when the anchors begin dragging they run for safety in the lee of Sledge Island or go off to sea. Often the gale blows for three or four consecutive days.

Nome in summer is a busy place. King Island Eskimos peddle their ivory on the main street. The stores are stocked with furs. Here and there men are seen working the beach sands while on the first and second beaches large dredges mechanically pan for gold dust. The cutter CHELAN saw a decided change later in the year when it visted Nome after a fire which destroyed about 80% of its business section and 40% of the residential section.

The next place of interest passed was a small projection to the northwest of Nome about 60 miles distance, called King Island. This rock is the home of the Eskimo tribe of natives called King Islanders. They build their houses on stilts as there is no level spot, the sides of rock being sheer. These natives spend their summers in Nome, leaving King Island about June 21. In October they are taken back to their island home by the cutter NORTHLAND. This place is surrounded by ice during the winter and in the spring months it is a spendid hunting ground for walrus.

After a few days in the Bering Strait and in the Arctic Ocean, St. Lawrence Bay in Siberia was entered. At this point fresh water was taken aboard. After a two-day stop, St. Lawrence Island was visted. St. Matthew Island, an uninhabited island in the Bering Sea, was next on the schedule, and from there the CHELAN proceeded to Nunivak Island, the home of the most primitive people in Alaska.

The next point of interest to visit was Bogoslof Island located about 60 miles northwest of Unalaska. Enroute to this, the codfishermen from the United States who arrive in Bering Sea in June and leave about September 15, were passed. In addition thereto the Japanese crab fishing fleet consisting of large ships, trawlers and crab boats were seen. These boats catch the large spider crabs which are canned on the larger vessels, Some of the whalers from the Aleutians and a number of vessels of the salmon canning fleet from Bristol Bay greeted the CHELAN while patrolling.

Bogoslof is perhaps the most attractive of the islands of Alaska. Four days were spent here and then a course was set for Unalaska where the Oceanographic Cruise ended.

## STATISTICS OF CRUISE.

The Cutter CHELAN left Seattle on the 18 July, 1934, on Bering Sea patrol. Special arrangements had been made to utilize a part of the time to obtain data in the Bering Sea. A prearranged schedule prepared by the commanding officer assisted by the staff of the Oceanographic Laboratory of the University of Washington and approved by the Commander, Western Area, and the Coast Guard Headquarters was followed. It is interesting to note in this connection that in June 1881 the Revenue Cutter CORWIN landed a party of officers and men, Rear Admiral W. E. Reynolds (then a 3rd Lieutenant) in charge to make observations of the currents and temperatures of the waters that set through Bering Strait.

Prior to the cruise the cutter was outfitted with the necessary equipment. The sick bay was temporarily rebuilt to serve as a laboratory. The following equipment was taken:

1. Modern fathometer (recording up to 125 fathoms).
2. Thermograph, installed in the engine room.
3. 1 Cunningham, oceanographic sounding machine, type EGM #440, of the following description: 660 fathoms of 3/16" wire, 3 H.P. 220 volt A.C. 3-phase 60 cycle motor equipped with wire laying carriage, 4 speeds in raising and lowering, speed 3-½ feet per second in low and 7 feet in high, friction control and brake control.
4. 1 meter wheel.
5. 1 200 lb. lead sinker.

MEMBERS OF CREW OF CHELAN WITH LOST BABY SEAL.

NATIVES OF SAVOONGA, ST. LAWRENCE IS. ABOARD CHELAN.

BABY SEAL.

6. 1 Coast & Geodetic Survey salinity apparatus with all necessary chemicals and equipment for the analysis of sea water.
7. 1 Drift stick, weighted at 15 feet.
8. 1 Ekman current meter (University of Washington)*
9. 2 Nanson Knudson type water bottles, U.S.C.G.
10. 5 Improved type water bottles, Northwest Instrument Co. (University of Washington).
11. 7 messengers (2 U.S.C.G., 5 University of Washington).
12. 7 protected thermometers, reversing type (Richter and Wiese make) #2189, 3167, 3168, 3169, 3170, 3171 and 3172 (U. of W.).
13. 2 above type U.S.C.G.
14. 2 unprotected thermometers, reversing type of Richter and Wieso make #2965 and 2966 (U. of W.).
15. 2 snapper type bottom samplers with lead weight (U.S.C.G.).
16. 1 dredge type bottom sampler.
17. Equipment of nets and bottles for obtaining phyto plankton data.

(*). The current meter was of the latest Ekman type and had been calibrated before use by Prof. V. Walfred Ekman of Sweden.

The object of the cruise was to study the chemistry of the Bering Sea ocean floor, of the ocean water and of the various organisms and plants. This was accomplished by obtaining samples of water from which density and currents were calculated, temperatures measured, obtaining samples of water for determination of minor constituents and to study the vertical and geographical distribution of genera and species present.

The physical properties, namely temperatures, pressures and the concentration of salts were studied. The temperatures were measured first by ordinary thermometer immersed in water hauled on board with a bucket, secondly by recording thermograph placed in the intake of the condenser giving a continuous record of the surface temperatures, thirdly, intake temperatures taken hourly by the engineer force, fourth, reversing thermometer to obtain temperatures at various depths.

Collection of Samples. The CHELAN was provided with an electric winch and 600 fathoms of sounding wire for sampling operations. The length of the wire limited the sampling depth to approximately 1000 meters which was enough in most cases, as only 9 of the 120 stations occupied exceeded that depth. Samples were collected by means of reversing bottles of the Nanson-Knudsen type. Seven levels could be sampled at one haul, a sufficient number for all stations in the shallow region north of the Pribilof Islands. Two hauls were necessary at the deep stations south of the Pribilofs. Samples were drawn in duplicate from the water bottles into citrate bottles. The latter were tagged then stored in wooden cases to prevent breakage. One of the duplicates was used in the determination of nutrient salts soon after sampling. The other was reserved for chlorinity determinations which were made either in port or at the Oceanographic Laboratories at the end of the cruise.

Bottom samples were obtained at a number of stations by means of a clam shell grab. These samples were stored in pint and quart jars for furture analyses.

Samples of surface water obtained enroute from Seattle to Dutch Harbor were picked up from the moving ship by means of a bucket lowered over the side. Temperatures were obtained as soon as the samples came aboard. Due to the relatively small differences between the temperatures of the air and the water, those of the latter are reliable to within approximately one tenth degree centigrade.

Determination of Depth. A meter-wheel was used to determine the spacing of the sampling bottles placed on the line at definite intervals. Meter-wheel readings for a vertical wire accordingly indicated the depths of sampling but were checked for all deep stations by calculations based on differences in readings of the protected and unprotected thermometers. Wire angles were recorded if the line departed appreciably from the vertical and these were used in conjunction with the meter-wheel readings and those of the thermometers in obtaining the correct depth. Corrections for wire angle were seldom necessary as sampling operations were not carried out during heavy winds. In the few cases in which samples were obtained at odd depths at individual stations, the temperature and chlorinity measurements have been interpolated for uniform depths to facilitate comparisons between stations.

Bottom depths were obtained at the stations by means of sonicsounding (fathometer). Soundings given in the tables are corrected for temperature and chlorinity.

Temperature Determination. The water temperatures at the various stations were determined by means of reversing thermometers. The thermometers were manufactured by Richter and Wiese and were calibrated originally by the Physikalische-Technische Reichanstalt. Most of them had been recalibrated by the United States Bureau of Standards and were checked after the cruise at the Oceanographic Laboratories. Six of the eight thermometers used were graduated to 0.05° C. and could be read with an error of less than 0.01° C. The values for the temperatures given in the tables are corrected readings. Necessary corrections were made according to Schumacher's formula as given by Soule (1933).

Determination of Chlorinity. The chlorinities were all checked determinations obtained by titrations with silver nitrate solution according to the Mohr method. Standard sea water of the Hydrographic Laboratories of Copenhagen was used as a primary standard. The probable error of the chlorinity determinations is less than ± 0.01 °/oo.

Dissolved Oxygen. The dissolved oxygen was determined by means of the Winkler (1923) method. The samples for this determination were secured from the sampling bottles immediately after being received on deck and treated at once with the necessary reagents. The final titrations were all done aboard ship.

The dissolved oxygen is reported in the tables in units of milligram atoms per kilogram of water (1934). A milligram atom of an element is defined as that quantity of the element which has a mass in milligrams numerically equal to its atomic weight. The nutrient salts are reported in terms of microgram atoms of the principle element per kilogram of sea water. A microgram atom, abbreviated mcg. at., equals one thousandth of a milligram atom.

The per cent saturation of dissolved oxygen was calculated from tables prepared at the Oceanographic Laboratories. These tables are based on those of Whipple and Whipple (1911).

Soluble Phosphates. Soluble phosphates were determined by the cerulomolybdate method of Deniges (1920) according to the modification of Truog and Meyer (1929). In order to compensate for the salt error, phosphate-free sea water was used in the preparation of all comparison standards. So that no error would be introduced by storage, analyses were made on board ship as soon as possible after the samples had attained the temperature of the laboratory. This same procedure was followed in the determination of silicate and nitrite.

Determination of Silicates. The soluble silicates were determined by means of the silico-molybdate mentod using picric acid standards as outlined by Thompson and Houlton (1933).

Nitrite-Nitrogen. The determination of nitrites was made by the colorimetric method of Griess (1879) as modified by Ilosvay (1889). Nitrite-free sea water was used in the preparation of comparison standards to compensate for salt effects.

Determination of pH. A Hellige comparator was used with cresol red as the indicator. The data in the tables are not corrected for temperature or salt error.

Direct Current Measurements. The CHELAN was anchored at several shallow stations and the water current measured directly by means of a current meter of the latest Ekman type (1932). The current meter had been calibrated just before use by Professor V. Walfrid Ekman of Lund, Sweden. The current magnitudes listed in the tables are expressed in knots, and directions in degrees magnetic. No attempt has been made to correct the directions for local variation or the deviation due to the iron masses of the ship. The deviation caused by the ship's magnetism varies with the ship's heading and the depth of the current meter. In most cases it is probably not more than $10^{\circ}$ at 10 meters below the surface.

Dynamic Computations and Calculated Currents. The densities of the water samples at atmospheric pressure and the temperatures at which they occured in the sea were ascertained from the temperature and chlorinity data by the use of Knudsen's Hydrographical Tables (1901). The densities in situ and reciprocal quantities, the specific volumes in situ, dynamic depths, and relative velocities were then obtained by methods based on the Bjerknes theory (1910) similar to those outlined by Hesselberg and Sverdrup (1915) and Smith (1926). Tables by the latter authors have been modified at the Oceanographic Laboratories to give chlorinity-pressure corrections directly rather than salinity-pressure corrections thus eliminating from dynamical computations the unnecessary step of obtaining salinity. Currents as obtained by means of Bjerknes theory are relative, the currents of the upper water level being obtained in reference to the lowest observed level, where it is assumed that there is no movement of the water, or, expressed differently, the current near the bottom is taken as zero. The values for calculated currents appearing in the tables are based on this assumption. These relative values are almost identical with the absolute values at stations taken in deep water, but in shallow water in which there is an appreciable current at the bottom the calculated values are less than the absolute values.

<u>Explanation of Tables</u>. The experimental data and calculated dynamic quantities have been arranged in 4 tables. An outline of these tables and their contents is as follows:

Table I, section (a) gives the temperature and chlorinity data and calculated dynamic quantities for the different stations and sections established in Bering Sea. The same general form is used for each station. The station headings are for the most part self explanatory and contain the following information: station's number, position of station, date and time of sampling, the bottom depths as obtained by sonic soundings, and the physical nature of the bottom or bottom sediment for stations at which these observations were made.

The significance of the various columns is as follows:

Column 1. Depth in meters at which samples were taken. The values are regarded as numerically equal to the pressure in decibars.

2. Corrected temperatures, degrees centigrade.

3. Chlorinity, parts per mille. 3 (a) Salinity, parts per mille.

4. $\sigma_t = (\rho_{s,t,o} - 1)\ 10^3$, where $\rho_{s,t,o}$ is the density as computed from the temperature and chlorinity but not corrected for pressure.

5. $\sigma_{s,t,p} = (\rho_{s,t,p} - 1)\ 10^3$, where $\rho_{s,t,p}$ is the density in situ.

6. $\alpha_{s,t,p} \times 10^5$ equals the specific volume in situ multiplied by $10^5$.

7. Dynamic depths below the surface of corresponding isobaric levels of Column 1, expressed in units of dynamic meters.

In general, observations were made at certain standard depths but in a number of instances this was not possible. So that direct comparisons could be made between stations in these cases, the observed data were interpolated or extrapolated to other depths. These interpolated or extrapolated values and calculated quantities based thereon appear in the table enclosed by parentheses ().

Observations of doubtful value from any cause have been rejected and are not listed in the table.

Table I, section (b) contains additional chemical data for the stations given in Table I, and is arranged in a similar manner. The columns in Table I may be explained as follows:

Column 1. Depth in meters

2. Soluble phosphate concentration expressed in units of microgram atoms phosphorus per kilogram of sea water.

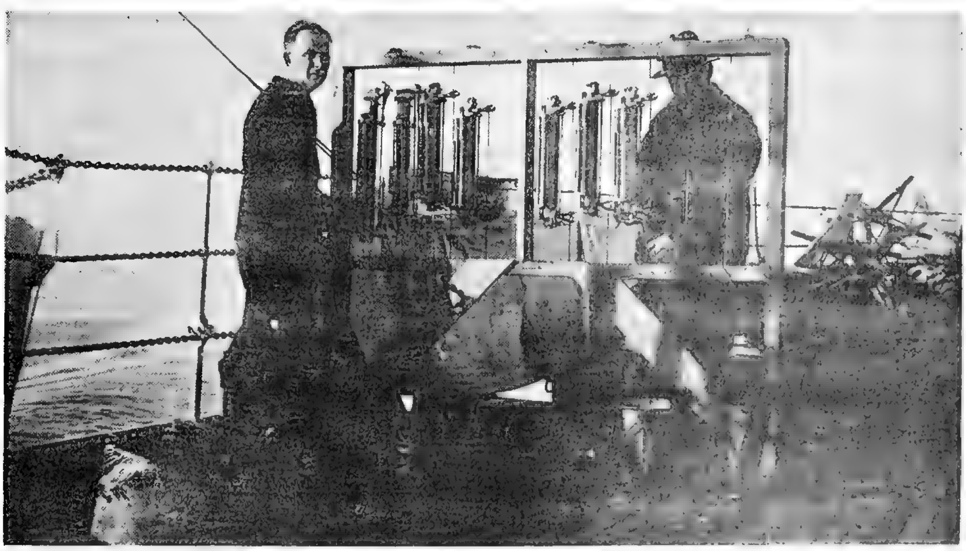
OBTAINING SAMPLES OF WATER FROM WATER BOTTLES.

KING ISLAND.

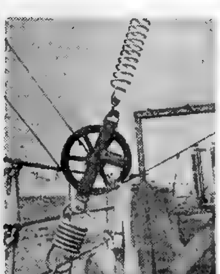
SOUNDING MACHINE.

DECK SCENE, TAKING SAMPLES OF WATER.

DOC BARNES WITH EKMAN METER.



DECK SCENE DR. PHIFER AND MR. BARNES.



DECK FAIRLEAD FOR SOUNDING WIRE.

DOC BARNES READING TEMPERATURE.

Column 3. Soluble silicate concentration as microgram atoms of silicon per kilogram of the sea water.

4. Nitrite nitrogen concentration as microgram atoms of nitrogen per kilogram of sea water.

5. Dissolved oxygen concentration as milligram atoms of oxygen per kilogram of sea water.

6. Dissolved oxygen as per cent saturation.

7. Hydrogen ion concentration as pH.

Table II contains the physical and chemical data of the surface waters as obtained on the cruise from the Strait of Juan de Fuca to Dutch Harbor. The column headings in this table have the same meaning as outlined for Table I.

Table III is a tabulation of the differences in dynamic depth, differences in dynamic height, and computed currents for the stations of sections given in Table I. The stations are grouped in pairs, as indicated in the headings. K is a constant for each pair of stations. The value of K is determined from the mean latitude of the stations, the distance between stations and the angular velocity of the earth's rotation. The columns have the following significance:

Column 1. Depth in meters or pressure in decibars.

2. $\Delta$ E x 10 = difference in dynamic depth x $10^3$ for the given pair of adjacent stations at the levels indicated in Column I. The differences are obtained from Table I by subtracting the values of dynamic depth at one station from those at another in the order indicated in the heading of the table.

3. $\Delta$ H x $10^3$ = difference in dynamic height x $10^3$ referred to the lowest common depth sampled.

4. This column contains the components of the water velocity in a direction perpendicular to the section. The velocity is expressed in units of knots (nautical miles per hour) and is relative to the lowest common depth sampled. Positive and negative values indicate the direction of the current across the section.

Table IV summarizes the direct current measurements as obtained at various stations in Bering Sea by the use of the Ekman current meter. An explanatory note is given at the beginning of the table.

Generally speaking the following data was obtained:

Dynamic sections taken, major 15 minor 14
Stations occupied, 120
Samples taken for temperature, 617
Chlorinity and salinity determination, 617 each
Current measurements by Ekman meter, taken at
7 stations, the instruments lowered, to different
depths from the surface to 40 meters, 148.
Drift stick data at each anchorage,
Determinations of minor constituents such as
Silicate, phosphate, dissolved oxygen, 600 each.
Ph and nitrate nitrogen 400 each

The Phyto Plankton obtained from net hauls and water bottle samples were taken to determine the vertical and geological distribution of genera and species present.

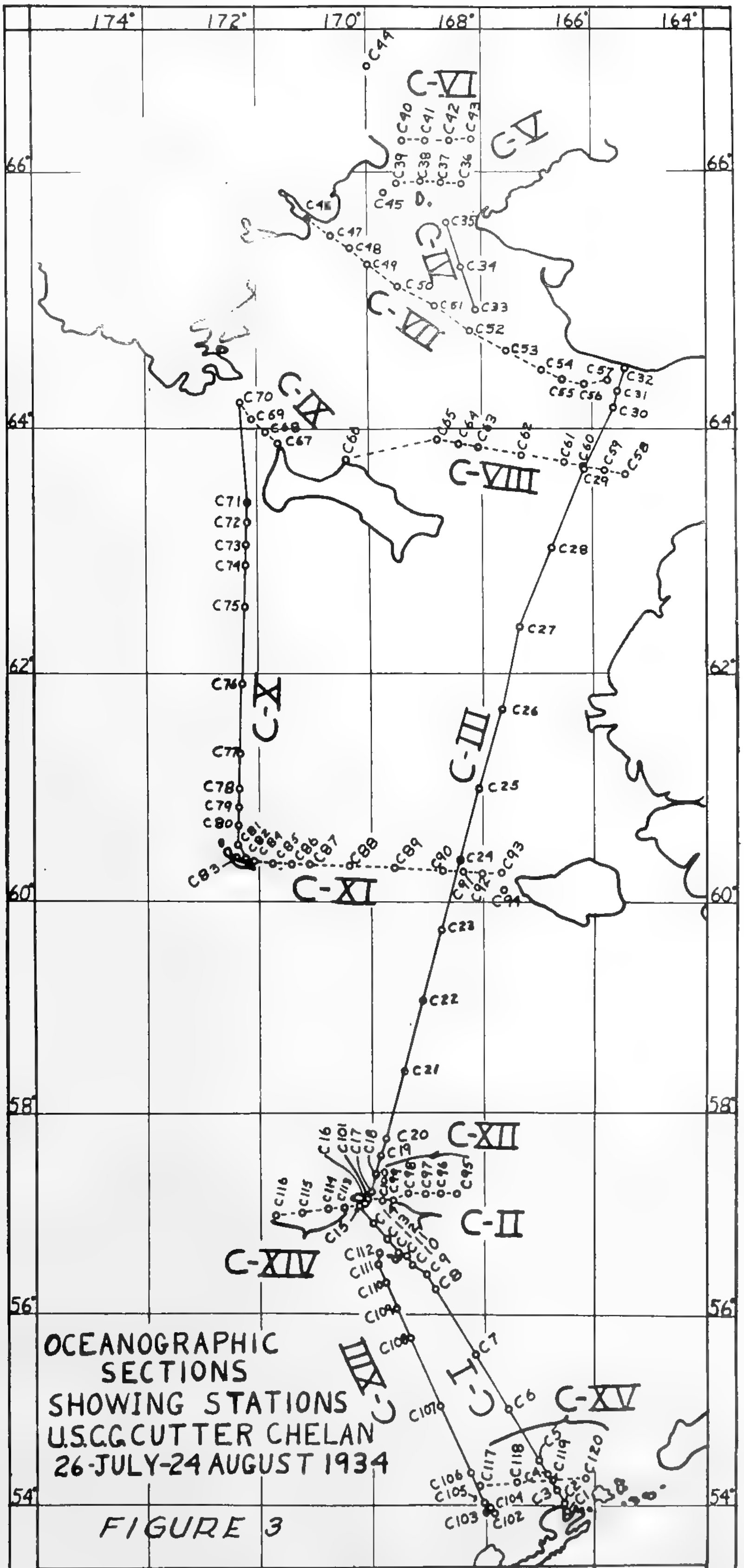
## FORESTRY.

Professor J.L. Alexander, accompanied the oceanographic party as assistant observer. One thousand seedlings of different varieties were received on board and a large quantity of seed. Seedlings were planted as follows: 300 on Expedition Island; 1 grove of 100 at Dutch Harbor; 250 distributed in Unalaska; 200 at St. Paul and the others variously distributed in the islands of the Sea. The seeds were distributed as follows: a number on St. Lawrence Island, on Nunivak Island, at St. Paul and in Unalaska.

## SECTIONS AND STATIONS:

The following shows the location of the various sections with their several stations. Nine east-west sections and six-north-south sections were established from Unalaska to the Arctic Circle with a total of 120 stations.

| Sections | No. | Stations | Place | Date |
|---|---|---|---|---|
| 1 | 11 | 1-11 | Dutch Harbor - St. George | 7/26-27/34 |
| 2 | 36 | 12-16 | St. George - St. Paul | 7/27/34 |
| 3 | 16 | 17-32 | St. Paul - Nome | 7/28/34 to 7/30/34 |
| 4 | 3 | 33-35 | King Island - Fairway Rock | 7/31/34 |
| 5 | 4 | 36-39 | Bering Strait, | 7/31/34 |
| 6 | 5 | 40-44 | Bering Strait, North of East Cape | 7/31/34 to 8/1/34 |
| - | 7 | 45a to g | Tidal cycle Bering Strait | 8/1/34 to 8/2/34 |
| 7 | 13 | 46a-b to 57 | St Lawrence Bay, Siberia to Nome | 8/2/34 to 8/4/34 |
| 8 | 9 | 58 to 66 | Lat. 62° 39' N., Long 165° 24' W. to Savoonga, St. Lawrence Island | 8/4/34 to 8/5/34 |




OCEANOGRAPHIC SECTIONS SHOWING STATIONS U.S.C.G. CUTTER CHELAN 26-JULY-24 AUGUST 1934

FIGURE 3

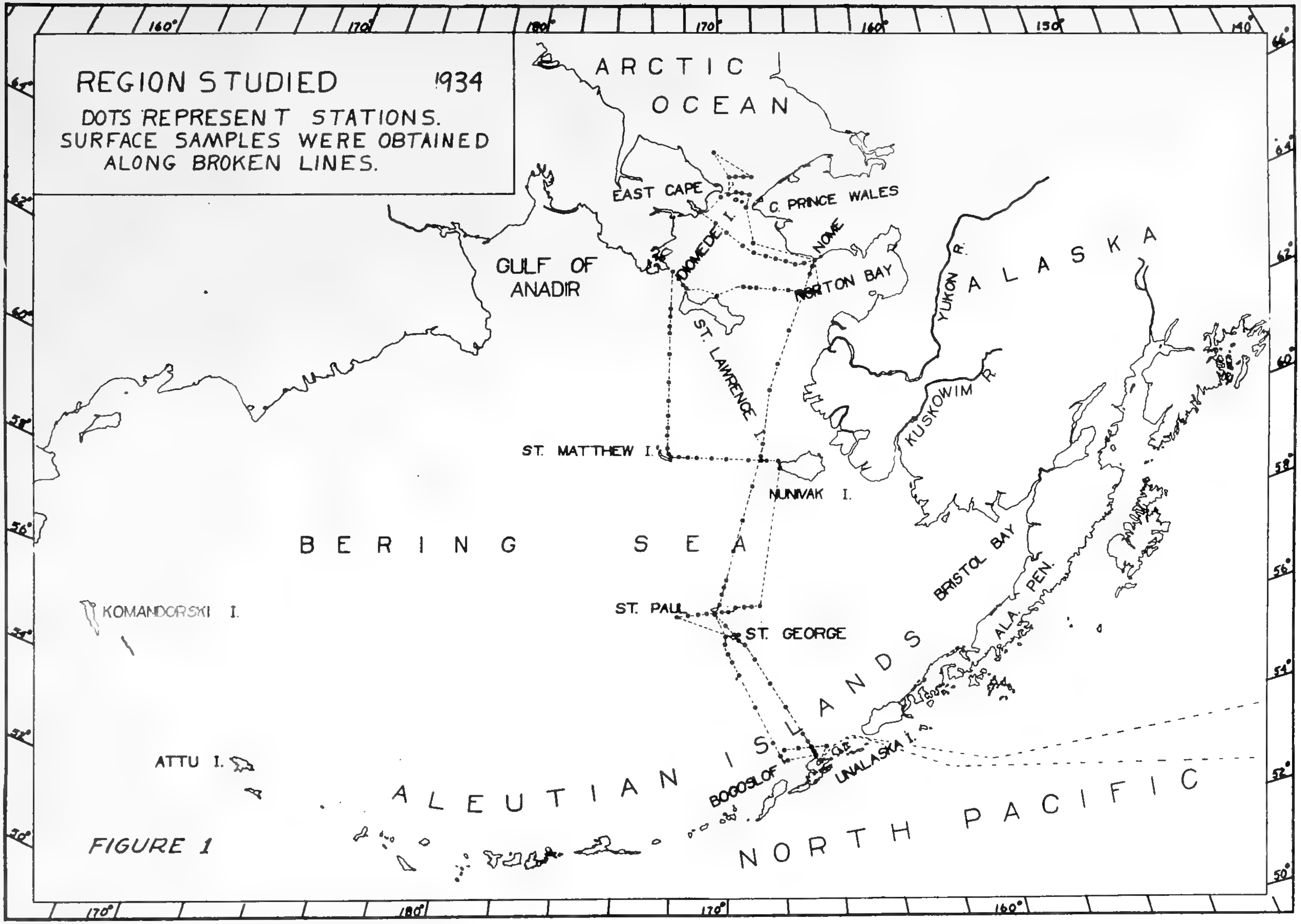

REGION STUDIED 1934
DOTS REPRESENT STATIONS.
SURFACE SAMPLES WERE OBTAINED
ALONG BROKEN LINES.
ARCTIC
OCEAN
EAST CAPE
C. PRINCE WALES
DIOMEDE I.
NOME
NORTON BAY
GULF OF
ANADIR
YUKON R.
ALASKA
KUSKOWIM R.
ST. LAWRENCE
ST. MATTHEW I.
NUNIVAK I.
BERING SEA
BRISTOL BAY
ALA. PEN.
ST. PAUL
ST. GEORGE
KOMANDORSKI I.
ALEUTIAN ISLANDS
BOGOSLOF
UNALASKA I.
ATTU I.
NORTH PACIFIC
160°
170°
180°
150°
140°
170°
160°
64°
62°
60°
58°
56°
54°
52°
50°

FIGURE 1

| Sections | No. | Stations | Place | Date |
|---|---|---|---|---|
| 9 | 4 | 67 to 70a | Gambell to Siberia | 8/5/34 to 8/6/34 |
| 10 | 13 | 70b to 82 | Siberia to St. Matthew Island | 8/6/34 to 8/7/34 |
| 11 | 10 | 84 to 93 | St. Matthew - Nunivak | 8/9/34 |
| - | 1 | 94 | Off Cape Mohican, Nunivak Island | 8/10/34 |
| 12 | 7 | 95 - 101 | East of St. Paul Island | 8/12/34 |
| 13 | 9 | 104b to 112 | Bogoslof Island, St George Island | 8/20/34 to 8/21/34 |
| 14 | 4 | 113 - 116 | St. Paul Island - West | 8/21/34 |
| 15 | 4 | 117 - 120 | Lat. 54° 12' 45" N. Long. 168° 05' - 35" W to Lat. 54° 19' N. Long. 166° 10' W | 8/24/34 |

The CHELAN was anchored in the following places for current data:

| | |
|---|---|
| Nome | 30 July |
| Western Bering Strait | 1 August |
| Off Gamble | 6 August |
| St. Matthew Island | 6 August |
| Cape Mohican | 10-11 August |
| Bogoslof | 18-19-20 August |

| | |
|---|---|
| Hours underway: | 897 |
| Miles cruised: | 11,683 |

## DESCRIPTION OF REGION.

Bering Sea, (figure I) second only to the Mediterranean Sea in size, covers an area of 878,000 square miles. It extends from latitude of 52° North to the Arctic Circle a distance of over 800 miles North and South and from 160° West to 160° East Longitude and is bounded on the south by the Alaskan Peninsula and the Aleutian Islands, on the east by Alaskan coast lines, and on the west by the Siberian coast, a maximum of over 1200 miles east and west. On the north, it is connected with the Arctic Ocean by means of Bering Strait.

The Aleutian Islands, jutting about 900 miles to the westward from the mainland to a comparatively short distance of the Asiatic mainland are a continuation of the Alaskan Peninsula. They form a partial barrier between the North Pacific Ocean and the Bering Sea. They are mountainous in the extreme and generally of volcanic origin. Their average elevation is about 1000 ft. reaching as maximum to 5000 ft. They are devoid of timber but a luxurious growth of flora is present generally below the snow line. The shores are bold on the northern side with numerous offlying islets, rocks and reefs to the southward. They are divided into groups, such as Fox Islands, Rat Islands, etc. The charts are usually inaccurate having been made from the early Russian charts.

The essential features of the bottom topography (figure 2) may be outlined as follows: The eastern and northern portions of Bering Sea are shallow, the bottom depth rarely exceeding 100 meters. Several islands among which are St. George and St. Paul (the Pribilofs), Nunivak, St. Matthew, St. Lawrence and the Diomedes, are located in the shallow region. The 100-meter contour extends from Unimak Pass in a northwesterly direction south of the Pribilof Islands to the east Siberian coast. The 1000 and 3000 meter contours lie to the southeast of the 100 meter contour and follow a direction roughly parallel to it. In most places the bottom drops off more abruptly between 1000 and 3000 meters than between 100 and 1000 meters. The southwestern portion of Bering Sea is a basin of uniform depth of approximately 3500 meters. It is connected to the Pacific Ocean between Attu Island and the Komandorski Islands by a channel of the same depth. This channel provides the sole means of circulation of the deep waters of the Bering Sea with those of the Pacific. Between Attu Island and the Alaskan Peninsula, the many islands of the Aleutian chain are separated by passes ranging in depth from 20 or 30 to over 1000 meters. These passes permit exchange of surface waters between the two bodies of water. North of the Aleutian Ridge the Bering Sea drops to a depth of over 3500 meters within 10 to 25 miles from the islands. The 1000 meter contour in some cases is less than two miles off shore. South of the islands the bottom of the Pacific slopes more gradually, the 1000 meter contour seldom being less than 10 miles from land, but extends to greater depths reaching a maximum of over 7000 meters in the Aleutian Trough, 100 miles south of the Ridge. Bering Strait connects Bering Sea with the Arctic Ocean. It is less than 50 miles wide at its narrowest point and is from 40 to 60 meters deep. Bering Strait provides a restricted path for the circulation of surface water between the Bering and the Arctic, but does not allow any transfer of deep water. Conditions thus exist in Bering Sea and the North Pacific that are not encountered in the more open North Atlantic.

The little that is known of the circulation of the waters of Bering Sea is due chiefly to reports from ships' navigators. This information for the eastern portion of Bering Sea as summarized in the "United States Coast Pilot" (1931) is essentially as follows: As far west as Attu Island, water flows through the passes of the Aleutian Islands from the Pacific to the Bering Sea. A rising tide increases the current to the north; a falling tide reverses it to the south but at a smaller velocity. Immediately north of the Aleutian Islands from Attu Island to Unalaska Island, the current set toward the east and are not affected by tides. In general the water of Eastern Bering Sea moves north and empties into the Arctic through Bering Strait. Normal currents in Bering Strait are reported as 2 knots, but here as in other parts of Bering Sea the currents may be strongly influenced by winds. The northward flow is substantiated by a similar movement of the ice which generally covers Bristol Bay and Bering Sea north of the Pribilofs during the winter months. In the western portion of the Bering Sea along the Siberian coast, south of the Gulf of Anadir, currents have been reported setting south, (Krummel, 1911). The reports of the Commanding Officers of the U.S. Coast Guard Cutters BEAR and CORWIN generally confirm these findings. (See pages 31 to 36 inclusive).

Tidal currents set through the various passes between the islands in a northerly or northeasterly direction on the flood tide and with an ebb tide, follow a southerly or southwesterly direction. Velocities as great as 9 knots are sometimes observed in the passes (U.S. Coast Pilot. Alaska. Part II, 304, (1931). The passes in the entire Aleutian Chain vary in depth from 15 to 20 fathoms to more than 300 fathoms, and thus provide paths for free circulation of the surface waters of Bering Sea and the North

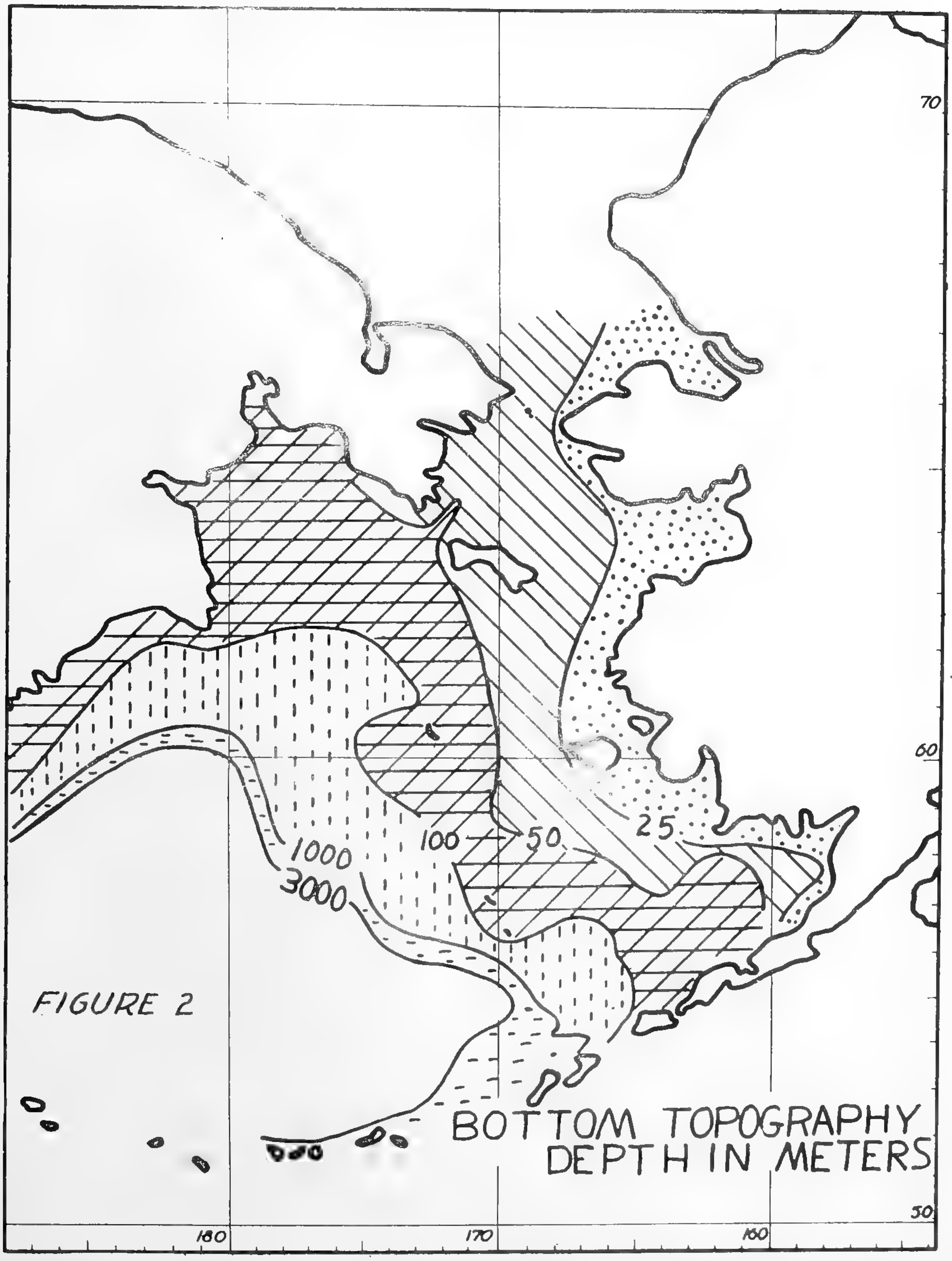

70
60
50
180
170
160
100
50
25
1000
3000
BOTTOM TOPOGRAPHY
DEPTH IN METERS

FIGURE 2

Pacific. However, the Aleutian Ridge prevents any exchange of the abysmal waters. Between Attu Island and the Komandorski Islands, depths of 2000 fathoms have been recorded, thus providing a means for the exchange of the deeper waters. (See CHELAN Report Pages 46 and 47).

Bering Strait prevents any exchange of the waters of the Arctic Ocean and thus produces conditions in Bering Sea and the North Pacific that are not encountered in the North Atlantic.

Three great rivers, the Yukon and Kuskokwim in Alaska and the Anadir in Siberia, discharge into the northern waters of Bering Sea.

The basin of Bering Sea is approximately divided into two equal portions by the 100-fathom contour which extends from Unimak Pass, in a northwesterly direction, to Siberia, passing just south of the Pribilof Islands. The sea floor, east and north of this contour, is an immense plateau of little changing depth, averaging between 20 and 30 fathoms and shoaling gradually toward the coast lines. West and south of the contour, the sea floor drops more or less rapidly to a basin approximating a depth of 2000 fathoms.

Prior to the sailing of the CHELAN from Seattle, a recording fathometer was installed. This kept an accurate account of the soundings up to 125 fathoms. The CHELAN covered much of the territory in the Bering Sea and some in the Arctic. An accurate record was kept of soundings and positions, which data was plotted. Many interesting observations were made from these soundings. It can be seen that if the elevation of the shores of the Bering Sea, the Arctic Ocean and a continental shelf lying off them is raised 200 feet they would connect Asia and Alaska; if they were raised 300 feet it would connect the eastern Aleutians as far as Umnak and the Pribilof Islands with the mainland of Alaska, laying bare a very large level plain, covering the northern half and most of the eastern part of the Bering Sea.

It was possible to observe the contour and constructions of many of the islands of the Bering Sea and the lines of Alaska and Asia. With this information and data with reference to the depths, it would appear that the glacial theory is a correct one. Soundings would indicate that a geologically short time ago the continent of North America and Asia were probably one being connected during the period when the mammoth passed over from Asia to America. Investigations have shown that man probably passed from Asia to America, over the Asian-American bridge or over that vast continental plateau which occupied what is now Bering Sea, Bering Strait, and a part of the Arctic Sea. The similarity of rock structure on both sides of Bering Strait is proof of the former land connection between Alaska and Siberia.

In spite of great variety in types, the American natives show definite similarities to Asiatics. A careful investigation of these tribes has given very significant indications as to the character of the ethnological connections between the northern Asiatics, and the Eskimo.

The Aleutians Islands and those of the Pribilofs, St. Matthew, St. Lawrence and Diomedes appear to be just a degraded portion of the Arctic glacial mountains with their foothills and most of the lowest portions under water;

the submerged ridges forming the passes between the islands, while the plains approaching these mountains now covered by the shallow waters form the Bering Sea. It bears out the theory that an ice sheet from the Arctic region once covered this area and discharged itself into the Pacific Ocean and that the basins of the Bering Sea, Bering Strait and the Arctic Ocean were simply a portion of the bed of the ice sheet which was erroded to a moderate depth beneath the level of the sea and over which the waters were gradually extended as the ice sheet was withdrawn and separated the two continents.

## ALEUTIAN ISLANDS - WEATHER.

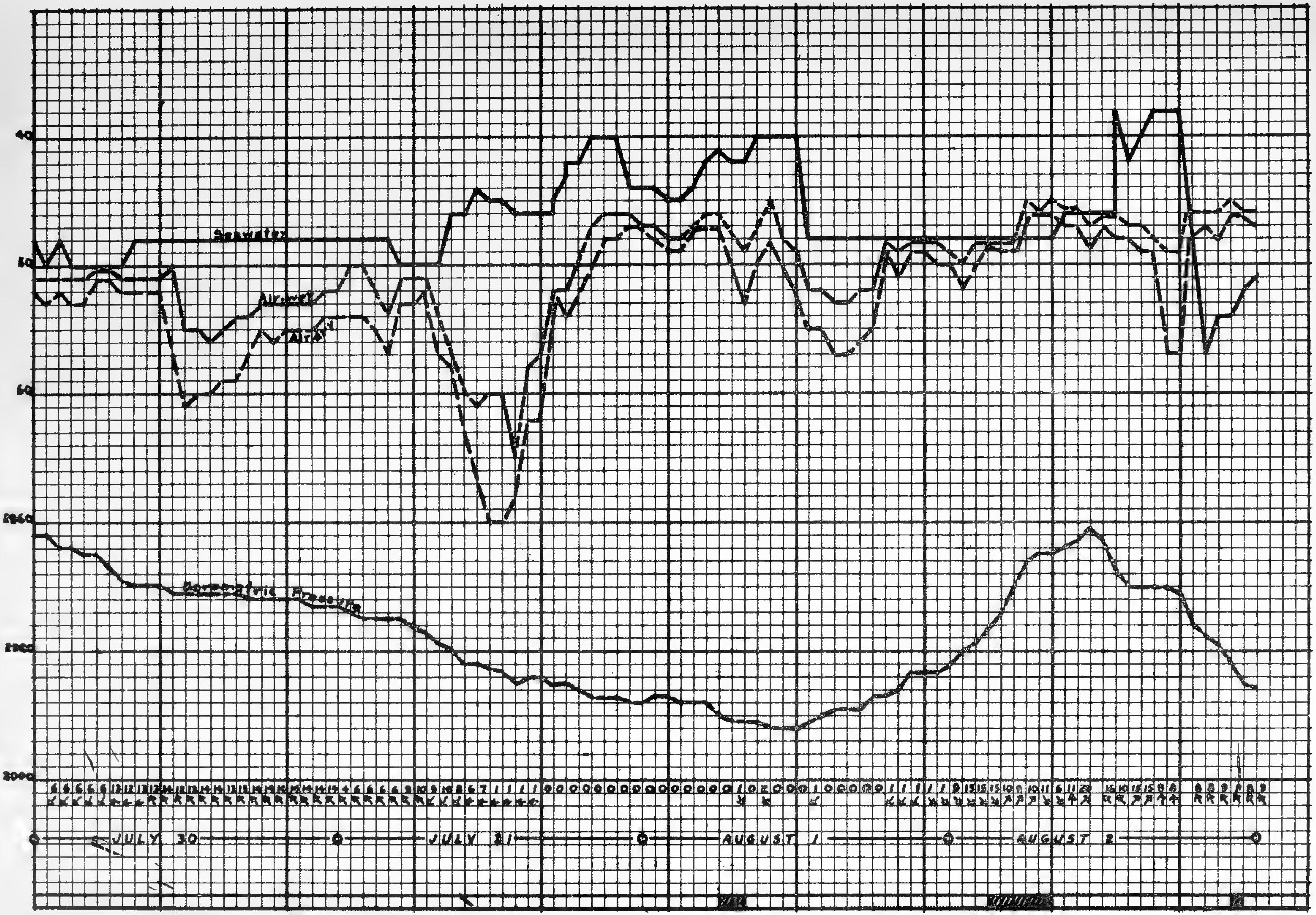
As a result of their location, winds from practically every direction are near saturation, This applies especially to those between southeast and southwest which have blown over the North Pacific Ocean, absorbing water from the Japanese current, this as a result of the higher water temperatures. South winds are usually present when the lows travel across the islands. Clear weather is usually present when the Polar Highs sweep southward toward the Aleutian Islands with a northwest to north winds, which winds contain air of low humidity far below saturation, being mostly from over Siberia and are thus dry. Most of the fall and winter storms of the North Pacific originate in the Aleutian Islands.

The weather in the Islands is usually misty with frequent blows but during the winter season and in the late spring northwest winds are encountered with consequent clear weather. The summer winds are usually southeast to southwest with an occasional northeaster. They are not very severe and of short duration but the winter gales are long and severe. The temperatures of the islands are not very extreme because of the fact that they lie between the warm Japanese current and the cold Bering Sea waters. They can be considered mild and stormy in winter and cool and damp in the summer months. No freezing temperatures occur during the summer months, the middle of May and first of October being the limiting periods. The precipitation averages about 70 inches with the greatest fall in the autumn and winter and the least in summer. Precipitation occurs on about 200 days a year, the most during October. The Kuro Suvo or Japanese current, breaks on the western end of the Aleutian chain. Half flows eastward south of the Island and carries with it the warm moist atmosphere which is condensed on the snow peaks and sinks downward in the fine and delicious mist that gives the grass its vivid, brilliant, perpetual green. The other half passes northward into Bering Sea.

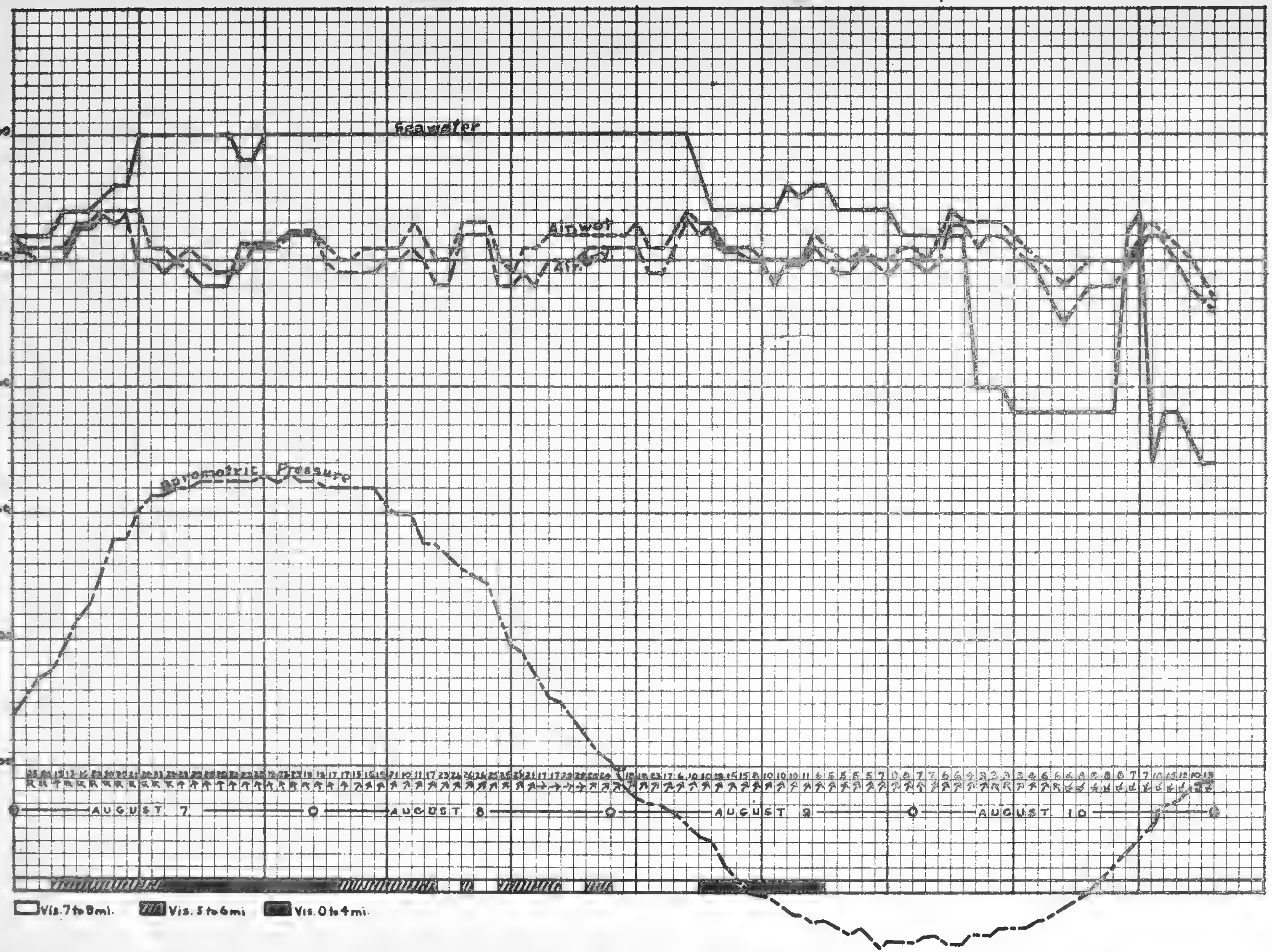
## BERING SEA.

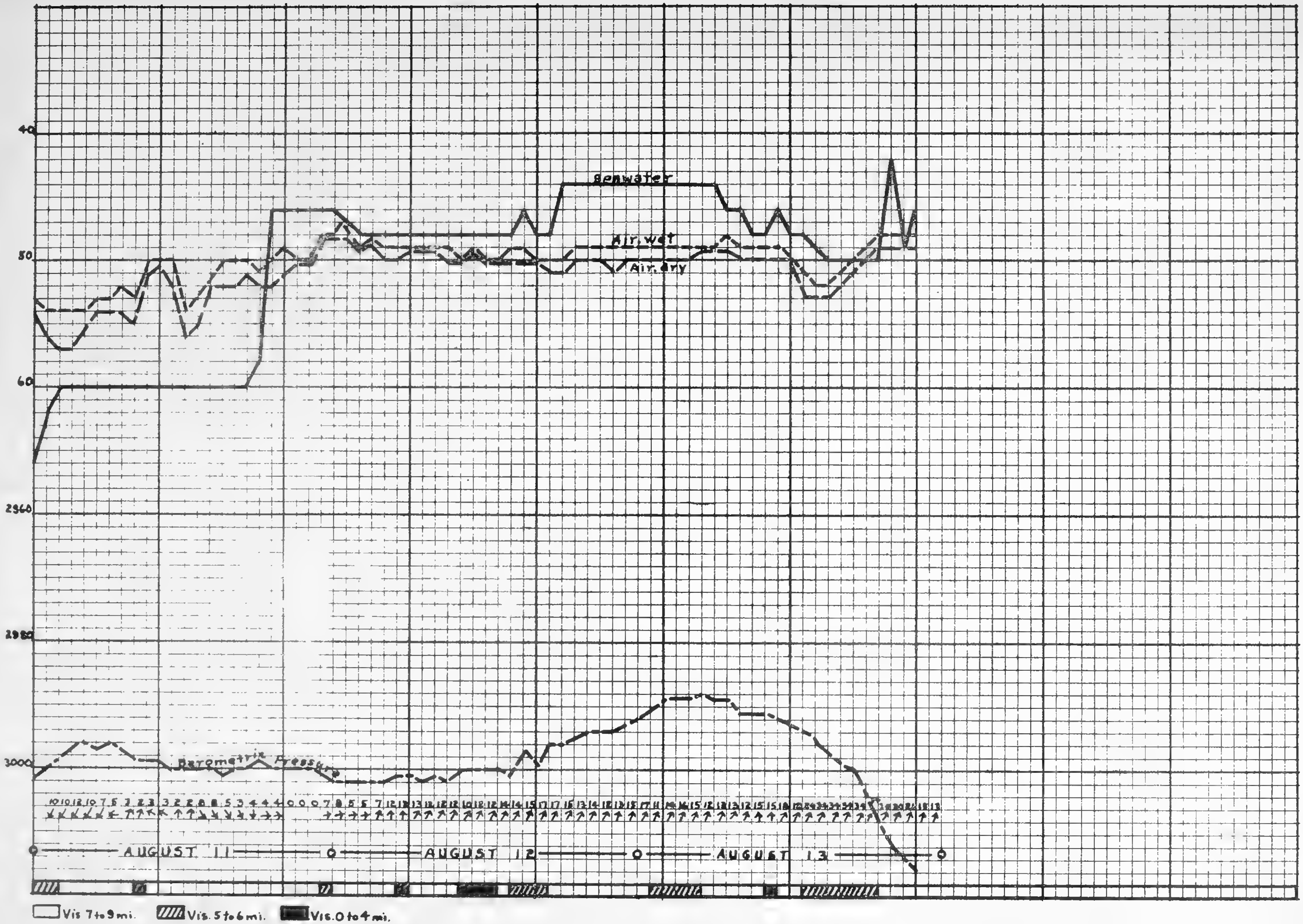
The most outstanding feature about the weather in Bering Sea is its great uncertainty. Like the Aleutian Islands good weather is rare and the winds cannot be depended upon to remain long in one quarter. The late spring and summer are mild and very foggy, with comparatively few strong winds and considerable rain. After September 1, gales become frequent but not so heavy, fogs gradually lessen, and toward the latter part of the month snow often accompanies the storms. During the fall and winter, gales are frequent, violent, and from almost any quarter.

Those gales are often accompanired by very low barometers. Though sometimes very severe, they are usually not so strong as would be expected

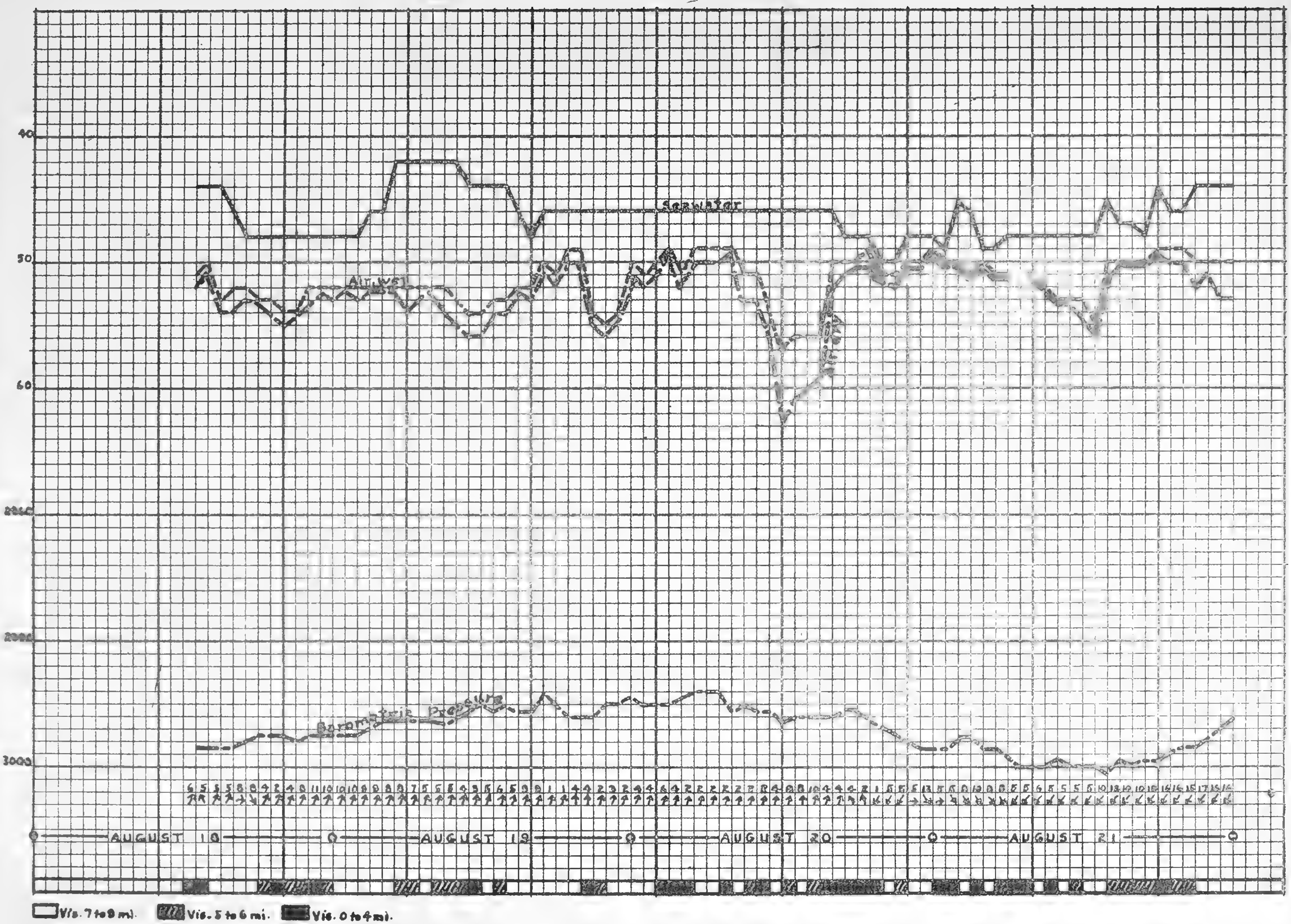



Vis. 7 to 9 mi. Vis. 5 to 6 mi. Vis. 0 to 4 mi.

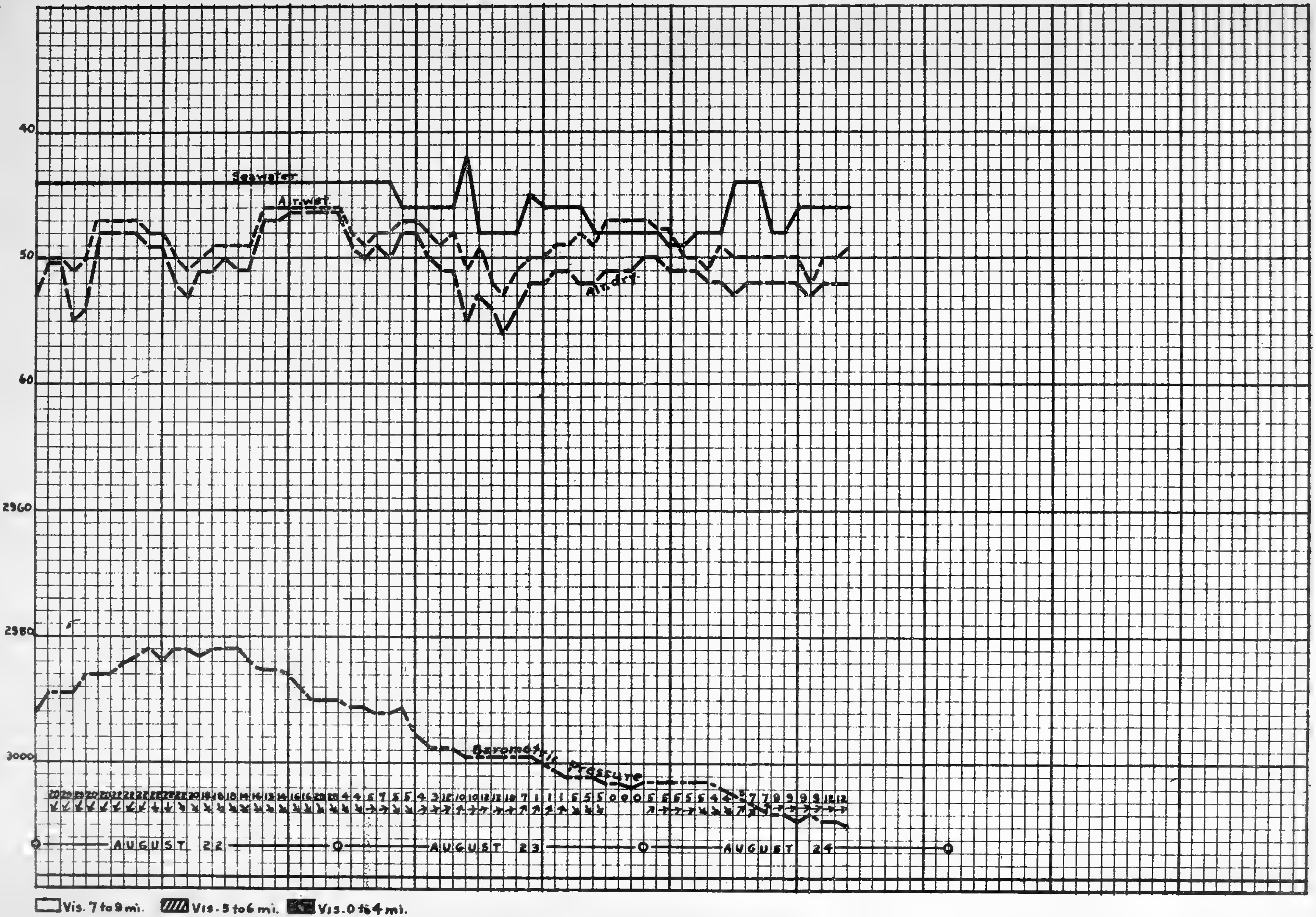

Seawater
Air wet
Air dry
Barometric Pressure
AUGUST 7
AUGUST 8
AUGUST 9
AUGUST 10
Vis. 7 to 8 mi.
Vis. 5 to 6 mi
Vis. 0 to 4 mi.



40
50
60
2960
2980
3000
Seawater
Air, wet
Air, dry
Barometric Pressure
0 AUGUST 11 0 AUGUST 12 0 AUGUST 13 0
Vis 7 to 9 mi.
Vis. 5 to 6 mi.
Vis. 0 to 4 mi.



40
50
60
3000
Seawater
Air wet
Barometric Pressure
AUGUST 18
AUGUST 19
AUGUST 20
AUGUST 21
Vis. 7 to 9 mi.
Vis. 5 to 6 mi.
Vis. 0 to 4 mi.


40
50
60
2960
2980
3000
Seawater
Air wet
Air dry
Barometric pressure
AUGUST 22
AUGUST 23
AUGUST 24
Vis. 7 to 9 mi.
Vis. 5 to 6 mi.
Vis. 0 to 4 mi.

by the fall of the barometer. There are often periods of moderate weather. Strong winds or gales from any quarter always bring thick weather, rain, or snow. With easterly or southerly winds the rain is continuous, while with westerly or northerly winds the rain or snow occurs at intervals in squalls, and when the wind subsides the weather is likely to be clear.

Southeast gales, with falling barometer and rising temperature are generally preceded by an almost unusual clearness of the air; cirrus clouds are seen southwestward, which gradually thicken and overspread the sky. The wind usually shifts to southwestward when the barometer ceases to fall, but it sometimes backs from southeast to northeast and generally goes to northwest before subsiding. Upon abating, the gale is followed by light westerly winds and comparatively clear weather. (See charts on weather).

Ice generally covers Bering Sea north of the Pribilof Islands and Bristol Bay during the winter, but there may be considerable seasonal variations. This ice invariably moves northward, propelled by the surface current through the Bering Sea into the Arctic Ocean, unless influenced by adverse winds. The movement generally begins in April, ice breaking along the Siberian coast. Bering Strait may not be free of ice until the first week in July.

## RESULTS AND DISCUSSION.

Temperature and Chlorinity Distribution. The distribution of surface temperature (Table I) was characterized by a decrease from east to west. Comparatively high temperatures of above 9° C. were found along the Alaskan coast off the Yukon Delta. This region extended from Nunivak Island through Norton Sound to the Seward Peninsula. In the southern portion of Bering Sea, a tongue of warm water protuded west of a line between St. George and Bogoslof Islands (Section XIII). Cold surface water of from 3° to 6° C. was found along the East Siberian coast, extending from St. Lawrence Island west of the Diomedes to the Arctic Ocean. Abnormally low surface temperatures of 2.34° C. and 2.32° C. were found at stations 39 and 50 within this area. Most of the surface temperatures observed were between 6° and 9°, indicating that temperature range throughout the central portion of Bering Sea and the eastern part of Bering Strait. Isotherms for subsurface levels to depths of 50 meters paralleled roughly surface isotherms and also contours of equal bottom depth. Temperatures at subsurface levels were lower than at the surface. The 6° isotherm at 25 meters occupied approximately the position of the 9° surface isotherm. Values of below 0° C. were found at 25 meters between St. Lawrence Island and the Siberian mainland (Stations 68 and 69). The coldest water on the cruise with a minimum temperature of -1.63°C. was found near the bottom (50 meters depth) in the region southwest of St. Lawrence Island. This cold area included Sections IX, X, and the western end of XI, pointing to the Gulf of Anadir as the "cold center" of Bering Sea.

Chlorinity values for surface waters increased from about 18.00 °/oo near the Aleutian Ridge to a maximum of above 18.25 °/oo, 50 miles north of the ridge. Continuing north from this area, the values decreased to between 17.25°/oo and 17.50 °/oo at 60° north latitude (Section XI). North of 60° the predominant variation was in an east-west direction, chlorinities increasing from 17.00 °/oo or less along the Alaskan shore to maximum values of above 18.00 °/oo a short distance from the East Siberian coast. Inshore values had dropped below 17.50 °/oo due to the fresh water drainage from land. Inflow from the Yukon, which drains over 330,000 square miles of territory, and the Kuskokwim Rivers explained the low chlorinities along the Alaskan coast. The relative distribution of chlorinity for subsurface levels down to 50 meters was similar to that at the surface, but the concentrations were higher. As with isotherms, isochlors paralleled roughly the bottom contours.

The vertical distribution of temperature and chlorinity varied considerably with location. Average values for 11 stations of under 30 meters in depth in Norton Sound showed a uniform temperature gradient with comparatively high temperatures extending to depths of 20 meters:

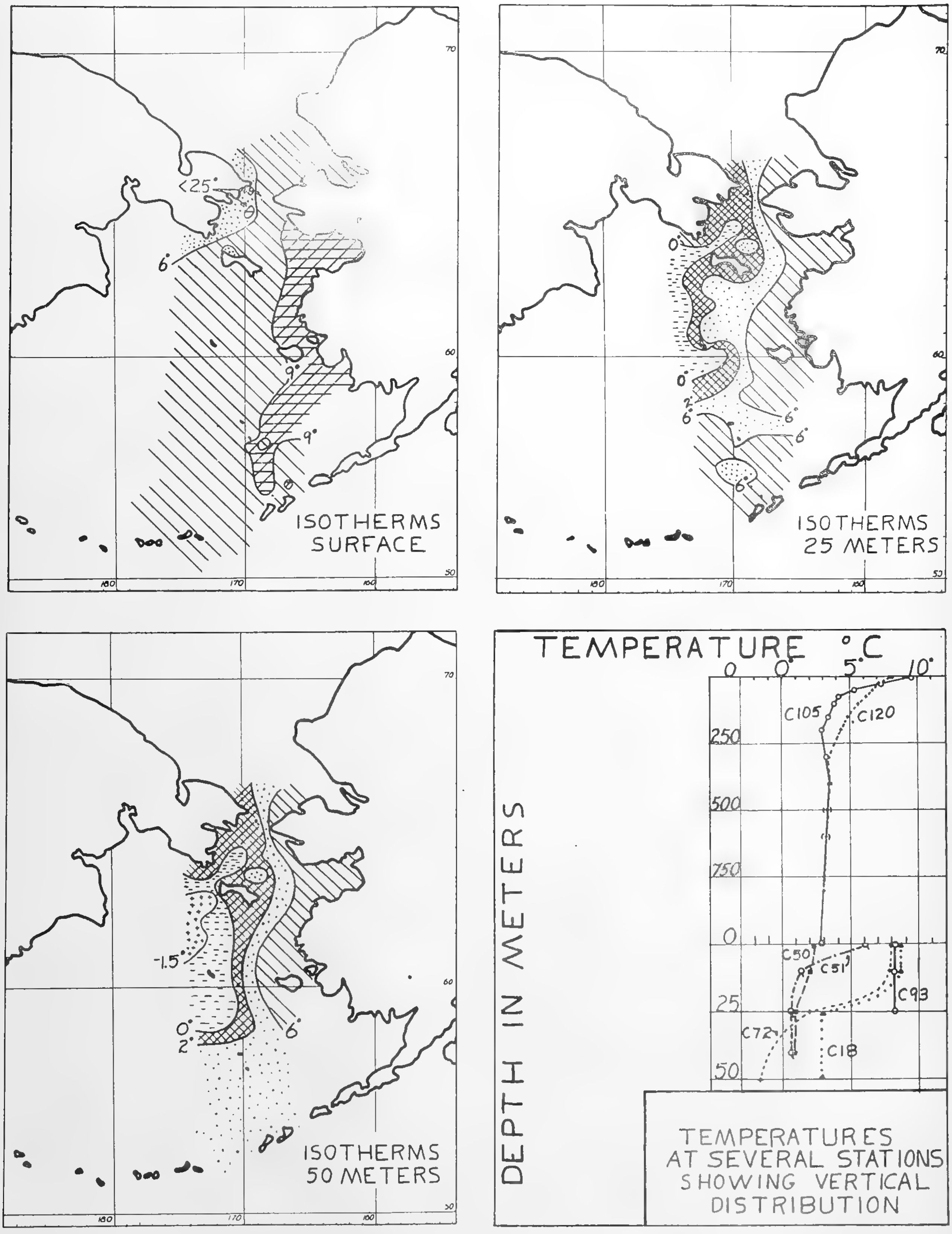
| Depth Meters | 0 | 10 | 20 |
|---|---|---|---|
| Temperature °C. | 9.29 | 7.18 | 5.94 |
| Chlorinity °/oo | 17.23 | 17.63 | 17.68 |

The Chlorinities showed the effect of surface dilution from the Yukon River. See especially the data for stations 28, 29, 58, and 59 in Table I. The waters at a number of stations near the Alaskan coast were well mixed from top to bottom. This was true of the stations near Nunivak Island, for example stations 23 to 25 in Section III and stations 91 and 92 of Section XI. At these stations the water had been so recently mixed that little evidence of the normal surface warming was found, temperatures being practicallythe same at all depths.

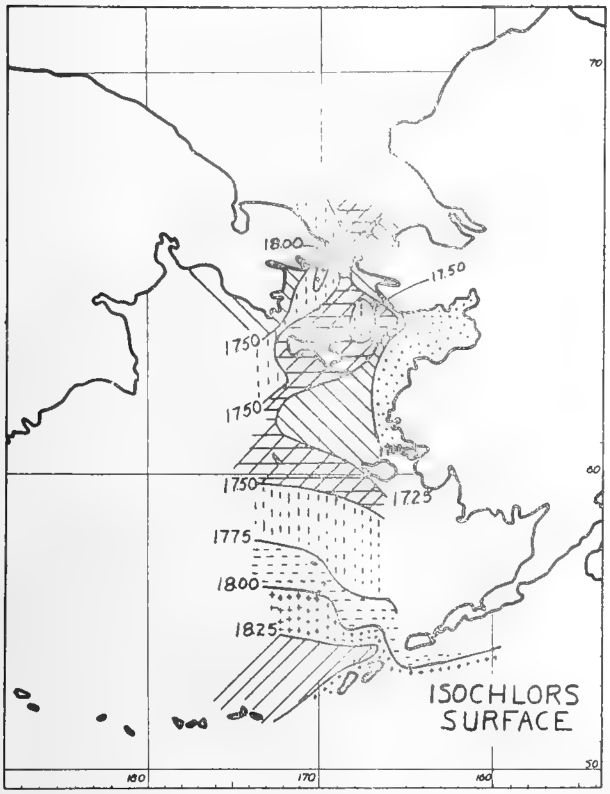
In general the shallow waters in central and western Bering Sea north of the Pribilof Islands, were divided into two distinct thermal layers separated by a transition zone of varying thickness. The upper warmer layer was of lower chlorinity than the cold bottom water. This condition is well illustrated by data from stations 95 to 98 in Section XII and stations 18 to 20 of Section III. At these stations the water of the first 10 meters below the surface lay in one homogeneous layer, and that below 25 meters lay in another having entirely different properties. At Station 97 the sharp temperature drop and chlorinity increase occured within a space of five meters. The water had a temperature of 8.35° C. and a chlorinity of 17.56 °/oo at 20 meters as contrasted to 3.53° C. and 17.86 °/oo at 25 meters. For most of the stations between St. Matthew and St. Lawrence Islands (Section X), the greatest changes in temperature and concentration took place between the depths of 10 and 25 meters. At stations 68 and 69 between St. Lawrence Island and Siberia (Section IX), the transition zone centered about a depth of 10 meters, whereas at Station 70A of the same section, the entire change had occured between the surface and 10 meters.

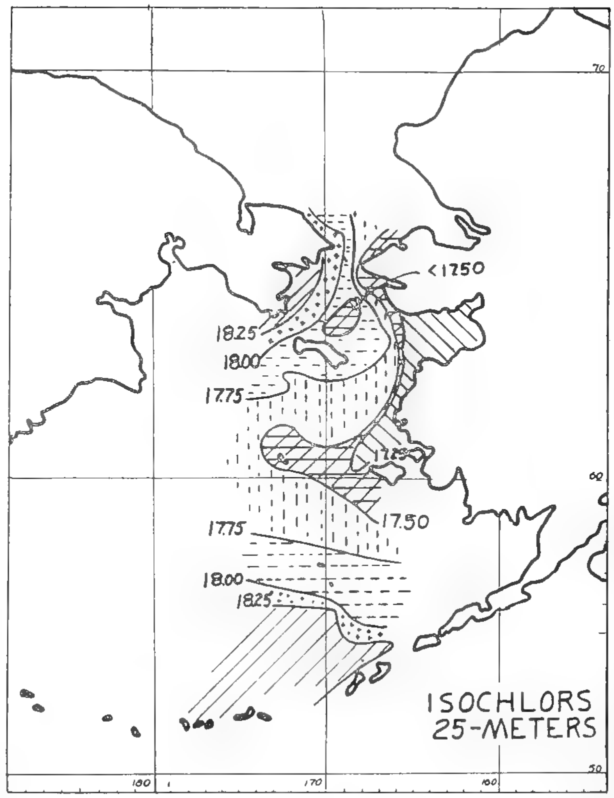
At stations 39 and 50 mentioned previously as having exceptionally low surface temperatures, temperature and chlorinity changes from top to bottom were small, less than 1.5° C. and 0.10 °/oo respectively. This water had evidently undergone very recent mixing. A comparison of the data at Station 50 with that of other stations in North Bering Sea shows the temperature to be too low and the chlorinity too high for water originating

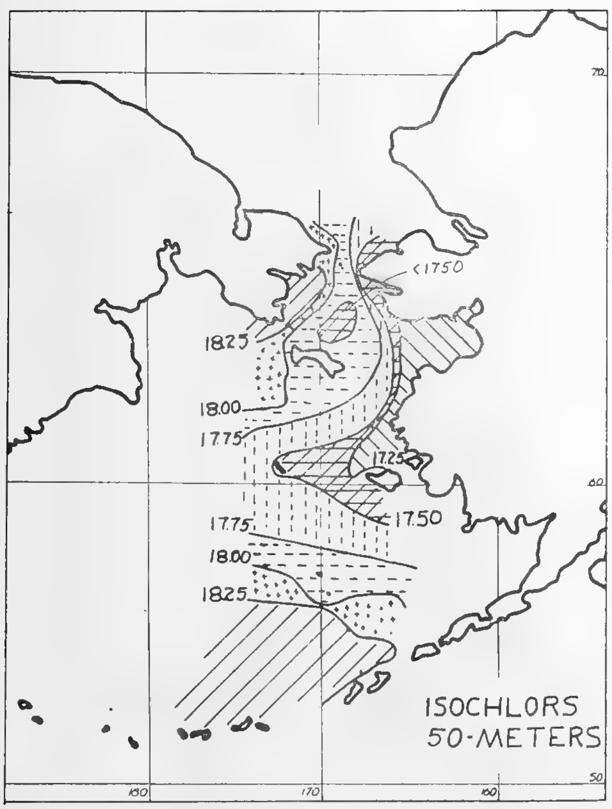
EE

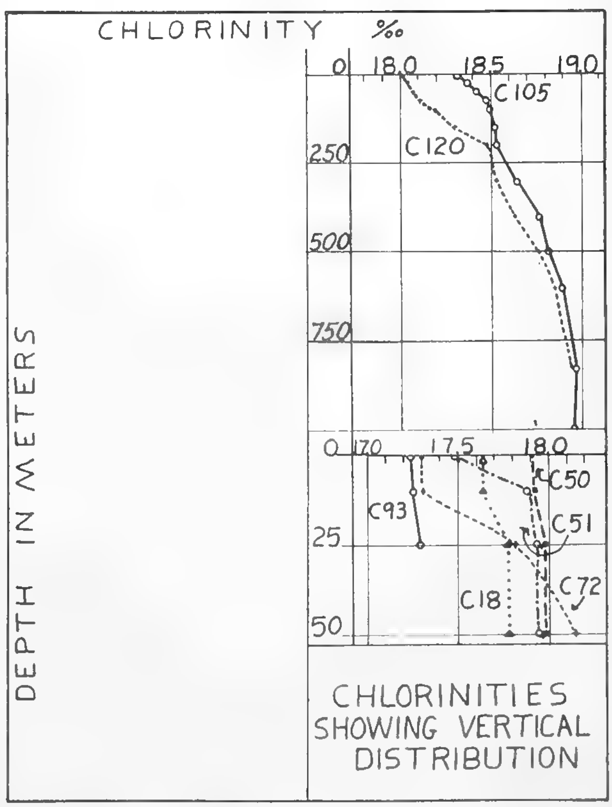


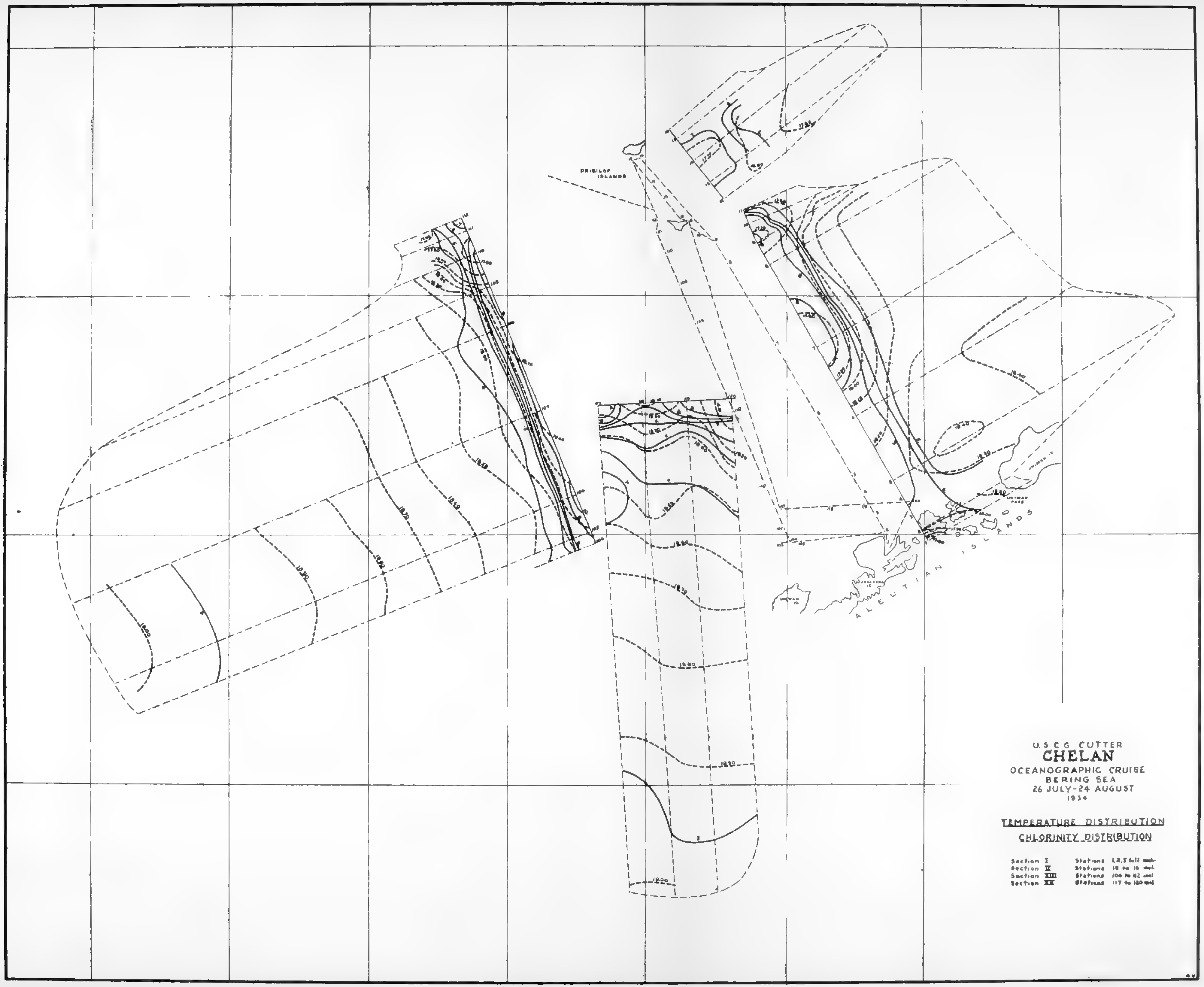
ISOTHERMS
SURFACE
<25°
6°
9°
9°
ISOTHERMS
25 METERS
0°
0°
2°
6°
6°
6°
6°
ISOTHERMS
50 METERS
-1.5°
0°
2°
6°
TEMPERATURE °C
0 0° 5° 10°
DEPTH IN METERS
250
500
750
0
25
50
C105
C120
C50
C51
C93
C72
C18
TEMPERATURES
AT SEVERAL STATIONS
SHOWING VERTICAL
DISTRIBUTION


18.00
17.50
1750
1750
1750
1725
1775
18.00
1825
ISOCHLORS
SURFACE
70
60
50
180
170
160

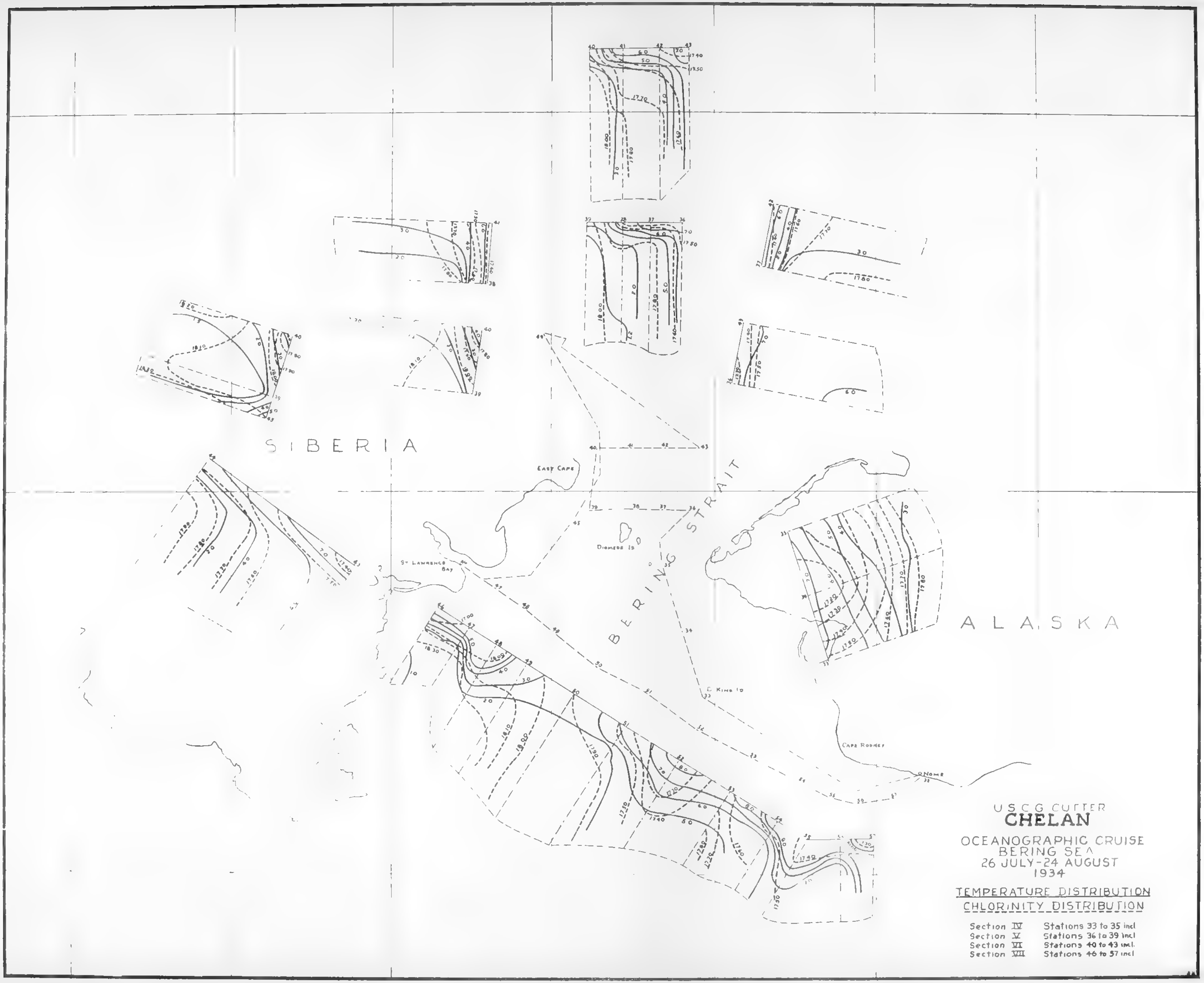

<1750
1825
18.00
17.75
1725
17.50
17.75
18.00
1825
ISOCHLORS
25-METERS
70
60
50
180
170
160


<1750
1825
18.00
17.75
1725
17.50
17.75
18.00
1825
ISOCHLORS
50-METERS
70
60
50
180
170
160


CHLORINITY ‰
DEPTH IN METERS
0
18.0
18.5
19.0
C105
C120
250
500
750
0
17.0
17.5
18.0
C50
C93
C51
25
C72
C18
50
CHLORINITIES
SHOWING VERTICAL
DISTRIBUTION


PRIBILOF ISLANDS
UNIMAK PASS
UNIMAK ID.
ALEUTIAN ISLANDS
U.S.C.G. CUTTER
CHELAN
OCEANOGRAPHIC CRUISE
BERING SEA
26 JULY–24 AUGUST
1934
TEMPERATURE DISTRIBUTION
CHLORINITY DISTRIBUTION


ALASKA
ST LAWRENCE ISLAND
NUNIVAK ID
U.S.C.G. CUTTER
CHELAN
OCEANOGRAPHIC
CRUISE
BERING SEA
26 JULY - 24 AUGUST
1934
TEMPERATURE DISTRIBUTION
CHLORINITY DISTRIBUTION
Section III Stations 17 to 32 incl.
Section VIII Stations 36 to 66 incl.
Section IX Stations 67 to 70 incl.
Section X Stations 70 to 82 incl.
Section XI Stations 84 to 94 incl.
Section XII Stations 95 to 101 incl.
Section XIV Stations 113 to 116 incl.


SIBERIA
ALASKA
BERING STRAIT
EAST CAPE
DIOMEDE IS
ST LAWRENCE BAY
C KING IS
CAPE RODNEY
NOME
U S C G CUTTER
CHELAN
OCEANOGRAPHIC CRUISE
BERING SEA
26 JULY-24 AUGUST
1934
TEMPERATURE DISTRIBUTION
CHLORINITY DISTRIBUTION
Section IV Stations 33 to 35 incl
Section V Stations 36 to 39 incl
Section VI Stations 40 to 43 incl.
Section VII Stations 46 to 57 incl

along the Alaskan coast. The temperatures and chlorinities are too low for water inshore along the Siberian coast at the same latitude. The source of this water must then have been at a distance, either north in the Arctic Ocean or southwest in the Gulf of Anadir. Both direct current measurements and calculated currents indicated the latter. This conclusion was substantiated by results from Station 69 which lay in the path of any water moving from the Gulf of Anadir to Station 50. The water at 69 was stratified as it came from the Gulf but had a mean chlorinity equal to that at 50, showing that the latter could have been formed by the mixing of the waters passing north between St. Lawrence Island and Siberia at, or near, Station 69. This water evidently continued on through Bering Strait in a path not far removed from Station 39.

In Section V (Station 36 to 39) taken across Bering Strait at its narrowest point, uniformly high temperatures and low chlorinities were found near the Alaskan Coast and low temperatures and high chlorinities on the Siberian side. Each water mass within itself was quite homogeneous due to mixing at the entrance to the strait. The difference between the two arose from their sources. The Siberian water came from the cold, relatively concentrated Gulf of Anadir and flowed toward Bering Strait west of St. Lawrence Island. The Alaskan water came from Bristol Bay and the Yukon Delta and moved northeast of St. Lawrence Island. At the two stations in the middle of the section (38 and 39), the lighter Alaskan water overflowed the more dense Siberian water causing stratification.

For the purpose of studying tidal effects and other variations of a short-time nature, values of temperature and chlorinity at intervals during a 23-hour period were determined in Bering Strait at Station 45. The properties of the water were practically constant at depths of 25 and 40 meters, but temperature values at the surface and 10 meter levels fluctuated widely. The mean values of temperature and chlorinity have been computed and are shown, together with the maximum and mean deviations from the mean in Table V.

TABLE V.

Temperature and chlorinity values, showing the maximum and mean deviation from the mean for a 23-hour period at Station 45 in Bering Strait

| | Temperature °C. | | | Chlorinity °/oo | | |
|---|---|---|---|---|---|---|
| Depth Meters | Mean | Maximum Deviation from Mean | Mean Deviation from Mean | Mean | Maximum Deviation from Mean | Mean Deviation from Mean |
| 0 | 4.79 | 0.95 | 0.64 | 18.10 | 0.05 | 0.02 |
| 10 | 2.67 | 0.83 | 0.51 | 18.16 | 0.02 | 0.01 |
| 25 | 1.53 | 0.085 | 0.03 | 18.20 | 0.02 | 0.01 |
| 40 | 1.49 | 0.06 | 0.03 | 18.21 | 0.02 | 0.01 |

The vertical distribution of temperature and chlorinity for the deep water stations between the Aleutian Ridge and the Pribilof Islands is perhaps best summarized by average results from several stations. The results from seven such stations (102, 105, 106, 107, 117, 118, and 119) have been averaged and are shown together with the maximum and mean deviations from the mean in

Table VI. Temperatures decreased with

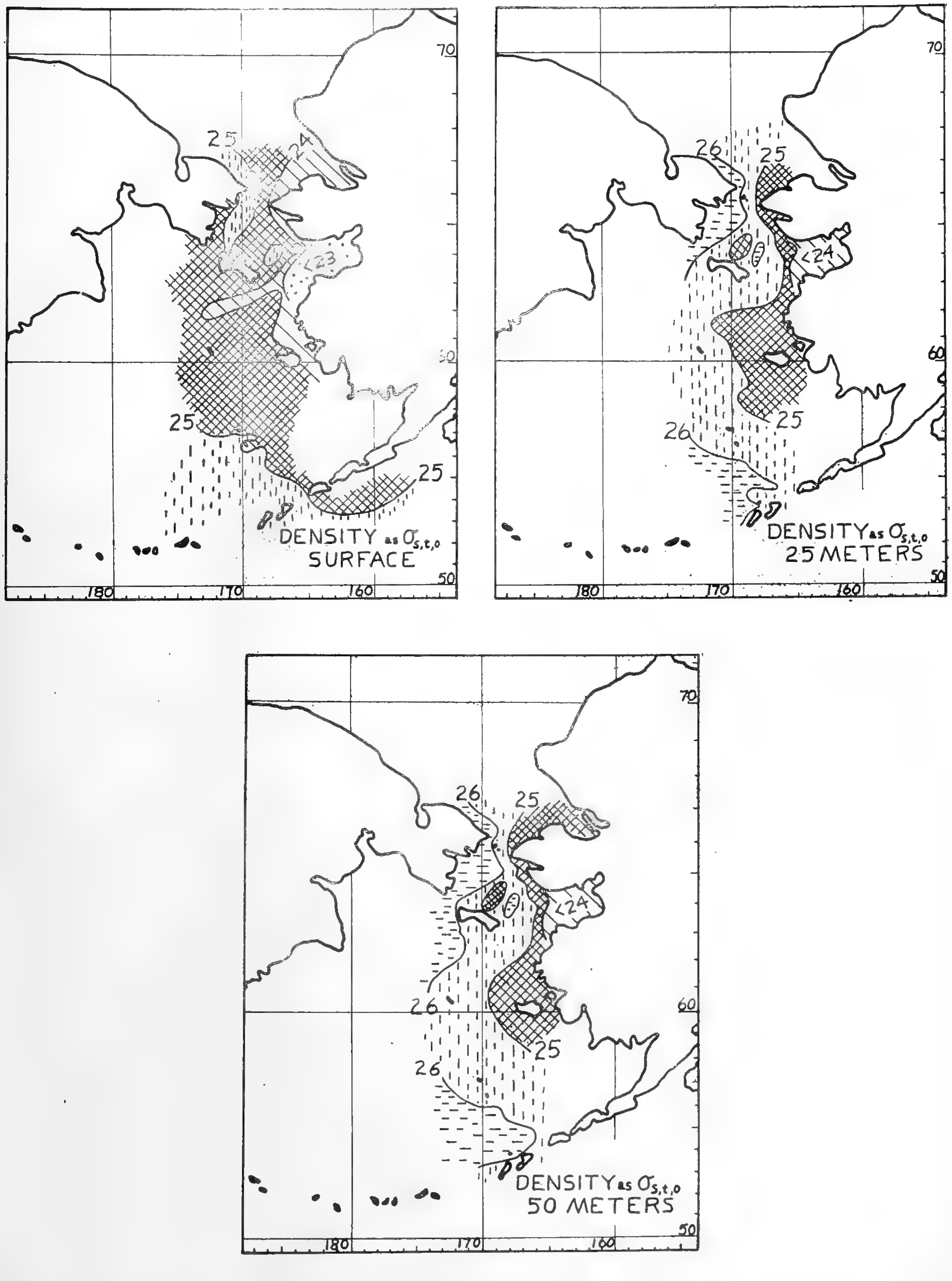
TABLE VI.

Temperature and chlorinity values showing the maximum and mean deviations from the mean at seven stations between the Aleutian Ridge and the Pribilof Islands

| Depth Meters | Temperature °C. | | | Chlorinity °/oo | | |
|---|---|---|---|---|---|---|
| | Mean | Maximum Deviation from Mean | Mean Deviation from Mean | Mean | Maximum Deviation from Mean | Mean Deviation from Mean |
| 0 | 8.88 | 2.27 | 1.10 | 18.17 | 0.18 | 0.10 |
| 10 | 8.31 | 2.24 | 1.06 | 18.21 | 0.17 | 0.07 |
| 25 | 7.04 | 1.71 | 1.21 | 18.27 | 0.10 | 0.06 |
| 50 | 5.00 | 0.74 | 0.33 | 18.33 | 0.10 | 0.06 |
| 75 | 4.50 | 0.82 | 0.48 | 18.40 | 0.08 | 0.05 |
| 100 | 4.23 | 0.72 | 0.51 | 18.45 | 0.07 | 0.04 |
| 150 | 3.72 | 0.97 | 0.50 | 18.49 | 0.05 | 0.02 |
| 200 | 3.34 | 0.71 | 0.34 | 18.53 | 0.05 | 0.02 |
| 300 | 3.52 | 0.44 | 0.14 | 18.63 | 0.04 | 0.03 |
| 400 | 3.46 | 0.09 | 0.03 | 18.74 | 0.06 | 0.03 |
| 500 | 3.37 | 0.06 | 0.03 | 18.81 | 0.05 | 0.02 |
| 600 | 3.27 | 0.05 | 0.02 | 18.87 | 0.06 | 0.03 |
| 800 | 3.04 | 0.07 | 0.03 | 18.95 | 0.04 | 0.02 |
| 1000 | 2.84 | 0.09 | 0.04 | 19.00 | 0.06 | 0.02 |

increasing depth to depths of 150-200 meters and then rose to a slight subsurface maximum at 300 meters. Between 400 and 1000 meters, a uniform decrease occured. The greatest temperature variations were in the first 25 meters, but considerable variation extended to depths of 300 meters. From 400 to 1000 meters, the mean deviation from the mean averaged 0.03° C. Chlorinity values showed a uniform increase with increasing depth. The greatest deviations from the mean occurred in the first 100 meters. Below 100 meters, the mean deviation from the mean never exceeded 0.03 °/oo.

Density. The density of the water at any given level is a function of the temperature and chlorinity and is determined by those values. For the area investigated, the isopycnic lines showing the distribution of density at the different levels are approximately parallel to the temperature and chlorinity contours as well as to the bottom contours. The lowest density values were found at the surface in Norton Sound off the Yukon Delta. Values of density expressed as $\sigma_{s,t,o}$ of under 23.00 were found in this region. Maximum values of above 25.00 were found just off the Siberian coast and also southwest of a line extending from the Pribilof Islands to Unimak Island. The distribution at the 25- and 50-meter levels was analagous to that at the surface, densities increasing from east to west. Values of about 26.00 were found at these levels in the deep water south of St. George Island and in the shallow water near the Siberian coast. Waters from the shallow region of northern Bering Sea were quite stable, densities increasing with depth, the increase being very rapid at the transition zone. Only at stations in positions of continuous mixing were densities uniform from top to bottom. In the region of deep water near Bogoslof Island, maximum values of $\sigma_{s,t,o}$ of 27.43 were found at 1000 meters. The stability of the water showed a normal decrease with increasing depth in this area.


DENSITY as $\sigma_{s,t,0}$
SURFACE
DENSITY as $\sigma_{s,t,0}$
25 METERS
DENSITY as $\sigma_{s,t,0}$
50 METERS
25
24
<23
26
<24
70
60
50
180
170
160

Currents. Calculated current results are given in Table IV. Two diagrams have been constructed, the first of which (Figure 4) shows the dynamic topography of the surface referred to the 1000 decibar level for the region of deep water between the Aleutian Ridge and the Pribilof Islands. The second diagram (Figure 5) shows the dynamic topography of the surface referred to the 50 decibar level for the region between St. Paul Island and the Arctic Ocean. Contour lines are drawn for intervals of two dynamic centimeters. Arrows show the direction of the current. Numbers adjacent to the arrows give the water velocities in knots. Not all stations in deep water region were sampled to depths of 1000 meters. In such cases the dynamic heights were obtained by extrapolation, using 1000-meter stations as a basis. The same procedure was followed for northern Bering Sea at stations less than 50 meters in depth. The diagrams are not exact at all points due to these extrapolations but are essentially correct as shown by checking the extrapolations using different reference stations. The small temperature and chlorinity variations at depths of 1000 meters (Table VI) indicate almost constant conditions with little current at that depth. Thus Figure 4, based on relative values, also gives quite accurately the picture of the absolute current field for the deeper region.

North of the Aleutian Ridge near Bogoslof Island, the currents paralleled the ridge toward the east, swung north in the vicinity of Unalaska Island as the water met the continental shelf, and then doubled back along the shelf as it headed to the northwest south of the Pribilof Islands. Current magnitudes in this area were 0.3 knot or less. Between Unimak and Unalaska Islands, the Pacific water set north into the Bering at velocities up to 0,4 knot. West of Unalaska Island, the velocity component towards the north was less, but the general transfer of water from the Pacific to the Bering was still present. Water velocities decreased with increasing depth, becoming small at depths of 800 to 1000 meters as compared to those at the surface.

In the northern portion of Bering Sea, water from Bristol Bay and the Yukon Delta moved north along the Alaskan coast and passed into the Arctic through the eastern portion of Bering Strait. Cold water from the Gulf of Anadir and perhaps some surface water from the deeper region of the Bering, moved north along the Asiatic coast and into the Arctic on the western side of the Strait. Small eddy currents were found between St. Lawrence and the Diomede Islands. Currents calculated by the Bjerknes method for the shallow waters of North Bering Sea are low, as this method gives only the relative velocities referred to the lowest observed level, and water at this level was shown by direct current measurements to be in motion. Surface currents depicted in Figure 5 and given in reference to the 50-deciber level accordingly do not give the obsolute currents for that region. The diagram, however, shows satisfactorily the lines of flow and relative currents.

Calculated currents showed that in general the water in Bering Sea moved in a direction paralleling the coast lines and the bottom contours. This can be readily seen by comparing figures 4 and 5 showing the currents with Figure 2 showing the bottom topography.

Direct currents as obtained by observations from the anchored ship by means of an Ekman current meter (Table IV) are shown for several stations in Figure 6. In this diagram the lengths of the arrows are proportional to the velocity of the water masses and their directions show the direction of the flow. In most cases the water was found to be in motion from top to bottom, the velocity decreasing with increasing depth. Current values obtained by direct measurement are absolute, and higher than the relative values obtained by dynamic methods. Both methods indicated the same water transfer, namely, from the Pacific north through the Bering and into the Arctic through Bering Strait.

Direct current measurements taken for a 21-hour period at Station 45 in Bering Strait gave a mean water velocity from top to bottom of 0.5 knot setting north. Currents varied from 0.3 to 0.7 knot during the observations but maintained a constant direction and showed little change of intensity with depth. Considering uniform velocity across Bering Strait at this point, its width and mean depth, the above velocity corresponds to a flow of 0.5 cubic nautical mile per hour. This flow is above 3% of that for the Gulf Stream at its narrowest point off the coast of Florida as calculated by Wüst (1930). It is equivalent to a river 15 times as large as the Mississippi which has an average hourly discharge of about 0.03 cubic nautical mile.

Similar current measurements were made for a nine-hour period at Station 70 between St. Lawrence Island and Siberia. The current at this place averaged 1.3 knot setting consistently about 15° east of north. The mean current was 0.26 knot greater at 5 meters than at 35 meters. Direct current measurements were made at stations 82 and 83 during and just after a heavy wind. The values were abnormally high for this region as was shown by the uniform decrease as the storm abated at the end of the observation period. Currents based on a 24-hour period of observation at Station 94 off Cape Mohican, Nunivak Island, were chiefly tidal in nature and followed the shore line. The currents reversed direction with a change of tide but showed a net transfer of water to the north. Currents at Station 103 at the west anchorage of Bogoslof Island were quite constant at 0.8 knot setting northwest. These currents can not be taken as a true measure of those in deep water a short distance offshore, as the water undoubtedly increased in velocity and modified its direction to conform to the bottom contour as it flowed over the shallow shelf surrounding the island.

The surface currents obtained by both direct measurements and dynamical methods agree well in direction with those outlined by the "United States Coast Pilot" - Alaska - Part II (1931). The magnitudes in a number of cases differed considerably from values reported by previous observers based on methods of a more or less qualitative nature. Prior to the cruise of the **CHELAN**, subsurface currents for most of the area investigated had never been determined.

Dissolved Oxygen and Minor Constituents. The data for dissolved oxygen and minor constituents are given in Table I, section b. Considering the horizontal distribution at the surface for the shallow region extending from the Pribilof Islands to the Arctic Ocean, oxygen concentrations were low, less than 0.5 milligram atom per kilo along the Alaskan coast, and high, greater than 0.9 milligram atom per kilo corresponding to about 150 per cent saturation along the Siberian coast in the vicinity of East Cape. The maximum value observed was 0.972 mg.at. (153 per cent saturation) at station 40 in the northern part of Bering Strait. The concentration for most of the central part of the region was approximately equal to the saturation value for the water. Phosphate concentration increased from less than 0.5 microgram atom per kilo on the eastern side of Bering Sea

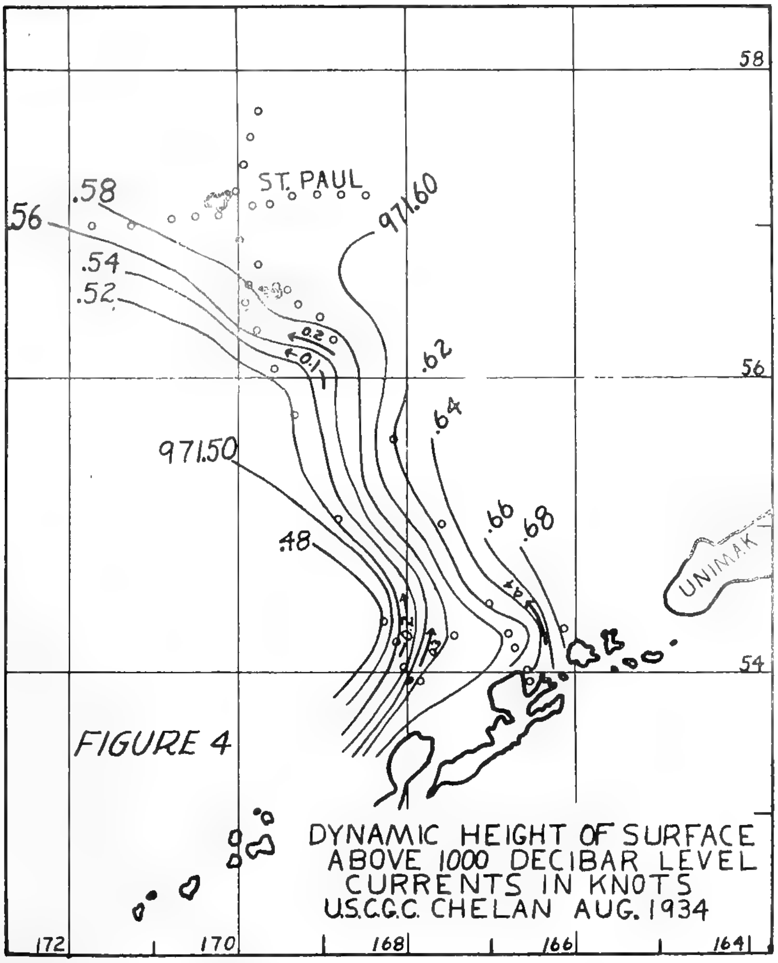
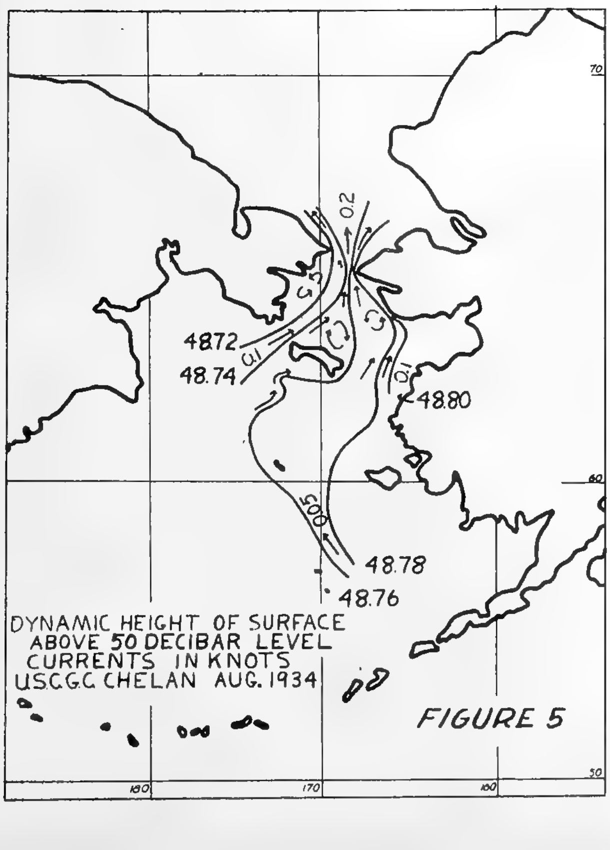



FIGURE 4

DYNAMIC HEIGHT OF SURFACE ABOVE 1000 DECIBAR LEVEL CURRENTS IN KNOTS U.S.C.G.C. CHELAN AUG. 1934




DYNAMIC HEIGHT OF SURFACE ABOVE 50 DECIBAR LEVEL CURRENTS IN KNOTS U.S.C.G.C. CHELAN AUG. 1934

FIGURE 5

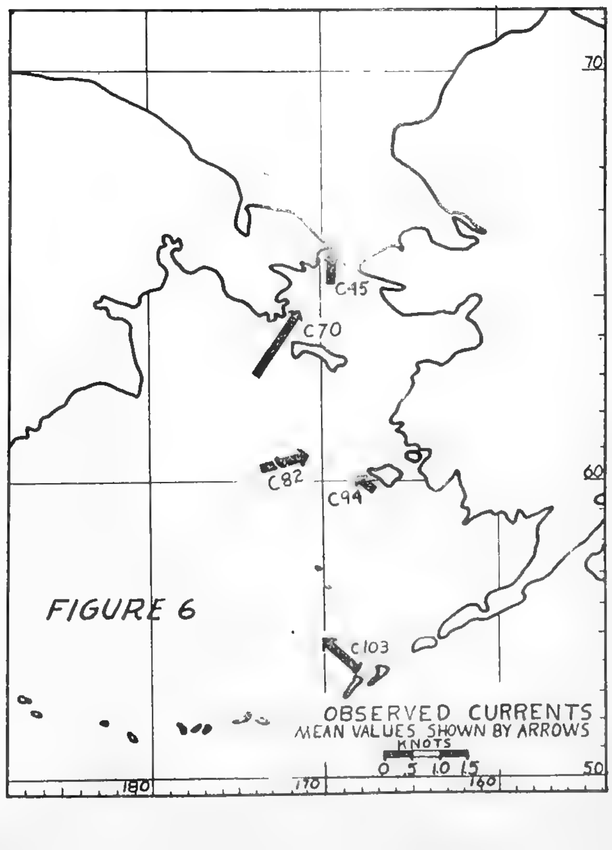



FIGURE 6

OBSERVED CURRENTS MEAN VALUES SHOWN BY ARROWS

to a maximum of 2.1 microgram atoms at Station 49, about 30 miles from the Siberian coast at the southern entrance to Bering Strait. Silicates at this station were 35 mcg.at. per kilo as contrasted to values of from 0 to 10 mcg. at. for the entire central portion of the area. In Norton Sound from Nunivak Island to Nome, silicate concentrations were higher, above 20 mcg. at., due to the soluble silicate carried down by the Yukon and Kuskokwim rivers. Nitrites were entirely absent or present in concentrations of less than 0.05 mcg. at. per kilo in the eastern and central area of North Bering Sea. The highest values above 0.20 mcg. at. were found along the Siberian coast. Unusually high concentration of nutrient salts and low concentrations of dissolved oxygen in the surface layers at stations 49 and 50 are explained on the basis of turbulence in that region as brought out in the discussion of temperature and chlorinity values. In South Bering Sea high concentrations of phosphate, silicate, and nitrite were found along or just north of the Aleutian Ridge. This may be explained by upwelling and mixing due to turbulence of the Pacific water as it passes across the Ridge into the Bering..

The horizontal distribution of nutrient salts at subsurface levels was relatively the same as at the surface, but the actual concentrations were higher at the lower levels. Throughout Bering Sea the contours showing the distribution of nutrient salts and dissolved oxygen, as was the case with the isotherms and isochlors, tended to follow the bottom contours and lie in the direction of the currents.

In order to show the vertical distribution in South Bering Sea, values of dissolved oxygen and nutrient salts for seven deep water stations (102, 105, 106, 107, 118, 119, and 120) have been averaged. These average values are given in Table VII. The concentration of dissolved oxygen

TABLE VII.

Average concentrations for dissolved oxygen and nutrient salts for seven stations in Bering Sea near Bogoslof Island. (Concentrations of dissolved oxygen are expressed as milligram-atoms and of nutrient salts as microgram-atoms of the characteristic element per kilo of sea water.)

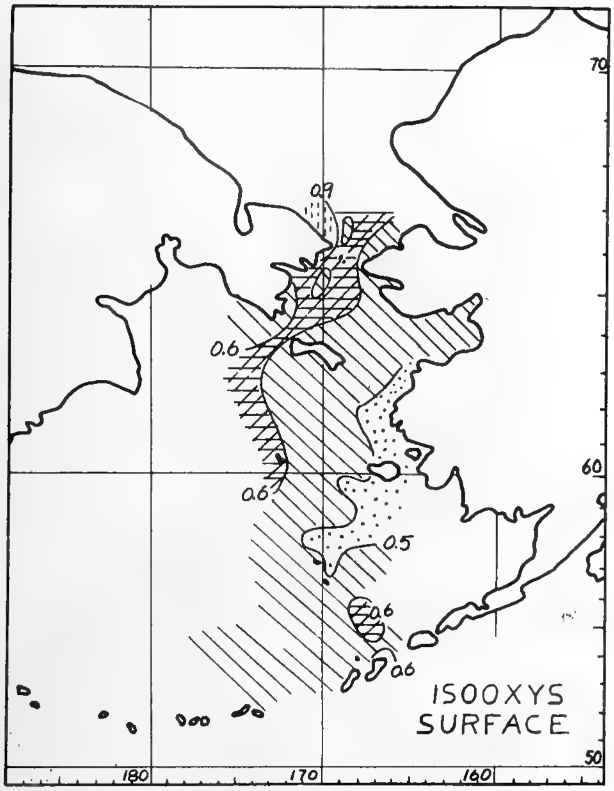
| Depth Meters | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | Phosphorus mcg.at. | Silicon mcg.at. | Nitrite Nitrogen mcg.at. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.521 | 90.4 | 1.3 | 29 | 0.14 | 8.09 |
| 10 | .531 | 91.2 | 1.5 | 31 | .13 | 8.09 |
| 25 | .513 | 86.0 | 1.7 | 38 | .16 | 8.08 |
| 50 | .459 | 73.7 | 1.9 | 49 | .20 | 8.06 |
| 75 | .445 | 71.0 | 2.0 | 54 | .13 | 8.05 |
| 100 | .433 | 68.8 | 2.0 | 58 | .12 | 8.04 |
| 150 | .404 | 63.7 | 2.0 | 64 | .09 | 7.99 |
| 200 | .398 | 62.0 | 2.3 | 69 | .05 | 7.94 |
| 300 | .323 | 50.3 | 2.5 | 82 | .02 | 7.90 |
| 400 | .205 | 32.3 | 2.6 | 91 | .00 | 7.86 |
| 500 | .133 | 20.7 | 2.8 | 105 | .00 | 7.81 |
| 600 | .096 | 14.9 | 2.8 | 115 | .00 | 7.81 |
| 800 | .061 | 9.4 | 2.9 | 130 | .00 | 7.78 |
| 1000 | .057 | 8.8 | 2.9 | 135 | .00 | 7.74 |

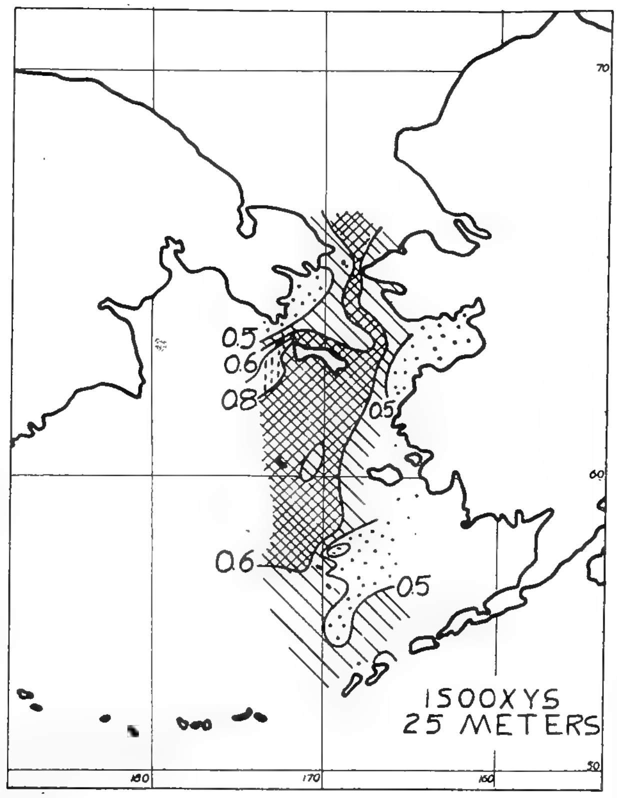
average slightly more at 10 meters than at the surface. Below 10 meters the concentration decreased to the lowest observed values at 1000 meters. A minimum oxygen zone was found at 800 meters at Station 105 and indicated at 1000 meters at other stations but was not definitely established as no samples were obtained below that depth. The values for dissolved oxygen at 1000 meters in this region were slightly higher than those found at the same depth in 1933 near Adak Island, 400 miles to the west (Thompson, Thomas and Barnes, 1934). The vertical distribution curves for the two localities, however, are of the same general type.

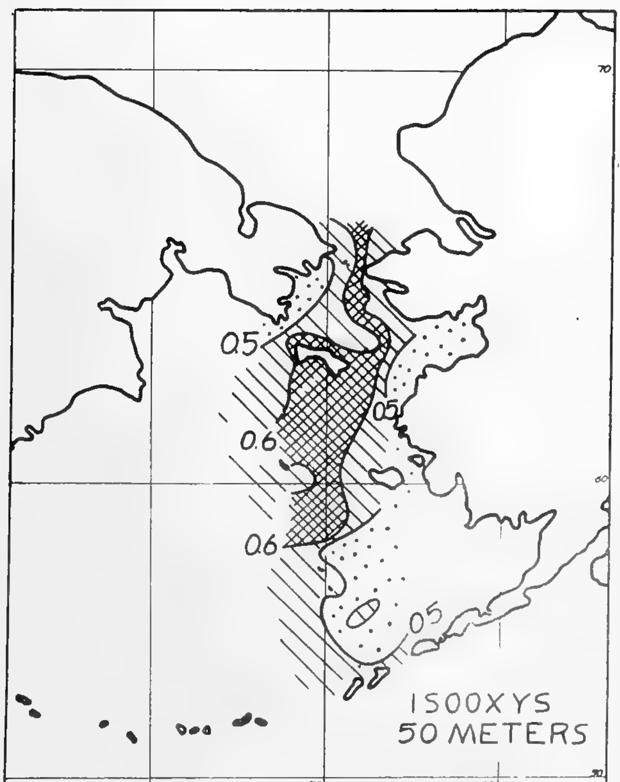
The most significant change in phosphate concentration was the rapid increase in the first 500 meters; below that depth, values either increased only slightly to maxima at 1000 meters or were constant. The concentration to a depth of 400 meters was considerably higher than that reported for the Pacific off the Washington coast in 1932 (1936). Below 400 meters, the values obtained from the two regions were almost indentical. Silicate concentrations also increased rapidly with depth in the upper levels. Little change occurred from 800 to 1000 meters. Silicate concentrations for surface layers were higher than those normally found in the Pacific near the Washington coast. A maximum for nitrite nitrogen of 0.20 mcg.at. per kilo was found at 50 meters. Concentrations were higher in the vicinity of the islands than at offshore stations. No nitrites were present at depths of over 300 meters. Values of pH decreased from about 8.1 at the surface to 7.8 at 500 meters; below this depth, the decrease was slight.

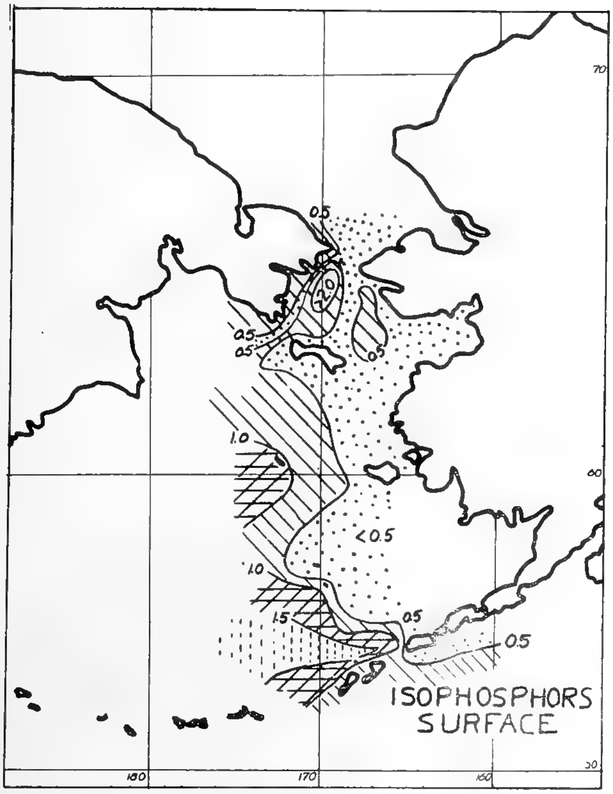
The distinct layering of water in North Bering Sea as demonstrated by temperature and chlorinity distribution, was shown also by the distribution of dissolved oxygen and nutrient salts. Referring again to Station 97 in which marked changes in temperature and chlorinity occurred between 20 and 25 meters, it is seen that this transition zone corresponds exactly to that for nutrient salts. Phosphate concentrations increased from 0.47 microgam atoms per kilo at 20 meters to 1.6 microgram atom per kilo at 25 meters. The corresponding increase in silicate and nitrite concentrations were from 8 to 30 and 0.00 to 0.26 respectively. Concentrations for the upper 20 meters were constant at the lower values, whereas concentrations for depths of 25 to 65 meters were constant at the higher values. Similar distributions were found at most stations sufficiently removed from areas of turbulence and mixing. In general the conclusions regarding the origin and flow of water as based on temperature and chlorinity measurements are confirmed by the distribution of dissolved oxygen and nutrient salts.

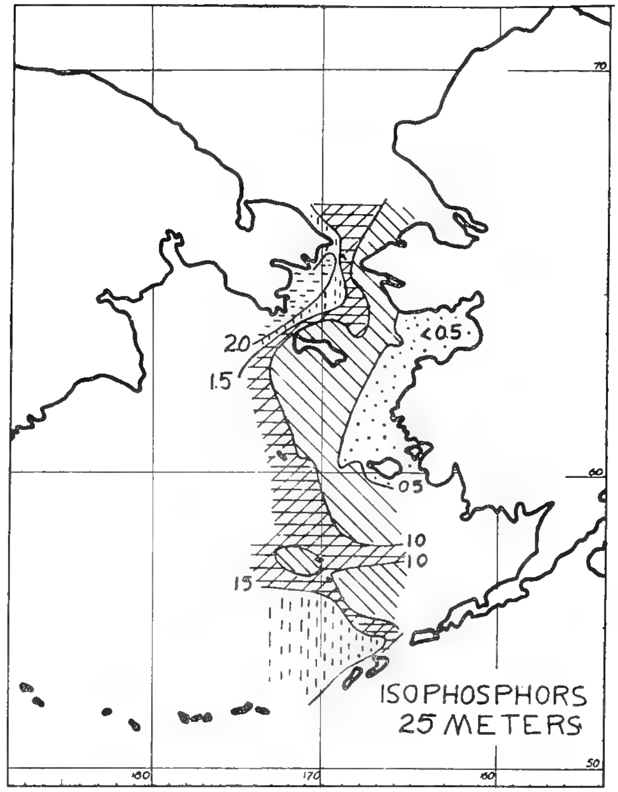
Surface Observations in the Pacific Ocean. The results from surface observations made while on route from Seattle to Dutch Harbor (Table II) may be summarized as follows: Temperatures and chlorinities were lower on the continental shelf at both ends of the route than at positions of deep water off the shelf. A maximum of 14.5° C. was found just off the continental shelf west of Vancouver Island (Latitude 49° 17' North, Longitude 127° 33' West). The temperature at a similar position with respect to the shelf south of the Alaskan Penisula was 10.5° C. The minimum temperature found was 7.4° C. in Unimak Pass. A maximum chlorinity of 18.21 °/oo was found in the Gulf of Alaska due south of Kodiak Island (54° 08' North, 155° 00' West). The minimum value, 17.29 °/oo, was found in the Strait of Juna de Fuca. Phosphates were high in the Strait, 1.6 mcg.at. per kilo, and decreased to a minimum of 0.16 mcg.at. at the position of maximum temperature off the continental shelf near Vancouver Island. Maximum nitrite values were also recorded in the Strait. Nitrite concentrations in the open sea varied

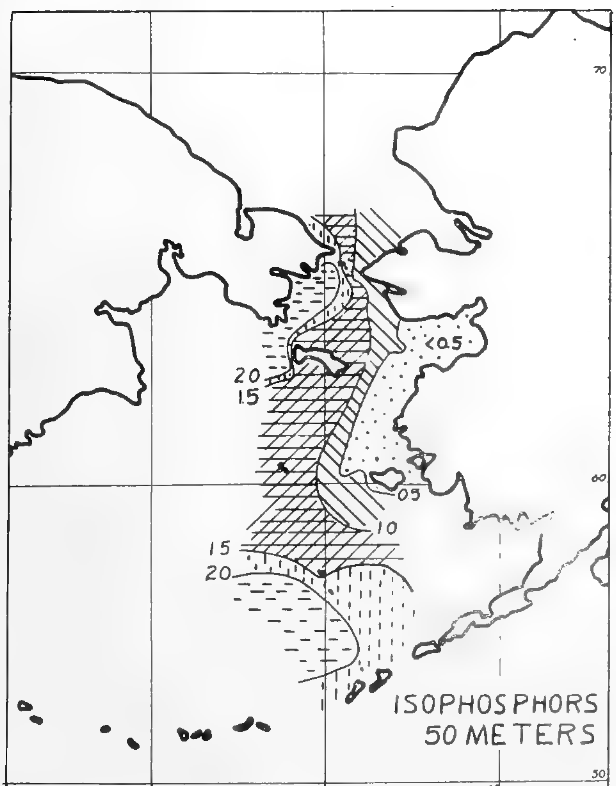

0.9
0.6
0.6
0.5
0.6
0.6
70
60
50
180
170
160
1500XYS
SURFACE

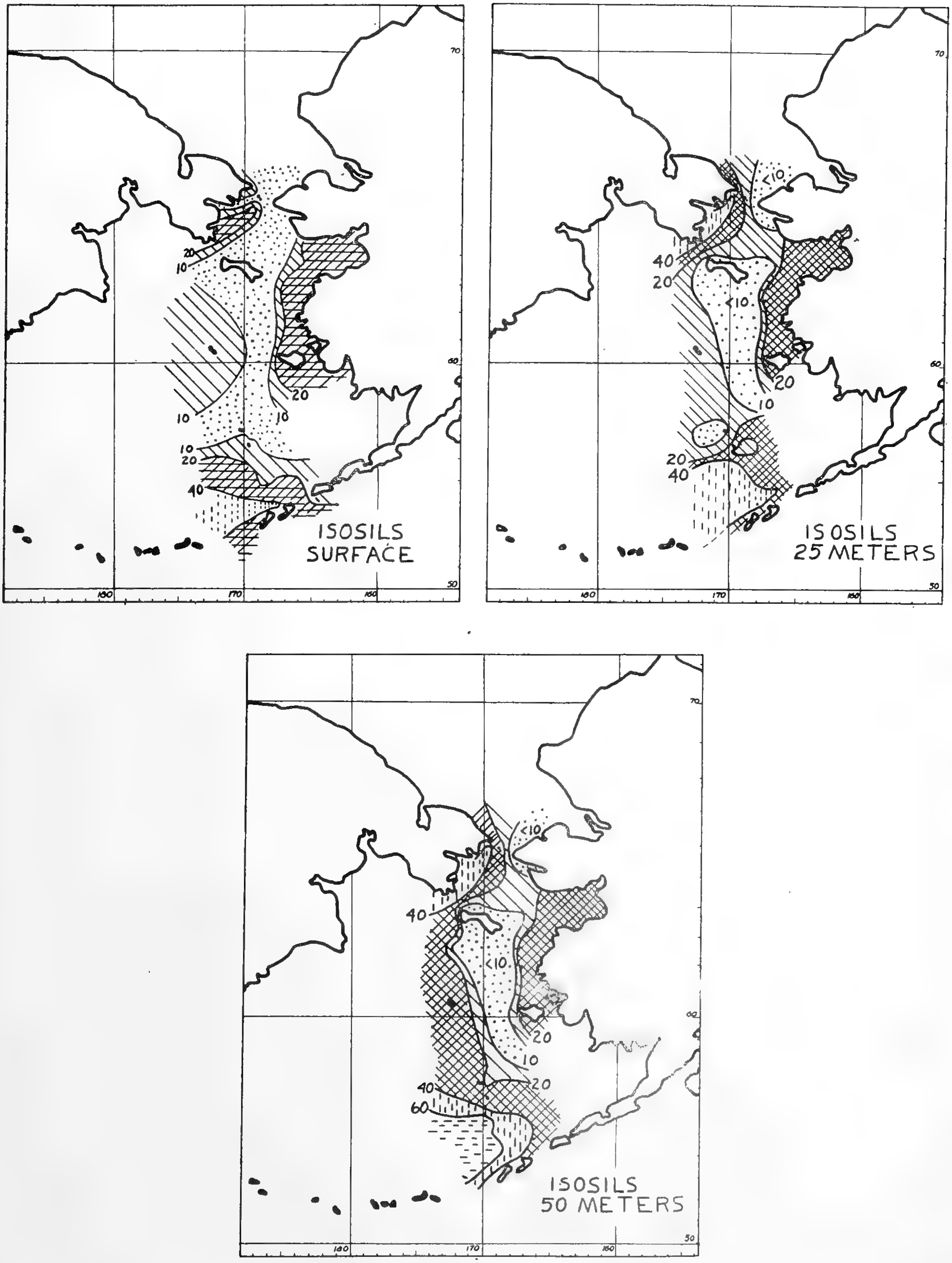

0.5
0.6
0.8
0.5
0.6
0.5
70
60
50
180
170
160
1500XYS
25 METERS

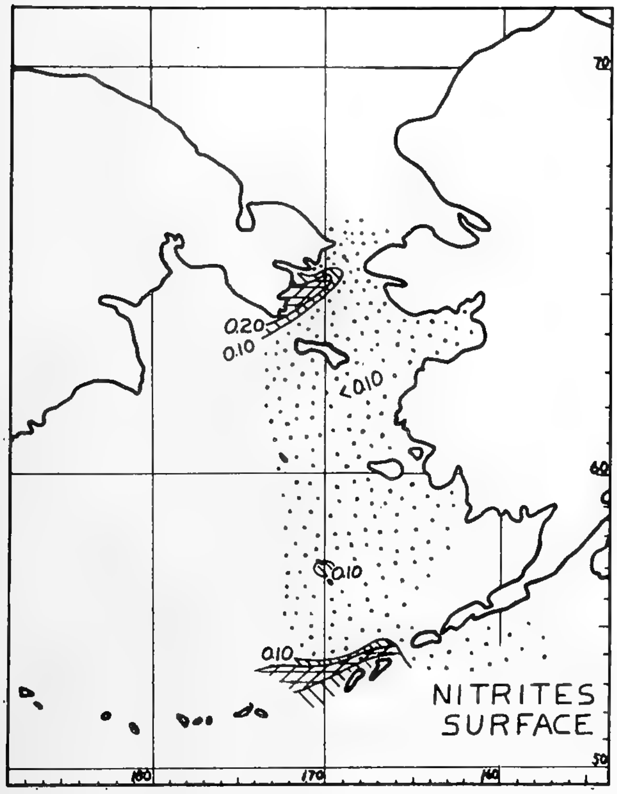

0.5
0.5
0.6
0.6
0.5
70
60
50
180
170
160
1500XYS
50 METERS

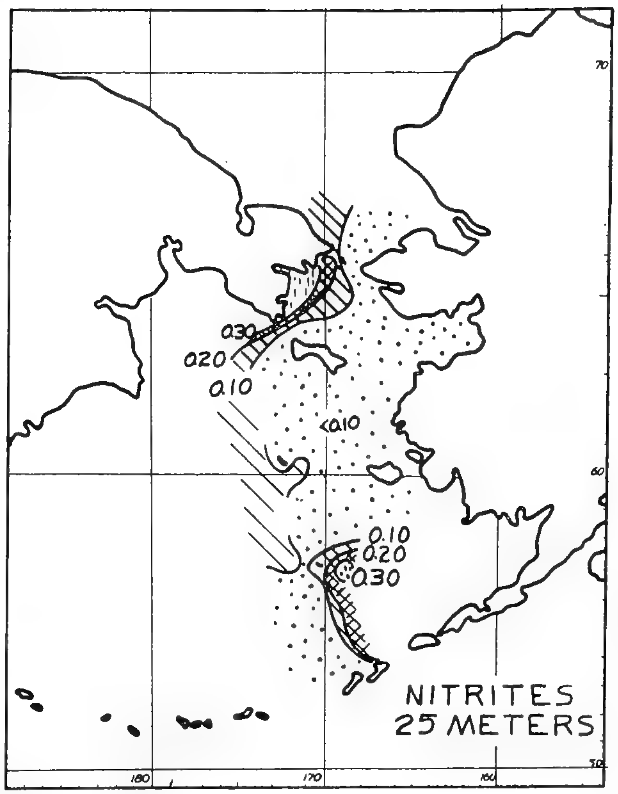

70
60
50
180
170
160
0.5
2.0
0.5
0.5
0.5
1.0
<0.5
1.0
1.5
0.5
0.5
ISOPHOSPHORS
SURFACE

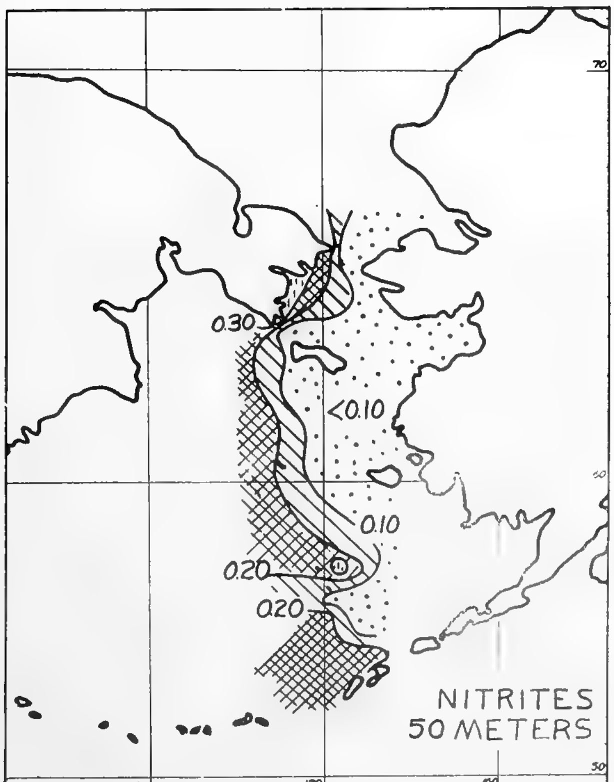

70
60
50
180
170
160
2.0
1.5
<0.5
0.5
1.0
1.0
1.5
ISOPHOSPHORS
25 METERS

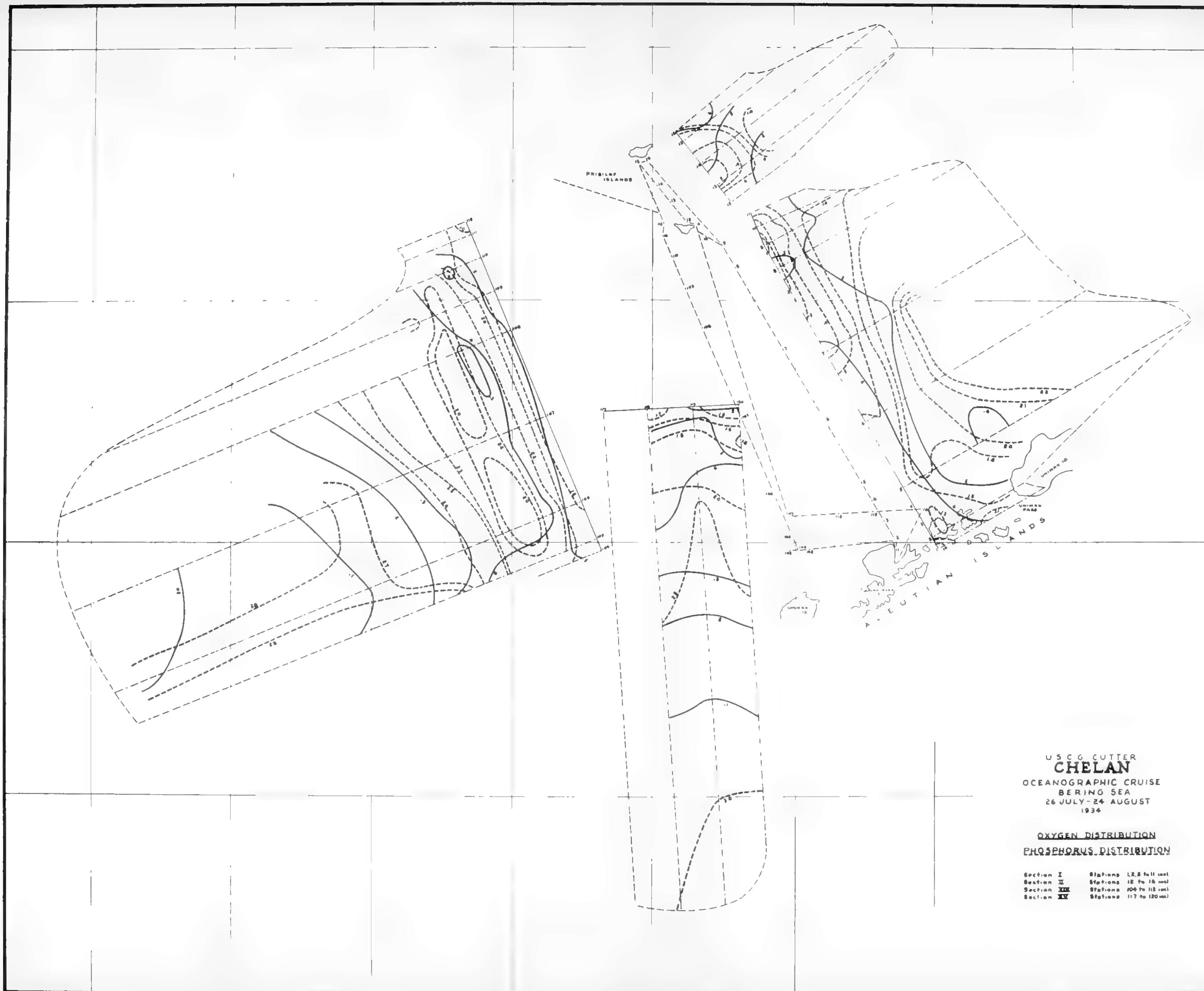

70
60
50
180
170
160
<0.5
2.0
1.5
0.5
1.0
1.5
2.0
ISOPHOSPHORS
50 METERS

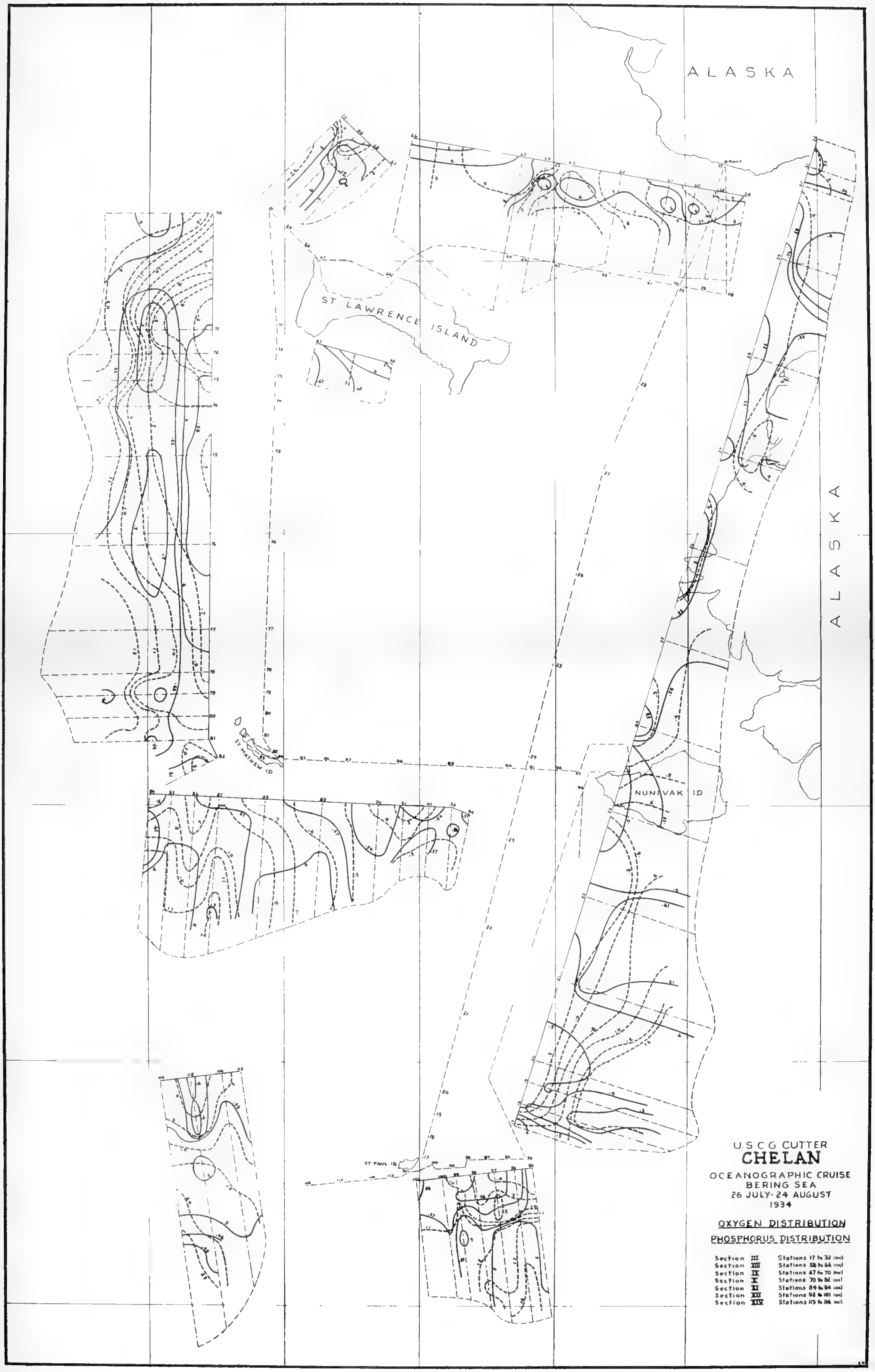

ISOSILS
SURFACE
ISOSILS
25 METERS
ISOSILS
50 METERS
70
60
50
180
170
160
10
20
40
<10
60

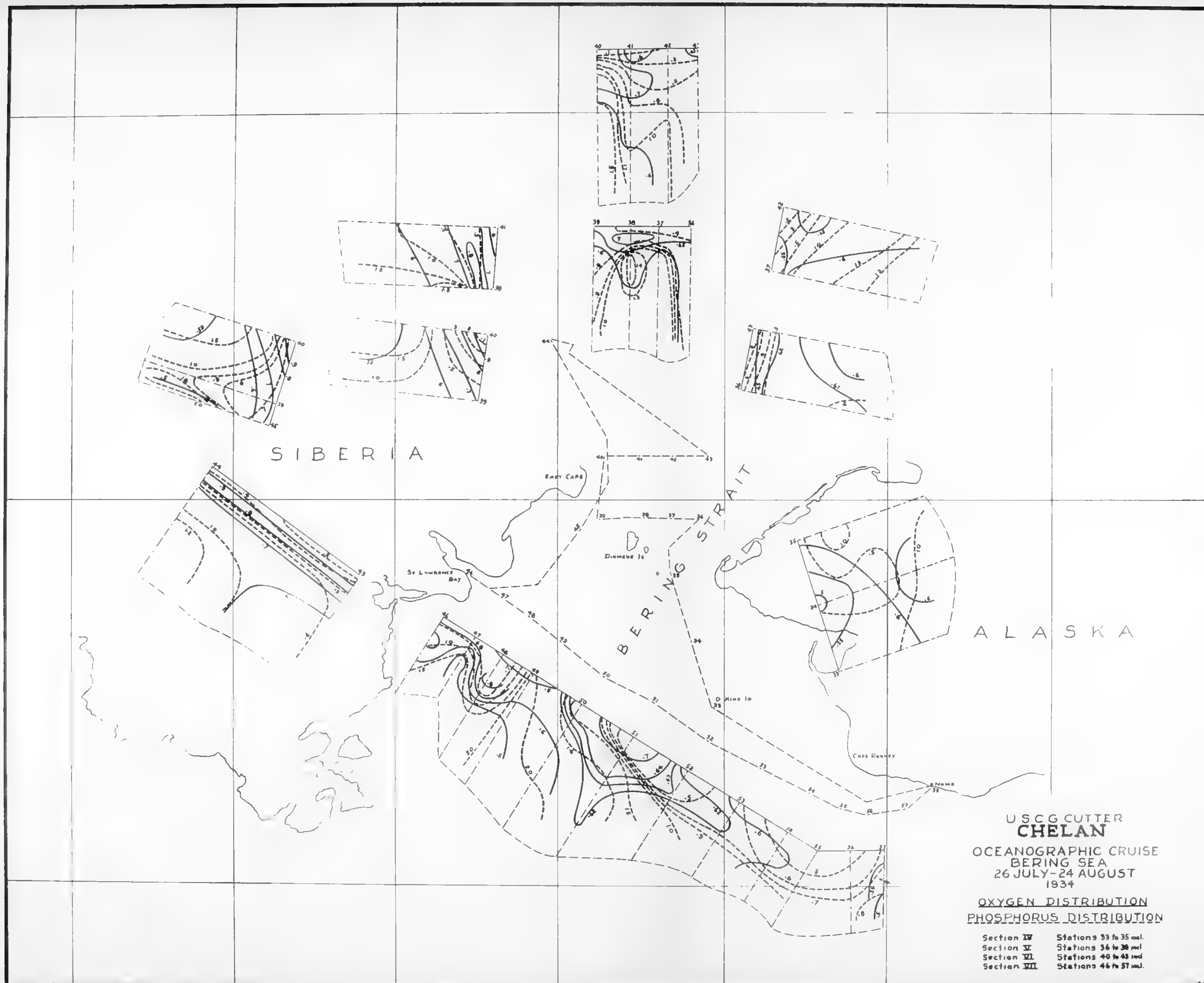

0.20
0.10
<0.10
0.10
0.10
NITRITES
SURFACE
70
60
50
180
170
160

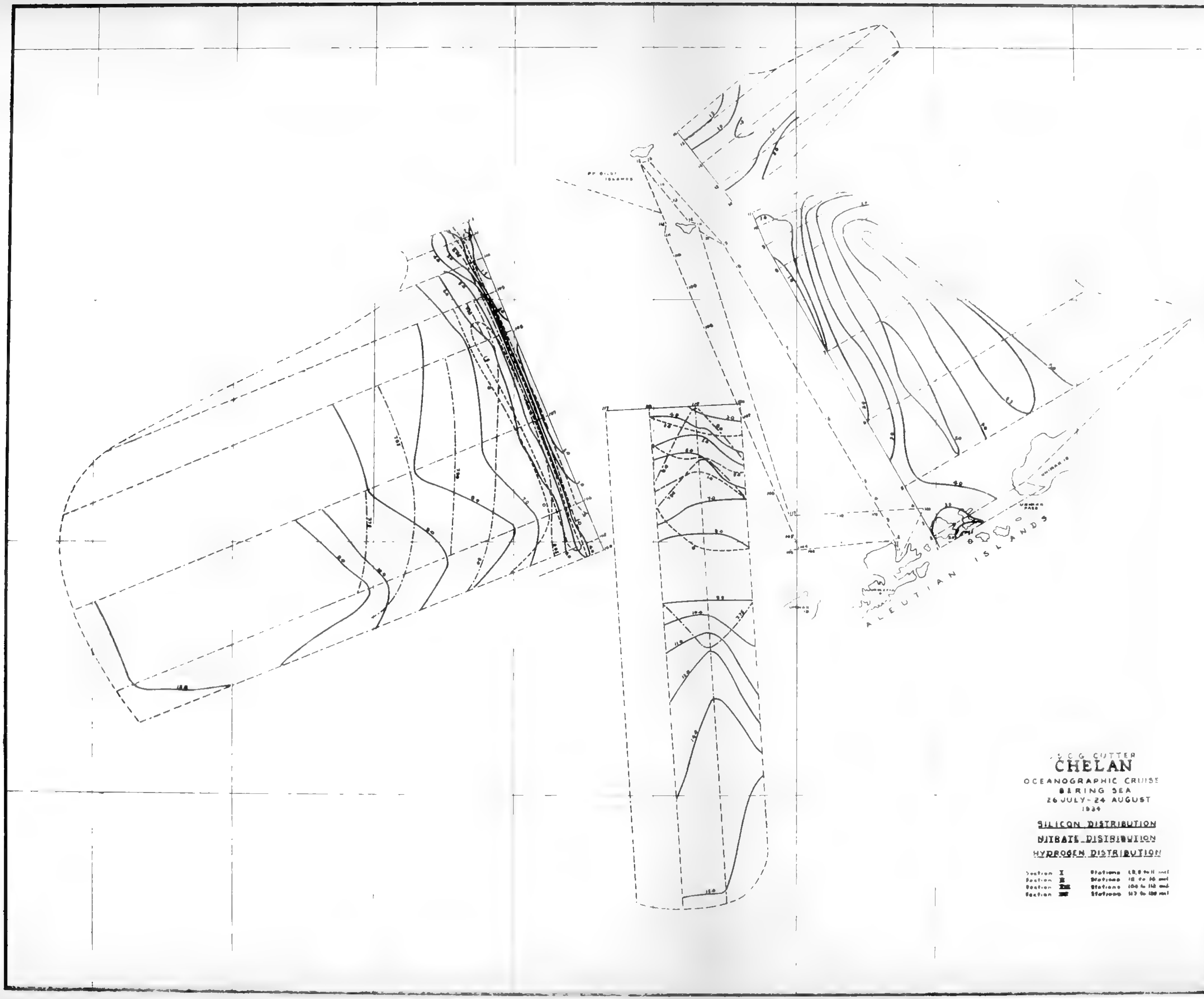

0.30
0.20
0.10
<0.10
0.10
0.20
0.30
NITRITES
25 METERS
70
60
50
180
170
160

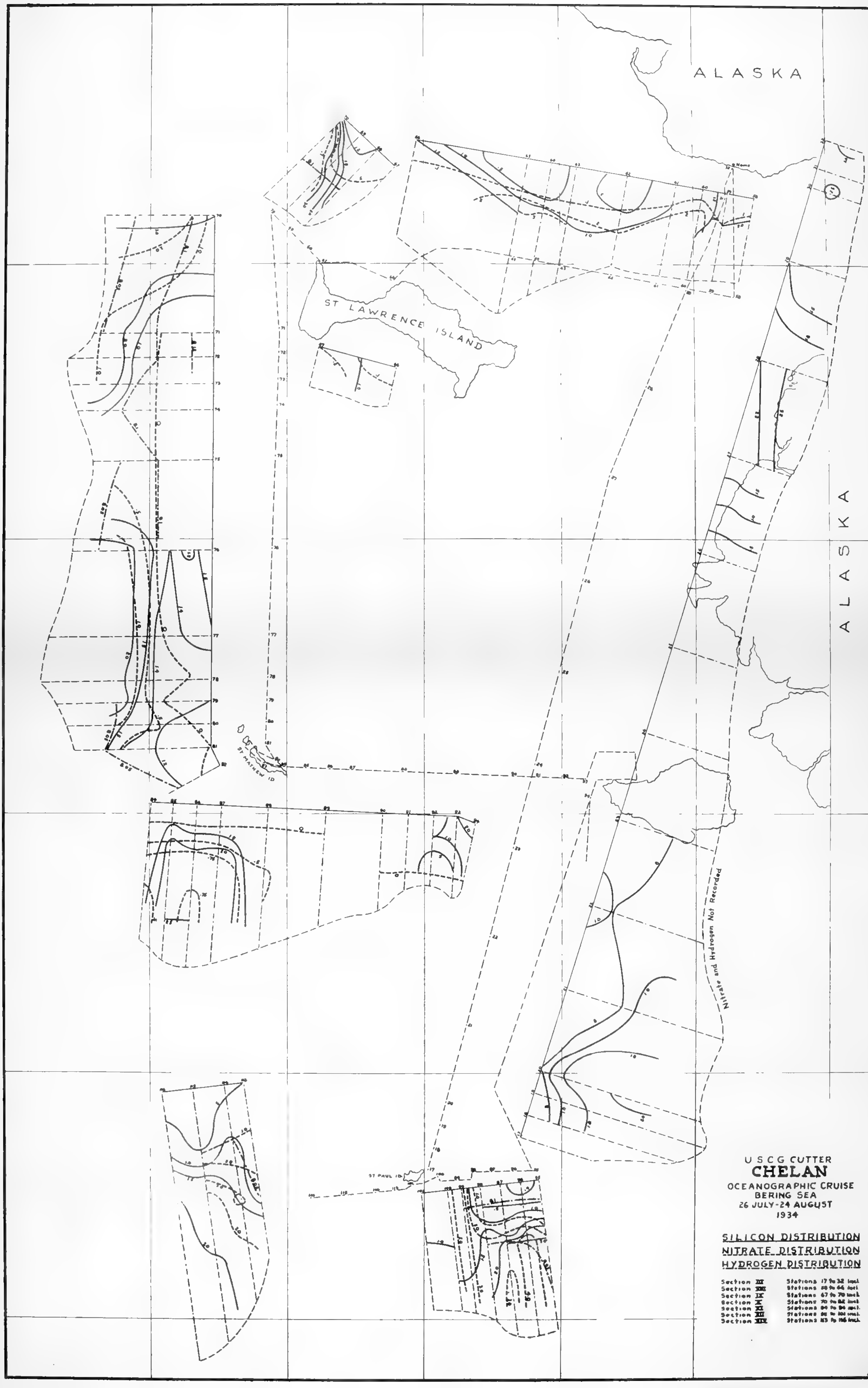

0.30
<0.10
0.10
0.20
0.20
NITRITES
50 METERS
70
60
50
180
170
160

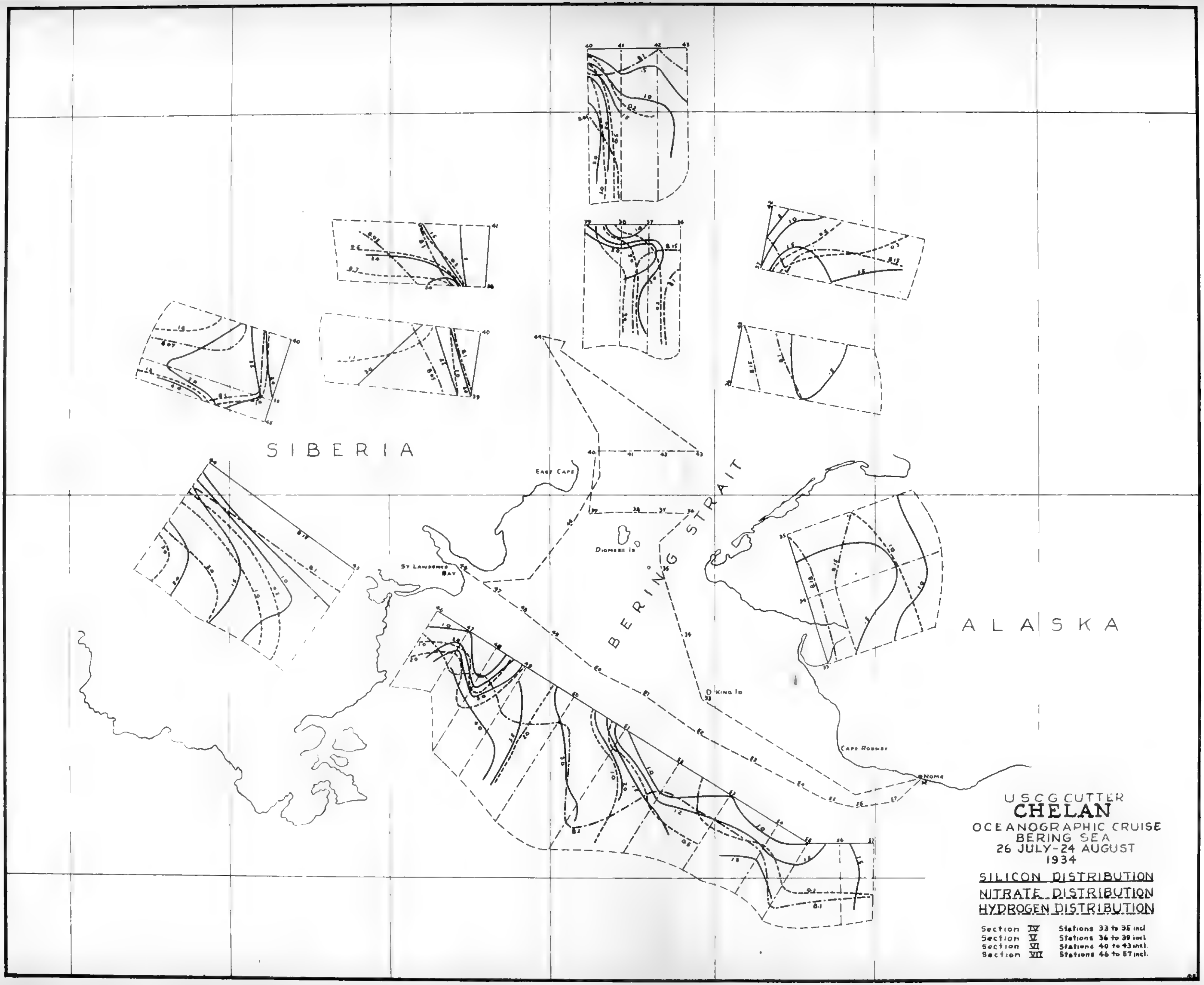

PRIBILOF ISLANDS
ALEUTIAN ISLANDS
U S C G CUTTER
CHELAN
OCEANOGRAPHIC CRUISE
BERING SEA
26 JULY - 24 AUGUST
1934
OXYGEN DISTRIBUTION
PHOSPHORUS DISTRIBUTION


U.S.C.G. CUTTER
CHELAN
OCEANOGRAPHIC CRUISE
BERING SEA
26 JULY-24 AUGUST
1934
OXYGEN DISTRIBUTION
PHOSPHORUS DISTRIBUTION
Section III Stations 17 to 32 incl.
Section VIII Stations 58 to 66 incl.
Section IX Stations 67 to 70 incl.
Section X Stations 70 to 82 incl.
Section XI Stations 84 to 94 incl.
Section XII Stations 96 to 101 incl.
Section XIV Stations 113 to 116 incl.
ALASKA
ALASKA
ST LAWRENCE ISLAND
NUNIVAK ID
ST MATHEW ID
ST PAUL ID


SIBERIA
ALASKA
BERING STRAIT
East Cape
St Lawrence Bay
Diomede Is
King Is
Cape Rodney
Nome
USCG CUTTER
CHELAN
OCEANOGRAPHIC CRUISE
BERING SEA
26 JULY-24 AUGUST
1934
OXYGEN DISTRIBUTION
PHOSPHORUS DISTRIBUTION
Section IV Stations 33 to 35 incl.
Section V Stations 36 to 39 incl.
Section VI Stations 40 to 43 incl.
Section VII Stations 46 to 57 incl.


ALEUTIAN ISLANDS
U.S.C.G. CUTTER
CHELAN
OCEANOGRAPHIC CRUISE
BERING SEA
26 JULY - 24 AUGUST
1934
SILICON DISTRIBUTION
NITRATE DISTRIBUTION
HYDROGEN DISTRIBUTION


ALASKA
ALASKA
ST LAWRENCE ISLAND
ST MATHEW ID
ST PAUL ID
Nitrate and Hydrogen Not Recorded
U S C G CUTTER
CHELAN
OCEANOGRAPHIC CRUISE
BERING SEA
26 JULY-24 AUGUST
1934
SILICON DISTRIBUTION
NITRATE DISTRIBUTION
HYDROGEN DISTRIBUTION
Stations 17 to 32 incl.
Stations 67 to 70 incl.


SIBERIA
ALASKA
BERING STRAIT
East Cape
St Lawrence Bay
Diomede Is
King Is
Cape Rodney
Nome
USCG CUTTER
CHELAN
OCEANOGRAPHIC CRUISE
BERING SEA
26 JULY-24 AUGUST
1934
SILICON DISTRIBUTION
NITRATE DISTRIBUTION
HYDROGEN DISTRIBUTION
Section IV Stations 33 to 35 incl
Section V Stations 36 to 39 incl.
Section VI Stations 40 to 43 incl.
Section VII Stations 46 to 57 incl.

irregularly from 0.00 to 0.27 mcg. at. per kilo. Soluble silicates were slightly less concentrated near the Alaskan Peninsula than off the continental shelf in the Gulf of Alaska. The properties of the water in the Pacific immediately south of the Alaskan Peninsula were quiet analagous to those of eastern Bering Sea and mark the North Pacific as the source of Bering Sea water.

## Bibliography.


1879. Griess, P. Ber. 12: 427.

1889. Ilosvay, M.L. Bull. Soc. Chem., Ser. 3, 2: 347.

1901. Knudsen, Martin. Hydrographical Tables, Copenhagen.

1910. Bjerknes, V.F.K. and Sandstrom, J.W. Dynamic Meteorology and Hydrography. Carnegie Inst. Pub. No. 88. Washington, D.C.

1911. Krummel, Otto. Handbuch der Ozeanographie, Vol. 2, p. 723-724. Stuttgart.

Whipple, G.C. and Whipple, M.C. J. Am. Chem. Soc. 33, p. 362-365.

1915. Hesselberg, Th. and Sverdrup, H.U. Bergens Museums Aarbok, No. 14, 1914-1915. Bergen.

1920. Deniges, C.C.R. Acad. des. Sc., Paris, 171, 802.

1923. Winkler, L.W. Standard Methods of Water Analysis. Am. Publ. Health Assoc. 5th ed. 59-61.

1926. Smith, E.H. U.S. Coast Guard Bulletin No. 14. Washington, D.C.

1929. Truog, E. and Meyer, A.H. Ind. Eng. Chem. Anal. Ed. 1, p. 136-139.

1930. Wüst, Georg. Der Golfstrom. Sonderabdruk Aus Der Zeitschrift Der Gesellschaft Für Erdkunde Zu Berlin. Jahragang 1930, Nr. ½, p. 42-59. Berlin.

1931. Unites States Coast Pilot, Alaska, Pt. II, p. 13-14 and p. 304. Washington.

1932. Ekman, V.W. Journ. du Conseil VII, No. 1, p. 3-10.

1933. Soule, F.M. Hydrographic Rev. 10, p. 126-130.

Thompson, T.G. and Houlton, H.G. Ind. Eng. Chem. Anal. Ed. 5, 417.

1934. Carter, N.M., Moberg, E.G., Skogsberg, T., and Thompson, T.G. Proc. Fifth Pac. Sci. Cong. A5, p. 2123-2127.

Thompson, T.G., Thomas, B.D. and Barnes, C.A. Distribution of Dissolved Oxygen in the North Pacific Ocean. James Johnstone Memorial Volume, p. 203-234. Liverpool.

1936. Igelsrud, I., Robinson, R.J. and Thompson, T.G. University of Washington Publications in Oceanography, Vol. 3, No. 1, p. 1-34. Seattle.

TABLE I.

Section (a)
1. Temperature
2. Chlorinity
3. Salinity
4. Dynamic Depth

Section (b)
1. Phosphorus
2. Silicon
3. Nitrite
4. Dissolved Oxygen

Addenda sheet, Table I. Under section (a) change heading Chlorinity and Dynamic Depth from:

| Depth Meters | Temperature °C. | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|

to

| Depth Meters | Temperature °C. | Chlorinity °/oo | Salinity °/oo | $\sigma t$ | $\sigma s,t,p$ | $\alpha s,t,p$ $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|

Addenda sheet, Table I. Under section (b) change heading Phosphorus. Silicon, Nitrite Nitrogen from:

| Depth Meters | Phosphorus mg.at.x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. |
|---|---|---|---|---|---|

to

| Depth Meters | Phosphorus mcg. at. | Silicon mcg.at. x $10^2$ | Nitrite Nitrogen $NO_2$ - N mcg.at | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. |
|---|---|---|---|---|---|

## SECTION 1 - Dutch Harbor - St. George

Station: 1 Lat. 53° 57 N Long. 166° 31' W Date: 7-26-34 Time: 1131-1216
Sonic Depth: 67 fathoms (123 meters) Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.55 | 17.78 | 32.12 | 25.10 | 25.10 | 97551 | 0 |
| (10) | (7.20) | (17.84) | (32.23) | (25.23) | (25.28) | (534) | (9.75425) |
| 25 | 6.67 | 17.93 | 32.39 | 25.44 | 25.56 | 508 | 24.38238 |
| 50 | 6.33 | 17.99 | 32.52 | 25.58 | 25.81 | 484 | 48.75638 |
| 75 | 5.77 | 18.13 | 32.75 | 25.84 | 26.19 | 448 | 73.12288 |
| 100 | 5.25 | 18.22 | 32.92 | 26.02 | 26.48 | 420 | 97.48138 |

Station: 2 Lat. 54° 02' N Long. 166° 35' W Date: 7-26-34 Time: 1256-1335
Sonic Depth: 45 fathoms (82 meters) Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.52 | 18.12 | 32.74 | 25.72 | 25.72 | 97492 | 0 |
| 10 | 6.27 | 18.12 | 32.74 | 25.75 | 25.81 | 484 | 9.74880 |
| 25 | 6.30 | 18.12 | 32.74 | 25.75 | 25.87 | 478 | 24.37095 |
| 50 | 5.40 | 18.17 | 32.83 | 25.93 | 26.18 | 449 | 48.73683 |
| 75 | 5.16 | 18.22 | 32.92 | 26.03 | 26.38 | 430 | 73.09670 |

Station: 1

| Depth Meters | Phosphorous mg.at.x $10^3$ | Silicon mg.at.x $10^2$ | Nitrite Nitrogen mg.at.x $10^4$ | Dissolved Oxygen: mg.at. | Dissolved Oxygen: % Sat | pH |
|---|---|---|---|---|---|---|
| 0 | 0.79 | 2.0 | | .655 | 110.5 | |
| (10) | (1.04) | (2.8) | | (.637) | (106.6) | |
| 25 | 1.42 | 4.0 | | .609 | 100.8 | |
| 50 | 1.20 | 3.0 | | .608 | 100.0 | |
| 75 | 1.04 | 3.0 | | .566 | 92.2 | |
| 100 | 1.42 | 3.0 | | .508 | 81.8 | |

Station: 2

| Depth Meters | Phosphorous mg.at.x $10^3$ | Silicon mg.at.x $10^2$ | Nitrite Nitrogen mg.at.x $10^4$ | Dissolved Oxygen: mg.at. | Dissolved Oxygen: % Sat | pH |
|---|---|---|---|---|---|---|
| 0 | 1.42 | 3.0 | | .637 | 105.5 | |
| 10 | 1.26 | 2.5 | | .634 | 104.4 | |
| 25 | 1.42 | 2.5 | | .610 | 100.5 | |
| 50 | 1.48 | 3.5 | | .558 | 90.1 | |
| 75 | 1.58 | 4.0 | | .516 | 83.0 | |

Station: 3 Lat. 54° 10' N Long. 166° 42' W Date: 7-26-34 Time: 1422-1603
Sonic Depth: Over 1000 meters Bottom:

| Depth Meters | Temperature °C. | Chlorinity °/oo | t | s,t,p | s,t,p x 10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|
| 0 | 6.68 | 18.11 | 25.69 | 25.69 | 97495 | 0 |
| 10 | 6.08 | .11 | .76 | .81 | 484 | 9.7490 |
| 25 | 5.92 | .11 | .78 | .89 | 476 | 24.3709 |
| 50 | 5.09 | .22 | 26.04 | 26.28 | 439 | 48.7353 |
| 75 | 5.07 | .23 | .05 | .40 | 428 | 73.0937 |
| 100 | 4.48 | .36 | .30 | .77 | 393 | 97.4463 |
| 150 | 3.97 | .48 | .53 | 27.25 | 347 | 146.131 |
| 200 | 3.91 | .51 | .58 | .52 | 322 | 194.799 |
| 300 | 3.65 | .58 | .70 | 28.11 | 266 | 292.093 |
| 400 | 3.45 | .61 | .77 | .65 | 215 | 389.333 |

Station: 4 Lat. 54° 19' N Long. 166° 51' W Date: 7-26-34 Time: 1648-1828
Sonic Depth: 780 meters Bottom:

The observations from this station were discarded as unreliable.

Station: 3

| Depth Meters | Phosphorous mcg.at. | Silicon mcg. at. | $NO_2^-$-N mcg.at. | Dissolved Oxygen mg.at | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.79 | 20 | | 0.586 | 97.3 | |
| 10 | 0.88 | 20 | | .655 | 107.4 | |
| 25 | 1.25 | 20 | | .615 | 100.5 | |
| 50 | 1.5 | 40 | | .483 | 77.5 | |
| 75 | 1.7 | 40 | | .461 | 74.0 | |
| 100 | 2.0 | 45 | | .385 | 61.0 | |
| 150 | 2.4 | 50 | | .401 | 63.0 | |
| 200 | 2.5 | 60 | | .399 | 62.4 | |
| 300 | 2.5 | 70 | | .350 | 54.6 | |
| 400 | 2.5 | 80 | | .310 | 48.1 | |

Station: 4

The observations from this station were discarded as unreliable.

## SECTION 1 - Dutch Harbor - St. George

**Station:** 5 **Lat.** 54° 28' N **Long.** 167° 00' W **Date:** 7-26-34 **Time:** 1911-2008

**Sonic Depth:** 255 fathoms (466 meters) **Bottom:**

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,0}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x$10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.81 | 18.26 | 32.99 | 25.75 | 25.75 | 97489 | 0 |
| 10 | 7.72 | 18.26 | 32.99 | 25.77 | 25.82 | 483 | 9.74860 |
| 25 | 6.07 | 18.30 | 33.06 | 26.03 | 26.17 | 452 | 24.36873 |
| 50 | 4.38 | 18.40 | 33.24 | 26.38 | 26.62 | 407 | 48.72610 |
| 75 | 4.13 | 18.42 | 33.28 | 26.44 | 26.79 | 391 | 73.07585 |
| 100 | 4.04 | 18.45 | 33.33 | 26.48 | 26.95 | 376 | 97.42173 |
| 150 | 4.35 | 18.32 | 33.10 | 26.26 | 26.96 | 373 | 146.10988 |
| 200 | 4.29 | 18.46 | 33.35 | 26.47 | 27.41 | 332 | 194.78613 |
| 300 | 3.41 | 18.46 | 33.35 | 26.56 | 27.97 | 279 | 292.09163 |
| 400 | 3.44 | 18.52 | 33.46 | 26.63 | 28.51 | 228 | 383.34513 |

**Station:** 5

| Depth Meters | Phosphorous mg.at.x $10^3$ | Silicon mg.at.x $10^2$ | Nitrite Nitrogen mg.at.x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat | pH |
|---|---|---|---|---|---|---|
| 0 | 1.42 | 3.5 | | .628 | | |
| 10 | 1.51 | 4.0 | | .627 | | |
| 25 | 1.89 | 4.0 | | .558 | | |
| 50 | 1.51 | (4.8) | | .435 | | |
| 75 | 1.58 | 5.5 | | .418 | | |
| 100 | 2.05 | 6.0 | | .359 | | |
| 150 | 2.05 | 5.5 | | .483 | | |
| 200 | 2.21 | 6.0 | | .364 | | |
| 300 | 2.21 | 6.0 | | .383 | | |
| 400 | 2.37 | 7.0 | | .400 | | |

## SECTION 1 - Dutch Harbor - St. George

Station: 6 Lat. 55° 02' N. Long. 167° 35' W Date: 7-27-34 Time: 2258-0003
Sonic Depth: 137 fathoms (251 meters) Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\rho_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x10^5 | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.77 | 18.11 | 32.72 | 25.54 | 25.54 | 97509 | 0 |
| 10 | 7.30 | 18.12 | 32.74 | 25.62 | 25.67 | 497 | 9.75030 |
| 25 | 6.23 | 18.18 | 32.84 | 25.85 | 25.97 | 469 | 24.37275 |
| 50 | 4.27 | 18.26 | 32.99 | 26.19 | 26.43 | 425 | 48.73450 |
| 75 | 4.26 | 18.32 | 33.10 | 26.27 | 26.62 | 407 | 73.08850 |
| 100 | 3.95 | 18.38 | 33.21 | 26.39 | 26.85 | 385 | 97.43750 |
| 150 | 3.72 | 18.42 | 33.28 | 26.47 | 27.19 | 353 | 146.12200 |
| 200 | 3.40 | 18.50 | 33.42 | 26.62 | 27.56 | 317 | 194.78950 |

Station: 7 Lat. 55° 36' N Long. 168° 11' W Date: 7-27-34 Time: 0254-0335
Sonic Depth: 131 fathoms (240 meters) Bottom:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 9.21 | 17.78 | 32.12 | 24.85 | 24.85 | 97575 | 0 |
| 10 | 9.19 | 17.79 | 32.14 | 24.86 | 24.95 | 569 | 9.75720 |
| 25 | 8.40 | 17.83 | 32.21 | 25.05 | 25.17 | 545 | 24.39075 |
| 50 | 5.26 | 18.03 | 32.57 | 25.75 | 26.00 | 466 | 48.76713 |
| 75 | 3.44 | 18.17 | 32.83 | 26.14 | 26.50 | 418 | 73.12763 |
| 100 | 3.24 | 18.24 | 32.95 | 26.26 | 26.73 | 397 | 97.47950 |

Station: 8 Lat. 56° 16' N Long. 168° 53' W Date: 7-27-34 Time: 0624-0750
Sonic Depth: Bottom: Rocky

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 8.62 | 17.87 | 32.29 | 25.08 | 25.08 | 97553 | 0 |
| 10 | 8.56 | 17.87 | 32.29 | 25.08 | 25.14 | 548 | 9.75505 |
| 25 | 7.44 | 17.92 | 32.38 | 25.31 | 25.43 | 520 | 24.38515 |
| 50 | 3.39 | 18.07 | 32.65 | 26.00 | 26.24 | 443 | 48.75553 |
| 75 | 3.56 | 18.19 | 32.86 | 26.14 | 26.49 | 419 | 73.11328 |
| 100 | 3.31 | 18.30 | 33.06 | 26.33 | 26.80 | 390 | 97.46440 |
| 125 | 3.38 | 18.30 | 33.06 | 26.32 | 26.90 | 380 | 121.81065 |

SECTION 1 - Dutch Harbor, - St. George

Station: 6

| Depth Meters | Phosphorous mg.at.x $10^3$ | Silicon mg.at.x $10^2$ | Nitrite Nitrogen mg.at.x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.10 | 2.0 | | .633 | 107.8 | |
| 10 | 0.95 | (2.5) | | .637 | 107.4 | |
| 25 | 1.20 | 3.0 | | .578 | 95.2 | |
| 50 | 1.89 | 5.0 | | .498 | 78.4 | |
| 75 | 2.05 | 5.0 | | .480 | 75.7 | |
| 100 | 2.21 | 6.0 | | .467 | 73.2 | |
| 150 | 2.21 | 5.0 | | .446 | 69.5 | |
| 200 | 2.37 | 6.5 | | .432 | 66.9 | |

Station: 7

| Depth Meters | Phosphorous mg.at.x $10^3$ | Silicon mg.at.x $10^2$ | Nitrite Nitrogen mg.at.x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 1.0 | | .604 | 105.6 | |
| 10 | 0.38 | 2.0 | | .600 | 104.9 | |
| 25 | 0.57 | 3.0 | | .583 | 100.2 | |
| 50 | 1.51 | 4.5 | | .588 | 94.4 | |
| 75 | 1.89 | 5.5 | | .505 | 77.9 | |
| 100 | 2.21 | 6.0 | | .430 | 66.1 | |

Station: 8

| Depth Meters | Phosphorous mg.at.x $10^3$ | Silicon mg.at.x $10^2$ | Nitrite Nitrogen mg.at.x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.16 | 1.5 | | .485 | 83.9 | |
| 10 | 0.32 | 0.8 | | | | |
| 25 | 0.47 | 1.2 | | .506 | 85.3 | |
| 50 | 1.26 | 3.5 | | .410 | 63.0 | |
| 75 | 1.42 | 6.0 | | .472 | 73.1 | |
| 100 | 1.58 | 6.0 | | .383 | 58.9 | |
| 125 | 1.58 | 5.5 | | .315 | 48.6 | |

## SECTION 1 - Dutch Harbor - St. George

Station: 9   Lat. 56° 25' N   Long. 169° 02' W   Date: 7-27-34   Time: 0833-0926
Sonic Depth: 63 fathoms (115 meters)   Bottom: Sand

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x$10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.04 | 17.69 | 31.96 | 24.76 | 24.76 | 97584 | 0 |
| 10 | 8.97 | 17.69 | 31.96 | 24.76 | 24.81 | 579 | 9.75815 |
| 25 | 8.30 | 17.74 | 32.05 | 24.94 | 25.06 | 555 | 24.39320 |
| 50 | 2.27 | 17.86 | 32.27 | 25.79 | 26.03 | 463 | 48.77045 |
| 75 | 2.67 | 18.03 | 32.57 | 26.00 | 26.36 | 432 | 73.13233 |
| 100 | 2.72 | 18.04 | 32.59 | 26.02 | 26.48 | 420 | 97.48883 |

Station: 10   Lat. 56° 30' N   Long. 169° 17' W   Date: 7-27-34   Time: 1008-1054
Sonic Depth: 51 fathoms (93 meters)   Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x$10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.29 | 17.75 | 32.07 | 24.95 | 24.95 | 97565 | 0 |
| 10 | 8.20 | 17.75 | 32.07 | 24.97 | 25.02 | 559 | 9.75620 |
| 25 | 5.84 | 17.79 | 32.14 | 25.34 | 25.46 | 517 | 24.38690 |
| 47.5 | 4.75 | 17.80 | 32.16 | 25.48 | 25.71 | 493 | 46.32553 |
| (50) | (4.72) | (17.81) | (32.17) | (25.49) | (25.74) | (491) | (48.76283) |
| 72.5 | 4.49 | 17.85 | 32.25 | 25.57 | 25.90 | 475 | 70.69653 |
| (75) | (4.46) | (17.86) | (32.26) | (25.58) | (25.93) | (473) | (73.13338) |

Station: 11   Lat. 56° 36' N   Long. 169° 26' W   Date: 7-27-34   Time: 1130-1153
Sonic Depth: 24 fathoms (44 meters)   Bottom: Sand and shell

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x$10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 5.78 | 17.81 | 32.16 | 25.37 | 25.37 | 97526 | 0 |
| 10 | 5.93 | 17.81 | 32.18 | 25.36 | 25.41 | 522 | 9.75240 |
| 25 | 4.98 | 17.82 | 32.20 | 25.48 | 25.60 | 504 | 24.37935 |

## SECTION 1 - Dutch Harbor - St. George

Station: 9

| Depth Meters | Phosphorous mg.at.x $10^3$ | Silicon mg.at.x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.5 | | .567 | 98.6 | |
| 10 | 0.32 | (0.6) | | .553 | 96.2 | |
| 25 | 0.32 | 0.8 | | .590 | 101.0 | |
| 50 | 1.42 | 3.2 | | .524 | 78.1 | |
| 75 | 1.42 | 4.3 | | .419 | 63.3 | |
| 100 | 1.51 | 4.5 | | .437 | 66.0 | |

Station: 10

| Depth Meters | Phosphorous mg.at.x $10^3$ | Silicon mg.at.x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.22 | 0.7 | | .536 | 91.9 | |
| 10 | 0.25 | 0.8 | | .509 | 87.0 | |
| 25 | 0.57 | 1.8 | | .506 | 82.0 | |
| 47.5 | 0.79 | 2.5 | | .536 | 84.7 | |
| (50) | (0.77) | (2.4) | | (.535) | (84.6) | |
| 72.5 | 0.63 | 2.0 | | .480 | 75.5 | |
| (75) | (0.63) | (2.0) | | (.473) | (74.6) | |

Station: 11

| Depth Meters | Phosphorous mg.at.x $10^3$ | Silicon mg.at.x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.57 | 1.8 | | .540 | 87.5 | |
| 10 | 0.57 | 1.8 | | .558 | 90.7 | |
| 25 | 0.88 | 2.2 | | .518 | 82.5 | |

SECTION II - St. George - St. Paul

Station: 12 Lat. 56° 36' N Long. 169° 37' W Date: 7-27-34 Time:
Sonic Depth: Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.25 | 17.78 | 32.12 | 25.28 | 25.28 | 97534 | 0 |
| 10 | 6.10 | 17.79 | 32.14 | 25.30 | 25.36 | 527 | 9.75305 |
| 15 | 6.07 | 17.79 | 32.14 | 25.30 | 25.38 | 525 | 14.62935 |

Station: 13 Lat. 56° 46' N Long. 169° 46' W Date: 7-27-34 Time: 1405-1432
Sonic Depth: 38 fathoms (70 meters) Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.68 | 17.75 | 32.07 | 25.04 | 25.04 | 97557 | 0 |
| 10 | 7.67 | 17.75 | 32.07 | 25.04 | 25.09 | 552 | 9.75545 |
| (15) | (6.79) | (17.78) | (32.12) | (25.20) | (25.27) | (535) | (14.63263) |
| 25 | 5.07 | 17.84 | 32.23 | 25.51 | 25.63 | 501 | 24.38443 |
| 50 | 4.19 | 17.89 | 32.32 | 25.66 | 25.90 | 475 | 48.75643 |

Station: 14 Lat. 56° 56' N Long. 169° 59' W Date: 7-27-34 Time: 1522-1553
Sonic Depth: 36 fathoms (66 meters) Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.97 | 17.67 | 31.92 | 24.89 | 24.89 | 97571 | 0 |
| 10 | 7.94 | 17.68 | 31.94 | 24.91 | 24.97 | 564 | 9.75675 |
| 25 | 4.11 | 17.83 | 32.21 | 25.59 | 25.71 | 494 | 24.38610 |
| 50 | 4.07 | 17.85 | 32.25 | 25.62 | 25.86 | 479 | 48.75773 |

Station: 15 Lat. 57° 07' N Long. 170° 14' W Date: 7-27-34 Time: 1645
Sonic Depth: 10 fathoms (18 meters) Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.49 | 17.76 | 32.09 | 25.21 | 25.21 | 97541 | 0 |
| 10 | 6.48 | 17.76 | 32.09 | 25.21 | 25.26 | 536 | 9.75385 |

Station: 16 Lat. 57° 07' N Long. 170° 10' W Date: 7-27-34 Time: 1920
Sonic Depth: Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.29 | 17.76 | 32.09 | 25.24 | 25.24 | 97538 | 0 |
| 10 | 6.29 | 17.76 | 32.09 | 25.24 | 25.29 | 533 | 9.75355 |
| 25 | 6.26 | 17.76 | 32.09 | 25.25 | 25.37 | 526 | 24.38298 |

## SECTION II. - St. George - St. Paul

Station: 12

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 1.5 | | .430 | 70.4 | |
| 10 | 0.63 | 1.8 | | .416 | 67.9 | |
| 15 | 0.63 | 2.0 | | .518 | 84.5 | |

Station: 13

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.25 | 0.5 | | .484 | 81.9 | |
| 10 | 0.32 | 0.5 | | .464 | 78.5 | |
| (15) | (0.58) | (0.9) | | (.485) | (80.3) | |
| 25 | 1.10 | 1.8 | | .526 | 83.9 | |
| 50 | 1.26 | 2.5 | | .492 | 76.9 | |

Station: 14

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 0.7 | | .527 | 89.3 | |
| 10 | 0.32 | 0.8 | | .493 | 83.6 | |
| 25 | 1.10 | 0.2 | | .472 | 73.5 | |
| 50 | 1.10 | 0.2 | | .391 | 60.9 | |

Station: 15

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.57 | 1.5 | | .587 | 96.5 | |
| 10 | 0.88 | 1.5 | | .602 | 99.0 | |

Station: 16

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.88 | 1.5 | | .603 | 98.9 | |
| 10 | 0.95 | 1.5 | | .610 | 100.0 | |
| 25 | 0.79 | 1.5 | | .596 | 97.7 | |

## SECTION III - St. Paul Island - Nome

Station: 17 Lat. 57° 15' N Long. 170° 01' W Date: 7-28-34 Time: 1645-1701
Sonic Depth: 17 fathoms (31 meters) Bottom: Rock

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 5.95 | 17.77 | 32.10 | 25.29 | 25.29 | 97533 | 0 |
| 10 | 5.93 | 17.77 | 32.10 | 25.29 | 25.35 | 528 | 9.75305 |
| 25 | 5.92 | 17.77 | 32.10 | 25.29 | 25.41 | 522 | 24.38180 |

Station: 18 Lat. 57° 25' N Long: 169° 57' W Date: 7-28-34 Time: 1755-1818
Sonic Depth: 37 fathoms (68 meters) Bottom: Rock and shell

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 8.50 | 17.64 | 31.87 | 24.77 | 24.77 | 97583 | 0 |
| 10 | 8.50 | 17.64 | 31.87 | 24.77 | 24.82 | 578 | 9.75805 |
| 25 | 2.96 | 17.78 | 32.12 | 25.62 | 25.67 | 497 | 24.38823 |
| 50 | 2.84 | 17.78 | 32.12 | 25.63 | 25.87 | 478 | 48.75935 |

Station: 19 Lat. 57° 35' N Long: 169° 52' W Date: 7-28-34 Time: 1903-1934
Sonic Depth: 42 fathoms (77 meters) Bottom: Sand

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 8.34 | 17.58 | 31.76 | 24.71 | 24.71 | 97589 | 0 |
| 10 | 8.32 | 17.60 | 31.80 | 24.75 | 24.80 | 580 | 9.75845 |
| 25 | 2.58 | 17.78 | 32.12 | 25.65 | 25.77 | 488 | 24.38855 |
| 50 | 2.57 | 17.79 | 32.14 | 25.66 | 25.90 | 475 | 48.75893 |

Station: 20 Lat. 57° 46' N Long: 169° 46' W Date: 7-28-34 Time: 2017-2047
Sonic Depth: 38 fathoms (70 meters) Bottom: Dark Sand

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 8.27 | 17.57 | 31.74 | 24.70 | 24.70 | 97590 | 0 |
| 10 | 8.26 | 17.57 | 31.74 | 24.70 | 24.75 | 585 | 9.75875 |
| 25 | 2.44 | 17.75 | 32.07 | 25.62 | 25.74 | 491 | 24.38945 |
| 50 | 2.26 | 17.76 | 32.09 | 25.64 | 25.88 | 477 | 48.76045 |

## SECTION III - St. Paul Island - Nome

Station: 17

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.10 | 0.0 | | .606 | 98.5 | |
| 10 | 1.10 | 0.0 | | .599 | 97.4 | |
| 25 | 1.20 | 0.0 | | .594 | 96.6 | |

Station: 18

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 0.8 | | .401 | 68.9 | |
| 10 | 0.63 | 0.8 | | .380 | 65.3 | |
| 25 | 1.35 | 1.8 | | .288 | 43.6 | |
| 50 | 1.26 | 1.8 | | .327 | 49.4 | |

Station: 19

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 0.5 | | .417 | 71.5 | |
| 10 | 0.54 | 0.9 | | .507 | 87.0 | |
| 25 | 1.32 | 1.8 | | .341 | 51.2 | |
| 50 | 1.35 | 1.8 | | .296 | 44.4 | |

Station: 20

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.25 | 0.8 | | .464 | 79.5 | |
| 10 | 0.57 | 1.8 | | .408 | 69.9 | |
| 25 | 1.35 | 1.8 | | .500 | 74.7 | |
| 50 | 1.42 | 2.3 | | .491 | 73.2 | |

## SECTION III - St. Paul Island - Nome

Station: 21 Lat. 58° 24' N Long. 169° 26' W Date: 7-29-34 Time: 2343-0021
Sonic Depth: 38 fathoms (70 meters) Bottom: Grey Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x 10^5 | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.09 | 17.52 | 31.65 | 24.66 | 24.66 | 97594 | 0 |
| 10 | 8.08 | 17.52 | 31.65 | 24.66 | 24.71 | 589 | 9.75915 |
| 25 | 8.10 | 17.52 | 31.65 | 24.66 | 24.77 | 583 | 24.39705 |
| (40) | (3.68) | (17.59) | (31.77) | (25.19) | (25.39) | (524) | (39.03008) |
| 50 | 0.74 | 17.63 | 31.85 | 25.55 | 25.80 | 485 | 48.78055 |

Station: 22 Lat. 59° 05' N Long. 169° 06' W Date: 7-29-34 Time: 0318-0351
Sonic Depth: 27 fathoms (49 meters) Bottom: Rock

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.85 | 17.52 | 31.65 | 24.70 | 24.70 | 97590 | 0 |
| 10 | 7.81 | 17.52 | 31.65 | 24.70 | 24.75 | 585 | 9.75875 |
| 25 | 2.60 | 17.59 | 31.78 | 25.37 | 25.48 | 515 | 24.39125 |
| 40 | 2.49 | 17.60 | 31.80 | 25.40 | 25.60 | 504 | 39.01768 |

Station: 23 Lat. 59° 44' N Long. 168° 44' W Date: 7-29-34 Time: 0647-0706
Sonic Depth: 24 fathoms (44 meters) Bottom: Rock

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 5.99 | 17.43 | 31.49 | 24.81 | 24.81 | 97579 | 0 |
| 10 | 5.96 | 17.43 | 31.49 | 24.81 | 24.86 | 574 | 9.75765 |
| 25 | 5.95 | 17.43 | 31.49 | 24.81 | 24.93 | 568 | 24.39330 |

Station: 24 Lat. 60° 23' N Long. 168° 23' W Date: 7-29-34 Time: 1003-1030
Sonic Depth: 20 fathoms (37 meters) Bottom: Rock

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.69 | 17.21 | 31.09 | 24.28 | 24.28 | 97630 | 0 |
| 10 | 7.66 | 17.21 | 31.09 | 24.28 | 24.33 | 625 | 9.76275 |
| (20) | (7.66) | (17.21) | (31.09) | (24.28) | (24.37) | (621) | (19.52505) |
| 25 | 7.66 | 17.21 | 31.09 | 24.28 | 24.39 | 619 | 24.40605 |

# SECTION III - St. Paul Island - Nome

Station: 21

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x 10[illegible] | Nitrite Nitrogen mg.at. x 10[illegible] | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 0.5 | | .581 | 99.1 | |
| 10 | 0.57 | 0.5 | | .618 | 105.5 | |
| 25 | 0.63 | 0.8 | | .608 | 103.8 | |
| (40) | (1.06) | (1.2) | | (.606) | (93.3) | |
| 50 | 1.35 | 1.5 | | .604 | 86.3 | |

Station: 22

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.06 | 1.0 | | .604 | 102.0 | |
| 10 | 0.16 | 0.8 | | .606 | 102.4 | |
| 25 | 0.95 | 0.8 | | .636 | 95.2 | |
| 40 | 0.95 | 0.8 | | .625 | 93.3 | |

Station: 23

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 0.5 | | .403 | 65.3 | |
| 10 | 0.63 | 0.5 | | .541 | 87.7 | |
| 25 | 0.63 | 0.8 | | .554 | 89.8 | |

Station: 24

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.16 | 0.5 | | .599 | 100.5 | |
| 10 | 0.32 | 0.5 | | .577 | 96.8 | |
| (20) | (0.42) | (0.5) | | (.576) | (96.7) | |
| 25 | 0.47 | 0.5 | | .576 | 96.6 | |

## SECTION III - St. Paul Island - Nome

**Station:** 25 **Lat.** 61° 07' N **Long.** 168° 03' W **Date:** 7-29-34 **Time:** 1329-1348
**Sonic Depth:** 16 fathoms (29 meters) **Bottom:** Rock

| Depth Meters | Temperature °C | Chlorinity ‰ | Salinity ‰ | $\sigma_{s,t,0}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.26 | 17.14 | 30.97 | 24.10 | 24.10 | 97647 | 0 |
| 10 | 8.22 | 17.14 | 30.97 | 24.10 | 24.15 | 642 | 9.76445 |
| (16) | (8.21) | (17.14) | (30.97) | (24.10) | (24.17) | (640) | (15.62291) |
| 20 | 8.21 | 17.14 | 30.97 | 24.10 | 24.19 | 638 | 19.52845 |

**Station:** 26 **Lat.** 61° 42' N **Long.** 167° 37' W **Date:** 7-29-34 **Time:** 1647-1714
**Sonic Depth:** 14.5 fathoms (25 meters) **Bottom:** Hard Grey Sand and Shell

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 9.24 | 17.54 | 31.69 | 24.52 | 24.52 | 97607 | 0 |
| 10 | 8.80 | 17.56 | 31.73 | 24.61 | 24.67 | 593 | 9.76000 |
| 16 | 8.75 | 17.56 | 31.73 | 24.62 | 24.70 | 590 | 15.61549 |

**Station:** 27 **Lat.** 62° 24' N **Long.** 167° 20' W **Date:** 7-29-34 **Time:** 2012-2037
**Sonic Depth:** 15 fathoms (27 meters) **Bottom:** Black mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 8.84 | 17.24 | 31.15 | 24.15 | 24.15 | 97642 | 0 |
| 10 | 6.41 | 17.72 | 32.01 | 25.17 | 25.22 | 540 | 9.75910 |
| (16) | (6.30) | (17.72) | (32.01) | (25.19) | (25.26) | (536) | (15.61138) |
| 20 | 6.23 | 17.72 | 32.01 | 25.20 | 25.30 | 533 | 19.51275 |

**Station:** 28 **Lat.** 63° 02' N **Long.** 166° 45' W **Date:** 7-30-34 **Time:** 2337-0008
**Sonic Depth:** 17 fathoms (31 meters) **Bottom:** Hard mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 9.64 | 16.47 | 29.76 | 22.96 | 22.96 | 97756 | 0 |
| 10 | 5.71 | 17.58 | 31.76 | 25.06 | 25.12 | 550 | 9.76530 |
| (18) | (5.64) | (17.60) | (31.81) | (25.10) | (25.20) | (542) | (17.56398) |
| 20 | 5.62 | 17.61 | 31.82 | 25.11 | 25.21 | 541 | 19.51985 |

SECTION III - St. Paul Island - Nome

Station: 25

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^3$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 0.5 | | .587 | 99.5 | |
| 10 | 0.38 | 0.5 | | .583 | 98.8 | |
| (16) | (0.45) | (0.5) | | (.582) | (98.7) | |
| 20 | 0.50 | 0.5 | | .582 | 98.6 | |

Station: 26

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^3$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 0.0 | | .494 | 86.0 | |
| 10 | 0.32 | 0.0 | | .573 | 99.0 | |
| 16 | 0.16 | 0.0 | | .572 | 98.6 | |

Station: 27

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^3$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 2.0 | | .598 | 102.7 | |
| 10 | 0.57 | 2.0 | | .532 | 87.4 | |
| (16) | (0.53) | (2.3) | | (.583) | (95.4) | |
| 20 | 0.47 | 2.5 | | .617 | 100.8 | |

Station: 28

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^3$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 2.2 | | .548 | 95.0 | |
| 10 | 0.32 | 2.4 | | .556 | 88.4 | |
| (18) | (0.44) | (2.6) | | (.523) | (83.0) | |
| 20 | 0.47 | 2.7 | | .515 | 81.6 | |

## SECTION III - St. Paul Island - Nome

**Station:** 29 **Lat.** 63° 40' N **Long.** 166° 09' W **Date:** 7-30-34 **Time:** 0310-0332
**Sonic Depth:** 14.5 fathoms (26 meters) **Bottom:** Hard black mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,0}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.49 | 16.51 | 29.83 | 23.03 | 23.03 | 97749 | 0 |
| 10 | 7.72 | 17.52 | 31.65 | 24.71 | 24.76 | 584 | 9.76665 |
| (15) | (5.35) | (17.59) | (31.76) | (24.96) | (25.03) | (558) | (14.64520) |
| 18 | 5.53 | 17.61 | 31.82 | 25.12 | 25.22 | 540 | 17.57161 |

**Station:** 30 **Lat.** 64° 10' N **Long.** 165° 37' W **Date:** 7-30-34 **Time:** 0609-0625
**Sonic Depth:** 12 fathoms (22 meters) **Bottom:** Hard black mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.77 | 17.39 | 31.42 | 24.53 | 24.53 | 97603 | 0 |
| 10 | 7.76 | 17.38 | 31.40 | 24.52 | 24.57 | 602 | 9.76040 |
| 15 | 7.74 | 17.39 | 31.42 | 24.53 | 24.60 | 599 | 14.64043 |

**Station:** 31 **Lat.** 64° 18' N **Long.** 165° 33' W **Date:** 7-30-34 **Time:** 0703-0730
**Sonic Depth:** 11.5 fathoms (21 meters) **Bottom:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 9.49 | 17.57 | 31.74 | 24.52 | 24.52 | 97607 | 0 |
| 10 | 9.47 | 17.57 | 31.74 | 24.52 | 24.57 | 602 | 9.76045 |
| 15 | 9.55 | 17.60 | 31.80 | 24.55 | 24.62 | 597 | 14.64043 |

**Station:** 32 **Lat.** 64° 29' N **Long.** 165° 25' W **Date:** 7-30-34 **Time:**
**Sonic Depth:** 9 fathoms (17 meters) **Bottom:** Grey mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 10.88 | 15.04 | 27.18 | 20.75 | 20.75 | 97967 | 0 |
| 10 | 10.78 | 15.20 | 27.47 | 20.99 | 21.04 | 939 | 9.79530 |

## SECTION III - St. Paul Island - Nome

Station: 29

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 1.5 | | .557 | 96.4 | |
| 10 | 0.32 | 0.5 | | .617 | 102.5 | |
| (15) | (0.42) | (0.7) | | (.614) | (98.9) | |
| 18 | 0.47 | 0.7 | | .612 | 96.8 | |

Station: 30

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.41 | 2.0 | | .594 | 100.0 | |
| 10 | 0.47 | 2.8 | | .599 | 100.8 | |
| 15 | 0.32 | 2.3 | | .597 | 100.5 | |

Station: 31

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 2.5 | | .535 | 93.9 | |
| 10 | 0.32 | 2.0 | | .558 | 97.9 | |
| 15 | 0.32 | 2.0 | | .557 | 97.9 | |

Station: 32

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 2.8 | 0.0 | .558 | 97.2 | |
| 10 | 0.32 | 3.5 | 0.0 | .551 | 96.0 | |

## SECTION IV - King Island to Fairway Rock

**Station:** 33 **Lat.** 64° 57' N **Long.** 168° 06' W **Date:** 7-31-34 **Time:** 1053-1114
**Sonic Depth:** 23 fathoms (42 meters) **Bottom:** Coarse grey sand

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,0}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.95 | 17.51 | 31.64 | 24.80 | 24.80 | 97580 | 0 |
| 10 | 6.73 | 17.51 | 31.64 | 24.84 | 24.90 | 571 | 9.75755 |
| 25 | 4.68 | 17.66 | 31.91 | 25.29 | 25.41 | 522 | 24.38953 |
| 35 | 2.31 | 18.05 | 32.61 | 26.06 | 26.23 | 444 | 34.13783 |

**Station:** 34 **Lat.** 65° 16' N **Long.** 168° 16' W **Date:** 7-31-34 **Time:** 1240-1258
**Sonic Depth:** 28 fathoms (51 meters) **Bottom:** Rock and Sand

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.75 | 17.14 | 30.97 | 24.17 | 24.17 | 97640 | 0 |
| 10 | 6.12 | 17.18 | 31.04 | 24.44 | 24.50 | 609 | 9.76245 |
| 25 | 4.10 | 17.48 | 31.58 | 25.08 | 25.20 | 542 | 24.39878 |
| (35) | (3.34) | (17.70) | (31.97) | (25.46) | (25.63) | (501) | (34.15093) |
| (40) | (2.95) | (17.81) | (32.17) | (25.66) | (25.86) | (479) | (39.02543) |
| 43 | 2.72 | 17.87 | 32.29 | 25.77 | 25.98 | 468 | 41.94968 |

**Station:** 35 Lat. 65° 37' N Long. 168° 38' W Date: 7-31-34 Time: 1436-1454
**Sonic Depth:** 26 fathoms (47.5 meters) **Bottom:** Coarse Gravel

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 6.96 | 17.28 | 31.22 | 24.48 | 24.48 | 97611 | 0 |
| 10 | 5.64 | 17.34 | 31.33 | 24.73 | 24.78 | 582 | 9.75965 |
| 25 | 3.42 | 17.50 | 31.62 | 25.17 | 25.29 | 534 | 24.39335 |
| 40 | 3.19 | 17.86 | 32.27 | 25.72 | 25.93 | 473 | 39.01888 |

## SECTION IV - King Island to Fairway Rock

Station: 33

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.95 | 0.2 | 0.0 | .574 | 95.2 | 8.2 |
| 10 | 0.95 | 0.5 | 0.0 | .581 | 95.7 | 8.15 |
| 25 | 1.04 | 1.0 | 0.0 | .550 | 86.8 | 8.1 |
| 35 | 1.17 | 1.3 | 0.1 | .646 | 96.6 | 8.1 |

Station: 34

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 0.0 | 0.0 | .499 | 83.7 | 8.2 |
| 10 | 0.32 | 0.0 | 0.0 | .544 | 88.0 | 8.15 |
| 25 | 0.32 | 0.0 | 0.0 | .658 | 102.0 | 8.15 |
| (35) | (0.93) | (0.6) | (0.1) | (.560) | (86.0) | (8.15) |
| (40) | (1.24) | (0.8) | (0.2) | (.511) | (77.0) | (8.15) |
| 43 | 1.42 | 1.0 | 0.2 | .481 | 72.4 | 8.15 |

Station: 35

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.25 | 0.7 | 0.0 | .655 | 108.4 | 8.18 |
| 10 | 1.51 | 0.7 | 0.0 | .644 | 103.2 | 8.18 |
| 25 | 0.63 | 1.0 | 0.1 | .637 | 97.1 | 8.15 |
| 40 | 0.95 | 1.0 | 0.1 | .635 | 96.9 | 8.15 |

# SECTION V - Bering Strait

Station: 36 Lat. 65° 54' N Long. 168° 21' W Date: 7-31-34 Time: 1621-1649
Sonic Depth: 30 fathoms (55 meters) Bottom: Black Clay and Gravel

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.27 | 17.28 | 31.22 | 24.43 | 24.43 | 97615 | 0 |
| 10 | 6.17 | 17.57 | 31.74 | 24.98 | 25.03 | 558 | 9.75865 |
| 25 | 6.11 | 17.58 | 31.76 | 25.01 | 25.13 | 549 | 24.39168 |
| (40) | (5.95) | (17.58) | (31.76 | (25.03) | (25.23) | (539) | (39.02328) |
| 45 | 5.89 | 17.58 | 31.76 | 25.03 | 25.25 | 537 | 43.90028 |

Station: 37 Lat. 65° 55' N Long. 168° 42' W Date: 7-31-34 Time: 1731-1801
Sonic Depth: 29 fathoms (53 meters) Bottom: Gravel and Shell

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.45 | 17.36 | 31.36 | 24.53 | 24.53 | 97606 | 0 |
| 10 | 2.63 | 17.77 | 32.10 | 25.63 | 25.68 | 496 | 9.75510 |
| 25 | 2.70 | 17.83 | 32.21 | 25.71 | 25.83 | 482 | 24.37845 |
| (40) | (2.68) | (17.84) | (32.23) | (25.73) | (25.94) | (472) | (39.00000) |
| 45 | 2.68 | 17.84 | 32.23 | 25.73 | 25.96 | 470 | 43.87365 |

Station: 38 Lat. 65° 56' N Long. 169° 05' W Date: 7-31-34 Time: 1845-1920
Sonic Depth: 29 fathoms (53 meters) Bottom: Shale and Rock

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.71 | 17.49 | 31.60 | 24.81 | 24.81 | 97579 | 0 |
| 5 | 4.31 | 17.60 | 31.80 | 25.24 | 25.27 | 535 | 4.87785 |
| 10 | 1.32 | 17.85 | 32.25 | 25.84 | 25.89 | 476 | 9.75313 |
| 20 | 1.23 | 17.85 | 32.25 | 25.84 | 25.94 | 472 | 19.74740 |
| 25 | 1.28 | 17.85 | 32.25 | 25.84 | 25.96 | 470 | 24.37408 |
| 40 | 1.18 | 17.86 | 32.27 | 25.87 | 26.07 | 459 | 38.99376 |

Station: 39 Lat. 65° 54' N Long. 169° 32' W Date: 7-31-34 Time: 2006-2027
Sonic Depth: 29 fathoms (53 meters) Bottom: Coarse Gravel

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 2.34 | 18.05 | 32.61 | 26.06 | 26.06 | 97460 | 0 |
| 5 | 1.20 | 18.08 | 32.66 | 26.17 | 26.20 | 447 | 4.87268 |
| 10 | 1.15 | 18.09 | 32.68 | 26.20 | 26.25 | 442 | 9.74490 |
| 15 | 1.12 | 18.09 | 32.68 | 26.20 | 26.27 | 440 | 14.61695 |
| 25 | 1.13 | 18.10 | 32.70 | 26.21 | 26.33 | 435 | 24.36070 |
| (40) | (1.04) | (18.11) | (32.72) | (26.24) | (26.44) | (424) | (38.97513) |
| 43 | 1.02 | 18.11 | 32.72 | 26.24 | 26.45 | 423 | 41.89792 |

SECTION V - Bering Strait

Station: 36

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.22 | 0.5 | 0.0 | .682 | 113.6 | 8.2 |
| 10 | 0.57 | 0.5 | 0.0 | .616 | 100.5 | 8.15 |
| 25 | 0.57 | 0.5 | 0.0 | .620 | 101.0 | 8.1 |
| (40) | (0.73) | (0.5) | (0.0) | (.613) | (99.3) | (8.1) |
| 45 | 0.79 | 0.5 | 0.0 | .610 | 98.9 | 8.1 |

Station: 37

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 1.0 | 0.0 | .671 | 112.2 | 8.20 |
| 10 | 1.26 | 3.0 | 0.4 | .567 | 85.1 | 8.15 |
| 25 | 1.26 | 1.5 | 0.4 | .565 | 85.0 | 8.15 |
| (40) | (1.33) | (2.0) | (0.4) | (.563) | (84.6) | (8.15) |
| 45 | 1.35 | 2.2 | 0.4 | .562 | 84.5 | 8.15 |

Station: 38

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.13 | 0.2 | 0.0 | .679 | 111.9 | 8.2 |
| 5 | 0.32 | 0.2 | 0.0 | .828 | 87.1 | 8.2 |
| 10 | 1.42 | 3.0 | 0.7 | .619 | 90.0 | 8.2 |
| 20 | 1.42 | 2.5 | 0.9 | .609 | 88.3 | 8.2 |
| 25 | 1.26 | 2.5 | 0.8 | .558 | 85.5 | 8.2 |
| 40 | 1.26 | 2.5 | 0.8 | .558 | 85.3 | 8.2 |

Station: 39

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 2.0 | 0.9 | | | 8.10 |
| 5 | 0.79 | 2.5 | 1.0 | .634 | 92.3 | 8.10 |
| 10 | 0.79 | 2.5 | 1.0 | .568 | 82.4 | 8.05 |
| 15 | 0.79 | 2.5 | 1.0 | .549 | 79.7 | 8.05 |
| 25 | 0.88 | 2.8 | 1.0 | .590 | 85.6 | 8.05 |
| (40) | (0.94) | (3.0) | (1.0) | (.588) | (85.2) | (8.05) |
| 43 | 0.95 | 3.0 | 1.0 | .587 | 85.1 | 8.05 |

SECTION VI - Bering Strait, North of East Cape

Station: 40 Lat. 66° 14' N Long. 169° 25' W Date: 7-31-34 Time: 2153-2211
Sonic Depth: 31 fathoms (57 meters) Bottom: Gravel

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 4.51 | 17.71 | 32.00 | 25.38 | 25.38 | 97525 | 0 |
| 10 | 2.09 | 18.05 | 32.61 | 26.08 | 26.14 | 453 | 9.74890 |
| 25 | 1.55 | 18.21 | 32.90 | 26.34 | 26.46 | 422 | 24.36453 |
| (35) | (1.57) | (18.21) | (32.90) | (26.34) | (26.51) | (417) | (34.10648) |
| 45 | 1.60 | 18.21 | 32.90 | 26.34 | 26.57 | 412 | 43.84793 |

Station: 41 Lat. 66° 15' N Long. 169° 00' W Date: 7-31-34 Time: 2255-2312
Sonic Depth: 31½ fathoms (57½ meters) Bottom: Grey Mud, Gravel and Shell

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.58 | 17.42 | 31.47 | 24.73 | 24.73 | 97587 | 0 |
| 10 | 3.69 | 17.68 | 31.94 | 25.41 | 25.46 | 517 | 9.75520 |
| 25 | 3.12 | 17.81 | 32.18 | 25.64 | 25.76 | 489 | 24.38065 |
| (45) | (3.10) | (17.82) | (32.20) | (25.66) | (25.88) | (477) | (43.87725) |
| 50 | 3.09 | 17.82 | 32.20 | 25.67 | 25.91 | 474 | 48.75103 |

Station: 42 Lat. 66° 14' N Long. 168° 34' W Date: 8-1-34 Time: 2356-0016
Sonic Depth: 31 fathoms (57 meters) Bottom: Mud and Gravel

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.52 | 17.40 | 31.44 | 24.71 | 24.71 | 97589 | 0 |
| 10 | 3.48 | 17.61 | 31.82 | 25.33 | 25.39 | 524 | 9.75565 |
| 25 | 3.29 | 17.71 | 32.00 | 25.49 | 25.61 | 503 | 24.38368 |
| (35) | (3.30) | (17.71) | (32.00) | (25.49) | (25.66) | (498) | (34.13273) |
| 50 | 3.32 | 17.72 | 32.01 | 25.50 | 25.75 | 490 | 48.75680 |

Station: 43 Lat. 66° 14' N Long. 168° 10' W Date: 8-1-34 Time: 0100-0116
Sonic Depth: 24 fathoms (44 meters) Bottom: Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.48 | 17.37 | 31.38 | 24.54 | 24.54 | 97605 | 0 |
| 10 | 6.84 | 17.55 | 31.71 | 24.87 | 24.93 | 568 | 9.75865 |
| 25 | 6.62 | 17.58 | 31.76 | 24.95 | 25.07 | 554 | 24.39280 |
| 35 | 6.46 | 17.58 | 31.76 | 24.97 | 25.14 | 548 | 34.14790 |

## SECTION VI - Bering Strait, North of East Cape

Station: 40

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.06 | 0.0 | 0.0 | .972 | 152.6 | 8.15 |
| 10 | 1.26 | 2.0 | 1.0 | .755 | 112.4 | 8.10 |
| 25 | 1.89 | 3.5 | 1.2 | .584 | 85.9 | 8.05 |
| (35) | (1.89) | (3.5) | (1.3) | (.594) | (86.9) | (8.05) |
| 45 | 1.89 | 3.5 | 1.4 | .597 | 87.9 | 8.05 |

Station: 41

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.06 | 0.0 | 0.0 | .504 | 82.7 | 8.15 |
| 10 | 0.47 | 0.5 | 0.0 | .796 | 122.7 | 8.10 |
| 25 | 0.95 | 1.5 | 0.3 | .604 | 91.8 | 8.10 |
| (45) | (1.07) | (1.5) | (0.4) | (.592) | (90.1) | (8.06) |
| 50 | 1.10 | 1.5 | 0.4 | .589 | 89.5 | 8.05 |

Station: 42

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.16 | 0.0 | 0.0 | .636 | 104.1 | 8.10 |
| 10 | 0.47 | 0.8 | 0.0 | .684 | 104.6 | 8.10 |
| 25 | 1.01 | 1.2 | 0.2 | .612 | 93.2 | 8.10 |
| (35) | (1.01) | (1.2) | (0.2) | (.609) | (92.8) | (8.10) |
| 50 | 1.01 | 1.2 | 0.3 | .605 | 92.1 | 8.10 |

Station: 43

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.13 | 0.0 | 0.0 | .662 | 110.9 | 8.15 |
| 10 | 0.57 | 0.0 | 0.0 | .620 | 102.5 | 8.10 |
| 25 | 0.57 | 0.8 | 0.0 | .602 | 99.2 | 8.10 |
| 35 | 0.57 | 0.6 | 0.0 | .580 | 95.2 | 8.10 |

## STATION 44 - Arctic Ocean, North of East Cape

Station: 44  Lat. 66° 46' N  Long. 170° 01' W  Date: 8-1-34  Time: 0605-0633
Sonic Depth: 26 fathoms (47½ meters)  Bottom: Soft black mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 5.90 | 17.67 | 31.92 | 25.16 | 25.16 | 97546 | 0 |
| 10 | 1.57 | 17.89 | 32.32 | 25.88 | 25.94 | 472 | 9.75090 |
| 25 | 1.40 | 17.94 | 32.41 | 25.96 | 26.07 | 459 | 24.37073 |
| 35 | 1.36 | 17.94 | 32.41 | 25.96 | 26.13 | 454 | 34.11638 |

## STATION 44 - Arctic Ocean, North of East Cape

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat | pH |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 0.0 | 0.0 | .925 | 150.2 | 8.15 |
| 10 | 0.79 | 1.5 | 0.3 | .688 | 100.9 | 8.10 |
| 25 | 1.42 | 2.0 | 1.6 | .615 | 89.8 | 8.10 |
| 35 | 1.42 | 2.5 | 3.5 | .610 | 89.1 | 8.10 |

## SECTION - Tidal Cycle Bering Strait

**Station:** 45 A  **Lat.** 65° 51' N  **Long.** 169° 45' W  **Date:** 8-1-34  **Time:** 1200
Sonic Depth: 26 fathoms ($47\frac{1}{2}$ meters)  **Bottom:** Soft sand and Gravel

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 5.31 | 18.10 | 32.70 | 25.84 | 25.84 | 97481 | 0 |
| 10 | 2.87 | 18.18 | 32.84 | 26.20 | 26.25 | 442 | 9.74625 |
| 25 | 1.55 | 18.22 | 32.92 | 26.36 | 26.47 | 421 | 24.36088 |
| 40 | 1.51 | 18.22 | 32.92 | 26.36 | 26.56 | 413 | 38.97343 |

**Station:** 45 B  **Date:** 8-1-34  **Time:** 1530

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 5.61 | 18.12 | 32.74 | 25.84 | 25.84 | 97481 | 0 |
| 10 | 3.50 | 18.15 | 32.79 | 26.10 | 26.15 | 451 | 9.74660 |
| 25 | 1.53 | 18.21 | 32.90 | 26.34 | 26.46 | 422 | 24.36208 |
| 40 | 1.51 | 18.22 | 32.92 | 26.36 | 26.56 | 413 | 38.97470 |

**Station:** 45 C  **Date:** 8-1-34  **Time:** 1900

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 4.39 | 18.12 | 32.74 | 25.97 | 25.97 | 97469 | 0 |
| 10 | 3.45 | 18.17 | 32.83 | 26.14 | 26.20 | 447 | 9.74580 |
| 25 | 1.61 | 18.21 | 32.90 | 26.34 | 26.46 | 422 | 24.36098 |
| 40 | 1.48 | 18.22 | 32.92 | 26.36 | 26.56 | 413 | 38.97360 |

**Station:** 45 D  **Date:** 8-1-34  **Time:** 2300

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 5.23 | 18.09 | 32.68 | 25.84 | 25.84 | 97481 | 0 |
| 10 | 2.58 | 18.17 | 32.83 | 26.22 | 26.27 | 440 | 9.74605 |
| 25 | 1.45 | 18.20 | 32.88 | 26.34 | 26.46 | 422 | 24.36070 |
| 40 | 1.43 | 18.20 | 32.88 | 26.34 | 26.55 | 414 | 38.97340 |

SECTION - Tidal Cycle Bering Strait

Station: 45 A

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 1.0 | 0.0 | .771 | 124.2 | 8.15 |
| 10 | 0.79 | 2.0 | 0.4 | .583 | 88.6 | 8.15 |
| 25 | 2.05 | 4.5 | 1.4 | .480 | 70.6 | 8.10 |
| 40 | 2.05 | 4.5 | 1.4 | .434 | 63.8 | 8.10 |
| **Station: 45 B** | | | | | | |
| 0 | 0.44 | 0.5 | 0.0 | .964 | 156.2 | 8.10 |
| 10 | 0.72 | 1.0 | 0.4 | .684 | 105.6 | 8.15 |
| 25 | 2.05 | 4.5 | 1.4 | .528 | 77.5 | 8.10 |
| 40 | 2.05 | 4.5 | 1.4 | .507 | 74.4 | 8.10 |
| **Station: 45 C** | | | | | | |
| 0 | 0.54 | 1.2 | 0.0 | .942 | 148.6 | 8.10 |
| 10 | 0.54 | 1.5 | 0.0 | .816 | 125.9 | 8.10 |
| 25 | 1.42 | 4.5 | 1.1 | .627 | 92.3 | 8.05 |
| 40 | 1.42 | 4.5 | 1.3 | .419 | 61.5 | 8.05 |
| **Station: 45 D** | | | | | | |
| 0 | 0.47 | 1.0 | 0.0 | .917 | 147.2 | 8.18 |
| 10 | 0.95 | 3.5 | 2.0 | .790 | 119.2 | 8.15 |
| 25 | 2.05 | 5.0 | 2.3 | .634 | 93.0 | 8.10 |
| 40 | 2.21 | 5.5 | 2.5 | .531 | 77.9 | 8.05 |

## SECTION - Tidal Cycle Bering Strait

**Station:** 45 E  **Lat.** 65° 51' N  **Long.** 169° 45' W  **Date:** 8-2-34  **Time:** 0310
**Sonic Depth:** 26 fathoms ($47\frac{1}{2}$ meters)  **Bottom:** Soft sand and Gravel

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 5.22 | 18.07 | 32.65 | 25.81 | 25.81 | 97484 | 0 |
| 10 | 2.25 | 18.16 | 32.81 | 26.22 | 26.27 | 440 | 9.74620 |
| 25 | 1.54 | 18.18 | 32.84 | 26.30 | 26.42 | 426 | 24.36115 |
| 40 | 1.52 | 18.20 | 32.88 | 26.33 | 26.54 | 415 | 38.97423 |

**Station:** 45 F  **Date:** 8-2-34  **Time:** 0814

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 3.84 | 18.12 | 32.74 | 26.03 | 26.03 | 97463 | 0 |
| 10 | 2.18 | 18.16 | 32.81 | 26.23 | 26.28 | 439 | 9.74510 |
| 25 | 1.54 | 18.18 | 32.84 | 26.30 | 26.42 | 426 | 24.35998 |
| 40 | 1.52 | 18.19 | 32.86 | 26.31 | 26.51 | 417 | 38.97320 |

**Station:** 45 G  **Date:** 8-2-34  **Time:** 1100

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 3.90 | 18.05 | 32.61 | 25.92 | 25.92 | 97473 | 0 |
| 10 | 1.88 | 18.16 | 32.81 | 26.25 | 26.30 | 437 | 9.74550 |
| 25 | 1.49 | 18.22 | 32.92 | 26.37 | 26.48 | 420 | 24.35978 |
| 40 | 1.47 | 18.21 | 32.90 | 26.35 | 26.56 | 413 | 38.97225 |

## SECTION - Tidal Cycle Bering Strait

Station: 45 E

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 1.0 | 0.0 | .880 | 141.3 | 8.17 |
| 10 | 0.95 | 4.0 | 1.8 | .666 | 99.7 | 8.15 |
| 25 | 2.21 | 4.5 | 2.3 | .545 | 79.7 | 8.10 |
| 40 | 2.21 | 4.5 | 2.6 | .509 | 74.7 | 8.10 |

Station: 45 F

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 1.2 | 0.0 | .888 | 137.7 | 8.15 |
| 10 | 1.26 | 3.5 | 2.3 | .684 | 102.2 | 8.10 |
| 25 | 2.21 | 4.5 | 2.3 | .557 | 81.8 | 8.05 |
| 40 | 2.21 | 4.5 | 2.5 | .543 | 79.7 | 8.05 |

Station: 45 G

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.54 | 1.0 | 0.0 | .873 | 135.8 | 8.18 |
| 10 | 1.10 | 3.5 | 2.2 | .575 | 85.3 | 8.10 |
| 25 | 1.42 | 4.5 | 2.5 | .546 | 80.2 | 8.08 |
| 40 | 1.42 | 4.5 | 2.5 | .540 | 79.3 | 8.05 |

## SECTION VII - St. Lawrence Bay, Siberia to Nome

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| **Station: 46 A** Lat. 65° 37' N | Long. 170° 58' W | Date: 8-2-34 | Time: 1610 | | | | |
| Sonic Depth: 18 fathoms (33 meters) | Bottom: Mud | | | | | | |
| 0 | 6.25 | 16.52 | 29.85 | 23.48 | 23.48 | 97706 | 0 |
| 10 | 2.03 | 18.22 | 32.92 | 26.33 | 26.39 | 429 | 9.75675 |
| 25 | 0.91 | 18.46 | 33.35 | 26.75 | 26.87 | 383 | 24.36765 |
| **Station: 46 B** | | Date: 8-3-34 | Time: 1135 | | | | |
| 0 | 5.52 | 16.96 | 30.64 | 24.20 | 24.20 | 97637 | 0 |
| 10 | 1.98 | 18.22 | 32.92 | 26.35 | 26.39 | 429 | 9.75330 |
| (15) | (1.36) | (18.36) | (33.17) | (26.56) | (26.63) | (406) | (14.62418) |
| 25 | 0.13 | 18.63 | 33.66 | 27.03 | 27.15 | 357 | 24.36225 |
| **Station: 47** Lat. 65° 31' N | Long. 170° 40' W | Date: 8-3-34 | Time: 1313-1327 | | | | |
| Sonic Depth: 14 fathoms ($25\frac{1}{2}$ meters) | Bottom: Mud and Shell | | | | | | |
| 0 | 5.12 | 17.66 | 31.91 | 25.25 | 25.25 | 97537 | 0 |
| 10 | 1.59 | 18.29 | 33.04 | 26.46 | 26.51 | 417 | 9.75270 |
| 15 | 1.49 | 18.31 | 33.08 | 26.50 | 26.58 | 411 | 14.62340 |
| **Station: 48** Lat. 65° 25' N | Long. 170° 21' W | Date: 8-3-34 | Time: 1415-1441 | | | | |
| Sonic Depth: 24 fathoms (44 meters) | Bottom: Grey Sand and Shell | | | | | | |
| 0 | 5.86 | 17.98 | 32.48 | 25.61 | 25.61 | 97503 | 0 |
| 10 | 5.17 | 18.04 | 32.59 | 25.77 | 25.82 | 483 | 9.74930 |
| (15) | (3.89) | (18.11) | (32.72) | (25.99) | (26.06) | (460) | (14.62288) |
| 25 | 1.33 | 18.25 | 32.97 | 26.42 | 26.55 | 415 | 24.36665 |
| 35 | 1.23 | 18.29 | 33.04 | 26.48 | 26.65 | 404 | 34.10760 |
| **Station: 49** Lat. 65° 18' N | Long. 170° 01' W | Date: 8-3-34 | Time: 1523-1547 | | | | |
| Sonic Depth: 25 fathoms (46 meters) | Bottom: Black Mud | | | | | | |
| 0 | 3.49 | 18.06 | 32.63 | 25.98 | 25.98 | 97468 | 0 |
| 5 | 3.53 | 18.07 | 32.65 | 25.99 | 26.02 | 464 | 4.87330 |
| 20 | 1.63 | 18.22 | 32.92 | 26.36 | 26.45 | 423 | 19.48983 |
| 35 | 1.56 | 18.24 | 32.95 | 26.39 | 26.56 | 413 | 34.10253 |

SECTION VII - St. Lawrence Bay, Siberia to Nome

Station: 46 A

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 0.7 | 0.5 | .543 | 87.3 | 8.15 |
| 10 | 1.10 | 1.2 | 0.1 | .405 | 60.3 | 8.10 |
| 25 | 1.58 | 2.8 | 6.1 | .441 | 64.1 | 8.05 |

Station: 46 B

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.57 | 0.8 | 0.2 | .688 | 109.4 | 8.10 |
| 10 | 0.95 | 1.2 | 0.0 | .712 | 106.0 | 8.10 |
| (15) | (1.26) | (1.5) | (1.3) | (.648) | (95.3) | (8.08) |
| 25 | 1.89 | 2.0 | 4.0 | .519 | 74.0 | 8.05 |

Station: 47

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 1.0 | 0.0 | .682 | 108.4 | 8.12 |
| 10 | 1.89 | 3.5 | 2.2 | .475 | 70.1 | 8.10 |
| 15 | 2.05 | 4.0 | 2.7 | .496 | 73.0 | 8.10 |

Station: 48

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.16 | 0.5 | 0.0 | | | 8.10 |
| 10 | 0.16 | 0.5 | 0.0 | .835 | 133.8 | 8.10 |
| (15) | (0.61) | (1.9) | (0.9) | (.702) | (110.4) | (8.08) |
| 25 | 1.51 | 4.8 | 2.8 | .436 | 63.7 | 8.05 |
| 35 | 1.58 | 5.0 | 2.8 | .483 | 70.1 | 8.05 |

Station: 49

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 2.05 | 3.5 | 2.2 | .464 | 71.4 | 8.15 |
| 5 | 2.05 | 3.5 | 2.2 | .633 | 97.4 | 8.15 |
| 20 | 2.21 | 3.8 | 2.5 | .500 | 73.6 | 8.10 |
| 35 | 2.21 | 4.5 | 2.5 | .475 | 70.0 | 8.08 |

## SECTION VII - St. Lawrence Bay, Siberia to Nome

**Station:** 50 **Lat.** 65° 08' N **Long.** 169° 28' W **Date:** 8-3-34 **Time:** 1716-1733
**Sonic Depth:** 29 fathoms (53 meters) **Bottom:** Rocky

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 2.32 | 17.90 | 32.34 | 25.84 | 25.84 | 97481 | 0 |
| 10 | 2.00 | 17.92 | 32.38 | 25.89 | 25.95 | 471 | 9.74760 |
| 25 | 0.92 | 17.98 | 32.48 | 26.05 | 26.17 | 450 | 24.36668 |
| (35) | (0.87) | (17.98) | (32.48) | (26.05) | (26.22) | (445) | (34.11143) |
| 40 | 0.85 | 17.98 | 32.48 | 26.05 | 26.25 | 442 | 38.98358 |

**Station:** 51 **Lat.** 64° 58' N **Long.** 168° 50' W **Date:** 8-3-34 **Time:** 1902-1928
**Sonic Depth:** 28 fathoms (51 meters) **Bottom:** Grey Sand

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.11 | 17.48 | 31.58 | 24.87 | 24.87 | 97573 | 0 |
| 5 | 5.92 | 17.50 | 31.62 | 24.92 | 24.96 | 565 | 4.87845 |
| 10 | 1.38 | 17.88 | 32.30 | 25.87 | 25.93 | 473 | 9.75440 |
| 25 | 0.69 | 17.93 | 32.39 | 25.99 | 26.10 | 456 | 24.37408 |
| 40 | 0.72 | 17.94 | 32.41 | 26.00 | 26.20 | 447 | 38.99180 |

**Station:** 52 **Lat.** 64° 48' N **Long.** 168° 10' W **Date:** 8-3-34 **Time:** 2100-2112
**Sonic Depth:** 21 fathoms (38 meters) **Bottom:** Rocky

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.10 | 17.12 | 30.93 | 24.09 | 24.09 | 97648 | 0 |
| 10 | 6.99 | 17.21 | 31.09 | 24.37 | 24.42 | 616 | 9.76320 |
| (20) | (5.20) | (17.38) | (31.39) | (24.82) | (24.91) | (569) | (19.52245) |
| 25 | 4.30 | 17.46 | 31.55 | 25.04 | 25.16 | 546 | 24.40035 |

**Station:** 53 **Lat.** 64° 36' N **Long.** 167° 34' W **Date:** 8-3-34 **Time:** 2244-2258
**Sonic Depth:** 17 fathoms (31 meters) **Bottom:** Rocky

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.96 | 17.66 | 31.91 | 24.89 | 24.89 | 97571 | 0 |
| 10 | 5.62 | 17.79 | 32.14 | 25.36 | 25.41 | 522 | 9.75465 |
| 20 | 4.07 | 17.85 | 32.25 | 25.61 | 25.70 | 494 | 19.50545 |

## SECTION VII - St. Lawrence Bay, Siberia to Nome

Station: 50

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.48 | 2.8 | 1.5 | .671 | 100.1 | 8.15 |
| 10 | 1.58 | 3.0 | 1.5 | .617 | 91.4 | 8.10 |
| 25 | 1.89 | 3.0 | 1.2 | .559 | 82.7 | 8.05 |
| (35) | (2.04) | (3.0) | (1.2) | | | (8.05) |
| 40 | 2.11 | 3.0 | 1.2 | | | 8.05 |

Station: 51

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 1.0 | 0.0 | .761 | 124.1 | 8.15 |
| 5 | 0.38 | 1.0 | 0.0 | .788 | 127.9 | 8.15 |
| 10 | 1.51 | 2.0 | 1.0 | .665 | 106.9 | 8.10 |
| 25 | 1.73 | 2.8 | 1.4 | .621 | 98.1 | 8.10 |
| 40 | 1.89 | 3.2 | 1.4 | .620 | 98.1 | 8.10 |

Station: 52

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 0.8 | 0.2 | .619 | 104.7 | 8.10 |
| 10 | 0.38 | 0.8 | 0.2 | .630 | 104.3 | 8.10 |
| (20) | (1.07) | (1.5) | (0.5) | (.579) | (92.4) | (8.12) |
| 25 | 1.42 | 1.8 | 0.6 | .553 | 86.4 | 8.12 |

Station: 53

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 1.0 | 0.0 | .596 | 101.2 | 8.10 |
| 10 | 0.69 | 1.2 | 0.0 | .621 | 100.2 | 8.10 |
| 20 | 0.95 | 1.4 | 0.5 | .609 | 94.9 | 8.05 |

SECTION VII - St. Lawrence Bay, Siberia to Nome

Station: 54 Lat. 64° 28' N Long. 166° 54' W Date: 8-4-34 Time: 0026-0041
Sonic Depth: 16 fathoms (29 meters) Bottom: Rocky

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.44 | 17.47 | 31.56 | 24.39 | 24.39 | 97619 | 0 |
| 10 | 6.82 | 17.59 | 31.78 | 24.93 | 24.99 | 562 | 9.75905 |
| 20 | 5.69 | 17.60 | 31.80 | 25.09 | 25.19 | 543 | 19.51430 |

Station: 55 Lat. 64° 23' N Long. 166° 33' W Date: 8-4-34 Time: 0130-0145
Sonic Depth: 18 fathoms (33 meters) Bottom: Black Mud and Shell

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.42 | 17.36 | 31.36 | 24.24 | 24.24 | 97633 | 0 |
| 10 | 9.23 | 17.40 | 31.44 | 24.32 | 24.37 | 621 | 9.76270 |
| (20) | (7.31) | (17.47) | (31.57) | (24.69) | (24.78) | (582) | (19.52310) |
| 25 | 6.34 | 17.51 | 31.64 | 24.88 | 25.00 | 561 | 24.40135 |

Station: 56 Lat. 64° 21' N Long. 166° 10' W Date: 8-4-34 Time: 0230-0241
Sonic Depth: 16 fathoms (29 meters) Bottom: Black Mud and Shell

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.55 | 17.34 | 31.33 | 24.19 | 24.19 | 97638 | 0 |
| 10 | 6.90 | 17.45 | 31.53 | 24.73 | 24.78 | 582 | 9.76100 |
| 20 | 6.70 | 17.46 | 31.55 | 24.76 | 24.85 | 575 | 19.51885 |

Station: 57 Lat. 64° 23' N Long. 165° 44' W Date: 8-4-34 Time: 0326-0344
Sonic Depth: 16 fathoms (29 meters) Bottom: Black Mud and Shell

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 10.15 | 17.27 | 31.20 | 23.99 | 23.99 | 97657 | 0 |
| 10 | 9.45 | 17.50 | 31.62 | 24.42 | 24.48 | 611 | 9.76340 |
| 20 | 9.45 | 17.50 | 31.62 | 24.42 | 24.52 | 607 | 19.52430 |

SECTION VII - St. Lawrence Bay, Siberia to Nome

Station: 54

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 0.6 | 0.0 | .595 | 104.0 | 8.10 |
| 10 | 0.57 | 1.2 | 0.1 | .602 | 99.5 | 8.10 |
| 20 | 0.88 | 1.8 | 0.3 | .578 | 93.2 | 8.05 |

Station: 55

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.44 | 1.0 | 0.0 | .600 | 104.7 | 8.10 |
| 10 | 0.50 | 1.2 | 0.0 | .597 | 104.0 | 8.10 |
| (20) | (0.73) | (1.4) | (0.1) | (.585) | (102.0) | (8.10) |
| 25 | 0.85 | 1.5 | 0.1 | .579 | 101.0 | 8.10 |

Station: 56

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 1.0 | 0.0 | .580 | 101.3 | 8.10 |
| 10 | 0.57 | 1.2 | 0.0 | .594 | 98.2 | 8.10 |
| 20 | 0.79 | 1.4 | 0.2 | .594 | 97.7 | 8.10 |

Station: 57

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 1.8 | 0.0 | .572 | 101.2 | 8.10 |
| 10 | 0.79 | 1.8 | 0.0 | .545 | 95.4 | 8.12 |
| 20 | 0.88 | 2.0 | 0.1 | .486 | 85.1 | 8.10 |

SECTION VIII - Lat. 63° 39' N, Long. 165° 24' W to Savoonga, St. Lawrence Island

Station: 58 Lat. 63° 39' N Long. 165° 24' W Date: 8-4-34 Time: 2206-2237
Sonic Depth: 12 fathoms (22 meters) Bottom: Black Mud

| Depth Meters | Temperature °C | Chlorinity ‰ | Salinity ‰ | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 10.90 | 16.23 | 29.33 | 22.41 | 22.41 | 97808 | 0 |
| 10 | 8.78 | 16.67 | 30.12 | 23.36 | 23.42 | 712 | 9.77600 |
| 15 | 8.74 | 16.69 | 30.16 | 23.40 | 23.47 | 707 | 14.66148 |

Station: 59 Lat. 63° 40' N Long. 165° 48' W Date: 8-4-34 Time: 2311-2327
Sonic Depth: 13 fathoms (24 meters) Bottom: Black Mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 10.66 | 16.38 | 29.60 | 22.66 | 22.66 | 97784 | 0 |
| 10 | 8.56 | 16.98 | 30.68 | 23.83 | 23.89 | 667 | 9.77255 |
| 15 | 6.69 | 17.37 | 31.38 | 24.64 | 24.72 | 588 | 14.65393 |

Station: 60 Lat. 63° 43' N : Long. 166° 10' W Date: 8-5-34 Time: 0014-0028
Sonic Depth: 14.5 fathoms (26.5 meters) Bottom: Black Mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 9.71 | 16.87 | 30.48 | 23.50 | 23.50 | 97794 | 0 |
| 10 | 6.49 | 17.59 | 31.78 | 24.97 | 25.02 | 559 | 9.76315 |
| (15) | (5.72) | (17.65) | (31.88) | (25.14) | (25.22) | (540) | (14.64080) |
| 20 | 4.95 | 17.70 | 31.98 | 25.31 | 25.41 | 522 | 19.51720 |

Station: 61 Lat. 63° 44' N Long. 166° 51' W Date: 8-5-34 Time: 0111-0127
Sonic Depth: 16 fathoms (29 meters) Bottom: Black Mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 9.67 | 17.46 | 31.55 | 24.33 | 24.33 | 97625 | 0 |
| 10 | 7.24 | 17.87 | 32.29 | 25.28 | 25.34 | 529 | 9.75770 |
| 20 | 4.90 | 17.97 | 32.47 | 25.71 | 25.81 | 484 | 19.50835 |

Station: 62 Lat. 63° 48' N Long. 167° 16' W Date: 8-5-34 Time: 0255-0314
Sonic Depth: 17.5 fathoms (32 meters) Bottom: Black Mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 8.28 | 17.88 | 32.30 | 25.13 | 25.13 | 97548 | 0 |
| 10 | 7.40 | 17.87 | 32.29 | 25.25 | 25.31 | 532 | 9.75400 |
| (20) | (5.75) | (17.94) | (32.42) | (25.56) | (25.65) | (499) | (19.50555) |
| 25 | 4.92 | 17.98 | 32.48 | 25.72 | 25.84 | 481 | 24.37998 |

SECTION VIII - Lat. 63° 39'N, Long. 165° 24' W to Savoonga, St. Lawrence Island

Station: 58

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 2.0 | 0.0 | .568 | 100.7 | 8.10 |
| 10 | 0.47 | 2.0 | 0.1 | .536 | 91.5 | 8.10 |
| 15 | 0.57 | 2.3 | 0.1 | .501 | 85.5 | 8.10 |

Station: 59

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 1.6 | 0.0 | .572 | 101.1 | 8.10 |
| 10 | 0.44 | 1.6 | 0.0 | .584 | 99.7 | 8.10 |
| 15 | 0.50 | 2.0 | 0.1 | .554 | 91.1 | 8.15 |

Station: 60

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 1.2 | 0.0 | .574 | 100.2 | 8.10 |
| 10 | 0.54 | 1.2 | 0.2 | .603 | 99.0 | 8.10 |
| (15) | (0.59) | (1.4) | (0.3) | (.582) | (94.1) | (8.10) |
| 20 | 0.63 | 1.5 | 0.3 | .562 | 89.2 | 8.10 |

Station: 61

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.54 | 1.0 | 0.0 | .574 | 101.1 | 8.10 |
| 10 | 0.54 | 1.0 | 0.1 | .436 | 73.2 | 8.10 |
| 20 | 0.69 | 1.4 | 0.3 | .616 | 98.1 | 8.10 |

Station: 62

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 0.3 | 0.3 | .566 | 97.3 | 8.15 |
| 10 | 0.63 | 0.3 | 0.0 | .598 | 100.7 | 8.15 |
| (20) | (0.84) | (0.8) | (0.2) | (.593) | (96.3) | (8.15) |
| 25 | 0.95 | 1.0 | 0.2 | .591 | 94.1 | 8.15 |

SECTION VIII - Lat. 63° 39' N, Long. 165° 24' W, to Savoonga, St. Lawrence Island

Station: 63 Lat. 63° 51' N Long. 168° 03' W Date: 8-5-34 Time: 0442-0457
Sonic Depth: 19.5 fathoms (35.5 meters) Bottom: Grey Sand

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | °s,t,o | °s,t,p | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.81 | 17.77 | 32.10 | 25.05 | 25.05 | 97556 | 0 |
| 10 | 4.12 | 17.88 | 32.30 | 25.65 | 25.70 | 494 | 9.75250 |
| 25 | 1.91 | 18.03 | 32.57 | 26.06 | 26.18 | 449 | 24.37323 |

Station: 64 Lat. 63° 53' N Long. 168° 24' W Date: 8-5-34 Time: 0541-0556
Sonic Depth: 20.5 fathoms (37.5 meters) Bottom: Grey Sand

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.95 | 17.37 | 31.38 | 24.47 | 24.47 | 97612 | 0 |
| 10 | 6.57 | 17.65 | 31.89 | 25.05 | 25.10 | 551 | 9.75815 |
| 25 | 2.06 | 17.99 | 32.50 | 25.99 | 26.10 | 456 | 24.38368 |

Station: 65 Lat. 63° 55' N Long. 168° 48' W Date: 8-5-34 Time: 0640-0655
Sonic Depth: 20 fathoms (36.5 meters) Bottom: Shell

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 8.33 | 17.16 | 31.00 | 24.12 | 24.12 | 97645 | 0 |
| 10 | 6.69 | 17.26 | 31.18 | 24.48 | 24.53 | 606 | 9.76255 |
| 25 | 5.65 | 17.36 | 31.36 | 24.75 | 24.86 | 574 | 24.40105 |

Station: 66 Lat. 63° 44' N Long. 170° 26' W Date: 8-5-34 Time: 1134
Sonic Depth: 10 fathoms (18 meters) Bottom: Mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 6.45 | 17.41 | 31.46 | 24.72 | 24.72 | 97588 | 0 |
| 10 | 6.35 | 17.41 | 31.46 | 24.73 | 24.78 | 582 | 9.75850 |

SECTION VIII - Lat. 63° 39' N, Long. 165° 24' W to Savoonga, St. Lawrence Island

Station: 63

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.79 | 0.7 | 0.0 | .596 | | 8.10 |
| 10 | 0.95 | 0.8 | 0.0 | .603 | | 8.10 |
| 25 | 1.26 | 1.0 | 0.3 | .506 | | 8.10 |

Station: 64

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 0.0 | 0.0 | .598 | | 8.15 |
| 10 | 0.57 | 0.2 | 0.0 | .469 | | 8.15 |
| 25 | 1.26 | 1.2 | 0.4 | .567 | | 8.10 |

Station: 65

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 0.0 | 0.0 | .601 | | 8.15 |
| 10 | 0.32 | 0.0 | 0.0 | .647 | | 8.15 |
| 25 | 0.47 | 1.3 | 0.3 | .585 | | 8.15 |

Station: 66

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 1.3 | 0.0 | .497 | | 8.15 |
| 10 | 0.63 | 1.5 | 0.1 | .614 | | 8.15 |

SECTION IX - Gambell - Siberia

Station: 67 Lat. 63° 52' N Long. 171° 36' W Date: 8-5-34 Time: 1903
Sonic Depth: 9.5 fathoms (17.5 meters) Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 4.94 | 17.55 | 31.71 | 25.10 | 25.10 | 97551 | 0 |
| 10 | 2.81 | 17.68 | 31.94 | 25.48 | 25.54 | 510 | 9.75305 |

Station: 68 Lat. 63° 58' N Long. 171° 52' W Date: 8-5-34 Time: 2230-2246
Sonic Depth: 25 fathoms (46 meters) Bottom: Rock and Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.82 | 17.42 | 31.47 | 24.56 | 24.56 | 97603 | 0 |
| 10 | 5.98 | 17.74 | 32.05 | 24.25 | 25.30 | 532 | 9.75675 |
| 25 | 0.36 | 17.86 | 32.27 | 25.95 | 26.07 | 459 | 24.38108 |
| 35 | 0.55 | 17.86 | 32.27 | 25.95 | 26.12 | 454 | 34.12673 |

Station: 69 Lat. 64° 04' N Long. 172° 07' W Date: 8-5-34 Time: 2327-2352
Sonic Depth: 31 fathoms (57 meters) Bottom: Clay and Gravel

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.83 | 17.70 | 31.98 | 24.95 | 24.95 | 97565 | 0 |
| 10 | 4.46 | 17.90 | 32.34 | 25.65 | 25.70 | 494 | 9.75295 |
| 25 | - 0.54 | 18.03 | 32.57 | 26.19 | 26.30 | 437 | 24.37278 |
| (35) | (- 0.56) | (18.04) | (32.58) | (26.20) | (26.37) | (431) | (34.11618) |
| 45 | - 0.58 | 18.04 | 32.59 | 26.21 | 26.43 | 425 | 43.85898 |

Station: 70 A Lat. 64° 13' N Long. 172° 19' W : Date: 8-6-34 Time: 0100
Sonic Depth: 26 fathoms (48 meters) Bottom: Rocky

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.27 | 16.96 | 30.64 | 23.85 | 23.85 | 97671 | 0 |
| 10 | 0.91 | 18.17 | 32.83 | 26.33 | 26.39 | 429 | 9.75500 |
| 25 | 0.90 | 18.17 | 32.83 | 26.33 | 26.45 | 423 | 24.36890 |
| 35 | 0.87 | 18.17 | 32.83 | 26.33 | 26.50 | 418 | 34.11095 |

## SECTION IX - Gambell - Siberia

Station: 67

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 0.5 | 0.2 | .653 | | 8.15 |
| 10 | 0.32 | 0.5 | 0.5 | .681 | | 8.15 |

Station: 68

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 1.2 | 0.0 | .602 | | 8.12 |
| 10 | 0.63 | 1.0 | 0.0 | .712 | | 8.10 |
| 25 | 1.07 | 1.3 | 0.5 | .805 | | 8.10 |
| 35 | 1.20 | 1.5 | 0.6 | .787 | | 8.10 |

Station: 69

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.25 | 0.8 | 0.0 | .586 | | 8.15 |
| 10 | 0.32 | 1.3 | 0.0 | .778 | | 8.15 |
| 25 | 1.73 | 3.8 | 0.7 | .581 | | 8.10 |
| (35) | (1.89) | (3.9) | (0.8) | (.578) | | (8.08) |
| 45 | 2.05 | 4.0 | 0.8 | .575 | | 8.05 |

Station: 70 A

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.32 | 1.2 | 0.0 | .566 | | 8.15 |
| 10 | 1.89 | 4.0 | 1.0 | .442 | | 8.10 |
| 25 | 2.05 | 3.8 | 1.0 | .418 | | 8.10 |
| 35 | 2.05 | 3.8 | 1.0 | .436 | | 8.05 |

## SECTION X - Siberia - St. Matthew Island

**Station:** 70 B  **Lat.** 64° 13' N  **Long.** 172° 19' W  **Date:** 8-6-34  **Time:** 1102
**Sonic Depth:** 26 fathoms (48 meters)  **Bottom:** Rocky

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s.t.o}$ | $\sigma_{s.t.p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.03 | 17.21 | 31.09 | 24.49 | 24.49 | 97610 | 0 |
| 10 | 1.12 | 18.21 | 32.90 | 26.37 | 26.42 | 426 | 9.75180 |
| 25 | 0.72 | 18.36 | 33.17 | 26.61 | 26.73 | 397 | 24.36353 |
| 35 | 0.53 | 18.39 | 33.22 | 26.67 | 26.84 | 386 | 34.10268 |

**Station:** 71  **Lat.** 64° 25' N  **Long.** 172° 12' W  **Date:** 8-6-34  **Time:** 1500-1518
**Sonic Depth:** 36 fathoms (66 meters)  **Bottom:** Grey Sand

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.80 | 17.34 | 31.33 | 24.45 | 24.45 | 97613 | 0 |
| 10 | 7.00 | 17.38 | 31.40 | 24.62 | 24.67 | 592 | 9.76025 |
| 25 | 1.81 | 17.72 | 32.01 | 25.62 | 25.84 | 481 | 24.39148 |
| (35) | (0.44) | (17.85) | (32.26) | (25.88) | (26.05) | (461) | (34.13908) |
| 50 | -1.60 | 18.06 | 32.63 | 26.27 | 26.52 | 416 | 48.75435 |

**Station:** 72  **Lat.** 63° 15' N  **Long.** 172° 12' W  **Date:** 8-6-34  **Time:** 1603-1624
**Sonic Depth:** 34.5 fathoms (63 meters)  **Bottom:** Black Mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.98 | 17.30 | 31.26 | 24.37 | 24.37 | 97621 | 0 |
| 10 | 7.85 | 17.30 | 31.26 | 24.59 | 24.45 | 614 | 9.76175 |
| 25 | 1.91 | 17.81 | 32.18 | 25.74 | 25.86 | 479 | 24.39373 |
| 50 | -1.33 | 18.15 | 32.79 | 26.41 | 26.66 | 403 | 48.75398 |

**Station:** 73  **Lat.** 63° 05' N  **Long.** 172° 13' W  **Date:** 8-6-34  **Time:** 1706-1724
**Sonic Depth:** 34 fathoms (62 meters)  **Bottom:** Black Mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.93 | 17.44 | 31.51 | 24.58 | 24.58 | 97601 | 0 |
| 10 | 7.89 | 17.52 | 31.65 | 24.69 | 24.74 | 586 | 9.75935 |
| 25 | 2.00 | 17.77 | 32.10 | 25.67 | 25.79 | 486 | 24.38975 |
| 50 | -1.56 | 18.05 | 32.61 | 26.25 | 26.50 | 418 | 48.75275 |

## SECTION X - Siboria - St. Matthow Island

Station: 70 B

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.10 | 3.0 | 0.8 | .570 | 92.1 | 8.12 |
| 10 | 2.14 | 3.2 | 2.0 | .502 | 73.0 | 8.10 |
| 25 | 2.27 | 3.8 | 2.6 | .351 | 50.6 | 8.05 |
| 35 | 2.37 | 4.0 | 2.6 | .400 | 57.5 | 8.05 |

Station: 71

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.25 | 0.0 | 0.0 | .591 | 99.5 | 8.15 |
| 10 | 0.32 | 0.0 | 0.0 | .608 | 100.7 | 8.15 |
| 25 | 0.41 | 0.0 | 0.0 | .791 | 116.2 | 8.10 |
| (35) | (1.06) | (1.04) | (0.4) | (.695) | | (8.08) |
| 50 | 2.05 | 2.6 | 1.0 | .551 | | 8.05 |

Station: 72

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.19 | 0.0 | 0.0 | .504 | 85.3 | 8.15 |
| 10 | 0.38 | 0.0 | 0.0 | .587 | 99.3 | 8.15 |
| 25 | 0.63 | 0.0 | 0.0 | .738 | 108.8 | 8.10 |
| 50 | 2.14 | 2.7 | 1.0 | .545 | | 8.05 |

Station: 73

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.44 | 0.0 | 0.0 | .591 | 99.8 | 8.15 |
| 10 | 0.54 | 0.0 | 0.0 | .583 | 98.6 | 8.12 |
| 25 | 0.57 | 0.0 | 0.0 | .832 | 123.1 | 8.12 |
| 50 | 1.89 | 2.5 | 1.0 | .527 | | 8.05 |

# SECTION X - Siberia - St. Matthew Island

**Station:** 74 **Lat.** 62° 54' N **Long.** 172° 14' W **Date:** 8-6-34 **Time:** 1809-1826
**Sonic Depth:** 32 fathoms (59 meters) **Bottom:** Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x 10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.28 | 17.58 | 31.76 | 24.72 | 24.72 | 97588 | 0 |
| 10 | 8.20 | 17.58 | 31.76 | 24.73 | 24.78 | 582 | 9.75850 |
| 25 | 4.95 | 17.62 | 31.83 | 25.20 | 25.32 | 531 | 24.39298 |
| (40) | (1.35) | (17.79) | (32.15) | (25.70) | (25.90) | (475) | (39.01338) |
| 50 | -1.06 | 17.91 | 32.36 | 26.04 | 26.28 | 439 | 48.76323 |

**Station:** 75 **Lat.** 62° 33' N **Long.** 172° 15' W **Date:** 8-6-34 **Time:** 1959-2016
**Sonic Depth:** 28.5 fathoms (52 meters) **Bottom:** Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x 10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.24 | 17.69 | 31.96 | 24.88 | 24.88 | 97572 | 0 |
| 10 | 8.10 | 17.72 | 32.01 | 24.94 | 25.00 | 561 | 9.75665 |
| 25 | 3.12 | 17.79 | 32.14 | 25.61 | 25.73 | 492 | 24.38563 |
| 40 | -0.51 | 18.06 | 32.63 | 26.24 | 26.44 | 424 | 39.00433 |

**Station:** 76 **Lat.** 61° 56' N **Long.** 172° 16' W **Date:** 8-6-34 **Time:** 2322-2340
**Sonic Depth:** 33 fathoms (60 meters) **Bottom:** Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x 10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.96 | 17.10 | 30.90 | 23.94 | 23.94 | 97662 | 0 |
| 10 | 8.95 | 17.10 | 30.90 | 23.94 | 23.99 | 657 | 9.76595 |
| 25 | 0.90 | 17.66 | 31.91 | 25.60 | 25.72 | 493 | 24.40220 |
| (40) | (-0.40) | (17.83) | (32.16) | (25.89) | (26.09) | (457) | (39.02345) |
| 50 | -1.26 | 17.94 | 32.41 | 26.08 | 26.32 | 435 | 48.76820 |

**Station:** 77 **Lat.** 61° 19' N **Long.** 172° 20' W **Date:** 8-7-34 **Time:** 0245-0317
**Sonic Depth:** 38 fathoms (70 meters) **Bottom:** Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x 10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.36 | 17.26 | 31.18 | 24.25 | 24.25 | 97652 | 0 |
| 9 | 8.32 | 17.27 | 31.20 | 24.27 | 24.33 | 625 | 8.78657 |
| 22 | 3.39 | 17.39 | 31.42 | 25.02 | 25.13 | 549 | 21.47288 |
| (25) | (2.79) | (17.41) | (31.46) | (25.09) | (25.21) | (541) | (24.71292) |
| (40) | (-0.68) | (17.53) | (31.67) | (25.43) | (25.63) | (501) | (39.34107) |
| 43 | 0.77 | 17.55 | 31.71 | 25.50 | 25.72 | 493 | 41.95229 |

SECTION X - Siberia - St. Matthew Island

Station: 74

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.60 | 0.0 | 0.0 | .593 | 101.4 | 8.15 |
| 10 | 0.60 | 0.0 | 0.0 | .583 | 99.5 | 8.15 |
| 25 | 0.63 | 0.0 | 0.0 | .664 | 105.2 | 8.12 |
| (40) | (0.97) | (0.78) | (0.3) | (.641) | | 8.10 |
| 50 | 1.20 | 1.3 | 0.5 | .625 | | 8.08 |

Station: 75

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.72 | 0.0 | 0.0 | .586 | 100.2 | 8.13 |
| 10 | 0.63 | 0.0 | 0.0 | .586 | 100.0 | 8.10 |
| 25 | 0.69 | 0.0 | 0.0 | .706 | 107.2 | 8.10 |
| 40 | 1.10 | 0.0 | 0.2 | .591 | | 8.05 |

Station: 76

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 2.0 | 0.0 | .588 | 101.2 | 8.10 |
| 10 | 0.69 | 1.2 | 0.0 | .584 | 100.5 | 8.10 |
| 25 | 0.88 | 1.5 | 0.0 | .751 | 10[illegible].7 | 8.10 |
| (40) | (1.04) | (2.1) | (1.1) | (.681) | | (8.08) |
| 50 | 1.14 | 2.5 | 1.8 | .635 | | 8.05 |

Station: 77

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 1.5 | 0.0 | .595 | 101.5 | 8.10 |
| 9 | 0.95 | 1.5 | 0.0 | .595 | 101.3 | 8.10 |
| 22 | 1.07 | 1.2 | 0.0 | .699 | 106.4 | 8.10 |
| (25) | (1.11) | (1.4) | (0.3) | (.692) | | (8.10) |
| (40) | (1.31) | (2.3) | (1.6) | (.659) | | (8.10) |
| 43 | 1.35 | 2.5 | 1.9 | .652 | | 8.10 |

## SECTION X - Siberia - St. Matthew Island

**Station:** 78 **Lat.** 61° 01' N **Long.** 172° 21' W **Date:** 8-7-34 **Time:** 0449-0510
**Sonic Depth:** 40 fathoms (73 meters) **Bottom:** Soft Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.01 | 17.29 | 31.24 | 24.35 | 24.35 | 97623 | 0 |
| 9 | 7.93 | 17.29 | 31.24 | 24.36 | 24.41 | 617 | 8.78580 |
| 22 | 2.82 | 17.44 | 31.51 | 25.15 | 25.27 | 536 | 21.47075 |
| 43 | -0.05 | 17.49 | 31.60 | 25.39 | 25.60 | 504 | 41.94995 |

**Station:** 79 **Lat.** 60° 52' N **Long.** 172° 22' W **Date:** 8-7-34 **Time:** 0557-0625
**Sonic Depth:** 36 fathoms (66 meters) **Bottom:** Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.84 | 17.25 | 31.17 | 24.32 | 24.32 | 97626 | 0 |
| 9 | 7.77 | 17.28 | 31.22 | 24.37 | 24.42 | 616 | 8.78589 |
| 22 | 2.12 | 17.44 | 31.51 | 25.20 | 25.31 | 532 | 21.47051 |
| (39) | (-0.42) | (17.54) | (31.69) | (25.47) | (25.67) | (497) | (38.04823) |
| 43 | -1.02 | 17.56 | 31.73 | 25.53 | 25.75 | 490 | 41.94782 |

**Station:** 80 **Lat.** 60° 42' N **Long.** 172° 23' W **Date:** 8-7-34 **Time:** 0711-0743
**Sonic Depth:** 34 fathoms (62 meters) **Bottom:** Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.12 | 17.30 | 31.26 | 24.49 | 24.49 | 97610 | 0 |
| 9 | 7.04 | 17.30 | 31.26 | 24.50 | 24.55 | 604 | 8.78463 |
| (10) | (6.76) | (17.31) | (31.27) | (24.54) | (24.59) | (600) | (9.76065) |
| 22 | 3.44 | 17.40 | 31.44 | 25.04 | 25.16 | 547 | 21.46945 |
| (25) | (3.20) | (17.40) | (31.45) | (25.07) | (25.19) | (543) | (24.10517) |
| 39 | 2.06 | 17.44 | 31.51 | 25.20 | 25.40 | 523 | 38.05040 |

**Station:** 81 **Lat.** 60° 31' N **Long.** 172° 24' W **Date:** 8-7-34 **Time:** 0832-0858
**Sonic Depth:** 32 fathoms (59 meters) **Bottom:** Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 4.84 | 17.37 | 31.38 | 24.85 | 24.85 | 97575 | 0 |
| 10 | 4.82 | 17.39 | 31.42 | 24.88 | 24.94 | 567 | 9.75710 |
| (19) | (4.14) | (17.42) | (31.47) | (24.99) | (25.08) | (553) | (18.53740) |
| 25 | 3.69 | 17.44 | 31.51 | 25.07 | 25.19 | 543 | 24.39035 |
| (39) | (2.81) | (17.44) | (31.51) | (25.15) | (25.36) | (527) | (38.04525) |
| 45 | 2.43 | 17.44 | 31.51 | 25.18 | 25.40 | 523 | 43.89695 |

## SECTION X - Siberia - St. Matthew Island

Station: 82 Lat. 60° 24' N Long. 172° 14' W Date: 8-7-34 Time: 1035
Sonic Depth: 14 fathoms (26 meters) Bottom:

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 4.80 | 17.38 | 31.40 | 24.87 | 24.87 | 97573 | 0 |
| 10 | 4.78 | 17.38 | 31.40 | 24.88 | 24.94 | 567 | 9.75700 |
| 19 | 4.32 | 17.39 | 31.42 | 24.93 | 25.03 | 558 | 18.53763 |

SECTION X - Siberia - St. Matthew Island

| Depth Meters | Phosphorous mg.at. x 10 | Silicon mg.at. x 10 | Nitrite Nitrogen mg.at. x 10 | Dissolved Oxygen mg. at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| **Station: 78** | | | | | | |
| 0 | 0.63 | 1.2 | 0.0 | .609 | 103.0 | 8.10 |
| 9 | 0.95 | 1.2 | 0.0 | .608 | 102.7 | 8.10 |
| 22 | 1.10 | 1.2 | 0.2 | .696 | 104.3 | 8.10 |
| 43 | 1.42 | 2.2 | 1.8 | .670 | | 8.10 |
| **Station: 79** | | | | | | |
| 0 | 0.88 | 1.2 | 0.0 | .595 | 100.2 | 8.10 |
| 9 | 0.95 | 1.3 | 0.0 | .595 | 100.0 | 8.10 |
| 22 | 0.95 | 1.3 | 0.0 | .710 | 104.7 | 8.10 |
| (39) | (1.33) | (2.2) | (1.9) | (.622) | | (8.05) |
| 43 | 1.42 | 2.5 | 2.3 | .601 | | 8.05 |
| **Station: 80** | | | | | | |
| 0 | 0.95 | 1.2 | 0.0 | .610 | 101.2 | 8.10 |
| 9 | 0.95 | 1.2 | 0.0 | .610 | 101.0 | 8.10 |
| (10) | (0.96) | (1.2) | (0.1) | (.612) | (100.7) | (8.10) |
| 22 | 1.10 | 1.2 | 0.5 | .633 | 96.5 | 8.10 |
| (25) | (1.13) | (1.3) | (0.6) | (.633) | (95.8) | (8.10) |
| 39 | 1.26 | 1.5 | 1.0 | .629 | 92.6 | 8.05 |
| **Station: 81** | | | | | | |
| 0 | 1.04 | 1.2 | 0.0 | .621 | 97.8 | 8.15 |
| 10 | 1.04 | 1.2 | 0.1 | .621 | 97.8 | 8.10 |
| (19) | (1.04) | (1.2) | (0.2) | (.635) | (98.4) | (8.10) |
| 25 | 1.04 | 1.2 | 0.3 | .644 | 98.8 | 8.10 |
| (39) | (1.15) | (1.4) | (0.5) | (.636) | (95.4) | (8.10) |
| 45 | 1.20 | 1.5 | 0.6 | .632 | 93.9 | 8.05 |
| **Station: 82** | | | | | | |
| 0 | 1.01 | 1.2 | 0.0 | .621 | 97.8 | 8.10 |
| 10 | 0.32 | 1.2 | 0.0 | .603 | 95.0 | 8.10 |
| 19 | 1.20 | 1.2 | 0.2 | .603 | 93.8 | 8.05 |

## SECTION XI - St. Matthew - Nunivak

**Station:** 84 **Lat.** 60° 22' N **Long.** 172° 07' W **Date:** 8-9-34 **Time:** 0555-0614
**Sonic Depth:** 32 fathoms (59 meters) **Bottom:** Rocky

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x 10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 4.81 | 17.38 | 31.40 | 24.87 | 24.87 | 97573 | 0 |
| 10 | 4.81 | 17.38 | 31.40 | 24.87 | 24.93 | 568 | 9.75705 |
| 25 | 3.87 | 17.44 | 31.51 | 25.06 | 25.18 | 544 | 24.39045 |
| 45 | 1.94 | 17.41 | 31.46 | 25.16 | 25.38 | 525 | 43.89735 |

**Station:** 85 **Lat.** 60° 21' N **Long.** 171° 45' W **Date:** 8-9-34 **Time:** 0700-0722
**Sonic Depth:** 37 fathoms (68 meters) **Bottom:** Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x 10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.22 | 17.31 | 31.27 | 24.49 | 24.49 | 97610 | 0 |
| 10 | 6.15 | 17.33 | 31.31 | 24.66 | 24.71 | 589 | 9.75995 |
| 25 | -0.33 | 17.48 | 31.58 | 25.38 | 25.50 | 514 | 24.39268 |
| (45) | (-0.36) | (17.48) | (31.58) | (25.38) | (25.60) | (504) | (43.89448) |
| 50 | -0.37 | 17.48 | 31.58 | 25.38 | 25.62 | 502 | 48.76968 |

**Station:** 86 **Lat.** 60° 21' N **Long.** 171° 25' W **Date:** 8-9-34 **Time:** 0808-0838
**Sonic Depth:** 38 fathoms (70 meters) **Bottom:** Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x 10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.32 | 17.33 | 31.31 | 24.37 | 24.37 | 97621 | 0 |
| 10 | 3.30 | 17.31 | 31.27 | 24.34 | 24.39 | 619 | 9.76200 |
| 25 | 1.62 | 17.44 | 31.51 | 25.23 | 25.35 | 528 | 24.39803 |
| 50 | -0.86 | 17.46 | 31.55 | 25.37 | 25.61 | 503 | 48.77690 |

**Station:** 87 **Lat.** 60° 20' N **Long.** 171° 07' W **Date:** 8-9-34 **Time:** 0929-0950
**Sonic Depth:** 37 fathoms (68 meters) **Bottom:** Grey Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x 10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.26 | 17.30 | 31.26 | 24.33 | 24.33 | 97625 | 0 |
| 10 | 8.24 | 17.29 | 31.24 | 24.32 | 24.37 | 621 | 9.76230 |
| 25 | -0.59 | 17.47 | 31.56 | 25.38 | 25.50 | 514 | 24.39743 |
| (45) | (-0.65) | (17.47) | (31.56) | (25.38) | (25.60) | (504) | (43.89923) |
| 50 | -0.67 | 17.47 | 31.56 | 25.38 | 25.62 | 502 | 48.77443 |

**Station:** 88 **Lat.** 60° 20' N **Long.** 170° 24' W **Date:** 8-9-34 **Time:** 1122-1150
**Sonic Depth:** 33 fathoms (60 meters) **Bottom:** Grey Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | σs,t,o | σs,t,p | Vs,t,p x 10⁵ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.26 | 17.34 | 31.33 | 24.39 | 24.39 | 97619 | 0 |
| 10 | 8.22 | 17.34 | 31.33 | 24.39 | 24.44 | 614 | 9.76165 |
| 25 | 1.15 | 17.44 | 31.51 | 25.26 | 25.38 | 525 | 24.39708 |
| (40) | (1.12) | (17.45) | (31.52) | (25.27) | (25.47) | (516) | (39.02515) |
| 45 | 1.10 | 17.45 | 31.53 | 25.27 | 25.50 | 514 | 43.90098 |

## SECTION XI - St. Matthew - Nunivak

Station: 84

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.79 | 1.0 | 0.0 | .520 | 81.9 | 8.10 |
| 10 | 0.79 | 1.0 | 0.0 | .615 | 96.9 | 8.05 |
| 25 | 1.10 | 1.0 | 0.8 | .638 | 98.3 | 8.10 |
| 45 | 0.79 | 1.5 | 0.0 | .541 | 79.3 | 8.10 |

Station: 85

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.79 | 1.5 | 0.0 | .604 | 100.3 | 8.10 |
| 10 | 0.85 | 1.5 | 0.0 | .597 | 96.9 | 8.10 |
| 25 | 1.10 | 2.5 | 1.0 | .605 | | 8.10 |
| (45) | (1.10) | (2.5) | (1.0) | (.592) | | (8.06) |
| 50 | 1.10 | 2.5 | 1.0 | .589 | | 8.05 |

Station: 86

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 1.5 | 0.0 | .570 | 97.1 | 8.10 |
| 10 | 0.63 | 1.2 | 0.0 | .573 | 97.6 | 8.10 |
| 25 | 0.79 | 2.2 | 0.8 | .601 | 87.5 | 8.05 |
| 50 | 1.10 | 2.5 | 0.6 | .609 | | 8.05 |

Station: 87

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.79 | 1.2 | 0.0 | .587 | 99.8 | 8.10 |
| 10 | 0.85 | 1.2 | 0.0 | .521 | 88.6 | 8.10 |
| 25 | 1.10 | 2.4 | 1.0 | .555 | | 8.10 |
| (45) | (1.23) | (2.2) | (1.0) | (.504) | | (8.10) |
| 50 | 1.26 | 2.2 | 1.0 | .491 | | 8.10 |

Station: 88

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 1.0 | 0.0 | .579 | 98.5 | 8.10 |
| 10 | 0.72 | 1.0 | 0.0 | .578 | 93.1 | 8.10 |
| 25 | 0.88 | 1.0 | 0.5 | .598 | 86.0 | 8.10 |
| (40) | (0.88) | (1.2) | (0.5) | (.610) | (87.7) | (8.10) |
| 45 | 0.88 | 1.2 | 0.5 | .614 | 88.2 | 8.10 |

SECTION XI - St. Matthew - Nunivak

Station: 89 Lat. 60° 19' N Long. 169° 34' W Date: 8-9-34 Time: 1340-1351
Sonic Depth: 27 fathoms (50 meters) Bottom: Grey Mud.

| Depth Meters | Temperature °C | Chlorinity ‰ | Salinity ‰ | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p} \times 10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.56 | 17.36 | 31.36 | 24.52 | 24.52 | 97607 | 0 |
| 10 | 7.54 | 17.36 | 31.36 | 24.52 | 24.57 | 602 | 9.76045 |
| 25 | 4.44 | 17.43 | 31.49 | 24.98 | 25.09 | 552 | 24.39700 |
| 40 | 3.92 | 17.44 | 31.51 | 25.05 | 25.25 | 537 | 39.02868 |

Station: 90 Lat. 60° 18' N Long. 168° 44' W Date: 8-9-34 Time: 1549-1604
Sonic Depth: 23 fathoms (42 meters) Bottom: Shell

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 6.93 | 17.31 | 31.27 | 24.53 | 24.53 | 97606 | 0 |
| 10 | 6.78 | 17.32 | 31.29 | 24.55 | 24.60 | 599 | 9.76025 |
| 25 | 6.63 | 17.33 | 31.31 | 24.59 | 24.71 | 589 | 24.39935 |

Station: 91 Lat. 60° 16' N Long. 168° 21' W Date: 8-9-34 Time: 1657-1714
Sonic Depth: 21 fathoms (38 meters) Bottom: Grey Sand

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.94 | 17.24 | 31.15 | 24.28 | 24.28 | 97630 | 0 |
| 10 | 7.85 | 17.24 | 31.15 | 24.29 | 24.35 | 623 | 9.76270 |
| 25 | 7.72 | 17.24 | 31.15 | 24.31 | 24.42 | 616 | 24.40570 |

Station: 92 Lat. 60° 16' N Long. 168° 01' W Date: 8-9-34 Time: 1802-1818
Sonic Depth: 16 fathoms (29 meters) Bottom: Hard

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 8.40 | 17.24 | 31.15 | 24.22 | 24.22 | 97635 | 0 |
| 10 | 8.36 | 17.24 | 31.15 | 24.22 | 24.28 | 630 | 9.76325 |
| 20 | 8.35 | 17.24 | 31.15 | 24.22 | 24.32 | 626 | 19.52605 |
| (25) | (8.35) | (17.24) | (31.15) | (24.22) | (24.34) | (624) | (24.40730) |

Station: 93 Lat. 60° 15' N Long. 167° 42' W Date: 8-9-34 Time: 1902-1915
Sonic Depth: 19.5 fathoms (35.5 meters) Bottom: Shell

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 8.22 | 17.24 | 31.15 | 24.24 | 24.24 | 97633 | 0 |
| 10 | 8.20 | 17.25 | 31.17 | 24.26 | 24.31 | 627 | 9.76300 |
| 25 | 8.23 | 17.29 | 31.24 | 24.32 | 24.43 | 615 | 24.40615 |

## SECTION XI - Station off Cape Mohican - Nunivak Island

Station: 94 Lat. 60° 08' N Long. 167° 37' W Date: 8-10-34 Time: 1925

Sonic Depth: 16 fathoms (29 meters) Bottom: Hard

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.10 | 17.30 | 31.26 | 24.35 | 24.35 | 97623 | 0 |
| 10 | 8.08 | 17.29 | 31.24 | 24.34 | 24.39 | 619 | 9.76210 |
| 25 | 8.09 | 17.33 | 31.31 | 24.40 | 24.52 | 607 | 24.40405 |

## SECTION XI - St. Matthew - Nunivak

Station: 89

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.57 | 0.0 | 0.0 | .564 | 94.6 | 8.10 |
| 10 | 0.57 | 0.0 | 0.0 | .584 | 98.0 | 8.10 |
| 25 | 0.63 | 0.0 | 0.0 | .609 | 95.0 | 8.10 |
| 40 | 0.63 | 0.0 | 0.0 | .604 | 93.1 | 8.10 |

Station: 90

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 0.0 | 0.0 | .521 | 86.0 | 8.10 |
| 10 | 0.47 | 0.0 | 0.0 | .532 | 87.6 | 8.10 |
| 25 | 0.47 | 0.0 | 0.0 | .543 | 89.0 | 8.10 |

Station: 91

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.25 | 0.0 | 0.0 | .538 | 90.7 | 8.10 |
| 10 | 0.32 | 0.0 | 0.0 | .556 | 93.8 | 8.10 |
| 25 | 0.57 | 0.0 | 0.0 | .581 | 97.5 | 8.10 |

Station: 92

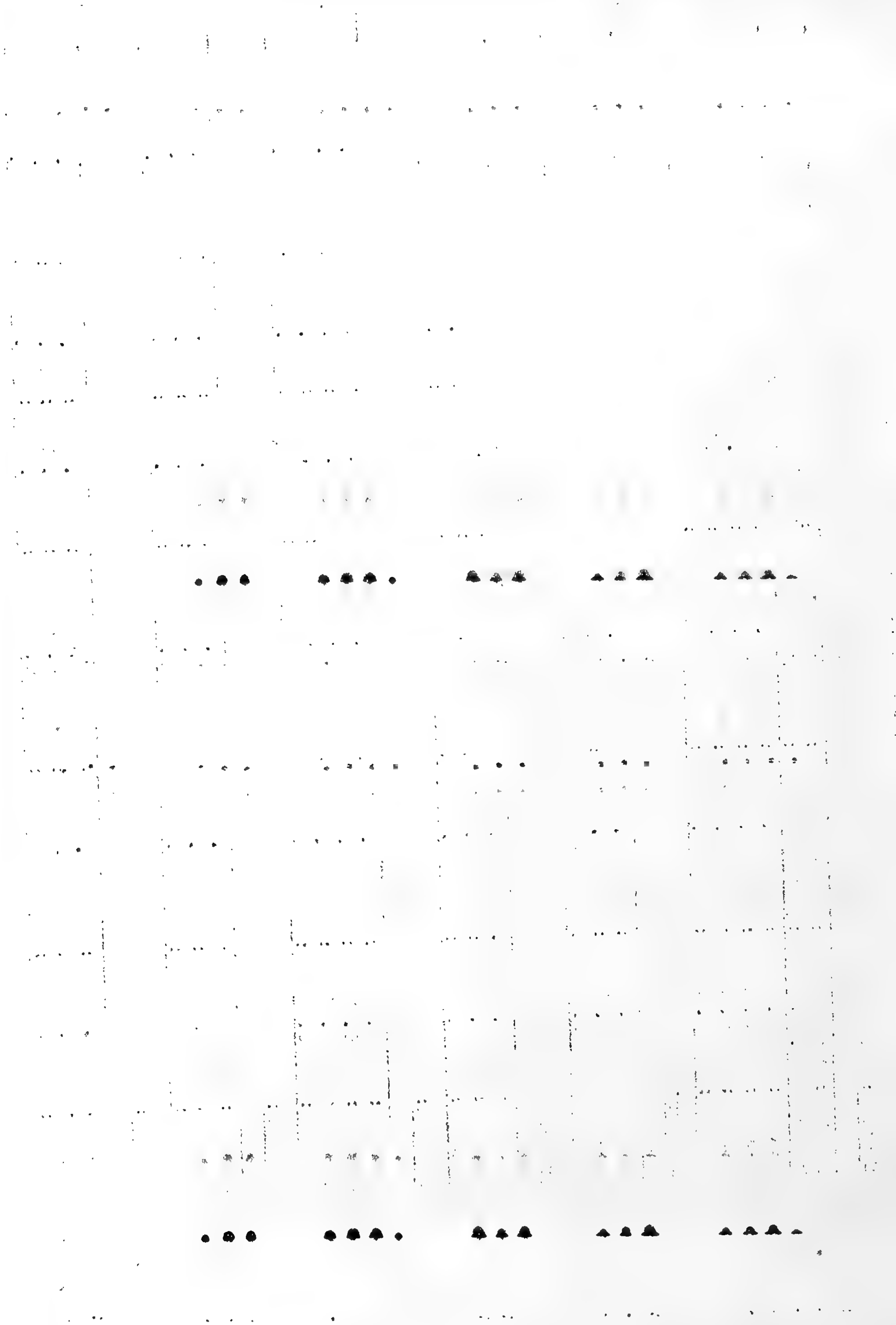
| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 0.0 | 0.0 | .516 | 87.9 | 8.10 |
| 10 | 0.47 | 1.0 | 0.0 | .571 | 97.3 | 8.10 |
| 20 | 0.57 | 0.8 | 0.0 | .570 | 96.9 | 8.10 |
| (25) | (0.62) | (0.9) | (0.0) | (.570) | (96.7) | (8.10) |

Station: 93

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 2.0 | 0.0 | .572 | 97.1 | 8.10 |
| 10 | 0.47 | 1.2 | 0.0 | .581 | 98.6 | 8.10 |
| 25 | 0.57 | 0.5 | 0.0 | .567 | 93.3 | 8.10 |

Station: 94

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.22 | 2.0 | 0.0 | .560 | 94.9 | 8.15 |
| 10 | 0.32 | 2.0 | 0.0 | .578 | 98.0 | 8.15 |
| 25 | 0.47 | 1.5 | 0.0 | .562 | 95.3 | 8.15 |



## SECTION XII - East of St. Paul Island

**Station:** 95 **Lat.** 57° 14' N **Long.** 168° 30' W **Date:** 8-12-34 **Time:** 0834-1856
**Sonic Depth:** 42 fathoms (77 meters) **Bottom:** Hard

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.09 | 17.71 | 32.00 | 24.78 | 24.78 | 97582 | 0 |
| 10 | 9.06 | 17.71 | 32.00 | 24.78 | 24.83 | 577 | 9.75795 |
| 25 | 3.62 | 17.85 | 32.25 | 25.66 | 25.78 | 487 | 24.38775 |
| 50 | 3.59 | 17.86 | 32.27 | 25.68 | 25.93 | 473 | 48.75775 |
| 65 | 3.59 | 17.86 | 32.27 | 25.68 | 25.99 | 467 | 63.37825 |

**Station:** 96 **Lat.** 57° 14' N **Long.** 168° 48' W **Date:** 8-12-34 **Time:** 0942-1001
**Sonic Depth:** 42 fathoms (77 meters) **Bottom:** Black Mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 9.10 | 17.70 | 31.98 | 24.76 | 24.76 | 97584 | 0 |
| 10 | 9.08 | 17.70 | 31.98 | 24.76 | 24.81 | 579 | 9.75815 |
| 25 | 3.25 | 17.84 | 32.23 | 25.68 | 25.80 | 485 | 24.38795 |
| 50 | 3.20 | 17.86 | 32.27 | 25.72 | 25.97 | 469 | 48.75720 |
| 65 | 3.22 | 17.85 | 32.25 | 25.70 | 26.01 | 465 | 63.37725 |

**Station:** 97 **Lat.** 57° 14' N **Long.** 169° 06' W **Date:** 8-12-34 **Time:** 1048-1112
**Sonic Depth:** 41 fathoms (75 meters) **Bottom:** Black Mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 8.75 | 17.54 | 31.69 | 24.59 | 24.59 | 97600 | 0 |
| 10 | 8.70 | 17.54 | 31.69 | 24.59 | 24.64 | 595 | 9.75975 |
| 15 | 8.67 | | | | | | |
| 20 | 8.35 | 17.56 | 31.73 | 24.68 | 24.77 | 583 | 19.51865 |
| 25 | 3.53 | 17.86 | 32.27 | 25.69 | 25.81 | 484 | 24.39533 |
| 50 | 3.51 | 17.86 | 32.27 | 25.69 | 25.94 | 472 | 48.76483 |
| (60) | (3.51) | (17.86) | (32.27) | (25.69) | (25.98) | (468) | (58.51183) |
| 65 | 3.51 | 17.86 | 32.27 | 25.69 | 26.00 | 466 | 63.38518 |

## SECTION XII - East of St. Paul Island

Station: 95

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 0.5 | 0.0 | .528 | 92.0 | 8.10 |
| 10 | 0.38 | 0.5 | 0.0 | .547 | 95.1 | 8.10 |
| 25 | 1.73 | 3.0 | 2.3 | .509 | 78.3 | 8.10 |
| 50 | 1.73 | 3.0 | 2.3 | .510 | 78.5 | 8.05 |
| 65 | 1.73 | 3.0 | 2.3 | .484 | 74.5 | 8.05 |

Station: 96

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 0.2 | 0.0 | .573 | 99.8 | 8.15 |
| 10 | 0.44 | 0.5 | 0.0 | .575 | 100.2 | 8.10 |
| 25 | 1.73 | 3.0 | 5.6 | .497 | 75.8 | 8.05 |
| 50 | 1.89 | 3.0 | 5.6 | .481 | 73.3 | 8.05 |
| 65 | 1.83 | 3.0 | 5.6 | .505 | 77.0 | 8.05 |

Station: 97

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 0.5 | 0.0 | .598 | 103.1 | 8.15 |
| 10 | 0.57 | 0.5 | 0.0 | .597 | 102.9 | 8.10 |
| 15 | | | | | | |
| 20 | 0.47 | 0.8 | 0.0 | .558 | 95.5 | 8.10 |
| 25 | 1.58 | 3.0 | 2.8 | .454 | 69.7 | 8.05 |
| 50 | 1.58 | 3.0 | 3.3 | (.468) | (71.8) | 8.05 |
| (60) | (1.75) | (3.0) | (3.3) | (.473) | (72.7) | (8.05) |
| 65 | 1.83 | 3.0 | 3.3 | .476 | 73.1 | 8.05 |

## SECTION XII - East of St. Paul Island

**Station:** 98  **Lat.** 57° 14' N  **Long.** 169° 24' W  **Date:** 8-12-34  **Time:** 1158-1215
**Sonic Depth:** 38 fathoms (69.5 meters) **Bottom:** Hard

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.65 | 17.64 | 31.87 | 24.75 | 24.75 | 97585 | 0 |
| 10 | 8.61 | 17.66 | 31.91 | 24.78 | 24.83 | 577 | 9.75810 |
| 25 | 3.44 | 17.76 | 32.09 | 25.55 | 25.67 | 497 | 24.38865 |
| (40) | (3.21) | (17.79) | (32.14) | (25.61) | (25.81) | (484) | (39.01223) |
| 50 | 3.05 | 17.81 | 32.18 | 25.65 | 25.89 | 476 | 48.76028 |
| 60 | 3.04 | 17.82 | 32.20 | 25.67 | 25.96 | 470 | 58.50758 |

**Station:** 99  **Lat.** 57° 10' N  **Long.** 169° 43' W  **Date:** 8-12-34  **Time:** 1314-1332
**Sonic Depth:** 26 fathoms (47.5 meters) **Bottom:** Hard

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 6.61 | 17.74 | 32.05 | 25.18 | 25.18 | 97544 | 0 |
| 10 | 6.30 | 17.76 | 32.09 | 25.24 | 25.30 | 533 | 9.75385 |
| 25 | 5.66 | 17.77 | 32.10 | 25.33 | 25.45 | 518 | 24.38268 |
| 40 | 5.25 | 17.78 | 32.12 | 25.40 | 25.60 | 504 | 39.00932 |

**Station:** 100  **Lat.** 57° 09' N  **Long.** 169° 54' W  **Date:** 8-12-34  **Time:** 1358-1413
**Sonic Depth:** 29 fathoms (53 meters) **Bottom:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 6.60 | 17.77 | 32.10 | 25.21 | 25.21 | 97541 | 0 |
| 10 | 6.54 | 17.77 | 32.10 | 25.22 | 25.27 | 535 | 9.75380 |
| (20) | (6.43) | (17.77) | (32.10) | (25.24) | (25.33) | (530) | (19.50705) |
| 25 | 6.38 | 17.77 | 32.10 | 25.24 | 25.36 | 527 | 24.38340 |
| 40 | 5.99 | 17.77 | 32.10 | 25.29 | 25.49 | 514 | 39.01153 |

**Station:** 101  **Lat.** 57° 07' N  **Long.** 170° 13' W  **Date:** 8-12-34  **Time:** 1700
**Sonic Depth:** 14 fathoms (25.5 meters) **Bottom:** Hard

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 6.88 | 17.75 | 32.07 | 25.16 | 25.16 | 97546 | 0 |
| 10 | 6.88 | 17.75 | 32.07 | 25.16 | 25.21 | 541 | 9.75435 |
| 20 | 6.80 | 17.75 | 32.07 | 25.17 | 25.26 | 536 | 19.50810 |

SECTION XII - East of St. Paul Island

Station: 98

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | .05 | 0.0 | .482 | 83.1 | 8.15 |
| 10 | 0.47 | .05 | 0.0 | .581 | 100.2 | 8.10 |
| 25 | 1.26 | 1.8 | 2.3 | .550 | 84.2 | 8.05 |
| (40) | (1.54) | (1.9) | (2.3) | (.532) | (80.9) | (8.05) |
| 50 | 1.73 | 2.0 | 2.3 | .520 | 78.9 | 8.05 |
| 60 | 1.58 | 2.0 | 2.3 | .500 | 75.9 | 8.05 |

Station: 99

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.95 | 1.2 | 3.3 | .591 | 97.5 | 8.10 |
| 10 | 1.10 | 1.2 | 3.7 | .583 | 95.6 | 8.10 |
| 25 | 1.26 | 1.3 | 3.3 | .497 | 80.3 | 8.10 |
| 40 | 1.10 | 1.5 | 3.3 | .510 | 83.1 | 8.10 |

Station: 100

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 1.01 | 1.0 | 1.8 | .571 | 94.2 | 8.10 |
| 10 | 1.01 | 1.0 | 1.8 | .575 | 94.9 | 8.10 |
| (20) | (1.07) | (1.0) | (1.8) | (.572) | (94.2) | (8.10) |
| 25 | 1.10 | 1.0 | 1.8 | .570 | 93.8 | 8.10 |
| 40 | 1.10 | 1.5 | 1.8 | .568 | 92.5 | 8.10 |

Station: 101

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 1.10 | 1.0 | 1.8 | .581 | 96.5 | 8.10 |
| 10 | 1.10 | 1.0 | 1.8 | .580 | 96.3 | 8.10 |
| 20 | 1.10 | 1.0 | 1.8 | .545 | 90.4 | 8.10 |

## SECTION XIII - Bogosloff Island - St. George Island

**Station:** 104 B  **Lat.** 53° 57' N  **Long.** 168° 00' W  **Date:** 8-20-34  **Time:** 1625
**Sonic Depth:** 45 fathoms (82 meters)  **Bottom:** Volcanic Ash

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.66 | 18.32 | 33.10 | 25.71 | 25.71 | 97493 | 0 |
| 10 | 8.03 | 18.33 | 33.12 | 25.82 | 25.87 | 478 | 9.74855 |
| 25 | 7.85 | 18.33 | 33.12 | 25.84 | 25.96 | 470 | 24.36965 |
| 50 | 5.08 | 18.45 | 33.33 | 26.37 | 26.61 | 408 | 48.72940 |
| 75 | 4.91 | 18.45 | 33.33 | 26.38 | 26.72 | 397 | 73.08003 |

**Station:** 105  **Lat.** 54° 03' N  **Long.** 168° 02' W  **Date:** 8-20-34  **Time:** 1732-1845
**Sonic Depth:** 800 fathoms (1460 meters) **Bottom:**

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.64 | 18.31 | 33.08 | 25.54 | 25.54 | 97509 | 0 |
| 10 | 8.74 | 18.31 | 33.08 | 25.68 | 25.74 | 491 | 9.75000 |
| 25 | 7.35 | 18.37 | 33.19 | 25.98 | 26.09 | 457 | 24.37110 |
| 50 | 5.34 | 18.42 | 33.28 | 26.30 | 26.55 | 414 | 48.72998 |
| 75 | 4.19 | 18.47 | 33.37 | 26.50 | 26.85 | 385 | 73.07985 |
| 100 | 3.89 | 18.48 | 33.39 | 26.55 | 27.02 | 369 | 97.42410 |
| 150 | 3.40 | 18.52 | 33.46 | 26.64 | 27.36 | 337 | 146.10060 |
| 200 | 2.97 | 18.53 | 33.48 | 26.70 | 27.65 | 309 | 194.76210 |
| 300 | 3.27 | 18.64 | 33.68 | 26.83 | 28.24 | 254 | 292.04360 |
| 400 | 3.48 | 18.76 | 33.89 | 26.98 | 28.86 | 195 | 389.26810 |
| 500 | 3.35 | 18.81 | 33.98 | 27.07 | 29.41 | 143 | 486.43710 |
| 600 | 3.27 | 18.89 | 34.13 | 27.19 | 29.99 | 088 | 583.55260 |
| 800 | 3.03 | 18.96 | 34.25 | 27.31 | 31.04 | 96989 | 777.62960 |
| 1000 | 2.83 | 18.94 | 34.22 | 27.29 | 31.95 | 904 | 971.52260 |

## SECTION XIII - Bogosloff Island - St. George Island

**Station:** 106 **Lat.** 54° 22' N **Long.** 168° 17' W **Date:** 8-20-34 **Time:** 2038-2157
Sonic Depth: 780 fathoms (1425 meters) Bottom:

| Depth Meters | Temperature °C | Chlorinity ‰ | Salinity ‰ | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p} \times 10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 10.15 | 18.23 | 32.94 | 25.34 | 25.34 | 97528 | 0 |
| 10 | 9.40 | 18.26 | 32.99 | 25.51 | 25.57 | 507 | 9.75175 |
| 25 | 8.41 | 18.27 | 33.01 | 25.67 | 25.79 | 486 | 24.37623 |
| 50 | 4.61 | 18.40 | 33.24 | 26.34 | 26.59 | 410 | 48.73823 |
| 75 | 4.05 | 18.48 | 33.39 | 26.53 | 26.88 | 382 | 73.08723 |
| 100 | 3.78 | 18.52 | 33.46 | 26.60 | 27.06 | 365 | 97.43060 |
| 150 | 3.48 | 18.54 | 33.49 | 26.66 | 27.38 | 335 | 146.10560 |
| 200 | 3.33 | 18.58 | 33.57 | 26.73 | 27.68 | 307 | 194.76610 |
| 300 | 3.46 | 18.67 | 33.73 | 26.85 | 28.26 | 252 | 292.04560 |
| 400 | 3.41 | 18.79 | 33.95 | 27.03 | 28.91 | 190 | 389.26660 |
| 500 | 3.33 | 18.86 | 34.07 | 27.14 | 29.48 | 136 | 486.42960 |
| 600 | 3.22 | 18.93 | 34.20 | 27.25 | 30.06 | 082 | 583.53860 |
| 800 | 3.00 | 18.98 | 34.29 | 27.34 | 31.08 | 96986 | 777.60660 |
| 1000 | 2.77 | 19.03 | 34.38 | 27.43 | 32.10 | 890 | 971.48260 |

SECTION XIII - Bogosloff Island - St. George Island

Station: 104 B

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.73 | 3.5 | 2.2 | .620 | 107.8 | 8.1 |
| 10 | 1.73 | 3.5 | 0.8 | .578 | 99.1 | 8.1 |
| 25 | 1.73 | 3.5 | 0.5 | .572 | 97.8 | 8.1 |
| 50 | 1.89 | 5.5 | 1.3 | .490 | 78.9 | 8.1 |
| 75 | 1.89 | 5.5 | 1.2 | .480 | 76.9 | 8.1 |

Station: 105

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.73 | 3.0 | 0.6 | .581 | 103.2 | 8.1 |
| 10 | 1.73 | 3.5 | 0.6 | .581 | 101.4 | 8.1 |
| 25 | 1.83 | 4.0 | 0.6 | .566 | 95.9 | 8.1 |
| 50 | 2.05 | 5.0 | 2.0 | .522 | 84.5 | 8.1 |
| 75 | 2.21 | 6.0 | 0.9 | .493 | 77.8 | 8.05 |
| 100 | 2.21 | 6.5 | 0.4 | .484 | 75.7 | 8.05 |
| 150 | 2.37 | 7.0 | 0.2 | .474 | 73.4 | 8.05 |
| 200 | 2.52 | 7.5 | 0.0 | .459 | 70.3 | 8.05 |
| 300 | 2.84 | 8.0 | 0.0 | .315 | 48.7 | 8.00 |
| 400 | 2.84 | 9.0 | 0.0 | .159 | 24.8 | 7.95 |
| 500 | 2.84 | 10.0 | 0.0 | .129 | 20.0 | 7.9 |
| 600 | 2.84 | 10.0 | 0.0 | .089 | 13.8 | 7.9 |
| 800 | 2.84 | 12.0 | 0.0 | .058 | 9.0 | 7.9 |
| 1000 | 2.84 | 13.0 | 0.0 | .078 | 12.0 | 7.9 |

Station: 106

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.48 | 3.3 | 0.3 | .494 | 88.5 | 8.1 |
| 10 | 1.51 | 3.5 | 0.5 | .549 | 97.2 | 8.1 |
| 25 | 1.70 | 3.5 | 0.8 | .555 | 96.0 | 8.1 |
| 50 | 2.21 | 6.0 | 2.2 | .428 | 68.0 | 8.1 |
| 75 | 2.37 | 6.5 | 0.0 | .395 | 62.1 | 8.05 |
| 100 | 1.83 | 7.0 | 0.0 | .389 | 60.3 | 8.05 |
| 150 | 1.89 | 8.0 | 0.0 | .359 | 55.7 | 8.05 |
| 200 | 2.52 | 8.0 | 0.0 | .390 | 60.3 | 8.00 |
| 300 | 2.68 | 9.0 | 0.0 | .229 | 35.6 | 7.90 |
| 400 | 2.68 | 9.0 | 0.0 | .150 | 23.3 | 7.90 |
| 500 | 2.78 | 11.5 | 0.0 | .089 | 13.8 | 7.75 |
| 600 | 2.78 | 11.5 | 0.0 | .072 | 11.1 | 7.75 |
| 800 | 2.78 | 11.5 | 0.0 | .058 | 9.0 | 7.75 |
| 1000 | 2.78 | 12.0 | 0.0 | .049 | 7.5 | 7.70 |

## SECTION XIII - Bogosloff Island - St. George Island

**Station:** 107 **Lat.** 55° 04' N **Long.** 168° 49' W **Date:** 8-21-34 **Time:** 0121-0329
**Sonic Depth:** Greater than 1000 fathoms **Bottom:**

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.77 | 17.99 | 32.50 | 25.07 | 25.07 | 97554 | 0 |
| 10 | 8.62 | 18.04 | 32.59 | 25.32 | 25.38 | 525 | 9.75395 |
| 25 | 5.52 | 18.23 | 32.94 | 26.00 | 26.12 | 455 | 24.37745 |
| 50 | 4.26 | 18.33 | 33.12 | 26.29 | 26.54 | 415 | 48.73620 |
| 75 | 3.81 | 18.37 | 33.19 | 26.40 | 26.75 | 395 | 73.08745 |
| 100 | 3.77 | 18.44 | 33.31 | 26.50 | 26.98 | 373 | 97.43358 |
| 150 | 3.51 | 18.47 | 33.37 | 26.56 | 27.27 | 345 | 146.11333 |
| 200 | 3.20 | 18.52 | 33.46 | 26.65 | 27.39 | 334 | 194.77808 |
| 300 | 3.44 | 18.62 | 33.64 | 26.78 | 28.18 | 259 | 292.06458 |
| 400 | 3.44 | 18.74 | 33.86 | 26.95 | 28.84 | 197 | 389.29258 |
| 500 | 3.37 | 18.84 | 34.04 | 27.10 | 29.44 | 140 | 486.46108 |
| 600 | 3.27 | 18.89 | 34.13 | 27.19 | 29.99 | 088 | 583.57508 |
| 800 | 3.04 | 18.96 | 34.25 | 27.31 | 31.04 | 96989 | 777.65208 |
| 1000 | 2.79 | 19.03 | 34.38 | 27.43 | 32.10 | 890 | 971.55108 |

**Station:** 108 **Lat.** 55° 46' N **Long.** 169° 21' W **Date:** 8-21-34 **Time:** 0643-0815
**Sonic Depth:** 1000 fathoms (1830 meters) **Bottom:**

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.96 | 18.13 | 32.75 | 25.39 | 25.39 | 97524 | 0 |
| 10 | 8.84 | 18.14 | 32.77 | 25.42 | 25.47 | 516 | 9.75200 |
| 25 | 6.00 | 18.30 | 33.06 | 26.04 | 26.16 | 451 | 24.37453 |
| 50 | 4.66 | 18.39 | 33.22 | 26.34 | 26.59 | 410 | 48.73215 |
| 75 | 4.34 | 18.43 | 33.30 | 26.42 | 26.77 | 393 | 73.08253 |
| 100 | 4.01 | 18.48 | 33.39 | 26.53 | 27.00 | 371 | 97.42803 |
| 150 | 3.65 | 18.53 | 33.48 | 26.63 | 27.35 | 338 | 146.10528 |
| 200 | 3.51 | 18.54 | 33.49 | 26.66 | 27.60 | 314 | 194.76828 |
| 300 | 3.44 | 18.62 | 33.64 | 26.78 | 28.18 | 259 | 292.05478 |
| 400 | 3.43 | 18.72 | 33.82 | 26.93 | 28.82 | 199 | 389.28378 |

Depths below 400 meters were disregarded as unreliable.

# SECTION XIII - Bogosloff Island - St. George Island

Station: 107

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.79 | 1.0 | 0.2 | .564 | 100.2 | 8.10 |
| 10 | 0.88 | 1.2 | 0.5 | .538 | 93.1 | 8.10 |
| 25 | 1.89 | 4.0 | 2.2 | .478 | 77.3 | 8.05 |
| 50 | 2.05 | 5.5 | 1.2 | .437 | 68.8 | 8.05 |
| 75 | 2.37 | 6.0 | 0.0 | .420 | 65.5 | 8.05 |
| 100 | 2.21 | 6.0 | 0.0 | .385 | 60.1 | 8.05 |
| 150 | 2.05 | 7.0 | 0.0 | .396 | 61.4 | 8.05 |
| 200 | 2.37 | 7.0 | 0.0 | .389 | 59.9 | 7.90 |
| 300 | 2.68 | 8.0 | 0.0 | .332 | 51.5 | 7.90 |
| 400 | 2.68 | 9.0 | 0.0 | .197 | 30.6 | 7.85 |
| 500 | 2.84 | 10.0 | 0.0 | .117 | 18.2 | 7.75 |
| 600 | 2.84 | 12.0 | 0.0 | .080 | 12.4 | 7.75 |
| 800 | 2.84 | 12.0 | 0.0 | .056 | 8.6 | 7.75 |
| 1000 | 2.84 | 12.0 | 0.0 | .046 | 7.1 | 7.70 |

Station: 108

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.07 | 2.2 | 0.3 | .543 | 94.8 | 8.10 |
| 10 | 1.20 | 2.2 | 0.4 | .439 | 76.5 | 8.10 |
| 25 | 1.89 | 4.5 | 1.0 | .398 | 65.4 | 8.05 |
| 50 | 2.08 | 6.0 | 2.0 | .406 | 64.6 | 7.95 |
| 75 | 2.21 | 6.5 | 2.2 | .423 | 66.8 | 7.95 |
| 100 | 2.21 | 7.0 | 0.0 | .279 | 43.8 | 7.95 |
| 150 | 1.73 | 7.5 | 0.0 | .355 | 55.2 | 7.90 |
| 200 | 2.37 | 8.0 | 0.0 | .393 | 60.9 | 7.90 |
| 300 | 2.46 | 8.0 | 0.0 | .315 | 48.8 | 7.85 |
| 400 | 2.68 | 9.0 | 0.0 | .201 | 31.2 | 7.85 |

# SECTION XIII - Bogosloff Island - St. George Island

**Station:** 109 **Lat.** 56° 05' N **Long.** 169° 36' W **Date:** 8-21-34 **Time:** 0946-1100
**Sonic Depth:** 108 fathoms (198 meters) **Bottom:** Rocky

| Depth Meters | Temperature °C | Chlorinity ‰ | Salinity ‰ | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.44 | 18.01 | 32.54 | 25.15 | 25.15 | 97546 | 0 |
| 10 | 8.88 | 18.05 | 32.61 | 25.28 | 25.34 | 529 | 9.75375 |
| 25 | 6.02 | 18.19 | 32.86 | 25.88 | 26.00 | 466 | 24.37838 |
| 50 | 4.25 | 18.32 | 33.10 | 26.27 | 26.51 | 417 | 48.73875 |
| 75 | 3.98 | 18.37 | 33.19 | 26.38 | 26.73 | 397 | 73.09050 |
| 100 | 3.76 | 18.40 | 33.24 | 26.44 | 26.90 | 380 | 97.43763 |
| 125 | 3.68 | 18.47 | 33.37 | 26.54 | 27.13 | 359 | 121.78000 |
| 150 | 3.64 | 18.47 | 33.37 | 26.54 | 27.26 | 346 | 146.11813 |
| 175 | 3.47 | 18.55 | 33.51 | 26.68 | 27.50 | 323 | 170.45175 |

**Station:** 110 **Lat.** 56° 20' N **Long.** 169° 47' W **Date:** 8-21-34 **Time:** 1208-1235
**Sonic Depth:** 90 fathoms (165 meters) **Bottom:** Hard

| Depth Meters | Temperature °C | Chlorinity ‰ | Salinity ‰ | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.44 | 17.75 | 32.07 | 24.79 | 24.79 | 97581 | 0 |
| 10 | 8.14 | 17.75 | 32.07 | 24.99 | 25.04 | 557 | 9.75690 |
| 25 | 5.94 | 17.82 | 32.20 | 25.38 | 25.50 | 514 | 24.38723 |
| 50 | 3.01 | 17.96 | 32.45 | 25.87 | 26.11 | 455 | 48.75835 |
| 75 | 3.22 | 18.11 | 32.72 | 26.07 | 26.43 | 425 | 73.11835 |
| 100 | 3.71 | 18.27 | 33.01 | 26.25 | 26.71 | 398 | 97.47123 |
| 150 | 3.51 | 18.43 | 33.30 | 26.50 | 27.22 | 350 | 146.15823 |

SECTION XIII - Bogosloff Island - St. George Island

Station: 109

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.76 | 1.2 | 0.1 | .564 | 99.3 | 8.10 |
| 10 | 1.01 | 1.4 | 0.2 | .467 | 81.4 | 8.10 |
| 25 | 1.73 | 4.0 | 2.1 | .532 | 87.2 | 8.05 |
| 50 | 2.14 | 5.5 | 0.7 | .454 | 71.5 | 8.05 |
| 75 | 2.21 | 5.5 | 0.2 | .444 | 69.6 | 7.95 |
| 100 | 2.27 | 6.5 | 0.0 | .403 | 62.8 | 7.95 |
| 125 | 2.05 | 7.0 | 0.0 | .428 | 66.7 | 7.95 |
| 150 | 2.37 | 7.5 | 0.0 | .377 | 58.6 | 7.95 |
| 175 | 1.89 | 8.0 | 0.0 | .394 | 61.1 | 7.95 |

Station: 110

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 0.5 | 0.0 | .509 | 89.3 | 8.10 |
| 10 | 0.47 | 0.7 | 0.0 | .445 | 75.5 | 3.10 |
| 25 | 1.10 | 1.8 | 0.8 | .532 | 86.5 | 8.10 |
| 50 | 1.10 | 3.5 | 0.5 | .409 | 62.2 | 8.10 |
| 75 | 2.05 | 5.0 | 0.4 | .382 | 58.4 | 8.10 |
| 100 | 2.21 | 6.0 | 0.4 | .432 | 67.1 | 8.05 |
| 150 | 2.21 | 7.0 | 0.2 | .401 | 62.1 | 8.05 |

SECTION XIII - Bogosloff Island - St. George Island

Station: 111 Lat. 56° 31' N Long. 169° 55' W Date: 8-21-34 Time: 1319-1337
Sonic Depth: 54 fathoms (99 meters) Bottom: Black Mud, Shell and Sand

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p} \times 10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 6.97 | 17.81 | 32.18 | 25.22 | 25.22 | 97540 | 0 |
| 10 | 6.15 | 17.82 | 32.20 | 25.35 | 25.41 | 522 | 9.75310 |
| 25 | 5.96 | 17.83 | 32.21 | 25.39 | 25.50 | 513 | 24.38073 |
| 50 | 4.82 | 17.86 | 32.27 | 25.56 | 25.80 | 485 | 48.75548 |
| 75 | 3.72 | 17.89 | 32.32 | 25.71 | 26.06 | 460 | 73.12360 |

Station: 112 Lat. 56° 37' N Long. 169° 53' W Date: 8-21-34 Time: 1408-1424
Sonic Depth: 50 fathoms (91 meters) Bottom: Rock and Mud

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.39 | 17.80 | 32.16 | 25.16 | 25.16 | 97546 | 0 |
| 10 | 7.13 | 17.80 | 32.16 | 25.19 | 25.24 | 538 | 9.75420 |
| 25 | 6.71 | 17.80 | 32.16 | 25.25 | 25.37 | 526 | 24.38400 |
| 50 | 5.60 | 17.84 | 32.23 | 25.44 | 25.68 | 496 | 48.76175 |
| 75 | 3.36 | 17.93 | 32.39 | 25.80 | 26.16 | 451 | 73.13013 |

## SECTION XIII - Bogosloff Island - St. George Island

Station: 111

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.10 | 1.0 | 0.4 | .542 | 90.3 | 8.10 |
| 10 | 1.26 | 1.8 | 0.7 | .541 | 88.4 | 8.10 |
| 25 | 1.26 | 2.0 | 0.5 | .560 | 91.2 | 8.10 |
| 50 | 1.51 | 2.7 | 1.5 | .523 | 82.9 | 8.05 |
| 75 | 1.89 | 3.5 | 1.0 | .502 | 77.5 | 8.05 |

Station: 112

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | 0.79 | 1.2 | 0.4 | .610 | 102.5 | 8.10 |
| 10 | 0.88 | 1.2 | 0.4 | .584 | 97.5 | 8.10 |
| 25 | 1.10 | 1.5 | 0.3 | .552 | 91.4 | 8.10 |
| 50 | 1.51 | 2.0 | 1.0 | .550 | 83.7 | 8.10 |
| 75 | 1.89 | 4.0 | 1.2 | .519 | 79.5 | 8.10 |

## SECTION XIV - St. Paul Island - West

Station: 113 Lat. 57° 04' 30" N Long. 170° 30' 45" W Date: 8-21-34 Time: 0533-0551
Sonic Depth: 40 fathoms (73 meters) Bottom: Hard

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 7.89 | 17.77 | 32.10 | 25.04 | 25.04 | 97557 | 0 |
| 10 | 7.62 | 17.77 | 32.10 | 25.08 | 25.14 | 548 | 9.75525 |
| 25 | 7.22 | 17.77 | 32.10 | 25.13 | 25.25 | 537 | 24.38663 |
| 50 | 4.52 | 17.86 | 32.27 | 25.59 | 25.83 | 482 | 48.76400 |
| 65 | 4.12 | 17.87 | 32.29 | 25.64 | 25.95 | 471 | 63.38548 |

Station: 114 Lat. 57° 05' N Long. 170° 49' W Date: 8-21-34 Time: 0637-0657
Sonic Depth: 51 fathoms (93 meters) Bottom: Black Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.41 | 17.79 | 32.14 | 24.99 | 24.99 | 97562 | 0 |
| 10 | 8.40 | 17.79 | 32.14 | 24.99 | 25.04 | 557 | 9.75595 |
| 25 | 6.31 | 17.79 | 32.14 | 25.28 | 25.40 | 523 | 24.38695 |
| 50 | 4.47 | 17.86 | 32.27 | 25.60 | 25.84 | 481 | 48.76245 |
| (65) | (3.70) | (17.94) | (32.43) | (25.79) | (26.09) | (457) | (63.38280) |
| 75 | 3.19 | 18.00 | 32.52 | 25.91 | 26.27 | 440 | 73.12758 |

Station: 115 Lat. 57° 02' 45" N Long. 171° 16' 45" W Date: 8-21-34 Time: 0807-0339
Sonic Depth: 60 fathoms (110 meters) Bottom: Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.67 | 17.79 | 32.14 | 24.96 | 24.96 | 97565 | 0 |
| 10 | 8.64 | 17.79 | 32.14 | 24.96 | 25.01 | 560 | 9.75625 |
| 25 | 8.63 | 17.79 | 32.14 | 24.96 | 25.07 | 554 | 24.38980 |
| 30 | 6.96 | 17.86 | 32.27 | 25.30 | 25.45 | 518 | 29.26660 |
| 40 | 4.46 | 17.90 | 32.34 | 25.64 | 25.84 | 481 | 39.01655 |
| 50 | 3.58 | 17.90 | 32.34 | 25.73 | 25.98 | 468 | 48.76400 |
| 75 | 3.10 | 18.14 | 32.77 | 26.12 | 26.48 | 420 | 73.12500 |
| 100 | 3.03 | 18.17 | 32.83 | 26.18 | 26.64 | 405 | 97.47813 |

SECTION XIV - St. Paul Island - West

Station: 113

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.63 | 0.5 | 0.3 | .580 | 98.5 | 8.10 |
| 10 | 0.63 | 0.8 | 0.8 | .586 | 99.0 | 8.10 |
| 25 | 0.76 | 0.8 | 1.2 | .586 | 98.2 | 8.10 |
| 50 | 1.39 | 2.7 | 2.6 | .535 | 84.1 | 8.05 |
| 65 | 1.48 | 3.0 | 2.5 | .493 | 76.9 | 8.05 |

Station: 114

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 0.0 | 0.0 | .585 | 100.5 | 8.10 |
| 10 | 0.57 | 0.3 | 0.0 | .581 | 99.8 | 8.10 |
| 25 | 1.04 | 1.2 | 1.0 | .539 | 88.4 | 8.05 |
| 50 | 1.48 | 2.8 | 3.2 | .543 | 85.5 | 8.05 |
| (65) | (1.73) | (3.8) | (2.1) | (.516) | (79.8) | (8.02) |
| 75 | 1.89 | 4.5 | 1.3 | .498 | 76.0 | 8.00 |

Station: 115

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.38 | 0.0 | 0.0 | .601 | 99.7 | 8.10 |
| 10 | 0.38 | 0.0 | 0.0 | .600 | 103.4 | 8.10 |
| 25 | 0.44 | 0.0 | 0.0 | .603 | 104.0 | 8.10 |
| 30 | 0.95 | 0.8 | 1.4 | .562 | 93.7 | 8.10 |
| 40 | 1.58 | 2.5 | 3.0 | .428 | 67.3 | 8.08 |
| 50 | 1.58 | 3.0 | 1.4 | .558 | 83.0 | 8.05 |
| 75 | 2.05 | 5.0 | 0.2 | .467 | 71.3 | 7.95 |
| 100 | 2.21 | 6.5 | 0.1 | .448 | 68.3 | 7.90 |

## SECTION XIV - St. Paul Island - West

Station: 116 Lat. 57° 02' N Long. 171° 46' W Date: 8-21-34 Time: 0945-1007

Sonic Depth: 64 fathoms (117 meters) Bottom: Mud

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.98 | 17.78 | 32.12 | 24.91 | 24.91 | 97569 | 0 |
| 10 | 8.93 | 17.79 | 32.14 | 24.92 | 24.98 | 563 | 9.75660 |
| 25 | 6.88 | 17.87 | 32.29 | 25.32 | 25.44 | 519 | 24.38775 |
| 50 | 3.54 | 18.05 | 32.61 | 25.95 | 26.20 | 447 | 48.75850 |
| 75 | 3.10 | 18.19 | 32.86 | 26.19 | 26.55 | 414 | 73.11613 |
| 100 | 3.11 | 18.20 | 32.88 | 26.21 | 26.67 | 402 | 97.46813 |

## SECTION XIV - St. Paul Island - West

Station: 116

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 0.47 | 0.0 | 0.0 | .586 | 102.1 | 8.10 |
| 10 | 0.47 | 0.0 | 0.1 | .586 | 101.7 | 8.10 |
| 25 | 0.95 | 0.5 | 1.2 | .578 | 96.2 | 8.10 |
| 50 | 2.05 | 3.5 | 2.7 | .535 | 82.3 | 8.05 |
| 75 | 2.37 | 5.8 | 0.2 | .435 | 66.5 | 7.95 |
| 100 | 2.21 | 6.0 | 0.0 | .416 | 63.6 | 7.90 |

SECTION XV - Lat. 54° 12' 45" N Long. 168° 05' 35" W to Lat. 54° 19' N Long. 166° 10' W

Station: 117 Lat. 54° 12' 45" N Long. 168° 05' 35" W Date: 8-24-34 Time: 0509-0611
Sonic Depth: 700 fathoms ( 1280 meters)

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $\alpha_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.43 | 18.27 | 33.01 | 25.51 | 25.51 | 97512 | 0 |
| 10 | 9.32 | 18.28 | 33.03 | 25.55 | 25.61 | 503 | 9.75075 |
| 25 | 8.47 | 18.33 | 33.12 | 25.76 | 25.87 | 478 | 24.37433 |
| 50 | 5.32 | 18.38 | 33.21 | 26.24 | 26.48 | 420 | 48.73658 |
| 75 | 4.34 | 18.43 | 33.30 | 26.42 | 26.77 | 393 | 73.08820 |
| 100 | 3.69 | 18.47 | 33.37 | 26.54 | 27.01 | 370 | 97.43358 |
| 150 | 2.75 | 18.48 | 33.39 | 26.65 | 27.37 | 336 | 146.11008 |
| 200 | 2.79 | 18.55 | 33.51 | 26.74 | 27.69 | 306 | 194.77058 |
| 300 | 3.45 | 18.66 | 33.71 | 26.84 | 28.25 | 253 | 292.05008 |
| 400 | 3.44 | 18.77 | 33.91 | 27.00 | 28.88 | 193 | 389.27308 |
| 500 | 3.32 | 18.81 | 33.98 | 27.07 | 29.41 | 143 | 486.44108 |
| 600 | 3.26 | 18.86 | 34.07 | 27.15 | 29.95 | 092 | 583.55858 |
| 800 | 2.97 | 18.95 | 34.23 | 27.30 | 31.03 | 96990 | 777.64058 |
| 1000 | 2.77 | 19.00 | 34.33 | 27.39 | 32.06 | 894 | 971.52458 |

Station: 118 Lat. 54° 16' N Long. 167° 26' W Date: 8-24-34 Time: 0743-0904
Sonic Depth: 775 fathoms (1420 meters)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 7.30 | 18.03 | 32.57 | 25.49 | 25.49 | 97514 | 0 |
| 10 | 6.85 | 18.15 | 32.79 | 25.73 | 25.79 | 486 | 9.75000 |
| 25 | 6.02 | 18.20 | 32.88 | 25.90 | 26.02 | 464 | 24.37125 |
| 50 | 5.30 | 18.24 | 32.95 | 26.04 | 26.28 | 439 | 48.73413 |
| 75 | 5.32 | 18.33 | 33.12 | 26.17 | 26.51 | 417 | 73.09113 |
| 100 | 4.95 | 18.40 | 33.24 | 26.31 | 26.78 | 392 | 97.44225 |
| 150 | 4.26 | 18.47 | 33.37 | 26.48 | 27.20 | 352 | 146.12825 |
| 200 | 3.22 | 18.48 | 33.39 | 26.60 | 27.54 | 319 | 194.79600 |
| 300 | 3.49 | 18.60 | 33.60 | 26.75 | 28.10 | 267 | 292.08600 |
| 400 | 3.45 | 18.72 | 33.82 | 26.93 | 28.82 | 199 | 389.31600 |
| 500 | 3.43 | 18.77 | 33.91 | 27.00 | 29.35 | 149 | 486.49000 |
| 600 | 3.32 | 18.82 | 34.00 | 27.08 | 29.88 | 099 | 583.61400 |
| 800 | 3.08 | 18.93 | 34.20 | 27.27 | 31.00 | 96993 | 777.70600 |
| 1000 | 2.91 | 19.00 | 34.33 | 27.37 | 32.03 | 890 | 971.59500 |

SECTION XV - Lat. 54° 12' 45" N Long. 168° 05' 35" W to Lat. 54° 19' N Long. 166° 10' W

Station 117

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | | | | | | |
| 10 | | | | | | |
| 25 | | | | | | |
| 50 | | | | | | |
| 75 | | | | | | |
| 100 | | | No additional data taken on this station | | | |
| 150 | | | | | | |
| 200 | | | | | | |
| 300 | | | | | | |
| 400 | | | | | | |
| 500 | | | | | | |
| 600 | | | | | | |
| 800 | | | | | | |
| 1000 | | | | | | |

Station: 118

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.42 | 3.5 | 3.0 | .550 | 93.7 | 8.10 |
| 10 | 1.42 | 4.0 | 1.8 | .510 | 86.0 | 8.10 |
| 25 | 1.58 | 4.5 | 2.4 | .514 | 84.3 | 8.10 |
| 50 | 1.73 | 4.8 | 2.4 | .438 | 70.6 | 8.05 |
| 75 | 1.83 | 5.0 | 2.0 | .440 | 70.7 | 8.05 |
| 100 | 1.89 | 6.0 | 1.8 | .429 | 68.8 | 8.05 |
| 150 | 1.89 | 6.0 | 1.2 | .462 | 73.0 | 8.00 |
| 200 | 2.21 | 6.0 | 0.0 | .462 | 71.2 | 7.90 |
| 300 | 2.37 | 8.5 | 0.0 | .334 | 51.9 | 7.90 |
| 400 | 2.37 | 9.0 | 0.0 | .226 | 35.1 | 7.75 |
| 500 | 2.84 | 11.0 | 0.0 | .144 | 22.4 | 7.70 |
| 600 | 2.84 | 12.0 | 0.0 | .107 | 16.6 | 7.70 |
| 800 | 2.84 | 14.0 | 0.0 | .064 | 9.9 | 7.70 |
| 1000 | 3.00 | 15.0 | 0.0 | .058 | 8.9 | 7.70 |

SECTION XV - Lat. 54° 12' 45" N Long. 168° 05' 35" W to Lat. 54° 19' N Long. 166° 10' W

Station: 119 Lat. 54° 17' N Long. 166° 48' W Date: 8-24-34 Time: 1031-1140
Sonic Depth: 785 fathoms (1435 meters)

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 9.26 | 18.24 | 32.95 | 25.50 | 25.50 | 97513 | 0 |
| 10 | 9.19 | 18.24 | 32.95 | 25.51 | 25.57 | 507 | 9.75100 |
| 25 | 8.16 | 18.30 | 33.06 | 25.75 | 25.87 | 478 | 24.37488 |
| 50 | 5.09 | 18.34 | 33.13 | 26.21 | 26.45 | 423 | 48.73750 |
| 75 | 4.76 | 18.41 | 33.26 | 26.35 | 26.70 | 399 | 73.09025 |
| 100 | 4.68 | 18.43 | 33.30 | 26.38 | 26.84 | 386 | 97.43838 |
| 150 | 4.11 | 18.49 | 33.40 | 26.53 | 27.25 | 347 | 146.12163 |
| 200 | 3.80 | 18.53 | 33.48 | 26.62 | 27.56 | 318 | 194.78788 |
| 300 | 3.59 | 18.60 | 33.60 | 26.74 | 28.14 | 263 | 292.07838 |
| 400 | 3.46 | 18.68 | 33.75 | 26.87 | 28.75 | 205 | 389.31238 |
| 500 | 3.41 | 18.78 | 33.93 | 27.01 | 29.36 | 148 | 486.48888 |
| 600 | 3.26 | 18.82 | 34.00 | 27.09 | 29.89 | 098 | 583.61183 |
| 800 | 3.06 | 18.91 | 34.16 | 27.23 | 30.97 | 96996 | 777.70588 |
| 1000 | 2.80 | 18.99 | 34.31 | 27.37 | 32.03 | 896 | 971.59788 |

Station: 120 Lat. 54° 19' N Long. 166° 10' W Date: 8-24-34 Time: 1307-1410
Sonic Depth: 485 fathoms (887 meters)

| Depth Meters | Temperature °C | Chlorinity °/oo | Salinity °/oo | $\sigma_{s,t,o}$ | $\sigma_{s,t,p}$ | $V_{s,t,p}$ x $10^5$ | Dynamic Depth |
|---|---|---|---|---|---|---|---|
| 0 | 8.25 | 18.01 | 32.54 | 25.33 | 25.33 | .97529 | 0 |
| 10 | 7.72 | 18.02 | 32.56 | 25.42 | 25.47 | 516 | 9.75225 |
| 25 | 7.14 | 18.04 | 32.59 | 25.54 | 25.66 | 498 | 24.37830 |
| 50 | 6.70 | 18.07 | 32.65 | 25.63 | 25.86 | 479 | 48.75043 |
| 75 | 6.19 | 18.11 | 32.72 | 25.75 | 26.10 | 456 | 73.11730 |
| 100 | 5.60 | 18.19 | 32.86 | 25.93 | 26.40 | 428 | 97.47780 |
| 150 | 4.82 | 18.30 | 33.06 | 26.18 | 26.88 | 382 | 146.18030 |
| 200 | 4.35 | 18.48 | 33.39 | 26.49 | 27.43 | 330 | 194.85830 |
| 300 | 3.47 | 18.53 | 33.48 | 26.65 | 28.07 | 270 | 292.15830 |
| 400 | 3.51 | 18.63 | 33.66 | 26.78 | 28.65 | 215 | 389.40080 |
| 500 | 3.41 | 18.76 | 33.89 | 26.98 | 29.33 | 151 | 486.58380 |
| 600 | 3.31 | 18.85 | 34.05 | 27.12 | 29.92 | 095 | 583.70680 |
| 800 | 3.01 | 18.94 | 34.22 | 27.28 | 31.01 | 96[illegible]92 | 777.79380 |

SECTION XV - Lat. 54° 12' 45" N Long. 168° 05' 35" W to Lat. 54° 19' N Long. 166° 10' W

Station: 119

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.58 | 2.8 | 1.2 | .442 | 77.8 | 8.0 |
| 10 | 1.58 | 3.0 | 1.2 | .509 | 89.5 | 8.0 |
| 25 | 1.64 | 3.5 | 1.2 | .495 | 85.4 | 8.0 |
| 50 | 1.83 | 5.0 | 2.0 | .385 | 61.9 | 8.0 |
| 75 | 1.89 | 5.5 | 2.0 | .439 | 70.0 | 8.0 |
| 100 | 1.89 | 6.0 | 2.0 | .404 | 64.4 | 7.90 |
| 150 | 1.89 | 6.5 | 0.8 | .396 | 32.3 | 7.85 |
| 200 | 2.52 | 7.0 | 0.3 | .389 | 60.8 | 7.80 |
| 300 | 2.52 | 8.5 | 0.0 | .323 | 50.3 | 7.80 |
| 400 | 2.68 | 9.0 | 0.0 | .230 | 35.8 | 7.80 |
| 500 | 2.84 | 12.0 | 0.0 | .146 | 22.7 | 7.75 |
| 600 | 3.00 | 14.0 | 0.0 | .100 | 15.5 | 7.75 |
| 800 | 3.00 | 14.5 | 0.0 | .067 | 10.4 | 7.75 |
| 1000 | 3.00 | 15.0 | 0.0 | .061 | 9.4 | 7.70 |

Station: 120

| Depth Meters | Phosphorous mg.at. x $10^3$ | Silicon mg.at. x $10^2$ | Nitrite Nitrogen mg.at. x $10^4$ | Dissolved Oxygen mg.at. | Dissolved Oxygen % Sat. | pH |
|---|---|---|---|---|---|---|
| 0 | 1.10 | 2.5 | 2.0 | .446 | 76.5 | 8.10 |
| 10 | 1.42 | 2.8 | 2.0 | .509 | 86.4 | 8.10 |
| 25 | 1.42 | 3.0 | 1.8 | .501 | 83.9 | 8.10 |
| 50 | 1.73 | 3.0 | 1.8 | .550 | 91.4 | 8.05 |
| 75 | 1.58 | 3.5 | 2.2 | .510 | 83.9 | 8.05 |
| 100 | 1.83 | 4.0 | 2.0 | .503 | 81.7 | 8.05 |
| 150 | 1.89 | 5.0 | 2.0 | .318 | 50.6 | 7.95 |
| 200 | 1.89 | 7.0 | 1.8 | .398 | 63.0 | 7.90 |
| 300 | 2.37 | 8.0 | 0.0 | .378 | 58.6 | 7.80 |
| 400 | 2.52 | 9.0 | 0.0 | .294 | 45.7 | 7.75 |
| 500 | 2.84 | 10.0 | 0.0 | .150 | 23.3 | 7.75 |
| 600 | 2.84 | 11.0 | 0.0 | .107 | 16.6 | 7.75 |
| 800 | 3.00 | 16.0 | 0.0 | .066 | 10.2 | 7.70 |

TABLE II.

Current Tabulations.

Tabulations of $10^5$ x difference in dynamic depth, $10^5$ x difference in dynamic height, and computer in knots perpendicular to the section relative to the lowest common depth sampled for the stations of the section occupied.

Addenda sheet, Table II. Change heading from:

| Depth Meters : | D x $10^5$ : | H x $10^5$ : | Knots : |
|---|---|---|---|

or from

| Depth Meters : | D x 10 : | E x 10 : | Knots : |
|---|---|---|---|

to

| Depth Meters : | $\Delta$D x $10^5$ : | $\Delta$H x $10^5$ : | Knots : |
|---|---|---|---|

TABLE III.

Physical and chemical conditions of the surface waters from the Strait of Juan de Fuca to Dutch Harbor, Alaska. U.S.C.G. Cutter CHELAN, July 1934.

| Time | Lat. N. | Long. W. | Temp. °C. | Cl °/oo | $\sigma_t$ | P mcg.at. | Si mcg.at. | $NO_2^-$-N mcg.at. |
|---|---|---|---|---|---|---|---|---|
| July 18, 1934 | | | | | | | | |
| 2140 | 48° 17' | 123° 40' | 10.8 | 17.29 | 25.91 | 1.6 | | 0.82 |
| July 19, 1934 | | | | | | | | |
| 0100 | 48° 30' | 124° 47' | 12.5 | 17.73 | 24.22 | 0.63 | | 0.36 |
| 0500 | 48° 53' | 126° 09' | 12.8 | 17.79 | 24.24 | 0.80 | | 0.07 |
| 0900 | 49° 17' | 127° 33' | 14.5 | 17.65 | 23.69 | 0.16 | | 0.00 |
| 1300 | 49° 44' | 128° 56' | 14.2 | 17.80 | 23.98 | 0.63 | | 0.07 |
| 1700 | 50° 03' | 130° 10' | 13.4 | 17.85 | 24.20 | 0.80 | | 0.11 |
| 2200 | 50° 26' | 131° 32' | 13.4 | 17.87 | 24.23 | 0.90 | | 0.00 |
| July 20, 1934 | | | | | | | | |
| 0100 | 50° 41' | 132° 28' | 13.2 | 17.85 | 24.24 | 1.4 | | 0.05 |
| 0500 | 50° 59' | 133° 38' | 12.6 | 17.85 | 24.36 | 0.32 | | 0.07 |
| 0930 | 51° 25' | 135° 23' | 12.6 | 17.83 | 24.33 | 0.32 | | 0.11 |
| 1300 | 51° 41' | 136° 26' | 12.2 | 17.99 | 24.63 | 0.95 | | 0.00 |
| 1700 | 51° 50' | 137° 16' | 11.8 | 18.00 | 24.73 | 0.95 | | 0.11 |
| 2100 | 52° 13' | 139° 19' | 12.2 | 18.03 | 24.69 | 1.05 | | 0.11 |
| July 21, 1934 | | | | | | | | |
| 0100 | 52° 27' | 140° 47' | 12.2 | 18.00 | 24.65 | 1.10 | 35 | 0.11 |
| 0500 | 52° 39' | 142° 17' | 10.9 | 18.11 | 25.05 | 1.10 | 15 | 0.14 |
| 0900 | 52° 55' | 144° 15' | 11.2 | 18.08 | 24.94 | 1.25 | 20 | 0.11 |
| 1300 | 53° 09' | 145° 37' | 11.6 | 18.18 | 25.01 | 1.4 | 20 | 0.18 |
| 1700 | 53° 19' | 147° 11' | 11.6 | 18.18 | 25.01 | 1.4 | 30 | 0.23 |
| 2145 | 53° 32' | 148° 56' | 11.2 | 18.13 | 25.02 | 0.95 | 40 | 0.27 |
| July 22, 1934 | | | | | | | | |
| 0100 | 53° 40' | 150° 16' | 10.8 | 18.15 | 25.12 | 1.1 | 30 | 0.07 |
| 0530 | 53° 47' | 152° 00' | 10.7 | 18.18 | 25.17 | 0.95 | 40 | 0.18 |
| 0900 | 53° 53' | 153° 21' | 11.1 | 18.21 | 25.14 | 0.95 | 20 | 0.18 |
| 1300 | 54° 08' | 155° 00' | 10.6 | 18.18 | 25.19 | 0.95 | 20 | 0.18 |
| 1900 | 54° 06' | 157° 19' | 10.8 | 18.14 | 25.10 | 0.95 | 30 | 0.18 |
| 2400 | 54° 03' | 159° 32' | 10.5 | 17.99 | 24.94 | 0.80 | 10 | 0.05 |
| July 25, 1934 | | | | | | | | |
| 0730 | 54° 02' | 162° 25' | 9.6 | 17.83 | 24.86 | 0.63 | 10 | 0.05 |
| 1200 | 54° 17' | 164° 11' | 8.2 | 17.44 | 24.53 | 0.25 | 5 | 0.00 |
| 1600 | 54° 19' | 165° 52' | 7.4 | 17.83 | 25.19 | 1.1 | 20 | 0.11 |

## SECTION I

| Depth Meters | Dx10 | Hx10 | Knots | Dx10 | Hx10 | Knots | Dx10 | Hx10 | Knots | Dx10 | Hx10 | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station: 2-1, K = 17.8 | | | | Station: 3-2 | | | Station: 4-3 | | | Station: 5-4 | | |
| 0 | 0 | -2618 | -0.46 | | | | | | | | | |
| 10 | -545 | -2073 | -0.37 | | | | | | | | | |
| 25 | -1143 | -1475 | -0.26 | | | | | | | | | |
| 50 | -1955 | -663 | -0.12 | | | | | | | | | |
| 75 | -2618 | 0 | 0.00 | | | | | | | | | |
| 100 | | | | | | | | | | | | |
| 150 | | | | | | | | | | | | |
| 200 | | | | | | | | | | | | |
| 300 | | | | | | | | | | | | |
| 400 | | | | | | | | | | | | |
| Station: 6-5, K = 2.31 | | | | Station: 7-6, K = 2.24 | | | Station: 8-7, K = 1.89 | | | Station: 9-8, K = 8.64 | | |
| 0 | 0 | 337 | 0.01 | 0 | 4200 | 0.09 | 0 | -1510 | -0.03 | 0 | 2443 | 0.21 |
| 10 | 170 | 167 | 0.00 | 690 | 3510 | 0.08 | -215 | -1295 | -0.02 | 310 | 2133 | 0.18 |
| 25 | 402 | 65 | 0.00 | 1800 | 2400 | 0.05 | -560 | -950 | -0.02 | 805 | 1638 | 0.14 |
| 50 | 840 | -503 | -0.01 | 3263 | 937 | 0.02 | -1160 | -350 | -0.01 | 1492 | 951 | 0.08 |
| 75 | 1265 | -928 | -0.02 | 3913 | 287 | 0.01 | -1435 | -75 | 0.00 | 1905 | 538 | 0.05 |
| 100 | 1577 | -1240 | -0.03 | 4200 | 0 | 0.00 | -1510 | 0 | 0.00 | 2443 | 0 | 0.00 |
| 150 | 1212 | -875 | -0.02 | | | | | | | | | |
| 200 | 337 | 0 | 0.00 | | | | | | | | | |
| Station: 10-9, K = 8.62 | | | | Station: 11-10, K = 11.5 | | | | | | | | |
| 0 | 0 | 105 | 0.01 | 0 | -755 | 0.01 | | | | | | |
| 10 | -195 | 300 | 0.03 | -380 | -375 | 0.00 | | | | | | |
| 25 | -630 | 735 | 0.06 | -755 | 0 | 0.00 | | | | | | |
| 50 | -762 | 367 | 0.07 | | | | | | | | | |
| 75 | 105 | 0 | 0.00 | | | | | | | | | |

Positive values indicate currents running West
Negative values indicate currents running East

SECTION II

| Depth Meters | Station: 13-12, K = 7.17 Dx$10^5$ | Hx$10^5$ | Knots | Station: 14-13, K = 6.87 Dx$10^5$ | Hx$10^5$ | Knots | Station: 15-14, K = 6.35 Dx$10^5$ | Hx$10^5$ | Knots | Dx$10^5$ | Hx$10^5$ | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 328 | 0.02 | 0 | 130 | 0.01 | 0 | -290 | -0.02 | | | |
| 10 | 240 | 88 | 0.01 | 130 | 0 | 0.00 | -290 | 0 | 0.00 | | | |
| 15 | 328 | 0 | 0.00 | | | | | | | | | |
| 25 | | | | 167 | -37 | 0.00 | | | | | | |
| 50 | | | | 130 | 0 | 0.00 | | | | | | |

Positive values indicate currents setting West
Negative values indicate currents setting East

# SECTION III

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station: 18-17 | | | | Station: 19-18 | | | Station: 20-19 | | | Station: 21-20 | | |
| K = 7.76 | | | | K = 7.75 | | | K = 7.74 | | | K = 2.07 | | |
| Depth Meters | $Dx10^5$ | $Hx10^5$ | Knots | $Dx10^5$ | $Hx10^5$ | Knots | $Dx10^5$ | $Hx10^5$ | Knots | $Dx10^5$ | $Hx10^5$ | Knots |
| 0 | 0 | 643 | 0.05 | 0 | 42 | 0.00 | 0 | 152 | 0.01 | 0 | 2010 | 0.04 |
| 10 | 500 | 143 | 0.01 | 40 | 82 | -0.01 | 30 | 122 | 0.01 | 40 | 1970 | 0.04 |
| 25 | 643 | 0 | 0.00 | 32 | -74 | -0.01 | 90 | 62 | 0.00 | 760 | 1250 | 0.03 |
| 50 | | | | -42 | 0 | 0.00 | 152 | 0 | 0.00 | 2010 | 0 | 0.00 |
| Station: 22-21 | | | | Station: 23-22 | | | Station: 24-23 | | | Station: 25-24 | | |
| K = 2.00 | | | | K = 2.04 | | | K = 2.07 | | | K = 2.06 | | |
| 0 | 0 | -1240 | -0.02 | 0 | 205 | 0.00 | 0 | 1275 | 0.03 | 0 | 340 | 0.01 |
| 10 | -40 | 1200 | -0.02 | -110 | 315 | 0.01 | 510 | 765 | 0.02 | 170 | 170 | 0.00 |
| 20 | | | | | | | | | | 340 | 0 | 0.00 |
| 25 | -580 | -660 | -0.01 | 205 | 0 | 0.00 | 1275 | 0 | 0.00 | | | |
| 40 | -1240 | 0 | 0.00 | | | | | | | | | |
| Station: 26-25 | | | | Station: 27-26 | | | Station: 28-27 | | | Station: 29-28 | | |
| K = 1.95 | | | | K = 1.89 | | | K = 1.93 | | | K = 1.91 | | |
| 0 | 0 | -742 | -0.01 | 0 | -411 | -0.01 | 0 | 620 | 0.01 | 0 | 263 | 0.01 |
| 10 | -445 | -297 | -0.01 | -90 | -321 | -0.01 | 620 | 90 | 0.00 | 135 | 128 | 0.00 |
| 16 | -742 | 0 | 0.00 | -411 | 0 | | | | | | | |
| 18 | | | | | | | | | | 263 | 0 | 0.00 |
| 20 | | | | | | | 710 | 0 | 0.00 | | | |
| Station: 30-29 | | | | Station: 31-30 | | | Station: 32-31 | | | | | |
| K = 2.43 | | | | K = 8.87 | | | K = 6.63 | | | | | |
| 0 | 0 | -477 | -0.01 | 0 | 0 | 0.00 | 0 | 3485 | 0.23 | | | |
| 10 | -625 | 148 | 0.00 | 5 | -5 | 0.00 | 3485 | 0 | 0.00 | | | |
| 15 | -477 | 0 | 0.00 | 0 | 0 | 0.00 | | | | | | |

Positive values indicate currents setting West
Negative values indicate currents setting East

## SECTION IV

| Depth Meters | Station: 34-33, K = 3.77 Dx10^5 | Hx10^5 | Knots | Station: 35-34, K = 3.77 Dx10^5 | Hx10^5 | Knots | Station: Dx10^5 | Hx10^5 | Knots |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1310 | 0.05 | 0 | -655 | -0.02 | | | |
| 10 | 490 | 820 | 0.03 | -280 | -375 | -0.01 | | | |
| 25 | 925 | 385 | 0.01 | -543 | -112 | 0.00 | | | |
| 35 | 1310 | 0 | 0.00 | -655 | 0 | 0.00 | | | |

Positive values indicate currents setting West
Negative values indicate currents setting East

SECTION V

| Station: 36-37<br>K = 8.75 | | | | Station: 37-38<br>K = 8.29 | | | Station: 38-39<br>K = 7.16 | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth<br>Meters | $Dx10^5$ | $Hx10^5$ | Knots | $Dx10^5$ | $Hx10^5$ | Knots | $Dx10^5$ | $Hx10^5$ | Knots |
| 0 | 0 | 2663 | 0.23 | 0 | 437 | 0.04 | 0 | 1863 | 0.13 |
| 5 | | | | | | | 517 | 1346 | 0.10 |
| 10 | 355 | 2308 | 0.20 | 197 | 240 | 0.02 | 823 | 1040 | 0.07 |
| 25 | 1323 | 1340 | 0.12 | 437 | 0 | 0.00 | 1338 | 525 | 0.04 |
| 40 | 2328 | 335 | 0.03 | | | | 1863 | 0 | 0.00 |
| 45 | 2663 | 0 | 0.00 | | | | | | |

Positive values indicate currents setting North
Negative values indicate currents setting South

## SECTION VI

| Depth Meters | Station: 41-40, K = 7.86: $Dx10^5$ | $Hx10^5$ | Knots | Station: 42-41, K = 7.86: $Dx10^5$ | $Hx10^5$ | Knots | Station: 43-42, K = 7.86: $Dx10^5$ | $Hx10^5$ | Knots |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 2932 | 0.23 | 0 | 577 | 0.05 | 0 | 1517 | 0.12 |
| 10 | 630 | 2302 | 0.18 | 45 | 532 | 0.04 | 300 | 1217 | 0.10 |
| 25 | 1612 | 1311 | 0.10 | 203 | 374 | 0.03 | 1012 | 505 | 0.04 |
| 35 | | | | | | | 1517 | 0 | 0.00 |
| 45 | 2932 | 0 | 0.00 | | | | | | |
| 50 | | | | 577 | 0 | 0.00 | | | |

Positive values indicate currents setting North
Negative values indicate currents setting South

## SECTION VII

| Depth Meters | Dx10$^5$ | Hx10$^5$ | Knots | Dx10$^5$ | Hx10$^5$ | Knots | Dx10$^5$ | Hx10$^5$ | Knots | Dx10$^5$ | Hx10$^5$ | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station: 47-46B, K = 8.32 | | | | Station: 48-47, K = 7.90 | | | Station: 49-48, K = 7.19 | | | Station: 50-49, K = 4.35 | | |
| 0 | 0 | -78 | -0.01 | 0 | -52 | 0.00 | 0 | -507 | -0.04 | 0 | 890 | 0.04 |
| 10 | -60 | -18 | 0.00 | -340 | 288 | 0.02 | | | | | | |
| 15 | -78 | 0 | 0.00 | -52 | 0 | 0.00 | | | | | | |
| 25 | | | | | | | | | | | | |
| 35 | | | | | | | -507 | 0 | 0.00 | 890 | 0 | 0.00 |
| Station: 51-50, K = 4.06 | | | | Station: 52-51, K = 3.97 | | | Station: 53-52, K = 4.08 | | | Station: 54-53, K = 4.08 | | |
| 0 | 0 | 822 | 0.03 | 0 | 2627 | 0.10 | 0 | -1700 | -0.07 | 0 | 855 | 0.04 |
| 10 | 680 | 142 | 0.01 | 880 | 1747 | 0.07 | -855 | -845 | -0.03 | 440 | 445 | 0.02 |
| 20 | | | | | | | -1700 | 0 | 0.00 | 885 | 0 | 0.00 |
| 25 | 740 | 82 | 0.00 | 2627 | 0 | 0.00 | | | | | | |
| 40 | 822 | 0 | 0.00 | | | | | | | | | |
| Station: 55-54, K = 7.59 | | | | Station: 56-55, K = 7.97 | | | Station: 57-56, K = 7.82 | | | | | |
| 0 | 0 | 880 | 0.07 | 0 | -425 | -0.03 | 0 | 545 | 0.04 | | | |
| 10 | 365 | 515 | 0.04 | -170 | -255 | -0.02 | 240 | 305 | 0.02 | | | |
| 20 | 880 | 0 | 0.00 | -425 | 0 | 0.00 | 545 | 0 | 0.00 | | | |

Positive values indicate currents setting North
Negative values indicate currents setting South

## SECTION VIII

| Depth Meters | Station: 58-59, K = 8.02 Dx10$^5$ | Hx10$^5$ | Knots | Station: 59-60, K = 7.[illegible] Dx10$^5$ | Hx10$^5$ | Knots | Station: 60-61, K = 8.9 Dx10$^5$ | Hx10$^5$ | Knots | Station: 61-62, K = 3.82 Dx10$^5$ | Hx10$^5$ | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 755 | 0.06 | 0 | 1313 | 0.10 | 0 | 885 | 0.08 | 0 | 280 | 0.01 |
| 10 | 345 | 410 | 0.03 | 940 | 373 | 0.03 | 545 | 340 | 0.03 | 370 | -90 | 0.00 |
| 15 | 755 | 0 | 0.00 | 1313 | 0 | 0.00 | | | | | | |
| 20 | | | | | | | 885 | 0 | 0.00 | 280 | 0 | 0.00 |

| Depth Meters | Station: 62-63, K = 3.82 Dx10$^5$ | Hx10$^5$ | Knots | Station: 63-64, K = 8.00 Dx10$^5$ | Hx10$^5$ | Knots | Station: 64-65, K = 8.00 Dx10$^5$ | Hx10$^5$ | Knots | Station: 65-66, K = 1.78 Dx10$^5$ | Hx10$^5$ | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 675 | 0.03 | 0 | -1045 | -0.08 | 0 | -1737 | -0.14 | 0 | 405 | 0.01 |
| 10 | 150 | 525 | 0.02 | -565 | -480 | -0.04 | -440 | -1297 | -0.10 | 405 | 0 | 0.00 |
| 25 | 675 | 0 | 0.00 | -1045 | 0 | 0.00 | 1737 | 0 | 0.00 | | | |

Positive values indicate currents setting North
Negative values indicate currents setting South

## SECTION IX

| Station: 67-68 K = 8.90 | | | | Station: 68-69 K = 8.89 | | | Station: 69-70A K = 8.88 | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth Meters | $Dx10^5$ | $Hx10^5$ | Knots | $Dx10^5$ | $Hx10^5$ | Knots | $Dx10^5$ | $Hx10^5$ | Knots |
| 0 | 0 | -370 | -0.03 | 0 | 1055 | 0.09 | 0 | 523 | 0.05 |
| 10 | -370 | 0 | 0.00 | 380 | 675 | 0.06 | -205 | 728 | 0.06 |
| 25 | | | | 830 | 225 | 0.02 | 388 | 135 | 0.01 |
| 35 | | | | 1055 | 0 | 0.00 | 523 | 0 | 0.00 |

Positive values indicate currents setting Northeast
Negative values indicate currents setting Southwest

## SECTION X

| Depth Meters | Station: 70B-71, K = 1.66: $Dx10^5$ | $Hx10^5$ | Knots | Station: 71-72, K = 7.98: $Dx10^5$ | $Hx10^5$ | Knots | Station: 72-73, K = 7.99: $Dx10^5$ | $Hx10^5$ | Knots | Station: 73-74, K = 8.03: $Dx10^5$ | $Hx10^5$ | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | -3640 | -0.06 | 0 | 87 | 0.01 | 0 | 123 | 0.01 | 0 | -1048 | -0.08 |
| 10 | -845 | -2795 | -0.05 | -150 | 237 | 0.02 | 240 | -117 | -0.01 | 85 | -963 | -0.08 |
| 25 | -2795 | -845 | -0.01 | -225 | 312 | 0.02 | 398 | -275 | -0.02 | -323 | -725 | -0.06 |
| 35 | -3640 | 0 | 0.00 | | | | | | | | | |
| 50 | | | | 87 | 0 | 0.00 | 123 | 0 | 0.00 | -1048 | 0 | 0.00 |

| Depth Meters | Station: 74-75, K = 3.85: $Dx10^5$ | $Hx10^5$ | Knots | Station: 75-76, K = 2.03: $Dx10^5$ | $Hx10^5$ | Knots | Station: 76-77, K = 2.21: $Dx10^5$ | $Hx10^5$ | Knots | Station: 77-78, K = 4.44: $Dx10^5$ | $Hx10^5$ | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 905 | 0.03 | 0 | -1912 | -0.04 | 0 | -393 | -0.01 | 0 | 234 | 0.01 |
| 9 | | | | | | | | | | 77 | 157 | 0.01 |
| 10 | 185 | 720 | 0.03 | -930 | -982 | -0.02 | | | | | | |
| 22 | | | | | | | | | | 213 | 21 | 0.00 |
| 25 | 735 | 170 | 0.01 | -1657 | -255 | -0.01 | 297 | -690 | -0.02 | | | |
| 40 | 905 | 0 | 0.00 | -1912 | 0 | 0.00 | -393 | 0 | 0.00 | | | |
| 43 | | | | | | | | | | 234 | 0 | 0.00 |

| Depth Meters | Station: 78-79, K = 8.23: $Dx10^5$ | $Hx10^5$ | Knots | Station: 79-80, K = 8.24: $Dx10^5$ | $Hx10^5$ | Knots | Station: 80-81, K = 8.25: $Dx10^5$ | $Hx10^5$ | Knots | Station: 81-82, K = 9.18: $Dx10^5$ | $Hx10^5$ | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 213 | 0.02 | 0 | -217 | -0.02 | 0 | 515 | 0.04 | 0 | -23 | 0.00 |
| 9 | -9 | 222 | 0.02 | 126 | -343 | -0.03 | | | | | | |
| 10 | | | | | | | 355 | 160 | 0.01 | 10 | -33 | 0.00 |
| 19 | | | | | | | | | | -23 | 0 | 0.00 |
| 22 | -84 | 189 | 0.02 | 106 | -323 | -0.03 | | | | | | |
| 25 | | | | | | | 602 | -87 | -0.01 | | | |
| 39 | | | | -217 | 0 | 0.00 | 515 | 0 | 0.00 | | | |
| 43 | 213 | 0 | 0.00 | | | | | | | | | |

Positive values indicate currents setting West
Negative Values indicate currents setting East

## SECTION XI

| Depth Meters | Station: 85-84, K = 8.27 Dx10^5 | Hx10^5 | Knots | Station: 86-85, K = 8.27 Dx10^5 | Hx10^5 | Knots | Station: 87-86, K = 8.27 Dx10^5 | Hx10^5 | Knots | Station: 88-87, K = 8.27 Dx10^5 | Hx10^5 | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | -287 | -0.02 | 0 | 722 | 0.06 | 0 | -247 | -0.02 | 0 | 175 | 0.01 |
| 10 | 290 | -577 | -0.05 | 205 | 517 | 0.04 | 30 | -277 | -0.02 | -65 | 240 | 0.01 |
| 25 | 223 | -510 | -0.04 | 535 | 187 | 0.02 | -60 | -187 | -0.02 | -35 | 210 | 0.01 |
| 45 | -287 | 0 | 0.00 | 722 | 0 | 0.00 | | | | 175 | 0 | 0.00 |
| 50 | | | | | | | -247 | 0 | 0.00 | | | |

| Depth Meters | Station: 89-88, K = 3.31 Dx10^5 | Hx10^5 | Knots | Station: 90-89, K = 3.18 Dx10^5 | Hx10^5 | Knots | Station: 91-90, K = 6.90 Dx10^5 | Hx10^5 | Knots | Station: 92-91, K = 8.28 Dx10^5 | Hx10^5 | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 353 | 0.01 | 0 | 235 | 0.01 | 0 | 635 | 0.04 | 0 | 160 | 0.01 |
| 10 | -120 | 473 | 0.02 | -20 | 255 | 0.01 | 245 | 390 | 0.03 | 55 | 105 | 0.01 |
| 25 | -8 | 361 | 0.01 | 235 | 0 | 0.00 | 635 | 0 | 0.00 | 160 | 0 | 0.00 |
| 40 | 353 | 0 | 0.00 | | | | | | | | | |

| Depth Meters | Station: 93-92, K = 8.28 Dx10^5 | Hx10^5 | Knots |
|---|---|---|---|
| 0 | 0 | -115 | -0.01 |
| 10 | -25 | -90 | -0.01 |
| 25 | -115 | 0 | 0.00 |

Positive values indicate currents setting North
Negative values indicate currents setting South

# SECTION XII

| Depth Meters | Station: 95-96, K = 9.50 Dx10^5 | Hx10^5 | Knots | Station: 96-97, K = 9.50 Dx10^5 | Hx10^5 | Knots | Station: 97-98, K = 8.55 Dx10^5 | Hx10^5 | Knots | Station: 98-99, K = 8.55 Dx10^5 | Hx10^5 | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 100 | 0.01 | 0 | -793 | -0.07 | 0 | 425 | 0.04 | 0 | 291 | 0.02 |
| 10 | -20 | 120 | 0.01 | -160 | -633 | -0.06 | 165 | 260 | 0.02 | 425 | -134 | -0.01 |
| 25 | -20 | 120 | 0.01 | -738 | -55 | -0.01 | 668 | -243 | -0.02 | 597 | -306 | -0.03 |
| 40 | | | | | | | | | | 291 | 0 | 0.00 |
| 50 | 55 | 45 | 0.00 | -763 | -30 | 0.00 | 455 | -30 | 0.00 | | | |
| 60 | | | | | | | 425 | 0 | 0.00 | | | |
| 65 | 100 | 0 | 0.00 | -793 | 0 | 0.00 | | | | | | |

| Depth Meters | Station: 99-100, K = 12.23 Dx10^5 | Hx10^5 | Knots | Station: 100-101, K = 6.11 Dx10^5 | Hx10^5 | Knots |
|---|---|---|---|---|---|---|
| 0 | 0 | -221 | -0.03 | 0 | -105 | -0.01 |
| 10 | 5 | -216 | -0.03 | -55 | -50 | 0.00 |
| 20 | | | | -105 | 0 | 0.00 |
| 25 | -72 | -149 | -0.02 | | | |
| 40 | -221 | 0 | 0.00 | | | |

## SECTION XIII

| Depth Meters | Station: 105-104B K = 14.81 Dx10^5 | Hx10^5 | Knots | Station: 106-105 K = 4.43 Dx10^5 | Hx10^5 | Knots | Station: 107-106 K = 1.87 Dx10^5 | Hx10^5 | Knots | Station: 108-107 K = 1.90 Dx10^5 | Hx10^5 | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | -18 | 0.00 | 0 | -4000 | -0.18 | 0 | 4848 | 0.09 | 0 | -880 | -0.02 |
| 10 | 145 | -163 | -0.02 | 175 | -4175 | -0.18 | 220 | 4628 | 0.09 | -195 | -685 | -0.01 |
| 25 | 145 | -163 | -0.02 | 513 | -4513 | -0.20 | 122 | 4726 | 0.09 | -292 | -588 | -0.01 |
| 50 | 58 | -76 | -0.01 | 825 | -4825 | -0.21 | -203 | 5051 | 0.09 | -405 | -475 | -0.01 |
| 75 | 18 | -36 | -0.01 | 738 | -4738 | -0.21 | 22 | 4826 | 0.09 | -492 | -388 | -0.01 |
| 100 | -18 | 0 | 0.00 | 650 | -4650 | -0.21 | 298 | 4550 | 0.09 | -555 | -325 | -0.01 |
| 150 | | | | 500 | -4500 | -0.20 | 773 | 4075 | 0.08 | -805 | -75 | 0.00 |
| 200 | | | | 400 | -4400 | -0.19 | 1198 | 3650 | 0.07 | -980 | 100 | 0.00 |
| 300 | | | | 200 | -4200 | -0.19 | 1898 | 2950 | 0.06 | -980 | 100 | 0.00 |
| 400 | | | | -150 | -3850 | -0.17 | 2598 | 2250 | 0.04 | -880 | 0 | 0.00 |
| 500 | | | | -750 | -3250 | -0.14 | 3148 | 1700 | 0.03 | | | |
| 600 | | | | -1400 | -2600 | -0.11 | 3648 | 1200 | 0.02 | | | |
| 800 | | | | -2300 | -1700 | -0.08 | 4548 | 300 | 0.01 | | | |
| 1000 | | | | -4000 | 0 | 0.00 | 4848 | 0 | 0.00 | | | |

| Depth Meters | Station: 109-108 K = 4.14 Dx10^5 | Hx10^5 | Knots | Station: 110-109 K = 4.94 Dx10^5 | Hx10^5 | Knots | Station: 111-110 K = 7.19 Dx10^5 | Hx10^5 | Knots | Station: 112-111 K = 12.30 Dx10^5 | Hx10^5 | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1285 | 0.05 | 0 | 4010 | 0.20 | 0 | 525 | 0.04 | 0 | 653 | 0.08 |
| 10 | 175 | 1110 | 0.05 | 315 | 3695 | 0.18 | -380 | 905 | 0.07 | 110 | 543 | 0.07 |
| 25 | 385 | 900 | 0.04 | 885 | 3125 | 0.15 | -650 | 1175 | 0.08 | 327 | 326 | 0.04 |
| 50 | 660 | 625 | 0.03 | 1960 | 2050 | 0.10 | -287 | 812 | 0.06 | 627 | 26 | 0.00 |
| 75 | 797 | 488 | 0.02 | 2785 | 1225 | 0.06 | 525 | 0 | 0.00 | 653 | 0 | 0.00 |
| 100 | 960 | 325 | 0.01 | 3360 | 650 | 0.03 | | | | | | |
| 150 | 1285 | 0 | 0.00 | 4010 | 0 | 0.00 | | | | | | |

Positive values indicate currents setting West
Negative values indicate currents setting East

## SECTION XIV

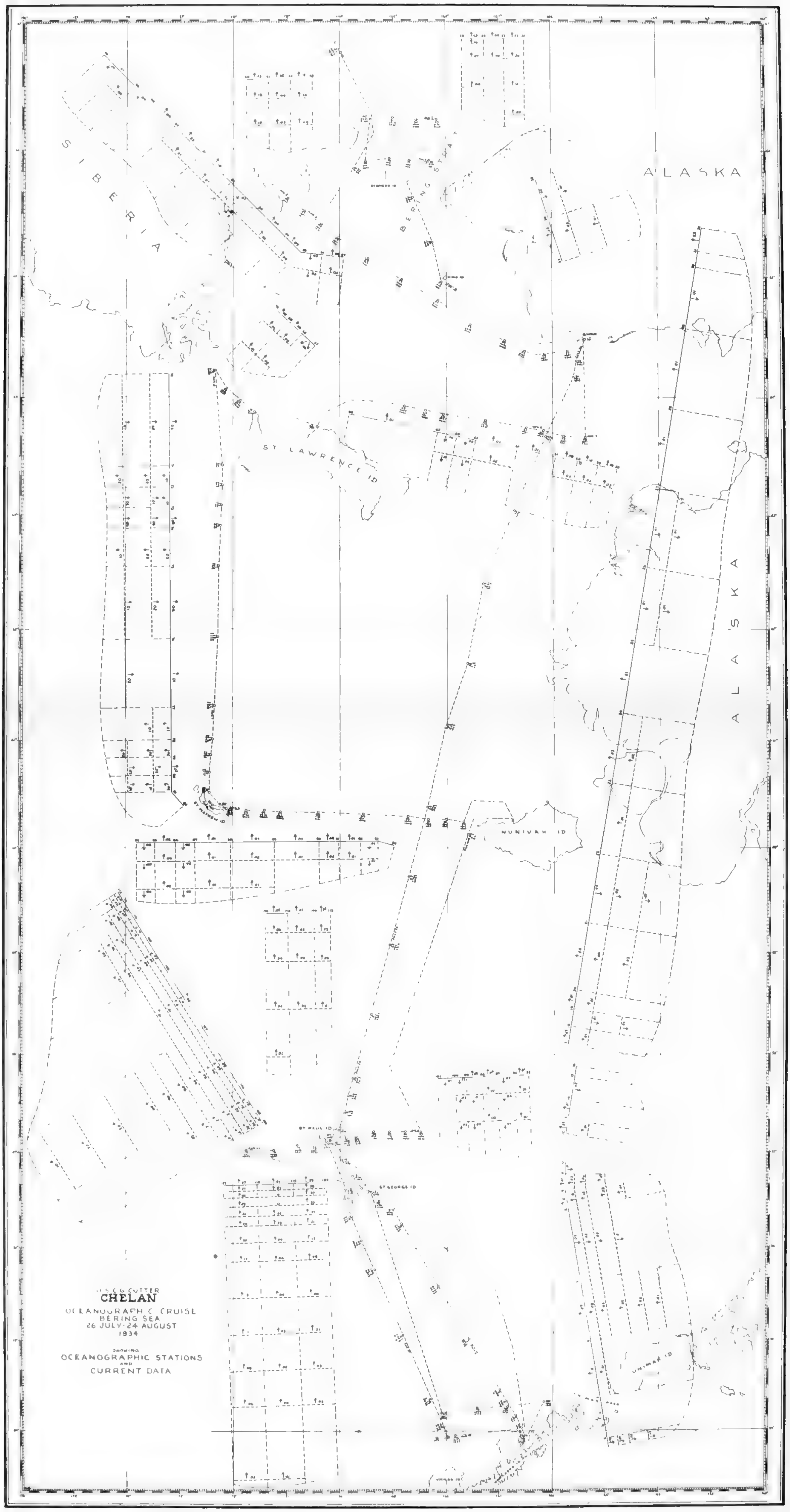
| Depth Meters | Station: 113-114, K = 8.57 Dx10$^5$ | Hx10$^5$ | Knots | Station: 114-115, K = 5.36 Dx10$^5$ | Hx10$^5$ | Knots | Station: 115-116, K = 5.36 Dx10$^5$ | Hx10$^5$ | Knots | Dx10 | Hx10 | Knots |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 268 | 0.02 | 0 | 258 | 0.01 | 0 | 1000 | 0.05 | | | |
| 10 | -70 | 338 | 0.03 | -30 | 288 | 0.02 | -35 | 1035 | 0.06 | | | |
| 25 | -32 | 300 | 0.03 | -285 | 543 | 0.03 | 205 | 795 | 0.04 | | | |
| 50 | 155 | 113 | 0.01 | -155 | 413 | 0.02 | 550 | 450 | 0.02 | | | |
| 65 | 268 | 0 | 0.00 | | | | | | | | | |
| 75 | | | | 258 | 0 | 0.00 | 887 | 113 | 0.01 | | | |
| 100 | | | | | | | 1000 | 0 | 0.00 | | | |

Positive values indicate currents setting North
Negative values indicate currents setting South

## SECTION XV

| | Station: 118-117, K = 3.85 | | | Station: 119-118, K = 4.02 | | | Station: 120-119, K = 4.43 | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth Meters | $Dx10^5$ | $Hx10^5$ | Knots | $Dx10^5$ | $Hx10^5$ | Knots | $Dx10^5$ | $Hx10^5$ | Knots |
| 0 | 0 | 7042 | 0.27 | 0 | 288 | 0.01 | 0 | 8792 | 0.39 |
| 10 | -75 | 7117 | 0.27 | 100 | 188 | 0.01 | 125 | 8667 | 0.38 |
| 25 | -308 | 7350 | 0.28 | 363 | -75 | 0.00 | 342 | 8450 | 0.37 |
| 50 | -245 | 7287 | 0.28 | 337 | -49 | 0.00 | 1293 | 7499 | 0.33 |
| 75 | 293 | 6749 | 0.26 | -88 | 376 | 0.02 | 2705 | 6087 | 0.27 |
| 100 | 867 | 6175 | 0.24 | -387 | 675 | 0.03 | 3942 | 4850 | 0.21 |
| 150 | 1817 | 5225 | 0.20 | -662 | 950 | 0.04 | 5867 | 2925 | 0.13 |
| 200 | 2542 | 4500 | 0.17 | -812 | 1100 | 0.04 | 7042 | 1750 | 0.08 |
| 300 | 3592 | 3450 | 0.13 | -762 | 1050 | 0.04 | 7992 | 800 | 0.04 |
| 400 | 4292 | 2750 | 0 11 | -362 | 650 | 0.03 | 8842 | -50 | 0.00 |
| 500 | 4892 | 2150 | 0.08 | -112 | 400 | 0.02 | 9492 | -700 | -0.03 |
| 600 | 5542 | 1500 | 0.06 | -212 | 500 | 0.02 | 9492 | -700 | -0.03 |
| 800 | 6542 | 500 | 0.02 | -12 | 300 | 0.01 | 8792 | 0 | 0.00 |
| 1000 | 7042 | 0 | 0.00 | 288 | 0 | 0.00 | | | |

Positive values indicate currents setting North
Negative values indiacte currents setting South


U.S.C.G. CUTTER
CHELAN
OCEANOGRAPHIC CRUISE
BERING SEA
26 JULY-24 AUGUST
1934
SHOWING
OCEANOGRAPHIC STATIONS
AND
CURRENT DATA
ALASKA
SIBERIA
BERING STRAIT
ST LAWRENCE ID
NUNIVAK ID
ST MATTHEW ID
ST PAUL ID
ST GEORGE ID
UNIMAK ID
UNALGA ID
DIOMEDE ID

Coast Guard Cutter CHELAN. Current measurements, oceanographic cruise.

| Date. Aug. | Time. | Station number. | Depth (meters) | Ekman current meter reading. Knots. | Direction Mag. ° | Direction True ° | Drift stick data. Direction (true)° | Drift stick data. Knots | Position. Lat. | Position. Long. | Tide. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1415 | A 45 | surface | .44 | 350 | 9 | | | 65 - 51 N | 169 - 45W | ebb |
| | 1510 | | 5 | .61 | 0 | 19 | 40 | .6 | | | |
| | 1427 | | 10 | .62 | 0 | 19 | | | | | |
| | 1440 | | 25 | .58 | 6 | 25 | | | | | |
| | 1500 | | 40 | .43 | 3 | 22 | | | | | |
| | 1710 | B 45 | surface | .50 | 358 | 17 | | | 65 - 51 N | 169 - 45W | flood |
| | 1720 | | 5 | .58 | 0 | 19 | 55 | .45 | | | |
| | 1735 | | 10 | .55 | 11 | 30 | | | | | |
| | 1752 | | 25 | .67 | 10 | 29 | | | | | |
| | 1804 | | 40 | .55 | 7 | 26 | | | | | |
| 1 | 2018 | C 45 | surface | .45 | 348 | 7 | | | 65 - 51 N | 169 - 45W | flood |
| | 2028 | | 5 | .46 | 10 | 29 | 42 | .7 | | | |
| | 2038 | | 10 | .51 | 7 | 26 | | | | | |
| | 2051 | | 25 | .73 | 0 | 19 | | | | | |
| | 2103 | | 40 | .53 | 6 | 25 | | | | | |
| 1 | 2317 | D 45 | surface | .43 | 340 | 359 | | | 65 - 51 N | 169 - 45W | slack |
| | 2329 | | 5 | .64 | 358 | 17 | 30 | .4 | | | |
| | 2340 | | 10 | .63 | 0 | 19 | | | | | |
| | 2351 | | 25 | .61 | 10 | 29 | | | | | |
| | 0004 | | 40 | .46 | 8 | 27 | | | | | |
| 2 | 0342 | E 45 | surface | .17 | 60 | 19 | | | 65 - 51 N | 169 - 45W | ebb |
| | 0351 | | 5 | .39 | 320 | 339 | 15 | .4 | | | |
| | 0400 | | 10 | .43 | 0 | 19 | | | | | |
| | 0410 | | 25 | .53 | 7 | 26 | | | | | |
| | 0420 | | 40 | .48 | 7 | 26 | | | | | |
| 2 | 0911 | F 45 | surface | .32 | 0 | 19 | | | 65 - 51 N | 169 - 45W | slack |
| | 0920 | | 5 | .49 | 310 | 329 | 355 | .2 | | | |
| | 0931 | | 10 | .39 | 350 | 9 | | | | | |
| | 0941 | | 25 | .31 | 16 | 35 | | | | | |
| | 0958 | | 40 | .38 | 20 | 39 | | | | | |

Coast Guard Cutter CHELAN. Current measurements, oceanographic cruise.

| Date. | Time. | Station number. | Depth (meters) | Ekman current motor reading. Knots. | Direction Mag. ° | Direction True ° | Drift stick data. Direction (true)° | Drift stick data. Knots | Position. Lat. | Position. Long. | Tide. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aug. 2 | 1116 | G 45 | surface | .45 | 342 | 1 | | | 65 - 51 N | 169 - 45W | ebb |
| | 1126 | | 5 | .39 | 342 | 1 | 335 | .25 | | | |
| | 1134 | | 10 | .36 | 348 | 7 | | | | | |
| | 1143 | | 25 | .35 | 7 | 26 | | | | | |
| | 1152 | | 40 | .37 | 6 | 25 | | | | | |
| 2 | 1710 | A 46 | surface | .26 | 152 | 171 | | | 65 - 37 N | 171 - 06W | flood |
| | 1718 | | 5 | .06 | 0 | 19 | 45 | .4 | | | |
| | 1729 | | 10 | .07 | 40 | 59 | | | | | |
| | 1738 | | 25 | .17 | 190 | 209 | | | | | |
| | 1749 | | surface | .25 | 103 | 122 | | | | | |
| 3 | 1016 | B 46 | surface | .13 | 330 | 349 | | | 65 - 37 N | 171 - 06W | ebb |
| | 1025 | | 5 | .08 | 190 | 209 | 0 | 0 | | | |
| | 1054 | | 25 | .07 | 190 | 209 | | | | | |
| 6 | 0125 | 70 - A | surface | 1.26 | 7 | 24 | | | 64 - 13 N | 172 - 19W | flood |
| | 0138 | | 5 | 1.46 | 20 | 37 | 68 | 1.35 | | | |
| | 0145 | | 10 | 1.42 | 24 | 41 | | | | | |
| | 0219 | | 25 | 1.47 | 30 | 57 | | | | | |
| | 0229 | | 35 | 1.29 | 30 | 57 | | | | | |
| 6 | 0420 | 70 - B | surface | 1.39 | 7 | 24 | | | 64 - 13 N | 172 - 19W | flood |
| | 0425 | | 5 | 1.53 | 20 | 37 | 55 | 1.5 | | | |
| | 0429 | | 10 | 1.58 | 20 | 37 | | | | | |
| | 0435 | | 25 | 1.48 | 27 | 44 | | | | | |
| | 0442 | | 35 | 1.43 | 27 | 44 | | | | | |
| 6 | 0719 | 70 - C | surface | 1.47 | 10 | 27 | | | 64 - 13 N | 172 - 19W | ebb |
| | 0726 | | 5 | 1.47 | 4 | 21 | 80 | 1.4 | | | |
| | 0730 | | 10 | 1.41 | 23 | 40 | | | | | |
| | 0734 | | 25 | 1.20 | 58 | 75 | | | | | |
| | 0741 | | 35 | .93 | 47 | 64 | | | | | |
| 6 | 0747 | 70 - C' | surface | 1.55 | 16 | 33 | | | 64 - 13 N | 172 - 19W | ebb |
| | 0753 | | 10 | 1.43 | [illegible] | 57 | | | | | |

Coast Guard Cutter CHELAN. Current measurements, oceanographic cruise.

| Date. | Time. | Station number. | Depth (meters) | Ekman current meter reading. | | | Drift stick data. | | Position. | | Tide. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Knots. | Direction | | Direction (true)° | Knots | | | |
| Aug. | | | | | Mag.° | True° | | | Lat. | Long. | |
| 6 | 1015 | 70 - D | surface | 1.14 | 8 | 25 | | | 64 - 13 N | 172 - 19W | ebb |
| | 1020 | | 5 | 1.12 | 42 | 59 | 88 | 1.3 | | | |
| | 1024 | | 10 | 1.08 | 46 | 63 | | | | | |
| | 1030 | | 25 | .99 | 40 | 57 | | | | | |
| | 1035 | | 35 | .89 | 30 | 47 | | | | | |
| 7 | 1758 | 82 - B | 5 | .86 | 56 | 71 | 120 | .55 | 60 - 24 N | 172 - 14W | ebb |
| | 1807 | | 10 | .89 | 92 | 107 | | | | | |
| | 1803 | | 15 | .92 | 100 | 115 | | | | | |
| 7 | 2018 | 82 - C | 5 | .98 | 12 | 29 | 120 | 1.4 | 60 - 24 N | 172 - 14W | ebb |
| | 2023 | | 15 | 1.08 | 125 | 140 | | | | | |
| | 2317 | 82 - D | 5 | 1.07 | 107 | 122 | 120 | 1.1 | 60 - 24 N | 172 - 14W | flood (s) |
| | 2324 | | 15 | .90 | 115 | 130 | | | | | |
| 8 | 0724 | 82 - E | 5 | .25 | 35 | 50 | 220 | .2 | 60 - 24 N | 172 - 14W | ebb |
| | 0728 | | 15 | .60 | 128 | 143 | | | | | |
| | 0736 | | 5 | .36 | 56 | 71 | | | | | |
| 8 | 1006 | 82 - F | 5 | .36 | 60 | 75 | 350 | .25 | 60 - 2[illegible] N | 172 - 14W | flood |
| | 1015 | | 15 | .34 | 132 | 147 | | | | | |
| 8 | 1533 | 83 | surface | .26 | 103 | 119 | 0 | .1 | 60 - 24 N | 172 - 25W | flood |
| | 1541 | | 15 | .27 | 137 | 153 | | | | | |
| 10 | 0335 | 94 | surface | .42 | 216 | 232 | | | 60 - 08 N | 167 - 32 W | flood |
| | 0343 | | 5 | .34 | 302 | 316 | 220 | .7 | | | |
| | 0352 | | 15 | .48 | 184 | 200 | | | | | |
| 10 | 1843 | 94 - A | surface | 1.01 | 332 | 348 | | | 60 - 08 N | 167 - 32W | flood |
| | 1851 | | 5 | .80 | 14 | 30 | 10 | .9 | | | |
| | 1900 | | 10 | 1.01 | 16 | 32 | | | | | |
| | 1905 | | 25 | .90 | 360 | 06 | | | | | |
| 10 | 2208 | 94 - B | surface | .99 | 160 | 176 | | | 60 - 08 N | 167 - 32W | ebb |
| | 2214 | | 5 | 1.15 | 150 | 166 | 185 | .7 | | | |
| | 2220 | | 10 | 1.13 | 146 | 162 | | | | | |
| | 2227 | | 25 | 1.03 | 142 | 158 | | | | | |

Coast Guard Cutter CHELAN. Current measurements, oceanographic cruise.

| Date. Aug. | Time. | Station number. | Depth (meters) | Ekman current meter reading. Knots. | Direction Mag. ° | Direction True ° | Drift stick data. Direction (true)° | Drift stick data. Knots | Position. Lat. | Position. Long. | Tide. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0111 | 94 - C | surface | 1.37 | 178 | 194 | | | 60 - 08 N | 167 - 32W | ebb |
| | 0116 | | 5 | 1.66 | 169 | 135 | 178 | 1.5 | | | |
| | 0123 | | 10 | 1.50 | 158 | 174 | | | | | |
| | 0129 | | 25 | 1.21 | 150 | 166 | | | | | |
| 11 | 0414 | 94 - D | surface | .64 | 180 | 196 | | | 60 - 08 N | 167 - 32W | flood |
| | 0419 | | 5 | .64 | 227 | 243 | 195 | 1.0 | | | |
| | 0423 | | 10 | .59 | 170 | 186 | | | | | |
| | 0428 | | 25 | .43 | 130 | 146 | | | | | |
| 11 | 0712 | 94 - E | surface | .66 | 318 | 334 | | | 60 - 08 N | 167 - 32W | flood |
| | 0713 | | 5 | .69 | 353 | 09 | 350 | .6 | | | |
| | 0720 | | 10 | .75 | 357 | 13 | | | | | |
| | 0725 | | 25 | .57 | 355 | 11 | | | | | |
| 11 | 1005 | 94 - F | surface | .66 | 320 | 336 | | | 60 - 08 N | 167 - 32W | flood |
| | 1009 | | 5 | .65 | 0 | 16 | 350 | .5 | | | |
| | 1022 | | 10 | .55 | 0 | 16 | | | | | |
| | 1023 | | 25 | .32 | 295 | 311 | | | | | |
| 11 | 1255 | 94 - G | surface | .28 | 330 | 346 | | | 60 - 08 N | 167 - 32W | flood |
| | 1259 | | 5 | .25 | 350 | 06 | 305 | .2 | | | |
| | 1303 | | 10 | .59 | 321 | 337 | | | | | |
| | 1311 | | 25 | .61 | 290 | 306 | | | | | |
| 11 | 1501 | 94 - H | surface | .75 | 323 | 339 | | | 60 - 08 N | 167 - 32W | ebb |
| | 1505 | | 5 | 1.02 | 338 | 354 | 335 | .5 | | | |
| | 1509 | | 10 | 1.10 | 340 | 356 | | | | | |
| | 1513 | | 25 | .98 | 330 | 346 | | | | | |
| 11 | 1646 | 94 - I | surface | 1.23 | 332 | 349 | | | 60 - 08 N | 167 - 32W | ebb |
| | 1650 | | 5 | 1.46 | 350 | 6 | 345 | .9 | | | |
| | 1654 | | 10 | 1.40 | 350 | 6 | | | | | |
| | 1659 | | 25 | 1.17 | 350 | 6 | | | | | |
| 11 | 1301 | 94 - J | surface | 1.30 | 338 | 354 | | | 60 - 08 N | 167 - 32W | ebb |
| | 1306 | | 5 | 1.53 | 350 | 6 | 330 | 1.5 | | | |

Coast Guard Cutter CHELAN. Current measurements, oceanographic cruise.

| Date. | Time. | Station number. | Depth (meters) | Ekman current motor reading. | | | Drift stick data. | | Position. | | Tide. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Knots. | Direction | | Direction (true)° | Knots | | | |
| Aug. | | | | | Mag.° | True ° | | | Lat. | Long. | |
| 11 | 1309 | | 10 | 1.46 | 353 | 9 | | | | | |
| | 1814 | | 25 | 1.24 | 352 | 8 | | | | | |
| 18 | 1643 | 103 | surface | .91 | 328 | 343 | | | 53 - 57 N | 167 - 52W | flood |
| | 1647 | | 10 | .88 | 335 | 350 | 10 | 1.0 | | | |
| | 1653 | | 18 | .24 | 340 | 355 | | | | | |
| 18 | 2011 | 103 - B | surface | .94 | 332 | 347 | | | 53 - 57 N | 167 - 52W | ebb |
| | 2020 | | 10 | .83 | 334 | 349 | 320 | 1.0 | | | |
| | 2028 | | 18 | .79 | 336 | 351 | | | | | |
| 18 | 2307 | 103 - C | surface | .69 | 350 | 5 | | | 53 - 57 N | 167 - 52W | ebb |
| | 2312 | | 10 | .92 | 324 | 339 | 315 | .95 | | | |
| | 2318 | | 18 | .76 | 330 | 345 | | | | | |
| 19 | 0207 | 103 - D | surface | .74 | 327 | 342 | | | 53 - 57 N | 167 - 52W | ebb |
| | 0212 | | 10 | .73 | 332 | 347 | 0 | 1.1 | | | |
| | 0217 | | 18 | .60 | 340 | 355 | | | | | |
| 19 | 0511 | 103 - E | surface | 1.00 | 330 | 345 | | | 53 - 57 N | 167 - 52W | flood |
| | 0521 | | 10 | .93 | 322 | 337 | 350 | 1.1 | | | |
| | 0526 | | 18 | .63 | 330 | 345 | | | | | |
| 19 | 0810 | 103 - F | surface | .97 | 330 | 345 | | | 53 - 57 N | 167 - 52W | flood |
| | 0815 | | 10 | .89 | 322 | 338 | | | | | |
| | 0819 | | 18 | .77 | 327 | 343 | | | | | |
| 19 | 1335 | 103 - G | surface | .22 | 30 | 345 | | | 53 - 57 N | 167 - 52W | flood |
| | 1340 | | 10 | .48 | 345 | 0 | 10 | 1.0 | | | |
| | 1345 | | 18 | .44 | 325 | 340 | | | | | |

TABLE IV.

Direct current measurements by Ekman current meter for several of the stations occupied. Values for surface observations are low due to the shielding effect of the ship and are not used in obtaining mean values. Directions are magnetic and true. Mean directions are based on measurements at depths of and greater than ten meters.

Addenda sheet, Table IV. Add the following under:

| Station | Velocity (mean) | | Direction (mag) (mean) |
|---|---|---|---|
| A-45 | .56 | | 3 |
| B-45 | .60 | | 9 |
| C-45 | .60 | | 4 |
| D-45 | .57 | | 6 |
| E-45 | .48 | | 5 |
| F-45 | .36 | | 8 |
| G-45 | .37 | | 0 |
| | | Mean values for 21 hour period. | |
| | .51 | | 6 |
| A-70 | 1.42 | | 27 |
| B-70 | 1.51 | | 24 |
| C-70 | 1.24 | | 39 |
| D-70 | 1.01 | | 41 |
| | | Mean values for 9 hour period. | |
| | 1.29 | | 33 |
| B-82 | .89 | | |
| C-82 | 1.05 | | |
| D-82 | .98 | | |
| E-82 | .45 | | |
| F-82 | .35 | | |
| A-94 | .93 | | 8 |
| B-94 | 1.11 | | 144 |
| C-94 | 1.40 | | 154 |
| D-94 | .53 | | 150 |
| E-94 | .68 | | 356 |
| F-94 | .47 | | 332 |
| G-94 | .55 | | 305 |
| H-94 | 1.05 | | 335 |
| I-94 | 1.31 | | 350 |
| J-94 | 1.38 | | 352 |
| A-103 | .75 | | 337 |
| B-103 | .87 | | 335 |
| C-103 | .82 | | 327 |
| D-103 | .72 | | 336 |
| E-103 | .88 | | 326 |
| F-103 | .88 | | 324 |
| G-103 | .40 | Mean values for 21 hour period. | 325 |
| | .77 | | 332 |

## TABLE IV (a)

Drift stick data obtained from observations at anchor.

### CURRENTS.

The following observations were made with a drift stick 15 feet long weighted to float one foot above the surface:

### NOME

30 July, 1934.

| | | | |
|---|---|---|---|
| 1200 | 298 | .5 | F |
| 1400 | 290 | 1.0 | F |
| 1600 | 288 | .6 | E |
| 1800 | 292 | .55 | E |
| 2000 | 305 | .6 | E |
| 2200 | 310 | .1 | E |
| 2400 | 320 | .1 | F |

31 July, 1934.

| | | | |
|---|---|---|---|
| 0200 | 290 | .1 | F |
| 0400 | 295 | .55 | F |

### STATION 45

1 August, 1934.

| | | | |
|---|---|---|---|
| 1230 | 25 | .6 | E |
| 1300 | 41 | .55 | E |
| 1400 | 44 | .55 | E |
| 1500 | 40 | .6 | E |
| 1600 | 42 | .5 | E |
| 1700 | 55 | .45 | F |
| 1800 | 56 | .35 | F |
| 1900 | 60 | .65 | F |
| 2000 | 42 | .7 | F |
| 2100 | 35 | .65 | F |
| 2200 | 20 | .5 | F |
| 2300 | 30 | .4 | F |
| 2400 | 30 | .3 | E |

2 August, 1934.

| | | | |
|---|---|---|---|
| 0100 | 38 | .5 | E |
| 0200 | 23 | .6 | E |
| 0300 | 15 | .4 | E |
| 0400 | 15 | .4 | E |
| 0500 | 30 | .45 | E |
| 0600 | 65 | .6 | F |
| 0700 | 20 | .75 | F |
| 0800 | 25 | .5 | F |
| 0900 | 355 | .1 | F |
| 1000 | 5 | .1 | E |
| 1100 | 335 | .25 | E |
| 1200 | 25 | .2 | E |

### St. Lawrence Island.

2 August, 1934.

| | | | |
|---|---|---|---|
| 1630 | 145 | .4 | F |
| 1800 | 110 | .6 | F |
| 1900 | 90 | .1 | F |
| 2000 | 80 | .1 | F |
| 2100 | 85 | .1 | F |
| 2200 | 80 | .1 | F |
| 2300 | 230 | .1 | F |
| 2400 | 270 | .1 | F |

3 August, 1934.

| | | | |
|---|---|---|---|
| 0100 | 0 | 0 | E |
| 0200 | 0 | 0 | E |
| 0300 | 0 | 0 | E |
| 0400 | 0 | 0 | E |
| 0500 | 0 | 0 | E |
| 0600 | 0 | 0 | E |
| 0700 | 0 | 0 | E |
| 0800 | 0 | 0 | E |
| 0900 | 0 | 0 | E |
| 1000 | 0 | 0 | E |
| 1100 | 0 | 0 | F |
| 1200 | 0 | 0 | F |

## TABLE IV (a) continued.

### Nunivak Island.

9 August, 1934.

| | | | |
|---|---|---|---|
| 2300 | 250 | 1.0 | E |
| 2400 | 235 | 1.0 | E |

10 August, 1934.

| | | | |
|---|---|---|---|
| 0100 | 260 | 1.0 | E |
| 0200 | 250 | .9 | F |
| 0300 | 220 | .7 | F |
| 0400 | 290 | .7 | F |
| 1817 | 355 | 1.0 | F |
| 1900 | 10 | .9 | F |
| 2000 | 5 | .7 | E |
| 2100 | 180 | .2 | E |
| 2200 | 185 | .7 | E |
| 2300 | 180 | 1.2 | E |
| 2400 | 180 | 1.5 | E |

11 August, 1934.

| | | | |
|---|---|---|---|
| 0100 | 178 | 1.5 | E |
| 0200 | 178 | 1.5 | E |
| 0300 | 193 | 1.4 | E |
| 0400 | 195 | 1.0 | E |
| 0500 | 180 | .6 | F |
| 0600 | 0 | 0 | F |
| 0700 | 350 | .6 | F |
| 0800 | 350 | .7 | F |
| 0900 | 355 | .75 | F |
| 1000 | 350 | .5 | F |
| 1100 | 350 | .4 | F |
| 1200 | 350 | .2 | F |
| 1300 | 325 | .2 | F |
| 1400 | 340 | .45 | E |
| 1500 | 335 | .45 | E |
| 1600 | 345 | .9 | E |
| 1700 | 355 | 1.3 | E |
| 1800 | 350 | 1.5 | E |

### St. Matthew Island.

7 August, 1934.

| | | | |
|---|---|---|---|
| 1100 | 290 | 1.25 | F |
| 1200 | 320 | 1.4 | F |
| 1300 | 305 | 1.4 | F |
| 1400 | 310 | .9 | F |
| 1500 | 273 | .65 | F |
| 1600 | 265 | .45 | E |
| 1700 | 120 | .5 | E |
| 1800 | 120 | .35 | E |
| 1900 | 120 | 1. | E |
| 2000 | 120 | 1.4 | E |
| 2100 | 100 | 1.3 | E |
| 2200 | 120 | 1.3 | E |
| 2300 | 120 | 1.1 | F |
| 2400 | 123 | 1. | F |

8 August, 1934.

| | | | |
|---|---|---|---|
| 1300 | 360 | .1 | F |
| 1400 | 360 | .45 | F |
| 1500 | 360 | .1 | F |
| 1600 | 360 | .1 | F |
| 1700 | 360 | .55 | E |
| 1800 | 70 | .45 | E |
| 1900 | 80 | .7 | E |
| 2000 | 120 | .55 | E |
| 2100 | 90 | .5 | E |
| 2200 | 90 | .45 | E |
| 2300 | 100 | .15 | E |
| 2400 | 90 | .2 | F |
| 0100 | 173 | .4 | F |
| 0200 | 235 | .3 | F |
| 0300 | 277 | .5 | F |
| 0400 | 335 | .5 | F |
| 0500 | 300 | .2 | F |
| 0600 | 260 | .1 | E |
| 0700 | 220 | .2 | E |
| 0800 | 230 | .2 | E |
| 0900 | 80 | .2 | E |
| 1000 | 350 | .25 | E |

## Bogoslof Island.

WEST ANCHORAGE: 18 August

| | | |
|---|---|---|
| 1700 | 10° | 1.0 knot |
| 1800 | 10 | .95 knot |
| 1900 | 5 | .95 knot |
| 2000 | 350 | 1.0 knot |
| 2100 | 350 | 1.0 knot |
| 2200 | 0 | .95 knot |
| 2300 | 315 | .95 knot |
| 2400 | 325 | 1.1 knot |

Light south-southwest airs

WEST ANCHORAGE: 19 August

| | | |
|---|---|---|
| 0100 | 350° | 1.0 knot |
| 0200 | 0 | 1.1 knot |
| 0300 | 350 | .7 knot |
| 0400 | 0 | 1.0 knot |
| 0500 | 300 | 1.0 knot |
| 0600 | 355 | 1.1 knot |
| 0700 | 350 | 1.0 knot |
| 0800 | 350 | 1.0 knot |
| 0900 | 330 | .95 knot |
| 1000 | 335 | .95 knot |
| 1100 | 330 | .6 knot |
| 1200 | 330 | .4 knot |
| 1300 | 10 | .4 knot |
| 1400 | 10 | 1.0 knot |

Light south-southwest airs

EAST ANCHORAGE: 19 August

| | | |
|---|---|---|
| 1630 | 325 | .25 knot |
| 1700 | 325 | .25 knot |
| 1800 | 325 | .25 knot |
| 1900 | 325 | .25 knot |
| 2000 | 280 | .3 knot |
| 2100 | 310 | .3 knot |
| 2200 | 280 | .2 knot |
| 2300 | 270 | .2 knot |
| 2400 | 10 | .3 knot |

Light southwest airs

EAST ANCHORAGE: 20 August

| | | |
|---|---|---|
| 0100 | 30 | .5 knot |
| 0200 | 80 | .55 knot |
| 0300 | 40 | .55 knot |
| 0400 | 10 | .6 knot |
| 0500 | 0 | .1 knot |
| 0600 | 325 | .1 knot |
| 0700 | 325 | .1 knot |
| 0800 | 210 | .25 knot |
| 0900 | 210 | .1 knot |
| 1000 | 210 | .1 knot |
| 1100 | 210 | .1 knot |
| 1200 | 210 | .1 knot |
| 1300 | 225 | .35 knot |
| 1400 | 220 | .35 knot |
| 1500 | 170 | .35 knot |
| 1600 | 160 | .5 knot |

Light southwest airs.

It should be noted that the current was practically constant in direction on the west side, whereas on the east side an eddy seemed to be felt. Upon approaching and leaving the island a current of .78 knots per hour, 98° true was observed.

CURRENTS, BERING SEA AND ARCTIC OCEAN.

The following is quoted from the U.S. Coast Pilot, Alaska, Part II, 1931:

Between Cape Cheerful and St. George Island the current is not believed to have any decided set or flow unless influenced by the wind. With a strong wind a current is likely to set with it, but $\frac{1}{2}$ point allowance in a course will be sufficient to overcome any set that will be found in this vicinity due to this cause.

Between St. Matthew and Nunivak Islands the set of the current is northward; with prevailing northeast winds it sets northwest, and with northwest and southwest winds, northeast. This northerly current continues and increases between St. Lawrence Island and the mainland, being stronger toward the mainland north of the mouth of the Yukon River, where it amounts to about 1 knot, except in the early summer, when, increased by the freshets in the Yukon, it may amount to 2 knots or more. A strong northeasterly current setting on the Yukon flats has been observed, amounting at times to $2\frac{1}{2}$ knots. The current sets north across Norton Sound to Sledge Island and then follows the coast to Bering Strait. It is strongly marked between Sledge Island and Bering Strait.

In Bering Strait the current sets north, and when not influenced by wind its velocity is about 2 knots an hour. Protracted northerly gales which prevail in the autumn change its direction to southward, but on the cessation of the wind it quickly set north again. Strong southerly gales increase its velocity to 3 knots. The current is stronger east of the Diomede Islands than west of them.

From Bering Strait to Point Barrow there is a general current setting northward alongshore (stronger inshore), which, when not affected by winds or stopped by the ice, has a velocity of not less than 1 knot at any part of it. The current from the strait turns northeastward and is joined north of Cape Krusenstern by that from Kotzebue Sound. From Eschscholtz Bay a northerly current sets alongshore on the eastern side of Kotzebue Sound, having a velocity of $\frac{1}{2}$ to 1 knot at Cape Blossom. It continues past Cape Krusenstern, where it is increased by the flow from Hotham Inlet to a velocity of 1 to 2 knots, and northward of the cape joins the current from Bering Strait, where, in the latter part of July and August, its velocity is $1\frac{1}{2}$ to 2 knots. It continues with the same velocity around Point Hope, then with a reduced velocity to Cape Lisburne and across to a short distance south of Point Lay. After rounding Point Hope, and thence to Icy Cape, the current does not appear so strong, and, as a rule, is about 1 knot.

In the bight between Cape Lisburne and Cape Beaufort there is a tidal current, and unless driven in by a westerly wind the outside general current is not felt.

Northward of Point Lay, if the ice has not opened up from the shore, the current is stopped; but if the ice is open to Point Barrow, the current continues along the shore and, because of the contracted space between the shore and the ice, increases in velocity to from 2 to 3 knots and sometimes more at Point Barrow.

This general current is more or less affected by the wind and may be decreased or even stopped at times by northerly winds, but when the wind abates it starts again. When the wind is with the current its velocity is increased. Well offshore the currents are variable and not so strong and depend to a great extent on the winds. There is, however, a general set northward.

A report from the Coast Guard states that in the vicinity of Point Barrow (that is, from Sea Horse Island to Point Barrow) a northeast wind will act against a northly current and produce a resultant current which will carry the ice offshore.

The following is quoted from Physical Geography of the Sea (Maury) - 1857:

A surface current flows north through Behring Strait into the Arctic Ocean, but in the Atlantic the current is from, not into the Arctic Sea: it flows south on the surface, north below: Behring Strait being too shallow to admit of mighty undercurrent or to permit the introduction from the polar basin of any large icebergs into the Pacific.

The following is quoted from the cruise of the CORWIN in the Arctic Ocean -,1881: (Notes and Observations by Hooper):

A bright ice-blink had been in sight, to the eastward, all the afternoon, and about 8 p.m., the ice was raised on the port beam and ahead. We soon discovered the straits to be entirely filled with ice, coming through from Bering Sea, compelling us to lay by until morning. During the night the set of the current, after careful observation, was found to be about one knot per hour to the northward.

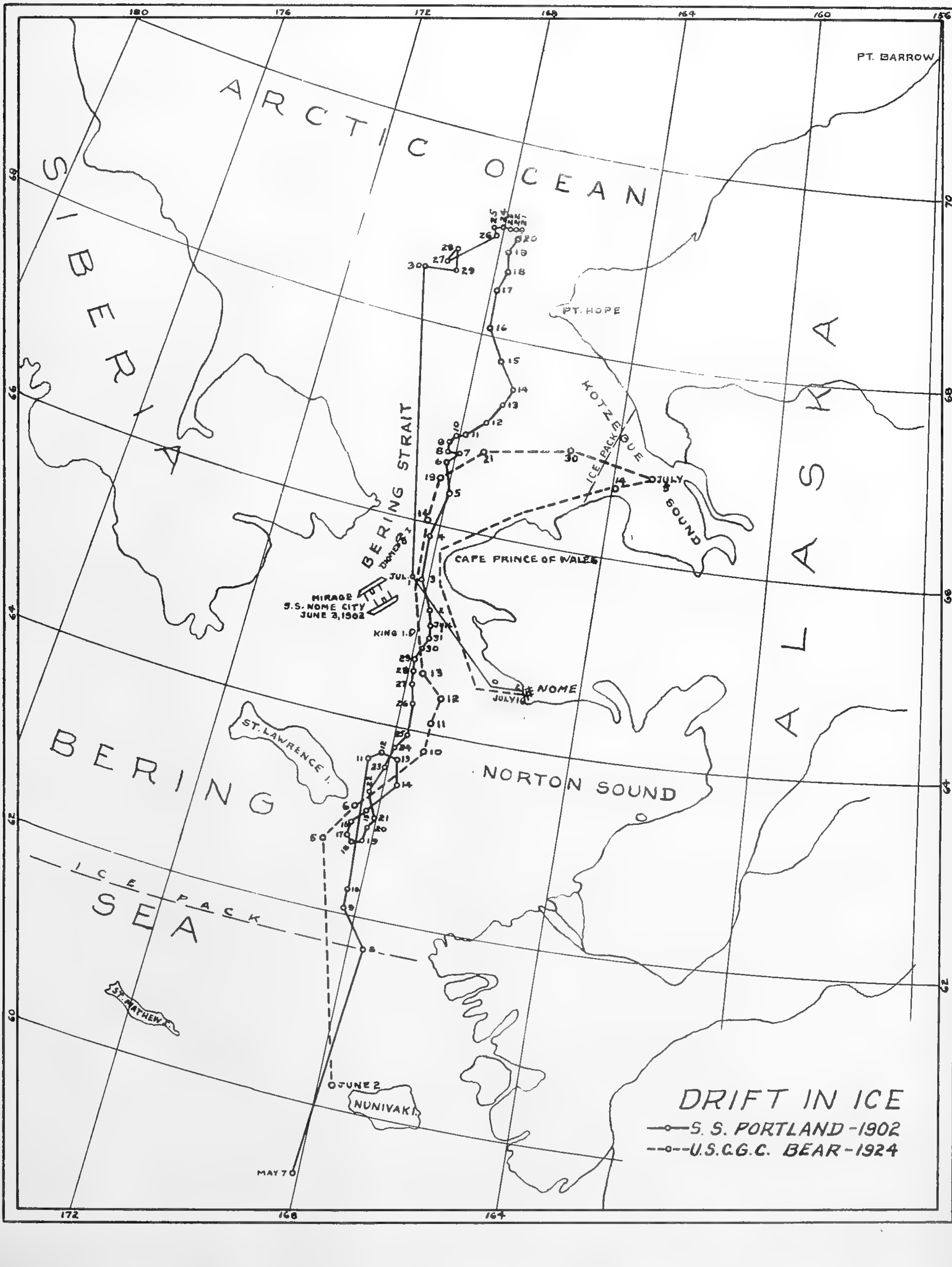
* * * * * * * * * * * *

On the 30th of May, being anchored at the West Diomede, the ice was observed to be setting to the northward about 2 knots per hour, the wind blowing fresh southeast with snow-squalls.

During the night of June 3 the CORWIN, while trying to get south through Bering Strait, was met by a large body of ice drifting through into the Arctic Ocean from Bering Sea which completely filled the strait. Being compelled to heave, until the next forenoon, the drift of the vessel was noted and found to be northwest, velocity about one-half a knot per hour, weather calm.

June 7, steaming from Saint Lawrence Bay to Saint Lawrence Island, in calm weather, a current set the vessel 30 miles in an east-northeast direction in twenty hours.

July 2, steaming from Bering Strait to Marcus Bay, time nineteen hours, the vessel was set to the northeast 18 miles. There was no wind at the time, but for several days previously a fresh north-northwest gale had been blowing. In passing through the strait near the Diomede Islands at that time a strong current had been encountered, which had been the subject of remark on board, some estimating it as high as 3 knots per hour.



ARCTIC OCEAN
SIBERIA
ALASKA
PT. BARROW
PT. HOPE
KOTZEBUE SOUND
ICE PACK
BERING STRAIT
CAPE PRINCE OF WALES
MIRAGE S.S. NOME CITY JUNE 2, 1902
KING I.
NOME
ST. LAWRENCE I.
NORTON SOUND
BERING SEA
ICE PACK
ST. MATHEW I.
NUNIVAK I.
JUNE 2
MAY 7
DRIFT IN ICE
S. S. PORTLAND - 1902
U.S.C.G.C. BEAR - 1924

From 7 p.m., July 2, to 4 a.m., July 3, steaming from Marcus Bay towards Saint Michael's, Norton Sound, the current set the vessel east-northeast 30 miles.

On the afternoon of July 12 a short trip was made at Cape Prince of Wales. A strong northerly current necessitated frequent working of the engine to hold the vessel in position. Wind moderate and variable.

July 30, while made fast to the shore ice at the east end of Herald Island, the current was measured with the chip and line and found to be to the northward 1 knot per hour. There was no appreciable change in the velocity or direction of the current during the time the CORWIN remained at the island -- from 9:45 p.m., until 3 a.m. The ice was setting steadily northward during that time.

At Cape Wankerem, latitude 68° 05', longitude 176° 30', a tidal current was observed with a rise and fall at that time of about 2 feet, the flood setting along the coast to the northward.

At 7:30, August 3, in the Arctic Ocean, south of Wrangel Island, being able to see a mile or more, we got under way and steamed to the northwest under one bell until 9, when it again shut down thick, just as we came up to the ice. The engine was stopped and soundings made in $19\frac{3}{4}$ fathoms of water, soft bottom, temperature at bottom 40°, the current setting to the westward very gently, not more than a quarter of a knot.

* * * * * * * * * * * *

The bed of the navigable part of the Arctic Ocean lying north of Bering Straits is a vast plain, with an average depth of less than 30 fathoms. South of Wrangel Island the soundings are remarkably regular, at 22 fathoms for many miles, but toward the Asiatic side of the strait the water deepens to 27 fathoms at a distance of 20 miles from the coast, gradually shoaling to 14 in the next 10 miles. Just east of Herald Island the depth exceeds 30 fathoms, and to the northeast a few miles reaches 40. This is undoubtedly caused by the current which sets northward between Herald Island and the Herald Shoal.

* * * * * * * * * * * *

On the 4th of August, while cruising in the strait south of Wrangel Island, our observations showed a west-northwest set of 12 miles, the wind light and variable.

On the 4th and 5th of August the ship's position was determined by observation, showing a current of 1 knot per hour north-northwest; wind moderate, from east to southeast.

On the 10th of August, while at anchor off the south coast of Wrangel Island, near the edge of the ice-pack, the current was observed to be setting in a northeasterly direction, from one-quarter to one-half a knot per hour.

On the following day, when about 8 miles off the southeast end of Wrangel Island, the current was measured with a chip and line, and found to be about three-quarters of a knot per hour in a northeasterly direction (the direction of the coast-line). During the night the ice continued to drift to the northward, the lead in which the CORWIN was at anchor changing its position about 8 miles. On the following morning (August 12), while at anchor near the shore off the east end of Wrangel Island, the current was observed to be north $1\frac{1}{4}$ knots per hour. The wind during the 11th and 12th was moderate from west to southwest.

August 13, the vessel's position was determined by observations, and the reckoning brought forward showed a north-northeast current of 1 mile per hour for the twenty-four hours.

At midnight, August 16, stopping at Point Belcher, the current was found to be setting along the coast to the northward about 1 mile per hour. The same current was observed a few hours later near Point Barrow. The wind during the day was light and variable.

August 17, measured the velocity of the current while at anchor at Point Barrow, and found it to be $1\frac{3}{4}$ miles per hour, following the direction of the land to the northeast. During our stay at Point Barrow the wind was light and variable, so that it would have but little effect upon the current.

August 18, got under way from Point Barrow, and steamed to the southward, with a strong head current, which was no doubt accelerated by a fresh southwest wind. At 7 a.m. the following day at Point Belcher found the current setting to the northeast along the land, but very much decreased in velocity; the wind light southerly.

From noon August 19 to noon August 20, steaming to the southward between Icy Cape and Point Hope, the vessel was set to the northward 30 miles.

From 5 p.m. August 20 until meridian of the 21st the current was found to have set 12 miles north by east one-half east.

From 4 p.m. August 22 until meridian August 24, in Bering Strait and Sea between the Diomede Islands and Plover Bay, the current set 75 miles to the northward, the wind blowing a fresh gale from south and southeast. Three days later, in returning over this track with a moderate northerly wind, no current was encountered.

In September the result of our observations in Kotzebue Sound showed a tidal current with a rise and fall of about 3 feet.

* * * * * * * * * * * *

On the afternoon of September 14 we passed Cape Prince of Wales about 4 p.m., having a strong northerly current while in the straits, which we estimated at 3 knots per hour.

* * * * * * * * * * * *

The discovery of a tidal current in Bering Strait and the Arctic Ocean is not new, it having been known to exist and been reported by several navigators. The boat expedition under Commander Pullen, R.N., along the north coast of Alaska, in 1849, found 18 inches rise and fall at Point Barrow and the same at the mouth of the Mackenzie. Richardson speaks of the ebb and flow of the tide east of the Mackenzie. The CORWIN found 2 feet rise and fall at Wankerem and 3 feet in Kotzebue Sound. Parry found a tidal current in Melville with the flood tide setting to the southward. W.H. Dall, United States Coast Survey, found a tidal current in Bering Strait in 1880 with the flood tide, which was the stronger, setting to the northward.

* * * * * *

One theory advanced in relation to the Bering Strait current is that it is caused by the rivers emptying into Bering Sea and Norton Sound. The effect of the rivers in Kotzebue Sound was remarked by Captain Beechey, R.N., who, in speaking of a current encountered between Point Hope and Kotzebue Sound, says:

> It varied from $1\frac{1}{2}$ to 3 miles per hour and was strongest inshore. It was very constant, and the water was much fresher than the ordinary sea water.

He adds:

> It is necessary here to give some further particulars of this current, in order that it may not be supposed that the whole body of water between the two continents was setting into the Polar Sea at so considerable a rate. By sinking the patent log first 5 fathoms and then 3 fathoms, and allowing it to remain in the first instance six hours and in the latter twelve hours, it was clearly ascertained that there was no current at either of those depths. But at the distance of 9 feet from the surface the motion of the water was nearly equal to that at the top. Hence, we must conclude that the current was superficial and confined to a depth of between 9 and 12 feet. By the freshness of water alongside, Captain Beechey believed the current was occasioned by the many rivers which at this time of the year empty themselves into the sea at different parts of the coast at Schischmareff Inlet.

He further says:

> So far there is nothing extraordinary in the fact, but why this body of water should continually press to the northward in preference to taking any other direction or gradually expending itself in the sea is a question of considerable interest.

The remark applies with equal force to such rivers in Kotzebue Sound as pass through Bering Strait, while the decreased specific gravity of the river water, due to its higher temperature and freedom from salt, would prevent its readily mingling with the surrounding salt water. The fact of its flowing northward through Bering Strait, notwithstanding the course of the current is broken by shoals, sand bars, capes, islands, etc., is not so readily explained except upon the theory of the surrounding current having the same direction.

As evidence of the existence of a current northward through Bering Strait, we have first the remarkable drift of the Jeannette. This vessel entered the ice near where the observations of the Rodgers are said to have upset all existing theories in relation to Arctic currents, yet notwithstanding the enormous friction of the ice, at points of contact, to be overcome, and in the face of adverse winds, which many times set her back to the south and eastward during the twenty months she was helplessly embayed in the ice, as a resultant of all currents she made a drift of 500 miles in a northwesterly direction.

* * * * * *

The discovery near Herald Island of part of a vessel burned south of Bering Strait must also be regarded as evidence pointing in the same direction. We have also the testimony of the whalers, the only men who navigate those seas regularly, not one of whom, so far as I can learn, doubts the existence of this current. Then comes the testimony of the natives living on the shores of Bering Strait to the same effect. But in all this evidence there is nothing inconsistent with a regular tidal current in Bering Strait.

* * * * * *

## MAMMALS.

An excellent opportunity was made possible by the Bering Sea Cruises to observe the peculiarities of the sea lion, the walrus and the seal. The sea lions were encountered in the Aleutian Islands, the Pribilof Islands and Bogoslof Island, the seals were seen on the Pribilof Islands and on Bogoslof Island; while the walrus were seen off St. Lawrence Island, St. Lawrence Bay, in Bering Strait and in the Arctic Ocean. These mammals, also called pinnepods, are built primarily for life in the water. Their activities ashore are very limited. Their bodies are more or less fishlike in form and their limbs are to a great degree finfooted.

## THE SEAL.

The fur seals of the Bering Sea form two independent herds which have distinct places of habitation and separate ways of migration. The seal of the American herd is concentrated on the Pribilofs and is called callorhinus alascanus while the callorhinus ursinus (Russian) visit the Komandorski Islands and the callorhinus civilensis, the Japanese, visit the Kurile Islands. The differences in the color of the skins, in the forms of the bodies and in the construction of the skulls make it possible to differentiate between the various classes. For example, the American seals have stouter broader heads, thicker necks, superior fur and different claws. The greater portion of the world's supply of fur seal comes from the Pribilof Islands.

Seals are amphibious mammals. On land their forefeet are used for climbing, while the hind flippers are dragged. At sea the forefeet are

FUR SEALS, ST. PAUL ISLAND.

the propelling power, the hind ones being used as rudders.

The general color of the bull is black with grayish shoulders and brownish face. The female is lighter in color. The young is usually all black, having a brown mouth. On the top of the head, the males have a well marked crest of hair. The hair of the male is longer than that of the female. Males also have long slender cylindrical and tapering whiskers. The pup seals about a week old are about a foot long and weigh about 7 pounds. At 6 months they are about 2 feet and weigh about 25 pounds. Yearlings are about 40 inches long and weigh 40 pounds. Two yearlings are about 4 feet long and weigh about 60 pounds. Old bulls weigh about 500 lbs., and are about 7 feet long. The average weight of the cow is about 85 pounds. The neck, chest and shoulders of a bull comprise more than 2/3 of its whole weight and it is in this long thick neck and fore feet that all their strength is centered.

Between the first and the 15th of May the first bulls are found on the Pribilof rookeries. At that time they spend much time swimming off the beach, a condition that soon changes when the main body arrives. The first arrivals are not generally the oldest but are the finest specimens and are the ones that later control the harems ashore. With the coming of foggy weather, about 15 June, bull seals come up by thousands and locate themselves in advantageous positions for the arrival of the females.

The seals are polygamous type and have harems averaging 12 females. The selections of a special location on the breeding ground are not necessarily the same every year. Immediately upon the arrival of the herd at their summer home, vicious battles are fought between the developed male seals for the domination of the harems. Small colonies composed of many female seals and one lord are formed. This leaves generally a large number of robust young male seals. Once in a while they make a raid, when the lord of the harem is not looking, and endeavor to steal some of the females. If they are successful, they lay the foundation for a harem of their own.

The bulls show remarkable courage and strength is defending their temporary homes. The fighting seems to be done mostly by their teeth, they seizing each other's hide and shaking. It usually results in a bad wound, the sharp needlelike teeth tearing out strips of skin and blubber.

Seals are the most intelligent of the mammals. They resemble a dog. They can be taught to obey in the same way. They bark somewhat the same, they cool themselves by opening their mouths and have generally speaking a similar head. They are playful. They however sometimes stretch out their bodies like striking adders and make vicious snaps at anyone within reach.

Man is number one enemy of the fur seal but under the existing law the seals have a splendid chance. The killer whale preys on the young. The shark and swordfish attack to a lesser degree.

The seal chart shows the general run of the seal. It is reported that at one time they made the shores of Guadaloupe Island but now they seldom reach below 32° N Latitude. The information was obtained from

Coast Guard records, from Captain Bissett, one of the early sealers and from others of his associates.

THE FOLLOWING IS QUOTED FROM CAPTAIN BISSETT'S REPORT.

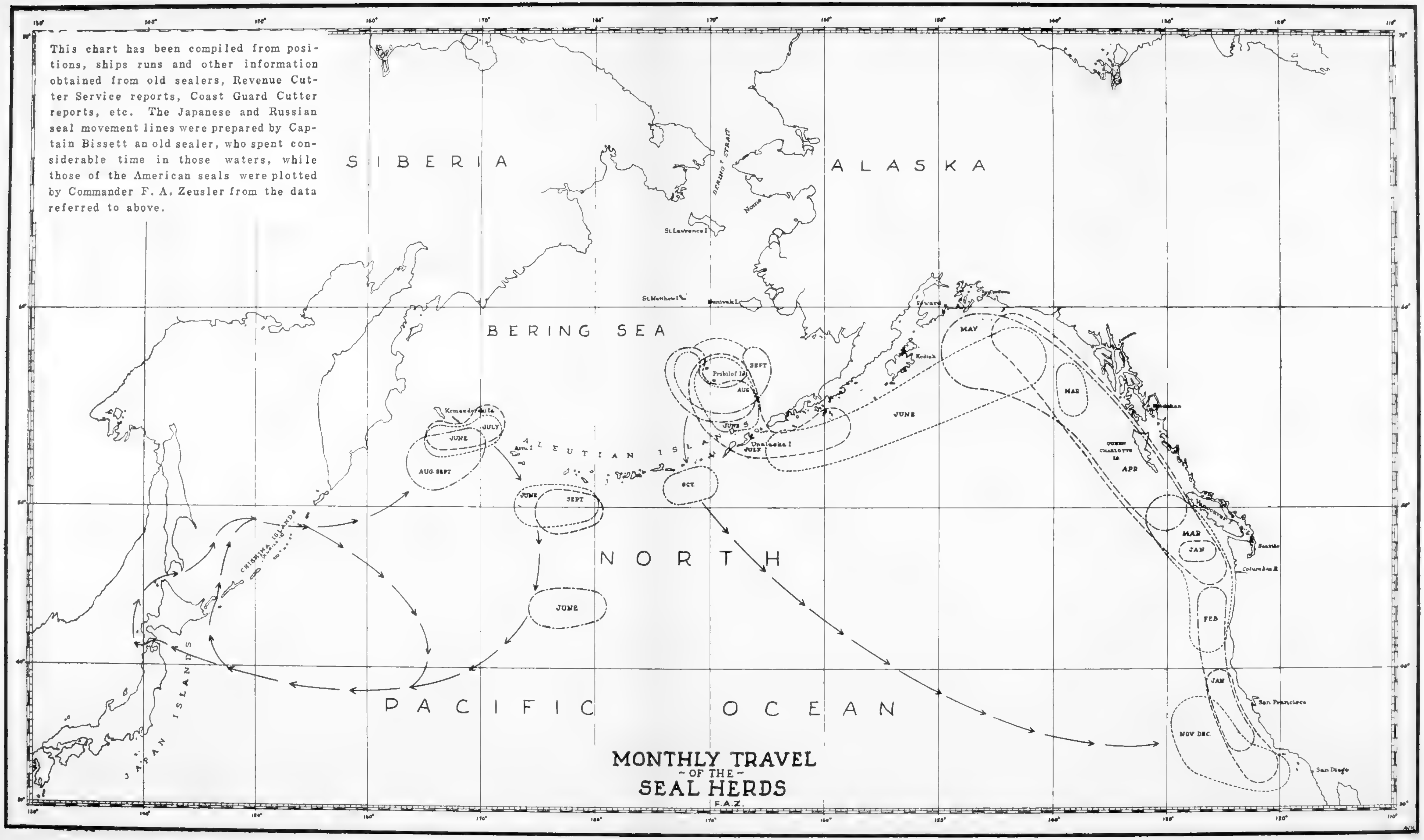
"Seals on leaving the Bering Sea in October and November enter the North Pacific through 72 Pass and make course for an area in about latitude 33° - 38°N and for 150 - 400 miles west of the California Coast, arriving in that vicinity from early November until the middle of December. They remain here until the month of February. The movement on the return migration that of the smaller cows and young bulls begins much earlier than that of the mature cows. In some years this part of the herd arrives off the coast of Oregon and Washington and as far north as Cape Cook on Vancouver Island early in January. The south end of the herd however trails as far back as the southern California Coast. The herd moves rather slowly along the coast of Queen Charlotte Island, thence along the Alaska coast, up to the Gulf of Alaska, arriving at the Fair Weather Grounds in April and May. On these grounds, which seem to be an immense feeding grounds many of the seals remain till sometime in June. At this time the cows are heavy with pups and begin to arrive, forming the forward moving part of the herd but do not remain long in the vicinity but move through the different passes on to the breeding grounds in July."

"We sealers used to hunt them while they were feeding some 60 miles offshore. We remained in the seal hunting until late September and sometimes until October."

"In my opinion all the great seal herds, most birds and even fish when migrating follow great elliptical paths to and from their breeding and spawning grounds. On the west coast of North America the seal movement is against the clock and on the coast of Japan and Russia clockwise. I have hunted in both those grounds."

"A large bank exists probably 150 - 200 miles south of Attu Island extending from the meridian of Attu to the 180th. The extent of this bank, north and south, is evidently very great. There is evidence from the color of the water and the flocks of sea birds that there must be soundings at no very great depth in the large area. This seems to be a herding for young bulls principally and a few of the smaller cows. I have crossed the bank many times. The area was well known to most of the old sealers that visted the Japan and Copper Island sealing grounds and we crossed it diagonally on our return from Copper Island to Cape Flattery. It was the general opinion of the sealer that the herd was a part of the Copper Island herd."

"Up until the seals leave the islands they live on their mother's milk. Cows will only suckle their own pups. The pups are weaned about the first of October. The bull seals arrive on the islands covered with fat and for three months remain on the island to domineer over their various households and multitudinous better halves, with little sleep and with no food. The mother seals swim out to sea in search of squib and other food, and there formerly met death at the hands of the poachers. As a majority of the seals killed at sea were females, the effect of the pelagic catch was felt directly on the breeding herd. The forfeiture of the mother's life meant the forfeiture also of not only the life of


This chart has been compiled from positions, ships runs and other information obtained from old sealers, Revenue Cutter Service reports, Coast Guard Cutter reports, etc. The Japanese and Russian seal movement lines were prepared by Captain Bissett an old sealer, who spent considerable time in those waters, while those of the American seals were plotted by Commander F. A. Zeusler from the data referred to above.
SIBERIA
ALASKA
BERING STRAIT
Nome
St Lawrence I
St Matthew I
Nunivak I
BERING SEA
Seward
Kodiak
Pribilof Is
SEPT
AUG
JUNE
JULY
Unalaska I
Komandorskie Is
JUNE
JULY
AUG. SEPT
Attu I
ALEUTIAN ISLANDS
OCT
JUNE
SEPT
JUNE
MAY
MAR
JUNE
QUEEN CHARLOTTE IS
APR
MAR
JAN
Seattle
Columbia R
FEB
JAN
San Francisco
NOV DEC
San Diego
CHISHIMA ISLANDS
JAPAN ISLANDS
NORTH
PACIFIC OCEAN
MONTHLY TRAVEL
OF THE
SEAL HERDS
F.A.Z.

the baby she left at home in the rookery, but also of the life of the baby yet unborn that she carried with her.

The older seals do not obtain their food from a very great depth, living mostly on squib and surface fish. Our investigations indicate that the seals seldom eat salmon, taking them only when they pass through a school. They seem to prefer pollack instead. However, they eat more salmon off the Copper Island rookeries, but even there the general food is squib and pollack. They seldom distrub the fisheries. They do not eat shellfish. Some cod but no halibut were found. The migratory feature of the seal is due generally speaking to food conditions but the departure from the Islands in October is due mostly to the approaching winter conditions. There seems to be a relations between 100 fathom curve and the location where the seals get their food. The cows most frequent feeding ground is about 75 miles SE to NW of the Pribilofs, just off 100 fathom curve."

"The cows are usually about three years old when they bear their first pups, having but one offspring at a time. Cows can easily recognize the young by the individual cries in addition to the peculiar individual odors. The mother single them out of thousands but the pups don't seem to be able to recognize their mother. The apathy with which the young are treated by the old is rather strange. They are seldom fondled. The cows show little concern over the death of their offspring once they leave them."

"Bulls have a number of peculiar tones but cows can only bleat. When surprised the seal will usually sit up in an erect position and growl and make a spitting noise, showing the teeth."

"About the middle of August there seems to be a breaking up of the harems as the breeding is over. They come and go at random, the cows going to sea more often than the bulls. The pups are clumsy and weak but take to the water to learn to swim. They soon swim and seem to thoroughly enjoy themselves. By the 15th of September they are out on their own resources except for food. By one October the rookeries are pretty well broken up. By 30th October very few remain. The falling snow and the heavy rain have thoroughly discouraged them. The seal likes cool, moist weather. The hazy, foggy weather of June, July and August is to their liking. They apparently do not like temperatures of $50^{\circ}$ F."

When the natives off the coast of the United States kill their seals during the months of March and April, it is done by canoe at sea. The fishing gear consists of two spears which are fitted to a pronged pole about 15 feet long. To the spear is attached a line which is fastened to the spear pole or is held in the hand of the spearman when he throws the weapon. A seal club is also provided as well as two seal skin buoys, the latter being taken in the canoe to be used in rough weather or if a seal, having been speared, cannot be managed with line, the other buoy is bent on and the seal played. Its efforts to escape by driving and plunging soon plays out the seal and it is then hauled alongside and clubbed. Killing the seals ashore is somewhat different. The killing of seals occurs during the last two weeks of July. Early in the morning the fur-seals from one rookery or another are cut off from escape by sea and are driven inland. About half a mile from the shore the herd is examined. Old males, females and puppies are selected and freed from the drive and returned to the shore, and the males between three and five years old are driven to the killing places. The weight of the skin must be between 8 and 12 lbs. They are driven slowly and permitted to halt and cool off at regular intervals, as heating them injures their fur. They seldom show fight and move along like a flock of sheep. When they reach the killing grounds, they are rested and cooled and when ready the eligible males are driven from the herd, surrounded by natives who then do the killing by striking each seal on the head by a blow from a heavy club. A single stroke properly delivered will crush the bone of the seal's skull at once. The finishing touches are made then with a long knife thrust into the heart of the senseless seal and it is then bled. After the killing, the body of the seal is rolled over on its back and the natives make a single cut through the skin along the neck, chest and belly from the lower jaw to the tail. The hind and fore flippers are lifted and a circular hole is made, and the hide is cut free from the body. The skins are cleaned and then salted and at the end of the season are brought south and delivered to the designated firm to prepare the skins for auction.

## REPORT OF CAPTAIN HOOPER, U.S.R.M.

21 NOVEMBER, 1892.

The native hunters divide the seals into six classes as follows:

| | |
|---|---|
| Sok'atch | Old Bull |
| Polu-sok'atch | Half-grown-bull |
| Holosty'ak | Young male |
| Mátkah | Breeding cow |
| Molodáya-mátkah | Young cow |
| Koteck | Pup |

As a result of my investigations I find that the fur seals when leaving Bering Sea in the fall go through Four Mountain Pass, Umnak Pass, Akutan Pass, Unimak Pass, and the False Pass; by far the greatest number, probably a majority of all the pups going through Unimak Pass which being wider than the others, is less subject to strong currents, tide rips, etc., than the narrower passes. It coincides most nearly with the line of travel of the migratory herd of cows, young males, and pups which go to the coasts of California, Oregon and Washington, etc., as well as that of a large number of males which remain in Alaska waters during the winter.

It is also the most available pass for the use of all classes of seals on account of the prevailing winds. Seals always travel with a fair wind if possible. A few stray individuals only, mostly pups go through the narrow pass between Akutan and Akutan Island; which on account of its rapid currents, rocks and reefs is filled with tide rips and overfalls.

According to native testimony, the season during which the sok'atch or old bulls go through the passes is from the 15th to the 22nd of October. They leave the sea ahead of the migrating herd, always travel by themselves and go very fast. After leaving Bering Sea they go to the eastward and pass the winter south of Unimak Island and the Alaska Peninsula and in the

Alaskan Gulf. During our spring cruise we found large numbers of them off the Mt. Fairweather region where they had undoubtedly wintered. Although I made inquiry at that time of all hunters both white and native met with and had a careful lookout kept from the vessel at all times, I could not learn of any number of old bulls having been seen south of the southern limit of Alaska and only vague rumors of a limited number being taken as far south as Forrester Island near Dixon's Entrance. Polu-sek'atch or half-grown bulls are often erroneously called "Old bulls" by the white hunters, the name being properly applied to the old males inhabiting the breeding rookeries. The old bulls are very large, weighing from six to eight hundred pounds, perhaps more. Two were taken by the "CORWIN'S" hunters from the herd encountered off the Mt. Fairweather region, the pelts of which weighed sixty-one and sixty-five pounds respectively.

Individuals of the Polu-sek'atch are sometimes found with the migrating herd of cows, young males and pups but by far the greater number of them as well as many of the larger Holosty'ak remain in Bering Sea or in the waters off the Coast of Alaska all winter. They are seen during the winter by the natives of Belkofsky, Unga, and Sand Point when out sea otter hunting and are both seen and taken by the Sanak natives throughout the winter. Many Holosty'ak and Polu-sek'atch remain upon the Pribilof Islands until the ice comes down, and drives the fish away when they must search for other feeding grounds. As I have stated in a former report to the Hon. Secretary of the Treasury, I landed upon St. Paul's Island about the 24th of January, 1886 and was informed that a "drive" had been made the day previous and a large number of Holosty'ak (about one thousand) killed.

But a few male seals of more than four years of age accompany the migrating herd on its voyage across the Pacific. A large percentage of all the adult male portion of the fur seal herd remain in Alaskan waters throughout the year, spending the time from May until October upon the Pribilof Islands and the balance of the year in Bering Sea and the Pacific Ocean near the Alaskan Coast. The great migrating herd consisting of Mat'kah, Molodaya, Holosty'ak, and Kotock begins to go through the passes about October 22nd. The invariable answer made by the natives to the question "What time do the cows, young males and pups begin to go through the passes?" was "Desya' travo Octy a bri'ya" - October 10th old style or October 22nd new style. At first they are seen in very small numbers; as a rule I think but a few stray individuals go through the passes before the first of November and the herd is not fairly upon the move before the tenth.

While cruising near the passes during October, we saw but five seals in all. On October 20th, two were seen an adult and a pup in the Bering Sea near Unimak Pass. They had apparently no intention of going out at once as they were playing and were in reality swimming away from the pass when seen. On October 22nd, two more seals were seen as before an adult and a pup in the south end of False Pass, commonly called Morzovia Straits; just entering the Pacific. On the same day some hours later a single adult seal was seen near Amagat Island a few miles east of False Pass. It had doubtless come through the pass.

On November 3rd, while cruising in the vicinity of Four Mountain and

Umnak Passes under favorable conditions, a north west wind and a moderate sea, a few seals were observed; in each case only single individuals were seen and those seemed to be equally divided between adults, yearlings and pups. No seals were taken by the native hunters at Kashega, Macushiu or Akutan this year during October.

The first seal seen in Unalaska Bay this year was on October 21st, and but five had been seen in the bay up to the end of October. A record kept at Unalaska for the past twelve years shows the average date of the first appearance of seals in the bay to be October 24th, and the average date of the last appearance to be January 1st., the earliest and latest dates being respectively October 18th and January 4th. During strong gales, the pups come into the bays in the vicinity of the passes for temporary shelter. This fact doubtless gave rise to the belief that the adults and pups travel separately when leaving Bering Sea -- a belief that has no foundation in fact.

The season during which the seals use the passes to the west of Unalaska (Four Mountain and Umnak) ends about December 1st, one month earlier than in the passes to the east of Unalaska Island. This undoubtedly is due to cold westerly and north westerly gales which occur in December and the seals' dislike to traveling against wind and sea as shown by the testimony of all natives. They can go from the Pribilof Islands to the passes east of Unalaska Island, (Akutan, Unimak and False) with a fair wind, while to reach the passes west of Unalaska Island, they have almost continual strong head winds and seas to contend with after the end of November.

About the end of December, a little more than two months from the time the first seals appear in the passes going from Bering Sea into the Pacific, the main body of the herd may be considered out of Bering Sea, although some reasons seals are seen in the passes as late as the 12th of January. The close of the migrating season varies a few days from year to year, according to the condition of the weather, an early approach of winter causing an early southward movement of the seal herd and the contrary. In about the same time that the main body of the herd has occupied in going through the passes and before the last of it is fairly through, the first part of the herd has made its appearance upon the coasts of California and Oregon, having travelled a distance of more than two thousand miles, more than double the distance made at any other part of the route in the same time. In view of all the circumstances, the stormy condition of the sea, the prevalence in the Pacific of heavy easterly gales, the seals' dislike to swimming against wind and sea, the delay necessarily caused in obtaining food, the fact that a portion of the migrating herd consists of pups not yet six months of age and considering further the rate of speed at which seals travel on other parts of the route, they being five months and a half from January 1st to until June 15th making the return trip from the coast of California to the Aleutian Island Passes, following the coast line which increases the distance about one-third, it is evident that the seal herd after leaving the passes makes its way to the coasts of the Pacific States without unnecessary delay. The part of the herd which first goes out through the passes takes a more southerly route than those that go later. But a small part of the entire herd goes to the coasts of California, and Oregon. Many seals reach the coast farther north, some of those going out through the passes last going no doubt direct to the coast of Washington and even farther north. In 1886 during a passage in the United States Revenue Steamer "Rush" from Puget Sound to Unalaska, where we arrived on the 19th of January, I saw fur seals nearly every day, the vessel having passed through the herd then on its migration from the passes to the coast and extending entirely across the Pacific Ocean.

The time of the appearance of the fur seal herd off the coast of the Pacific States differ slightly with different seasons, but as I learned during my investigations last spring and as I have already reported coincides with the arrival of the smelts, herring and eulachon which each spring come into the rivers in large numbers to spawn. If the fish come into the rivers unusually early the seals appear off the coast correspondingly early; if the fish are late the seals also are late. That the seals must find fishing banks on the route does not follow; the supply of surface fishes, squib, it appears to be ample for their wants. Both in Bering Sea and the Pacific Ocean during our summer investigations, we found herds of seals with their stomachs well filled in nearly two-thousand fathoms of water.

In relation to the way seals travel, whether singly or in bands, the natives agree that they travel singly or in small bands never exceeding five or six and generally by twos and threes.

One intelligent native in answer to the question, said "Seals travel like people - sometimes one goes alone and sometimes with another".

Systematic observations of the movements of the seals in the Pacific Ocean near the passes at this season of the year is impracticable. Almost constant gales and thick weather prevail. In the influence of the strong currents through the passes the sea is very rough and even were it possible for a vessel to remain there, few if any seals would be seen. Under such circumstances, the seals travel very fast and remain under water except when forced to come to the surface to breathe and then only the nose is above the water for a moment. In bad weather on the sealing grounds in the Pacific and Bering Sea, the seals disappear so entirely that the Indian seal hunters believe they go to the bottom and remain there until the weather becomes better.

But having previously observed the seals over the entire route and over a large portion of it many times, I am able to state positively that in no part of it do they travel in bands. Leaving San Franciso in March of the present year, I followed the seals along the coast northward to the Alaskan Gulf making careful observations of their habits, etc; subsequently and while the seals were still moving toward the passes, I went several times over their track between the Alaskan Gulf and the passes. I spent the month of August observing the seals in Bering Sea and in addition the cruise just completed covering October and a part of November.

As stated elsewhere in making the passage from Puget Sound to Unalaska in January 1886, I passed entirely through the seal herd then making its migrating to the "coast". I have cruised in Bering Sea seven seasons including the present and have many times been along the coasts of California, Oregon and Washington during the months that the seals were present. I have at all times in Bering Sea in the Pacific Ocean and in the Aleutian Island passes seen seals travelling singly or in twos and threes; frequently a young male, female and pup are seen together, the only exception to this being when they haul out on floating patches of kelp. In Bering Sea, I have often seen a dozen or twenty seals upon one patch of drift kelp apparently resting. If disturbed, however, they spring into the water and separate, entirely regardless of each other. From my own observations and what information I can gather from all sources, I believe that upon leaving the islands in the fall, the seals are entirely independent of each other, each following its own inclination, and that the small groups of twos and threes sometimes seen are but temporary and more accidental than otherwise. The coast of the Pacific States is the destination of the herd after leaving the passes, and a milder climate and the small fish that infest the rivers in the spring the incentives. The southern range of the herd being determined by the individual likes is reached by but a small part of the entire herd. Up to the time of reaching the coast the seals are very much scattered. After reaching the coast and while following it along to the northward the scattered seals close up somewhat and assume at times something the character of a herd or band. This however is but accidental. If disturbed, they always scatter in all directions instead of moving off in one direction as do walrus, sea-lion, porpoises and other animals that are known to travel in bands or schools.

On November 10th, the CORWIN left the vicinity of the passes and shaped a course for San Francisco. No seals were seen on that day. On the following morning in Lat. 51° 49' N., Long. 160° 26' W., one seal apparently a yearling was seen and on the morning of the 12th in Lat. 50° 08' N., Long. 156° 40' W., what was believed to be a pup seal was seen -- the only seals seen during the passage although a good lookout was kept at all times.

## THE SEA LION.

The sea lion is a great furless seal. Its color is dark chocolate brown. The length of a full grown male is about 11 feet and its weight is as much as 1100 pounds. The female seldom is over ½ the size of the male. The baby seal weighs approximately 25 pounds and is about 2 feet in length.

The seal lion is polygamous. Like the seal the bulls congregate on their rookeries. Three or four weeks after the bulls establish their homes the cows make their appearance. Usually a savage fight occurs between males the younger and weaker ones are driven away leaving the larger and stronger bulls in charge forming harems of about 12 cows each.

The young are born during the months of May and June. The young must strive for themselves early in life their lot being somewhat different from the baby walruses.

The sea-lion as a whole remain in the vicinity of their rookeries the year round. They are a timorous lot. If they are approached by man the bulls and cows rush off into the water, leaving their young behind.

They usually swim offshore for a safe distance and huddle together in packs of about 200 each. They hold their head and neck high out of water roaring in concert incessantly making a deafening noise as in protest of their being disturbed. As soon as they are left alone they return to their rookery. They swim with ease and with considerable speed. As they approach the beach their heads are held well up, out of the water as tho picking the best landing place. In beaching they seem to take advantage of the existing swells and sea to help them land. On shore they can travel at approximate speed of one mile per hour.

The sea-lion altho provided with flippers similar to the fur seal cannot use them as freely. They seldom explore very much ashore but locate in a strategic position and sprawl all over the ground.

The voice of a sea-lion is a deep roar. When natives have a sea-lion drive it parallels the seal drive. The bulls however, are shot down and the female speared.

The hides are used for boats, the intestines for water proof clothing, the meat for food, the skin of the flipper for soles of boots and the oil for light and fuel.

The food of the sea-lion consists generally of fish, mollusk, crustaceans, or birds.

The sand beaches of Bogoslof were beset with sea-lions. They seemed to keep well clear of the rocks while at Boulder Island and Walrus Island, they seemed to remain on the rocks at all times.

## THE WALRUS.

The walrus is a member of the seal family but is larger and lives in much colder water. They are helpless bundles of blubber protected by a thick tough skin from ½ to 3" thick. The female is smaller than the male. Its tusks are smaller, thiner and set closer together.

The walrus can float with ease, swim at a fair rate of speed and while ashore can waddle at about 1 mile per hour.

The walrus are more or less gregarious and do not seem to be migratory. They limit their movement to the shore line and to large masses of ice.

The walrus is monogamous. During the months of May and June they head for shore when the female gives birth to their young, usually one pup but seldom more than two. The female suckle their young for a long period. Keeping well clear of the rest of the herd with their new born. The walrus protects its young and is extremely affectionate. When one is injured the whole herd usually gets into action. They are not easily alarmed and it is for that reason a hunter can approach very close to them. Unless attacked the walrus is really inoffensive and harmless but becomes a powerful and dangerous enemy when annoyed.

Their voice is a loud roar which can be heard a long distance. Their roar in a fog is usually a sign of ice or at least of cold water.

Walrus subsists on mollusks and sea grass which, they obtain from the bottom of the sea by digging with their tusks. The shells are removed by means of their teeth and their tongue. The young live for about two years almost solely on the milk of their mother, they being unable to dig for their food until their tusks have attained at least 3 inches in length. The tusks are also used as weapons.

Man is the main enemy of the walrus altho the polar bear is a consistent foe. The killer whale pursues the young walrus but never attacks the older one.

The walrus is killed today mostly by man with firearms. The hide is used for boats, the tusks for trade, the flesh and oil for food and the intestines for rain clothing for their natives.

SOUNDINGS

The CHELAN in 1934 under Commander F. A. Zeusler made an oceanographic survey and ran a series of lines of sounding to the northwestward in Bering Sea which indicated the existence of certain shoal water. The CHELAN in 1935 and in 1936 under Commander L. V. Kielhorn continued the survey work. The contour development is shown on the accompanying chart. This chart is submitted because of its bearing on the flow of water in the Pacific Ocean and in the Bering Sea.

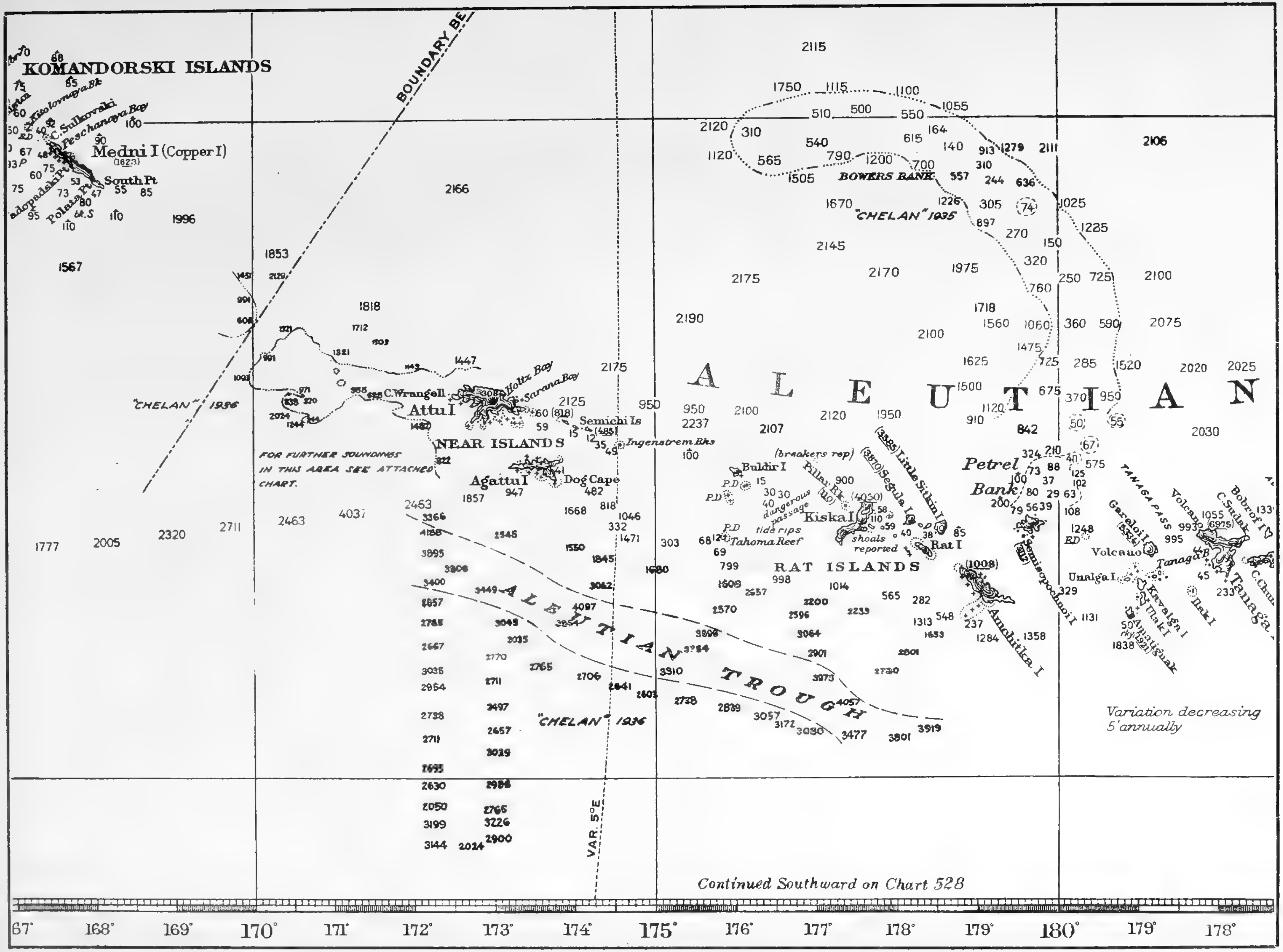
Extracts from letter of Commanding Officer, CHELAN, Commander L. V. Kielhorn, with reference to soundings in western Bering Sea and North Pacific Ocean are quoted as follows:

"Unalaska, Alaska,
25 September, 1936.

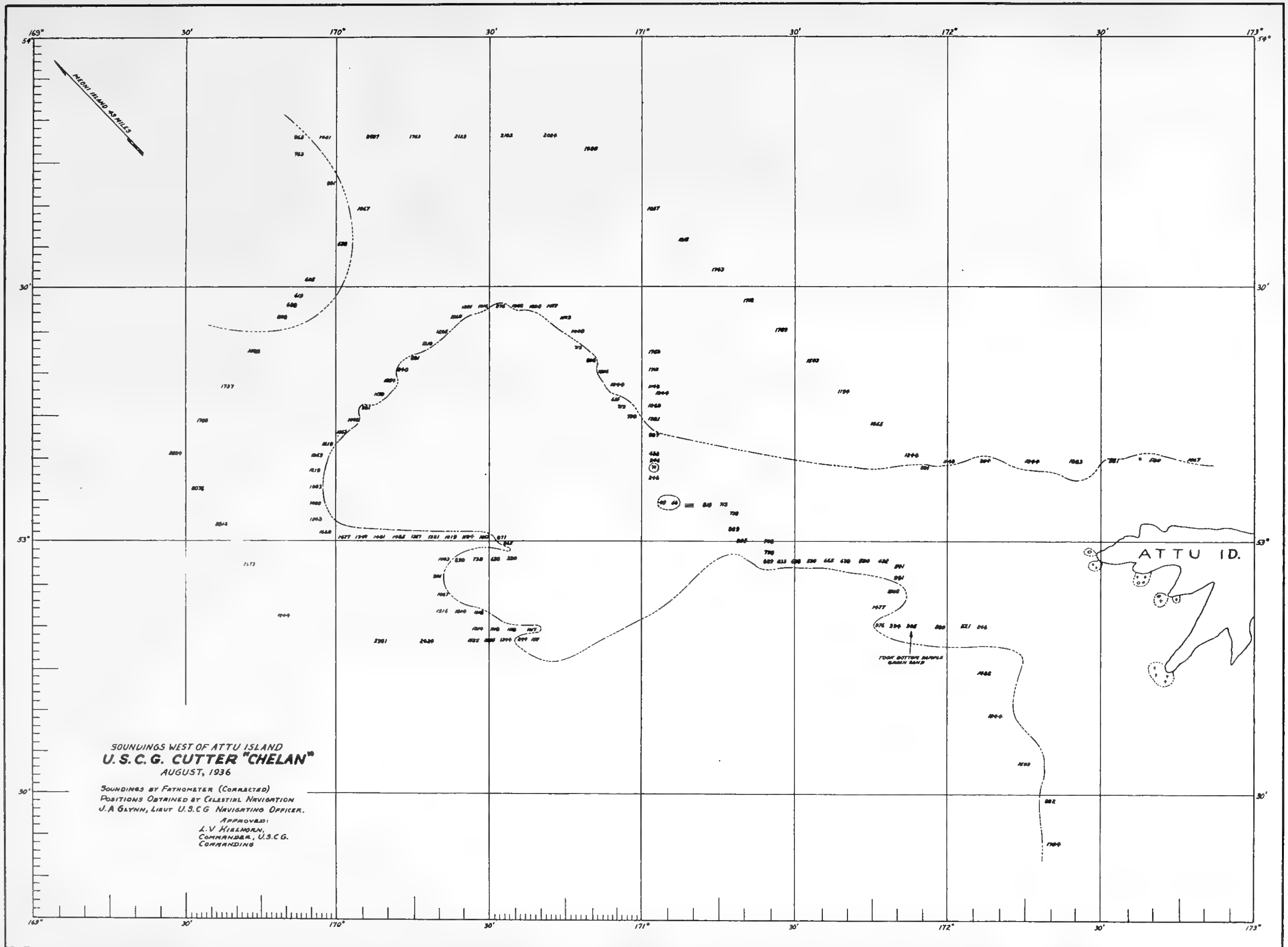
"The object of sounding south of the Aleutians to find and develop a bank reported south of Attu by an "old time sealer" as a herding place for young bull seals. The report stated that the shoal was known to most of the older sealers who visited Japan and Copper Island and that it was crossed diagonally when returning from the Commander Islands and to Cape Flattery. The CHELAN failed to find such a bank, but instead, learned that the Aleutian Trough is much narrower, closer to the islands, and deeper than hitherto supposed. There is reason for believing also that it extends further west than at present shown.

"Upon leaving this area for Attu it was decided to join the thousand-fathom curves on the northern and southern sides of that island. Much to the surprise of all the curve took the ship more and more to the westward, where, in Longitude 170 east, it terminated in a shoal, triangular in shape, and of large area. Evidence of another shoal beyond this was found extending to the northwestward. Time and approaching bad weather did not permit further exploration but sufficient information is uncovered to indicate quite clearly that shoal water exisits here in much the same way as it does among the other groups between the Alaskan and Kamchatkan Peninsulas, thus establishing all these islands as of the same geologic period and origin. Much more work is necessary to develop the area west of Attu satisfactorily, but enough is now known to warrant belief that the soundings will show a highly irregular bottom with many pinnacles.

"The surveying was done under conditions exceptionally good for this region and season. Light variable breezes prevailed and, although observations could not be had as often as desired because of mostly



KOMANDORSKI ISLANDS
Medni I (Copper I)
South Pt
BOUNDARY BE
Attu I
C. Wrangell
Holtz Bay
Sarana Bay
NEAR ISLANDS
Agattu I
Dog Cape
Semichi Is
Ingenstrem Bks
FOR FURTHER SOUNDINGS IN THIS AREA SEE ATTACHED CHART.
"CHELAN" 1936
"CHELAN" 1935
BOWERS BANK
ALEUTIAN
Buldir I
Pillar Rk
Segula I
Little Sitkin I
Kiska I
Rat I
Tahoma Reef
RAT ISLANDS
Petrel Bank
Semisopochnoi I
Amchitka I
TANAGA PASS
Gareloi I
Volcano
Unalga I
Kavalga I
Ulak I
Amatignak
Ilak I
Tanaga I
C. Sudak
Bobrof I
ALEUTIAN TROUGH
VAR. 5° E
Variation decreasing 5' annually
Continued Southward on Chart 528
167° 168° 169° 170° 171° 172° 173° 174° 175° 176° 177° 178° 179° 180° 179° 178°


SOUNDINGS WEST OF ATTU ISLAND
U.S.C.G. CUTTER "CHELAN"
AUGUST, 1936
SOUNDINGS BY FATHOMETER (CORRECTED)
POSITIONS OBTAINED BY CELESTIAL NAVIGATION
J.A GLYNN, LIEUT U.S.C.G NAVIGATING OFFICER.
APPROVED:
L.V KIELHORN,
COMMANDER, U.S.C.G.
COMMANDING
ATTU ID.
MEONI ISLAND 43 MILES
TOOK BOTTOM SAMPLE GREEN SAND
169°
170°
171°
172°
173°
54°
53°
30'

overcast weather, the small drift, averaging less than one-fifth knot per hour (see current sheet), lessened the necessity of having them more frequently, and considerable confidence is to be placed in the accuracy of the work in general.

"The CHELAN is provided with a Submarine Signal Company fathometer, type 515E, and recorder, type 505, with two oscillators in parallel for deep soundings. With this device soundings of more than four thousand fathoms came in sharp and clear under normal conditions. There is also installed a wire sounding machine for depths not greater than a thousand meters, its use being primarily for obtaining water samples and temperatures. It is thus seen that the ship is well equipped for hydrographic surveying and dynamic observations. The fathometer was carefully inspected by an agent of the company in Seattle in June of the present year, both for operation and adjustment to the standard white light speed of 820 fathoms per second. In addition the wire sounding machine was used on several occasions to check the fathometer. Salinities were somewhat lower than expected but these determinations were checked a number of times and are believed to be correct. The water temperatures agree remarkably well with those observed in the Gulf of Alaska by the Coast and Geodetic Survey."

N.H.O.407 CURRENT REPORT HI-9

For Record in the United States Hydrographic Office

Vessel (name, flag, type) U. S. S. CHELAN C.G.

Master (name) L. V. KIELHORN, Comdr., U.S.C.G. Owners name and address

Observer (name and rank) J. A. Glynn, Lt. U.S.C.G. U. S. Government

Address to which an acknowledgment should be made Commanding Officer, U. S. S. CHELAN, C.G., Seattle, Wash.

Voyage: From Amchitka, Aleutian Island. to Attu, Aleutian Islands. on Hydrographic cruise south and west of Aleutians

Draft: Departure 14'3" For'd 15'6" Aft. Arrival 11'6" For'd 14'8" Aft.

| Year 1936 | | | Position | | Current | | Wind | Water temp. | Condition of Sea | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mo. | Day | Time | Latitude | Longitude | Set | Drift | Direction force | Injection | Am't | Swell | from |
| 8 | 20 | 1626 | 51-04N | 179-07E | | | NE 2 | 53 | NE 1 | NE | 1 |
| 8 | 21 | 1338 | 51-58N | 172-24E | 245° | 0.24 | | | | | |
| 8 | 21 | 1338 | 51-58N | 172-24E | | | SW 1 | 55 | SW 1 | SW | 1 |
| 8-22 | | 1335 | 50-02N | 173-00E | Nil | Nil | | | | | |
| 8 | 22 | 1335 | 50-02N | 173-00E | | | NW 2 | 54 | NW 1 | W | 1 |
| 8 | 23 | 1309 | 50-14N | 178-33E | 0° | 0.20 | | | | | |
| 8 | 23 | 1309 | 50-14N | 178-33E | | | W 2 | 54 | NE 1 | NE | 1 |
| 8 | 24 | 1320 | 51-36N | 175-27E | 70° | 0.12 | | | | | |
| 8-24 | | 1320 | 51-36N | 175-27E | | | NW 1 | 55 | SW 1 | SW | 1 |
| 8 | 25 | 1333 | 52-21N | 172-20E | 250° | 0.30 | | | | | |
| 8 | 25 | 1332 | 52-21N | 172-20E | | | SSE 2 | 54 | SSE 1 | SSE | 1 |
| 8 | 26 | 1318 | 53-09N | 169-56E | 350° | 0.25 | | | | | |
| 8 | 26 | 1318 | 53-09N | 169-56E | | | SE 2 | 54 | SE 1 | SE | 1 |
| 8 | 27 | 0908 | 53-20N | 171-39E | 15° | 0.12 | | | | | |

ADDITIONAL REMARKS

The current observation between Augst 24 and August 25 includes a 4-mile drift 350° between 2330 August 24 and 0700 August 25, during which time the ship was drifting in latitude 53-23N, 171-02E. Subsequent observations of the sun determined this drift which observations were taken before noon, 25 August.

FATHOMETER CORRECTIONS TO STANDARD

VELOCITY 820

Locality off ATTU, ALEUTIANS, August, 1936.

Observed data indicated by asterick

Other Salinities indicated by formula:

$$X = \frac{y^{72}}{10^{106.8447}}$$

and other temperatures adopted.

| DEPTH | | Salinity | Temperatures | Correction |
|---|---|---|---|---|
| Meters | Fathoms | °/oo | °C | Factor |
| 4* | 2.2 | 31.00* | 11.5* | |
| 15* | 8.2 | 31.25* | 10.5* | |
| 30* | 16.4 | 31.45* | 8.25* | |
| 50* | 27.4 | 31.85* | 5.5* | |
| 100* | 54.7 | 32.18* | 4.0* | 0.983 |
| 300* | 164.1 | 32.67* | 3.75* | 0.983 |
| 500* | 273.5 | 32.90 | 3.5* | 0.982 |
| 1000* | 547.0 | 33.22 | 3.0* | 0.984 |
| 1500 | 820.5 | 33.40 | 3.0 | 0.988 |
| 2000 | 1094.0 | 33.54 | 2.5 | 0.994 |
| 2500 | 1367.5 | 33.64 | 2.5 | 0.996 |
| 3000 | 1641.0 | 33.73 | 2.5 | 1.005 |
| 3500 | 1914.5 | 33.80 | 2.0 | 1.010 |
| 4000 | 2188.0 | 33.86 | 2.0 | 1.015 |
| 4500 | 2461.5 | 33.92 | 2.0 | 1.019 |
| 5000 | 2735.0 | 33.96 | 1.5 | 1.024 |
| 6000 | 3282.0 | 34.05 | 1.5 | 1.037 |
| 7000 | 3829.0 | 34.12 | 1.5 | 1.046 |
| 8000 | 4376.0 | 34.19 | 1.5 | 1.056 |

# BOGOSLOF ISLAND.

Bogoslof Island, the mystery island of the Bering Sea has long been the center of interest for the vessels of the Coast Guard while on Seal Patrol. Altho many positions have been reported its location was definitely ascertained by a survey party of the U. S. Coast and Geodetic Survey in 1935. Through the courtesy of that service the latest chart is included with other running surveys made previously by Coast Guard Officers. Bogoslof has never been inhabited by man but has always been a hauling out place for herds of sea lions and a nesting place for millions of sea birds principally murres and sea gulls.

Generally speaking the island is about 60 miles west of Unalaska and about 25 miles north of the Aleutian Islands. It is thus far off the usual trade routes and is seldom seen by the merchant fleet but it is visited each year by the cutters. It is for that reason many of the changes of the volcano reported have been observed by the Coast Guard.

This island was shown on the charts of Krenitzen and Levoshef in 1769. Captain James Cook on his third voyage, sighted an island on October 29, 1778 describing it as an "elevated rock which appeared as a tower". The rock, was no doubt the remains of an ancient island which was shown as "Sail Rock" on many of the early charts.

The first recorded eruption of Bogoslof or Joanna Bogoslof (St. John the Theologian) so called by the Russians, occured in 1796 when a large peak rose out of the sea close to "Sail Rock."

Father Veniaminoff the Russian Missionary to the Aleutians writes the following account:

> The new island, Bogoslof, in latitude 53° 58' north and longitude 168° 05' west, rose from the sea in the early part of May, 1796. Before the island appeared above the sea, there had been witnessed for a long time in that spot, a column of smoke. On the 8th of May, after a strong subterranean noise, with the wind fresh from the northwest, the new small black islet became visible through the fog; and from the summit great flames shot forth. At the same time there was a great earthquake in the mountains of the northwest part of Unmak Island; accompanied by a great noise like the cannonading of heavy guns; and the next day the flames and earthquake continued. The flames and smoke were seen for a long time. Many masses of pumice stone were ejected on the first appearance of the island.

In 1806 Langsdorf passed the island and said that the center point looked like a pillar. At that time there were four rounded summits which rose over above the other like steps. The new island apparently continued to grow and in 1817 its circumference was estimated at 2½ miles. At that time its height was estimated at 350 feet. From reports, in 1823 the island cooled sufficiently for it to become a rookery for sea-lions and a bird sanctuary.

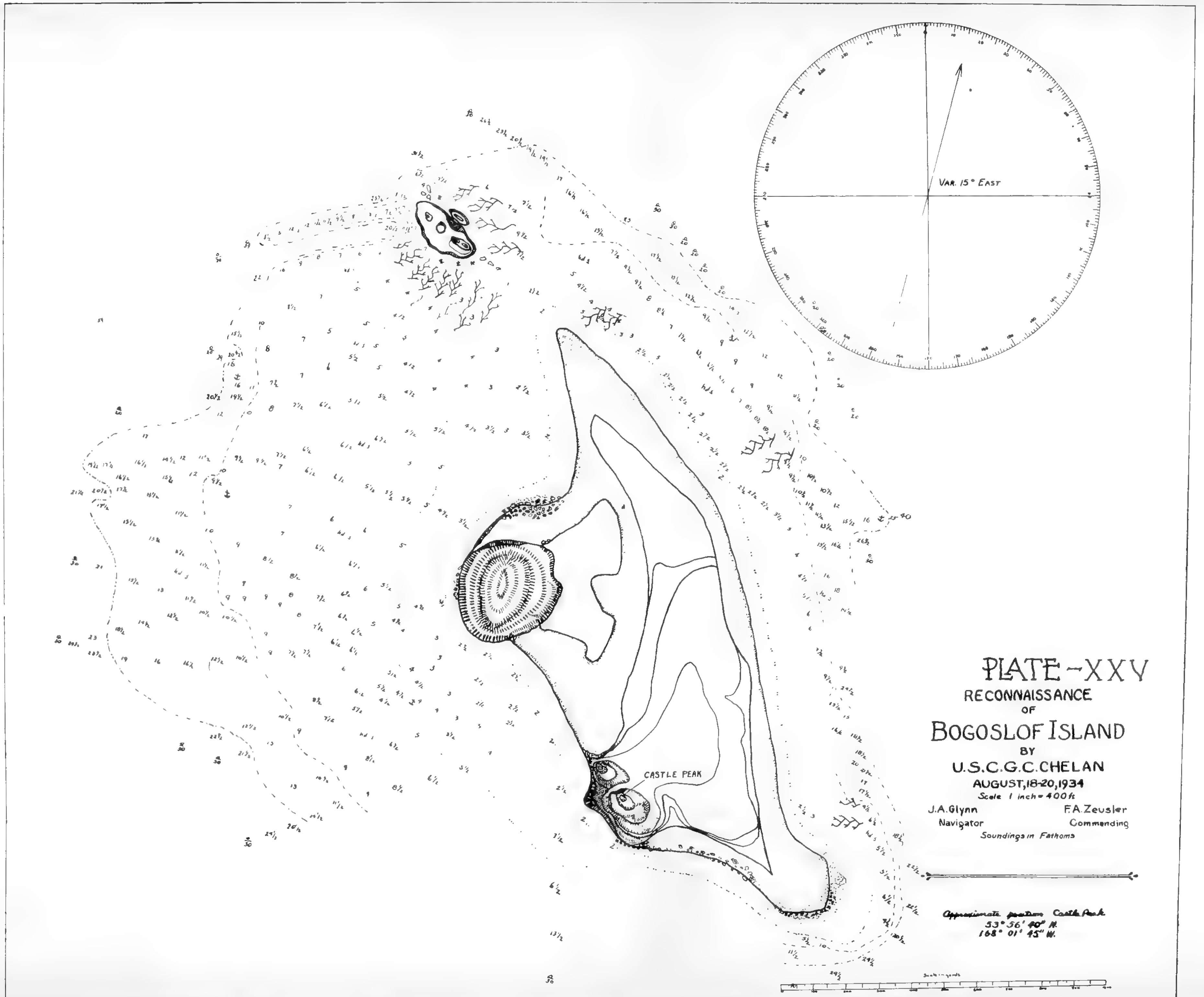


PLATE – XXV
RECONNAISSANCE
OF
BOGOSLOF ISLAND
BY
U.S.C.G.C. CHELAN
AUGUST, 18-20, 1934
Scale 1 inch = 400 ft
J.A. Glynn
Navigator
F.A. Zeusler
Commending
Soundings in Fathoms
Approximate position Castle Peak
53° 56' 40" N.
168° 01' 45" W.
VAR. 15° EAST
CASTLE PEAK

It is reported that in June 1820 the Russian sloop "Good Intent" passed by the island. At that time the island was cold, as sea-lions were along the shore line altho a column of smoke arose from the crater. The circumference was estimated at 4 miles and the height about 500 feet. The next report by Veniaminoff states that the island ceased to increase in 1823.

In 1832 the island was again visited. At that time it was about 2 miles in circumference and about 1500 feet high. The island was pyramidal in shape with a long tongue of land on which were seen herds of sea-lions.

In 1873 the scientist Dall visited the island and made a number of sketches. The island had become smaller and had changed materially.

The next great recorded activity occured about 1883. In September of that year Captain Anderson of the Schooner Mathew Turner landed at Bogoslof and found two peaks instead of one. The new peak was found to be about one mile north-northwest of the old peak. It was estimated between 800 and 1200 feet in height. It was steaming and smoking violently. This new peak was known as New Bogoslof for a period of time but gradually became known as Fire Island its present name.

In 1884 Lieutenant Cantwell and Lieutenant Doty of the Cutter CORWIN charted the island. There was a vast change in appearance in 1873. Extracts from the report are herewith quoted:

REPORT OF SECOND LIEUT. JOHN C . CANTWELL. U.S.R.C. CORWIN, 1884.

"Approaching the island from the northeast it has the appearance of being divided into two parts, the northern portion being in a state of eruption and the southern portion a much serrated rock rising almost perpendicularly from the sea, while between the two and nearer the northern part of the Bogoslov a tower-like rock rises with a slight inclination towards the north to a height of eighty-six feet. At a distance it might be easily mistaken for a sail upon the horizon; for this reason it is called Ship Rock or Sail Rock. A nearer approach discovers the fact that the two elevations are connected by a low, flat beach free from rocks and affording an axcellent landing place for small boats. The CORWIN steamed around the northern end of the island and close enough to obtain an accurate view of the volcano. The top was hidden by clouds of steam and smoke which issued not only from the crater but also poured forth with great violence from rents or areas in the sides of the cone. On the northeast side these apertures are particularly well defined. I counted fifteen steam jets forming a group situated on a horizontal line about two-thirds the distance from the base to the apex of the cone. This group was the more noticable on account of the force with which the steam escaped as well as the marked regularity of the spaces separating the vents. The sketch marked A gives a view of the northern end of the island and the position of steam jets mentioned above.

"When the center of the island bore northeast and distant three-quarters of a mile the CORWIN was anchored in thirteen fathoms water and a boat lowered in which we proceeded towards the shore, sounding in from ten to twelve fathoms until within one hundred and fifty feet of the beach, when the water gradually shoaled and we landed without difficulty, the wind being light from northeast and the sea smooth. The landing place is shown in the sketch marked B.

"The narrow isthmus connecting the old and the new formations is composed of a mixture of fine black sand and small oolitic stone, the greatest quantity of sand being on a line dividing the island longitudinally into two parts. During our stay the water did not rise high enough to cover this beach, but pieces of drift-wood, algae, etc., found on the highest parts fully show that at times of highest tides or during severe storms the entire isthmus is submerged.

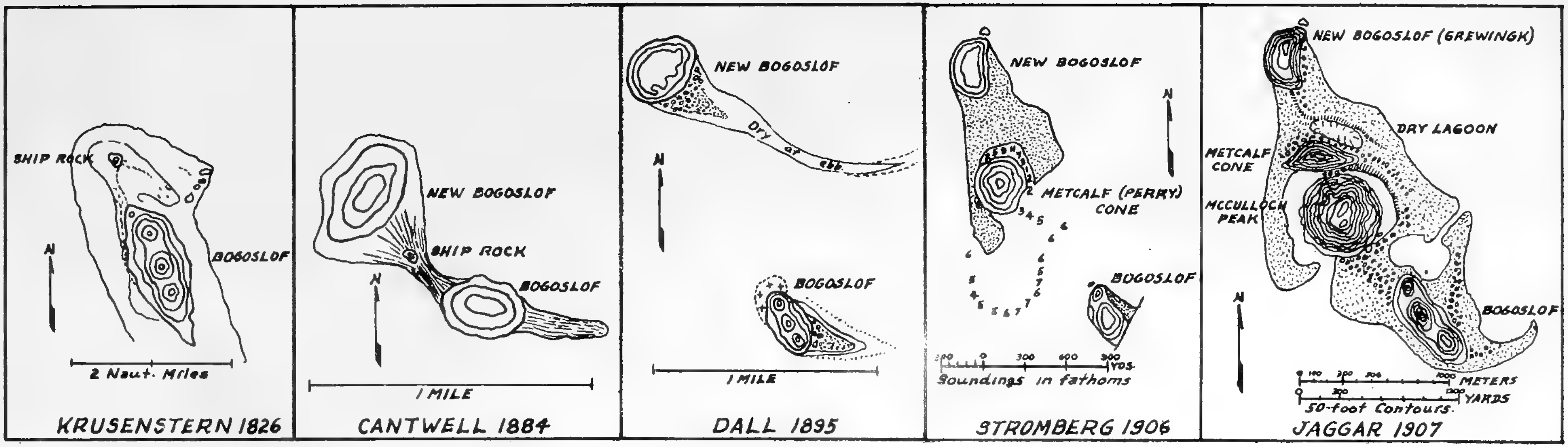
"The sides of the Bogoslov rise with a gentle slope to the crater and the ascent at first appearance is easy, but the thin layer of ash formed into a crust by the action of rain and moisture is not strong enough to sustain a man's weight. At every step my feet crushed through the outer covering and I sunk at first ankle-deep and later on knee-deep into a soft, almost impalpable dust which arose in clouds and nearly suffocated me. As the summit was reached the heat of the ashes became almost unbearable, and I was forced to continue the ascent by picking my way over rocks and bowlders whose surfaces being exposed to the air were cooler and afforded a more secure foothold.

"The temperature of the air at the base was 44° and at the highest point reached 60°. A thermometer buried in the sand at the foot of the cone registered 44°, half-way to the top, 191°, and in a crevice of the ramparts of the crater the mercury rapidly expanded and filled the tube, when the bulb burst, and shortly afterwards the solder used in attaching the suspension ring to the instrument was fused. We estimated the tempertture at this point to be 500° Fahrenheit. The temperature of the water around the island was the same as that of the sea, as observed on board the CORWIN at the time, was 40°.

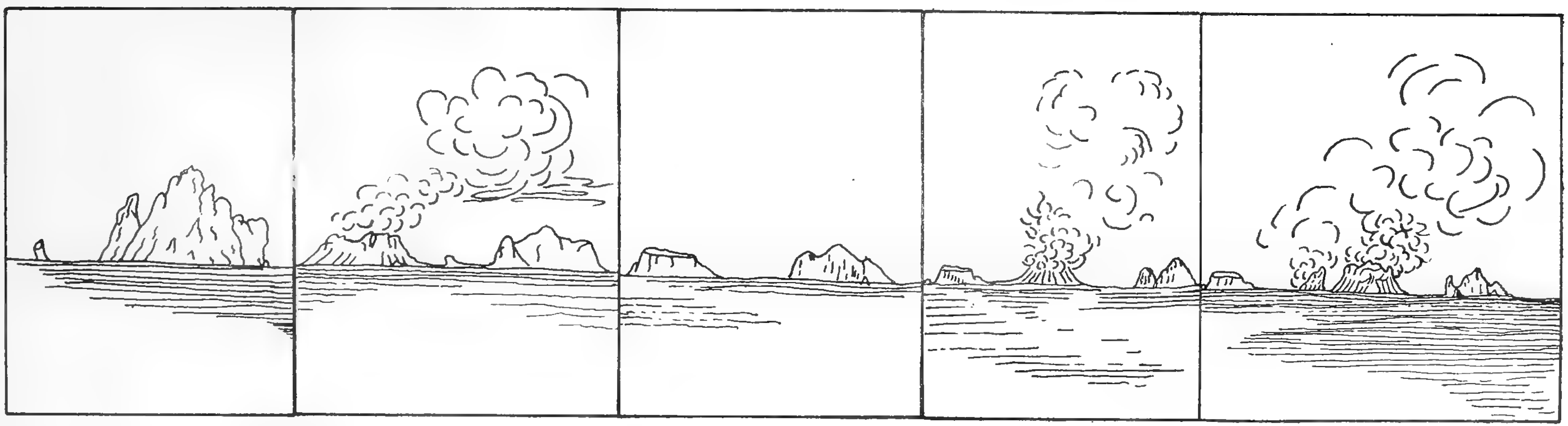
"On all sides of the cone there are perforations through which the steam escaped with more or less energy. I observed from some vents the steam was emitted at regular intervals, while from others it issued with no perceptible intermission. Around each vent there was formed a thick deposit of sulphur, the vapor arising from which was suffocating and nauseating in the extreme.

"An examination of the interior of the crater was not satisfactory on account of the clouds of smoke and steam arising and obscuring the view. On the northwest side the surface of the cone is broken into a thousand irregularities by masses of volcanic and metamorphic rock. On allother sides, however, the accumulation of ash and dust has almost entirely covered the rocks and the sides appear more even and less precipitous.

"A curious fact to be noted in regard to this volcano is the entire absence, apparently, of lava and cinder. Nowhere could I find the slightest evidence of either of these characteristics of other volcanoes




CHARTS AND CORRESPONDING SKETCHES OF BOGOSLOF ISLAND.



COURTESY OF THE BULLETIN OF THE AMERICAN GEOGRAPHICAL SOCIETY OF NEW YORK.

A

hitherto examined in the Aleutian Islands. Small quantities of rock-froth consisting of unfused particles in a semi-fused mass were seen, but the heat of discharge has evidently never been sufficient to produce firm fusion. Specimens of dust collected from one of the vents was compared with volcanic dust which fell in the village of Ounalaska October 20, 1883, and found to be identical in character.

"Descending to the beach on the east side I found it to be much the same formation as on the west side, with perhaps the exception that the line of sand here approaches nearer the water-line. The pebbles seen on the island are universally of a dark-gray color, with small black spots and worn surface by attrition.

"I saw no shells and but little sea-weed. Kelp in considerable quantities, however, was observed close inshore.

"A walk of a third of a mile brought me to old Bogoslov, where the beach abruptly terminates. The northern end of this rock rises almost perpendicularly to a distance of some 325 feet. Its face is deeply indented at the base, forming a cave-like recess which gives the rock the appearance of leaning toward the north.

"Probably nowhere can there be found a better example of the disintegration of stone into soil by the action of the atmosphere. The composition of the islet was originally of slate or shale. It is now breaking down on all sides and crumbling to dust. The central portion seemed to be composed of a more enduring substance, but a close examination was impossible on account of the loose, crumbling nature of the rock forming the sides and the precipitous ascent. I fired a rifle-shot into a flock of puffin, myriads of which were perched in the clefts and niches of the rock, and when they rose small pieces of stone were detached and inturn displaced larger pieces of stone until a perfect avalanche of stone came down the declivity, scoring great ruts in the hillside and tearing up great masses of stone, which were dashed to pieces on the shore below.

"Specimens of outer rock were found at the base of the old Bogoslov, on the southern side, which, being struck with a hammer, crumbled to dust, in some cases deeply tinted with red, showing the presence of iron.

"Hard bowlders of some hard, smooth stone fringe the bases of both the old and new Bogosloff, but a careful examination of the surrounding waters, both in small boats and on board the CORWIN, failed to show any outlying dangers. A spot of sand and pebble formation extends from the southern end of old Bogoslov four-tenths of a mile in a southeasterly direction, and, like the isthmus connecting the two islands, is probably submerged at times of highest tides or during severe storms. The depth of water around the island is shown upon the chart accompanying the report.

"Puffin in great numbers were seen on old Bogoslov, and it is probable they make this isolated spot a breeding place. I also saw numbers of harlequin-ducks, gulls, and kittiwakes. A dead albatross was picked up on the beach, but it is probable it was washed ashore, as its presence in these latitudes is not common. Several herds of sea-lions were found on the beaches and on the rocks of the island. They evinced no fear of our party until fired into, when they entered the water and followed us from point to point, evidently viewing our intrusion with the greatest curiosity and astonishment.

"Angular measurements were made on the shore by Lieut. D.W. Hall to determine the heights of the peaks and the dimensions of the island, with the following results:

| | Feet. |
|---|---|
| Height of east pinnacle old Bogoslov - - - - - - - - - - | 334 |
| Height of center pinnacle old Bogoslov - - - - - - - - - | 289 |
| Height of west pinnacle old Bogoslov - - - - - - - - - - | 324 |
| Breadth of base old Bogoslov - - - - - - - - - - - - - - | 933 |
| Height of Sail Rock - - - - - - - - - - - - - - - - - - | 875 |
| Width of isthmus (narrowest)- - - - - - - - - - - - - - | 326 |
| Length of southern spit - - - - - - - - - - - - - - - - | 1,824 |
| Extreme length of island - - - - - - - - - - - - - - - - | 7,904 |

"General trend of island, SE. by E. and NW. by W.

By observations of Lieut. J.W. Howison the position of Sail Rock was reckoned to be latitude 53° 55' 18" north and longitude 168° 00' 21".7 west."

In 1885 the CORWIN again visited the island at that time a narrow neck of land connected the island. The activity had stopped materially. There was little change from 1884. The lower peak was 450 feet and the higher one 525 feet.

In 1887 the island was visited by Mr. W.C. Greenfield, at that time the contours had changed materially.

In 1890 and 1891 the island was visited by the Cutter GRANT and by the U.S.S. ALBATROSS.

In 1895 scientist Dall again visited the island and found much erosion.

The Cutter GRANT under Captain Tozier visited the island in 1896. Lieutenant Commander Perry then a junior officer states:

> "There were two islands at that time separated by a channel 200 yards wide. These islands were inhabited by a great herd of sea-lions also by myriads of birds. The level ground was strewn with eggs and Perry Peak was honeycombed with nests".

In 1897 Dr. L. Stejneger passed close by the island taking pictures.

In 1898 the CORWIN visited the island and found much erosion.

In 1899 the Harriman Expedition visited the Bogoslof amd obtained considerable data.

In 1900 the cutter reported that the heat had died out on Fire Island. A passage between the two islands was found with not less than 7 fathoms of water.

Between 1900 and 1904 the island was visited by cutters which reported few marked changes until latter part of 1905 a new peak appeared half way between the two islands. This peak was connected with Fire Island and left a passage between it and Castle Island with a least depth of 5 fathoms.

Early in 1906 the island was surveyed by officers of the Cutter PERRY. The new peak was called Perry Peak. It was still separated from old Bogoslof by a channel about 7 fathoms deep but connected with Fire Island. In May 1906 the U.S.S. Albatross visited the island and observed the new steaming volcano. During the latter part of 1906 the cutter found that another peak was formed filling the space between Perry Peak and Castle Island, this again making one island of the group.

In 1907 a local trader visited the island and found that the additional peak had formed. This was later found by the McCullock in July of the same year and that one peak had half collapsed and that the channel between it and Castle Rock had filled up with McCullock Peak, estimated 500 feet high. In October the McCullock again visited the island. McCullock peak was gone and a hot water lagoon was in its place, the other peak still stood. The average life of the two new peaks in the middle were about 10 months.

In July 1908 the Cutter RUSH visited the island and the officers made another survey. Perry Peak had disappeared, a high ridge of land had been found extending from Fire Island to Castle Rock with a maximum height of 300 feet, the Castle Rock entrance had been closed and a new entrance near Fire Island had been found.

In 1909 the cutter visited the island but no important change occurred.

From this point on extracts of reports are quoted giving eye-witness accounts of the existing changes.

Report of Captain F. J. Haake, U.S.R.C.S., Commanding Revenue Cutter PERRY on observations of Bogoslof Island: - June 15-16, 1910.

"The formation of Bogoslof Island has undergone considerable change since our visit last year. The two small islets reported last year as having come up in the lake, have united and risen to a height of about 185 feet above the lake level, and extended to and joined the N.E. shore strip forming a neck of land extending into the lake in a S.W. direction: the shore strip on the N.E. side had also risen about ten feet above last year's height. Castle Rock, Fire Island, and the S.W. shore of the lake remain the same as last year. In the lake, which is salt water, we found temperatures ranging from 62 to 110 degrees. On the new land the most active portion is on its west side where considerable sulphur fumes and boiling water are emitted from small holes in the ground. There is no crater formation, and only at one spot on top

(N.W.Side) is any activity shown. There are a number of gullies leading from the top of the new land to the lake and the old land as if there had been a great rush of water: one place resembled a 4 foot road made by road scraper, perfectly smooth from top to bottom.

"To the navigating officer of this vessel, Lieutenant Waesche, is due the credit for the survey and photographic work, preparation of the sketch and collecting the specimens."

Report of Captain Quinan, Commanding U.S. Coast Guard Cutter Tahoma, September 14, 1910.

"Bogoslof Island is somewhat oval in shape and is about $1\frac{1}{2}$ statute miles long and three-quarters of a mile wide in its widest part, with its major axis lying in a north-west and south-east direction, magnetic.

"Its shore line is comparatively regular except at the north end, where there ia a large arch rock which at a distance appears detached from the main land but really connects with it by a low rocky neck. It has three distinct elevations; Fire Island, at the northerly end, 175 feet high; Castle Rock, at the southerly end, 289 feet high, midway between them. No particular difficulties presented themselves in computing the heights of Fire Island and Castle Rock, except the time necessary for setting up instruments and taking angles, and measuring base lines. With Perry Peak, however, the conditions were bad, as the base and portions of the peak were enveloped in vapor and steam and the lagoon was steaming. The height was finally computed and is approximately correct, as the top of Perry Peak when viewed from the ship was seen to be almost on a level with the top of Fire Island.

"Fire Island (175 feet high) apparently has not changed since the observations made by the Revenue Cutter PERRY in June, 1910, but the top and the side of Castle Rock (289 feet high) appear to be split off by earthquake effects of the recent eruption.

"The new land in the center has entirely changed its formation since the last observations were made. At that time it was in the form of a long sloping plateau; now the middle of this plateau has been dished out, forming two peaks, the higher one being towards Fire Island. The lower one, which is about 100 feet high, I have named Tahoma Peak for designation. At the same time a high embankment has been thrown up from the lagoon between Fire Island and the new land, dividing the lagoon in two parts, and making a uniform slope from the top of the high peak to the edge of the lagoon, and thus giving the only means of access to the new land.

"The lagoon is much narrower than shown on the sketch of Bogoslof made three years ago. On account of the high land, which has recently formed between the logoon and shore line, it was impracticable to get the boat over into the lagoon to take soundings.

"The new land between Fire Island and Perry Peak is soft-sun-dried and cracked towards Fire Island, and soft and steaming near the lagoon. The center of volcanic activity is at the base of the new land toward

Fire Island on the edge of the small lagoon. Here an area of several hundred yards is in violent agitation, boiling water spurting up through the mud, which gives up a dense steam and vapor, making it impossible to see farther than a few feet. Two pools of water, each about four feet in diameter, are in a state of excessive ebullition they are small geysers in fact, as the water is thrown to a height of about five feet by the rapidly escaping steam. On account of the escaping steam and the treacherous character of the ground which could not be trusted with one's weight, the farther end of this active area could not be examined. On the east side of the new land where it had been dished out, and at the edge of the lagoon, there is a group of steaming conical rocks of recent formation. The water in the lagoon around these steaming rocks is boiling, but the action is not nearly so violent as at the geysers.

"A number of sulphur patches were noticed in those places where vapors were rising.

"Along the western beach abreast of Perry Peak was found a cave-in about 18 feet in diameter and 15 feet deep; probably very recent, but nothing of importance to be noticed about it.

"No irregularities were noticed in the boat compass, which was observed at different points on the island, and seemed to be no magnetic influence.

"The sea lions at Sea Lion Point were just as numerous as formerly, but all the murres which inhabited Fire Island and Castle Rock are gone. In fact there were no birds on the island except a few sea gulls around the sea lion rookery. The skeltons of murres are scattered over all the island, showing that most of them must have been killed by the action of the volcano during the last three months.

"A number of temperatures were taken in the lagoon, and a uniform temperature of 107° F. was obtained except at the extreme northerly end, where it was found to be 90° F.

"Specimens of lava, pumice, sand, etc., were collected, temperatures taken at the places where found, and the specimens labeled as follows:

" * * "A" - taken at the edge of the lake at the extreme north-west end. The temperature of the lake at this point was 90° F. and of the soil 75° F.

* * * * * * * * * * * * * 

" * * "B" - found about 300 yards almost due east of Fire Island, and about 200 yards from the north-east shore of the lake. The temperature of the soil at this point was 108° F.

" * * "C" - found about 500 yards east-south-east of Fire Island. The temperature of the soil at this point was 140° F.

" * * "D" - found about 500 yards to the northward of Castle Rock. The temperature of the soil at this point was 70° F.

" * * * "F" - found in the mouth of a gas jet about 400 yards north by west of Castle Rock, and about 50 yards from the edge of the lake. Temperature 210° F. Numerous gas jets of this type extend all along the north-east shore of the lake, about 50 to 100 yards from the lake edge, and from the location of specimen "D" to specimen "F". Steam and some sulphurous gas rise from all these openings. A thin layer of sulphur surrounds all of them. The sulphur is in two forms: the ordinary flowers of sulphur, and the neddle crystal form.

" * * * "G" - found about 500 yards north-west of Castle Rock and about 25 feet from the edge of the lake. Temperature 75° F.

" * * * "H" - is the only weed observed growing on the island, found half way between Perry Peak and Sea Lion Rock. No temperature was taken.

" * * * "I" - taken at the extremity of the lake nearest Fire Island. The temperature of the water at this point was 90° F.

* * * * * * * * * * * * * * *

" * * * "K" and "L" - taken on the west side of the lake, about 500 yards south from Fire Island, and on the opposite side of the lake from the small crater, at the foot of Perry Peak, which is most active. The temperature of the water here was 107° F.

" * * * "M" - taken from one of the most active "Sulphur Beds" on the west side of the island, near the foot of Perry Peak.

"The temperature of the air along the island ranged from about 54° F. along the open beach to 58° F. under the lee of Perry Peak. The temperature of the sea water about the island at the average distance of 3/4 of a mile only varied from 43° F. to 45° F. The barometer registered 30.27.

"There have been no tidal observations as far as known at Bogoslof, but using Unalaska as a port of reference, at the time of computing the heights of the peaks it was low water and at the beginning of the flood. There is probably a range of about three feet.

"Numerous soundings were taken from the ship all around the island at a distance ranging from a half mile to one mile, and the bottom was found to be very deep, and irregular on the southwest side of the island. There and on the north side of the island, the discoloration of the water indicated some shoaling, although no reefs or breaks could be seen.

* * * * * * * * * * * * * * *

"We left Bogoslof at 6:45 P. M., September 14, 1910 and proceeded to Attu. On the 18th instant I shaped a course for Bogoslof, intending to take soundings from the ship's boats close to the island, in radial lines, before proceeding to Chernofski. About four o'clock of the morning of the 19th, when we were about 25 miles southwest of Bogoslof, the officer-of-the-deck reported forked lightning in the northeast. I thought this very strange, as it was a beautiful clear night with a gentle northerly wind, and I immediately concluded from these weather conditions, and its direction, that it had something to do with Bogoslof, as thunder storms are unheard of in the Bering Sea, especially in September. At daylight, an hour later, my suspicion was confirmed. When Bogoslof was first sighted, both Castle and Fire Island were visible; Perry Peak was in state of eruption. At first it resembled in appearance a waterspout, which afterwards spread and enveloped the whole island. On approaching the island it was found to be in violent state of eruption, throwing up immense clouds of vapor, smoke and ashes. A thick, dark cloud hung over the island, and at the same time a tongue of flame could be seen shooting up from the crater. Intermittent forked lightning split the clouds extending to the crater, followed by sharp peals of thunder.

"We were then four miles southwest of the island, and the wind shifting from northeast blew directly towards the ship. It was necessary to steam to the northward to avoid the ashes, some of which fell on the ship's deck, and which I gathered and marked "Specimen "K".

"The eruption though constant was intermittent in intensity, and presented an ever changing aspect. Vapor rose to a height of several thousand feet, spreading at the top and assuming a mushroom appearance resembling a huge white cauliflower. Then at times in the center of this white mass would appear a black streak of ashes, and mud, most of which fell on the island but some on the sea, pattering like immense drops of rain.

"Officers and men stood on deck fascinated with the magnificent spectacle, which was still further enhanced by the rays of the rising sun just peeping over Mount Makushin.

"After getting to windward of the island, we approached to within a little over a mile. All sea lions and gulls had disappeared. I deemed it imprudent to send a boat close to shore to obtain soundings, as I was afraid the wind which was light might suddenly shift.

"After remaining in the vicinity several hours and taking some valuable photographs, we proceeded to Chernofski.

"On the morning of the 21st, when returning to Unalaska, Bogoslof was observed to be still steaming."

Report of Lieutenant Commander K. W. Perry, U.S.R.C. MANNING 1911.

"On a cruise from Unalaska to Attou we kept off our course in order to visit these islands. We found that one island had entirely disappeared and the other greatly changed from its former appearance. The remains of Perry Peak emitted some smoke. Finding no anchorage the MANNING lay to and a party of us landed. We walked by shore half way around the island then walked across to our starting point. The surface was crusted and thickly perforated by fumeroles. Putting a finger into one of these, I found it very hot below the surface. This made us a bit uneasy and we hastened to the beach and went aboard ship.

"The hordes of birds formerly there had practically disappeared and the only sea lions we saw were in a small herd swimming along shore."

REPORT OF 2ND. LIEUTENANT L. L. BENNETT, U.S. COAST GUARD CUTTER MCCULLOCH, AUGUST 14, 1916.

"Landing was made on this island about 8:00 a.m., August 14, 1916, on its easterly side which furnished a good lee. The general trend of the island is northwest and southeast. It is located in the Bering Sea about 28 miles northward of Umnak Island, and is about a mile in extent and about 1/4 mile wide. The eastern beach is steep and no difficulty was experienced in landing. The first point visited was the Southern peak, called Castle Peak. This peak is about 200 feet high, and is the nesting place for thousands of murres which cover its slopes. At this season the hatching period of these birds is about completed and all the peaks are covered with young birds and broken egg shells. The ascent toward Castle Peak, from the east beach, is gradual, first the beach itself, then a plateau which occupies the entire middle portion of the island rising to the peaks on the western side. The surface of this plateau is covered with volcanic boulders,ranging in size from about the size of a football to that of a hogshead, and its surface is scored in an east and west direction by a series of comparatively clear lanes or spaces between the boulders, some of which are so free from rocks as to give the impression that they were cleared by hand. These lanes lead from the high ground, which rises into the peaks, to the eastern beach and are doubtless indicative of an ancient flow of lava. A short moss or mold, very green, is found on the gradual slopes leading to the peaks, but the peaks themselves are bare and rocky. The plateau ends abruptly on the northwest end of the island, rising sheer from a flat beach which terminates in a rocky point extending toward Fire Island. About half way between the cliff of the plateau and the rocky point forming the northeast spit, which seems to occupy the position previously assigned to Perry Peak, is a hot lake about 100 yards in diameter, from the surface of which steam is continually rising. Along the shores of this lake may be seen numerous gas bubbles. Between the lake and the cliff of the central plateau the beach is almost flat, and here occurs the only real vegetation on the islands. This consists of patches of coarse grass and short trailing vines. This end of the island contains a quantity of driftwood, which is some distance from the water's edge, and this point seems to be the principle rookery of the sea lions which inhabit this vicinity, there being eight dead pups lying about, also two medium sized dead lions. Both of the latter had a shot or harpoon hole in the back.

"As the eastern beach trands toward the northwest point it becomes rough, being covered with round boulders, and the point itself is a plateau about fifty feet high and composed of extremely rough and jagged volcanic rocks. This part of the island is so rough and broken that it is impossible to walk on it. The rocks are very warm to the touch and vapor rises from among them.

"Fire Peak, or Fire Island, is now a distinct island of itself, although it was obviously once a part of the main island. It is rounded in outline, shows distinct stratified markings on its eastern side, and is separated from the main island by a strait about 600 yards wide. This strait appears to contain numerous shoals, and is greatly frequented by the sea lions. An attempt was made to walk from the northwestern to the southeastern end of the island by way of the western beach, but it was found impossible to do so on account of the roughness of the beach, and also on account of the fact that the western side of Castle Peak descends sheer to the water's edge. The eastern beach is of an average width of about 75 yards. Except at its northwest end, it is smooth and free from boulders. It is composed of small particles of ground volcanic rock, no sand being noticed at any point of the island. The central plateau slopes toward the southeast point of the island into a smooth beach and spit, much frequented by sea lions."

REPORT OF CAPTAIN W. T. STROMBERG, COMMANDING U. S. COAST GUARD CUTTER ALGONQUIN, SEPTEMBER 13, 1922.

"Change is the only dependable thing about Bogoslof Volcano, unless the regular annual visit (for rearing their young) of the Murre, seagulls, and sea lions be an exception. Five times have I visited it. Five distinctly different views have I seen. The last time, as far as could be learned at Unalaska, that Bogoslof decided to make a sudden transformation was in 1916. There is much to cause one to accept this statement. The island is entirely cold. A few tufts of growing grass were found. The beaches have begun to show signs of permanemce (driftwood, sea grasses, etc.). The high plateau has many gullies on the eastern slope caused by the heavy rains.

"There was quite a contrast between my first visit (1906) and my last (1922). Then there was a large peak probably 450 feet in height about half way between Fire Island (Grewingk) on the North and Castle Rock on the South. This mountain was giving off sulphurous vapors. In the crevices we lighted pine slivers as we climbed its faces. Numerous vents fringed with bright yellow sulphur were found near its base. The peak was enshrouded in a dense vapor around its central rock, popularly supposed to have been what was known locally by mariners and shown by geographers as "Ship Rock". Cantwell's map (1884) shows it, while Dall's outline (1896) does not, although it is said to have later appeared again. The water at its base was hot below, cold at the surface. There was a flat area connecting the new peak (known by some as Metcalf Cone, by us as "Perry" Peak from the old Revenue Cutter PERRY on which we were serving when the visit was made) with Grewingk. This area was dotted with many hot water holes, in many of which eggs could be boiled. The central portion of this area was lower than the seashore probably below the general sea level. Then I climbed a mountain, whose sides were hot and on which rested very insecurely rocks of a size dangerous to those in the rear of the party. Then the Castle Rocks portion was isolated, Grewingk being then honored with visiting parties. Then panoramas were taken from Grewingk's easily scaled plateau. Hundreds of sea lion foregathered on a long spit on the S.E. end of Castle Rock, thousands of seagulls and tens of thousands California murre builded their nests, deposited their eggs, hatched and reared their young on both Castle Rock and Grewingk. Everywhere there was evidence of one's insecurity from the effects of the enormous forces just beneath us. Nothing was old, everything new. One ran from one surprise to another. My 1906 sketch was taken from Grewingk. While sitting on its summit (Southern end) running in the shore line the earth decided to rumble a little. This rumble caused me the loss of several drawing instruments as it hastened my departure. Then passage by deep draft vessels could have been made between the two portions of the volcano by keeping near and leaving "Perry" Peak of the North. Then there was so much ado everywhere that, in our short visit, accurate bearings and distances were not taken. I still remember vividly each incident though sixteen years have elapsed. Now everything is tomb-like in its quietness, excepting the raucous squawking of the Murre and the discordant, attempted defiantly terrifying roar of the sea lions. The smoking peak is no more. In its place is water lapping, gently or violently, as old Neptune decrees, the shores of a new island which has caused Grewingk to lose its pre-eminence as a visited spot. No one is ever likely to scale Grewingk's precipitous, crumbling heights again, while Castle Rocks have become the point of vantage from which the general view of the island is taken. Now the earth is cold, the water is cold, no vapors are to be seen. Nothing of interest remains save comparison with what was. The Murres still come back. Perhaps to do honor to their forebears' spirits, surely to rear their young. The seagulls are also still to be found, but both these species are found in very much smaller numbers than of yore. The sea lions too are still true to the call of their progenitors though they too are smaller in number. I personally considered the males to be largely in excess of the females, but several of those in the visiting party hold the contrary. The chief sea lion rookery is at the extreme Northern end of the island making out from Castle Rock. There was naught to excite one in the matter of danger unless it were being caught on the precipitous slopes of Castle Rocks with one's foot hold insecure due to easily dislodged rocks. To the East, a couple of hundred yards from where formerly Metcalf Cone ("Perry" Peak) and later "Perry" Peak reared their smoky interesting heads begins a high plateau, presenting perpendicular faces seaward and unscalable on the west face and scalable in but few places on the East side, varying in height from fifteen feet to probably two hundred at its highest (middle)point. This plateau runs into and merges with Castle Rock due South of it, and with a long spit north of it, forming one island about one nautical mile long in a due south line. Passage may now be made by moderate draft vessels leaving the place where "Perry" Peak formerly stood on the South hand. Excitement being less, more accurate data was obtained, though due to threatening weather conditions, our stay was all too short. The distance North and South, East and West, of the prominent points were obtained. Bearings of various prominent points were taken. Moving picture scenes were gotten. Photographs and sketches were made. Several celestial observations, both on ship and shore taken by different officers, five of us in fact. The average result was taken, latitude 53° -57' N., 168° - 04' W. A line of soundings was made along the East shore and in the passage between Grewingk and the spit. Landing was made on the beach in a bight on the East shore E.N.E. from Castle Rock peaks.. No difficulty was experienced as the wind and sea were both from the westward. The many photographs taken will depict the island in elevation from various view points. The extent of the island is shown in the accompanying sketch which is accurate enough to give anyone a definite idea of the island. The general appearance of the island built up around Castle Rocks gives one the impression that the whole sea bed was pushed up bodily by enormous, though evenly applied pressure. This is evident from the fact that numerous quite distinct strata are practically horizontal. The high plateau is covered with brown, igneous rock, easily broken up and pulvered, varying in size from gravel to huge boulders. The heavy rains have eroded gullies of considerable size on the South end of the East side of the plateau. It was through one of these that I reached the top. A sandy beach fringes the island on all sides. This beach is probably 200 feet wide, except on the extreme South side where little or no sandy beach exists. The whole soil seems of the same general nature, some in lumps or boulders, the other in gravel sand, or solidified powder. To me the outstanding features of Bogoslof are:

1. The apparent solidity of Castle Rocks.
2. The dimension in size of Grewingk (It is no more than one-eighth its 1906 size).
3. The fact that Grewingk is merely a huge pile of rock (held together by loose lava) gradually falling with the sea.
4. The fact that the edge of the crater, is, as always, concave to the southwest.
5. The general appearance of permanence.
6. The impression that the "pushed up" sea bottom forms the island proper.
7. The decrease in the number of birds and sea lions.
8. The appearance of erosion on Castle Rocks.
9. The apparent lack of change in sounding a few hundred yards off.
10. The change in the direction of the eastern edge of the crater.

My present tour of duty in Alaskan waters is about over. I don't know whether or not I shall ever come again. Should I come - in what guise will Bogoslof present itself? No conjecture is safe. Of one thing only will I be sure and that is - change."

REPORT OF COMMANDING OFFICER, CAPTAIN J.T.HOTTEL, NORTHLAND, 27 SEPT., 1927.

"On September 27, 1927, the NORTHLAND enroute to the Pribolof islands stopped off Bogoslof Island to investigate a report that the Island was showing new activity.

"The observations showed:

(1) That in place of two islands, Castle Rock and Grewingk, or Fire Island, as last reported there now existed only one island, Castle Rock and Grewingk were now connected by a long sandpit. Previously a deep channel was reported between these islands.

(2) That great activity had taken place and was taking place on Bogoslof Island. A new mound had risen about 175 feet above the plane of the island in the approximate former positions of Metcalf Cove and McCulloch's Peak. A great amount of steam was coming out of this new mound or cone."

REPORT OF COMMANDER C. DENCH, U.S.C.G.C. TALLAPOOSA, 1931.

"Left Nikolski at 8:05 p.m. 6 June and arrived off Bogoslof Island at 6:30 the next morning. A landing party examined the island carefully and made a running survey of the land area. Temperatures in the lake were found to range from 64° to 144° Fahrenheit, and the water is salty. The lake appears to have the same level as the sea. The lava bed, from which steam is now being emitted, is plainly older than the lava at Gareloi. It was jagged, however, and one needs to exercise caution in climbing up there. It is always possible that a fairly heavy piece of rock may be so poised as to fall with a man's weight upon it. The lava area was climbed nearly to its summit. No clearly defined crater was observed but at the center the crevasses were deeper and more jagged than elsewhere. Steam is issuing from quite a number of places all over the top and partly down the sides of the lava area. The lake is also giving forth vapor which is sulphurous, but not to such a degree as to cause irritation.

"Proceeding in the direction of Fire Island the party came upon the sea lion herd on the more northerly rookery on Bogoslof Island. The bulls and cows put off into the water leaving their young on the beach. Some of the pups were so young that they had not yet learned to bark. These did not object to being petted, but most of the young sea lions protested with what lung power they have against being touched. During all the time we stood at the rookery the roar from the bulls and cows continued unabated and at full blast. The landing party counted 180 pups at this rookery, and as the more southerly rookery is the larger, the total sea lion population probably runs between 1,000 and 2,000.

"A number of sea gull eggs were seen upon a plateau away from the rookeries, and a peculiar fly is quite numerous there.

"It was interesting to note the first sign of vegetation. This consists of small patches of moss high upon the more westerly of the two sharp peaks. When on the island twenty years ago I saw no sign of vegetation whatever."

REPORT OF COMMANDER F. A. ZEUSLER, U. S. C. G. C. CHELAN, AUGUST, 1934.

"The CHELAN anchored at 1605 18 August in a comparatively shallow spot on the western side of the island and plans were made to make a reconnaissance survey of the island. On the afternoon of the 18th signals were erected at the most important points and a base line of 800 yards established on Sea Lion Point. On 19 August a reconnaissance by plane table was begun and soundings were taken up to 20 fathoms and to the limit of the visibility from the vessel, as intermittent fog prevented distant soundings. On the afternoon of 18 August the vessel was shifted to the east anchorage. On 19 August, the reconnaissance by plane table was completed and a series of soundings taken on the eastern side up to the 20 fathom depth. A staff compass reconnaissance was also made by Professor Alexander in order to check the high water line with the plane table. No opportunity was had to obtain the position by astronomical observations. Although the sun was seen a number of times during the day, the horizon was usually obscured, making it impossible to obtain an accurate position. The vessel was gotten underway at 1658, 20 August, as the wind had shifted to the north northeastward and conditions were becoming unfavorable for further surveying.

"The soundings were taken by the personnel in a motor boat, positions were obtained every five soundings by bearings and distances from the bridge by calibrated range finder from the CHELAN and checked by calibrated stadimeter in the boat, and the speed of the motor boat was determined by the contour of the bottom using the standard instructions as published by the Coast Survey.

"On 24 August the CHLEAN had occasion to occupy station #117, which was located about 10 miles north of Bogoslof. The weather was clear, sea calm and light westerly airs were encountered. The vessel was gotten underway from this position at a known speed and bearings were taken at regular intervals from Castle Rock cutting in on the known headlands by bearings and taking observations of the sun. The position obtained by this method of Castle Rock was 54-57 North, 168-02 West.

"In making the approach the vessel was kept one mile south and constant soundings were taken. An anchorage was found in 16 fathoms off the northwest cove of Bogoslof. Left tangent, Fire Island bearing 47° true, right tangent McCullough Peak (which was also in line with Castle Rock bearing 138° true. A comparatively hard sandy bottom was found, samples of which proved to be a mixture of volcanic ash and sand. This proved to be a fairly good bottom for holding. When the anchor was weighed it was found that it was absolutely clean and the chain had worn bright in places. Soundings indicated that an anchorage can be had at a reasonable distance off shore from anywhere off the west side of the island, north of the bearing 105° true from Castle Rock and south of a bearing of 95° true from Sea Lion Point. From the soundings it is evident that the bottom is regular and slopes gradually to the beach. No indications of rocks off shore were seen, although at different stages of the tide, current swirls were seen, which seemed to indicate projections, from their very character, but investigations were made of the number of these and in each case it was found the bottom was clear of obstructions. It is believed that a better anchorage in more shallow water will be found off McCullough Peak, at an approximate bearing of 110°, in 10 fathoms of water and about 800 yards off shore. The vessel could be anchored in 6 fathoms of water and in that way be an absolute lee for a southwest to northeast gale. An anchorage on the west side is better than that on the east side, because of a more extended shelf. It is believed that the best anchorage on the east side is about 500 yards off shore in about 13 fathoms of water on a bearing of Sea Lion Point 276°. No soundings were taken off the southern part of the island, because of the fact that the water is comparatively deep close up to the beach and no anchorage would be found for a large vessel, although a smaller vessel could anchor fairly close in-shore in 5 fathoms of water and bearing left tangent, McCullough Peak 0° and Castle Rock bearing 103°.

Bogoslof, now is divided into two parts, first the main island, which runs approximately 340° - 160° and consists of Castle Peak and the adjacent peak, McCullough Peak, a large salt water lake and the hills or hammocks that make out to Castle Peak and second Fire Island. Castle Peak has two summits, very sharp in outline, the highest point being 360 feet. The southeast point is comparatively flat and consists of a sandy beach northward and a rock-bound beach to the southward and southwestward. The eastern shore line consists of a flat sandy beach backed by comparatively high wavecut terrace about 75 yards from the shore line. The beach continues to Sea Lion Point, from there it makes off into shallow water. Small boats can be taken in to the wave-cut entrance a short distance off Sea Lion Point from east to west and vice versa. The island is 1925 yards long and about 850 yards at its widest point, at McCullough Peak. Fire Island is found bearing 312° from Sea Lion Point, at a distance of 350 yards. Comparatively deep water is fairly close to the shore and numerous rocks are located inshore, their presence being made known by the heavy kelp that is found on the northeastern and western sides of the island. The character of the island has not changed since last reported, it still consists of three pinnacles. It has a number of wave-cut caves on the southwestern side and a large cave on the northeastern side. The name Fire Island is a misnomer, at first glance Fire Island would be taken for Castle Peak because of its resemblance to a medieval castle. Fire Island is 270 feet at the highest point.

"Both Castle Peak and Fire Island are cores of an extinct volcano and are dead. McCullough Peak is an active volcano and is constantly smoking. A live fissure was found on the western shore of the island, which emits considerable gas and steam at high tide. The upper plateau is covered with volcanic bombs, some of hugh proportions, the larger ones being evidence of a terrific explosion of years back, the smaller ones being indications of an erruption of more recent times.

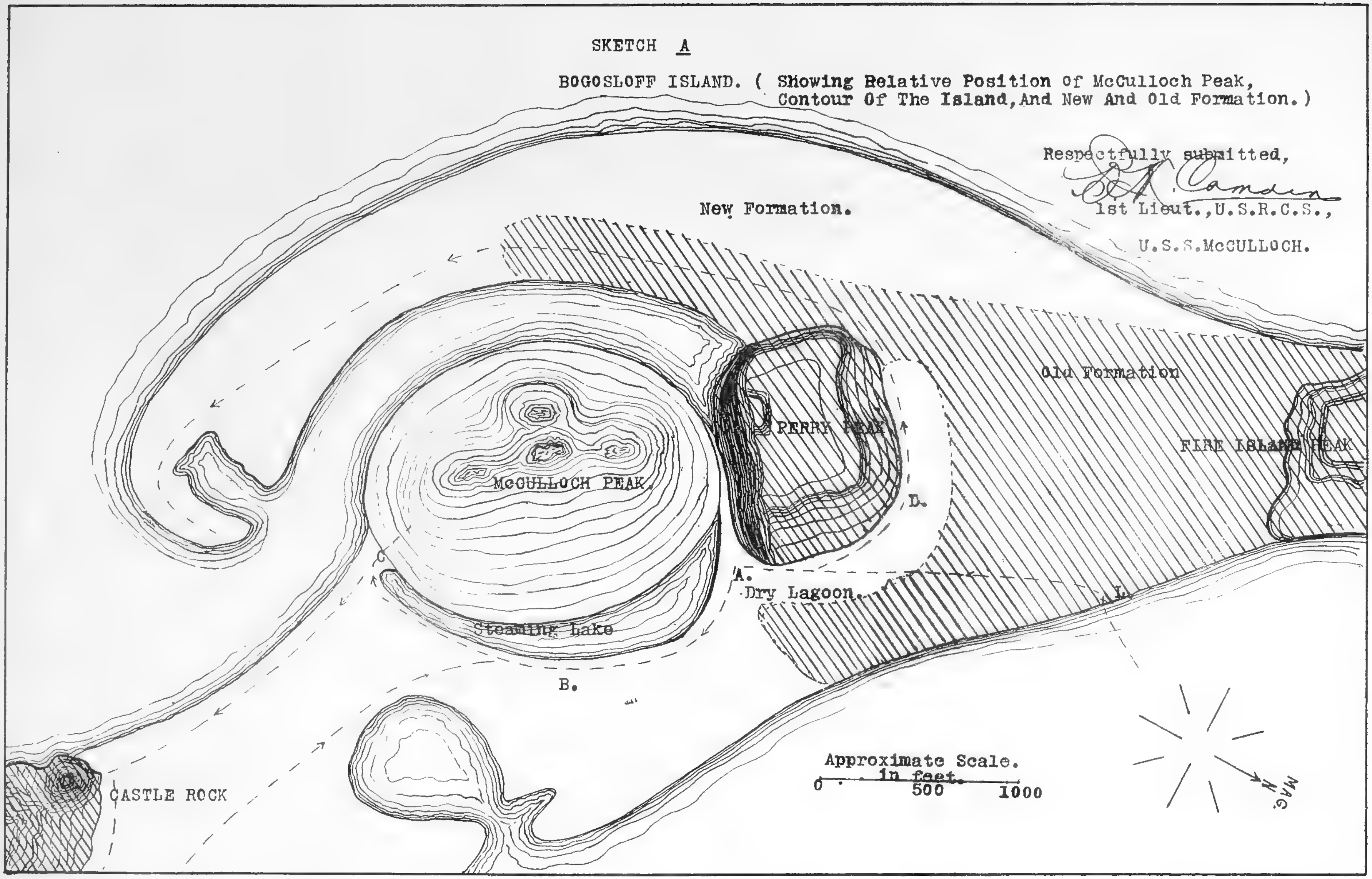
"No fresh water was found. A small salt water lake is located at the northwest end; water from this lake on analysis shows a chlorinity of 19.39%, indicating a salt content of about 8% higher than that of the surface water of the surrounding sea. The surface temperature of the lake water varied from 14.5° C., to 19° C., as compared to a temperature of 9° C., for the surface water of the sea. Volcanic activity furnished sufficient heat to maintain this comparatively high temperature of the lake and to evaporate the sea water, which seeped through to a high salt concentration. A small hot spring was found on the east side near the north point that appeared from seepage during high tide. The temperature of this water ranged up to 85° C., with a chlorinity of 20.42%. Five glass fishing buoys, such as the Japanese use, were found in the salt water lake.

"As the island is of volcanic origin of recent times, no fuel other than driftwood was found. The following species of trees were noted: Douglas Fir, Sitka Spruce, Western Hemlock, Western Red Cedar, Northern Black Cottonwood and Alder. The above listed species are all West Coast trees and no Asistic species were noted.

"The below listed birds were observed:

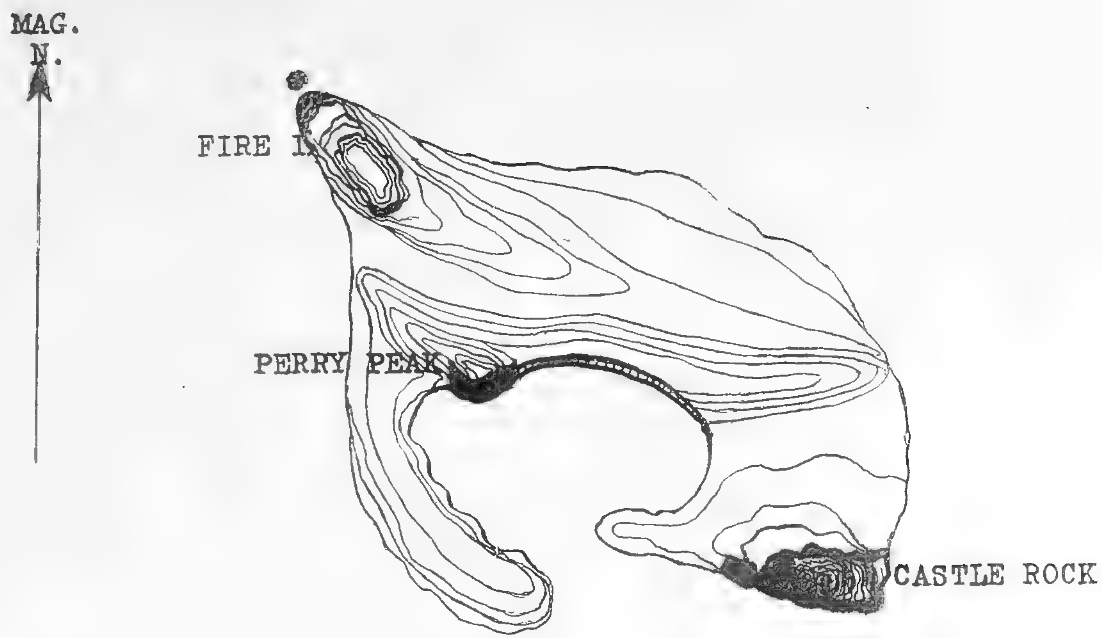
Glancous Winged Gull; nesting on level or gently sloping areas of island; young birds found.
Common Murre; nesting on rocky cliffs and ledges of Fire Island. Castle Rock and the adjacent peaks and McCullough Peaks, eggs and young birds in all stages of development.
Horned Puffin; nesting in burroughs along the wave-cut terraces, eggs and young birds were seen.
Forked Tailed Petrel; came aboard the ship at night and were found on deck where they had fallen after striking the deck houses.

"The following animals were observed on the island; Herds of sea lions occupying the various beaches which totalled approximately 1000,


SKETCH A
BOGOSLOFF ISLAND. ( Showing Relative Position of McCulloch Peak, Contour Of The Island, And New And Old Formation.)
Respectfully submitted,
1st Lieut., U.S.R.C.S.,
U.S.S. McCULLOCH.
New Formation.
Old Formation
PERRY PEAK
FIRE ISLAND PEAK
McCULLOCH PEAK.
A.
B.
C.
D.
Dry Lagoon.
Steaming Lake
CASTLE ROCK
Approximate Scale.
in feet.
0
500
1000
MAG. N

## SKETCH OF BOGOSLOF ISLAND

AS OBSERVED FROM THE U.S.S.McCULLOCH,OCTOBER 15, 1907.

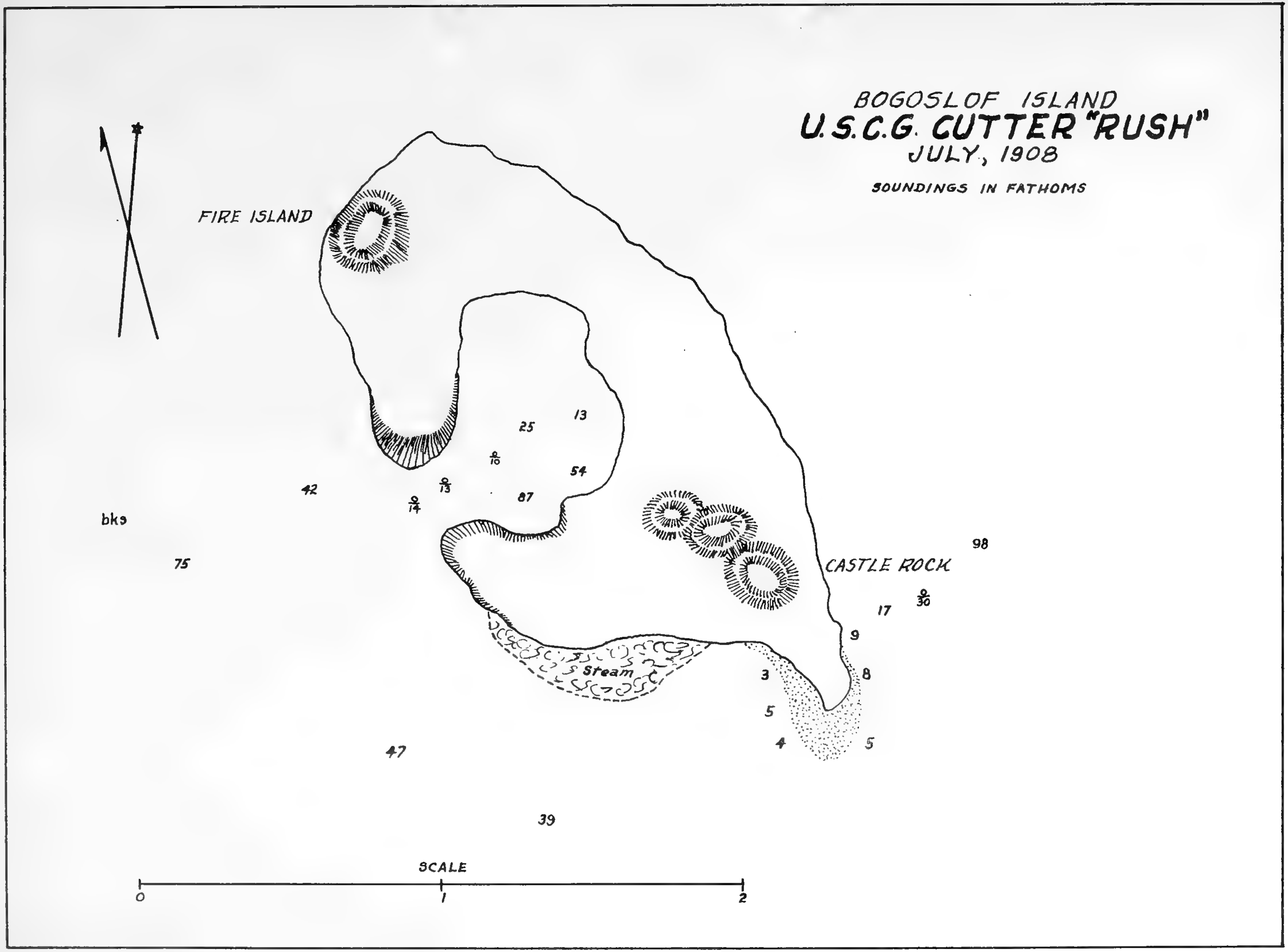


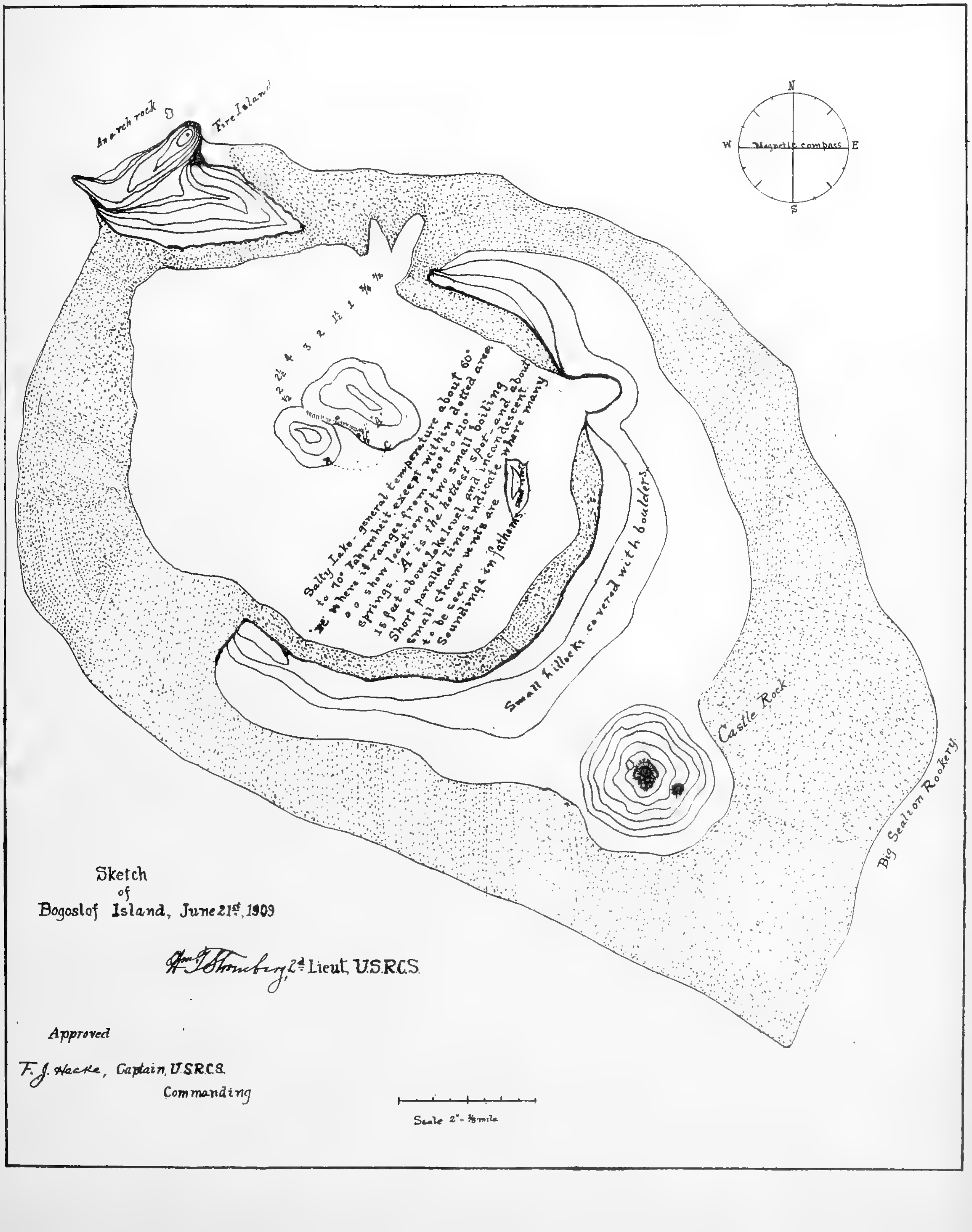

NAUTICAL MILES

0 —— 1

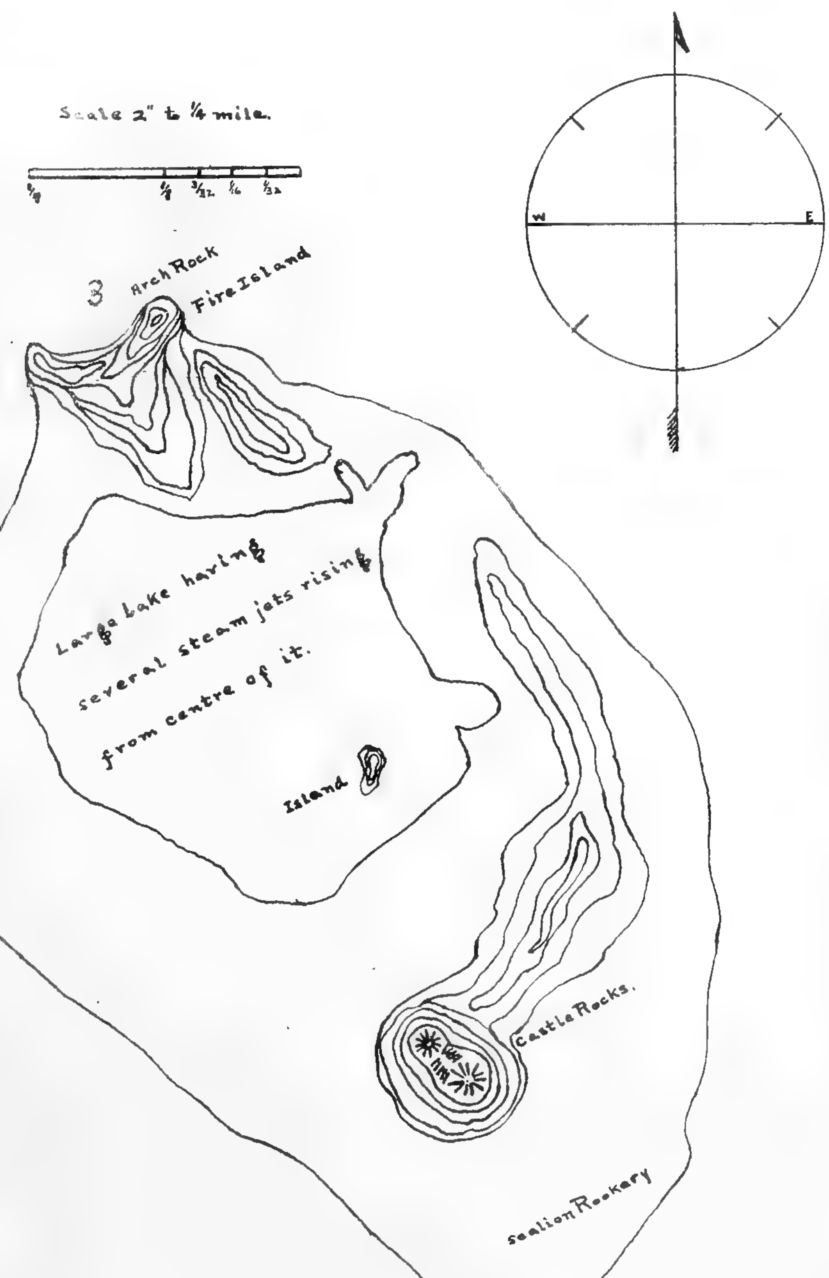
Respectfully Submitted,

1st Lieut,U.S.R.C.S.


BOGOSLOF ISLAND
U.S.C.G. CUTTER "RUSH"
JULY, 1908
SOUNDINGS IN FATHOMS
FIRE ISLAND
CASTLE ROCK
Steam
bks
75
42
47
39
25
13
54
87
17
98
9
8
3
5
4
5
SCALE
0
1
2



An arch rock
Fire Island
N
W
E
S
Magnetic compass
Salty Lake - general temperature about 60°
to 70° Fahrenheit except within dotted area
where it ranges from 140° to 210°
o o show location of two small boiling
springs. 'A' is the hottest spot - and about
15 feet above lake level and incandescent.
Short parallel lines indicate where many
small steam vents are
to be seen.
Soundings in fathoms.
Small hillocks covered with boulders
Castle Rock
Big Sealion Rookery
Sketch
of
Bogoslof Island, June 21st, 1909
Wm. T. Stromberg, 2d Lieut, U.S.R.C.S.
Approved
F. J. Hacke, Captain, U.S.R.C.S.
Commanding
Scale 2" = 1/8 mile




Sketch of Bogoslof Island, Bering Sea.

U.S.R.C. "Rush", September 20, 1908.

Respectfully Submitted,

L. T. Chalker,

2nd Lieut., Navigator.

Approved,

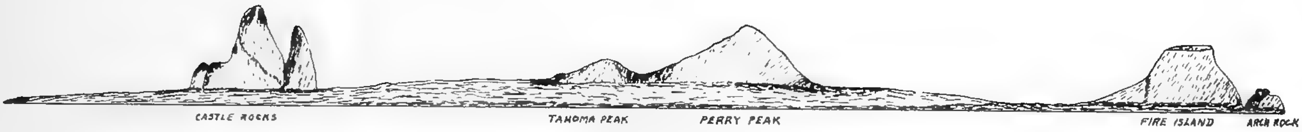
D. F. A. de Otte,

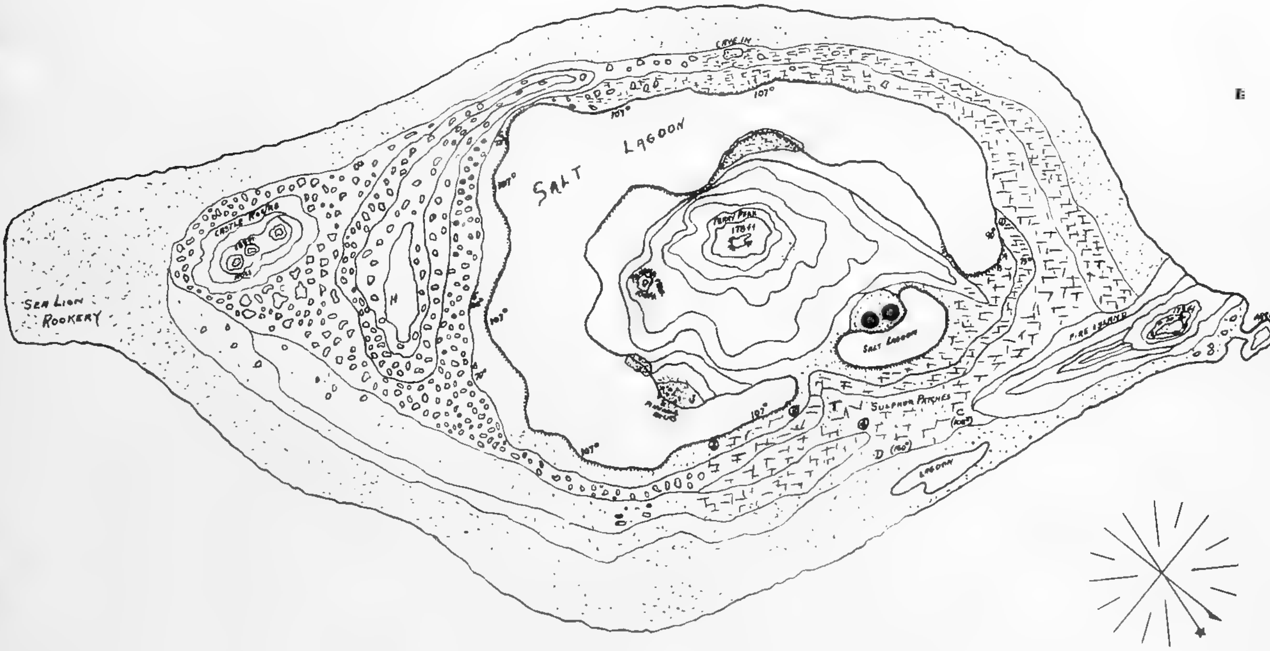
Captain, U.S.R.C.S., Com'd'g.

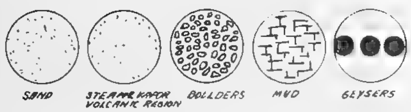
Respectfully forwarded,

W. V. E. Jacobs, Captain, U.S.R.C.S.

Com'd'g Bering Sea Fleet




TEMPERATURES – FAHRENHEIT
HEIGHTS – FEET
BAROMETER – 30.27
WIND – S.E. 15–20 MILES per HR

SOUNDINGS – FATHOMS
RED LETTERS – SPECIMENS
WEATHER – PARTLY CLEAR, SMOOTH SEA.
TEMPERATURE of SEA – 43° to 45°

TEMPERATURE of AIR – MIN. 54° – MAX 58°

¼ NAUTICAL MILE

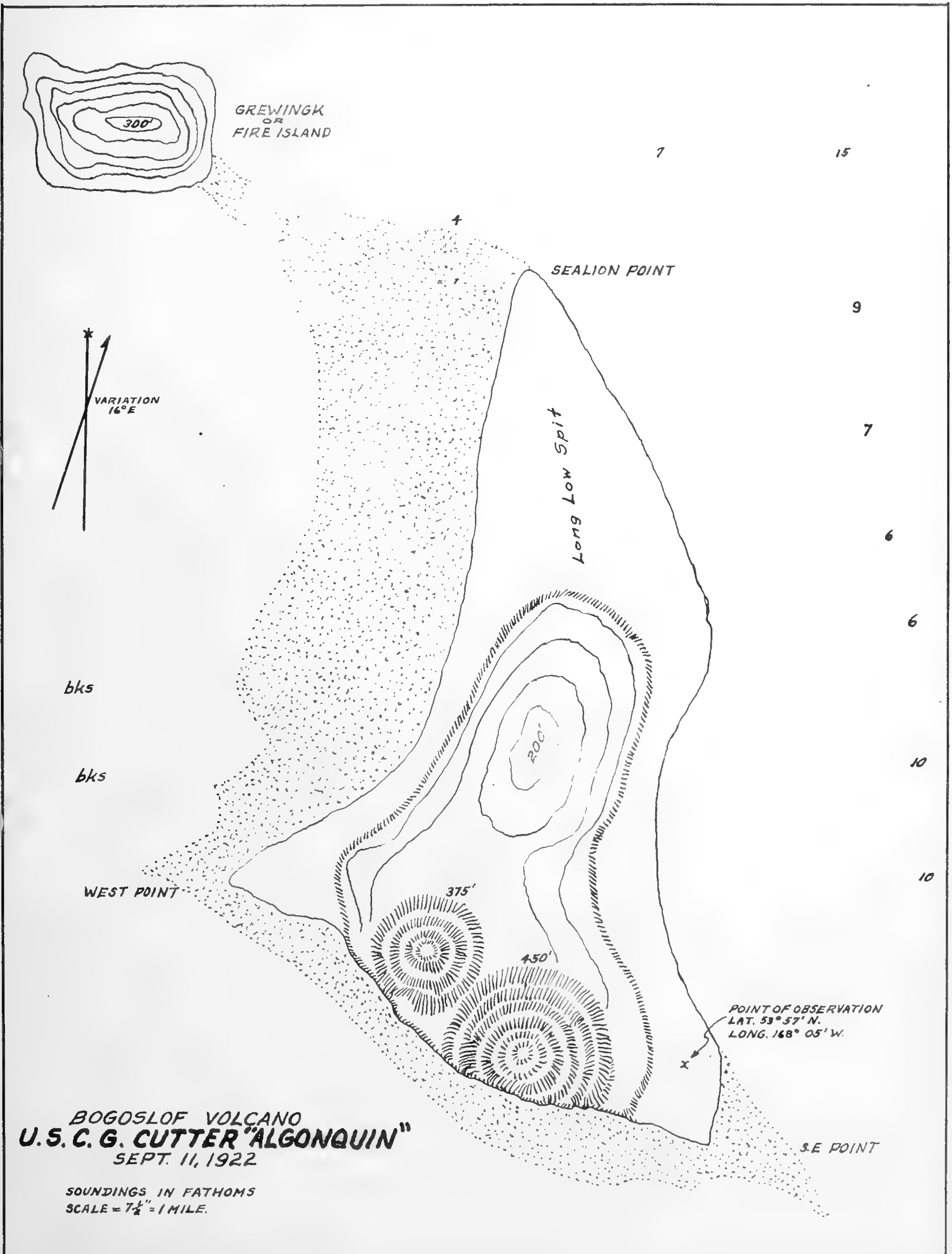
# SKETCH OF BOGOSLOF ISLAND

LAT. 53°–58′N LONG 167°–50′N

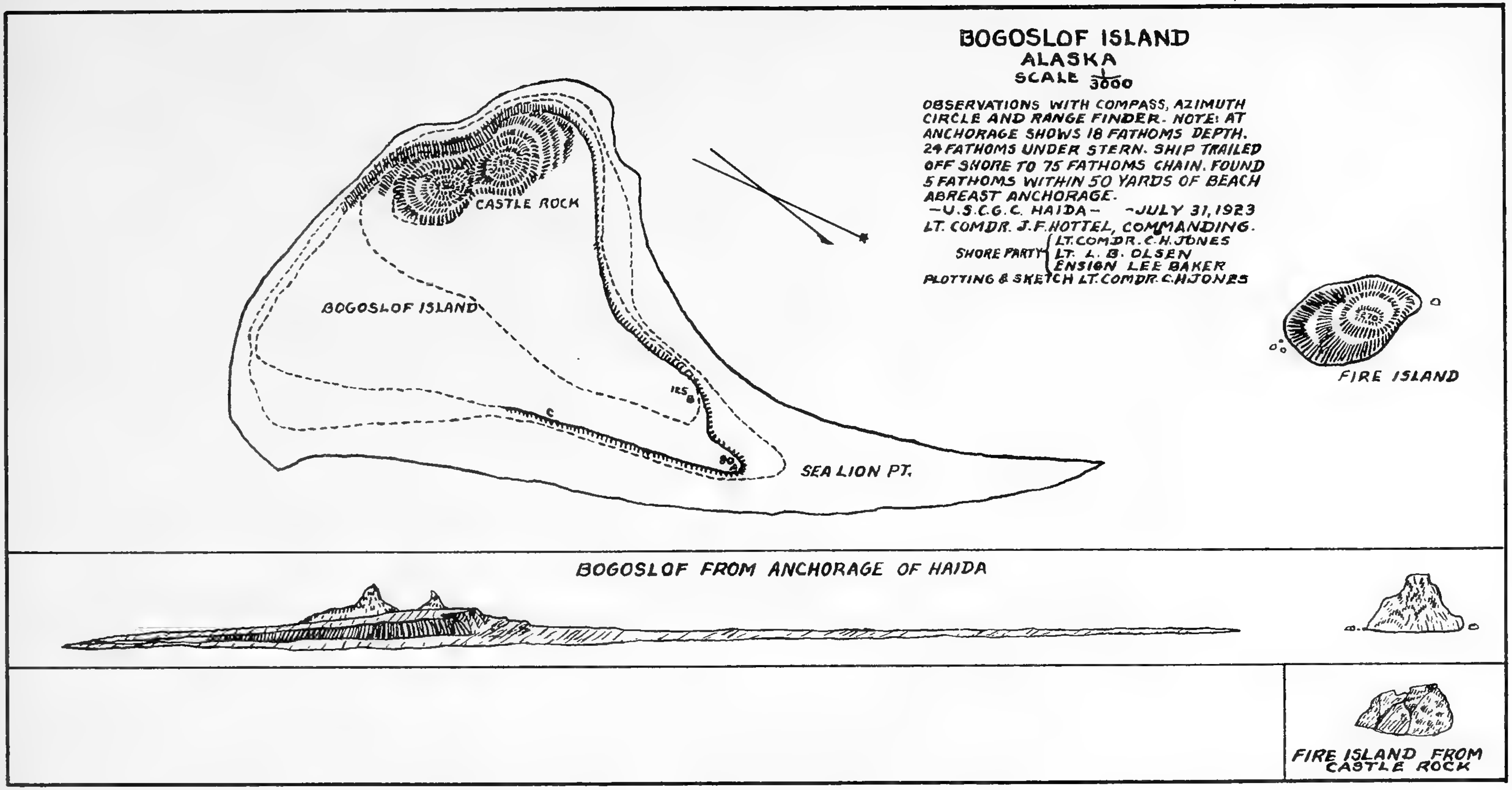
U.S. REVENUE CUTTER "TAHOMA" J.H. QUINAN, CAPT. U.S.R.C.S. COMDG.

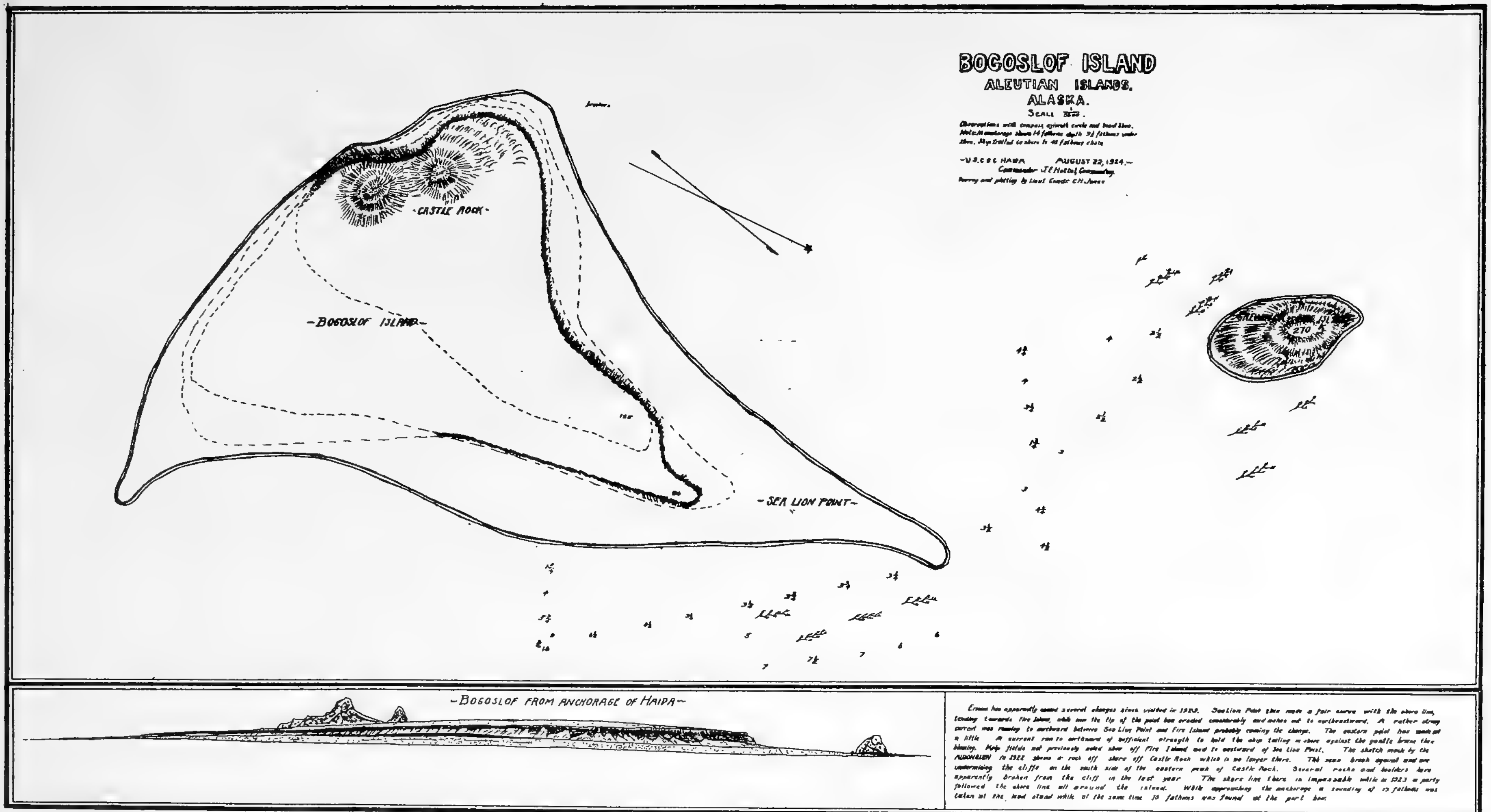
SEPTEMBER 19 1910

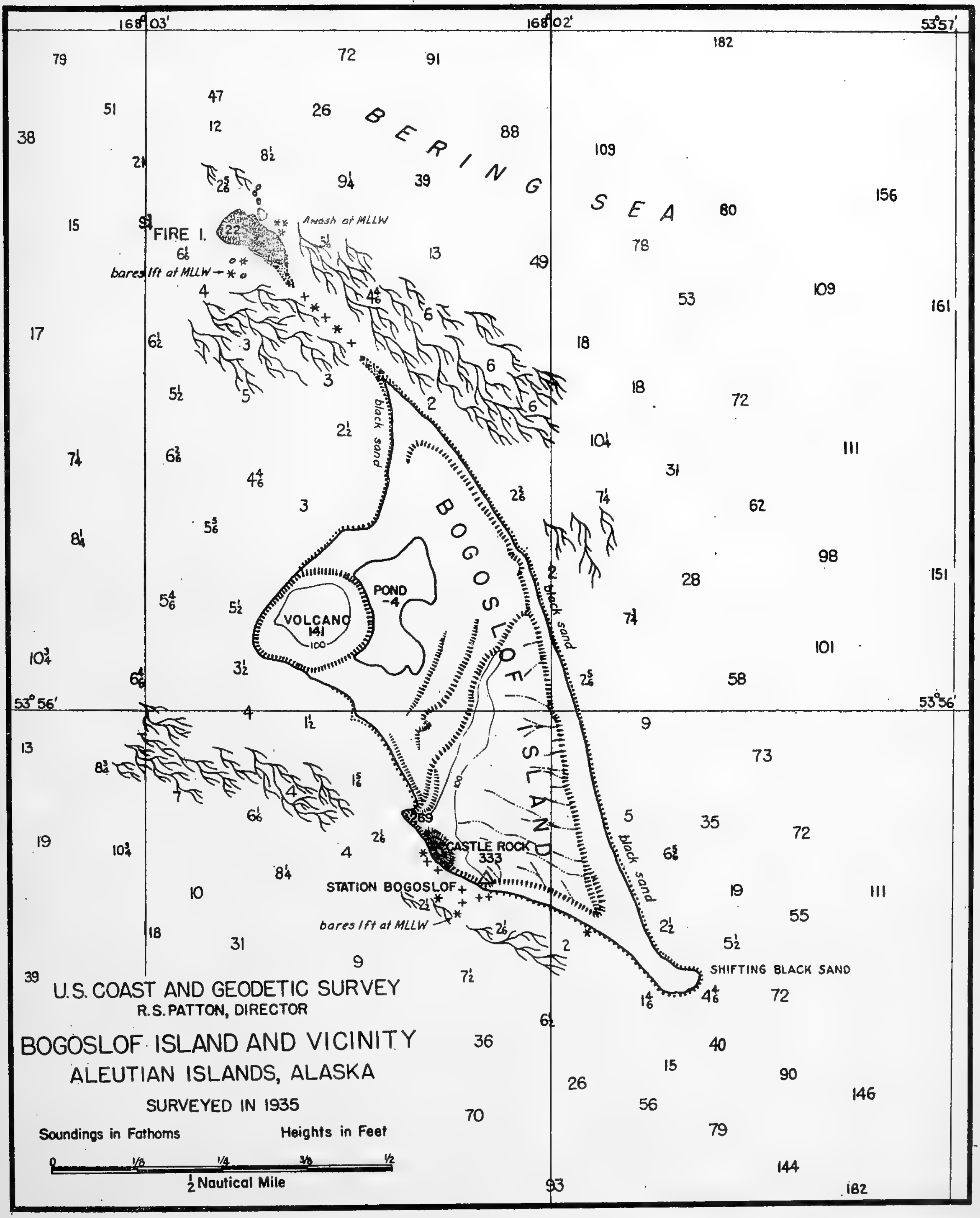
A.H. SCALLY, 2nd Lieut. U.S.R.C.S. Navigator.



300'
GREWINGK
OR
FIRE ISLAND
7
15
4
SEALION POINT
9
VARIATION
16° E
Long Low Spit
7
6
6
bks
bks
200'
10
10
WEST POINT
375'
450'
POINT OF OBSERVATION
LAT. 53° 57' N.
LONG. 168° 05' W.
BOGOSLOF VOLCANO
U.S.C.G. CUTTER "ALGONQUIN"
SEPT. 11, 1922
S.E POINT
SOUNDINGS IN FATHOMS
SCALE = 7½" = 1 MILE.


BOGOSLOF ISLAND
ALASKA
SCALE 1/3000
OBSERVATIONS WITH COMPASS, AZIMUTH CIRCLE AND RANGE FINDER. NOTE: AT ANCHORAGE SHOWS 18 FATHOMS DEPTH. 24 FATHOMS UNDER STERN. SHIP TRAILED OFF SHORE TO 75 FATHOMS CHAIN. FOUND 5 FATHOMS WITHIN 50 YARDS OF BEACH ABREAST ANCHORAGE.
—U.S.C.G.C. HAIDA— —JULY 31, 1923
LT. COMDR. J.F. HOTTEL, COMMANDING.
SHORE PARTY: LT. COMDR. C.H. JONES, LT. L. B. OLSEN, ENSIGN LEE BAKER
PLOTTING & SKETCH LT. COMDR. C.H. JONES
CASTLE ROCK
BOGOSLOF ISLAND
SEA LION PT.
FIRE ISLAND
BOGOSLOF FROM ANCHORAGE OF HAIDA
FIRE ISLAND FROM CASTLE ROCK


BOGOSLOF ISLAND
ALEUTIAN ISLANDS.
ALASKA.
SCALE
—U.S.C.&G.S. HAIDA AUGUST 22, 1924.—
-CASTLE ROCK-
-BOGOSLOF ISLAND-
-SEA LION POINT-
270
-BOGOSLOF FROM ANCHORAGE OF HAIDA-
Erosion has apparently caused several changes since visited in 1923. Sea Lion Point then made a fair curve with the shore line, tending towards Fire Island, while now the tip of the point has eroded considerably and makes out to northeastward. A rather strong current was running to northward between Sea Lion Point and Fire Island probably causing the change. The eastern point has made out a little. A current ran to northward of sufficient strength to hold the ship tailing in shore against the gentle breeze then blowing. Kelp fields not previously noted show off Fire Island and to westward of Sea Lion Point. The sketch made by the ALDONALLEN in 1922 shows a rock off shore off Castle Rock which is no longer there. The seas break against and are undermining the cliffs on the south side of the eastern peak of Castle Rock. Several rocks and boulders have apparently broken from the cliff in the last year. The shore line there is impassable while in 1923 a party followed the shore line all around the island. While approaching the anchorage a sounding of 13 fathoms was taken at the lead stand while at the same time 10 fathoms was found at the port bow.



U.S. COAST AND GEODETIC SURVEY
R.S. PATTON, DIRECTOR
BOGOSLOF ISLAND AND VICINITY
ALEUTIAN ISLANDS, ALASKA
SURVEYED IN 1935
Soundings in Fathoms
Heights in Feet
0
1/8
1/4
3/8
1/2
½ Nautical Mile
168°03'
168°02'
53°57'
53°56'
BERING SEA
BOGOSLOF ISLAND
FIRE I.
Awash at MLLW
bares 1ft at MLLW
black sand
VOLCANO
141
POND
-4
CASTLE ROCK
333
269
STATION BOGOSLOF
SHIFTING BLACK SAND

MCCOLLOUGH PEAK, BOGOSLOF ISLAND 1906.

BOGOSLOF ISLAND LOOKING N.E. SHOWING EXPLOSION NEAR CASTLE ROCK OCT. 15, 1907.

BOGOSLOF ISLAND LOOKING S.W. OCT. 15, 1907.

BOGOSLOF ISLAND AS SEEN BY U.S.C.G. CUTTER "TAHOMA" SEPT. 14, 1910.

B


BOGOSLOF ISLAND, WEST SIDE, LOOKING NORTH FROM SEA LION POINT. CASTLE ROCK N.¾ MILE. FIRE ISLAND N. x W. ¼W. U.S.C.G. CUTTER "RUSH" JUNE 20, 1908.


BOGOSLOF ISLAND, WEST SIDE, LOOKING E.S.E. INTO BAY AT CASTLE ROCK. U.S.C.G. CUTTER "RUSH" JUNE 20, 1908.


BOGOSLOF ISLAND. FIRE ISLAND N.E. x E. ½ E. CASTLE ROCK E. ½ S. U.S.C.G. CUTTER "RUSH" SEPT. 20, 1909.


BOGOSLOF ISLAND. FIRE ISLAND E.S.E. CASTLE ROCK S.E. U.S.C.G. CUTTER "RUSH" SEPT. 20, 1909.

C

BOGOSLOF ISLAND AS SEEN BY U.S.C.G. CUTTER "MANNING" 1912.

BOGOSLOF ISLAND AS SEEN BY U.S.C.G. CUTTER "UNALGA" 1913.

BOGOSLOF ISLAND AS SEEN BY U.S.C.G. CUTTER "CHELAN" AUGUST 1929.

SEALION HERD, BOGOSLOF ISLAND.

BOGOSLOF ISLAND AS SEEN BY U.S.C.G. CUTTER "BOUTWELL" AUG. 9, 1920.

BOGOSLOF ISLAND BEARING 260°
SEPT. 11, 1922.

BOGOSLOF ISLAND AS SEEN BY U.S.C.G. CUTTER "HAIDA" AUG. 23, 1926. LEFT TANGENT 129° TRUE.

BOGOSLOF ISLAND AS SEEN BY U.S.C.G. CUTTER "HAIDA" AUG. 23, 1926. THE CASTLES BEARING 298° TRUE. DISTANCE ONE MILE.

BOGOSLOF ISLAND AS SEEN BY U.S.C.G. CUTTER
"NORTHLAND" SEPT. 27, 1927

BOGOSLOF ISLAND AS SEEN BY U.S.C.G. CUTTER
"NORTHLAND" SEPT. 27, 1927

BOGOSLOF ISLAND AUG. 26, 1928.

SEALION, BOGOSLOF ISLAND

BOGOSLOF ISLAND 1908.

BOGOSLOF ISLAND 1934.

BOGOSLOF ISLAND JUNE 26, 1916 N. BY E.
DISTANCE 1.5 MILES.

including the bulls, cows and pups. Whales were seen hovering around the island, also some seals which were found on the rocks in the wake of Fire Island and McCullough Peak. The seals appeared to be fur seals, being limited in number.

"Thirty seed spots were made in the area northwest of the copper box on the eastern slope of the island. Seeds of Douglas Fir, Western Red Cedar, Sitka Fir, Sitka Spruce and Western Hemlock were used. Two species of succulent plants were noted on the beach near the salt water lake and in the water of a unicellular green algae. Terrestrial forms of unicellular algae grew on the slopes near the nesting places of the murres. A few small tufts of grass grew on the eastern slope, and one prominent tuft on the western side between Sea Lion Point and McCullough Peak.


Reference (1) Files at Coast Guard Headquarters.
(2) Cruise of CORWIN 1881.
(3) Cruise of CORWIN 1884.
(4) Cruise of CORWIN 1885.
(5) Bulletin of the American Geographical Society, Volume XL - No. 7, July 1908.
(6) National Geographic Society Magazine, February, 1909, Volume XX - No. 2.
(7) Letters and pictures from:

Admiral R. R. Waesche
Admiral W. E. Reynolds, Ret.
Commodore R. O. Crisp, Ret.
Commodore D. F. A. deOtte, Ret.
Captain E. S. Addison, Ret.
Captain C. H. Scott, Ret.
Captain (E) C. G. Porcher, Ret.
Captain W.T. Stromberg, Ret.
Captain J. F. Hottel
Captain L. J. Chalker
Captain E. D. Jones
Captain R. W. Dempwolf
Captain R. C. Weightman
Captain C. F, Howell
Commander (E) W. M. Prall
Commander J. C. Cantwell, Ret.
Commander (E) W. C. Maglathlin
Commander C. H. Jones
Commander P. F. Roach
Commander (E) H. Perham
Commander M. J. Ryan
Commander L. L. Bennett
Commander C. H. Dench
Commander W. K. Scammall
Commander S. S. Yeandle
Commander (E) J. F. Hahn, Ret.
Commander (E) J. N. Heimer
Commander L. V. Kielhorn
Lieut. Commander J. H. Quinan
Lieut. Commander K. W. Perry, Ret.
Lieut. J. A. Glynn

SEA OTTERS.

This report covers, generally speaking, the mammals encountered by the CHELAN in 1933 and 1934 and on previous visits to Alaska by Commander F. A. Zeusler, In view of the fact that no live sea otters were seen at any time, the subject was not covered. However, it is felt that in view of the recent observations made of the sea otter herd by the CHELAN under Commander L. L. Kielhorn, U. S. Coast Guard, a report should be included as an addition to the CHELAN observation of 1934. Therefore, by permission of Coast Guard Headquarters extracts from the CHELAN reports of 1935 and 1936 are quoted:

"Recent reports of large number sea otters on southern side Amchitka Island have been confirmed by CHELAN who with U.S.S. OGLALA of Aleutian Island Survey Expedition have circumnavigated this island. No otter on Kiska, Khwostof, Davidof, Segula, Little Sitkin, Semisopochnoi, probably reason survival this herd is due to extensive foul grounds on the Pacific side of the islands. Estimate of number of otter varies from one to six thousand but CHELAN counted in small area in dense fog from ships boat about fifty. Otter appears to be spreading to Rat and neighboring islands and are found in dense kelp beds about one eighth mile off shore which is generally unapproachable from Pacific side.

"CHELAN

Kiska, Alaska,
31 August, 1936.

"From: Lieutenant Commander S. P. Swicegood.
"To: Commanding Officer, CHELAN.

"Subject: Amchitka Sea Otter Survey Expedition.

"Reference: * * * * * * * * * * * * *

"Invlosure: * * * * * * * * * * * * *

"In accordance with instructions * * * * * * * * * * * * * * a survey of the sea otter in the immediate vicinity of Amchitka Island was made during the period 10-19 August, 1936.

"The party of two officers and ten men, having been transported from Unalaska to Amchitka on the DAPHNE, was landed at Constantine Harbor at noon, 10 August, 1936. There the base camp was established and the work carried on from that point. Six tents were erected for shelter of the party and two folding cots installed in each tent. One of the cabins was selected for use as a cook house and a place to store provisions. The portable radio set was at first set up in one of the tents but, due to the dampness, was later installed in the house.

"In order to arrive at an accurate estimate of the situation and plan of operations - the first step undertaken, after the base camp had been established, was to scout as much of the eastern half of the island as possible with the purpose of obtaining data concerning the location of the sea otter and other pertinent and general information. This was accomplished and the following facts established thereby:

"(a) The presence of sea otter in abundance along the southern shore of the island, but found only in the water.

"(b) The absence of sea otter on the northern shore of the island insofar as could be observed from land.

"(c) A herd of sea lions were found on the rocky beach near the eastern extremity of the Bering Sea side of the island. (These animals furnish a source of food supply to the natives of the island during the trapping season.)

"(d) The presence on the island of at least two unknown persons. One man had been observed on shore from the DAPHNE as she approached. Two men were seen by one scouting group, but, due to the easy concealment afforded by tall grass and the numerous ravines, an attempt to catch up with them failed. Their tracks were closely inspected where found in soft mud. Their feet were small, both men wearing about a size $7\frac{1}{2}$ boot. One had rubber boots and the other leather ones. The lengths of the steps indicated men of smaller than average stature.

"(e) The topography of the eastern half of the island: low rolling hills with numerous lakes and pot-holes; steep and generally rocky cliffs along the shore, cut by ravines and fissures; a rock-strewn shore line and some fresh water streams. Tundra, with soft moss, believed to be reindeer moss, and lush grass growing in the ravines and stream beds makes walking difficult.

"The plan adopted for carrying out the survey was to divide the party into two equal groups, one group in charge of Ensign Opp to move to the southern side of the island and traverse that side, establishing successive temporary camps as the counting progressed. The other group was to remain at the base camp to further inspect the Bering Sea side of the island, using the 19-foot surfboat with outboard motor, if practicable; maintain radio communications with the CHELAN; maintain contact with the counting party by messenger and assist that party in moving camp and supply them with any additional provisions required. In this manner the eastern half of the island would be covered. Survey of the western half of the island in a similar manner was contemplated, provided a suitable landing place could be located there.

"The foregoing plan was placed in effect and a camp established on the southern shore of the island on 13 August, 1936, at approximately $179^{\circ}\ 17\frac{1}{2}'$ East. The counting of the sea otter was commenced the following day, Ensign Opp, with one assistant, counting.

"Some of the otter were close enough to the shore to be counted separately while others remained in groups or herds, too distant to be counted individually and making it possible to only estimate their numbers. Consequently, two sets of figures were necessary, the number actually counted in an area and the total number estimated to be in that area. Care was taken to underestimate rather than overestimate. Results of the counting are as follows:

| "DATE | SECTION | NO. ACTUALLY COUNTED | TOTAL NO. ESTIMATED |
|---|---|---|---|
| 14 Aug. | 179° 27' E. to 179° 17½' E. | 177 | 400 |
| 15 Aug. | 179° 17½' E. to 179° 10' E. | 217 | 500 |
| 16 Aug. | 179° 10' E. to 179° 00' E. | 410 | 700 |
| | | 804 | 1600 |

"Fog and choppy seas hindered the use of the surfboat in inspecting the Bering Sea side of the island. Advantage was taken of the only day of favorable weather to make a cruise to the westward of Constantine Harbor, On this occasion, about ten sea otter were discovered in a kelp patch near the western end of Kirilof Bay and about three-quarters of a mile offshore. These animals were too far off shore to have been distinguished from on shore and were the only ones actually seen on the northern side of the island.

"At the conference held aboard the CHELAN upon her arrival, it was decided that a reasonably accurate estimate of the number of the sea otter in the vicinity of Amchitka Island could be made from the data already obtained and that, due to the lateness of the season and likelihood of unfavorable weather, it would be inadvisable to continue to survey on the western half of the island.

"The shore line of the Pacific side of Amchitka Island is forty-five miles long and along twenty-four miles of this side 804 sea otter were actually counted, while a conservative estimate placed the number for that section at 1600. Assuming that section covered presents a fair average, it is estimated that the number of sea otter on the south side of Amchitka Island is 3000. The ten sea otter found in Kirilof Bay indicate that at least 100 additional are located on the northern shore of the island. It is therefore estimated that there are a minimum of 3100 sea otter in the waters surround Amchitka Island.

"All of the sea otter observed were in the water except in one instance when a group of five was seen on some rocks lying offshore. No indications whatever of the animals having been on shore were discovered. They remained for the most part in groups or herds in and about the kelp patches and appeared to stay in fixed areas. A few, however, swam along the shore and came near enough in to present excellent opportunities to watch them. In feeding they dive and reappear a few seconds later with what appears to be seaweed. This they consume while swimming slowly on their backs and holding the foods in their front flippers. These flippers are short with paw-like parts and are used with considerable dexterity. In a playful mood they present marvelous exhibitious of aquatic gracefulness, lolling about, usually on their backs, in the breakers, appearing to miss the jagged rocks by inches. A number of times they were seen mating while in the water.

"A small group of trappers' dwellings, consisting of one boat house (containing two dories), four barabaras, and one out-house, was found on the Pacific side at about 179° 13' East. Another barabara was found on the Pacific side about 179° 05' East. Near 179° 18' East on the same side of the island, an old village site was located. The place was overgrown with lush green grass, peculiar to such sites but the hollows forming the interiors of the barabaras were easily discernible.

"Plant life found on Amchitka is very similar to that found on other islands of the Aleutian chain except that hills are covered with a moss believed to be reindeer moss. Cloud berries (rubus chamaemorus) are found in abundance. They grow but a few inches from the ground, are edible, but have a peculiar and unpalatable flavor. Some plants identified on the island, with the assistance of Miss Isobel Hutchinson, the British botanist, are: clymis aronarius, lathyrus maritimus, senecia seudarneca, anemore zephyra, primula, chrysanthemum (Asiatic type), linnea borealis, honkenya peploides, claybonia, and sarmentosa.

"The only animals seen on the island in addition to the sea otter were red fox and sea lions. Birds found were: Stilt sandpiper, (microplamahimantopus), house wren (troglodytes aedon), Northern American raven (corvus corax principalis), glaucous winged gull (larus glaucescens), sparrow (specie undetermined) -- large sparrow of slate grey color and having no distinctive markings-- believed to be a fox sparrow (passerella) of an undetermined type, bald eagle (haliaeetus platyrhchos), gadwall (chaulelasmus striperus), mallard (aras platyrhychos), and red throated loon (gavia stellata).

"Fish abound in the waters about the island and in the large lakes. "Dolly Vardon" trout, "Humpback" salmon, and "Rock" bass are found in the salt water, while in the lakes there are "Silver" salmon (about 10" long) and "Dolly Vardon" trout. The coloring, as well as the flesh of the bass caught by the party, was of a very greenish hue. The flesh was wormy and unfit for food. Fish were found in the lakes which appeared to be entirely landlocked.

"The island is of a volcanic rock formation, similar to that of the other islands of the Aleutian chain. Samll pieces of calcite, marble quartz and volcanic slate found along the beach.

* * * * * * * * * * * * * * * * * * *

"The high cliffs bordering the southern shoreline of the island afford excellent sites for the erection of observation stations on any of the numerous promontories.

"It is believed that the plan used in conducting this survey was generally satisfactory. The establishment of a base camp wherein to locate the radio set and to store supplies is considered desirable, as the task of transporting the radio set with its storage battery along with the counting party would not only require extra men but would subject the set to unpreventable rough handling as well as to the dampness. The total number in the party could very well be reduced to seven, four with the counting party and three at the base camp. The tents were fairly satisfactory as were the sleeping bags for men sleeping under cover. Men who may have to sleep in the open, however, should be provided with good water-proof sleeping bags to protect them against drenching rainfalls. Each man in the party should have a pocket compass. Fog is common and the absence of distinguishable landmarks makes it decidedly too difficult, at such time, to follow a direct course. Gasoline stoves with fuel are too heavy to be packed and the mobile party would be supplied with smaller alcohol stoves, which are light and take up little space.

"No moving pictures were taken of the sea otter as they were too distant from shore to be photographed by the camera with which the party was supplied. * * * * * * * * * * * * * * * * * * * * * * * * * * * * "

S. P. SWICEGOOD

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

"CHELAN Kiska, Alaska, 1 September, 1936.

From: Commanding Officer, CHELAN.
To: Commander, Bering Sea Patrol Force.

Subject: Amchitka Sea Otter Survey Expedition.

Forwarded.

"From what the commanding officer has been able to learn from various sources it is believed that sea otter are to be found in varying numbers on nearly all islands of the Rat and Andreanof groups.

"The sea otter survey at Amchitka was instituted by the CHELAN for the purpose of placing into the hands of the officers concerned the best obtainable data relative to the actual number on Amchitka, unofficial reports heretofore having ranged from three hundred to three thousand. As the count exceeds even the largest number previously estimated, that for all the islands must be stepped up accordingly.

"At present comparatively few persons know of the presence of sea otter on the Aleutians. It would seem, therefore, prevention of the best sort to take active measures in advance of the spread of the information contained in subject report, to the end that what may become a fur source of first rank may be fostered and developed to the utmost."

L. V. KIELHORN

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

INDEX

INDEX

INDEX