

XV

HYDROGRAPHY IN PASSAMAQUODDY BAY AND VICINITY, NEW BRUNSWICK.

(By Professor ALEXANDER VACHON, B.A., L.Ph., etc., Laval University, Quebec.)

The laws that regulate the distribution of the plankton in the sea furnish a problem of paramount importance in the progressive industry of fisheries. Qualitative and quantitative determinations of the plankton are made at selected hydrographic stations, since the plankton is followed by multitudes of fishes which live on it, and those fishes are followed by others which serve as food for men.

As the plankton, which regulates, to a great extent, the migrations of the fish, is itself at the mercy of the chemical, physical and mechanical conditions of the sea, it is easily understood of what economical importance a correct knowledge of those conditions will prove. We speak of the migrations of the herrings and sardines; they are the same as those of the plankton which serve as food for them, and the presence of the plankton is ruled by depth, light, temperature, salinity, pressure and density.

TEMPERATURE.

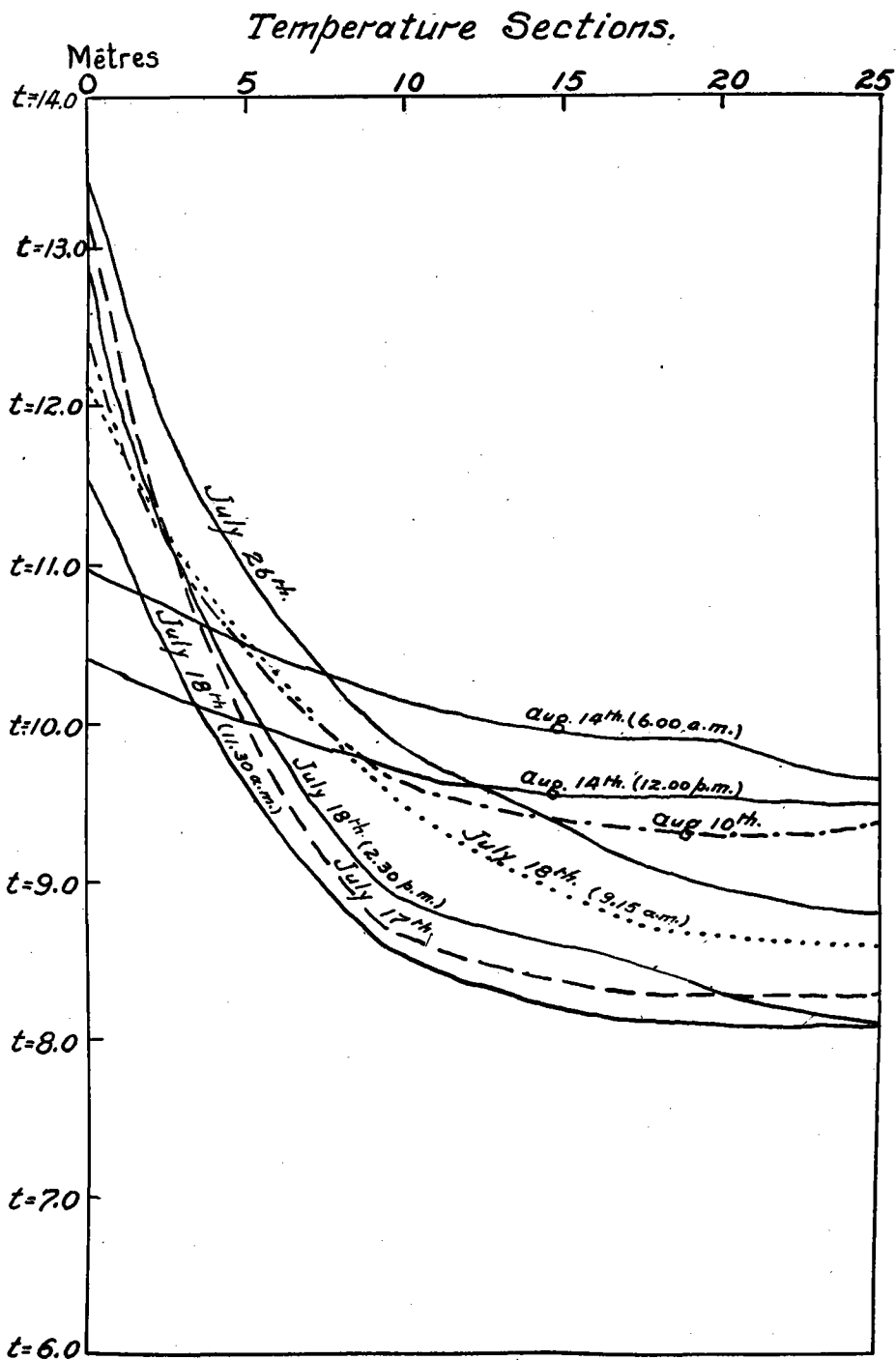
The heat of the atmosphere, emanating from the sun, penetrates the water, and is attenuated according as the depth increases. At the surface, the temperature of the water is almost as changeable as that of the air adjoining it, the variations of which find their repercussion in the contiguous liquid, although somewhat mitigated. Cold in winter, warmer in summer, the surface water expresses the alterations in the temperature of the air. Therefore, in summer, the sun's rays heat the water at the surface, and to a depth of a few meters. The difference between the temperature of the day and that of the night ceases to be perceptible at a small depth; in order to find the region which is insensible to summer and winter variations, we must go down further. At about one thousand metres, the secular variations are imperceptible. Then begins the zone where the temperature never varies; by a slow and regular progression, the temperature grows colder and colder until it is only about one or two degrees above zero. This low temperature is found even in the tropical regions, where the scorching rays of the sun beam constantly upon the surface.

Ordinarily, the water gradually becomes cooler from the surface to the bottom, because, apart from the effect of the sun's heat at the top, cold water is more dense and goes to the bottom; but, in the polar regions, and where there are cold currents, we sometimes find an area of colder water between two warmer regions, and this state of unstable equilibrium, where the water is cooler, more salt and more dense, affords very interesting information.

Light does not penetrate into the water further than two or three hundred metres from the surface, hence, no green plants are found at such depths, as light is necessary for the decomposition of carbon dioxide which is the bread of the vegetable kingdom.

When water is heated, it goes to the surface; if it be concentrated, it seeks a lower level; should it cool for some reason or other, by the atmosphere or by evaporation, it also descends. Everything influences the temperature of the superficial water, the cold, polar currents as well as the hot currents coming from the equatorial regions.

We understand why it is that the water is so cold at the bottom of the ocean, since cold water descends, and being free from the heating influence of the sun in those depths, where the light of day never reaches, and, on account of the feeble power of water to conduct heat, the temperature of the lower regions of the ocean never varies. Kelvin and Wegemann made calculations concerning the conduction of heat through water and came to the conclusion that this conduction is practically negligible. With a temperature of 30° C. at the surface and the water perfectly still, it would take one hundred years for any heat to be perceived at a depth of a hundred



SESSIONAL PAPER No. 38a

metres. Therefore, in practice, heat propagates through the water only by the movements of the waves and currents.

Looking over our records one can see that at the same depths in different stations, the temperature gradually becomes higher as the season advances, and in the month of July, at *Prince* station 5, we found a temperature of 4°.9 C. at 100 fathoms or 182 metres.

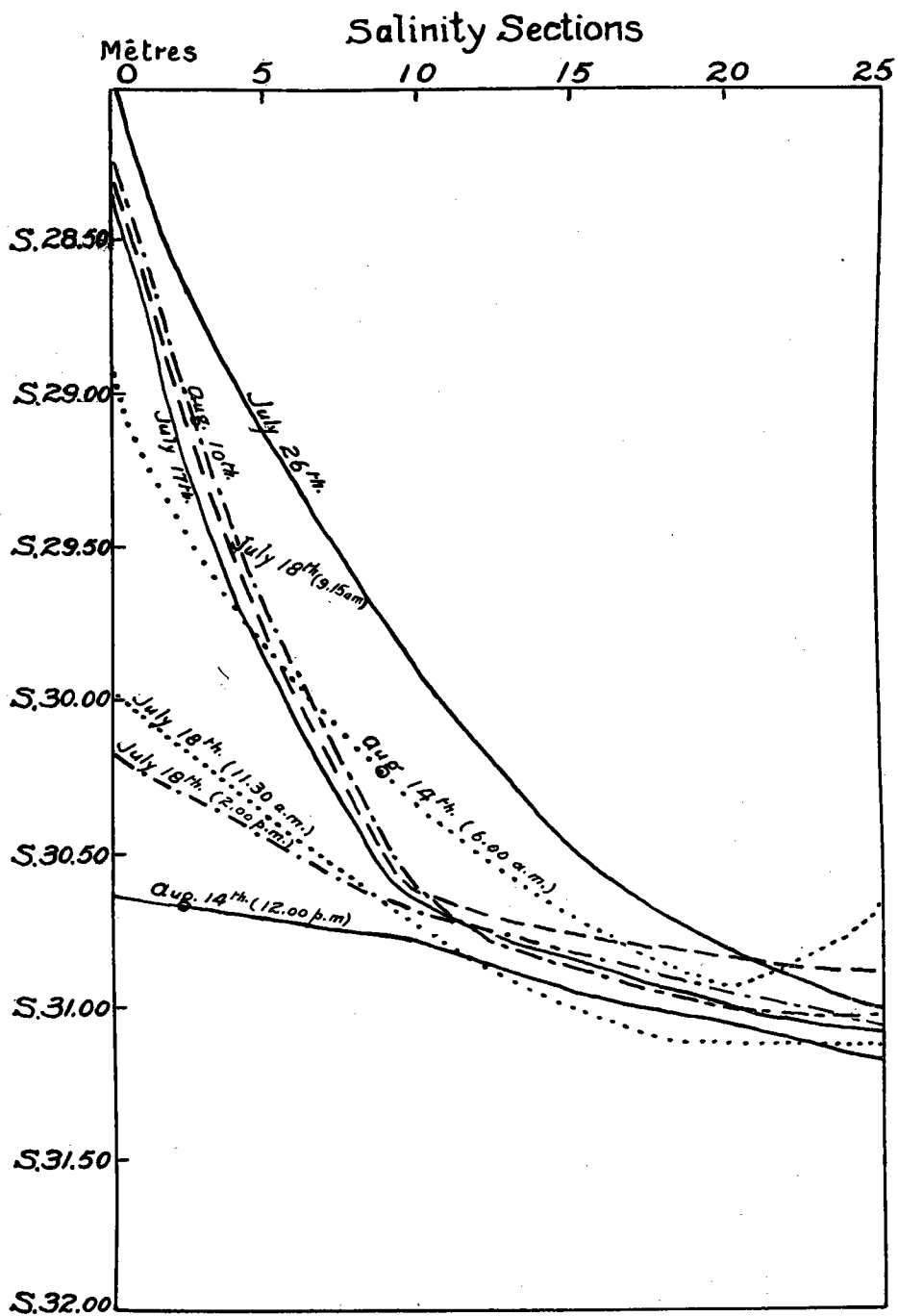
It is an easy matter to find out the temperature of the air or of the surface water; the thermometer can be read directly as soon as the expansion or contraction of the liquid in the tube is in equilibrium with its surroundings. However, it is not thus when one has to measure the exact temperature of a layer of water situated at a depth of a few hundred or thousand feet. Between the surface and the deep layer to be examined, there may be and, as a matter of fact, there are other layers that are colder or warmer. Even if the thermometer is sent down and left long enough to indicate the temperature of the water at a measured depth, when it is brought up to be read, the mercurial column, by going through regions of different temperatures, will change in length; it will contract, if it meets colder water and will expand if it comes in contact with warmer regions, it is impossible, therefore, to thus get the temperature of the lower regions of the sea with an ordinary thermometer. Besides, the thermometer is subjected, in the lower regions, to the enormous pressure of the upper layers, that of one atmosphere for every ten metres; even if the instrument is not broken, it will be crushed; the diameter of the tube getting smaller, the mercury will indicate a higher temperature for the same expansion, and, therefore, the reading of the thermometer will be too high. It took almost two centuries to resolve these perplexing problems.

Without going into details about the different suggestions worked out to reach a solution of the problems, suffice it to say that the best of all the thermometers that have been invented so far for taking the temperature of the lower regions is the Negretti-Zambra reversing thermometer; this is the one we used in our determinations. Negretti and Zambra invented this thermometer in 1878 and it has undergone no essential changes since that time. It is noteworthy to remark here that in this type there is a narrowing of the tube just above the bulb and, when the thermometer is placed with the bulb pointing downwards, the mercury fills the tube above the narrowing to a greater or less extent according to the temperature. If the thermometer is tipped over, either by the closing of the water-bottle, as it happens with the Pettersen-Nansen bottle, or while a messenger is sent down the wire, as in the case of the Ekman reversing apparatus, the mercury breaks off at the narrowing and the mercury which was above this point sinks down to the opposite end of the tube and fills it to a certain height; a scale on the tube thus gives the temperature at the time the thermometer was turned over: that is called the temperature *in situ*. The length of the broken thread of mercury varies somewhat in passing through water of higher or lower temperature and this change is calculated when the temperature of the mercury is known at the time of the reading, and this is the reason why there is always with the apparatus a second ordinary thermometer that gives the reading temperature so that the correction may be made. In order that the thermometer may be able to withstand the pressure of the water, it is placed inside a strong glass tube.

SALINITY.

Since there is no element that is absolutely insoluble, every element is found to a certain degree in sea-water. By very accurate analysis, elements which one would not expect to find have been discovered in it; common metals, such as iron, manganese and zinc, as well as precious metals, like gold and silver are found in sea-water. Those rarer metals, being present only in infinitesimal quantities, are not detected by the ordinary methods of analysis.

The water of the ocean evaporates, condenses and falls again upon the earth in the form of rain; it washes the earth, oozes through it and by the streams and rivers is carried back to where it started from. This water, coming in contact with all sorts of



SESSIONAL PAPER No. 38a

substances, takes up all that it can dissolve and carries it down into the ocean and, though the quantity of a substance which goes into solution may be comparatively small, we understand how it is that the sea contains such diverse elements.

The two predominant elements which are found in the water of the sea are chlorine and sodium. It seems logical to admit that the sea was always salt since we find in the ocean of to-day certain shells which require a definite salinity and which were quite abundant in the Cambrian seas.

Dittmar gives the following composition and percentage of the salts in sea-water:—

Sodium chloride, Na Cl.	27.213 gr. per litre.
Magnesium chloride, Mg Cl ₂	3.807 " " "
Magnesium sulphate, Mg SO ₄	1.658 " " "
Calcium sulphate, Ca SO ₄	1.260 " " "
Potassium sulphate, K ₂ SO ₄	0.863 " " "
Calcium carbonate, Ca CO ₃	0.123 " " "
Magnesium bromide, Mg Br ₂	0.076 " " "
	<hr/>
	35.000 " " "

Thoulet gives a somewhat different composition, though the amount of total salts is much the same, 35.0631 gr. per thousand grams of sea-water:—

Sodium chloride, NaCl.	27.3726 gr. per kilog.
Potassium chloride, K Cl.	0.5921 " " "
Rubidium chloride, Rb Cl.	0.0190 " " "
Calcium sulphate, Ca SO ₄	1.3229 " " "
Magnesium sulphate, Mg SO ₄	2.2434 " " "
Magnesium chloride, Mg Cl ₂	3.3625 " " "
Magnesium bromide, Mg Br ₂	0.0547 " " "
Calcium metaphosphate, Ca (PO ₃) ₂	0.0156 " " "
Calcium bicarbonate, Ca C ₂ O ₃	0.0625 " " "
Iron bicarbonate, Fe C ₂ O ₃	0.0149 " " "

From the analyses that have been made of a great many samples of sea-water, it can be stated that there are about 35 grams of salt in a thousand grams of sea-water. This amount is greater in some regions, for instance in the tropical regions and in the gulf stream, where evaporation is more intense. It is much less in other parts, especially near the continental shores where the flow of fresh water from the coast lessens the proportion of salt. For instance, in my determinations, I found as low as 15.13 gr. per thousand at *Prince Station* 18, 19.18 per thousand at Station 20, 18.35 per thousand at Station 21, 15.63 per thousand at Station 22, etc. This is easily explained by the fact that there is at those points a mixture of fresh water from the coast.

However, the average amount of salt in the ocean is about 35 gr. per thousand parts by weight. In the percentage of salts given by Dittmar and Thoulet, the acids and bases have been arbitrarily combined. Still it is very probable that in the water the salts are not found as indicated. The elements and acid radicals are found by analysis, but nothing tells us how they exist in solution. The dissolved substances mainly exist as ions, and from the freezing point and boiling point of sea-water, we calculate the ionic dissociation to be about 90 per cent; thus, only one-tenth of the total solids are present in the water as salts. It would be better, therefore, to write the composition of the solids in sea-water, as it is given by Dr. Johan Hjort:—

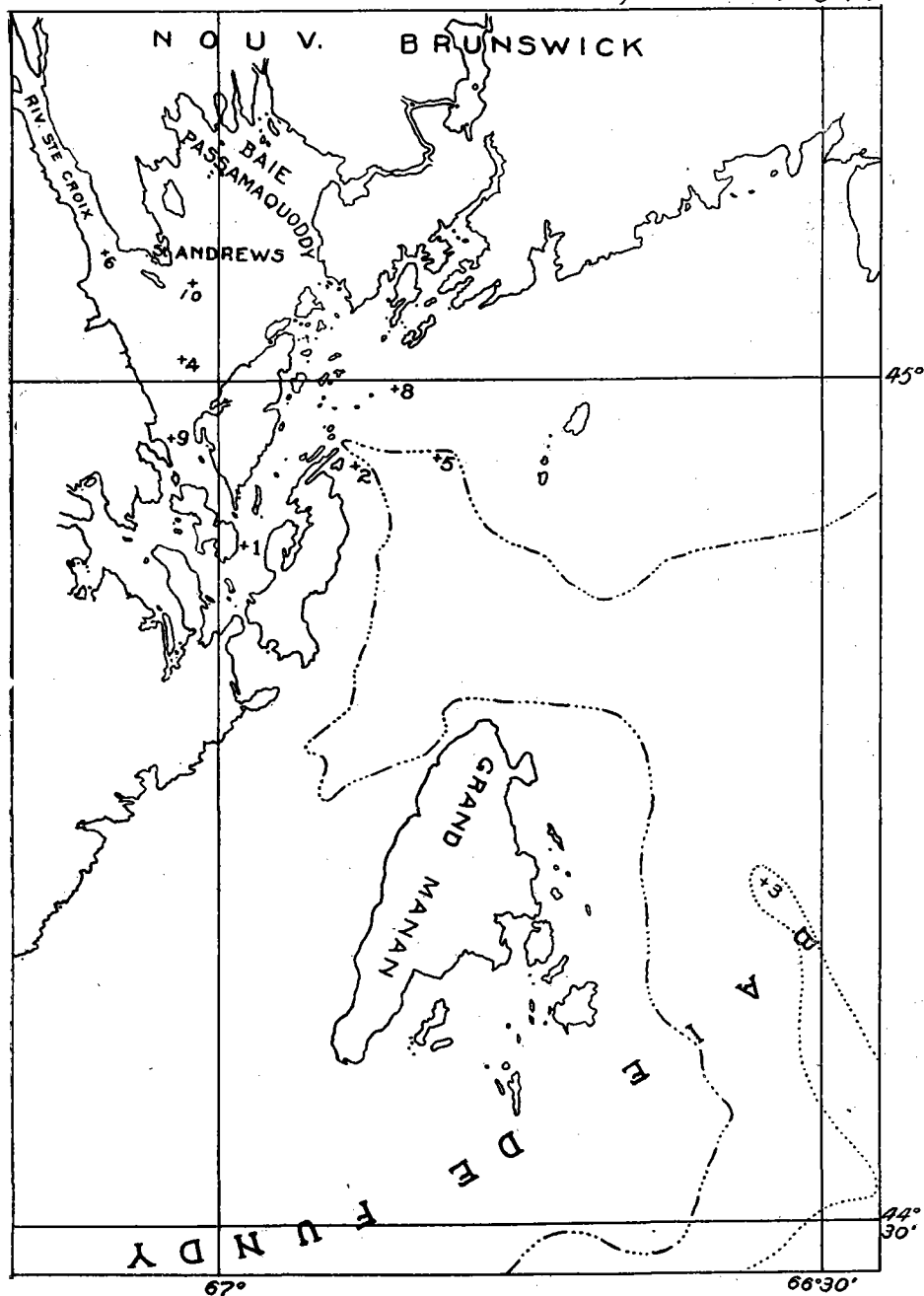
Na.	10.722 parts per 1000.	30.64%
Mg.	1.316 " " "	3.76%
Ca.	0.420 " " "	1.20%
K.	0.382 " " "	1.09%
Cl.	19.324 " " "	55.21%
SO ₄	2.696 " " "	7.70%
CO ₃	0.074 " " "	0.21%
Br.	0.066 " " "	0.19%
	<hr/>	
	35.000	100.00%

From the foregoing, one can readily perceive that the salinity of sea-water is not identical everywhere in the ocean; it varies in different regions and at different depths.

WESTERN ARCHIPELAGO

Prince Stations

Professor Vachon, Hydrography.



SESSIONAL PAPER No. 38a

A necessary condition to make a determination of the salinity of sea-water is to secure a sample of water collected at a certain date in a certain place, at the surface or at a known depth, which is guaranteed free from mixture with different water and which has in no way evaporated.

The surface water can be collected in a bucket and hauled up. The glass bottle in which the water is to be preserved for analysis is rinsed with a portion of the sample, then filled, well stoppered and it can be kept as long as the bottle is almost completely filled and hermetically closed.

From July 14 to July 25 my samples were kept in Imperial pint bottles; after the latter date I used citrate of magnesia bottles. I took the temperature of the surface from the water in the bucket by means of a Centigrade thermometer graduated in tenths of a degree and whose accuracy I had verified beforehand.

To collect samples from below the surface, a great number of methods have been invented. At first, an ordinary stoppered bottle was sent down to a certain depth by means of a weight, and, at the desired depth, the bottle was opened and filled with water by pulling a cord attached to the stopper. In drawing it up, very little water from the surface layers could mix with the sample.

The Petterson-Nansen bottle, which we used for collecting our samples from July 14 to July 25, can isolate a sample of water at any depth. This bottle is sent down open, the lid being suspended in the upper part of the frame and held by a spring. We used the reversing thermometer attached to the frame of the bottle. We left the bottle at the desired depth for five minutes so that the thermometer could have time to accurately mark the temperature of the water *in situ*. A messenger was then sent down along the wire; this messenger unhooks the lid; the weight, which hangs below the apparatus, clasps the whole thing together and closes the bottle. This is composed of a series of metallic cylinders to insulate the water and a thermometer can be placed on the inside; this thermometer, which, however, is but slightly affected by varying temperatures as the bottle is pulled up, was not used in our determinations.

When we used the Petterson-Nansen bottle, the depth was taken in fathoms, as the meter-wheel had not arrived at the station, but, in my tables, the fathoms are expressed in metres.

From July 25, we used the Nansen reversing bottles for collecting our samples and the meter-wheel or determining the depth. The Nansen bottle has attached to it a thermometer which is tipped over with the bottle by means of a messenger. We allowed this bottle to remain at least three minutes in the water before pulling it up for a reading. A number of these bottles can be fastened along the line; a messenger is hooked below each bottle, except the lowest one; this messenger is released when the bottle is tipped over by means of a messenger sent from above; the result is that the next bottle is reversed; this releases another messenger and so on. By this apparatus, a number of samples can be taken at the same time at different depths and the bottles are not so heavy and clumsy as the Petterson-Nansen bottle.

The samples of water collected must afterwards be analysed. In such analysis the halogens are titrated with silver nitrate and the results given as grams of chlorine per thousand grams of water.

We have seen that there are many substances in sea-water, and, though the proportion of salts varies from one place to another, the relative proportion of the different elements is about the same everywhere; thus, when the quantity of chlorine has been accurately determined, we have the proportion of total salts in the sample examined. Mohr's method is used for the determination of chlorine. If a neutral or slightly alkaline solution of a chloride, bromide or iodide, in which there is a little potassium chromate comes in contact with a neutral solution of silver nitrate a white precipitate is formed as long as there is a trace of halide in solution. Thus, in sea-water, the bromine and small amount of iodine present are precipitated along with the chlorine, but the whole is calculated in grams of chlorine per thousand grams of water. As soon

as the last trace of halide is precipitated, the potassium chromate indicates the end of the reaction by forming a red precipitate with the silver nitrate. If the strength of the silver nitrate has already been determined with a solution of chloride of known strength, the amount of halides in the unknown solution or in the sea-water that is analysed can be found by simple proportion. The solution of known strength which is used in hydrography for standardizing the silver nitrate solution is the sample of "normal water" which is furnished in closed glass tubes by the International Council. The amount of chlorine is marked on the tube; the sample I used contained 19.386 parts of chlorine per thousand grams. When possible, it is well to have a few bottles of the "normal water" in order to occasionally titrate the silver nitrate solution; the amount of chlorine indicated on the tube is not absolutely reliable after the tube is two-thirds empty.

As Doctor Huntsman could only obtain, last summer, and with considerable trouble, one tube of "normal water," we had to be satisfied with that.

Here I desire to express my gratitude to the Biological Board, and especially Professor Macallum, for the opportunity of taking up this study, to Dr. Huntsman, the zealous and active curator of the Biological Station at St. Andrew's, who gave so generously both of his time and of his experience to help me in every possible way in my work, and to Sir George Garneau, professor of analytical chemistry in Laval University, who helped me in the salinity determinations.

For accurate sea-water analysis, a special burette is desirable: the ordinary burette is too wide and too short for the required accuracy. The reading should be certain to a hundredth part of a c.c., which is difficult with the ordinary burette. Besides, the "drainage error" is greater than in the special one, the upper part of which is an ungraduated bulb that terminates in a fine jet. The lower part of this burette is a narrow tube graduated in hundredths of a c.c. At the present time it is most difficult, not to say impossible, to obtain one of those special burettes. Dr. Huntsman was able to get one from Dr. Mathews, of the Plymouth Marine Biological laboratory, England, but, most unfortunately, it was broken when it reached me. Two others, made to order by the Eimer and Amend Company also arrived in a broken state. We hope to be fully equipped with all the special apparatus in the near future.

DENSITY.

The density of sea-water can be taken with a pycnometer, or else with an areometer, at constant temperature; the second method is less accurate. But the densities, though they may be accurately determined by either of the methods, do not give the exact density of the water *in situ*, where it possessed a certain temperature and was compressed by a mass of water. The density of sea-water is inversely proportionate to the temperature and directly proportionate to the salinity; the lower the temperature and the higher the percentage of salts, the heavier the water. When both the temperature and the salinity of a sample of water are known, the specific gravity may easily be calculated by means of Knudsen's tables.

When I reached the Biological Station, I began my work by making salinity determinations of samples of water which had been collected a year before in St. Mary's Bay and the Annapolis Basin. The Imperial pint bottles that contained those samples were not hermetically closed; there was a deposit of salt on the covers and frequently on the outside of the bottles.

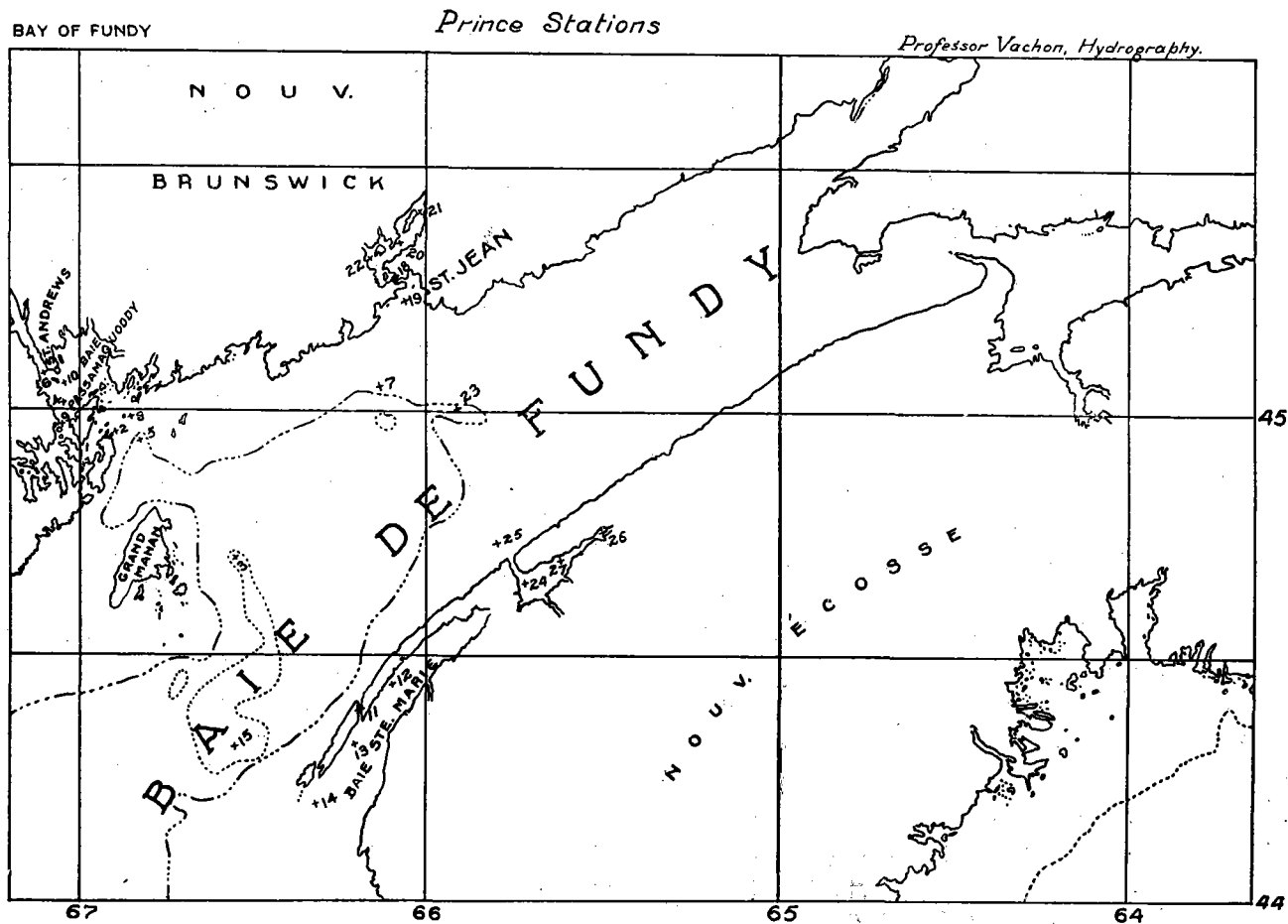
Supposing the water had evaporated, one would expect a high percentage of salts; nevertheless, the results are low, and though I give them in the tables, I can, in no way, guarantee their accuracy. There are other results obtained with samples taken at the same stations in September and October.

The other samples of water were collected on the given dates at stations chosen by Dr. Huntsman, where a study of the plankton is carried on along with the hydrography.

SESSIONAL PAPER No. 38a

At *Prince* Station 1, we find a higher temperature and lower salinity at 30 metres than at 20 which showing the water at this point was in a state of unstable equilibrium, a layer of higher density being above one of lower density. As a general rule, such strange results were obtained with many of the water-samples collected later in the season. For instance, at *Prince* Station 4, the results are normal until September 15. Then we find a salinity of 31.13 ‰ at 35 metres when the salinity at 30 metres was as high as 32.57 ‰, giving a density of 23.96 for the first and 25.10 for the second. At the same station, on October 3, we obtained a salinity of 30.73 ‰ at 20 metres when that of the surface was 31.66 ‰. The same consideration can be made concerning Station 6, when we find on September 15 a temperature of 10.17° and a salinity of 31.67 ‰ at 35 metres whereas at 30 metres the temperature was 10.12° and the salinity 31.69 ‰. As one can see by the tables, a number of water samples, collected at Station 6 in October, were lost, so we cannot say whether the extraordinary result mentioned is accidental. It will be seen also that at *Prince* station 6 the salinity varies greatly with the tide, especially at the surface and it is easy to understand that it should be so on account of the flow of fresh water from the Ste. Croix river, as station 6 is located in the mouth of the river, between the Biological Station and Robbinston. At station 9 on September 15 we find a zigzag of temperatures and salinities: the temperature rises somewhat from 10 to 20 metres while the salinity lowers; at 50 metres the salinity is 31.21 ‰ when we find 32.15 ‰ at 40 metres. the salinity afterwards rises normally to the bottom but the temperature rises also; however, from 50 metres down, the density increases in a normal manner. On October 3, we find at the same station (20 metres) a density of 23.88 between 24.34 at 10 and 24.40 at 30 metres. At station 16 we get a salinity of 32.63 ‰ at the surface, 32.07 ‰ at 10 metres and 31.47 ‰ at 20 metres. At 30 metres the salinity rises somewhat, but so does the temperature; there is another decrease in salinity at 40 metres. The high percentage of salts in the surface water of station 17 can be explained by the fact that the sample was collected in Yarmouth Harbour, where the depth is only 13 metres, and, therefore, the water is easily mixed.

All the bottles, except one, were broken, which contained the samples collected at Station 20; it is unfortunate as the temperatures predicted interesting figures for the salinity. From a depth of 10 metres down the temperature rises, 6.08° at 10 metres, 6.43 at 15 m., then 8.22, 10.98, 11.74, 11.93, 12.00. Perhaps the upper layers had been first cooled down to a certain depth, and that they had begun to get warmer again as the air temperature rose. But a fact worthy of attention in this particular case is that the temperature of the surface water is 15.69° when the air temperature is 11.80°. At station 21 there is also a decrease of temperature from the surface to a depth of 20 metres, but there is a rise of temperature from 30 metres to the bottom. However, at this station, as the salinity rises from the upper layers to the bottom, the increase of density is also normal. The temperatures taken at station 24 deserve special attention from the fact that there is very little difference between the surface temperature and that of the bottom, 9.37° at the surface and 9.29° at 55 metres. From 9.37° at the surface we get 9.32°, 9.31°, 9.28°; then a rise 9.29°, 9.30°; a slight fall to 9.28° and 9.29° at the bottom. These temperatures were taken at 9.20 a.m. The same day, at 5.45 in the afternoon, we have somewhat equivalent results, but the low salinity, instead of being at 50 metres, as in the forenoon when the tide was high is at 40 metres, at low tide. Two of the samples collected at station 24, September 23, 5.45 p.m. were lost; the others gave very extraordinary salinity results. The highest salinity, 32.37 ‰ is at the surface. We found 32.29 ‰ at 10 metres, 31.28 ‰ at 40 metres and 31.13 ‰ at 50 metres. A glance at the results given for stations 25 and 27 shows that at those stations also the density of the water was higher at the surface than at a certain depth. At station 25 we find a salinity of 32.47 ‰ at 10 metres and only 31.54 ‰ ten metres lower and so forth and so on.



SESSIONAL PAPER No. 38a

The following samples were collected by Mr. W. H. Chase, of Acadia University, a year before I reached the station. (The stations are indicated on a chart at the laboratory, at St. Andrews):—

Date.	Station.	Depth.	Salinity S. ‰.
July 7, 1915.	St. Mary's bay, No. 1	Bottom	29.18
" 7, 1915.	" " 2	"	31.20
" 7, 1915.	" " 3	"	31.89
" 7, 1915.	" " 4	"	30.76
" 7, 1915.	" " 5	"	30.70
" 7, 1915.	" " 6	"	31.47
" 7, 1915.	" " 7	"	31.48
" 8, 1915.	" " 8	"	30.78
" 8, 1915.	" " 9	"	30.18
" 7, 1915.	" " 10	"	30.76
" 13, 1915.	" " 11	"	30.06
" 8, 1915.	" " 12	"	31.45
" 13, 1915.	" " 13	"	30.80
" 8, 1915.	" " 14	"	29.86
" 8, 1915.	" " 15	"	30.91
" 8, 1915.	" " 16	"	30.77
" 13, 1915.	" " 17	"	30.18
" 13, 1915.	" " 18	"	29.99
" 13, 1915.	" " 19	"	29.86
" 13, 1915.	" " 20	"	30.25
" 13, 1915.	" " 21	"	30.38
" 13, 1915.	" " 22	"	30.78
" 23, 1915.	Annapolis basin, No. 25	Surface.	29.99
" 23, 1915.	" " 25	27.3 metres.	30.40
" 24, 1915.	" " 28	Surface.	30.52
" 24, 1915.	" " 28	Bottom.	30.53
" 23, 1915.	" " 29	Surface.	30.63
" 23, 1915.	" " 29	Bottom (6.3 m.).	30.71
" 23, 1915.	" " 30	" (4.6 m.).	29.79
" 24, 1915.	" " 31	Surface.	30.05
" 24, 1915.	" " 31	Bottom.	30.77
June 22, 1915.	Black Rock.	72.7 metres.	26.69
July 14, 1916.	Off Wilson's beach.	Surface.	30.88
			t°=8.8

[illegible]

SESSIONAL PAPER No. 38a

COLLECTED.

Date.	Hour.	Depth in Metres.	Air Temperature ° C.	Tide.	Wind.	Sky.	Depth of determinations in metres.	Water Temperature ° C.	Chlorine. Cl. ‰	Salinity. S. ‰	Density. σ_t	Colour of Water.
1916.												
July 25	11.50 a.m.	32.7	9.44	2½ hours of low tide.	S. W. breeze.	Cloudy.	Sur- face.	9.00	17.43	31.48	24.39	
" 25	12.10 p.m.	32.7	9.44	"	"	"	20 m.	7.90	17.49	31.61	24.66	
" 25	11.50 a.m.	32.7	9.44	"	"	"	28 "	7.40	17.56	31.62	24.72	
Aug. 2	4.00 p.m.	32.7	9.02	2¼ hours ebb.	Calm.	"	Sur- face.	8.70	17.31	31.27	24.28	
" 2	4.00 "	32.7	9.02	"	"	"	10 m.	8.30	17.32	31.29	24.26	
" 2	4.00 "	32.7	9.02	"	"	"	20 "	8.28	17.36	31.36	24.42	
" 2	4.00 "	32.7	9.02	"	"	"	30 "	8.10	17.36	31.36	24.44	
" 19	1.20 "	43 m.	12.00	½ hour to high tide.	"	Clear.	Sur- face.	8.7	17.56	31.73	24.65	
" 19	1.20 "	43 "	12.00	"	"	"	10 m.	8.25	17.63	31.86	24.81	
" 19	1.20 "	43 "	12.00	"	"	"	20 "	9.31	17.62	31.83	24.76	
" 19	1.20 "	43 "	12.00	"	"	"	30 "	8.29	17.60	31.81	24.75	
" 19	1.20 "	43 "	12.00	"	"	"	40 "	8.23	17.59	31.79	24.75	
" 31	3.35 "	35 "	15.60	2¼ hours to low tide.	S. W. breeze.	"	Sur- face.	9.52	17.63	31.84	24.61	
" 31	3.35 "	35 "	15.60	"	"	"	20 m.	9.10	17.67	31.93	24.72	
" 31	3.35 "	35 "	15.60	"	"	"	30 m.	9.08	17.67	31.93	24.72	
Sept. 14	3.20 "	32 "	22.63	2 hours ebb.	Calm.	"	Sur- face.	10.30	17.30	31.25	24.01	Bluish
" 14	3.20 "	32 "	22.63	"	"	"	10 m.	9.54	Sam- ple	lost.		
" 14	3.20 "	32 "	22.63	"	"	"	20 "	9.43	17.81	32.18	24.86	"
" 14	3.20 "	32 "	22.63	"	"	"	25 "	9.45	17.70	31.99	34.71	"
Oct. 3	3.45 "	35 "	13.81	High	Light S. W.	"	Sur- face.	9.30	Sam- ple	lost.		Green ish.
" 3	3.45 "	35 "	13.81	"	"	"	10 m.	9.21	"	"	"	"
" 3	3.45 "	35 "	13.81	"	"	"	20 "	9.13	17.81	32.18	24.94	"
" 3	3.45 "	35 "	13.81	"	"	"	30 "	9.15	17.69	31.96	24.74	"
" 17	10.11 a.m.	44 "	12.45	Low	S. W. strong.	Clouds, rain.	Sur- face.	9.02	No water.			
" 17	10.11 "	44 "	12.45	"	"	"	20 m.	8.81	"	"		"
" 17	10.11 "	44 "	12.45	"	"	"	40 "	8.78	"	"		"
No determinations were made at Station No. 2.												

[illegible]

SESSIONAL PAPER No. 38a

COLLECTED—Con.

Date.	Hour.	Depth in metres.	Air temperature t° C.	Tide.	Wind.	Sky.	Depth of determinations in metres.	Water temperature t° C.	Chlorine Cl. ‰.	Salinity S. ‰.	Density σt.	Color of Water.
1916.												
July 24	12.20 p.m.	188 m.	14.42	½ hour to low water.	S.E.	Cloudy rain.	Surf-ace.	10.00	16.84	30.43	23.41	
"	24	12.50 "	188 m.	"	"	"	45 m.	5.90	17.87	32.29	25.46	
"	24	12.35 "	188 m.	"	"	"	90 "	4.50	18.05	32.60	25.85	
"	24	12.20 "	188 m.	"	"	"	150 "	4.90	18.06	32.62	25.84	
"	24	12.00 noon.	188 m.	"	"	"	185 "	4.90	18.06	32.62	25.84	
Aug. 23	11.54 a.m.	185 m.	13.28	2¼ hours ebb.	S.W. breeze.	Fog . .	Surf-ace.	10.98	17.58	31.77	24.29	
"	25	12.54 p.m.	185 "	"	"	"	10 m.	9.87	17.66	31.91	24.60	
"	25	12.54 "	185 "	"	"	"	25 "	9.11	17.66	31.91	24.71	
"	25	12.54 "	185 "	"	"	"	50 "	7.43	17.94	32.41	25.35	
"	25	12.34 "	185 "	"	"	"	75 "	6.47	18.05	32.60	25.61	
"	25	12.34 "	185 "	"	"	"	100 "	6.10	18.19	32.85	25.88	
"	25	12.34 "	185 "	"	"	"	125 "	6.02	18.22	32.93	25.94	
"	25	12.15 "	185 "	"	"	"	150 "	5.83	18.22	32.93	25.98	
"	25	12.15 "	185 "	"	"	"	175 "	5.82	18.24	32.95	25.98	
Oct. 4	2.00 "	173 m.	15.48	1 hour flood.	Light S.W.	Hazy . .	Surf-ace.	11.07	Sample lost.			Dark Green
"	4	2.23 "	173 "	"	"	" . . .	10 m.	10.05	17.67	31.92	24.58	"
"	4	2.13 "	173 "	"	"	" . . .	20 "	9.67	Sample lost.			"
"	4	2.13 "	173 "	"	"	" . . .	25 "	8.71	17.93	32.39	25.16	"
"	4	2.13 "	173 "	"	"	" . . .	30 "	8.59	17.97	32.47	25.24	"
"	4	2.00 "	173 "	"	"	" . . .	40 "	8.27	Sample lost.			"
"	4	2.00 "	173 "	"	"	" . . .	50 "	7.92	18.05	32.61	25.44	"
"	4	2.00 "	173 "	"	"	" . . .	75 "	6.70	17.94	32.42	25.46	"
"	4	1.45 "	173 "	"	"	" . . .	100 "	6.35	Sample lost.			"
"	4	1.45 "	173 "	"	"	" . . .	150 "	6.12	17.99	32.51	25.59	"
"	4	1.45 "	173 "	"	"	" . . .	173 "	6.15	18.25	32.98	25.95	"
July 20	3.30 "	30 "	23.00	1 hour to high tide.	"	Bright.	Surf-ace.	11.40	16.80	30.36	23.11	
"	20	3.30 "	30 "	"	"	" . .	9 m.	8.80	17.15	30.99	24.07	
"	20	3.30 "	30 "	"	"	" . .	18.3 "	8.30	17.23	31.13	24.22	
"	20	3.30 "	30 "	"	"	" . .	27.4 "	8.10	17.28	31.23	24.32	
"	27	3.30 "	30 "	1 hour to low tide.	S.W. breeze.	Bright.	Surf-ace.	15.90	16.03	28.97	21.18	
"	27	3.30 "	30 "	"	"	"	10 m.	9.80	16.91	30.56	23.57	
"	27	3.30 "	30 "	"	"	"	15 "	8.79	17.21	31.09	24.14	
"	27	3.30 "	30 "	"	"	"	25 "	8.50	17.28	31.22	24.29	
Aug. 3	4.00 "	30 "	16.30	1 hour ebb.	"	Cloudy.	Surf-ace.	11.0	16.75	30.27	23.12	
"	3	4.00 "	30 "	"	"	"	10 m.	8.92	17.15	30.99	24.02	
"	3	4.00 "	30 "	"	"	"	20 "	8.91	17.15	30.99	24.02	
"	3	4.00 "	30 "	"	"	"	30 "	8.85	17.20	31.07	24.21	
Aug. 10	5.30 p.m.	29 m.	21.70	Half flood.	Calm.	Clear.	Surf-ace.	13.22	16.71	30.19	22.67	
"	10	"	"	"	"	"	10 m.	9.30	17.12	30.94	23.91	
"	10	"	"	"	"	"	20 m.	9.19	17.20	31.08	24.04	
"	10	"	"	"	"	"	25 m.	9.01	17.21	31.09	24.09	
"	17	5.00 p.m.	33 m.	Half ebb.	Light S.E.	Hazy.	Surf-ace.	10.95	16.92	30.58	25.36	
"	17	"	"	"	"	"	10 m.	9.80	17.12	30.94	23.84	
"	17	"	"	"	"	"	20 m.	9.43	17.33	31.32	24.19	
"	17	"	"	"	"	"	30 m.	9.10	17.46	31.55	24.40	

[illegible]

SESSIONAL PAPER No. 38a

COLLECTED—*Con.*

Date.	Hour.	Depth in Metres.	Air Temperature ° C.	Tide.	Wind.	Sky.	Depth of Determinations in metres.	Water Temperature ° C.	Chlorine. Cl. ‰	Salinity. S. ‰	Density. σ_t	Colour of Water.
1916.												
Aug. 16	1.35 p.m.	120 m.	12.00	$\frac{3}{4}$ hour to high tide.	S.W. breeze choppy.	Hazy.	Sur-face.	9.60	17.40	31.45	24.27	
" 25	4.45 p.m.	28 m.	14.31	$1\frac{1}{2}$ hour flood	Calm.	Foggy.	Sur-face.	12.48	no sample		of water.	
" 25	"	"	"	"	"	"	15 m.	9.50	"	"	"	
" 25	"	"	"	"	"	"	25 m.	9.57	"	"	"	
" 31	12.50 p.m.	31 m.	14.91	$\frac{1}{2}$ hour to high tide.	"	Clear.	Sur-face.	14.91	17.03	30.77	22.73	
" 31	"	"	"	"	"	"	20 m.	10.07	17.48	31.59	24.30	
" 31	"	"	"	"	"	"	30 m.	10.01	17.49	31.61	24.33	
Sept. 15	5.00 p.m.	36 m.	13.88	$\frac{1}{2}$ ebb.	S.E., light breeze.	Hazy.	Sur-face.	10.95	17.25	31.17	23.82	Gray-ish.
" 15	5.15 p.m.	"	"	"	"	"	10 m.	10.26	17.42	31.48	24.19	"
" 15	5.00 p.m.	"	"	"	"	"	20 m.	10.07	18.02	32.56	25.07	"
" 15	"	"	"	"	"	"	30 m.	9.98	18.03	32.57	25.10	"
" 15	"	"	"	"	"	"	35 m.	9.98	17.23	31.13	23.96	"
Oct. 3	10.20 a.m.	31 m.	13.20	Low.	Calm.	Clear.	Sur-face.	10.60	17.52	31.66	24.28	"
" 3	"	"	"	"	"	"	10 m.	9.96	sample	lost.		
" 3	"	"	"	"	"	"	20 m.	9.83	17.01	30.73	23.71	"
" 3	"	"	"	"	"	"	30 m.	9.82	17.60	31.81	24.56	"
" 3	"	"	"	"	"	"	"	"	"	"	"	
" 16	12.53 p.m.	30 m.	12.41	$2\frac{1}{2}$ hours to high water.	Moder. S.W.	Cloudy.	Sur-face.	9.35	sample	lost.		"
" 16	"	"	"	"	"	"	20 m.	9.14	"	"	"	"
" 16	"	"	"	"	"	"	30 m.	8.98	"	"	"	"
" 21	2.07 p.m.	27 m.	13.38	$\frac{1}{2}$ hour flood.	Strong S.W.	Cloudy, rain.	Sur-face.	9.32	no water	sample.		"
" 21	"	"	"	"	"	"	10 m.	9.18	"	"	"	"
" 21	"	"	"	"	"	"	20 m.	9.08	"	"	"	"
" 21	"	"	"	"	"	"	26 m.	8.88	"	"	"	"
" 27	9.16 a.m.	30 m.	6.21	$\frac{1}{2}$ hour flood.	Moder. N.W.	Clear.	Sur-face.	8.51	"	"	"	Green-ish.
" 27	"	"	"	"	"	"	20 m.	8.81	"	"	"	"
" 27	"	"	"	"	"	"	30 m.	8.80	"	"	"	"
July												
25	9.00 a.m.	90 m.	12.80	High.	S.W. breeze.	Clear.	Sur-face.	8.50	17.42	31.47	24.28	
" 25	"	"	"	"	"	"	28 m.	7.40	17.48	31.59	24.70	
" 25	"	"	"	"	"	"	45 m.	6.90	17.61	31.82	24.97	
" 25	"	"	"	"	"	"	65 m.	6.40	17.61	31.82	25.03	
" 25	"	"	"	"	"	"	85 m.	5.90	17.69	31.96	25.21	
" 16	1.25 p.m.	"	"	"	"	"	10 m.	9.02	17.49	31.60	24.49	
" 16	1.30 p.m.	"	"	"	"	"	25 m.	8.33	17.54	31.70	24.66	
" 16	1.35 p.m.	"	"	"	"	"	50 m.	8.31	17.62	31.84	24.80	
" 16	"	"	"	"	"	"	75 m.	7.92	17.62	31.84	24.85	
" 16	"	"	"	"	"	"	100 m.	6.64	17.87	32.29	25.37	
" 16	"	"	"	"	"	"	110 m.	6.40	17.92	32.38	25.45	
Sept. 18	11.09 a.m.	100 m.	13.12	Low tide.	Calm.	Clear.	Sur-face.	11.30	16.70	30.18	22.99	Gray.
" 18	11.24 a.m.	"	"	"	"	"	10 m.	10.08	16.92	30.58	23.53	"
" 18	"	"	"	"	"	"	20 m.	9.74	17.02	30.75	23.76	"

SAMPLES

[illegible]

SESSIONAL PAPER No. 38a

COLLECTED—*Con.*

Date.	Hour.	Depth in metres.	Air temperature ° C.	Tide.	Wind.	Sky.	Depth of determinations in metres.	Temperature ° C.	Chlorine. Cl. ‰	Salinity. S. ‰	Density. σ _t .	Colour of water.
1916.												
Sept. 18	11 13 a.m.	120 m.	12.00	$\frac{3}{4}$ hour to high tide.	S.W. breeze choppy.	Hazy.	25 m.	9.55	17.17	31.02	23.95	Gray.
" 18	"	"	"	"	"	"	30 m.	9.51	17.71	32.00	24.72	"
" 18	"	"	"	"	"	"	40 m.	9.32	17.72	32.02	24.75	"
" 18	11.00 a.m.	"	"	"	"	"	50 m.	9.08	17.84	32.23	24.98	"
" 18	"	"	"	"	"	"	75 m.	8.26	18.02	32.56	25.36	"
" 18	"	"	"	"	"	"	100 m.	7.61	18.04	32.60	25.47	"
Oct. 1	9.04 a.m.	99 $\frac{1}{2}$ m.	10.4	Half ebb.	Light W.	Hazy.	Sur-face.	9.62	17.40	31.45	24.27	"
" 4	9.18 a.m.	"	"	"	"	"	10 m.	9.48	17.53	31.68	24.47	Greenish.
" 4	9.06 a.m.	"	"	"	"	"	20 m.	9.43	17.77	32.10	24.81	"
" 4	"	"	"	"	"	"	30 m.	9.36	17.78	32.13	24.84	"
" 4	"	"	10.40	"	"	"	40 m.	9.21	17.78	32.13	24.85	"
" 4	8.51 a.m.	"	"	"	"	"	50 m.	9.07	17.82	32.20	24.95	"
" 4	"	"	"	"	"	"	75 m.	8.85	17.82	32.20	24.97	"
" 4	"	"	"	"	"	"	99 m.	7.98	17.99	32.50	25.34	"
July 17	5.10 p.m.	31 m.	15.30	1 hour ebb.	S.W.	Cloudy.	Sur-face.	13.15	15.69	28.36	21.27	"
" 17	"	"	"	"	"	"	9.10 m	8.80	16.92	30.58	23.75	"
" 17	4.50 p.m.	"	"	3 hrs. 40 m. ebb.	"	"	18.30 m.	8.30	17.12	30.94	24.07	"
" 17	4.10 p.m.	"	"	3 hours ebb.	"	"	27.40 m.	8.30	17.22	31.10	24.21	"
" 18	9.15 a.m.	"	14.00	1 hour flood.	Calm.	Foggy.	Sur-face.	12.10	15.68	28.33	21.45	"
" 18	"	"	"	"	"	"	9.10 m	9.60	16.92	30.57	23.61	"
" 18	9.00 a.m.	"	"	45 min. flood	"	"	18.30 m.	8.70	17.05	30.81	23.95	"
" 18	8.45 a.m.	"	"	$\frac{1}{2}$ hour flood.	"	"	25.60 m.	8.60	17.08	30.87	24.00	"
" 18	11.30 a.m.	"	15.10	3 hours flood	"	"	Sur-face.	11.50	16.60	29.99	22.82	"
" 18	"	"	"	"	"	"	9.10 m	8.60	16.96	30.65	23.83	"
" 18	11.15 a.m.	"	"	"	"	"	18.30 m.	8.10	17.22	31.11	24.24	"
" 18	11.30 a.m.	"	"	"	"	"	27.40 m.	8.10	17.23	31.14	24.25	"
" 18	2.35 p.m.	"	16.30	High tide.	"	"	Sur-face.	12.80	16.70	30.17	22.73	"
" 18	"	"	"	"	"	"	9.10 m	8.95	16.96	30.64	23.76	"
" 18	2.00 p.m.	31 "	16.30	"	"	"	27.40 m.	8.10	17.20	31.08	24.22	"
" 26	4.30 p.m.	31 "	21.00	Low tide circ.	"	Cloudy.	Sur-face.	13.40	15.34	27.72	20.71	"
" 26	4.30 "	31 "	21.00	"	"	"	10 m.	9.84	16.55	29.90	23.04	"
" 26	4.30 "	31 "	21.00	"	"	"	15 m.	9.40	16.87	30.48	23.55	"
" 26	4.30 "	31 "	21.00	"	"	"	25 m.	8.80	17.10	30.90	23.99	"
Aug. 10	11.45 a.m.	30 "	18.50	$\frac{1}{2}$ flood	N. W. breeze.	Clear.	Sur-face.	12.65	15.65	28.28	21.33	"
" 10	11.45 "	30 "	18.50	"	"	"	10 m.	9.60	16.93	30.59	23.62	"
" 10	11.45 "	30 "	18.50	"	"	"	20 m.	9.30	17.14	30.98	23.96	"
" 10	11.45 "	30 "	18.50	"	"	"	25 m.	9.37	17.17	31.02	23.98	"
" 14	6.00 a.m.	28 "	11.96	Low tide	Strong N. W.	Cloudy.	Sur-face.	10.95	16.01	28.94	22.10	"

8 GEORGE N, A. 1918

SAMPLES

[illegible]

SESSIONAL PAPER No. 38a

COLLECTED—Con.

Date.	Hour.	Depth in Metres.	Air Temperature t° C.	Tide.	Wind.	Sky.	Depth of determinations in metres.	Water Temperature t° C.	Chlorine. Cl. ‰.	Salinity. S‰.	Density. σ _t .	Colour of Water.
1916.												
Aug; 14	6.00 a.m.	28 m.	11.90	Low tide circ.	Strong..	Cloudy.	18.30 m.	10.95	16.01	28.94	22.10	
" 14	6.00 "	28 "	11.90	" "	"	"	10 m.	9.13	16.78	30.33	23.33	
" 14	6.00 "	28 "	11.90	" "	"	"	20 m.	9.91	16.98	30.69	23.65	
" 14	6.00 "	28 "	11.90	" "	"	"	25 m.	9.68	17.12	30.93	23.86	
" 14	12.00 p.m.	33 "	12.20	High tide.	"	"	Sur-face.	10.40	16.96	30.64	23.51	
" 14	12.00 "	33 "	12.20	" "	"	"	10 m.	9.70	17.03	30.77	23.75	
" 14	12.00 "	33 "	12.20	" "	"	"	20 m.	9.55	17.18	31.03	23.97	
" 14	12.00 "	33 "	12.20	" "	"	"	25 m.	9.50	17.24	31.15	24.05	
" 14	12.00 "	33 "	12.20	" "	"	"	30 m.	9.48	17.24	31.15	24.06	
" 18	8.30 a.m.	29 "	13.80	½ hour to low tide.	South breeze.	Hazy	Sur-face.	11.75	16.07	29.04	23.19	
" 18	8.30 "	29 "	13.80	" "	"	"	10 m.	10.38	16.83	30.40	23.34	
" 18	8.30 "	29 "	13.80	" "	"	"	20 m.	10.09	17.13	30.95	23.82	
" 18	8.30 "	29 "	13.80	" "	"	"	25 m.	10.06	17.15	30.98	23.83	
" 22	1.10 p.m.	28 "	22.38	Low tide.	Calm...	"	Sur-face.	14.22	15.62	23.22	20.96	
" 22	1.10 p.m.	28 "	22.38	" "	"	"	10 m.	10.51	17.03	30.78	23.59	
" 22	1.10 p.m.	28 "	22.38	" "	"	"	20 m.	9.83	17.24	31.16	24.01	
" 22	1.10 p.m.	28 "	22.38	" "	"	"	25 m.	9.78	17.30	31.26	24.11	
" 23	8.20 a.m.	32 "	14.90	High tide.	S.E. breeze.	"	Sur-face.	12.29	16.93	30.59	23.10	
" 23	8.20 a.m.	32 "	14.90	" "	"	"	10 m.	10.60	17.17	31.02	23.79	
" 23	8.20 a.m.	32 "	14.90	" "	"	"	15 m.	10.29	17.21	31.10	23.88	
" 23	7.58 a.m.	32 "	14.90	" "	"	"	20 m.	9.78	17.39	31.43	24.22	
" 23	7.58 a.m.	32 "	14.90	" "	"	"	25 m.	9.69	17.43	31.49	24.30	
" 23	7.58 a.m.	32 "	14.90	" "	"	"	30 m.	9.68	17.43	31.49	24.31	
" 31	9.45 a.m.	28 "	15.20	2 hours flood	Calm...	Sun-shine.	Sur-face.	12.52	16.14	29.17	22.00	
" 31	9.45 a.m.	28 "	15.20	" "	"	"	20 m.	10.28	17.32	31.29	24.03	
" 31	9.45 a.m.	28 "	15.20	" "	"	"	27 m.	10.26	17.34	31.34	24.07	
Sept. 15	12.03 p.m.	36 "	16.80	2 hrs to high tide.	Light S.E. breeze.	Clear	Sur-face.	11.73	16.70	30.17	22.92	Gray.
" 15	12.03 p.m.	36 "	16.80	" "	"	"	10 m.	10.31	17.26	31.19	23.88	"
" 15	12.03 p.m.	36 "	16.80	" "	"	"	20 m.	10.21	17.54	31.69	24.32	"
" 15	12.03 "	36 "	16.80	" "	"	"	35 "	10.17	17.53	31.67	24.34	"
Oct. 2	11.30 a.m.	31 "	12.95	½ flood.	North	"	Sur-face.	10.52	17.01	30.73	23.56	Greenish.
" 2	11.30 "	31 "	12.95	" "	"	"	10 m.	10.18	17.03	30.77	23.65	Gray.
" 2	11.30 "	31 "	12.95	" "	"	"	20 "	10.12	17.31	31.27	24.06	"
" 2	11.30 "	31 "	12.95	" "	"	"	30 "	10.11	17.45	31.54	24.25	"
" 9	7.50 "	33 "	11.72	2 hours to high tide.	N.-E. breeze.	Cloudy rain.	Sur-face.	10.31	No water sample.			Grayish.
" 9	7.50 "	33 "	11.72	" "	"	"	20 m.	10.04	"	"	"	"
" 9	7.50 "	33 "	11.72	" "	"	"	30 "	10.01	"	"	"	"
" 16	4.11 p.m.	35 "	14.21	1 hour ebb.	Moderate N.-W.	partly cloudy.	Sur-face.	9.42	Sample lost.			Greenish.
" 16	4.11 "	35 "	14.21	" "	"	"	20 m.	9.16	"	"	"	"
" 16	4.11 "	35 "	14.21	" "	"	"	30 "	9.12	"	"	"	"
" 21	9.37 a.m.	31 "	13.91	2½ hours ebb.	Fresh S.-W.	Misty Clouds.	Sur-face.	9.47	No water sample.			Grayish.
" 21	9.37 "	31 "	13.91	" "	"	"	10 m.	9.06	"	"	"	"
" 21	9.37 "	31 "	13.91	" "	"	"	20 "	8.90	"	"	"	"
" 21	9.37 "	31 "	13.91	" "	"	"	30 "	8.88	"	"	"	"

8 GEORGE V, A. 1918

SAMPLES

[illegible]

SESSIONAL PAPER No. 38a

COLLECTED—*Con.*

Date.	Hour.	Depth in metres.	Air temperature ° C.	Tide.	Wind.	Sky.	Depth of determinations in metres.	Water temperature ° C.	Chlorine Cl. ‰	Salinity S. ‰	Density <i>et.</i>	Colour of water.
1916.												
Oct. 27	10.25 "	34 "	7.38	1½ hours to high tide.	Moderate. N.-W.	Clear...	Surface.	8.90	No water sample.			Gre'n-ish Gray.
" 27	10.25 "	34 "	7.38	"	"	" ...	20 m.	8.82	"	"	"	"
" 27	10.25 "	34 "	7.38	"	"	" ...	30 "	8.82	"	"	"	"
		84 "										
		84 "										
July 14	5.00 p.m.	73 "	12.15				9 m.	7.62	17.33	31.32	24.47	...
Aug. 3	3.00 p.m.	73 m.	15.05	High.	S.-W. breeze.	Cloudy.	Sur. face.	9.50	17.06	30.82	23.81	.....
" 3	3.00 "	73 "	15.05	"	"	"	10 m.	9.10	17.11	30.92	23.95	.....
" 3	3.00 "	73 "	15.05	"	"	"	20 "	8.95	17.18	31.04	24.08	.....
" 3	3.00 "	73 "	15.05	"	"	"	30 "	8.60	17.26	31.19	24.23	.....
" 3	3.00 "	73 "	15.05	"	"	"	40 "	8.42	17.32	31.29	24.33	.....
" 10	12.45 "	72 "	22.20	Low tide ..	very slight S. breeze.	Clear...	Sur. face.	12.62	16.18	29.24	22.16	.....
" 10	12.45 "	72 "	22.20	" ...	"	"	10 m.	10.02	16.99	30.71	23.62	.....
" 10	12.45 "	72 "	22.20	" ...	"	"	20 "	9.20	17.23	31.13	24.09	.....
" 10	12.45 "	72 "	22.20	" ...	"	"	30 "	9.12	17.25	31.16	24.13	.....
" 10	12.45 "	72 "	22.20	" ...	"	"	40 "	9.12	17.25	31.16	24.13	.....
" 17	3.50 "	72 "	18.30	1½ hour ebb.	Calm...	"	Sur. face.	10.05	17.36	31.36	24.14	.....
" 17	3.50 "	72 "	18.30	"	"	"	10 m.	9.57	17.36	31.36	24.14	.....
Aug. 17	4.00 p.m.	72 m.	18.30	1½ hr. ebb.	Calm.	Clear.	20 m.	9.48	17.38	31.40	24.24	.....
" 17	4.00 "	72 "	18.30	"	"	"	30 m.	9.02	17.47	31.57	24.46	.....
" 17	4.00 "	72 "	18.30	"	"	"	40 m.	9.01	17.47	31.57	24.46	.....
Aug. 31	2.00 "	78 m.	16.68	¾ hr. ebb.	S.W. breeze.	"	Sur. face.	12.21	17.06	30.82	23.34	.....
" 31	2.00 "	78 "	16.68	"	"	"	20 m.	10.16	17.45	31.54	24.25	.....
" 31	2.00 "	78 "	16.68	"	"	"	75 m.	9.81	17.53	31.67	24.46	.....
Sept. 15	3.26 "	76 m.	14.80	½ hr. ebb.	S.E. breeze.	Hazy.	Sur. face.	10.42	17.24	31.16	23.89	Gray.
" 15	3.26 "	76 "	14.80	"	"	"	10 m.	10.11	17.58	31.75	24.44	"
" 15	3.26 "	76 "	14.80	"	"	"	20 m.	10.12	17.57	31.74	24.44	"
" 15	3.26 "	76 "	14.80	"	"	"	30 m.	10.11	17.59	31.78	24.45	"
" 15	2.51 "	76 "	14.80	"	"	"	40 m.	10.02	17.79	32.15	24.75	"
" 15	2.51 "	76 "	14.80	"	"	"	50 m.	9.85	17.27	31.21	24.05	"
" 15	3.15 "	76 "	14.80	"	"	"	60 m.	9.92	17.42	31.47	24.25	"
" 15	3.15 "	76 "	14.80	"	"	"	70 m.	9.92	17.62	31.84	24.53	"
" 15	3.15 "	76 "	14.80	"	"	"	75 m.	9.93	17.80	32.16	24.78	"
Oct. 3	11.49 a.m.	75 m.	14.56	1 hr. flood.	S.W. light breeze.	Clear.	Sur. face.	10.61	17.40	31.45	24.12	Gre'n-ish.

SESSIONAL PAPER No. 38a

COLLECTED—*Con.*

Date.	Hour.	Depth in Metres.	Air Temperature ° C.	Tide.	Wind.	Sky.	Depth in determinations metres.	Water Temperature t° C.	Chlorine. Cl. ‰	Salinity. S. ‰	Density. σ _t .	Colour of Water.
1916.												
Oct. 3	11.49 a.m.	75 m.	14.56	1 hr. flood.	S. W. light breeze.	Clear.	10 m.	10.20	17.52	31.65	24.34	Gray.
"	3 11.49 "	75 "	14.56	"	"	"	20 m.	10.12	17.19	31.07	23.88	"
"	3 11.49 "	75 "	14.56	"	"	"	30 m.	9.98	17.54	31.70	24.40	"
"	3 11.35 "	75 "	14.56	"	"	"	40 m.	9.85	sample lost.	"	"	"
Oct. 3	11.35 "	75 m.	14.56	1 hr. flood.	S. W. light breeze.	"	50 m.	9.83	17.64	31.88	24.58	Gre'n-ish.
"	3 11.35 "	75 "	14.56	"	"	"	75 m.	9.68	17.71	32.00	24.70	Gray.
Oct. 17	8.32 "	76 m.	11.61	1½ hr. to low tide.	Strong S. W.	Cloudy, rain.	Sur-face.	9.10	No	water.	"	"
"	17 8.32 "	76 "	11.61	"	"	"	20 m.	9.01	"	"	"	"
"	17 8.32 "	76 "	11.61	"	"	"	75 m.	8.91	"	"	"	"
Aug. 3	5.00 p.m.	20 m.	.....	2½ hrs. ebb tide.	S. W. breeze.	Cloudy.	Sur-face.	10.70	16.77	30.30	23.21	"
"	3 5.00 "	20 "	.....	"	"	"	10 m.	8.95	17.13	30.96	23.99	"
"	3 5.00 "	20 "	.....	"	"	"	20 m. (bot-tom.)	8.75	17.18	31.04	24.09	"
Aug. 17	6.10 "	18 m.	15.12	2 hrs. to low tide.	.....	Slight haze.	Sur-face.	11.75	17.07	30.84	23.43	"
"	17 6.10 "	18 "	15.12	"	"	"	10 m.	10.18	17.18	31.04	23.89	"
"	17 6.10 "	18 "	15.12	"	"	"	15 m.	10.19	17.23	31.13	23.94	"
Aug. 24	3.45 "	16 m.	17.28	Low tide.	Light E.	Rain.	Sur-face.	13.70	No	water.	"	"
"	24 3.45 "	16 "	17.28	"	"	"	10 m.	9.72	"	"	"	"
"	24 3.45 "	16 "	17.28	"	"	"	15 m.	9.61	"	"	"	"
Aug. 31	11.25 a.m.	21 m.	16.89	2 hrs. to high tide.	Calm.	Clear.	Sur-face.	12.20	17.18	31.05	23.51	"
"	31 11.25 "	21 "	16.89	"	"	"	15 m.	10.19	17.43	31.49	24.22	"
"	31 11.25 "	21 "	16.89	"	"	"	20 m.	10.09	17.48	31.59	24.30	"
Sept. 15	10.41 "	20 m.	16.58	2½ hrs. flood.	Light S. E. breeze.	"	Sur-face.	11.42	17.41	31.46	23.97	Gray.
"	15 10.41 "	20 "	16.58	"	"	"	10 m.	10.24	17.46	31.55	24.25	"
Oct. 3	9.05 "	17 m.	10.98	1 hr. to low tide.	N. W. moderate.	"	Surf.	10.51	17.36	31.36	24.06	"
"	3 9.05 "	17 "	10.98	"	"	"	10 m.	10.38	17.52	31.66	24.30	"
"	3 9.05 "	17 "	10.98	"	"	"	15 m.	9.72	17.53	31.67	24.42	"
"	9 9.33 "	22 "	10.90	High tide.	N. E.	cloudy.	Surf.	10.20	no	water.	"	"
"	9 9.33 "	22 "	10.90	"	"	"	10 m.	9.83	"	"	"	"
"	9 9.33 "	22 "	10.90	"	"	"	20 m.	9.85	"	"	"	"
"	16 11.09 "	19 "	11.12	2 hrs. flood.	S. W. moderate.	"	Surf.	9.24	17.64	31.88	24.64	Gre'n-ish Gray.
"	16 11.09 "	19 "	11.12	"	"	"	13 m.	9.12	17.70	31.99	24.77	"
"	16 11.09 "	19 "	11.12	"	"	"	18 m.	9.12	17.69	31.96	24.76	"
"	21 12.52 p.m.	18 "	13.45	1 hr. to low tide.	Strong S. W.	clouds, rain.	Surf.	9.30	no	water.	"	Gray-ish.
"	21 12.52 "	18 "	13.45	"	"	"	10 m.	8.95	"	"	"	"
"	21 12.52 "	18 "	13.45	"	"	"	17 m.	8.86	"	"	"	"
"	27 8.08 a.m.	19 "	4.62	2½ hrs. flood.	Mode-rate.	partly cloudy.	Surf.	8.64	"	"	"	Gre'n-ish Gray.

8 GEORGE V, A. 1918

SAMPLES

"Prince" Station No.	Locality.	Position (vide chart.)	Latitude.	Longitude.	Bottom.
10.....	Passamaquoddy Bay, near Eastern entrance to St. Andrews Har- bour.	Navy Bar Lt. bears N.W. by $N\frac{1}{2}$ N. $\frac{3}{4}$ mile. Tongue Shoal Lt. bears E. by N. $\frac{3}{4}$ N., $\frac{1}{4}$ mile.	45° 3' 14" N.	67° 1' 45" W.	Mud and rocks.
10.....	" "	" "	"	"	"
10.....	" "	" "	"	"	"
11.....	Petite Passage.....	In a direct line between Tiverton and East Ferry about midway.	44° 23' 52" N.	66° 12' 34" W.	Hard sand and rocks.
11.....	"	" "	"	"	"
11.....	"	" "	"	"	"
11.....	"	" "	"	"	"
11.....	"	" "	"	"	"
11.....	"	" "	"	"	"
11.....	"	" "	"	"	"
12.....	St. Mary's Bay, off Little River.	One mile S.E. from Little River wharf.	44° 26' 17" N.	66° 6' 33" W.	Fine sand.
12.....	" "	" "	"	"	"
12.....	" "	" "	"	"	"
12.....	" "	" "	"	"	"
12.....	" "	" "	"	"	"
12.....	" "	" "	"	"	"
13.....	St. Mary's Bay, below Southern end of Petite Passage.	South Point of Digby neck bears N.E. $\frac{1}{2}$ N. $2\frac{1}{2}$ miles. Church Pt. bears E. by S. $\frac{1}{4}$ S. $4\frac{1}{4}$ miles.	44° 20' 7" N.	66° 13' 24" W.	"
13.....	" "	" "	"	"	"
13.....	" "	" "	"	"	"
13.....	" "	" "	"	"	"
13.....	" "	" "	"	"	"
15.....	Bay of Fundy, off Brier Island.	$8\frac{1}{2}$ miles N.-W. by W. from north end of Grande Pas- sage. Run N. N.W. 4 miles, then run W. $\frac{1}{2}$ N., $5\frac{1}{2}$ miles.	44° 19' 30" N.	66° 32' 28" W.	Fine sand..
15.....	" "	" "	"	"	"
15.....	" "	" "	"	"	"
15.....	" "	" "	"	"	"
15.....	" "	" "	"	"	"
15.....	" "	" "	"	"	"
15.....	" "	" "	"	"	"
15.....	" "	" "	"	"	"
15.....	" "	" "	"	"	"
15.....	" "	" "	"	"	"
15.....	" "	" "	"	"	"

SESSIONAL PAPER No. 38a

COLLECTED—*Con.*

Date.	Hour.	Depth of Metres.	Air temperature ° C.	Tide.	Wind.	Sky.	Depth of determinations in metres.	Water temperature ° C.	Chlorine Cl. ‰.	Salinity S. ‰.	Density σ_t .	Colour of Water.
1916.												
Oct. 27	8.08 a.m.	19 m.	4.62	hrs. flood.	N.W.	cloudy.	13 m.	8.92	no	water.		Gray.
" 27	8.08 "	19 "	4.62	"	"	"	18 m.	8.87		"		"
Sept. 2	7.55 "	30 "	13.02	Low tide.	South breeze.	cloudy.	Surf.	9.00	17.91	32.37	25.08	
" 2	7.55 "	30 "	13.02	"	"	"	10 m.	8.91	17.94	32.41	25.14	
" 2	7.55 "	30 "	13.02	"	"	"	20 m.	8.91	17.89	32.32	25.07	
" 2	7.55 "	30 "	13.02	"	"	"	25 m.	8.42	17.89	32.32	25.13	
" 2	1.15 p.m.	35 "	15.28	High tide.	Strong south.	cloudy	Surf.	10.57	17.73	32.03	24.59	Bluish.
" 2	1.15 "	35 "	15.28	"	"	"	10 m.	10.32	17.79	32.15	24.70	"
" 2	1.15 "	35 "	15.28	"	"	"	20 m.	10.21	17.81	32.18	24.75	"
" 2	1.15 "	35 "	15.28	"	"	"	30 m.	10.13	17.79	32.15	24.75	"
" 4	8.50 a.m.	24 "	13.38	Low tide.	S.W.N. breeze.	clear.	Surf.	12.92	17.70	31.98	24.10	"
" 4	8.50 "	24 "	13.38	"	"	"	10 m.	12.92	17.70	31.99	24.10	"
" 4	8.50 "	24 "	13.38	"	"	"	20 m.	11.51	17.76	32.09	24.46	"
" 4	3.10 p.m.	31 "	12.20	High tide.	S.W. breeze.	cloudy.	Surf.	12.58	17.67	31.93	24.13	Grayish.
" 4	3.10 "	31 "	12.20	"	"	"	10 m.	12.51	17.68	31.95	24.15	"
" 4	3.10 "	31 "	12.20	"	"	"	20 m.	11.12	17.73	32.03	24.49	"
" 4	3.10 "	31 "	12.20	"	"	"	30 m.	11.04	17.77	32.10	24.55	"
" 5	10.27 a.m.	50 "	11.90	Low tide.	N.E. breeze.	"	Surf.	11.08	17.74	32.05	24.51	Grayish.
" 5	10.41 "	50 "	11.90	"	"	"	10 m.	10.14	17.83	32.21	24.79	"
" 5	10.41 "	50 "	11.90	"	"	"	20 m.	9.82	17.85	32.26	24.86	"
" 5	10.27 "	50 "	11.90	"	"	"	30 m.	9.60	17.86	32.28	24.93	"
" 5	10.27 "	50 "	11.90	"	"	"	40 m.	9.18	17.91	32.36	25.05	"
" 5	10.27 "	50 "	11.90	"	"	"	48 m.	9.09	17.93	32.40	25.12	"
Sept. 6	11.45 a.m.	203 m.	14.80	Low tide...	Calm...	Cloudy.	Surface.	9.17	17.98	32.48	25.15	Dark blue.
" 6	12.15 p.m.	203 "	14.80	"	"	"	10 m.	8.58	18.00	32.52	25.25	"
" 6	12.15 "	203 "	14.80	"	"	"	20 "	8.40	18.01	32.54	25.31	"
" 6	12.15 "	203 "	14.80	"	"	"	25 "	8.31	18.02	32.55	25.33	"
" 6	12.15 "	203 "	14.80	"	"	"	50 "	8.15	18.03	32.56	25.37	"
" 6	12.10 "	203 "	14.80	"	"	"	75 "	7.78	18.05	32.61	25.46	"
" 6	12.00 noon.	203 "	14.80	"	"	"	100 "	7.49	18.10	32.71	25.53	"
" 6	11.45 a.m.	203 "	14.80	"	"	"	125 "	6.28	18.19	32.87	25.85	"
" 6	11.45 "	203 "	14.80	"	"	"	150 "	5.88	18.22	32.91	25.97	"
" 6	11.45 "	203 "	14.80	"	"	"	175 "	5.57	18.24	32.96	26.03	"
" 6	11.45 "	203 "	14.80	"	"	"	200 "	5.55	18.12	32.74	25.57	"

SAMPLES

"Prince" Stations No.	Locality.	Position (vide chart.)	Latitude.	Longitude.	Bottom.
16.....	Gulf of Maine, outside	Beside Yarmouth, N.-W.	43° 48' 48" N..	66° 15' 54" W..	Hard rocks
16.....	Yarmouth Harbour.	Fairway buoy.	" ..	" ..	and gravel
16.....	" ..	" ..	" ..	" ..	" ..
16.....	" ..	" ..	" ..	" ..	" ..
16.....	" ..	" ..	" ..	" ..	" ..
16.....	" ..	" ..	" ..	" ..	" ..
16.....	" ..	" ..	" ..	" ..	" ..
16.....	" ..	" ..	" ..	" ..	" ..
16.....	" ..	" ..	" ..	" ..	" ..
16.....	" ..	" ..	" ..	" ..	" ..
17.....	Yarmouth Harbour....	$\frac{1}{4}$ mile outside Bunker Id. red light. Abreast lower end of Ship's Stern.	43° 48' 13" N..	66° 8' 42" W..	Soft mud...
17.....	" ..	" ..	" ..	" ..	" ..
17.....	" ..	" ..	" ..	" ..	" ..
17.....	" ..	" ..	" ..	" ..	" ..
17.....	" ..	" ..	" ..	" ..	" ..
18.....	St. John River, between	About 100 yds. off east cor- ner of Lovett's Pt. to- ward Marble Cove Pt.	45° 16' 38" N.,	66° 5' 53" W..	Rocks and sawdust.
18.....	Fairville and Indian- town.	" ..	" ..	" ..	" ..
18.....	" ..	" ..	" ..	" ..	" ..
18.....	" ..	" ..	" ..	" ..	" ..
18.....	" ..	" ..	" ..	" ..	" ..
19.....	Bay of Fundy, off St.	Partridge Id. bell boat bear N.E. by N. $\frac{1}{4}$ N. $2\frac{1}{2}$ miles. Eastern end of Meogenes Id. bears N.-W. by N. $2\frac{1}{8}$ miles.	45° 12' 11" N.	66° 3' 40" W..	Soft mud...
19.....	" ..	" ..	" ..	" ..	" ..
19.....	" ..	" ..	" ..	" ..	" ..
20.....	Kennebecasis Bay, at	Milkish Head bears N. by W. $\frac{1}{2}$ W. $\frac{1}{2}$ mile. Out- side point of Long Id. bears N.-E. by E. $\frac{1}{4}$ E. by $1\frac{1}{4}$ miles.	45° 20' 57" N..	66° 4' 8" W...	" ..
20.....	western end of Long Id.	" ..	" ..	" ..	" ..
20.....	" ..	" ..	" ..	" ..	" ..
20.....	" ..	" ..	" ..	" ..	" ..
20.....	Kennebecasis Bay, at	Milkish head bears N. by W. $\frac{1}{2}$ W. $\frac{1}{2}$ mile. Outside point of Long Id. bears N. E. by E. $\frac{1}{4}$ E. $1\frac{1}{4}$ miles.	45° 12' 57" N.	66° 4' 8" W..	" ..
20.....	Western end of Long Id.	" ..	" ..	" ..	" ..
20.....	" ..	" ..	" ..	" ..	" ..
20.....	" ..	" ..	" ..	" ..	" ..
20.....	" ..	" ..	" ..	" ..	" ..
21.....	Kennebecasis Bay, at	Outside point of Long Id. bears S.W. by S. $\frac{1}{4}$ S., 1 mile. Northern end of Long Id. bears N.N.W.	45° 24' 44" N.	66° 1' 43" W.	" ..
21.....	eastern end of Long Id.	" ..	" ..	" ..	" ..
21.....	" ..	" ..	" ..	" ..	" ..
21.....	" ..	" ..	" ..	" ..	" ..
21.....	" ..	" ..	" ..	" ..	" ..
21.....	" ..	" ..	" ..	" ..	" ..
21.....	" ..	" ..	" ..	" ..	" ..

SESSIONAL PAPER No. 38a

COLLECTED—Con.

Date.	Hour.	Depth in metres.	Air temperature ° C.	Tide.	Wind.	Sky.	Depth of determinations in metres.	Water temperature ° C.	Chlorine Cl. ‰	Salinity S. ‰	Density σ_t	Colour of water.
1916. Sept.	7 12.40 p.m.	41 m.	16.68	Low tide...	Calm...	Foggy..	Sur- face.	10.03	17.85	32.25	24.84	"
"	7 12.50 "	41 "	16.68	"	"	"	10 m.	9.82	17.60	31.81	24.53	"
"	7 12.50 "	41 "	16.68	"	"	"	20 "	9.78	17.39	31.42	24.24	"
"	7 12.50 "	41 "	16.68	"	"	"	30 "	9.72	16.22	29.32	22.59	"
"	7 12.50 "	41 "	16.68	"	"	"	40 "	9.69	17.21	31.09	23.99	"
"	9 7.45 a.m.	47 "	12.52	1 hour to high tide.	"	Fog and rain.	Sur- face.	9.40	18.06	32.63	25.23	Gray ish.
"	9 8.04 "	47 "	12.52	"	"	"	10 m.	9.21	17.75	32.07	24.83	"
"	9 8.04 "	47 "	12.52	"	"	"	20 "	9.12	17.42	31.47	24.37	"
"	9 7.45 "	47 "	12.52	"	"	"	30 "	9.20	17.59	31.78	24.61	"
"	9 7.45 "	47 "	12.52	"	"	"	40 "	9.18	17.58	31.76	24.58	"
"	9 7.45 "	47 "	12.52	"	"	"	45 "	9.18	17.89	32.33	25.02	"
"	8 6.20 "	15 "	13.70	High tide..	South...	Thick Fog.	Sur- face.	11.22	17.25	31.17	23.77	"
"	8 6.20 "	15 "	13.70	"	"	"	10 m.	10.83	17.54	31.69	24.27	"
"	8 6.20 "	15 "	13.70	"	"	"	15 "	10.82	Water	sample	lost.	"
"	8 1.20 p.m.	13 "	14.25	Low tide...	S.-W. breeze.	Foggy..	Sur- face.	12.70	17.78	32.12	24.25	"
"	8 1.20 "	13 "	14.25	"	"	"	10 m.	11.78	17.53	31.68	24.09	"
"	8 1.20 "	13 "	14.25	"	"	"	13 "	11.56	17.54	31.69	24.15	"
"	21 4.13 "	35 "	16.35	"	Light S.-W.	Smoky	Sur- face.	14.86	Water	sample	lost.	Bro'n.
"	21 4.13 "	35 "	16.35	"	"	"	10 m.	13.19	8.36	15.13	10.55	"
"	21 4.13 "	35 "	16.35	"	"	"	20 "	11.91	Water	sample	lost.	"
"	21 4.13 "	35 "	16.35	"	"	"	30 "	11.55	14.36	25.96	19.71	"
"	21 4.25 "	35 "	16.35	"	"	"	34 "	9.28	14.55	26.30	20.31	"
"	19 10.39 a.m.	19 "	12.25	1 hr. to low tide.	"	Cloudy.	Sur- face.	11.78	Water	sample	lost.	Green
"	19 10.39 "	19 "	12.26	"	"	"	10 m.	10.62	17.03	30.78	23.57	"
"	19 10.39 "	19 "	12.26	"	"	"	19 m.	10.59	Water	sample	lost.	"
"	19 4.00 p.m.	55 "	11.80	1 hour river flood.	Light N.-W. breeze.	Clear...	Sur- face.	15.69	"	"	"	Bro'n.
"	19 4.20 "	55 "	11.80	"	"	"	5 m.	12.93	"	"	"	"
"	19 4.10 "	55 "	11.80	"	"	"	10 "	6.08	"	"	"	"
"	19 4.20 "	55 "	11.80	"	"	"	15 "	6.43	"	"	"	"
Sept.	19 4.10 p.m.	55 m.	11.80	1 hr. river flood.	Light N.W. breeze.	clear.	20 m.	8.22	10.61	19.18	14.92	Bro'n.
"	19 3.55 "	55 "	11.80	"	"	"	30 m.	10.98	water	sample	lost.	"
"	19 3.55 "	55 "	11.80	"	"	"	40 m.	11.74	"	"	"	"
"	19 3.55 "	55 "	11.80	"	"	"	44 m.	11.93	"	"	"	"
"	19 4.40 "	55 "	11.80	"	"	"	55 m.	12.00	"	"	"	"
"	20 3.40 "	48 "	16.10	"	N.W. breeze.	"	Sur- face.	15.38	"	"	"	"
"	20 3.40 "	48 "	16.10	"	"	"	"	7.20	10.15	18.35	14.38	"
"	20 3.50 "	48 "	16.10	"	"	"	10 m.	6.11	11.13	20.13	15.86	"
"	20 3.50 "	48 "	16.10	"	"	"	20 m.	10.18	11.53	20.85	15.95	"
"	20 3.40 "	48 "	16.10	"	"	"	30 m.	11.15	11.69	21.14	16.03	"
"	20 3.40 "	48 "	16.10	"	"	"	40 m.	11.21	water	sample	lost.	"
"	20 3.40 "	48 "	16.10	"	"	"	45 m.	16.10	"	"	"	Bro'n.
"	21 2.48 "	11 "	17.54	"	S.S.E. breeze.	Hazy.	Sur- face.	13.67	8.64	15.63	11.4	"

8 GEORGE V, A. 1918

SAMPLES

[illegible]

SESSIONAL PAPER No. 38a

COLLECTED—Con.

Date.	Hour.	Depth in metres.	Air temperature t° C.	Tide.	Wind.	Sky.	Depth of determinations in metres.	Water temperature t° C.	Chlorine Cl. ‰	Salinity S. ‰	Density σ _t .	Colour of water.
1916.												
Sept. 21	2.43 p.m.	11 m.	17.54	.....	S.E. breeze.	Hazy.	5 m.	11.70	water	sample	lost.	"
" 21	2.43 "	11 m.	17.54	.....	"	"	10 m.	.....	.....	.....	.....	.....
Sept. 22	12.43 p.m.	95 m.	17.74	1½ hr. to low tide.	Calm.	Clear.	Surface.	10.30	17.36	31.37	24.09	Blue.
" 22	1.07 "	95 "	17.74	"	"	"	10 m.	9.56	17.74	32.06	24.76	"
" 22	1.07 "	95 "	17.74	"	"	"	20 m.	8.83	17.85	32.25	25.04	"
" 22	12.56 "	95 "	17.74	"	"	"	25 m.	8.73	17.89	32.32	25.09	"
" 22	12.56 "	95 "	17.74	"	"	"	30 m.	8.57	17.93	32.40	25.18	"
" 22	12.56 "	95 "	17.74	"	"	"	40 m.	8.38	17.95	32.44	25.24	"
" 22	12.43 "	95 "	17.74	"	"	"	50 m.	8.12	17.96	32.46	25.28	"
" 22	12.43 "	95 "	17.74	"	"	"	75 m.	7.93	18.01	32.55	25.38	"
" 22	12.43 "	95 "	17.74	"	"	"	95 m.	7.90	18.03	32.58	25.42	"
" 23	9.19 a.m.	58 "	12.83	High tide.	Light S.E. breeze.	cloudy.	Surface.	9.37	17.86	32.28	24.95	Gre'n-ish.
" 23	9.43 "	58 "	12.83	"	"	"	10 m.	9.32	water	sample	lost.	Gray.
" 23	9.33 "	58 "	12.83	"	"	"	20 m.	9.31	17.94	32.41	25.07	"
" 23	9.33 "	58 "	12.83	"	"	"	25 m.	9.28	17.93	32.39	25.07	"
" 23	9.33 "	58 "	12.83	"	"	"	30 m.	9.29	17.93	32.39	25.07	"
" 23	9.19 "	58 "	12.83	"	"	"	40 m.	9.30	17.96	32.45	25.10	"
" 23	9.19 "	58 "	12.83	"	"	"	50 m.	9.28	17.33	31.32	24.22	"
" 23	9.19 "	58 "	12.83	"	"	"	55 m.	9.29	17.89	32.33	25.01	"
" 23	5.52 p.m.	55 "	15.58	Low tide.	S.W. breeze.	clear.	Surface.	10.48	17.91	32.37	24.84	Gray-ish.
" 23	5.49 "	55 "	15.58	"	"	"	10 m.	10.37	17.87	32.29	24.80	"
" 23	5.49 "	55 "	15.58	"	"	"	20 m.	10.30	water	sample	lost.	"
" 23	5.37 "	55 "	15.58	"	"	"	30 m.	10.22	"	"	"	"
" 23	5.37 "	55 "	15.58	"	"	"	40 m.	10.18	17.31	31.28	24.05	"
" 23	5.37 "	55 "	15.58	"	"	"	50 m.	9.86	17.23	31.13	24.00	"
Sept. 23	2.16 p.m.	74 m.	15.95	½ hour to low tide.	S.E. breeze.	Cloudy.	Surface.	9.30	17.95	32.44	25.10	Gre'n-ish.
" 23	2.45 "	74 "	15.95	"	"	"	10 m.	9.08	17.97	32.47	25.16	Gray.
" 23	2.33 "	74 "	15.95	"	"	"	20 m.	9.08	17.45	31.54	24.42	"
" 23	2.33 "	74 "	15.95	"	"	"	25 m.	9.07	17.57	31.75	24.58	"
" 23	2.33 "	74 "	15.95	"	"	"	30 m.	9.09	17.96	32.46	25.13	"
" 23	2.18 "	74 "	15.95	"	"	"	40 m.	9.02	17.92	32.38	25.09	"
" 23	2.18 "	74 "	15.95	"	"	"	50 m.	9.02	17.98	32.48	25.17	"
" 23	2.18 "	74 "	15.95	"	"	"	73 m.	9.03	17.95	32.43	25.14	"
Sept. 27	12.18 "	75 "	12.19	High tide.	S.W. breeze.	Hazy.	Sur. face.	9.21	Water	sample	lost.	Gre'n-ish.
" 27	12.31 "	75 "	12.19	"	"	"	10 m.	9.17	"	"	"	Blue.
" 27	12.18 "	75 "	12.19	"	"	"	20 m.	9.18	"	"	"	"
" 27	12.18 "	75 "	12.19	"	"	"	25 m.	9.13	17.40	31.45	24.34	"
" 27	12.18 "	75 "	12.19	"	"	"	30 m.	9.16	17.40	31.44	24.34	"
" 27	12.02 "	75 "	12.19	"	"	"	40 m.	9.14	17.85	32.25	24.98	"
" 27	12.02 "	75 "	12.19	"	"	"	50 m.	9.13	17.62	31.84	24.65	"
" 27	12.02 "	75 "	12.19	"	"	"	74 m.	9.13	Water	sample	lost.	"

"Prince" Stations No.	Locality.	Position (vide chart.)	Latitude.	Longitude.	Bottom.
26.....	Basin in River, inside Annapolis Royal.	Lighthouse in bend above Granville ferry bears N. by W. $\frac{1}{2}$ W. First point on south side above basin bears E.	44° 44' 55" N.	65° 29' 52" W.	Very soft mud.
26.....	" "	" "	"	"	"
26.....	" "	" "	"	"	"
26.....	" "	" "	"	"	"
26.....	" "	" "	"	"	"
27.....	Annapolis River, north ern passage, around Goat Island.	Lighthouse on Shaffner's Point bears N.E. $\frac{1}{2}$ E Western side of Goat Id. bears S.E. by S. $\frac{1}{2}$ S.			
27.....	" "	" "	44° 42' 21" N.	65° 37' 29" W.	Soft mud.
27.....	" "	" "	"	"	"
27.....	" "	" "	"	"	"
27.....	" "	" "	"	"	"
		3 miles.....			
	Briar Island to Yarmouth.	5 ".....			
		8 ".....			
		11 ".....			
		14 ".....			
		17 ".....			
		20 ".....			
		23 ".....			
		26 ".....			

Contrib. Can. Biol. Fish. Downloaded from www.nrcresearchpress.com by McMaster University on 11/20/14
For personal use only.

SESSIONAL PAPER No. 38a

COLLECTED—*Con.*

Date.	Hour.	Depth in metres.	Air temperature °C.	Tide.	Wind.	Sky.	Depth of determinations in metres.	Water temperature °C.	Chlorine Cl. ‰	Salinity S. ‰	Density σ_t .	Colour of water.
1916.												
Sept. 25	10.19 a.m.	24 m.	13.40	High tide.	Quite heavy N.W. breeze.	Haze.	Sur-face.	14.05	16.14	29.17	21.71	Mud-dy.
" 25	10.19 "	24 "	13.46	"	"	"	10 m.	13.99	16.81	30.38	22.64	"
" 25	10.19 "	24 "	13.40	"	"	"	20 m.	13.72	16.95	30.63	22.90	"
Sept. 25	4.28 p.m.	22 "	14.71	Low tide.	Heavy N.W. breeze.	"	Sur-face.	14.45	16.39	29.61	21.97	"
" 25	4.28 "	22 "	14.71	"	"	"	10 m.	14.18	16.41	29.65	22.05	"
" 25	4.28 "	22 "	14.71	"	"	"	20 m.	14.00	16.72	30.21	22.52	"
Sept. 26	10.54 a.m.	30 "	10.28	High tide.	Heavy N.W. breeze.	Partly cloudy.	Sur-face.	11.62	17.69	31.96	24.35	Gre'n-ish.
" 26	10.54 "	30 "	10.28	"	"	"	10 m.	11.62	17.36	31.36	23.88	Gray.
" 26	10.54 "	30 "	10.28	"	"	"	20 m.	11.18	17.77	32.10	24.52	"
" 26	10.54 "	30 "	10.28	"	"	"	25 m.	11.17	17.79	32.15	24.55	"
Sept. 7	9.12 "	"	"	"	South.	Foggy.	Sur-face.	10.10	No wa-ter sa-mples.			
" 7	9.33 "	"	11.70	"	"	"	"	10.00	17.76	32.09	24.71	
" 7	9.56 "	"	11.40	"	"	"	"	10.40	17.73	32.03	24.60	
" 7	10.16 "	"	11.80	"	"	"	"	10.80	17.69	31.96	24.49	
" 7	10.39 "	"	11.60	"	"	"	"	11.10	17.69	31.97	24.43	
" 7	11.02 "	"	11.80	"	"	"	"	11.20	Sample of water lost.			
" 7	11.22 "	"	11.50	"	"	"	"	9.95	17.51	31.64	24.36	
" 7	11.44 "	"	11.70	"	"	"	"	10.45	17.34	31.34	24.04	
" 7	12.10 p.m.	"	12.30	"	"	"	"	10.20	17.70	31.99	24.59	

8 GEORGE V, A. 1918

Date.	Hour.	Locality.	Temperature.
1916.			
September 1	11.30 a.m.	Head Harbour to Petit Passage, 23 miles	10.90
" 1	11.45 a.m.	" " 25 $\frac{1}{2}$ "	10.95
" 1	12.00 p.m.	" " 27 $\frac{1}{2}$ "	9.20
" 1	12.15 p.m.	" " 29 $\frac{1}{2}$ "	9.05
" 1	12.30 p.m.	" " 31 $\frac{1}{2}$ "	10.85
" 1	12.45 p.m.	" " 33 $\frac{1}{2}$ "	9.90
" 1	1.00 p.m.	" " 35 $\frac{1}{2}$ "	9.80
" 1	1.15 p.m.	" " 37 $\frac{1}{2}$ "	9.85
" 1	1.30 p.m.	" " 39 "	9.55
" 1	1.45 p.m.	" " 40 $\frac{1}{2}$ "	10.00
" 1	2.00 p.m.	" " 42 $\frac{1}{2}$ "	9.75
" 1	2.15 p.m.	" " 43 $\frac{1}{2}$ "	9.10
" 1	2.30 p.m.	" " 45 $\frac{1}{2}$ "	9.00
" 1	2.45 p.m.	" " 47 $\frac{1}{2}$ "	9.20

Fraser—Hydroids of Eastern Canada.

WESTERN ARCHIPELAGO

