

ANNUAL MEETING - JUNE 1965Another cold year: 1964

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Monitoring of temperature conditions in Subarea 4 was continued in 1964 from surface and bottom temperature observations. Halifax Section over the central Scotian Shelf was occupied 7 times during the year by C. S. S. BAFFIN, C. S. S. HUDSON, C. N. A. V. SACKVILLE and C. G. S. A. T. CAMERON. If the seasonal coverage had apparently been neglected, repeated coverage within a relatively short time has been emphasized. Surface observations at 6 coastal stations were continued as well as bottom observations at 2 stations in the Gulf of Maine-Bay of Fundy area. Some of the features observed in 1964 are described here.

Halifax Section

Figure 1 shows only four of the seven sections occupied during the year.

Early spring (26 March): A cold mixed layer, with a maximum thickness of 100 m, extended across the Scotian Shelf and to at least 40 miles south of the Shelf. The surface temperature varied between -1.2 and 1.9°C . Similar conditions have been observed during winter in 1959 and 1961. The mixed layer extended down to only 60 m over Emerald Bank where bottom temperatures varied between 3.0 and 4.0°C . South of the Bank they varied between 2.0 and 3.0°C . These bottom temperatures were all below average. The observed maximum temperature in the deep waters of the Scotian Gulf, 6.1°C , was below average by approximately 2.0°C .

Summer (15 and 24 July): The general features of temperature and salinity distributions have changed slightly in the 8-day interval. In both cases, the surface layer of temperature below 15.0°C , extended across the Shelf down to a maximum of 20 m. However, on the shore end of the section, the surface temperatures had decreased by almost 2.0°C , from 15 to 24 July. The intermediate temperature layer, observed in both series, occupied the whole width of the Shelf. The maximum temperature observed in the deep waters of the Scotian Gulf, 5.1°C , and the bottom temperature on Emerald Bank, 2.2°C , were much below average, the former being a record low temperature, associated with a relatively low salinity ($<34.5\text{‰}$). Also during both series, an area of steep gradient of bottom temperature, from 3.0 to 7.0°C , was predominant south of Emerald Bank. Changes in both temperature and salinity distributions were observed south of the Scotian Shelf from 15 to 24 July.

Late summer (9 September): The temperature of the surface layer had increased from 13.0 - 15.0°C to 16.0 - 19.0°C from July to September. A well defined intermediate temperature layer with temperature below 3.0°C was observed across the Shelf at an average depth of 55 m. Observed maximum temperature in the Scotian Gulf, 6.4°C , and bottom temperature on Emerald Bank, 3.7°C , were still below average. The steep temperature gradient on the bottom, south of Emerald Bank, was observed again in September, leading to a core of warm water between the Shelf and cool waters offshore.

Late autumn (25 November, 3 and 7 December): The 3 series have similar features, a mixed layer from surface down to 50 m or deeper, a segmentation of the intermediate temperature layer resulting from a wedge-like intrusion of warm waters over the Scotian Shelf. Such an intrusion is indicated by surface temperature distribution from charts produced by Oceanographic Services for Defence, by the vertical uniformity of temperature distribution as compared to the stratification of adjacent

stations and by the relatively high salinity in Emerald Bank area. A similar intrusion had been observed previously, in November 1962. The effect of this intrusion seemed to last for at least 2 weeks. The observed maximum temperature, 6.5°C, in the Scotian Gulf was a slight increase over the September temperature. However, the volume of this body of relatively warm water had increased considerably, presumably as a result of the wedge-like intrusion. By 7 December, the bottom temperature on Emerald Bank was 6.9°C. South of the Bank towards the edge of the Continental Shelf, the bottom temperatures decreased to less than 3.0°C.

Coastal Stations (Table I)

The main features of the 1964 surface temperatures are: a general decrease from the 1963 level, more pronounced during the second half of the year with the exception of the Gulf of St. Lawrence (4T) and a negative deviation from long term averages. The bottom temperatures in 4X also indicate a decrease from 1963 to 1964 and a negative deviation from long-term averages generally more pronounced during the second half of the year.

The St. Andrews surface temperatures are taken as an index of temperature variations on the Continental Shelf (4X, V, W). For the year, these surface temperatures were the lowest since 1948. During the third quarter, they were the lowest since 1943. Bottom temperatures on the northern side of the Bay of Fundy during the fourth quarter (October-December) were the lowest since 1935.

Discussion

The years 1959 and 1961 have also been labelled "cold years" but the year 1964 was colder than these previous ones. The main difference between them consists in the time of year of greatest negative anomaly. In 1959 and 1961, the greatest negative anomalies generally occurred during the first half of the year, and in 1964 they occurred during the second half. In this sense, the year 1964 is unusual. Within the deep layers of the Scotian Gulf, during mid-summer 1964, the waters were the coldest ever observed.

The cooling trend experienced since the mid-1950's is still continuing but is somewhat more pronounced since 1960 than in the previous five years.

Table 1. Average temperature variations and anomalies

		Bay of Fundy- Gulf of Maine		Central Scotian Shelf	Gulf of St. Lawrence
		4X		4V	4T
		surface	bottom	surface	surface
Average monthly variation from 1963 to 1964	January- June	°C -0.8	°C -0.9	°C -0.7	°C -0.5
	July- December	-1.3	-1.4	-0.9	-0.3
Average anomaly from long-term average	January- June	-0.6	-0.9	-1.5	-0.1
	July to December	-1.3	-1.9	-1.4	-1.0

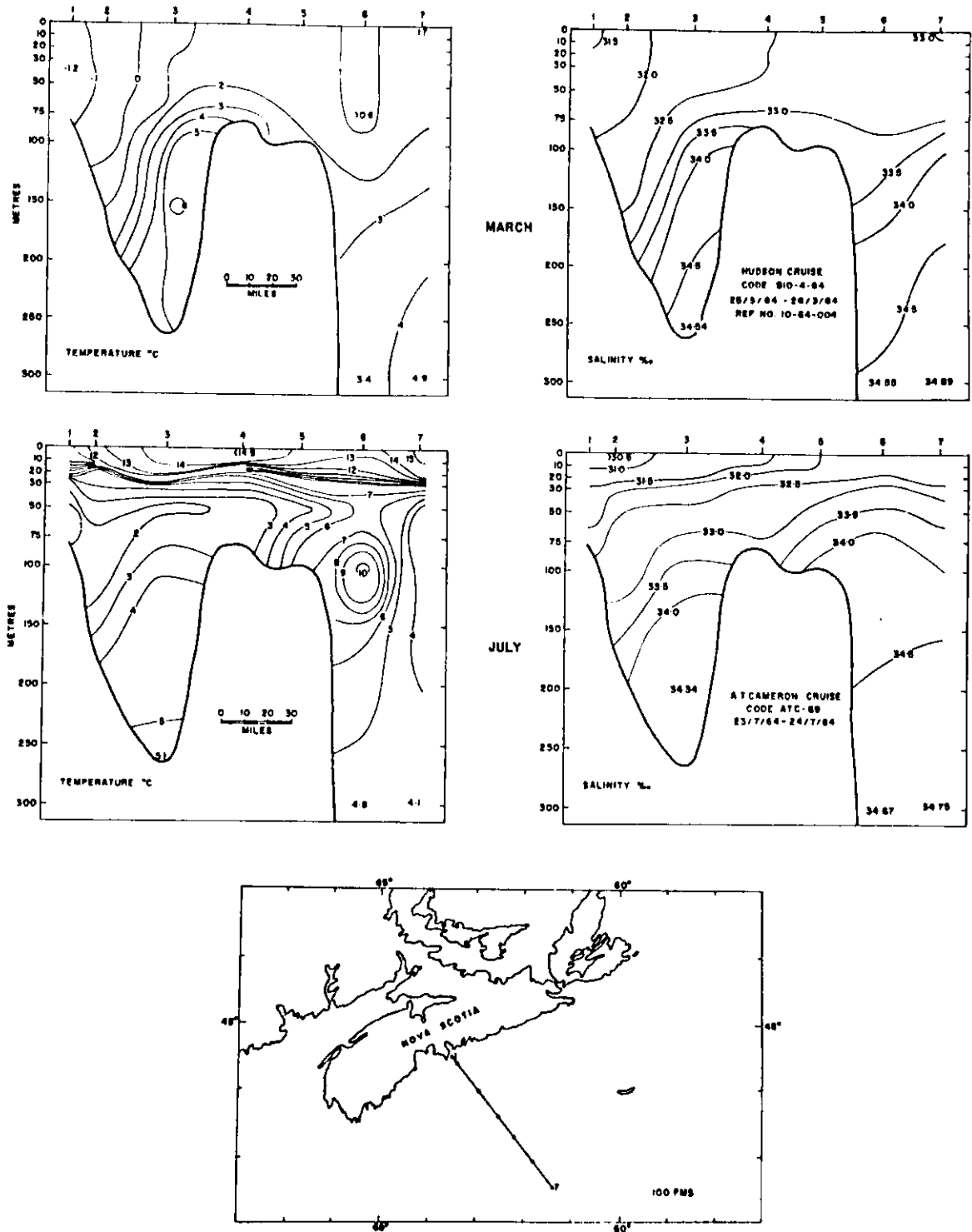


Fig. 1. Temperature and salinity distributions off Halifax, N.S., 1964.

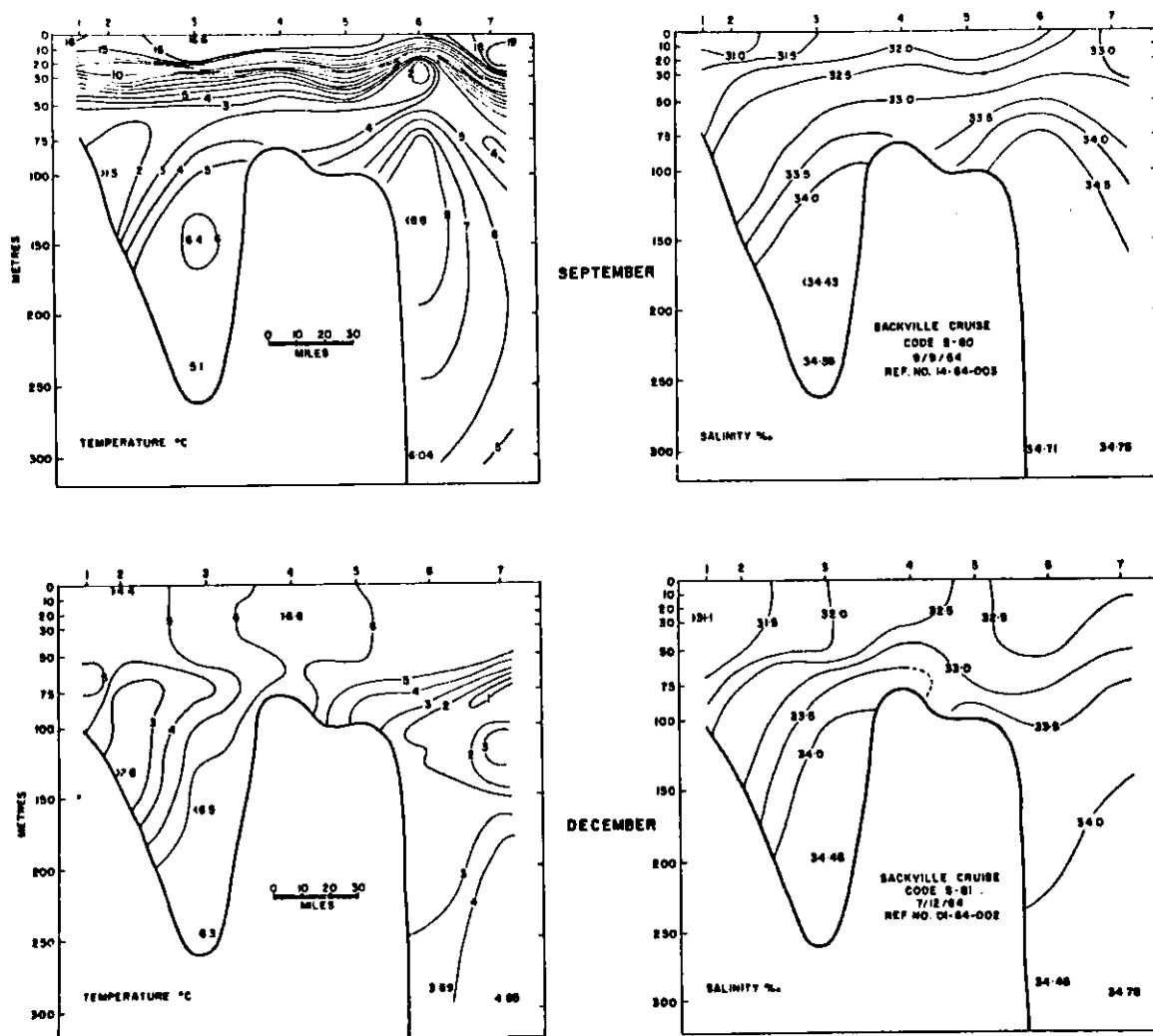


Fig. 1.(continued)

Temperature and salinity distributions
off Halifax, N.S., 1964.