

Mean Temperature and Salinity Conditions Near the Entrance to the Bay of Fundy, 1951-80

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Abstract

Monthly mean temperature and salinity conditions in the 1951-80 period are presented for Prince 5, a station near the entrance to the Bay of Fundy. Vertical gradients are generally weak due to strong tidal mixing, although the effect of the peak runoff from the Saint John River is detectable as a surface salinity minimum in May. Comparison with means for the 1932-51 period indicates generally higher winter and spring temperatures and lower salinities during the 1951-80 period.

Introduction

Monitoring of temperature and salinity conditions in the outer Quoddy area near the entrance to the Bay of Fundy has been conducted by the St. Andrews Biological Station since 1924. Measurements were taken at the station known as Prince 5 ($44^{\circ}56.8'N$, $66^{\circ}48.7'W$) (Fig. 1) approximately once per month at standard depths using reversing thermometers and water bottles. Salinities were determined initially by titration and in more recent years with the use of a salinometer. The data series represents the longest continuous record of its type off eastern Canada.

Results and Discussion

The long-term means of temperature and salinity at Prince 5 for the 1951-80 period are presented in this paper. The 30-year period is in compliance with the standard base period of the World Meteorological Organization and the recommendation of the NAFO Scientific Council (NAFO, 1983). Data prior to 1973 were obtained from the Marine Environmental Data Service (MEDS), Ottawa, Ontario, and 1973-80 data were received directly from the Biological Station, St. Andrews, New Brunswick (J. Hull, pers. comm.).

The temperature and salinity data were edited prior to determining the means. Densities were first calculated and the temperature and salinity records were then smoothed to remove any density inversions. The inversions were assumed to have arisen through instrument or recording errors. After editing, the temperature and salinity data were linearly interpolated to standard depths (0, 10, 25, 50, 75, and 90 m), where necessary. The monthly means and their standard deviations are listed in Table 1, together with the numbers of observations.

The generally weak vertical gradients in both temperature and salinity (Fig. 2) are a consequence of the intense tidal mixing which is caused by the strong tidal currents in the Bay of Fundy. Stratification occurs at certain times of the year, however, with a maximum in May. This corresponds with the time of the minimum surface salinity and is attributed to the effects of the peak runoff from the Saint John River.

Monthly mean temperatures and salinities at Prince 5 had been calculated previously by Bailey *et al.* (1954). From data collected during 1932-51, they determined averages for the surface (0-25 m), intermediate (25-75 m) and bottom (75-90 m) layers by using linear interpolation between observations at standard depths. For comparative purposes, mean values for these same layers were calculated from the 1951-80 data. The seasonal cycle of mean temperature and

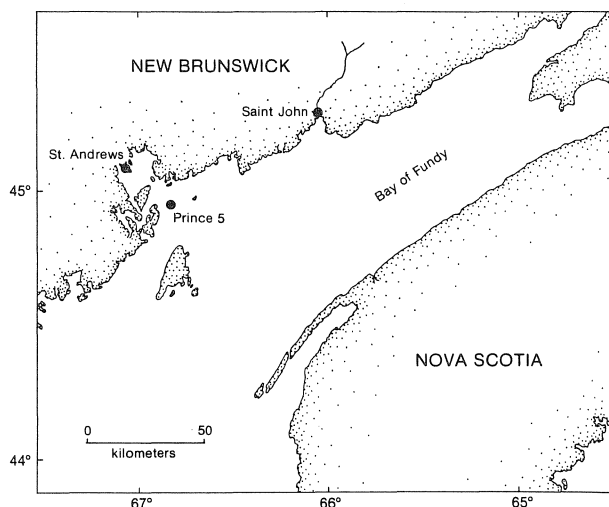


Fig. 1. The Bay of Fundy showing the location of hydrographic station Prince 5.

TABLE 1. Mean temperatures and salinities, together with standard deviations and numbers of observations, by month and depth for the 1951-80 period at Prince 5 in the Bay of Fundy.

Depth (m)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)													
0	Mean	3.9	1.9	2.0	3.0	5.1	7.5	9.7	11.2	11.6	10.5	9.1	6.7
	SD	1.2	1.1	1.0	1.1	0.9	1.6	1.1	1.0	1.1	0.8	1.2	1.0
	N	28	29	29	28	28	29	29	29	29	28	29	27
10	Mean	4.2	2.1	2.0	2.9	4.6	6.7	8.9	10.7	11.2	10.5	9.1	6.7
	SD	1.1	1.0	1.0	0.9	1.0	1.0	1.0	1.2	0.9	0.9	1.0	1.1
	N	28	28	29	29	28	29	29	29	29	29	29	28
25	Mean	4.4	2.3	2.1	2.9	4.5	6.4	8.6	10.5	11.0	10.5	9.2	6.8
	SD	1.1	0.9	1.0	0.9	0.8	0.8	1.0	1.1	0.9	0.9	0.8	1.0
	N	28	28	29	29	28	29	29	29	29	28	29	28
50	Mean	4.4	2.4	2.1	2.8	4.4	6.2	8.3	10.3	10.8	10.5	9.2	6.8
	SD	1.1	0.9	1.0	0.9	0.8	0.8	1.1	1.3	1.0	0.9	0.8	1.1
	N	28	28	29	29	28	29	29	29	29	28	29	28
75	Mean	4.6	2.5	2.1	2.8	4.2	6.0	8.0	9.9	10.5	10.4	9.2	6.9
	SD	1.2	1.0	1.1	0.9	0.8	0.9	1.2	1.3	1.0	0.8	0.9	1.1
	N	28	28	29	29	28	29	29	29	29	28	29	28
90	Mean	4.7	2.6	2.4	2.8	4.0	5.6	7.6	9.4	9.9	10.3	9.3	6.9
	SD	1.3	1.0	1.2	1.0	0.9	1.0	1.3	1.4	1.0	0.9	0.9	1.1
	N	28	28	29	29	28	28	29	29	29	28	29	27
Salinity													
0	Mean	32.17	31.95	31.73	31.19	30.54	31.11	31.54	31.83	32.19	32.46	32.32	32.28
	SD	0.29	0.46	0.41	0.51	1.30	0.51	0.31	0.29	0.19	0.30	0.49	0.45
	N	28	29	29	26	27	28	26	26	26	26	25	24
10	Mean	32.21	31.98	31.78	31.34	30.90	31.25	31.58	31.88	32.26	32.52	32.38	32.30
	SD	0.29	0.42	0.38	0.42	0.71	0.35	0.29	0.27	0.21	0.25	0.43	0.46
	N	28	29	29	27	27	28	26	26	27	26	25	24
25	Mean	32.26	32.01	31.84	31.49	31.16	31.35	31.66	31.96	32.30	32.55	32.42	32.33
	SD	0.28	0.40	0.33	0.37	0.49	0.33	0.27	0.26	0.20	0.24	0.42	0.44
	N	28	29	29	27	27	28	26	26	27	26	26	24
50	Mean	32.30	32.06	31.88	31.62	31.45	31.46	31.74	32.02	32.38	32.58	32.47	32.39
	SD	0.28	0.39	0.33	0.37	0.30	0.30	0.23	0.23	0.21	0.25	0.39	0.43
	N	28	29	29	27	27	28	26	26	27	26	26	24
75	Mean	32.34	32.10	31.94	31.79	31.63	31.60	31.88	32.14	32.49	32.67	32.57	32.43
	SD	0.28	0.36	0.33	0.35	0.31	0.36	0.25	0.25	0.28	0.25	0.37	0.41
	N	27	29	29	26	27	27	26	26	27	26	25	24
90	Mean	32.45	32.16	32.06	31.90	31.84	31.87	32.12	32.34	32.68	32.75	32.70	32.51
	SD	0.32	0.33	0.31	0.28	0.31	0.40	0.34	0.27	0.29	0.26	0.42	0.39
	N	27	29	29	25	26	26	26	26	27	25	25	24

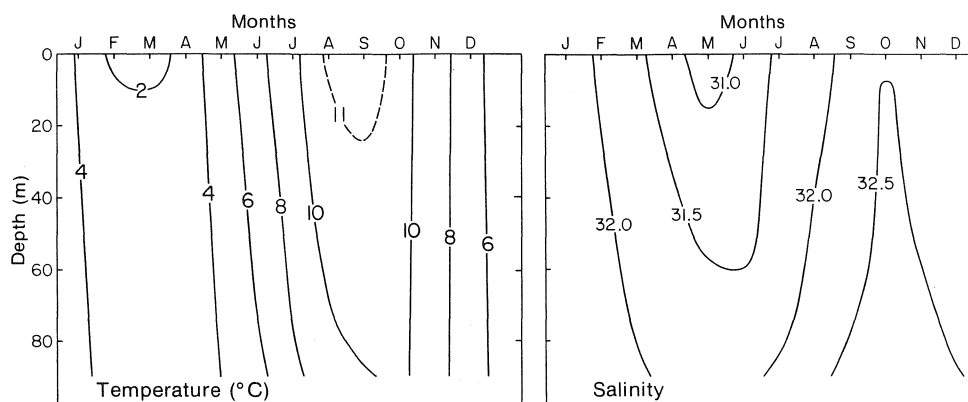


Fig. 2. Vertical profiles of monthly mean temperature and salinity at Prince 5 for the 1951-80 period.

salinity was similar for the two periods. Mean temperatures during the first half of the year, however, were higher in all three layers during the recent period by approximately 0.5°C (i.e. there was a higher winter minimum). In addition, the salinities throughout the water column in all months were generally lower (approximately 0.1) during the 1951–80 period.

References

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