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Hydrographic Observations in Subareas 2 - 5 in 1969

by

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Introduction

During two cruises of RV "Walther Herwig" in the ICNAF-Area several temperature - and salinity sections and additional BT-stations were obtained in Subareas 2, 3, 4, and 5 both in Jan./Feb. and Oct./Nov. 1969. As far as possible nearly the same sections were occupied on both cruises.

Observations were curried out only once.in the Grand Bank - Flemish Cap area (Div. 3 O - L - M) in February 1969. On account of severe ice conditions off Labrador at the same time of the year only few hydrographic stations could be obtained off South Labrador and none off Central - or North Labrador. But in late October 1969 one section off North Labrador (Div. 2 G) and one off South Labrador (Div. 2 J) were carried out across the Labrador Current.

Our gratitude and acknowledgement is due to Mr. K. Weidemann, hydrographic technician on both cruises, for taking most hydrographic observations and providing the majority of the data for this paper. Unfortunately the drawings of comparable sections taken at different times are not always of the same scale, but redrawing would be possible after the Annual Meeting, if desired.

Subarea 2 - Labrador

By the end of February 1969 the drift ice border off Labrador was almost everywhere extended beyond the shelf edge as indicated in Fig. 1. Accordingly our hydrographic program had to be restricted to one very short section across the south-eastern slope of Hamilton Inlet Bank (Div. 2 J). Nevertheless the hydrographic situation as shown in Fig. 1 indicated that cold water masses of the arctic component of the Labrador Current seemed to occupy the whole shelf area at least down to 200 m. Still on the slope of the Bank bottom temperature in 400 m was below 3° C. In the surface layer down to 40 m arctic water ($< -1.75^{\circ}$ C, < 33.3 °/oo) was extended beyond the 1000 m line. The highest temperature (4.18° C)

GH

and salinity (34.95 °/oo) were observed off the slope (Stat. 7) in 510 m and 725 m respectively.

This hydrographic situation suggested that the dense cod concentrations successfully fished at the slope areas were possibly due to the very limited areas of optimal temperature conditions. But preliminary results of hydrographic observations in the same area in February 1970 did apparently not confirm this suggestion.

A more complete impression of the hydrographic conditions off Labrador could be obtained in late October 1969. A comparison of the sections off Cape Chidley (Div. 2 G) Fig. 2, and across Hamilton Inlet Bank (Div. 2 J, on the same line as the Canadian standard section off Seal Islands), Fig. 3, shows that the warmer West Greenland component of the Labrador Current decreased on its way south somewhat in temperature and salinity but its core went upwards, so that water of 3 - 4° C reached the slope off South Labrador in depths about 100 m less than off North Labrador. From February to October 1969 the warmer slope water of South Labrador showed only changes in its depths level by about 150 m but not in temperature and salinity (Fig. 1 and 3).

Compared to October 1967 (Redbook 1968, Part II, p. 56 and Pt.III, p. 27) water temperatures off Cape Chidley were quite similar in 1969, but the salinities were higher in the upper 200 m, while at Hamilton Inlet Bank only the offshore component showed similar values to 1967. Over the inshore part of the Bank the core of the cold water reached from 100 m down to the bottom with minimum temperatures in the Hawke Channel, which is rather unusual. Because of its heaviness this cold water might possibly remain there for a longer time.

Subarea 3, - Newfoundland

The Canadian standard section across the Grand Bank at 47° N to Flemish Cap routinely occupied by the St. John's Station in summer was additionally taken by RV "Walther Herwig" in February 1969 (Fig. 4). Contrary to the extreme temperature stratification prevailing in summer almost homogenous temperatures around 0° C and salinities around 33.0 °/oo from surface to bottom were observed over the Grand Bank. The inshore and offshore cores of the cold water parts of the Labrador Current were only indicated by temperatures slightly below 0° C. On the eastern slope of the Bank bottom temperatures increased rather quickly from 1 to 3° C between 200 and 300 m. Again nearly homogenous temperatures around 4° C were observed on Flemish Cap.

A further section, Fig. 5, from the south-western slope of the Grand Bank northward to the inner station 105 of the section to Flemish Cap showed a similar uniformity of the hydrographic situation on the Bank.

Subarea 4

The sections worked across Cabot Strait between Cape Breton Island (Div.4Vn) and Burgeo Bank (Div.3Ps) in February (Fig. 6) and at the end of October (Fig. 7) show a very similar and apparently rather constant stratification of the water layers exceeding 100 m. A well developed more or less horizontal thermocline in about 150 m separated the deeper warm

water of relatively high salinity occupying the whole Laurentian Channel from a cold layer above. In February this cold water occupied the whole upper layer until the surface showing the lowest temperatures at the surface. According to further hydrographic or BT stations distributed along both sides of the Laurentian Channel as far southeast as the southeastern slope of Banquereau Bank (Div.4Vs) and the southwestern slope of St. Pierre Bank (Div.3Ps) respectively. Surface temperatures increased gradually from about 0.1°C over the shelf off Cape Breton Island to about 2°C over the southeastern slope of Banquereau Bank, whereas they remained fairly stable around 1°C along the western slopes of Burgeo and St. Pierre Bank. By the end of October the cold layer had become an intermediate layer by formation of a second thermocline separating it from a warm surface layer. At the same time herring fishery was carried out by German trawlers off Cape Breton Island.

A similar pattern of stratification is shown by the sections across Emerald Bank (Div.4W) at corresponding times of the year. The temperatures involved here, however, were considerably higher (Fig. 8 and 11). Very warm near bottom water with > 9°C in the Emerald Basin occupied the whole shelf area in February as well as in November 1969.

Subarea 5

The two sections across the eastern part of Georges Bank (Div.5Ze) show in January homogeneous temperatures all over the Bank of 5 to 6°C from surface to bottom, but increasing rapidly to over 12°C at the southern slope (Fig. 9). In November temperatures up to over 10°C from surface to bottom were found on top of the Bank, but cores of colder water around 6°C flanking the northern as well as the southern slopes (Fig. 12). Almost the same temperature distribution, but slightly higher salinities were observed over the western part of the Bank early in the year (Fig. 10). In November the salinity distribution was almost the same over both parts of the Bank, whereas the temperatures on top of the western part were considerably higher, up to over 13°C (Fig. 13).

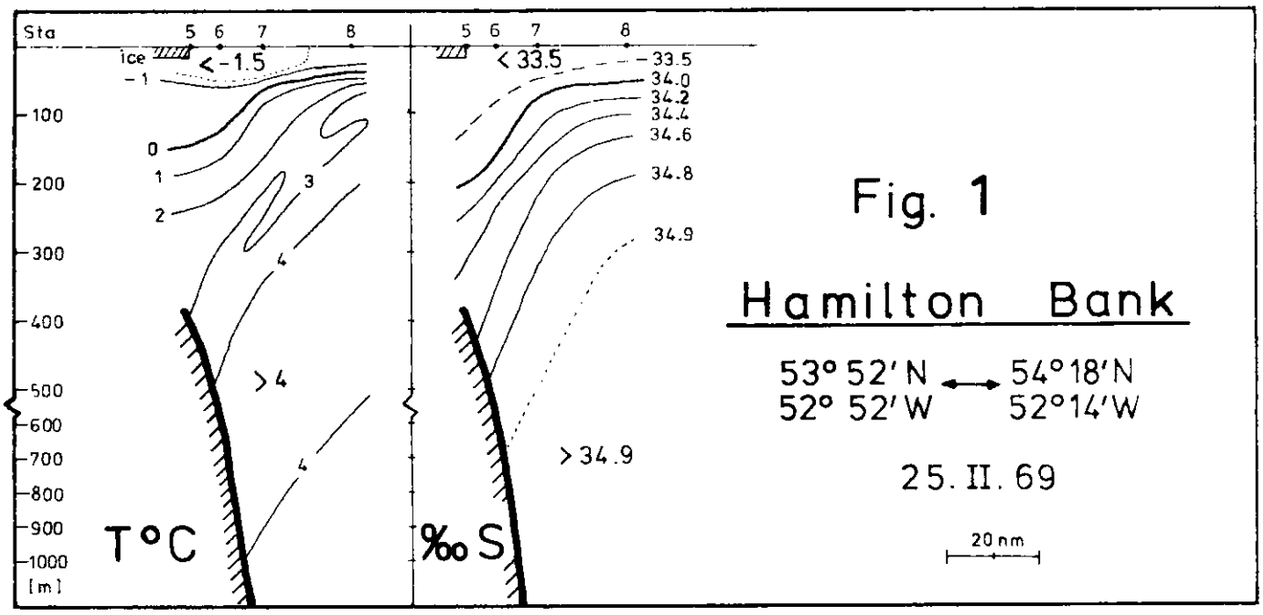


Fig. 1

Hamilton Bank

53° 52′ N ⟷ 54° 18′ N
52° 52′ W 52° 14′ W

25. II. 69

20 nm

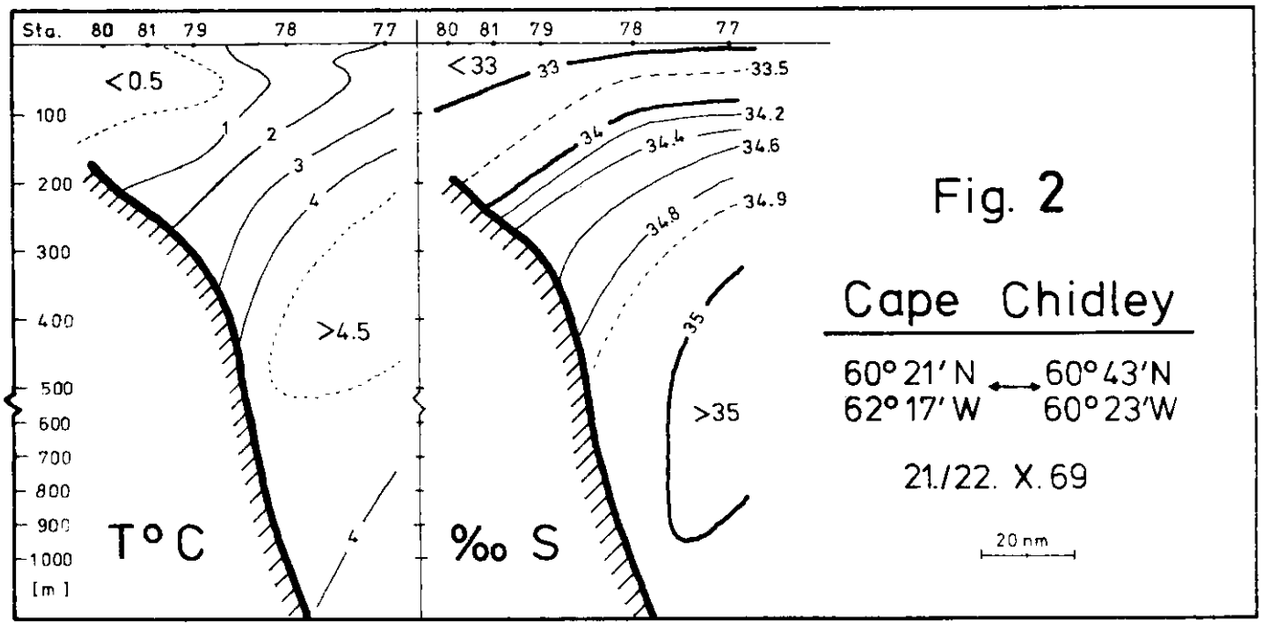


Fig. 2

Cape Chidley

60° 21′ N ⟷ 60° 43′ N
62° 17′ W 60° 23′ W

21./22. X. 69

20 nm

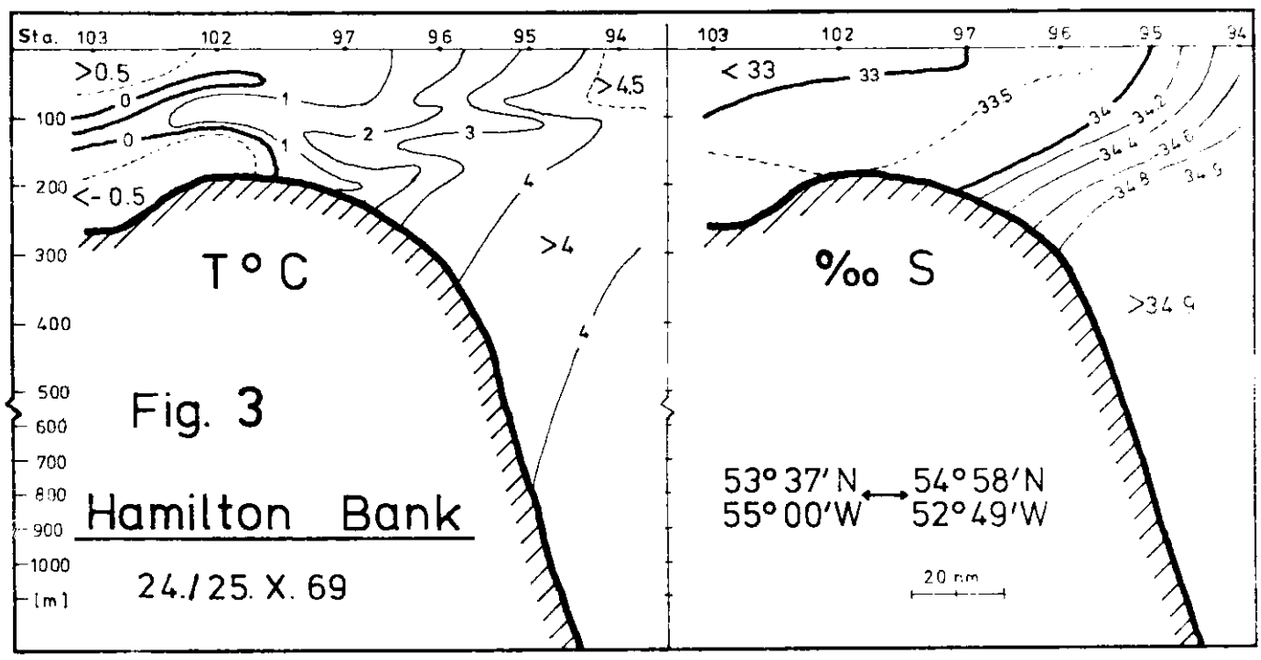


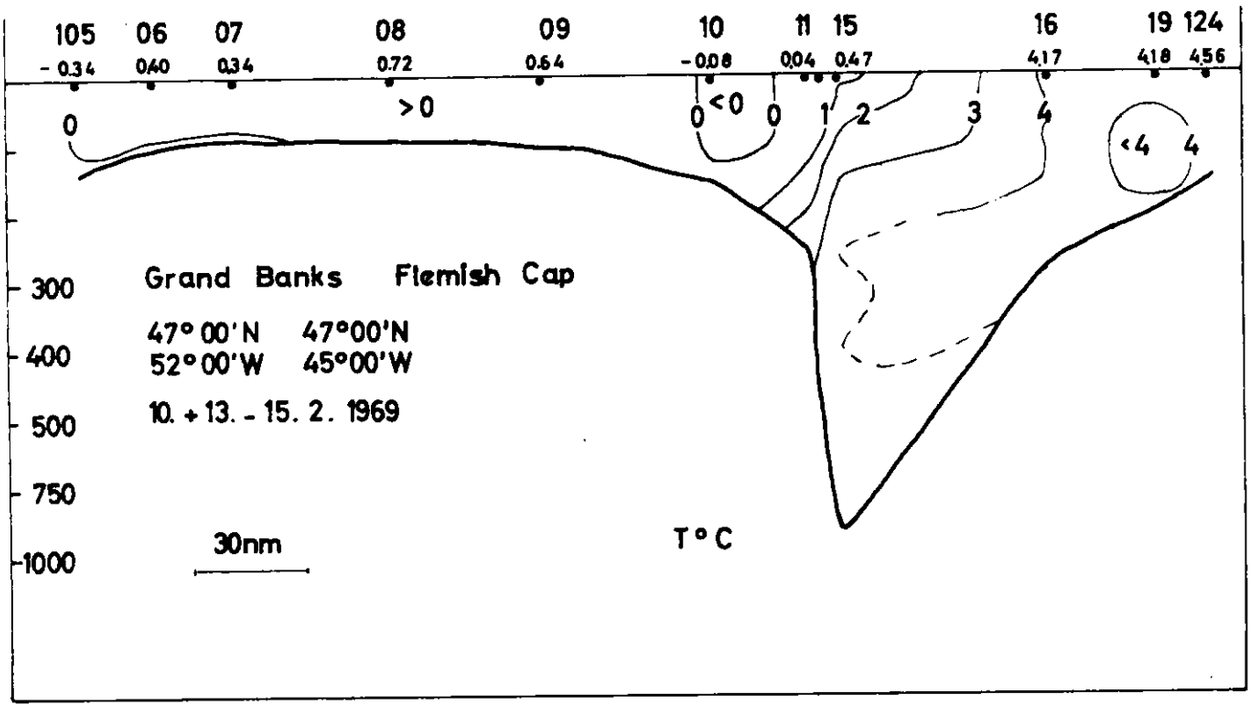
Fig. 3

Hamilton Bank

24./25. X. 69

53° 37′ N ⟷ 54° 58′ N
55° 00′ W 52° 49′ W

20 nm


105 06 07 08 09 10 11 15 16 19 124
- 0.34 0.40 0.34 0.72 0.64 - 0.08 0.04 0.47 4.17 4.18 4.56
0
>0
0 <0 0 1 2 3 4
<4 4
300
400
500
750
1000
Grand Banks Flemish Cap
47° 00' N 47°00'N
52° 00' W 45°00'W
10. + 13. - 15. 2. 1969
30nm
T° C

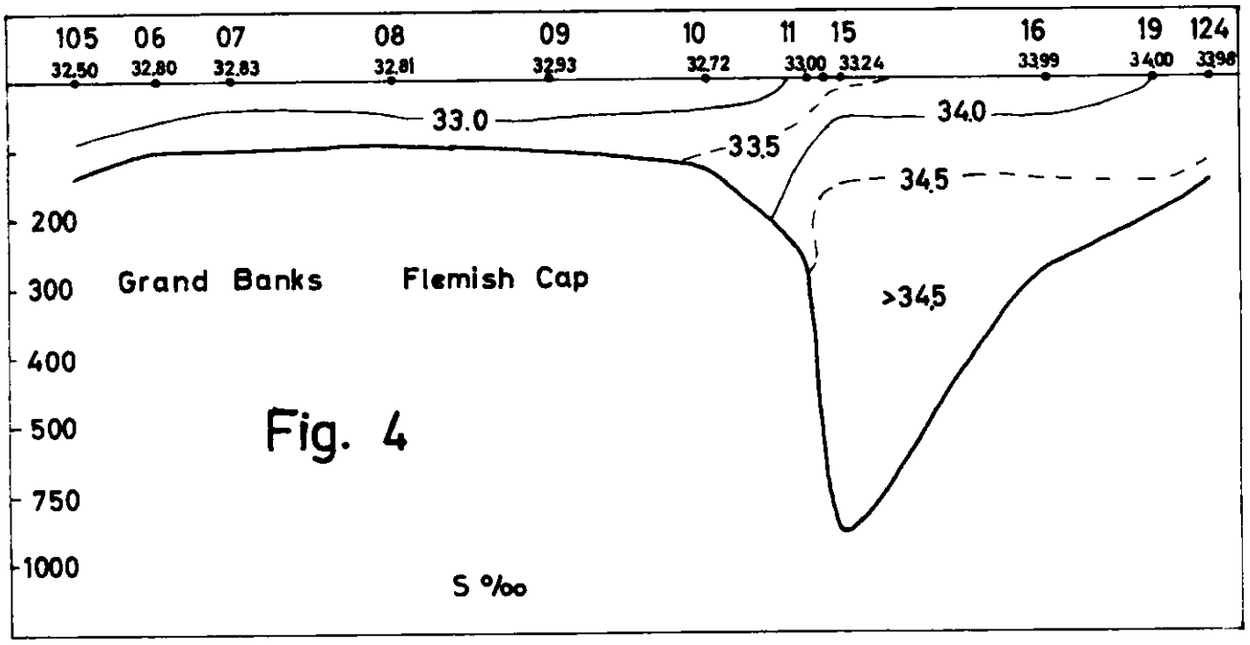
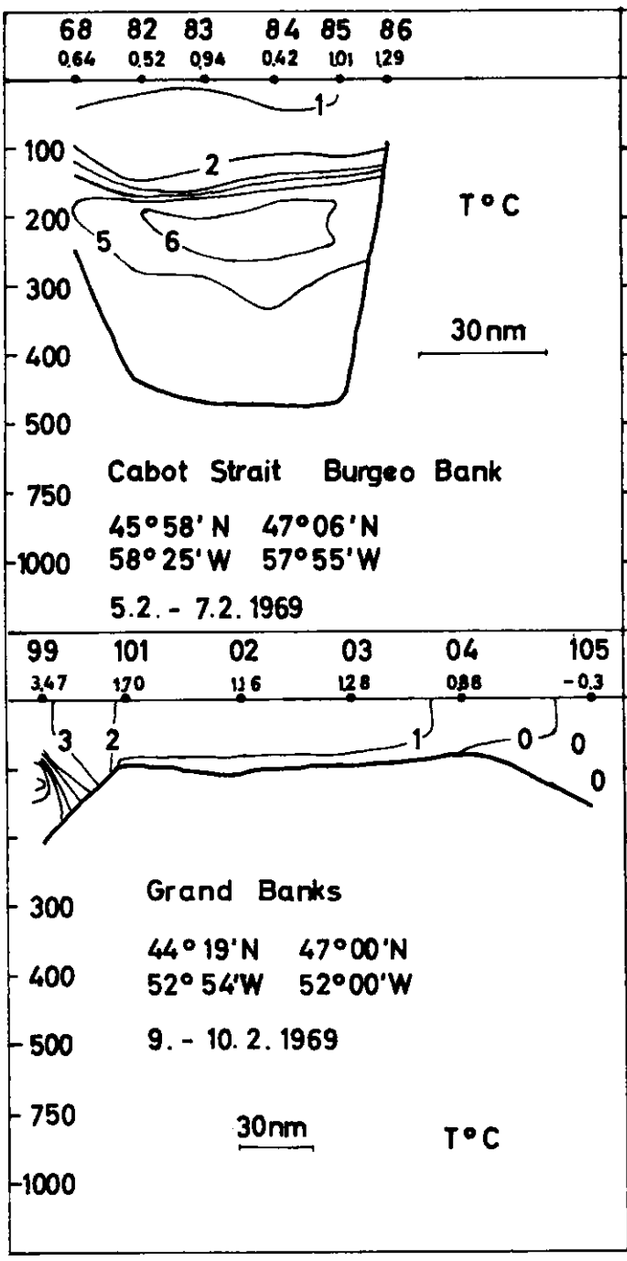

105 06 07 08 09 10 11 15 16 19 124
32.50 32.80 32.83 32.81 32.93 32.72 33.00 33.24 33.99 34.00 33.98
33.0
33.5
34.0
34.5
>34.5
200
300
400
500
750
1000
Grand Banks Flemish Cap
S ‰

Fig. 4


68 82 83 84 85 86
0,64 0,52 0,94 0,42 1,01 1,29
1
2
5
6
100
200
300
400
500
750
1000
T°C
30nm
Cabot Strait Burgeo Bank
45°58' N 47°06'N
58°25'W 57°55'W
5.2. - 7.2.1969

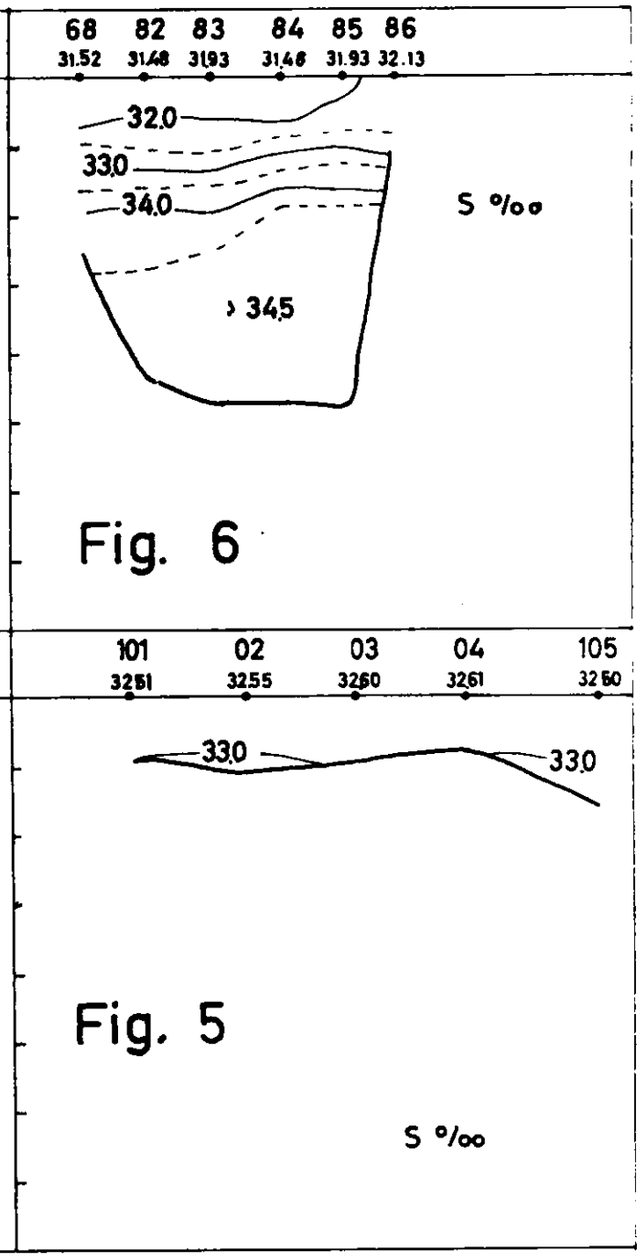

68 82 83 84 85 86
31,52 31,48 31,93 31,46 31,93 32,13
32,0
33,0
34,0
> 34,5
S °/oo

Fig. 6

99 101 02 03 04 105
3,47 1,70 1,16 1,28 0,86 -0,3
3
2
1
0
0
0
300
400
500
750
1000
Grand Banks
44°19'N 47°00'N
52°54'W 52°00'W
9. - 10. 2. 1969
30nm
T°C

101 02 03 04 105
32,51 32,55 32,60 32,61 32,60
33,0
33,0
S °/oo

Fig. 5

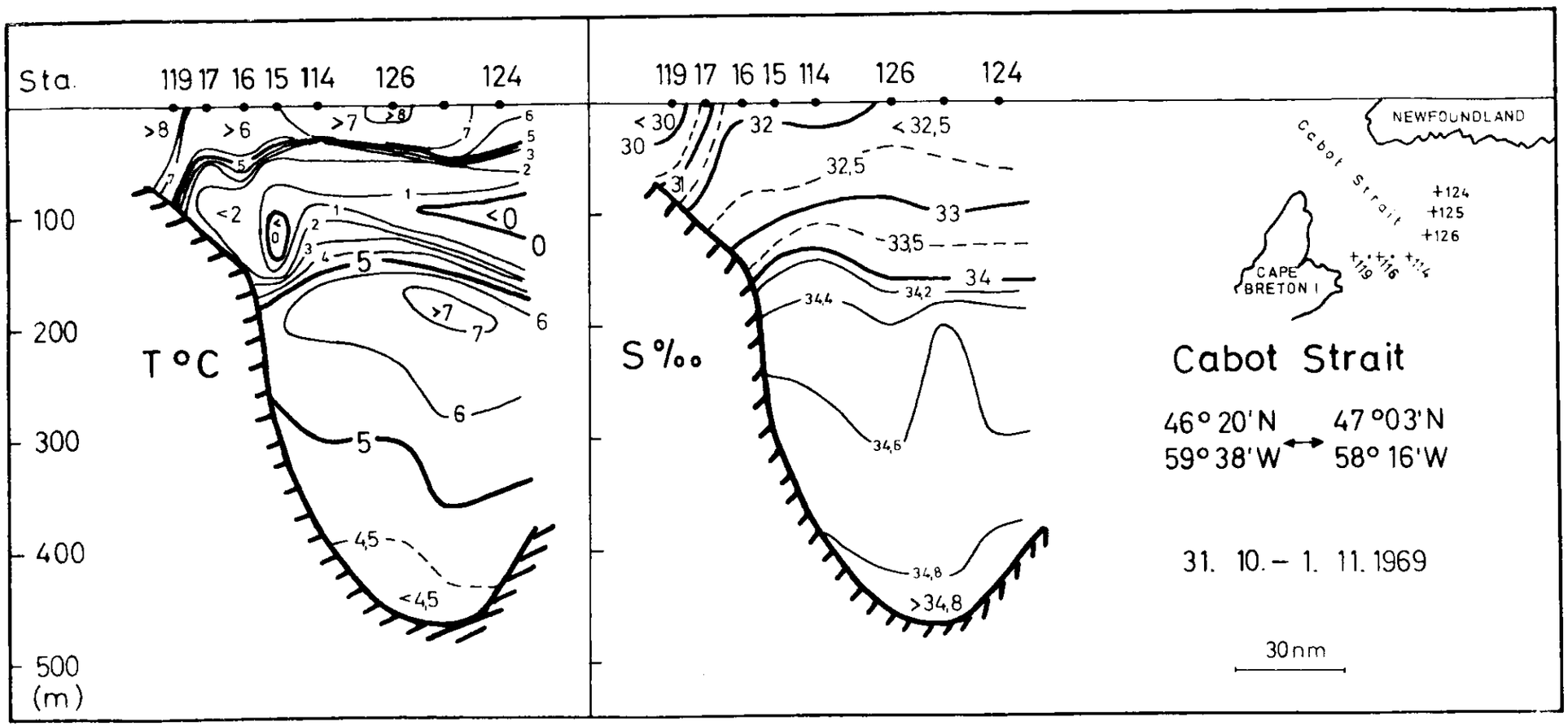

Sta.
119 17 16 15 114 126 124
100
200
300
400
500
(m)
T °C
>8
>6
>7
<2
<0
0
5
6
4,5
<4,5
S ‰
< 30
30
31
32
< 32,5
32,5
33
33,5
34
34,2
34,4
34,6
34,8
>34,8
NEWFOUNDLAND
Cabot Strait
CAPE BRETON I
+124
+125
+126
Cabot Strait
46° 20' N
59° 38' W
47° 03' N
58° 16' W
31. 10. – 1. 11. 1969
30 nm

Fig. 7

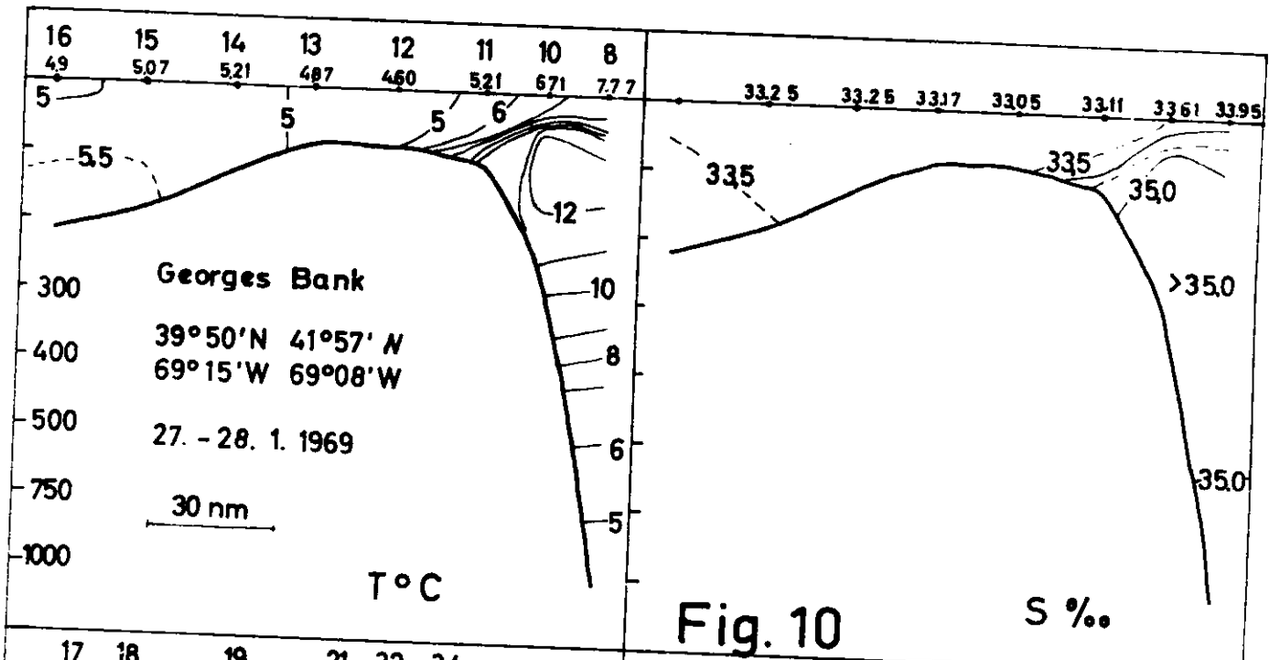


Fig. 10

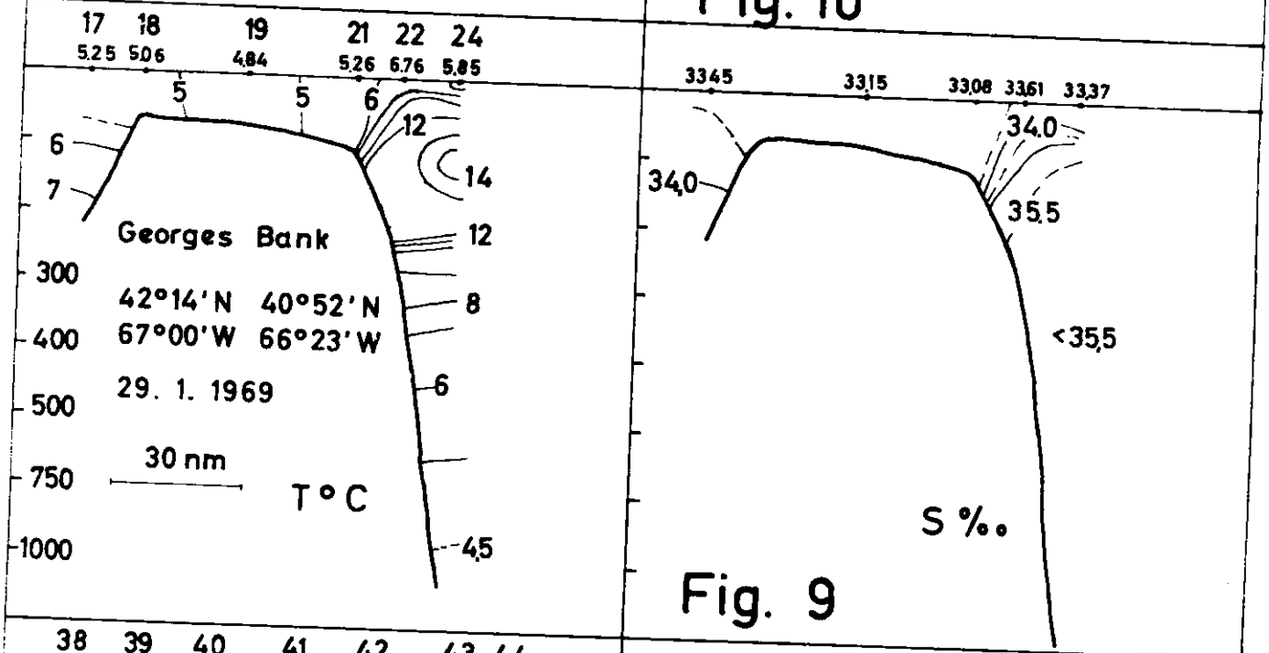


Fig. 9

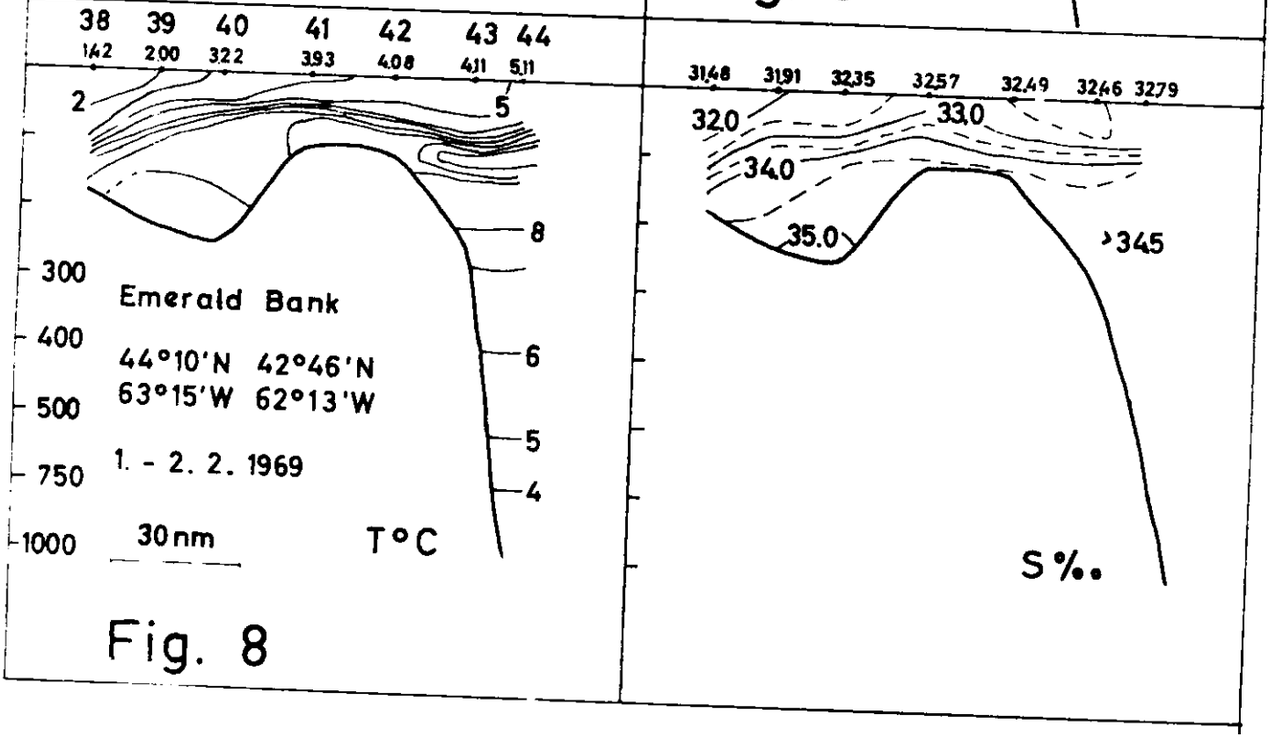
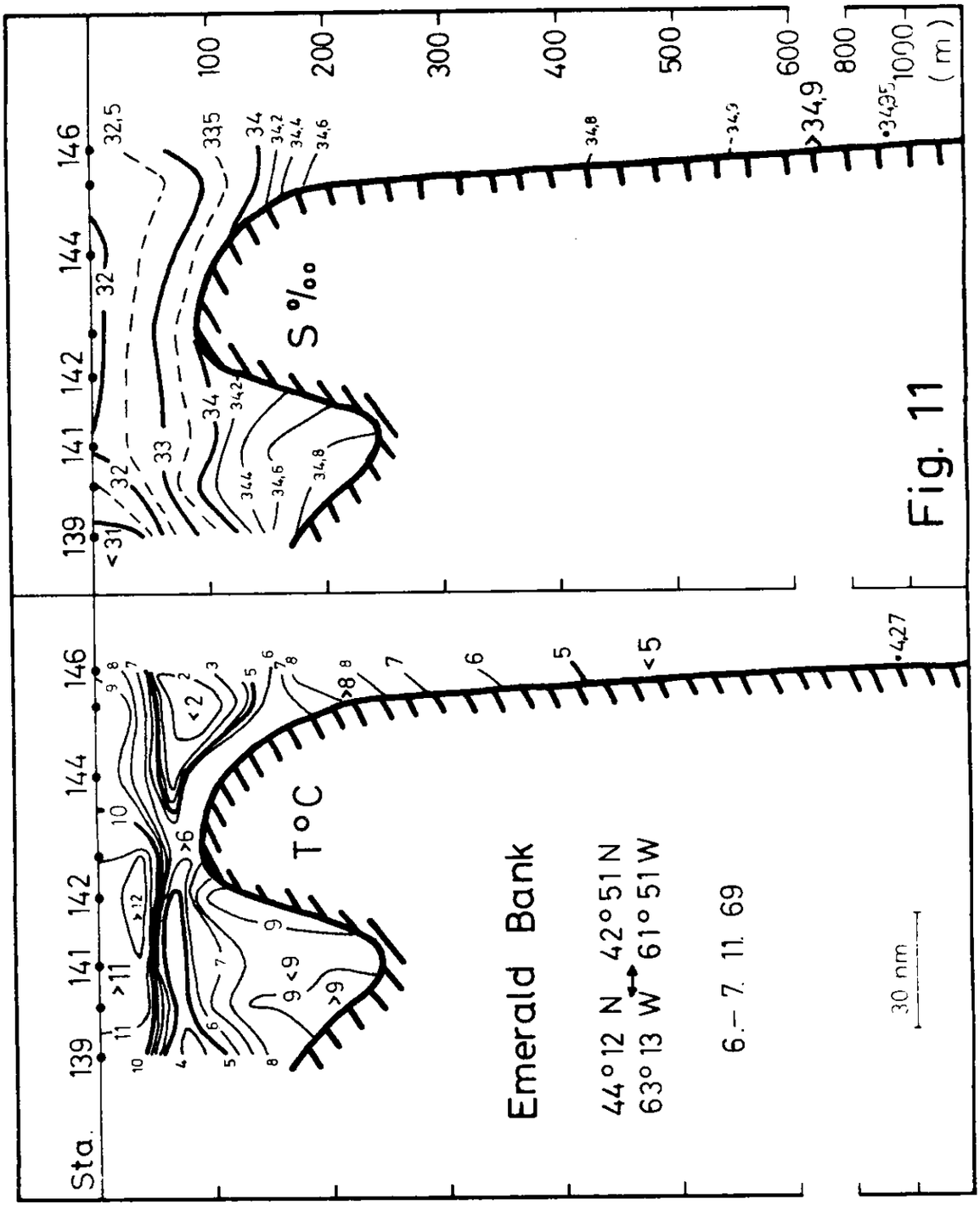


Fig. 8


Sta.
139
141
142
144
146
T°C
S‰
Emerald Bank
44° 12 N 42° 51 N
63° 13 W 61° 51 W
6.– 7. 11. 69
30 nm
(m)
100
200
300
400
500
600
800
1000
•427
•3435
Fig. 11

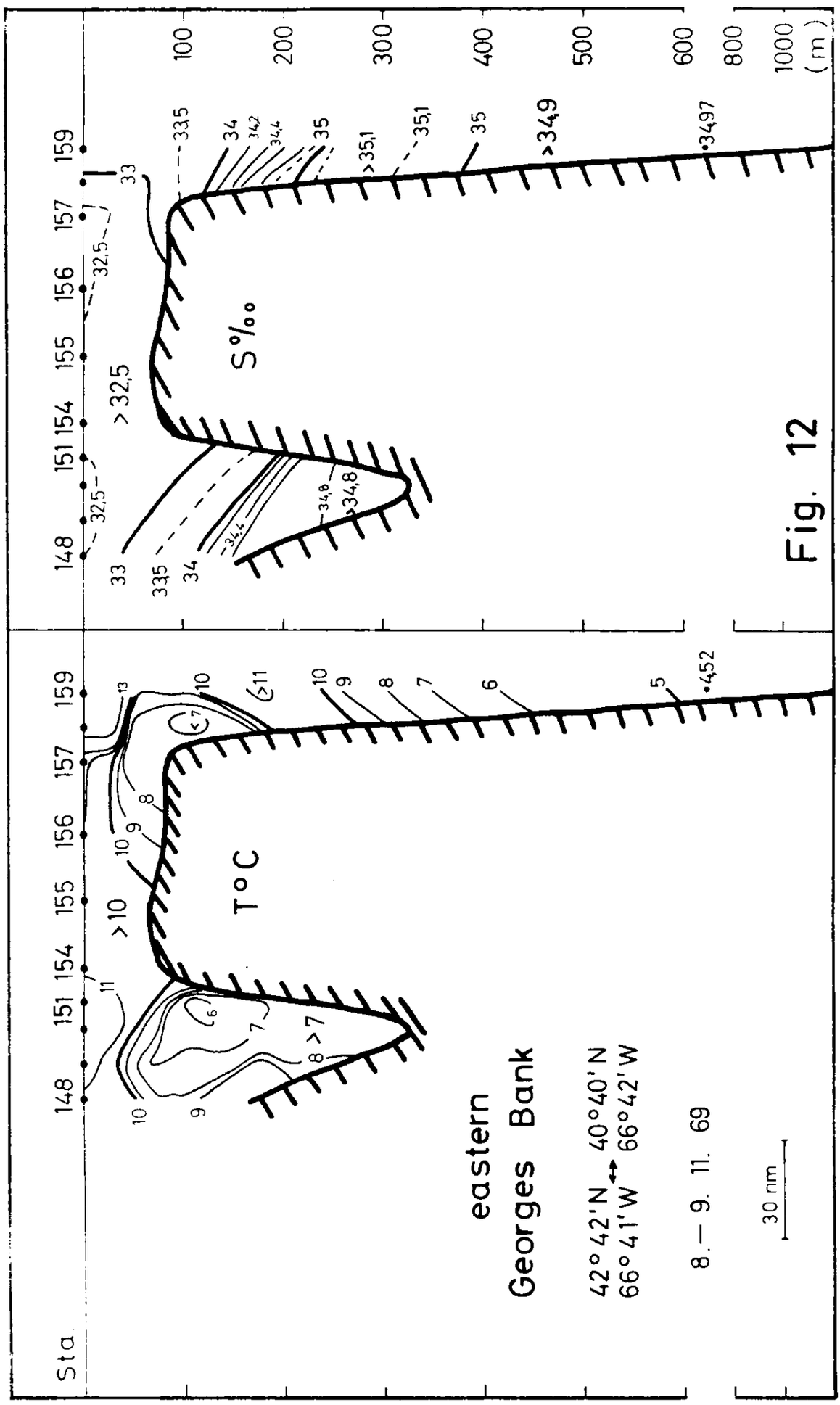

Sta
148
151
154
155
156
157
159
T°C
S‰
eastern
Georges Bank
42°42'N — 40°40'N
66°41'W — 66°42'W
8. — 9. 11. 69
30 nm
100
200
300
400
500
600
800
1000
(m)

Fig. 12

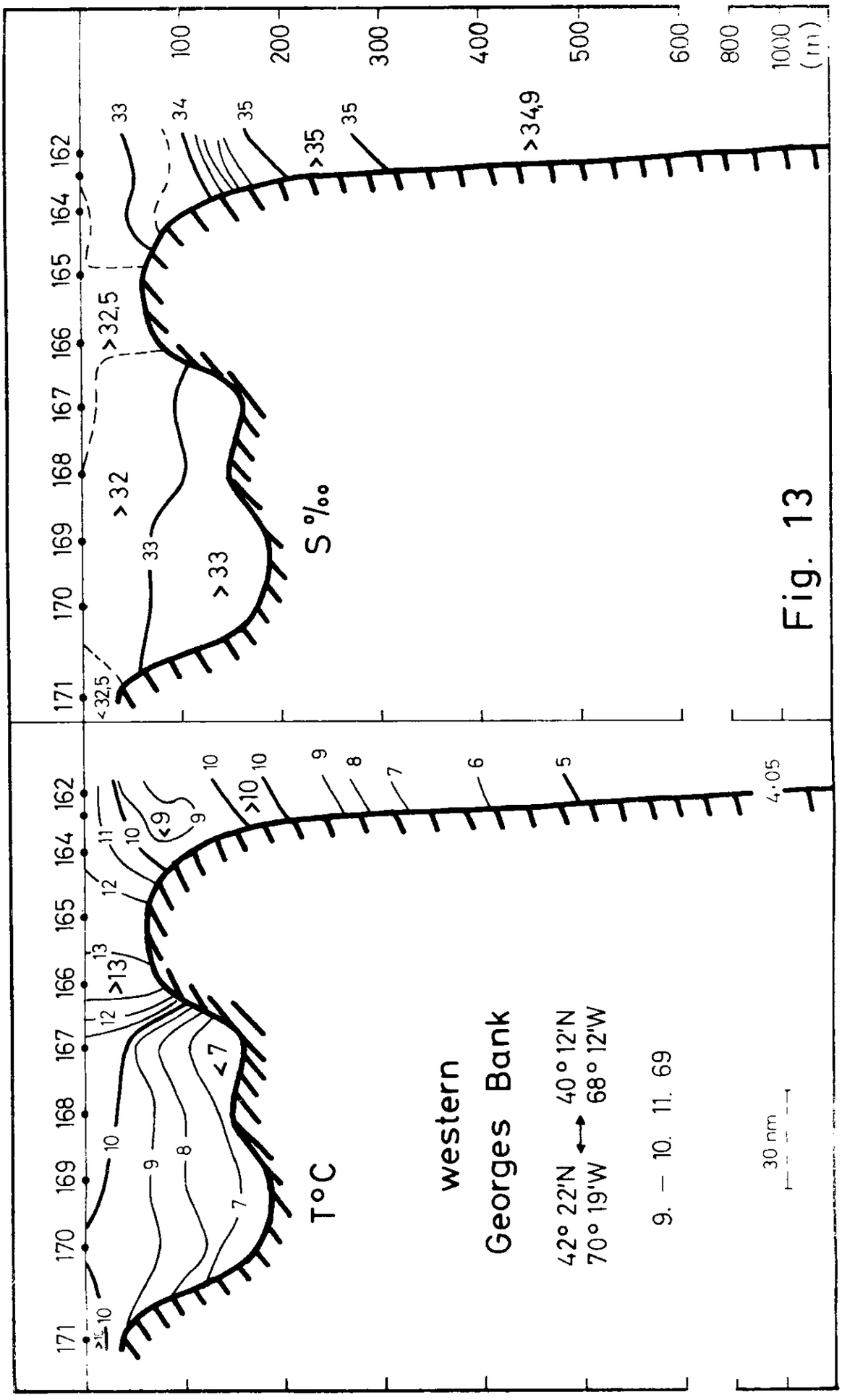

T°C
S ‰
western
Georges Bank
42° 22'N ↔ 40° 12'N
70° 19'W ↔ 68° 12'W
9. — 10. 11. 69
30 nm
171
170
169
168
167
166
165
164
162
100
200
300
400
500
600
800
1000
(m)
>13
>10
<7
<9
>32
>33
>32,5
>35
>34,9
<32,5
4°05

Fig. 13