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Hydrographic conditions off West Greenland during November 1976

by

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Introduction

Between November 17th, 1976 and November 29th, 1976 fishery oceanographic investigations were carried out from board R.V. "Walther Herwig" in ICNAF Division 1D, 1E and 1F. The measurements consist of Nansen casts and BT - records. During this cruise four standard oceanographic sections off West Greenland were completed (Fig.1). All surface measurements were used to plot the temperature - and salinity- distribution at the sea surface (Fig.2,3). Figs. 4 and 5 show the distribution of both parameters at the sea floor. The results of the investigations along the standard oceanographic sections are given in Figs.6 to 9.

To compare the 1976 findings with the mean situation all German serial data available for the Fyllas Bank section during fall were used to calculate mean values of temperature and salinity. Our own measurements cover the period from 1963 to 1976 with a major gap in the early seventieth. The mean temperature and salinity of distinct water layers along the section are given in Table 2 to 4.

Horizontal distribution of temperature and salinity

Similar to our results during August 1975 (STEIN, 1976) the distribution of both parameters at the sea surface as well as at the sea floor delineates very clearly the meandering path of the Polar Front which follows the continental margin. Off West Greenland the frontal zone broadens when going northward.

The vertical distribution of temperature and salinity

Four Standard ICNAF Oceanographic Sections were partly completed in Subarea 1:

Table 1: List of Standard Oceanographic Stations off West Greenland (carried out during November 1976).

| Section Name | Latitude | Longitude | Stat.No |
|----------------------|----------|-----------|---------|
| Cape Farewell (I) | 59°16'N | 44°51'N | 181 |
| | 59°27'N | 44°30'N | 182 |
| | 59°34'N | 44°12'W | 183 * |
| | 59°36'N | 44°06'W | 184 |
| | 59°41'N | 44°02'W | 187 * |
| Cape Desolation (II) | 60°50'N | 48°45'W | 164 |
| | 60°46'N | 48°56'W | 165 * |
| | 60°43'N | 49°11'W | 167 |
| | 60°35'N | 49°36'W | 168 * |
| Frederikshaab (III) | 61°56'N | 49°58'W | 156 |
| | 61°54'N | 50°16'W | 157 * |
| | 61°51'N | 50°35'W | 159 |
| | 61°49'N | 50°50'W | 160 * |
| | 61°47'N | 51°09'W | 161 |
| Fyllas Bank (IV) | 64°01'N | 52°19'W | 109 |
| | 63°58'N | 52°44'W | 112 |
| | 63°55'N | 53°07'W | 115 |
| | 63°53'N | 53°22'W | 117 |
| | 63°49'N | 53°55'W | 118 |
| | 63°45'N | 54°30'W | 119 |

(the asterik denotes non-standard stations)

The arctic component of the West Greenland Current exercises a vigorous influence on the stratification of the upper 200 m of the water column Figs. (6 to 9). Along all sections steep slopes of isothermes and isohalines were observed, indicating the frontal zone between the cold nearshore component and the warmer offshore component of the West Greenland Current.

Temperature and salinity changes on the Fyllas Bank

The amount of temperature and salinity changes on the Fyllas Bank is estimated at ICNAF Standard Oceanographic stations 1 to 5 (see Tab. 2-4).

Table 2: Deviations of temperature and salinity at ICNAF Standard Oceanographic stations 1, 2 and 3

| Station 1 : 64°01'N, 52°19'W | | | | | | | | | | |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|------------|-----------------|-----------------|
| a) T °C | | | | | | | | | | |
| Depth range | 1963 | 1964 | 1965 | 1966 | 1967 | 1969 | 1972 | 1976 | Mean value | ΔT_{76} |
| 0-50 | 0.18 | 2.60 | 1.01 | 2.69 | - | 0.27 | 0.30 | 1.34 | 1.20 | +0.13 |
| b) Salinity | | | | | | | | | | |
| Depth range | 1963 | 1964 | 1965 | 1966 | 1967 | 1969 | 1972 | 1976 | Mean value | ΔS_{76} |
| 0-50 | 33.12 | 32.84 | 32.06 | 31.30 | - | 31.45 | 32.52 | 33.44 | 32.39 | +1.05 |
| Station 2 : 63°58'N, 52°44'W | | | | | | | | | | |
| a) T °C | | | | | | | | | | |
| Depth range | 1963 | 1964 | 1965 | 1966 | 1967 | 1969 | 1972 | 1976 | Mean value | ΔT_{76} |
| 0-50 | 0.11 | 2.62 | 1.41 | 2.56 | 1.01 | 0.05 | -0.48 | - | 1.04 | - |
| b) Salinity | | | | | | | | | | |
| Depth range | 1963 | 1964 | 1965 | 1966 | 1967 | 1969 | 1972 | 1976 | Mean value | ΔS_{76} |
| 0-50 | 33.15 | 33.19 | 32.27 | 31.53 | 32.77 | 30.75 | 32.48 | - | 32.31 | - |
| Station 3 : 63°55'N, 53°07'N | | | | | | | | | | |
| a) T °C | | | | | | | | | | |
| Depth range | 1963 | 1964 | 1965 | 1966 | 1969 | 1972 | 1976 | Mean value | ΔT_{76} | |
| 0-50 | 0.62 | 2.83 | 1.08 | 2.46 | 0.23 | 0.52 | 1.76 | 1.36 | +0.40 | |
| b) Salinity | | | | | | | | | | |
| Depth range | 1963 | 1964 | 1965 | 1966 | 1969 | 1972 | 1976 | Mean value | ΔS_{76} | |
| 0-50 | 33.22 | 33.27 | 32.13 | 32.23 | 31.55 | 32.99 | 33.68 | 32.72 | +0.96 | |

Table 3: Deviations of temperature and salinity at ICNAF Standard Oceanographic station 4

| Station 4 : 63°53'N, 53°22'W | | | | | | | | | | |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------------|-----------------|--|
| a) T °C | | | | | | | | | | |
| Depth range | 1963 | 1964 | 1965 | 1966 | 1967 | 1969 | 1976 | Mean values | ΔT_{76} | |
| 0-50 | 0.62 | 4.08 | 1.25 | 3.28 | 2.09 | 1.02 | 2.45 | 2.11 | +0.34 | |
| 50-100 | 1.00 | 5.32 | 2.48 | 4.15 | 3.15 | 2.34 | 3.17 | 3.09 | +0.08 | |
| 100-200 | 2.15 | 5.92 | 4.00 | 5.15 | 4.33 | 4.27 | 4.18 | 4.29 | -0.11 | |
| 200-300 | 3.54 | - | 5.64 | 5.70 | 5.16 | 5.76 | 5.21 | 5.17 | +0.04 | |
| 300-400 | 4.36 | - | - | 5.85 | - | 5.61 | 5.27 | 5.27 | 0 | |
| 400-500 | 5.15 | - | - | 5.95 | - | 5.51 | - | 5.54 | - | |
| 0-500 | 3.20 | - | - | 5.26 | - | 4.54 | - | 4.33 | - | |
| b) Salinity | | | | | | | | | | |
| Depth range | 1963 | 1964 | 1965 | 1966 | 1967 | 1969 | 1976 | Mean values | ΔS_{76} | |
| 0-50 | 33.19 | 33.11 | 32.16 | 33.11 | 33.48 | 32.46 | 33.88 | 33.06 | +0.82 | |
| 50-100 | 33.26 | 34.26 | 32.74 | 33.78 | 34.01 | 33.28 | 34.01 | 33.62 | +0.39 | |
| 100-200 | 33.76 | - | 33.49 | 34.25 | 34.42 | 34.34 | 34.36 | 34.10 | +0.26 | |
| 200-300 | 34.42 | - | 34.21 | 34.54 | 34.74 | 34.90 | - | 34.56 | - | |
| 300-400 | 34.68 | - | - | 34.66 | - | 34.98 | - | 34.77 | - | |
| 400-500 | 34.86 | - | - | 34.78 | - | 35.03 | - | 34.89 | - | |
| 0-500 | 34.19 | - | - | 34.32 | - | 34.41 | - | 34.31 | - | |

Table 4: Deviations of temperature and salinity at ICNAF Standard Oceanographic station 5

| Station 5 : 63°48'N, 53°56'W | | | | | |
|------------------------------|-------|-------|-------|-------------|-----------------|
| a) T °C | | | | | |
| Depth range | 1964 | 1967 | 1976 | Mean values | ΔT_{76} |
| 0 - 50 | 2.89 | 2.39 | 2.67 | 2.65 | +0.02 |
| 50 -100 | 4.75 | 4.72 | 5.07 | 4.85 | +0.22 |
| 100 -200 | 6.28 | 5.44 | 5.30 | 5.67 | -0.37 |
| 200 -300 | 6.71 | 5.44 | 5.08 | 5.74 | -0.66 |
| 300 -400 | 6.21 | 5.33 | 4.63 | 5.39 | -0.76 |
| 400 -500 | 5.64 | 5.18 | 4.35 | 5.06 | -0.71 |
| 0 -500 | 5.70 | 4.95 | 4.61 | 5.09 | -0.48 |
| b) Salinity | | | | | |
| Depth range | 1964 | 1967 | 1976 | Mean values | ΔS_{76} |
| 0 - 50 | 33.68 | 33.50 | 33.78 | 33.65 | +0.13 |
| 50 -100 | 34.31 | 34.53 | 34.52 | 34.45 | +0.07 |
| 100 -200 | 34.85 | 34.97 | 34.77 | 34.86 | -0.09 |
| 200 -300 | 35.14 | 35.05 | 34.91 | 35.03 | -0.12 |
| 300 -400 | 35.08 | 35.11 | 34.93 | 35.04 | -0.11 |
| 400 -500 | 34.98 | 35.17 | 34.93 | 35.03 | -0.10 |
| 0 -500 | 34.80 | 34.85 | 34.73 | 34.79 | -0.06 |

Compared to the mean hydrographic situation the measurements of 1976 yield a warmer and saltier surface layer (0-50, 50-100) whereas the deeper layers were colder and less salty than usual. This fact indicates a rather warm arctic component during fall 1976 off West Greenland. The deep layers, however, mainly influenced by the warm component of the West Greenland Current were up to 0.76 colder than normal.

References

STEIN, M., 1976: Hydrographic conditions off West Greenland and on the East Greenland shelf during the summer of 1975.

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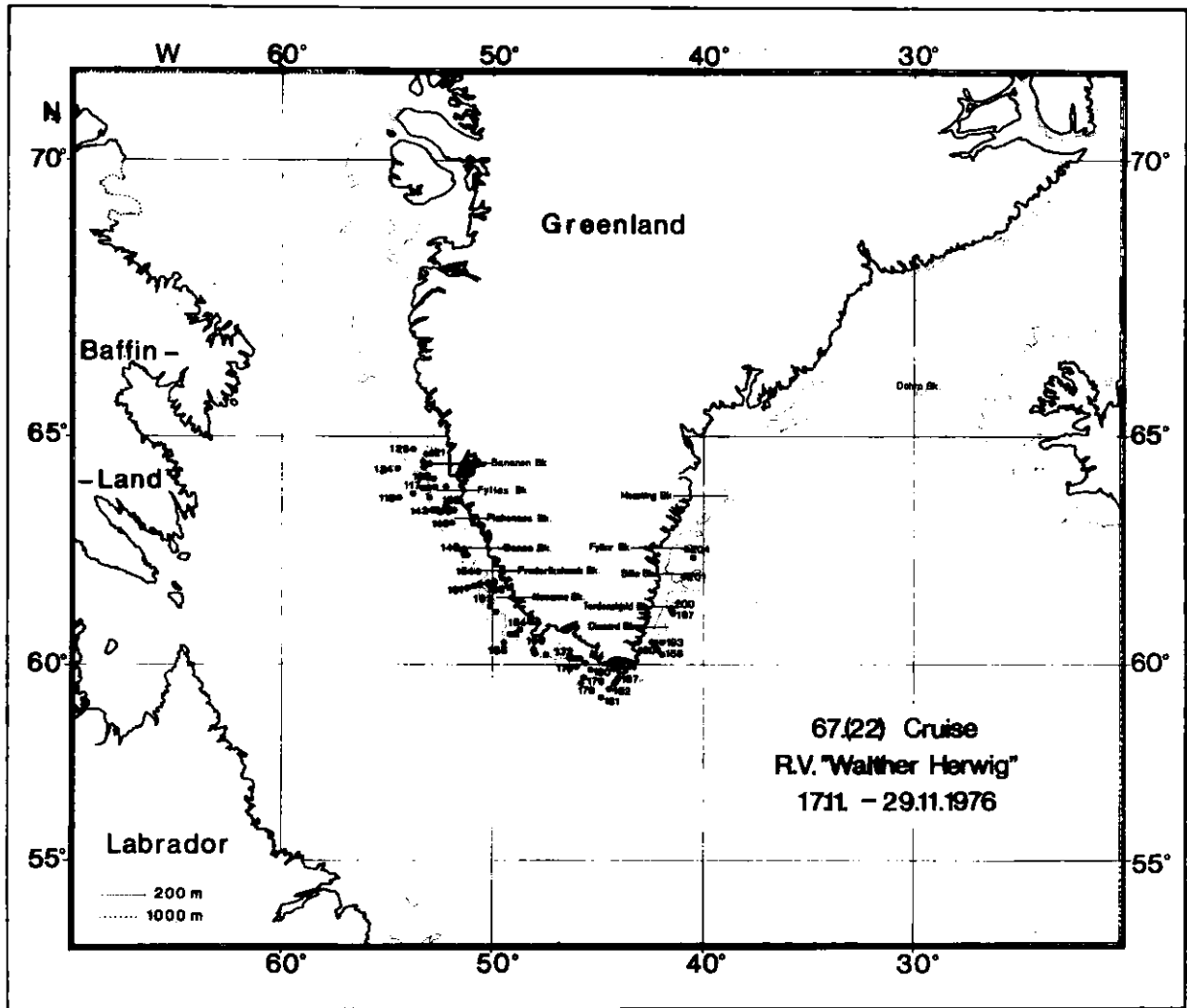


Fig. 1

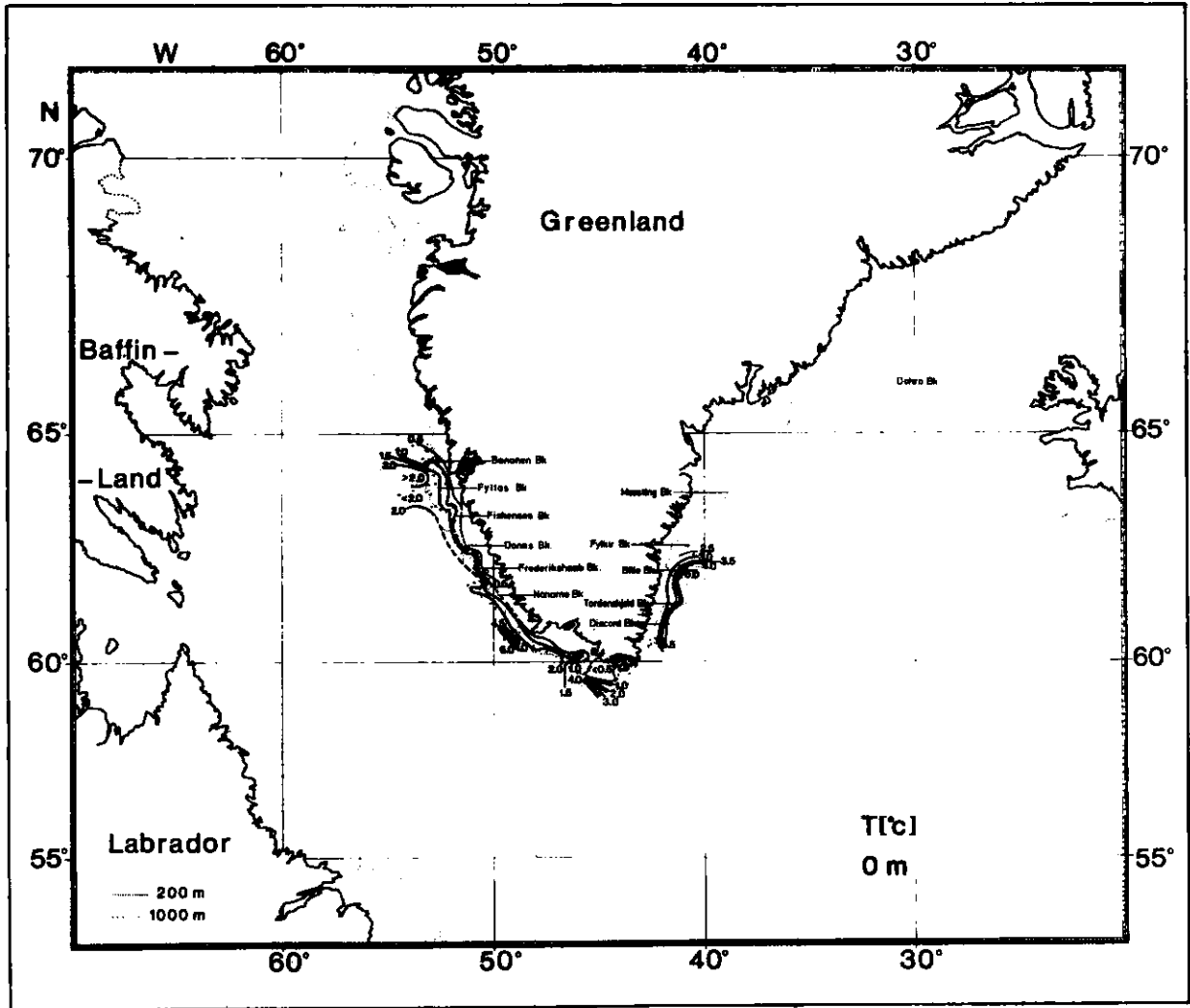


Fig. 2

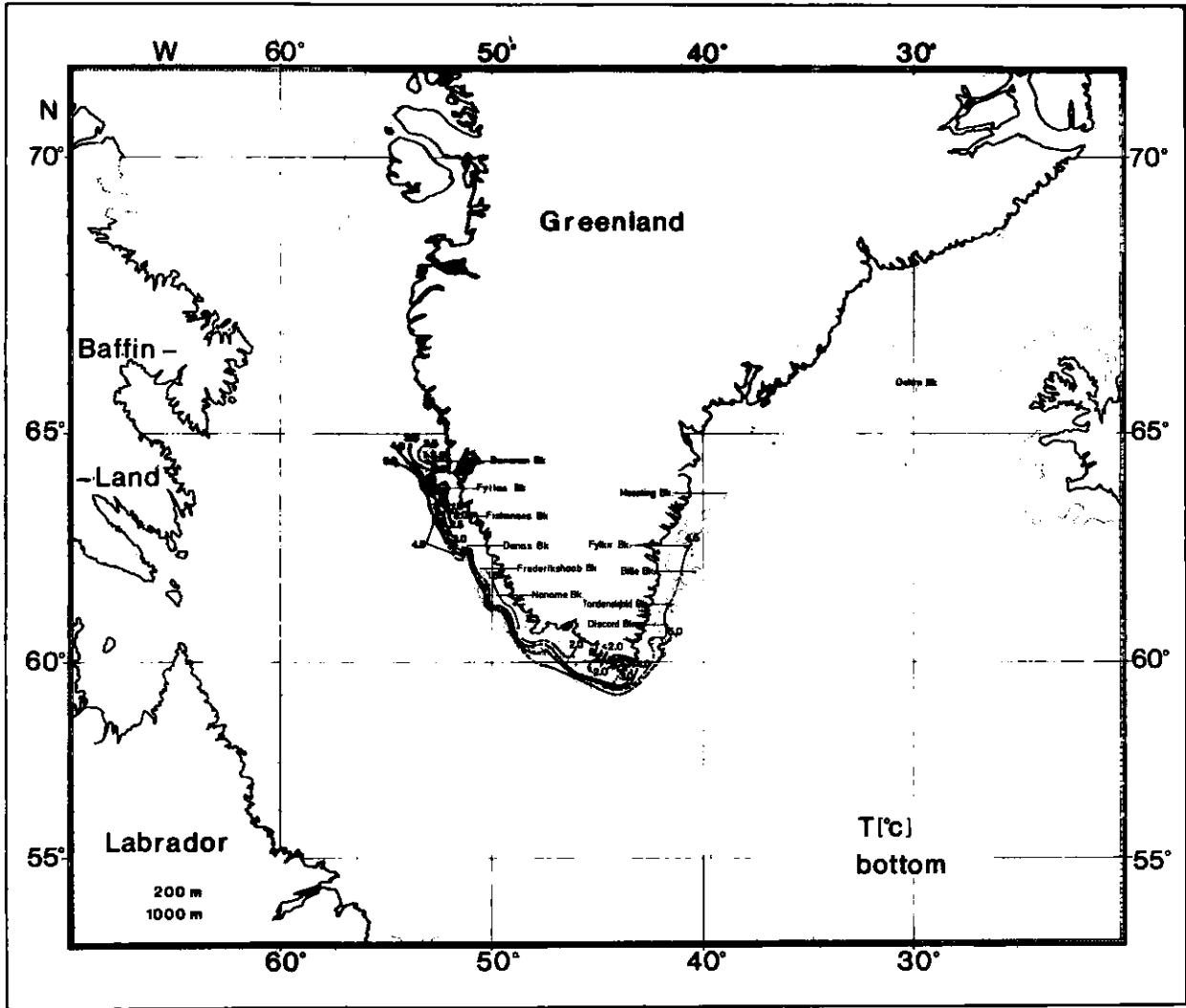


Fig. 3

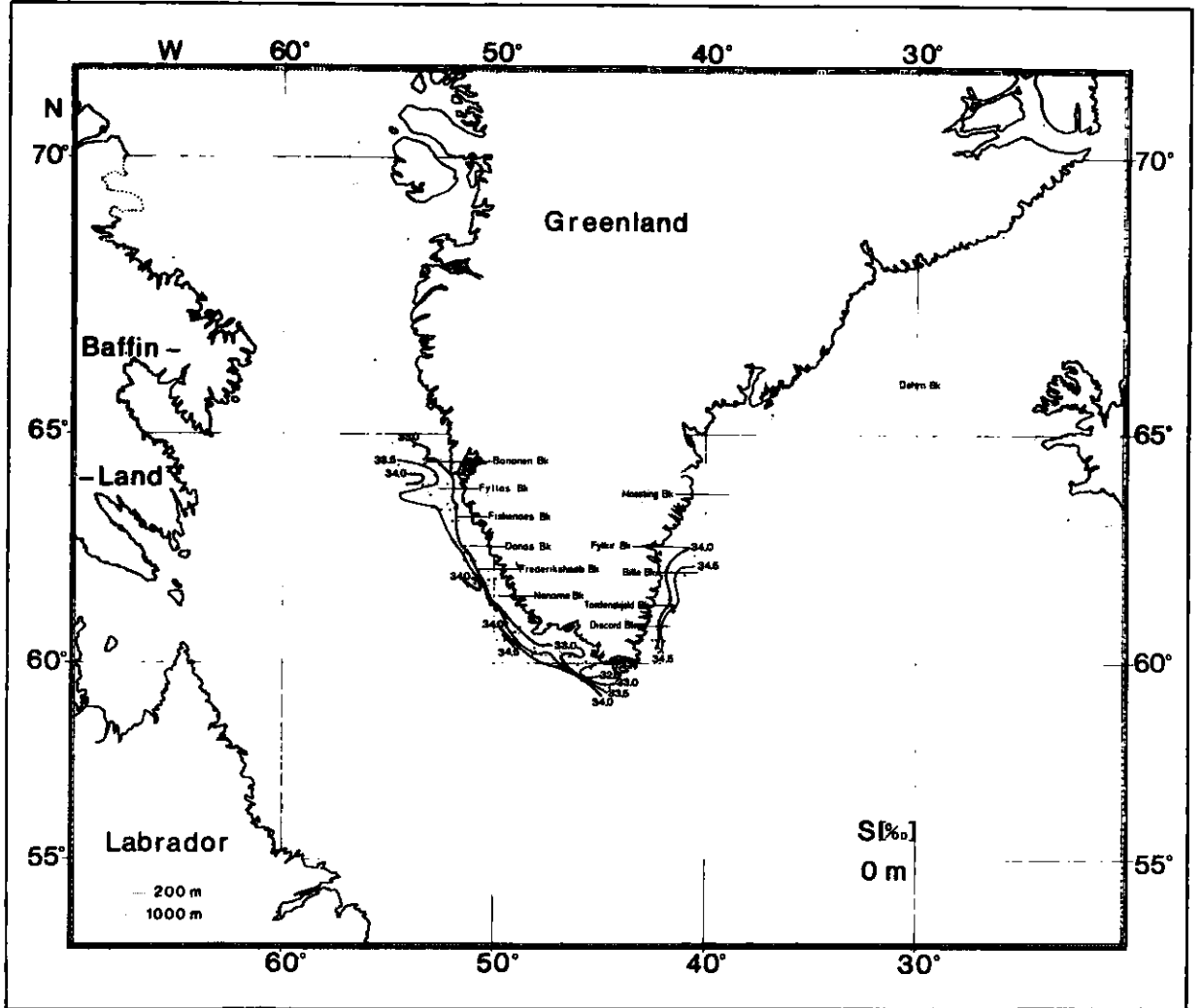


Fig. 4

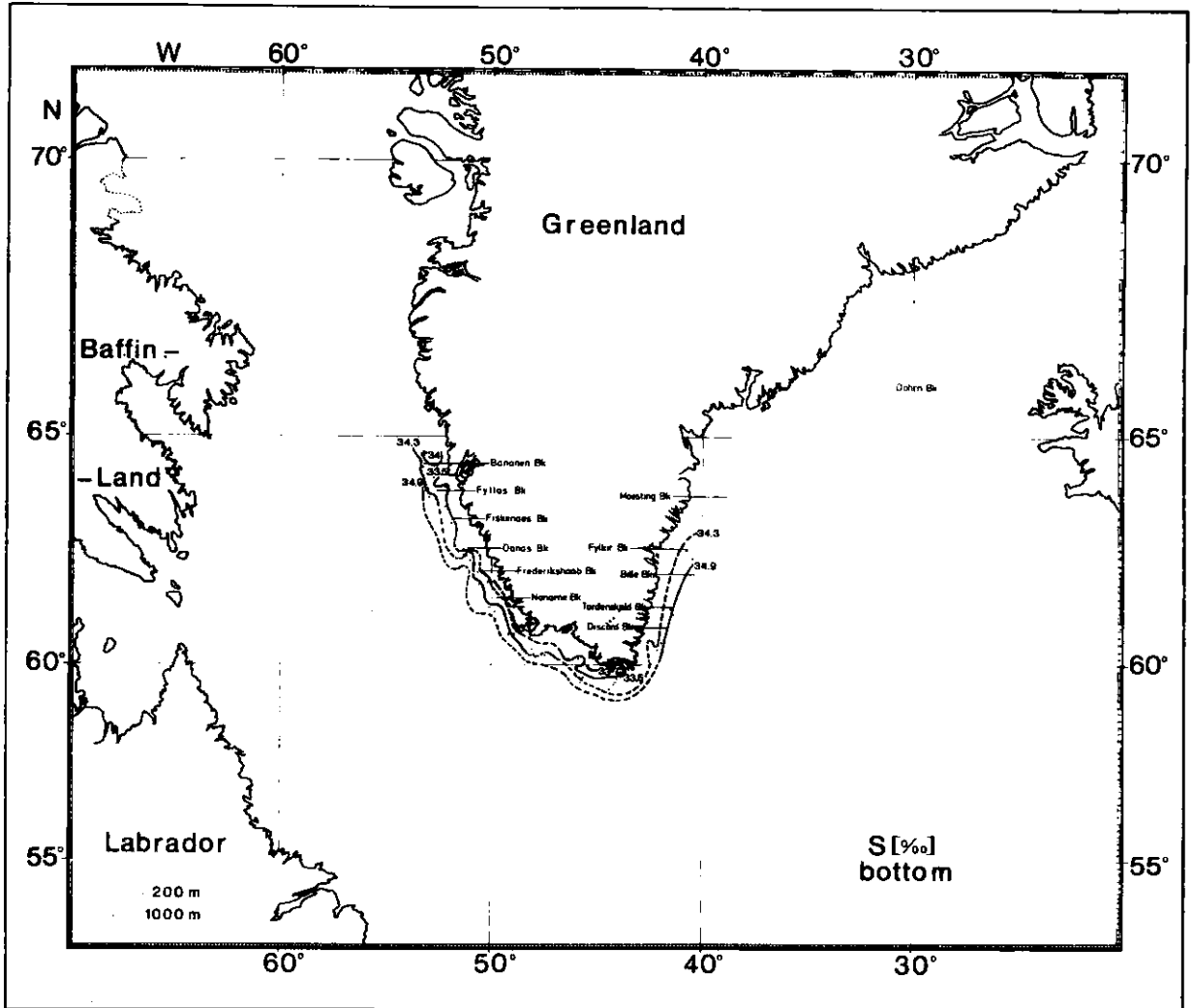


Fig. 5

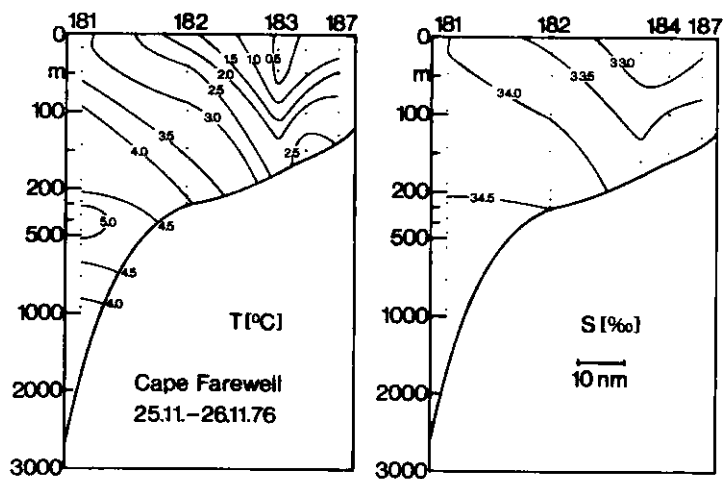


Fig. 6

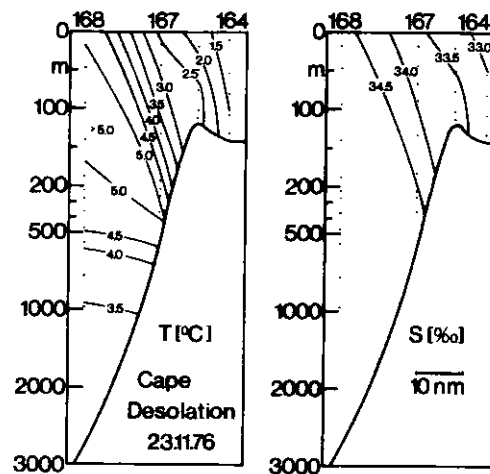


Fig. 7

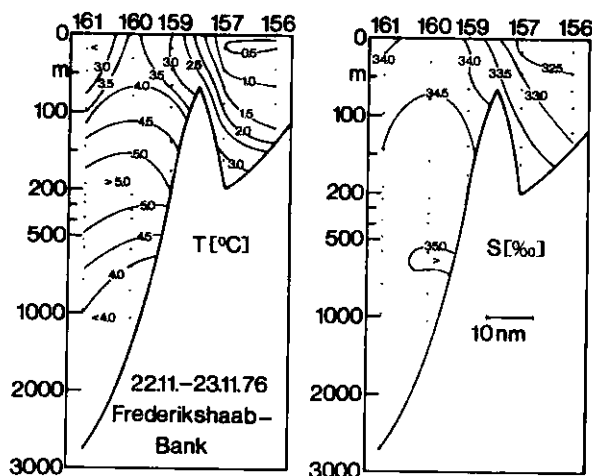


Fig. 8

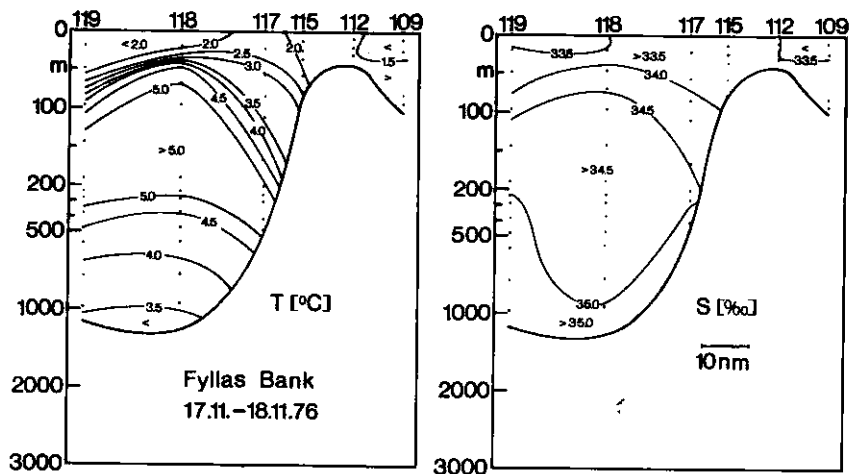


Fig. 9