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# Hydrographic Conditions in Divisions 2G, 2H and 2J in 1978 and 1979

by

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## 1. Introduction

The hydrographical situation in NAFO divisions 2G, 2H and 2J were observed while investigating ground fish stocks on board the research vessel "Ernst Haeckel" in 1978 (23rd September to 20th October) and ROS 414 "Walter Barth" in 1979 (20th November, 13th December). Oceanological data were obtained from samples taken with a Nansen bottle. Temperatures were measured with a reversing thermometer and a salinometer was used to measure salinity.

The temperature and salinity were measured at the surface and near the bottom at each of the fishery stations. In 1978 hydrographic data were obtained from 62 stations in NAFO division 2. The corresponding number in 1979 was 74.

## 2. Analysis of water masses in the Labrador Sea (NAFO division 2)

All temperature (t) and salinity (S) measurements were required for the T, S-analysis of the water masses in the whole of division 2. The results (Fig. 1 and Fig. 2) show a mixture of two water masses. This mixture obviously consists of surface water from the Labrador shelf ($t \leqq 0\ ^{o}C$, $S \leqq 33.0$ ‰) representing the Arctic component of the Labrador current and intermediate water from the Labrador Sea ($t \leqq 3.6\ ^{o}C$, $S \leqq 34.78$ ‰) which is the East Greenland component of the Labrador current (after LEE, 1968, and STEIN, 1975). The results for 1978 do not show such clear relationships in the T, S-diagram as those for 1979. Especially the surface temperature values show considerable variation. Surface water from the Labrador shelf was found to occupy a large proportion of the region investigated in 1979 (cf. Fig. 2).

## 3. Horizontal temperature and salinity distribution

Temperature and salinity measurements were used to plot the horizontal distributions of both parameters both at the surface and in the near-bottom water. The means of these parameters were also calculated for the bottom layer. Due to the fishery programme, the investigations were restricted mainly to the slope of the continental shelf.

### 3.1. Horizontal temperature and salinity distribution in NAFO division 2G

Hydrographic data were obtained in NAFO division 2 G at 16 stations in 1978 and 18 stations in 1979. The positions of the stations and hydrographical conditions are shown in Fig. 3-6.

The surface is influenced by colder and less saline water from the north-west. Temperatures were as low as -0.67 °C, and the salinity dropped to below 32 ‰. Both temperatures and salinities were higher at the bottom near the shelf slope in 1978 than in 1979. In 1978, temperatures between 3.6 and 4.2 °C were measured. The salinity was fairly uniform at about 34.7 ‰. In 1979, temperatures varied between 2.9 and 3.7 °C, and salinities between 34.2 and 34.9 ‰.

### 3.2 Horizontal temperature and salinity distribution in NAFO division 2H

Hydrographic data from NAFO divison 2H were obtained at 12 stations in 1978 and 15 stations in 1979. The positions of the stations are shown in Fig. 7-10, together with the temperatures and salinities at the surface and at the bottom.

A cold, low salinity layer was situated at the surface in the south-western part of the area. Temperatures below 0 °C and salinities $< 32.5$ ‰ were measured in this layer.

At the bottom, temperatures were between 3.5 and 4.1 °C in 1978 and increased with increasing depth. In the north-western part of the area, colder water with an even lower salinity predominated up to the edge of the shelf. Salinities in this area fluctuated between 34.5 and 34.7 ‰.

This region was influenced from the north by a colder water mass in 1979. Temperatures were between 3.0 and 3.9 °C, and the salinity fluctuated between 34.5 and 34.9 ‰.

3.3. Horizontal temperature and salinity distribution in NAFO division 2J

This division was investigated most extensively. Data were taken at 34 stations in 1978 and 41 in 1979. The positions of the stations and the corresponding hydrographical data are shown in Fig. 11-14.

Towards the shore, the surface layer consisted of colder water of low salinity. Temperatures below 0 °C and salinities $\leq$ 32.5 ‰ were observed here. Although temperatures above 4 °C were measured in the bottom layer at great depths on the shelf slope in 1978, in 1979 they were generally between 3.0 and 3.8 °C. In 1979, the salinity at great depths over a large proportion of the area was higher than that observed in 1978.

4. The mean situation

The means of the temperatures and salinities measured near the bottom were calculated for different depths. Table 1 shows the mean temperatures and Table 2 the mean salinities. In addition, n (number of observations) and s (standard deviation) calculated by the formula

$$s = \sqrt{\frac{1}{n-1} \sum_{i} (x_i - \bar{x})^2} .$$

are given.

The conclusions which are made at part 2 and 3 are confirmed by Tables 1 and 2. The mean temperatures in 1978 were up to 0.75 °C higher in 1978 than in 1979. The largest differences were observed at depths down to 500 m in division 2G. Salinities at depths down to 500 m were lower in 1979 than in 1978, but the situation was reversed at depths greater than 500 m.

Literature

LEE, A.J. 1968 — NORWESTLANT Surveys: Physical Oceanography, ICNAF Special Publication No. 7, Environmental Surveys-NORWESTLAND 1 - 3, 1963, Part I, Dartmouth, N.S., Canada, 1968

STEIN, M. — Hydrographic conditions on Hamilton Inlet Bank (Div. 2J) in the fall of 1974, ICNAF Res. Doc. 75/29

STEIN, M. — Hydrographic conditions on Hamilton Inlet Bank (Div. 2J) in the fall of 1975, ICNAF Res. Doc. 76/VI/88

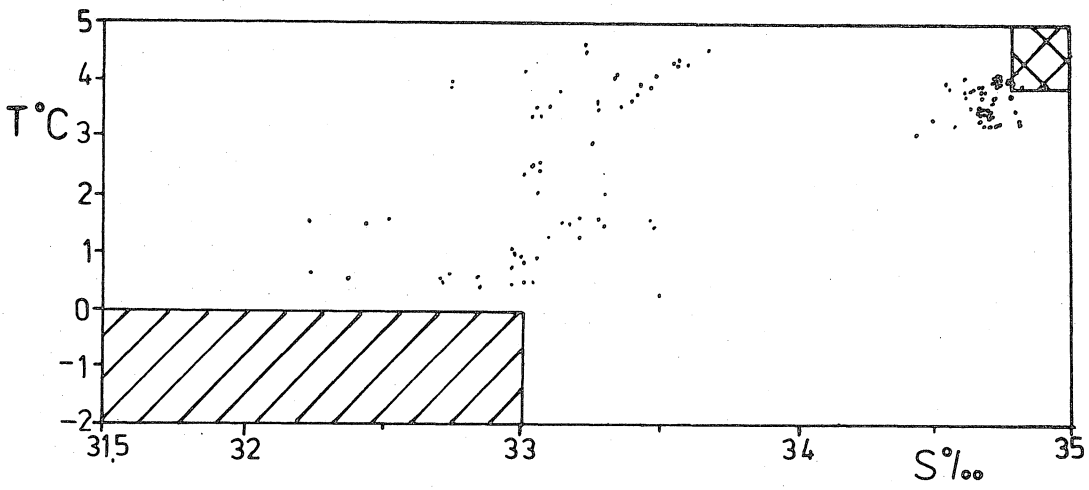
Table 1: Bottom mean temperatures (°C) at different depths

| depth (m) | | 301-400 | | | 401-500 | | | 501-750 | | | 751-1000 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Div. | Year | T | n | s | T | n | s | T | n | s | T | n | s |
| 2 G | 1978 (11.-18.10.) | 3.78 | 3 | 0.16 | 3.80 | 5 | 0.27 | 3.84 | 3 | 0.34 | 3.60 | 1 | - |
| | 1979 (20.-25.11.) | 3.11 | 1 | - | 3.05 | 3 | 0.66 | 3.73 | 2 | 0.01 | 3.65 | 1 | - |
| 2 H | 1978 (18.-20.10.) | 3.60 | 5 | 0.35 | - | | - | 3.73 | 5 | 0.32 | - | - | - |
| | 1979 (25.-28.11.) | 3.34 | 4 | 0.49 | 3.42 | 3 | 0.19 | 3.47 | 4 | 0.30 | 3.88 | 1 | - |
| 2 J | 1978 (23.-30.9.) | 3.82 | 7 | 0.31 | 3.67 | 7 | 0.37 | 3.80 | 8 | 0.43 | 3.94 | 3 | 0.08 |
| | 1979 (29.11.-13.12.) | 3.24 | 11 | 0.43 | 3.62 | 9 | 0.23 | 3.45 | 10 | 0.35 | 3.63 | 8 | 0.19 |

Table 2: Bottom mean salinity (o/oo) at different depths

| depth(m) | | 301-400 | | | 401-500 | | | 501-750 | | | 751-1000 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Div. | Year | S | n | s | S | n | s | S | n | s | S | n | s |
| 2 G | 1978 | 34.644 | 3 | 0.033 | 34.639 | 5 | 0.067 | 34.701 | 3 | 0.023 | 34.792 | 1 | - |
| | 1979 | 34.532 | 1 | - | 34.439 | 3 | 0.306 | 34.769 | 2 | 0.002 | 34.885 | 1 | - |
| 2 H | 1978 | 34.570 | 5 | 0.102 | - | - | - | 34.701 | 5 | 0.029 | - | - | - |
| | 1979 | 34.632 | 4 | 0.156 | 34.773 | 3 | 0.041 | 34.774 | 4 | 0.071 | 34.893 | 1 | - |
| 2 J | 1978 | 34.661 | 7 | 0.066 | 34.729 | 7 | 0.043 | 34.760 | 8 | 0.048 | 34.625 | 3 | 0.136 |
| | 1979 | 34.567 | 11 | 0.171 | 34.747 | 9 | 0.060 | 34.723 | 10 | 0.090 | 34.820 | 8 | 0.022 |

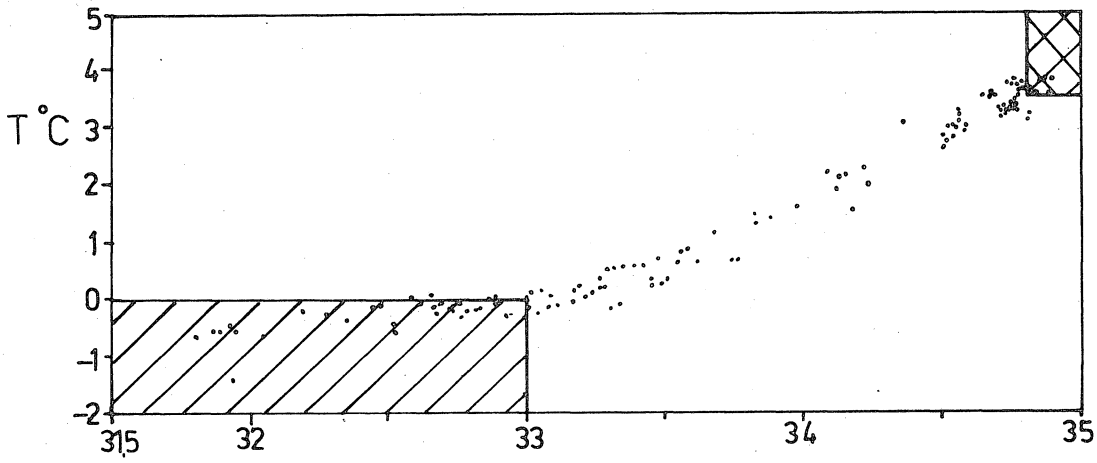
Fig.1: T,S-Analysis, NAFO-Division 2, in the fall of 1978




Labrador Shelf Surface Water (LSSW)

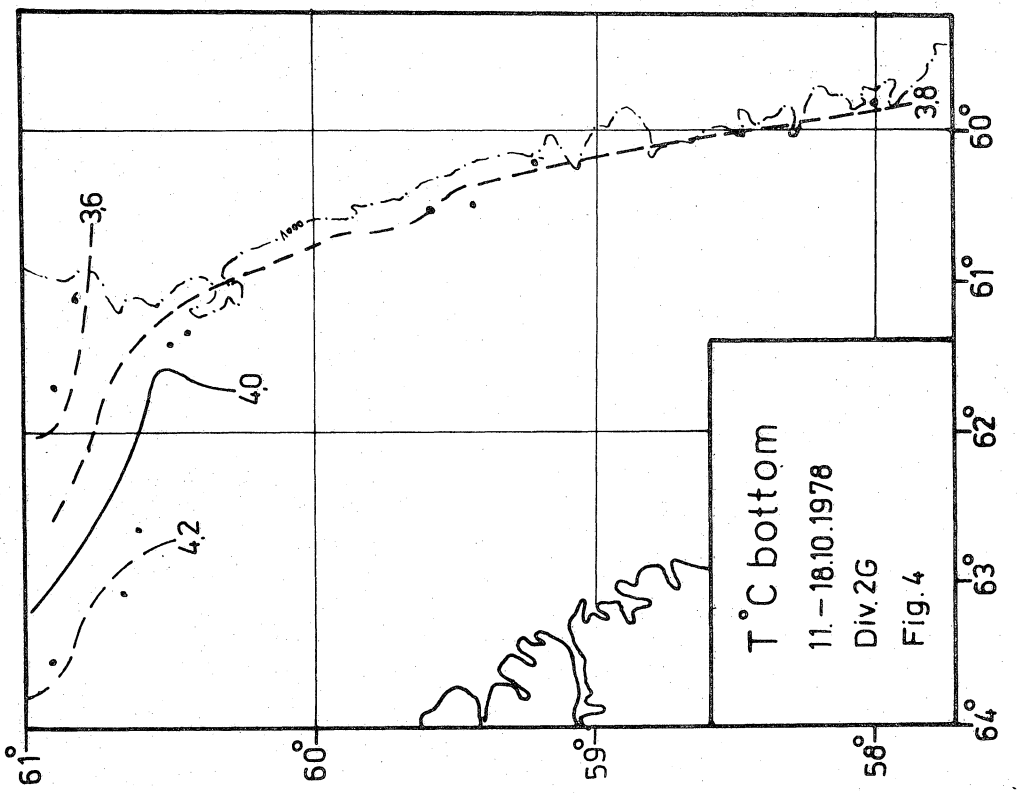
Labrador Sea Intermediate Water LSIW

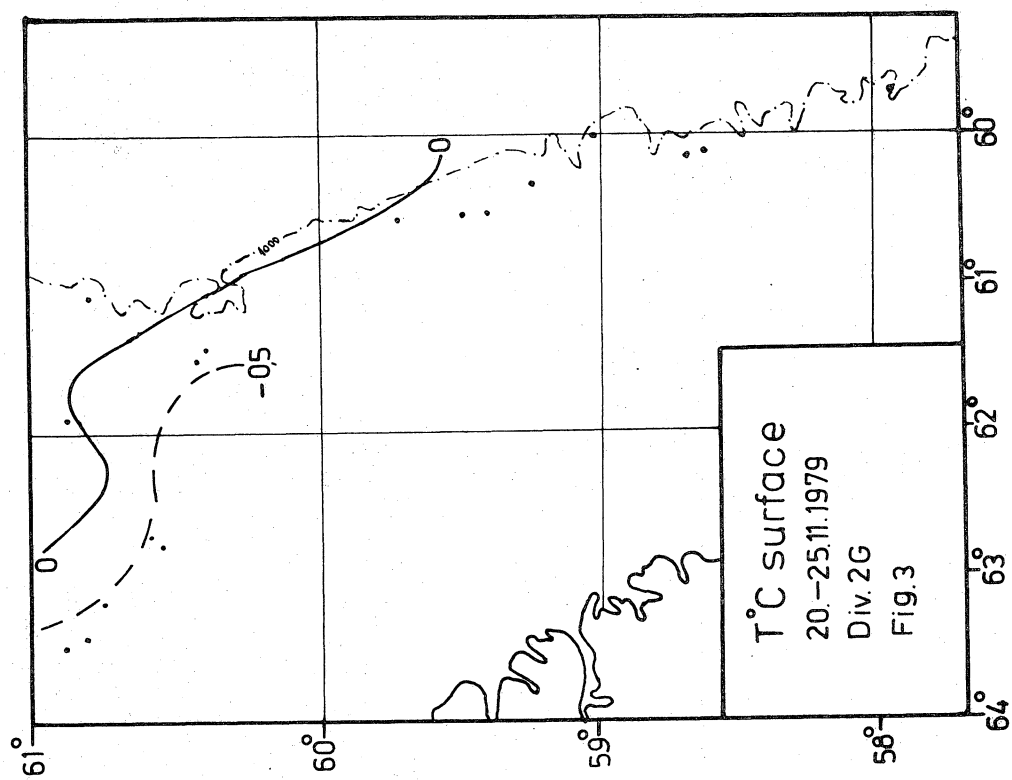
Fig.2: T,S-Analysis, NAFO-Division 2, in the fall of 1979

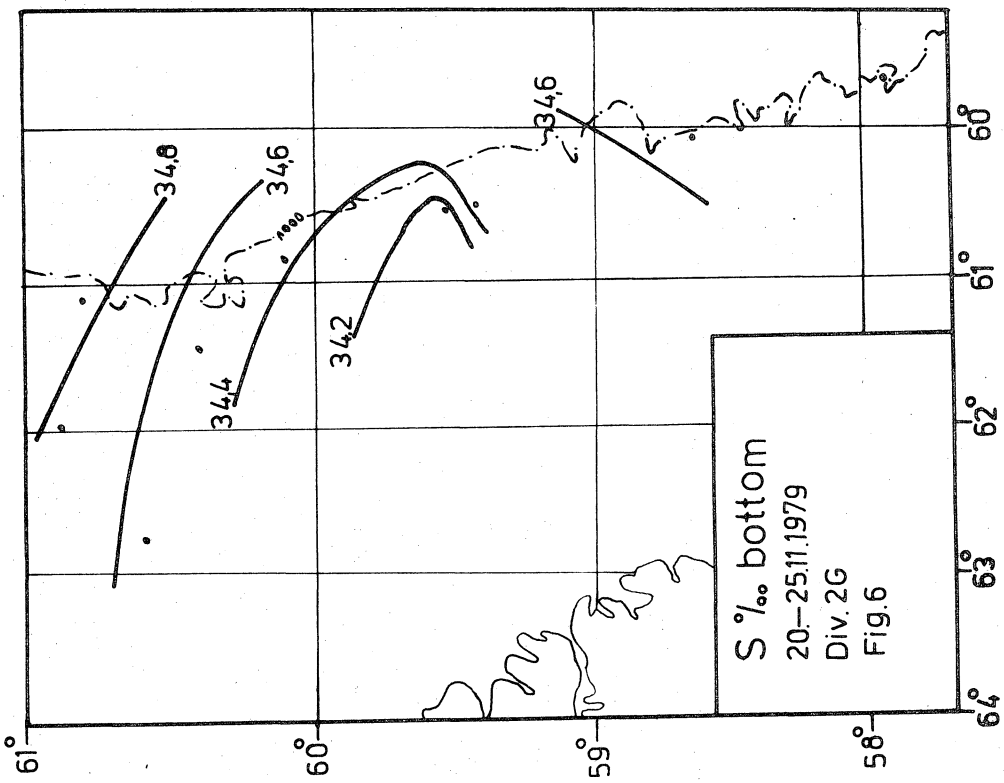


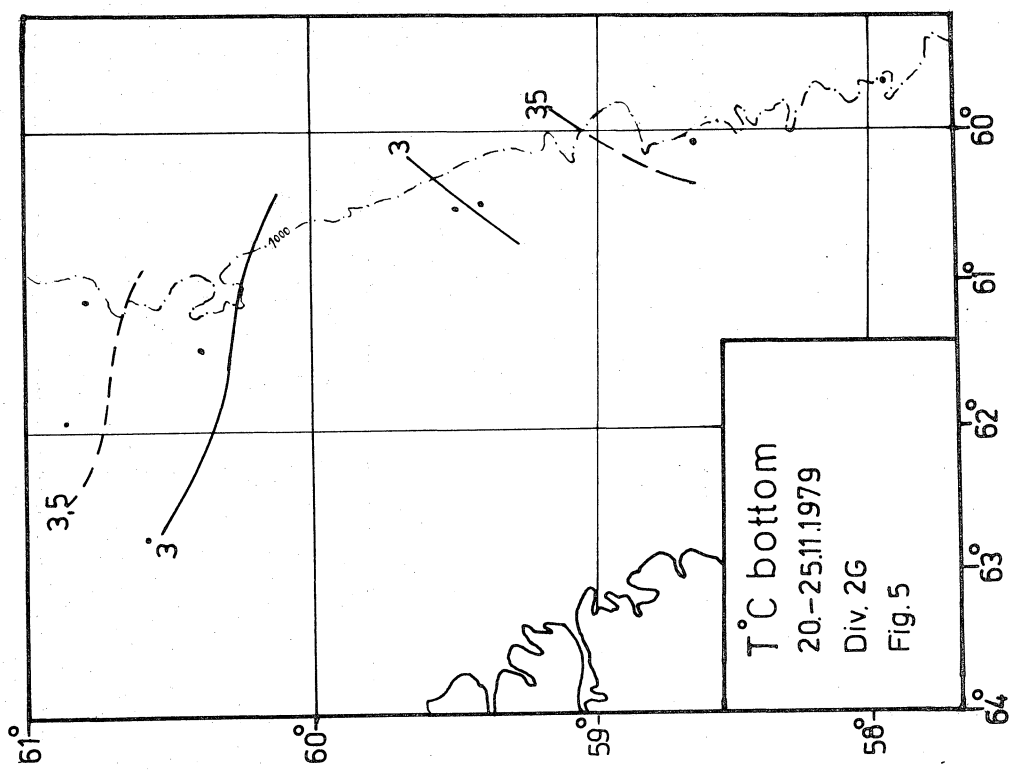

Labrador Shelf Surface Water (LSSW)

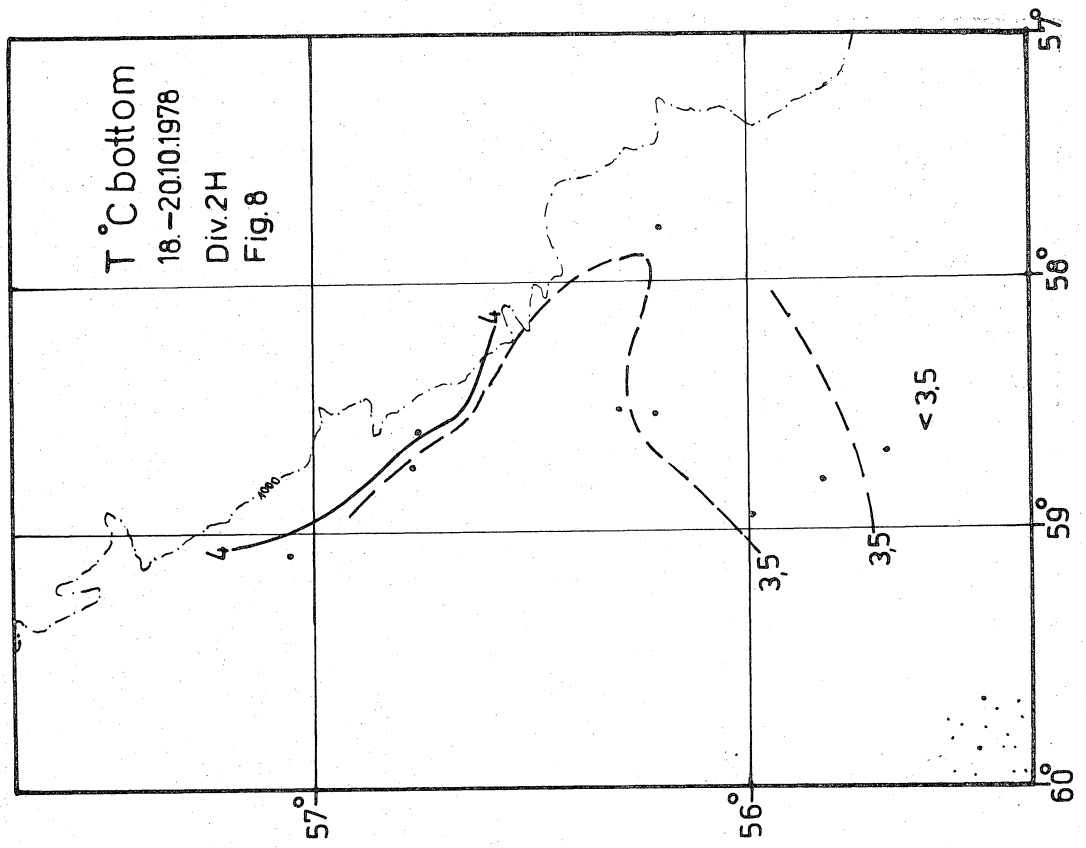
Labrador Sea Intermediate Water (LSIW)

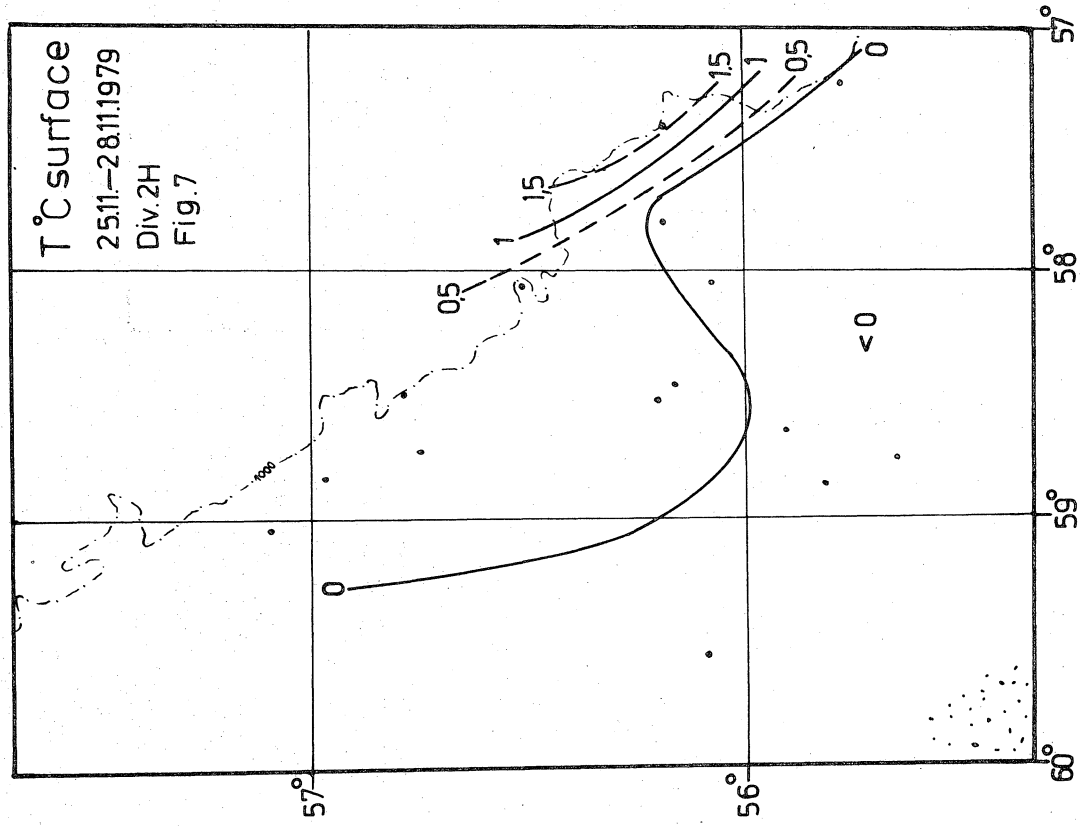

T°C bottom
11.–18.10.1978
Div. 2G
Fig. 4
3.6
4.0
4.2
3.8
1000
61°
60°
59°
58°
60°
61°
62°
63°
64°

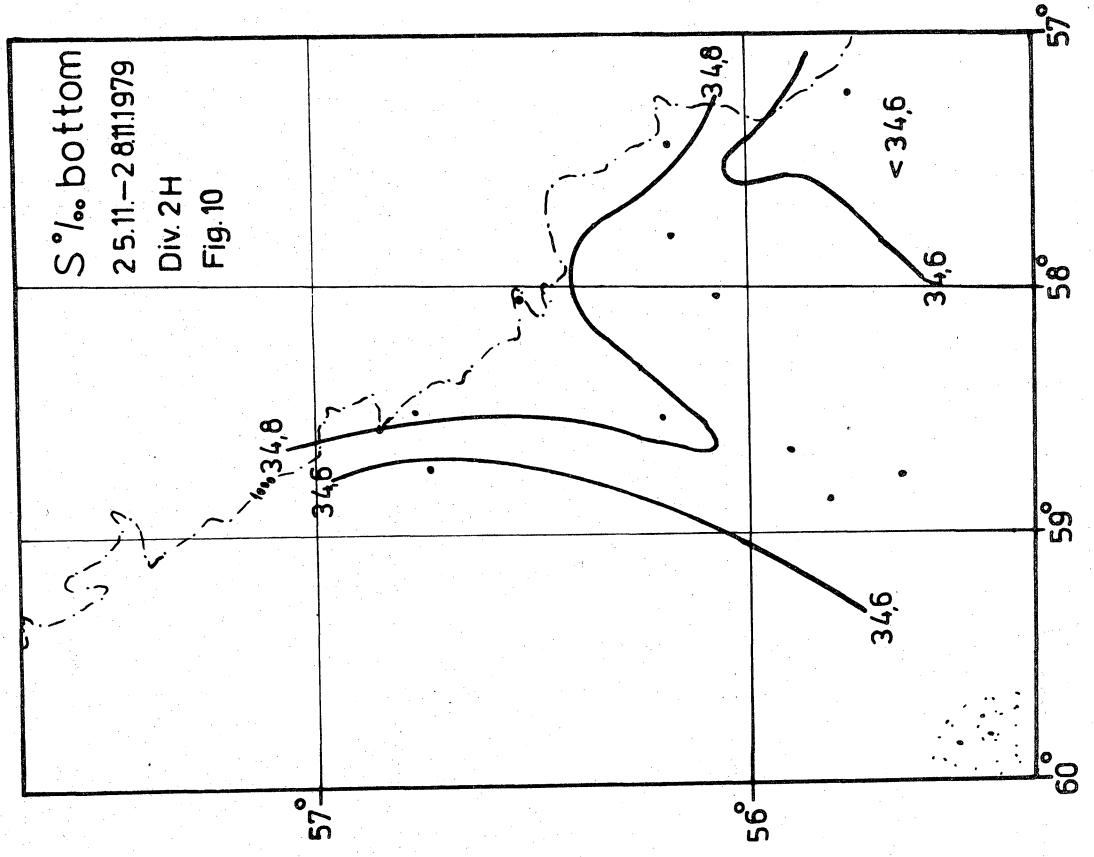

T°C surface
20.–25.11.1979
Div. 2G
Fig. 3
0
-0.5
1000
61°
60°
59°
58°
60°
61°
62°
63°
64°

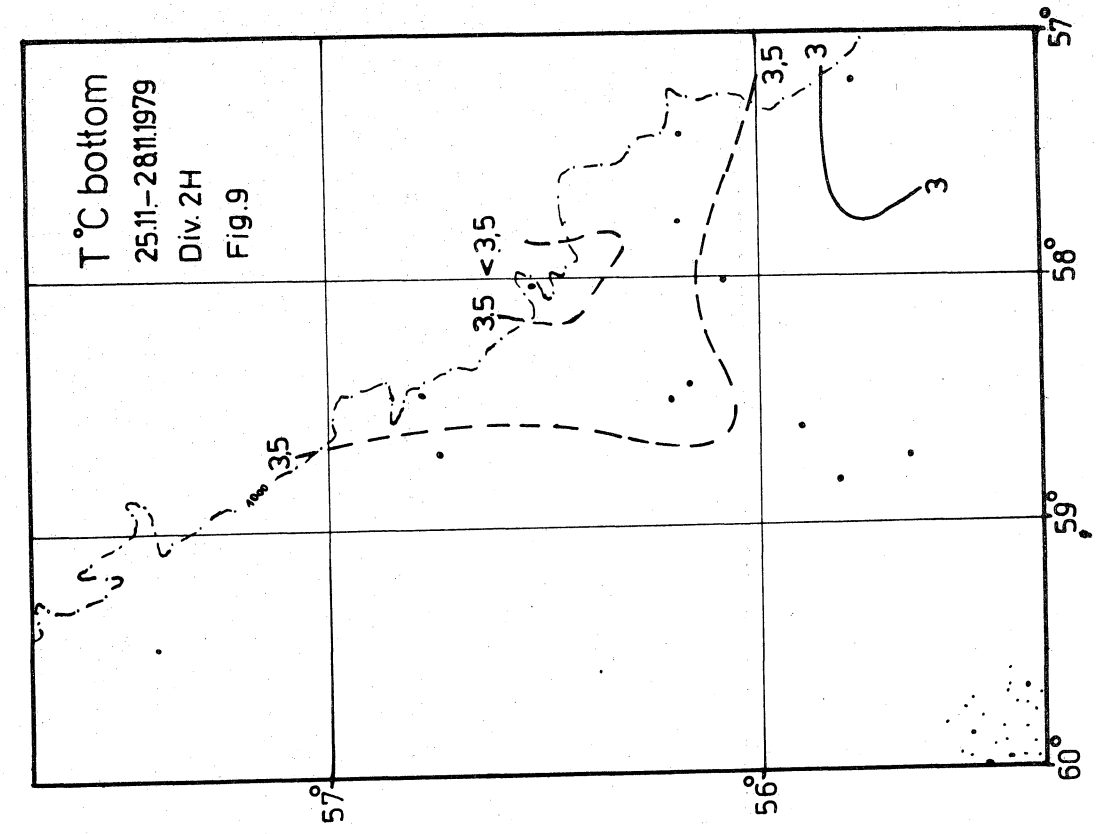

34,8
34,6
34,6
34,4
34,2
1000
2.5
61°
60°
59°
58°
60°
61°
62°
63°
64°
S ‰ bottom
20.–25.11.1979
Div. 2G
Fig. 6

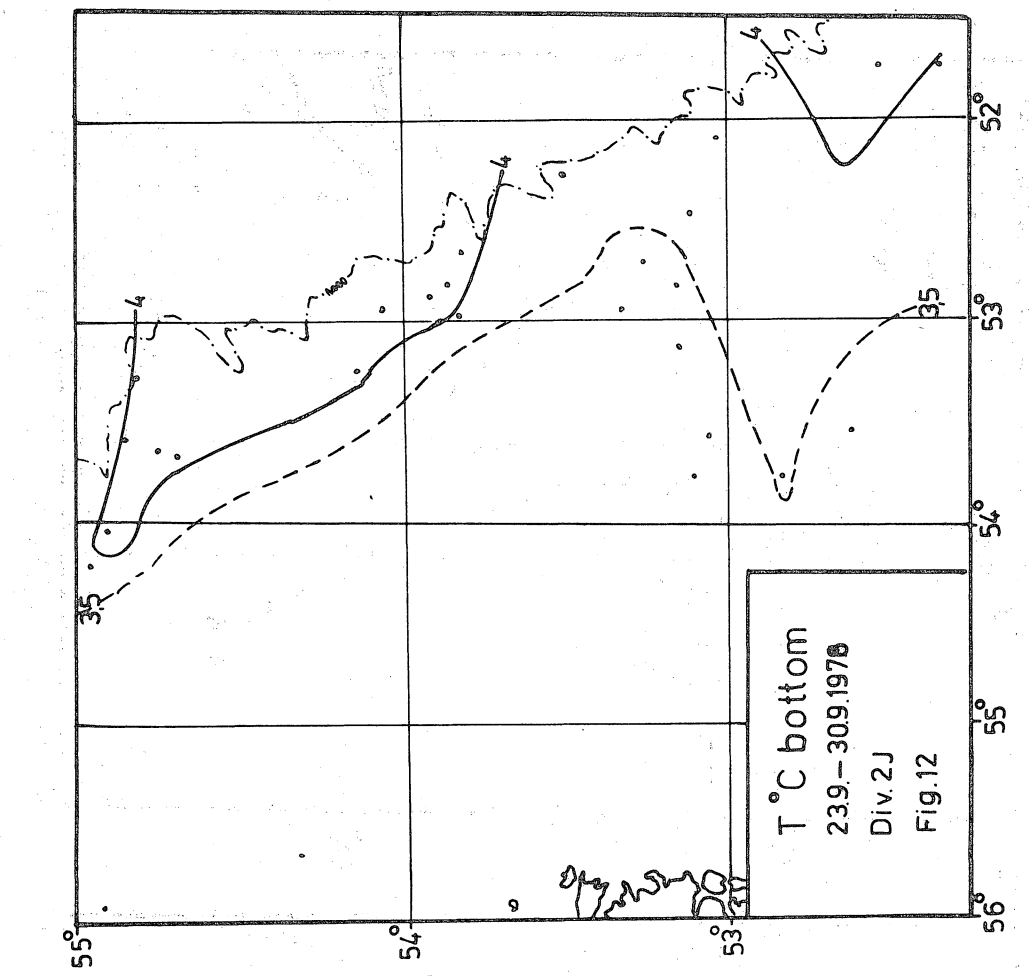

3,5
3
3
3,5
1000
61°
60°
59°
58°
60°
61°
62°
63°
64°
T°C bottom
20.–25.11.1979
Div. 2G
Fig. 5

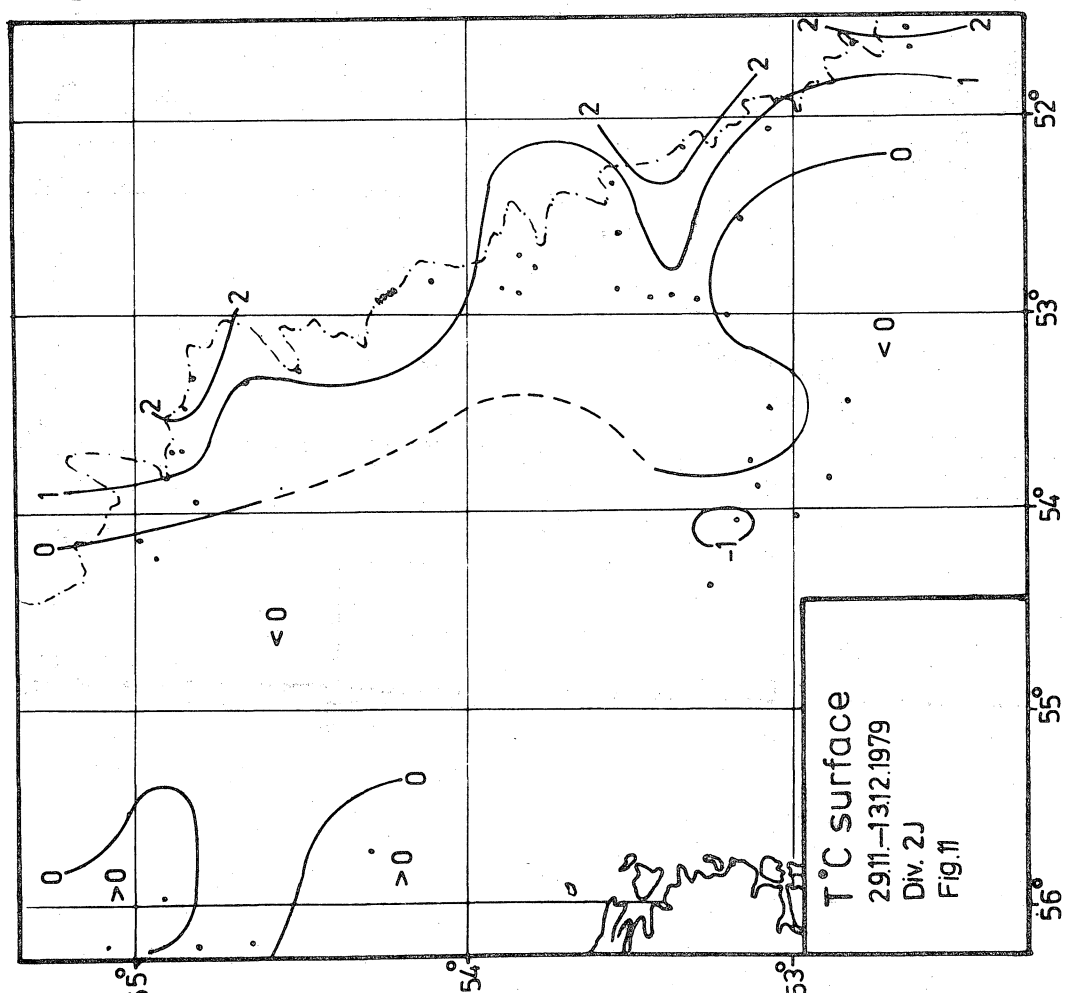

T °C bottom
18.–20.10.1978
Div.2H
Fig.8
4
3,5
3,5
< 3.5
1000
57°
56°
58°
59°
60°

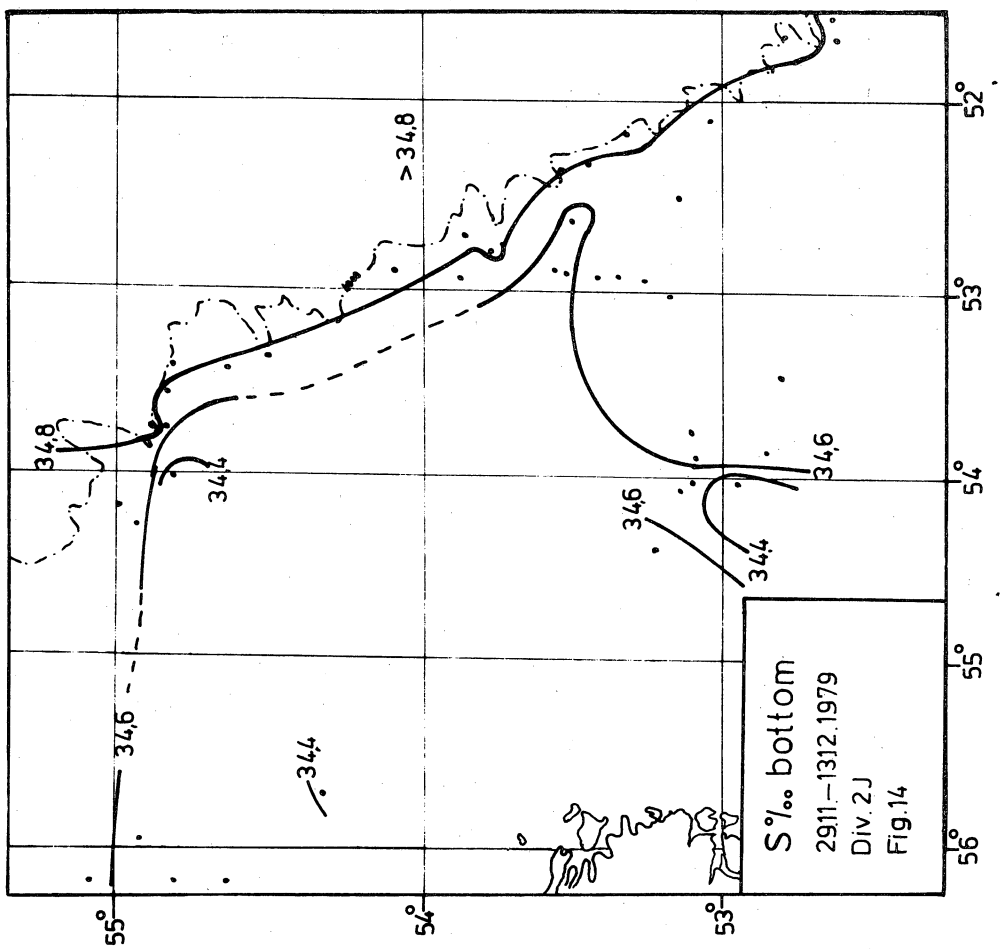

T °C surface
25.11.–28.11.1979
Div.2H
Fig.7
0
0,5
1
1,5
1,5
1
0,5
0
< 0
1000
57°
56°
58°
59°
60°

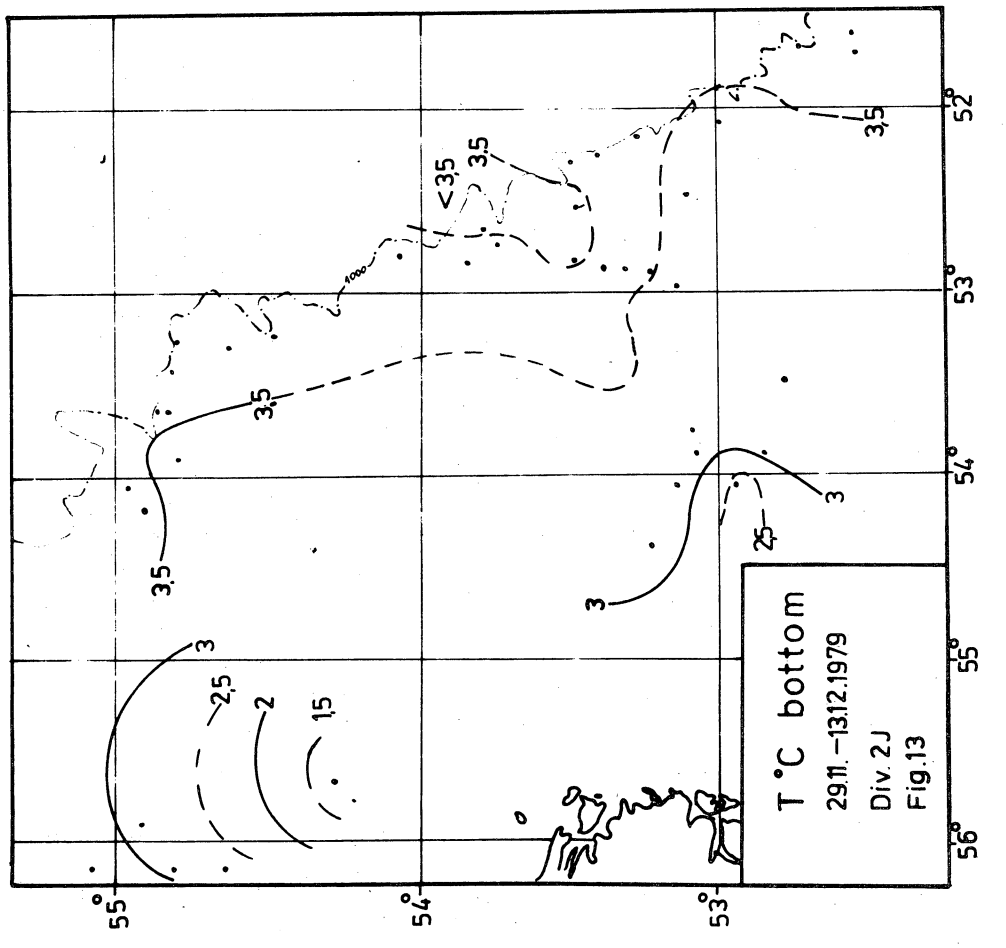

S °/₀₀ bottom
25.11.–28.11.1979
Div. 2H
Fig. 10
34,8
34,6
< 34,6
34,6
34,8
34,6
57°
56°
57°
58°
59°
60°


T °C bottom
25.11.–28.11.1979
Div. 2H
Fig. 9
3,5
< 3,5
3,5
3
3
57°
56°
57°
58°
59°
60°


T °C bottom
23.9.–30.9.1978
Div. 2J
Fig.12
55°
54°
53°
52°
56°
35


T °C surface
29.11.–13.12.1979
Div. 2J
Fig.11
55°
54°
53°
52°
56°
< 0
> 0
0
1
2
-1


S‰ bottom
29.11.–13.12.1979
Div. 2J
Fig.14
>34,8
34,8
34,6
34,4
34,6
34,4
34,6
34,4
55°
54°
53°
52°
53°
54°
55°
56°


T °C bottom
29.11.–13.12.1979
Div. 2J
Fig.13
<3,5
3,5
3,5
3,5
3,5
3
3
2,5
2
1,5
3
2,5
55°
54°
53°
52°
53°
54°
55°
56°