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International Council for
the Exploration of the Sea

CM 1981/G:78
Demersal Fish Committee
Ref: Pelagic Fish and
Hydrographic committees

Anon. 1981

Preliminary report of the International 0-group fish survey in
the Barents Sea and adjacent waters in August - September 1981

The seventeenth annual International 0-group fish survey was
made during the period 12 August - 6 September 1981 in the
Barents Sea and adjacent waters. The following research vessels
participated in the survey:

| State | Name of vessel | Survey time | Research Institute |
|--------|----------------|-------------------------|--|
| Norway | "Johan Hjort" | 21 August - 5 September | Institute of Marine Research, Bergen |
| Norway | "G.O. Sars" | 14 August - 4 September | " " |
| Norway | "Michael Sars" | 12 August - 4 September | " " |
| USSR | "Persey 3" | 22 August - 6 September | The Polar Research Institute of Marine Fisheries and Oceano- graphy, Murmansk |
| USSR | "Akhill" | 23 August - 1 September | " " |

Names of scientists and technicians who took part on the dif-
ferent vessels are given in the Appendix.

The survey data were analysed 5-7 September in Hammerfest.
Observations concerning the geographical distribution og 0-
group fish and their abundance are given in this report to-
gether with a brief description of the temperature conditions
in the area.

MATERIAL AND METHODS

The geographical distribution of 0-group fish were estimated by
fishing with a small meshed midwater trawl. The vessels parti-
cipating in the survey in 1981 used the type of midwater trawl
recommended by the meeting held after the survey in 1980 (Anon.

1980b). The trawling procedure was standardized in accordance with the recommendation made at the same meeting. At about every 30 nautical miles sailed the trawl was towed 0.5 nautical mile at each depth; the headline of the trawl at 0, 20 and 40 m. If traces on the echosounder deeper than 60 m were recognized as 0-group fish the trawl was also towed at 60 m.

Survey tracks and hydrographical stations are given in Fig. 1. Trawl stations with and without catch are given on the distribution charts in Figs. 10-17, as filled and open symbols respectively. The density grading is based on catch in number per 1.0 nautical mile trawling.

HYDROGRAPHY

Hydrographic observations were made along all the survey tracks, normally after each 30 nautical miles sailed. Horizontal temperature distribution is shown for 0, 50, 100 and 200 m depth (Figs. 2-5). Figs. 6-9 show the temperature conditions at four standard sections, and the mean temperature of these sections are given in Tables 1-4. Some general comments are given below:

1. Kola Meridian

Mean water temperatures on this section were the following: 0-50 m: 6.6°C , 50-200 m: 2.7°C , 0-200 m: 3.7°C .

Those temperatures were below the long-term mean by -0.6 , -0.8 , -0.8 respectively, i.e. after 1980 some cooling was again observed.

2. Kanin Meridian

In 1981, the mean water temperature on this section was below that of 1980 and considerably less than the long-term mean, particularly in the southern part of the section. Temperature values for southern and northern parts of the section were: 2.7 and 2.5°C , anomalies were: -1.3 and -0.7°C respectively.

3. North Cape - Bear Island section

Mean water temperature on this section was 5.3°C , which is 0.3° below the long-term mean for the 1965 - 1981 period of observations.

4. Section west of Bear Island

In 1981, water temperature on this section in the 0-200 m layer was 4.4°C , which is close to the long-term mean of 4.3°C .

In 1981 temperature conditions in the Barents Sea were colder than those of the mean level for 1965-1981, particularly in the east. To the west, the anomalies decreased, and on the section west of Bear Island mean temperature was at the level of the long-term mean.

DISTRIBUTION AND ABUNDANCE OF 0-GROUP FISH

Geographical distributions of 0-group fish are shown by shaded areas in Figs. 10-17. Double shading indicates dense concentrations. The criteria for discrimination between scattered and dense concentrations are the same as used in earlier reports (Anon. 1978).

Abundance indices estimated as the area of distribution with areas of high densities weighted by 10, are given in Table 5. Length frequency distributions of the main species are given in Table 6.

Two new sets of abundance indices have been estimated for 0-group cod (Randa 1981). They are both based on stratified mean catch in numbers for a standard trawl haul of one nautical mile. The stratification system was based on 17 geographical areas. Basis for the establishment of these strata was that some trawl stations could be allocated to each strata every year. In addition, attention was paid to the temperature conditions and the water transport in the different currents in the surveyed area.

Herring (Fig. 10)

0-group herring were found only on six stations in the Bear Island - Spitsbergen area. In contrast to the most recent years no herring were captured off the Finnmark coast. Although one single haul off Spitsbergen gave a catch of 10 per nautical mile, the abundance of 0-group herring in the surveyed area seems to be low.

Capelin (Fig. 11)

The distribution of 0-group capelin in 1981 is distinguished from the distributions in the most recent years by being extended considerably more towards west and northwest, whereas the distribution to the east is less extensive. The main area of dense concentrations was found off the Finnmark coast and the distribution of 0-group capelin in 1981 clearly reflects a westerly distribution of the spawning.

0-group capelin are mostly found entrangled in the meshes in the middle part of the trawl. It is difficult to sample 0-group capelin unbiased because a varying proportion is washed out of the meshes depending on the weather conditions. In the past, abundance indices for 0-group capelin have not been very reliable. However, the extensive area of distribution in 1981 indicates that the 1981 year class of capelin is abundant.

Cod Fig. 12)

The main distribution of 0-group cod is separated into two areas west of Spitsbergen and one area north of Finnmark with an extension southeastward to the Kola peninsula. The distribution to the southeast is clearly more pronounced than in the most recent years. The total area of distribution is relatively small, the concentrations were generally low and the resulting index is less than half of the long-term average.

The data were normalized by applying a logarithmic transformation to the catch in numbers of 0-group cod per nautical mile and confidence limits for the two sets of abundance indices were estimated (Table 7). The sets of indices are on a logarithmic scale and transformed back to numbers of 0-group cod per standard trawl haul. The indices together with their confidence limits are shown in Table 7. Details of the calculations are given in Randa (1981). The basic theory behind the calculations is provided by Pennington and Grosslein (1978), Aitchinson and Brown (1957) and Jones (1956).

The correlation coefficient between the area based abundance indices for 0-group cod of the year classes 1965-1975 and the VPA estimates for the same yearclasses as 3 year old (Anon 1980b) is 0.70. The corresponding correlation coefficient between logarithmic indices and the VPA estimates is 0,88, and between retransformed indices and VPA estimates 0,83. The new sets of abundance indices for the 1981 year class of cod are low, and they indicate a year class strength below all year classes since 1968.

Haddock (Fig. 13)

Two main areas of distribution of 0-group haddock were found, one area north of Finnmark and another extending from west of Bear Island northward up to Spitsbergen and along part of its west coast. The distribution is more to the west than in most earlier years. The area is small, the concentrations were low and the index indicates that the 1981 year class of haddock is very poor, possibly the least abundant year class after 1967.

Polar cod (Fig. 14)

There are three main areas of distribution of polar cod. The largest area is in the Bear Island - Spitsbergen region and is assumed to represent the western component of the stock. This is also where the largest concentrations were found, in an area

from east of Bear Island to southeastern Spitsbergen. The main area for the eastern component of the stock was found along the coast of Novaya Zemlya north of 73°N. Polar cod were also found in a smaller area north of the Kola peninsula and these were assumed to belong to the eastern component of the stock. The indices indicate that the 1981 year class of the western component is very rich, possibly the most abundant year class recorded in the 0-group surveys, whereas in the eastern part the year class seems to be below average. However, the latter estimate may not be very reliable since the distribution in the east extends beyond the surveyed area.

Redfish (Fig. 15)

The distribution of 0-group redfish is similar to those of the most recent years, but the area of highest concentrations is more to the southwest. The index indicates that the 1981 year class is nearly as rich as the 1979 year class which has the highest index recorded in these surveys.

Greenland halibut (Fig. 16)

The distribution of Greenland halibut was as usual confined chiefly to the Bear Island - West Spitsbergen area. The index is the highest recorded in the 0-group surveys.

Long rough dab (Fig. 17)

The distribution of 0-group long rough dab in 1981 is similar to the one in 1980, but does not extend so far to the east. The index of abundance indicates that the 1981 year class is above average.

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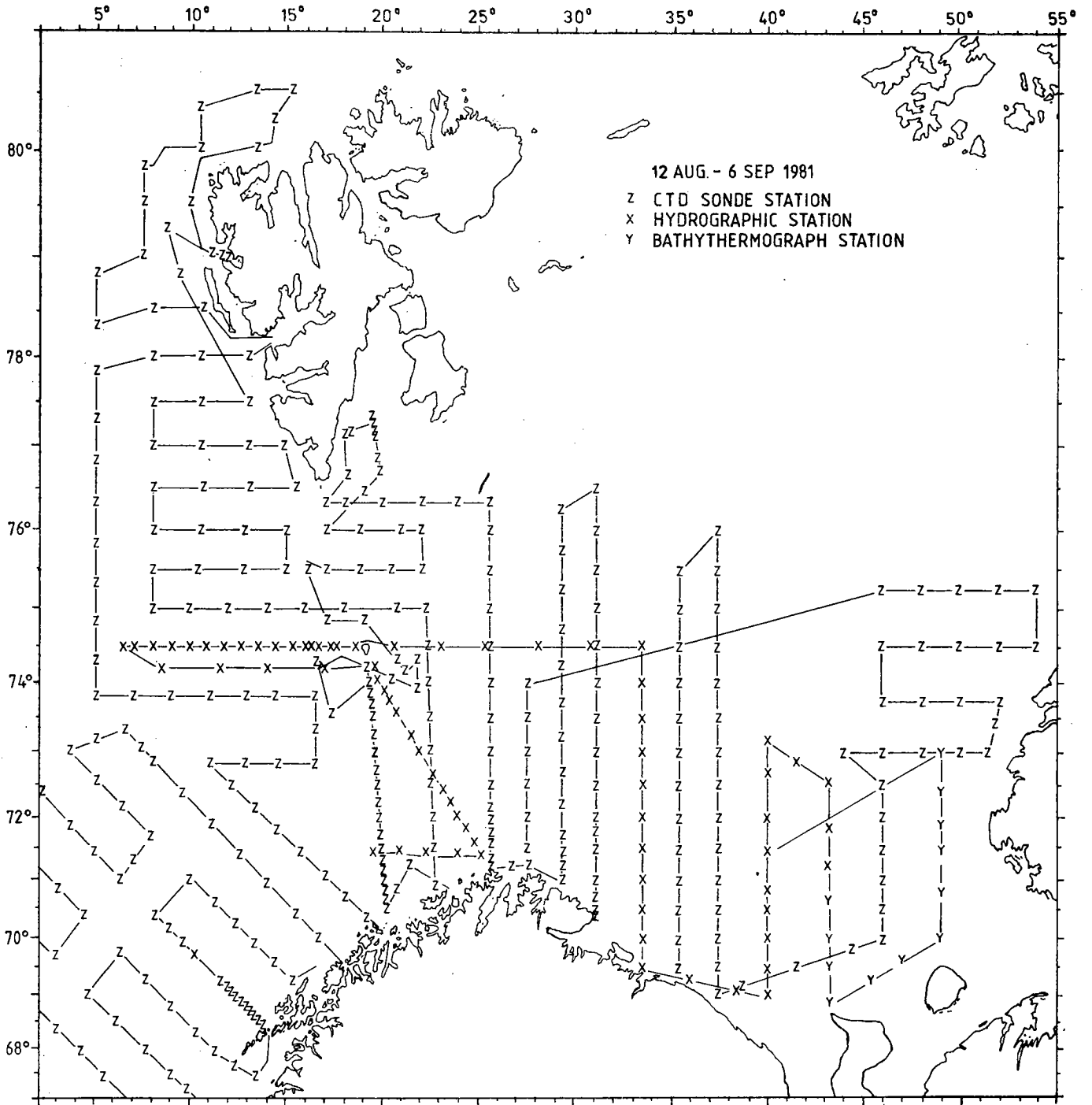


Fig. 1. Survey tracks of the ships and the grid of hydrographic stations.

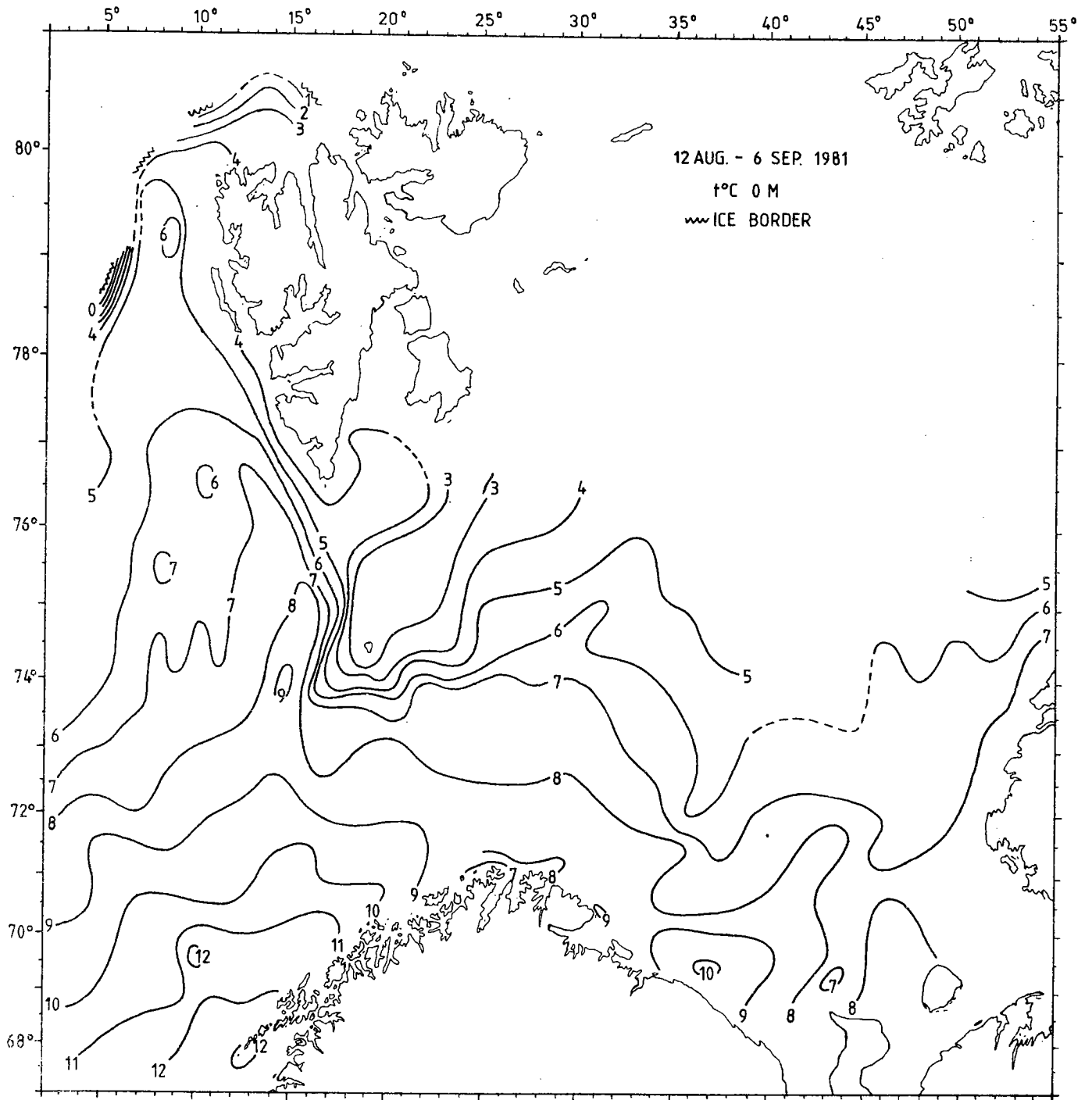


Fig. 2. Isotherms at 0 m.

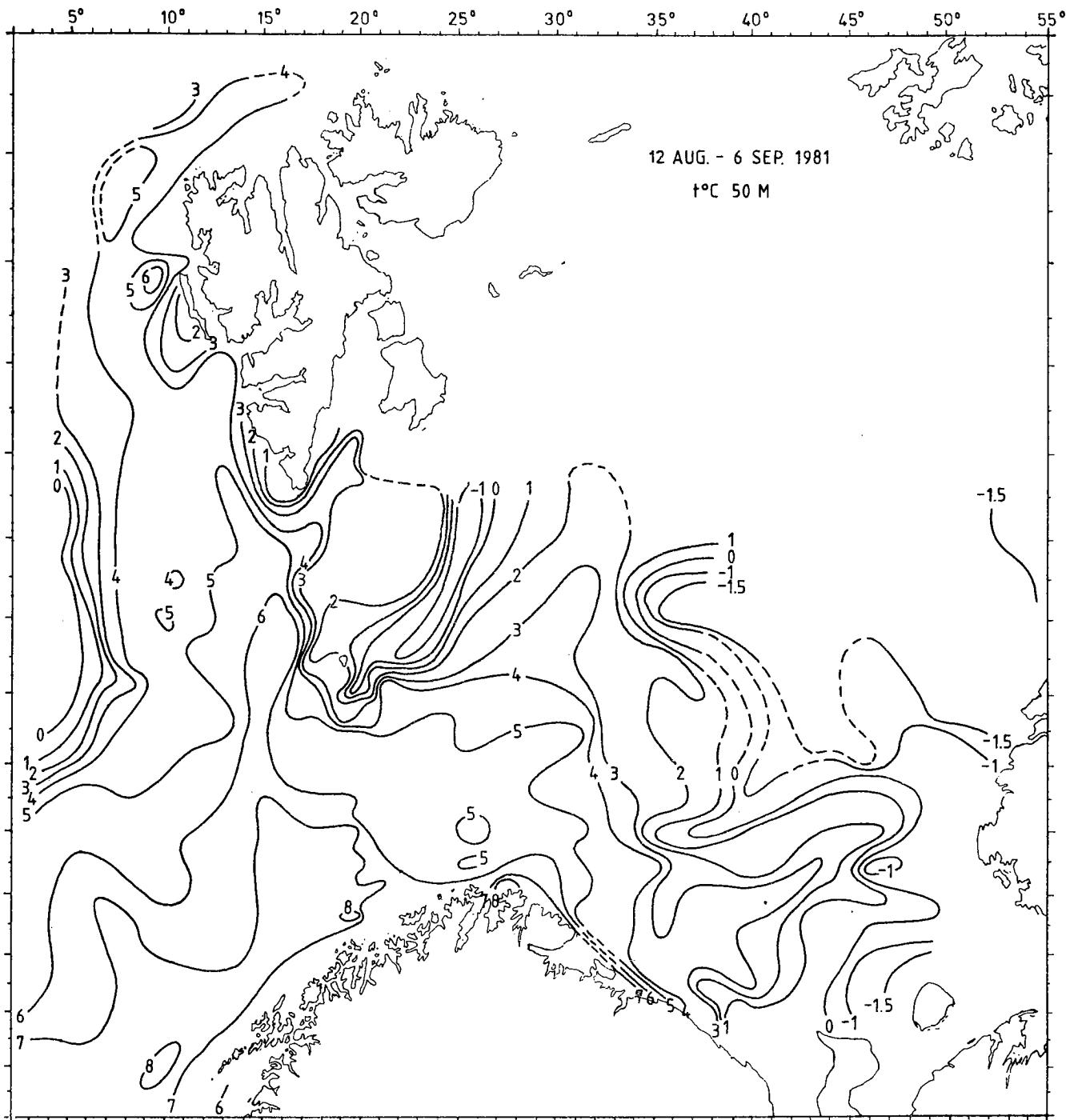


Fig. 3. Isotherms at 50 m.

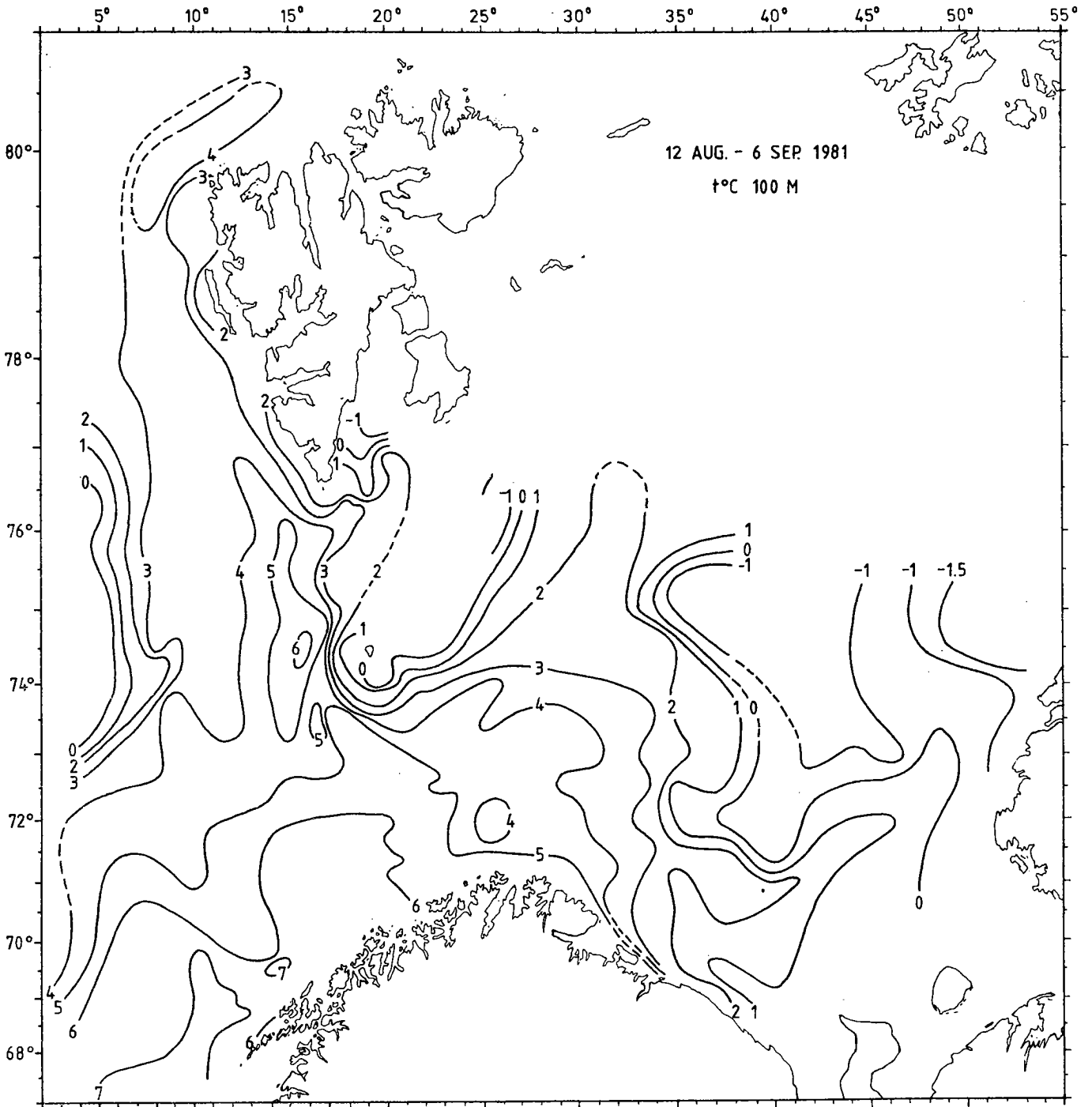


Fig. 4. Isotherms at 100 m.

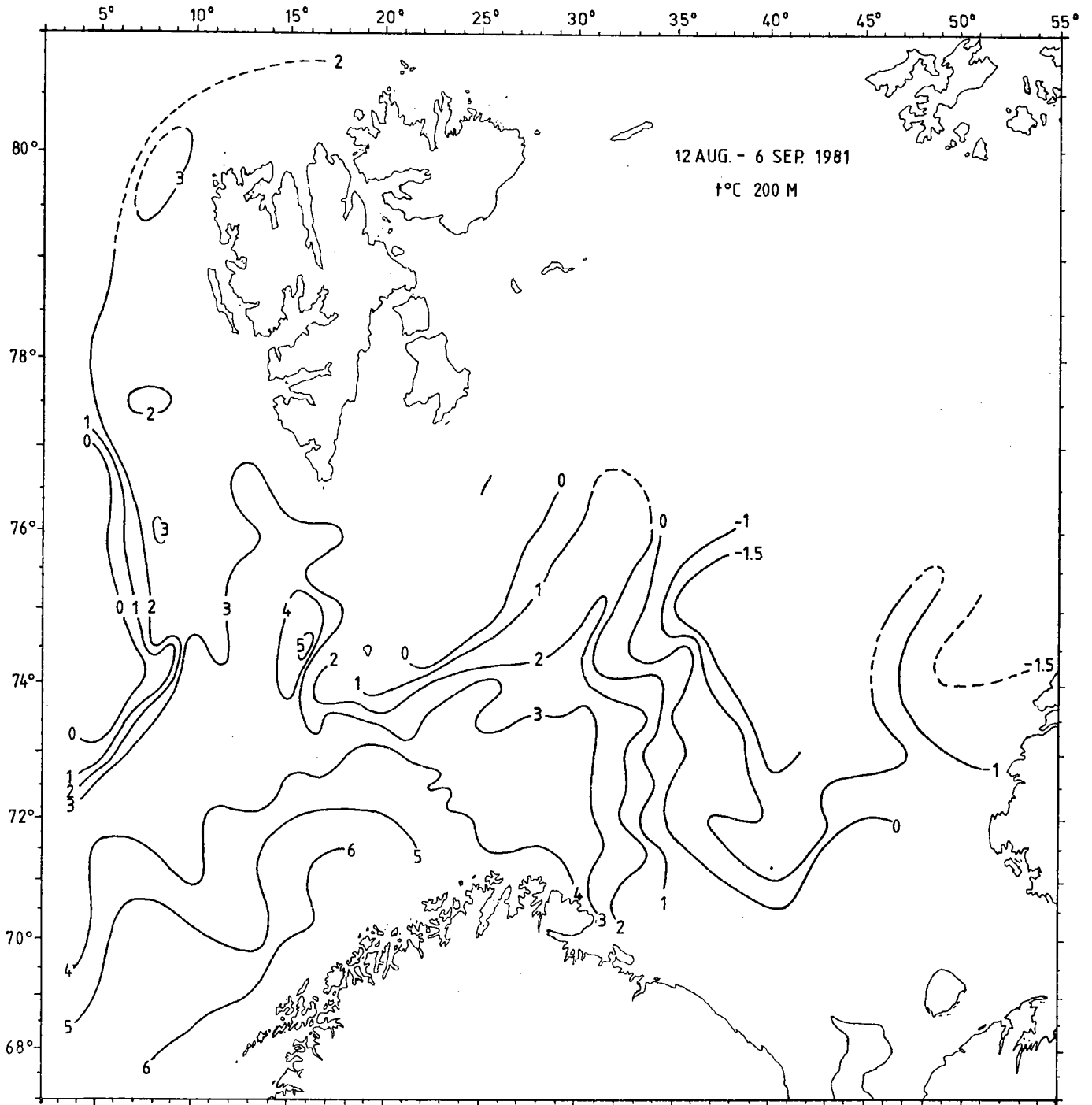


Fig. 5. Isotherms at 200 m.

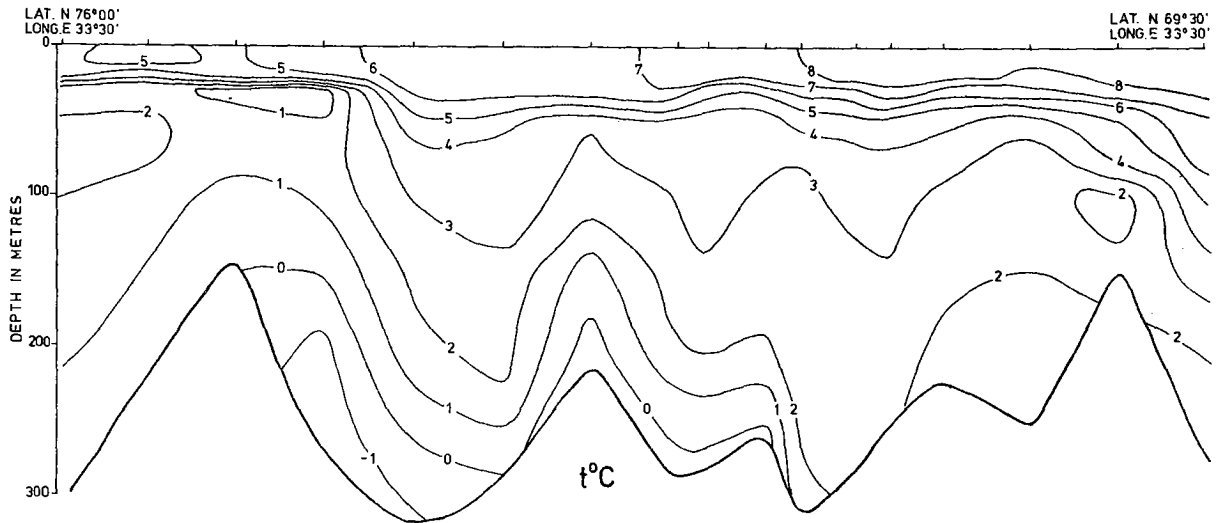


Fig. 6. Temperature section along the Kola meridian.

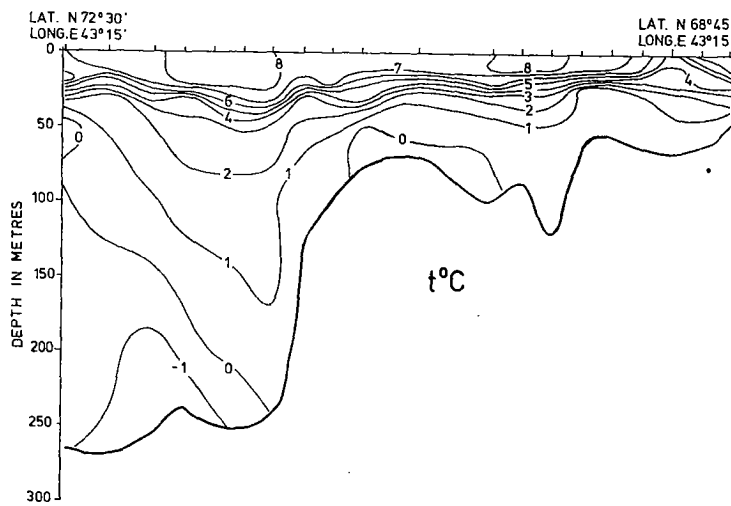


Fig. 7. Temperature section Cape Kanin - North.

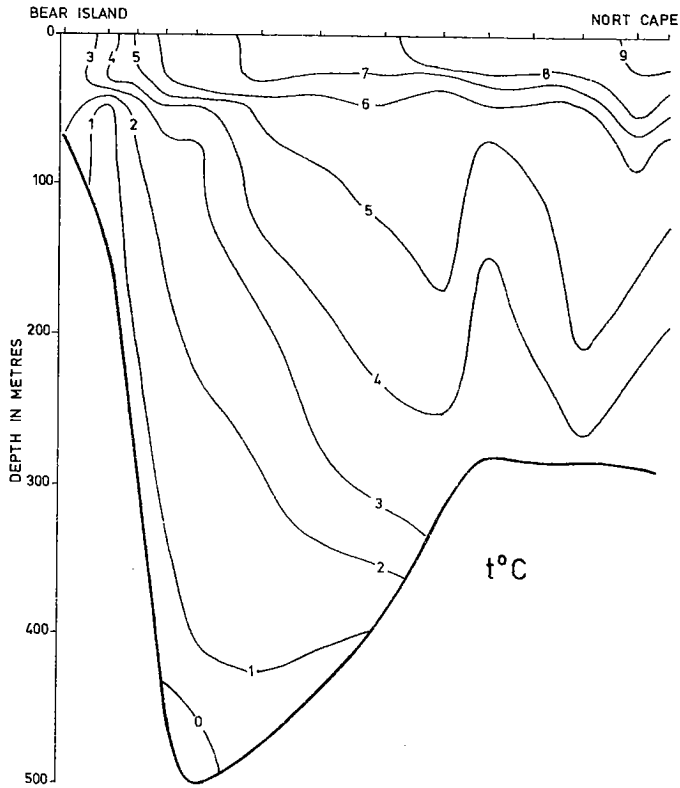


Fig. 8. Temperature section Bear Island - North Cape.

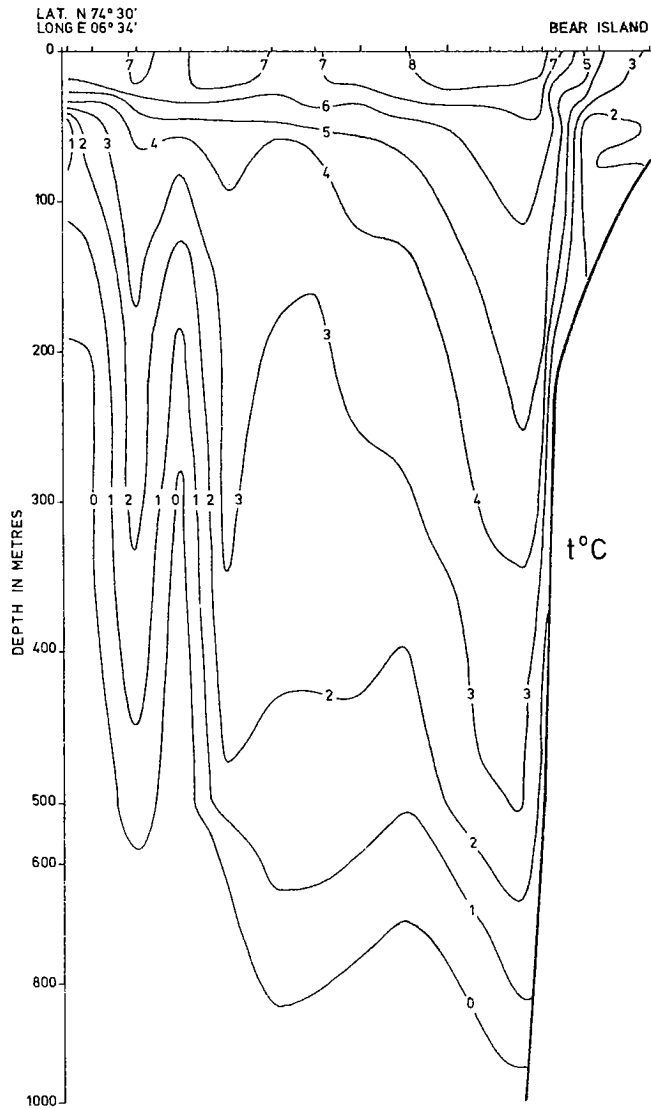


Fig. 9. Temperature section Bear Island - West.

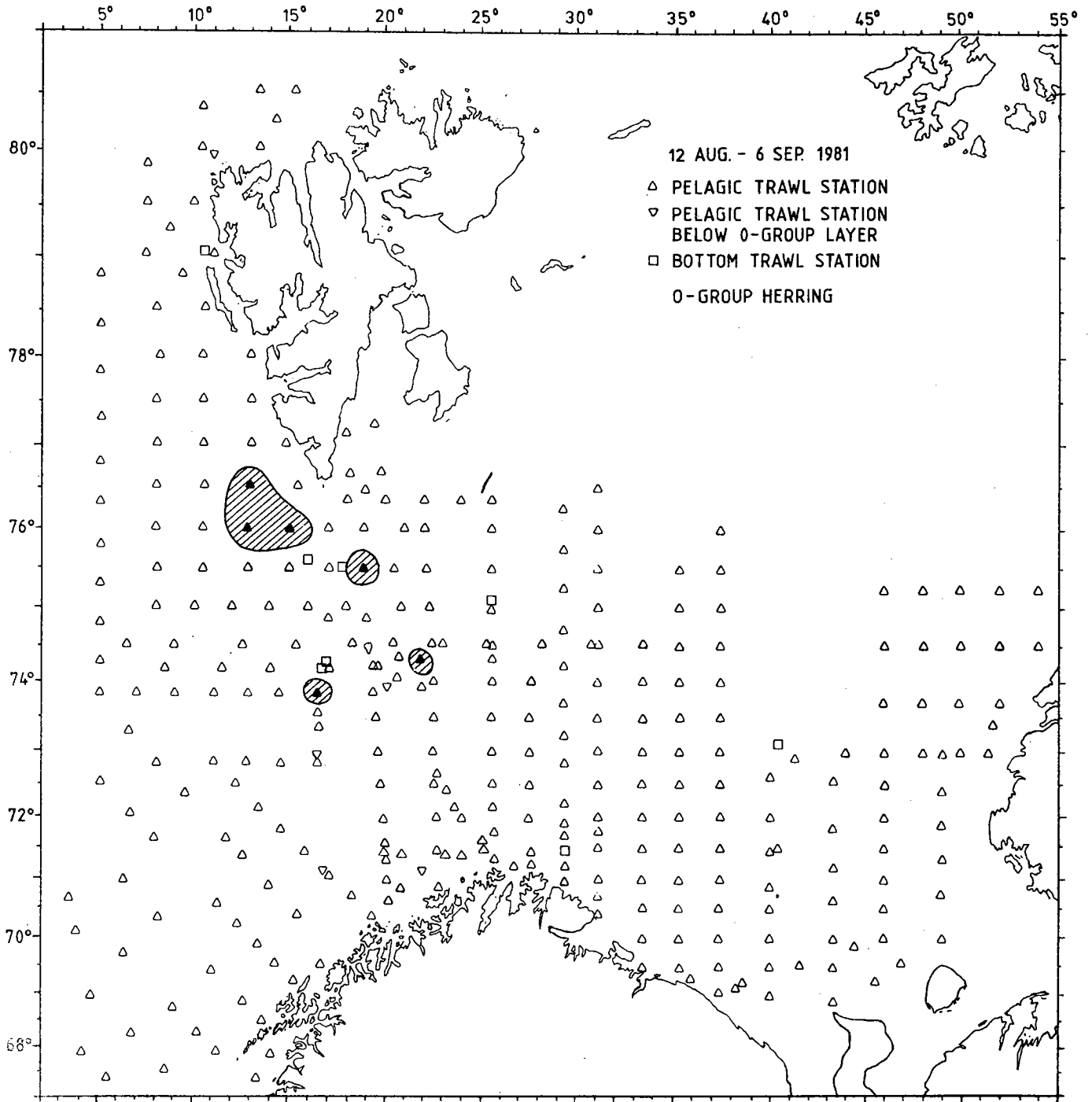


Fig. 10. Distribution of 0-group herring.

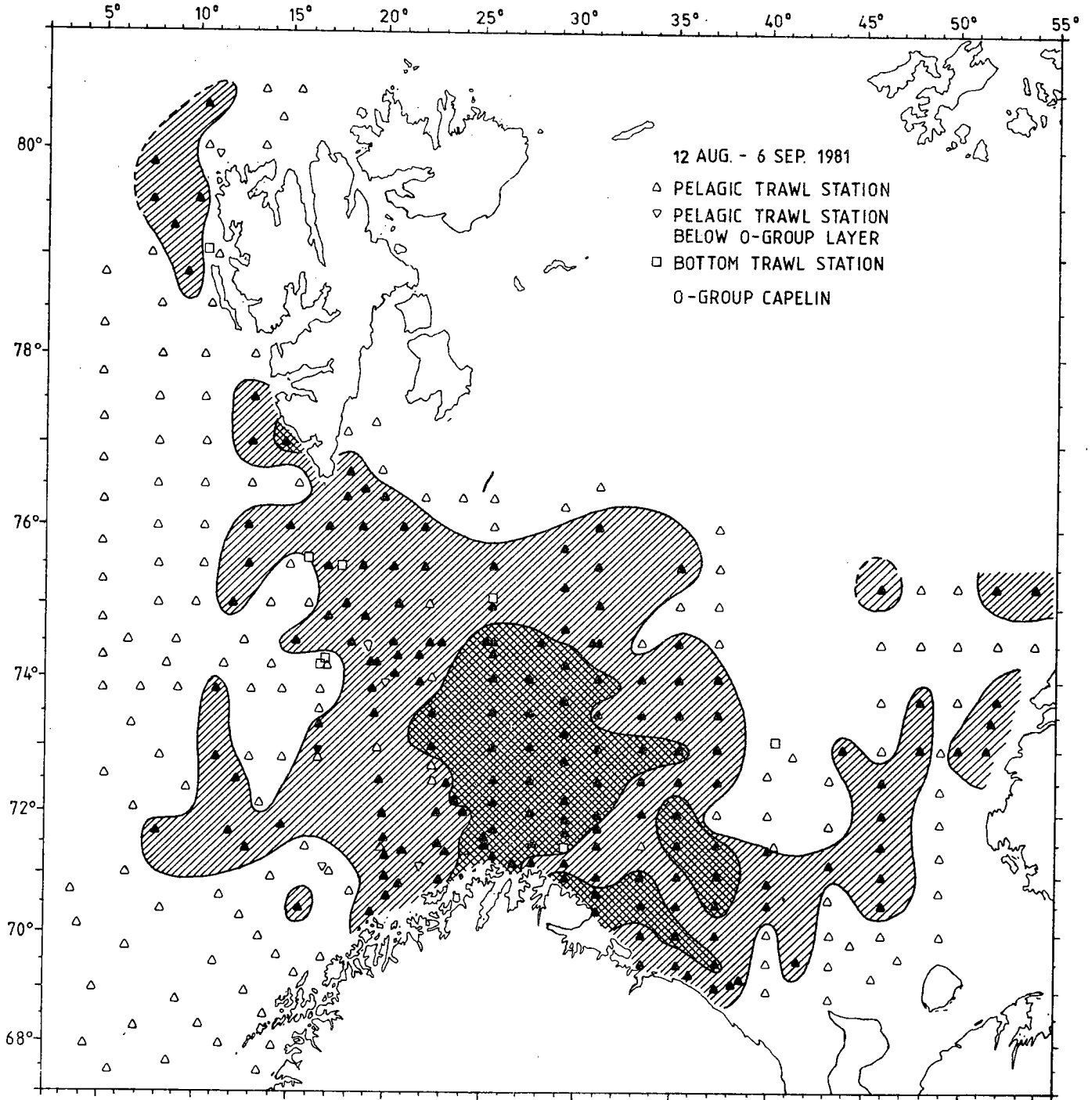


Fig. 11. Distribution of 0-group capelin.

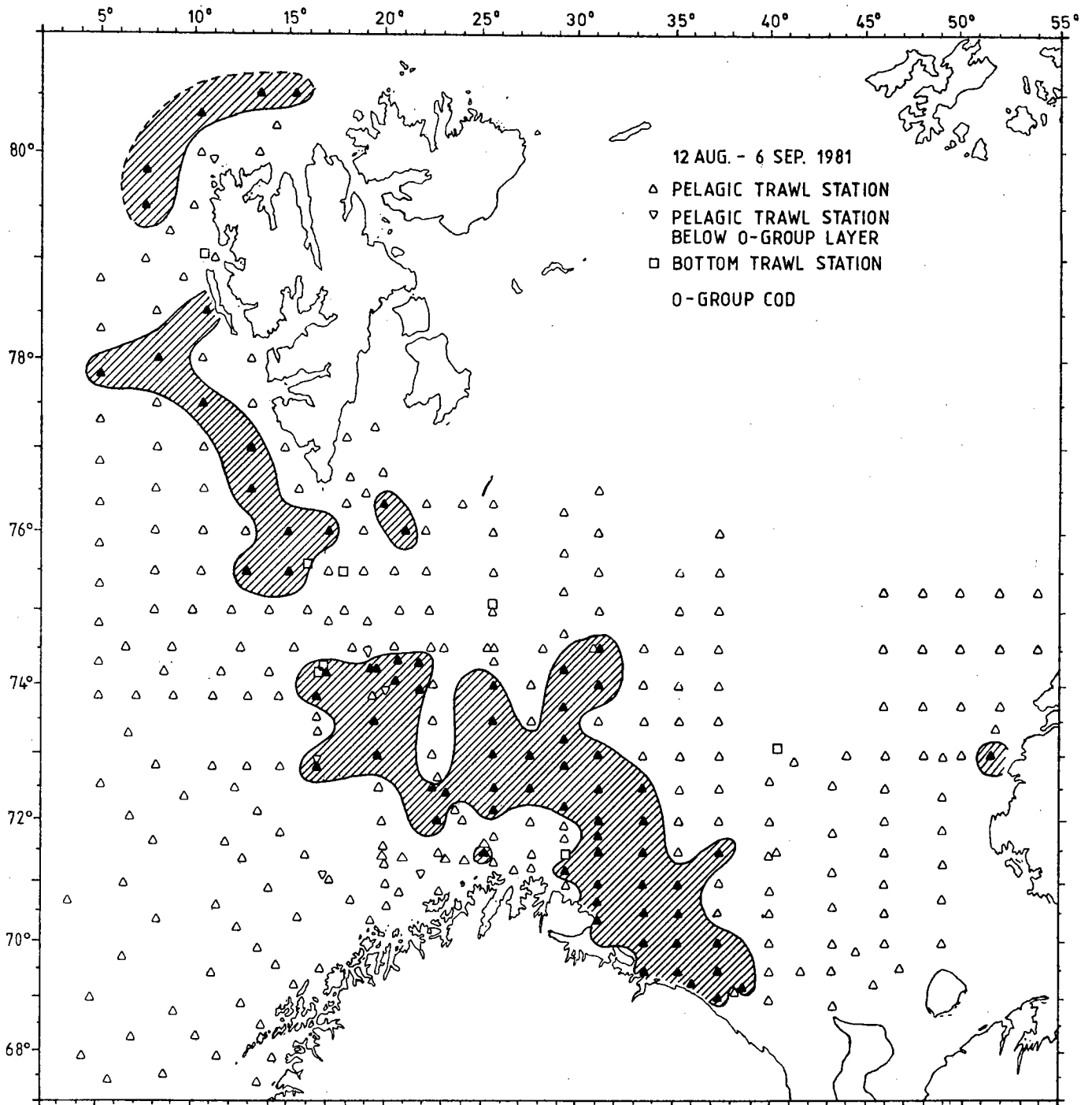


Fig. 12. Distribution of 0-group cod.

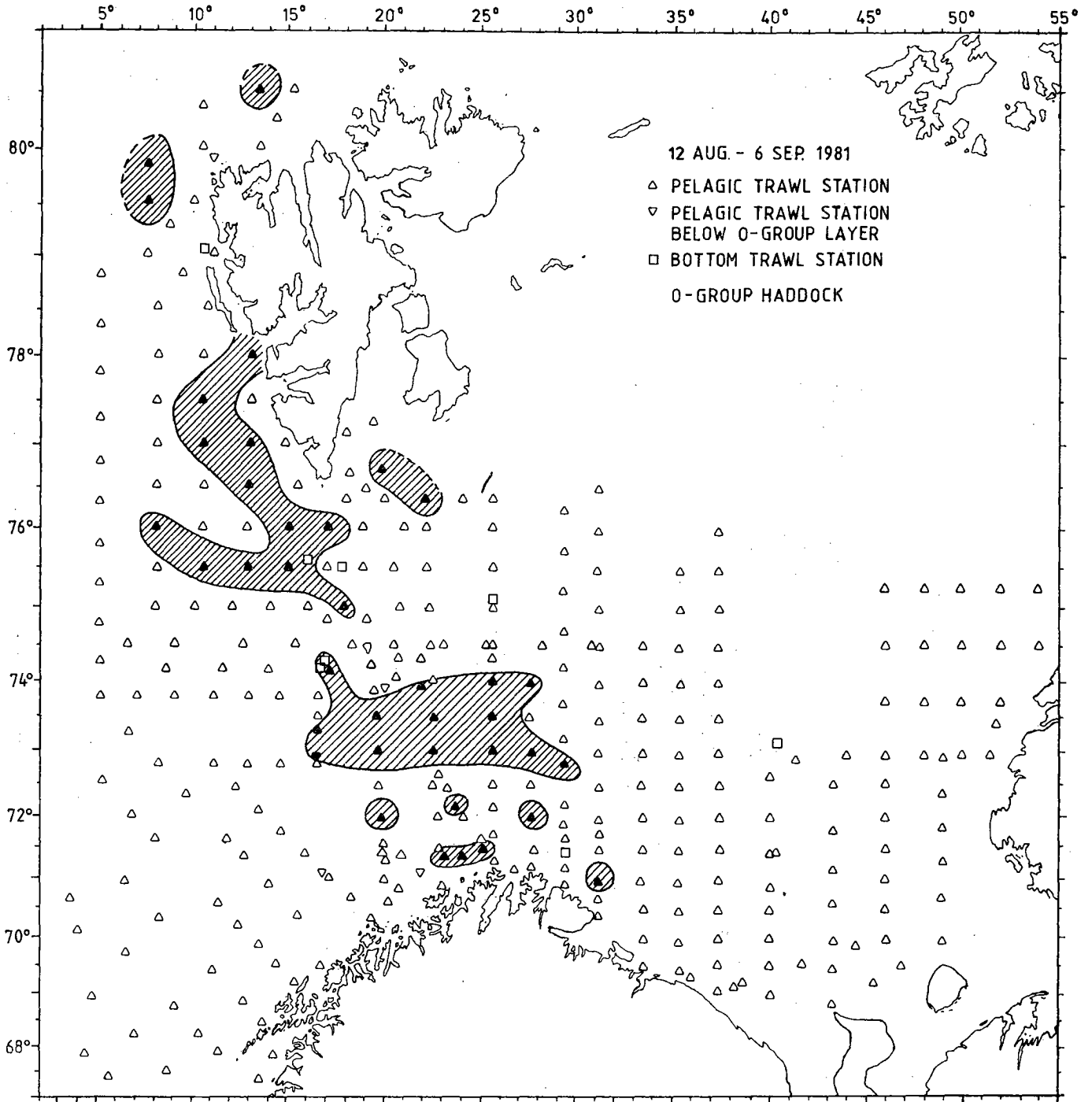


Fig. 13. Distribution of 0-group haddock.

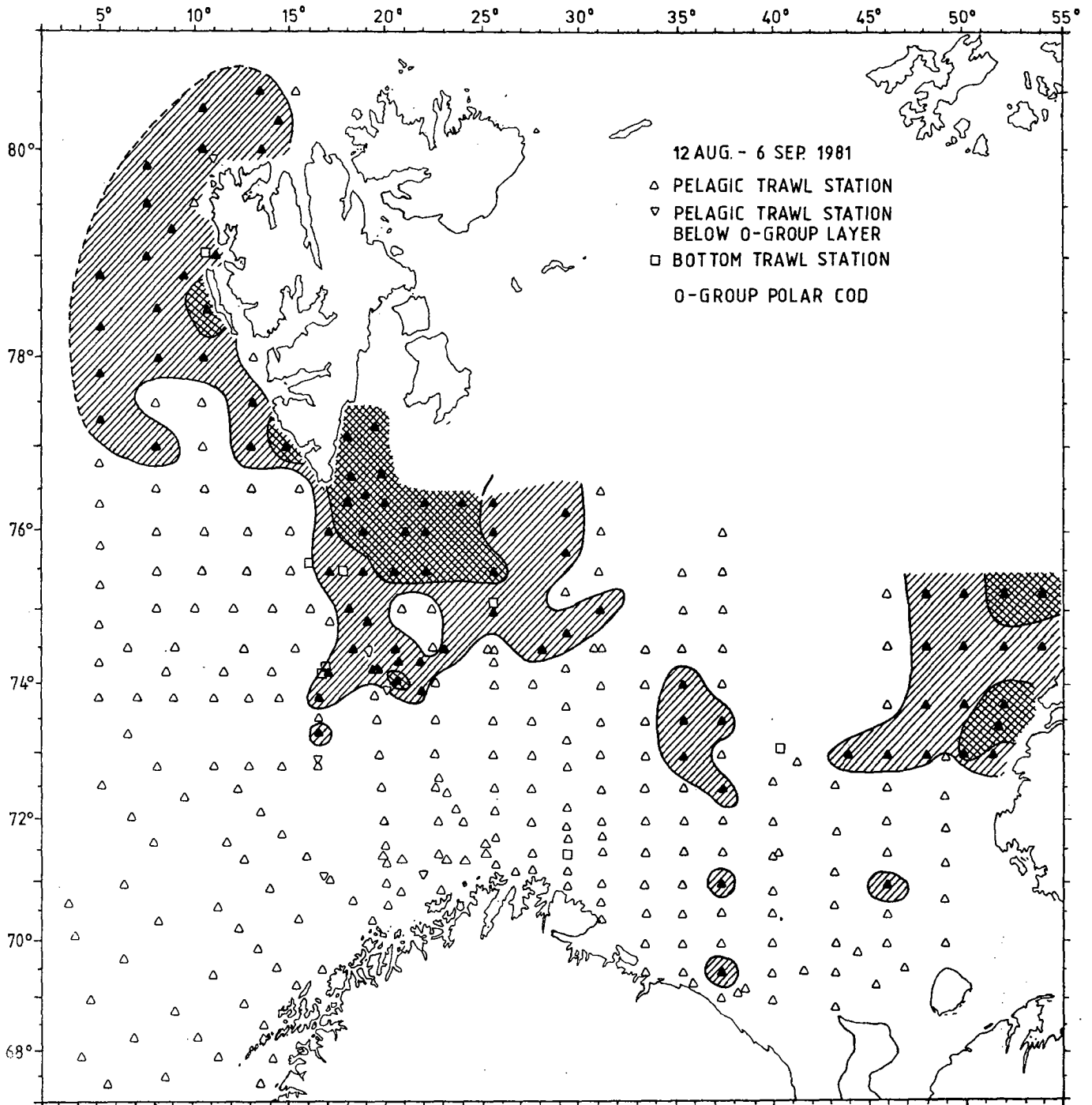


Fig. 14. Distribution of 0-group polar cod.

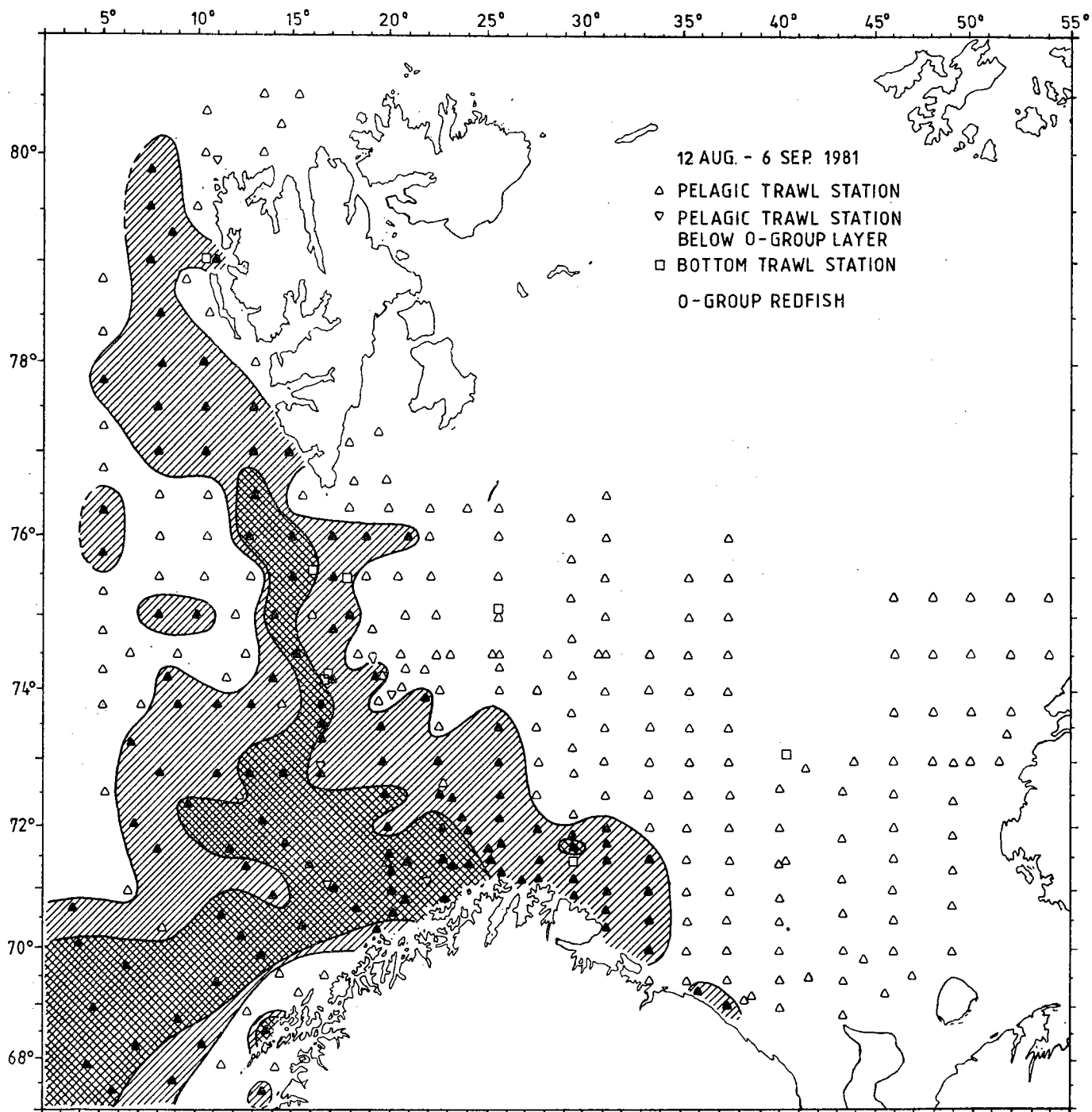


Fig. 15. Distribution of 0-group redfish.

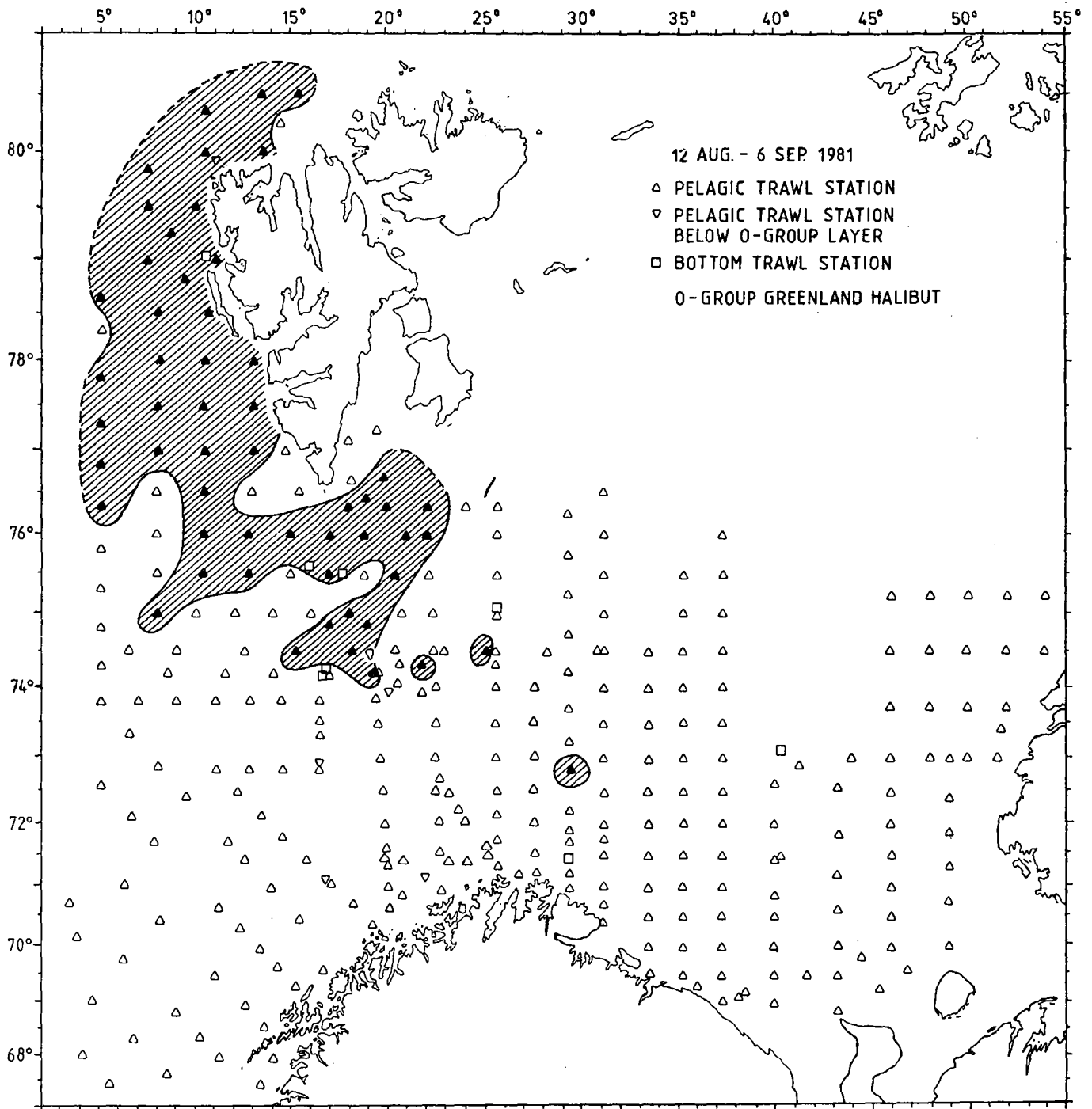


Fig. 16. Distribution of 0-group Greenland halibut.

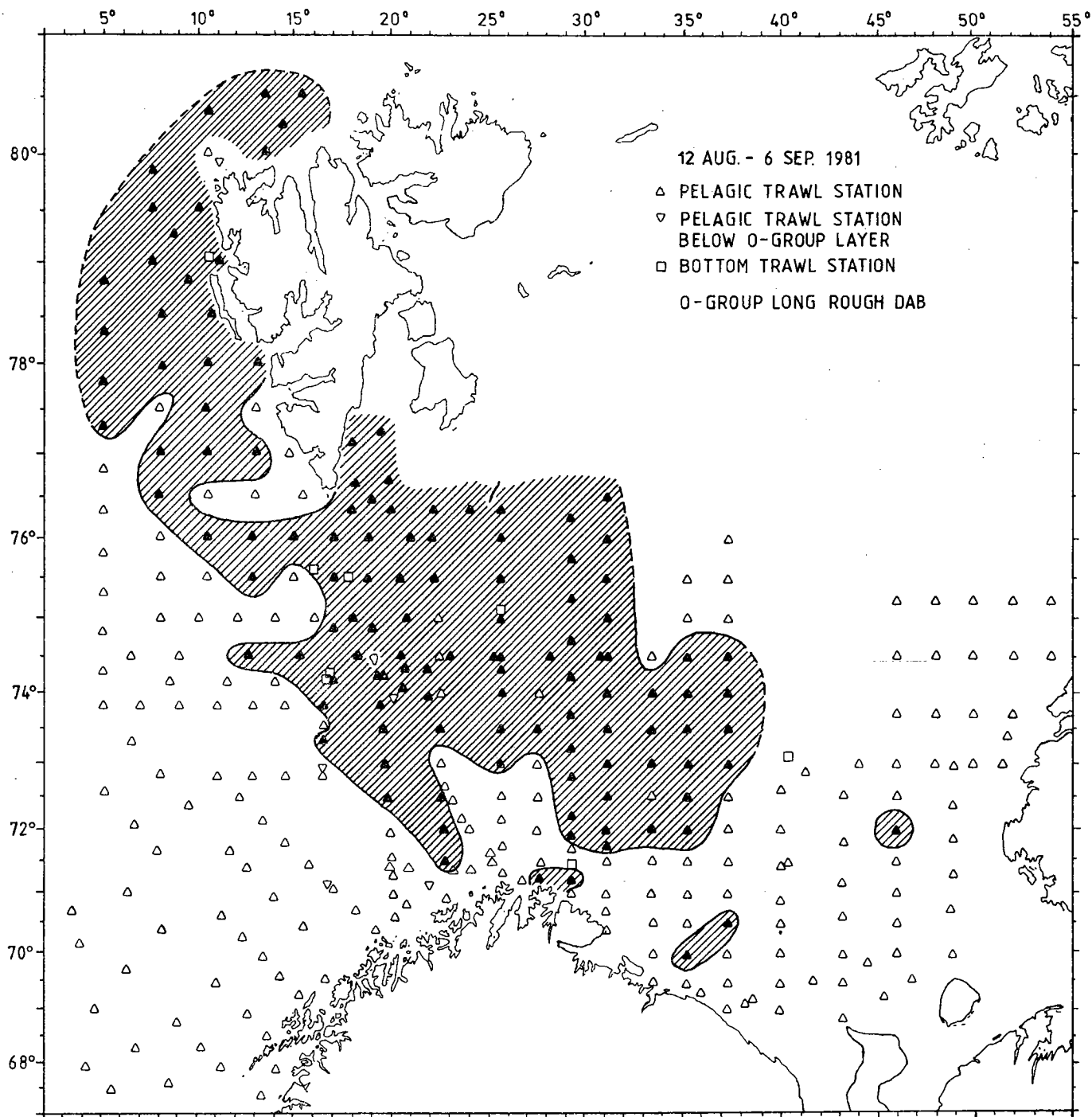


Fig. 17. Distribution of 0-group long rough dab.

Table 1. Mean water temperature in the Murmansk Current, the Kola section (between 70°30'N and 69°30'N) at the end of August and at the beginning of September (t°C).

| Year | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | Average 1965-1981 | |
|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------------------|--|
| Layer | | | | | | | | | | | | | | | | | | | |
| 0-50 m | 6.7 | 6.7 | 7.5 | 6.4 | 6.7 | 7.8 | 7.1 | 8.7 | 7.7 | 8.1 | 7.0 | 8.1 | 6.9 | 6.6 | 6.5 | 7.4 | 6.6 | 7.2 | |
| 50-200 m | 3.8 | 2.6 | 4.0 | 3.7 | 3.1 | 3.6 | 3.2 | 4.0 | 4.5 | 3.9 | 4.6 | 4.0 | 3.4 | 2.5 | 2.9 | 3.5 | 2.7 | 3.5 | |
| 0-200 m | 4.6 | 3.6 | 4.9 | 4.4 | 4.0 | 4.7 | 4.2 | 5.2 | 5.5 | 4.9 | 5.2 | 5.0 | 4.3 | 3.6 | 3.8 | 4.5 | 3.7 | 4.5 | |

Table 2. Mean water temperature in the Cape Canin - North section (between 68°45'N and 72°00'N) from surface to bottom at the end of August and at the beginning of September (t°C).

| Year | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | Average 1965-1981 | |
|-----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------------------|-----|
| Layer | | | | | | | | | | | | | | | | | | | |
| 1 68°45'N | 4.8 | 2.0 | 6.1 | 4.7 | 2.6 | 4.0 | 4.0 | 5.1 | 5.7 | 4.6 | 5.6 | 4.9 | 4.1 | 2.4 | 2.0 | 3.3 | 2.7 | 4.0 | |
| 2 70°05'N | | | | | | | | | | | | | | | | | | | |
| 3 71°00'N | 4.2 | 2.5 | 3.6 | 3.1 | 2.3 | 3.3 | 3.2 | 4.1 | 4.5 | - | 4.3 | 4.6 | 3.3 | 1.7 | 1.8 | 3.0 | 2.5 | 3.3 | |
| 4 72°00'N | | | | | | | | | | | | | | | | | | | 3.3 |

Table 3. Mean water temperature in the North Cape current, the North Cape to Bear Island section (between 71°33'N, 25°02'E and 73°35'N, 20°46'E) at the end of August and at the beginning of September (t°C).

| Year | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | Average 1965-1981 | |
|---------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------------------|--|
| Layer | | | | | | | | | | | | | | | | | | | |
| 0-200 m | 5.1 | 5.5 | 5.6 | 5.4 | 6.0 | 6.1 | 5.7 | 6.3 | 5.9 | 6.1 | 5.7 | 5.7 | 4.8 | 5.0 | 5.3 | 5.7 | 5.3 | 5.6 | |

Table 4. Mean water temperature in the West Spitsbergen current along the Bear Island West section (between 06°34'E and 15°55'E) at the end of August and at the beginning of September (t°C).

| Year | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | Average 1965-1981 | |
|---------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------------------|--|
| Layer | | | | | | | | | | | | | | | | | | |
| 0-200 m | 3.3 | 4.2 | 3.6 | 4.2 | - | 4.2 | 3.9 | 5.0 | 4.6 | 4.9 | 5.0 | 4.0 | 4.1 | 4.4 | 4.9 | 4.4 | 4.3 | |

Table 5. Abundance indices.

| Year | Species | Cod | Haddock | Polar cod | | Redfish | Greenland Halibut | Long rough dab |
|------|---------|-----|---------|-----------|------|---------|-------------------|----------------|
| | | | | West | East | | | |
| 1965 | | 6 | 7 | 0 | | 159 | | 66 |
| 1966 | | 1 | 1 | 129 | | 236 | | 97 |
| 1967 | | 34 | 42 | 165 | | 44 | | 73 |
| 1968 | | 25 | 8 | 60 | | 21 | | 17 |
| 1969 | | 93 | 82 | 208 | | 295 | | 26 |
| 1970 | | 606 | 115 | 197 | | 247 | | 12 |
| 1971 | | 157 | 73 | 181 | | 172 | | 81 |
| 1972 | | 140 | 46 | 140 | | 177 | | 65 |
| 1973 | | 684 | 54 | (26) | | 385 | | 67 |
| 1974 | | 51 | 147 | 227 | | 468 | | 83 |
| 1975 | | 343 | 170 | 75 | | 315 | | 113 |
| 1976 | | 43 | 112 | 131 | | 447 | | 96 |
| 1977 | | 173 | 116 | 157 | 70 | 472 | | 72 |
| 1978 | | 106 | 61 | 107 | 144 | 460 | | 76 |
| 1979 | | 94 | 69 | 23 | 302 | 980 | | 69 |
| 1980 | | 49 | 54 | 79 | 247 | 651 | | 108 |
| 1981 | | 65 | 30 | 149 | 73 | 861 | 38.0 | 95 |

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24
1

Table 6. Length distribution of 0-group fish in per cent.

| Length mm | Herring | Capelin | Polar cod | | Greenland Halibut | Long rough dab | Haddock | Cod | Redfish |
|--------------|---------|---------|-----------|-------|----------------------|-------------------|---------|------|---------|
| | | | East | West | | | | | |
| 5-9 | | | | | | | | | 0.0 |
| 10-14 | | | | | | 0.0 | | | 1.1 |
| 15-19 | | 0.3 | | | | 2.0 | | | 1.9 |
| 20-24 | | 4.9 | 0.2 | 3.6 | | 14.6 | | | 1.9 |
| 25-29 | | 12.8 | 0.7 | 16.7 | | 36.7 | | | 2.7 |
| 30-34 | | 16.0 | 17.5 | 33.4 | | 31.9 | 1.18 | 2.2 | 2.6 |
| 35-39 | | 13.2 | 51.1 | 37.6 | 0.2 | 10.0 | 2.35 | 1.8 | 12.1 |
| 40-44 | | 16.7 | 26.9 | 8.2 | 1.1 | 3.5 | 5.88 | 5.4 | 38.5 |
| 45-49 | 23.5 | 22.6 | 3.5 | 0.4 | 3.0 | 1.2 | 4.71 | 6.5 | 29.4 |
| 50-54 | | 10.9 | 0.2 | 0.1 | 6.2 | 0.1 | 5.9 | 15.2 | 9.6 |
| 55-59 | 17.7 | 2.7 | | 0.0 | 12.1 | 0.0 | 11.8 | 14.8 | 0.2 |
| 60-64 | 58.8 | 0.1 | | | 19.9 | | 5.9 | 14.4 | |
| 65-69 | 11.8 | 0.0 | | | 25.6 | | 28.2 | 18.8 | |
| 70-74 | | | | | 24.3 | | 5.9 | 14.4 | |
| 75-79 | | | | | 6.6 | | 10.6 | 5.4 | |
| 80-84 | | | | | 0.9 | | 8.2 | 1.1 | |
| 85-89 | | | | | | | 5.9 | | |
| 90-94 | | | | | | | 3.5 | | |
| N | 19 | 658174 | 2176 | 43207 | 437 | 4052 | 85 | 277 | 982905 |
| Mean Length | 59.1 | 39.9 | 38.2 | 34.1 | 65.4 | 29.9 | 66.3 | 60.5 | 42.5 |

Table 7. Abundance indices with 90% confidence limits for 0-group cod.

| Year class | Logarithmic indices | | Retransformed indices | |
|------------|---------------------|-------------------|-----------------------|-------------------|
| | Index | Confidence limits | Index | Confidence limits |
| 1965 | 0.01 | x) | 0.10 | x) |
| 1966 | 0.03 | 0.02-0.05 | 0.14 | 0.14-0.15 |
| 1967 | 0.06 | 0.03-0.11 | 0.34 | 0.30-0.37 |
| 1968 | 0.02 | 0.01-0.05 | 0.24 | 0.22-0.26 |
| 1969 | 0.31 | 0.22-0.43 | 2.51 | 2.20-2.87 |
| 1970 | 2.54 | 2.07-3.01 | 369.19 | 268.89-506.91 |
| 1971 | 0.83 | 0.61-1.08 | 28.13 | 9.15-47.11 |
| 1972 | 0.62 | 0.42-0.86 | 6.47 | 5.10-8.19 |
| 1973 | 1.33 | 1.04-1.66 | 170.69 | 126.90-229.60 |
| 1974 | 0.35 | 0.22-0.51 | 6.50 | 4.81-8.12 |
| 1975 | 0.97 | 0.71-1.27 | 157.87 | 114.13-218.39 |
| 1976 | 0.15 | 0.07-0.26 | 1.26 | 1.01-1.56 |
| 1977 | 0.51 | 0.37-0.69 | 12.81 | 4.53-21.08 |
| 1978 | 0.28 | 0.18-0.39 | 3.72 | 3.15-4.39 |
| 1979 | 0.44 | 0.30-0.61 | 3.36 | 2.71-4.17 |
| 1980 | 0.17 | 0.11-0.24 | 0.98 | 0.88-1.09 |
| 1981 | 0.11 | 0.06-0.19 | 0.71 | 0.61-0.82 |

x) 0-group cod caught only in one haul.

APPENDIX

| Survey period | Research vessel | Research Institute | Participants |
|-------------------------|-----------------|---|---|
| 22 August - 6 September | "Persey III" | Polar Research Institute of Marine Fisheries and Oceanography, Murmansk | I.V. Borokin, N.P. Chebotok, A.S. Galikin, A.Sh. Gubaidullin, A.V. Ilyina, V.A. Khlyupin, L.N. Korol, S.A. Larkina, S.d. Melnikov, V.V. Podolsky, N.V. Vanyukhina, V.I. Zubov. |
| 23 August - 1 September | "Akhill" | " " | A.I. Lysota, V.I. Ashikhmin. |
| 12 August - 4 September | "Michael Sars" | Institute of Marine Research, Bergen | M. Abrahamson, S. Andraassen, J. Blindheim, A. Dommarnes, B. Hofstad, A.L. Halvorsen, T. Mørk, Ø. Skåthun, Ø. Tangen, J. Vartdal. |
| 14 August - 4 September | "G.O. Sars" | " " | O. Alvheim, B. Brynildsen, I. Byrkjedal, K. Hansen, K. Hestenes, A. Høyen, O.S. Kjesbu, W. Løtvedt, L. Middtun, E. Molvær, G. Molvik, T. Monstad, R. Pedersen, O.I. Poulsen, A. Randa, A. Roald, S. Sveinbjørnsson. |
| 21 August - 5 September | "Johan Hjort" | " " | G. Farstad, T. Jakobsen, H. Larsen, O. Martinsen, J.P. Maude, Ø. Torgersen. |