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Temperatures and salinities in the eastern Newfoundland area in 1969

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Introduction

After three years in which only the St. John's-Flemish Cap section was taken, the 6 standard sections taken yearly on approximately the same dates in July-August across the Labrador Current east of Newfoundland from 1951 to 1965 were occupied in 1969 by the *Cape Freels* operated for two cruises by the St. John's Station. Station 27, off Cape Spear was occupied monthly or oftener throughout the year. The section temperatures will be compared with the lowest, average, and highest temperatures at each depth at each station in 1951-65 in July-August. For the St. John's-Flemish Cap section it will be possible to make some comparisons also with sections taken in 1966-68.

Sections across the Labrador Current in July-August

Temperatures

In the Seal Islands, Labrador section across Hamilton Inlet Bank (Fig. 1), surface temperatures were a little above the average but the temperatures of the intermediate water over the continental shelf at some levels at several offshore stations were below the lowest previously recorded in this section and near the coast only about 0.1 to 0.2°C above the lowest recorded. The volume of water below -1°C was also much greater than usual. The deep water in Hawke Channel west of Hamilton Inlet Bank was colder than the average but 0.25 to 0.8°C higher than the lowest temperatures recorded.

In the section off Cape Bonavista (Fig. 2), surface temperatures in most of the section were slightly above average but in three seaward stations slightly below average. The amounts of cold water below 0°C and below -1°C were slightly greater than average and the coldest water 0.1°C lower than average. The part of the section intersecting the northern Grand Bank along the 50° longitude line (Fig. 2) has not been taken for enough of the 1951-65 period to be included in the averages. This section intersects the portion of the Labrador Current passing to the eastward and the comparisons with previous years and averages should be approximately the same as in the Cape Bonavista section.

In the St. John's-Flemish Cap section (Fig. 3), surface temperatures were about average. Temperatures generally in the water below 0°C in the shoreward part of the Avalon Channel at some depths and at the bottom were among the highest encountered in this section. Also in this part of the section the volume of water below 0°C was less than usual and only slightly greater than the least recorded. In this part of the section also, the volume of water below -1°C was much less than average but the lowest temperature, -1.47, was lower than average. Seaward over the surface of the Grand Bank, temperatures were slightly higher than average and the volume and temperatures of the eastern cold water part of the Labrador Current on the eastern slope of the Grand Bank were close to the average. Temperatures in the Flemish Channel, on Flemish Cap and on the eastern slope of Flemish Cap were above average but usually not as high as in 1968.

In the section from St. John's to the southeast slope of the Grand Bank (Fig. 4), surface temperatures over the Grand Bank were close to the lowest previously encountered but over the Avalon Channel and southwest of the Grand Bank were higher than the lowest but still below average. The low surface temperatures over the bank were partly due to the mixing of the upper layers, as the depth of the 10°C isotherm was greater than average. The volumes of water below 0°C and below -1°C in the Avalon Channel were somewhat less than average but the lowest temperature of this water was 0.06°C below average. Bottom temperatures in the Avalon Channel were slightly higher than any previously recorded

for this section. Bottom temperatures over the Grand Bank were higher than average, and the temperatures and volume of the water below 0°C on the southeastern slope of the Grand Bank close to the average. The 0 to 5° isotherms on the southeastern slope were much closer together than usual, the temperatures at 20-200 m at Station 33B and at 20-400 m at Station 33F were higher and above 300 m at 33F much higher than any previously encountered in this section.

In the section extending along the southwestern edge of the Grand Bank (Fig. 5) at about 75 m, surface temperatures were below average but this was partly, at least, due to the mixing of the upper layers as the 10°C contour extended more deeply than usual. Bottom temperatures over the bank were close to the average but in the Haddock Channel were about 0.3°C higher than any previously recorded for this section. The lowest temperatures in the Labrador Current section on the southeastern slope of the Grand Bank were close to the average and the volume of cold water below 0°C was less than the average.

In the section at 275 m along the southwestern slope of the Grand Bank and extending to St. Pierre Bank (Fig. 6), the temperatures of the southward flow of Labrador Current water through the Halibut Channel in 75-100 m at Station 10 were a little below the average. The temperatures of the eastern and central cold water (the eastern certainly and the central most likely derived from the eastern branch of the Labrador Current) were slightly lower than average and close to the usual volume. The deep water and bottom temperatures over the bank slope were intermediate between the average and the highest temperatures of the 1951-65 period.

Salinities

In these comparisons, salinities from 20 m to the surface are omitted as being too much influenced by local and temporary precipitation and runoff for useful comparison from year to year. In the Seal Island section off southern Labrador (Fig. 1), salinities at 30 m and deeper at the various stations were almost always below average and usually in the lowest quarter of the 1951-65, 1969 period. At 400

and 500 m at Station 56, salinities were among the highest in the period but at these levels variations in salinity from year to year were small.

In the Bonavista sections (Fig. 2), salinities at 30 m and deeper were almost all well below average, usually in the lower part of the lower quarter, and many of the salinities, especially at Stations 48 and 49, were the lowest yet encountered.

In the Flemish Cap section (Fig. 3) for which comparisons are available for the period 1951-68, at Stations 27, 28, and 37 (including the lowest temperatures) salinities were all below average and usually in the lower quarter. At Stations 34-36 and 37A-42, salinities were below average, usually in the lower quarter at the 30 m level, increasing in the deeper layers, usually to well above average. At the outermost station, 42A, for which there are records for only 1961-69, upper layer salinities down to 200 m were below average, in the lower part of the lower quarter, whereas all salinities from 250 to 1000 m were the highest yet recorded.

In the section from St. John's to the southeast slope of the Grand Bank (Fig. 4), at Stations 27, 28, 33A, and 33D most salinities were well below average, although at bottom at Station 27 and from 400 m to bottom at Station 33A they were above average. At other stations also, out to and including Station 33, salinities at 30 m were lower than usual, generally in the lower quarter, whereas the deeper levels were mostly near or above average. At Station 33B, salinities were above average from 30 to 150 m, with salinities at 50-100 m the highest on record. Salinities were below average from 200 to 300 m and slightly above average from 400 m to bottom. At Station 33D salinities at all levels to bottom were below average and usually in the lowest quarter. At the outer station, 33F, salinities at all levels were near or at the highest recorded.

In the section at about 80 m extending along the southwestern edge of the Grand Bank (Fig. 5), salinities at 30 m were below average and usually the lowest recorded (but at this level records are only for 1959-65 and 1969). Also salinities at three of the colder water stations, 20A,

20B, and 26A were below average, except near bottom at 20A. At the other stations out to and including Station 26D, salinities below 30 m were generally well above average. At the most easterly station, 26F, salinities were above average except at 30-50 and 250-300 m.

In the section at 275 m along the southwestern slope of the Grand Bank and extending to St. Pierre Bank (Fig. 6), salinities at 30 m were mostly below average. Almost all the other salinities were above average, apart from those at Station 10 where salinities at 3 of 7 levels (those at 200 m to bottom) were below average, and at Stations 13, 17 and 19 where the bottom salinities were below average.

Station 27, 1969

Winter-spring temperatures from surface to bottom at Station 27 off Cape Spear (Fig. 7) were higher than the 13-year average, 1950-62 (Templeman, 1965), apart from the low January temperatures at 150 m and bottom which were the effects of low temperatures generated in the previous year. For the remainder of the year, surface and bottom temperatures were close to the 13-year average. In June-December, intermediate water temperatures also were close to the average except that temperatures from June to early September at the 50 and 75 m levels were below 0°C and well below the 13-year average because in these months at these levels the average temperatures are above 0°C. The cold water below -1°C was not formed at Station 27 but arrived from northward in June and persisted in small amounts until early October, the lowest Labrador Current temperatures, as usual, gradually extending deeper as the year advanced.

Salinities did not differ greatly from those of 1968 (Templeman, 1969).

Acknowledgements

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References

Templeman, Wilfred, 1965. Anomalies of sea temperature at Station 27 off Cape Spear and of air temperature at Torbay-St. John's. Spec. Publ. int. Comm. Northw. Atlant. Fish., No. 6, p. 795-806.

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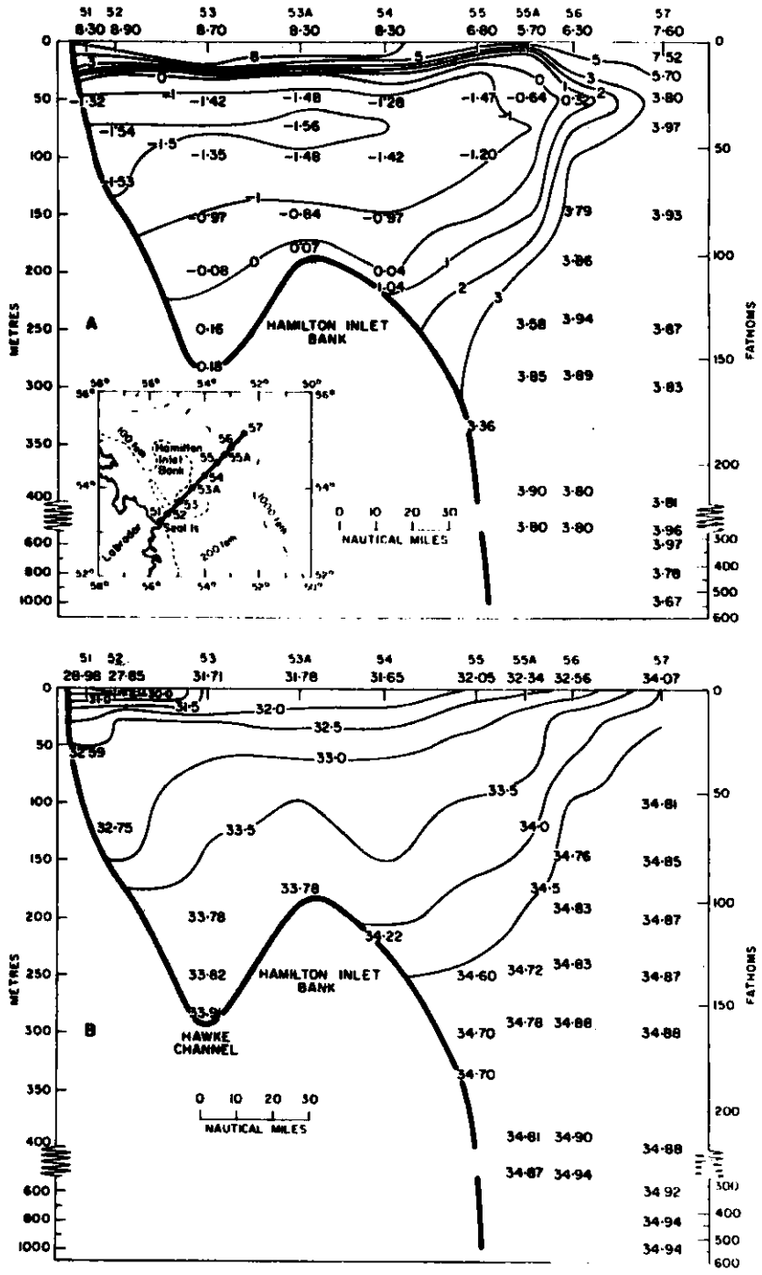

Fig. 1. Temperature (°C) above and salinity (‰) below, Seal Island-Hamilton Inlet Bank section, 4 August 1969.

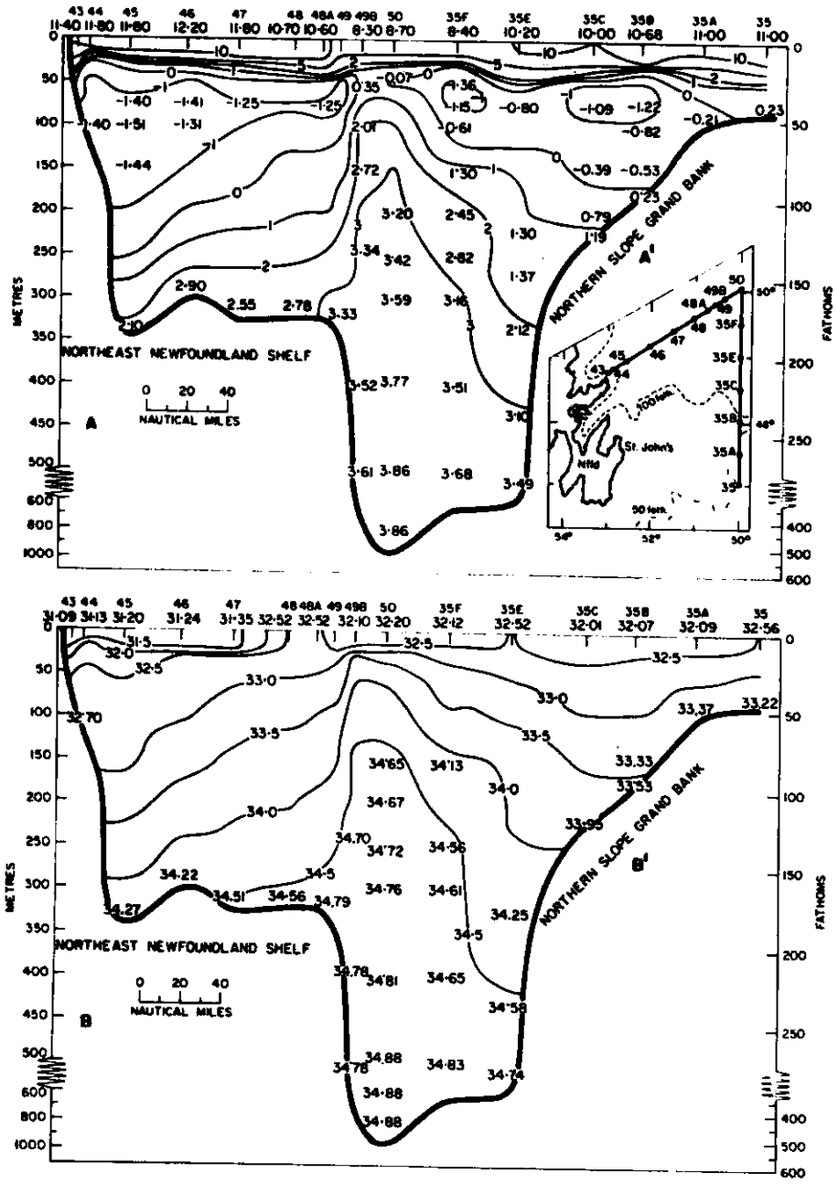

Fig. 2. Temperature (°C) above and salinity (‰) below, for section off Cape Bonavista, 2-3 August, and southward to northern Grand Bank, 29 July-1 August 1969.

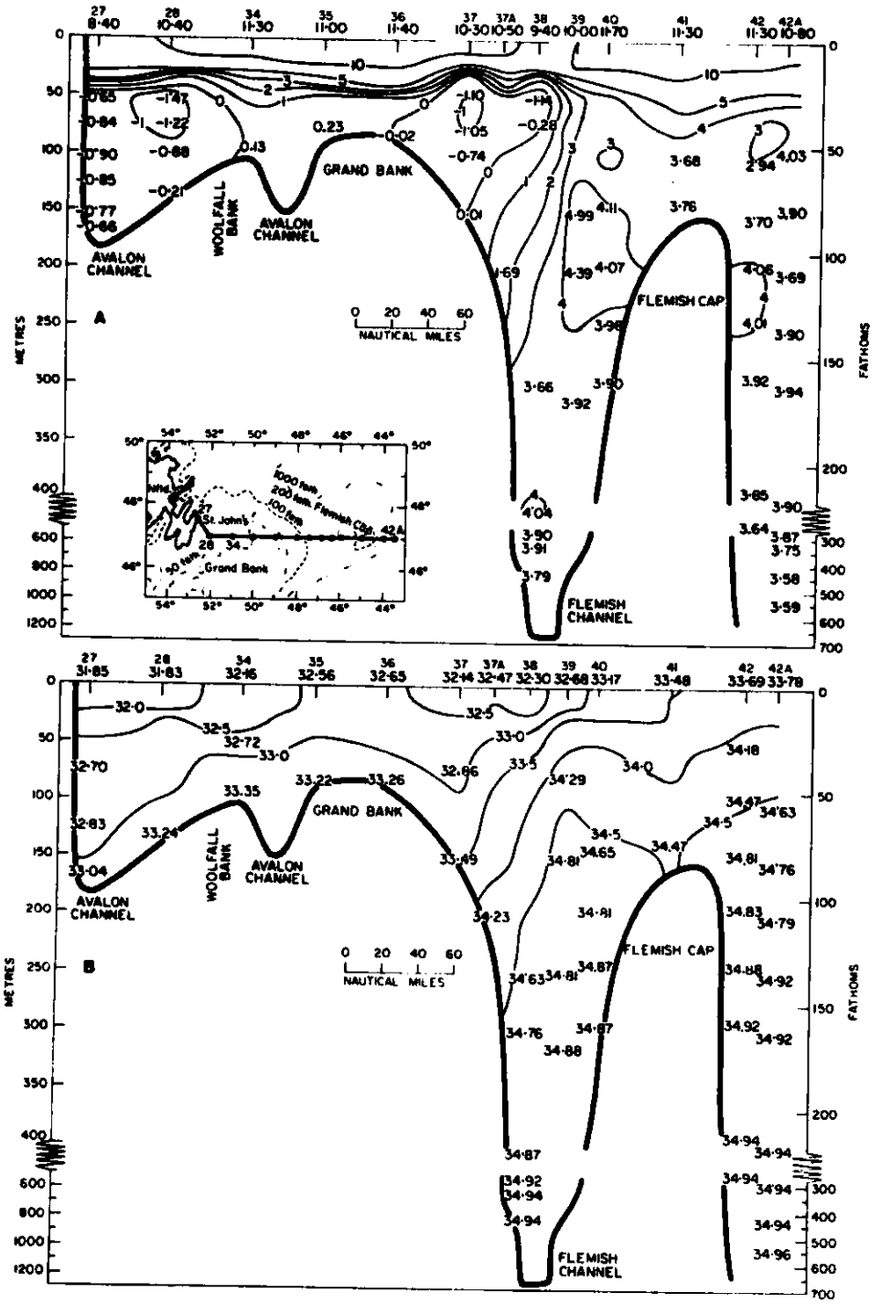

Fig. 3. Temperature (°C) above and salinity (‰) below, St. John's-Flemish Cap section, 29-31 July 1969.

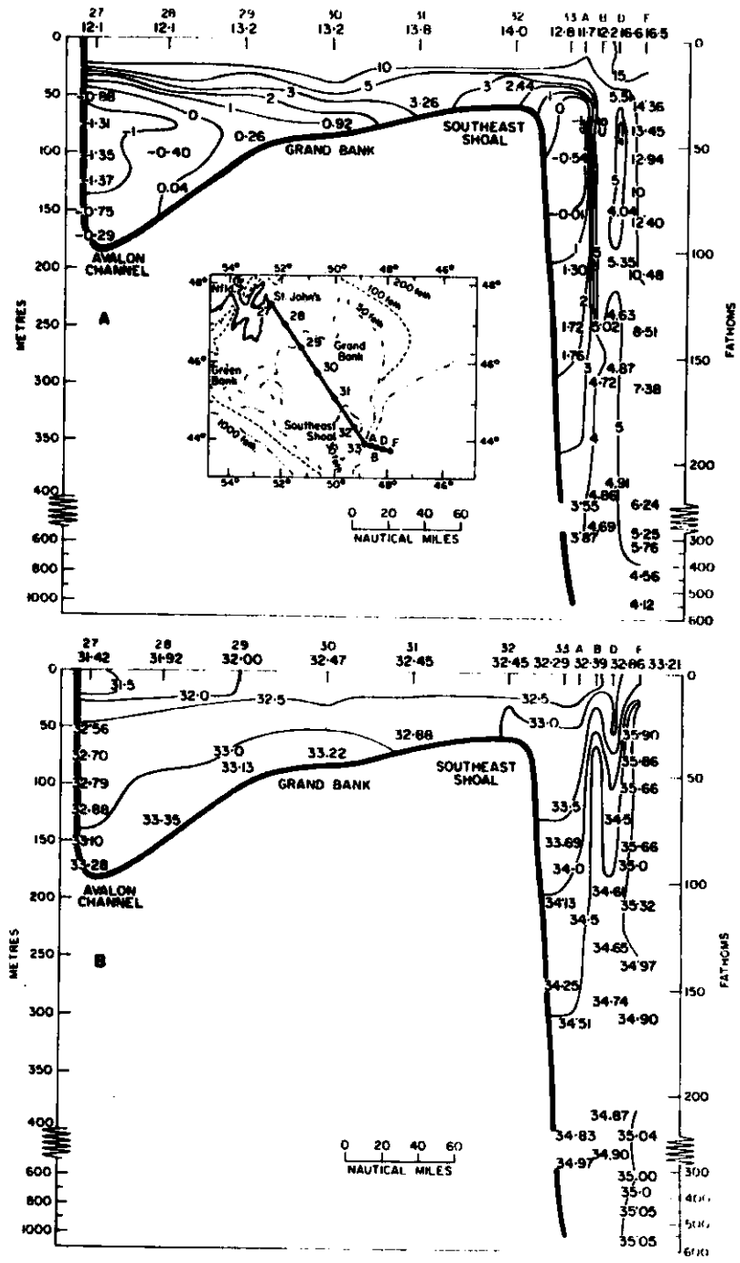

Fig. 4. Temperature (°C) above and salinity (‰) below, St. John's-SE slope Grand Bank, 18-20 August 1969.

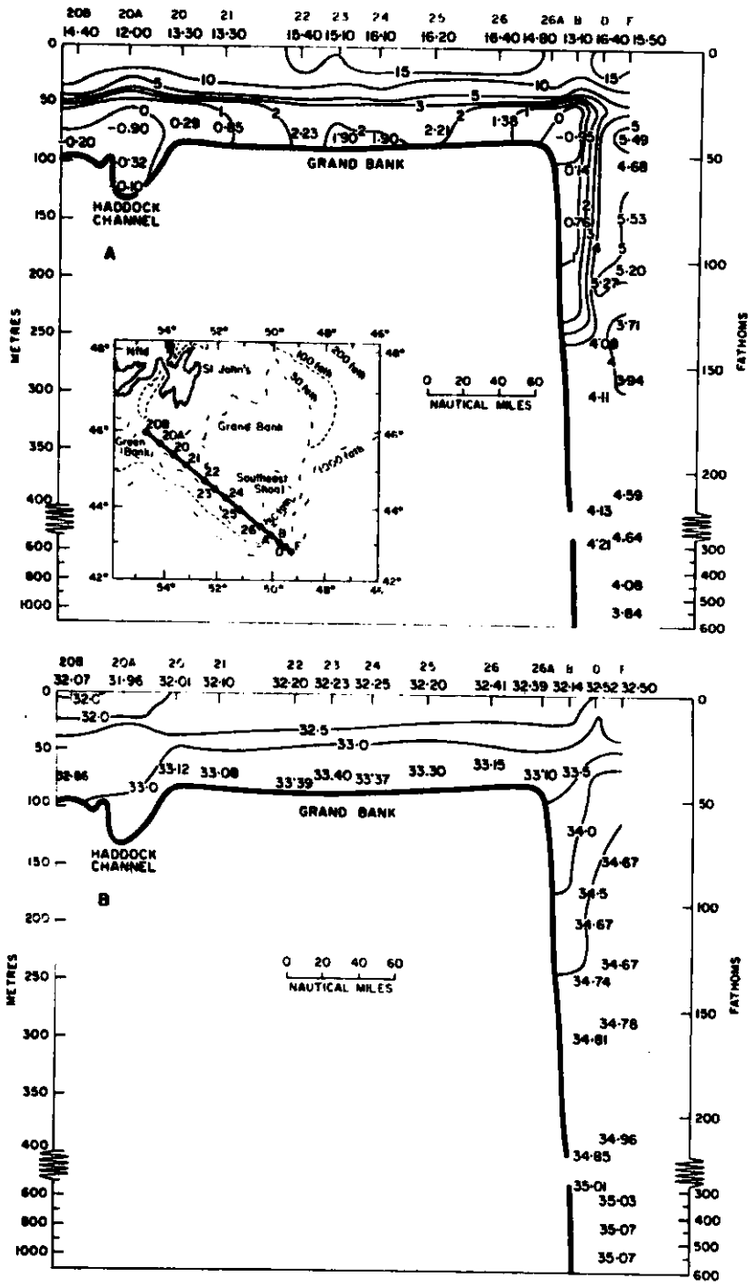

Fig. 5. Temperature (°C) above and salinity (‰) below, Green Bank-SE Grand Bank, 21-25 August 1969.

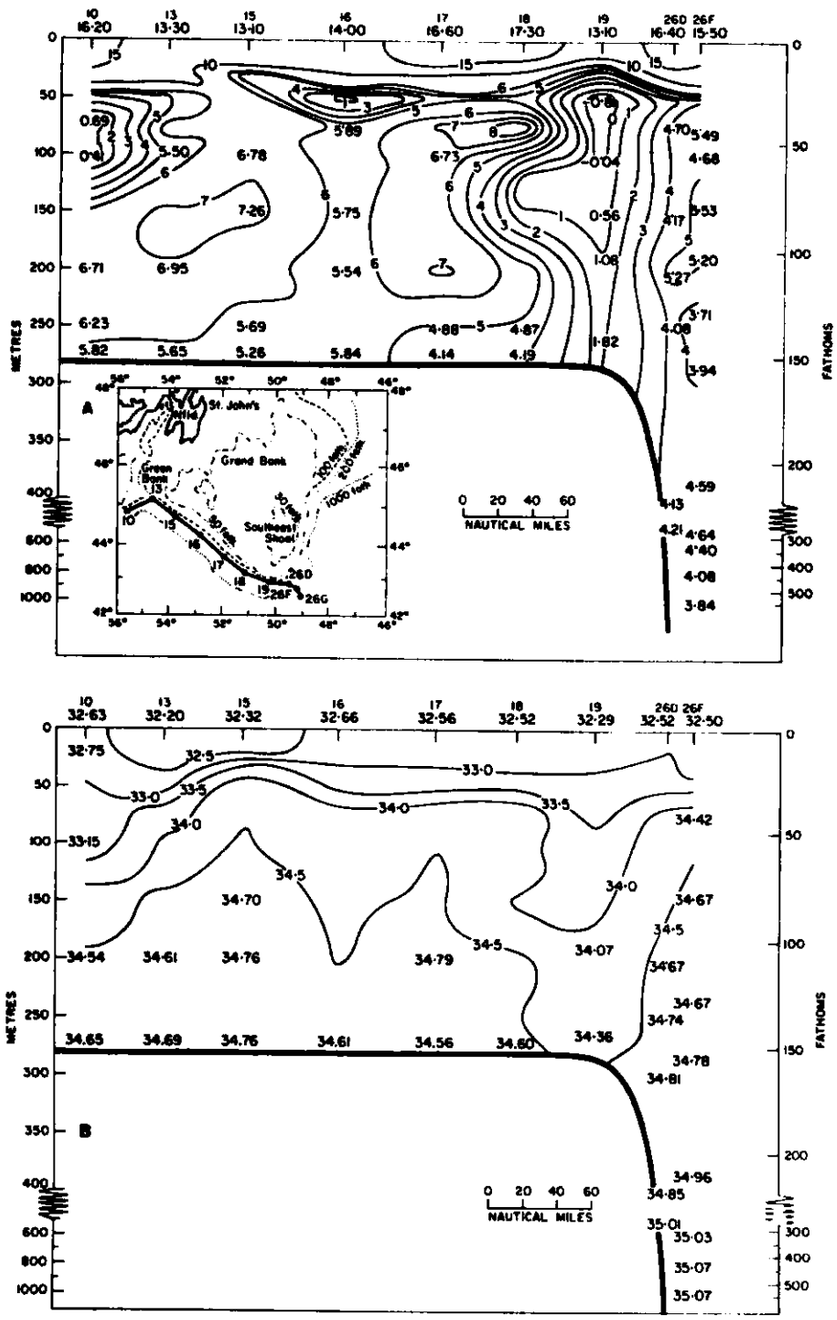

Fig. 6. Temperature (°C) above and salinity (‰) below, SW slope Grand Bank-St. Pierre Bank, 21-24 August 1969.

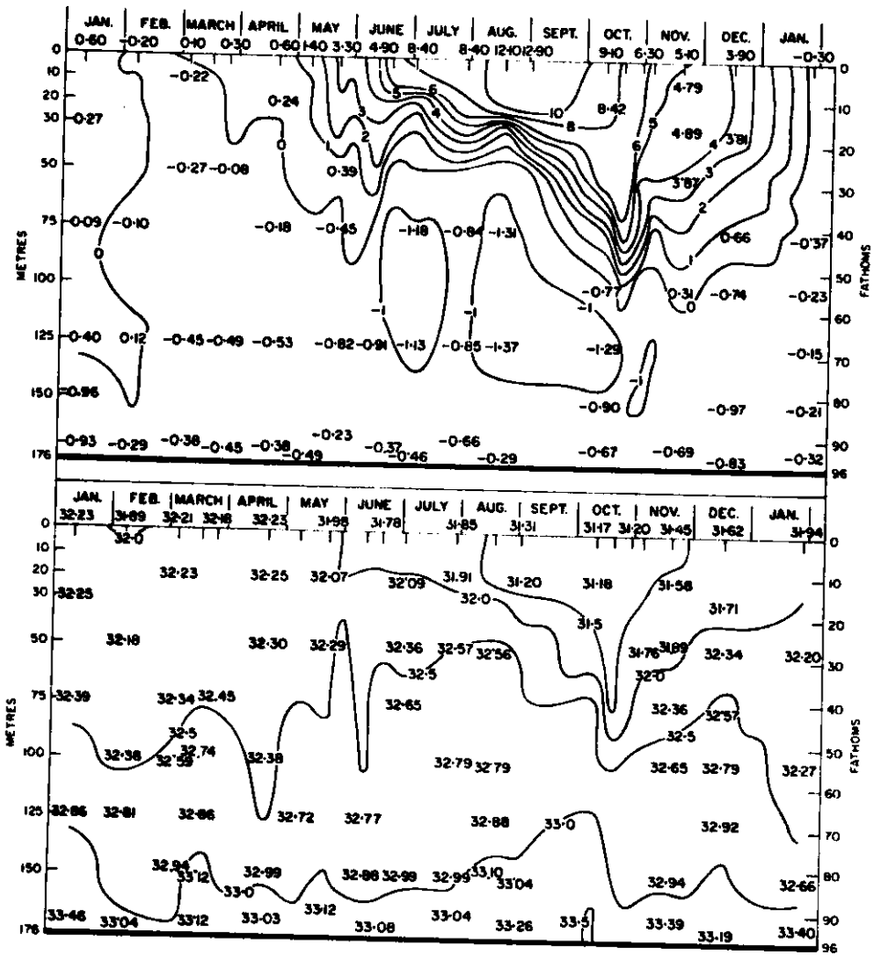

Fig. 7. Temperature (°C) above and salinity (‰) below, January 1969 to January 1970, from surface to bottom at Station 27 (see Fig. 3, 4 inset), 2 nautical miles off Cape Spear near St. John's.