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Hydrographic observations in Subareas 1, 2 and 3, July-August 1965

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Introduction

The 6 monitoring hydrographic sections across the Labrador Current and Continental Shelf from Seal Islands, Labrador to the southern Grand Bank were occupied 23 July-23 August 1965 by the Investigator II.

In approximately the same period, during a cruise of the A.T. Cameron 28 July-24 August to West Greenland with the author as scientist-in-charge, temperature sections were taken at fishing locations, often along somewhat scattered lines of stations, along the West Greenland coast and across the eastern half of Baffin Bay and the Labrador Sea (Fig. 1). These West Greenland temperatures were taken for background information for the fishing sets and were by surface thermometer, bathythermograph from surface to 275 m, reversing thermometers at 275 m, at bottom, and at intermediate levels. The temperature profiles appear to show the main features of the water masses, but, from the methods used, no salinities are available between those at the surface and those at 275 m.

West Greenland Area

In the northern sections westward from Disko Bank and Disko Bay across part of the deep water of Baffin Bay to the West Ice (Fig. 2A, 2B), the cold intermediate water of 0°C and lower formed by winter chilling extended from the coastal shelf westward, with the lowest temperatures (-1.5°C) and greatest volume toward the west. Below the cold layer the West Greenland Current was present with highest temperatures (as high as 3.3 to 3.4°C) at the slope of the West Greenland Shelf and lower temperatures westward and deeper. Even at 1,200-1,300 m the effects of this current were evident in temperatures of 0.1 to 0.2°C. Moderately warm water extended into Disko Bay with a small volume above 4°C at 275 m.

In the section extending into Baffin Bay from the northern peak of Store Hellefiske Bank (Fig. 2C), the effects of the West Greenland Current were great enough that the intermediate coldest water below 0°C

no longer touched the slope but was situated to the westward, the lowest temperature at the slope being 1.7°C . Westward over Baffin Bay near the West Ice, temperatures of 0°C were present at the surface. A bottom temperature of 4.5°C was found in the shallowest water on the bank and highest temperatures in the West Greenland Current below the intermediate layer were 3.5 to 3.6°C , slightly higher than in the more northern sections.

In the section extending southward over the eastern side of Store Hellefiske Bank and westward from the southern part of this bank (Fig. 2D), bottom temperatures on the bank were 5.5 and 5.0°C ; the lowest temperature of the intermediate water over the slope of the bank was 2.6°C and the highest temperature of the West Greenland Current below the intermediate layer was 4.9°C .

In the section from Lille Hellefiske Bank west over the Davis Strait Ridge (Fig. 3A), the lowest temperatures of the intermediate layer were 1.3 to 1.5°C and lay west of the slope, and the highest temperature of the West Greenland Current below the intermediate layer was 5.1°C .

In the sections from Fylla Bank and Fiskenaes Bank westward (Fig. 3B, 3C), bottom temperatures on the outer parts of the banks were moderately low, 2.0 to 2.1°C (on Banana Bank 1.5°C), and still colder water lay above and presumably coastward. The mixed East Greenland-Irminger Current water of 2 to 5°C , lay near the western shallower parts of the banks and slopes, and was flanked to the west and deeper by relatively unmixed Irminger Current water of 5 to 5.7°C . Temperatures as high as 3.7°C extended to over $1,400$ m.

In the Dana Bank section (Fig. 3D), bottom temperatures on the bank increased from 1.2°C toward the coast to 3.5°C at the turn of the seaward slope, and Irminger Current water, 5.0 - 6.0°C , relatively unmixed in the deeper part of the section, lay on or close to the western slope.

In the section extending southward from the seaward edge of the coastal bank west of Cape Desolation (Fig. 4), the effect of the East Greenland Current was evident in temperatures of 0.5 to 2.0°C near surface above the seaward edge of the coastal bank. Deeper and westward, over and close to the slope of the shelf, the Irminger Current or Atlantic component of the West Greenland Current had temperatures of 5.0 - 7.0°C between 100 and 800 m and temperatures as high as 3.4°C to $1,800$ m. Southward, over

and across the Labrador Sea toward the Northeast Newfoundland Shelf, the depth of the warm 5 and 6°C Atlantic component of the West Greenland Current decreased and such temperatures lay above 75 m.

Considering all the sections (Fig. 2-4), and Fig. 5 the shallowing, loss of volume, gradual cooling, and the lowering of the salinity of the deeper-water, higher-temperature portions of the West Greenland Current may be noted as usual with progress northward, especially beyond the Davis Strait Ridge into Baffin Bay.

On the more southern banks - Dana, Fiskenaes and Fylla - the effects of their proximity to the East Greenland Current, the melting ice and icebergs rounding Cape Farewell and their more coastal location produced lower summer temperatures in the shallow water of these banks than are present, due to surface warming and greater mixing, over Lille Hellefiske and Store Hellefiske Banks farther north. Surface temperatures over the outer parts of the coastal banks were considerably higher. In the deep water on the slopes of the banks it was evidently one of the warmer summers.

In the northern, Baffin Bay, sections (Fig. 2A, 2B, 2C) the higher surface salinities due to the influence of the West Greenland Current can be noted to the east and the lower surface salinities towards the melting ice in the west. The gradual decrease in the salinities of the deeper water, due to mixing, can be noted from 35.0‰ typical of Irminger Current-Atlantic water in the southernmost section to 34.3-34.4‰ in the most northerly sections.

Newfoundland-Labrador Area

In the section from Seal Islands across the southern part of Hamilton Inlet Bank (Fig. 5, 6), there was a much smaller volume than usual of water with temperatures below 0°C and especially below -1.0°C. Temperatures from surface to bottom down to almost 300 m in Hawke Channel and to 200 m over Hamilton Inlet Bank, especially the shoreward edge, were higher than in 1964 and above the average for recent years.

Salinities of the bottom water and for some distance above bottom over the shallower parts of Hamilton Inlet Bank and Hawke Channel were higher than in 1964 and 1963.

In the Bonavista section (Fig. 5, 7), temperatures from surface to bottom over the Northeast Newfoundland Shelf were higher than in 1964 - the surface temperatures being considerably higher. The deeper water to 1,000 m had slightly higher temperatures. On the northern slope of the Grand Bank, also included in this section, surface temperatures were higher and deeper water temperatures on and above the slope not greatly different from those of 1964. The deep slope water of the Northeast Newfoundland Shelf returned to the higher salinity (34.8-34.9‰) condition as in 1963 and did not show the 34.3-34.5‰ salinities present in 1964.

In the St. John's to Flemish Cap section (Fig. 5, 8), the surface water from the coast to the eastern Grand Bank, the coastal deep-water bottom temperatures, the deep water below 250 m on the eastern slope of the Grand Bank, and the water covering the top of Flemish Cap had higher temperatures than in 1964. Otherwise there was little change except that the eastern cold branch of the Labrador Current showed no temperatures lower than -0.8°C in 1965 and some water below -1.0°C was present in 1964. Salinities at the surface were lower shoreward and generally higher seaward above the eastern slope of the Grand Bank than in 1964. Also, above the eastern slope of the Grand Bank the lower salinities, like the temperatures of 3°C and lower, were restricted toward the bank rather than lying above the western part of Flemish Channel as in 1964. Thus, in this section the volume of this colder, lower salinity shoreward portion of the Labrador Current was less than in 1964.

In the section from St. John's to the southeastern slope of the Grand Bank (Fig. 5, 9), temperatures in the deeper water of the Avalon Channel, on the western slope of the Grand Bank, and also on the southeastern slope of the Grand Bank were higher but bottom temperatures on the Southeast Shoal were lower than in 1964. Salinities were generally similar to those of 1964.

In the section at about 75 m, extending along the southwestern edge of the Grand Bank (Fig. 5, 10), surface and eastern slope temperatures were higher than in 1964 but there was little difference in bottom temperatures over the surface of the bank in the two years. Salinities over the surface of the Grand Bank were slightly lower than those of 1964 and slightly higher than those of 1963.

In the section at 275 m, along the southwestern slope of the Grand Bank (Fig. 5, 11), surface temperatures were higher, and temperatures from the upper layers to the bottom in the water of the eastern part of the section, which is derived in large part from the eastern branch of the Labrador Current, were also higher than in 1964. In the western part of the section lowest temperatures were 0.3°C compared with -1.2°C in 1964. Salinities were generally similar to those of 1964 but the upwelling of higher salinity water to the surface at Station 15 which occurred in 1964 was not present in 1965. The intrusion below 150 m, at Station 13, of water with slightly higher temperatures ^{was} evident also in the presence of a very slightly higher salinity at this level. Also, at the edge of the eastern slope of the Grand Bank the intrusion of water with slightly higher temperature than in 1964 near bottom at Station 19 ^{was} accompanied by a slightly higher salinity.

At Station 27 near St. John's (Fig. 12), surface temperatures in July-September were slightly higher than in 1964 and for a longer period. Otherwise the temperature picture was very much like that of 1964. In January-February 1966, temperatures throughout most of the water column were higher than usual. Since this station is coastal and the depth is only 176 m, salinities are low, ranging in 1965 between 31.5 and 32.5‰ at the surface and 32.9 and 33.5‰ at the bottom. Lowest salinities in the surface layers were from June to November and at the bottom in late January to early February.

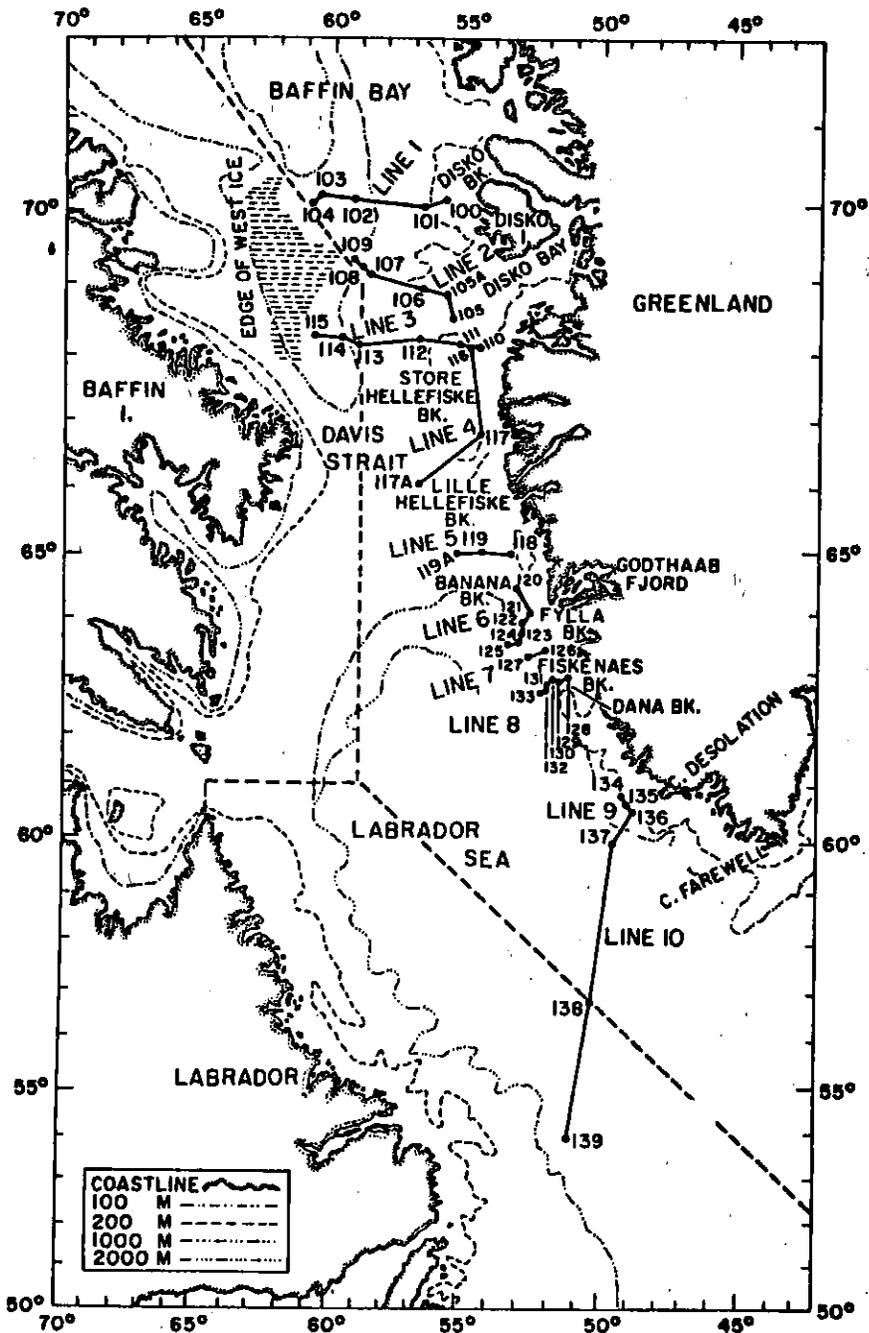


Fig. 1. Locations of the A.T. Cameron's fishing stations at which hydrographic observations of Fig. 2-5 were taken in Baffin Bay, along the West Greenland coast and in the Labrador Sea, July-August 1965.

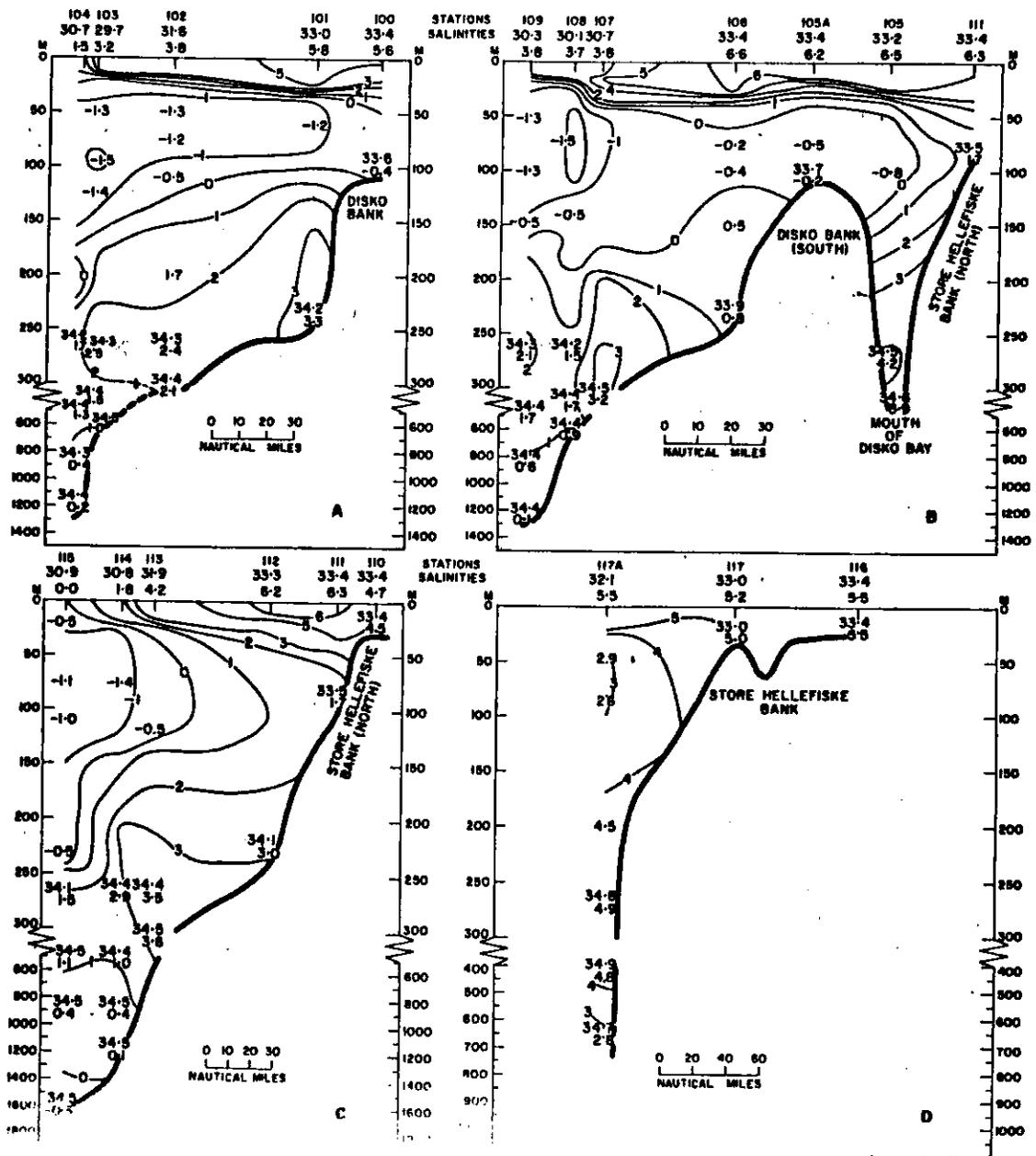


Fig. 2. Temperature sections, °C, 1965 (with individual salinities, ‰, inserted), A, from Disko Bank westward (Fig. 1, Line 1, 28-29 July); B, from northern end of Store Hellefiske Bank and mouth of Disko Bay westward over the southern part of Disko Bank (Fig. 1, Line 2, 30 July-2 August); C, from northern peak of Store Hellefiske Bank westward (Fig. 1, Line 3, 2-4 August); D, from northern peak of Store Hellefiske Bank southward over the eastern side of the bank and southwestward over the Davis Strait Ridge (Fig. 1, Line 4, 5-7 August).

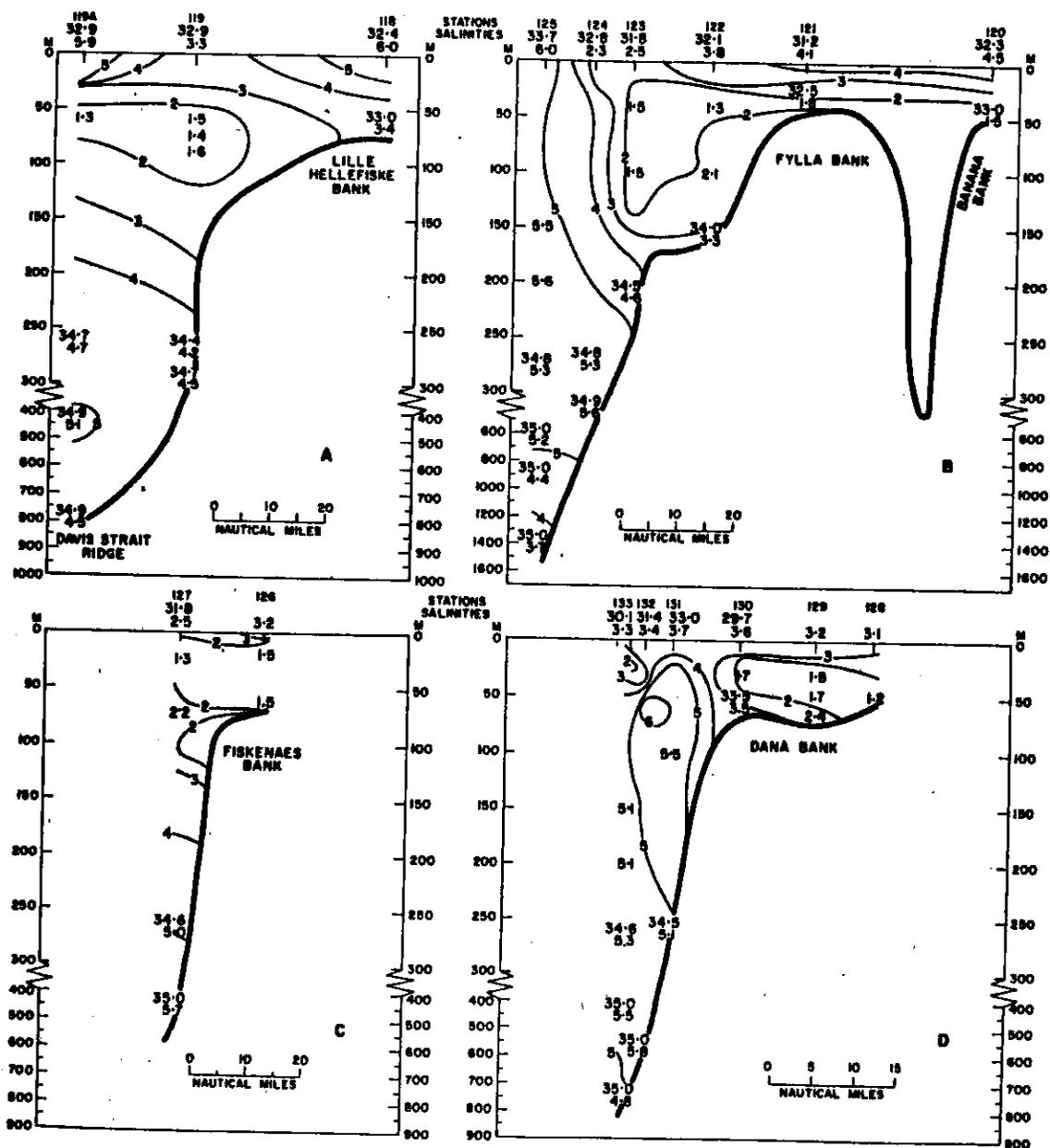


Fig. 3. Temperature sections, °C, 1965 (with individual salinities, ‰, inserted), A, from Lille Hellefiske Bank westward (Fig. 1, Line 5, 8-9 August); B, from Banana Bank southward to Fylla Bank and from Fylla Bank southward and westward (Fig. 1, Line 6, 9-14 August); C, from Fiskenaes Bank westward (Fig. 1, Line 7, 15-16 August); D, from Dana Bank westward and southward (Fig. 1, Line 8, 17-19 August).

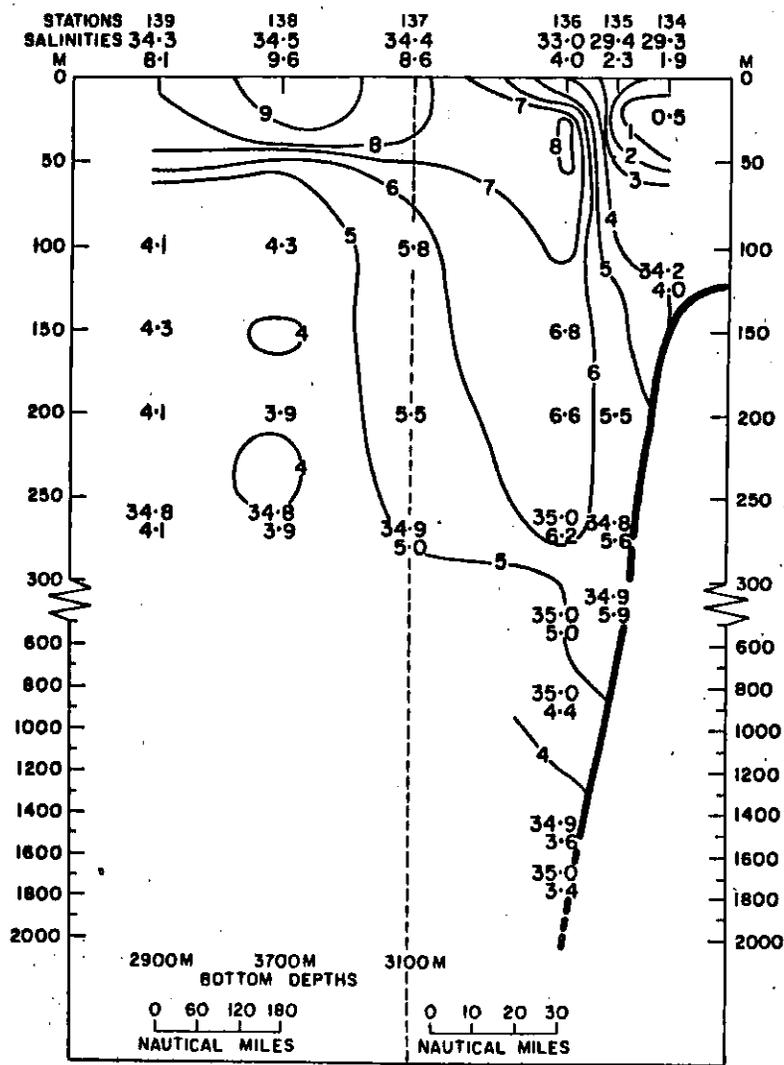


Fig. 4. Temperature section, °C, (with individual salinities, ‰, inserted), from the West Greenland Shelf off Cape Desolation southward across the Labrador Sea toward the Northeast Newfoundland Shelf (Fig. 1, Lines 9 and 10, 20-24 August 1965).

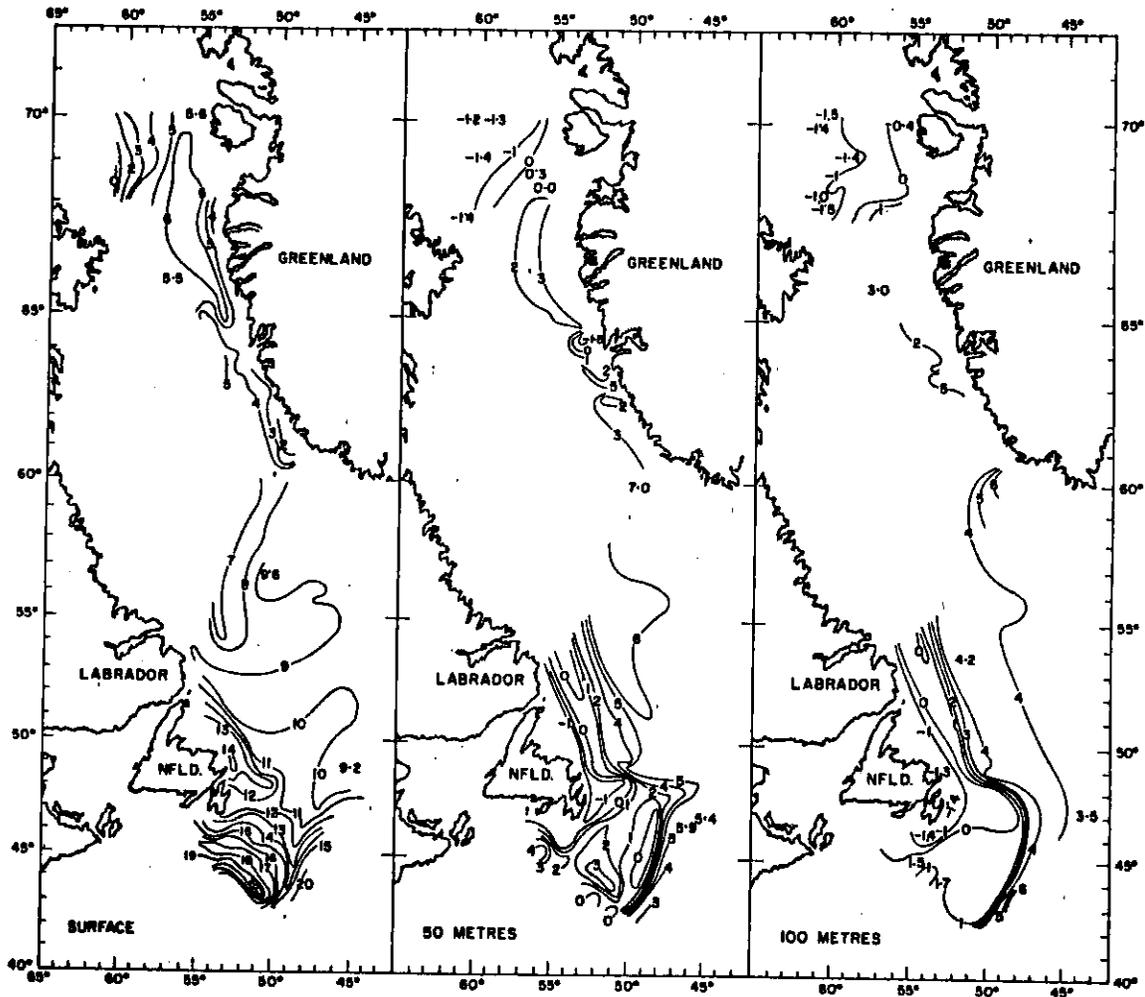


Fig. 5. Temperatures, °C, at surface, 50 m, and 100 m in the West Greenland and Newfoundland areas July-August, 1965. (West Greenland, Baffin Bay and Labrador Sea, 28 July-24 August; St. John's-Flemish Cap northward to off southern Labrador, 23 July-3 August. South of St. John's-Flemish Cap, 17-23 August).

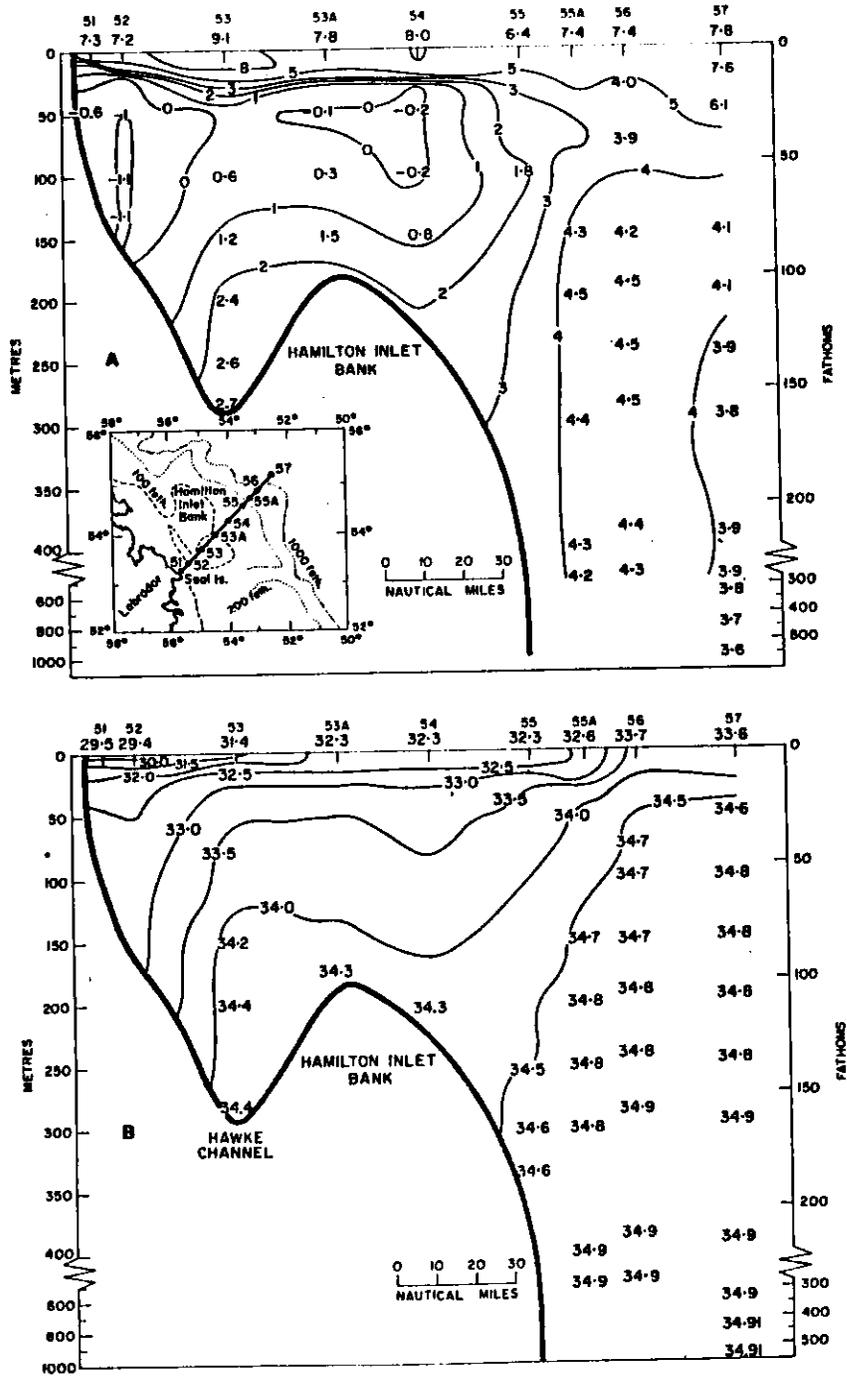


Fig. 6. A, temperature, °C, and B, salinity, ‰, sections, off Seal Islands across Hamilton Inlet Bank, 2-3 August 1965.

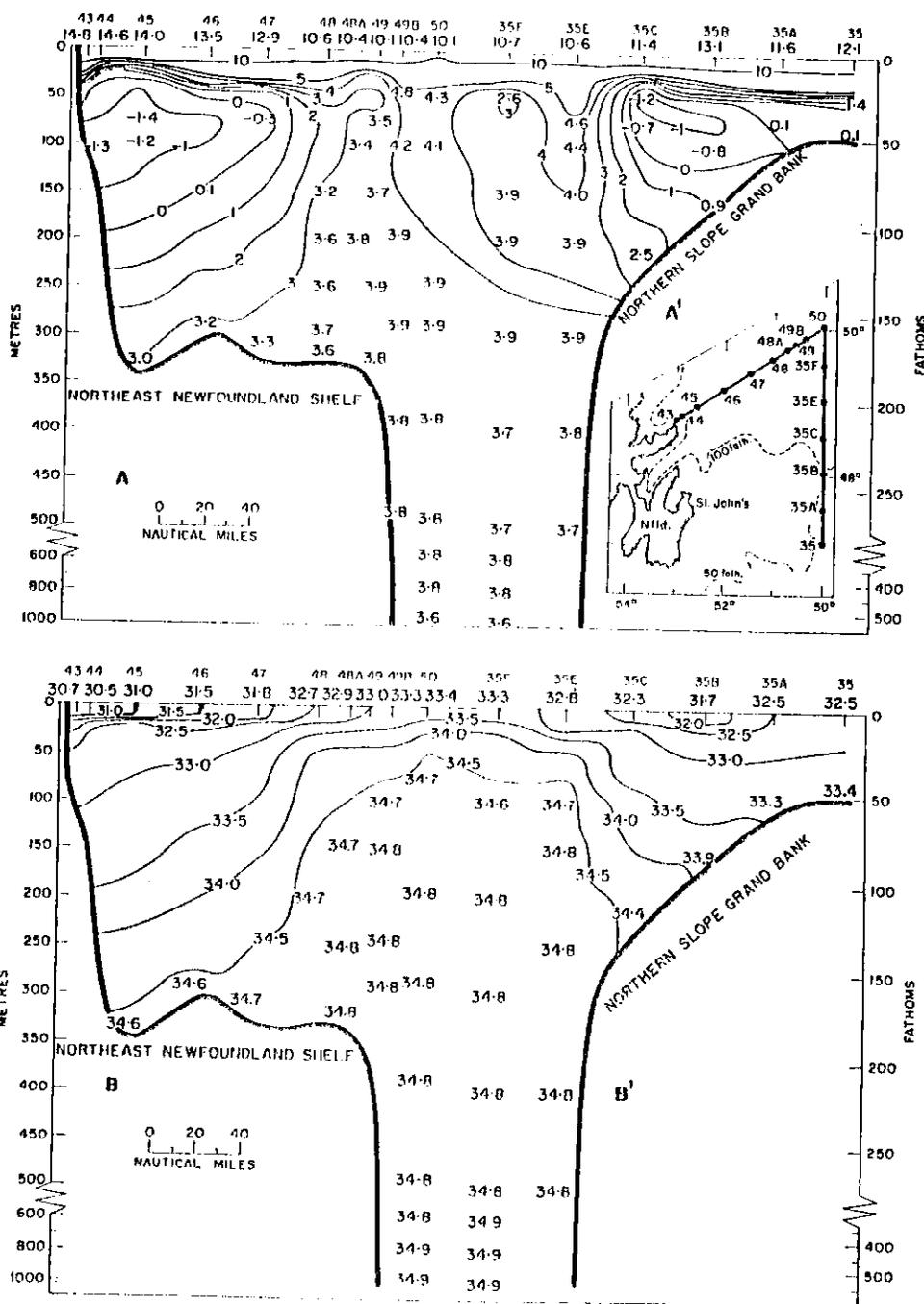


Fig. 7. A, A¹, temperature, °C, and B, B¹, salinity, ‰, sections, over the Northeast Newfoundland Shelf off Cape Bonavista and southward to northern Grand Bank, A, B, 31 July-1 August 1965 and A¹, B¹, 30-31 July 1965.

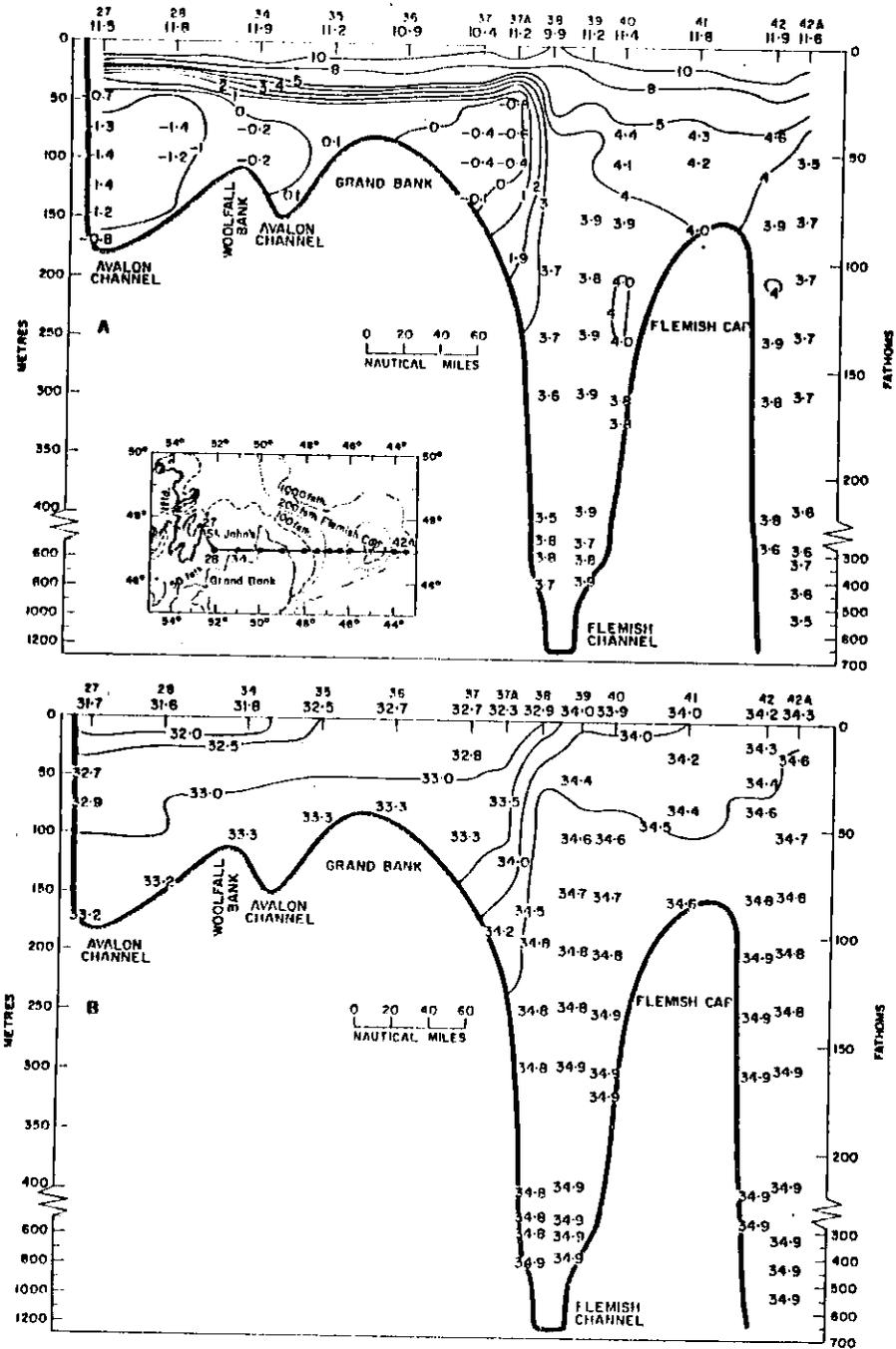


Fig. 8. A, temperature, °C, and B, salinity, ‰, sections, St. John's-Grand Bank-Flemish Cap, 23-25 July 1965.

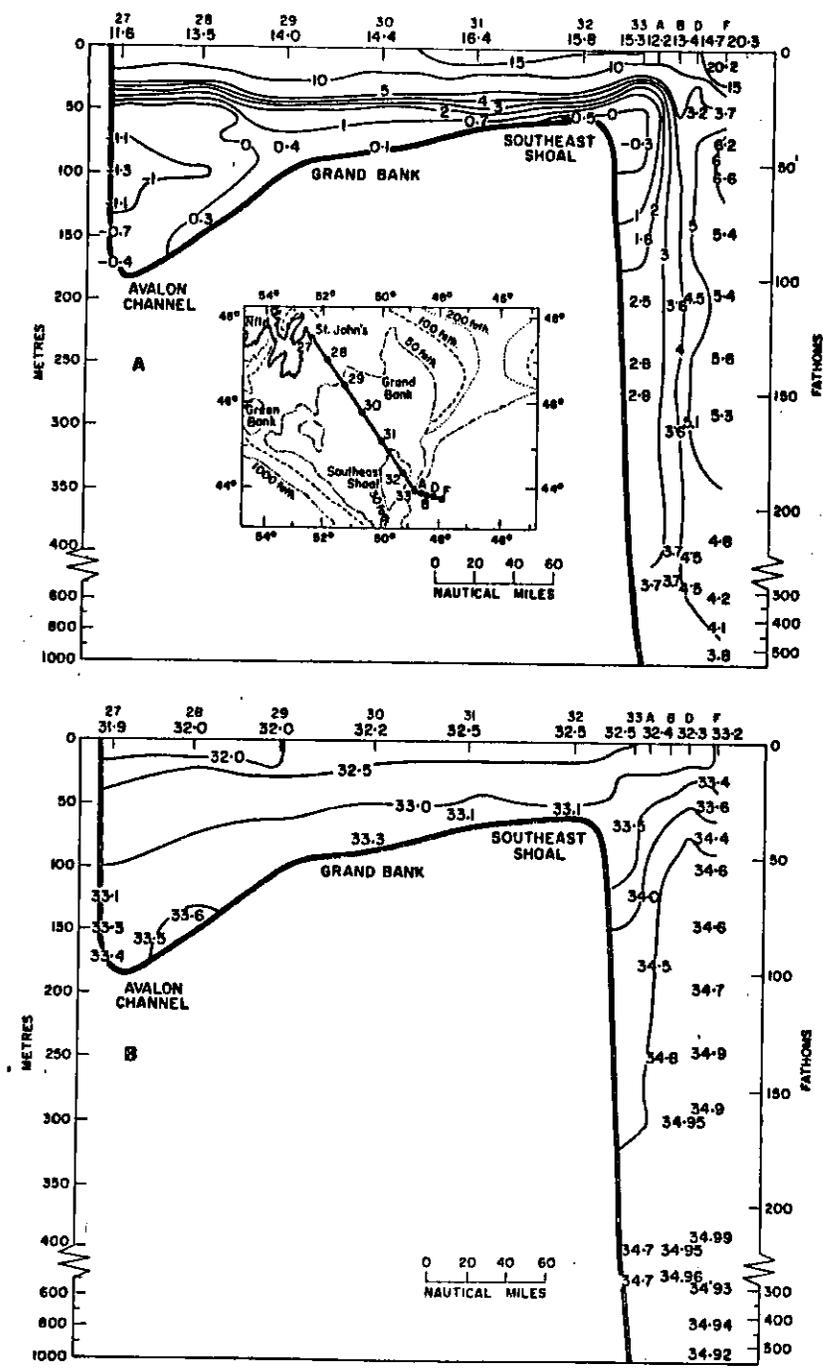


Fig. 9. A, temperature, °C, and B, salinity, ‰, sections, St. John's-SE slope Grand Bank, 17-19 August 1965.

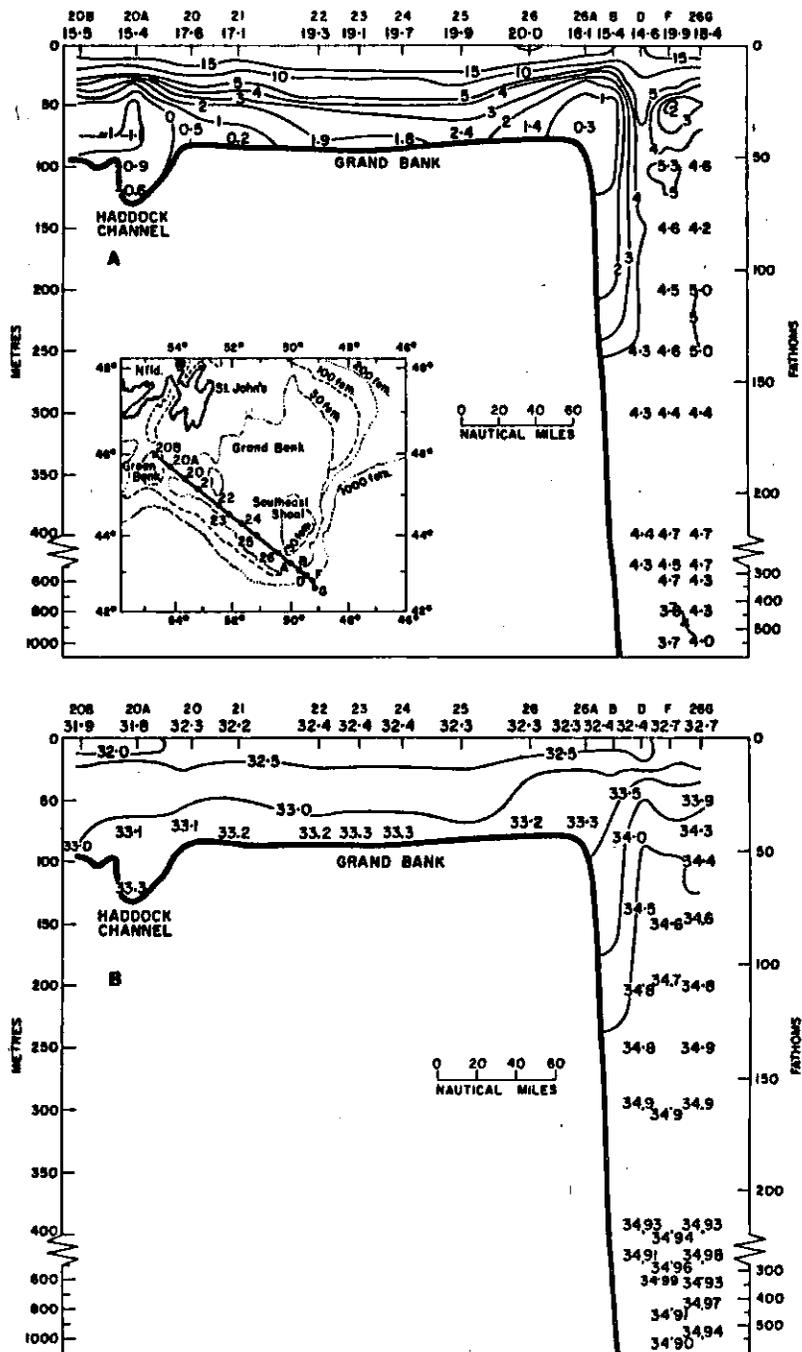


Fig. 10. A, temperature, °C, and B, salinity, ‰, sections, Green Bank-SE. Grand Bank, 20-23 August 1965.

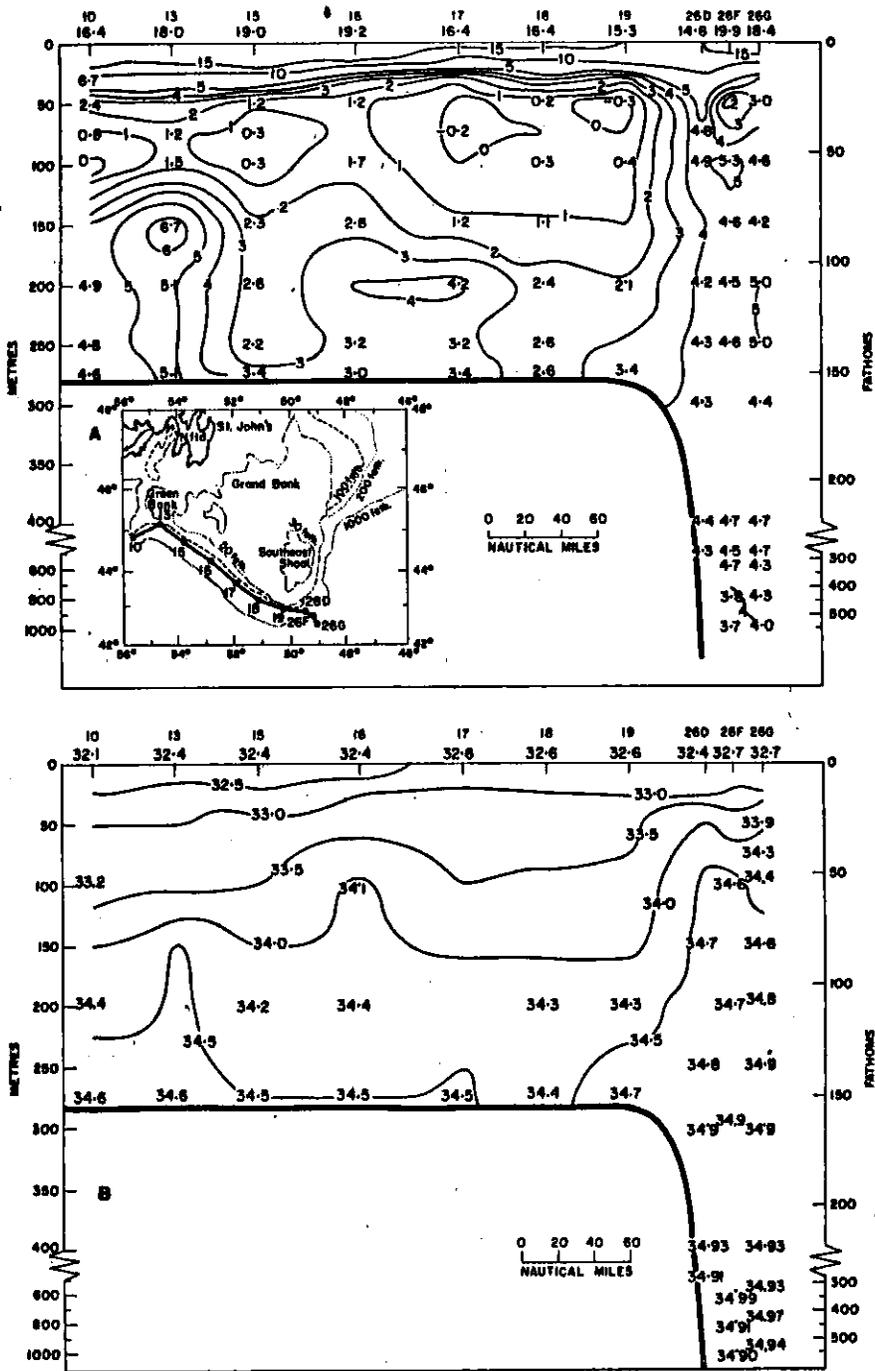


Fig. 11. A, temperature, °C, and B, salinity, ‰, sections, along the SW slope of the Grand Bank, 20-22 August 1965.

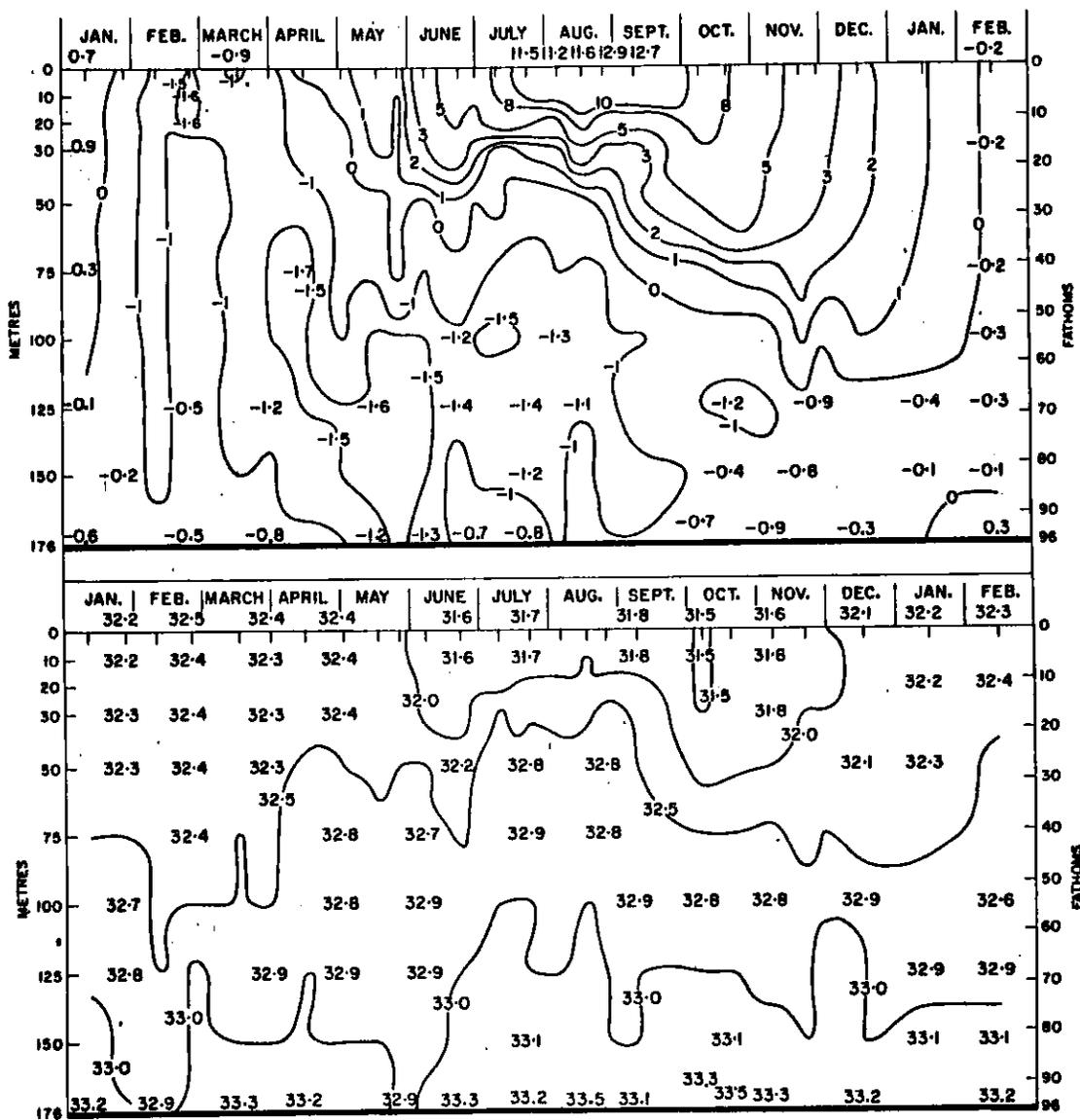


Fig. 12. Above, temperature, °C, and below, salinity, ‰, January 1965 to February 1966, from surface to bottom at Station 27 (see Fig. ⁸~~8~~⁹ inset), 2 nautical miles off Cape Spear near St. John's.