



CASE NO.

MANUSCRIPT REPORTS OF THE BIOLOGICAL STATIONS

No. 136

Contributions to the hydrography of the waters
of the Scotian shelf.

General hydrography - 1933.

by

H. B. Hachey

CONTRIBUTIONS TO THE HYDROGRAPHY OF THE WATERS
OF THE SCOTIAN SHELF

General Hydrography ----- 1935

by

H. B. Hachey

(with 38 figures)



**FISHERIES RESEARCH BOARD
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Contributions to the Hydrography of the Waters
of the Section Shelf.

Hydrography of the Waters ---- 1933.

by

H. B. Hooley

Introduction:

Periodic cruises over a portion of the Section shelf were initiated in 1932 ^{see previous reports} and were continued during the spring and summer season of 1933. This report deals with a description of the general hydrographic conditions met with during the 1933 season.

Monthly Cruises:

The monthly cruises carried out during the spring and summer season of 1933 consisted, as in 1932, of the occupation of stations 45 to 58 inclusive. Four cruises were made during the season, in May, June, July, and in the latter part of August. In the August cruise, stations 70 to 72 inclusive were occupied in addition to the regular stations of the cruise. *Data are appended in Table 1.*

The distribution of temperature and salinity for each of these cruises is shown in section in figures 1 to 9 inclusive. For convenience we denote the sections 45 to 48 as the northeast section, 45 to 50 as the outer section, and 50 to 54 as the southwest section.

In the May cruise (figures 1 and 6), water of a temperature greater than 5.0° C. and having a salinity greater than 33.50‰ ("bottom layer") occupies only a small portion of the southwest section as compared with the northeast and outer sections. Temperatures of this "bottom layer" ranged from 5.0° C. to 6.9° C., while the salinities ranged from 33.50‰ to 34.96‰. Water of a tempera-

and 33.50‰ ("intermediate layer") is found to occupy a greater proportion of the southwest section than of the northeast and outer sections. A large portion of the "intermediate layer" consists of water of a temperature less than 1.0° C which tends to hold to the coast. It will be noted that the location of the isohaline of 32.00‰ is at about the same level for all sections (at a depth of 25 to 40 metres offshore, and 50 to 75 metres inshore). It will be of interest to note that the location of this isohaline of 32.00‰ changed but little as the season progressed. The "upper layer" consisting of water of a salinity less than 32.00‰ reaches to depths as great as 70 metres inshore and 45 metres offshore. Close to the coast, subsurface waters of this "upper layer" were of a temperature less than 1.0° C., while the immediate surface temperatures were in the neighborhood of 5.0° C.

In the June cruise, (figures 2 and 7) the "bottom layer" has increased in thickness in the southwest section and remained practically the same thickness in the northeast and outer sections. As a result, the isohaline of 32.00‰ retaining its former level, the "intermediate layer" has decreased in thickness in the southwest section. Temperatures of the "bottom layer" range between 5.0° C. and 6.7° C., while temperatures of the "intermediate layer" (less than 5.0° C.) have on the average, become somewhat higher due to the almost total disappearance of the water of a temperature of less than 1.0° C. The "upper layer", consisting of water of a salinity greater than 32.00‰ has been warmed considerably and now consists almost wholly of water of a temperature greater than 5.0° C. (water of a temperature less than 5.0° C found at the greater depths inshore).

In the July cruise, (figures 3 and 8) the "bottom layer" has increased in thickness in the southwest section and decreased in thickness in the outer and southwest sections. At the position of the

of the isohaline of 32.00‰ remained at approximately the same depth, this means that the thickness of the "intermediate layer" has decreased in the southwest section and increased in the outer and northeast sections. The temperatures of the "bottom layer" ranged from 5.0° C. to 6.9° C.. The temperatures of the "intermediate layer" ranged from 1.8° C. to 5.0° C. in the southwest section, from 2.8° C. to 5.0° C. in the outer section, and from 1.0° C. to 5.0° C. in the northeast section with a slight trace of water of a temperature less than 1.0° C.. Waters of the "intermediate layer" therefore show progressive warming with the season. The "surface layer" has warmed considerably (surface temperatures as high as 17.3° C -- the upper ten metres of a temperature which is greater than 15.0° C.) but a small portion of the "upper layer" has temperatures less than 5.0° C. (at the greater depths close to the coast).

In the August cruise(carried out in the latter part of August and completed on September 2nd.), the thickness of the "bottom layer" remains practically unchanged in the northeast and southwest sections, but has decreased somewhat in thickness in the outer section (figures 4, 5, and 9). The temperatures of the "bottom layer" range between 5.0° C. and 6.7° C.. The position of the isohaline of 32.00‰ remains practically unchanged. Consequently, the only change in the thickness of the "intermediate layer" is to be noted in the increase in the thickness of this layer in the outer section. The temperatures of the "intermediate layer" range from 1.5° C. to 5.0° C. in the southwest section, from 2.7° C. to 5.0° C. in the outer section, and from 2.0° C. to 5.0° C. in the northeast section. This indicates that the "intermediate layer" of the northeast section has been warmed to some extent ^{while} but little change has occurred in the other sections. The temperature of the water of the "surface layer" is, on

the whole, greater than 5.0°C. , with surface temperatures as high as 19.9°C. , and temperatures greater than 16.0°C. at a depth of 10 metres.

The distribution of temperatures and salinities throughout the period of investigation is shown in plan, ^{for the surface} in figures 10, 11, 12, and 13. A lowering of the salinity with rise of temperature accompanies the progress of summer. Inshore salinities decreased from about 31.00% in May to about 30.25% in August, while offshore salinities decreased from about 31.75% (station 49) in May to about 31.00% (station 49) in August. Surface temperatures of about 5.0°C. in May increased to about 19.0°C. in August. The distribution of salinities and temperatures on the surface would seemingly tend to indicate that warmer and more saline waters tend to penetrate the area from offshore.

The distribution of temperatures and salinities throughout the period of investigation is shown in plan for a depth of fifty metres in figures 14, 15, 16, and 17. With the progress of summer, a slight decrease in salinity has taken place ---- from an approximate range of 31.75% to 32.50% in May, to an approximate range of 31.50% to 32.25% in August. From a minimum temperature of less than 1.0°C. in May, temperatures increased to a minimum of approximately 3.0°C. in August. Ingression of warmer and more saline water seems to take place from off shore and seems to have its greatest effect on the southwestern and outer sections.

The distribution of temperatures and salinities throughout the period of investigation is shown in plan for a depth of one hundred metres in figures 18, 19, 20, and 21. With the progress of summer, salinities decreased from a maximum of less than 34.00% to a maximum of less than 35.00% . Temperatures also decreased from a

maximum of less than 06.00°C. ^{in May} to a maximum of less than 15.00°C. in August. The isohalines and isotherms tend to follow the configuration of the bottom.

Weekly Cruises:

Seventeen weekly cruises were carried out during the season extending over the period May 12th, to September 4th, inclusive. The cruise as in the previous year (^{see previous reports} Hooley, 1933), consisted in occupying stations 551, 553, 62, 61, 60, and 59. The location^s of these stations are shown in the various figures 22--38 which illustrate in section the distribution of temperatures and salinities throughout the season. *Data are appended in Table 2.*

In the first cruise on May 15th. (figure 22), all the waters of the section (with the exception of the bottom waters at station 59) are of a salinity less than 32.50% ^{of a temperature} and less than 5.0°C. The greater portion of the section consists of water of a salinity between 31.50% and 32.50% , and of a temperature less than 1.0°C. In the cruise of the following week (May 22nd., figure 23), some warming of the upper layers has taken place, while water of a temperature greater than 2.0°C. is to be found at the bottom at station 59. Warming of the surface waters and ingression of warmer waters at the greater depths at station 59 is apparent for the week of May 29th. (figure 24), with but little change in salinities. Consequently, the water of less than 1.0°C. is gradually disappearing from the section. In the cruise of June 5th. (figure 25), water of a salinity slightly higher than 34.00% and of a temperature greater than 5.0°C. makes its appearance at the greater depths of the section, while surface waters are as high as 9.2°C. at the outer stations and higher than 10.0°C. at the inner stations. Conditions are but little changed in the following weeks (June 12th. figure 26. and June 19th. figure 27) but in the

the week of June 26th. (figure 28), water of a temperature less than 1.0°C . is only found in trace. Progressive warming of the surface layers is apparent with progress of summer. In the week of July 3rd. (figure 29), the water of a temperature less than 1.0°C . is quite prominent once again. Surface temperatures are now as high as 15.1°C .. In the week of July 10th. (figure 30), the water of a temperature less than 1.0°C . is ~~also prominent~~ found in trace, as is the case in the cruise of July 18th. (figure 31). We now find that the surface temperatures are as high as 18.6°C ., and that water of a salinity of less than 30.50% is of considerable extent in the surface layer. Water temperatures at the bottom of station 59 are as high as 6.0°C .. In the cruise of July 24th. (figure 32), the water of less than 1.0°C . is not to be found. It is obvious that due to the warming and freshening of the surface layers and the ingression of warmer and more saline waters at the greater depths, that stratification has been gradually increasing with the progress of ~~summer~~ the season. After July 18th. such changes are not so pronounced and to some extent a retrogression occurs and is noted in the cruises of July 31st. (figure 33), August 7th. (figure 34), August 14th. (figure 35), and August 21st. (figure 36). We find surface temperatures only as high as 17.8°C ., ^{and} bottom temperatures only as high as 4.9°C .. The salinities of the section have decreased at the greater depths and increased in the surface waters. In the cruise of August 28th. (figure 37), the upper thirty metres of the inshore waters have become fairly uniform in temperature (15.0°C . to 17.9°C .) and salinity (30.00% to 30.50%). It will be noted that the salinity, particularly of the bottom waters, for station 62 is comparatively low. This is probably due to the effects of a

Markedly Stratified Waters, in press; and *Tropics/37/* North Atlantic Cyclones and Coastal Waters, Progress Reports, 1954.). Water of a temperature less than 2.0°C . is noted only in trace. In the cruise of September 4th. (figure 38), the section shows recovery from the effects of the disturbance noted in the previous week. Water of a temperature less than 2.0°C . has disappeared from the section. Surface temperatures are as high as 18.3°C . Stratification (with the exception of the upper ten metres) is quite marked.

Summary:

1. Surface salinities decrease with progress of the season (May to early September).
2. Surface temperatures increase with progress of the season (May to early September).
3. The isohaline of 32.00% varies its position but little throughout the period of investigation.
4. A large body of water of a temperature lower than 1.0°C ., found in the area of investigation in May is not to be found in the area in the latter part of August.
5. Bottom salinities at the deeper stations decreased to some extent in the outer and northeastern sections, but increase slightly in the southwestern section.
6. The intermediate layer, on the whole, increased in thickness as the season progressed.
7. Ingression of warmer and more saline waters seems to take place from off shore reaching the outer and southwestern section first.
8. Stratification increases with progress of the season.
9. Indications of a disturbance caused by a tropical cyclone are noted in late August.

changes in temperatures and salinities which culminated in large variations in the latter part of August.

Addendum:

This report is one of a series entitled "Contributions to the Hydrography of the Scottish Shelf". The initial report of this series deals with a description of the submarine topography of the Scottish shelf, the water movements of importance as obtained from the literature, and a description of the hydrographic conditions as obtained in 1932. The second report deals with the water movements as determined by a hydrodynamical treatment of the 1932 data. This report dealing with the hydrographic conditions as determined by the data obtained in 1933 forms the third report of the series. Two papers dealing with particular phases of the observations are in the press, the first, a paper entitled "The effect of wind action on an inshore area of markedly stratified waters", and the second, a paper entitled "Movements resulting from the Mixing of Stratified Waters" also in the press is of interest. At an early date, a hydrodynamical treatment of the 1933 data will furnish information as to the prevailing water movements of that year. The effects of cyclonic storms will also be dealt with in some detail. For the present no attempt will be made to bring this data together, the matter being left for consideration in the near future.

Station	Depth	Salinity Temp.		Salinity Temp.		Salinity Temp.	
		May 17, 1933	June 15, 1933	July 26, 1933	Aug. 30, 1933	July 27, 1933	Aug. 30, 1933
45	Om.	31.15	50.14	50.68	30.03	17.7	30.03
	10m.	31.15	30.73	30.41	30.76	17.97	30.76
	25m.	31.31	31.27	31.06	31.84	16.22	31.84
	50m.	31.71	31.49	31.80	31.00	7.92	31.00
46	Om.	31.31	30.41	30.66	30.82	19.0	30.82
	10m.	31.27	30.46	30.64	30.81	17.88	30.81
	25m.	31.71	31.04	31.56	31.56	10.94	31.56
	50m.	31.83	31.82	31.85	32.08	4.63	32.08
	75m.	32.03	32.07	32.21	32.45	2.41	32.45
100m.	32.45	32.41	32.66	32.50	1.87	32.50	
47	Om.	31.51	30.75	31.00	30.79	19.0	30.79
	10m.	31.44	31.32	31.13	30.75	16.74	30.75
	25m.	31.76	31.96	31.54	31.40	9.91	31.40
	50m.	32.16	32.36	31.87	32.16	4.89	32.16
	75m.	32.52	32.90	32.61	32.79	2.87	32.79
100m.	33.51	33.43	32.97	33.26	3.94	33.26	
150m.	34.23	34.05	33.88	34.16	6.00	34.16	
175m.	34.34	34.29	34.07	34.27	6.21	34.27	
48	Om.	31.94	31.62	31.46	30.95	19.1	30.95
	10m.	31.87	31.55	31.40	30.81	19.23	30.81
	25m.	31.60	32.05	31.44	31.27	6.80	31.27
	50m.	32.43	32.45	32.13	32.07	3.64	32.07
	75m.	32.99	33.21	32.74	32.59	1.96	32.59
100m.	33.69	33.91	33.59	33.13	3.63	33.13	
150m.	34.45	34.36	34.13	34.04	5.76	34.04	
200m.	34.56	34.54	34.52	34.47	6.70	34.47	
49	Om.	31.76	31.53	31.40	30.99	19.6	30.99
	10m.	31.74	31.53	31.39	30.95	19.31	30.95
	25m.	31.98	31.96	31.69	31.91	6.53	31.91
	50m.	32.56	32.43	32.39	32.43	2.72	32.43
	75m.	33.40	33.22	33.76	33.15	3.68	33.15
100m.	33.84	33.76	33.56	33.40	4.34	33.40	

Table 1 (continued)

50	0m.	May 17, 1933			June 15, 1933			July 27, 1933			Aug. 31, 1933			
		31.76	5.7	31.62	11.2	9.86	31.61	9.86	31.42	16.87	31.08	19.00	31.09	19.6
	10m.	31.71	5.56	31.61	9.86	31.61	9.86	31.42	16.87	31.08	19.00	31.08	19.00	
	20m.	31.76	4.69	31.73	7.03	31.73	7.03	31.73	11.61	31.60	9.81	31.60	9.81	
	50m.	32.23	2.39	32.23	2.69	32.23	2.69	32.23	3.56	32.23	3.56	32.23	3.56	
	75m.	32.90	2.56	32.97	2.78	32.97	2.78	32.97	3.24	32.97	3.24	32.97	3.24	
	90m.	32.97	3.69	32.97	4.10	32.97	4.10	32.97	4.37	32.97	4.37	32.97	4.37	
		<p>May 15, 1933</p> <p>June 15, 1933</p> <p>July 27, 1933</p> <p>Aug. 31, 1933</p>												
51	0m.	31.66	5.8	31.26	11.0	31.08	17.2	31.08	17.2	31.15	19.9	31.15	19.9	
	10m.	31.66	4.74	31.24	9.45	31.15	16.67	31.15	16.67	31.04	19.46	31.04	19.46	
	25m.	31.92	4.59	31.92	5.89	31.92	6.20	31.92	6.20	31.89	6.46	31.89	6.46	
	50m.	32.36	2.86	32.43	2.94	32.29	2.66	32.29	2.66	32.39	2.80	32.39	2.80	
	75m.	32.84	2.76	32.99	3.24	32.65	2.16	32.65	2.16	32.75	2.75	32.75	2.75	
	100m.	33.57	4.69	33.57	4.93	33.53	4.72	33.57	4.93	33.57	4.93	33.57	4.93	
	110m.	33.73	5.06	33.65	4.93	33.64	4.92	33.63	4.87	33.63	4.87	33.63	4.87	
			<p>May 16, 1933</p> <p>June 15-16/33</p> <p>July 27, 1933</p> <p>Aug. 31, 1933</p>											
	52	0m.	31.16	4.3	30.59	9.5	30.52	17.0	30.52	17.0	30.82	19.2	30.82	19.2
		10m.	31.16	3.74	30.62	6.44	30.65	16.81	30.65	16.81	30.81	18.96	30.81	18.96
		25m.	31.82	0.99	31.96	4.22	31.76	9.77	31.82	7.59	31.82	7.59	31.82	7.59
50m.		32.12	0.94	32.18	2.80	32.21	3.62	32.25	3.29	32.25	3.29	32.25	3.29	
75m.		32.56	0.66	32.59	1.27	32.77	2.17	32.65	2.51	32.65	2.51	32.65	2.51	
100m.		32.47	0.94	32.99	2.20	32.44	4.35	32.46	4.35	32.46	4.35	32.46	4.35	
150m.		33.40	4.06	33.16	6.97	34.14	6.23	34.13	6.26	34.13	6.26	34.13	6.26	
200m.		34.43	6.20	34.34	6.37	34.23	6.39	34.29	6.34	34.29	6.34	34.29	6.34	
			<p>May 16, 1933</p> <p>June 16, 1933</p> <p>July 27, 1933</p> <p>Aug. 31, 1933</p>											
53		0m.	31.04	5.4	30.86	9.5	30.44	16.8	30.46	16.2	30.66	18.2	30.66	18.2
		10m.	31.00	4.43	30.97	6.49	30.41	16.41	30.41	16.41	30.46	17.9	30.46	17.9
	25m.	31.16	1.17	31.24	2.56	31.60	9.93	31.63	10.89	31.63	10.89	31.63	10.89	
	50m.	31.96	0.96	32.67	1.06	32.01	2.32	31.92	2.04	31.92	2.04	31.92	2.04	
	75m.	32.83	1.16	32.03	1.01	32.29	1.62	32.56	1.43	32.56	1.43	32.56	1.43	
100m.	32.41	1.26	32.47	1.67	32.65	2.33	32.61	1.93	32.61	1.93	32.61	1.93		
		<p>May 16, 1933</p> <p>June 16, 1933</p> <p>July 27, 1933</p> <p>Sept. 1, 1933</p>												
54	0m.	31.06	5.7	31.02	9.7	30.56	16.0	30.56	16.0	30.50	17.0	30.50	17.0	
	10m.	30.97	4.83	31.08	7.64	30.73	14.90	30.73	14.90	30.55	17.25	30.55	17.25	
	25m.	31.36	0.41	31.53	1.63	31.40	6.24	31.40	6.24	30.55	14.90	30.55	14.90	
	50m.	31.69	0.57	31.67	1.56	31.69	2.92	31.69	2.92	31.36	4.79	31.36	4.79	

Table (continued)

Station	Depth	Salinity Temp.	Salinity Temp.	Salinity Temp.	Salinity Temp.	
55	0m.	30.99	5.7	31.00	15.4	
	10m.	30.97	4.74	31.10	8.04	
	25m.	31.51	0.63	31.31	2.44	
	50m.	31.63	0.22	31.60	1.27	
	65m.	31.69	0.53	31.76	1.16	
		May 19, 1933	30.90	10.3	30.68	17.3
56	0m.	31.27	4.4	31.03	1.88	
	10m.	31.15	4.14	31.11	0.80	
	25m.	31.56	1.60	31.57	1.63	
	50m.	31.73	0.99	31.67	1.73	
	70m.	31.93	0.37	31.96	1.73	
		May 19, 1933	30.96	10.3	30.64	17.3
57	0m.	31.22	5.4	30.90	13.75	
	10m.	31.11	3.56	31.30	4.04	
	25m.	31.60	2.15	31.82	2.19	
	50m.	31.76	0.61	31.82	2.19	
		May 19, 1933	30.91	10.8	30.61	15.5
		July 29, 1933	31.00	6.10	31.02	4.96
58	0m.	31.11	3.99	31.11	2.96	
	10m.	31.31	1.64	31.71	2.03	
	25m.	31.90	0.63	31.62	1.94	
	50m.	31.90	0.63	31.96	1.51	
	70m.	31.95	0.67	31.96	1.51	
		July 29, 1933	30.96	10.3	30.66	16.8
59	0m.	31.18	5.1	31.76	19.8	
	10m.	31.11	3.99	31.71	17.83	
	25m.	31.31	1.64	32.10	9.52	
	50m.	31.90	0.63	32.57	4.16	
	70m.	31.95	0.67	32.92	3.52	
		Aug. 31, 1933	31.47	12.7	31.47	12.7
60	0m.	31.18	5.1	31.46	16.70	
	10m.	31.11	3.99	32.10	8.01	
	25m.	31.31	1.64	32.30	2.47	
	50m.	31.90	0.63	32.99	3.38	
	100m.	31.90	0.63	33.44	4.35	
	150m.	31.90	0.63	34.16	6.15	
175m.	31.95	0.67	34.30	6.23		
	Aug. 31, 1933	31.04	19.1	31.04	19.1	
71	0m.	30.99	19.26	30.99	19.26	
	10m.	32.01	8.70	32.01	8.70	
	25m.	32.54	3.90	32.54	3.90	
	50m.	32.81	2.91	32.81	2.91	
	100m.	33.44	4.13	33.44	4.13	
	150m.	34.16	6.15	34.16	6.15	
175m.	34.49	6.65	34.49	6.65		

Table 1 (concluded)

Sta.	Depth	Temp. Gal.		Temp. Gal.		Temp. Gal.		Temp. Gal.						
		May 19-33	May 22-33	May 29-33	June 5-33	June 12-33	June 19-33	June 26-33	June 3-33					
531	Om.	3.7	29.61	7.0	30.07	8.0	29.25	11.9	29.52	11.4	29.69	11.9	29.54	
	5m.	2.47	30.66	6.04	30.41	5.89	30.87	6.66	30.44	6.55	30.50	9.56	30.26	
	10m.	1.86	30.86	2.77	30.93	3.47	30.64	4.53	30.66	4.89	30.61	7.56	30.61	
	25m.	1.87	31.06	1.66	31.17	1.71	31.15	1.75	31.11	2.67	31.11	2.49	31.02	
	50m.	1.87	31.20	1.16	31.27	1.15	31.20	1.19	31.24	1.19	31.22	1.21	31.24	
		May 16-33	May 22-33	May 29-33	June 5-33	June 12-33	June 19-33							
535	Om.	4.2	30.70	6.7	30.52	8.4	30.35	9.7	30.25	9.2	30.52	10.8	30.37	
	5m.	3.67	30.77	5.30	30.63	5.20	30.70	7.66	30.54	7.87	30.70	9.66	30.80	
	10m.	3.59	30.64	2.99	31.15	2.79	30.92	4.84	31.04	5.93	31.11	9.79	30.85	
	20m.	1.95	31.51	1.62	31.44	2.25	31.52	2.61	31.22	4.53	31.24	5.13	30.95	
		May 15-33	May 23-33	May 29-33	June 5-33	June 12-33	June 19-33							
	62	Om.	4.0	31.24	5.6	31.17	6.4	31.04	10.6	30.75	8.2	31.04	9.9	30.66
10m.		2.15	31.26	3.07	31.51	4.84	31.28	5.69	31.15	4.72	31.15	9.24	30.75	
25m.		0.79	31.53	1.90	31.49	4.17	31.26	2.37	31.36	2.64	31.33	6.56	30.99	
30m.		0.61	31.53	1.16	31.56	2.35	31.42	1.26	31.39	2.42	31.33	4.70	31.11	
		May 15-33	May 23-33	May 29-33	June 5-33	June 12-33	June 19-33							
61		Om.	4.5	31.26	8.3	31.26	6.4	31.22	9.2	31.09	8.60	30.93	9.0	30.61
	10m.	3.68	31.17	4.45	31.20	5.09	31.20	6.03	31.15	7.80	30.66	8.06	30.55	
	25m.	2.76	31.53	1.69	31.44	4.53	31.24	2.37	31.56	2.79	31.18	5.11	31.06	
	50m.	0.95	31.92	1.59	31.69	1.01	31.66	1.08	31.47	1.24	31.73	2.65	31.46	
		May 15-33	May 23-33	May 29-33	June 5-33	June 12-33	June 19-33							
	60	Om.	4.0	31.20	4.7	31.24	5.7	31.00	7.2	30.61	9.0	30.91	9.2	30.85
10m.		2.83	31.22	4.04	31.16	3.97	30.99	5.04	30.61	6.64	30.62	7.66	30.52	
25m.		0.64	31.65	1.95	31.60	3.66	31.11	1.16	31.04	5.22	31.64	1.98	31.24	
50m.		0.89	31.94	0.58	31.71	2.45	31.83	1.18	31.64	2.17	31.63	1.23	31.67	
75m.		0.74	32.16	0.53	31.90	0.83	31.92	0.99	32.07	0.90	32.23	0.97	32.07	
100m.		0.76	32.25	0.56	31.99	0.71	32.07	1.63	32.54	1.09	32.30	1.16	32.25	
	May 15-33	May 23-33	May 29-33	June 5-33	June 12-33	June 19-33								
59	Om.	3.5	31.16	4.2	31.29	4.2	30.62	6.1	30.61	6.2	30.66	6.8	30.52	
	10m.	2.85	31.15	4.04	31.24	5.10	31.10	6.44	31.08	7.19	31.11	6.80	30.57	
	25m.	0.35	31.47	3.07	31.63	2.62	31.71	2.66	31.67	5.28	31.67	1.49	31.65	
	50m.	0.64	31.96	0.74	31.99	0.74	31.99	0.66	32.00	0.82	32.00	0.57	32.02	
	75m.	0.59	32.23	0.42	32.27	0.79	32.10	0.99	32.76	0.66	32.14	0.67	32.52	
	100m.	0.79	32.43	0.63	32.45	1.46	32.50	1.64	32.72	1.33	32.67	1.13	---	
150m.	1.80	32.68	2.82	32.94	4.67	32.60	5.38	34.07	5.26	33.66	5.41	---		

Table 2 (continued)

Sta.	Depth	Temp. Sal.		Temp. Sal.		Temp. Sal.		Temp. Sal.						
		Temp.	Sal.	Temp.	Sal.	Temp.	Sal.	Temp.	Sal.					
531	Om.	15.8	39.86	14.7	39.09	13.3	39.43	16.6	39.60	19.6	39.40	16.6	39.56	
	5m.	9.99	30.16	11.14	39.93	10.54	30.03	14.44	39.63	15.09	39.85	10.52	30.19	
	10m.	7.91	30.46	6.97	---	7.66	30.52	11.43	39.99	10.54	39.16	8.52	30.58	
	25m.	2.91	31.02	2.90	39.97	4.07	39.91	3.58	39.90	3.96	39.91	3.66	39.91	
	60m.	1.23	31.13	1.42	31.09	1.33	31.17	1.31	31.15	1.32	31.06	1.32	31.06	
533	Om.	15.8	30.10	16.3	39.34	12.1	39.97	16.7	39.17	17.6	39.96	16.2	39.03	
	5m.	9.55	30.52	6.86	39.61	10.64	30.86	15.08	30.52	14.03	30.12	7.06	30.97	
	10m.	6.95	30.79	6.47	39.90	6.96	30.66	12.42	39.54	11.04	39.59	5.97	31.06	
	20m.	6.96	30.60	4.08	31.17	3.56	31.26	6.45	30.64	7.54	39.73	5.96	31.27	
	68	Om.	9.5	30.62	13.1	39.41	12.5	39.43	16.2	39.46	16.7	39.48	15.4	39.40
61	10m.	7.44	30.97	9.03	39.62	11.83	39.43	14.08	39.46	11.78	39.61	7.21	39.97	
	25m.	3.04	31.22	2.83	31.26	2.77	31.35	3.00	30.64	5.42	31.09	3.70	31.27	
	30m.	2.55	31.35	1.69	31.49	2.54	31.29	7.05	39.77	5.11	31.15	2.46	31.53	
	61	Om.	10.6	30.69	10.5	39.97	12.6	39.44	15.2	39.59	17.2	39.50	13.4	39.93
	10m.	6.94	30.97	9.29	39.56	10.54	39.66	12.40	39.39	11.95	39.59	5.62	31.00	
60	25m.	3.13	31.00	4.62	30.93	1.97	31.33	6.50	30.66	4.29	31.22	3.37	31.24	
	50m.	1.34	31.62	1.96	31.60	1.00	31.62	2.61	31.46	1.86	31.65	1.79	31.76	
	60	Om.	10.9	30.46	11.1	39.97	11.6	39.53	15.6	39.86	16.9	39.62	14.0	39.97
	10m.	6.73	30.60	9.69	39.83	11.95	39.57	14.55	31.00	11.78	39.64	10.94	39.99	
	25m.	1.63	31.27	4.71	30.93	1.56	31.44	5.49	39.97	6.61	39.99	5.91	31.54	
59	50m.	1.68	32.01	1.15	31.60	1.24	31.76	1.17	31.91	2.52	31.65	1.64	32.07	
	75m.	0.70	32.13	0.70	32.21	0.95	31.567	0.93	32.09	1.37	32.25	2.00	32.61	
	100m.	1.31	32.43	1.14	32.47	1.27	32.50	1.29	32.50	1.55	32.48	2.57	32.90	
	59	Om.	10.3	39.63	11.5	39.61	11.5	39.43	15.5	31.46	16.0	39.66	16.7	39.91
	10m.	9.90	31.31	10.09	39.61	9.23	39.68	15.14	31.44	15.59	39.91	13.78	39.89	
58	25m.	5.82	31.83	5.21	31.74	5.01	31.62	10.73	31.71	6.57	31.44	6.24	31.62	
	50m.	2.79	32.25	0.64	32.00	2.15	32.14	4.26	32.25	3.51	32.10	3.04	32.23	
	75m.	2.99	32.66	0.84	32.34	1.64	32.61	3.90	32.66	1.22	32.45	1.87	32.59	
	100m.	2.52	32.86	2.54	32.83	2.69	32.90	3.69	32.15	2.74	32.66	3.69	32.22	
	150m.	5.69	34.02	5.75	34.02	6.79	33.91	6.15	34.18	5.67	33.95	5.62	33.99	

Table 2 (continued)

Sta.	Depth	Temp. Sal.										
		Aug. 7-35	Aug. 14-35	Aug. 21-35	Aug. 28-35							
531	0m.	14.9	29.83	15.0	30.19	16.1	30.14	16.1	29.64	16.1	29.16	
	5m.	6.31	30.50	15.80	30.16	14.83	30.23	15.73	29.72	17.57	29.34	
	10m.	7.86	30.61	11.82	30.50	8.30	30.72	15.23	29.85	14.44	29.94	
	25m.	4.27	30.97	1.42	30.91	4.67	30.90	4.46	30.23	4.57	30.97	
	60m.	1.33	31.15	1.40	31.11	1.42	31.15	1.47	31.09	1.53	31.15	
533	0m.	12.1	30.21	14.4	30.44	17.1	30.21	17.7	29.14	16.1	29.74	
	5m.	10.28	30.62	14.44	30.57	13.39	30.62	16.62	30.01?	17.62	29.73	
	10m.	7.20	30.91	13.04	30.73	10.22	30.52	13.52	29.85?	13.93	30.16	
	20m.	5.05	31.11	7.04	30.91	7.31	---	10.92	30.43	13.64	30.54	
	62	0m.	13.0	---	14.3	30.93	16.6	30.62	17.7	30.03	17.8	30.34
61	10m.	8.53	31.02	11.97	30.93	12.11	30.93	17.00	30.52	17.00	30.54	
	25m.	4.43	31.26	6.90	31.02	7.74	31.08	15.90	30.32	8.28	31.03	
	30m.	3.92	31.27	5.94	31.13	6.97	31.09	13.17	30.30	5.67	31.42	
	61	0m.	13.6	30.93	16.1	30.75	17.4	30.92	17.9	30.14	19.8	30.25
	10m.	12.17	30.82	14.97	30.70	7.46	31.13	16.90	30.12	16.65	30.37	
60	25m.	6.45	31.73	7.94	31.27	5.90	31.17	17.19	30.46	10.74	30.63	
	50m.	2.17	31.55	3.32	31.73	3.73	31.64	8.05	30.95	5.21	32.12	
	60	0m.	16.9	---	17.6	30.93	19.3	30.65	16.2	30.52	16.3	30.26
	10m.	13.51	30.93	16.1	30.99	17.63	30.73	17.63	30.50	17.65	30.23	
	25m.	8.54	31.82	5.40	31.86	7.66	31.44	6.62	30.91	14.83	30.89	
59	50m.	2.43	32.15	1.73	31.82	3.49	31.73	3.82	31.51	4.06	31.73	
	75m.	1.72	32.43	1.73	32.59	1.62	32.50	2.70	32.10	2.62	32.61	
	100m.	1.37	32.52	1.72	32.47	1.67	32.61	1.61	32.34	2.42	32.72	
	150m.	16.9	30.97	16.7	31.13	16.0	30.10	18.3	30.80	18.3	30.32	
	10m.	15.6	30.86	16.21	31.06	16.01	30.65	17.71	30.46	16.00	30.77	
59	25m.	11.46	31.67	6.56	31.73	7.29	31.11	6.72	31.13	12.45	32.43	
	50m.	4.93	32.29	1.61	32.10	3.03	32.27	2.41	31.60	4.84	32.43	
	75m.	2.65	32.54	1.56	32.54	0.92	32.43	2.43	32.34	3.67	32.77	
	100m.	3.46	33.08	2.70	32.92	1.53	32.53	2.47	32.79	3.31	33.06	
	150m.	4.60	33.57	4.63	33.69	4.98	33.75	5.27	33.84	4.93	33.69	

Table 2 (concluded)

