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APPOINTED UNDER THE TREATY BETWEEN THE UNITED STATES AND CANADA FOR THE PRESERVATION OF THE NORTHERN PACIFIC HALIBUT FISHERY

NUMBER 10

HYDROGRAPHIC SECTIONS AND CALCULATED CURRENTS IN THE GULF OF ALASKA

1929

BY

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AND
RICHARD VAN CLEVE

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FOREWORD

The present is a further report upon the hydrographical investigations carried on by the International Fisheries Commission under the terms of the Conventions of 1924 and 1930 between Canada and the United States, for the preservation of the halibut fishery of the Northern Pacific Ocean, including Bering Sea.

Reports 3 and 4, dealing with the hydrographic conditions and the currents in the Gulf of Alaska, were published in 1930. In Number 4, page 5, a brief statement of the purpose of the work was given. It is to determine the physical character and drift of the water within which the eggs and young of the halibut float. This drift determines the degree of interdependence of the regulatory areas adopted by the Commission. The areas and their separate control are of fundamental importance in the pronounced success which the Commission has had in rebuilding the supply of halibut. Report 9 deals with drift bottle experiments having the same purpose, and gives a summary of existing knowledge of currents in less technical language, in addition to a discussion of the distribution of young and adult halibut. The present report is, however, technical in character.

The International Fisheries Commission has had the help of an advisory board of four members: Dr. C. McLean Fraser, Dr. W. A. Clemens, N. B. Scofield, and Dr. Willis H. Rich.

The investigations have been carried on as part of a program directed by Dr. William F. Thompson, with a staff having its laboratories and headquarters at the University of Washington, Seattle, U. S. A.

JOHN P. BABCOCK, Chairman
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REPORTS BY THE INTERNATIONAL FISHERIES COMMISSION

1. Report of the International Fisheries Commission appointed under the Northern Pacific Halibut Treaty, by John Pease Babcock, Chairman, and William A. Found, Miller Freeman, and Henry O'Malley, Commissioners. Dominion of Canada, Ottawa, 1928.

   Same. Report of the British Columbia Commissioner of Fisheries for 1928, pp. 58-76. Victoria, 1929.

   Same. Report of the United States Commissioner of Fisheries for 1930, Appendix 1. U. S. Bureau of Fisheries Document No. 1073. Washington, 1930.

2. Life History of the Pacific Halibut (1) Marking Experiments, by William F. Thompson and William C. Herrington. Victoria, B. C., 1930.

3. Determination of the Chlorinity of Ocean Waters, by Thomas G. Thompson and Richard Van Cleve. Vancouver, B. C., 1930.

4. Hydrographic Sections and Calculated Currents in the Gulf of Alaska, 1927 and 1928, by George F. McEwen, Thomas G. Thompson, and Richard Van Cleve. Vancouver, B. C., 1930.

5. The History of the Pacific Halibut Fishery, by William F. Thompson and Norman L. Freeman. Vancouver, B. C., 1930.

6. Biological Statistics of the Pacific Halibut Fishery (1) Changes in Yield of a Standardized Unit of Gear, by William F. Thompson, Harry A. Dunlop, and F. Heward Bell. Vancouver, B. C., 1931.

7. Investigations of the International Fisheries Commission to December 1930, and their Bearing on Regulation of the Pacific Halibut Fishery, by John Pease Babcock, Chairman, William A. Found, Miller Freeman, and Henry O'Malley, Commissioners. Seattle, Washington, 1930.

8. Biological Statistics of the Pacific Halibut Fishery (2) Effect of Changes in Intensity upon Total Yield and Yield per Unit of Gear, by William F. Thompson and F. Heward Bell. Seattle, Washington, 1934.

9. Life History of the Pacific Halibut (2) Distribution and Early Life History, by William F. Thompson and Richard Van Cleve. Seattle, Washington, 1936.

10. Hydrographic Sections and Calculated Currents in the Gulf of Alaska, 1929, by Thomas G. Thompson, George F. McEwen, and Richard Van Cleve. Seattle, Washington, 1936.

Further reports will bear serial numbers and will be issued separately by the Commission.

HYDROGRAPHIC SECTIONS AND CALCULATED CURRENTS IN THE GULF OF ALASKA, 1929

By THOMAS G. THOMPSON, GEORGE F. McEWEN, and RICHARD VAN CLEVE

CONTENTS

INTRODUCTION

The results of a hydrographical study of the Gulf of Alaska, based upon data collected in 1927 and 1928, were given in a previous report by the present authors. The three sections at Ocean Cape, Cape Cleare, and Cape Chiniak investigated in 1928, extended seaward from points about four or five miles from shore and for a distance of sixty to seventy miles. In all three sections the outermost stations were just beyond the continental shelf, and it is interesting to note that it was at these stations that the currents of greatest intensity were obtained.

The prime purpose of the hydrographic studies, as mentioned previously, was to supply information that would be of value in the study of the drift of halibut eggs and larvæ. The greatest numbers of eggs and larvæ have been found just over the edge of the continental slope and some have been found floating far out in the Gulf. In view of this fact and because of the nature of the currents noted over the continental shelf, the number of stations in the sections were extended to conform to the general program of the International Fisheries Commission. Accordingly in 1929 samples were collected at the same time of year at all stations in the sections previously studied and at additional stations located at 20-mile intervals for over a hundred miles beyond the continental shelf. The original plan for the work in 1929 called for sections of 250 miles in length, but this was slightly modified because of the bad weather encountered. Thus the Ocean Cape section extended for 224 miles, the Cape Cleare section, 234 miles, and the Cape Chiniak section ran for only 175 miles.

The previous publication and the present paper are confined to the calculations of the resultant currents from fundamental data. In the future the International Fisheries Commission plans to check these theoretical computations with direct measurements by means of current meters, drift bottles, and drift buoys.

METHODS OF COLLECTION, ANALYSIS, AND CALCULATION

The methods of collection of the samples, the system of analysis, and the hydrodynamical treatment of the data are the same as previously described (McEwen, Thompson, and Van Cleve, 1930, pp. 9-12).

The results obtained from the various samples of water collected at the several sections are shown in the tables and diagrams. In Tables 1, 4, and 7, showing the fundamental data, the significance of the columns is as follows:

Column 1. Station number.
" 2. Depth of water in meters.
" 3. Depth at which samples were taken.
" 4. Dynamic depth.
" 5. Temperature.
" 6. Chlorinity.
" 7. $\sigma_{s,t,o} = (\text{Density} - 1)\ 10^3$, where the density is computed from the temperature and chlorinity but is not corrected for the pressure p.
" 8. $V_{s,t,p}$ equals the last three figures of the specific volume *in situ*.

$$V_{s,t,p} = \left(\frac{1}{\frac{\sigma_{s,t,p}}{1000}+1}\right)10^5.$$

" 9. Location of station.

THE SECTIONS

OCEAN CAPE SECTION—1929

The fundamental data for the Ocean Cape section are given in Table 1 and illustrated in Figure 1.

Temperatures: The temperatures of the waters in the Ocean Cape section in 1929 are markedly higher than those of the same section in 1928. While in 1928 there was only a subsurface band of water, corresponding roughly to the intermediate water, that had a temperature of 6.0° to 6.4°C., in 1929 the temperatures over the bank varied from 6.5° to 7.1°. The colder water found on the bottom at station 2 was noticed in 1928 as the colder water of higher chlorinity extending into the gully that lies between the shore and Yakutat Spit.

The drop from 6.5° to 5.5° in 1929 is comparatively rapid and forms a bank of water slanting from about 36 to 52 miles south of the Cape at the bottom, upward, and outward to about 59 to 77 miles south of the Cape at the surface. The temperatures in the surface layers are very uniform, varying from 5.0° to 5.5° and extending to 200 meters depth at stations 8 and 9 and to about 100 meters depth beyond. A spot of warmer water is noted at 0 to 25 meters in station 10.

From 5.0° to 4.0° the change is also comparatively rapid and takes place in the intermediate waters. The isotherms in the upper layers drop very markedly at the edge of the continental slope.

The uniformity of temperature of these waters, noted in 1927 and 1928, is again demonstrated. The greatest difference shown, that between 1400 meters depth at station 12 and 100 meters depth at station 3, is 4.7°.

Chlorinity: Separating the waters into the same categories according to their chlorinity as in the report on the 1927 and 1928 data, the coastal waters are found to extend from about 6 miles south of Ocean Cape on the bottom, upward and outward, varying in depth from 125 meters at station 3 to 55 meters at station 6. It reaches 74 miles south of the Cape, well beyond the continental slope. Beyond station 7 the intermediate waters may be seen to consist of two distinct layers. The upper uniform surface water of 18.00 o/oo Cl to 18.10 o/oo Cl averages about 50 meters in depth. The lower layer, which may be designated as the discontinuity layer, has a chlorinity of 18.10 o/oo to 18.70 o/oo. The discontinuity layer extends southward from station 8 at nearly the same level, averaging about 150 meters in thickness with its upper surface at 50 meters depth from stations 8 to 14 but dropping to a depth of 100 meters at the outermost station. At station 7 the isochlors slant downwards. The 18.70 isochlor drops to a depth of 350 meters at this point from a depth of 200 meters at station 8. It rises again over the edge of the bank so that the intermediate water covers the bank from 6 to 46 miles south of the Cape.

The ocean waters of chlorinity above 18.70 o/oo are very uniform in character, and its upper surface lies at about 200 meters depth except at station 7. It extends over the edge of the bank almost as far as station 5.

The results of the dynamical computations are given in Tables 2 and 3 and are illustrated in Figure 2. Parts of the section characterized by currents directed to the west alternated with those directed to the east. The marked irregularity indicated throughout the section which terminated with station 7 in 1928 extends to the end of the longer section of 1929. As before, the westward velocity was greatest off the continental slope, but its maximum value of 0.80 miles per hour was double that found for 1928, and the westward movement prevailed much farther downward than in 1928.

The average flow throughout the section was to the west, in accordance with the 1928 results.

CAPE CLEARE SECTION—1929

The fundamental data for the Cape Cleare section are given in Table 4 and illustrated in Figure 3.

Temperatures: The temperatures found in this section are noticeably higher than in 1928. The same body of warmer water is noted lying on the bottom from about 4 to 22 miles SE. of the Cape. Rising toward the surface, it extends almost to station 104, 34 miles from Cape Cleare.

The surface temperatures are low at the inner end of the section due to the presence of large outlets of fresh water in Prince William Sound and the Copper River. The temperatures increase outwards beyond the edge of the continental slope culminating in the body of warm water lying at stations 106 and 107 about 44 to 80 miles SE. of the Cape. Beyond this area of greater warmth, with the exception of a body of water found at stations 109 and 110 (about 102 to 144 miles offshore) that has a temperature exceeding 5.5°, they become lower. They reach a minimum 214 miles from the coast, increasing slightly at the last station.

The temperatures of the lower layers are, on the whole, very uniform. The isotherms rise toward the surface from the coast outward, indicating a warmer coastal zone. As in 1928 it is noted that in general the temperatures of the upper layers are lower than those of Ocean Cape, although the comparatively warmer surface temperatures seem to extend about 200 meters deeper in the Cape Cleare section. No such rapid temperature change is noticed in the Cape Cleare section as at Ocean Cape, and the extreme temperature range is even less than at the latter; i.e., 6.4° to 2.3°, or a difference of 4.1°.

Chlorinity: The lower chlorinities found in the coastal waters in this section show the effects of the proximity of Prince William Sound and the Copper River. Although in general the chlorinity of Cape Cleare is not much lower than that of the Ocean Cape section, the coastal waters show a much greater range of chlorinity values.

The 18.00 o/oo water covers only the inner edge of the bank to about 16 miles SE. of the Cape where it lies at a depth of 120 meters. Rising outwards toward the edge of the continental slope, it reaches a level of 85 meters below the surface at station 105, 44 miles offshore and just over the edge of the bank. It drops to a depth of 112 meters 10 miles farther out, then gradually rises, reaching the surface at station 110, 134 miles offshore.

Beyond station 110 the surface waters with 18.00 o/oo to 18.10 o/oo chlorinity show the same uniformity down to about 50 meters as was noticed at Ocean Cape. The water of the outermost station however shows a marked increase in chlorinity.

The intermediate water here covers the outer part of the bank from 16 to 34 miles offshore, extending to the edge of the continental slope. Its lower surface lies at approximately 210 meters at station 106, 20 miles to the southeast of the edge of the continental slope. One peak lies at station 108 at a depth of 178 meters and another at station 112 at 150 meters. The trough between the two "waves" lies at about 190 meters at station 110. Sixty miles beyond station 112, at station 115, it has again sunk to 180 meters. The whole discontinuity layer, including water of 18.10 o/oo Cl to 18.70 o/oo is seen to maintain approximately a constant level and a thickness of about 130 meters with the exception of the very decided drop and coincident thickening at station 106. The wave-like appearance described for the lower surface (the 18.70 o/oo isochlor) is exhibited by the entire layer.

The ocean water is found on the average at about 180 meters depth. The sinking of the isochlors at station 106 and their subsequent rise over the bank is

exhibited in a very marked degree by the 18.80 o/oo isochlor, which, sinking to 400 meters at 54 miles SE. of Cape Cleare, rises to 300 meters 10 miles farther in. The chlorinity generally is higher at the edge of the slope than at the next station 10 miles farther out.

The results of the dynamical computations are given in Tables 5 and 6 and illustrated in Figure 4. The irregularities in direction of the currents over the banks found in the 1928 sections were not observed in 1929. The currents are directed westward at all of the 5 inner stations. However, just at the edge of the continental slope a marked eastward current is found amounting to 0.73 knots at the surface and extending to a depth of 700 meters. The variability of the conditions is demonstrated here by comparing this result with that of the year previous when a current of 0.4 knots in a westerly direction was found at the same place. Farther out from the coast, just outside this eastward current, a westward current of a velocity of approximately 0.3 of a knot was calculated at the surface. This surface velocity increases to 0.4 knots farther out and thereafter decreases until a slight eastward current is again noticed between stations 112 and 114.

With slight variations the currents of the deeper layers are progressively less than those of the surface. The eastward current extended farther from the edge of the bank in the deeper layers than in the upper layers, although the velocity was very slight. A slight eastward current was also noticed from 400 to 1200 meters depths between stations 110 to 111, although a westward current was calculated for the upper 200 meters. While between stations 113 and 114, a slight westward current was found below 200 meters, a slight eastward current was shown in the surface layers.

In general the alternation of eastward and westward currents observed in 1928 was found to extend far into the Gulf and is quite evidently not constant in position or intensity from one year to the next. The westerly currents are dominant.

CAPE CHINIAK SECTION—1929

The fundamental data for the Cape Chiniak section are given in Table 7 and illustrated in Figure 5.

Temperatures: As in 1928 the temperatures of the entire Chiniak section are seen to be considerably lower than those of the other two sections, and in general the water is more nearly like true ocean water, being less affected by land drainage than the other localities. The temperatures are about 0.5° higher over the banks in 1929 than in 1928. The maximum temperatures are found at station 205 just at the edge of the bank.

The greatest range of temperature is 3.5°. The uniformity of temperature shown by the surface waters may be due to the lack of any large fresh water outlets near the section as well as to the great mixing of the waters by currents produced by winds and tides over the shallow banks. The occurrence of the warmer water at the edge of the continental shelf is a condition peculiar to Cape Chiniak and was noticed in 1928. It may be explained by the westward current

running with a velocity of 0.87 knots calculated between stations 207 and 208. This current gradually diminishes towards shore until between stations 203 and 204 a slight eastward current is observed. These two opposing currents cause the lighter warmer water to collect over the edge of the continental shelf.

Chlorinity: The chlorinity at Cape Chiniak in 1929 is seen to be higher over the banks than in the same section in 1928, but beyond the edge of the bank it is much the same as before. At the four inner stations it shows, like the temperatures, a remarkable homogeneity, varying only 0.04 o/oo throughout.

The coastal water is here confined to the bank proper covering the entire bank beyond station 204, about 35 or 36 miles ESE. of Cape Chiniak. It forms an almost perpendicular barrier with the intermediate water. Beyond the edge of the continental slope the intermediate water shows the same characteristics as in the Cape Cleare and Ocean Cape sections and may be divided into the very distinct surface water which is quite uniform and extends to about 50 meters depth at the outermost stations, then sinks to 100 meters at stations 206, 207, and 208.

From station 206 outwards to station 208, the discontinuity layer is about 100 meters in thickness and lies between the 100 and 200-meter levels. It rises at station 209, 115 miles offshore, to about 65 meters and is here about 125 meters in thickness. It continues to rise toward station 210 and reaches the 50-meter level at station 211. The isochlors exhibit a marked downward slope at the edge of the bank, the intermediate water dropping from about 185 meters at station 206 to 384 meters where it strikes the bank 13 miles farther in. It lies on the edge of the bank from 36 to 41 miles offshore at depths of 172 to 384 meters, respectively.

The results of the hydrodynamical computations are given in Tables 8 and 9 and illustrated in Figure 6. Very little movement of the water is shown over the bank, but a strong westward current of 1.00 knot is shown just over the edge. These results are in general agreement with those of 1928.

The westerly velocity extended to the depth of 500 meters and for 55 miles between stations 4 and 8. As in 1928, the average flow was to the west. Only between stations 208 and 209 was an easterly velocity found.

SUMMARY

In general the temperatures in the upper layers of all the sections are about 0.5° higher than those of 1928, although they were both taken at the same time of year.

The Ocean Cape and Cape Chiniak sections both show through their temperatures a sinking of the waters at the edge of the continental slope. At Cape Cleare there is a depression of the isotherms about 20 miles outside the edge of the bank, and they rise again over the edge of the bank. Thus at Ocean Cape and Cape Chiniak a strong westward current is noted immediately over the edge of the bank. At Cape Cleare it lies farther out while an eastward current is calculated for the waters at the edge of the slope.

The same depression of the isochlors near the edge of the continental slope is indicated in both the Ocean Cape and the Cape Cleare sections. This depression lies about 10 miles beyond the edge at Ocean Cape and 20 miles at Cape Cleare. In both these sections the isochlors rise noticeably over the edge of the bank. At Cape Chiniak the downward trend of the isotherms at the edge of the continental slope is analogous to the marked drop of the isochlors.

In all the sections the temperatures were higher inshore, decreasing out to sea. The position of the warmest water presented an interesting variation. At Ocean Cape it lay as a small body of water on the bank from 14 to 34 miles offshore at about 70 meters depth. At Cape Cleare two bodies of warmer water were noticed, separated by a tongue of slightly cooler water. The inner body covered the bank from station 101 to within 2 miles of station 103 and then proceeded outward off the bottom just reaching station 104 at 100 meters. Its upper surface lay at 50 meters depth. The outer body was found at station 106, 54 miles offshore, where it reached from the surface to a depth of 220 meters and extended from station 105 to 6 miles SE. of station 107. At Cape Chiniak the warm water was concentrated at station 205 just at the edge of the continental slope.

Beyond the areas where the chlorinities are affected by land drainage, etc., the three sections all show that the mixing effects of the stormwinds and waves are carried to approximately 50 meters depth. Below this is found the discontinuity layer which varies from 100 to 200 meters in depth, and beneath this, typical ocean water is found.

TABLE 1.—*Hydrographical data from the waters of the Gulf of Alaska off Ocean Cape, 1929.*

Station	Depth in Meters		Dynamic Depth	Temp. °C.	Chlor. o/oo	$\sigma_{s,t,o}$	$V_{s,t,p}$	Location
	Bottom	Sample						
1	115	0	0	6.00	17.57	25.00	559	4 mi. S. of Ocean Cape.
		25	24.38625	6.78	17.78	25.20	531	59:28:15 N. 139:54:40 W.
		50	48.76725	6.8	17.80	25.23	517	
		100	97.52000	6.8	17.81	25.24	494	
2	168	0	0	6.7	17.83	25.28	533	14 mi. S. of Ocean Cape.
		25	24.38212	6.8	17.83	25.27	524	59:19:40 N. 140:03:50 W.
		50	48.76162	6.75	17.83	25.27	512	
		100	97.50837	7.0	17.97	25.45	475	
		125	(121.86937)[1]	.....	.....	.....	(433)	
		150	146.21787	6.0	18.54	26.38	363	
3	137	0	0	6.80	17.86	25.32	530	24 mi. S. of Ocean Cape.
		25	24.38125	6.85	17.86	25.31	520	59:10:40 N: 140:13:30 W.
		50	48.75987	6.85	17.86	25.31	509	
		100	97.50837	7.10	17.91	25.35	485	
		125	121.87675	7.05	17.99	25.46	462	
4	143	0	0	6.85	17.86	25.31	531	34 mi. S. of Ocean Cape.
		25	24.38137	6.85	17.86	25.31	520	59:02:10 N. 140:22:50 W.
		50	48.75975	6.85	17.87	25.32	507	
		100	97.50475	7.00	17.99	25.47	473	
		125	121.87012	6.68	18.05	25.60	450	
5	185	0	0	6.5	17.84	25.33	529	44 mi. S. of Ocean Cape.
		25	24.38062	6.7	17.88	25.35	516	58:53:20 N. 140:32:00 W.
		50	48.75712	6.75	17.95	25.45	496	
		100	97.49662	6.65	18.04	25.59	462	
		125	(121.85462)	.....	.....	.....	(445)	
		175	170.54962	6.05	18.59	26.46	346	
6	320	0	0	6.95	17.90	25.34	527	54 mi. S. of Ocean Cape.
		25	24.38037	6.95	17.90	25.34	516	58:44:30 N. 140:41:30 W.
		50	48.75662	7.00	17.99	25.47	494	
		100	97.49612	7.00	18.06	25.58	464	
		175	(170.55223)	.....	.....	.....	(373)	
		200	194.88462	5.65	18.73	26.70	312	
7	1463 NB	0	0	6.1	17.94	25.52	511	64 mi. S. of Ocean Cape.
		25	24.37637	6.2	17.95	25.53	500	58:35:30 N. 140:50:20 W.
		50	48.74912	5.9	17.98	25.60	482	
		100	97.48337	5.5	17.98	25.65	455	
		200	194.89637	5.5	18.27	26.06	371	
		300	(292.22345)	.....	.....	.....	(283)	
		400	389.47137	5.4	18.85	26.89	204	
		500	486.64687	4.8	18.90	27.04	147	
		600	583.76987	4.7	18.93	27.09	099	
		700	680.83987	3.6	18.96	27.25	041	
		800	777.85337	3.35	19.00	27.33	986	
		900	874.81637	3.15	19.01	27.37	940	
		1000	.....	.....	.....	.....	.....	
		1200	.....	.....	.....	.....	.....	
		1400	.....	.....	.....	.....	.....	
8	1463 NB	0	0	5.2	18.06	25.80	485	84 mi. S. of Ocean Cape.
		25	24.36987	5.2	18.06	25.80	474	58:35:30 N. 140:50:20 W.
		50	48.73687	5.3	18.07	25.80	462	
		100	97.45962	5.5	18.17	25.92	429	
		200	194.82862	5.3	18.72	26.73	309	
		300	292.10062	4.0	18.84	27.04	235	
		400	(389.31095)	.....	.....	.....	(178)	
		500	486.46762	3.5	18.91	27.19	132	
		600	583.57862	3.8	18.93	27.19	090	
		700	(680.64095)	.....	.....	.....	(043)	
		800	777.65162	3.3	19.02	27.37	983	
		900	(874.60764)	.....	.....	.....	(902)	
		1100	.....	.....	.....	.....	.....	
		1300	.....	.....	.....	.....	.....	
		1500	.....	.....	.....	.....	.....	
9	1463 NB	0	0	5.1	18.03	25.77	489	104 mi. S. of Ocean Cape.
		25	24.37075	5.2	18.04	25.77	477	58:00:40 N. 141:27:20 W.
		50	48.73862	5.3	18.04	25.76	466	
		100	97.45862	5.2	18.26	26.08	414	
		200	194.81612	5.0	18.75	26.81	301	
		300	292.08562	4.2	18.83	27.01	238	
		400	389.30062	4.2	18.84	27.02	192	
		500	486.46662	3.9	18.88	27.11	140	

[1] All figures in parenthesis are interpolated.

TABLE 1.—(*Continued*).

Station	Depth in Meters		Dynamic Depth	Temp. °C.	Chlor. o/oo	$\sigma_{s,t,o}$	$\overline{V}_{s,t,p}$	Location
	Bottom	Sample						
		600	583.58012	3.8	18.95	27.22	087	
		700	680.64112	3.4	18.97	27.29	035	
		800	777.65312	3.5	18.99	27.31	989	
		900	874.61812	3.1	19.00	27.36	941	
		1000	971.53312	2.9	19.04	27.44	889	
		1100	.....	.....	.....	.....	.....	
		1300	1261.99762	2.5	19.06	27.50	754	
		1500	.....	.....	.....	.....	.....	
10	1463	0	0	5.7	18.00	25.66	499	124 mi. S. of Ocean Cape.
	NB	25	24.37312	5.7	18.01	25.67	486	57:42:50 N. 141:45:00 W.
		50	48.74212	5.3	18.04	25.76	466	
		100	97.46037	5.3	18.32	26.15	407	
		200	194.80937	3.9	18.74	26.91	291	
		300	292.07387	3.7	18.80	27.01	238	
		400	389.28687	3.6	18.83	27.07	188	
		500	486.44737	3.8	18.93	27.19	133	
		600	583.55687	3.7	18.95	27.23	086	
		700	680.61637	3.3	18.98	27.31	033	
		800	777.62537	3.1	18.99	27.35	985	
		900	.....	.....	.....	.....	.....	
		1000	.....	.....	.....	.....	.....	
		1200	.....	.....	.....	.....	.....	
		1400	.....	.....	.....	.....	.....	
11	1463	0	0	5.4	18.01	25.70	494	144 mi. S. of Ocean Cape.
	NB	25	24.37112	4.8	18.02	25.79	475	57:25:20 N. 142:03:20 W.
		50	48.73787	5.4	18.10	25.82	459	
		100	97.44962	4.9	18.43	26.35	388	
		200	194.78812	3.5	18.72	26.92	289	
		300	292.04912	3.6	18.83	27.07	233	
		400	389.25912	3.6	18.85	27.09	187	
		500	486.41862	3.6	18.92	27.20	132	
		600	583.52712	3.6	18.95	27.24	085	
		700	680.58662	3.3	18.97	27.30	034	
		800	777.59612	3.3	19.00	27.34	985	
		900	874.55712	3.1	19.03	27.41	937	
		1000	971.46962	2.9	19.05	27.45	888	
		1200	.....	.....	.....	.....	.....	
		1400	.....	.....	.....	.....	.....	
12	1463	0	0	5.2	18.00	25.71	493	164 mi. S. of Ocean Cape.
	NB	25	24.37125	5.0	18.02	25.77	477	57:07:40 N. 142:21:15 W.
		50	48.73937	5.2	18.02	25.74	468	
		100	97.46287	5.2	18.18	25.96	426	
		200	194.81887	3.4	18.74	26.95	286	
		300	292.07937	3.5	18.80	27.03	235	
		400	389.28737	3.5	18.87	27.13	181	
		500	486.44287	3.5	18.92	27.21	130	
		600	583.54887	3.4	18.95	27.26	082	
		700	680.60537	3.1	18.98	27.33	031	
		800	777.61287	3.1	19.00	27.36	984	
		900	874.57287	3.0	19.03	27.42	936	
		1000	971.48587	2.9	19.04	27.44	890	
		1200	1165.17187	2.6	19.08	27.52	796	
		1400	1358.67087	2.4	19.12	27.59	703	
13	1463	0	0	5.2	18.07	25.81	484	184 mi. S. of Ocean Cape.
	NB	25	24.36962	5.2	18.07	25.81	473	56:50:00 N. 142:38:40 W.
		50	48.73600	5.0	18.07	25.84	458	
		100	97.44750	4.6	18.41	26.36	388	
		200	194.78450	3.6	18.76	26.96	286	
		300	292.04400	3.6	18.83	27.07	233	
		400	389.25150	3.6	18.88	27.14	182	
		500	486.40850	3.5	18.91	27.19	132	
		600	583.51550	3.4	18.95	27.26	082	
		700	680.57200	3.3	18.99	27.33	031	
		800	777.57750	3.2	19.03	27.40	980	
		900	.....	.....	.....	.....	.....	
		1000	.....	.....	.....	.....	.....	
		1200	.....	.....	.....	.....	.....	
		1400	.....	.....	.....	.....	.....	
14	1463	0	0	5.3	18.07	25.80	485	204 mi. S. of Ocean Cape.
	NB	25	24.36962	5.2	18.08	25.82	472	56:32:30 N. 142:56:20 W.
		50	48.73600	5.1	18.08	25.84	459	
		100	97.45550	5.3	18.23	26.02	419	
		200	194.81000	3.5	18.71	26.90	290	

TABLE 1.—(*Continued*).

Station	Depth in Meters		Dynamic Depth	Temp. °C.	Chlor. o/oo	$\sigma_{s,t,o}$	$V_{s,t,p}$	Location
	Bottom	Sample						
		300	292.07050	3.5	18.83	27.08	231	
		400	389.27500	3.5	18.89	27.16	178	
		500	486.43100	3.5	18.89	27.16	134	
		600	583.53950	3.5	18.95	27.25	083	
		700	680.59700	3.2	18.98	27.32	032	
		800	777.60500	3.1	19.00	27.36	984	
		900	.....	.....	.....	.....	.....	
		1000	.....	.....	.....	.....	.....	
		1200	.....	.....	.....	.....	.....	
		1400	.....	.....	.....	.....	.....	
15	1463	0	0	5.5	18.00	25.68	496	224 mi. S. of Ocean Cape.
	NB	25	24.37262	5.4	17.99	25.67	486	56:25:10 N. 143:13:50 W.
		50	48.74275	5.4	17.98	25.66	475	
		100	97.46950	4.6	18.08	25.89	432	
		200	194.83700	4.4	18.69	26.78	303	
		300	292.11150	4.2	18.77	26.92	246	
		400	(389.28033)	.....	.....	.....	(190)	
		500	486.39450	3.9	18.91	27.15	137	
		600	583.50500	3.6	18.96	27.25	084	
		700	680.56400	3.5	18.99	27.31	034	
		800	(777.57312)	.....	.....	.....	(988)	
		900	.....	.....	.....	.....	.....	
		1000	.....	.....	.....	.....	.....	
		1200	1165.14400	2.8	19.08	27.50	798	
		1400	1358.64900	2.5	19.08	27.53	707	

TABLE 2.—*Tabulation of $10^5\Delta_n$ and $10^5\Delta_{nb}$, dynamic depth differences for stations 115-114, etc., in Ocean Cape Section, 1929.*

Depth in Meters	STATION													
	115–114	114–113	113–112	112–111	111–110	110–109	109–108	108–107	107–106	106–105	105–104	104–103	103–102	102–101
0	0 −3188	0 2750	0 −3537	0 1625	0 −2925	0 −2775	0 1048	0 −20873	0 1175	0 261	0 −1550	0 −663	0 738	0 −1163
25	300 −3488	0 2750	−163 −3374	13 1612	−200 −2725	237 −3012	88 960	−650 −20223	−400 1575	−25 286	−75 −1475	12 −675	−87 825	−413 −750
50	675 −3863	0 2750	−337 −3200	150 1475	−425 −2500	350 −3125	175 873	−1225 −19648	−750 1925	−50 311	−263 −1287	−12 −651	−175 913	−563 −600
100	1400 −4588	800 1950	−1537 −2000	1325 300	−1075 −1850	175 −2950	−100 1148	−2375 −18498	−1275 2450	−50 311	−813 −737	−362 −301	0 738	−1163 0
200	2700 −5888	2550 200	−3437 −100	3075 −1450	−2125 −800	675 −2100	−1250 2298	−6775 −14098	1175 0					
300	4100 −7288	2650 100	−3537 0	3025 −1400	−2475 −450	−1175 −1600	−1500 2548	−12283 −8590						
400	533 −3721	2350 400	−3587 50	2825 −1200	−2775 −150	−1375 −1400	−1033 2081	−16042 −4831						
500	−3650 462	2250 500	−3437 −100	2425 −800	−2875 −50	−1925 −850	−100 1148	−17925 −2948						
600	−3450 262	2400 350	−3337 −200	2175 −550	−2975 −50	−2325 −450	150 898	−19125 −1748						
								−19892 −981						
700	−3300 121	2500 250	−3337 −200	1875 −250	−2975 50	−2475 −300	17 1031	−20175 −698						
800	−3188 0	2750 0	−3537 0	1675 −50	−2925 0	−2775 0	150 898	−20873 0						
900				1575 50			0							

TABLE 3.—*Tabulation of computed velocity in knots relative to the bottom between stations 15-14, etc., perpendicular to a Section directed south from Ocean Cape, January, 1929.*

Depth in Meters	STATION													
	15–14	14–13	13–12	12–11	11–10	10-9	9–8	8–7	7–6	6–5	5–4	4–3	3–2	2–1
	K=.0000424	.0000424	.0000424	.0000424	.0000424	.0000424	.0000424	.0000424	.0000848	.0000848	.0000848	.0000848	.0000848	.0000848
0	–.14	+.12	–.15	.07	–.12	–.12	.04	–.88	.10	.02	–.13	–.06	.06	–.10
25	–.15	.12	–.14	.07	–.11	–.13	.04	–.86	.13	.02	–.13	–.06	.07	–.06
50	–.16	.12	–.14	.06	–.10	–.13	.04	–.82	.16	.03	–.11	–.06	.08	–.05
100	–.19	.08	–.08	.01	–.07	–.12	.05	–.76	.21	.03	–.06	–.03	.06	.00
125											.00	.00	.00	
140														
150														
175														
200	–.25	.01	.00	–.06	–.04	–.09	.09	–.59	.00	.00				
300	–.31	.00	.00	–.06	–.02	–.07	.10	–.36						
400	–.16	.02	.00	–.05	–.01	–.06	.09	–.20						
500	.02	.02	–.004	–.04	.00	–.04	.05	–.12						
600	.01	.01	–.01	–.03	.00	–.02	.04	–.07						
700	.00	.01	–.01	–.01	.00	–.01	.04	–.04						
800	.00	.00	.00	.00	.00	.00	.04	–.03						
900				.00			.00	.00						
1000				.00										
Distance between Stations in Km.	37.06	37.06	37.06	37.06	37.06	37.06	37.06		18.53	18.53	18.53	18.53	18.53	18.53
Depth at Station in meters								1463	320	185	143	137	168	115

TABLE 4.—*Hydrographical data from the waters of the Gulf of Alaska off Cape Cleare, January, 1929.*

Station	Depth in Meters		Dynamic Depth	Temp. °C.	Chlor. o/oo	$\sigma_{s,t,o}$	$V_{s,t,p}$	Location
	Bottom	Sample						
101	53	0	0	5.00	17.44	24.94	566	4 mi. SE. of Cape Cleare.
		25	24.39012	5.00	17.44	24.94	555	59:43:00 N. 147:53:00 W.
		50	48.77537	5.60	17.62	25.13	527	
102	124	0	0	4.90	17.51	25.05	556	14 mi. SE of Cape Cleare.
		25	24.38750	5.20	17.54	25.05	544	59:33:30 N. 147:41:45 W.
		50	48.76975	6.00	17.75	25.26	514	
		100	97.51875	6.30	17.85	25.36	482	
103	155	0	0	5.50	17.64	25.17	546	24 mi. SE. of Cape Cleare.
		25	24.38375	5.80	17.74	25.26	524	59:24:10 N. 147:40:30 W.
		50	48.76262	6.00	17.80	25.33	507	
		100	97.50637	6.40	17.96	25.51	468	
		140	136.48317	6.00	18.18	25.87	416	
104	210	0	0	5.80	17.86	25.44	519	34 mi. SE. of Cape Cleare.
		25	24.37825	5.90	17.87	25.44	507	59:14:50 N. 147:34:40 W.
		50	48.75262	6.00	17.94	25.53	488	
		100	97.48912	5.98	18.00	25.62	458	
		140	(136.46103)	.....	.....	.....	(417)	
		200	194.87662	5.40	18.67	26.64	317	
105	837	0	0	5.90	17.83	25.38	525	44 mi. SE. of Cape Cleare.
		25	24.37987	5.90	17.83	25.38	514	59:05:15 N. 147:28:20 W.
		50	48.75650	5.97	17.86	25.42	499	
		100	97.49325	6.00	18.07	25.72	448	
		200	194.87325	5.30	18.70	26.70	312	
		300	292.15325	4.67	18.80	26.90	248	
		400	389.37375	4.15	18.83	27.01	193	
		500	486.54025	3.92	18.88	27.11	140	
		600	583.65475	3.72	18.93	27.20	089	
		700	680.72025	3.55	18.94	27.22	042	
		800	777.73225	3.15	19.02	27.38	982	
106	1463 NB	0	0	6.15	17.87	25.41	521	54 mi. SE. of Cape Cleare.
		25	24.37887	6.15	17.87	25.41	510	59:55:30 N. 147:22:20 W.
		50	48.75512	6.20	17.87	25.41	500	
		100	97.49687	6.20	17.95	25.53	467	
		200	194.91287	6.27	18.39	26.14	365	
		300	292.22287	4.87	18.76	26.83	255	
		400	389.44937	4.20	18.80	26.96	198	
		500	486.62037	4.00	18.86	27.07	144	
		600	583.73887	3.80	18.91	27.16	093	
		700	680.80437	3.55	18.97	27.27	038	
		800	777.81737	3.40	18.99	27.32	988	
		900	874.78187	3.20	19.01	27.37	941	
		1000	971.69787	3.12	19.04	27.42	891	
		1200	1165.38487	2.75	19.08	27.50	796	
		1400	1358.88487	2.40	19.09	27.55	704	
107	1463 NB	0	0	5.40	17.73	25.31	532	76 mi. SE. of Cape Cleare.
		25	24.38100	5.80	17.80	25.35	516	58:35:00 N. 147:10:00 W.
		50	48.75687	6.40	17.95	25.50	491	
		100	97.49187	5.70	18.04	25.72	449	
		200	194.87037	5.40	18.73	26.73	308	
		300	292.15187	4.80	18.76	26.84	255	
		400	389.37687	4.25	18.82	26.98	195	
		500	486.54487	3.90	18.86	27.08	143	
		600	583.66337	3.80	18.89	27.13	094	
		700	680.73087	3.60	18.95	27.24	041	
		800	777.74737	3.50	18.98	27.29	992	
		900	874.71437	3.30	19.01	27.36	942	
		1000	971.63037	3.20	19.05	27.42	890	
		1200	1165.31637	2.70	19.08	27.51	796	
		1400	1358.81637	2.45	19.09	27.54	704	
108	1463 NB	0	0	5.30	17.91	25.57	507	98 mi. SE. of Cape Cleare.
		25	(24.37627)	.....	.....	.....	(496)	58:14:10 N. 146:56:40 W.
		50	48.74475	5.15	17.98	25.68	472	
		100	97.45825	5.20	18.50	26.43	382	
		200	194.79775	4.58	18.75	26.85	297	
		300	292.06675	4.07	18.80	26.97	241	
		400	389.28075	4.00	18.87	27.08	187	
		500	486.44275	3.85	18.90	27.14	137	
		600	583.55425	3.60	18.94	27.22	086	
		700	680.61525	3.45	18.97	27.28	036	
		800	777.62775	3.30	18.98	27.31	989	

TABLE 4.—(*Continued*).

Station	Depth in Meters		Dynamic Depth	Temp. °C.	Chlor. o/oo	$\sigma_{s,t,o}$	$V_{s,t,p}$	Location
	Bottom	Sample						
		900	874.59175	3.20	19.02	27.38	939	
		1000	971.50675	2.95	19.03	27.42	891	
		1200	1165.19675	2.67	19.06	27.48	799	
		1400	1358.70375	2.40	19.06	27.51	708	
109	1463	0	0	5.20	17.70	25.28	534	120 mi. SE. of Cape Cleare.
	NB	25	24.37912	5.75	17.91	25.51	500	57:53:15 N. 146:43:50 W.
		50	48.75150	5.50	17.96	25.62	479	
		100	97.47175	5.50	18.37	26.21	402	
		200	194.82325	5.10	18.76	26.81	301	
		300	292.09525	4.12	18.79	26.95	243	
		400	389.31175	3.98	18.84	27.04	190	
		500	486.47675	3.92	18.88	27.11	140	
		600	583.58975	3.65	18.95	27.23	086	
		700	680.64975	3.45	18.98	27.29	034	
		800	777.66141	.....	.....	.....	(986)	
		900	874.62475	3.40	19.02	27.36	941	
		1000	971.54125	3.00	19.03	27.42	892	
		1200	1165.23325	2.78	19.05	27.45	800	
		1400	1358.73825	2.50	19.09	27.54	705	
110	1463	0	0	5.20	18.02	25.74	490	142 mi. SE. of Cape Cleare.
	NB	25	24.37112	5.15	18.02	25.74	479	57:32:15 N. 146:31:00 W.
		50	48.73937	5.15	18.02	25.74	.....	
		100	97.46162	5.80	18.25	25.99	422	
		200	194.82262	4.98	18.75	26.81	300	
		300	292.09262	4.15	18.81	26.98	240	
		400	389.30612	3.90	18.86	27.08	187	
		500	486.46812	3.80	18.89	27.13	137	
		600	583.57962	3.62	18.94	27.22	086	
		700	680.64212	3.42	18.94	27.24	039	
		800	777.65362	3.20	19.01	27.37	984	
		900	874.61362	3.00	19.03	27.42	936	
		1000	971.52562	2.80	19.05	27.45	888	
		1200	1165.20762	2.55	19.08	27.52	794	
		1400	1358.70262	2.30	19.11	27.59	701	
111	1463	0	0	4.90	18.03	25.79	487	164 mi. SE. of Cape Cleare.
	NB	25	24.37025	5.00	18.04	25.80	475	57:11:25 N. 146:18:10 W.
		50	(48.73450)	.....	.....	.....	(477)	
		100	97.44350	5.20	18.46	26.37	387	
		200	194.78350	4.50	18.77	26.89	293	
		300	292.04950	4.10	18.82	27.00	239	
		400	389.26100	3.90	18.88	27.11	184	
		500	486.42150	3.75	18.90	27.15	137	
		600	583.53250	3.60	18.95	27.24	085	
		700	680.59250	3.40	18.97	27.29	035	
		800	777.60250	3.27	19.00	27.34	985	
		900	874.56400	3.10	19.02	27.39	938	
		1000	971.47700	2.90	19.05	27.45	888	
		1200	1165.16100	2.60	19.07	27.50	796	
		1400	1358.66000	2.35	19.11	27.58	703	
112	1463	0	0	4.75	18.04	25.82	483	186 mi. SE. of Cape Cleare.
	NB	25	24.36962	4.90	18.04	25.81	474	56:50:30 N. 146:05:50 W.
		50	48.73662	4.90	18.04	25.81	462	
		100	97.44462	5.20	18.58	26.54	370	
		200	194.77512	4.72	18.80	26.90	291	
		300	292.03862	4.00	18.83	27.03	236	
		400	389.24912	3.87	18.87	27.09	185	
		500	486.40912	3.75	18.91	27.16	135	
		600	583.51862	3.60	18.96	27.25	084	
		700	680.57562	3.40	19.00	27.33	030	
		800	777.58162	3.20	19.02	27.38	982	
		900	874.53912	3.07	19.05	27.43	933	
		1000	971.44912	2.87	19.06	27.47	887	
		1200	1165.12912	2.60	19.09	27.53	793	
		1400	1358.62812	2.35	19.07	27.53	706	
113	1463	0	0	4.80	18.06	25.85	481	208 mi. SE. of Cape Cleare.
	NB	25	24.36875	4.75	18.06	25.85	469	56:29:20 N. 145:53:20 W.
		50	48.73400	4.85	18.10	25.88	453	
		100	97.44200	4.80	18.49	26.45	379	
		200	194.77350	4.18	18.81	26.98	284	
		300	(292.03225)	.....	.....	.....	(236)	
		400	(389.24184)	.....	.....	.....	(161)	
		500	486.39900	3.62	18.92	27.20	133	
		600	583.50500	3.40	18.97	27.29	079	

TABLE 4.—(*Continued*).

Station	Depth in Meters		Dynamic Depth	Temp. °C.	Chlor. o/oo	$\sigma_{s,t,o}$	$V_{s,t,p}$	Location
	Bottom	Sample						
		700	680.56000	3.27	19.00	27.34	029	
		800	777.56550	3.15	19.00	27.35	984	
		900	874.52750	3.02	19.00	27.37	940	
		1000	971.44350	2.87	19.02	27.41	892	
		1200	1165.13350	2.60	19.06	27.49	798	
		1400	1358.63450	2.32	19.09	27.56	703	
114	1463	0	0	4.30	18.06	25.90	475	232 mi. SE. of Cape Cleare.
	NB	25	24.36775	4.47	18.06	25.88	466	56:06:45 N. 146:40:10 W.
		50	48.73287	4.50	18.06	25.88	455	
		100	97.44537	4.40	18.34	26.28	395	
		200	194.78737	4.12	18.77	26.93	289	
		300	292.04937	3.60	18.82	27.05	235	
		400	389.25687	3.60	18.89	27.15	180	
		500	486.41387	3.60	18.91	27.18	134	
		600	583.52137	3.45	18.96	27.26	081	
		700	680.57737	3.30	18.99	27.33	031	
		800	777.58387	3.15	19.02	27.38	982	
		900	874.54187	3.00	19.04	27.43	934	
		1000	971.45287	2.85	19.05	27.45	888	
		1200	1165.13887	2.60	19.06	27.49	798	
		1400	1358.63987	2.37	19.10	27.57	703	
115	1463	0	0	4.85	18.12	25.91	473	256 mi. SE. of Cape Cleare.
	NB	25	24.36650	4.87	18.14	25.94	460	55:43:40 N. 145:27:10 W.
		50	48.73000	4.87	18.14	25.94	448	
		100	97.44350	4.75	18.29	26.17	406	
		200	194.78700	3.67	18.80	27.01	281	
		300	292.04250	3.55	18.85	27.09	230	
		400	389.24650	3.50	18.89	27.16	178	
		500	486.40050	3.47	18.92	27.21	130	
		600	583.50650	3.40	18.95	27.26	082	
		700	680.56450	3.32	18.97	27.30	034	
		800	777.57350	3.20	19.00	27.35	984	
		900	874.53250	3.00	19.04	27.43	934	
		1000	971.44050	2.82	19.09	27.51	882	
		1200	1165.11550	2.57	19.09	27.53	793	
		1400	1358.60950	2.32	19.11	27.59	701	

TABLE 5.—*Tabulation of $10^5\Delta_n$ and $10^5\Delta_{nb}$, dynamic depth differences for stations 115-114, etc., in Cape Cleare Section, 1929.*

Depth in Meters	STATION													
	115–114	114–113	113–112	112–111	111–110	110–109	109–108	108–107	107–106	106–105	105–104	104–103	103–102	102–101
0	0 −3037	0 537	0 638	0 −3188	0 −4262	0 −3563	0 −3450	0 −11262	0 −6850	0 8512	0 −337	0 −2214	0 −1238	0 −562
25	−125 −2912	−100 637	−87 725	−63 −3125	−87 −4175	−800 −2763	285 3165	−473 −10789	213 −7063	−100 8612	−162 −499	−550 −1664	−375 −863	−262 −300
50	−287 −2750	−113 650	−262 900	212 −3400	−487 −3775	−1213 −2350	675 2775	−1212 −10050	175 −7025	−138 8650	−388 −725	−1000 −1214	−713 −525	−562 0
100	−187 −2850	337 200	−262 900	112 −3300	−1812 −2450	−1013 −2550	1350 2100	−3362 −7900	500 −6350	362 8150	−413 −750	−1725 −489	−1238 0	
200	−1037 −3000	1387 −850	−162 800	−838 −2350	−3912 −350	−63 −3500	2550 900	−7262 −4000	−4250 −2600	3962 4550	−337 0			
300	−687 −2350	1712 −1175	−637 1275	−1088 −2100	−4312 50	−263 −3300	2850 600	−8512 −2750	−7100 −250	6962 1550				
400	−1037 −2000	1503 −966	−728 1366	−1188 −2000	−4512 250	−563 −3000	3100 350	−9612 −1650	−7250 −400	7562 950				
500	−1337 −1700	1487 −950	−1012 1650	−1238 −1950	−4662 400	−863 −2700	3400 50	−10212 −1050	−7550 700	8012 500				
600	−1487 −1550	1637 −1100	−1362 2000	−1388 −1800	−4712 450	−1013 −2550	3550 100	−10912 −350	−7550 700	8412 100				
700	−1287 −1750	1737 −1200	−1562 2200	−1688 −1500	−4962 700	−763 −2800	3450 0	−11562 300	−7350 500	8412 100				
800	−1037 −2000	1837 −1300	−1612 2250	2088 −1100	−5112 850	−779 −2784	3366 84	−11962 700	−7000 150	8512 0				
900	−937 −2100	1437 −900	−1162 1800	−2488 −700	−4962 700	−1113 −2450	3300 150	−12262 1000	−6750 −100					
1000	−1237 1800	937 −400	−562 1200	−2788 −400	−4862 600	−1563 −2000	3450 0	−11962 1100	−6850 −100					
1200	−2337 −700	537 0	438 200	−3188 0	−4662 400	−2563 −1000	3650 −200	−11262 700	−6850 0					
1400	−3037 0	537 0	638 0	−3188 0	−4262 0	−3563 0	3450 0							

TABLE 6.—*Tabulation of computed velocity in knots relative to the bottom between stations 115-114, etc., perpendicular to a section directed southeast from Cape Cleare, January, 1929.*

Depth in Meters	STATION													
	115–114	114–113	113–112	112–111	111–110	110–109	109–108	108–107	107–106	106–105	105–104	104–103	103–102	102–101
	K=.0000347	.0000357	.0000389	.0000389	.0000389	.0000306	.0000534	.0000407	.0000389	.0000855	.0000855	.0000855	.0000855	.0000855
0	−.11	+.02	+.02	−.12	−.16	−.109	+.18	−.45	−.27	+.73	−.03	−.190	−.106	−.048
25	−.10	.02	.03	−.12	−.16	−.085	.17	−.43	−.27	.73	−.04	−.142	−.074	−.02
50	−.10	.020	.03	−.13	−.15	−.072	.15	−.41	−.27	.74	−.06	−.104	−.045	.00
100	−.10	.01	.03	−.13	−.09	−.078	.11	−.32	−.25	.69	−.06	−.042	.00	
125														
140														
150														
175														
200	−.11	−.03	.03	−.09	−.01	−.11	.05	−.16	.103	.39	.00	.00		
300	−.08	−.04	.05	−.08	.00	−.100	.03	−.11	.010	.13				
400	−.07	−.03	.05	−.08	.01	−.092	.02	−.07	.01	.08				
500	−.06	−.03	.06	−.07	.01	−.082	.00	−.04	.03	.04				
600	−.05	−.04	.08	−.07	.02	−.078	.00	−.01	.03	.01				
700	−.06	−.04	.09	−.06	.03	−.08	.00	.012	.02	.01				
800	−.07	−.05	.09	−.04	.03	−.08	.003	.027	.01	.00				
900	−.07	−.03	.07	−.03	.03	−.07	.01	.039	.00					
1000	−.06	−.01	.05	−.01	.02	−.061	.00	.043	.00					
1200	−.021	.00	.01	.00	.01	−.030	−.01	.027	.00					
1400	.00	.00	.00	.00	.00	.00	.00	.00						
Distance between Stations in Kms.	44.50	44.50	40.78	40.78	40.78	51.90	29.66	38.92	40.78	18.53	18.53	18.53	18.53	18.53
Depth at Station in meters									1463	837	210	155	124	53

TABLE 7.—*Hydrographical data from the waters of the Gulf of Alaska off Cape Chiniak, February, 1929.*

Station	Depth in Meters		Dynamic Depth	Temp. °C	Chlor. o/oo	$\sigma_{s,t,o}$	$V_{s,t,p}$	Location
	Bottom	Sample						
201	112	0	0	4.8	17.99	25.74	490	5 mi. ESE. of Cape Chiniak.
		25	24.37100	4.6	17.99	25.76	478	57:33:20 N. 152:03:00 W.
		50	48.73900	4.6	17.99	25.76	466	
		75	(73.10383)	.....	.....	.....	(455)	
		100	97.46650	4.5	17.99	25.77	444	
202	88	0	0	.....	.....	.....	(476)	15 mi. ESE. of Cape Chiniak.
		25	24.36900	4.6	18.00	25.78	476	57:26:20 N. 151:49:40 W.
		50	48.73675	4.6	17.99	25.76	466	
		75	73.10175	4.4	17.99	25.78	454	
203	73	0	0	4.7	18.01	25.78	487	25 mi. ESE. of Cape Chiniak.
		25	24.36987	4.5	18.02	25.82	472	57:19:10 N. 151:36:45 W.
		50	48.73662	4.5	18.01	25.80	462	
		70	68.22832	4.5	18.01	25.80	455	
204	152	0	0	4.7	17.98	25.74	491	35 mi. ESE. of Cape Chiniak.
		25	24.37087	4.6	18.00	25.78	476	57:12:00 N. 151:23:30 W.
		50	48.73862	4.6	17.99	25.76	466	
		100	97.46637	4.6	17.99	25.76	455	
		140	136.44057	4.5	17.99	25.77	426	
205	152	0	0	5.5	18.02	25.71	493	45 mi. ESE. of Cape Chiniak.
		25	24.37187	5.5	18.02	25.71	482	57:12:00 N. 151:23:30 W.
		50	48.74087	5.5	18.02	25.71	470	
		100	97.46562	5.7	18.19	25.92	429	
		140	(136.43930)	.....	.....	.....	(410)	
		200	194.87162	5.7	18.21	25.95	383	
		300	292.19362	5.0	18.73	26.78	261	
		375	365.12025	4.3	18.79	26.94	210	
206	987	0	0	4.6	18.07	25.88	477	55 mi. ESE. of Cape Chiniak.
		25	24.36762	4.4	18.07	25.90	464	56:57:30 N. 150:57:30 W.
		50	48.73237	4.6	18.07	25.88	454	
		100	97.44862	4.4	18.22	26.11	411	
		200	194.80262	4.7	18.76	26.85	297	
		300	292.07462	4.2	18.76	26.91	247	
		400	389.29012	3.8	18.87	27.10	184	
		500	(486.45536)	.....	.....	.....	(131)	
		600	(583.57185)	.....	.....	.....	(085)	
		700	680.64112	4.3	18.95	27.17	050	
		800	(777.65128)	.....	.....	.....	(999)	
		900	874.64412	3.5	18.94	27.23	953	
207	1463 NB	0	0	4.8	18.00	25.76	489	75 mi. ESE. of Cape Chiniak.
		25	24.36975	4.6	18.05	25.85	469	56:43:25 N. 150:32:00 W.
		50	48.73500	4.5	18.07	25.89	453	
		100	97.45350	4.7	18.17	26.01	421	
		200	194.81350	4.4	18.72	26.83	299	
		300	292.07950	3.6	18.83	27.07	233	
		400	389.28950	3.6	18.84	27.08	187	
		500	(486.44911)	.....	.....	.....	(134)	
		600	583.55850	3.3	18.94	27.25	082	
		700	680.61750	3.2	18.95	27.28	036	
		800	(777.62850)	.....	.....	.....	(987)	
		900	874.59050	3.0	19.02	27.40	937	
		1000	971.50250	2.8	19.06	27.47	887	
		1200	1165.18450	2.5	19.06	27.50	795	
		1400	1358.68250	2.3	19.09	27.56	703	
207A		0	0	4.4	18.10	25.93	473	85 mi. ESE. of Cape Chiniak. 56:36:30 N. 150:19:20 W.
208	1463 NB	0	0	4.3	18.11	25.96	469	95 mi. ESE. of Cape Chiniak.
		25	24.36550	4.2	18.13	26.00	455	56:29:15 N. 150:06:10 W.
		50	48.72725	4.3	18.16	26.03	439	
		100	97.44000	4.2	18.20	26.10	412	
		200	194.78700	3.8	18.80	27.00	282	
		300	292.04400	3.7	18.85	27.08	232	
		400	389.25000	3.6	18.90	27.17	180	
		500	486.40250	3.5	18.96	27.26	125	
		600	583.50250	3.3	18.99	27.33	075	
		700	680.55250	3.1	19.02	27.39	025	
		800	777.55600	3.0	19.01	27.39	982	
		900	874.51300	2.9	19.06	27.47	932	
		1000	971.42200	2.7	19.06	27.48	886	
		1200	1165.09800	2.4	19.09	27.55	790	
		1400	1358.59000	2.2	19.10	27.58	702	

TABLE 7.—(*Continued*).

Station	Depth in Meters		Dynamic Depth	Temp. °C.	Chlor. o/oo	$\sigma_{s,t,o}$	$V_{s,t,p}$	Location
	Bottom	Sample						
209	1463 NB	0	0	4.5	18.09	25.91	474	115 mi. ESE. of Cape Chiniak. 56:15:10 N. 149:40:20 W.
		25	24.36550	4.4	18.18	26.05	450	
		50	48.72625	4.2	18.18	26.07	436	
		100	97.43625	4.1	18.25	26.18	404	
		200	194.78725	3.8	18.75	26.94	289	
		300	292.04325	3.7	18.85	27.08	232	
		400	389.25325	3.6	18.85	27.09	186	
		500	486.41725	3.6	18.85	27.09	142	
		600	(583.53025)	.....	.....	.....	(088)	
		700	680.59125	3.4	18.99	27.32	032	
		800	777.59925	3.2	19.00	27.35	984	
		900	874.56075	3.4	19.03	27.38	939	
		1000	971.47375	2.8	19.06	27.47	887	
		1200	1165.15475	2.5	19.07	27.51	794	
		1400	1358.65175	2.3	19.09	27.56	703	
209A		0	0	.....	.....	.....	.....	125 mi. ESE. of Cape Chiniak.
210	1463 NB	0	0	4.3	18.12	25.97	468	135 mi. ESE. of Cape Chiniak. 56:01:00 N. 149:14:30 W.
		25	24.36575	4.4	18.12	25.96	458	
		50	48.72775	4.3	18.17	26.05	438	
		100	97.43850	4.3	18.26	26.18	405	
		200	194.78350	3.7	18.77	26.97	285	
		300	292.04400	3.6	18.80	27.02	236	
		400	389.25400	3.6	18.86	27.11	184	
		500	486.41100	3.5	18.92	27.21	130	
		600	583.51750	3.5	18.95	27.25	083	
		700	680.57600	3.3	18.97	27.30	034	
		800	777.58400	3.2	19.02	27.38	982	
		900	874.54300	3.0	19.03	27.42	936	
		1000	971.45650	2.9	19.03	27.43	891	
		1200	.....	.....	.....	.....	.....	
		1400	.....	.....	.....	.....	.....	
211	1463 NB	0	0	4.4	18.13	25.98	468	155 mi. ESE. of Cape Chiniak. 55:46:50 N. 148:49:50 W.
		25	24.36525	4.4	18:15	26.01	454	
		50	48.72637	4.4	18.20	26.08	435	
		100	97.42662	4.3	18.55	26.59	366	
		200	194.75012	3.7	18.80	27.01	281	
		300	292.00812	3.6	18.82	27.05	235	
		400	389.21562	3.6	18.89	27.15	180	
		500	486.37162	3.5	18.91	27.19	132	
		600	583.47862	3.4	18.95	27.26	082	
		700	680.53662	3.3	18.97	27.30	034	
		800	777.54612	3.1	18.99	27.35	985	
		900	874.50862	3.5	19.03	27.37	940	
		1000	971.42262	2.8	19.05	27.45	888	
		1200	1165.10762	2.6	19.07	27.50	797	
		1400	.....	.....	.....	.....	.....	

TABLE 8.—*Tabulation of $10^5\Delta_n$ and $10^5\Delta_{nb}$, dynamic depth differences for stations 211-210, etc., in Cape Chiniak Section, 1929.*

Depth in Meters	STATION									
	211–210	210–209	209–208	208–207	207–206	206–205	205–204	204–203	203–202	202–201
0	0 −3388	0 −1725	0 6175	0 −9250	0 −5362	0 −12893	0 −127	0 221	0 −12	0 −208
25	−50 −3338	25 −1750	0 6175	−425 −8825	213 −5575	−425 −12468	100 −227	100 121	87 −99	−200 −8
50	−138 −3250	150 −1875	−100 6275	−775 −8475	263 −5625	−850 −12043	225 −352	200 21	−13 1	−225 17
70								221 0	−12 0	−261 53
100	−1188 −2200	225 −1950	−375 6550	−1350 −7900	488 −5850	−1700 −11193	−75 −52			
140						−3848	−127			
200	−3338 −50	−375 −1350	25 6150	−2650 −6600	1088 −6450	−6900 −5993				
300	−3588 200	−75 −1800	−75 6250	−3550 −5700	488 −5850	−11900 −993				
375						−12893				
400	−3838 450	75 −1800	325 5850	−3950 −5300	−62 −5300					
500	−3938 550	−625 −1100	1475 4700	−4661 −4589	−625 −4737					
600	−3888 500	−1275 −450	2775 3400	−5600 −3650	−1335 −4027					
700	−3938 550	−1525 −200	3875 2300	−6500 −2750	−2362 −3000					
800	−3788 400	−1525 −200	4325 1850	−7250 −2000	−2278 −3084					
900	−3438 50	−1775 50	4775 1400	−7750 −1500	−5362 0					
1000	−3388 0	−1725 0	5175 1000	−8050 −1200						
1200	−4713		5675 500	−8650 600						
1400			6175 0	−9250 0						

TABLE 9.—*Tabulation of computed velocity in knots relative to the bottom between stations 211-210, 210-209, etc., perpendicular to a section directed south from Cape Chiniak, January, 1929.*

Depth in Meters	STATION									
	211–210	210–209	209–208	208–207	207–206	206–205	205–204	204–203	203–202	202–201
	K_n=.0000431	.0000431	.0000431	.0000431	.0000431	.0000862	.0000862	.0000862	.0000862	.0000862
0	–.15	–.07	.27	–.40	–.23	–1.11	–.01	.02	.00	–.02
25	–.14	–.07	.27	–.38	–.24	–1.08	–.02	.01	–.01	.00
50	–.14	–.08	.27	–.36	–.243	–1.04	–.03	.00	.00	.00
70								.00	.00	.00
75										.00
100	–.09	–.08	.28	–.34	–.25	–.96	.00			
125										
140						–.78	.00			
150										
175										
200	.00	–.06	.27	–.28	–.28	–.52				
300	.01	–.08	.27	–.24	–.26	–.09				
375						.00				
400	.02	–.08	.25	–.23	–.23					
500	.02	–.05	.20	–.20	–.20					
600	.02	–.02	.15	–.16	–.17					
700	.02	–.01	.10	–.12	–.13					
800	.02	–.01	.08	–.09	–.13					
900	.00	.00	.06	–.06	.00					
1000	.00	.00	.04	–.05						
1200			.02	–.03						
1400			.00	.00						
Distance between Stations in Kms.	37.06	37.06	37.06	37.06	37.06	18.53	18.53	18.53	18.53	18.53
Depth at Station in meters				1463	987	152	152	73		

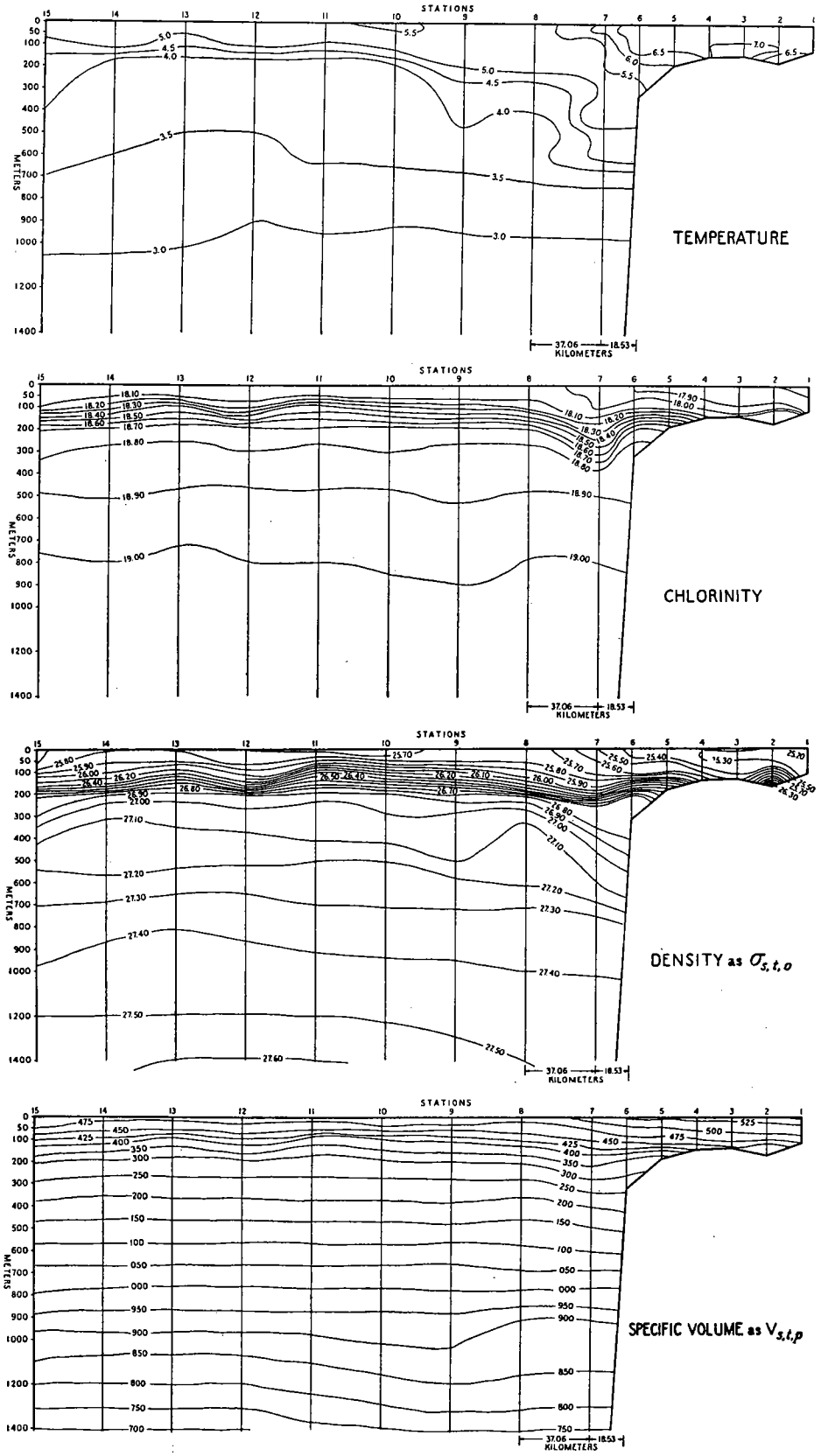

FIGURE 1.—Diagram of distribution of Temperature, Chlorinity, and Density as $\sigma_{s,t,o}$ for Ocean Cape Section.

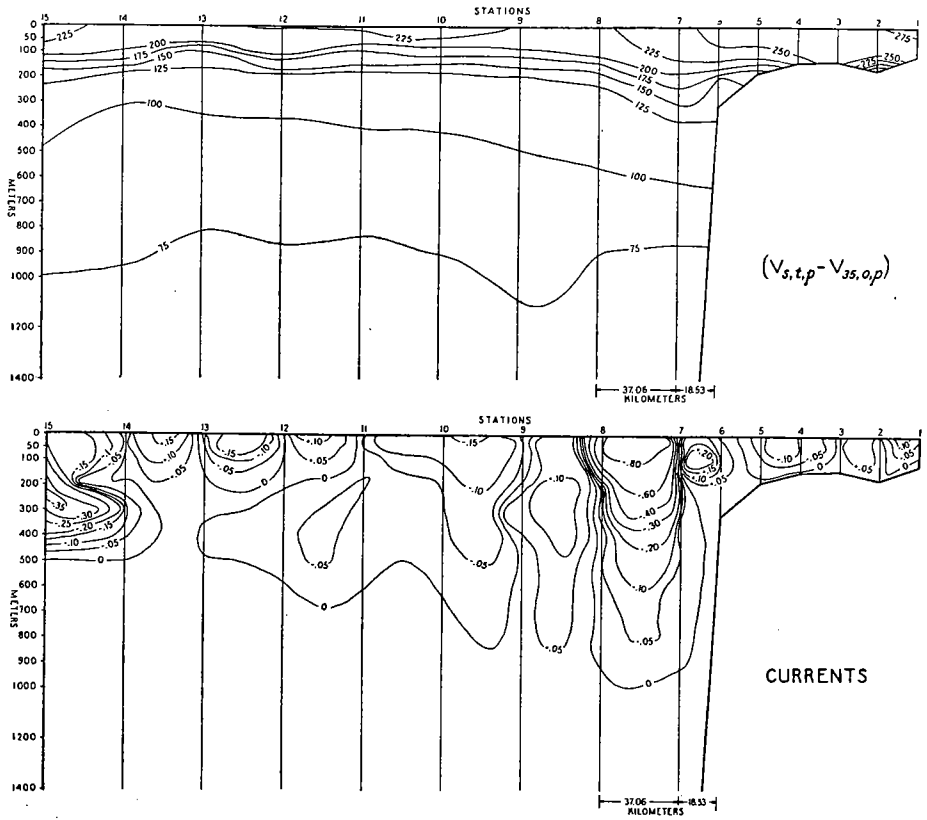

FIGURE 2.—Diagram of distribution of the specific volume as $V_{s,\,t,\,p}$, its anomaly $(V_{s,\,t,\,p} - V_{35.\,0.\,p})$, and the currents in knots in the Ocean Cape Section.

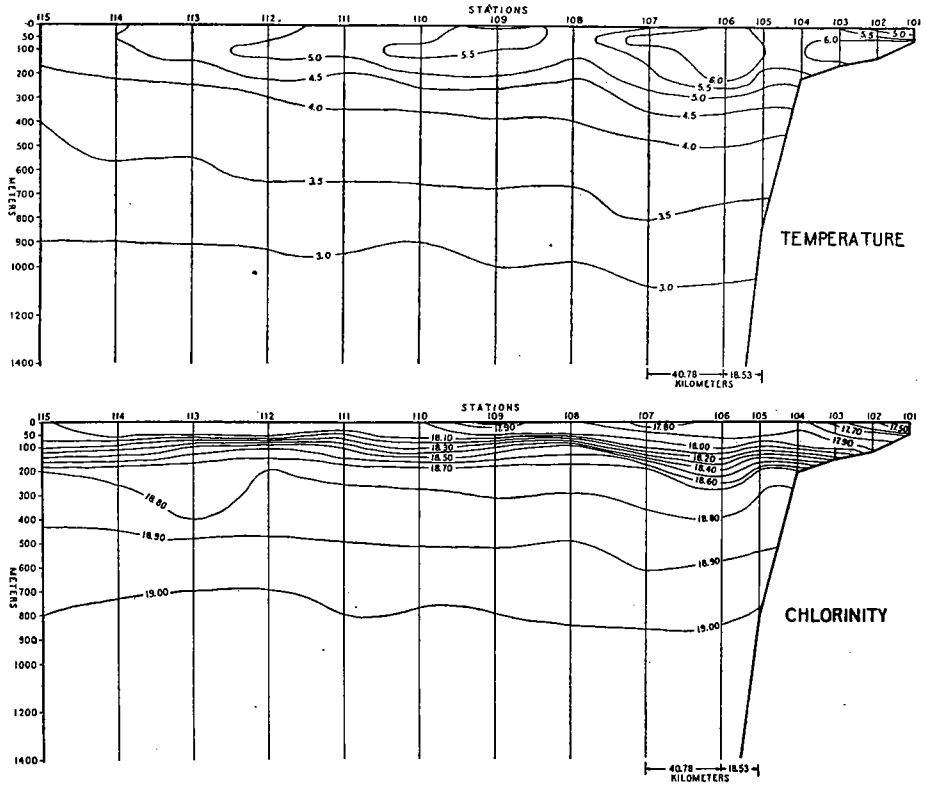

FIGURE 3.—Diagram of distribution of Temperature, Chlorinity, and Density as $\sigma_{s,\,t,\,o}$ for Cape Cleare Section.

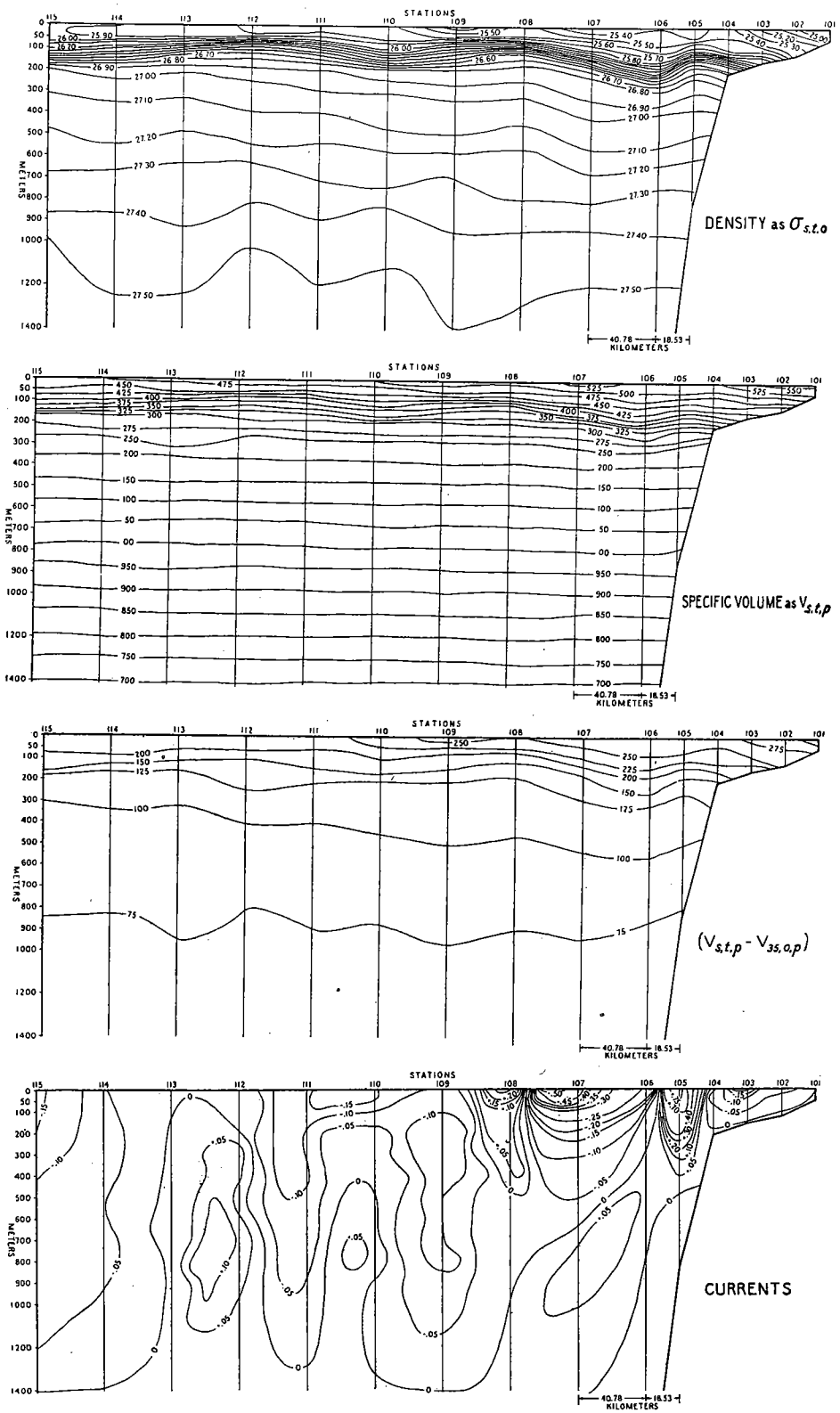

FIGURE 4.—Diagram of distribution of the specific volume as $V_{s,\ t,\ p}$, its anomaly $(V_{s,\ t,\ p} - V_{35,\ o,\ p})$, and the currents in knots in the Cape Cleare Section.

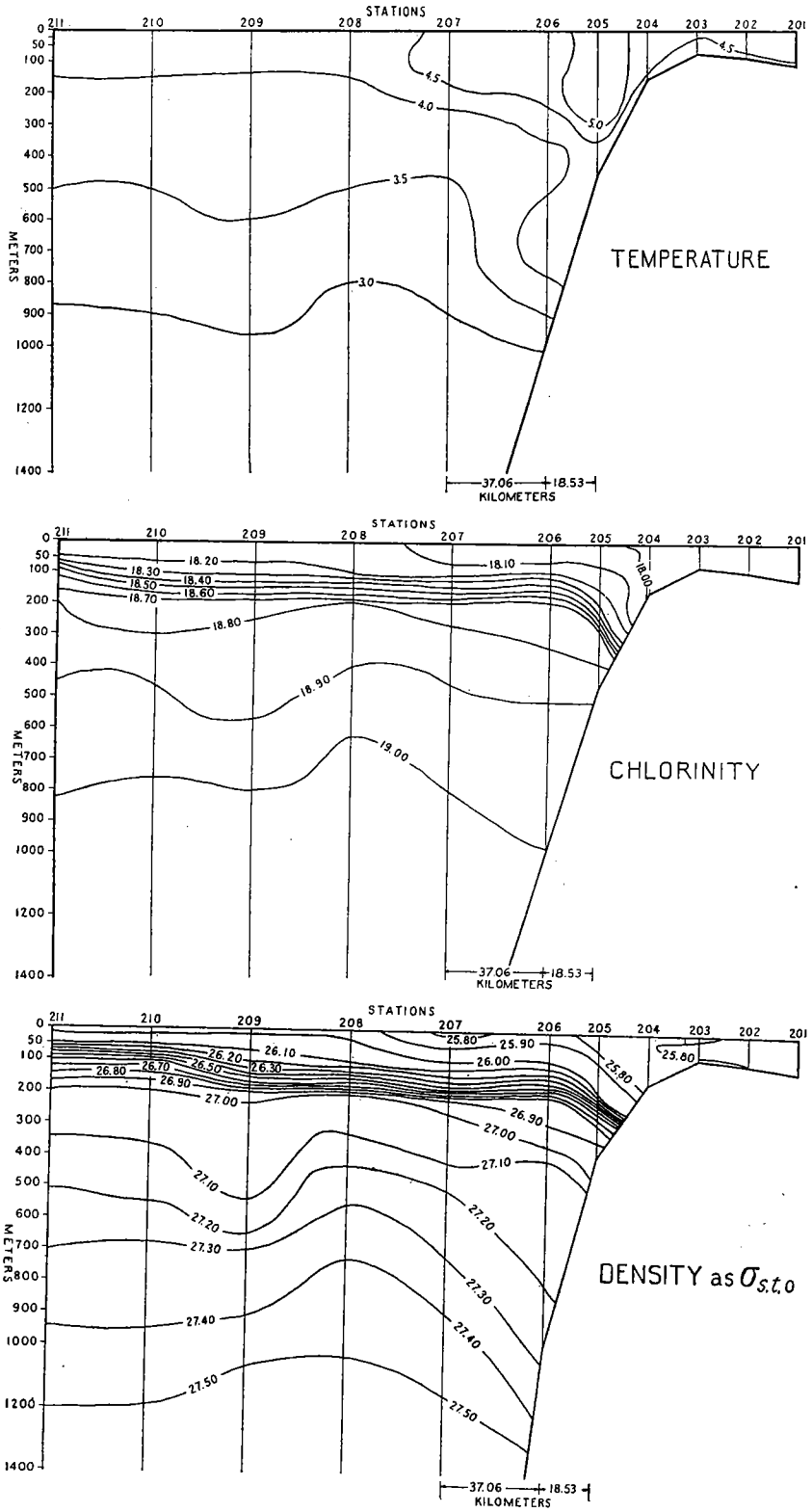

FIGURE 5.—Diagram of distribution of Temperature, Chlorinity, and Density as $\sigma_{s,\,t,\,o}$ for Cape Chiniak Section.

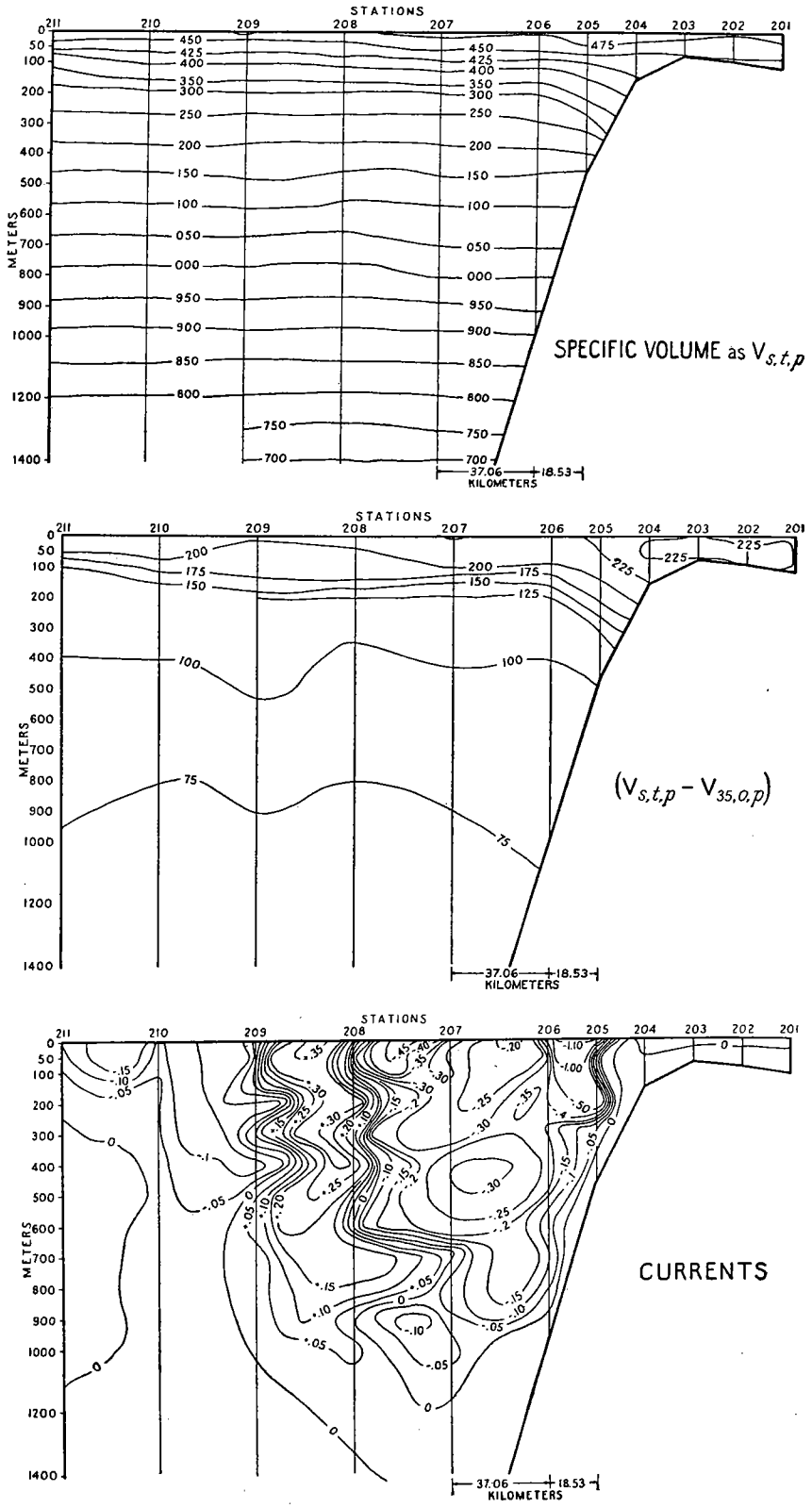

FIGURE 6.—Diagram of distribution of the specific volume as $V_{s,\ t,\ p}$, its anomaly $(V_{s,\ t,\ p} - V_{35,\ o,\ p})$, and the currents in knots in the Cape Chiniak Section.

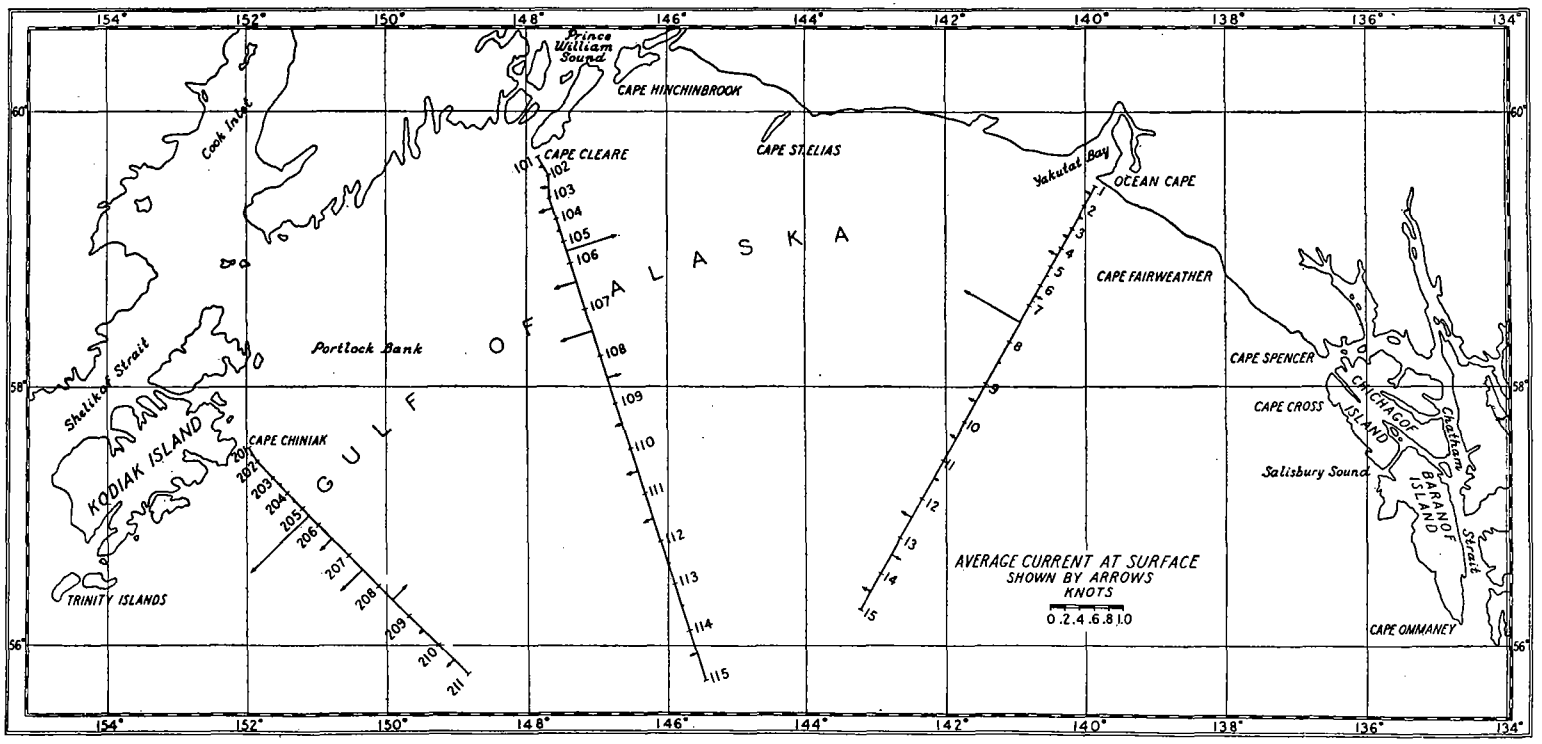

FIGURE 7.—The average current at the surface of Ocean Cape, Cape Cleare, and Cape Chiniak Sections in January.

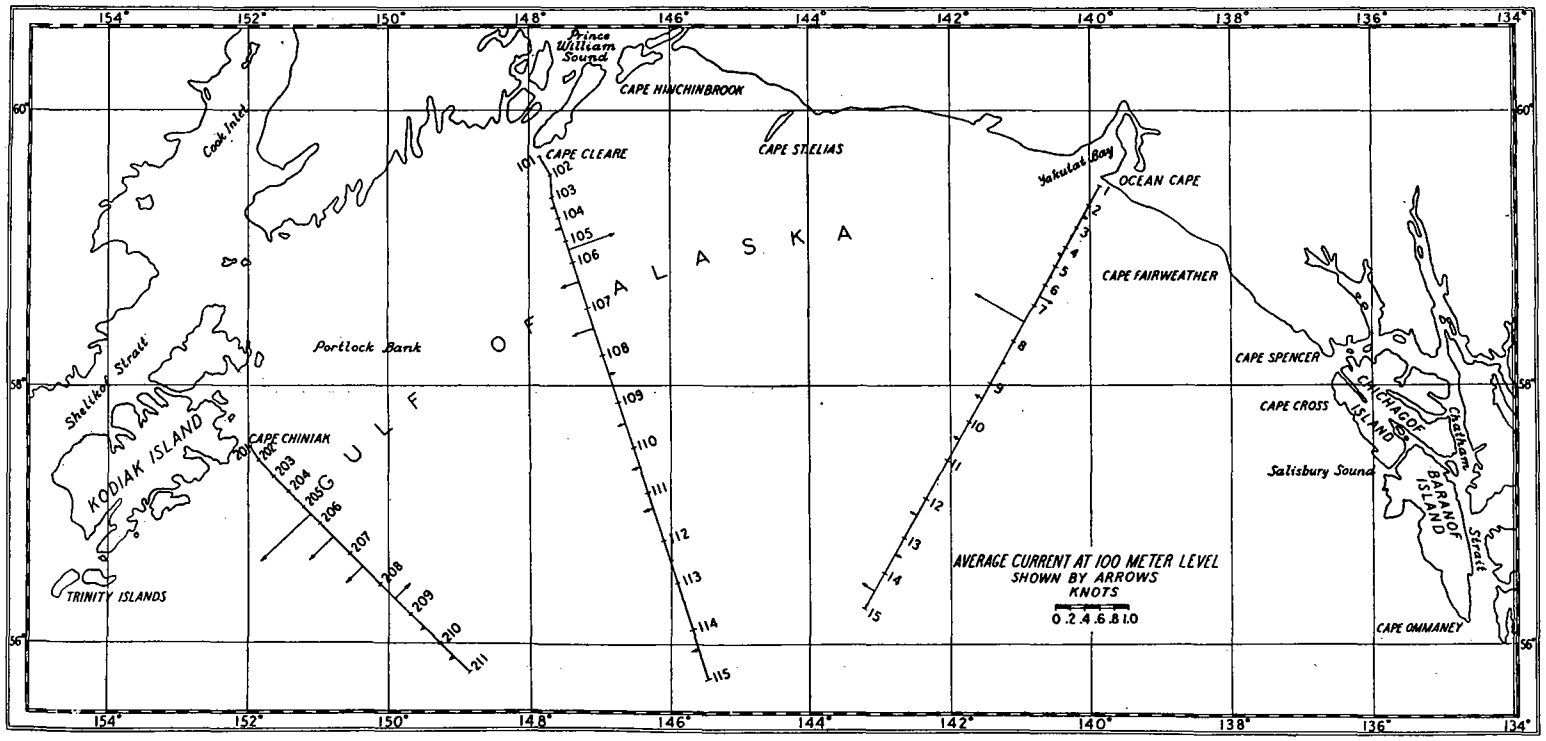

FIGURE 8.—The average current at the 100-meter level of Ocean Cape, Cape Cleare, and Cape Chiniak Sections in January.