International Council for
the Exploration of the Sea

CM 1979/H:65
Pelagic Fish Committee
Ref: Demersal Fish and
Hydrographic Committees

Preliminary report of the International 0-group fish survey in the Barents Sea and adjacent waters in August-September 1979

The fifteenth annual International 0-group fish survey was made during the period 19 August-14 September 1979 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"	26 August-14 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	19 August-14 September	" "
USSR	"Poisk"	29 August-14 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Akhill"	1 September-3 September	" "

Name of scientists and technicians who took part on the different vessels are given in the Appendix.

The survey data was analysed the 15-16 September in Hammerfest. Observations concerning the geographical distribution of 0-group fish and their abundance are given in this report together with a brief description of the temperature condition in the area.

Material and methods

Most of the trawl hauls are made at the depth of the heaviest trace of 0-group fish recorded on the echosounder, mainly between 0-50 m. Trawling procedure has been the same as in 1977 and 1978 (Ann. biol. 1978).

R/V "G.O. Sars" and R/V "Johan Hjort" are operating the midwater trawl from the stern, while R/V "Poisk" does it from the side of the vessel. The midwater trawl used by the Norwegian vessels has a 16 fathom horizontal and vertical opening, while the measures of the trawl used by the USSR vessel are 8-11 m and 4 m respectively. Norwegian vessels are able to trawl near the surface by using 4 bigger floats on the headline. Such floats are not used by the USSR vessel, and she is, therefore, not able to trawl in the near surface layer. All these factors give a low catch performance of the USSR vessel, especially for redfish and capelin. The catch rates of this vessel have, therefore, only been used as a guideline in the drawing of distribution charts for 0-group fish.

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.

Results

Hydrography (Figs. 2-9 and Tables 1-4)

Hydrographic observations were made along all survey tracks, mainly at each 30 nautical mile. Horizontal temperature distributions are shown for 0, 50 100 and 200 m depth (Figs. 2-5). Temperature condition is given in Figs. 6-9 for four standard hydrographic sections and the average temperature in these sections are given in Tables 1-4. Some general comments are given:

1) Kola section

The cooling of the 0-50 m, 50-200 m and 0-200 m layers observed from 1976 to 1978 was nearly reversed in 1979. However, the average temperature is still below the average for the period 1965-1979, with an anomalies of -0.7° for all three layers.

2) Cape Kanin - North section

A further decrease of average temperature in the 0 to bottom layer was observed from 1978 to 1979 in the southern part of the section (2.4 °C to 2.0 °C). In the northern part, the average temperature increased from 1.7 °C to 1.8 °C. For both parts of the section the temperature condition was at the lowest level recorded for the period, with anomalies of -2.2 and -1.5° respectively.

3) North Cape - Bear Island section

The average temperature in the 0-200 m layer increased from 5.0 °C in 1978 to 5.3 °C in 1979. However, the anomalies is still -0.3 °.

4) Bear Island - West section

The average temperature in the 0-200 m layer increased from 4.1 °C in 1978 to 4.4 °C in 1979, compared with the average 4.3 °C for the period 1966-1979.

In general, the temperatures in the Barents Sea were low in 1979. This should indicate a low water transport by the main current in this area. The average temperature condition west of Bear Island indicates a more normal transport by the Spitsbergen current.

Distribution and abundance of 0-group fish

Geographical distribution of 0-group fish are shown by shaded areas in Figs. 10-18. Double shading indicates dense concentrations. Criteria used to discriminate between scattered and dense concentrations are the same as used in earlier reports (Ann. biol. 1978).

Abundance indices estimated as the area of distribution, areas of high densities weighted by 10, are given in Table 5.

Herring (Fig. 10)

0-group herring was distributed over an area slightly larger than in 1978, but the overall density was lower. In addition to the observations along the coast of northern Norway, smaller areas or patches were located in the area west of Spitsbergen and in the Barents Sea. The offshore patches of herring in the Barents Sea were observed in areas with dense concentration of 0-group capelin. This might have created by difficulties in selecting 0-group herring from the catches, completely dominated by 0-group capelin.

Capelin (Fig. 11)

The 0-group capelin was mostly confined to the near surface layer and almost all capelin caught were found entangled in the trawl meshes. It was distributed over a much

wider area than in the recent 3 years, and dense concentrations covered the main part of the area. This create the highest abundance index recorded for the period 1965-1979. However, in spite of the rather low correlation between 0-group indices and acoustic abundance estimate of the year class as two year old, the high abundance index indicate that the 1979 year-class is good.

Cod (Fig. 12)

0-group cod was not observed as far north west of Spitsbergen as in 1978, but the 1979 year-class was recorded further to the east than last year. More than 85 0-group cod, the number discriminating between scattered and dense concentrations, was only caught on 2 trawl stations. The estimated abundance index indicates that the 1979 year class is below average, the same classification as given for the 1978 year-class.

Haddock (Fig. 13)

0-group haddock was not observed west of Spitsbergen as in 1978. The distribution in other parts of the area was similar to that in 1978. No dense concentrations were recorded, and the abundance index indicates that the 1979 year-class is below average strength, similar to the preceding year-class.

Saithe (Fig. 14)

In most years, only few 0-group saithe have been recorded outside the Norwegian coastal waters. However, in 1979 a patch was observed in the area west of Spitsbergen, a situation similar to that in 1967. No abundance index of any significance can be estimated on the basis of the survey data.

Polar cod (Fig. 15)

The distribution of 0-group polar cod was more or less similar to those of the preceding two years, with the Spitsbergen and the Novaya Zemlja components. Because of limited research vessel time, the area of distribution was not adequately covered, either in 1978 or in 1979. The estimated abundance indices are therefore too low for both components. However, even so the high abundance index of the 1979 year-class in the eastern component indicate a good year-class.

Redfish (Fig. 16)

The area of distribution was similar to that in 1978. However, a bigger area of dense concentration was observed. This involve a high abundance index, the highest recorded, which indicates another rich year class, the seventh in succession.

Greenland halibut (Fig. 17)

The distribution of 0-group Greenland halibut was similar to those of the two previous year classes, located mainly in the Spitsbergen area. The abundance index for the 1979 year-class indicates that it is above average strength.

Long rough dab (Fig. 18)

Unlike the previous two years, 0-group long rough dab was nearly absent in the area west of Spitsbergen. It extended further to the east in the Barents Sea than in 1978. The abundance index indicates a year-class of average strength.

Table 1. Mean water temperature in the Murmansk current, the Kola section (between 70°30' N and 72°30' N) at the end of August (T °C)

Year/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1965-1979
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	7.2
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	3.6
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

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

Year	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1965-1979
68°45'N 70°05'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	4.2
71°00'N 72°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	3.3

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 beginning of September (T °C)

Year/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1965-1979
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	5.6

Table 4. Mean water temperature in the West Spitsbergen current along the West Bear Island section (between 06°34' E and 15°55' E) in early September (T °C)

Year/ Layer	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1966-1979
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	4.3

Table 5. Abundance indices

Species Year	Cod	Haddock	Polarcod			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	< 1	12
1971	157	73		181		172	< 1	81
1972	140	46		140		177	8.0	65
1973	684	54		(26)		385	3.2	67
1974	51	147		227		468	13.4	83
1975	343	170		75		315	21.1	113
1976	43	112		131		447	15.6	96
1977	173	116	157		70	472	9.0	72
1978	106	61	107		144	460	35.4	76
1979	94	69	23		302	980	22.5	69

Appendix

Survey period	Research vessel	Research Institute	Participants
19 August- 14 September	"G.O. Sars"	Institute of Marine Research, Bergen.	A. Asenjo, E. Anziani, O. Alvhetm, H. Abrahamsen, J. Blindheim, A. Dommasnes, I. Forberg, H. Gundersen, J. Hamre, K. Hansen, K. Hestenes, A. Hylen, E. Molvær, A. Nødtvedt, A. Pedersen, A. Romslo, J. Røttingen, I. Svellingen.
26 August- 14 September	"Johan Hjort"	Institute of Marine Research, Bergen.	V.N. Bande, V. Frivoll, I. Hoff, E. Lifjell, S. Lygren, O. Martinsen, T. Monstad, Ø. Torgersen.
29 August- 14 September	"Poisk"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk.	N.G. Ushakov, V.S. Mamylov, N.P. Chebotok, B.N. Nenko, A.V. Averchenko, V.N. Zaitsev.
1 September- 3 September	"Akhill"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk.	

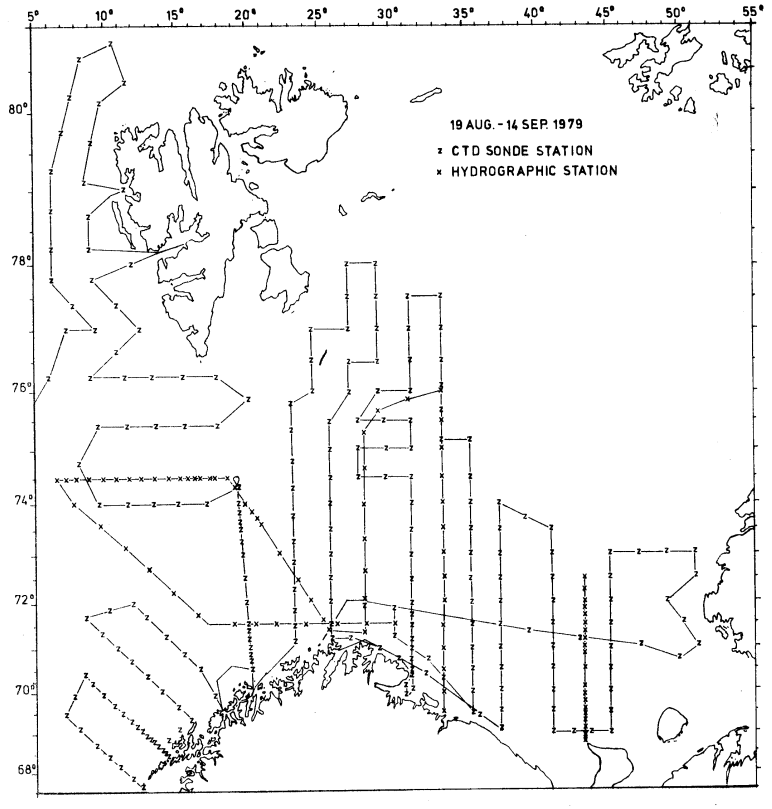

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

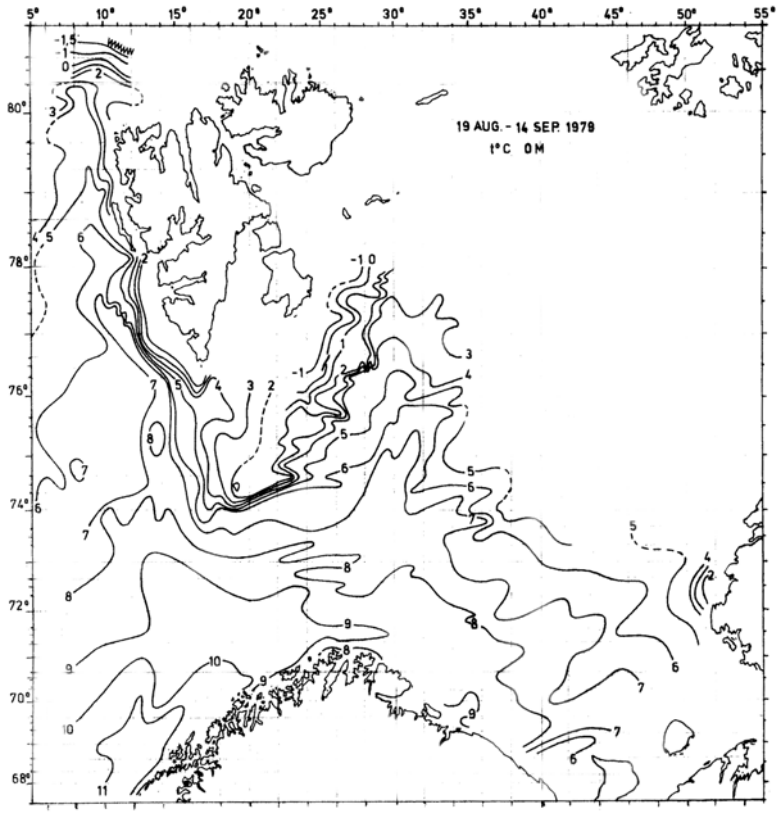

Fig. 2. Isotherms at 0 m

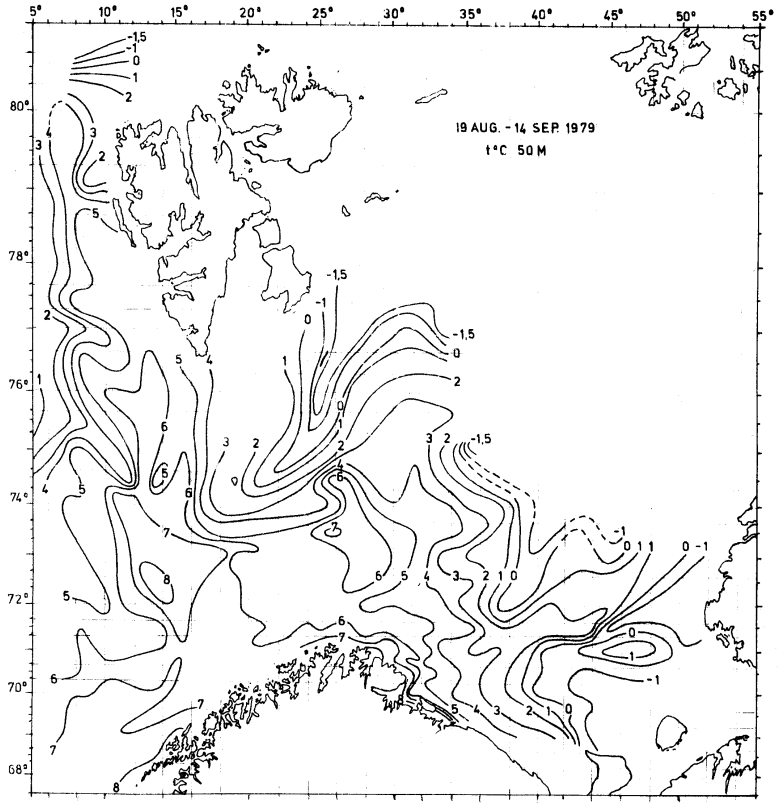

Fig. 3. Isotherms at 50 m

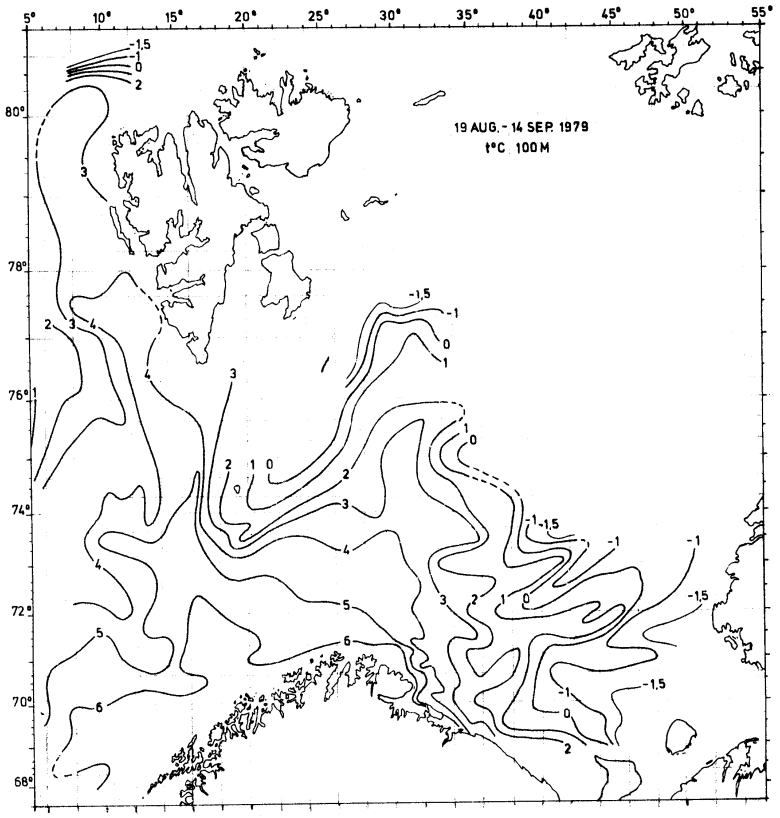

Fig. 4. Isotherms at 100 m

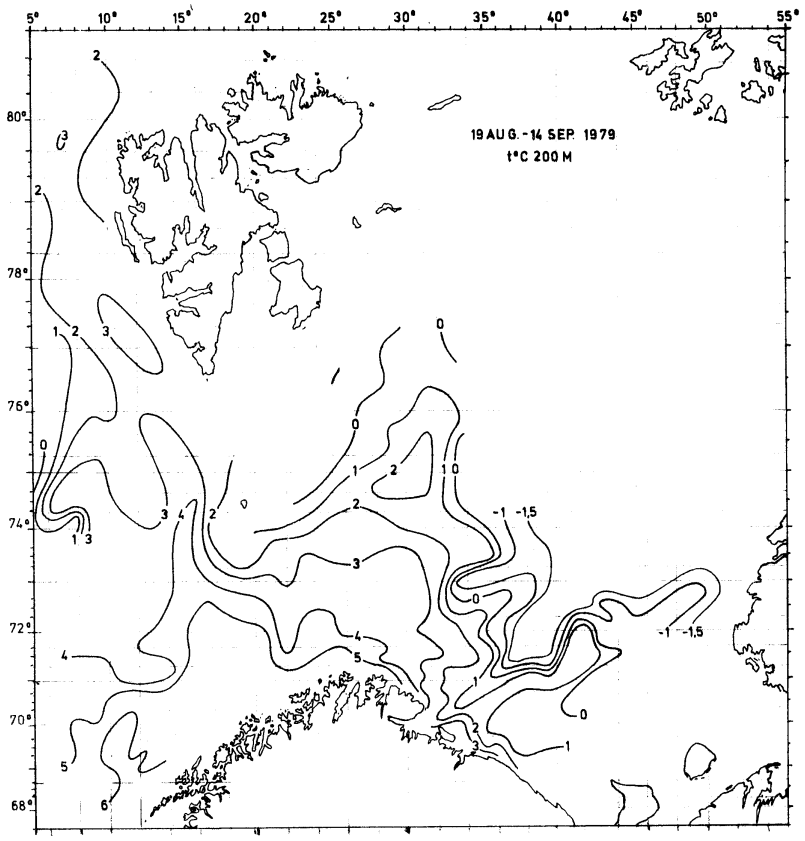

Fig. 5. Isotherms at 200 m

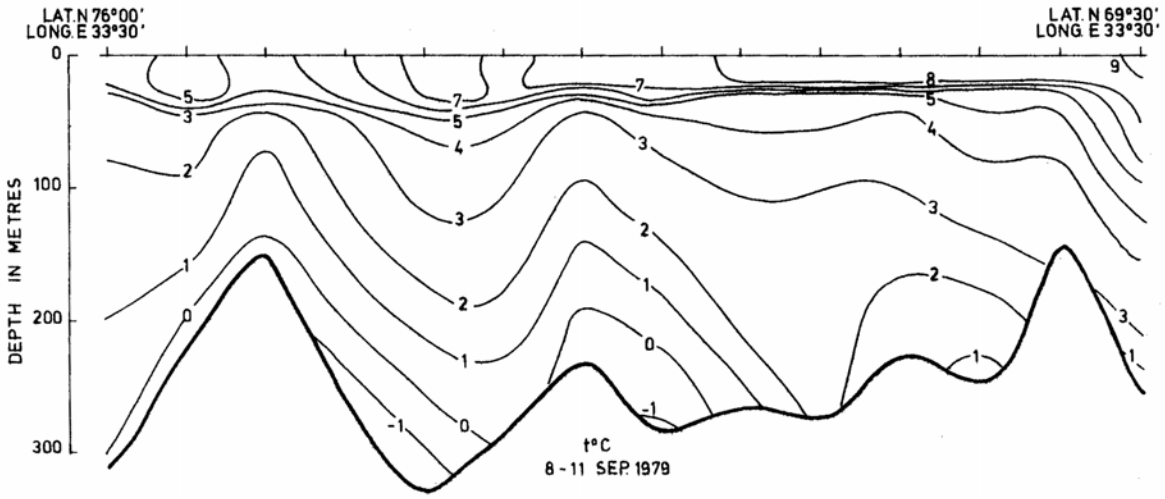

Fig. 6. Temperature section along the Kola meridian

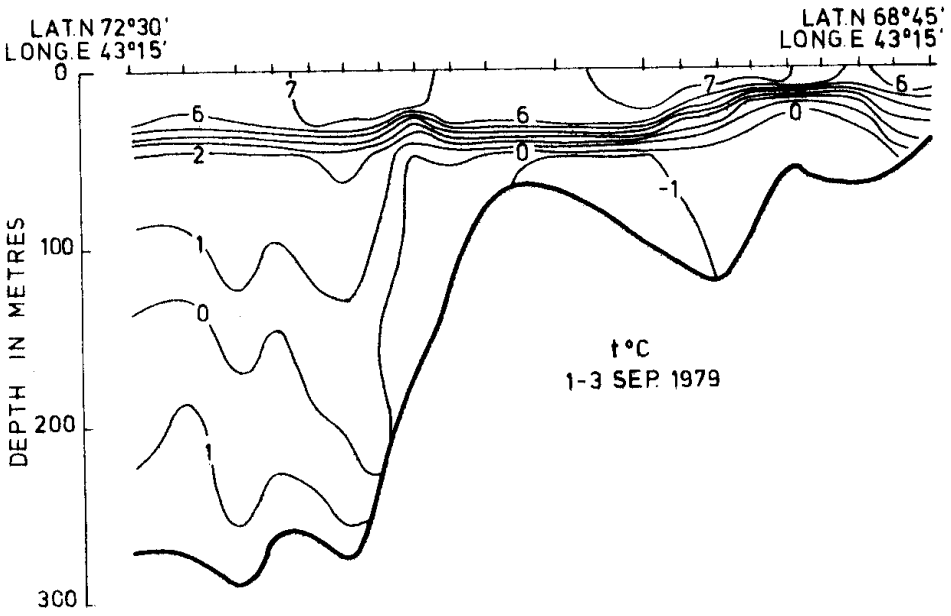

Fig. 7. Temperature section Cape Kanin-North

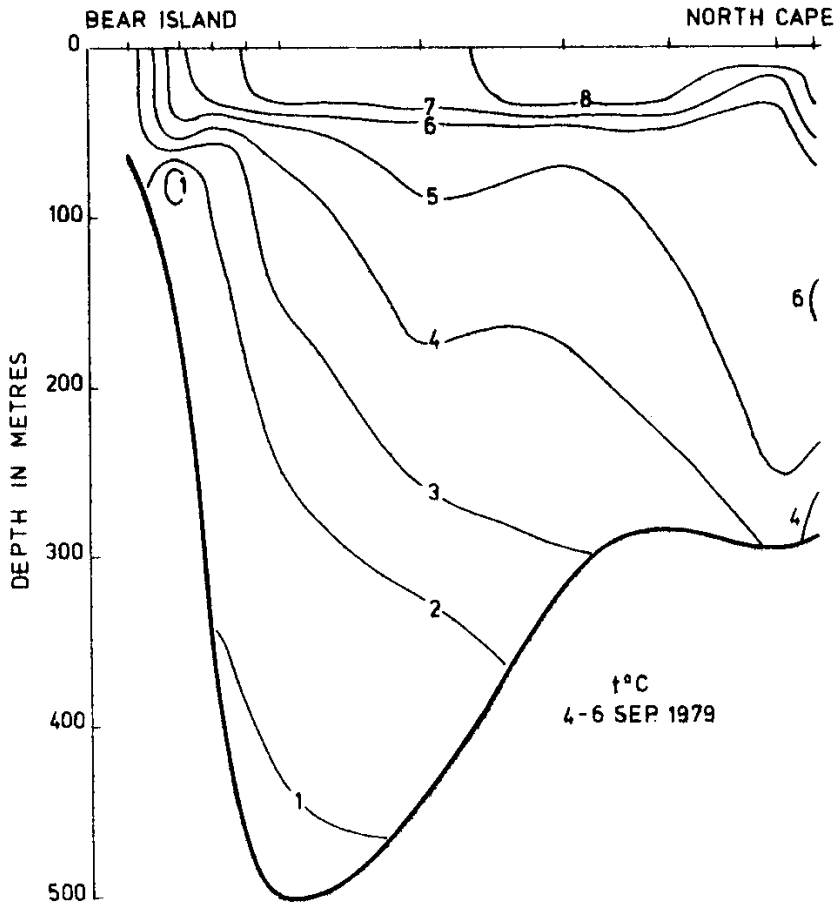

Fig. 8. Temperature section Bear Island-North Cape

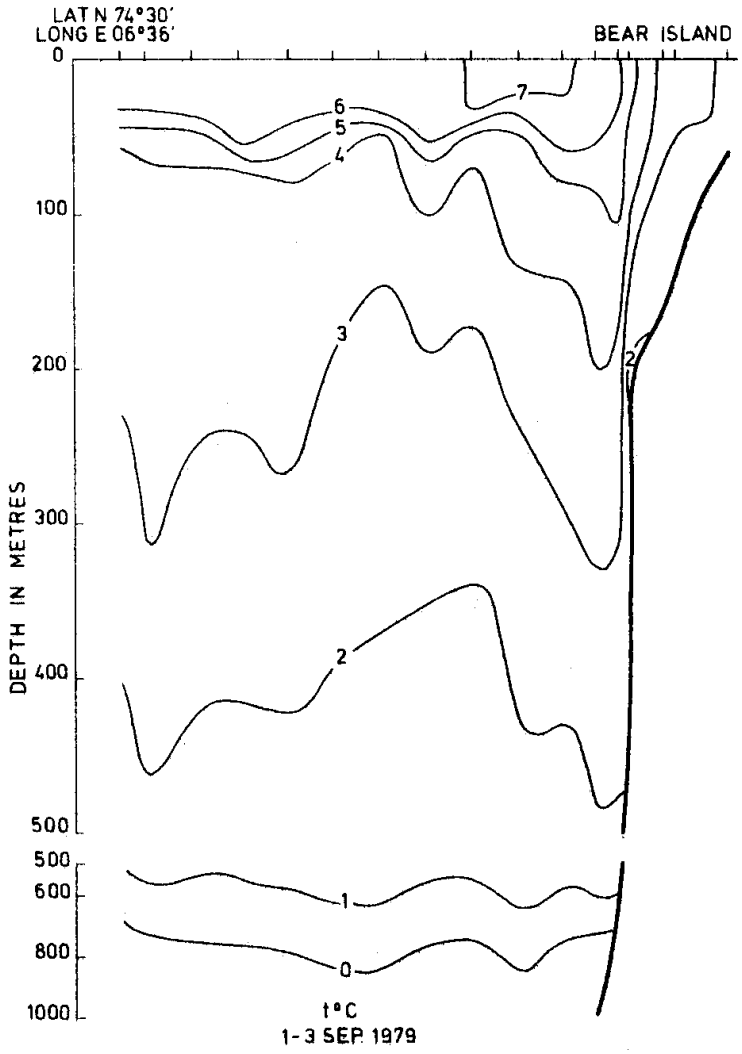

Fig. 9. Temperature section Bear Island-West

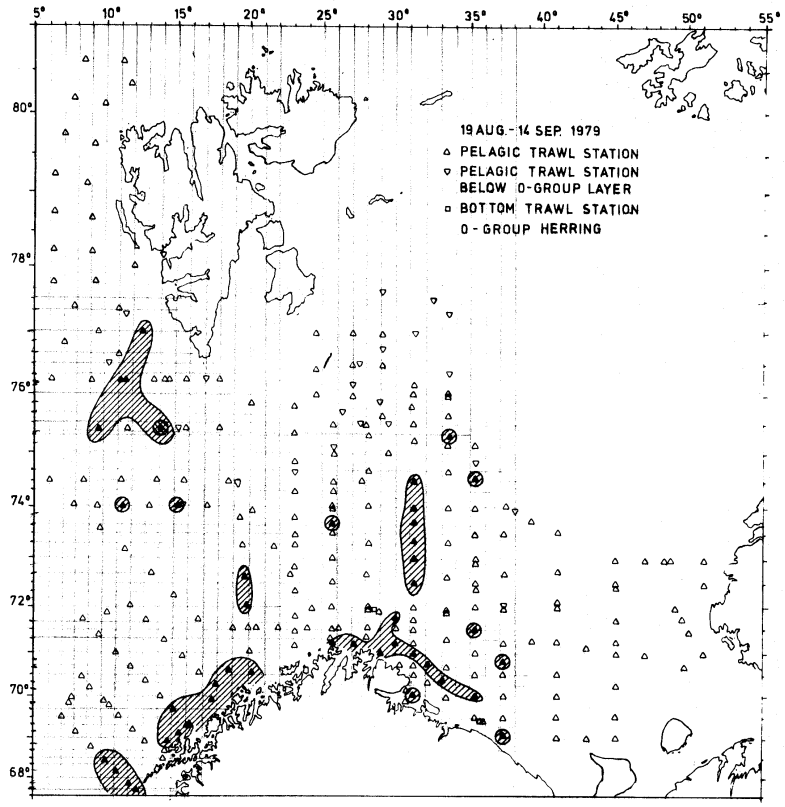

Fig. 10. Distribution of 0-group herring

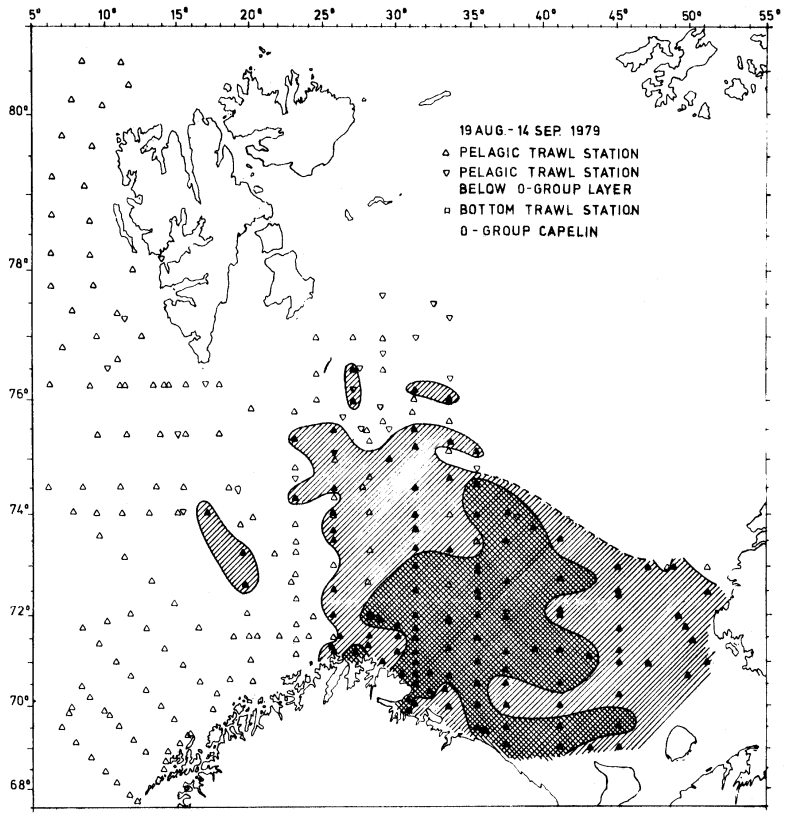

Fig. 11. Distribution of 0-group capelin

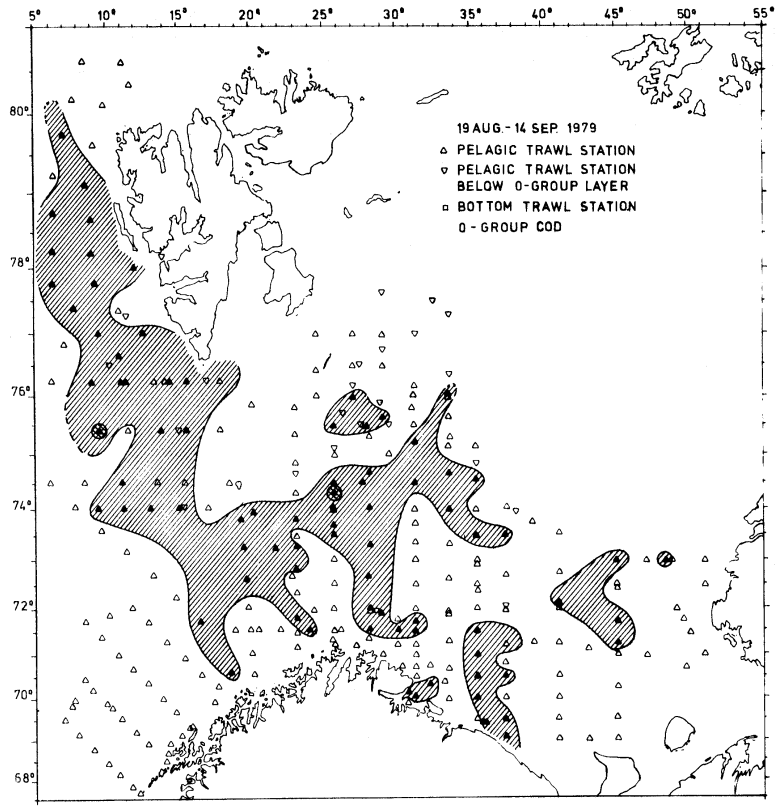

Fig. 12. Distribution of 0-group cod

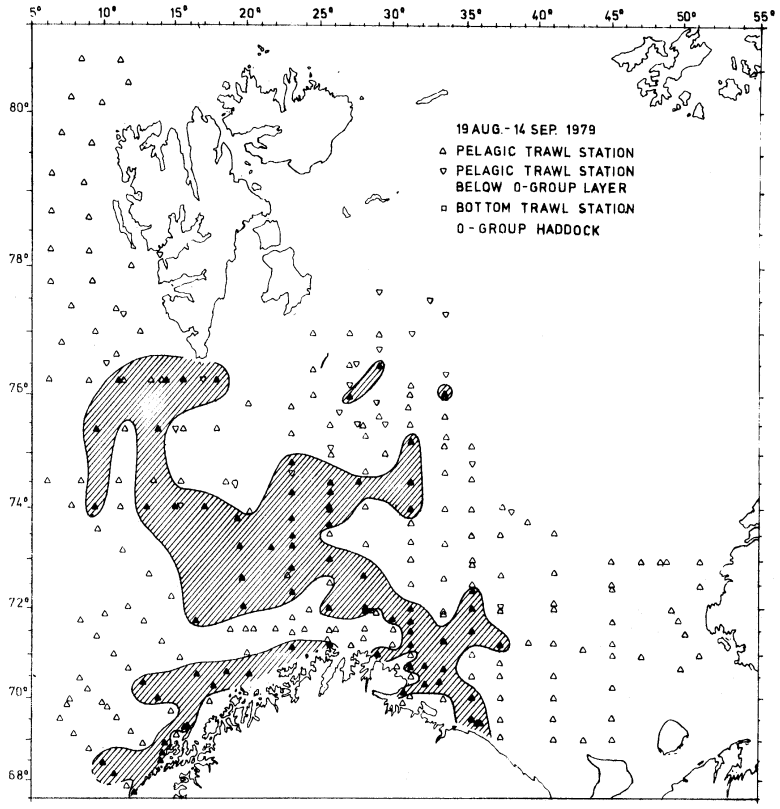

Fig. 13. Distribution of 0-group haddock

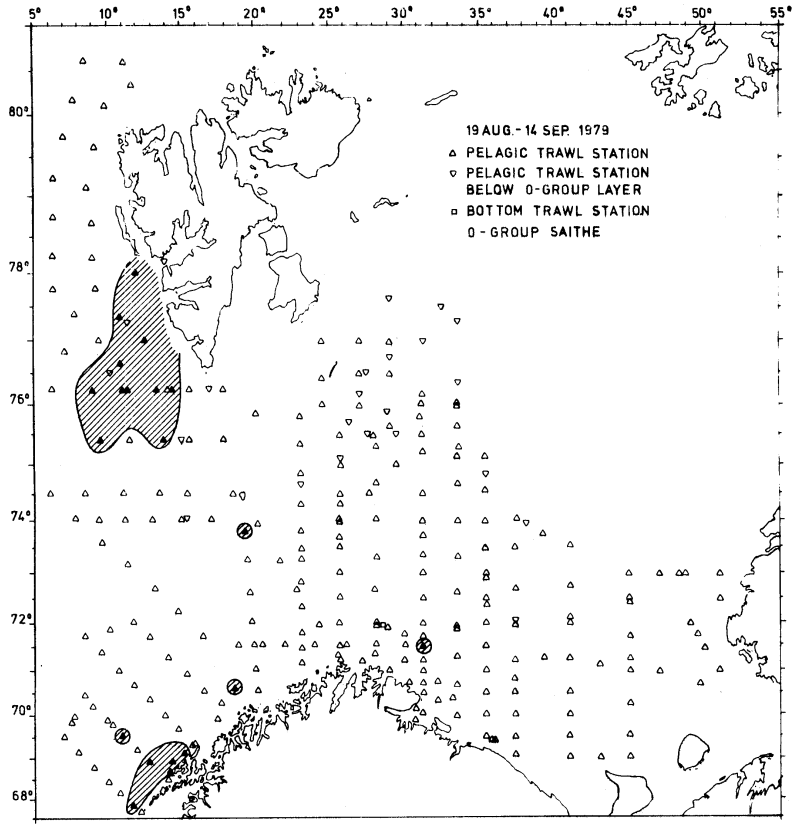

Fig. 14. Distribution of 0-group saithe

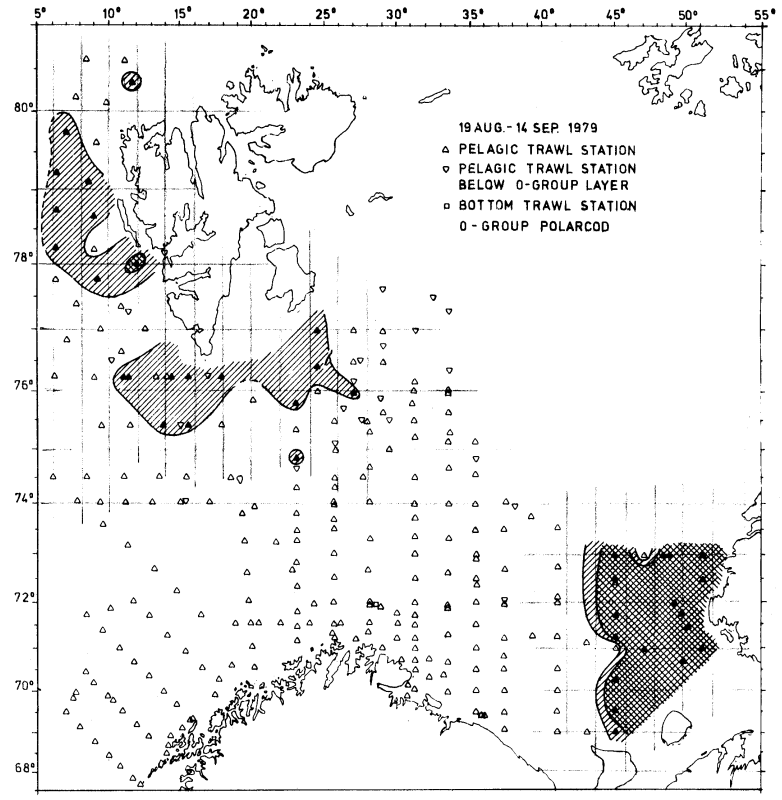

Fig. 15. Distribution of 0-group polar cod

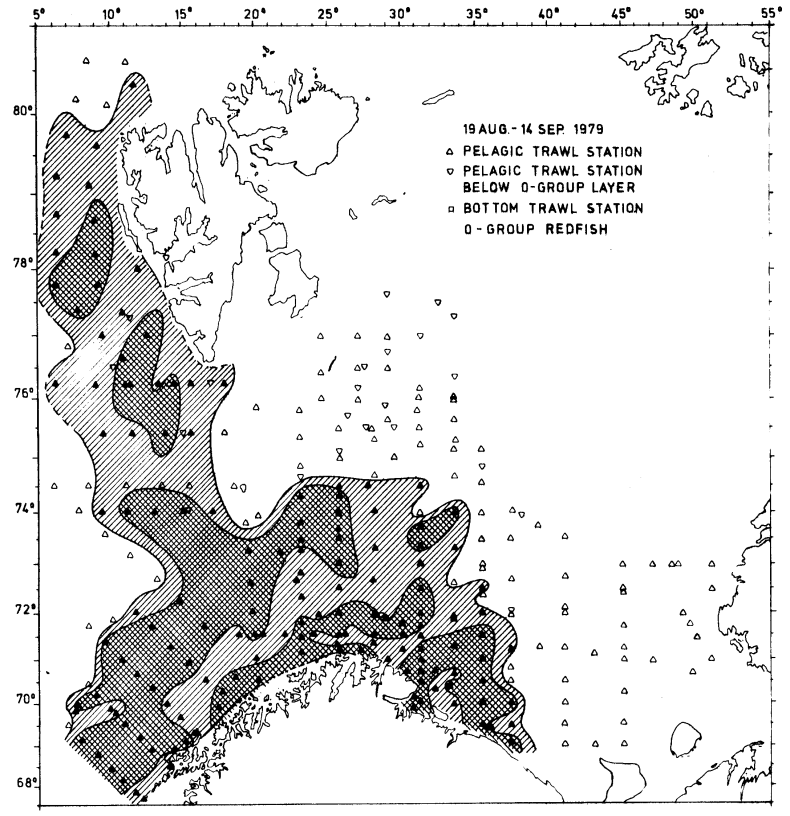

Fig. 16. Distribution of 0-group redfish

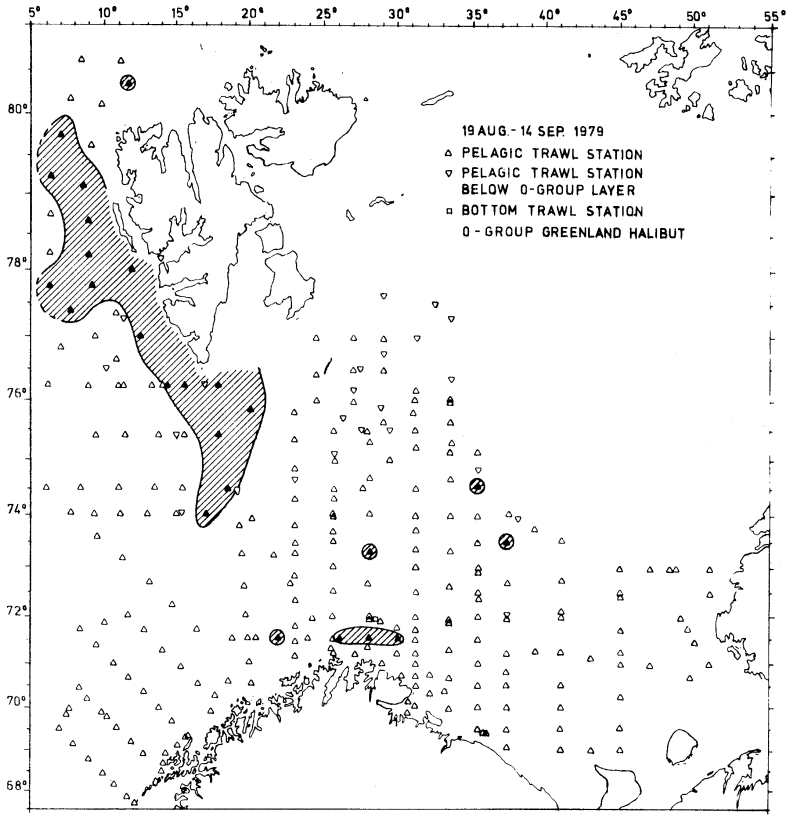

Fig. 17. Distribution of 0-group Greenland halibut

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Preliminary report of the International 0-group fish survey in the Barents Sea and adjacent waters in August-September 1980

The sixteenth annual International 0-group fish survey was made during the period 16 August-8 September 1980 in the Barents Sea and adjacent maters. The following research vessels participated in the survey:

State	Name of vessel	Survey time	Research Institute
Norway	"Johan Hjort"	16 Auqust-7 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	16 August-7 September	" "
Norway	"Michael Sars"	16 August-8 September	" "
USSR	"Poisk"	22 August-7 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Akhill"	2 September-4 September	" "

Name of scientists and technicians who took part on the different vessels are given in the Appendix.

The survey data was analysed the 8-9 September in Hammerfest. Observations concerning the geographical distribution of 0-group fish and their abundance are given in this report together with a brief description of the temperature condition in the area.

Material and methods

The geographical distributions of the 0-group Fish have in earlier surveys been estimated by fishing with a small meshed midwater trawl at the depth of the heaviest traces of 0-group fish on the echo-sounder, mainly between 0-50 m. In layers with no recordings hauls were made in the surface and with some recordings both in the surface and at 25 m depth, 0.5 n. mile in each depth. A higher standardized trawling procedure should be preferable. However, the trawling technics has made this difficult.

For fishing in the near surface layer floats were used on the headline of the trawl. By trawling deeper than 20 m a depth metering device had to be used for accurate control of the depth of trawling. Some trawling experiments in the beginning of the survey have shown that it is possible to control the trawling depth with both floats and metering device on the trawl. This make it possible to cover the mater column from 0-80 m in one haul. The Norwegian vessels, which use a trawl with a 20 m vertical opening cover this mater column by trawling with the headline in 0, 20, 40 and 60 m respectively.

A careful examination of all echo recordings have shown that 0-group fish is rear below 40-50 m. It should therefore only be necessary to trawl in 0, 20 and 40 m when the trawl has a 20 m opening.

After the 28 August this trawling procedure was followed by the Norwegian vessels on most of their trawl stations, and the trawling distance was 0,5 n. mile in 0, 20 and 40 m respectively. A trawl haul was made about every 30 nautical mile sailed. The USSR vessel, which used a trawl with a 6 m vertical and 10 m horizontal opening operated the trawl according to the old procedure.

The participants in the Hammerfest meeting discussed the need for a standardization of trawl gears and trawling procedure. They agreed to recommend that:

1) all vessels participating in the 0-group survey should use the same type of midwater trawl as the Norwegian vessels and it should be rigged in the same way;

2) the trawl should at each trawl station be working 0.5 n. mile in 0, 20 and 40 m, if necessary also in 60 m.

Trawl stations with and without catch are given on the distribution charts in Fig. 10-18, as filled and open symbols respectively. The density grading is based on catch in number per 1.0 nautical mile trawling.

Results

Hydrography (Figs. 2-9, Tables 1-4)

Hydrographic observations were made along all the survey tracks, normally after each 30 nautical miles sailed. Horizontal temperature distributions are shown for 0, 50, 100 and 200 m depth (Figs. 2-5). In Figs. 6-9 are given 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 section

During the last two years the mean temperature in this section has been low, but the I980 values are now close to the average for 1965-1980 in all three layers.

2) Cape Kanin - North section

The mean temperature in this section was in 1980 higher than in the previous years 1978 and 1979, but it is still below the average value for 1965-1980. The anomalies are -0.3 °C in the northern part and -0.8 °C in the southern part of the section.

3) North Cape - Bear Island section

The mean temperature in the section has gradually increased since 1977, the coldest year of the period 1965-1980. The 1980 value is 0.1 °C above the average 1965-1980.

4) Bear Island-West section

The mean temperature of the 0-200 m layer was this year 0.6 °C above the average value for the period 1965-1980. The 1980 therefore regarded as a rather warmer year and similar to the conditions found during 1973 and 1976-1977.

In general, the 1980 temperatures of the western Barents Sea are about normal, whereas the eastern part of the sea still is somewhat colder than the average 1965-1980. The temperature conditions west of the Bear Island indicate rather strong transport in the Spitsbergen current.

Distribution and abundance of 0-group fish

Geographical distribution of 0-group fish are shown by shaded areas in Figs. 10-18. Double shading indicates dense concentrations. Criteria used to discriminate between scattered and dense concentrations are the same as earlier reports (Ann. boil. 1978).

Abundance indices estimated as the area of distribution, areas of high densities weighted by 10, are given in Table 5. Lenght frequencies distributions of the main species are given in Fig. 19.

Capelin (Fig. 10)

The distribution of 0-group capelin in 1980 is similar to that found in 1979. The highest concentrations were found off the Finnmark and the Murman coast.

Contrary to the other species described in the present report, 0-group capelin is mostly found entangled in the meshes in the middle part of the trawl. This makes it difficult to sample 0-group capelin unbiased from year to year particularly because of variable weather conditions. Therefore it is regarded that an abundance index for capelin has little value. However, Table 5 gives the impression that the 1960 year-class is an abundant one.

Haddock (Fig. 11)

0-qroup haddock in 1980 has a westerly distribution, and is similar to that found in 1978. No high concentrations were found. The abundance index is only about half of the average abundance index in the previous 10 years.

Polar cod (Fig. 12)

The distribution of 0-group polar cod was similar to those found in the preceding three years, with a Spitsbergen and a Novaya Zemlya component. As in last years the area of distribution was not adequately covered because of limited research vessel time.

The estimated abundance indices are therefore too low for both components. The indices for the covered areas indicate that the 0-group polar cod is more abundant off Spitsbergen, but less abundant in the eastern part compared to 1979.

Greenland halibut (Fig. 13)

As in previous years 0-group Greenland halibut was mostly found off Bear Island and Spitsbergen. The abundance index for the 1980 year-class is close to the average abundance index from 1970 to 1979.

Herring (Fig. 14)

0-group herring was found in few numbers and only on 14 trawl stations, mainly off the East Finnmark coast. The abundance of the 0-group herring in the Barents Sea and adjacent areas is still low.

Cod (Fig. 15)

0-group cod was found in two main areas off the coast of Finnmark and west of Spitsbergen. It is the fourth year in succession a westerly distribution of 0-group cod has been observed.

The area of distribution was found to be rather small, and no dense concentrations were observed. The estimated abundance index of the 1980 year-class is about half of that for 1979, and is only 21 % of the average 0-group index for the previous 10 years.

Saithe (Fig. 16)

Only a few numbers of 0-group saithe were caught. As in previous years no abundance index of any significance can be estimated on the basis of the survey data.

Redfish (Fig. 17)

0-group redfish were found within a large area from Lofoten to the Murman coast, and continuously between Norway and the northern part of Spitsbergen. The abundance index of the 1980 year-class is the second highest recorded for redfish since 1965, only exceeded by the 1979.

Long rough dab (Fig. 18)

As in the last years, except for 1979, 0-group long rough dab was common in the trawl catches in the area west of Spitsbergen. Compared with 1979 it was also found further to the east in the Barents Sea. The abundance index is above the average in the previous 10 years.

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 (T °C)

Year/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1965-1980
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	7.2
50-200m	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	3.6
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	4.5

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

Year	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1965-1980
68°45'N 70°05'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	4.1
71°00'N 72°00'N	4.2	2.5	3.6	3.1	2.5	3.3	3.2	4.1	4.5	-	4.5	4.6	3.3	1.7	1.8	3.0	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/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1965-1980
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	5.6

Table 4. Mean water temperature in the West Spitsbergen current along the Bear Island West section (between 06°34' E and 15°55' E) in early September (T °C)

Year/ Layer	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1966-1980
0-200m	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	4.3

Table 5. Abundance indices

Species	Cod		Haddock	Polar cod			Redfish		Greenland	Long rough
Year		ln		West		East		ln	Halibut	dab
1965	6	1.79	7		0		159	5.07		66
1966	1	0.41	< 1		129		236	5.46		97
1967	34	3.53	42		165		44	3.78		73
1968	25	3.22	8		60		21	3.04		17
1969	93	4.53	82		208		295	5.69		26
1970	606	6.41	115		197		247	5.51	< 1	12
1971	157	5.06	73		181		172	5.15	< 1	81
1972	140	4.94	46		140		177	5.18	8.0	65
1973	684	6.53	54		(26)		385	5.95	3.2	67
1974	51	3.93	147		227		468	6.15	13.4	83
1975	343	5.84	170		75		315	5.75	21.1	113
1976	43	3.76	112		131		447	6.1	15.6	96
1977	173	5.15	116	157		70	472	6.16	9.0	72
1978	106	4.66	61	107		144	460	6.13	35.4	76
1979	94	4.54	69	23		302	980	6.89	22.5	69
1980	49	3.89	54	79		247	651	6.48	12.0	108
	cp. 163						cp. 346			

Appendix

Survey period	Research vessel	Research institute	Participants
22 August- 7 September	"Poisk"	Polar Research Institute of Marine Fisheries and Oceano- graphy, Murmansk	A.U. Averchenko, U.D. Boitsov, O.J. Gavrilina, A.U. Iljina, U.N. Kochedykov, L.N. Korol', V.S. Mamylov, U.N. Nenko, N.G. Ushakov, U.P. Vorontsov.
2 September- 4 September	"Akhill"	"	
16 August- 8 September	"Michael Sars"	Institute of Marine Research, Bergen	S. Brattås, R. Johannessen, J.Monstad, T. Monstad, J.H. Nilsen, T.H. Sangold, S. Torheim.
16 August- 8 Septeinber	"G.G. Sars"	"	G. Farstad, K. Gjertsen, K. Hansen, A. Hylen, H. Kismul, E. Lifjell, L. Midttun, E. Molvær, K. Randa, I. Svellingen, Ø. Tangen.
16 August- 8 September	"Johan Hjort"	"	C. Aranda, J. Blindheim, K.A. Larsen, O. Martinsen, C.J. Rørvik, J. Rørvik, J. Sortland, A. Thomassen, Ø. Torgersen

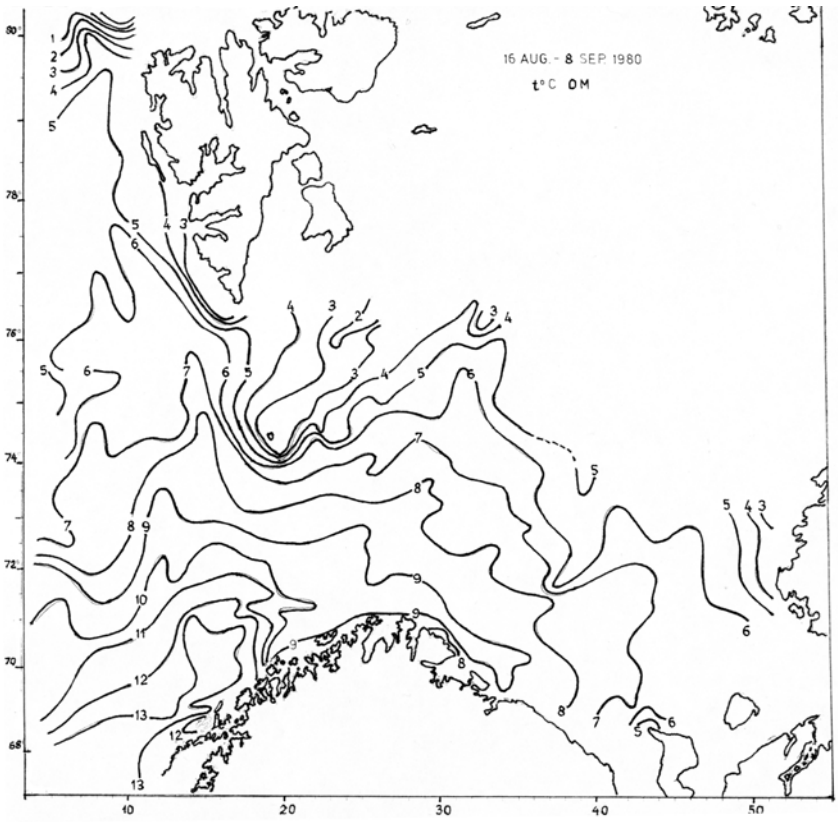

Fig. 2. Isotherms at 0 m

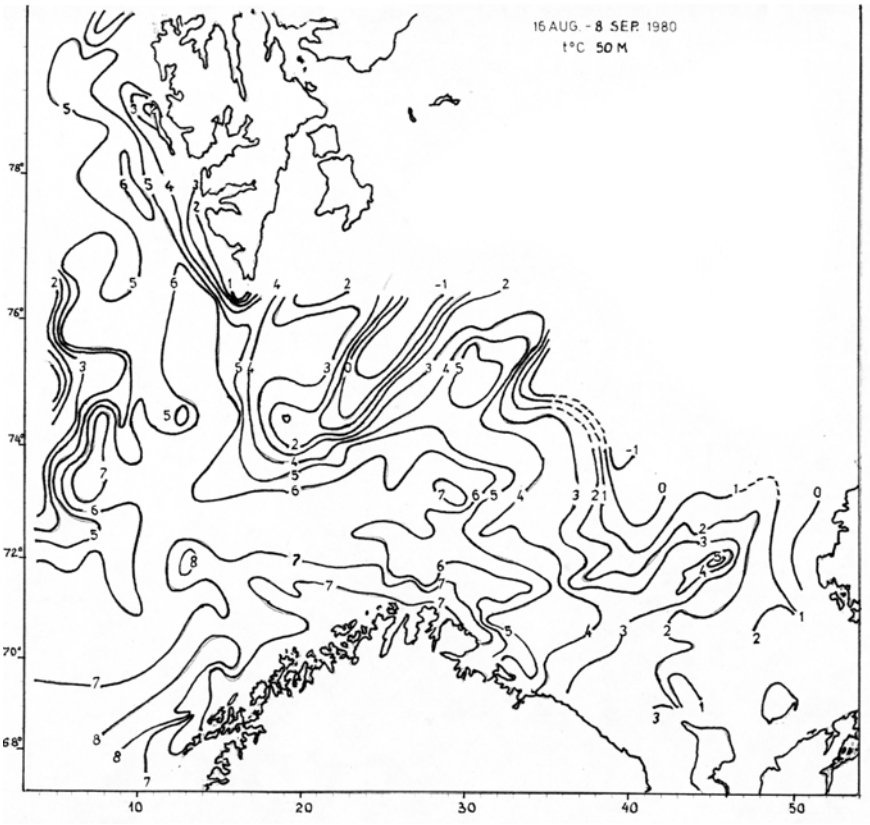

Fig. 3. Isotherms at 50 m

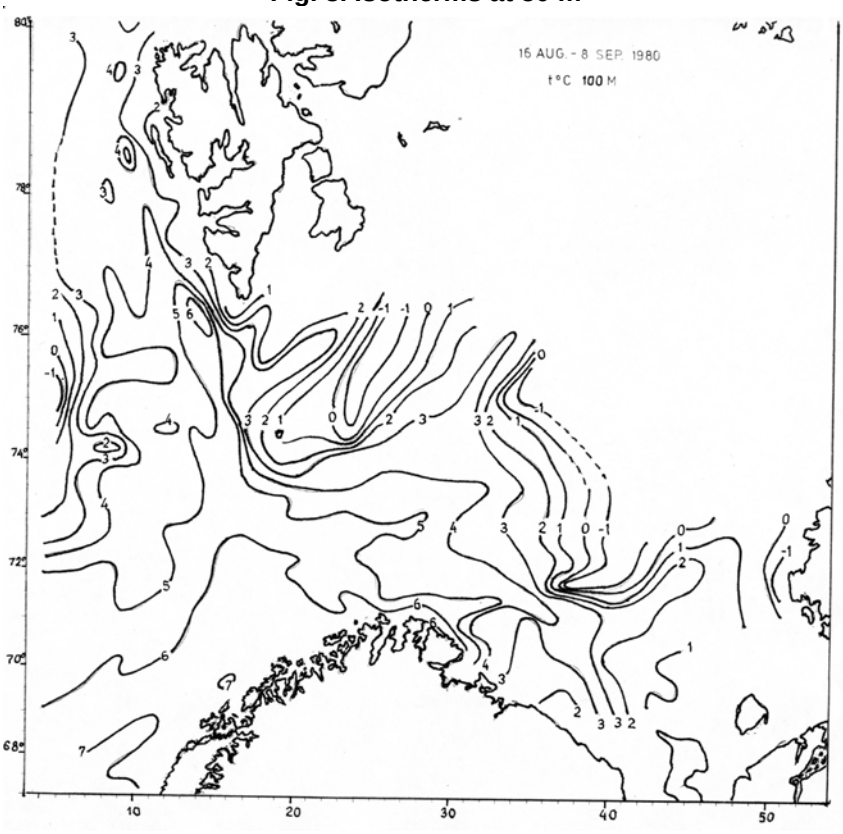

Fig. 4. Isotherms at 100 m

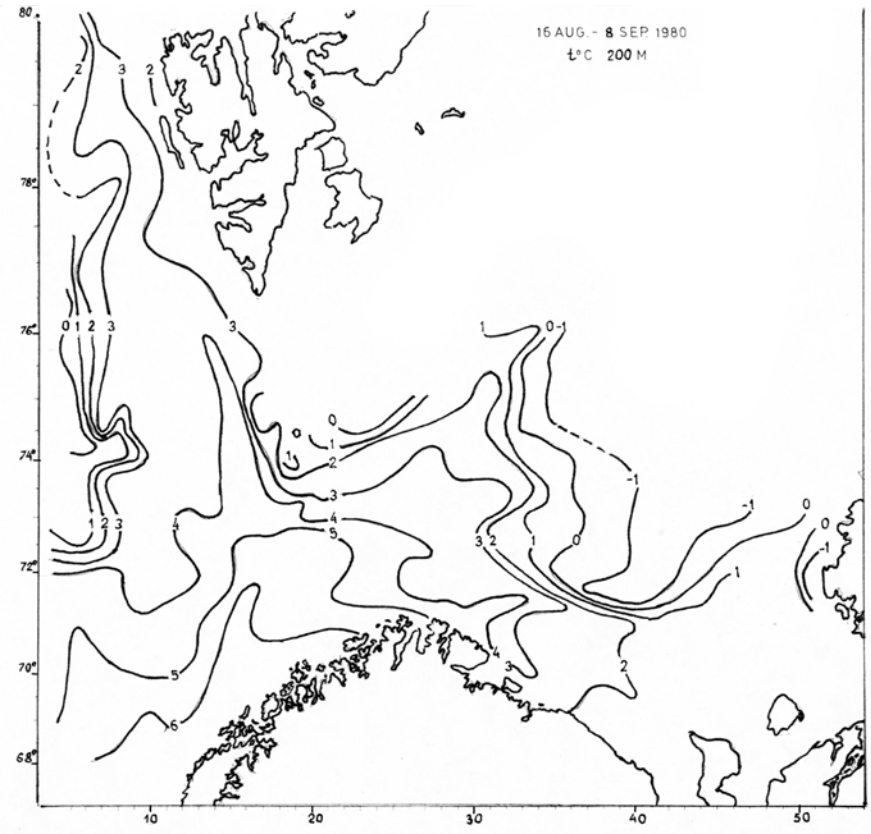

Fig. 5. Isotherms at 200 m

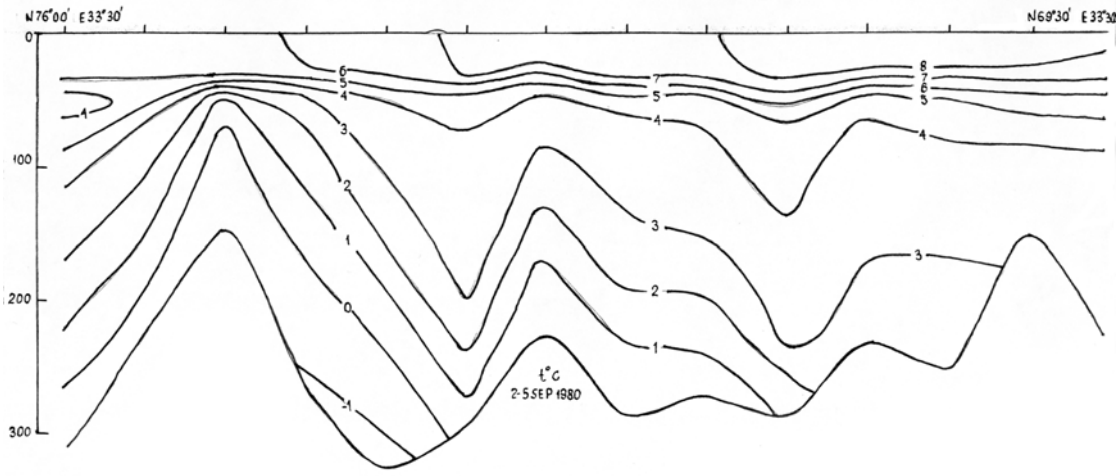

Fig. 6. Temperature section along the Kola meridian

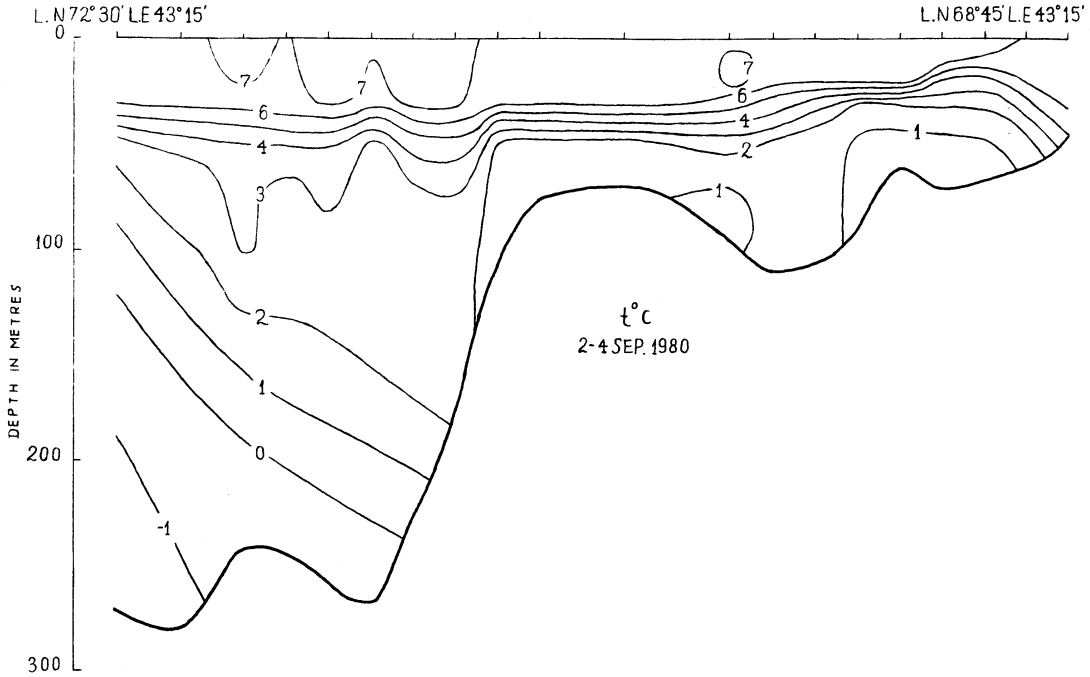

Fig. 7. Temperature section Cape Kanin-North

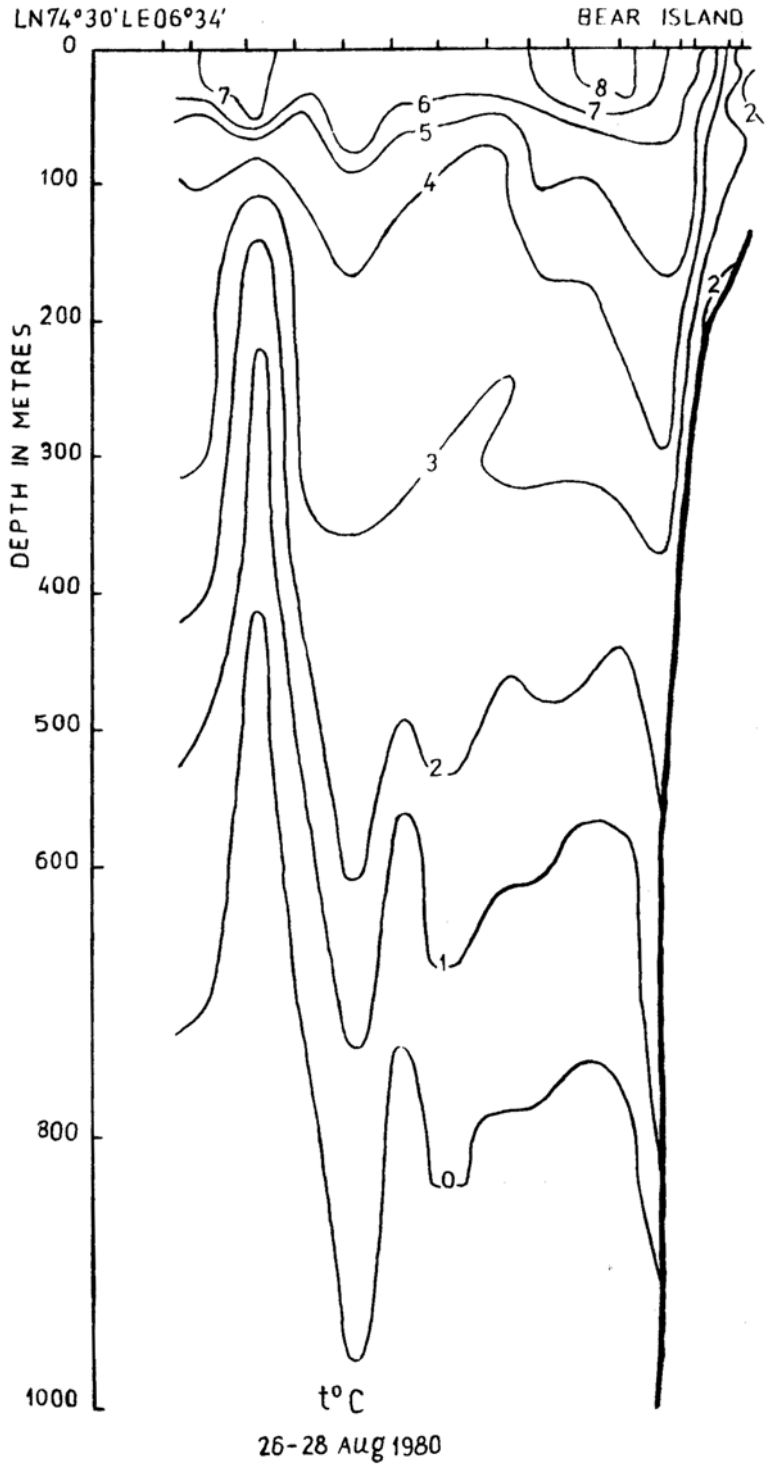

Fig. 8. Temperature section Bear Island-West

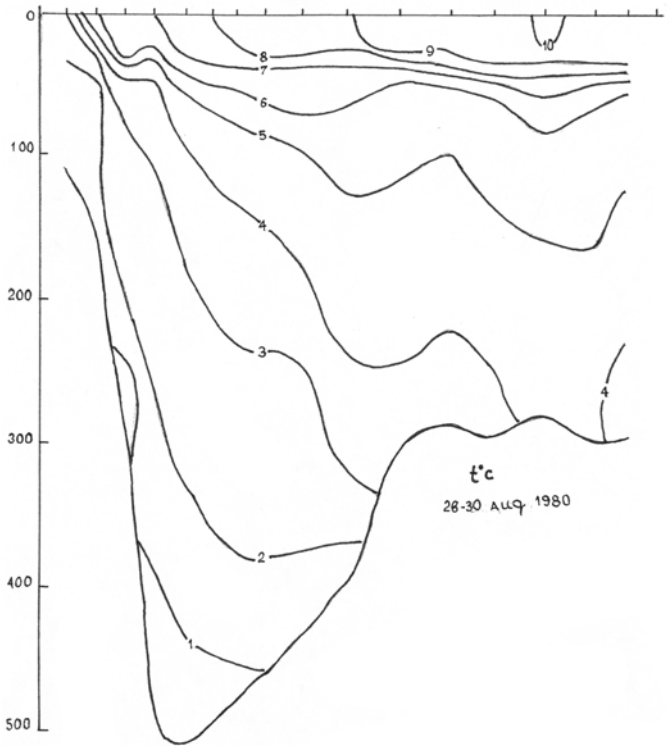

Fig. 9. Temperature section Cape Kanin-North

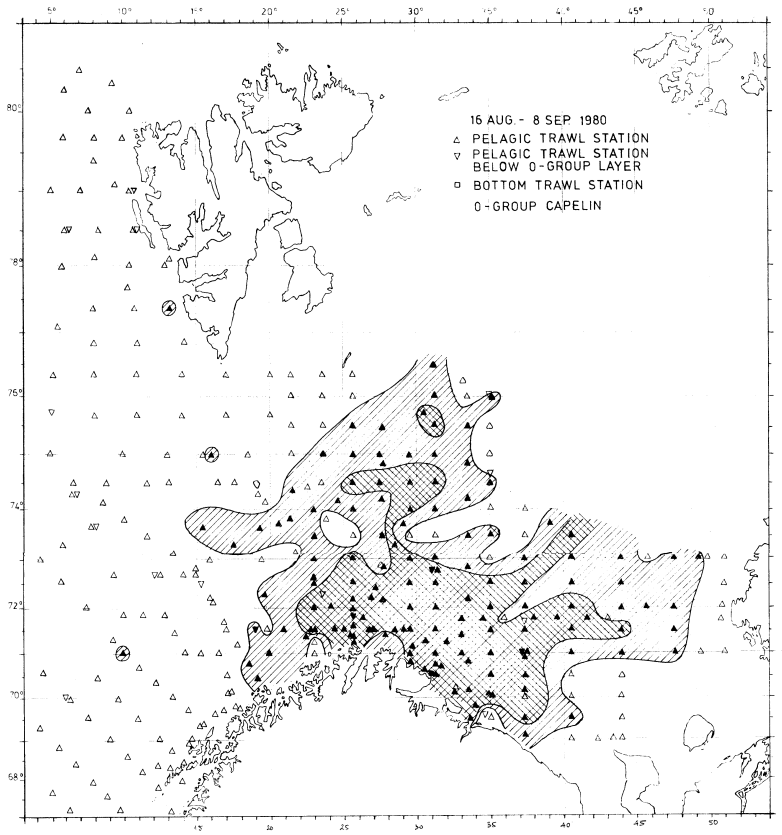

Fig. 10. Distribution of 0-group capelin

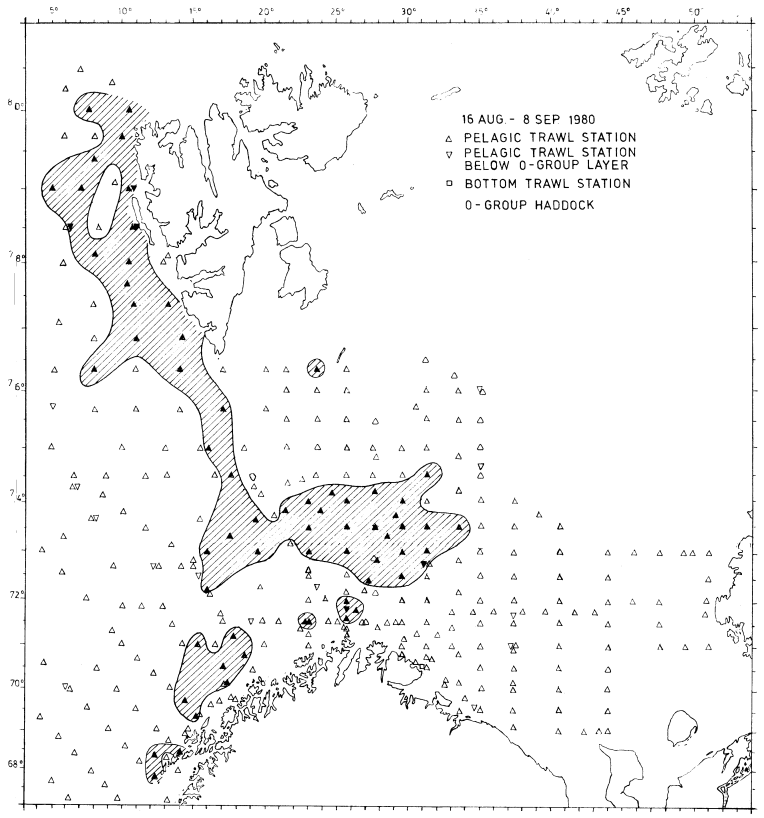

Fig. 11. Distribution of 0-group haddock

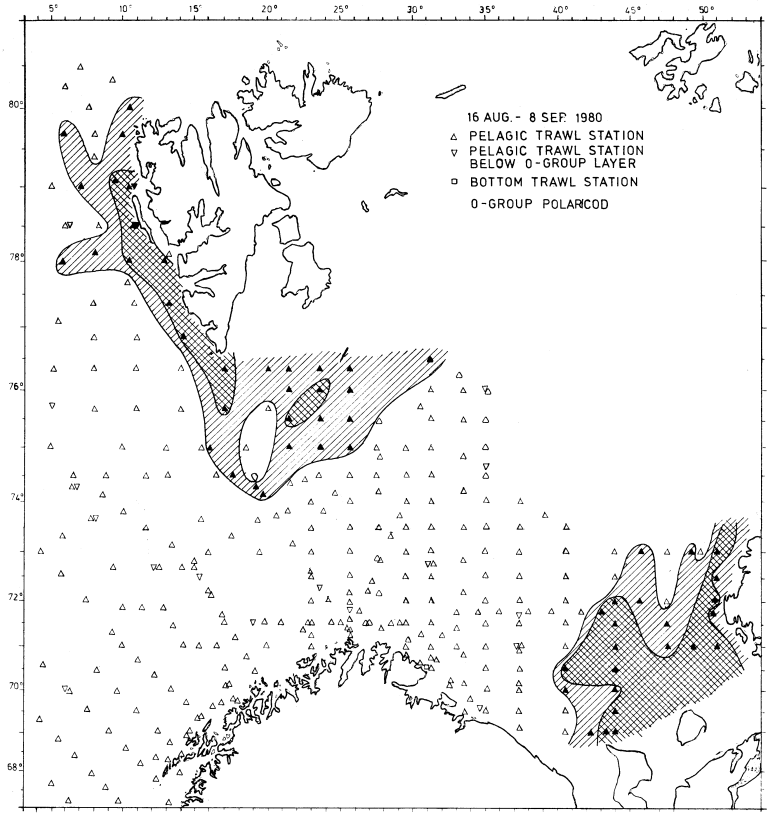

Fig. 12. Distribution of 0-group polar cod

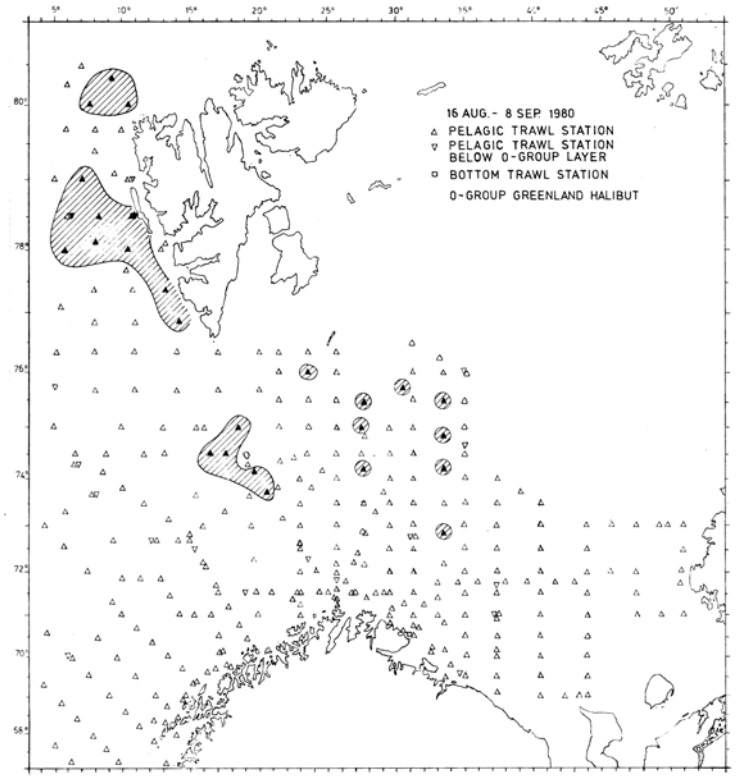

Fig. 13. Distribution of 0-group Greenland halibut

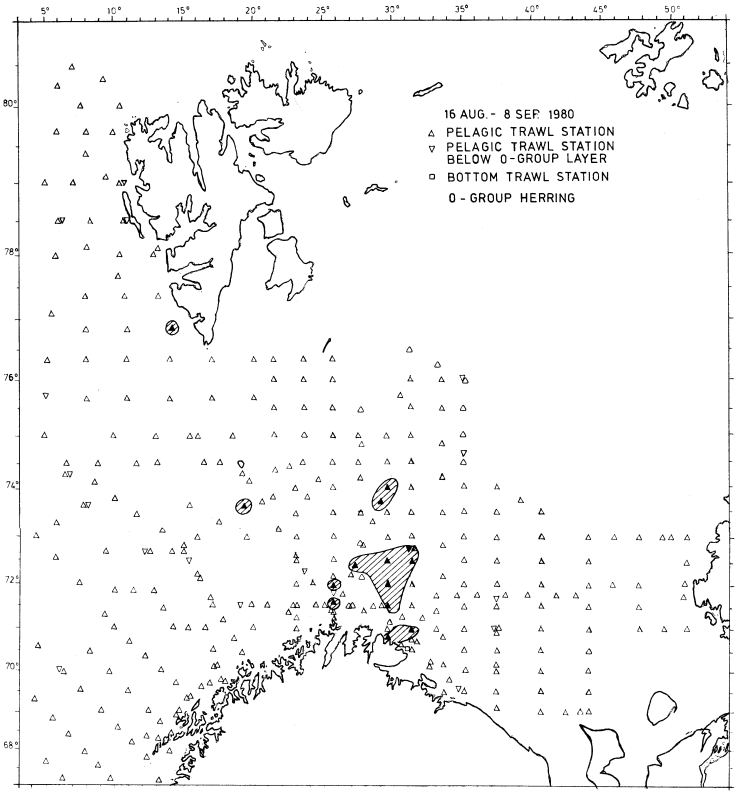

Fig. 14. Distribution of 0-group herring

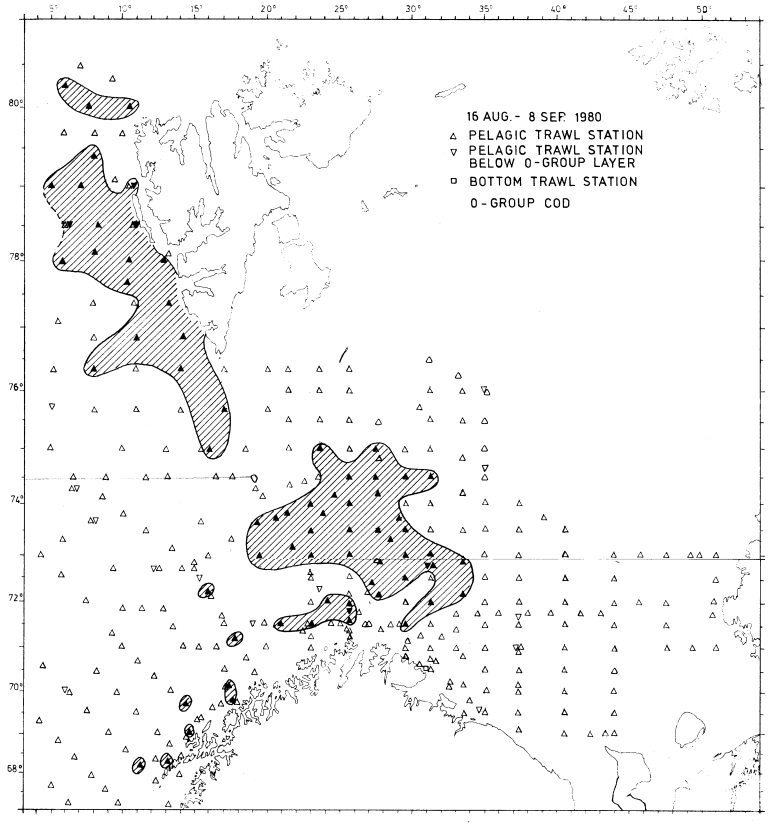

Fig. 15. Distribution of 0-group cod

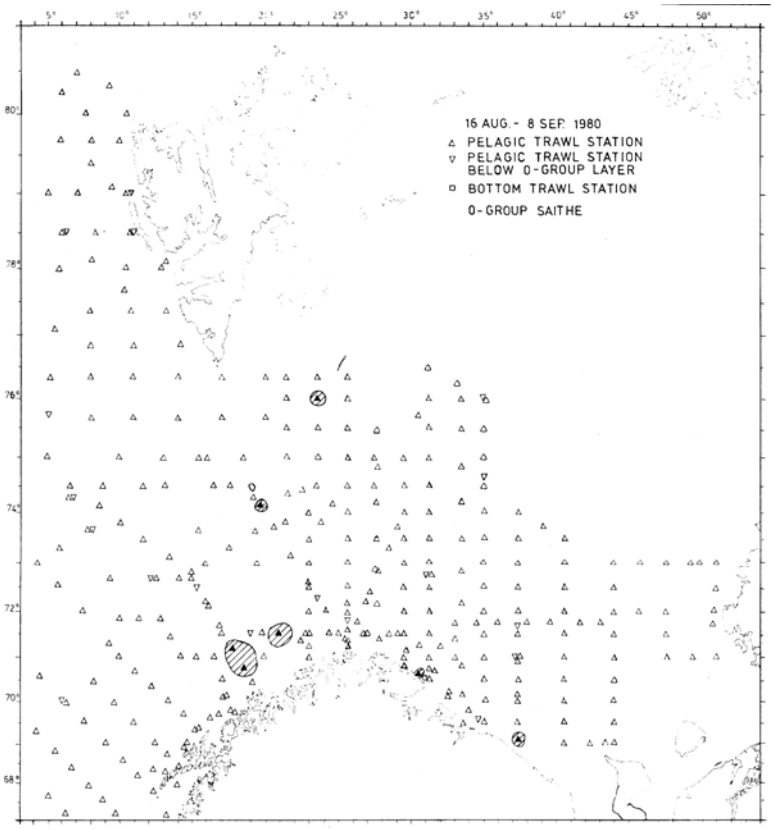

Fig. 16. Distribution of 0-group saithe

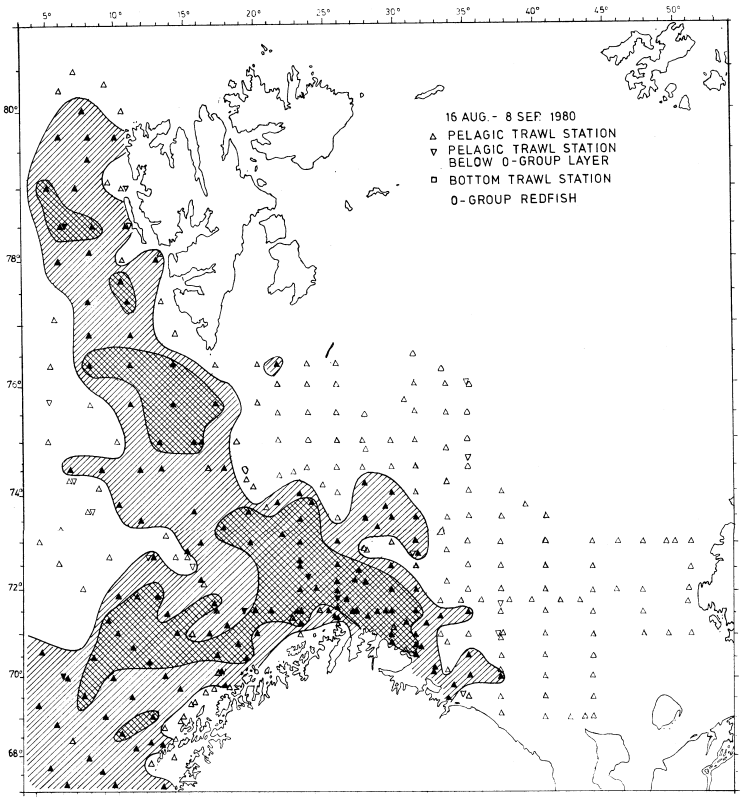

Fig. 17. Distribution of 0-group redfish

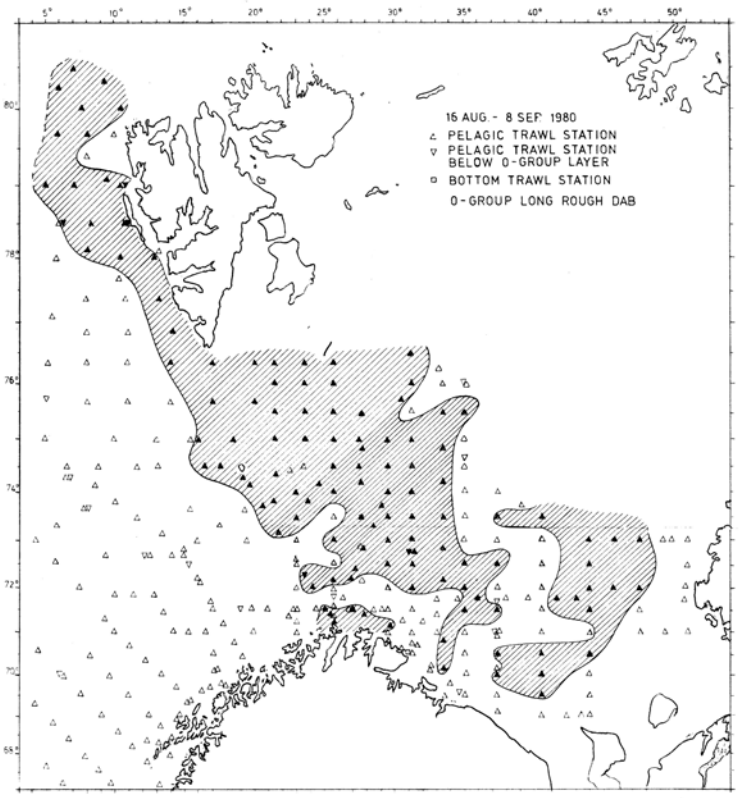

Fig. 18. Distribution of 0-group long rough dab

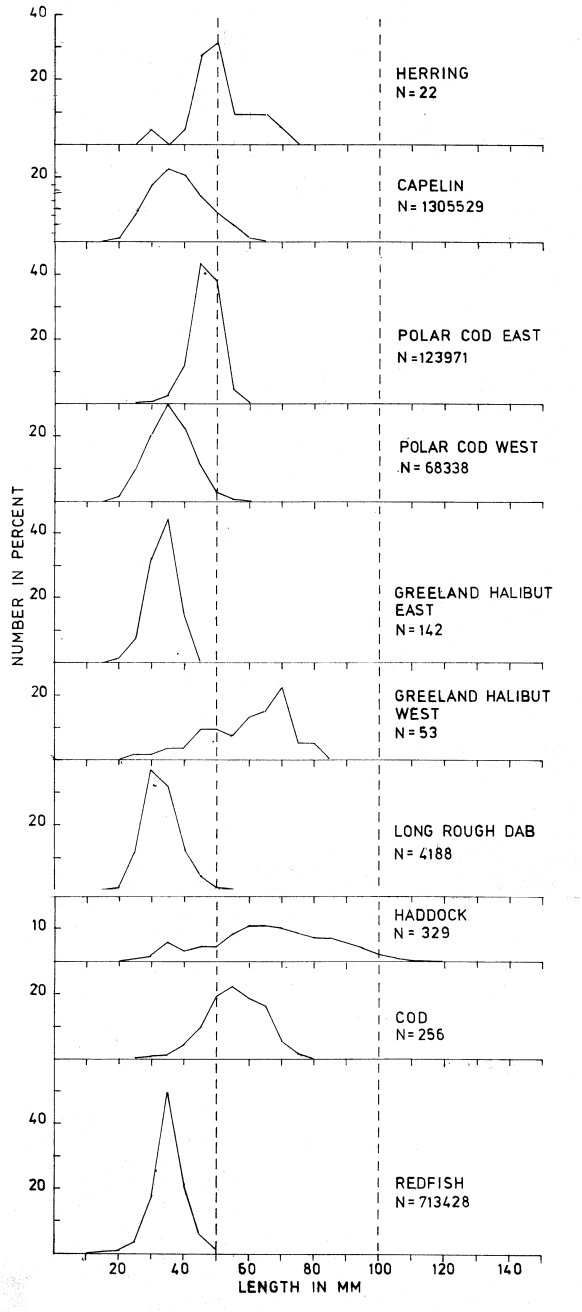

Fig. 19. Length distribution of 0-group fish

International Council for
the Exploration of the Sea

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

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-III"	22 August-6 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Akhill"	23 August-1 September	" "

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

The survey data were analysed 5-7 September in Hammerfest. Observations concerning the geographical distribution of 0-group fish and their abundance are given in this report together 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 participating 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 echo-sounder 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 is mostly found entranted 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 year-classes 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.

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 (T °C)

Year/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1965-1981
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 Kanin-North section (between 68°45' N and 72°00' N) from surface to bottom at the beginning of September (T °C)

Year/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1965-1981
68°45'N 70°05'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
71°00'N 72°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

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/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1965-1981
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/ Layer	1966	1967	196&	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1965-1981
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

Species	Cod	Haddock	Polar cod			Redfish	Greenland	Long
Year			West		East		halibut	rough dab
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	1	12
1971	157	73		181		172	1	81
1972	140	46		140		177	8.0	65
1973	684	54		(26)		385	3.2	67
1974	51	147		227		468	13.4	83
1975	343	170		75		315	21.1	113
1976	43	112		131		447	15.6	96
1977	173	116	157		70	472	9.0	72
1978	106	61	107		144	460	35.4	76
1979	94	69	23		302	980	22.5	69
1980	49	54	79		247	651	12.0	108
1981	65	30	149		73	861	38.0	95

Table 6. Length distribution of 0-group fish (%)

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		0.0		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, mm	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. Borkin, N.P. Chebotok, A.S. Galkin, A.Sh. Gubaidullin, A.V. Ilyina, V.A. Khiyupin, S.A. Larkina, S.D. Melnikov, L.N. Korol, 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. Abrahamsen, S. Andreassen, J. Blindheim, A. Dommasnes, 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. Hylen, O.S. Kjesbu, W. Løtvedt, L. Midttun, 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.

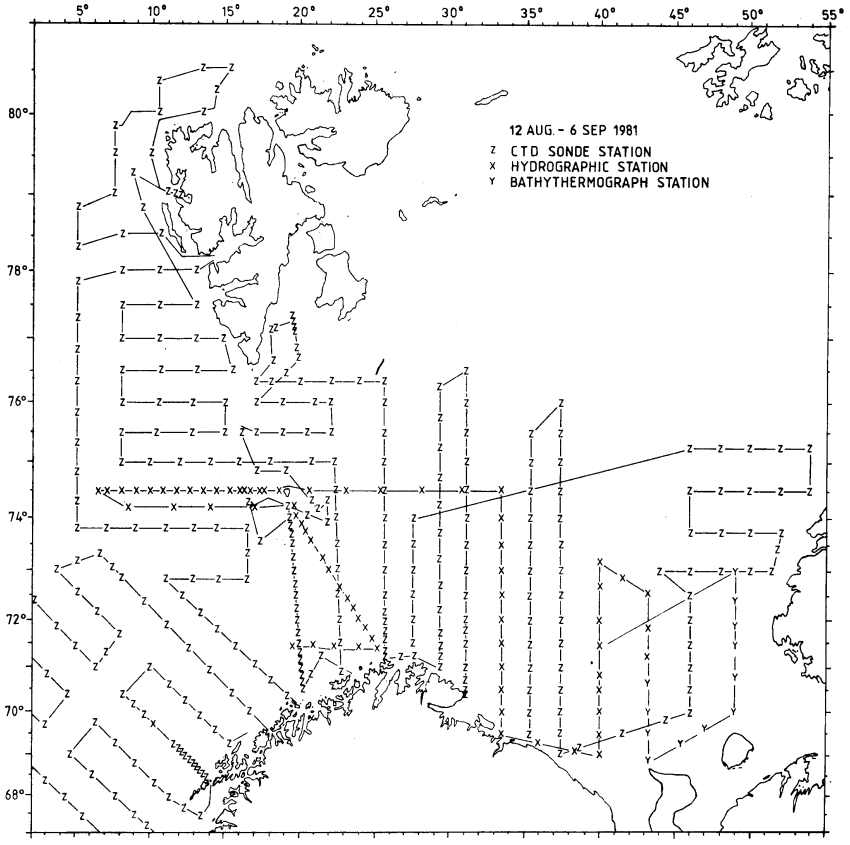

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

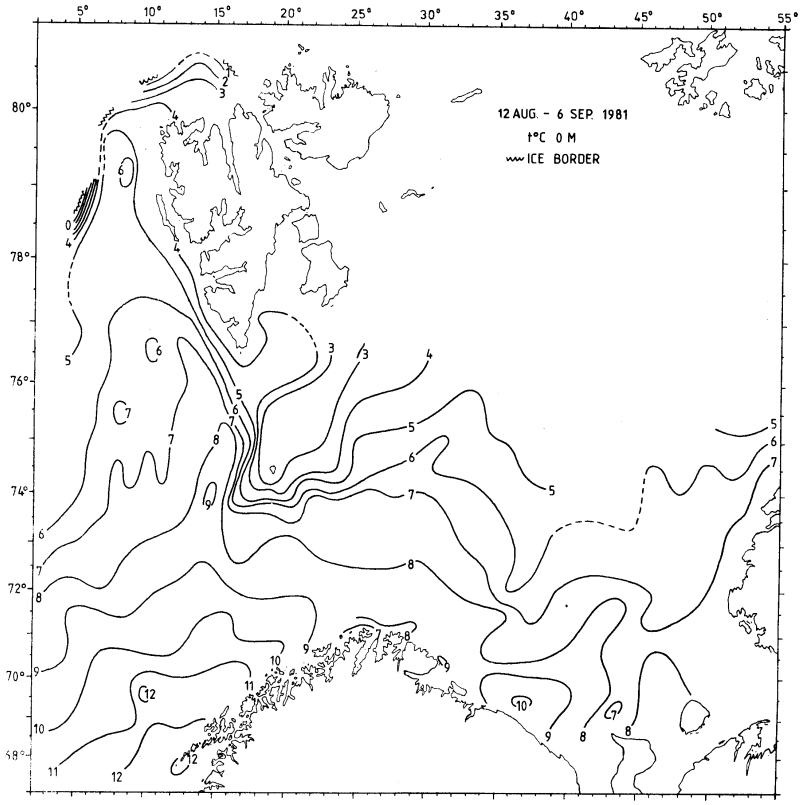

Fig. 2. Isotherms at 0 m

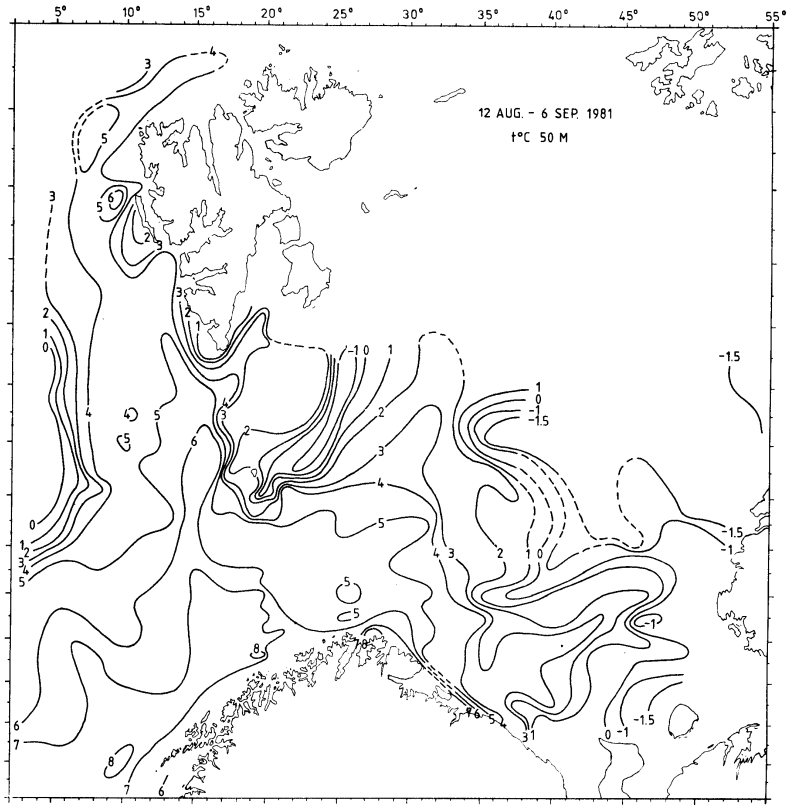

Fig. 3. Isotherms at 50 m

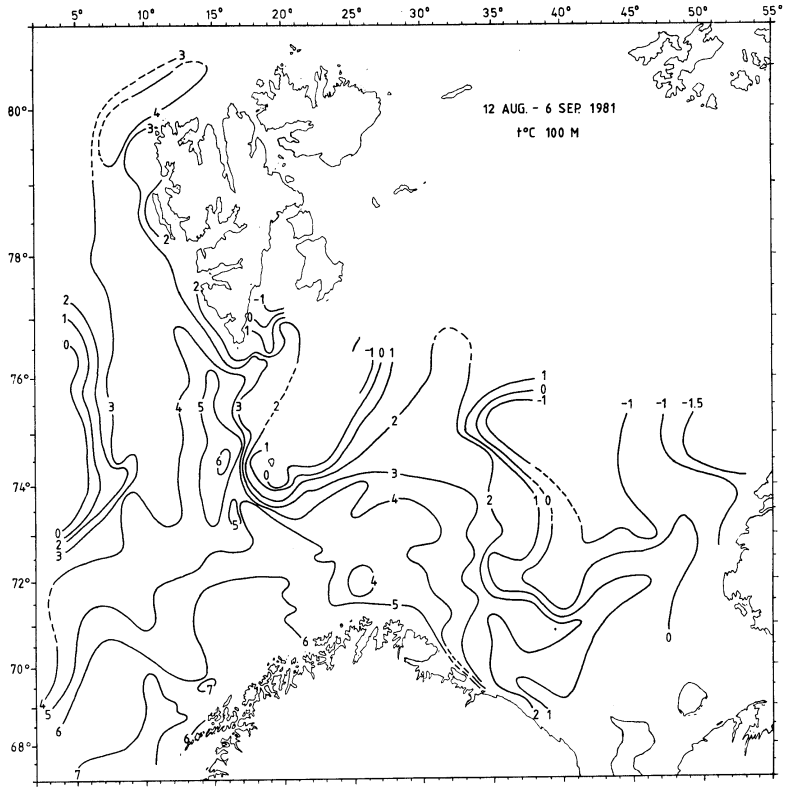

Fig. 4. Isotherms at 100 m

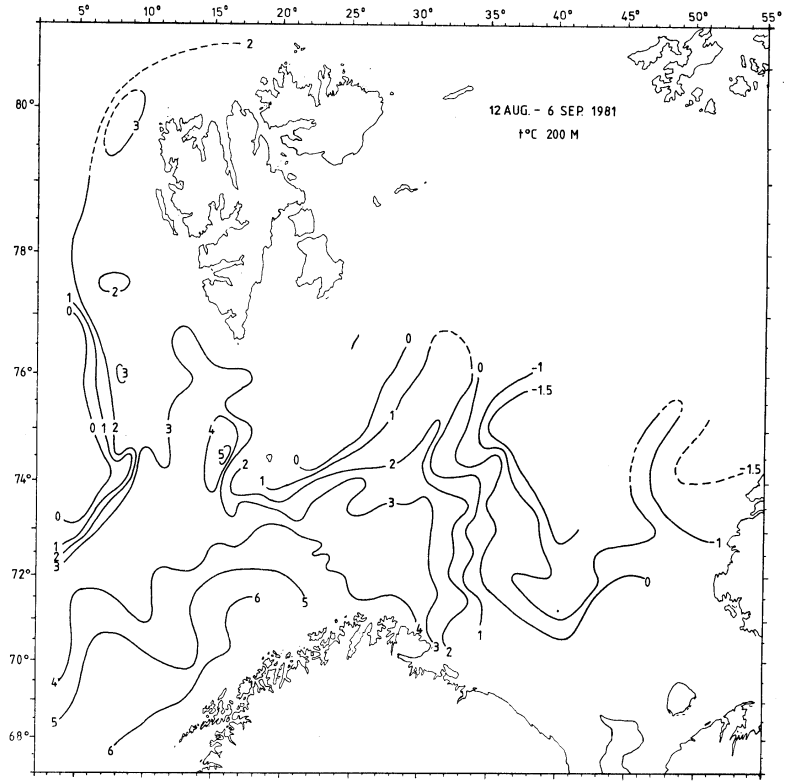

Fig. 5. Isotherms at 200 m

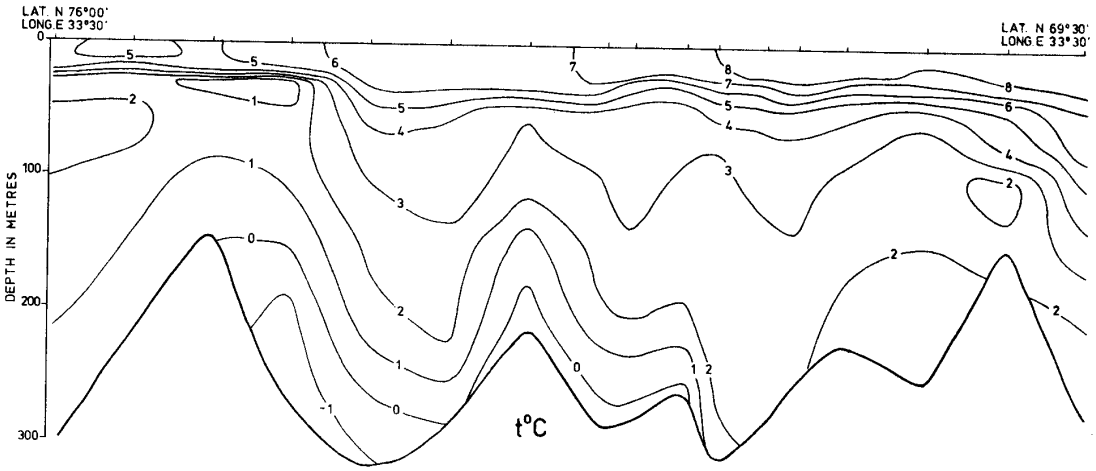

Fig. 6. Temperature section along the Kola meridian

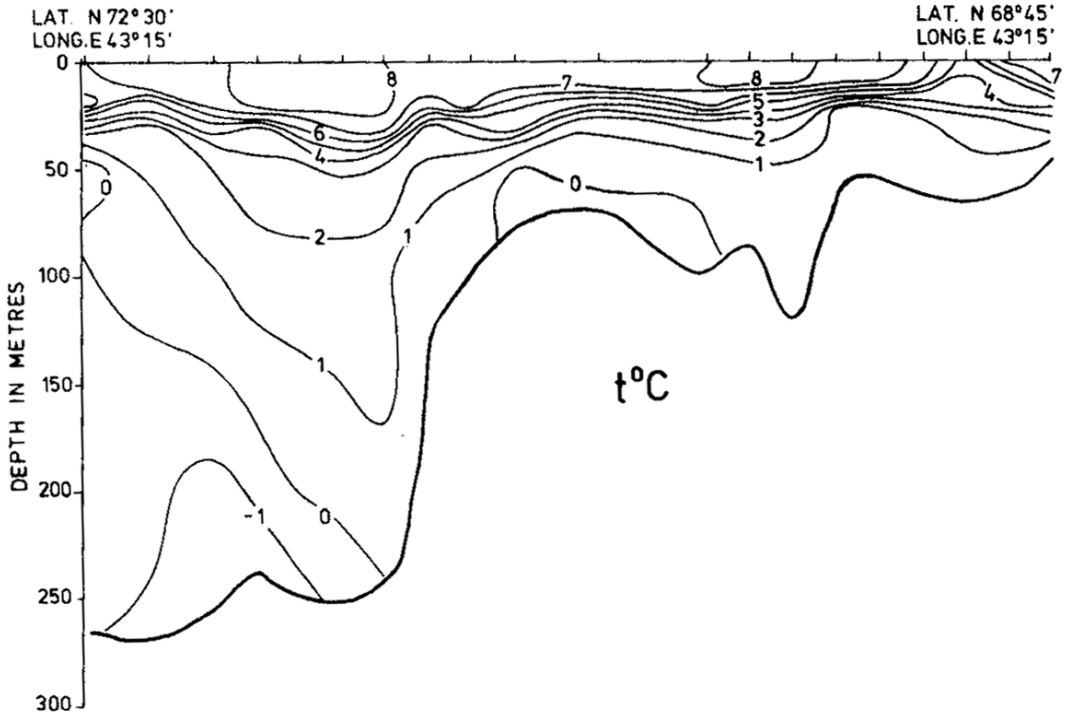

Fig. 7. Temperature section Cape Kanin-North

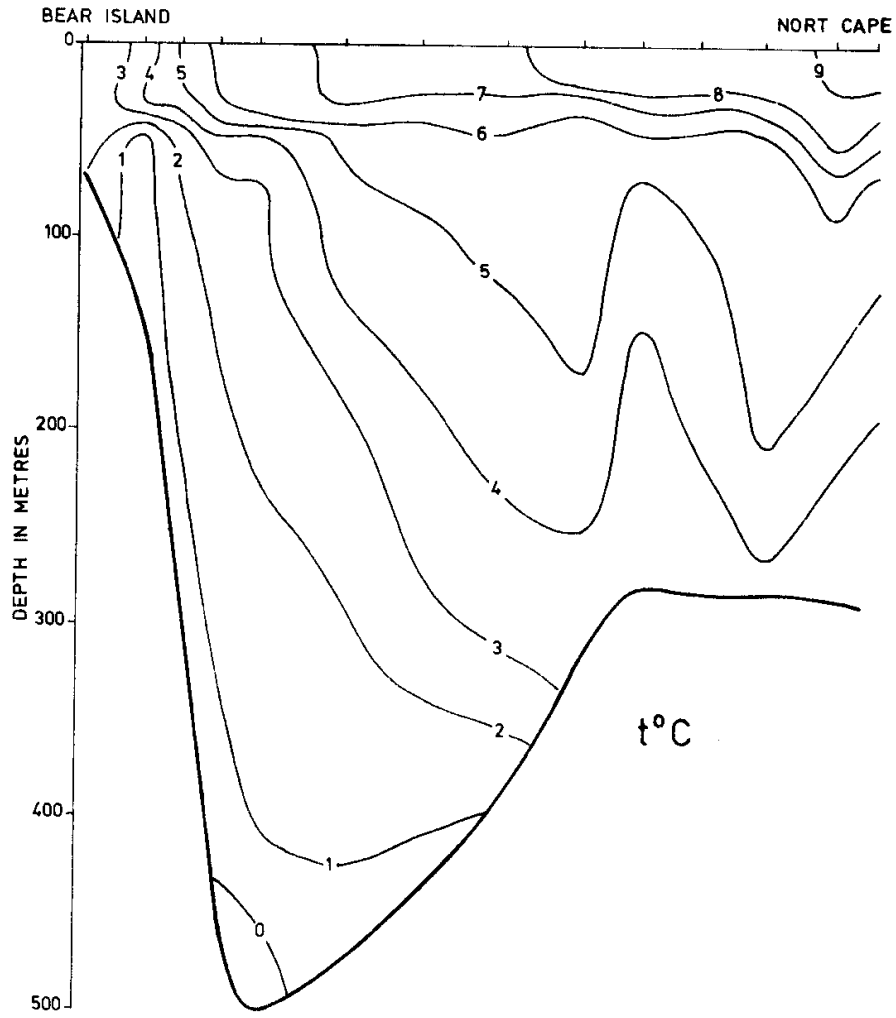

Fig. 8. Temperature section Bear Island-North Cape

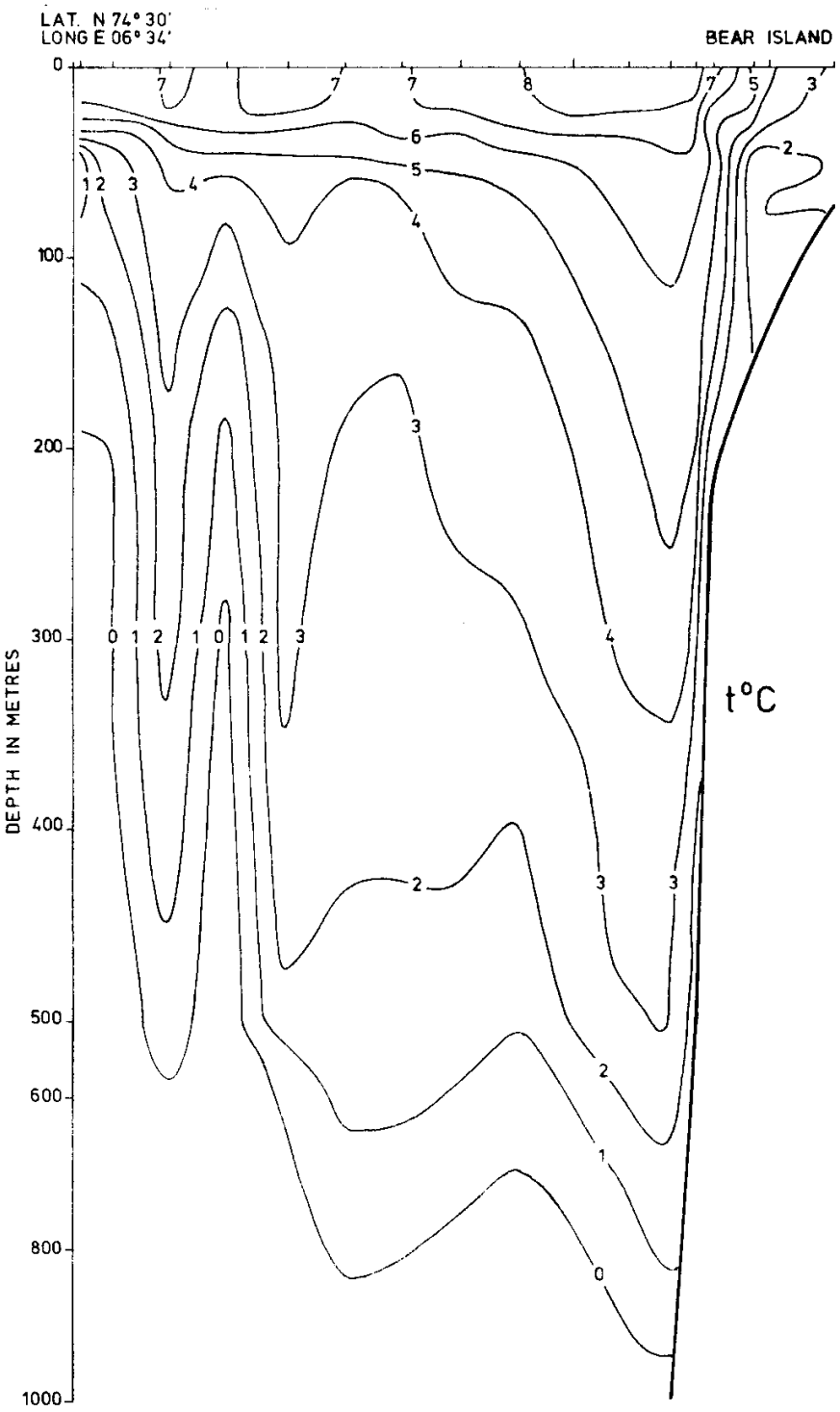

Fig. 9. Temperature section Bear Island-West

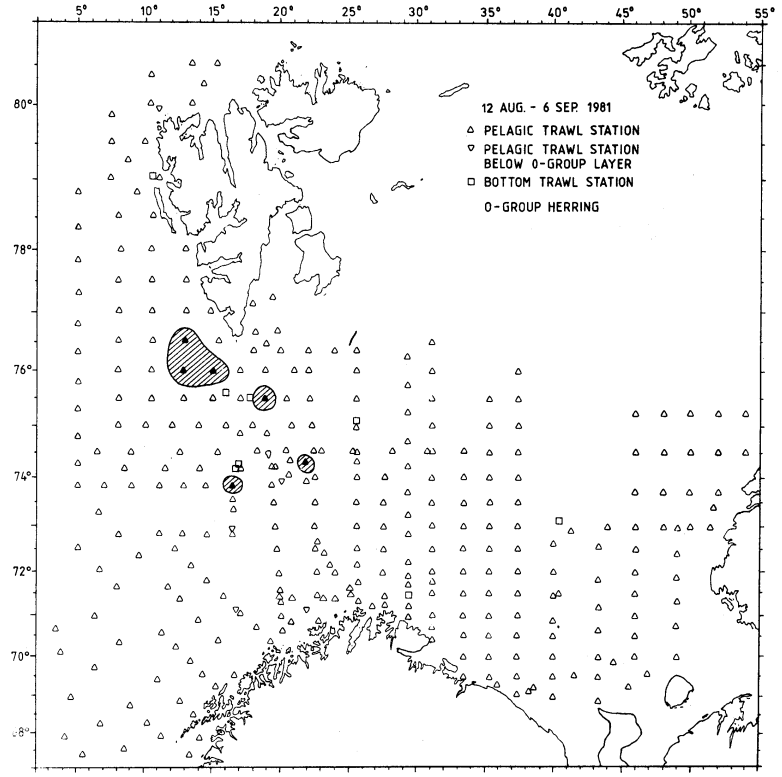

Fig. 10. Distribution of 0-group herring

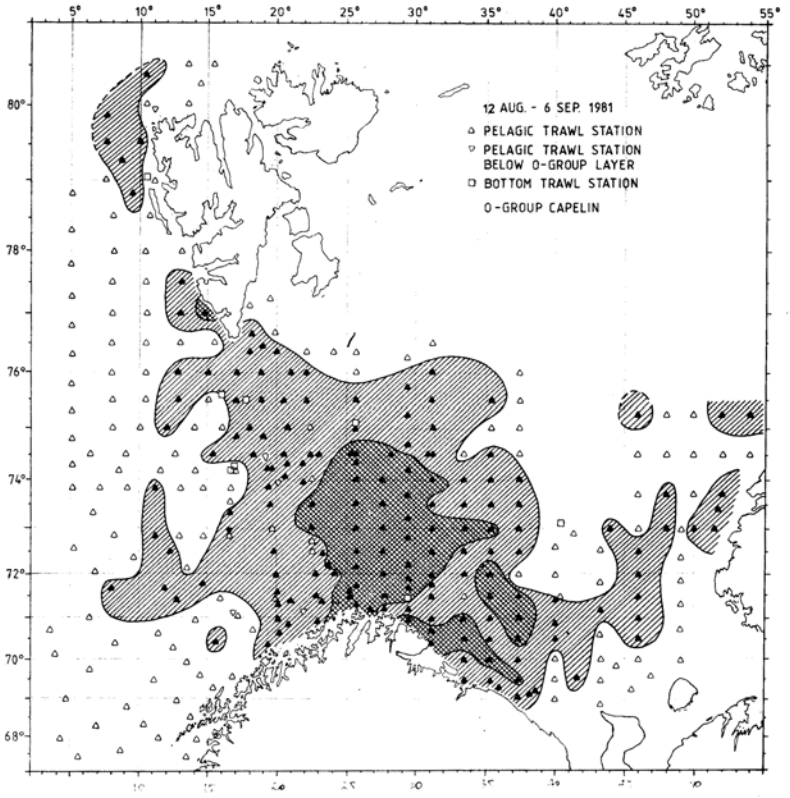

Fig. 11. Distribution of 0-group capelin

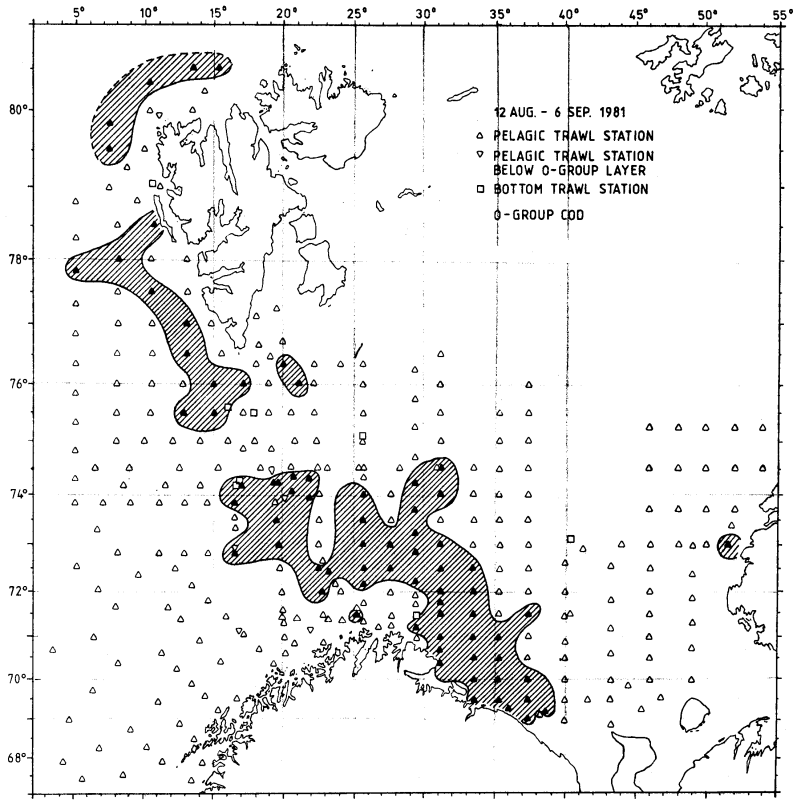

Fig. 12. Distribution of 0-group cod

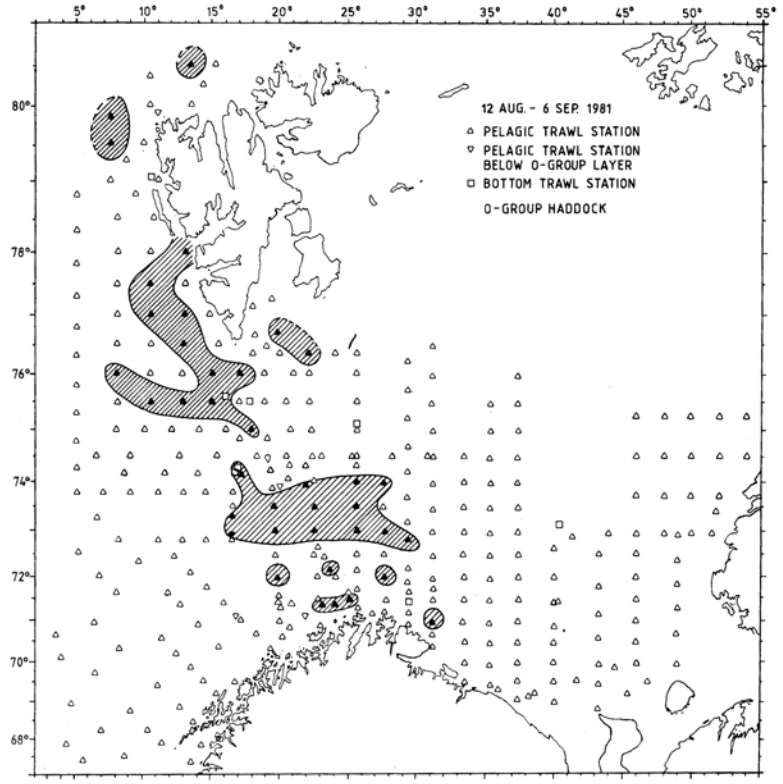

Fig. 13. Distribution of 0-group haddock

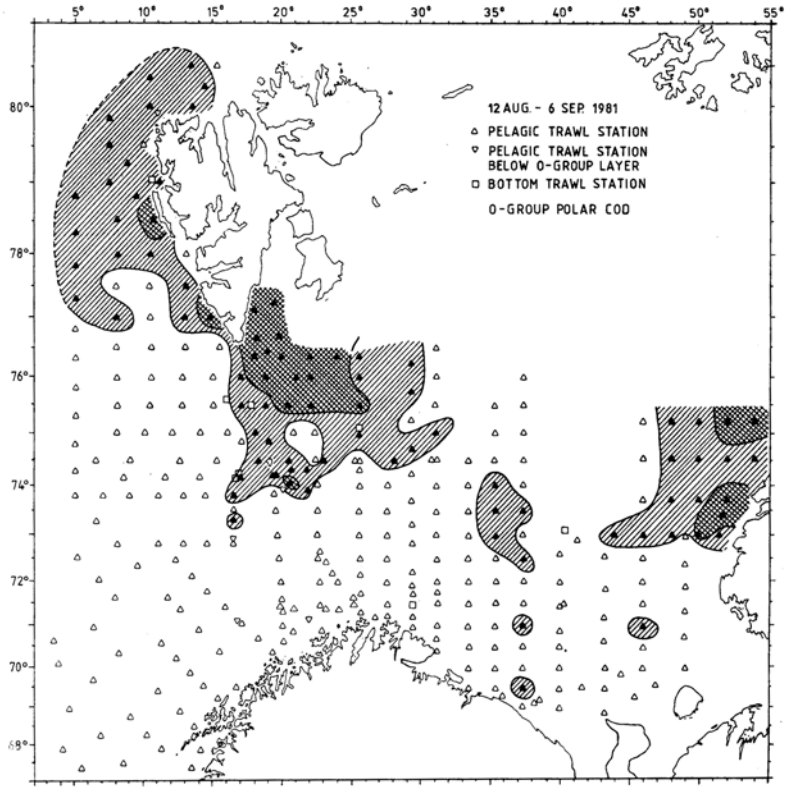

Fig. 14. Distribution of 0-group polar cod

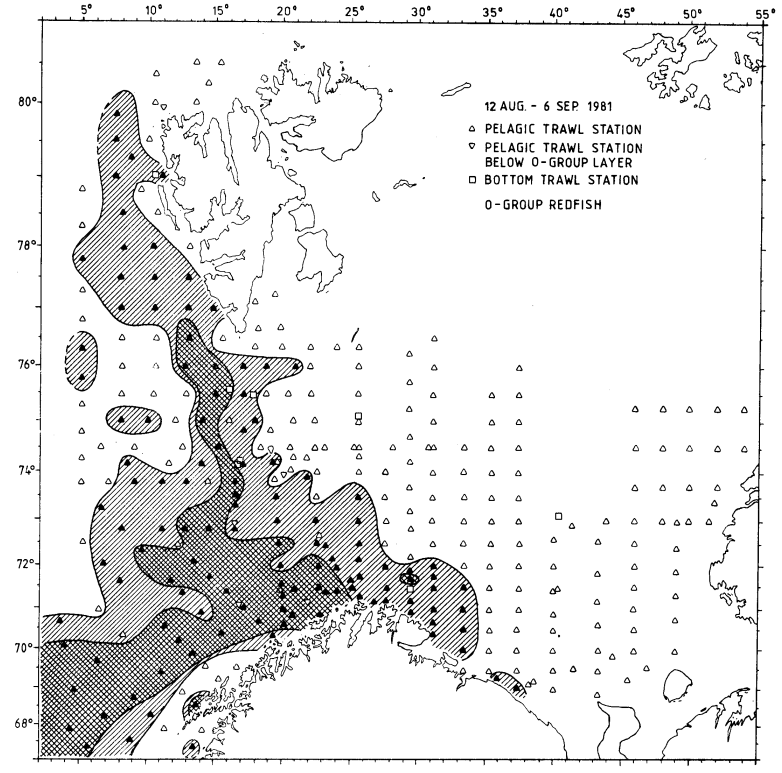

Fig. 15. Distribution of 0-group redfish

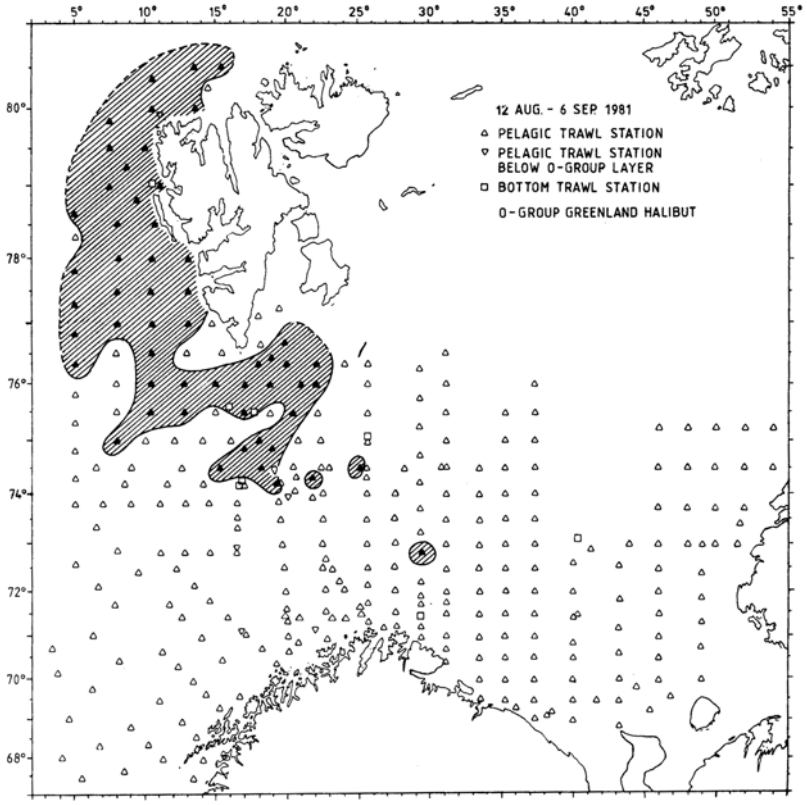

Fig. 16. Distribution of 0-group Greenland halibut

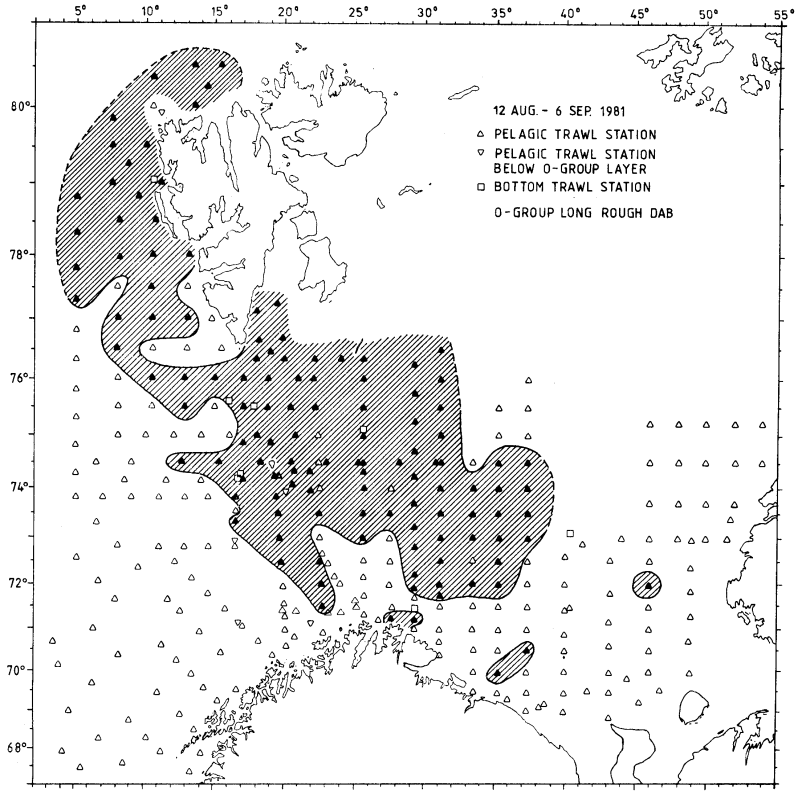

Fig. 17. Distribution of 0-group long rough dab

International Council for
the Exploration of the Sea

CM 1982/G: 44
Demersal Fish Committee
Ref: Pelagic Fish and
Hydrographic Committee

Preliminary report of the International 0-group fish survey in the Barents Sea and adjacent waters in August-September 1982

The eighteenth annual International 0-group fish survey was made during the period 17 August-5 September 1982 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"	17 August-5 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	21 August-5 September	"
Norway	"Michael Sars"	21 August- September	"
USSR	"Persey III"	31 August-5 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Poisk"	23 August-5 September	"
USSR	"Protsion"	28-30 August–7-8 September	"

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

Survey data were analysed 6-7 September in Hammerfest. Observations concerning the geographical distribution of 0-group fish and their abundance are given in this report together with a brief description of the temperature conditions in the area.

Due to several consecutive days with bad weather in the last part of the survey an area west and southwest of Bear Island in particular, was only partly recorded. In order to reduce this gap R/V "Michael Sars" took trawl stations on her way to a ground fish survey off Spitsbergen after the meeting in Hammerfest. The result from these trawl stations have been incorporated in this report.

Material and methods

The geographical distribution of 0-group fish were estimated by fishing with a small meshed midwater trawl. The vessels participating in the survey in 1982 used the type of midwater trawl recommended by the meeting held after the survey in 1980 (Anon. 1980). 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.

Survey tracks and hydrographical stations are given in Fig. 1. Trawl stations with and without catch are given on the distribution charts in Figs. 10-18, as filled with open symbols respectively. The density grading is based on catch in number per 1.0 nautical mile trawling.

Hydrography

Hydrological observations were carried out along all routes and as a role every 30 miles. The horizontal distribution of water temperature is given at 0, 50, 100 and 200 m depth. Temperature conditions data for 4 standart sections are shown in tables 1-4. The results of these observations are given below.

1) Kola section

In comparison with 1981 the water temperature has increased for all layers. The average water temperature at the 50-200 m and 0-200 m layers has exceeded the long-term mean, and at the 0-50 m layer the temperature was close to the long-term mean. Temperature anomaly at the 0-50 m layer was -0,1 °C, at the 50-200 m layer - +0,4 °C, at the 0-200 m layer - +0,3 °C.

2) Kanin section

In the southern part of the section the water temperature has increased from 2,7 °C up to 4,5 °C in comparison with 1981. In the northern part of the section rise of water temperature was insignificant (from 2,5 °C up to 2,8 °C). The anomaly of water temperature in the southern part of the section was +0,4 °C, in the northern part - -0,4 °C.

3) Norht Cape –Bear Island section

The average water temperature at the 0-200 m layer has insreased from 5,3 °C in 1981 up to 5,8 °C in 1982. The anomaly was +0,2 °C.

4) Bear Island – West section (on 74°30' N)

The water temperature at the 0-200 m layer has increased on 0,5 °C in comparison with the last year (from 4,4 °C up to 4,9 °C) and has exceeded the long-term mean on 0,5 °C.

Thus, temperature conditions in the Barents sea during the 0-group survey in 1982 were the same as long-term mean and have exceeded it only on 0,1-0,4 °C in the west of the sea. In the east part of the sea in this period weak negative anomalies were kept. It point to increase of advection of heat by currents in comparison with the last year; with usual solar radiating warming up of surfaces layers.

Distribution and abundance of 0-group fish

Geographical distributions of 0-group fish are shown by shaded areas in Figs. 10-l8. Double shading indicates dense concentrations. The criteria for discriminations 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 7.

Two new sets of abundance indices have been estimated for 0-group cod as described by Randa (1982). They are both based on 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 at least two 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.

Cod (Fig. 10)

The main distribution of 0-group cod is normally separated into two areas west of Spitsbergen and on area north of Finnmark with an extension southeastward to the Kola

peninsula. Although not clearly separated at the time when the survey was conducted, the same general pattern prevails.

The usual 0-group index as given in previous years is given in Table 5. The normalized indices introduced last year (Anon. 1981) and described by Randa (1982) are given in Table. 6.

The 1982 year-class seems to be about the same size as the 1977 year-class. That is larger than the last four year-classes (1978-1981), but well below the rich 1975 year-class that now dominants the fishery.

Haddock (Fig.11)

The distribution extended into more eastern waters than in 1981 when the distribution was more western than usual. The 0-group index indicates that the 1982 year-class is longer than the 1980 and the 1981 year-classes, or about the size of the 1978 and 1979 year-classes.

Herring (Fig. 12)

0-group herring were found on a larger number of stations than in the previous years. In addition to some isolated patches in the western part of the Barents Sea, 0-group herring were found over a relatively large area in the central and eastern part of the Barents Sea. The herring were usually found in areas with dense concentrations of 0-group capelin and/or 0-group redfish, and this created some difficulties in sorting out herring from the catches. It should be emphasized that the overall density of 0-group herring is still very low.

Capelin (Fig. 13)

As in 1981 the distribution of 0-group capelin was more westerly than in 1980 and previous years, reflecting a westerly distribution of the spawning. The area of distribution and overall density is also very similar to 1981, and indicates that the 1982 year-class may be abundant as well.

Polar cod (Fig. 14)

0-group polar cod was much less abundant than in the previous years, and the areas of distribution seemed to be smaller both for the eastern and the western components. It is however quite possible that the 0-group polar cod is distributed partly outside the investigated area.

Redfish (Fig. 15)

The distribution and abundance of 0-group redfish was similar to 1981, indicating a rich year-class.

Saithe (Fig. 16)

Saithe were found occasionally in most parts of the area surveyed, and except for one trawl haul off West Spitsbergen only in small numbers. Since the area surveyed only cover a smaller part of the area were 0-group saithe occur regularly the 0-group index has not been calculated.

Greenland halibut (Fig. 17)

The distribution of Greenland halibut was as usual confined chiefly to the Bear Island-West Spitsbergen area. The index is close to the average of 17.8 in the previous 10 years.

Long rough dab (Fig. 18)

The distribution of 0-group long rough dab in 1982 is similar to the one in 1981. The index of abundance is the highest on record.

Table 1. Mean water temperature in the Murmansk current, the Kola section (between 70°30' N and 72°30' N) at the end of August and the beginning of September 1982 (T °C)

Year/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1965-1982
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	7.1	7.3
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	4.0	3.6
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	4.8	4.5

Table 2. Mean water temperature in the Cape Kanin - North section (between 68°45' N and 72°00' N) at the surface at the end of August and at the beginning of September 1982 (T °C)

Year/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1965-1982
68°45'N 70°05'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	4.5	4.1
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	2.8	3.2

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 1982 (T °C)

Year/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1965-1982
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	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 1982 (T °C)

Year/ Layer	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1965-1982
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	4.9	4.4

Table 5. Abundance indices

Species / Year	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	1	12
1971	157	73		181		172	1	81
1972	140	46		140		177	8.0	65
1973	684	54		(26)		385	3.2	67
1974	51	147		227		468	13.4	83
1975	343	170		75		315	21.1	113
1976	43	112		131		447	15.6	96
1977	173	116	157		70	472	9.0	72
1978	106	61	107		144	460	35.4	76
1979	94	69	23		302	980	22.5	69
1980	49	54	79		247	651	12.0	108
1981	65	30	149		73	861	38.0	95
1982	107	73	14		50	494	16.0	140

Table 6. Abundance indices with 90 % confidence limits for 0-group cod

Year-class	Logarithmic indices		Retransformed indices	
	Index	Confidence Iimits	lndex	Confidence Iimits
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	0.11-0.2	0.98	0.88-1.09
1981	0.11	0.06-0.19	0.71	0.61-0.82
1982	0.77	0.57-0.98	7.2	5.9-8.9

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

Table 7. Length distribution of 0-group fish (%)

Length, mm	Herring	Capelin	Polar cod	Cod	Haddock	Redfish	Greenland halibut	Lrd	Saithe
10-14						0.1			
15-19			0.3	0.1		2.4		0.2	
20-24		0.9	5.0	1.3		7.1		2.7	
25-29		4.2	20.4	5.4		8.2		10.2	
30-34		10.7	24.8	6.6	0.1	14.5		25.3	
35-39	0.1	17.0	23.1	6.5	0.9	21.7	0.7	30.4	0.3
40-44	0.4	21.0	15.5	6.3	2.2	21.9	2.2	24.8	0.1
45-49	2.4	22.9	8.0	6.7	4.1	17.6	10.3	6.1	0.3
50-54	14.8	16.6	2.8	7.6	5.8	5.5	10.3	0.3	0.8
55-59	30.2	5.2		8.8	7.3	1.0	29.8		1.1
60-64	40.7	1.3		13.6	9.2		16.9		0.1
65-69	11.2	0.2		12.3	9.4		14.3		
70-74	0.1			12.0	11.2		8.8		0.1
75-79				6.8	9.8		5.2		0.1
80-84				4.4	9.5		1.1		0.2
85-89	0.1			1.2	9.9		0.4		0.1
90-94			0.1	0.4	8.3				0.9
95-99					5.4				0.1
100-104					4.0				2.6
105-109					1.7				10.6
110-114					0.8				16.5
115-119					0.3				22.1
120-124					0.1				14.1
125-129									12.0
130-134									9.9
135-139									3.2
N	1788	516805	1105	4212	3139	400809	272	5005	1166
Mean length, mm	57	41	32	54	72	36	58	34	117

Appendix

Survey period	Research vessel	Research Institute	Participants
August-6 September	"Poisk"	Polar Research Institute Marine Fisheries and Oceanography, Murmansk	N.G. Ushakov, V.K. Ozhigin, A. Sennikov and others
August-6 September	"Persey III"	"	
August-5 September	"G.O. Sars"	Institute of Marine Research, Bergen	K. Hansen, A. Hylen, H. Ludvigsen, H. Kismul, E.Molvær, A. Nødtvedt, A. Roald, K. Randa
August-September	"Michael Sars"	"	H. Abrahamsen, O. Alvheim, A. Donunasnes, K. Gjertsen, M. Myhr, J.E. Nygård
17 August-5 September	"Johan Hjort"	"	S. Andreassen, J. Blindheim, P. Bratland, K. Gjertsen, I. Hoff, E. Klæt, K. Lauvås, J.E. Klæt, S. Lygren, C.J. Rørvik, J.Rørvik, A.M. Skorpen

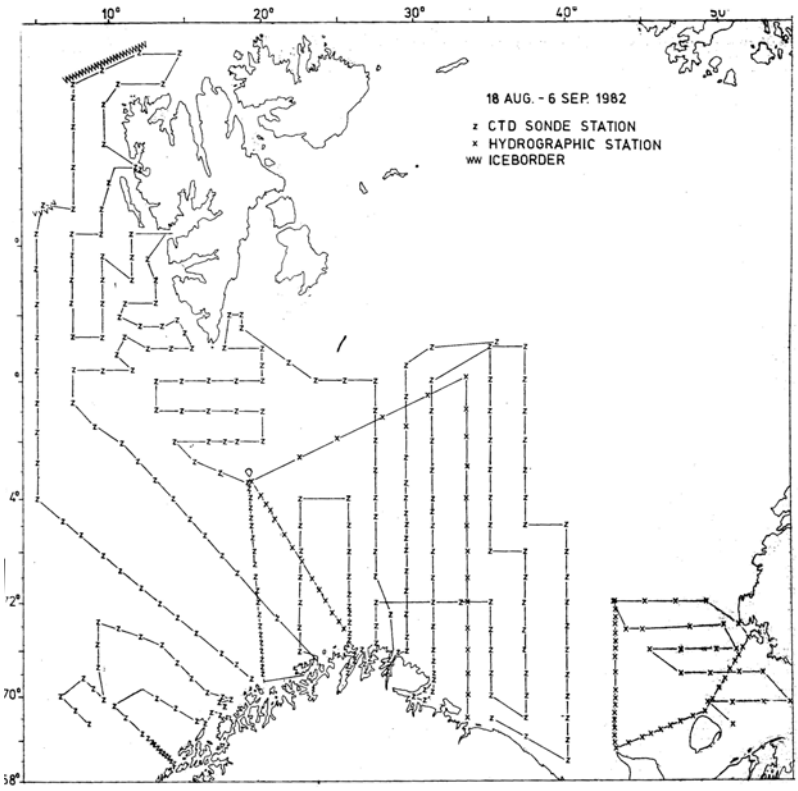

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

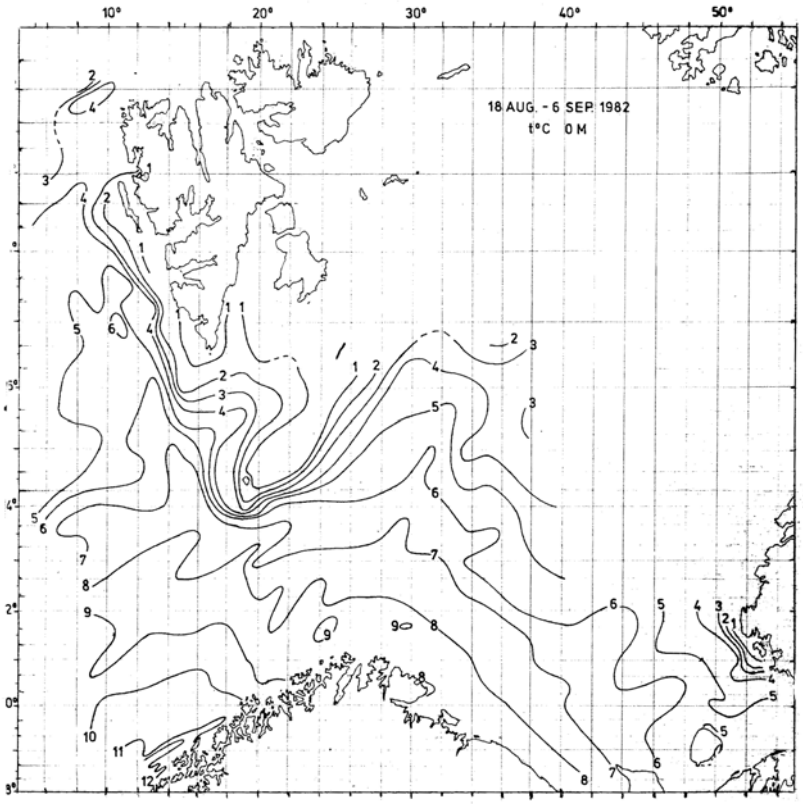

Fig. 2. Isotherms at 0 m

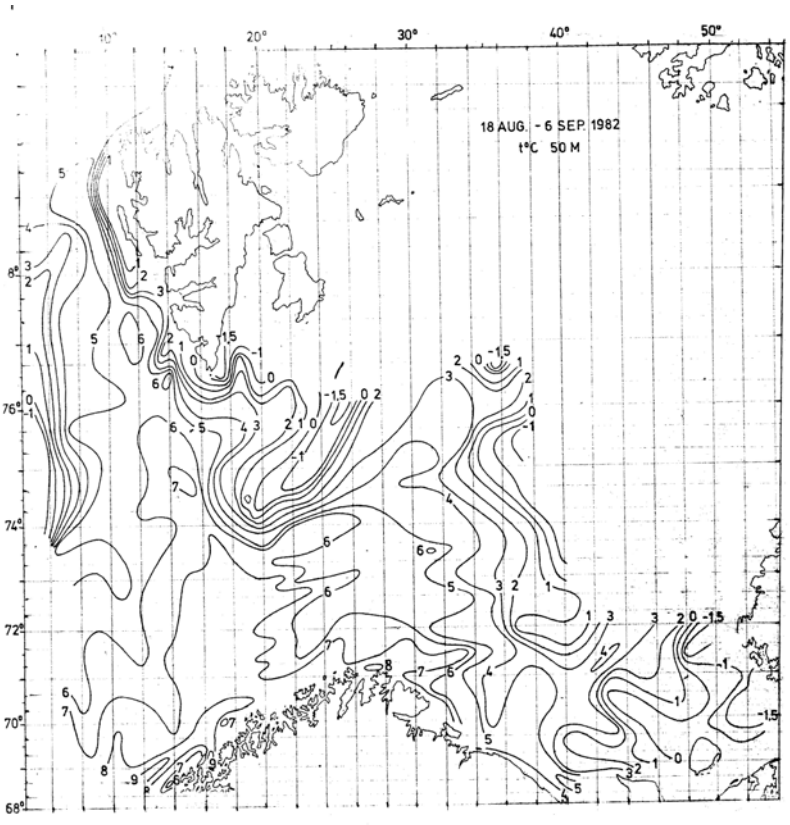

Fig. 3. Isotherms at 50 m

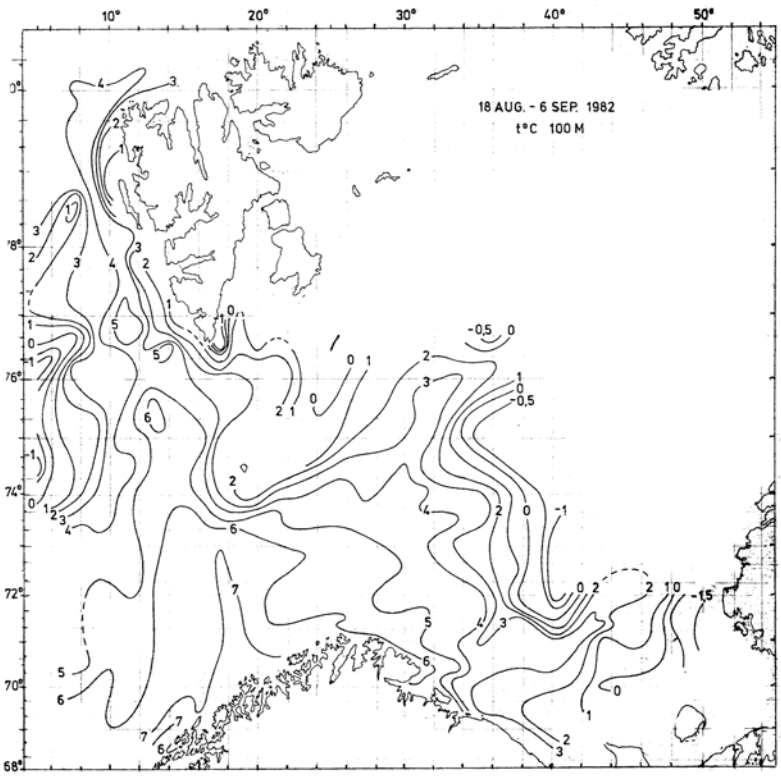

Fig. 4. Isotherms at 100 m

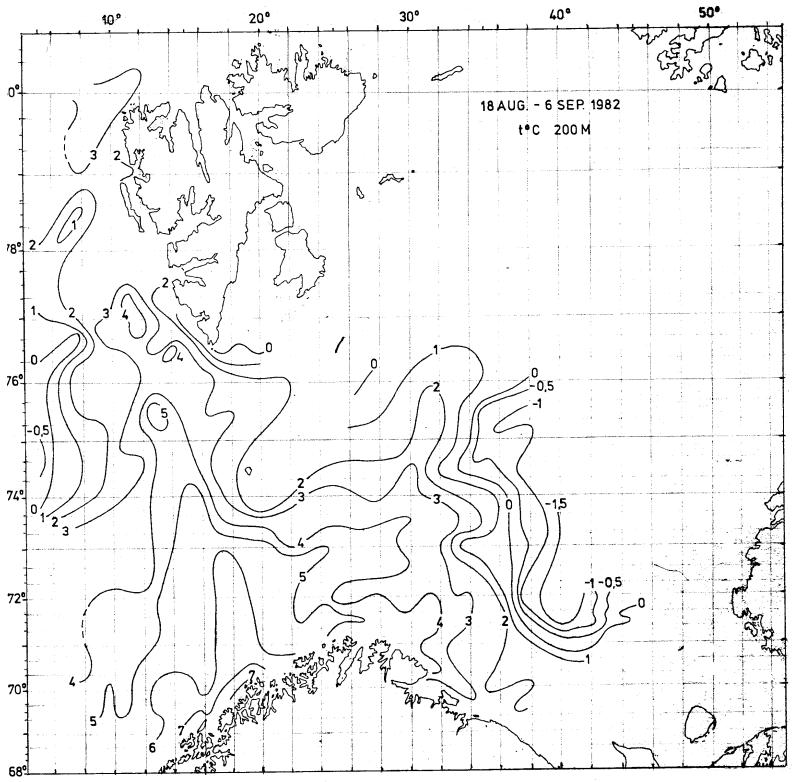

Fig. 5. Isotherms at 200 m

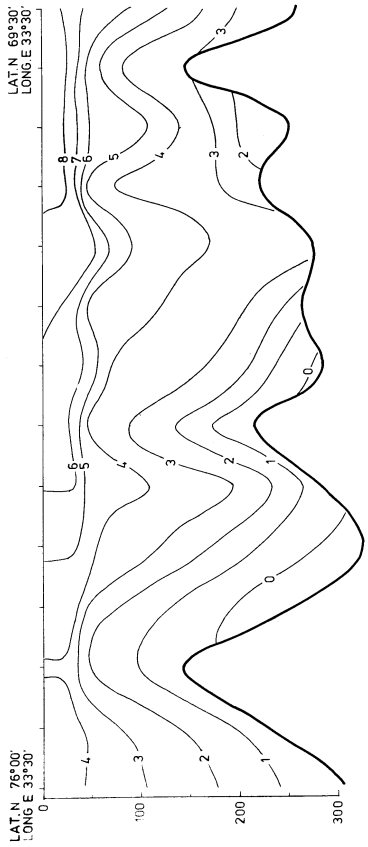

Fig. 6. Temperature section along the Kola meridian

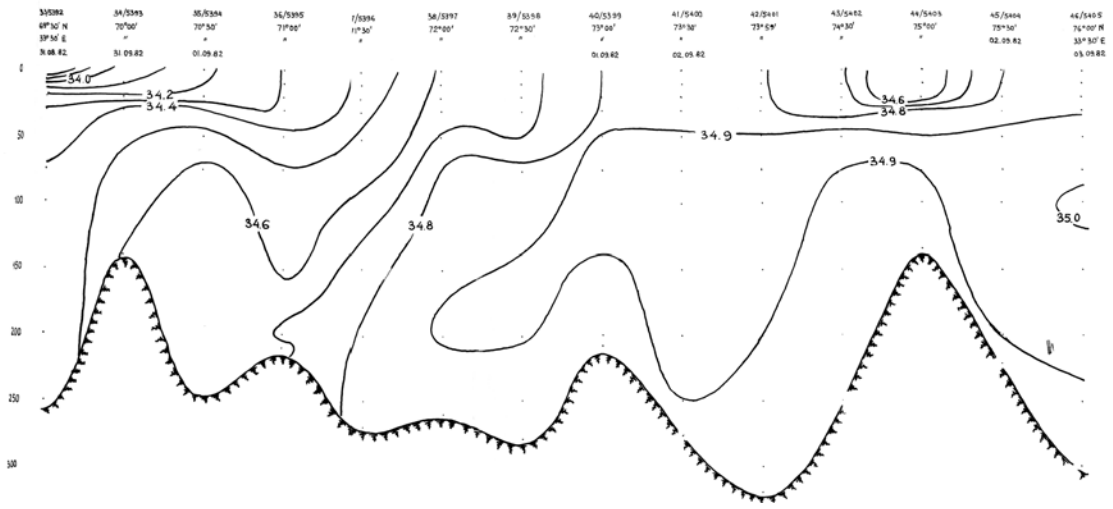

Fig. 7. Salinity section along the Kola meridian

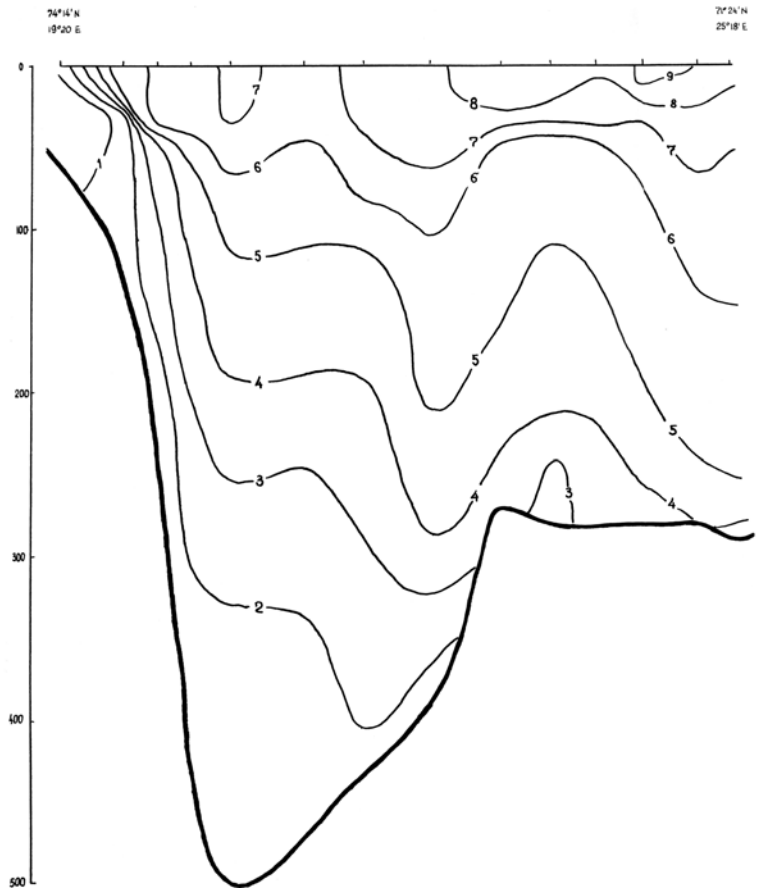

Fig. 8. Temperature section Bear Island-North Cape

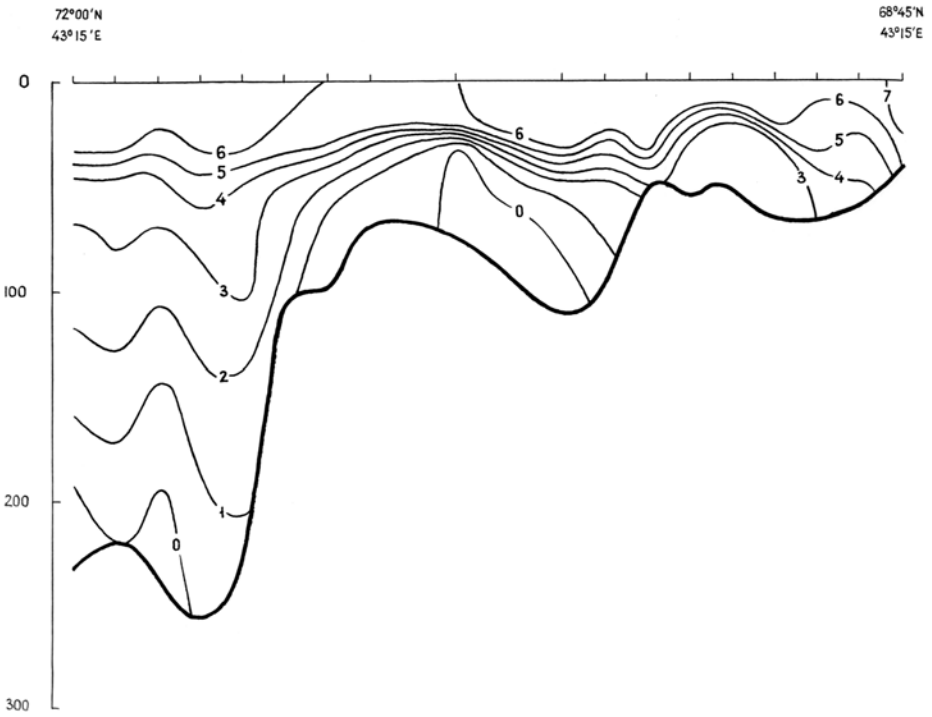

Fig. 9. Temperature section Cape Kanin-North

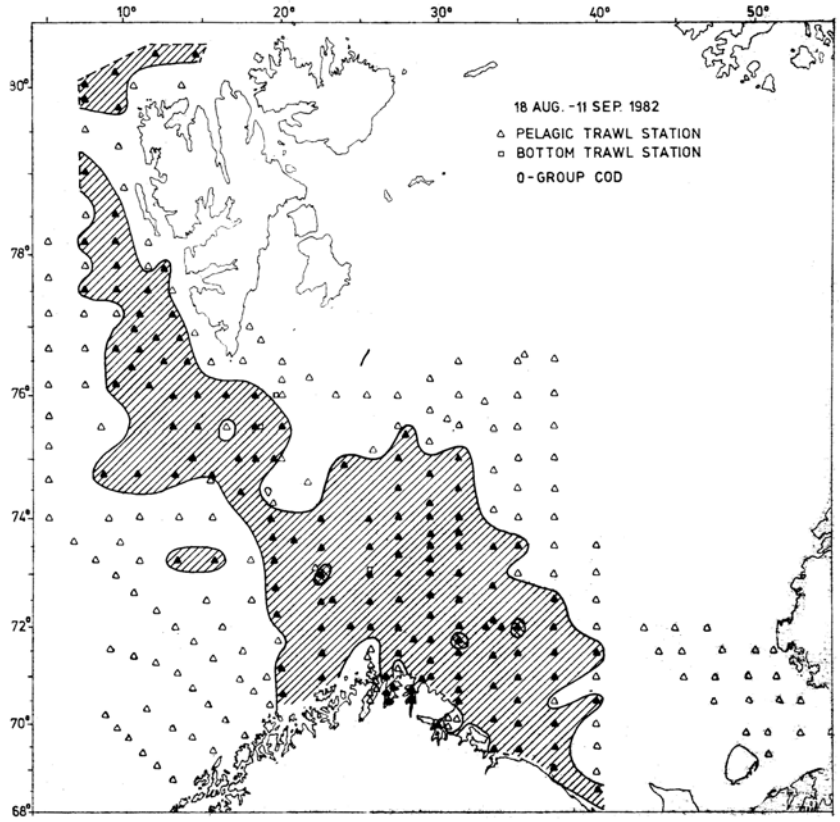

Fig. 10. Distribution of 0-group cod

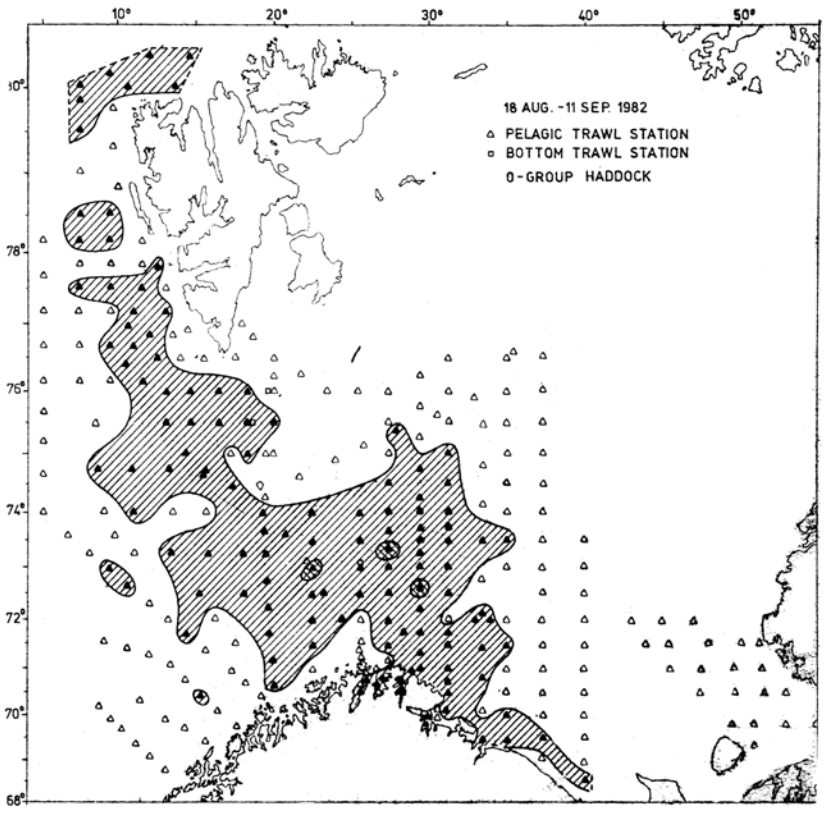

Fig. 11. Distribution of 0-group haddock

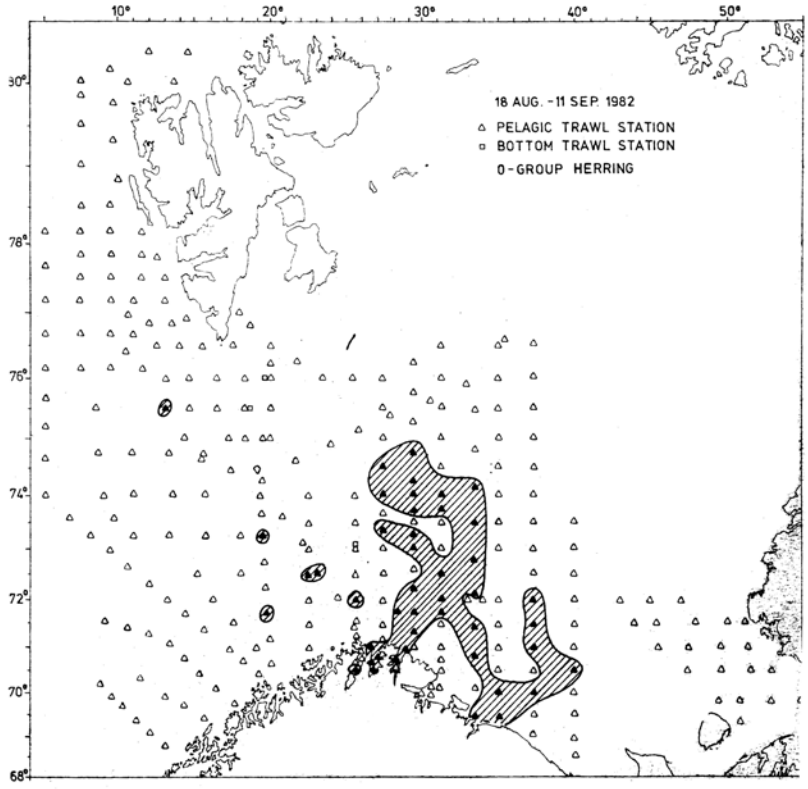

Fig. 12. Distribution of 0-group herring

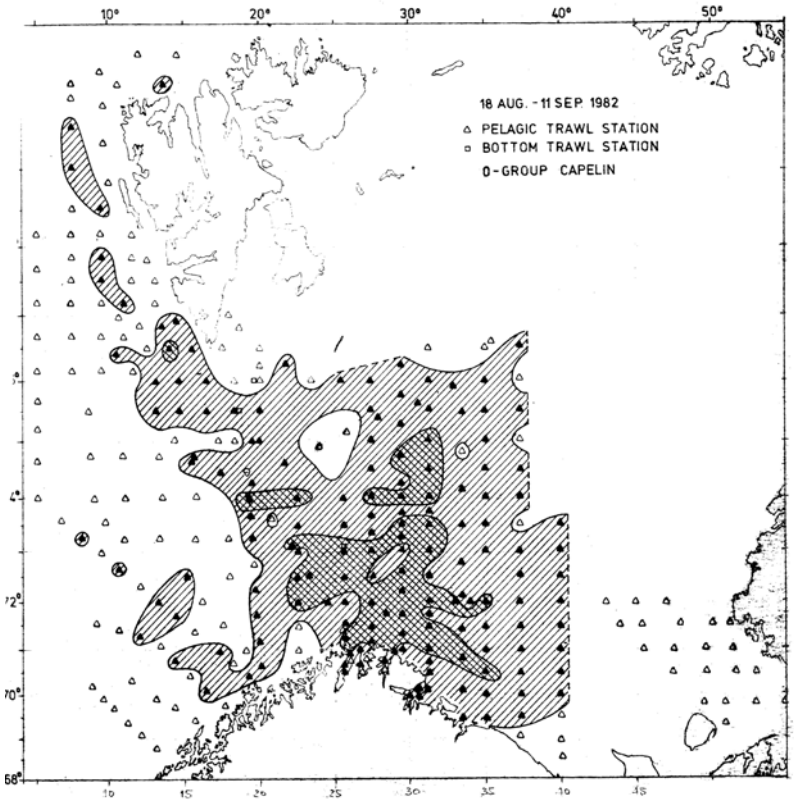

Fig. 13. Distribution of 0-group capelin

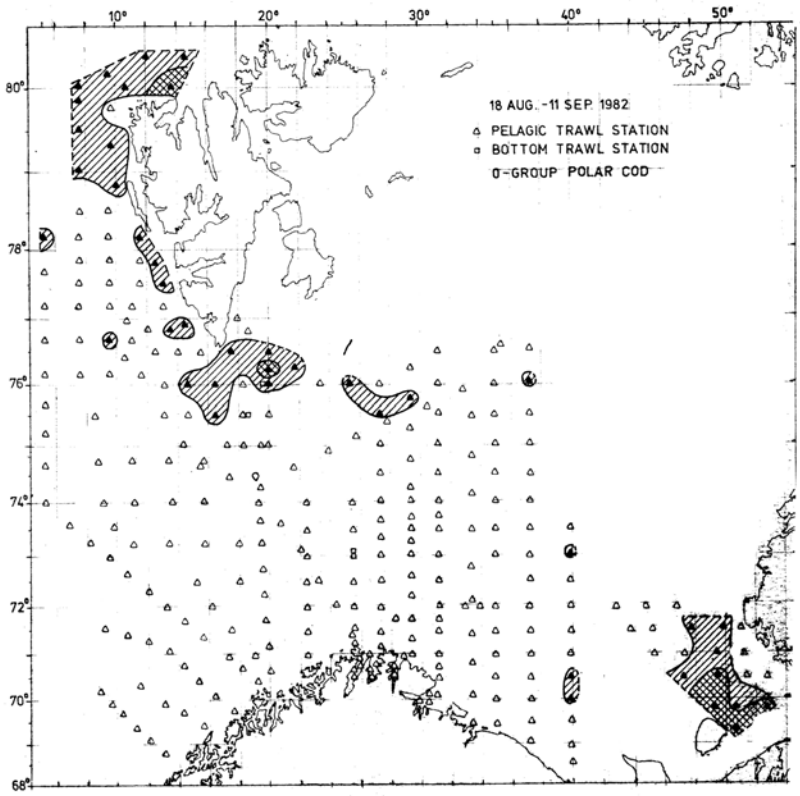

Fig. 14. Distribution of 0-group polar cod

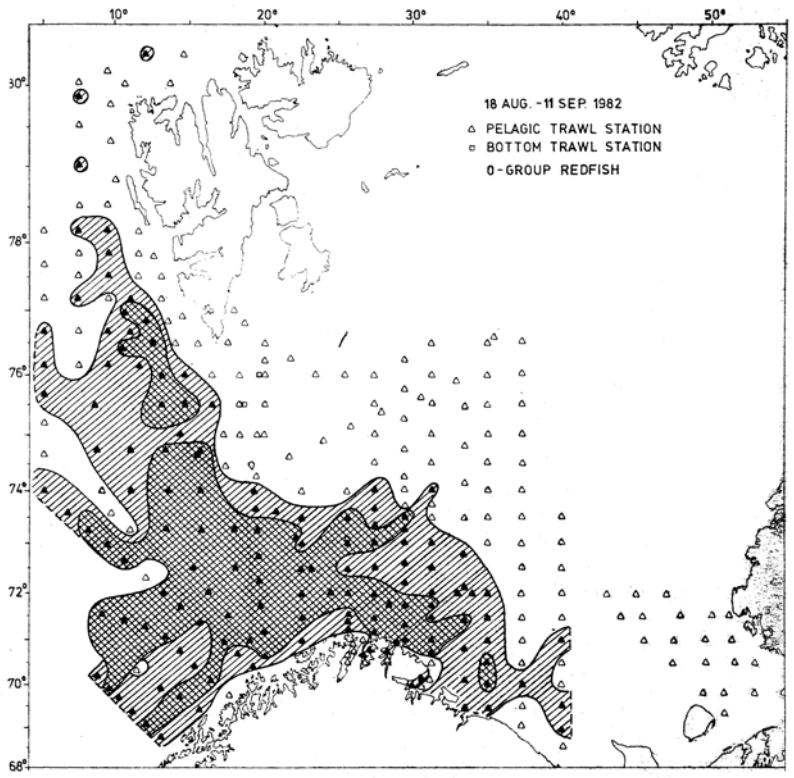

Fig. 15. Distribution of 0-group redfish

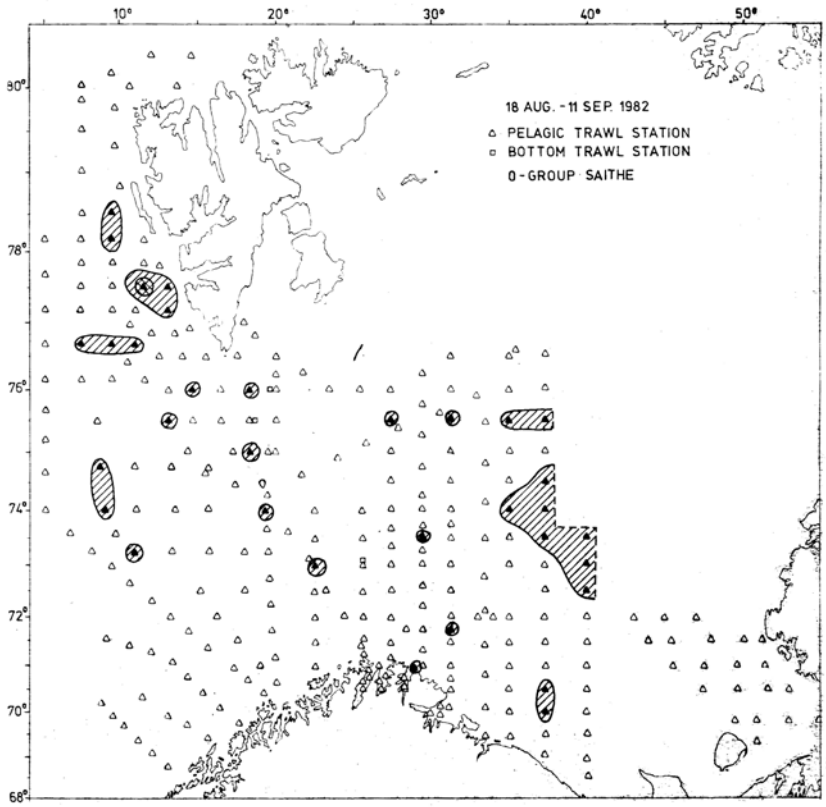

Fig. 16. Distribution of 0-group saithe

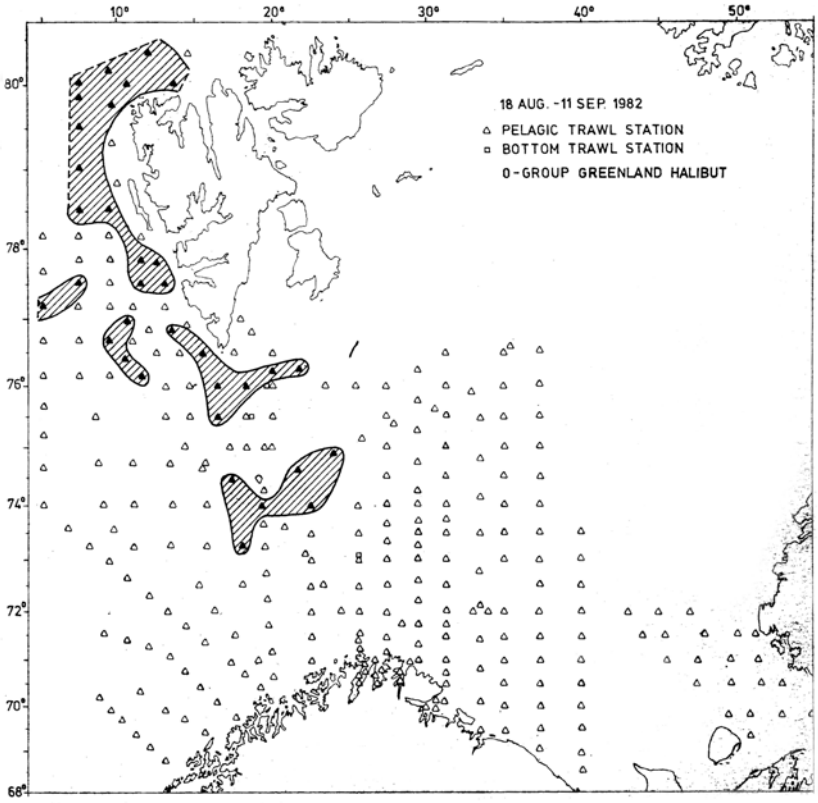

Fig. 17. Distribution of 0-group Greenland halibut

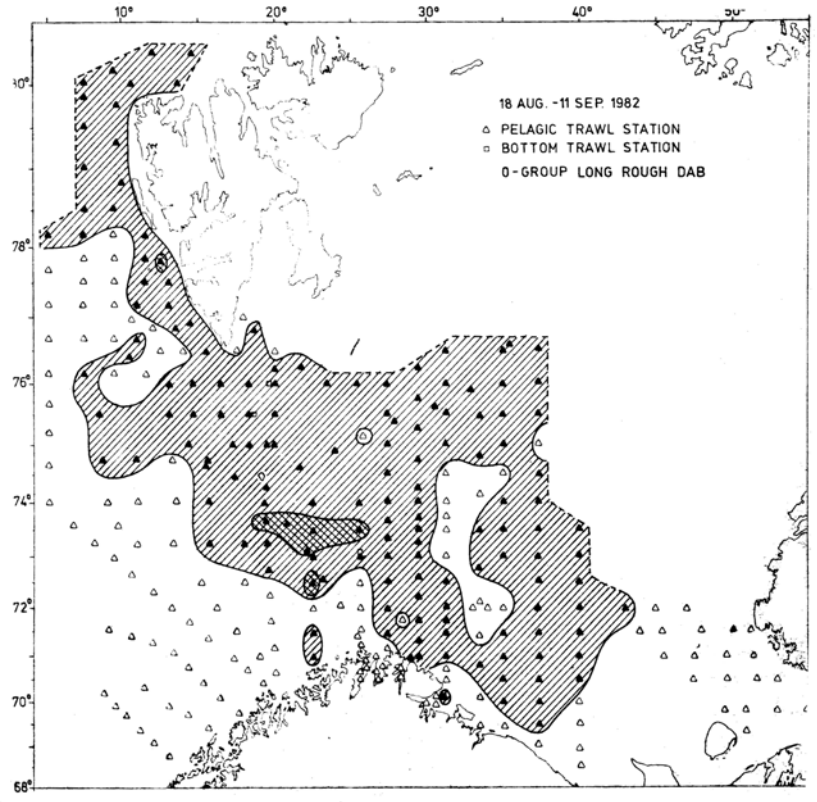

Fig. 18. Distribution of 0-group long rough dab

International Council for
the Exploration of the Sea

CM 1983/G:35
Demersal Fish Committee
Ref: Pelagic Fish and
Hydrographic Committee

Preliminary report of the International 0-group fish survey in the Barents Sea and adjacent waters in August-September 1983

The nineteenth annual International 0-group fish survey was made during the period 21 August-8 September 1983 in the Barents Sea and adjacent waters. The following research vessels participated in the survey:

State	Name of vessel	Survey time	Research Institute
Norway	"Eldjarn"	21 August-8 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	21 August-5 September	"
Norway	"Michael Sars"	21 August-5 September	"
USSR	"Persey III"	22 August-5 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Poisk"	24 August-3 September	"
USSR	"Alaid"	20 August-26 August	"

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

Survey data were analyzed 5-6 September in Hammerfest. Observations concerning the geographical distribution of 0-group fish and their abundance are given in this report together with a brief description of the temperature conditions in the area. Due to lack of time in the last part of the survey an area west and southwest of Bear Island in particular, was only partly covered. In order to reduce this gap R/V "Eldjarn" took trawl stations in the period 7 September-8 September on her way to a ground fish survey off Spitsbergen after the meeting in Hammerfest. The results from these trawl stations have been incorporated in this report.

Material and methods

The geographical distribution of 0-group fish were estimated by fishing with a small meshed midwater trawl. The vessels participating in the survey in 1983 (except "Poisk") used the type of midwater trawl recommended by the meeting held after the survey in 1980 (Anon., 1980). 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.

Survey tracks and hydrographical stations are given in Fig. 1. Trawl stations with and without catch are given on the distribution charts in Figs 10-19, as filled and open symbols respectively. The density grading is based on catch in number per 1.0 nautical mile trawling.

Hydrography

Hydrographical observation was 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 the four standard sections, and the mean temperature of these sections are given in Tables 1-4. Some general comments are given below:

1) Kola section

Compared with 1982 the temperature was almost 1 °C higher. In the layers 0-200 and 50-200 m the temperature was higher than the average long-term level. It's absolute values turned out to be the highest during the whole period of investigations. In the layer 0-50 m the temperature conditions reached the level of warm years (1974, 1976). The anomalies at this section were 0.8 °C for the layer 0-50 m, 1.0 °C for 0-200 m and 1.2 °C for 50-200 m.

2) Cape Kanin section

In the northern part of the section the temperature was 1.4 °C higher compared with 1982. Compared with the average long-term value the anomaly in this part of the section was 0.7 °C; in the southern part it was 1.0 °C.

3) North Cape - Bear Island section

The mean temperature in the 0-200 m has increased from 5.8° in 1982 to 6.3° in 1983. The anomaly was 0.7 °C.

4) Bear Island-West section

In the 0-200 m layer the temperature has increased by 0.2°C compared with the previous year, which is higher than the average long-term level for the period 1965-1982 by 0.7 °C.

Thus, in late August - early September 1983 the water temperature was higher than the previous year and above the average long-term value both in the eastern and western part of the survey area. The temperature conditions approached the level of warm years.

Distribution and abundance of 0-group fish

Geographical distributions of 0-group fish are shown by shaded areas in Figs. 10-18. Double shading indicates dense concentrations. The criteria for discriminations 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 7.

A new sets of abundance indices have been calculated for 0-group cod and haddock (Table 6) as described by Randa (1983). They are based on the number caught during a standard trawl haul of one nautical mile.

Herring (Fig. 10)

0-group herring was found on a far larger number of stations and the numbers of specimens at each station were also far greater than it has been observed since the international 0-group surveys started in 1965. The double shading indicates more than 1000 specimen per haul of 1 n. mile. 0-group herring were found in large areas of central and western parts of the Barents Sea and the most dense concentrations were found at the south-western limit of the survey area.

The extension of the distribution towards south-west, along the Norwegian coast is thus not covered in this survey but reports from Norwegian fishermen indicates that the 0-group herring is also distributed south of the Lofoten islands. It is therefore concluded that the overall density of 0-group herring is very high this year compared to all years after 1965.

Capelin (Fig. 11)

The area of distribution and the overall density is similar to that in 1982, and indicate that the 1983 year-class may be as abundant as the 1982 year-class. The density of capelin this year is somewhat higher in the north-western part of the survey area (off Spitsbergen) than in previous years.

Cod (Fig. 12)

The 0-group cod was distributed in two separated areas as in 1982, north of the Finnmark and Murman coast and west of Spitsbergen. Two different indices of year-class strength are given in Table 5 and 6. Both indices indicate that the 1983 year-class is a rich year-class, even more abundant than the 1975 year-class, which has dominated the fishery in the recent years.

Haddock (Fig. 13)

The distribution extended into more northeastern waters than in 1982. The two indices of year-class strength indicate that the 1983 year-class is stronger than the 1975 year-class, which has dominated the fishery in the late seventies and early eighties. The 1983 year-class was stronger in the 0-group survey than the 1982 year-class. However, a ground fish survey in winter 1983 indicates that the 1982 year-class is stronger than recorded in the 0-group survey.

Polar cod (Fig. 14)

0-group polar cod was as usually found in two separated areas. Areas of high concentrations were found mostly in the Spitsbergen area, and the abundance index indicated that the western component is the most abundant. The index for the eastern component indicated it to be less abundant than last year. The total index indicated the 1983 year-class is somewhat more abundant than the 1982 year-class. It is, however, quite possible that 0-group polar cod is distributed outside the investigated area in high numbers.

Redfish (Fig. 15)

The distribution of 0-group redfish is similar to the one found last year, indicating that the 1983 year-class is another strong one.

Greenland halibut (Fig. 16)

0-group Greenland halibut was as usually found in the Bear Island - West Spitsbergen area. The abundance index for the 1983 year-class is similar to the one for the 1982 year-class and close to the long time average.

Long rough dab (Fig. 17)

0-group long rough dab was found further to the north than in 1982. The calculated index is lower than the very high 1982 index and close to the 1981 figure.

Saithe (Fig. 18)

0-group saithe was found in an exceptionally large area in the central Barents Sea. The shaded area in Fig. 18 represents more than 85 specimens per haul of 1.0 nautical mile. 0-group saithe has not been observed in such high numbers during the 0-group survey since 1967. No index of abundance has been calculated because 0-group saithe is not found every year in the survey area.

Blue whiting (Fig. 19)

0-group blue whiting was recorded south of 75° N and between 20° E and 35° E. This is the first year 0-group blue whiting has been recorded during the 0-group survey in the Barents Sea. As for saithe no index of abundance has been calculated.

References

Anon., 1978. Preliminary report of the International 0-group fish survey in the Barents Sea and adjacent waters in August-September 1978. Coun. Meet. int. Coun. Explor. Sea, 1978 (H: 33); 1-24. [Mimeo.]

Anon., 1980. Preliminary report of the International 0-group fish survey in the Barents Sea and adjacent waters in August-September 1980. Coun. Meet. int. Coun. Explor. Sea, 1978 (G: 53): 1-25. [Mimeo.]

Randa, K., 1983. Abundance and distribution of 0-group Arcto-Norwegian cod and haddock 1965-1982. Contribution to the PINRO/IMR-symposium in Leningrad, September 1983. 1-26. [Mimeo.]

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 the beginning of September 1983 (T °C)

Year/ Layer	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1965-1983
0-50 m	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	7.1	8.1	7.3
50-200 m	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	4.0	4.8	3.6
0-200 m	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	4.8	5.6	4.6

Table 2. Mean water temperature in the Cape Kanin - 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 1983 (T °C)

Year/ Layer	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1965-1983
68°45'N 70°05'N	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	4.5	5.1	4.1
71°00'N 72°00'N	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	2.8	4.2	3.5

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 1983 (T °C)

Year/ Layer	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1965-1983
0-200 m	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	6.3	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 1983 (T °C)

Year/ Layer	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1965-1983
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	4.9	5.1	4.4

Table 5. Abundance indices

Species Year	Cod	Haddock	Polar cod			Redfish	Greenland halibut	Long rough dab	Capelin
			West		East				
1965	6	7		0		159		66	37
1966	1	1		129		236		97	119
1967	34	42		165		44		73	89
1968	25	8		60		21		17	99
1969	93	82		208		295		26	109
1970	606	115		197		247	1	12	51
1971	157	73		181		172	1	81	151
1972	140	46		140		177	8.0	65	275
1973	684	54		(26)		385	3.2	67	125
1974	51	147		227		468	13.4	83	359
1975	343	170		75		315	21.1	113	320
1976	43	112		131		447	15.6	96	281
1977	173	116	157		70	472	9.0	72	194
1978	106	61	107		144	460	35.4	76	40
1979	94	69	23		302	980	22.5	69	660
1980	49	54	79		247	651	12.0	108	592
1981	65	30	149		73	861	38.0	95	570
1982	114	90	14		50	694	17.0	150	393
1983	386	184	48		39	851	15.8	80	589

Table 6. Estimated indices with 90 % confidence limits of year class abundance for 0-group cod and haddock in the total area

Year-class	Cod			Haddock		
	Logarithmic index	Confidence limits (95%)		Logarithmic index	Confidence limits (95%)	
1965	+			0.01	0.00	0.04
1966	0.02	0.01	0.04	0.01	0.00	0.03
1967	0.04	0.02	0.08	0.08	0.03	0.13
1968	0.02	0.01	0.04	0.00	0.00	0.02
1969	0.25	0.17	0.34	0.29	0.20	0.41
1970	2.51	2.02	3.05	0.64	0.42	0.91
1971	0.77	0.57	1.01	0.26	0.18	0.36
1972	0.52	0.35	0.72	0.16	0.09	0.27
1973	1.48	1.18	1.82	0.26	0.15	0.40
1974	0.29	0.18	0.42	0.51	0.39	0.68
1975	0.90	0.66	1.17	0.60	0.40	0.85
1976	0.13	0.06	0.22	0.38	0.24	0.51
1977	0.49	0.36	0.65	0.33	0.21	0.48
1978	0.22	0.14	0.32	0.12	0.07	0.19
1979	0.40	0.25	0.59	0.20	0.12	0.28
1980	0.13	0.08	0.18	0.15	0.10	0.20
1981	0.10	0.06	0.18	0.03	0.00	0.05
1982	0.59	0.43	0.77	0.38	0.30	0.52
1983	1.69	1.34	2.08	0.62	0.48	0.77

Table 7. Length distribution of 0-group fish (%)

Length, mm	Herring	Capelin	Polar cod	Greenland halibut	Lrd	Haddock	Cod	Redfish	Saithe	Blue whiting
10-14								+		
15-19								0.2		
20-24		+	2.3		1.4			1.9		
25-29		0.1	19.2		4.1		+	6.1		0.1
30-34	+	0.6	31.9	0.4	13.0		+	11.4		1.0
35-39	+	6.0	20.8		22.1	0.1	0.2	15.2		2.6
40-44	+	16.7	16.7	2.8	34.9	0.8	0.8	21.1		5.4
45-49	0.1	18.4	5.3	7.9	19.5	1.5	1.7	22.7		4.9
50-54	0.4	21.8	3.3	7.9	1.9	3.0	2.8	14.4		7.9
55-59	0.9	20.9	0.3	4.7	+	3.1	3.5	5.8		8.3
60-64	3.2	10.6	0.1	18.5	+	5.1	6.0	0.9		16.2
65-69	9.0	4.6	+	18.9		5.8	7.4	+		15.9
70-74	17.3	0.4	+	29.9		6.3	13.6	+		13.4
75-79	13.2	+	+	4.3		7.3	18.9	+		11.0
80-84	13.6			3.5		8.9	16.8	+	0.4	7.9
85-89	12.9		+	1.2		8.5	12.7	+	1.0	4.1
90-94	13.4					10.3	7.9		3.1	1.7
95-99	8.9					8.5	3.7		2.3	0.4
100-104	5.8					8.6	2.6		7.3	0.1
105-109	1.0					6.2	0.7		9.0	
110-114	0.3					6.9	0.3		11.2	
115-119	0.1					4.6	0.1		19.2	
120-124						2.1	+		19.8	
125-129						0.1	+		16.4	
130-134						+	+		19.9	
135-139						+	+		17.3	
140-144						+	+		10.6	
145-149									4.4	
150-154									2.0	
155-159									0.3	
160-164									0.1	
N	96533	380747	56499	254	1191	6109	16550	430684	1373	761
Mean length, mm	82.6	51.7	35.6	65.2	39.3	88.7	78.0	42.9	124.8	65.6

Appendix

Survey period	Research vessel	Research Institute	Participants
24 August- 3 September	"Poisk"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk	I.V. Borkin, E.N. Loparev. V.N. Nen'ko
22 August- 5 September	"Persey III"	"	S.V. Belikov, N.V. Bryzgalova, E.S. Demidenko, P.V. Fedorov, V.A. Khljupin, L.N. Korol, V.I. Shapovalov, Ju.F. Shevtso, M.V. Shkatova, E.S. Shishkin, N.G. Ushakov, N.V. Vanjukhina, A.D. Voloshin
24 August- 3 September	"Alaid"	"	N.P. Chebotok, A.Ph. Pshenichnov
21 August- 5 September	"G.O. Sars"	Institute of Marine Research, Bergen	B. Brynildsen, A. Hylen, H. Kismul, L. Pettersen, J. Røttingen, A.M. Skorpen, I. Svellingen, B. Tveranger, E. Øvretvedt
21 August- 5 September	"Michael Sars"	"	I.M. Beck, K. Gjertsen, B. Kvinge, E. Molvær, H. Myran, R. Thoresen
21 August- 8 September	"Eldjarn"	"	O.R. Godø, B. Hoffstad, F. Lie, H. Ludvigsen, J.E. Klæt, M. Møgster, H. Mørner, K. Randa, A. Romslo, A.K. Solheim, Ø. Torgersen, S. Torheim

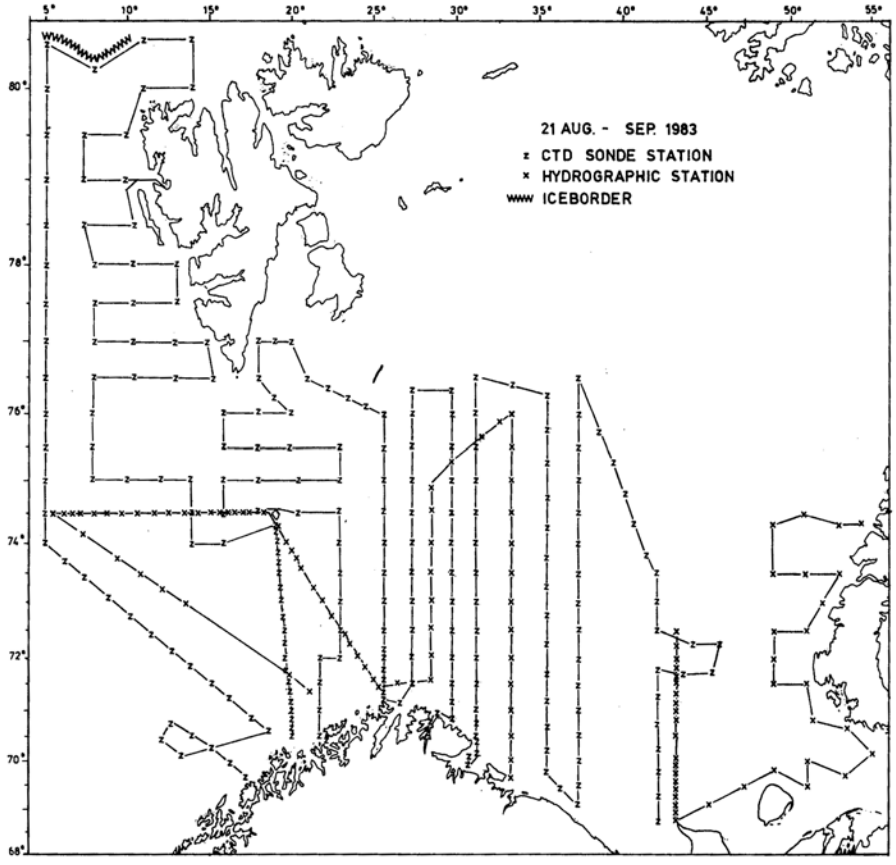

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

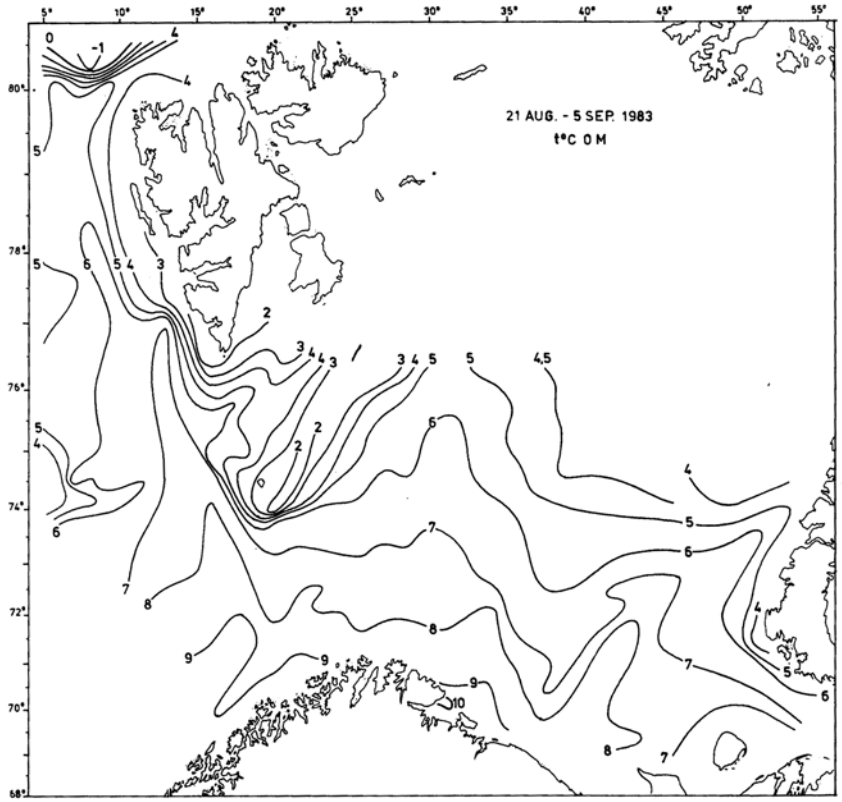

Fig. 2. Isotherms at 0 m

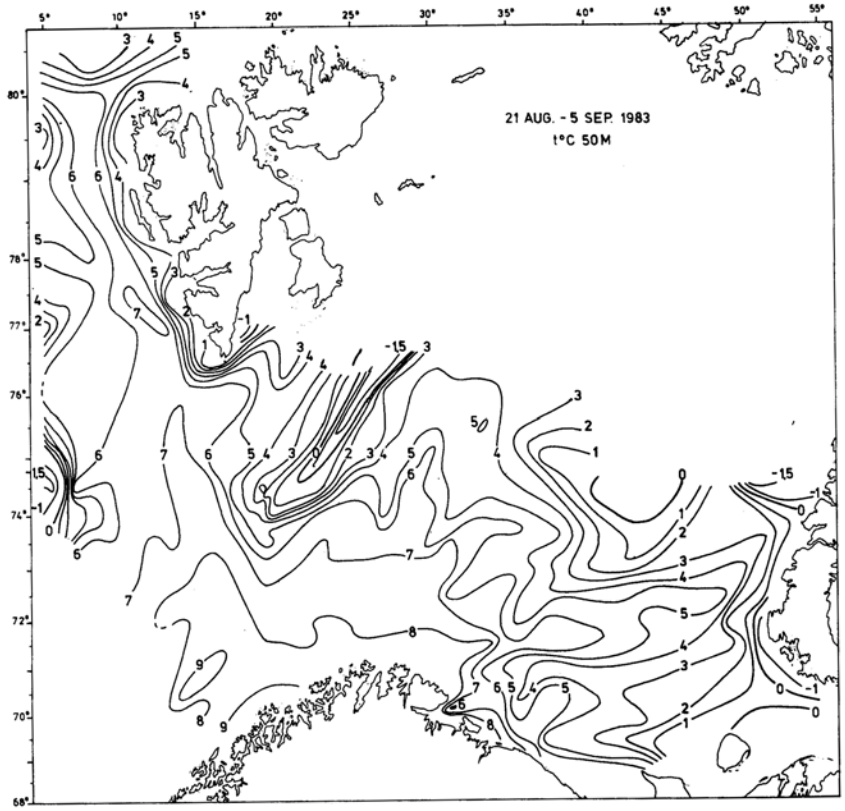

Fig. 3. Isotherms at 50 m

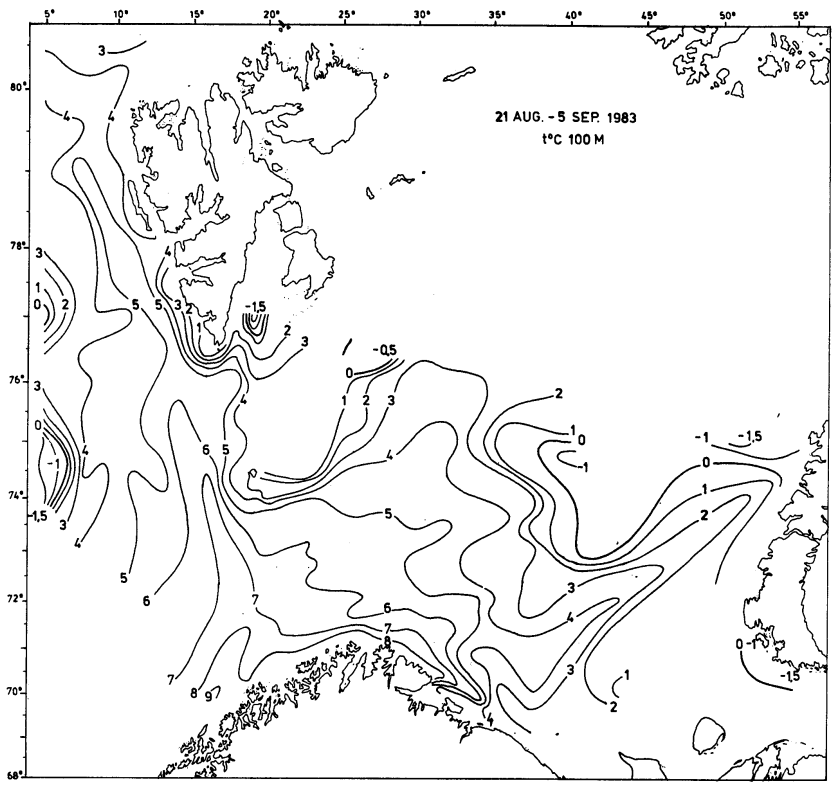

Fig. 4. Isotherms at 100 m

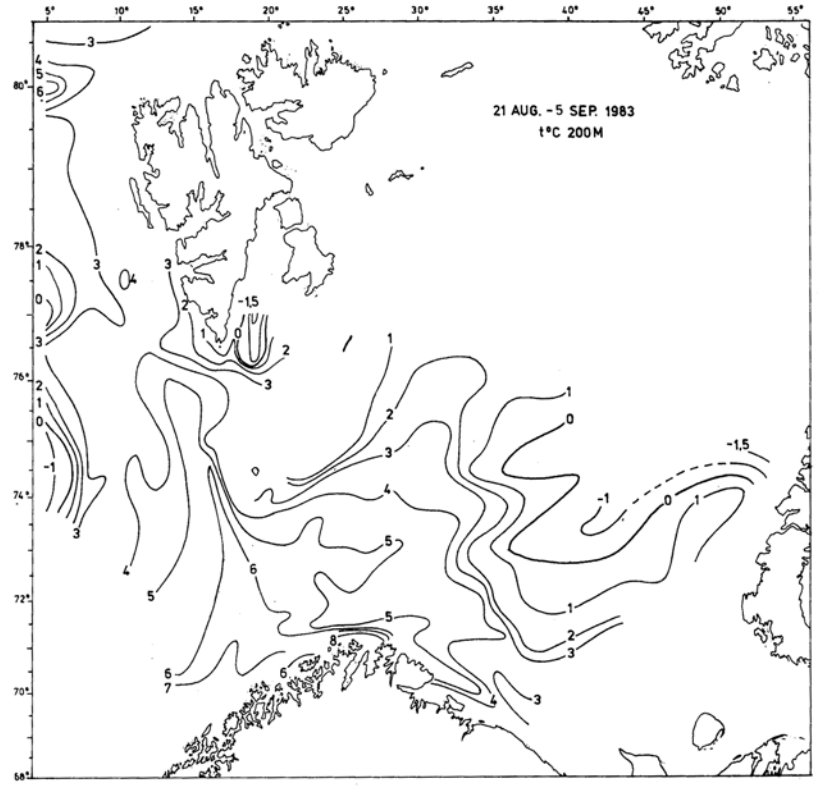

Fig. 5. Isotherms at 200 m

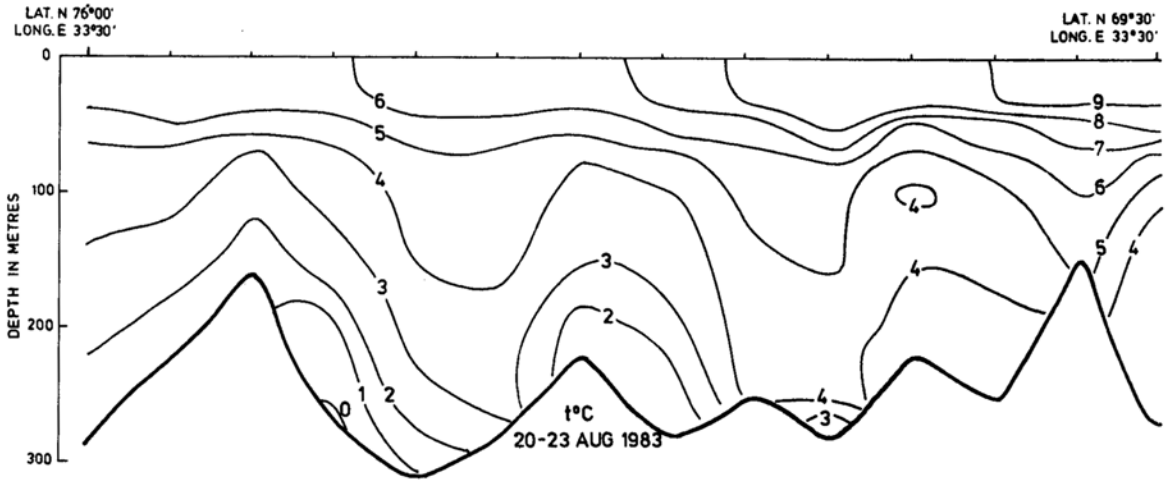

Fig. 6. Temperature section along the Kola meridian

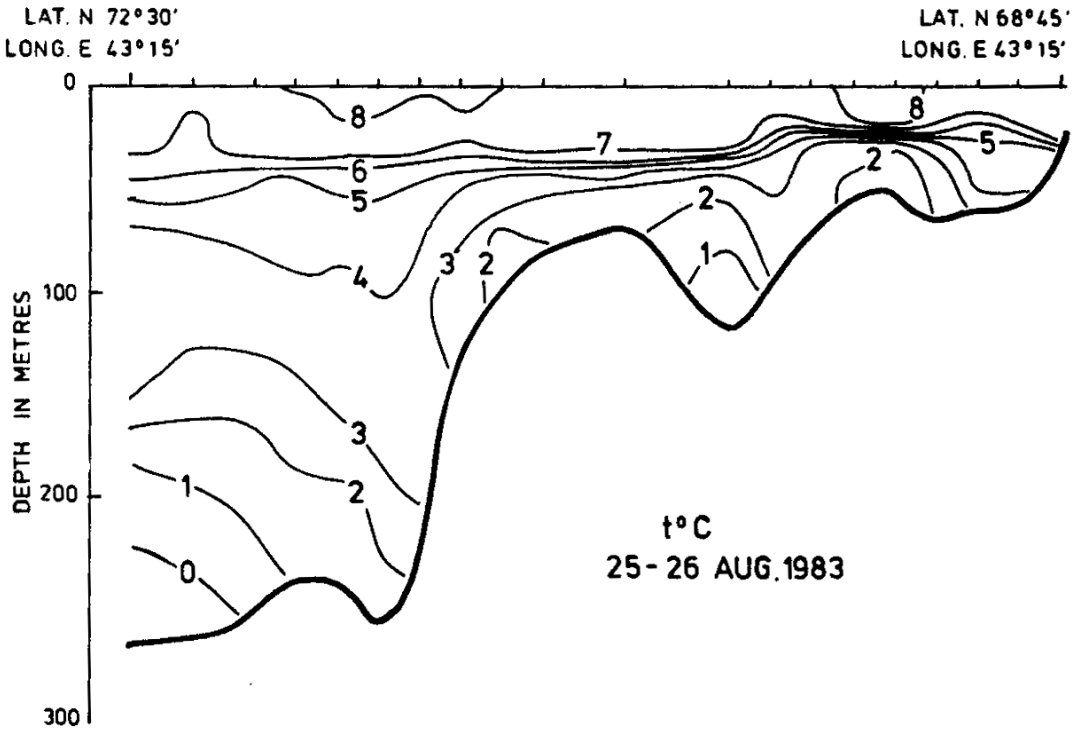

Fig. 7. Temperature section Cape Kanin-North

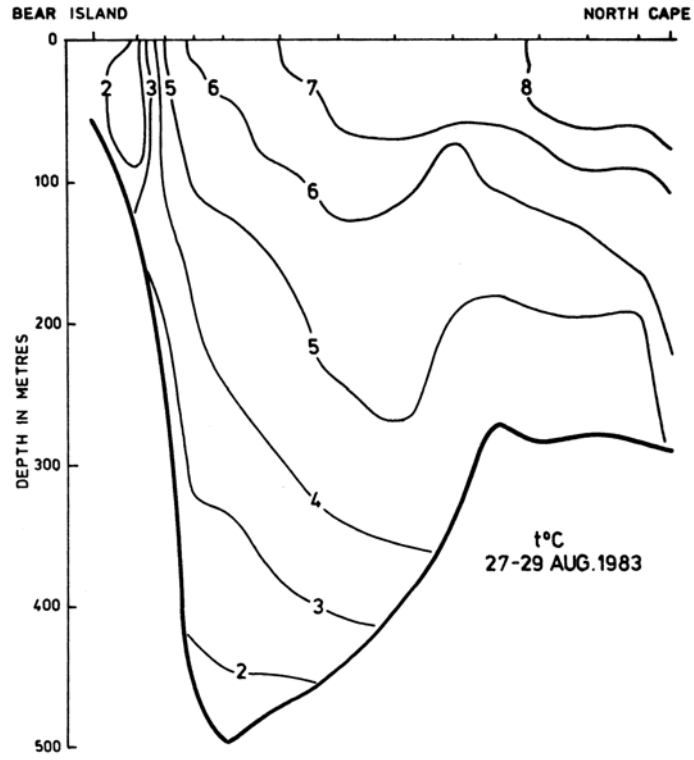

Fig. 8. Temperature section Bear Island-North Cape

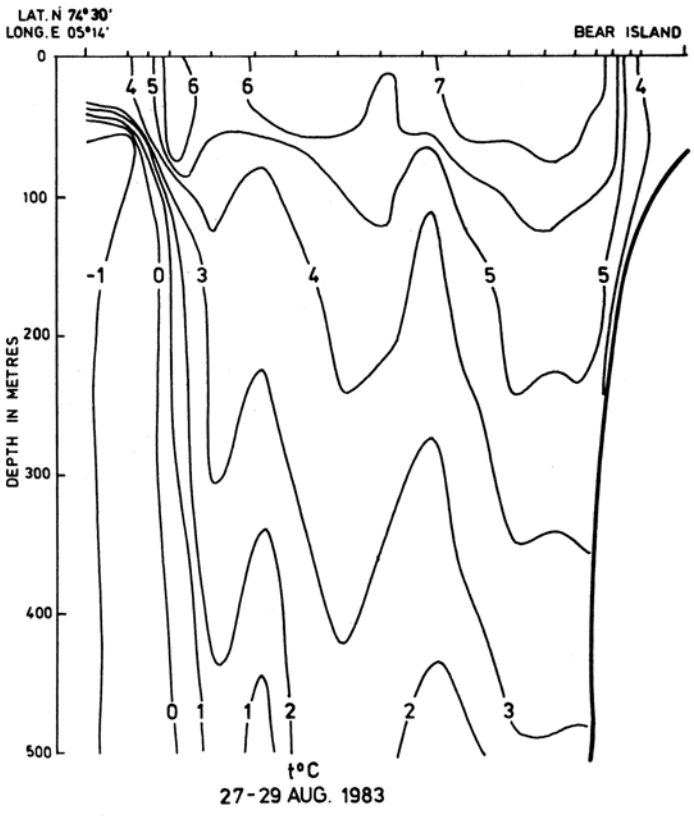

Fig. 9. Temperature section Bear Island-West

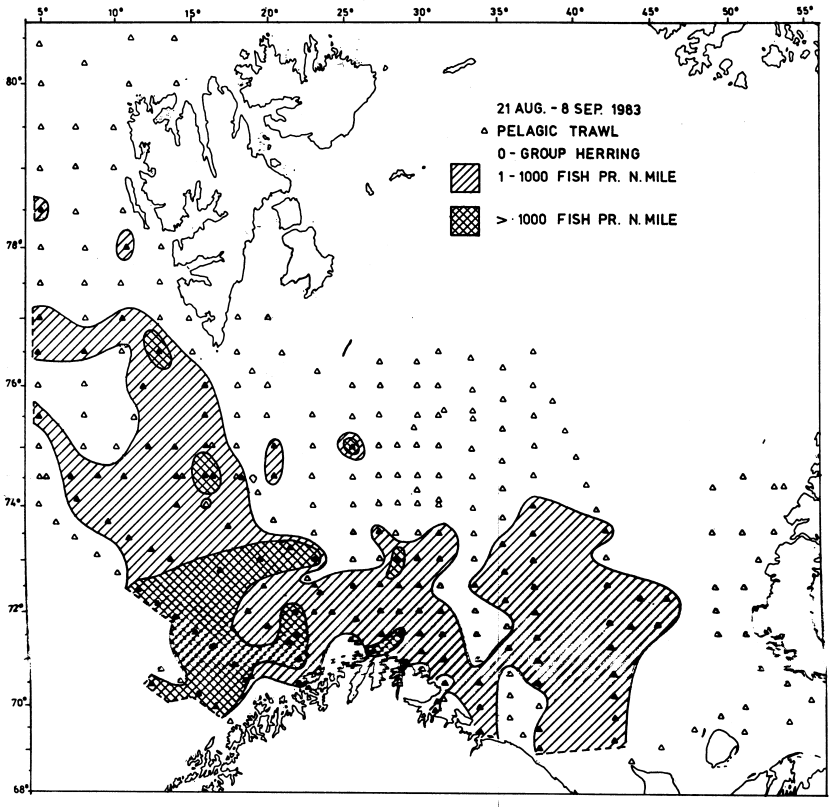

Fig. 10. Distribution of 0-group herring

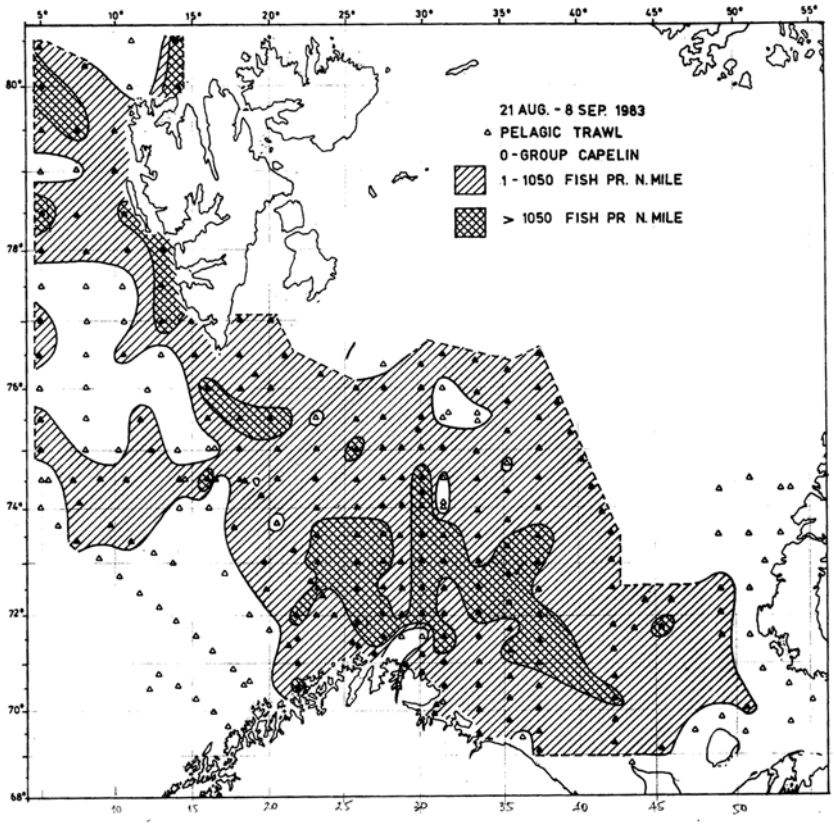

Fig. 11. Distribution of 0-group capelin

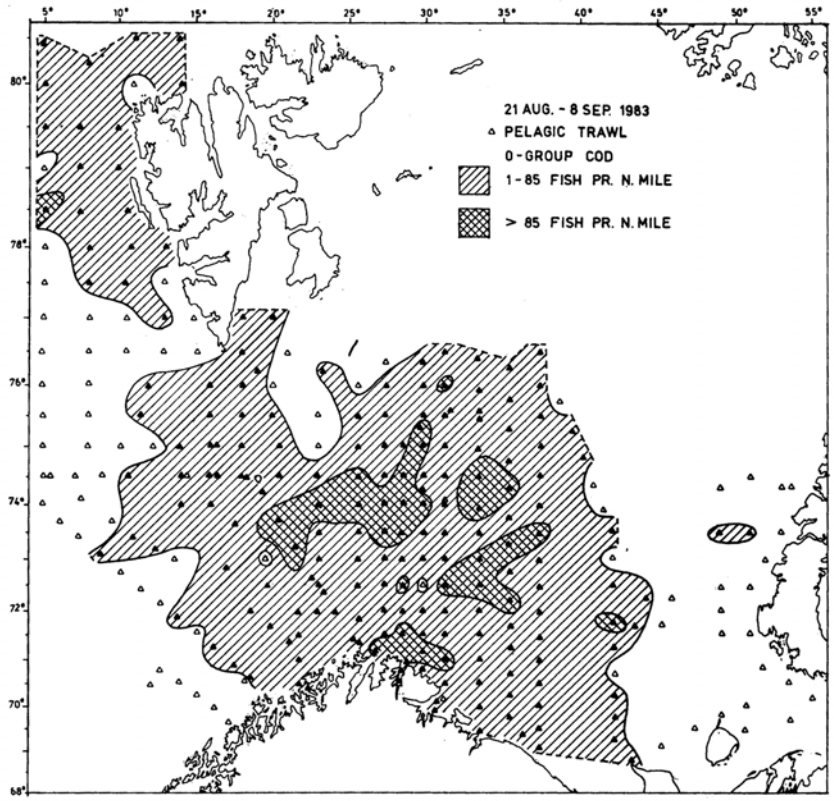

Fig. 12. Distribution of 0-group cod

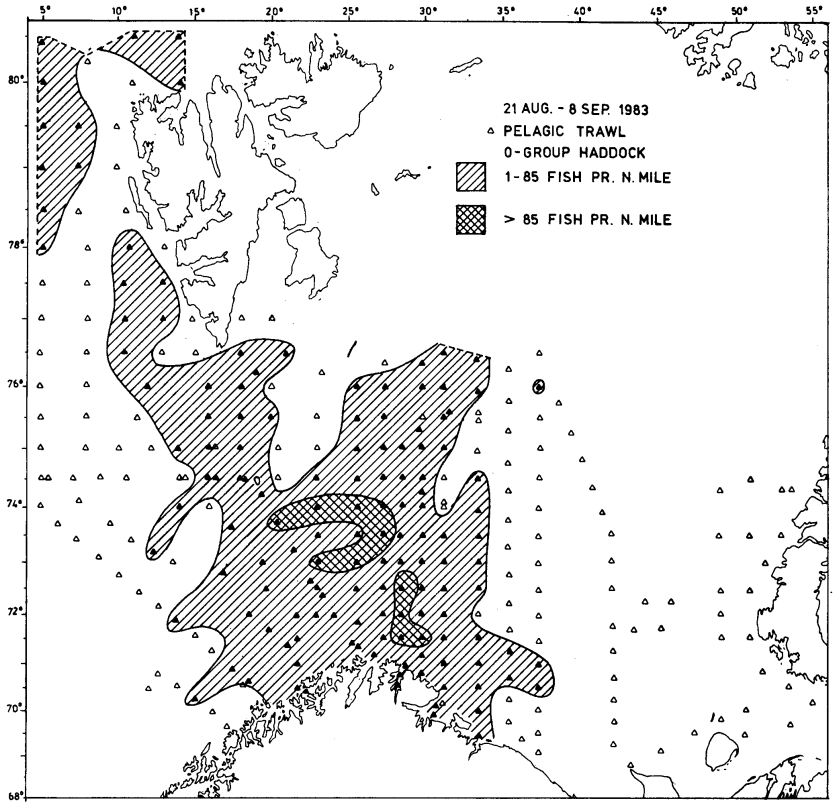

Fig. 13. Distribution of 0-group haddock

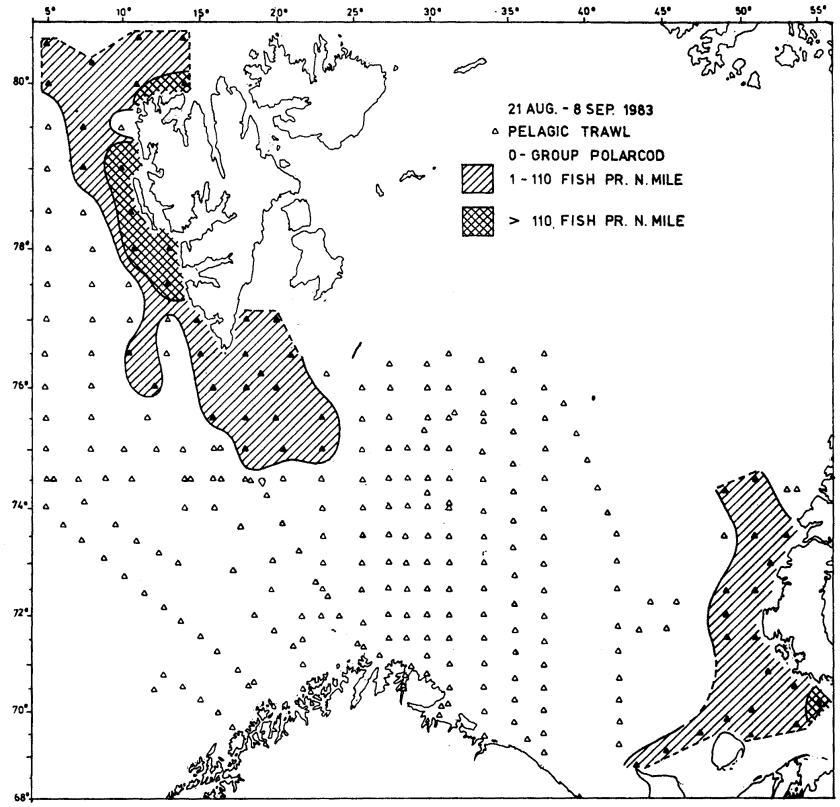

Fig. 14. Distribution of 0-group polar cod

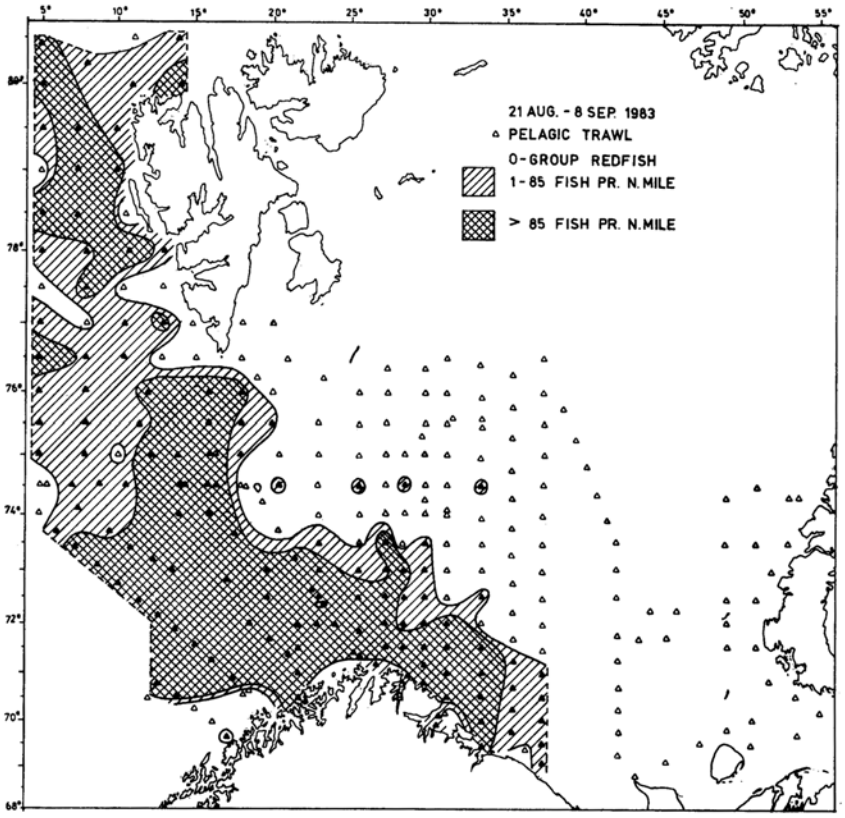

Fig. 15. Distribution of 0-group redfish

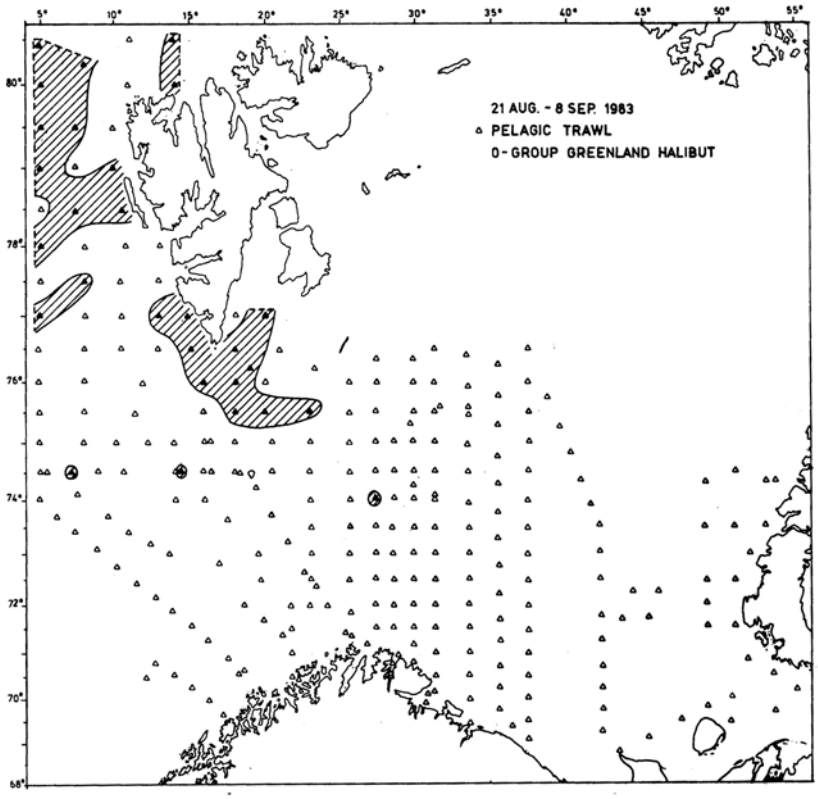

Fig. 16. Distribution of 0-group Greenland halibut

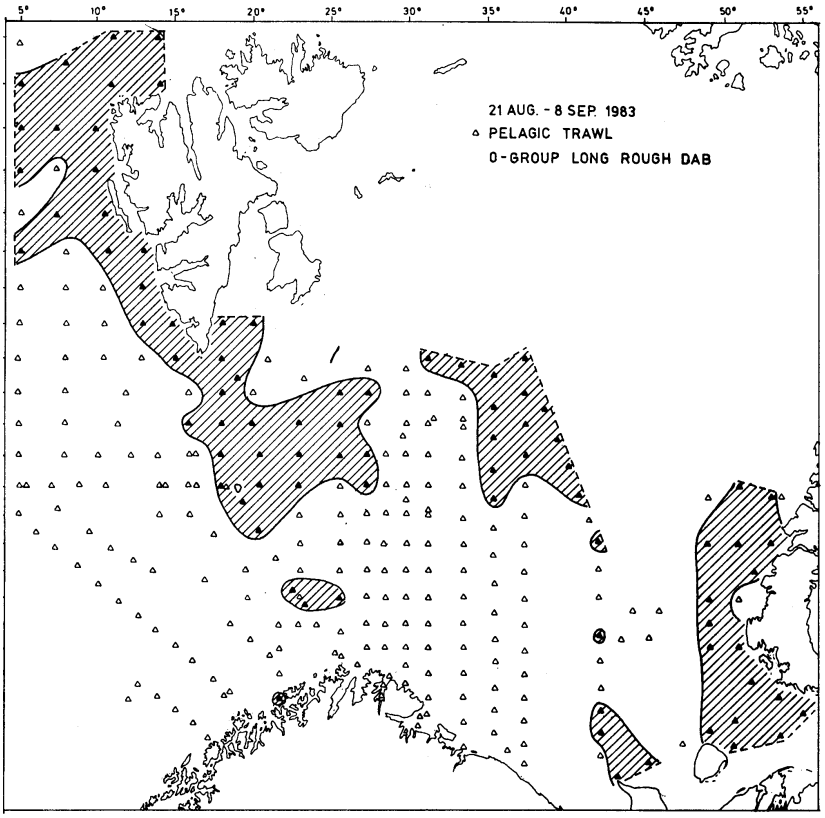

Fig. 17. Distribution of 0-group long rough dab

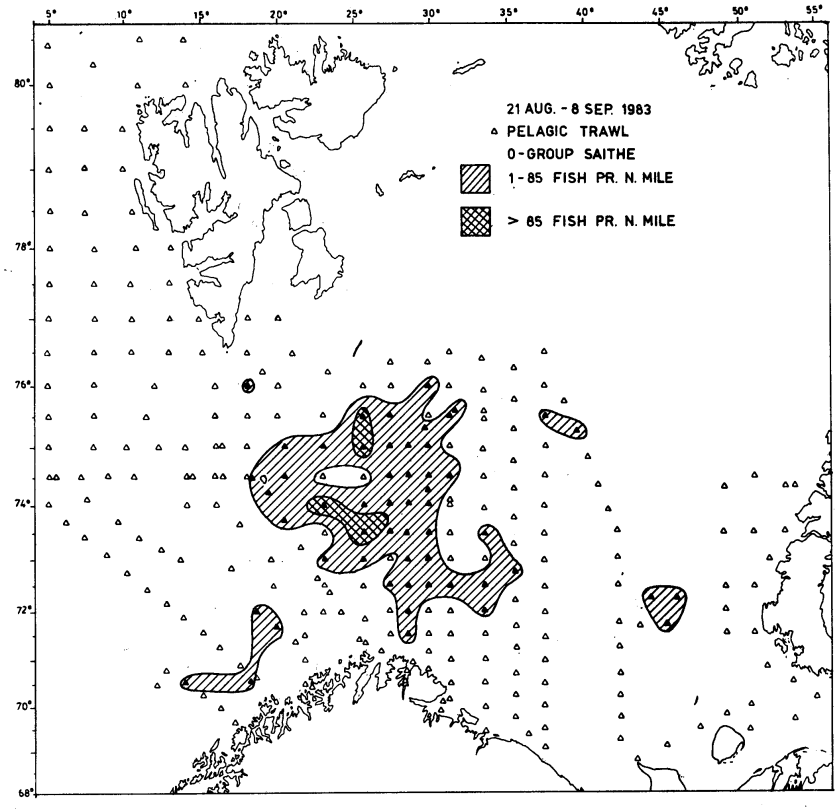

Fig. 18. Distribution of 0-group saithe

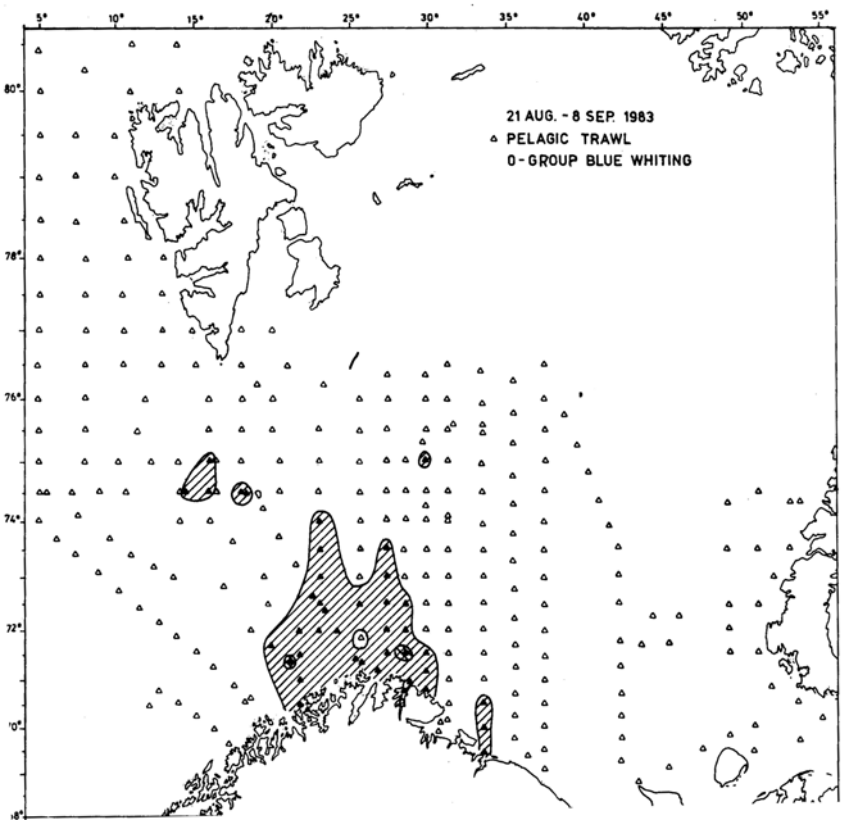

Fig. 19. Distribution of 0-group blue whiting

International Council for
the Exploration of the Sea

C.M. 1984/H.-36
Pelagic Fish Committe
Ref. Demersal Fish Committe

Preliminary report of the international 0-group fish survey in the Barents Sea and adjacent waters in August-September 1984

The twentieth annual International 0-group fish survey was made during the period 13 August-5 September 1984 in the Barents Sea and adjacent waters. The following research vessels participated in the survey:

State	Name of vessel	Survey period	Research Institute
Norway	"Eldjarn"	12 August-5 September	Institute of Marine, Research, Bergen
Norway	"G.O. Sars"	19 August-3 September	"
Norway	"Hakon Mosby"	19 Augus -5 September	"
USSR	"Persey III"	20 August-30 August	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Poisk"	26 August-29 August	"
USSR	"Alaid"	20 August-27 August	"
USSR	"Kokshaisk"	27 August-2 September	"

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

Preliminary analysis of the survey data were made 3 September in Hammerfest. Observations concerning the geographical distribution of 0-group fish and their abundance are given in this report together 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 participating in the survey in 1984 (except "Poisk") used the type of midwater trawl recommended by the meeting held after the survey in 1980 (Anon., 1983). 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, 40 and at 60 m when 0-group fish layer was recorded deeper than 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. 10-19 as filled and open symbols respectively. The density grading is based on catch in number per 1.0 nautical mile trawling.

Hydrography

Hydrographical 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 Table 1. Some general comments are given below:

1) Kola section

In 1983 the temperature in the layers 0-50, 50-200 and 0-200 m turned out to be the highest during the whole period of the 0-group survey. The mean temperatures in 1984 are 0.1, 0.7 and 0.6 °C lower than in the respective layers in 1983. However, they are all above the average for the period 1965-1984.

2) Cape Kanin - North section

An insignificant rise of water temperature was observed in the southern part of the section, as compared to 1983, and the temperature exceeded the long-term mean by 1,2 °C. The temperature in the northern part of the section kept close to the 1983 level and exceeded the normal by 0,9 °C.

3) North Cape - Bear Island section

In 1984 the mean temperature in the 0-200 m layer exceeded the long-term mean by 0.2 °C. Compared with 1983, it decreased by 0,4 °C.

4) Bear Island - West section (along 74°30' N)

The water temperatures in the West Spitsbergen Current remained close to the 1983 level and exceeded the normal by 0,6 °C.

Thus, in late August - early September 1984 the water temperature was lower than the previous year, but above the average long-term value both in the eastern and western part of the survey area.

Distribution and abundance of 0-group fish

Geographical distributions of 0-group fish are shown by shaded areas in Figs. 10-18. Double shading indicates dense concentrations. The criteria for discriminations are the same as used in earlier reports (Anon., 1980). Abundance indices, estimated as the area of distribution with areas of high densities weighted by 10, are given in Table 2. A new set of abundance indices have been calculated for 0-group cod and haddock (Table 3) as described by Randa (1984). These are based on the number caught during a standard trawl haul of one nautical mile. Length frequency distributions of the main species are given in Table 4.

Herring (Fig. 10)

The distribution of 0-group herring was restricted in 1984 to the western part of the Barents Sea, and the overall density was lower in 1984 than in 1983. However, with the exception of 1983, the density and distribution area of 0-group herring in 1984 is the largest since the present investigations started in 1965.

Capelin (Fig. 11)

The area of distribution and the overall density is similar to that in 1983 which indicate that the 1984 year-class may be as abundant as both the 1982 and 1983 year-classes. However according to the great variation in numbers of 0-group capelin in the catches, caused

by weather conditions, it must be stressed that an index of year-class strength of capelin is not as reliable as for other species.

Cod (Fig. 12)

The 0-group cod was distributed north of Finnmark and Murman coast and west of Spitsbergen. Both indices for year-class strength (Table 3 and 4) indicate that the 1984 year-class is a rich year-class, even more abundant than the 1975 year-class, which has dominated the fishery in the recent years. It is only exceeded in abundance at the 0-group stage by the outstanding 1970 and 1973 year-classes. The logarithmic index is only exceeded by the 1970 and 1983 year -classes.

Haddock (Fig. 13)

The distribution was similar to that in 1983. Both indices of year class strength indicate that the 1984 year-class is stronger than the 1975 year-class, which has dominated the fishery in the late seventies and early eighties. It is even stronger than the 1983 year-class, which was the most abundant year class recorded in the 0-group survey.

Polar cod (Fig. 14)

As in previous years, 0-group polar cod was found in two separated areas, off Spitsbergen and in the south-eastern part of the Barents Sea. The most dense concentrations were found off Spitsbergen. Sparse concentrations were recorded in the eastern part of the survey area. It is, however quite possible that 0-group polar cod is distributed outside the investigated area.

Redfish (Fig. 15)

The distribution of 0-group redfish is similar to the one found last year. The overall density indicate that the 1984 year-class is another strong one, but somewhat less abundant than the 1983 year-class.

Greenland halibut (Fig. 16)

0-group Greenland halibut was as usually found in the Bear Island - West Spitsbergen area. The abundance index for the 1984 year-class is higher than for the 1983 and 1982 year-classes and above the long term average.

Long rough dab (Fig. 17)

0-group long rough dab was found in many patches all over the survey area. The abundance index for 1984 is lower than the very high 1982 index and close to the average for the period 1965-1984.

Saithe (Fig. 18)

0-group saithe was found in many patches in the survey area. The double shaded area in Fig. 18 represents more than 85 specimen per haul of 1.0 nautical mile. 0-group saithe has only been observed in such high numbers during the 0-group surveys in 1967 and 1983, and no abundance index has been calculated.

Blue whiting (Fig. 19)

0-group blue whiting was recorded in the same area as in 1983, -south of 75° N and between 20° E and 35° E. No index of abundance has been calculated.

References

Anon., 1980. Preliminary report of the International 0-group fish survey in the Barents Sea and adjacent waters in August/September 1978. Annls. biol., Copenh., 35: 273-280.

Anon., 1983. Preliminary report of the International 0-group fish survey in the Barents Sea and adjacent waters in August/September 1980. Annls. biol., Copenh., 37: 259-266.

Randa, K., 1984. Abundance and distribution of 0-group Arcto-Norwegian cod and haddock 1965-1982. In The Proceedings of the Soviet-Norwegian on Reproduction and recruitment of Melic cod. Leningrad 26-30 Sept. 1983: 192-212.

Table 1. Mean water temperature during the International 0-group fish survey in the Barents Sea and adjacent waters in late August - early September 1984
2-4 - Murmansk Current: Kola section (70°30' N – 72°30' N)
5 - Cape Kanin section (68°45' N - 70°05' N)
6 - Cape Kanin section (71°00' N - 72°00' N)
7 - North Cape Current: North Cape - Bear Island section (71°33' N; 25°02' E - 73°35' N; 20°46' E)
8 - West Spitsbergen Current: Bear Island-West section (06°34' E-15°55' E)

Layer/ Year	0-50 m	50-200 m	0-200 m	0-bottom	0-bottom	0-200 m	0-200 m
1	2	3	4	5	6	7	8
1965	6.7	3.8	4.6	4.8	4.2	5.1	-
1966	6.7	2.6	3.6	2.0	2.5	5.5	3.3
1967	7.5	4.0	4.9	6.1	3.6	5.6	4.2
1968	6.4	3.7	4.4	4.7	3.1	5.4	3.6
1969	6.9	3.1	4.0	2.6	2.3	6.0	4.2
1970	7.8	3.6	4.7	4.0	3.3	6.1	-
1971	7.1	3.2	4.2	4.0	3.2	5.7	4.2
1972	8.7	4.0	5.2	5.1	4.1	6.3	3.9
1973	7.7	4.5	5.5	5.7	4.5	5.9	5.0
1974	8.1	3.9	4.9	4.6	-	6.1	4.6
1975	7.0	4.6	5.2	5.6	4.3	5.7	4.9
1976	8.1	4.0	5.0	4.9	4.6	5.7	5.0
1977	6.9	3.4	4.3	4.1	3.3	4.8	4.0
1978	6.6	2.5	3.6	2.4	1.7	5.0	4.1
1979	6.5	2.9	3.8	2.0	1.8	5.3	4.4
1980	7.4	3.5	4.5	3.3	3.0	5.7	4.9
1981	6.6	2.7	3.7	2.7	2.5	5.3	4.4
1982	7.1	4.0	4.8	4.5	2.8	5.8	4.9
1983	8.1	4.8	5.6	5.1	4.2	6.3	5.1
1984	7.7	4.1	5.0	5.4	4.1	5.9	5.0
Average 1965-1984	7.3	3.6	4.6	4.2	3.3	5.7	4.4

Table 2. Abundance indices

Species / Year	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	1	12
1971	157	73		181		172	1	81
1972	140	46		140		177	8.0	65
1973	684	54		(26)		385	3.2	67
1974	51	147		227		468	13.4	83
1975	343	170		75		315	21.1	113
1976	43	112		131		447	15.6	96
1977	173	116	157		70	472	9.0	72
1978	106	61	107		144	460	35.4	76
1979	94	69	23		302	980	22.5	69
1980	49	54	79		247	651	12.0	108
1981	65	30	149		73	861	38.0	95
1982	114	90	14		50	694	17.0,	150
1983	386	184	48		39	851	15.8	80
1984	486	255	115		16	732	40.4	70

Table 3. Estimated indices with 90 % confidence limits of year-class abundance for 0-group cod and haddock in the total area

Year-class	Cod			Haddock		
	Logarithmic index	Confidence limits (95%)		Logarithmic index	Confidence limits (95%)	
1965	+			0.01	0.00	0.04
1966	0.02	0.01	0.04	0.01	0.00	0.03
1967	0.04	0.02	0.08	0.08	0.03	0.13
1968	0.02	0.01	0.04	0.00	0.00	0.02
1969	0.25	0.17	0.34	0.29	0.20	0.41
1970	2.51	2.02	3.05	0.64	0.42	0.91
1971	0.77	0.57	1.01	0.26	0.18	0.36
1972	0.52	0.35	0.72	0.16	0.09	0.27
1973	1.48	1.18	1.82	0.26	0.15	0.40
1974	0.29	0.18	0.42	0.51	0.39	0.68
1975	0.90	0.66	1.17	0.60	0.40	0.85
1976	0.13	0.06	0.22	0.38	0.24	0.51
1977	0.49	0.36	0.65	0.33	0.21	0.48
1978	0.22	0.14	0.32	0.12	0.07	0.19
1979	0.40	0.25	0.59	0.20	0.12	0.28
1980	0.13	0.08	0.18	0.15	0.10	0.20
1981	0.10	0.06	0.18	0.03	0.00	0.05
1982	0.59	0.43	0.77	0.38	0.30	0.52
1983	1.69	1.34	2.08	0.62	0.48	0.77
1984	1.55	1.18	1.98	0.78	0.60	0.99

Table 4. Length distribution of 0-group fish in percent

Length, mm	Herring	Capelin	Cod	Haddock	Polar cod		Redfish	Greenland halibut	Lrd	Saithe	Blue whiting
					West	East					
10-14					+		0.3				
15-19				+	0.3		9.2				
20-24		+		+	0.7		21.9		0.3		
25-29		0.3			10.1		18.2		2.8		
30-34	+	3.4	+	+	28.8		12.1	1.8	21.3	+	5.3
35-39	+	7.7	0.1	0.1	21.2		11.0	2.5	32.7		3.2
40-44	+	12.1	0.3	0.5	19.3	12.2	10.5	7.9	28.7	+	9.5
45-49	0.3	16.9	0.8	1.1	12.1	41.0	10.8	6.5	12.2	+	11.6
50-54	0.6	18.7	2.4	2.4	5.4	36.6	4.3	10.1	1.4	+	10.5
55-59	1.4	18.0	4.7	4.6	1.7	8.5	1.2	7.9	0.3	+	23.2
60-64	3.1	17.0	8.5	6.9	0.3	1.3	0.3	10.1	+		9.5
65-69	5.1	5.2	13.6	8.4	+		+	13.7	0.3		8.4
70-74	7.3	0.7	18.1	9.0	0.1		+	14.1			11.6
75-79	15.5	+	21.9	7.6	+			14.4			1.1
80-84	20.5	+	16.0	9.7				7.2		+	
85-89	17.4	+	7.4	8.4	+	0.3		2.9			
90-94	15.9		4.1	9.1				1.0		+	
95-99	10.2		2.0	8.2						0.2	4.2
100-104	1.8		0.1	9.9	+					0.4	
105-109	0.8			6.1	+					1.4	2.1
110-114	0.1			4.1						2.0	
115-119		+	+	2.4						3.8	
120-124				1.1						7.8	
125-129				0.3						11.2	
130-134				+						14.4	
135-139				+	+					14.3	
140-144				+	+					19.1	
145-149										10.1	
150-154										8.5	
155-159										3.8	
160-164										1.9	
165-169										0.9	
170-174										+	
N	23876	337172	30719	8317	30537	317	317204	277	352	10423	95
Mean length, mm	83,6	52.1	74.6	84.8	38.3	49.9	32.5	64.3	39.1	137.2	58.4

Appendix

Survey period	Research vessel	Research Institute	Participants
20 august- 30 august	"Persey III"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk	A.S. Galkin, V.K. Ozhigin, L.N. Korol, A.E. Dorchenkov, I.N. Konforkin, A.A. Mukhin, V.V. Vlasov, N.V. Miss Vanukhina, I.V. Novikov, A.A. Gavrukhov
27 august- 2 September	"Kokshalsk"	"	V.N. Kaikov, V. Kaponirov, E.P. Loparev, L.D. Panasenko, S.S. Drobysheva, D.N.Klochkov, A.L. Lovchikov
26 august- 29 august	"Poisk"	"	A.I. Kurbatov, M.D. Kleopin, K. Lysunets, I.I. Prokopovich
20 august- 27 august	"Alaid"	"	B.P. Shein
19 august- 3 September	"G.O. Sars"	Institute of Marine Research, Bergen	B. Brynildsen, A. Hylen, H. Ludvlgsen, E. Nilsen, B. Reppe, A. Raknes, I. Svellingen, Ø. Tanken, E. Øvretvedt.
13 august- 5 September	"Eldjarn"	"	I. M. Beck, B. Hoffstad, B. Kvinge, K. Lauvås, L. Løvheim, T. Monstad, A. Romslo, E. Sælen, R. Toresen, A. Valantine
19 august- 5 September	"Håkon Mosby"	"	G. Hylen, I. Mørk, R. Pedersen, D. Rossebø, A.M. Skorpen, K. Sunnanå

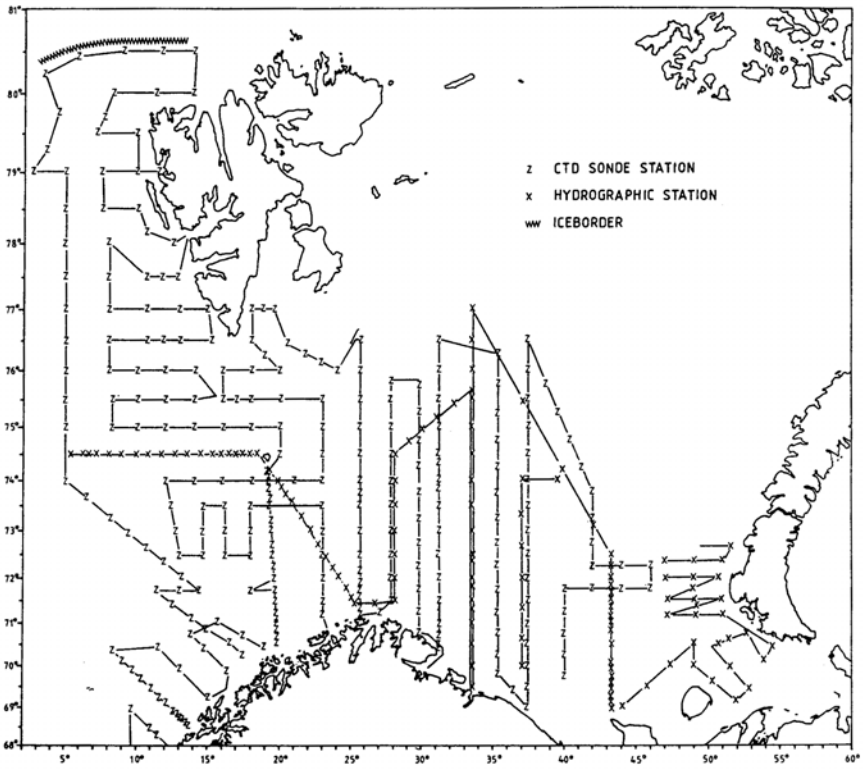

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

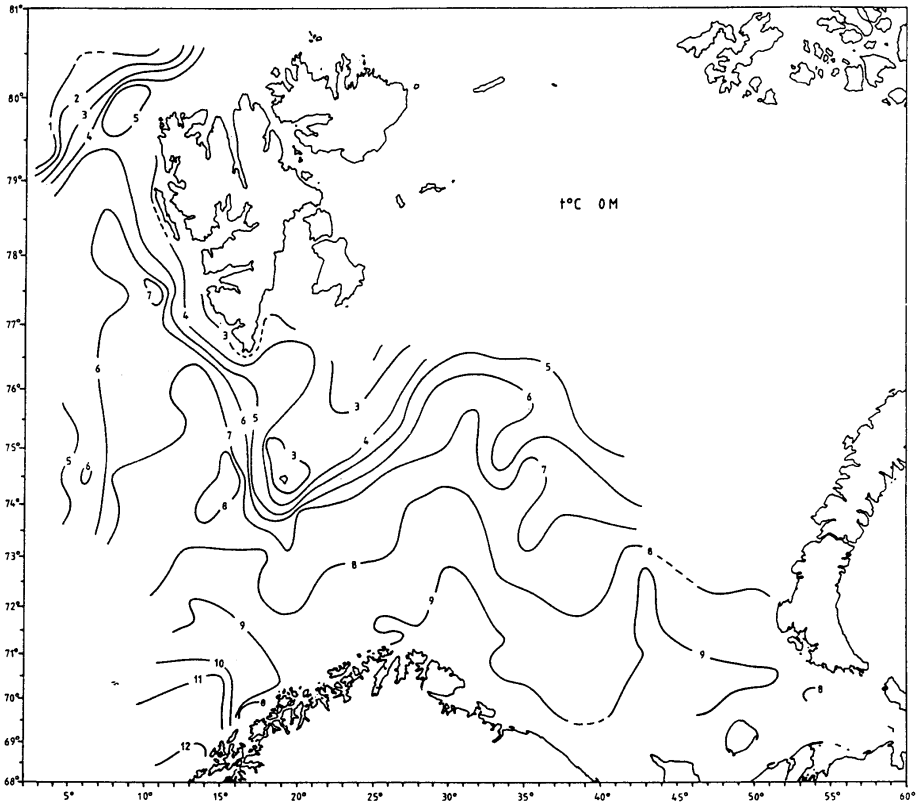

Fig. 2. Isotherms at 0 m

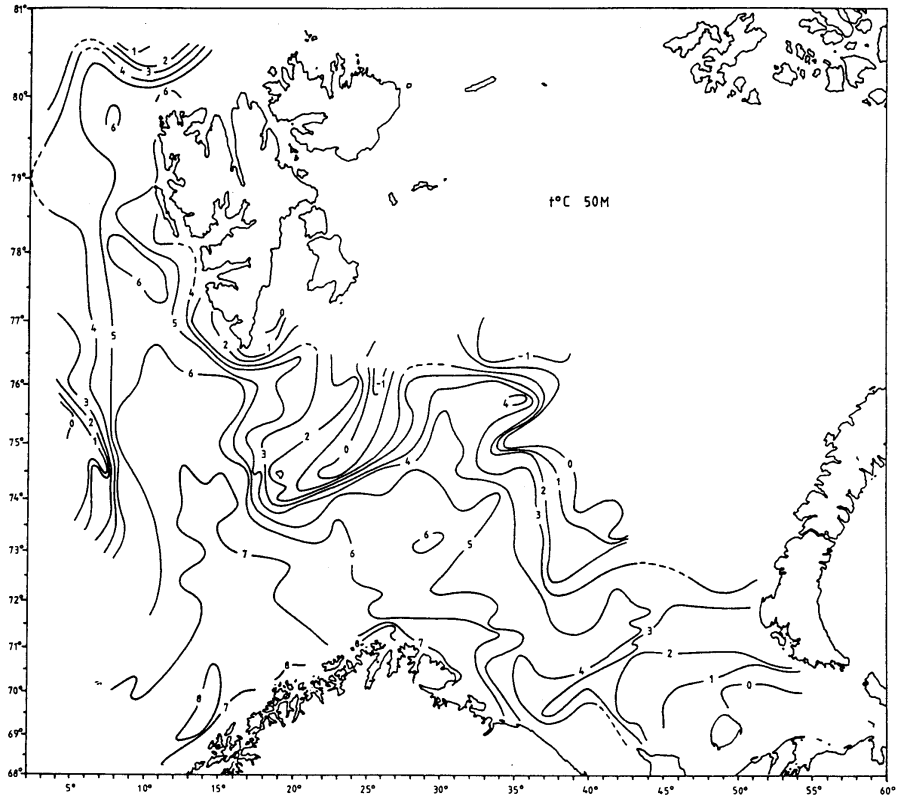

Fig. 3. Isotherms at 50 m

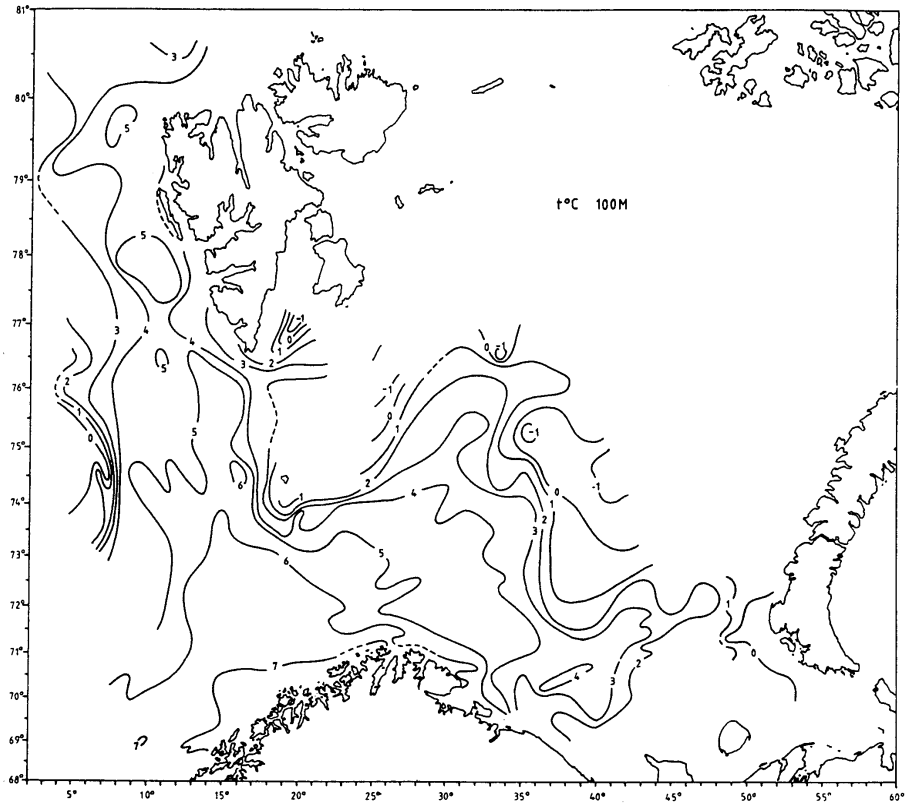

Fig. 4. Isotherms at 100 m

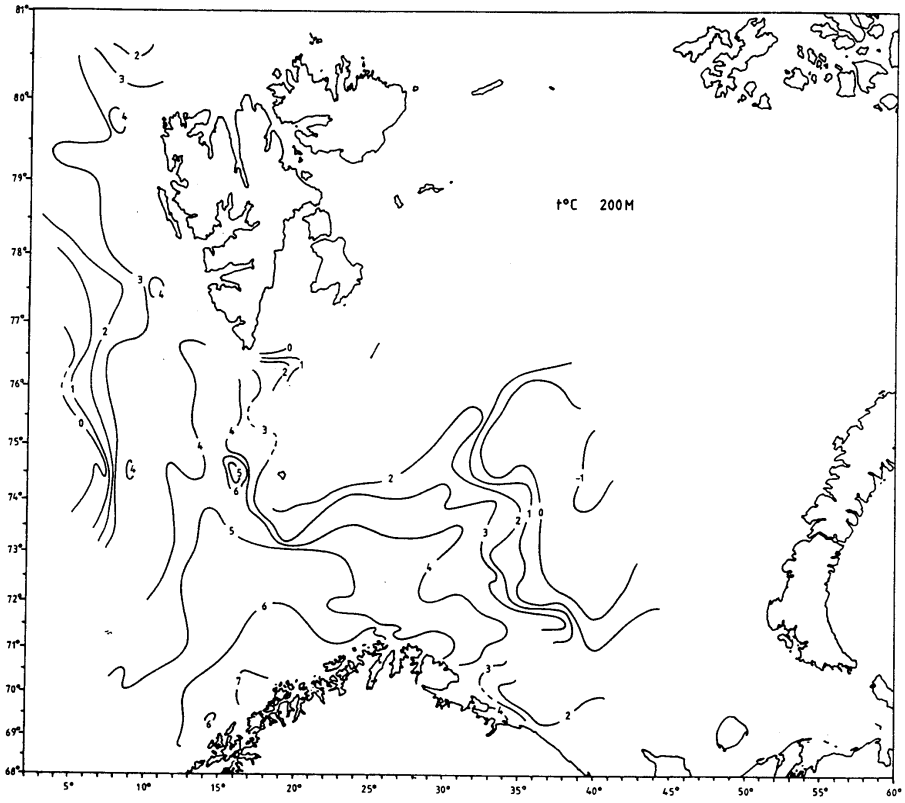

Fig. 5. Isotherms at 200 m

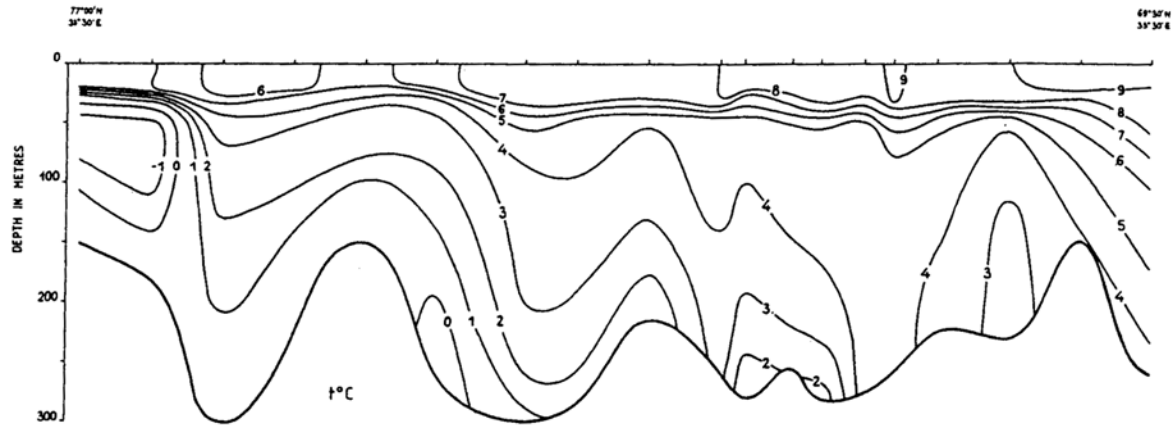

Fig. 6. Temperature section along the Kola meridian

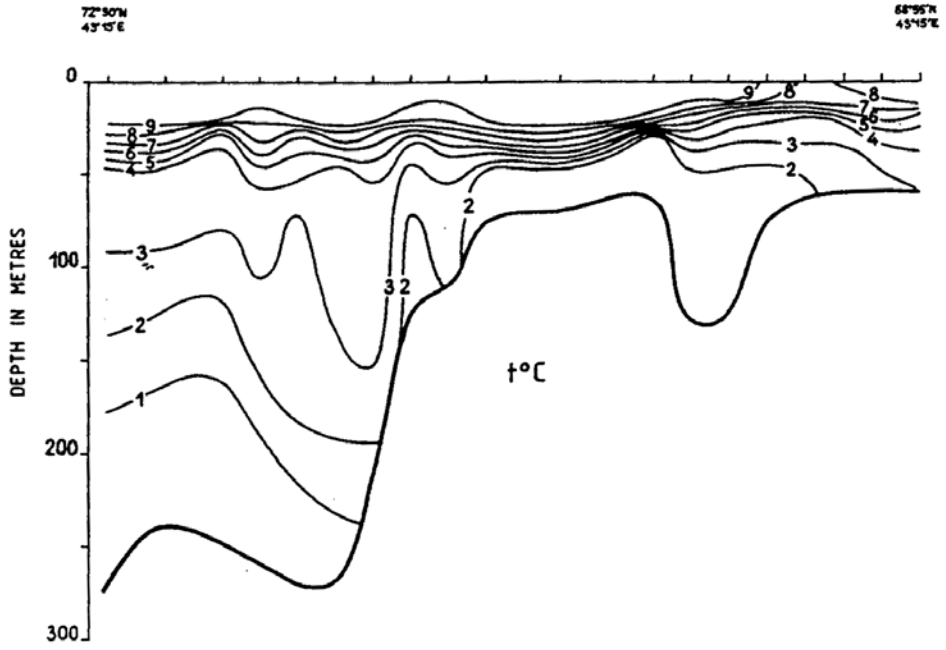

Fig. 7. Temperature section Cape Kanin-North

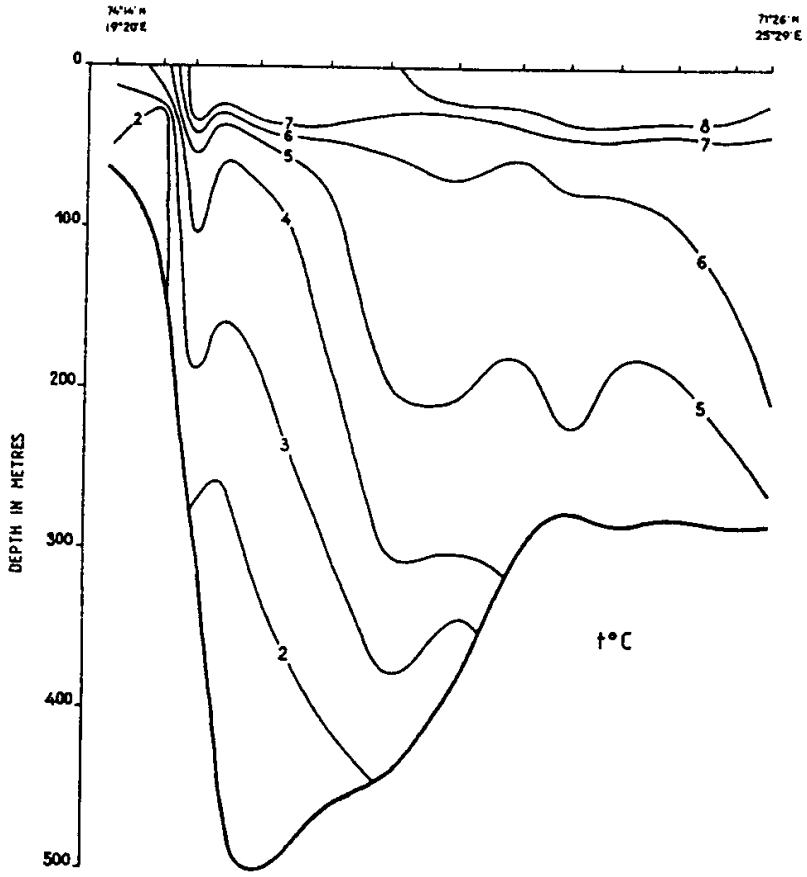

Fig. 8. Temperature section Bear Island-North Cape

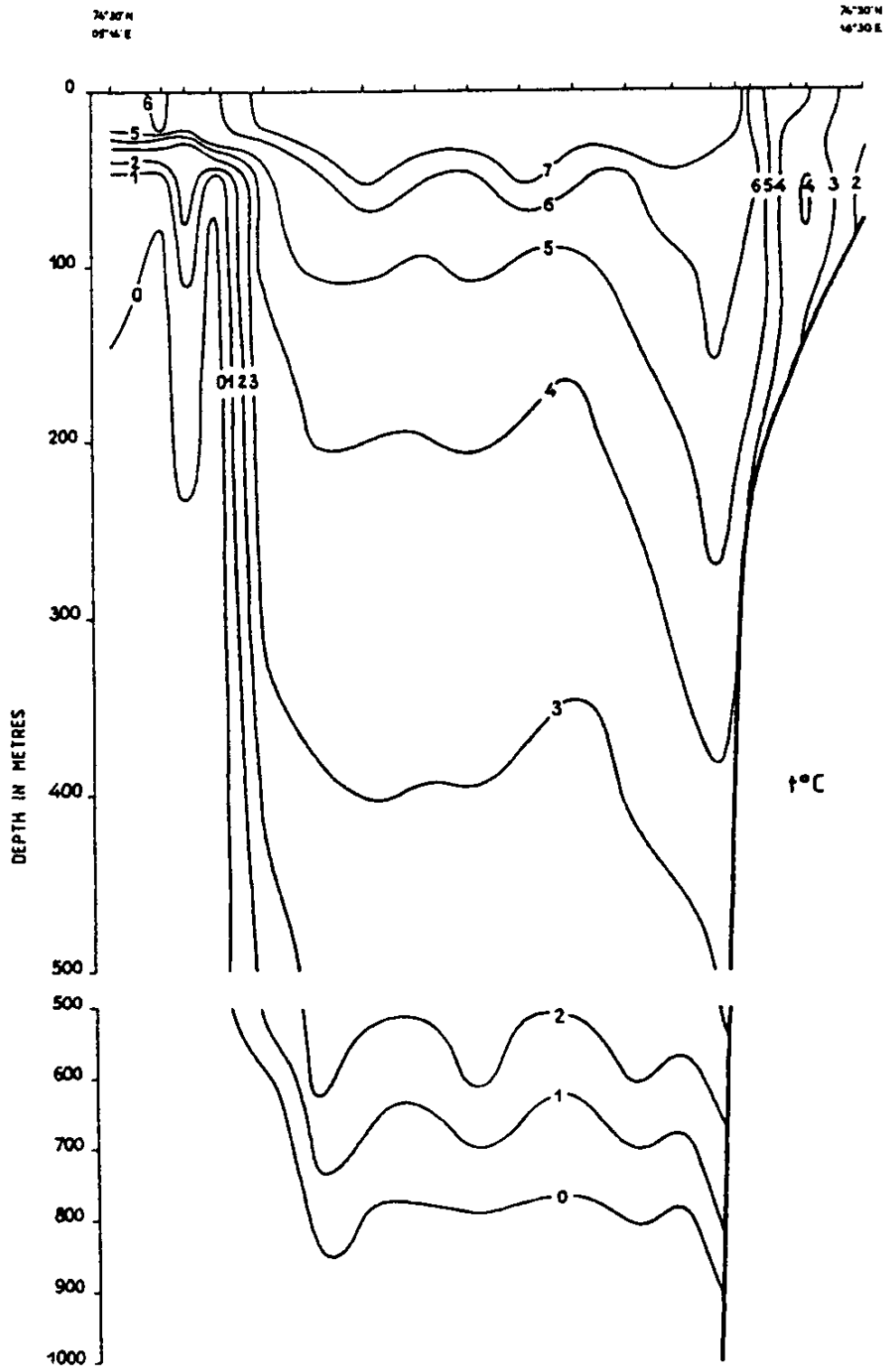

Fig. 9. Temperature section Bear Island-West

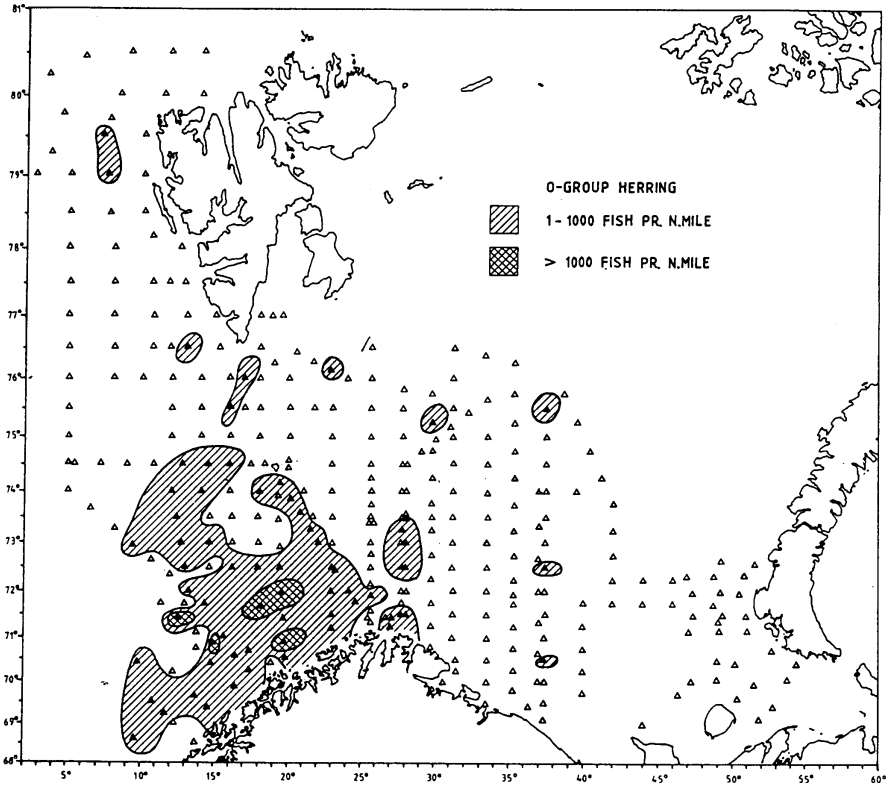

Fig. 10. Distribution of 0-group herring

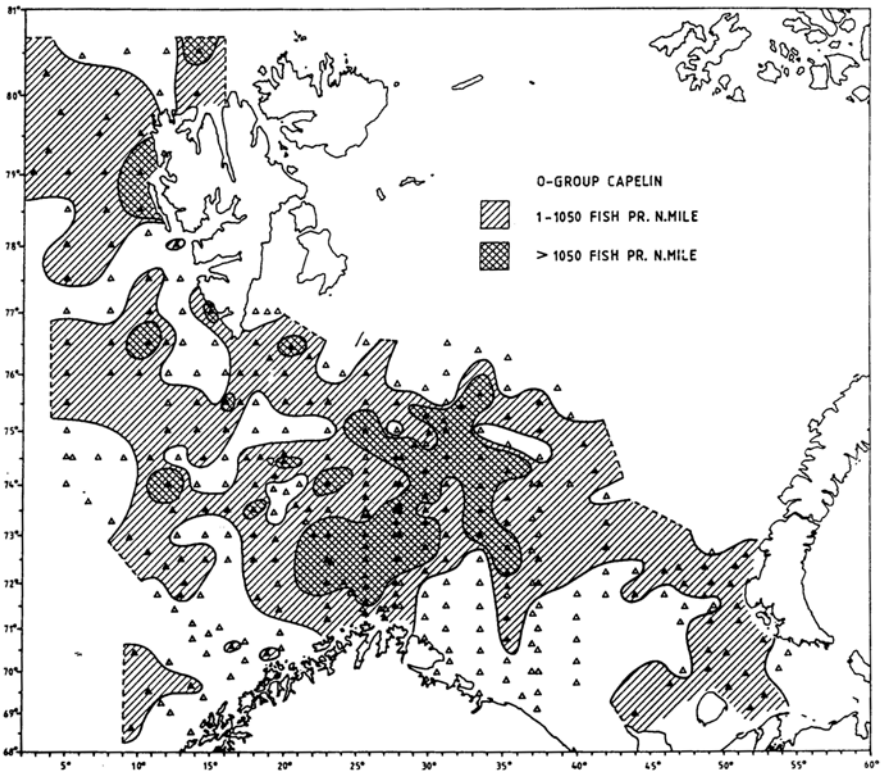

Fig. 11. Distribution of 0-group capelin

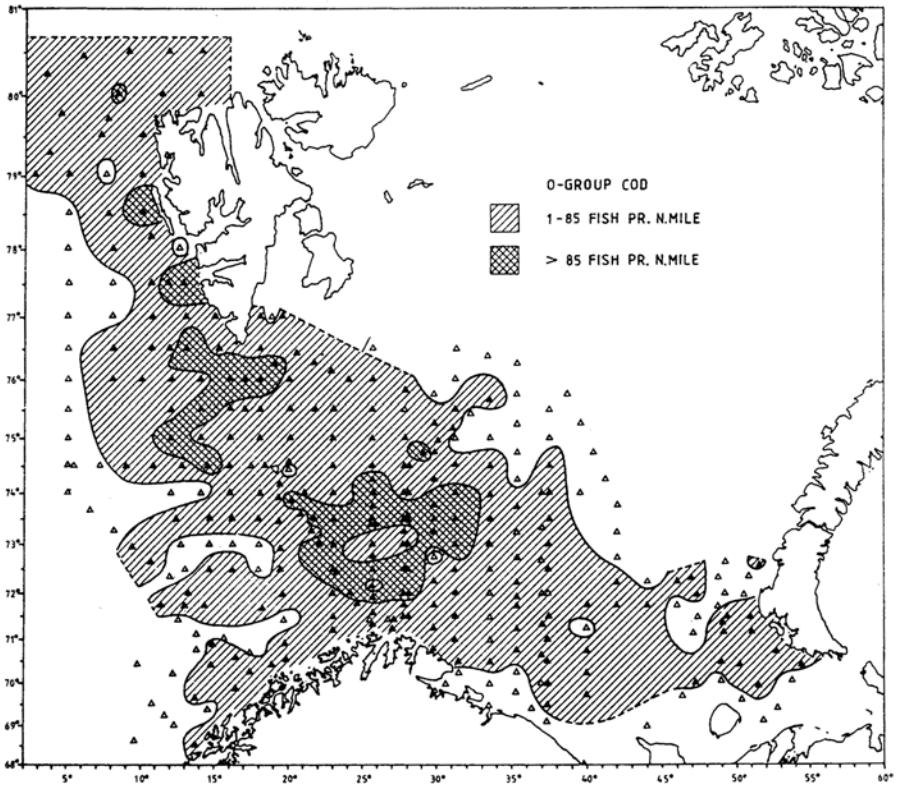

Fig. 12. Distribution of 0-group cod

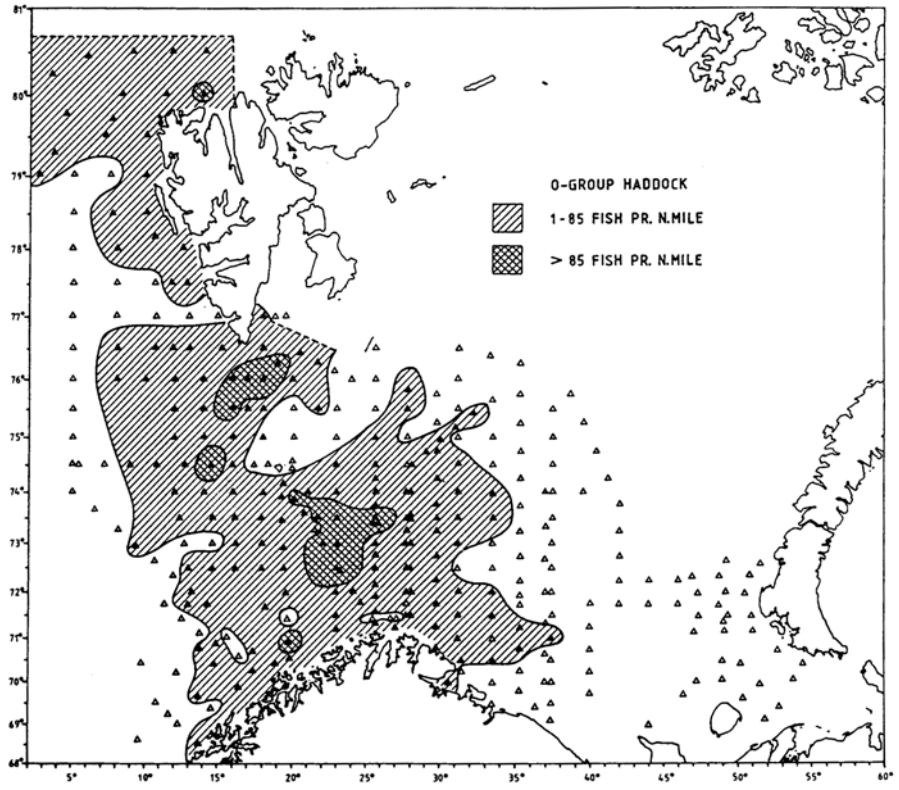

Fig. 13. Distribution of 0-group haddock

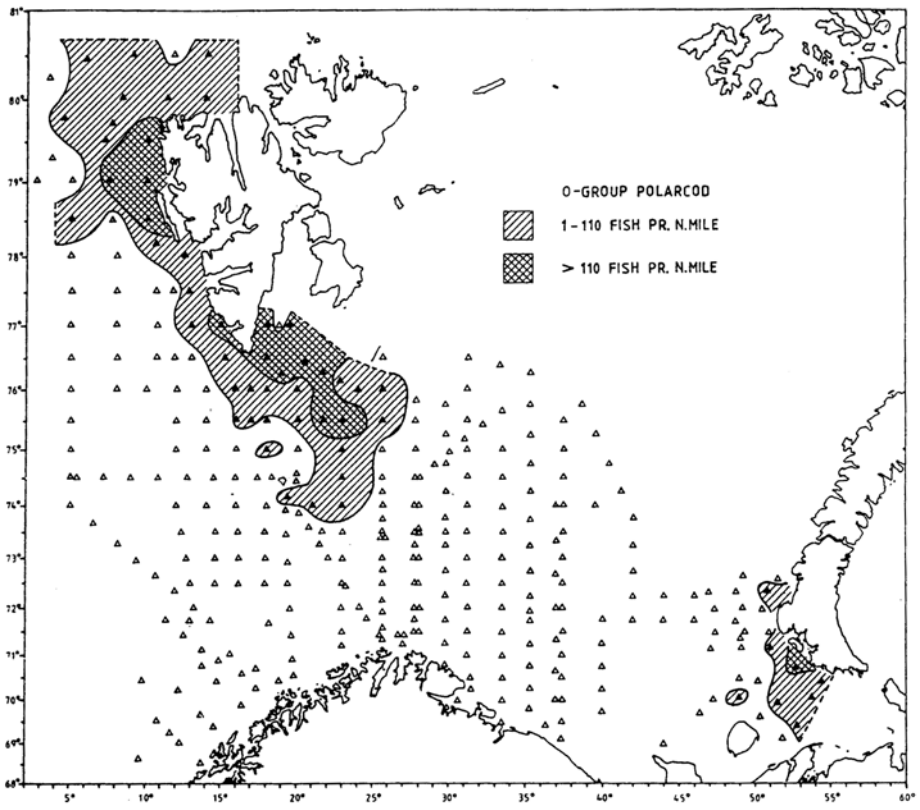

Fig. 14. Distribution of 0-group polar cod

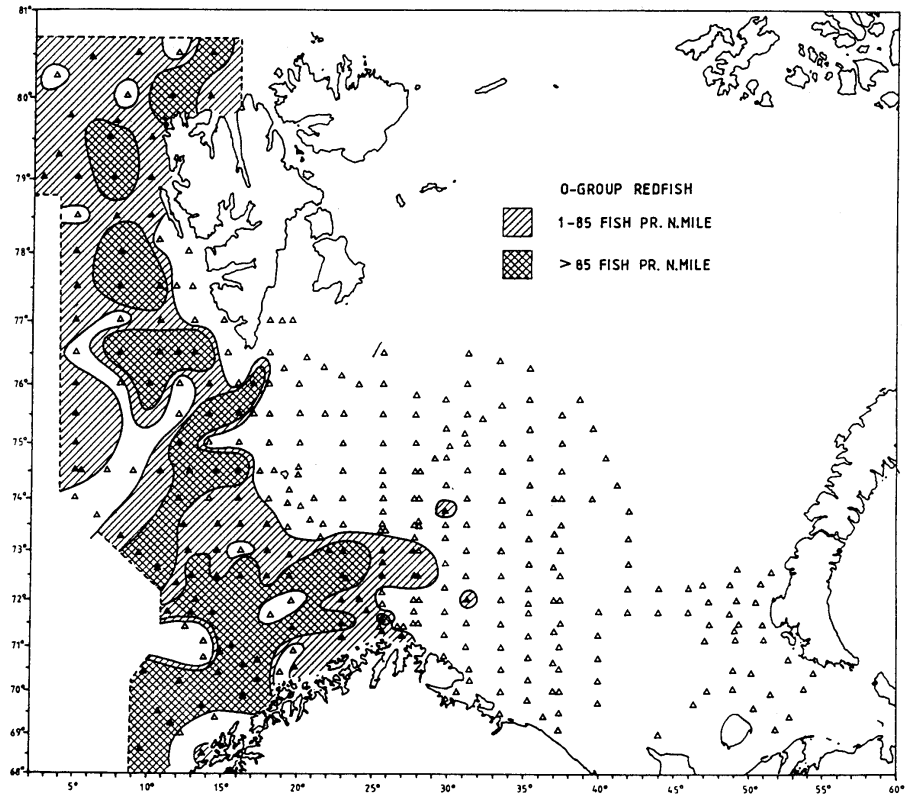

Fig. 15. Distribution of 0-group redfish

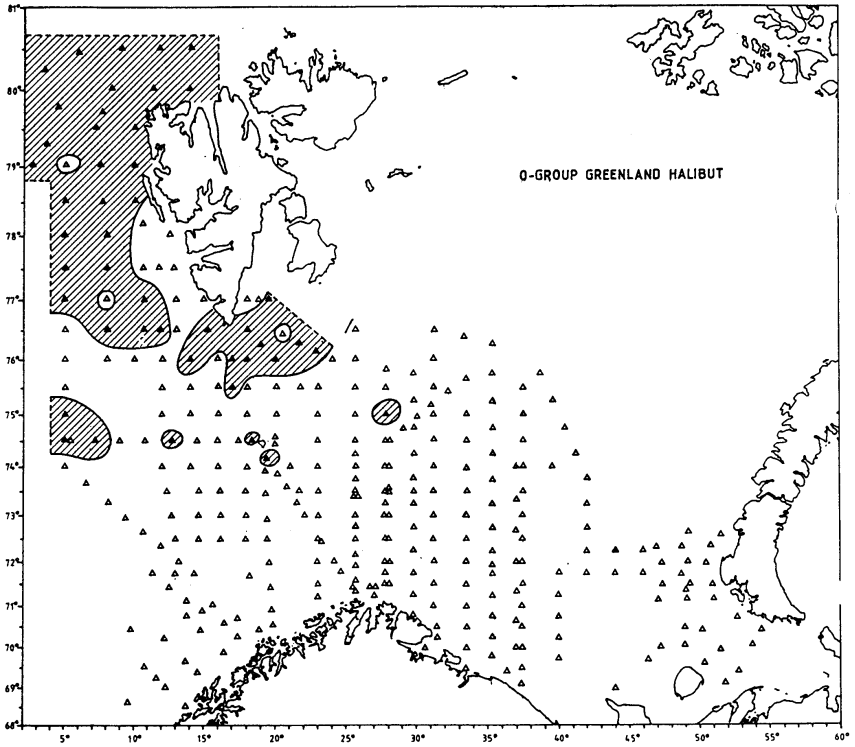

Fig. 16. Distribution of 0-group Greenland halibut

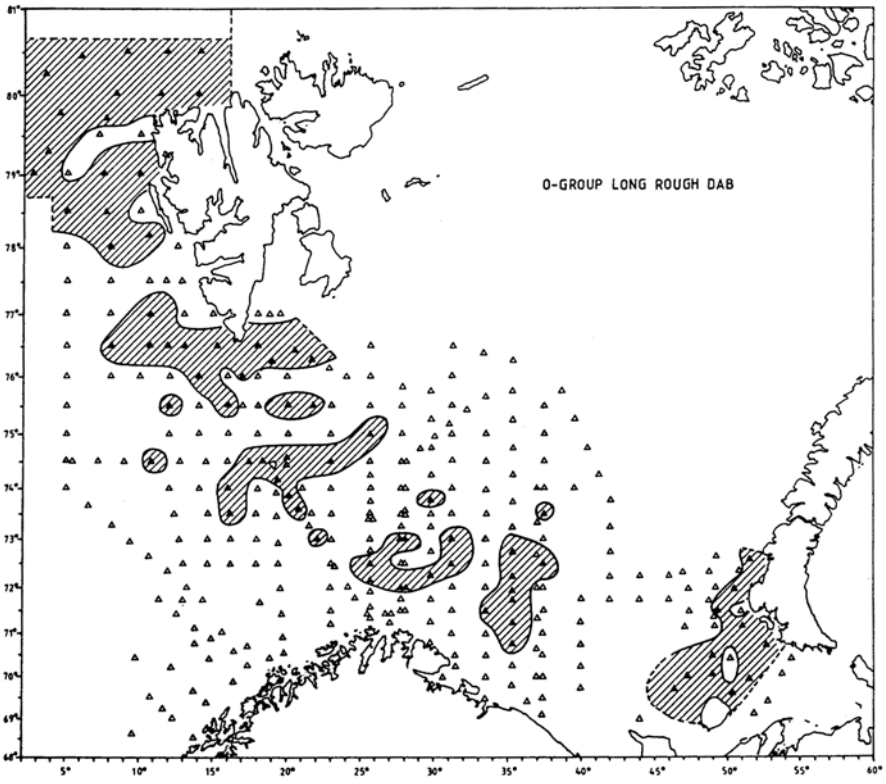

Fig. 17. Distribution of 0-group long rough dab

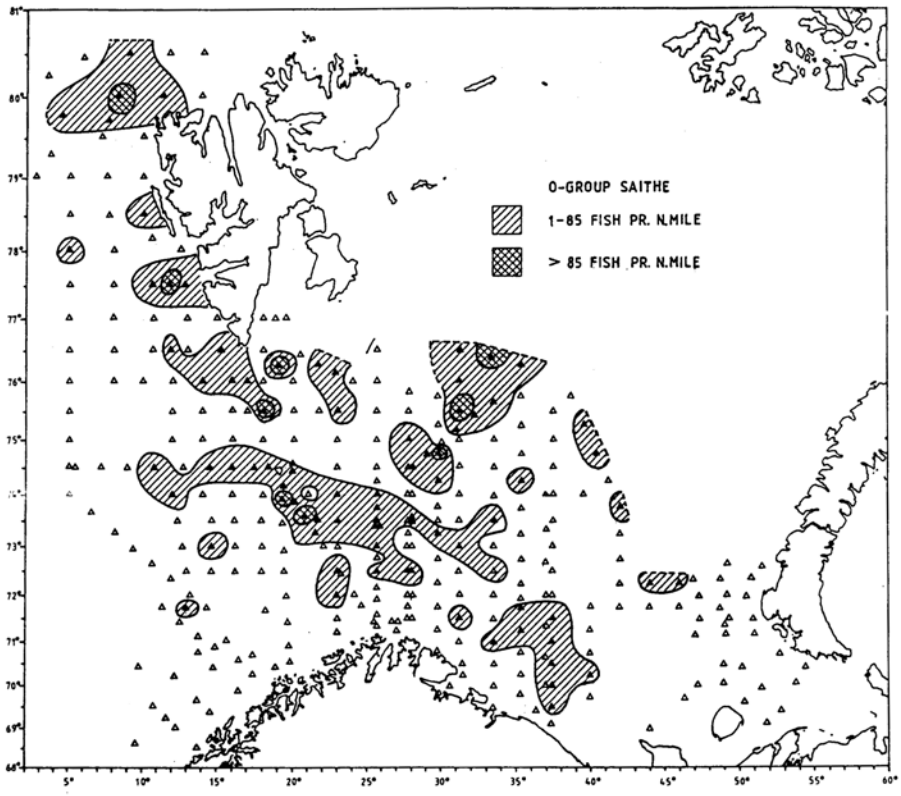

Fig. 18. Distribution of 0-group saithe

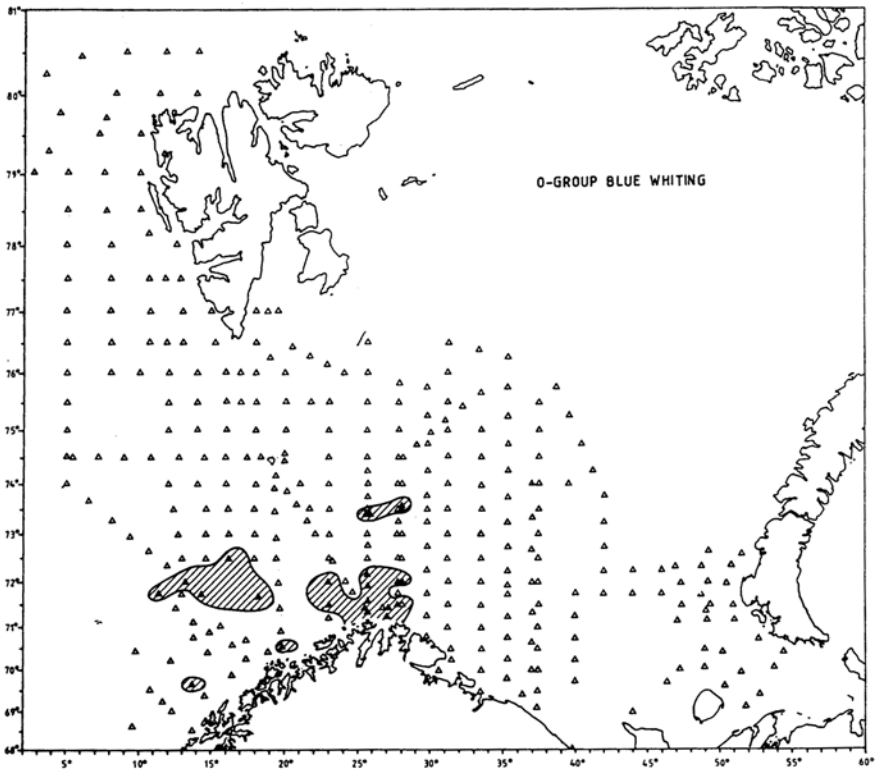

Fig. 19. Distribution of 0-group blue whiting

International Council for
the Exploration of the Sea

C.M. 1985/G:7
Demersal Fish Committe
Ref. Pelagic Fish committe

Preliminary report of the international 0-group fish survey in the Barents Sea and adjacent waters in August-September 1985

The twentifirst annual International 0-group fish survey was made during the period 17 August-4 September 1985 in the Barents Sea and adjacent waters. The following research vessels participated in the survey:

State	Name of vessel	Survey period	Research Institute
Norway	"Eldjarn"	19 August-4 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	19 August-3 September	"
Norway	"Häkon Mosby"	20 August-2 September	"
Norway	"Michael Sars"	17 August-19 August	"
USSR	"Kokshaysk"	23 August-2 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Vilnyus"	25 August-1 September	"

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

Preliminary analysis of the survey data were made 4-6 September in Hammerfest. Observations concerning the geographical distribution of 0-group fish and their abundance are given in this report together with a brief description of the temperature conditions in the area.

Materials and methods

The geographical distribution of 0-group fish were estimated by fishing with a small meshed midwater trawl. The vessels participating in the survey in 1985 used the type of midwater trawl recommended by the meeting held after the survey in 1980 (Anon., 1983). 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 was at 0, 20 and 40 m and additionally at 60 m when 0-group fish layer was recorded deeper than 60 m on the echo-sounder.

Survey tracks and hydrographical stations are given in Fig. 1. Trawl stations with and without catch are given on the distribution charts in Figs. 8-16, as filled and open symbols respectively. The density grading is based on catch in number per 1,0 nautical mile trawling.

Hydrography

Hydrographical 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. 6-7 show the temperature conditions at the Kola and Bear Island - West sections, and the mean temperature of these sections are given in Table 1 together with those at the Cape Kanin and North Cape - Bear Island sections.

In general there has been a trend at cooling trend in the Atlantic inflow since 1983. This is demonstrated by the temperature distribution at 50, 100 and 200 m depth, with the clearest deviation at the 50 m level. Hence, in 1983 the temperatures at this level were above 7 °C in the southwestern Barents Sea, south of 73 °C, while in 1985 the temperature in the same area were mainly below 6 °C. Similarly, temperatures above 6 °C were in 1985 not observed north of the latitude of Sörkapp while there were temperatures between 6 ° and 7 °C along the whole West Spitsbergen coast in 1983. This trend is also reflected in the mean temperatures of the sections (Table 1). The conditions in the various sections compared to the long-term mean for the period 1965-1985 were:

1) Kola section

Water temperature decreased in all the layers compared to those of the previous year. The temperature in the 50-200 and 0-200 m was close to the normal, but below the long-term mean in the 0-50 m layer.

2) Cape Kanin - North section

Compared to 1984 the temperature in the layer 0 m to bottom decreased by 0,9 °C in the northern part of the section, and it was close to the long-term level. In the southern part a decrease of 2,1 °C from 1984 was observed and the temperature was reduced to 0,8 °C below the long-term level.

3) North Cape - Bear Island section

Water temperature in the 0-200 m layer decreased by 0,7 °C from 1984 to 1985 and it was somewhat below the long-term mean.

4) Bear Island - West section (along 74°30' N)

Water temperature in the 0-200 m layer decreased by 0,4 °C compared to that of 1984 and exceeded the long-term mean by 0,2 °C.

Distribution and abundance of 0-group fish

Geographical distributions of 0-group fish are shown by shaded areas in Figs. 8-16. Double shading indicates dense concentrations. The criteria for discriminations are the same as used in earlier reports (Anon., 1980). Abundance indices, estimated as the area of distribution with areas of high densities weighted by 10, are given in Table 2. Another set of abundance indices is given for 0-group herring, cod and haddock (Table 3) as described by Randa (1984). These are based on the number caught during a standard trawl haul of one nautical mile. Length frequency distributions of the main species are given in Table 4.

Norwegian spring spawning herring (Fig. 8)

The distribution of herring is in 1985, as in 1984, restricted to the areas west of 28 °E. The overall density is comparable to 1984. Both year-classes are smaller than the 1983, but much higher than the average for the period 1965-1982.

Capelin (Fig. 9)

The area of distribution and the overall density is considerably smaller than the average for the years 1980-1984. This indicates a weak 1985 year-class of Barents Sea capelin, although it must be stressed that the results from the Barents Sea 0-group survey have not given such a reliable index of year class strength of capelin as for other species.

Cod (Fig. 10)

The 0-group cod had a wide distribution with a high abundance north of Finnmark and Murman coast and west of Spitsbergen. Two different abundance indices are given in Table 2 and 3. The indices are among the highest ever recorded and point for a very strong year-class. This indicate a series of strong year-classes occuring in 1983, 1984 and 1985.

Haddock (Fig. 11)

The 0-group haddock was distributed in two separate areas, north of Finnmark and west of Spitsbergen. The indices given in Table 2 and 3 indicate a somewhat above and close to average strength of the year-class, but smaller than the 1983 and 1984 year-classes.

Polar cod (Fig. 12)

The distribution of 0-group polar cod was almost the same in the western area as in 1984, but the abundance index was less than in 1984 and also somewhat below the long term average 1977-84. The eastern area of distribution including the area of dense concentrations was larger in 1985 compared with 1984. The abundance index was the greatest ever recorded and more than seven times greater than the average for 1981-84. A couple of extra stations in the north-eastern part of the investigated area this year may have minor influences on the comparison with previous years. As in previous years the eastern component of the 0-group polar cod was distributed north of the investigated area.

Redfish (Fig. 13)

The distribution of 0-group redfish is similar to those found in previous years with the highest densities west of Spitsbergen. The abundance index points to another good year-class somewhat stronger than the 1984 year-class but less than the 1983 year-class.

Greenland Halibut (Fig. 14)

The Greenland Halibut was distributed from Bear Island to the area north-west of Spitsbergen, and the highest densities was observed west of Spitsbergen. The 1985 year-class is indicated as the third best and well above the average for the last 5 years.

Long rough dab (Fig. 15)

Long rough dab was found in highest densities in the Bear Island area but patches were recorded in the whole survey area. The abundance index is at the same level as in 1983 and 1984 and very close to the average.

Saithe (Fig. 16)

It seems characteristic for the 0-group saithe to concentrate in patches in the survey area. Compared with 1984 a small number was caught and more than 1 specimen per haul of 1.0 nautical mile was only recorded on three trawl stations. No abundance index has been calculated.

Blue whiting

0-group blue whiting was recorded only on four stations within a small area south of 70°50' N and between 15° E and 19° E. The catches and the area of distribution was smaller than in 1983 and 1984. No abundance index has been calculated.

Mackerel

0-group mackerel was recorded on four stations with some concentrations in the area around 18° E and between 70°30' N and 71° N. No index of abundance has been calculated.

References

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Randa, K., 1984. Abundance and distribution of 0-group Arcto-Norwegian cod and haddock 1965-1982. Proceedings of the Soviet-Norwegian symposium on Reproduction and recruitment of Arctic cod. Leningrad 26-30 Sept. 1983: 192-212.

Toresen, R., 1985. Recruitment/indices of Norwegian spring-spawning herring for the period 1965-1984 based on the international 0-group fish surveys. Coun. Meet. int. Coun. Explor. Sea. 1985 (H: 54): 1-9 [Mimeo.]

Table 1. Mean water temperature during the International 0-group fish survey in the Barents Sea and adjacent waters in late August-early September 1985

2-4 - Murmansk Current: Kola section (70°30' N - 72°30' N)
5 - Cape Kanin section (68°45' N – 70°05' N)
6 - Cape Kanin section (71°00' N - 72°00' N)
7 - North Cape Current: North Cape - Bear Island section (71°33' N; 25°02' E – 73°35' N; 20°46' E)
8 - West Spitsbergen Current: Bear Island - West section (06°34' E –15°55' E)

Layer/Year	0-50 m	50-200 m	0-200 m	0-bottom	0-bottom	0-200 m	0-200 m
1965	6.7	3.8	4.6	4.8	4.2	5.1	-
1966	6.7	2.6	3.6	2.0	2.5	5.5	3.3
1967	7.5	4.0	4.9	6.1	3.6	5.6	4.2
1968	6.4	3.7	4.4	4.7	3.1	5.4	3.6
1969	6.9	3.1	4.0	2.6	2.3	6.0	4.2
1970	7.8	3.6	4.7	4.0	3.3	6.1	-
1971	7.1	3.2	4.2	4.0	3.2	5.7	4.2
1972	8.7	4.0	5.2	5.1	4.1	6.3	3.9
1973	7.7	4.5	5.5	5.7	4.5	5.9	5.0
1974	8.1	3.9	4.9	4.6	-	6.1	4.6
1975	7.0	4.6	5.2	5.6	4.3	5.7	4.9
1976	8.1	4.0	5.0	4.9	4.6	5.7	5.0
1977	6.9	3.4	4.3	4.1	3.3	4.8	4.0
1978	6.6	2.5	3.6	2.4	1.7	5.0	4.1
1979	6.5	2.9	3.8	2.0	1 .8	5.3	4.4
1980	7.4	3.5	4.5	3.3	3.0	5.7	4.9
1981	6.6	2.7	3.7	2.7	2.5	5.3	4.4
1982	7.1	4.0	4.8	4.5	2.8	5.8	4.9
1983	8.1	4.8	5.6	5.1	4.2	6.3	5.1
1984	7.7	4.1	5.0	5.4	4.1	5.9	5.0
1985	6.6	3.5	4.3	3.3	3.2	5.2	4.6
Average 1965-1985	7.2	3.6	4.2	4.1	3.3	5.6	4.4

Table 2. Abundance indices

Species / Year	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	1	12
1971	157	73		181		172	1	81
1972	140	46		140		177	8.0	65
1973	684	54		(26)		385	3.2	67
1974	51	147		227		468	13.4	83
1975	343	170		75		315	21.1	113
1976	43	112		131		447	15.6	96
1977	173	116	157		70	472	9.0	72
1978	106	61	107		144	460	35.4	76
1979	94	69	23		302	980	22.5	69
1980	49	54	79		247	651	12.0	108
1981	65	30	149		73	861	38.0	95
1982	114	90	14		50	694	17.0	150
1983	386	184	48		39	851	15.8	80
1984	486	255	115		16	732	40.4	70
1985	742	156	60		334	795	36.0	86

Table 3. Estimated indices with 90 % confidence limits of year-class abundance for 0-group cod and haddock in the total area

Year-class	Herring[1)]			Cod			Haddock		
	Logarithmic index	Confidence limits		Logarithmic index	Confidence limits		Logarithmic index	Confidence limits	
1965				+			0.01		
1966	0.14	0.04	0.31	0.02	0.01	0.04	0.01	0.00	0.03
1967	0.00	-	-	0.04	0.02	0.08	0.08	0.03	0.13
1968	0.00	-	-	0.02	0.01	0.04	0.00	0.00	0.02
1969	0.01	0.00	0.04	0.25	0.17	0.34	0.29	0.20	0.41
1970	0.00	-	-	2.51	2.02	3.05	0.64	0.42	0.91
1971	0.00	-	-	0.77	0.57	1.01	0.26	0.18	0.36
1972	0.00	-	-	0.52	0.35	0.72	0.16	0.09	0.27
1973	0.05	0.03	0.08	1 .48	1 .18	1 .82	0.26	0.15	0.40
1974	0.01	0.01	0.01	0.29	0.18	0.42	0.51	0.39	0.68
1975	0.00	-	-	0.90	0.66	1.17	0.60	0.40	0.85
1976	0.00	-	-	0.13	0.06	0.22	0.38	0.24	0.51
1977	0.01	0.00	0.03	0.49	0.36	0.65	0.33	0,21	0.48
1978	0.02	0.01	0.05	0.22	0.14	0.32	0.12	0.07	0.19
1979	0.09	0.01	0.20	0.40	0.25	0.59	0.20	0.12	0.28
1980	-	-	-	0.13	0.08	0.18	0.15	0.10	0.20
1981	0.00	-	-	0.10	0.06	0.18	0.03	0.00	0.05
1982	0.00	-	-	0.59	0.43	0.77	0.38	0.30	0.52
1983	1.77	1 .29	2.33	1.69	1.34	2.08	0.62	0.48	0.77
1984	0.34	0.20	0.52	1.55	1.18	1.98	0.78	0.60	0.99
1985	0.23	0.18	0.28	2.46	2.22	2.71	0.27	0.23	0.31

[1)] Assessments for 1965-1984 made by Toresen (1985).

Table 4. Length distribution of 0-group fish in percent

Length, mm	Herring	Capelin	Cod	Haddock	Polar cod		Redfish	Greenland halibut	Long rough dab	Saithe
					East	West				
10-14										
15-19							+			
20-24							+		1.7	
25-29		+	+		2.3	1.0	0.2		16.6	
30-34		0.2	+	0.1	21.2	4.3	8.0		29.0	
35-39		1.7	+	0.1	49.9	8.6	35.5		34.5	
40-44	+	5.5	0.2	0.3	18.0	30.6	28.0	0.3	14.1	
45-49	0.1	17.8	0.8	1.2	7.0	31.9	17.6	2.3	0.7	
50-54	0.4	39.9	1.8	2.4	1.3	19.3	7.1	12.9	0.1	
55-59	0.1	29.3	4.8	2.4	0.2	4.0	2.7	11.7	0.1	3.2
60-64	0.3	4.9	9.4	4.0	0.1	0.3	0.8	25.5	2.1	
65-69	1.6	0.2	17.1	5.0	+	+	0.1	24.4	1.1	1.6
70-74	4.1	0.2	21.9	7.9			+	14.6		11.1
75-79	9.5	0.1	20.9	10.8			+	2.3		1.6
80-84	13.8	+	13.9	11.1				6.0		3.2
85-89	20.6	0.1	6.1	12.6						3.2
90-94	23.0	0.1	2.2	13.8						1.6
95-99	9.1	+	0.8	10.4						4.7
100-104	10.8	+	0.1	.8.9						6.3
105-109	3.6	+		4.8						3.2
110-114	3.0	+		2.9						14.3
115-119	+			0.7						1.6
120-124				0.3						28.5
125-129				0.2						11.1
130-134				+						3.2
135-139				0.1						1.6
140-144				+						
Total numbers	170360	121288	71030	3524	5401	73698	1838899	349	1501	63
Mean length mm	89.7	52.9	73.4	85.6	38.1	45.7	42.0	64.5	35.8	107. 1

Appendix

Survey period	Research vessel	Research Institute	Participants
23 August- 2 September	"Kokshaysk"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk	N.A. Isaev, V.I. Zubov, N.G. Ushakov, S.D. Melnikov, V.I. Shapovalov, V.L. Kaponirov, N.V, Antropov, A.V. Mukhin, Yu.G. Ignatyev
25 August- 2 September	"Vilnyus"	"	A.I. Krysov, I.V, Borkin, A.V. Bezdenezhnykh, O.V. Solovyova, S.N. Ashikhmin, A.E. Dorchenkov, S.Yu. Annenkov, S.G. Isapu
19 August- 3 September	"G.O. Sars"	Institute of Marine Research, Bergen	H. Bjørke, A. Hylen, H.P. Knudsen, E. Moksness, J. Monkan, A. Raknes, A.M. Skorpen
19 August- 4 September	"Eldjarn"	"	J. Blindheim, M. Haukås, A. Nødtvedt, R. Pedersen, I. Røttingen, Ø. Torgersen
20 August- 2 September	"Hakon Mosby"	"	I. Hoff, H. Ludvigsen, K. Nedreaas, K. Nythun, K. Sunnanå, E. Sæthre
17 August- 19 August	"Michael Sars"	"	S. Kolbeinson, B. Kvinge, T. Monstad, J.H. Nilsen, Ø. Tangen

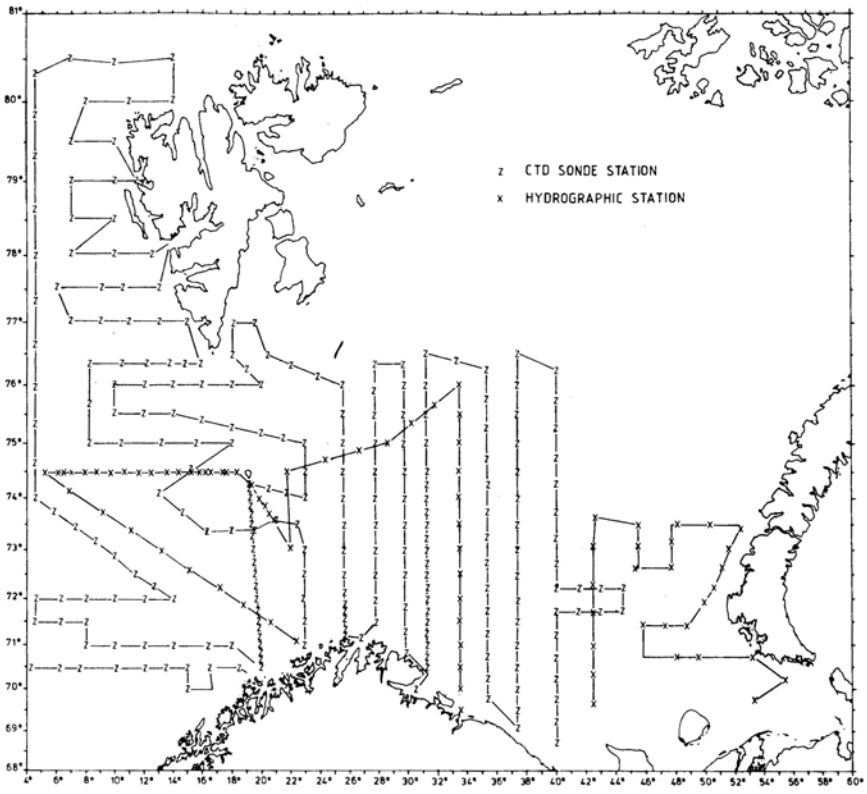

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

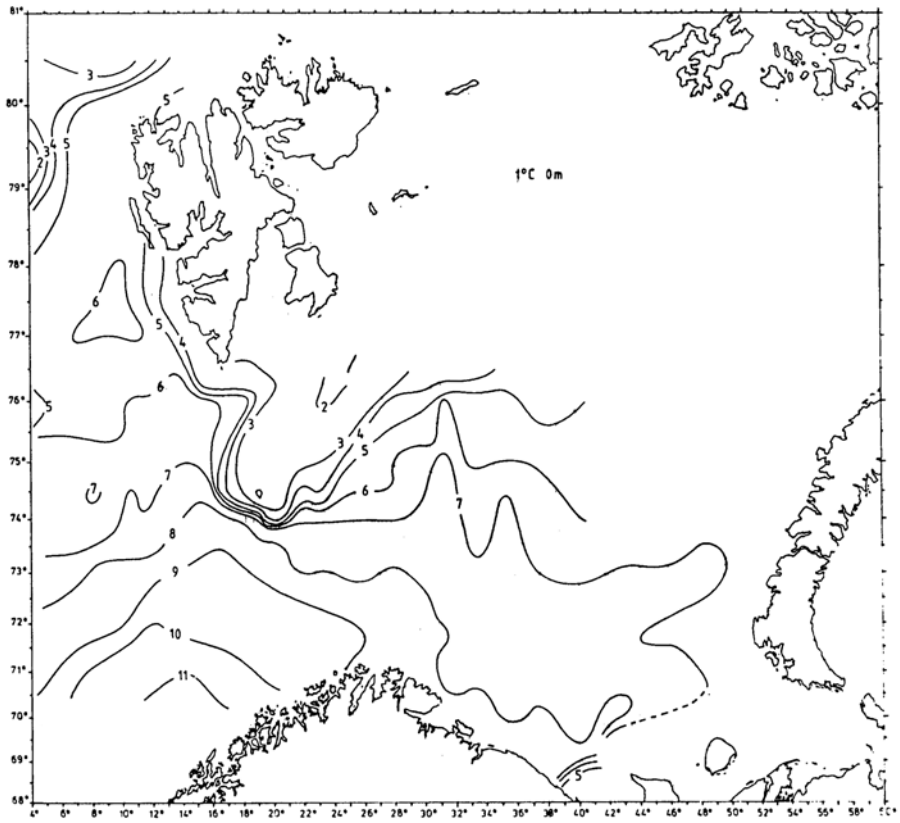

Fig. 2. Isotherms at 0 m

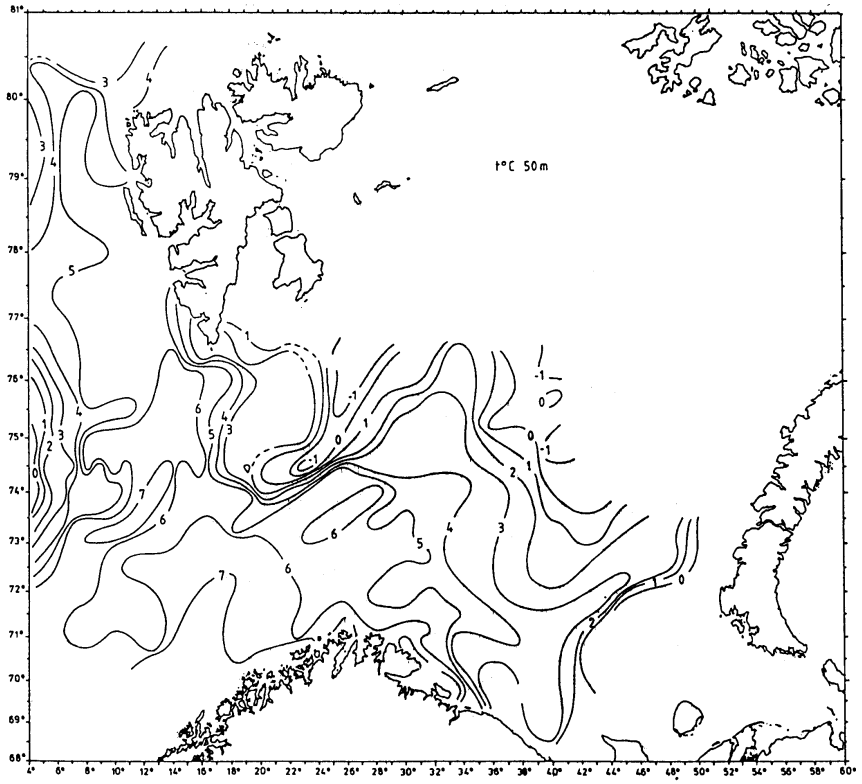

Fig. 3. Isotherms at 50 m

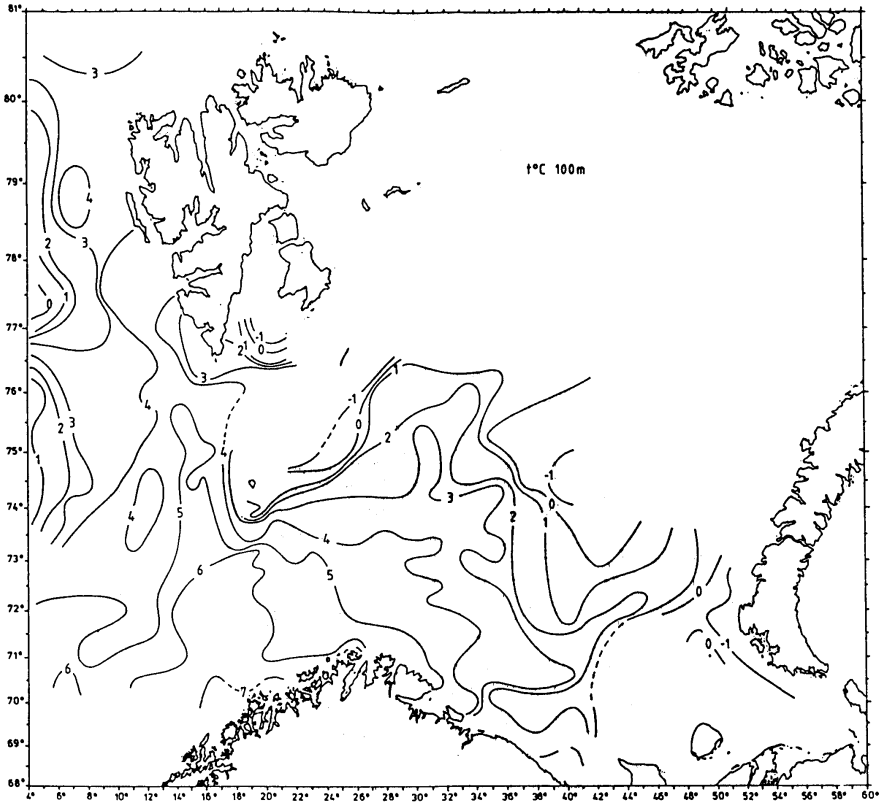

Fig. 4. Isotherms at 100 m

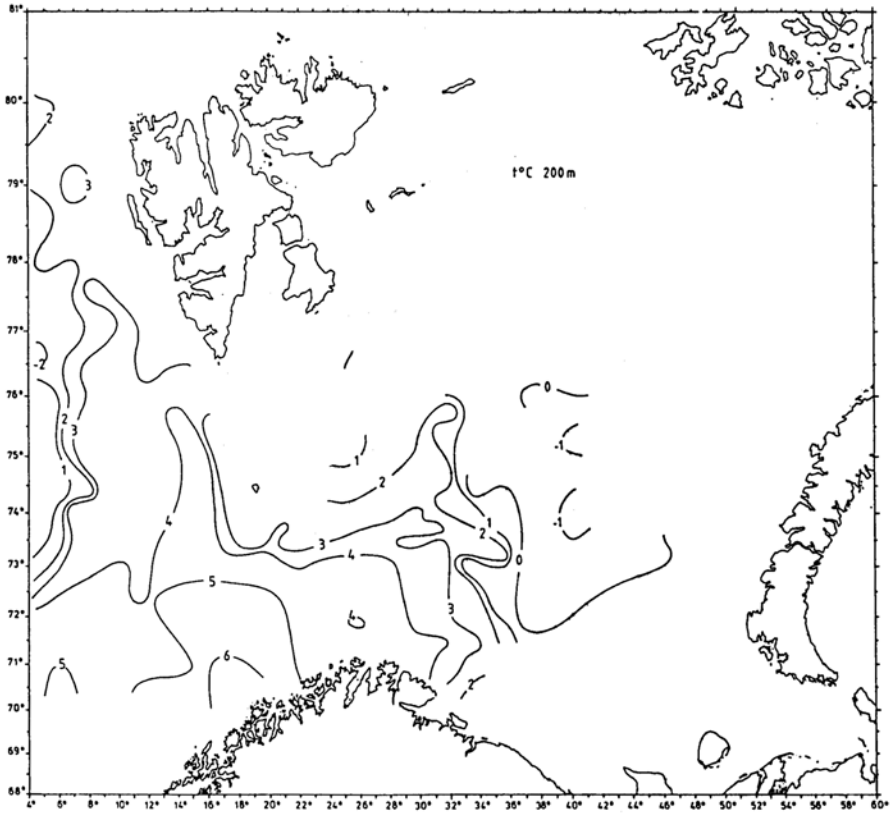

Fig. 5. Isotherms at 200 m

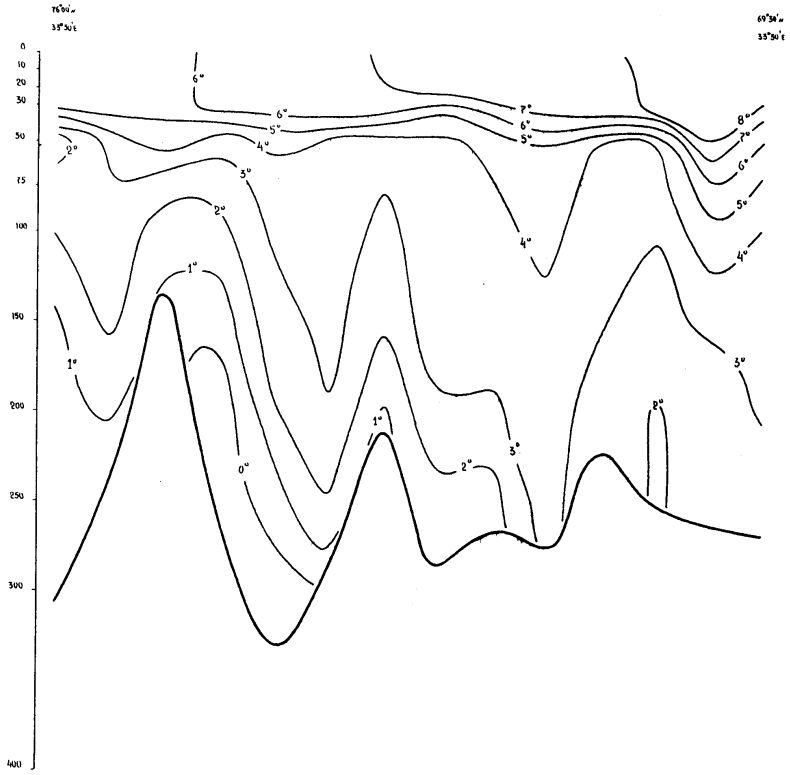

Fig. 6. Temperature section along the Kola meridian

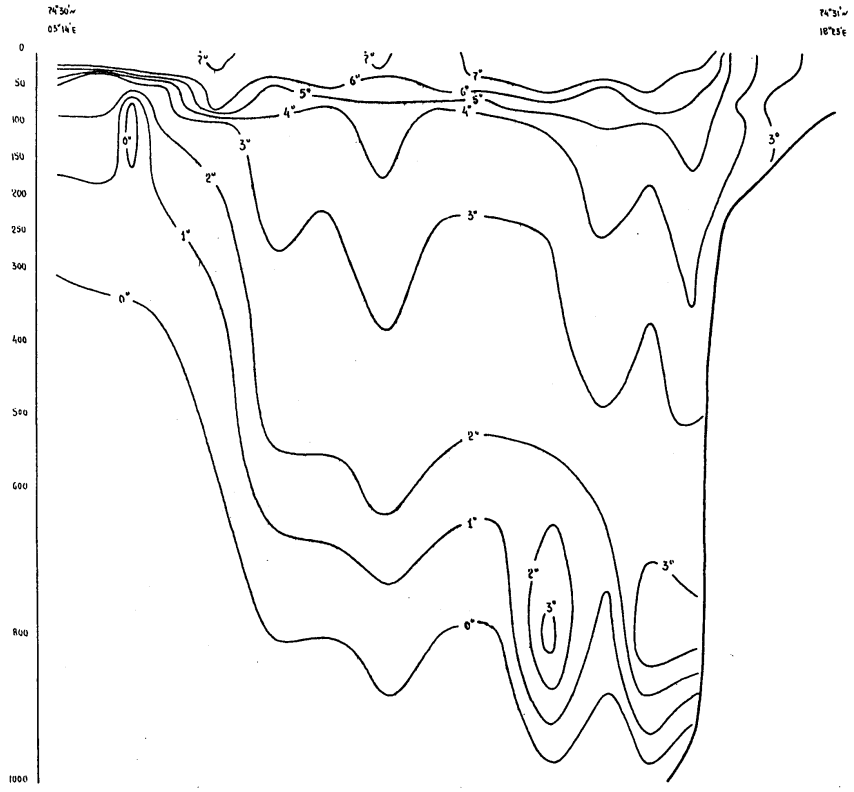

Fig. 7. Temperature section Bear Island-West

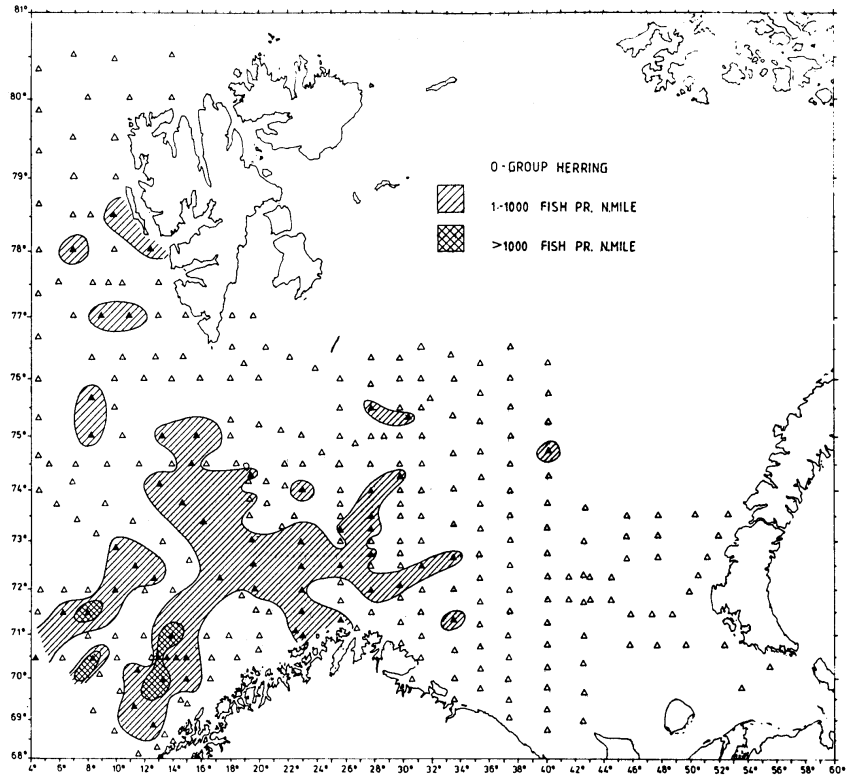

Fig. 8. Distribution of 0-group herring

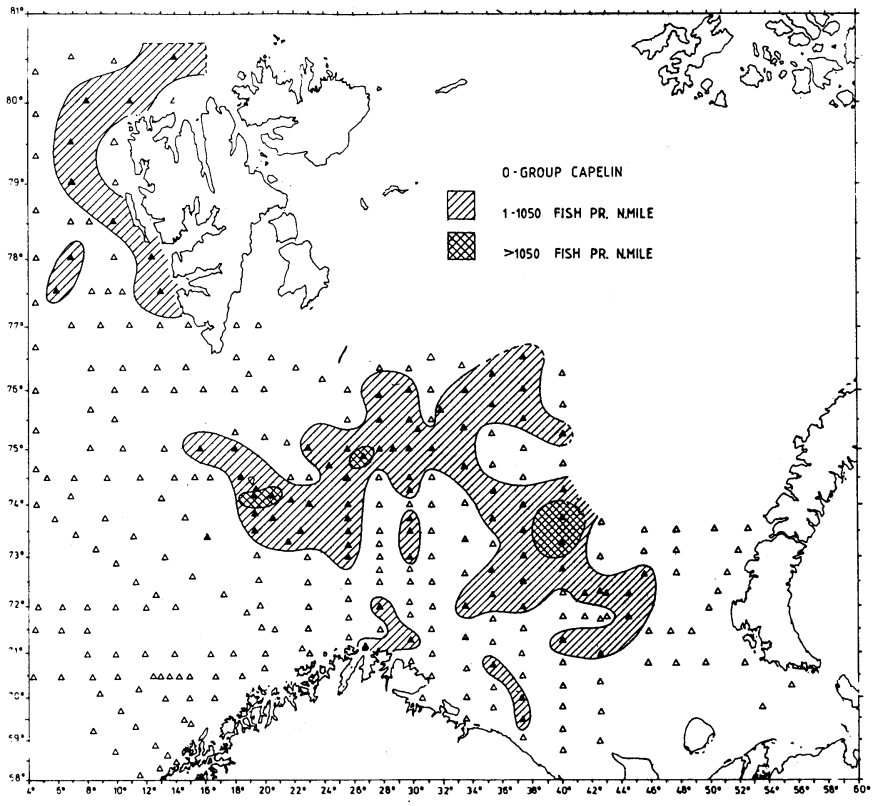

Fig. 9. Distribution of 0-group capelin

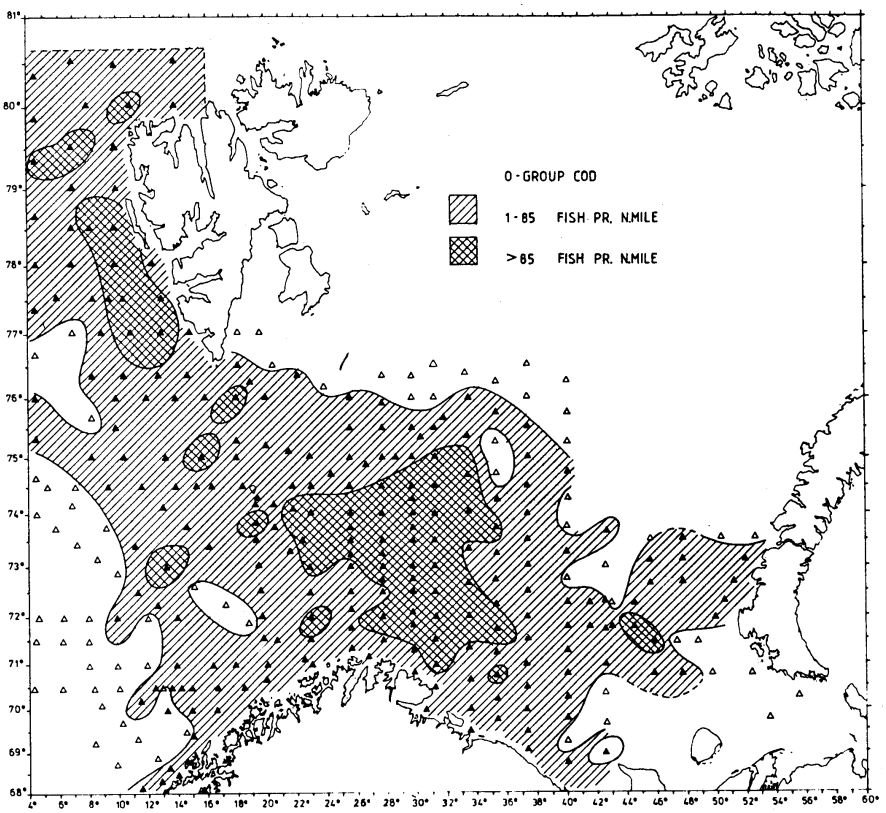

Fig. 10. Distribution of 0-group cod

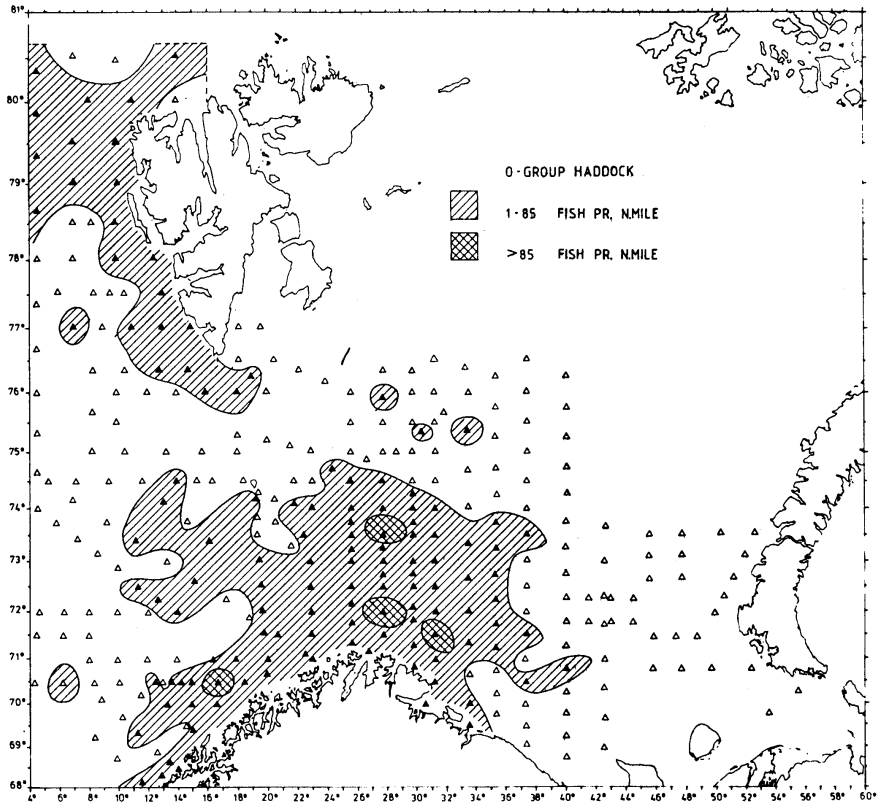

Fig. 11. Distribution of 0-group haddock

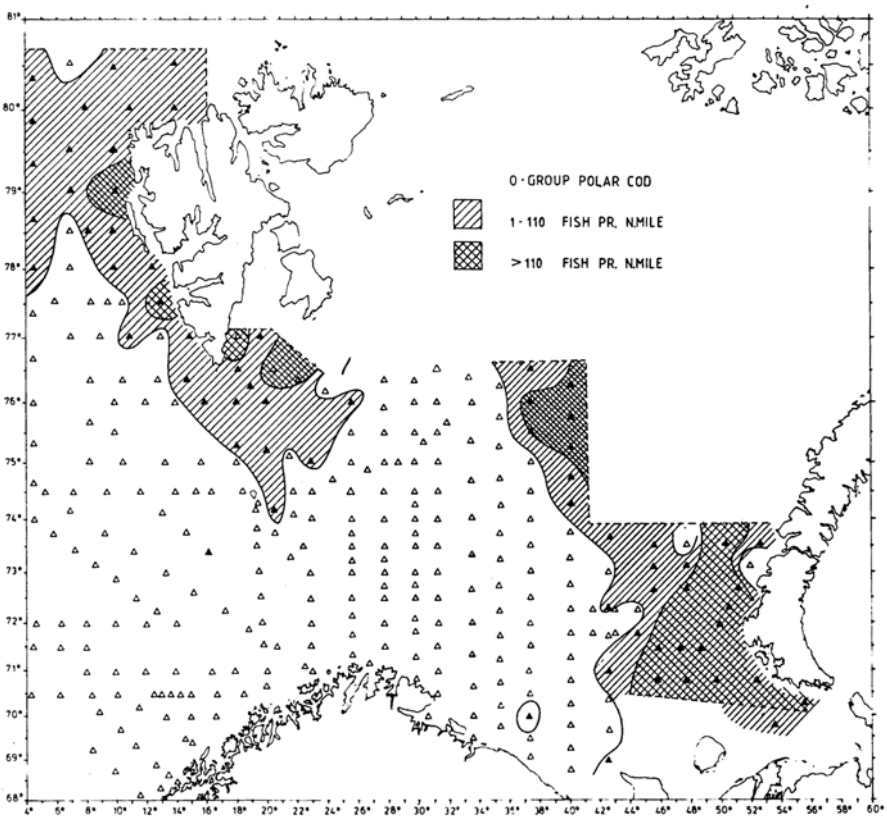

Fig. 12. Distribution of 0-group polar cod

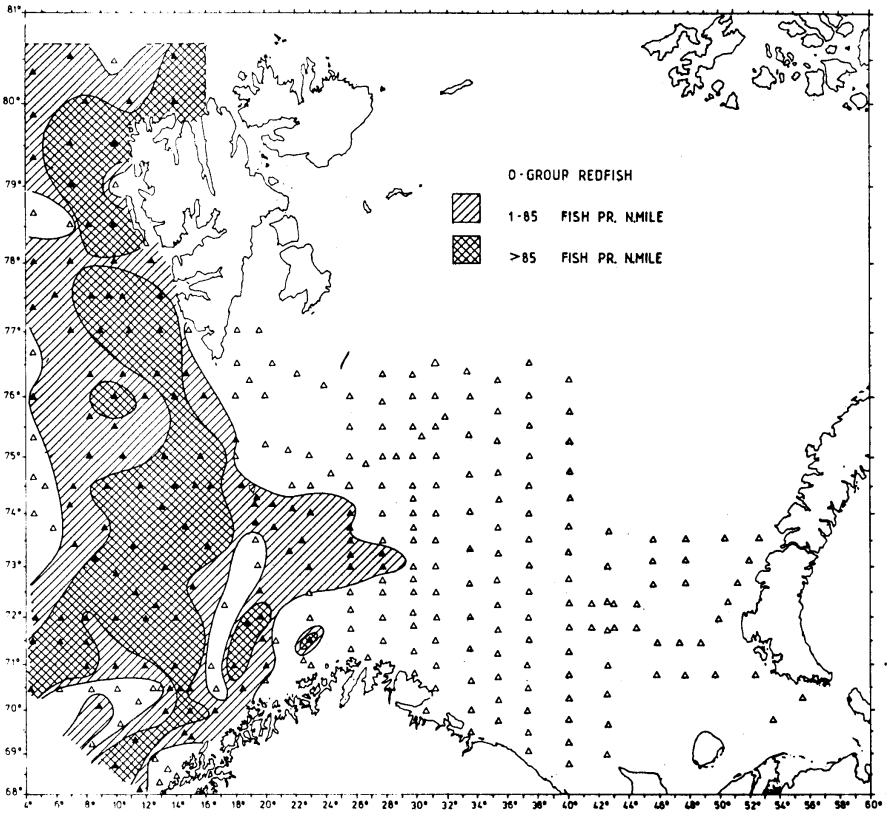

Fig. 13. Distribution of 0-group redfish

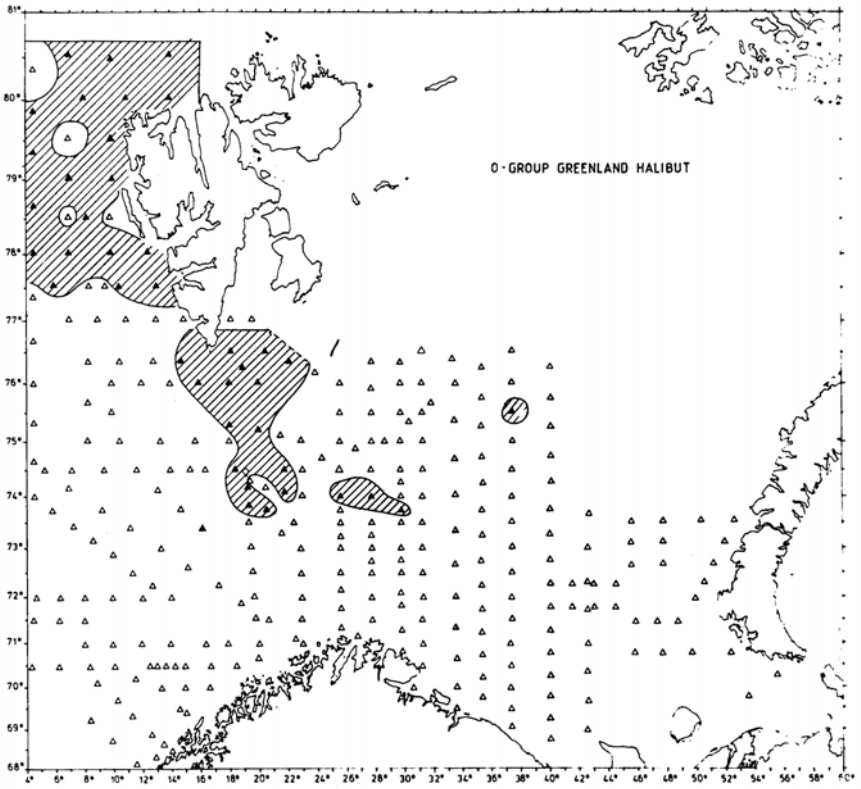

Fig. 14. Distribution of 0-group Greenland halibut

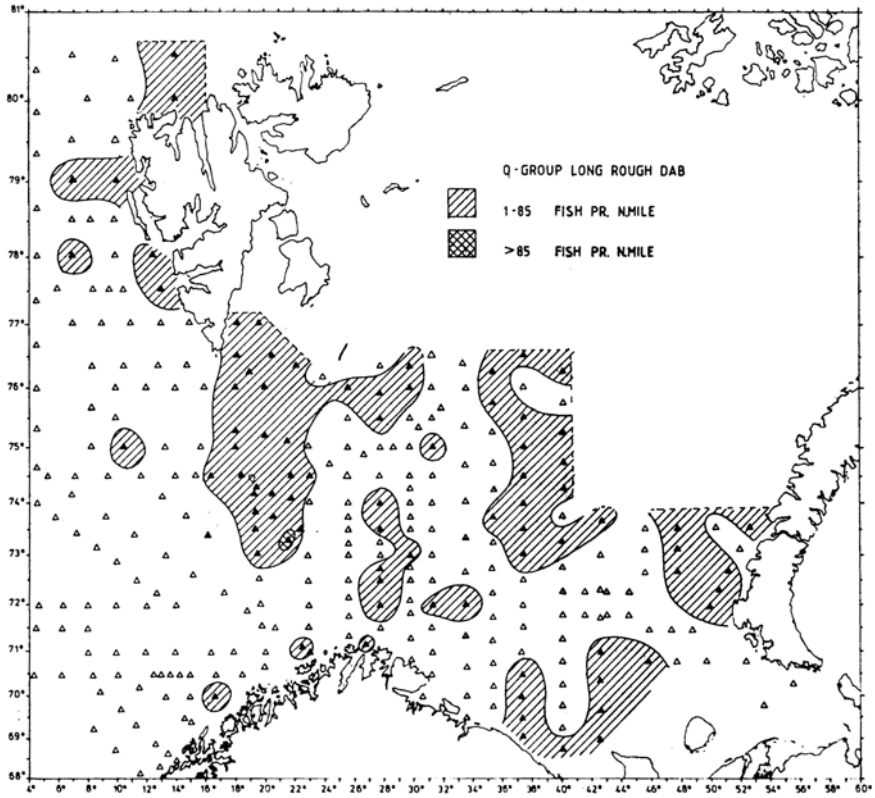

Fig. 15. Distribution of 0-group long rough dab

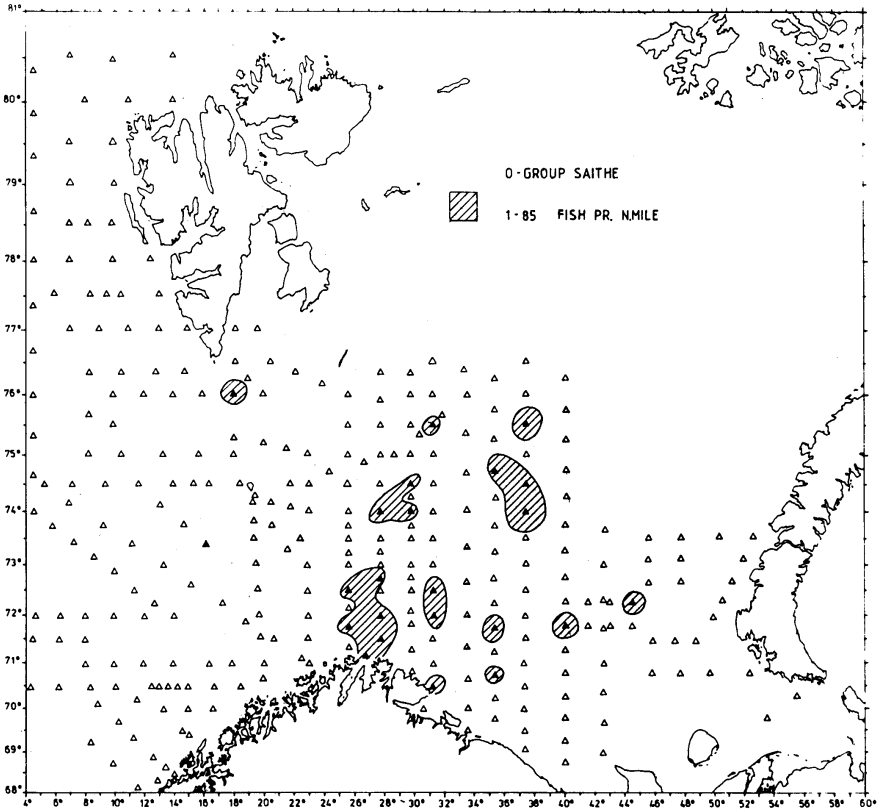

Fig. 16. Distribution of 0-group saithe

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Preliminary report of the international 0-group fish survey in the Barents Sea and adjacent waters in August-September 1986

The twenty-second annual International 0-group fish survey was made during the period 11 August-4 September 1986 in the Barents Sea and adjacent waters. The following research vessels participated in the survey:

State	Name of vessel	Survey period	Research Institution
Norway	"Eldjarn"	20 August-4 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	11 August-4 September	"
Norway	"Hakon Mosby"	20 August-3 September	"
USSR	"Kokshaysk"	21 August-1 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Vilnius"	20 August-2 September	"

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

Preliminary analyses of the survey data were made 4-5 September in Hammerfest. Observations concerning the geographical distribution of 0-group fish and their abundance are given in this report together 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 mesh midwater trawl. The vessels participated in the survey in 1986 used the type of midwater trawl recommended by the meeting held after the survey in 1980 (Anon. 1983). The trawling procedure was standardized in accordance with recommendation made at the same meeting. At about every 30 nautical miles sailed the trawl was towed in several depths in one haul. The standard procedure consisted of towings of 0.5 nautical mile in each of 3 depths with the headline of the trawl located at 0, 20 and 40 m. An additional tow at 60 m for 0.5 nautical miles was made when 0-group fish layer was recorded deeper than 60 m on the echo-sounder.

Survey tracks and hydrographic stations are given in Fig. 1. Trawl stations with and without catch are given on the distribution charts in Figs. 10-19, as filled and open symbols respectively. The density grading is based on catch in number per 1.0 nautical mile trawled.

Hydrography

Hydrographic observations were made along all the survey tracks normally after each 30 nautical miles sailed. Horizontal temperature distributions are shown for 0, 50, 100 and 200 m depth (Figs. 2-5). Figs. 6-9 show the temperature conditions at the Kola, Cape Kanin, North Cape-Bear Island and Bear Island- West sections. The mean temperature of these sections is given in Table 1. The 1986 data have been included in the calculations of the long-term means for these sections.

The analyses of the data had indicated a higher heat content of water masses in the survey area caused by an increased influx of water of Atlantic origin. Comparison of isotherm distributions with those of the previous year confirms this conclusion. Thus, at the 100 m depth the 6 °C isotherm has been observed at 74°30' N, whereas the temperature recorded here the year before was below б °C. At the surface the 9 °C isotherm reaches as far as the Kola meridian while in the previous year it was observed only east to the North Cape. The average temperatures compared to the long-term mean for 1965 - 1986 by section are as follows:

1) Kola section

The water temperature in the 0 - 50 m layer was 0.9 °C above that in the proceeding year and 0.3 °C higher than the long term mean. This may be caused by solar radiation as well as the increased inflow of Atlantic water. The temperatures in the 50-200 and 0-200 m layers were close to that observed in the previous year and somewhat lower average one.

2) Cape Kanin - North

In comparison to 1985, there was an increase observed in the temperature of the 0 m - bottom layer in the southern part of the section while in the northern part the temperature in this layer was close to average and similar to the proceeding year.

3) North Cape - Bear Island section

Temperature in the 0-200 m layer was 0.6 °C higher than in 1985 and 0.2 °C above the long-term mean.

4) Bear Island - West section (along 74°30' N)

In the 0-200 m layer the temperature was near average but lower than in the previous year. It is noteworthy that the warm water inflow is distributed more to the east with higher temperatures than last year. At the same time an increase in Arctic water influx from the north was observed which contributed to the formation of the clearly pronounced frontal zone. The general heat content was therefore lower than in the previous year.

Distribution and abundance of 0-group fish

Geographical distributions of 0-group fish are shown as shaded areas in Figs. 10-19. Double shading indicates dense concentrations. The criteria for discriminations are the same as used in earlier reports (Anon. 1980). Abundance indices, estimated as the area of distribution with areas of high densities weighted by 10, are given in Table 2. Another set of abundance indices is given for 0-group herring, cod and haddock (Table 3) as described by Randa (1984). These are based on the number caught during a standard trawl haul of one nautical mile. Length frequency distributions of the main species are given in Table 4.

Herring (Fig. 10)

The overall density and the area of distribution of herring are far smaller this year than it has been for the last three years. Only a few individuals are caught in the area covered by the five vessels. The estimated logarithmic index this year is zero indicating a weak year class comparable to the strength of the year classes in the early seventies and early eighties.

Capelin (Fig. 11)

Although the results from the Barents Sea 0-group survey have not given a reliable index of year class strength of capelin, it is evident that the 1986 year-class is very weak. This year, the western limit of the area of distribution was to the east of 30°E and the density is much lower than it has been for any of the year classes in the period 1980-1985.

Cod (Fig. 12)

The 0-group cod is found most abundant in the eastern part of the investigated area. The highest densities are found further to the southeast than previous years, probably indicating a strong drift along the coastal currents. The indices given in Table 2 and 3 points to a strong year-class in line with those of 1983 and 1984. The results indicate the presence of four strong year-classes following each other and this is very unusual.

Haddock (Fig. 13)

Haddock were only found in the central and southern part of the area. The distribution here is very much the same as last year. The indices given in Table 2 and 3 points to a year-class of the same strength as 1982 and 1985 year-classes, which are somewhat above average.

Polar cod (Fig. 14)

This year, polar cod was found as a continuous distribution from the east to the west in the northern part of the investigated area. The most dense concentrations were found in the eastern part of the survey area. Although the total area of distribution was not covered, the abundance index is the highest one for the eastern area since 1977. In the area to the west of 25°E, the high density also here indicates this year class to be a strong one.

Redfish (Fig. 15)

The redfish is found much further east than usual and the western border is further to the east than last year. The highest abundance is found north of Tromsø. The index in Table 2 is high and in line with previous years.

Greenland halibut (Fig. 16)

The distribution resembles the distribution found in resent years, except patches of Greenland halibut are also found all over the eastern area. The highest densities are found west of Spitsbergen. The index in Table 2 is the highest recorded.

Long rough dab (Fig. 17)

Long rough dab is extremely abundant this year and is found in high concentrations throughout the central and eastern area. The index given in Table 2 is 10 times that of the proceeding three years, which was close to average and five times the highest recorded previously.

Blue whiting (Fig. 18)

This map is included only to show the distribution and no indices are given.

Sandeel (Fig. 19)

Sandeel was found in high concentrations to the south-east. This is the same area as cod and capelin were found in high concentrations. Data from the survey also indicated that there were high concentrations of zooplankton in this area. No index is calculated for sandeel.

Squid

Squid were widely distributed throughout the western part of the survey area, but very little squid occurred east of the Kola section. The abundance of squid was also at a higher level than observed in previous surveys.

References

Anon. 1980. Preliminary report of the International 0-group fish survey in the Barents Sea and adjacent waters in August/September 1978. Annls Biol., Copenh., 35: 273-280.

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Randa, K. 1984. Abundance and distribution of 0-group Arcto-Norwegian cod and haddock 1965-1982. Proceedings of the Soviet-Norwegian symposium on Reproduction and recruitment of Arctic cod. Leningrad 26-30 Sept. 1983: 192-212.

Toresen, R. 1985. Recruitment/indices of Norwegian spring-spawning herring for the period 1965-1984 based on the international 0-group fish surveys. Coun. Meet. int. Coun. Explor. Sea, 1985 (H: 54): 1-9 [Mimeo.]

Table 1. Mean water temperature during the International 0-group fish survey in the Barents Sea and adjacent waters in late August-early September 1986

2-4 - Murmansk Current: Kola section (70°30' N - 72°30' N)
5 - Cape Kanin section (68°45' N-70°05' N)
6 - Cape Kanin section (71°00' N-72°00' N)
7 - North Cape Current: North Cape- Bear Island section (71°33' N; 25°02' E-73°35' N; 20°46' E)
8 - West Spitsbergen Current: Bear Island - West section (06°34' E -15°55' E)

Layer/ Year	0-50 m	50-200 m	0-200 m	0-bottom	0-bottom	0-200 m	0-200 m
1965	6.7	3.8	4.6	4.8	4.2	5.1	-
1966	6.7	2.6	3.6	2.0	2.5	5.5	3.3
1967	7.5	4.0	4.9	6.1	3.6	5.6	4.2
1968	6.4	3.7	4.4	4.7	3.1	5.4	3.6
1969	6.9	3.1	4.0	2.6	2.3	6.0	4.2
1970	7.8	3.6	4.7	4.0	3.3	6.1	-
1971	7.1	3.2	4.2	4.0	3.2	5.7	4.2
1972	8.7	4.0	5.2	5.1	4.1	6.3	3.9
1973	7.7	4.5	5.5	5.7	4.5	5.9	5.0
1974	8.1	3.9	4.9	4.6	-	6.1	4.6
1975	7.0	4.6	5.2	5.6	4.3	5.7	4.9
1976	8.1	4.0	5.0	4.9	4.6	5.7	5.0
1977	6.9	3.4	4.3	4.1	3.3	4.8	4.0
1978	6.6	2.5	3.6	2.4	1.7	5.0	4.1
1979	6.5	2.9	3.8	2.0	1.8	5.3	4.4
1980	7.4	3.5	4.5	3.3	3.0	5.7	4.9
1981	6.6	2.7	3.7	2.7	2.5	5.3	4.4
1982	7.1	4.0	4.8	4.5	2.8	5.8	4.9
1983	8.1	4.8	5.6	5.1	4.2	6.3	5.1
1984	7.7	4.1	5.0	5.4	4.1	5.9	5.0
1985	6.6	3.5	4.3	3.3	3.2	5.2	4.6
1986	7.5	3.4	4.4	3.9	3.2	5.8	4.4
Average 1965-1986	7.2	3.6	4.6	4.1	3.3	5.6	4.4

Table 2. Abundance indices

Species Year	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	1	12
1971	157	73		181		172	1	81
1972	140	46		140		177	8	65
1973	684	54		(26)		385	3	67
1974	51	147		227		468	13	83
1975	343	170		75		315	21	113
1976	43	112		131		447	16	96
1977	173	116	157		70	472	9	72
1978	106	61	107		144	460	35	76
1979	94	69	23		302	980	23	69
1980	49	54	79		247	651	12	108
1981	65	30	149		73	861	38	95
1982	114	90	14		50	694	17	150
1983	386	184	48		39	851	16	80
1984	486	255	115		16	732	40	70
1985	742	156	60		334	795	36	86
1986	434	160	111		366	702	55	755

Table 3. Estimated indices with 90 % confidence limits of year class abundance for 0-group cod and haddock in the total area

Year-class	Herring [1]			Cod			Haddock		
	Logarithmic index	Confidence limits		Logarithmic index	Confidence limits		Logarithmic index	Confidence limits	
1965				+			0.01		
1966	0.14	0.04	0.31	0.02	0.01	0.04	0.01	0.00	0.03
1967	0.00	-	-	0.04	0.02	0.08	0.08	0.03	0.13
1968	0.00	-	-	0.02	0.01	0.04	0.00	0.00	0.02
1969	0.01	0.00	0.04	0.25	0.17	0.34	0.29	0.20	0.41
1970	0.00	-	-	2.51	2.02	3.05	0.64	0.42	0.91
1971	0.00	-	-	0.77	0.57	1.01	0.26	0.18	0.36
1972	0.00	-	-	0.52	0.35	0.72	0.16	0.09	0.27
1973	0.05	0.03	0.08	1.48	1.18	1.82	0.26	0.15	0.40
1974	0.01	0.01	0.01	0.29	0.18	0.42	0.51	0.39	0.68
1975	0.00	-	-	0.90	0.66	1.17	0.60	0.40	0.85
1976	0.00	-	-	0.13	0.06	0.22	0.38	0.24	0.51
1977	0.01	0,00	0.03	0.49	0.36	0.65	0.33	0.21	0.48
1978	0.02	0.01	0.05	0.22	0.14	0.32	0.12	0.07	0.19
1979	0.09	0.01	0.20	0.40	0.25	0.59	0.20	0.12	0.28
1980	-	-	-	0.13	0.08	0.18	0.15	0.10	0.20
1981	0.00	-	-	0.10	0.06	0.18	0.03	0.00	0.05
1982	0.00	-	-	0.59	0.43	0.77	0.38	0.30	0.52
1983	1.77	1.29	2.33	1.69	1.34	2.08	0.62	0.48	0.77
1984	0.34	0.20	0.52	1.55	1.18	1.98	0.78	0.60	0.99
1985	0.23	0.18	0.28	2.46	2.22	2.71	0.27	0.23	0.31
1986	0.00	-	-	1.37	1.06	1.70	0.39	0.28	0.52

[1] Assessments for 1965-1984 made by Toresen (1985).

Table 4. Length distribution of 0-group fish in percent

Length (mm)	Herring	Capelin	Cod	Haddock	Polarcod		Redfish	Greenland halibut	Long rough dab	Sandeel
					East	West				
10-14							0.3			
15-19							2.5			
20-24	2.4	0.2	+	0.1		18.7	5.2		+	
25-29	2.4	3.0	0.1		+	25.4	3.7	0.1	2.2	
30-34	2.4	22.9	0.3	0.1	1.1	19.5	6.3		10.8	
35-39	2.4	38.0	1.1	0.6	25.7	9.4	23.0	0.7	18.6	
40-44		8.5	3.6	1.2	50.3	11.7	41.1	0.6	12.1	1.3
45-49	9.8	1.9	6.8	2.3	18.4	12.2	15.6	2.4	4.1	8.9
50-54	19.5	0.4	13.7	7.1	4.5	2.9	1.9	8.6	0.3	19.3
55-59	24.4	+	18.5	7.4	+	+	0.3	22.7	+	15.8
60-64	19.5	0.2	21.4	10.0		0.1	0.1	18.4		12.7
65-69	17.1	2.4	15.3	11.0		+		19.9		13.6
70-74		3.9	11.4	13.1		+		17.7		13.3
75-79		5.3	5.0	14.4		+		4.8		7.1
80-84		5.6	2.0	10.0		+		4.1		5.7
85-89		6.0	0.7	9.2		+		0.1		0.6
90-94		1.1	0.1	6.0		+				0.5
95-99		0.5		5.0		+				0.2
100-104		0.1		1.2		+				0.3
105-109				0.8						0.4
110-114				0.3						
115-119				+						
120-124				0.1						0.1
125-129				+						
130-134				+						
135-139										
140-144										
Total numbers	41	56479	11339	3229	40842	14983	545971	713	39472	41856
Mean length, mm	55.6	47.4	61.3	73.6	33.5	42.5	39.4	64.1	35.5	63.2

+) Less than 0.1.

Appendix

Survey period	Research vessel	Research Institute	Participants
21 August- 1 September	"Kokshaysk"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk	S.V Ashikhmin, A.V. Bezdenezhnykh, I.V. Borkin, M.F. Efremov, S.M. Gotovtsev, A.A. Konovalov, S.V. Ratushniy, V.P. Shurupov
20 August- 2 September	"Vilnius"	"	N.V. Vanjukhina, V.I. Zubov, A.L. Lovchikov, V.S. Mamylov, L.L. Pavljuchenko, A.I. Semochkin, S.B. Ustinov, N.G. Ushakov, B.S. Shabalin
11 August- 4 September	"G.O. Sars"	Institute of Marine Research, Bergen	H. Abrahamsen, L. Austgulen, P. Bangstad, I.M. Beck, M. Dahl, O. Gullaksen, K.H. Hansen, A. Hylen, H. Ludivigsen, E. Moksness, T. Monstad, T. Mørk, A. Raknes, E. Sælen, A. Totland, M. Wallevik. V. Wespestad.
20 August- 3 September	"Håkon Mosby"	"	B. Haugland, I. Hoff, M. Johannessen, E. Nilsen, K. Sunnanå.
20 August- 4 September	"Eldjarn"	"	K. Hansen, B. Hoffstad, R. Pettersen, A. Romslo, R. Toresen.

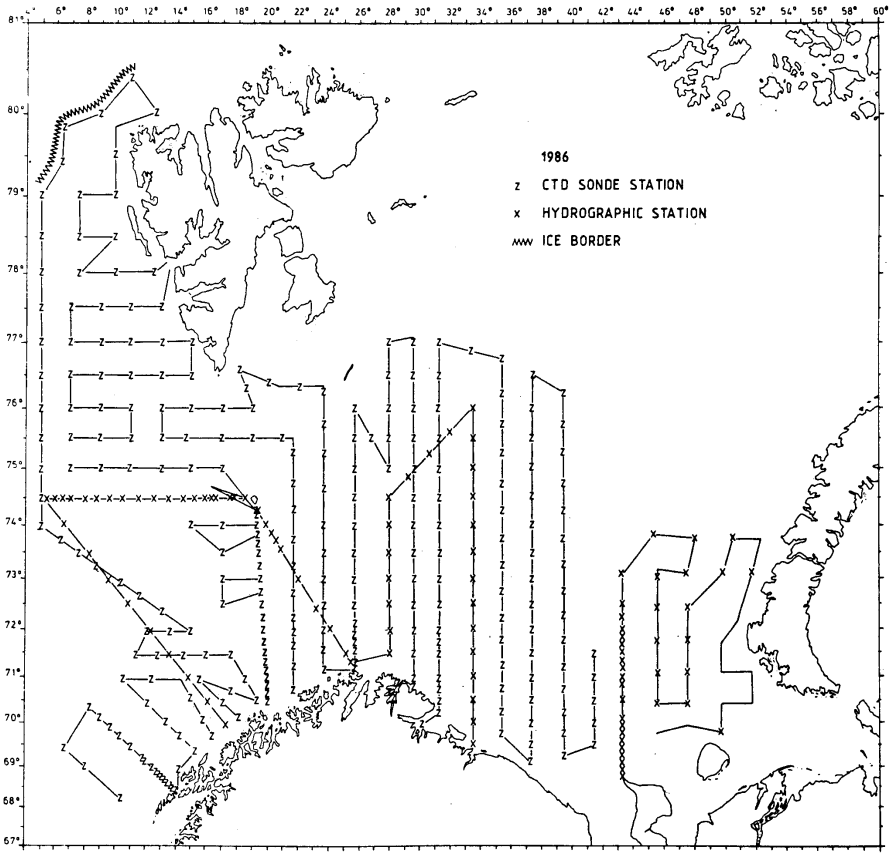

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

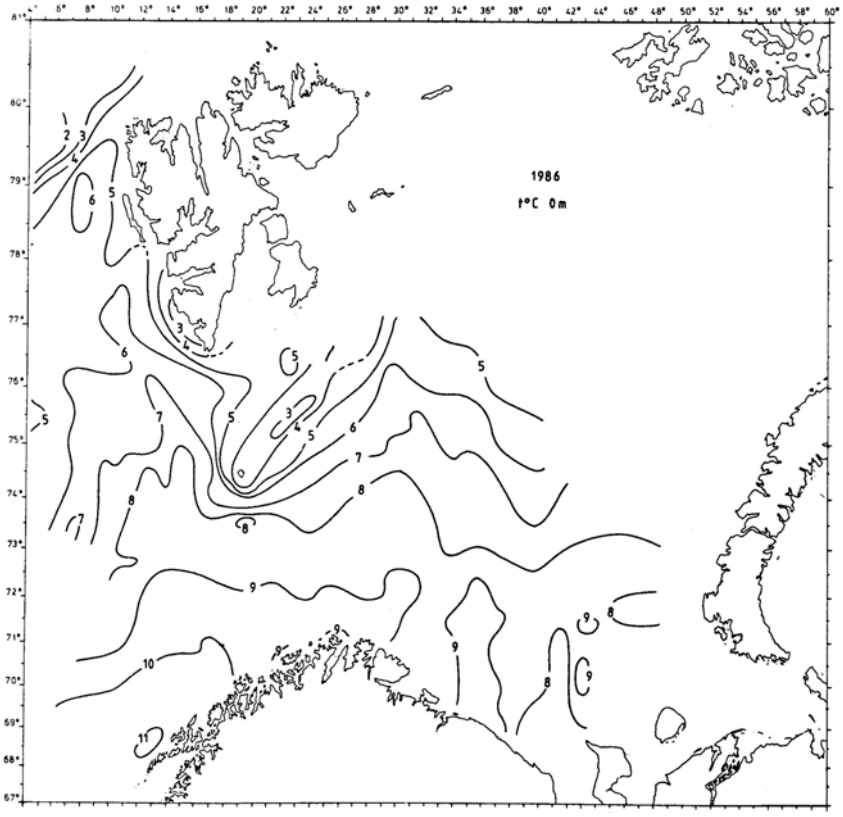

Fig. 2. Isotherms at 0 m

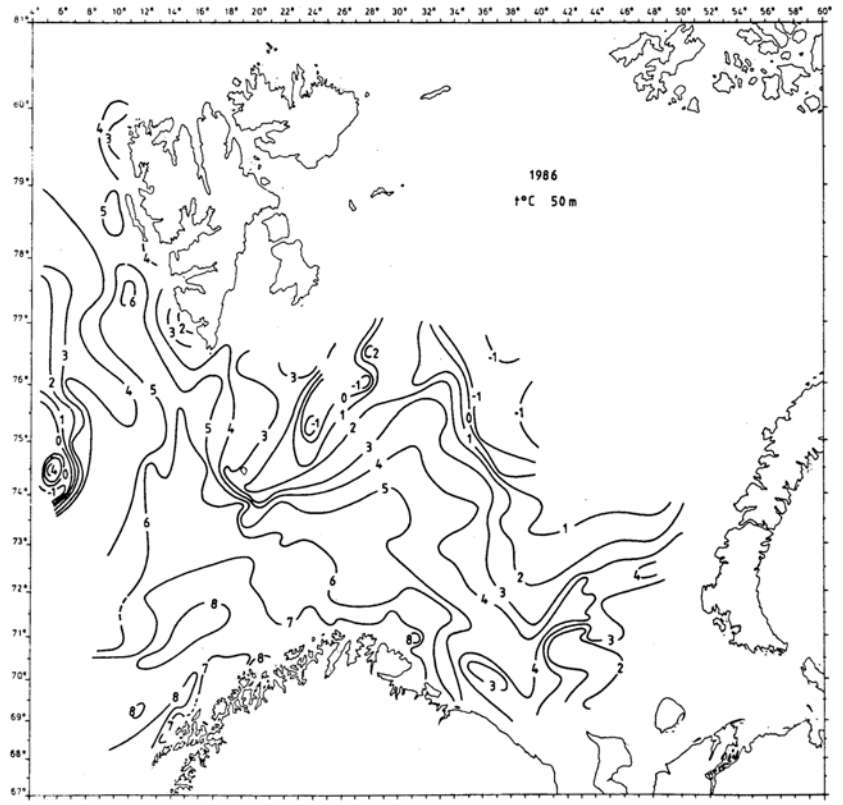

Fig. 3. Isotherms at 50 m

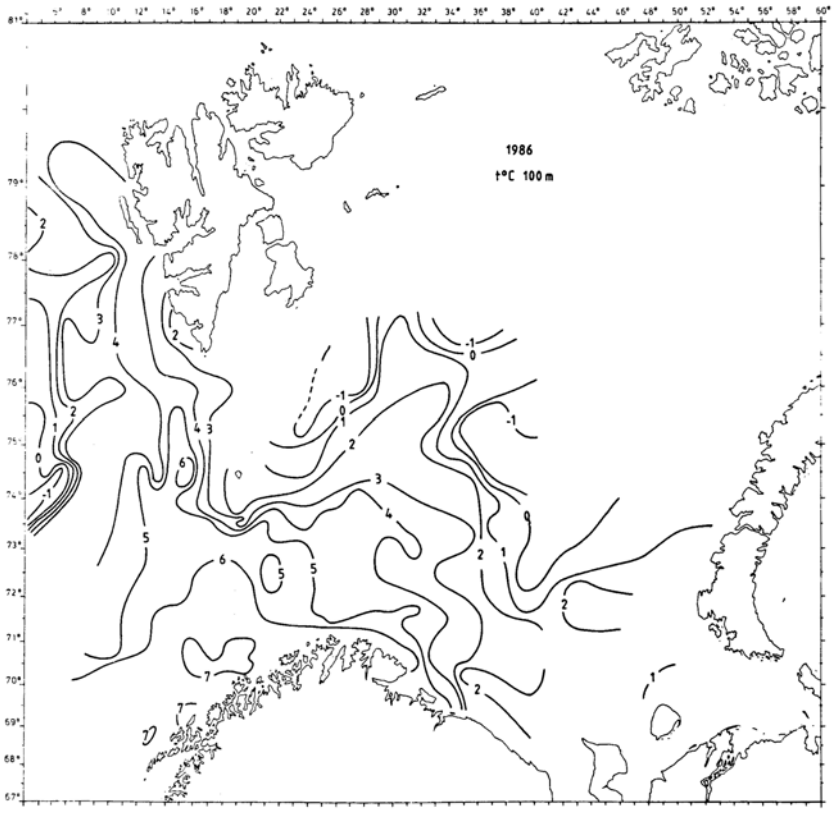

Fig. 4. Isotherms at 100 m

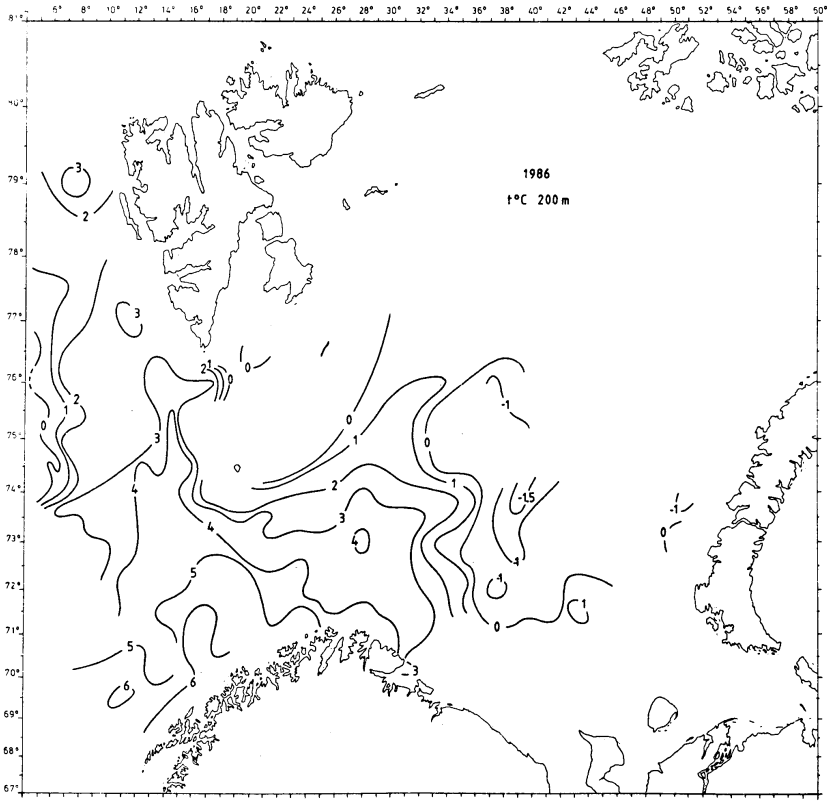

Fig. 5. Isotherms at 200 m

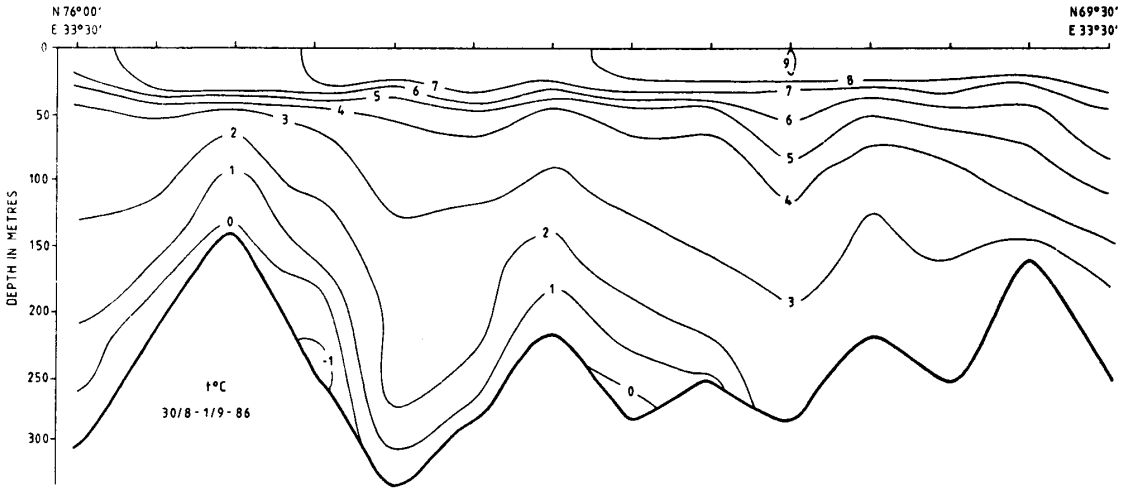

Fig. 6. Temperature section along the Kola meridian

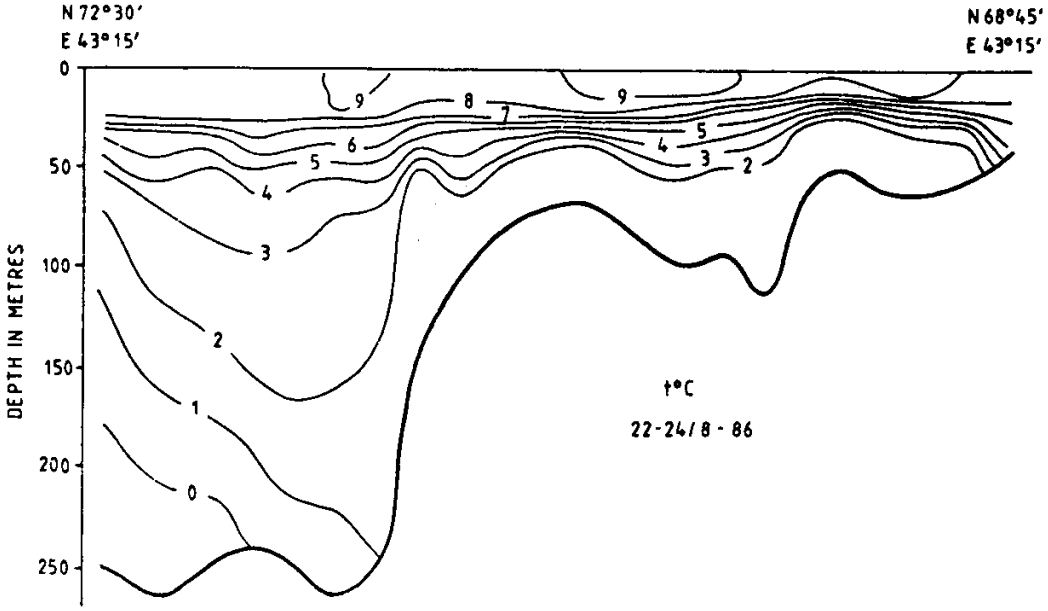

Fig. 7. Temperature section Cape Kanin-North

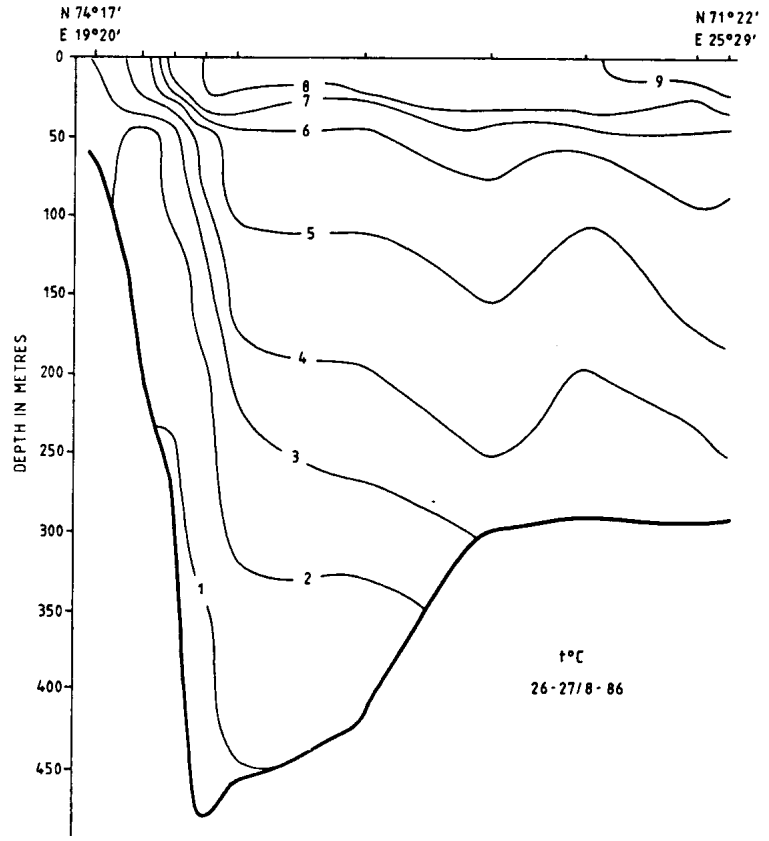

Fig. 8. Temperature section Bear Island-North Cape

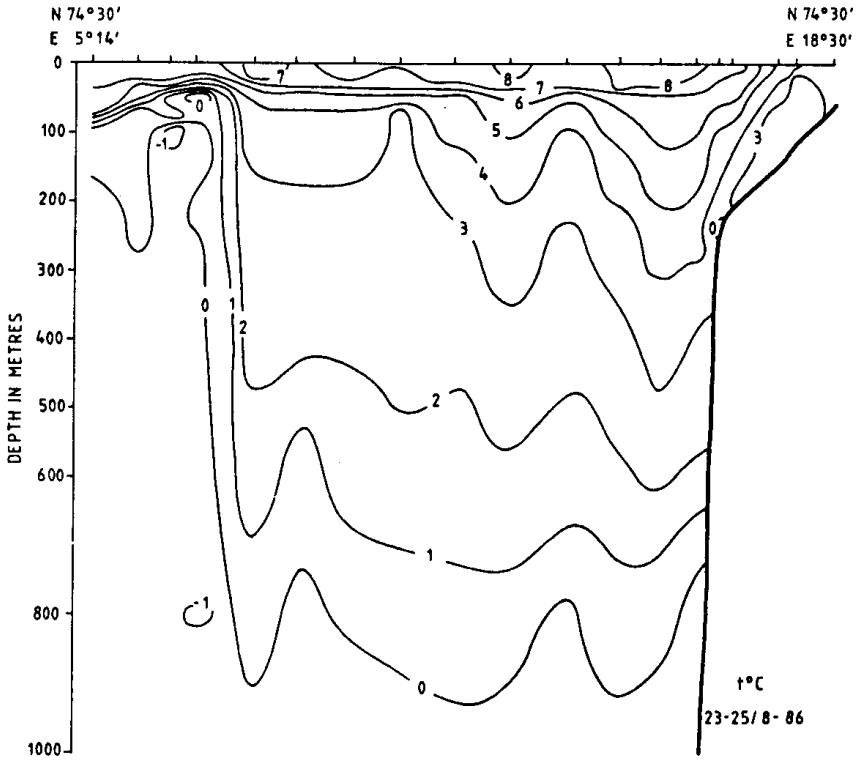

Fig. 9. Temperature section Bear Island-West

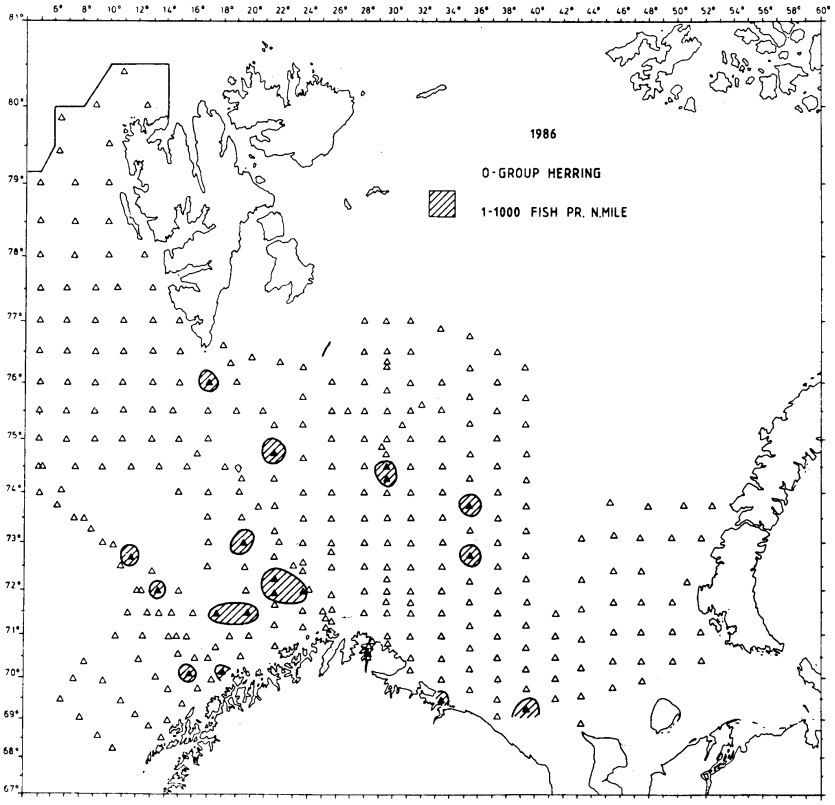

Fig. 10. Distribution of 0-group herring

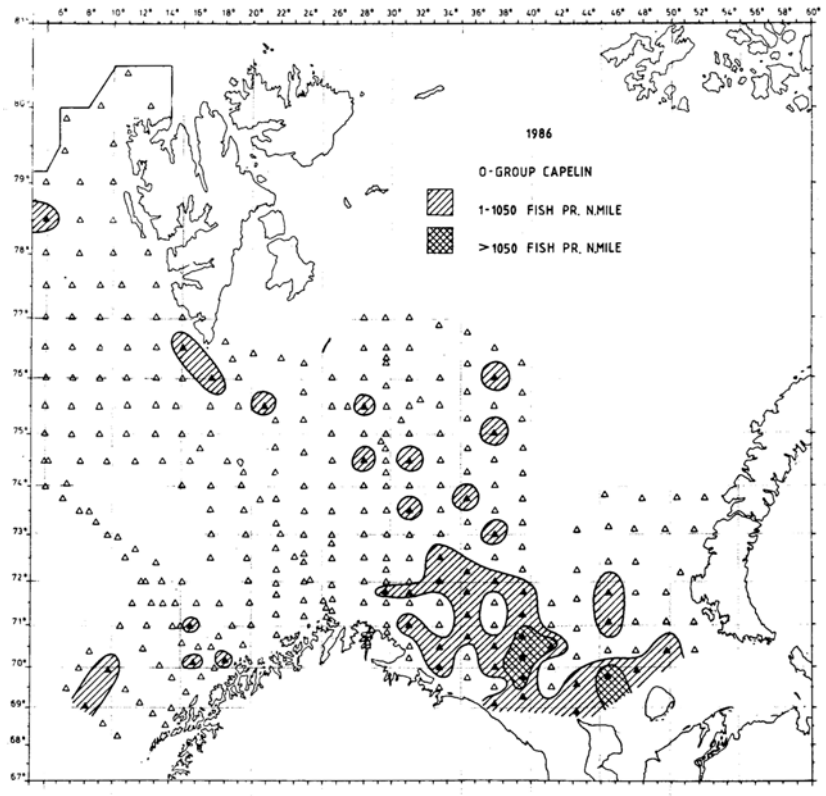

Fig. 11. Distribution of 0-group capelin

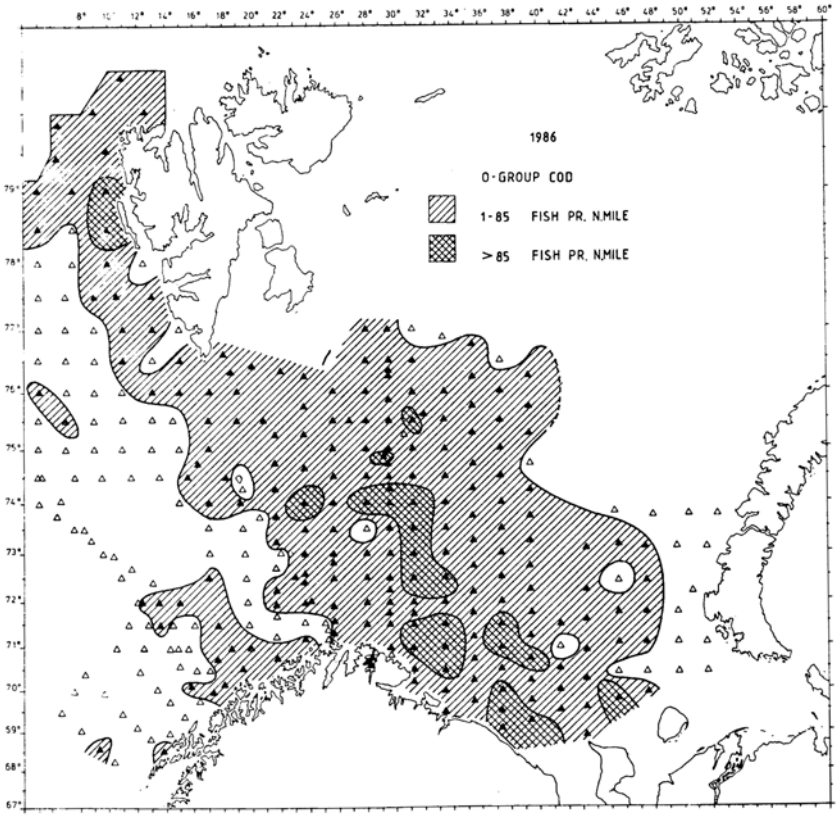

Fig. 12. Distribution of 0-group cod

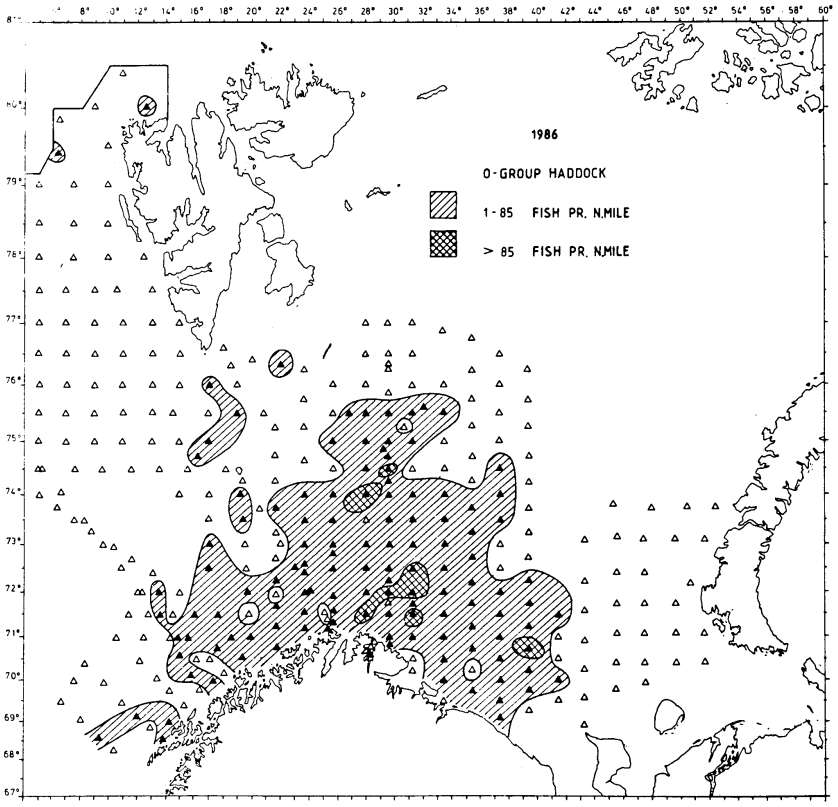

Fig. 13. Distribution of 0-group haddock

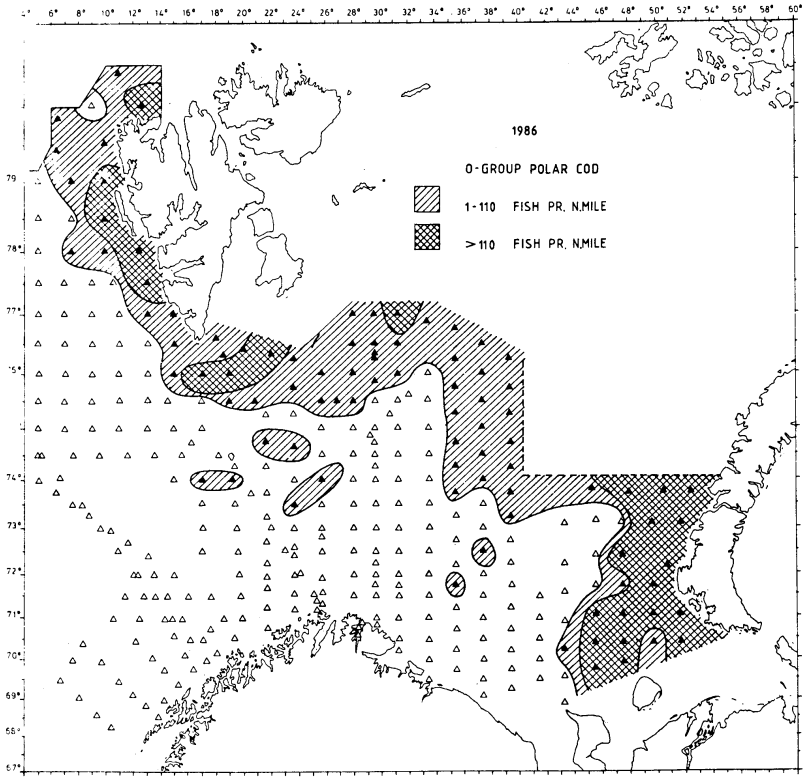

Fig. 14. Distribution of 0-group polar cod

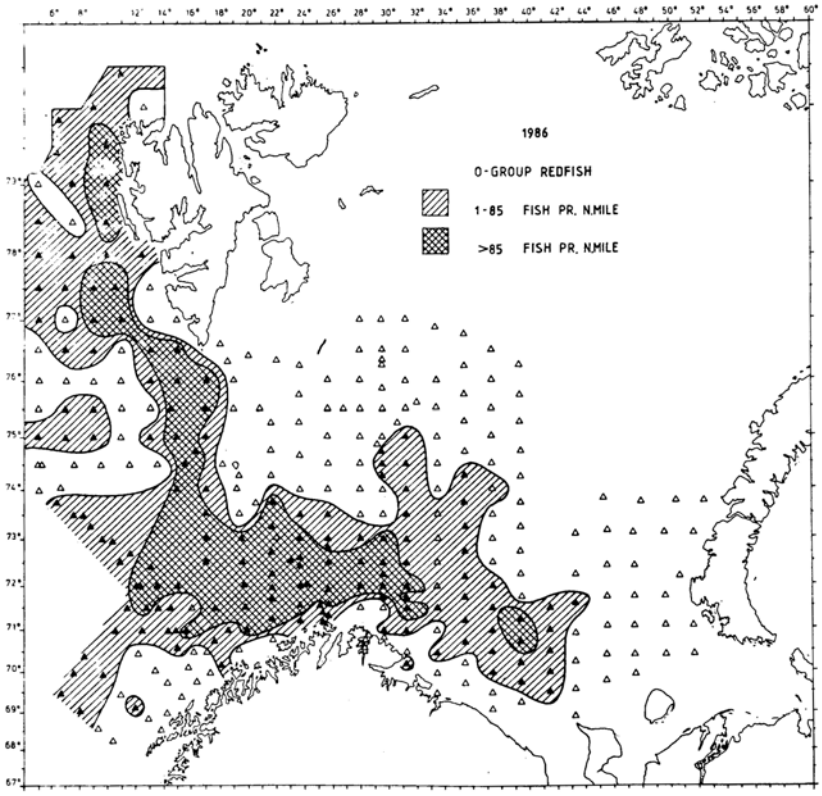

Fig. 15. Distribution of 0-group redfish

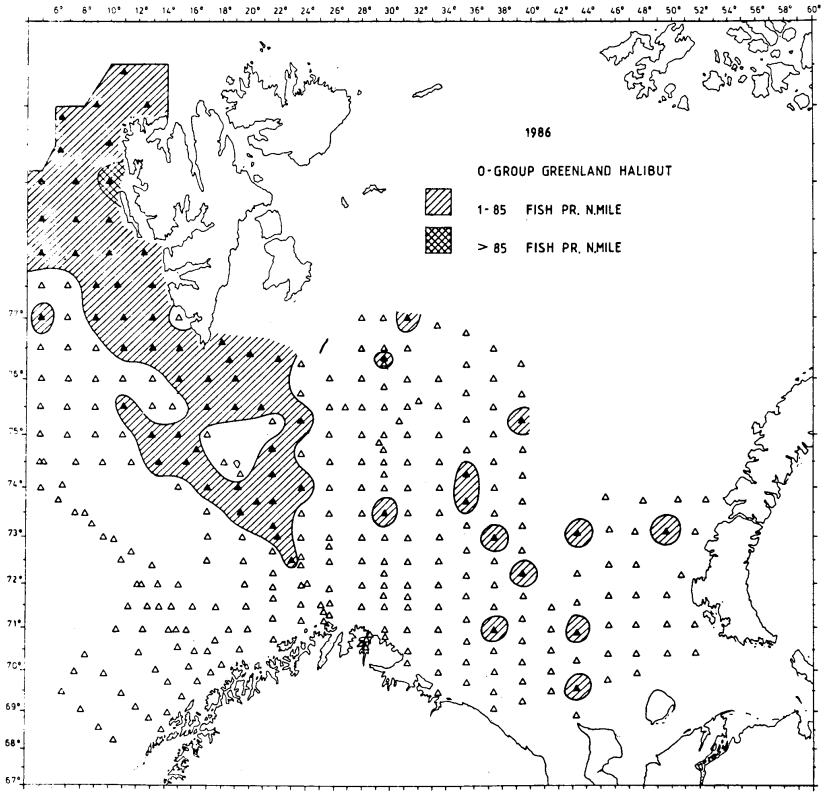

Fig. 16. Distribution of 0-group Greenland halibut

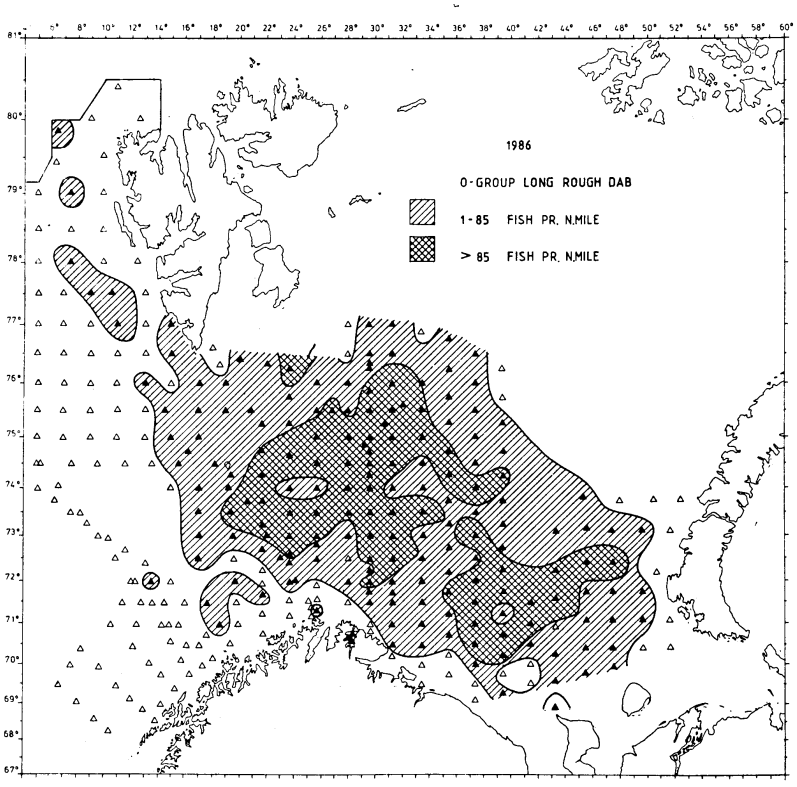

Fig. 17. Distribution of 0-group long rough dab

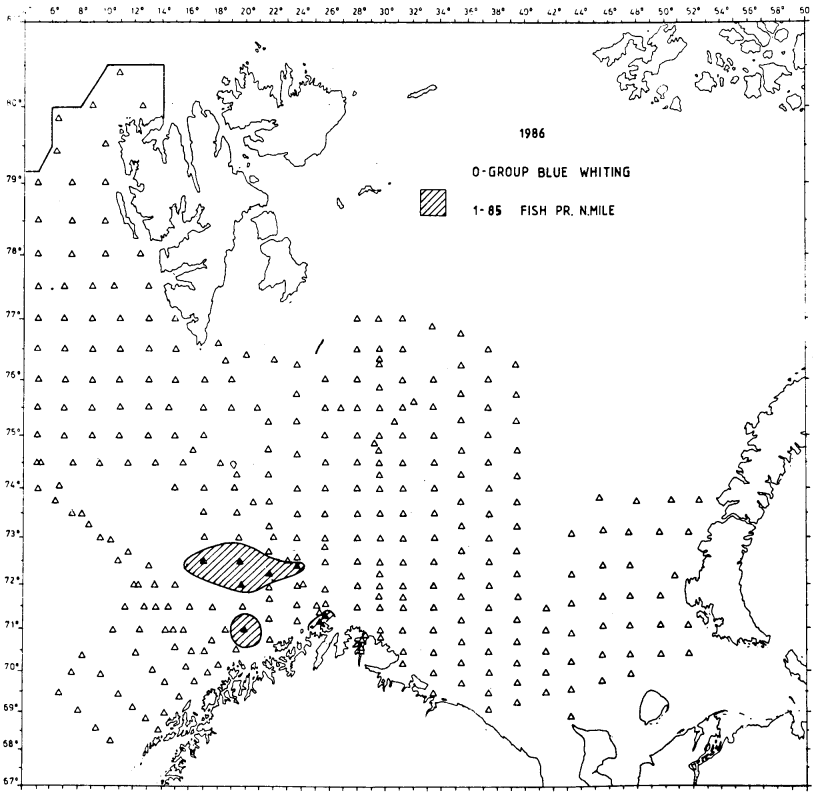

Fig. 18. Distribution of 0-group blue whiting

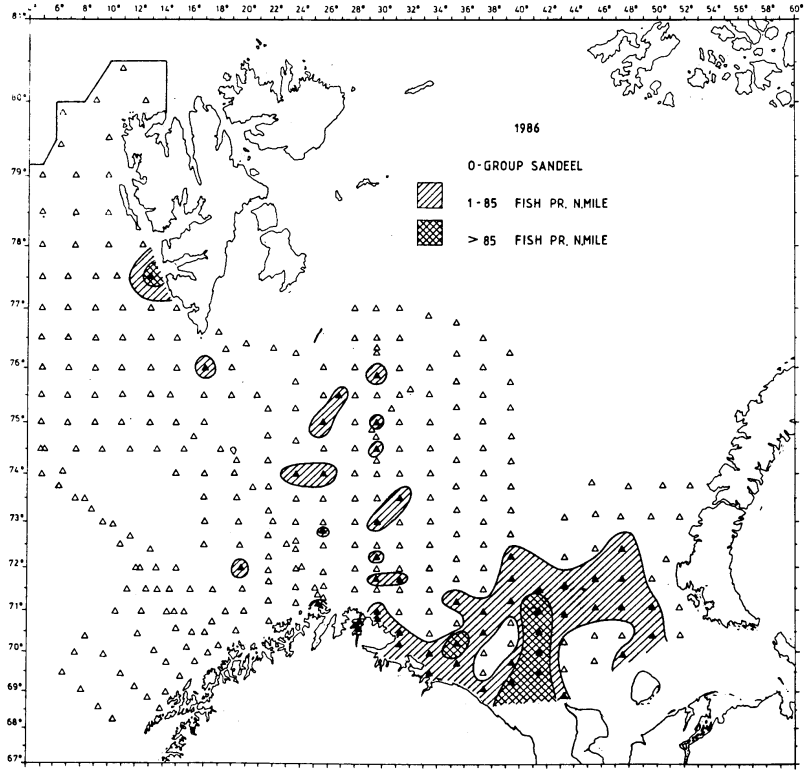

Fig. 19. Distribution of 0-group sandeel

International Council for
the Exploration of the Sea

C.M.1987/G: 38
Demersal Fish Committee
Ref. Pelagic Fish Committee

Preliminary report of the international 0-group fish survey in the Barents Sea and adjacent waters in August-September 1987

The twenty-third annual International 0-group fish survey was made during the period 17 August-3 September 1987 in the Barents Sea and adjacent waters. The following research vessels participated in the survey:

State	Name of vessel	Survey period	Research Institution
Norway	"Eldjarn"	17 August-3 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	17 August-3 September	"
Norway	"Håkon Mosby"	20 August-3 September	"
USSR	"Artemida"	18 August-28 August	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Vilnyus"	20 August-1 September	"

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

Preliminary analyses of the survey data were made 3-4 September in Hammerfest. Observations concerning the geographical distribution of 0-group fish and their abundance are given in this report together 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 mesh midwater trawl. The vessels participated in the survey in 1986 used the type of midwater trawl recommended by the meeting held after the survey in 1980 (Anon. 1983). The trawling procedure was standardized in accordance with recommendation made at the same meeting. At about every 30 nautical miles sailed the trawl was towed in several depths in one haul. The standard procedure consisted of towings of 0.5 nautical miles in each of 3 depths with the headline of the trawl located at 0, 20 and 40 m. An additional tow at 60 m for 0.5 nautical miles was made when 0-group fish layer was recorded deeper than 60 m on the echo-sounder.

Survey tracks and hydrographic stations are given in Fig. 1. Trawl stations with and without catch are given on the distribution charts in Figs. 14 - 21, as filled and open symbols respectively. The density grading is based on catch in number per 1.0 nautical mile trawled.

Hydrography

Hydrographic observations were made along all the survey tracks with 30-40 nautical miles between stations.

Horizontal temperature and salinity distribution are shown for 0, 50, 100 and 200 m depth (Figs. 2-9). Figs. 10-13 shows the temperature and salinity conditions in the Kola, Cape Kanin-Bear Island and Bear Island - West sections. The mean temperature for parts of these sections is given in Table 1.

In 1987 the temperature decreased in all layers of the Barents Sea compared to 1986, most in the surface layer. This is clearly demonstrated with values from the Kola section (Table 1). The temperature decrease is therefore mainly due to less warming of the surface layer from the atmosphere, but the temperature of the inflowing current are also somewhat lower than last year. The most considerable negative anomalies compared to the long-term mean were found in the middle and eastern parts of the sea.

Distribution and abundance of 0-group fish.

Geographical distributions of 0-group fish are shown as shaded areas in Figs. 14-21. Double shading indicates dense concentrations. The criteria for discriminations are the same as used in earlier reports (Anon. 1980). Abundance indices, estimated as the area of distribution with areas of high densities weighted by 10, are given in Table 2. Another set of abundance indices is given for 0-group herring, cod and haddock (Table 3) as described by Randa (1984). These are based on the number caught during a standard trawl haul of one nautical mile. Length frequency distributions of the main species are given in Table 4.

Herring (Fig. 14)

The overall density and the area of distribution of herring is about the same as last year, but far smaller than it has been for the 1983-1985 year-classes. Only a few individuals are caught in the area covered by the five vessels. The estimated logarithmic index for 1987 is zero, indicating a weak year class compared to the strength of the year-classes in the early seventies and early eighties.

Capelin (Fig. 15)

Although the results from the Barents Sea 0-group survey have not given a reliable index of year-class strength of capelin, it is evident that the 1987 year-class is very weak. This year, as last year, the western distribution was to the east of 30° E. No dense concentrations were observed and the density is much lower than it has been for any of the year-classes in the period 1980-1985.

Cod (Fig. 16)

The 0-group cod is this year found further to the west (west of 36° E) and not as far north in the Barents Sea as last year. No dense concentrations are observed and the catch per nautical mile is lower than last year. The indices (Tables 2 and 3) indicate a poor year-class. The logarithmic index indicates the strength to be of the same level as the poor 1980-1981 year-classes, corresponding to about 1/10 of the average strength of the 1983-1986 year-classes, classified as strong ones.

Haddock (Fig. 17)

As last year, haddock is only found in the central and western part of the area. The eastern and northern borders are further to the west and not as far north as observed in 1986. No dense concentrations are observed and the indices (Table 2 and 3) indicate about a poor

year-class, following a series of good year classes in 1982-1986. The logarithmic index indicates that the 1987 year-class is about 1/4 of the 1986 year-class.

Polar cod (Fig. 18)

Last year, polar cod was found as a continuous distribution from the east to the west in the northern part of the survey area. Even that year the total area of distribution was not covered. However, this year, the polar cod is found in two separate components, a western and an eastern. Dense concentrations is only found in the eastern area, and the abundance index for the 1987 year-class in this component is close to 2/5 of those for the 1985-1986 year-classes, which were indicated to be strong ones in the survey area. In the area to the west of 25° E, the density is estimated to be about 1/7 of the 1986 year-class.

Redfish (Fig. 19)

The distribution of redfish resembles that of last year, although the eastern border is further to the west in 1987. The highest abundance is found in the western part of the central survey area. The index (Table 2) is high, although the index is somewhat less than for the previous year classes. The 1987 year-class is indicated to be rich.

Greenland halibut (Fig. 20)

The distribution is similar to the distribution observed in 1986. The abundance index (Table 2) is at the same level as observed for the 1984-1986 year-classes, indicating a good year-class.

Long rough dab (Fig. 21)

Long rough dab is widely distributed as last year, although the eastern boarder is somewhat further to the west. Some dense concentrations are found in the central part of the survey area. The abundance index (Table 2) is about 1/4 of the 1986 year-class, indicating an average year-class.

Blue whiting

No 0-group blue whiting is found this year.

Sandeel

Few catches of 0-group sandeel is recorded in the southeastern part of the survey area. No high concentrations are observed and no abundance index is calculated.

Squid

Squid is widely distributed in the western part of the survey area, and few is caught east of 25° E. In 1987, the abundance of squid is at a much higher level than observed in previous years.

References

Anon. 1980. Preliminary report of the International 0-group fish survey in the Barents Sea and adjacent waters in August/September 1978. Annls Biol., Copenh., 35: 273-280.

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Randa, K. 1984. Abundance and distribution of 0-group Arcto-Norwegian cod and haddock 1965-1982. Proceedings of the Soviet-Norwegian symposium on Reproduction and recruitment of Arctic cod. Leningrad 26-30 Sept. 1983: 192-212.

Toresen, R. 1985. Recruitment/indices of Norwegian spring-spawning herring for the period 1965-1984 based on the international 0-group fish surveys. Coun. Meet. int. Coun. Explor. Sea, 1985 (H: 54): 1-9 [Mimeo.]

Table 1. Mean water temperature during the International 0-group fish survey in the Barents Sea and adjacent waters in late August - early September 1987.

2-4 - Murmansk Current: Kola section (70°30' N-72°30' N)
5 - Cape Kanin section (68°45' N-70°05' N)
6 - Cape Kanin section (71°00' N-72°00' N)
7 - North Cape Current: North Cape-Bear Island section (71°33' N; 25°02' E-73°35' N; 20°46' E)
8 - West Spitsbergen Current: Bear Island - West section (06°34' E-15°55' E)

Layer/Year	0-50 m	50-200 m	0-200 m	0-bottom	0-bottom	0-200 m	0-200 m
1	2	3	4	5	6	7	8
1965	6.7	3.8	4.6	4.8	4.2	5.1	-
1966	6.7	2.6	3.6	2.0	2.5	5.5	3.3
1967	7.5	4.0	4.9	6.1	3.6	5.6	4.2
1968	6.4	3.7	4.4	4.7	3.1	5.4	3.6
1969	6.9	3.1	4.0	2.6	2.3	6.0	4.2
1970	7.8	3.6	4.7	4.0	3.3	6.1	-
1971	7.1	3.2	4.2	4.0	3.2	5.7	4.2
1972	8.7	4.0	5.2	5.1	4.1	6.3	3.9
1973	7.7	4.5	5.5	5.7	4.5	5.9	5.0
1974	8.1	3.9	4.9	4.6	-	6.1	4.6
1975	7.0	4.6	5.2	5.6	4.3	5.7	4.9
1976	8.1	4.0	5.0	4.9	4.6	5.7	5.0
1977	6.9	3.4	4.3	4.1	3.3	4.8	4.0
1978	6.6	2.5	3.6	2.4	1.7	5.0	4.1
1979	6.5	2.9	3.8	2.0	1.8	5.3	4.4
1980	7.4	3.5	4.5	3.3	3.0	5.7	4.9
1981	6.6	2.7	3.7	2.7	2.5	5.3	4.4
1982	7.1	4.0	4.8	4.5	2.8	5.8	4.9
1983	8.1	4.8	5.6	5.1	4.2	6.3	5.1
1984	7.7	4.1	5.0	5.4	4.1	5.9	5.0
1985	6.6	3.5	4.3	3.3	3.2	5.2	4.6
1986	7.5	3.4	4.4	3.9	3.2	5.8	4.4
1987	6.2	3.3	3.9	2.6	2.5	5.2	3.9
Average 1965-1987	7.2	3.6	4.5	4.1	3.3	5.6	4.4

Table 2. Abundance indices

Species Year	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	1	12
1971	157	73		181		172	1	81
1972	140	46		140		177	8	65
1973	684	54		(26)		385	3	67
1974	51	147		227		468	13	83
1975	343	170		75		315	21	113
1976	43	112		131		447	16	96
1977	173	116	157		70	472	9	72
1978	106	61	107		144	460	35	76
1979	94	69	23		302	980	23	69
1980	49	54	79		247	651	12	108
1981	65	30	149		73	861	38	95
1982	114	90	14		50	694	17	150
1983	386	184	48		39	851	16	80
1984	486486	255	115		16	732	40	70
1985	742	156	60		334	795	36	86
1986	434	160	111		366	702	55	755
1987	102	72	17		153	631	41	174

Table 3. Estimated indices with 90 % confidence limits of year class abundance for 0-group herring, cod and haddock in the total area

Year-class	Herring [1)]			Cod			Haddock		
	Logarithmic index	Confidence limits		Logarithmic index	Confidence limits		Logarithmic index	Confidence limits	
1965				+				0.01	
1966	0.14	0.04	0.31	0.02	0.01	0.04	0.01	0.00	0.03
1967	0.00	-	-	0.04	0.02	0.08	0.08	0.03	0.13
1968	0.00	-	-	0.02	0.01	0.04	0.00	0.00	0.02
1969	0.01	0.00	0.04	0.25	0.17	0.34	0.29	0.20	0.41
1970	0.00	-	-	2.51	2.02	3.05	0.64	0.42	0.91
1971	0.00	-	-	0.77	0.57	1.01	0.26	0.18	0.36
1972	0.00	-	-	0.52	0.35	0.72	0.16	0.09	0.27
1973	0.05	0.03	0.08	1.48	1.18	1.82	0.26	0.15	0.40
1974	0.01	0.01	0.01	0.29	0.18	0.42	0.51	0.39	0.68
1975	0.00	-	-	0.90	0.66	1.17	0.60	0.40	0.85
1976	0.00	-	-	0.13	0.06	0.22	0.38	0.24	0.51
1977	0.01	0.00	0.03	0.49	0.36	0.65	0.33	0.21	0.48
1978	0.02	0.01	0.05	0.22	0.14	0.32	0.12	0.07	0.19
1979	0.09	0.01	0.20	0.40	0.25	0.59	0.20	0.12	0.28
1980	-	-	-	0.13	0.08	0.18	0.15	0.10	0.20
1981	0.00	-	-	0.10	0.06	0.18	0.03	0.00	0.05
1982	0.00	-	-	0.59	0.43	0.77	0.38	0.30	0.52
1983	1.77	1.29	2.33	1.69	1.34	2.08	0.62	0.48	0.77
1984	0.34	0.20	0.52	1.55	1.18	1.98	0.78	0.60	0.99
1985	0.23	0.18	0.28	2.46	2.22	2.71	0.27	0.23	0.31
1986	0.00	-	-	1.37	1.06	1.70	0.39	0.28	0.52
1987	0.00	0.00	0.03	0.17	0.01	0.40	0.10	0.00	0.25

[1)] Assessments for 1965-1984 made by Toresen (1985).

Table 4. Length distribution of 0-group fish in percent

Length (mm)	Herring	Capelin	Cod	Haddock	Polar cod		Redfish	Greenland halibut	L.R.D.	Sandeel
					East	West				
10-14							2.2			
15-19		+					9.3			
20-24		0.7				3.5	17.2		1.3	
25-29		11.2	0.1	0.1	0.6	9.2	18.7		11.0	
30-34		11.6	1.0	1.7	16.5	30.6	27.0	0.4	32.5	
35-39	9.1	19.8	1.6	3.3	37.5	29.6	16.0	0.9	35.0	
40-44	36.4	9.0	10.1	7.7	31.1	21.6	8.1	3.1	17.5	0.1
45-49	27.3	10.0	15.3	11.6	10.9	5.1	1.4	4.4	2.7	5.0
50-54	18.2	9.2	19.2	10.3	3.5	0.2	0.1	11.0	+	12.5
55-59	9.1	9.1	21.1	13.6			+	14.5		52.0
60-64		8.1	20.2	16.6				25.6		22.4
65-69		6.4	8.6	8.4				15.4	+	2.9
70-74		3.5	2.0	6.5		0.2		16.3		0.2
75-79		1.2	0.8	2.2				7.9		2.9
80-84		0.1		0.9				0.4		1.6
85-89				1.8						0.3
90-94				0.7						
95-99				0.6						
100-104				0.6						
105-109				0.3						
110-114				0.1						
115-119										
120-124										
125-129										
130-134										
135-139										
140-144										
Total numbers	11	4164	891	775	22558	487	118761	227	4784	858
Mean length, mm	46.6	46.1	55.2	58.5	39.8	36.2	29.9	62.7	35.7	58.9

+) Less than 0.1

Appendix

Survey period	Research vessel	Research Institute	Participants
18 August-28 August	"Artemida"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk	A.S. Galkin, S.D. Melnikov, V.I. Shapovalo, Yu.A. Perepechaev, A.G. Korneev, V.A. Tararoshchenko, V.V. Kryukov, V.I. Zubov, M.D. Kleopin, S.V. Lisovets, I.S. Shafran, V.M. Ulanov.
20 August-1 September	"Vilnyus"	"	S.A. Baranov, I.V. Borkin, V.V. llyin, V.M. Kapralov, O.P. Garbut, A.E. StepurinK.A. Trostin, Yu.E. Zhak.
17 August-3 September	"G.O. Sars"	Institute of MarineResearch, Bergen	A. Hylen, K.H. Hansen, A. Raknes, A.M. Skorpen, I.M. Beck, Ø. Tangen, R. Johannessen.
20 August-3 September	"Håkon Mosby"	"	K. Sunnanå, H. Senneset, V. AnthonypillaiE. Skoglund, I. Hoff.
17 August-3 September	"Eldjarn"	"	O. Nakken, A. Romslo, T. Mørk, T.I. Hallar, J.H. Nilsen, K. Hansen.

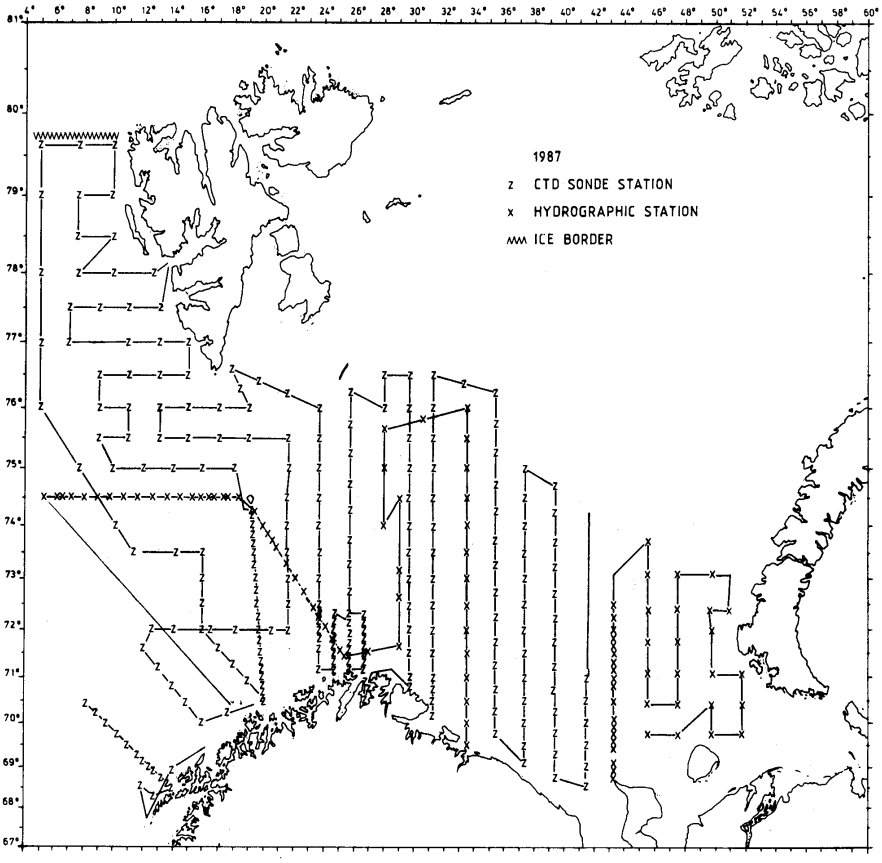

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

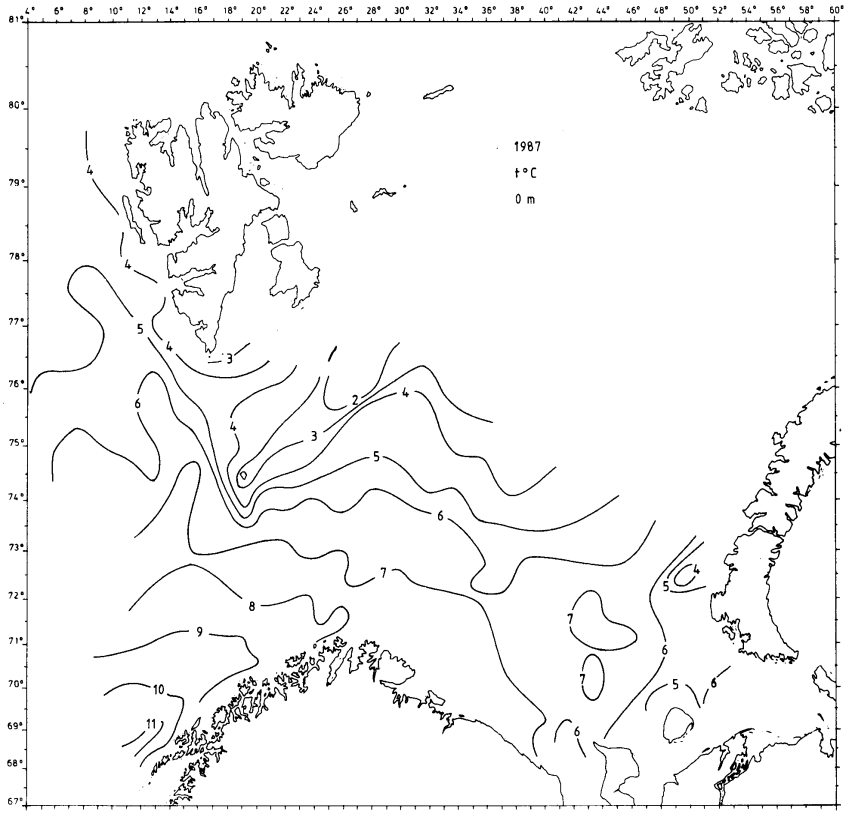

Fig. 2. Isotherms at 0 m

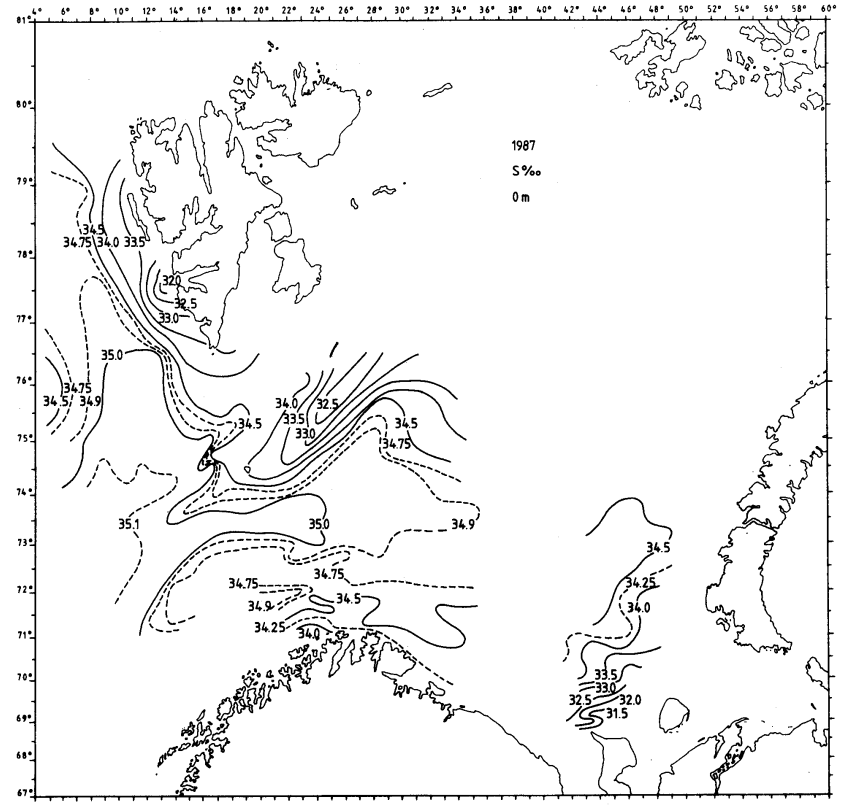

Fig. 3. Isohalines at 0 m

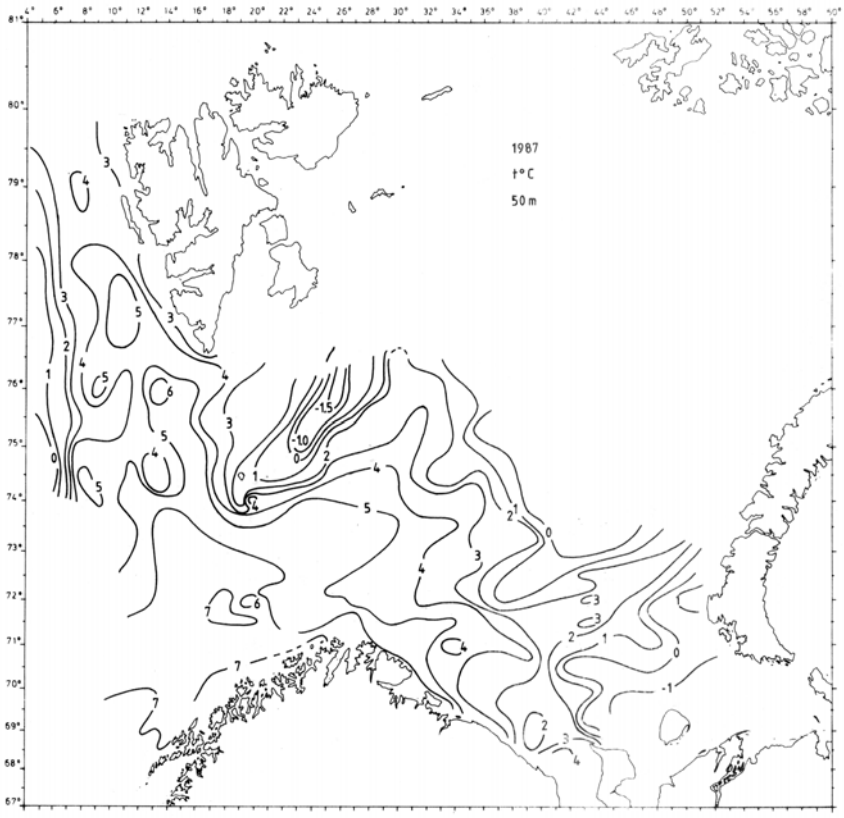

Fig. 4. Isotherms at 50 m

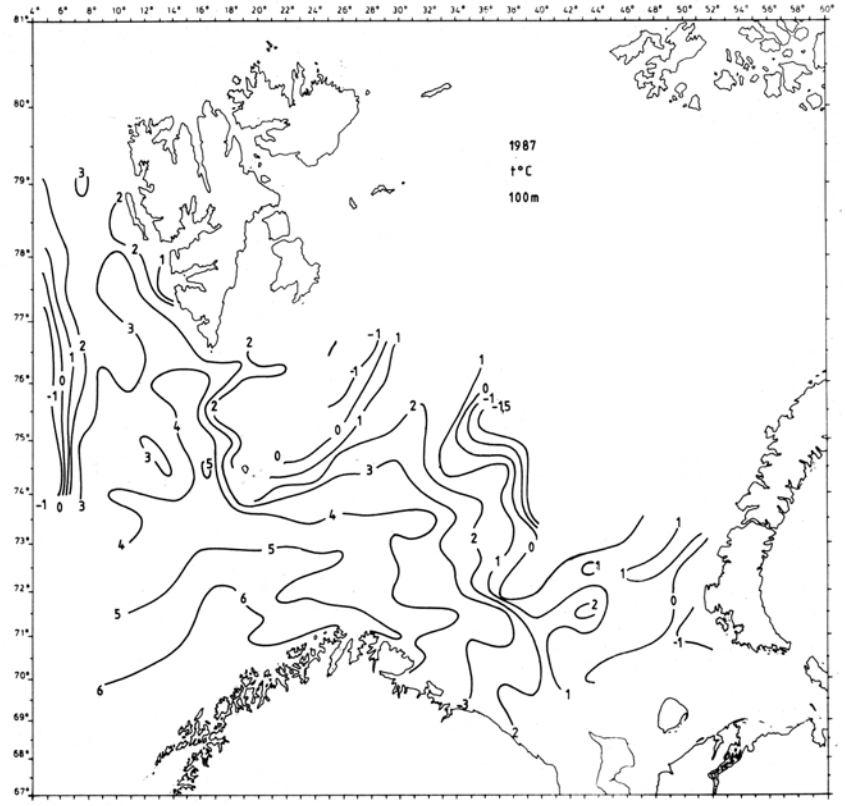

Fig. 5. Isohalines at 50 m

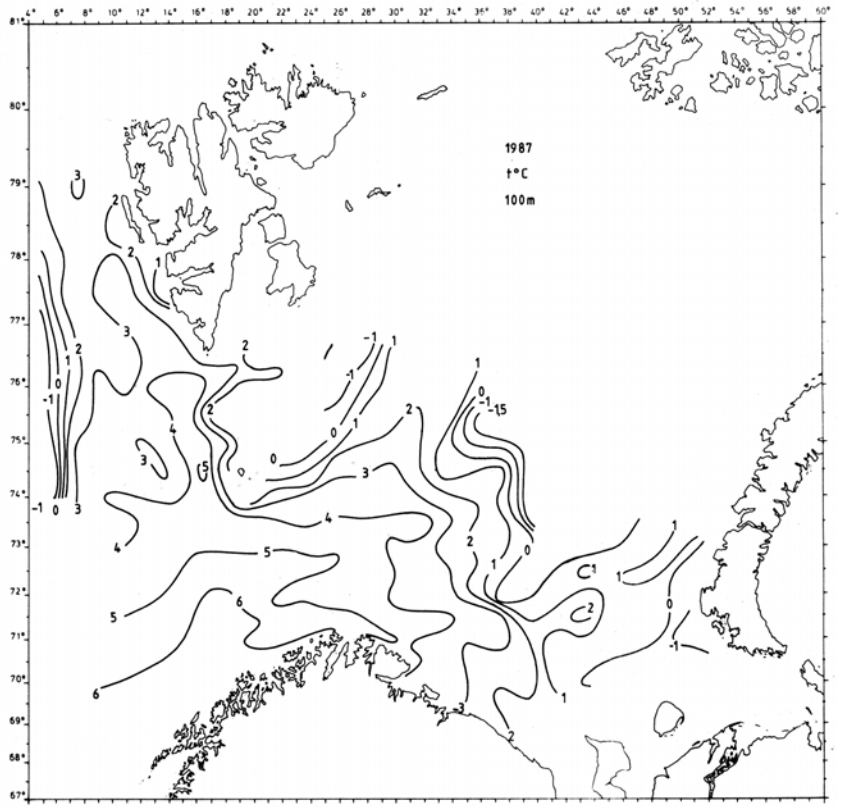

Fig. 6. Isotherms at 100 m

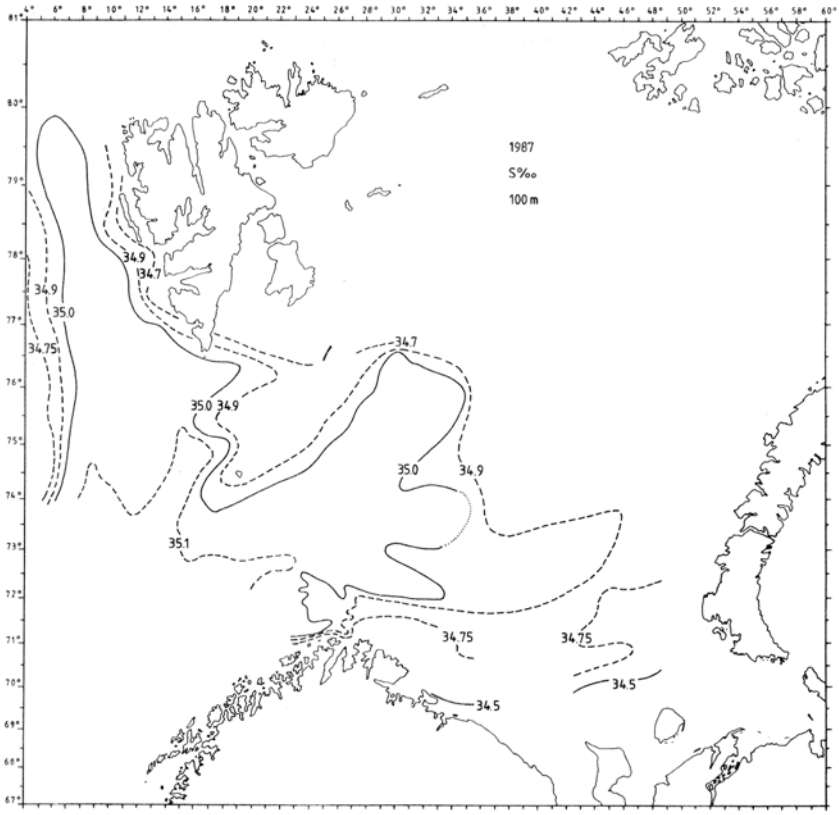

Fig. 7. Isohalines at 100 m

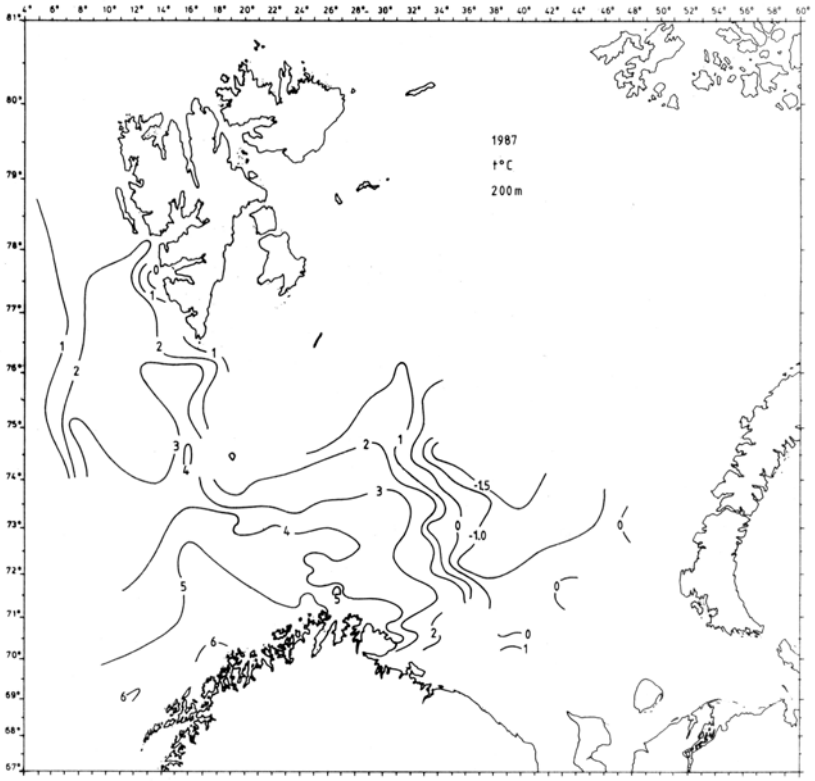

Fig. 8. Isotherms at 200 m

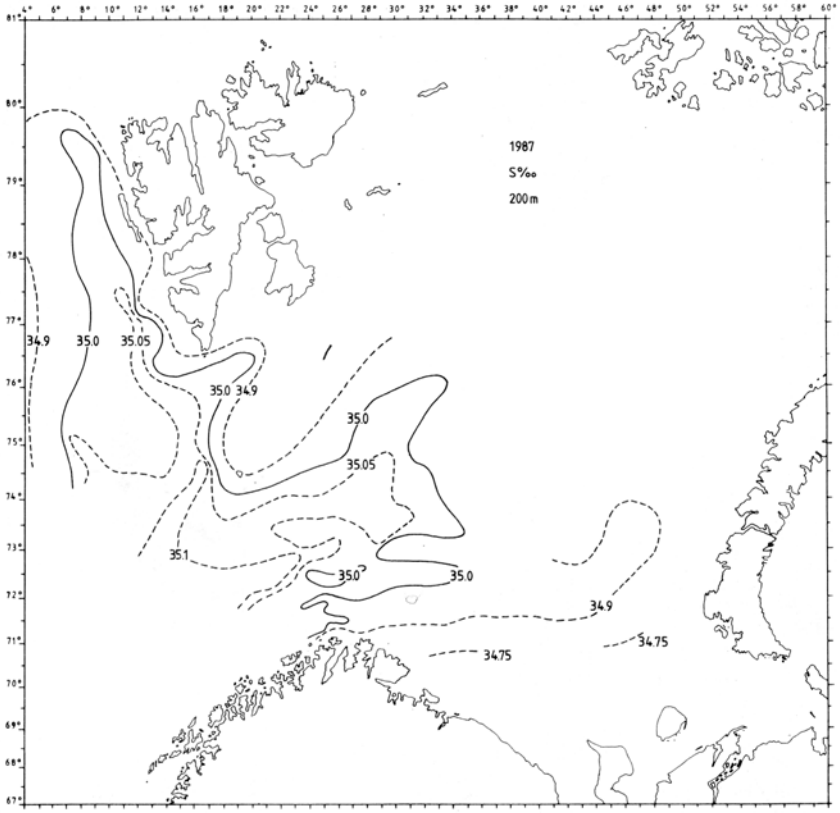

Fig. 9. Isohalines at 200 m

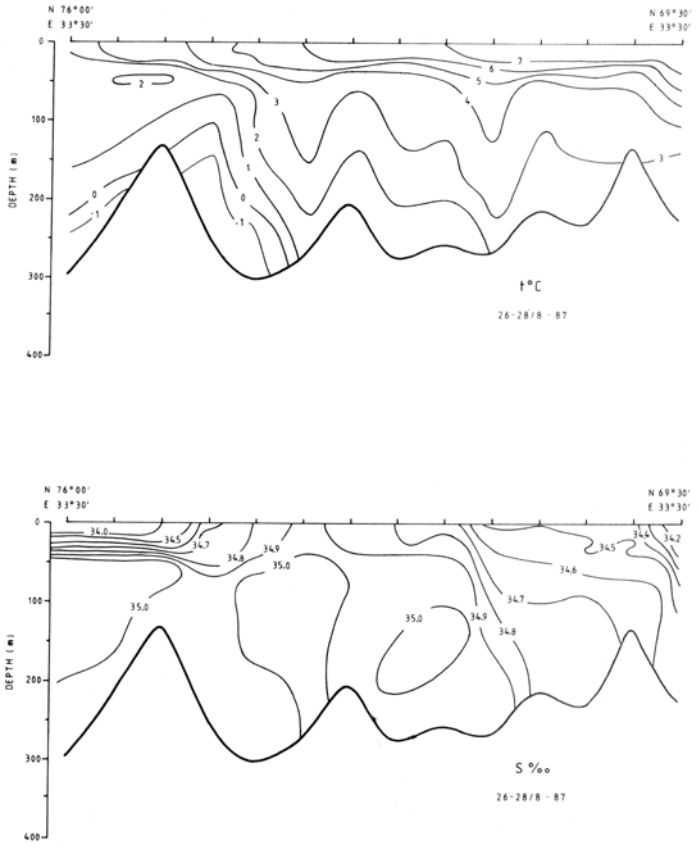

Fig. 10. Hydrographic section along the Kola meridian. Temperature and salinity

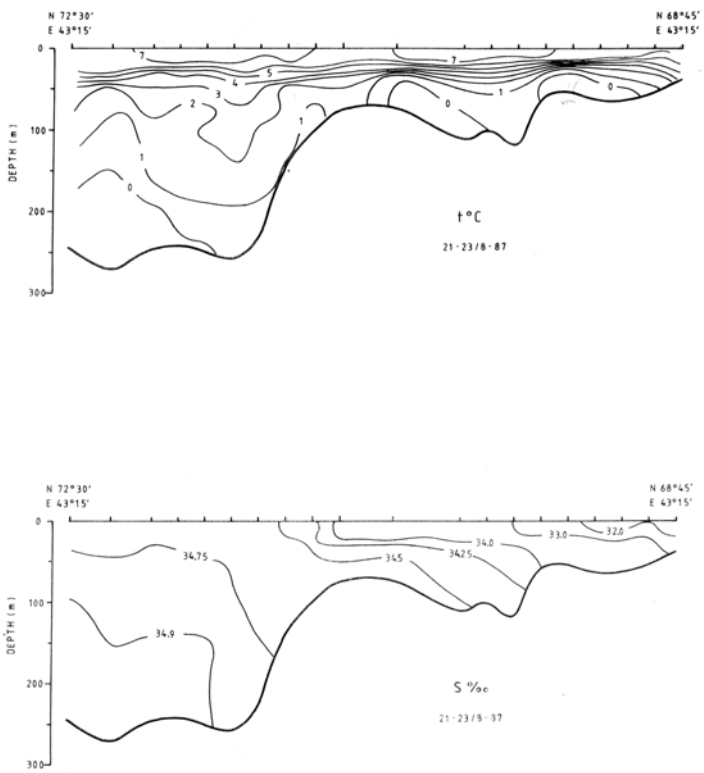

Fig. 11. Hydrographic section Cape Kanin-North. Temperature and salinity

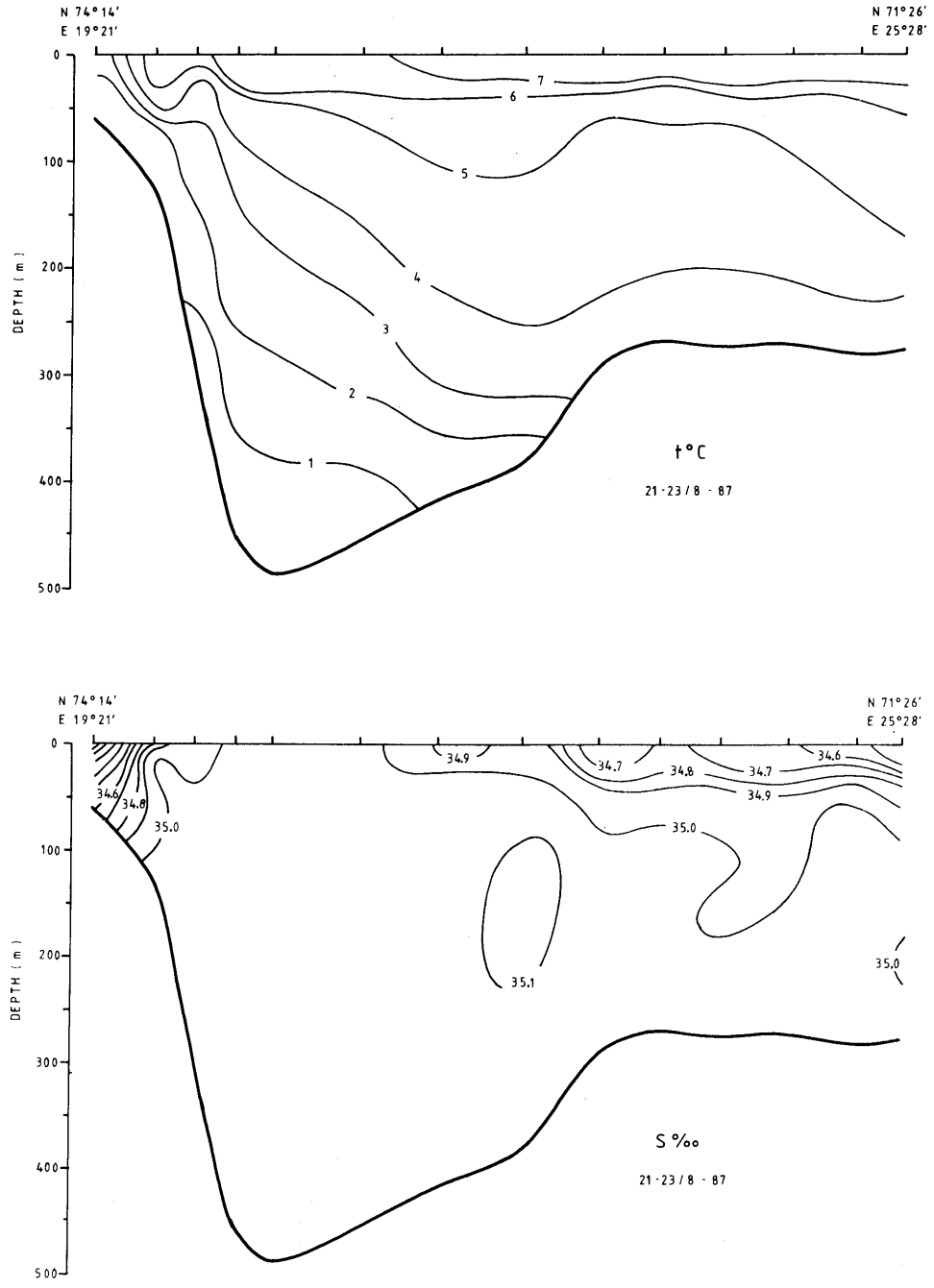

Fig. 12. Hydrographic section Bear Island-North Cape. Temperature and salinity

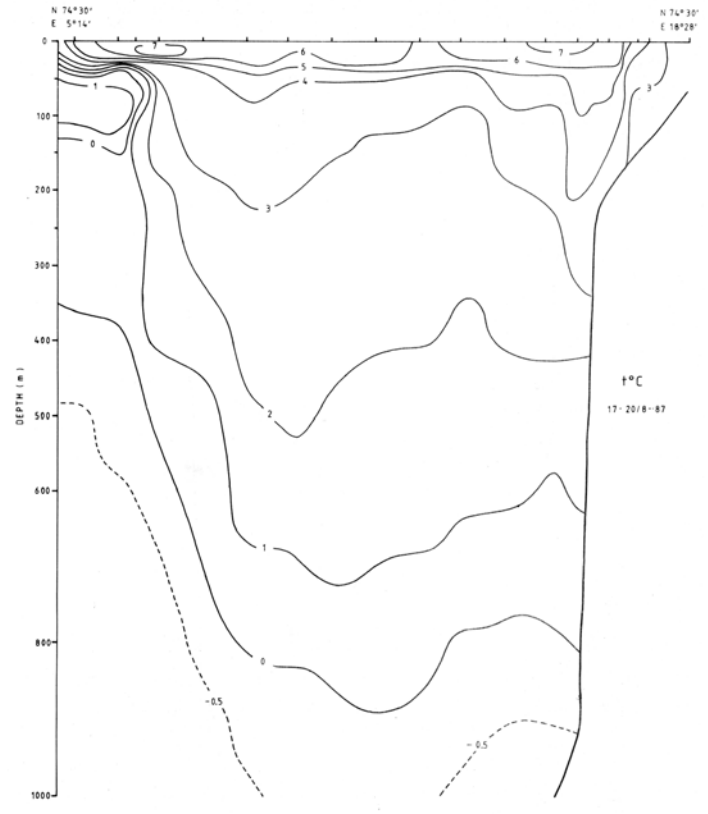

Fig. 13 a. Hydrographic section Bear Island-West. Temperature

Fig. 13 b. Hydrographic section Bear Island-West. Salinity

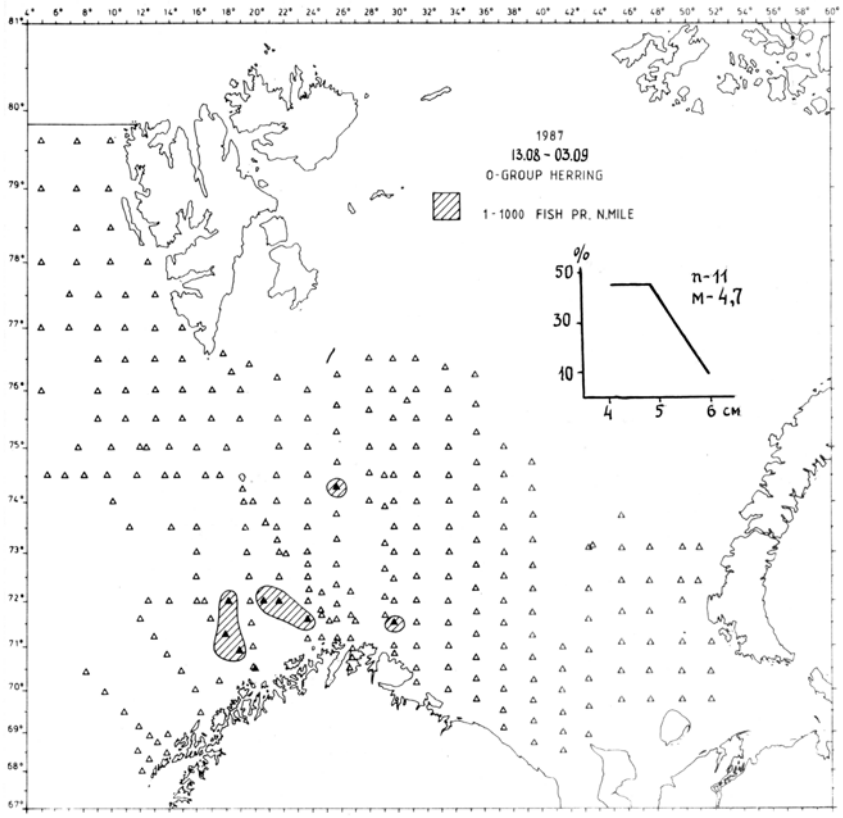

Fig. 14. Distribution of 0-group herring

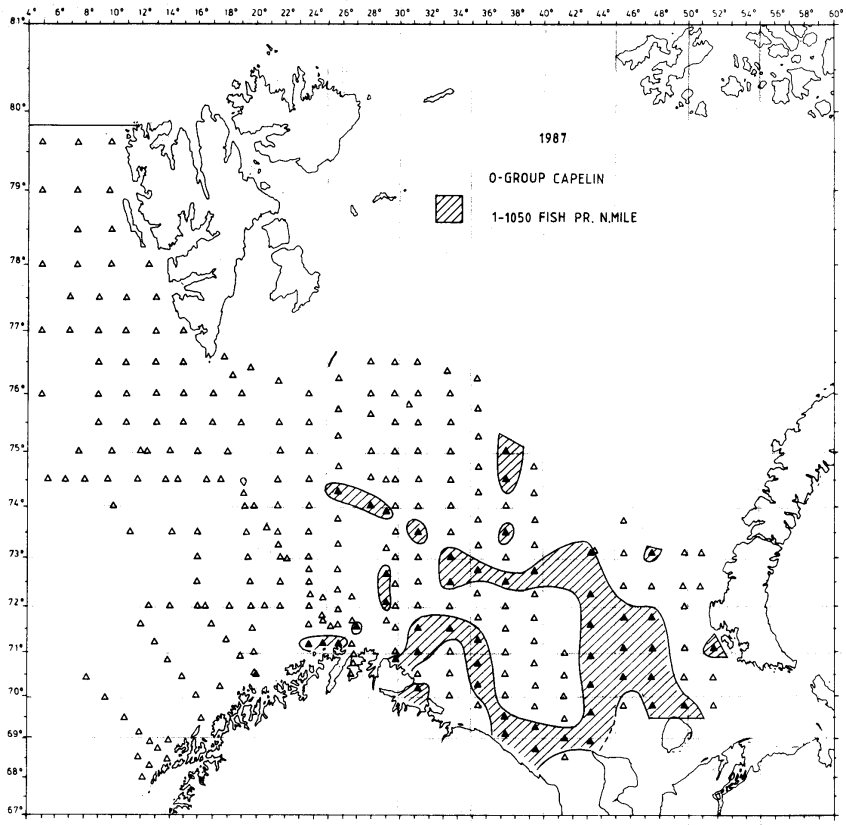

Fig. 15. Distribution of 0-group capelin

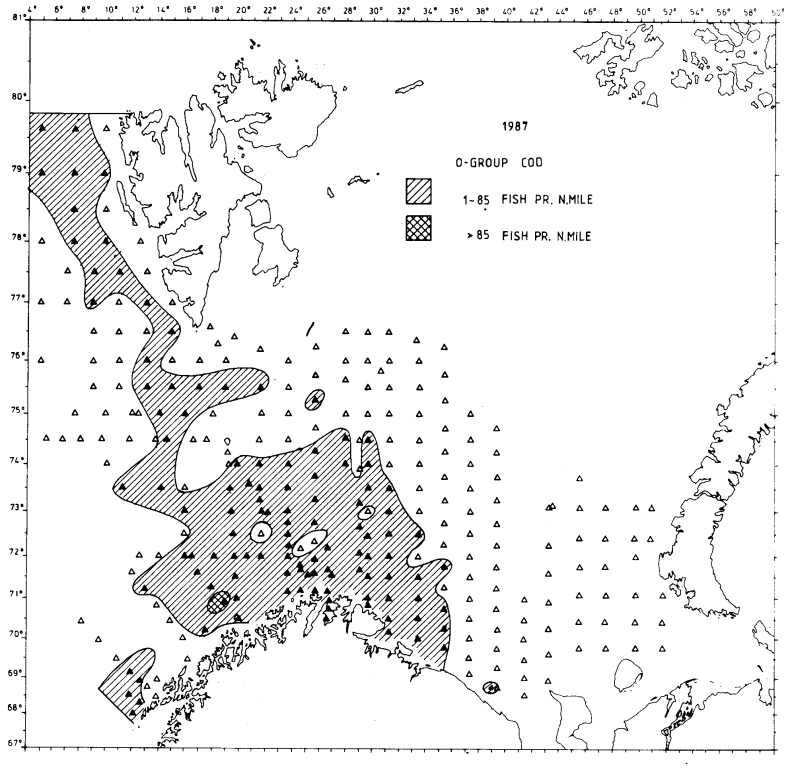

Fig. 16. Distribution of 0-group cod

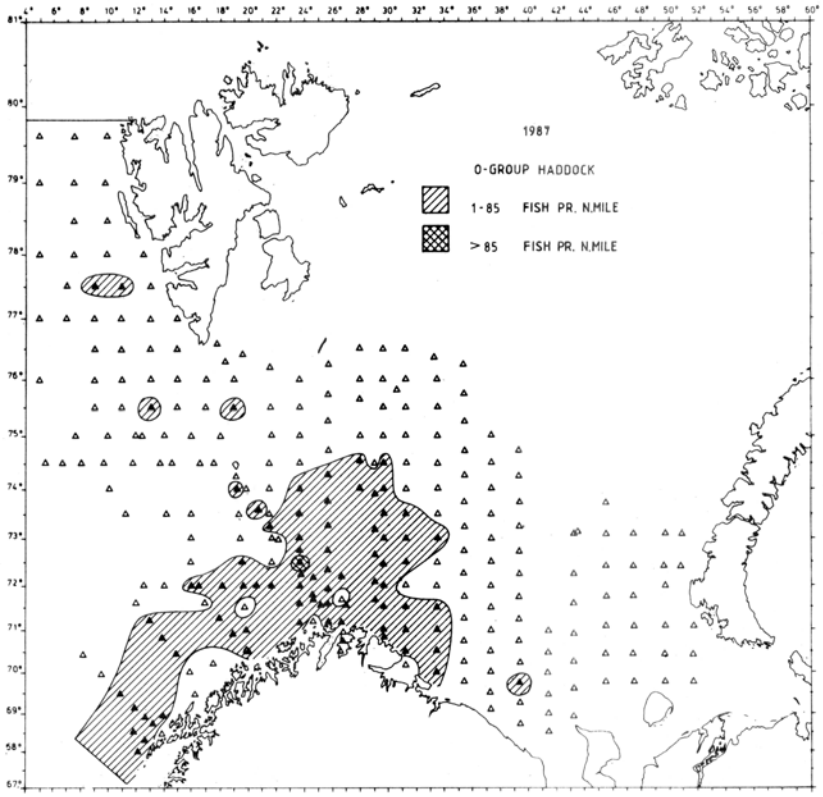

Fig. 17. Distribution of 0-group haddock

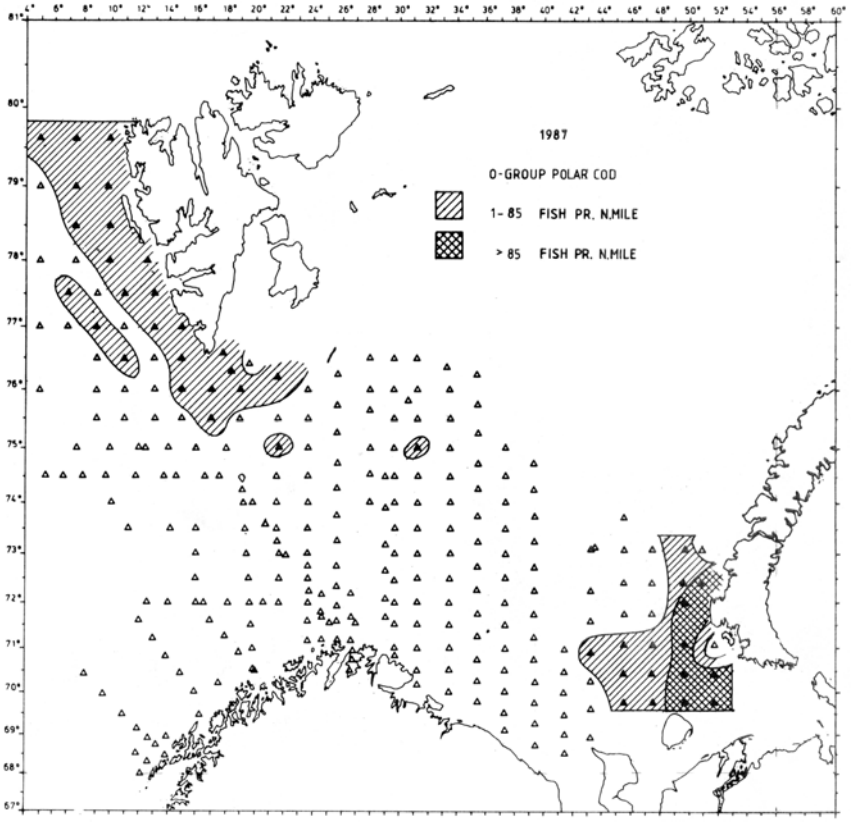

Fig. 18. Distribution of 0-group polar cod

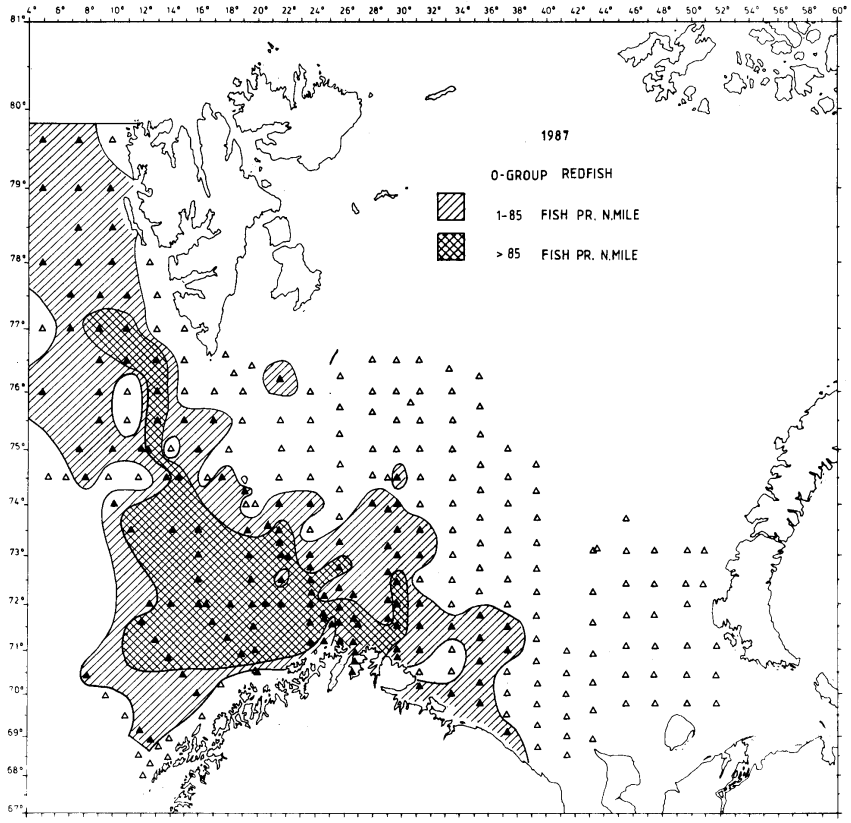

Fig. 19. Distribution of 0-group redfish

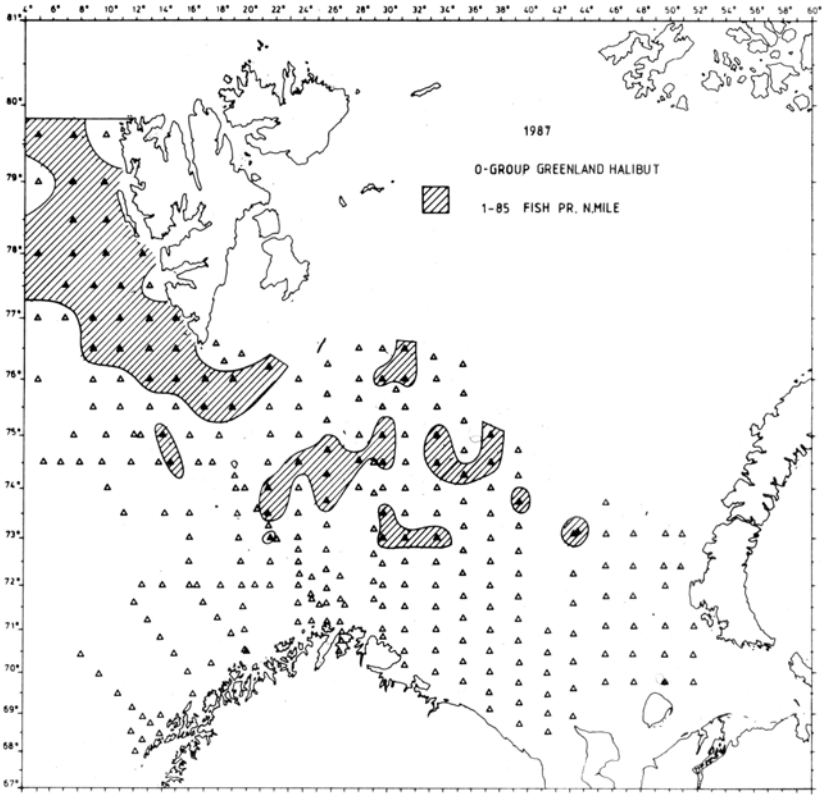

Fig. 20. Distribution of 0-group Greenland halibut

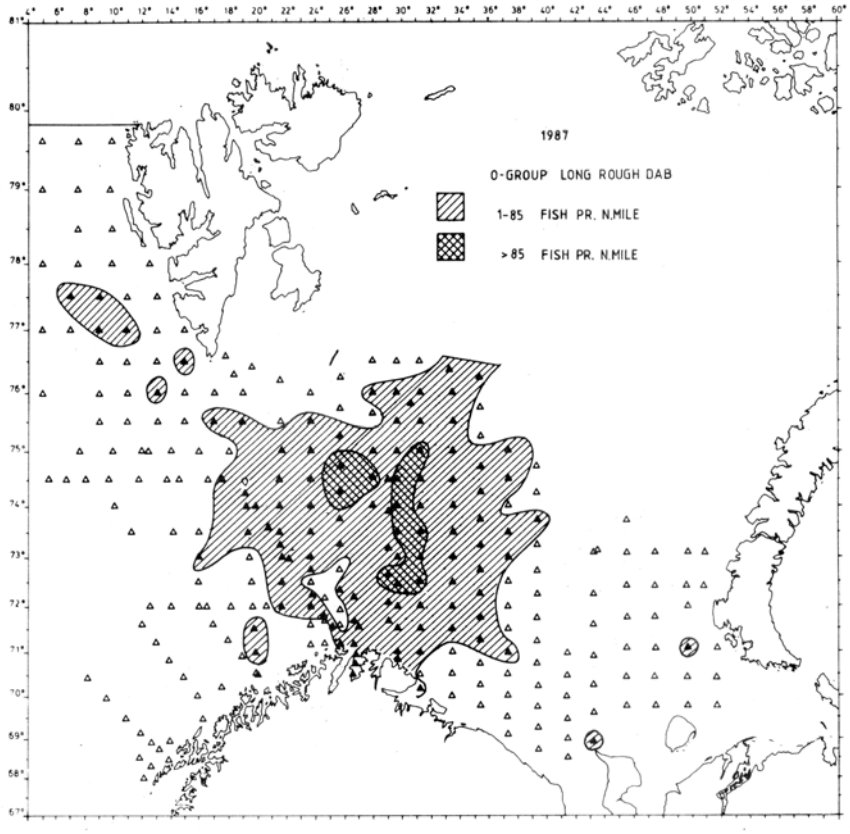

Fig. 21. Distribution of 0-group long rough dab