International Council for
the Exploration of the Sea

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Preliminary report of the international 0-group fish survey in the Barents Sea and adjacent waters in August-September 1988

The twenty-fourth annual International 0-group fish survey was made during the period 20 August-7 September 1988 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"	22 August-6 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	22 August-7 September	"
Norway	"Håkon Mosby"	20 August-3 September	"
USSR	"Artemida"	21 August-2 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Professor Marty"	26 August-4 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 7-8 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 hydrographical conditions in the area.

Material and methods

The geographical distribution of 0-group fish was estimated by fishing with a small mesh midwater trawl. The vessels participated in the survey in 1988 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 30-40 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 hydrographical stations are given in Fig. 1. Trawl stations with and without catch are given on the distribution charts in Figs. 14-26, 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 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 show the temperature and salinity conditions in the Kola, Cape Kanin, Bear Island - North Cape and Bear Island - West sections. The mean temperature for parts of these sections are listed in Table 1.

Due to favorable weather and increased advection into the Barents Sea, the total heat content compared to 1987 has increased and all temperatures are close to 1965-1988 norms (Table 1). The increased advection, especially of less saline water associated with the Norwegian Coastal Current, has led to a distinct decrease in salinity mainly of the upper 0-50 (100) meters. The horizontal temperature distribution at 50 m (Fig. 3) indicates a strong outflow around Bear Island.

Distribution and abundance of 0-group fish and Gonatus fabricii

Geographical distributions of 0-group fish are shown as shaded areas in Figs. 14-25, and of Gonatus fabricii in Fig. 26. 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 estimated logarithmic index for herring in 1988 is 0.30. This is about the 1984-level, far below the 1983 year-class strength. The area of distribution is different from the years 1983 and 1984 in that the 0-group herring in 1988 also were distributed outside Spitsbergen. 0-group herring in the fjords will in addition contribute to the total index.

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 1988 year-class is stronger than last year. A couple of dense concentrations were observed, and the area of distribution is also larger than the last two years. This year the main area of distribution was east of 26° E. The length distributions showed that 0-group capelin east of 40° E were considerably larger than further west.

Mackerel (Fig. 16)

Some 0-group mackerel were caught in the south-western part of the survey area. No abundance index has been calculated.

Cod (Fig. 17)

The area of distribution is very much the same as in 1987, although more patchy outside Spitsbergen. There were a few more areas with dense concentrations this year than last year. The abundance index (Table 2) indicate that the 1988 year-class is stronger than the 1987 year-class but considerably lower than the year-classes 1983-1986, possibly not far from the 1972 or 1982 year-class. The logarithmic index (Table 3) show a similar pattern although at a level somewhat lower than the 1972 and 1982 year-class. The mean length of the 0-group cod is higher this year than last year.

Haddock (Fig. 18)

The area of distribution is much the same as last year. The abundance index (Table 2) is about or slightly above the 1987 index, but below the 1982-1986 year-classes. The logarithmic index (Table 3) is sligthly above the 1987 year-class, at the 1979-1980 level, but far below the 1982-1986 year-classes. The mean length of the 0-group haddock had also increased.

Saithe (Fig. 19)

Only scattered catches of 0-group saithe were taken. No abundance index has been calculated.

Polar cod (Fig. 20)

The abundance index for the western component of polar cod is higher than last year, mainly because of a wider distribution. The abundance index for the eastern component is lower than last year, but above the poor year-classes 1981-1984. 0-group polar cod at or east of 40° E are this year included in the eastern group.

Blue whiting (Fig. 21)

Only some scattered catches of blue whiting were taken. No abundance index has been calculated.

Sandeel (Fig. 22)

The distribution of sandeel is mainly within the southeastern area. Bigger catches than last year were recorded, but no abundance index has been made.

Redfjsh (Fig. 23)

The area of distribution is this year enlarged towards the east, with dense concentrations as far east as 38–40° E. The 0-group redfish dominated most of the catches in the western and central part of the survey area. The calculated abundance index, indicating a strong year-class, is the second highest since 1965.

Greenland halibut (Fig. 24)

The area of distribution is much smaller than in 1987, and only a few specimens were caught on the positive stations. The abundance index shows an alarming low value indicating a poor year-class.

Long rough dab (Fig. 25)

The area of distribution is smaller than the previous years, and without dense concentrations. The abundance index indicate a poor year-class.

Gonatus fabricii (Fig. 26)

Gonatus is widely distributed in the western part of the survey area. In 1988 Gonatus were caught as far east as 34° E. The abundance of Gonatus in 1988 is at a higher level than in 1987, which again was at a much higher level than observed in previous years. The length interval was 12-95 mm.

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' – 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
1987	6.2	3.3	3.9	2.6	2.5	5.2	3.9
1988	7.1	3.7	4.5	3.9	2.9	5.5	4.2
Average 1965-1988	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	2	69
1980	49	54	79		247	651	12	108
1981	65	30	149		73	861	3	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
1987	102	72	17		155	631	41	174
1988	133	86	144		120	949	8	72

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
1988	0.32	0.16	0.53	0.33	0.22	0.47	0.13	0.05	0.34

[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 alibut	Long rough dab	Sandeel
					East	West				
10-14							0.1			
15-19							1.0		0.1	
20-24		0.1		0.1		+	2.8		0.7	
25-29		0.6		0.3		14.4	4.4		10.6	
30-34		1.7	0.3	0.2		46.4	10.9		30.6	1.5
35-39	+	8.9	0.9	0.9	1.0	26.0	30.6	1.9	32.3	7.5
40-44	+	15.9	3.3	1.7	13.3	9.6	26.2	1.9	22.7	14.1
45-49	0.1	13.7	6.2	3.6	23.2	2.9	13.5	7.6	2.2	17.4
50-54	1.3	22.5	9.3	5.5	42.2	0.5	7.1	15.1	0.3	21.7
55-59	6.3	23.2	10.8	6.2	17.0	0.1	3.0	18.9		22.9
60-64	20.9	3.4	12.7	9.1	3.3		0.5	18.9		6.8
65-69	27.9	1.9	14.0	9.0		+	+	18.9	0.1	4.0
70-74	22.3	2.5	12.1	10.5		+	+	13.2		2.4
75-79	14.1	1.4	12.9	9.2			+	3.8		0.2
80-84	6.3	1.6	8.5	8.5		+	+		0.1	0.1
85-89	0.6	1.2	5.4	6.5						0.1
90-94	0.1	1.0	2.5	5.2		+				0.3
95-99	+	0.1	0.9	5.4		+				0.7
100-104		+	+	4.2						0.3
105-109		+	0.1	2.9		+				0.2
110-114		+	+	5.4						+
115-119		+		1.8						
120-124		+	0.1	1.4		+				
125-129		+	+	1.0					0.1	
130-134				1.0						
135-139				0.1						
140-144		+		0.1						
Total numbers	39789	104960	2249	1741	1586	27738	603434	53	963	19587
Mean length, mm	66.7	50.0	64.8	76.6	48.5	32.1	37.8	58.4	33.8	50.0

Appendix

Survey period	Research vessel	Research Institute	Participants
26 August- 4 September	"Professor Marti"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk	N.G. Ushakov, S.D. Melnikov, V.I. Zubov, S.V. Ratushny, Yu.A. Perepechaev, A.G. Korneev, V.M. Kapralov, S.V. Lisovets, V.V. Doronin, S.M. Gotovtsev, A.P. Pronin.
21 August- 2 September	"Artemida"	"	V.S Bakanev, I.V. Borkin, V.I. Shapovalov, L.L. Pavlyuchenko, A.P. Pedchenko, I.D. Altynov, V.V. Konovalov, L.G. Kuzmin, A.I. Shatilov, I.A. Adarov, V.M. Ulanov, V.I. Lvov, N.V. Mokeeova, A. Badigin, S.Yu. Dudnikov, A.P. Shavgzhdis, M.I. Prikotov, S.N. Pryakhin.
22 August- 7 September	"G.O. Sars"	Institute of Marine Research, Bergen	A. Hylen, K. Nedreaas, E. Svendsen, S. Lygren, J.H. Nilsen, A. Raknes, K. Hansen, M. Dahl.
20 August- 3 September	"Hakon Meshy"	"	K. Hansen, K. Andreassen, I Sværen, Ø. Tangen, M. Johannessen, I. Hoff.
22 August- 6 September	"Eldjarn"	"	K. Sunnanå, B.K. Berntsen, H. Kismul, L. Løvheim, Ø. Nævdal, I. Svellingen, R. Pedersen.

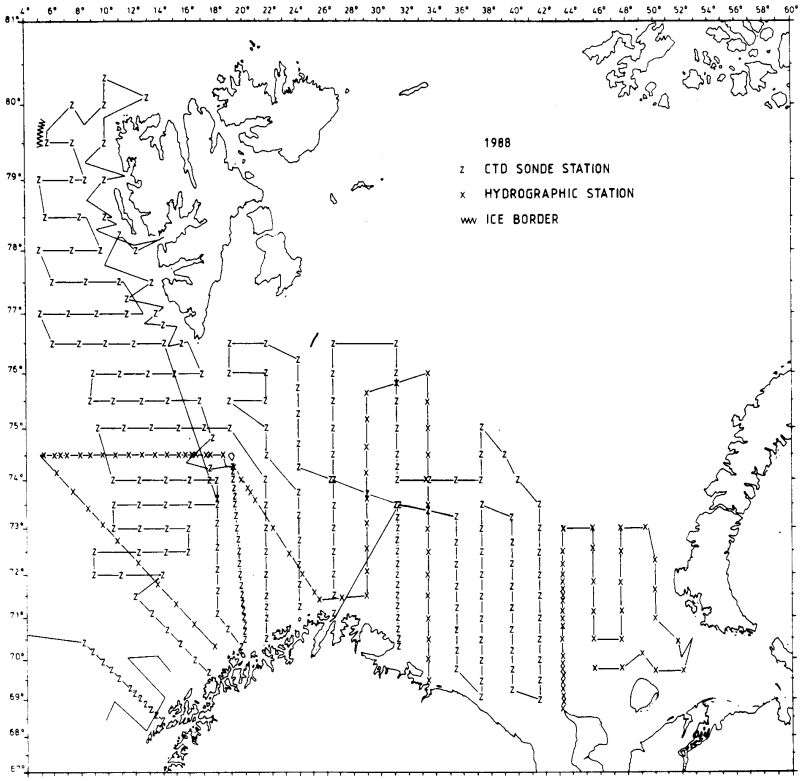

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

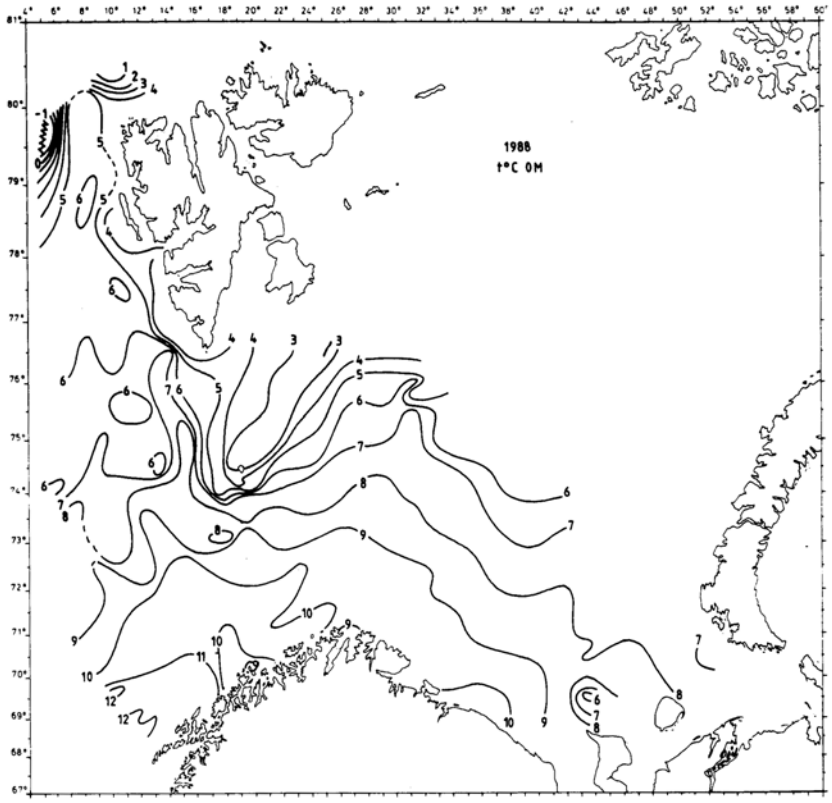

Fig. 2. Isotherms at 0 m

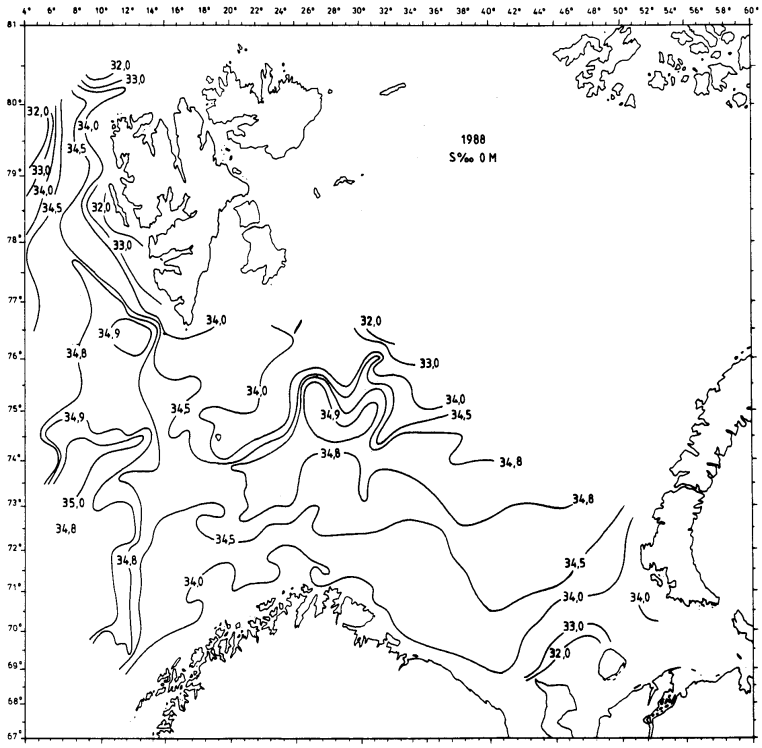

Fig. 3. Isohalines at 0 m

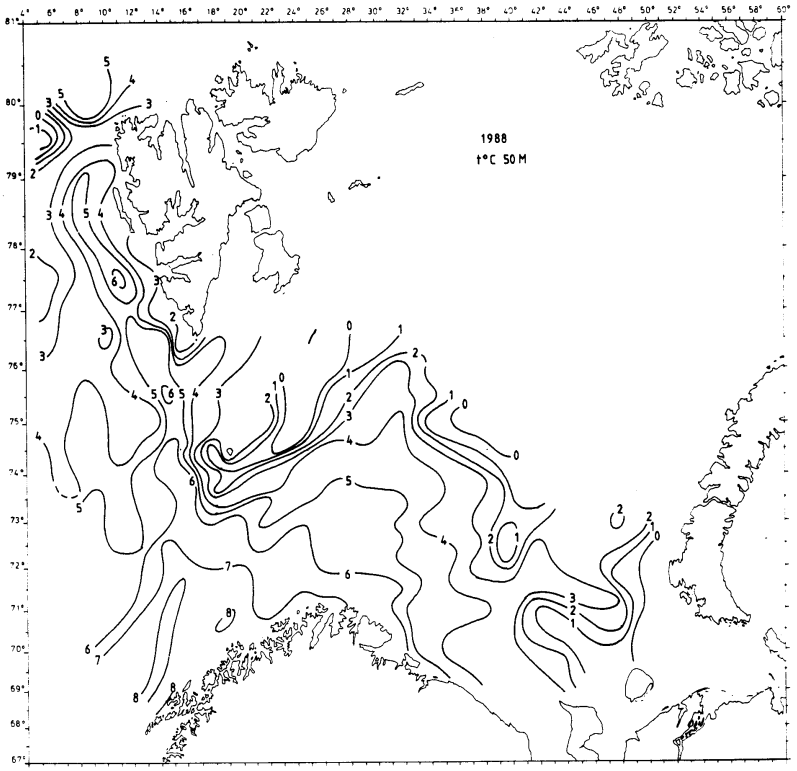

Fig. 4. Isotherms at 50 m

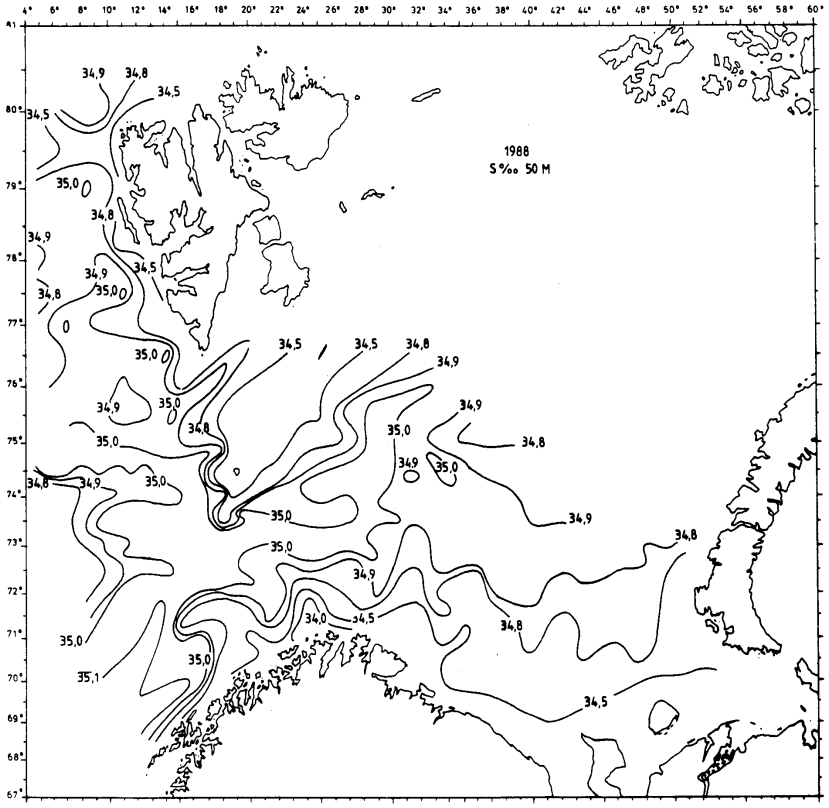

Fig. 5. Isohalines at 50 m

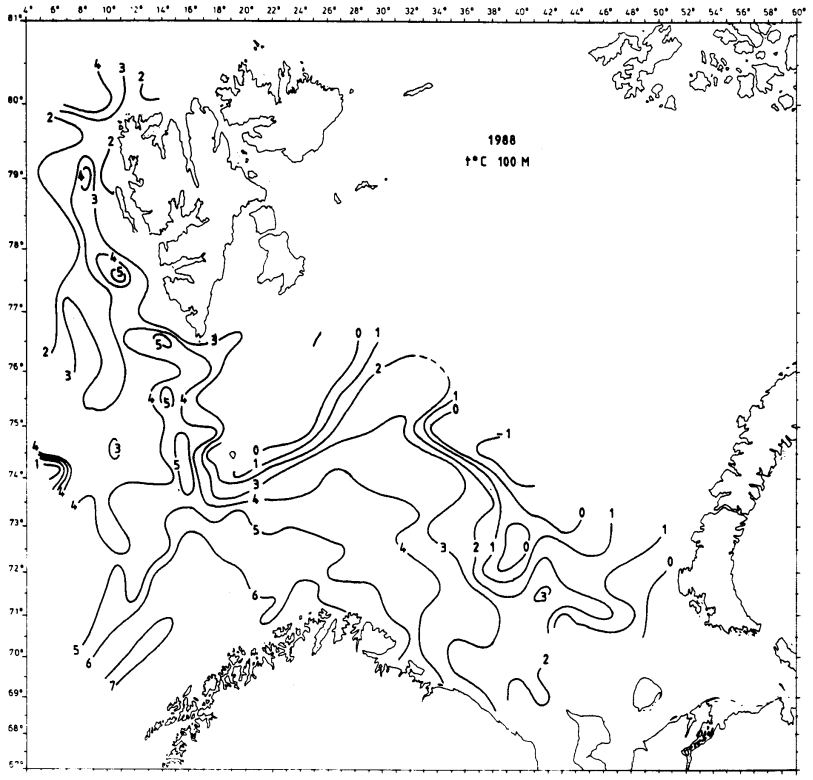

Fig. 6. Isotherms at 100 m

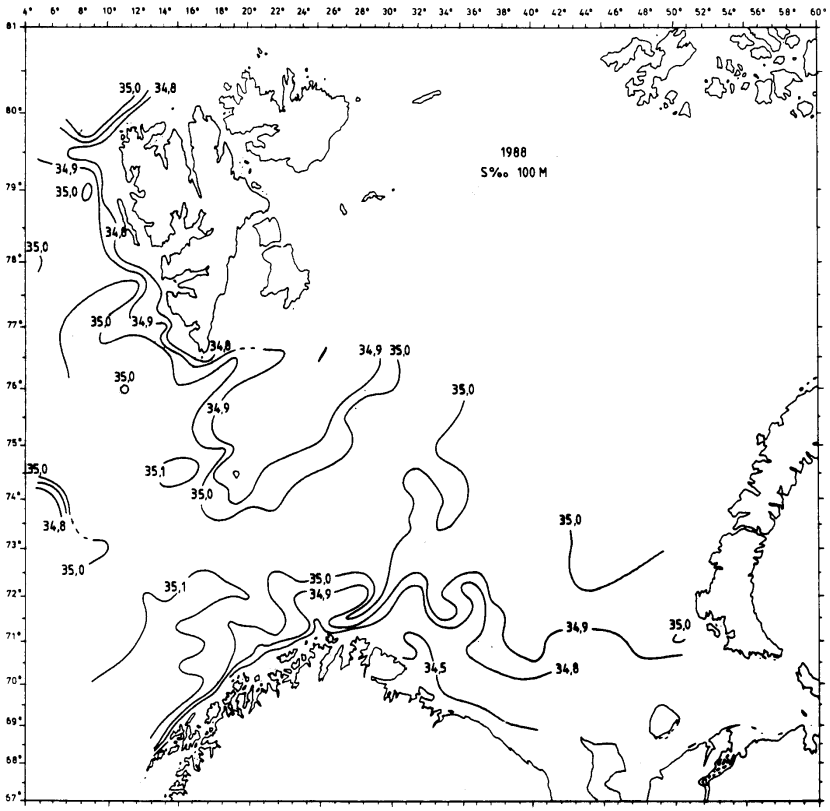

Fig. 7. Isohalines at 100 m

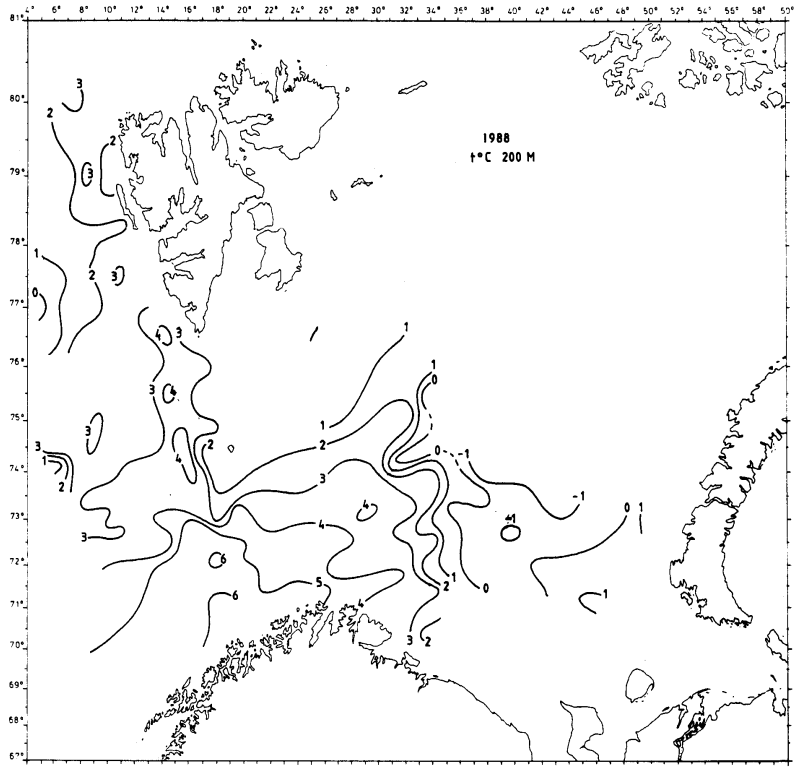

Fig. 8. Isotherms at 200 m

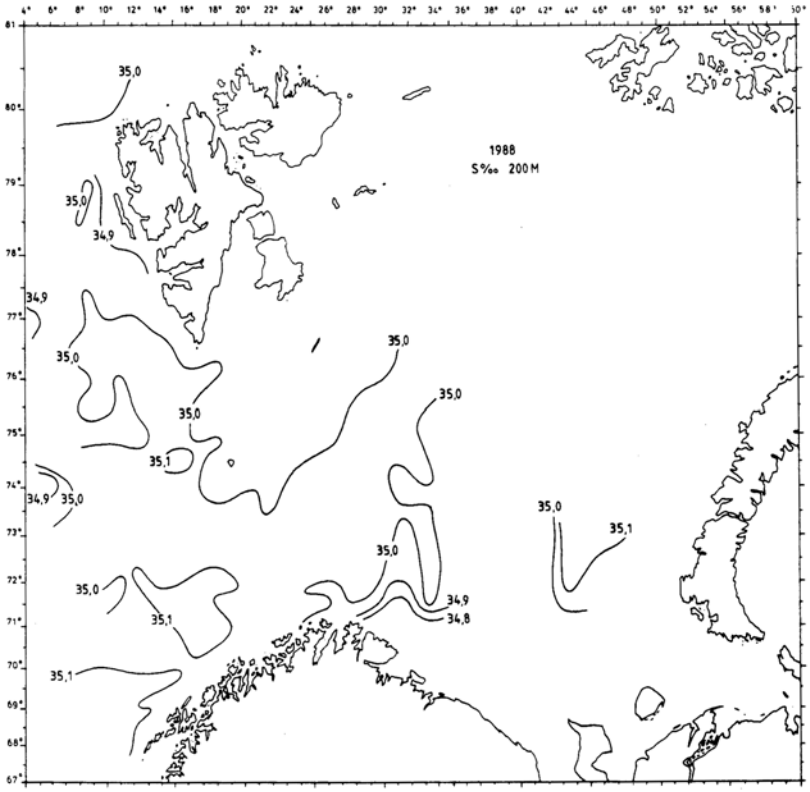

Fig. 9. Isohalines at 200 m

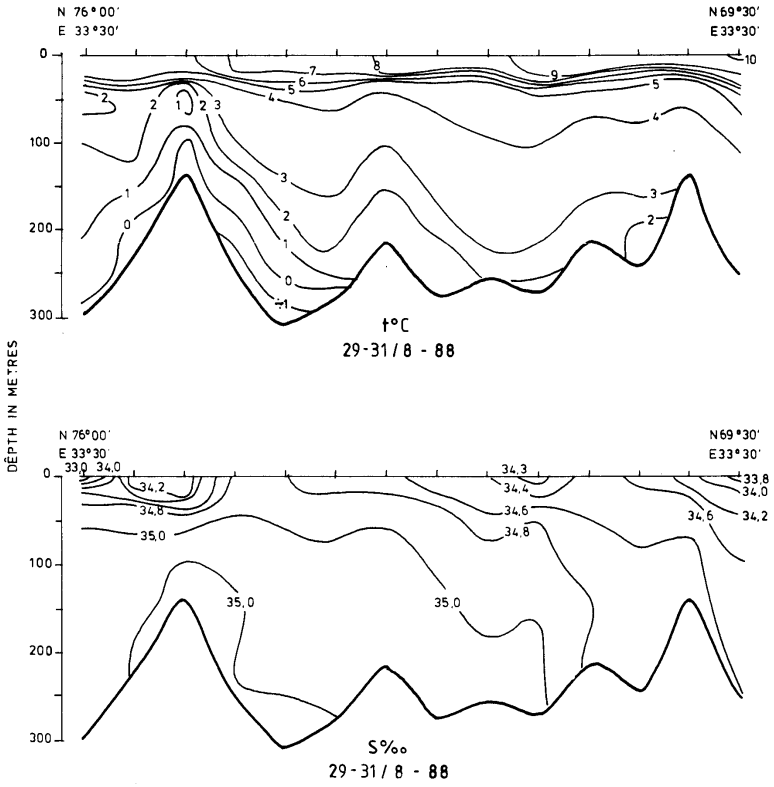

Fig. 10. Hydrographic section along the Kola meridian. Temperature and salinity

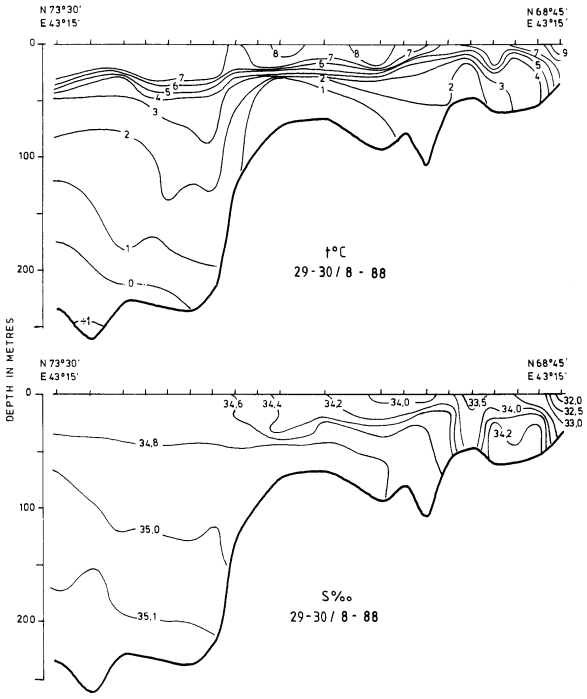

Fig. 11. Hydrographic section Cape Kanin-North. Temperature and salinity

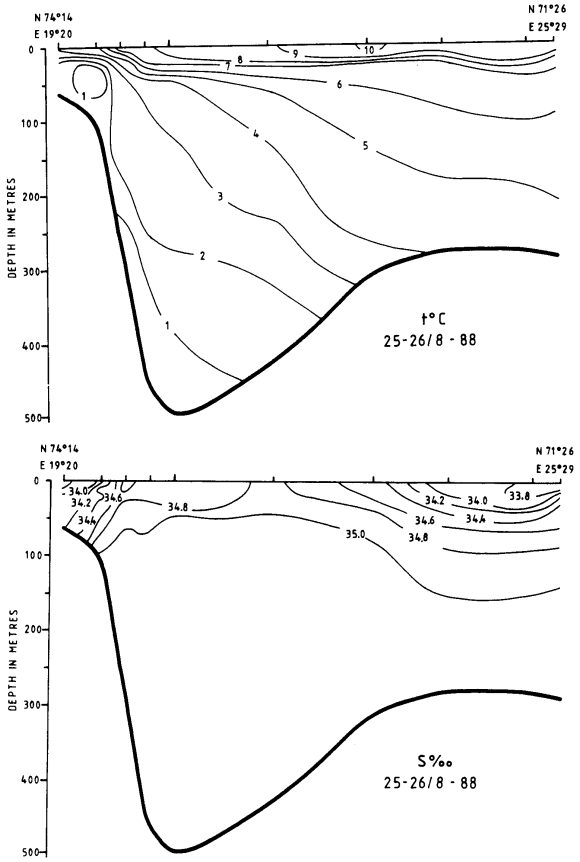

Fig. 12. Hydrographic section Bear Island-North Cape. Temperature and salinity

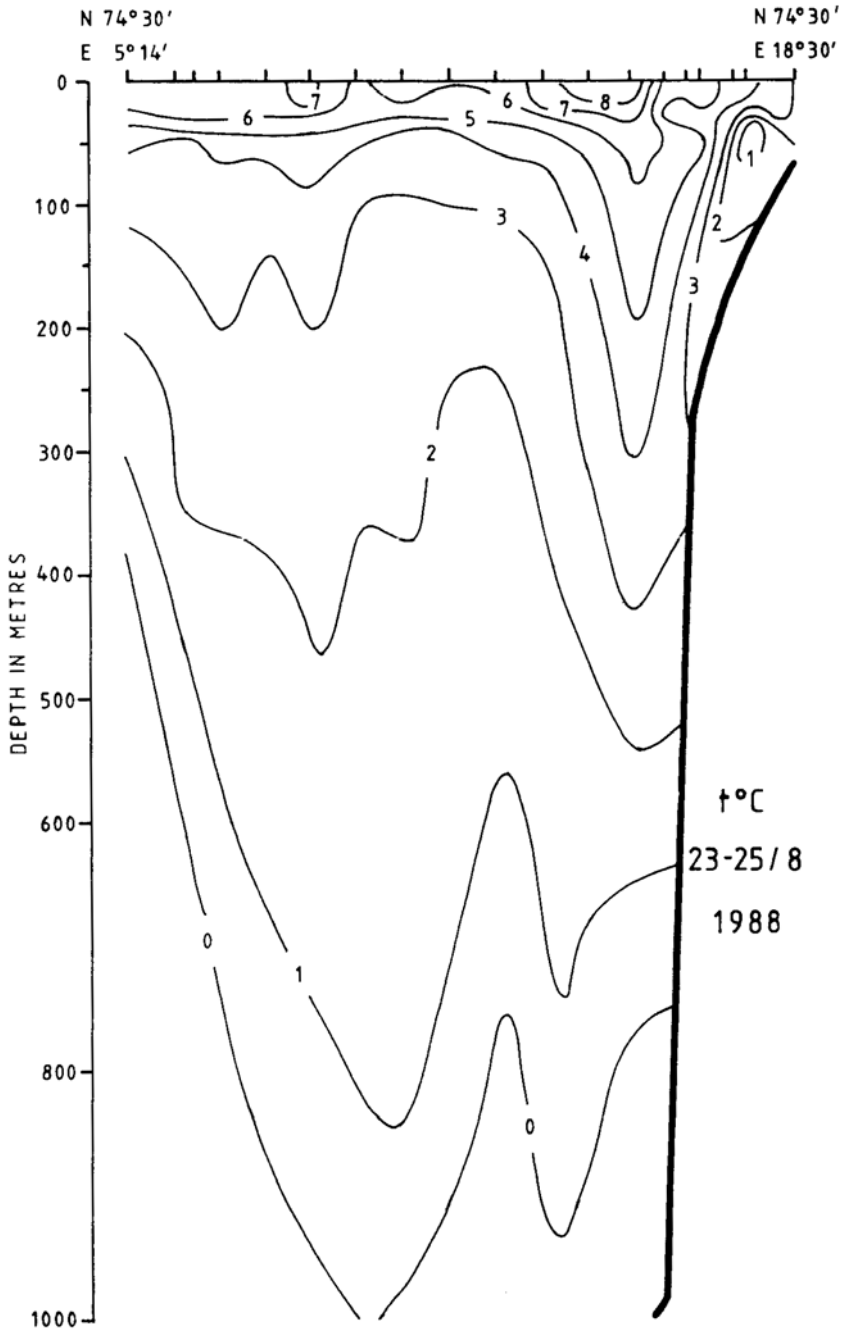

Fig. 13 a. Hydrographic section Bear Island-West. Temperature

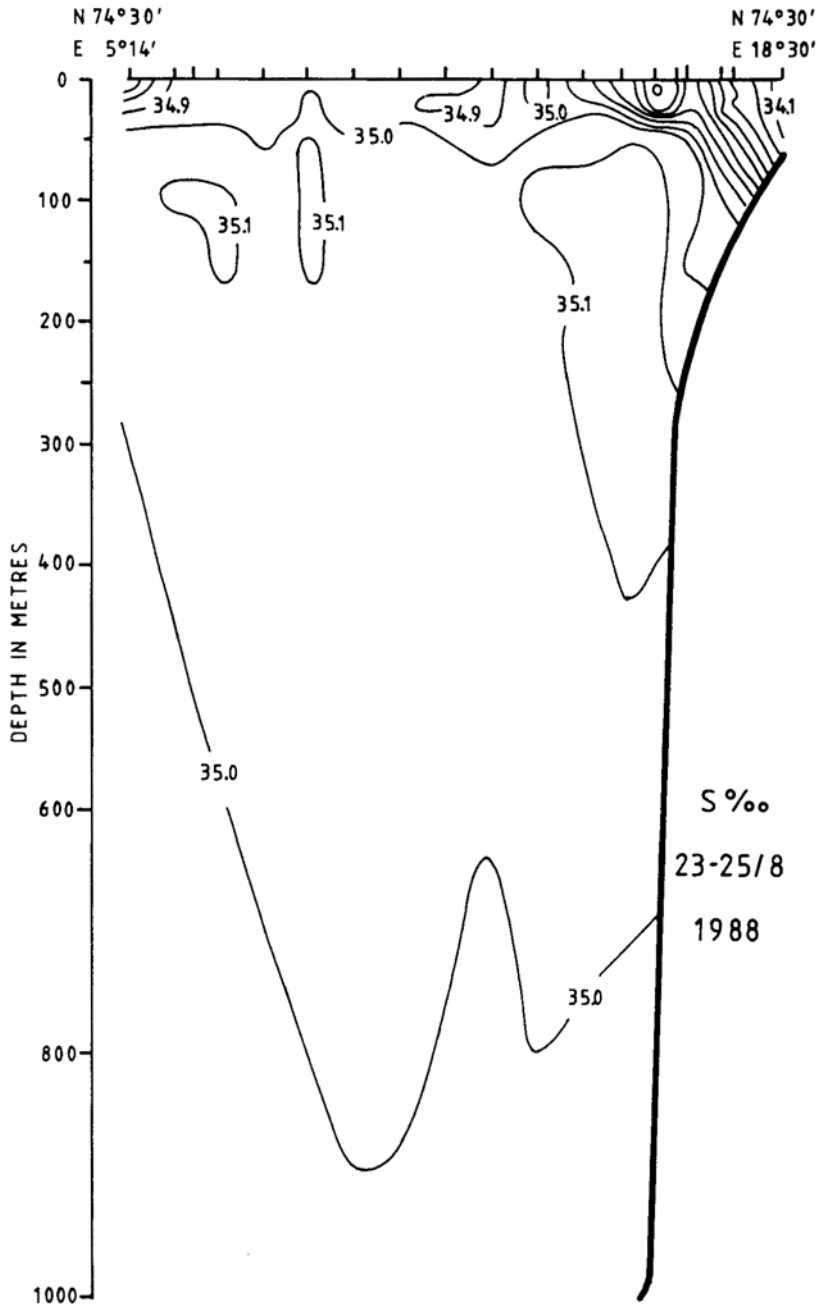

Fig. 13 b. Hydrographic section Bear Island-West. Salinity

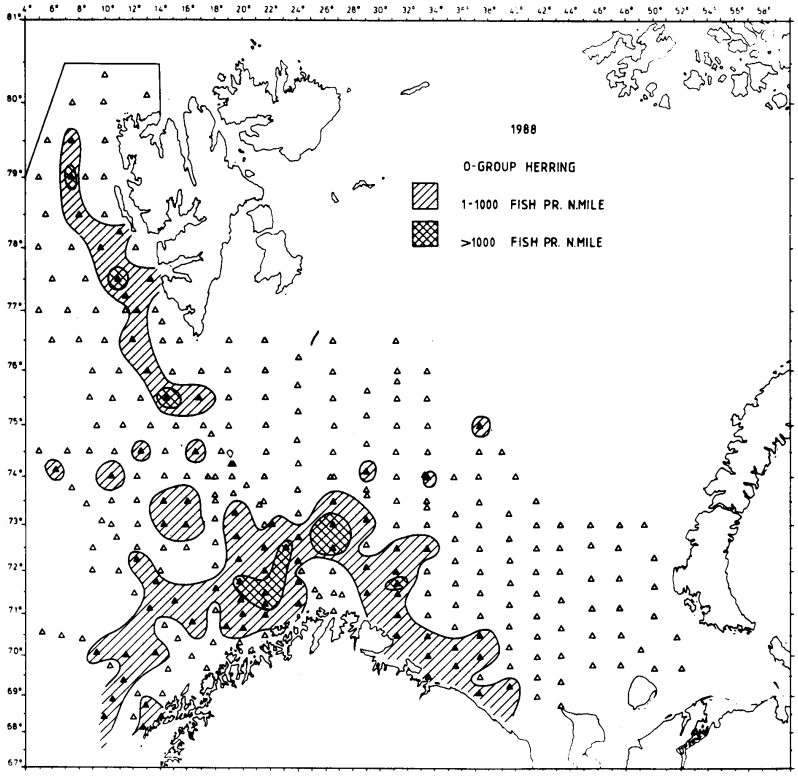

Fig. 14. Distribution of 0-group herring

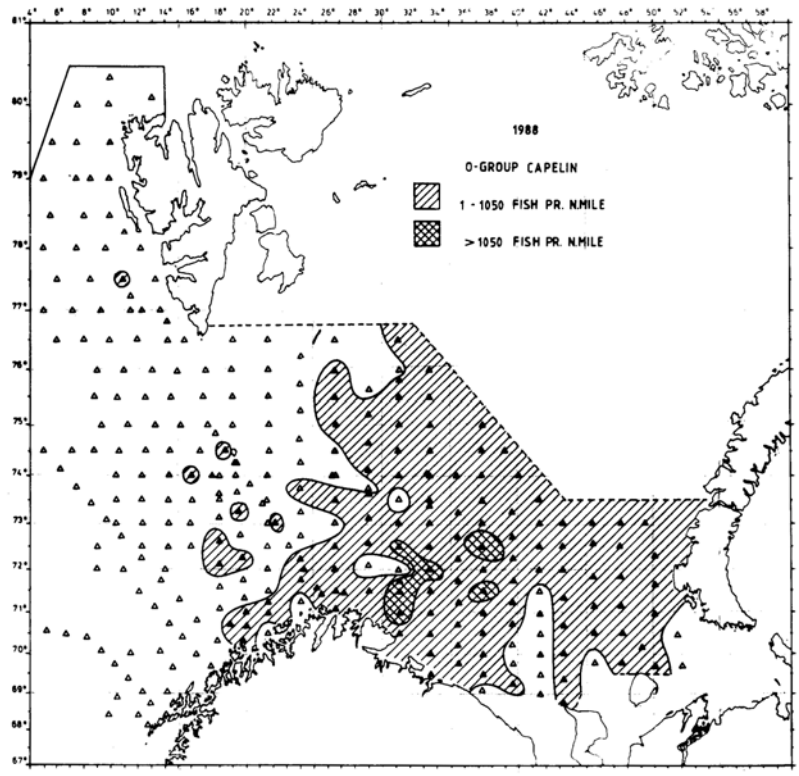

Fig. 15. Distribution of 0-group capelin

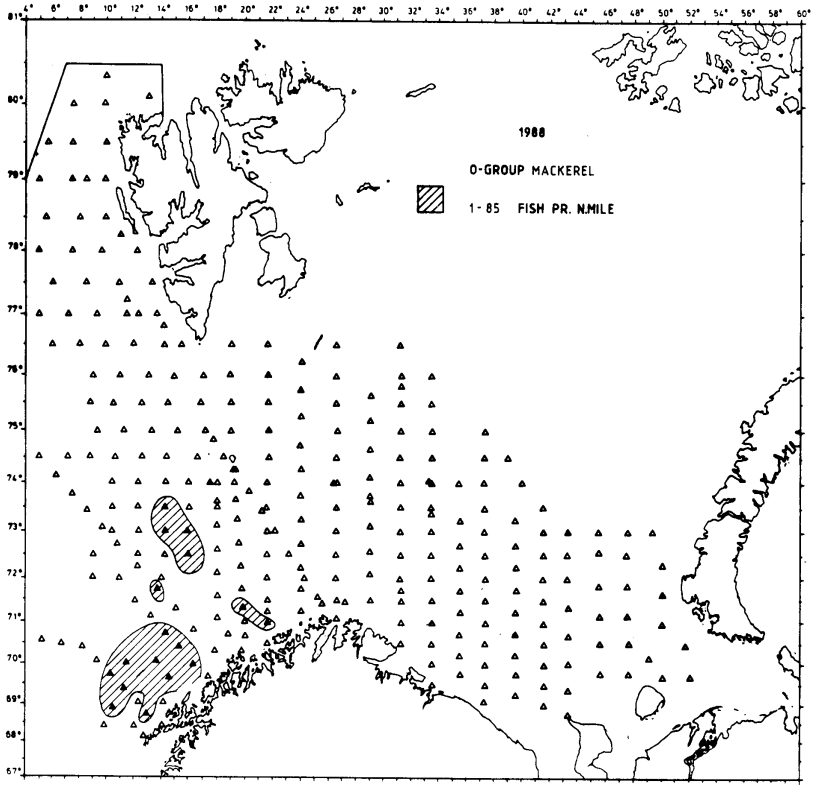

Fig. 16. Distribution of 0-group mackerel

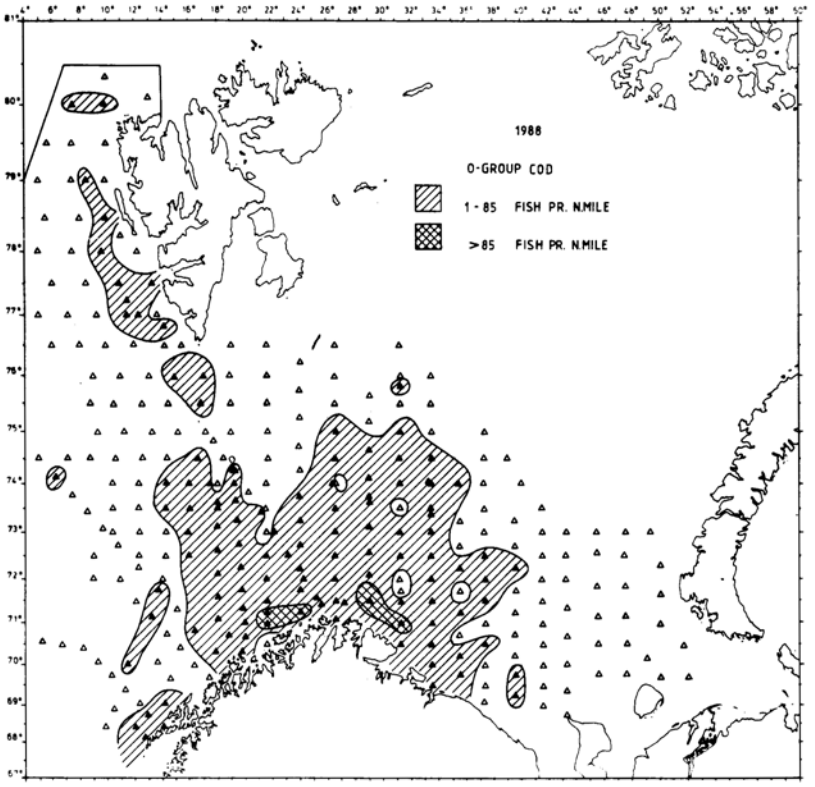

Fig. 17. Distribution of 0-group cod

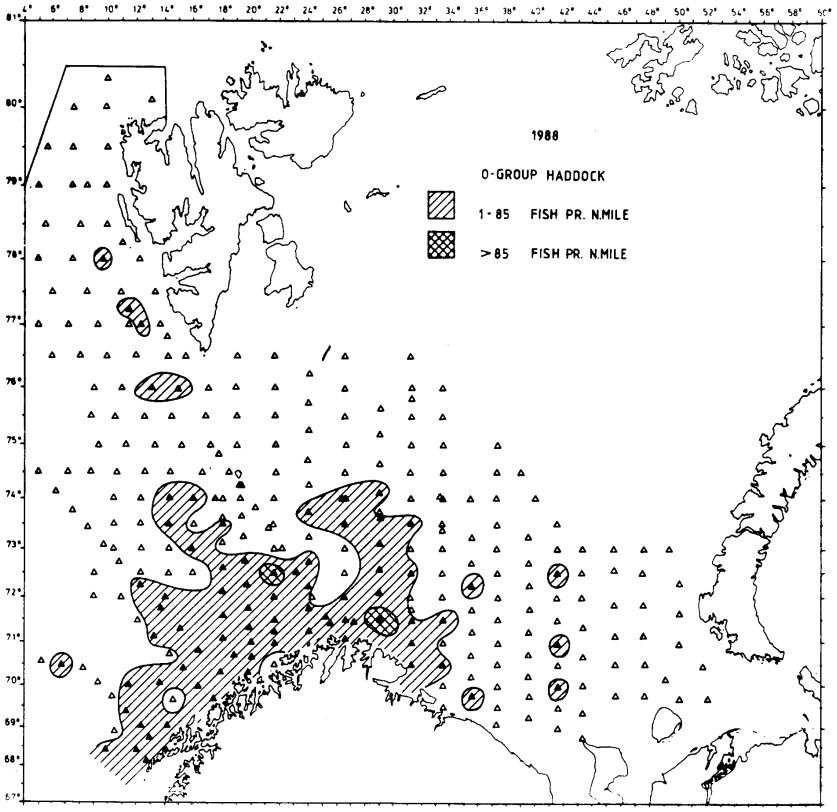

Fig. 18. Distribution of 0-group haddock

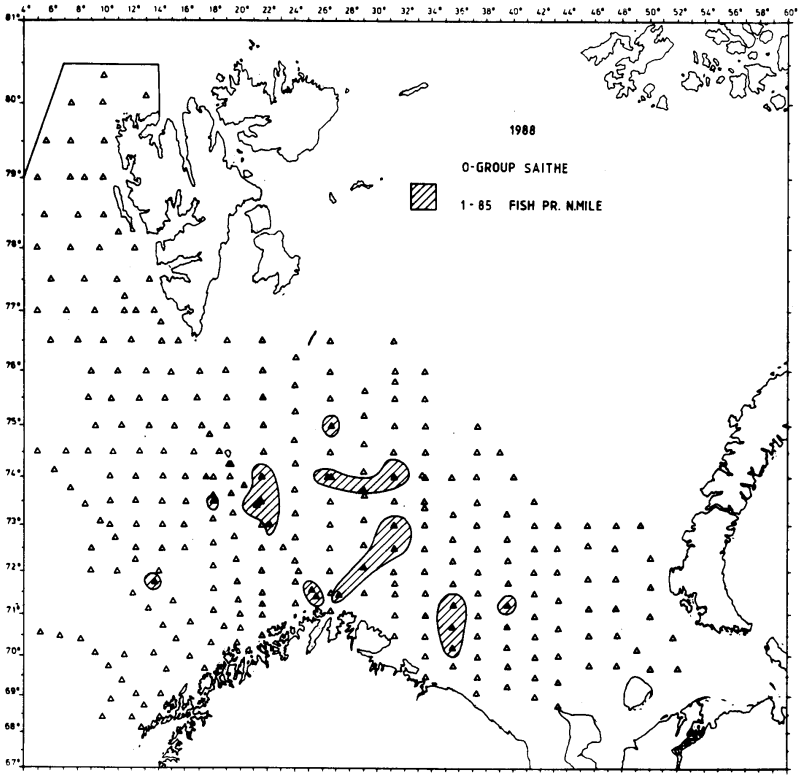

Fig. 19. Distribution of 0-group saithe

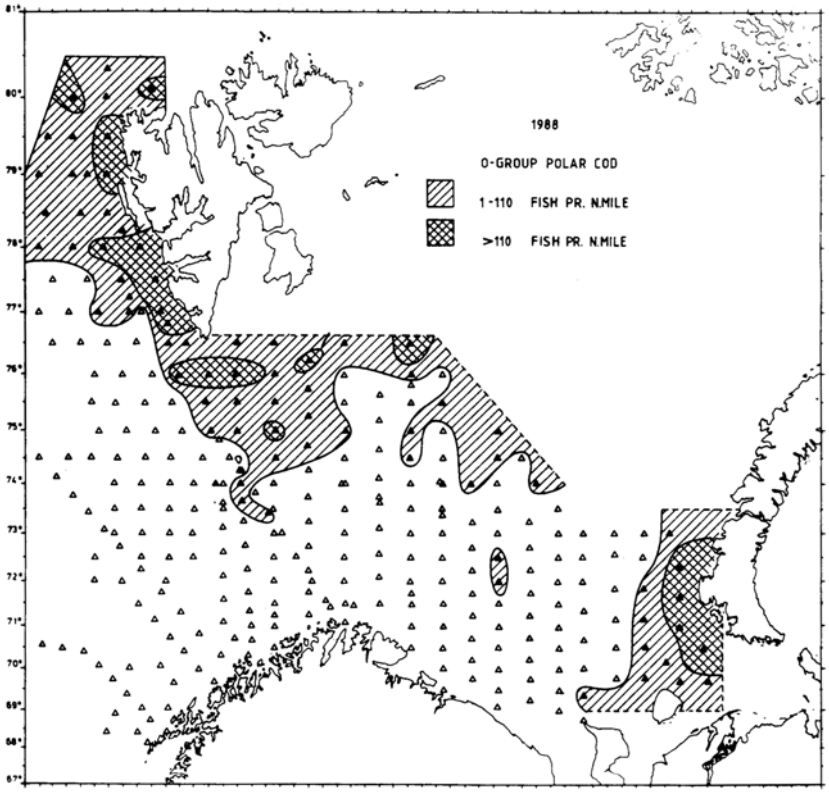

Fig. 20. Distribution of 0-group polar cod

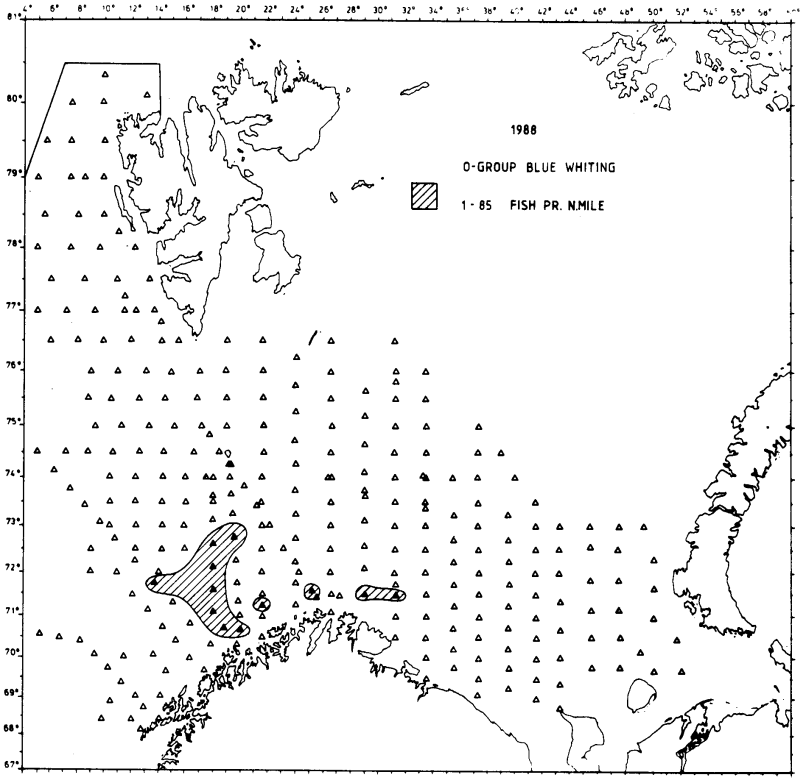

Fig. 21. Distribution of 0-group blue whiting

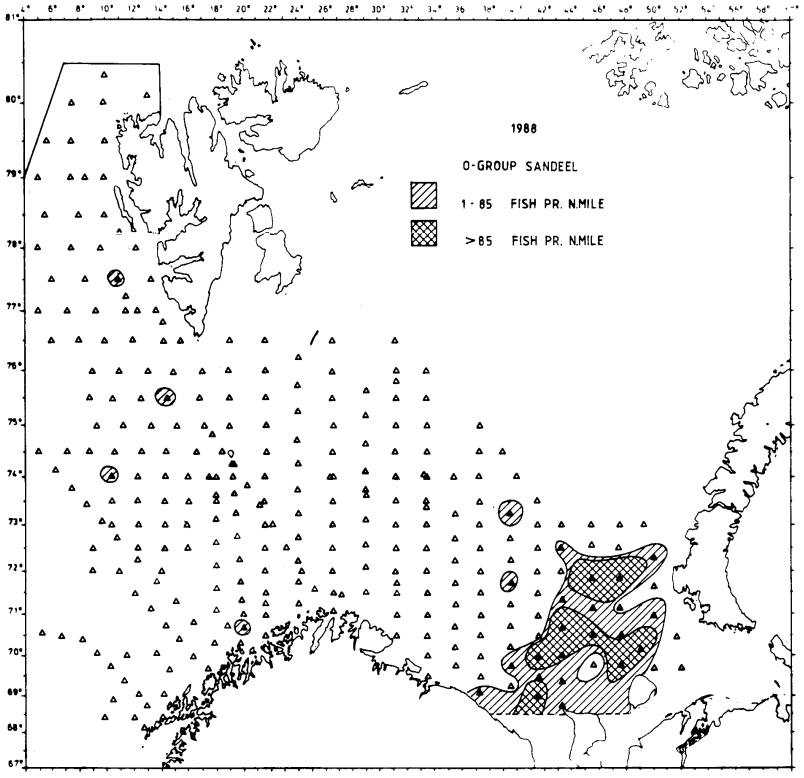

Fig. 22. Distribution of 0-group sandeel

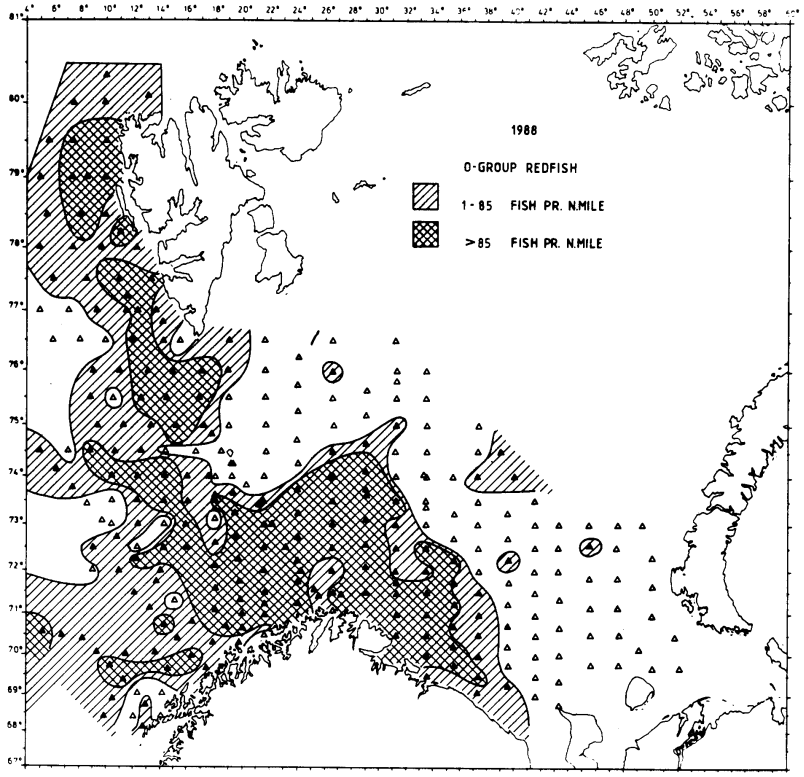

Fig. 23. Distribution of 0-group redfish

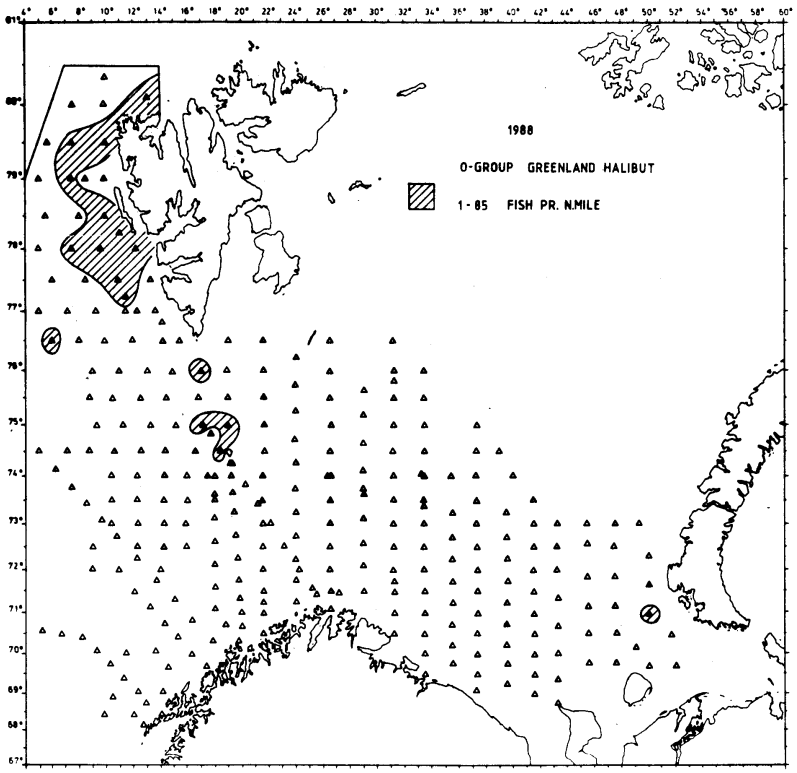

Fig. 24. Distribution of 0-group Greenland halibut

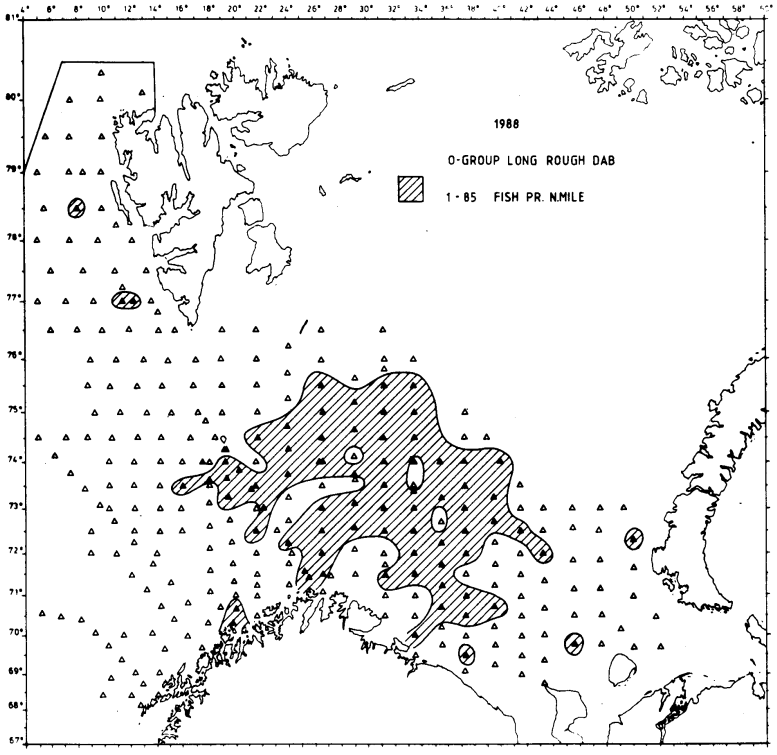

Fig. 25. Distribution of 0-group long rough dab

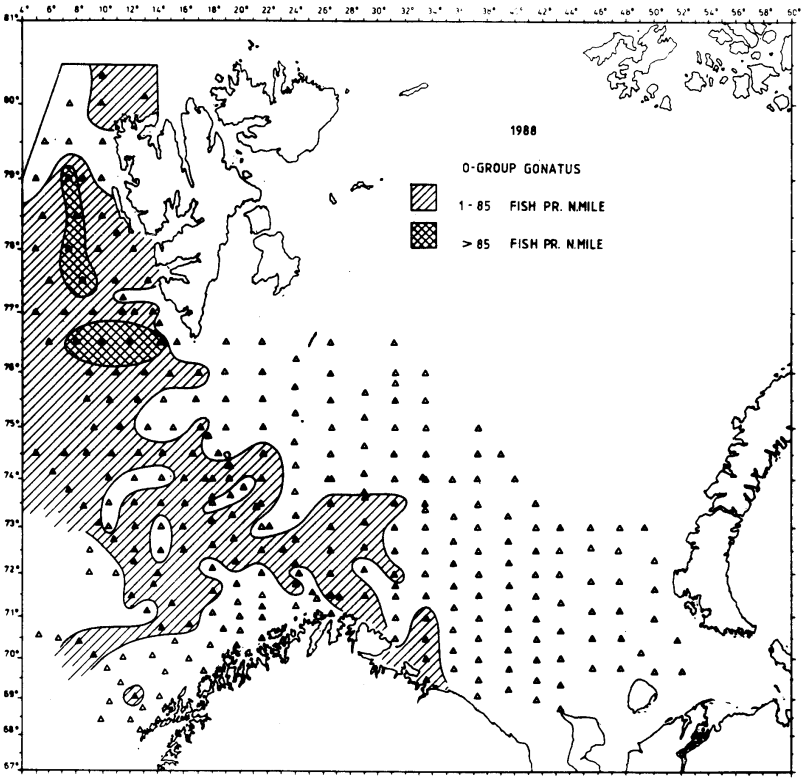

Fig. 26. Distribution of 0-group Gonatus fabricii

Preliminary report of the international 0-group fish survey in the Barents Sea and adjacent waters in August-September 1989

The twenty-fifth annual International 0-group fish survey was made during the period 21 August-11 September 1989 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"	22 August-11 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	21 August-11 September	"
Norway	"Michael Sars"	22 August-11 September	"
USSR	"Professor Marty"	20 August-8 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"PINRO"	20 August-9 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 11-12 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 hydrographical 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 1989 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 30-40 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 hydrographical stations are given in Fig. 1. Trawl stations with and without catch are given on the distribution charts in Figs. 16-28, 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 with 30-40 nautical miles between stations.

Horizontal temperature and salinity distribution are shown for 0, 50, 100 and 200 m depth (Figs. 2-11). Figs. 12-15 show the temperature and salinity conditions in the Kola, Cape Kanin, Bear Island-North Cape and Bear Island-West sections. The mean temperature for parts of these sections is listed in Table 1.

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

Temperature and salinity conditions in the Kola, Cape Kanin, Bear Island and Bear Island - North Cape sections are shown in graphic form. The mean temperatures have been calculated for fixed parts of these sections in different layers (see Table 1).

Mean water temperatures in the Barents Sea and adjacent waters in late August-early September 1989 have increased compared to 1988 in all layers and are considerably above 1965-1989 normal. On the Kola section mean temperature in layers 0-50, 0-200 m reached the maximum for the whole period of observations (since 1965). Together with this, a decrease in salinity was observed in layer 0-500 m west of Bear Island. A similar decrease was observed on Kola and Cape Kanin sections in all layers.

Distribution and anbudance of 0-group fish and Gonatus fabricii

Geographical distributions of 0-group fish are shown as shaded areas in Fig. 16-27, and of Gonatus fabricii in Fig. 28. 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 weighed by 10, are given in Table 2. Another set of abundance indices are given for 0-group herring, cod and haddock (Table 3) as decribed 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. 16)

0-group herring was caught on a far larger number of stations than has been observed during these surveys since 1983. However, the number of specimens caught in each station was low leading to a logarithmic index of 0.59. This value is slightly higher than for the 1984 and 1985 year-classes, but is considerable lower than the index of the 1983 year-class, estimated to 1.77.

Capelin (Fig. 17)

The area of distribution and the overall density is similar to what was recorded in 1983 and 1984, indicating that the 1989 year-class may be as abundant as the year-classes in the mid-eighties. However, according to the great variation in numbers of 0-group capelin in the catches, it must be stressed that an index of the year-class strength of capelin is not as reliable as for other species.

Mackerel (Fig. 18)

Some 0-group mackerel were caught in the south-western part of the survey area. No abundance index has been calculated.

Cod (Fig. 19)

The distribution of cod this year follow the same pattern as last year in the western and central part of the area. In the eastern part there is a separate distribution of cod close to Novaya Zemlya, and the main distribution also extend more to the south-east. The largest concentrations are found in this extension, but the indices calculated this year are only just above the indices of 1988. The logarithmic index is almost the same as in 1988 but the distribution index is about the average of the 1983 index and those found in 1987 and 1988.

Haddock (Fig 20)

The distribution of haddock is somewhat different this year than last. Haddock is found to be distributed more to the north-east and there is practically no haddock in the south-western waters. The indices show the same picture as for cod, the logarithmic index being almost equal to that of 1988 and the distribution index slightly above that of 1987 and 1988.

Saithe (Fig 21)

Only a few catches of single fishes of saithe were obtained and these are given in the map. No index have been calculated.

Polar cod (Fig. 22)

As observed earlier, 0-group polar cod was observed in two separated areas, off Spitsbergen and in the south-eastern part of the Barents Sea. However, the concentrations this year was very spare indicating the 1989 year-class to be a weak one.

Blue whiting (Fig. 23)

Only a few catches o-f blue whiting were obtained and these are shown in the map. No index have been calculated.

Sandeel (Fig 24)

The catches of sandeel were smaller this year than in 1968. Also the distribution area is smaller than last year. No index have been calculated.

Redfish (Fig 25)

The area of dense distribution of redfish is considerable smaller this year than last. In 1966 the redfish-distribution was extending far to the east with high concentrations and the redfish was dominant in the trawl catches in most of this area. This year redfish did not dominate the catches and the main concentrations are found in the currents going north along the western side of Spitsbergen and in the current going east along the Norwegian coast. The distribution index is about the level of 1966 indicating a somewhat above average year-class.

Greenland halibut (Fig 26)

Very few Greenland halibut were caught and the index is very low indicating a very weak year-class.

Long rough dab (Fig 27)

Also this year the index of long rough dab is very, indicating a weak year-class. The distribution is somewhat more to the north-west than in 1966.

Gonatus fabricii (Fig. 28)

Also this year concentrations of Gonatus fabricii with relative high abundance are found in the western area. The distribution do not reach as far to the south-east as last year.

References

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. Exolor. 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
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
1988	7.1	3.7	4.5	3.9	2.9	5.5	4.2
1989	8.6	4.8	5.8	6.5	3.4	6.9	4.9
Average 1965-1989	7.3	3.7	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	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	2	69
1980	49	54	79		247	651	12	108
1981	65	30	149		73	861	3	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
1987	102	72	17		155	631	41	174
1988	133	86	144		120	949	8	72
1989	202	112		247		698	5	92

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	Confidencelimits		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
1988	0.32	0.16	0.53	0.33	0.22	0.47	0.13	0.05	0.34
1989	0.59	0.39	0.66	0.38	0.30	0.48	0.14	0.10	0.20

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

Appendix

Survey period	Research vessel	Research Institute	Participants
20 August- 8 September	"Professor Marli"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk	I.V Borkin, B. Filoffov, I. Dolgolenko, Y. Perepechaev, A. Shvagzhdis, V. Ulanov, A. Pedchenko, A. Cheremovsky, K. Drevetnyak, V. Khvastov, A. Shatilov.
20 August- 9 September	"Pinro"		V. Komlichenko, A. Kusmichov, E. Shamraj, A. Doronin, A. Badiqin, A. Dorchenkov, S. Lisovetq, S. Gotovtsev.
21 August- 11 September	"G.O. Sars"	Institute of Marine Research, Bergen	I.M. Beck, O.J. Gullaksen, H. Hammer, H. Loeng, L. Midthun, R. Pedersen, S.Rosseland, H. Sagen, R. Toresen,
22 August- 11 September	"Michael Sars"		B. Hofstad, B. Kvinge, A. M. Skorpen, S. Sundby. K. Sunnana, P. Agotnes.
22 August- 11 September	"Eldjarn"		I. Byrkjedal, T.I. Halland, K.A. Hansen, K. Hansen, A. Hylen, K. Lauvas, L. L0vheim, M. Mogster.

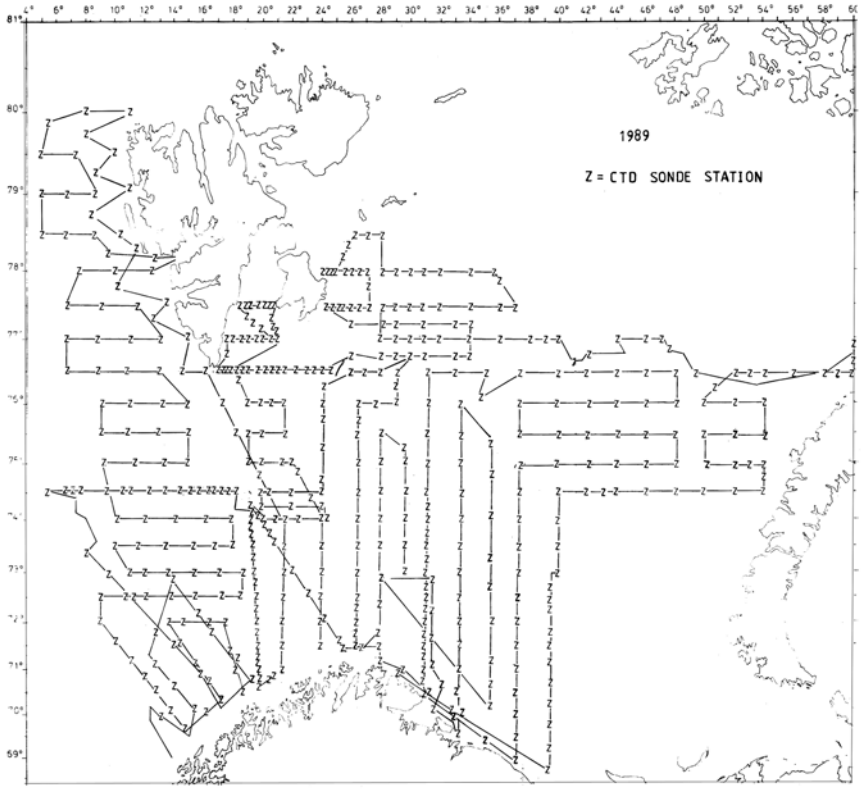

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

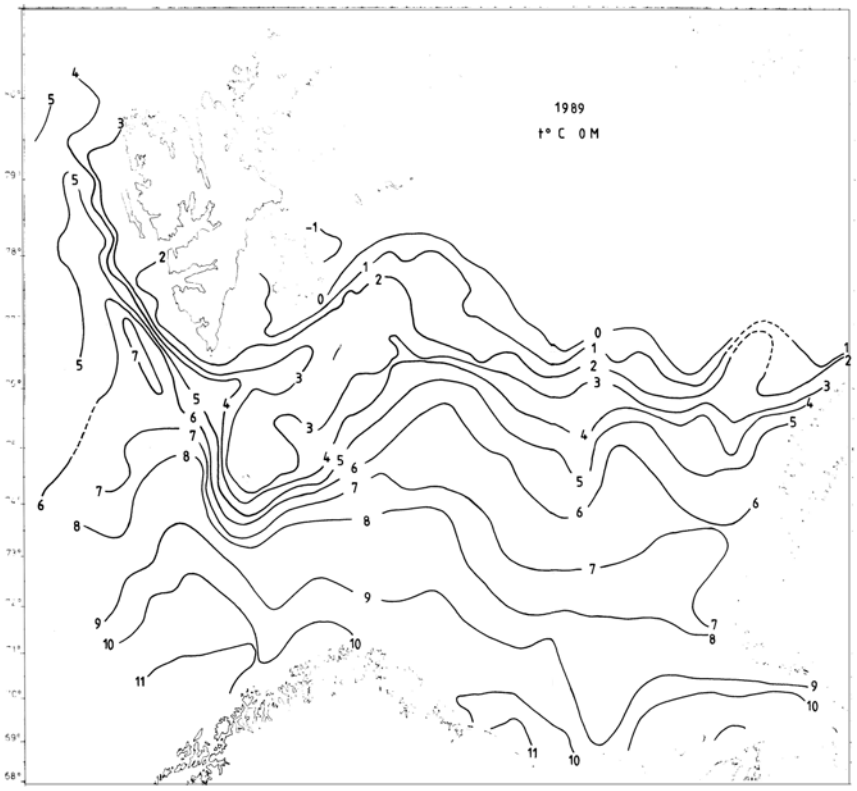

Fig. 2. Isotherms at 0 m

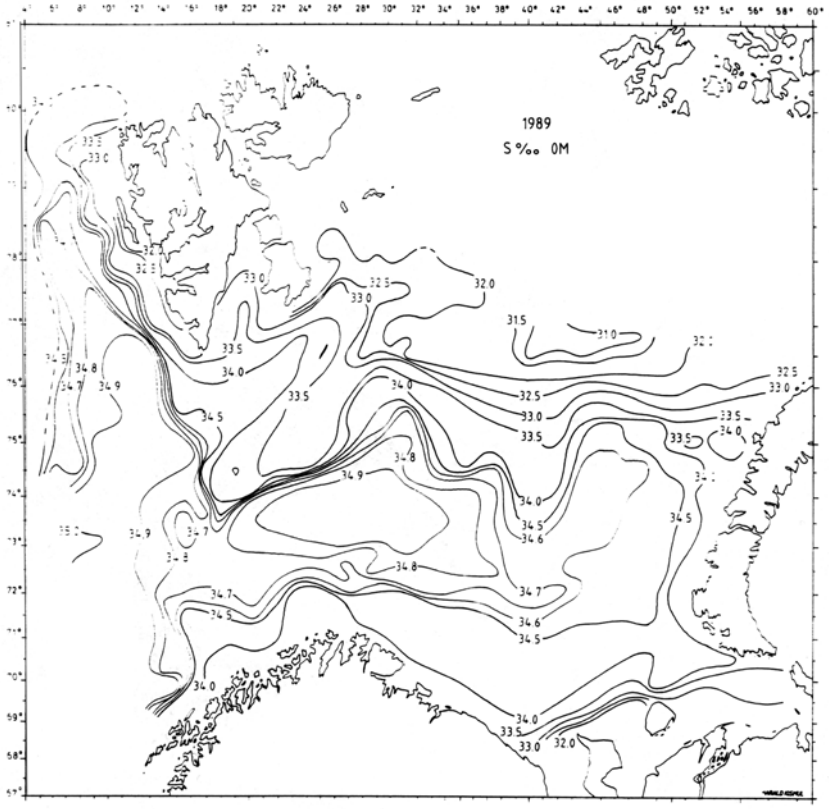

Fig. 3. Isohalines at 0 m

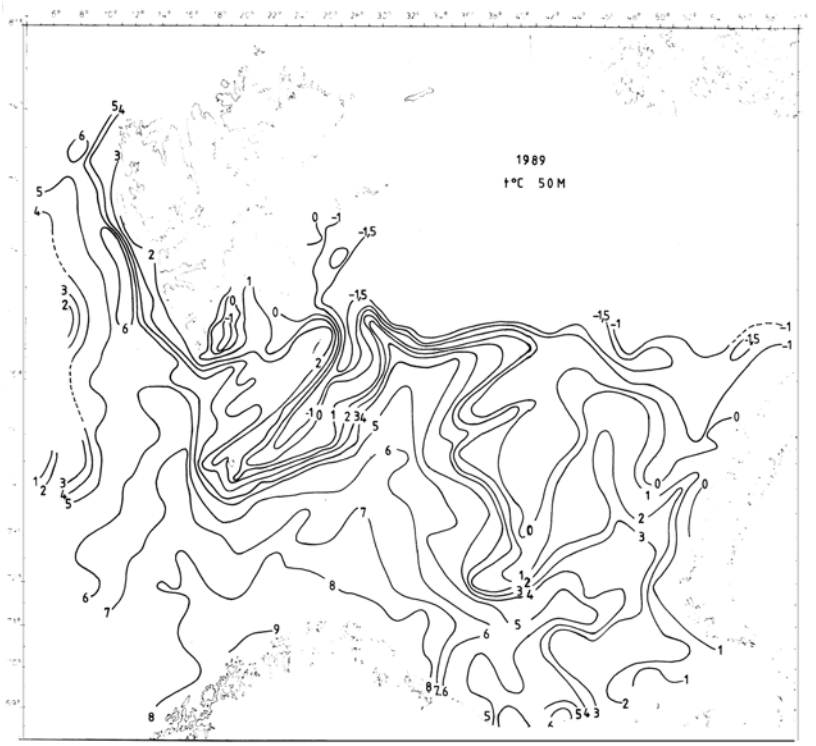

Fig. 4. Isotherms at 50 m

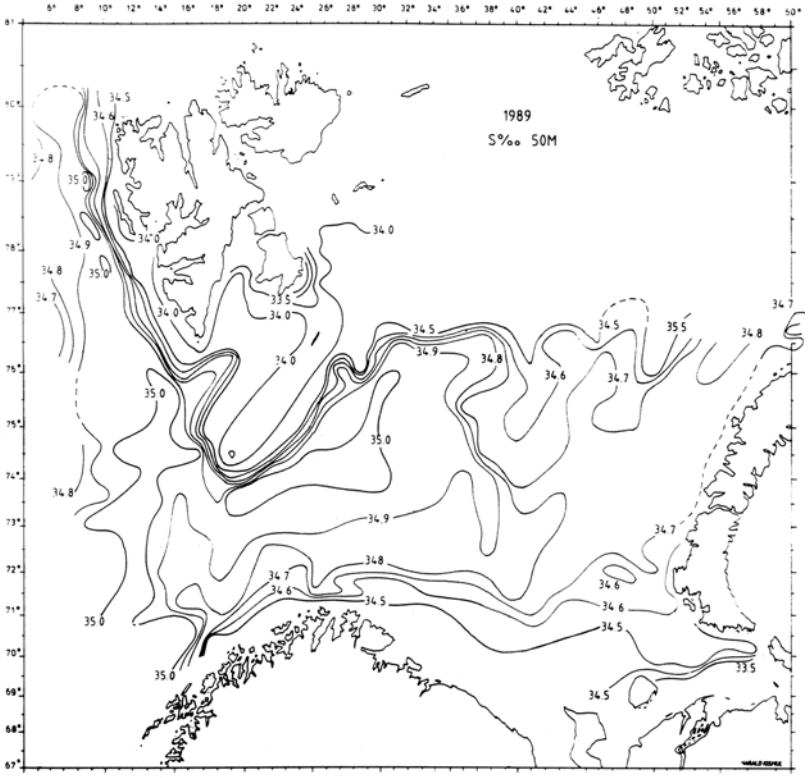

Fig. 5. Isohalines at 50 m

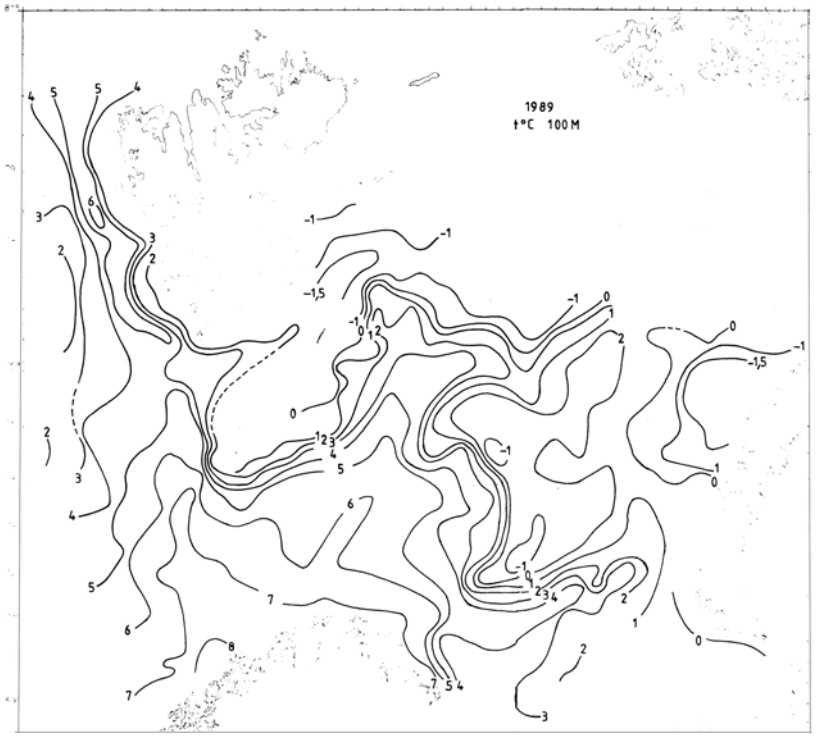

Fig. 6. Isotherms at 100 m

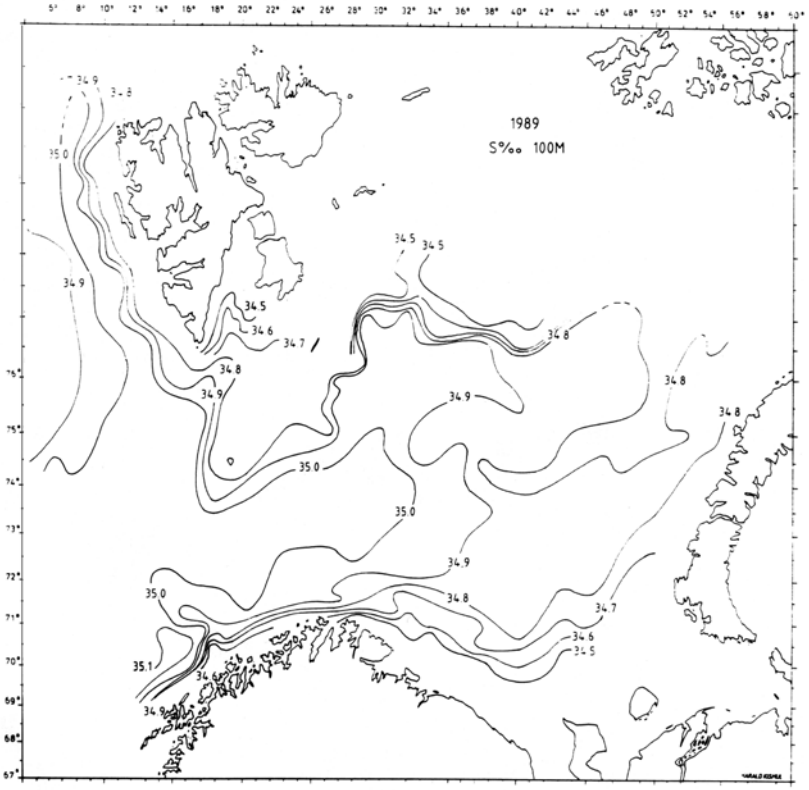

Fig. 7. Isohalines at 100 m

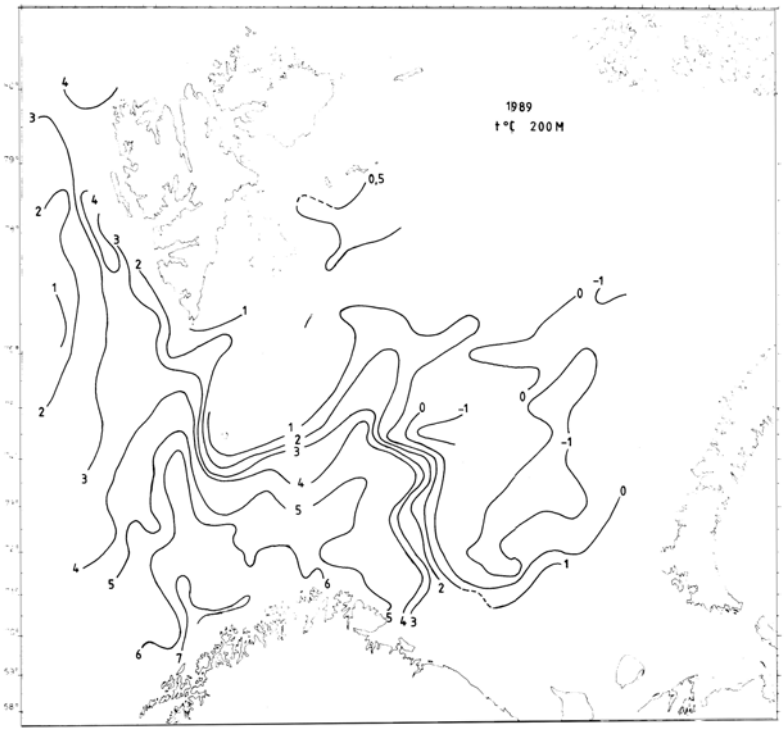

Fig. 8. Isotherms at 200 m

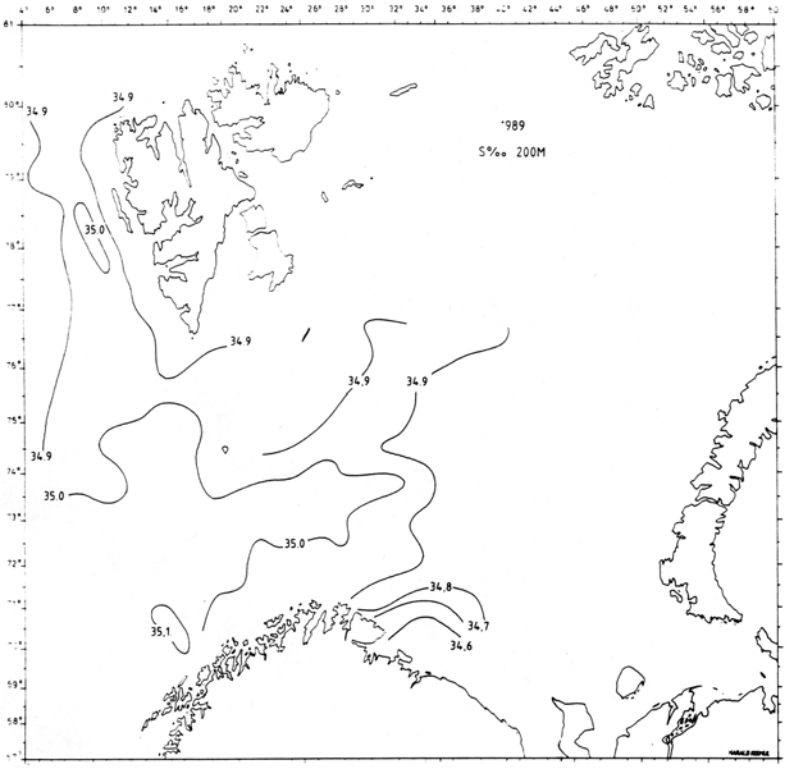

Fig. 9. Isohalines at 200 m

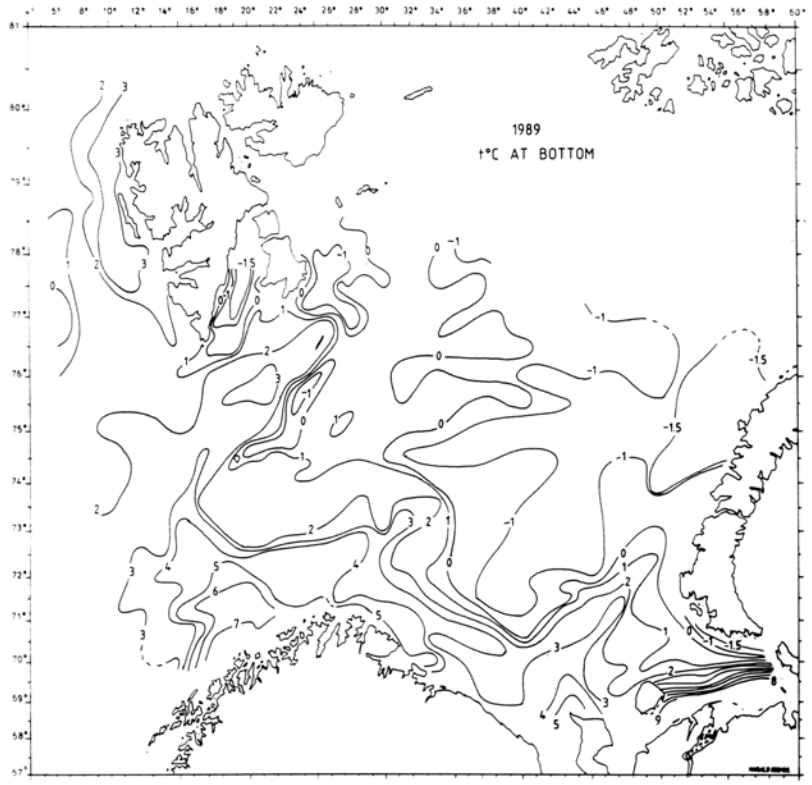

Fig. 10. Isotherms at bottom

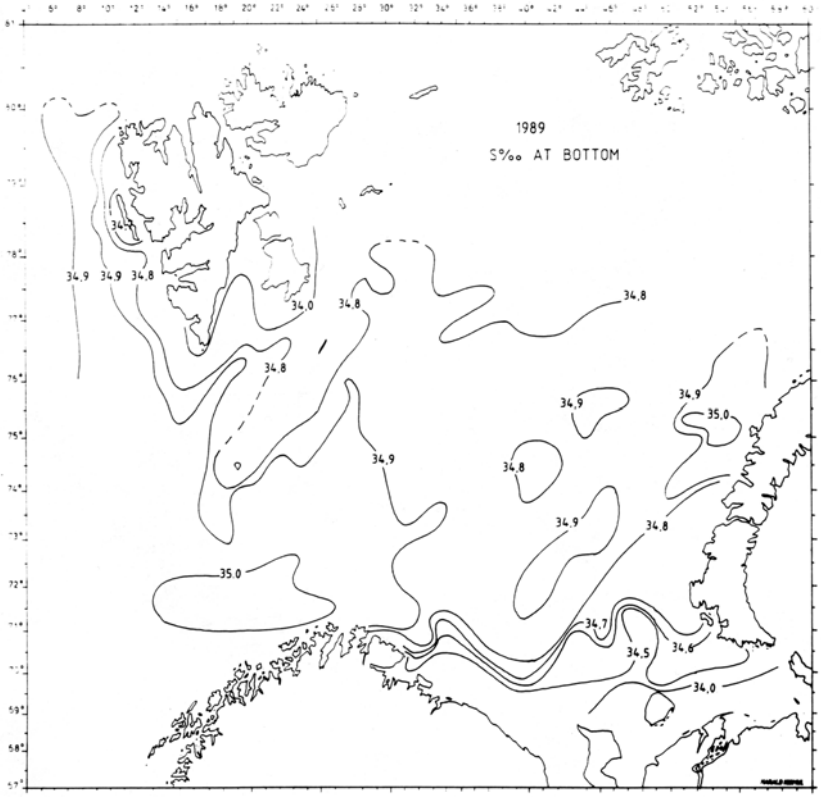

Fig. 11. Isohalines at bottom

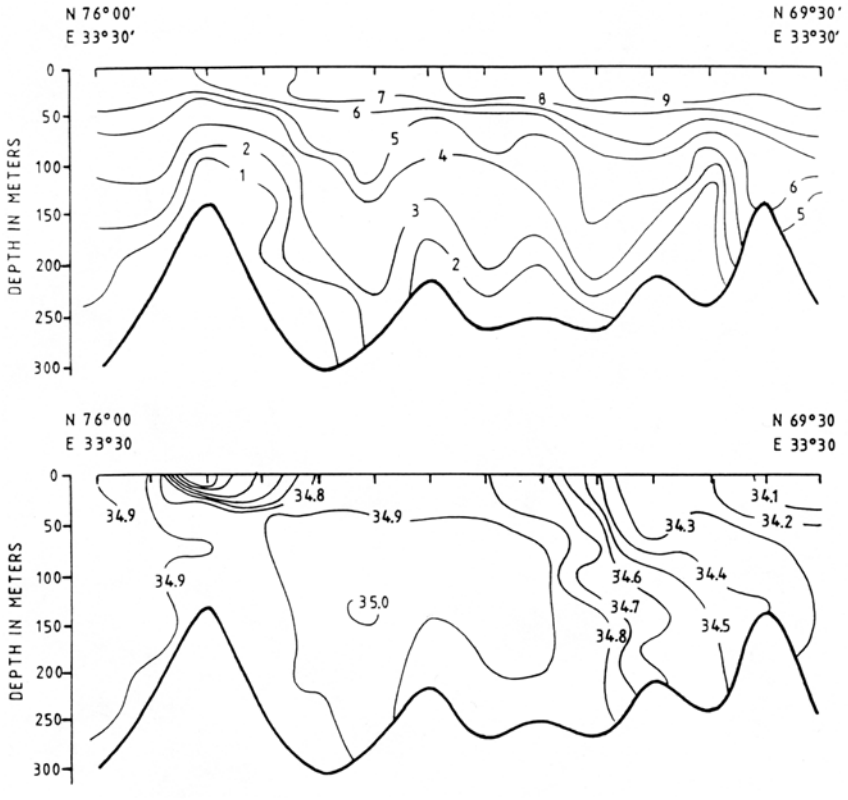

Fig. 12. Hydrographic section along the Kola meridian. Temperature and salinity

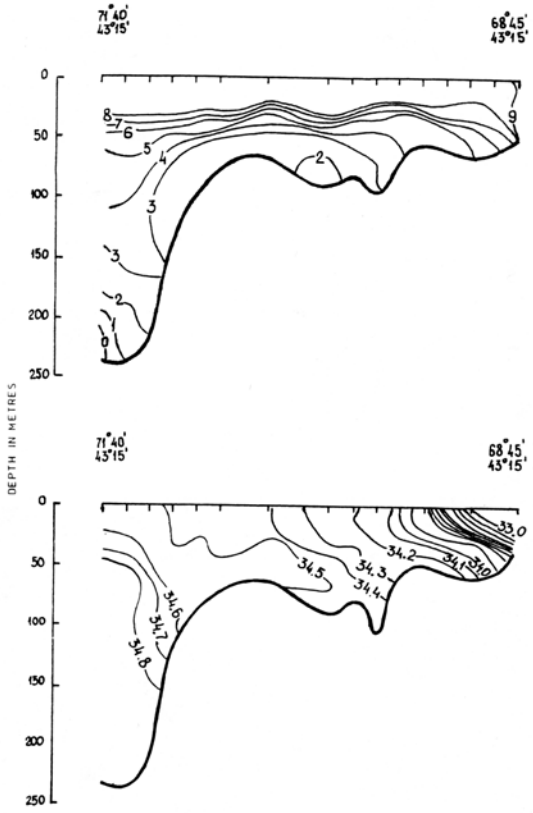

Fig. 13. Hydrographic section Cape Kanin-North. Temperature and salinity

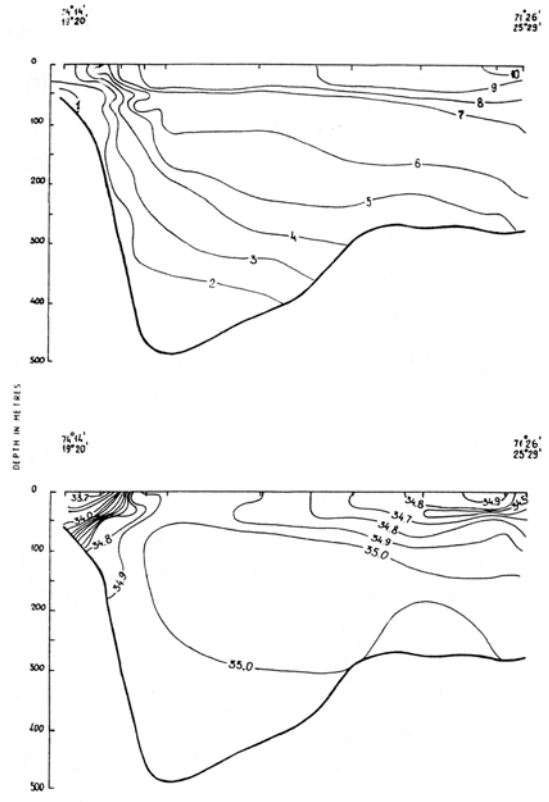

Fig. 14. Hydrographic section Bear Island-North Cape. Temperature and salinity

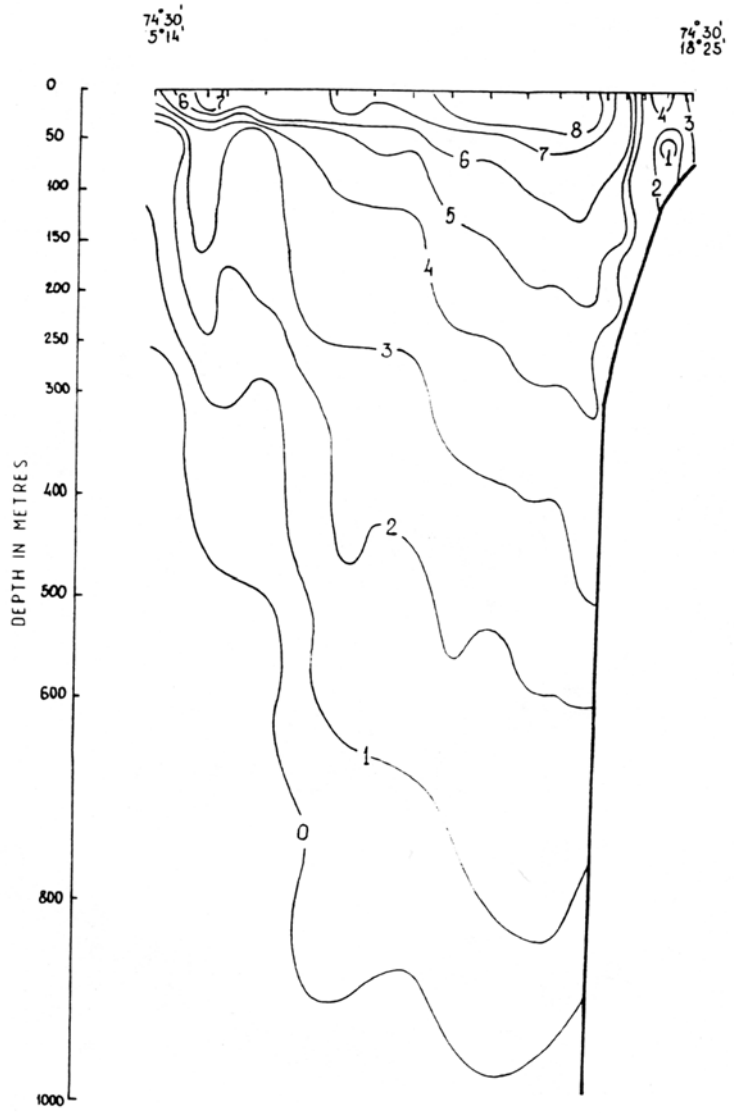

Fig. 15a. Hydrographic section Bear Island-West. Temperature

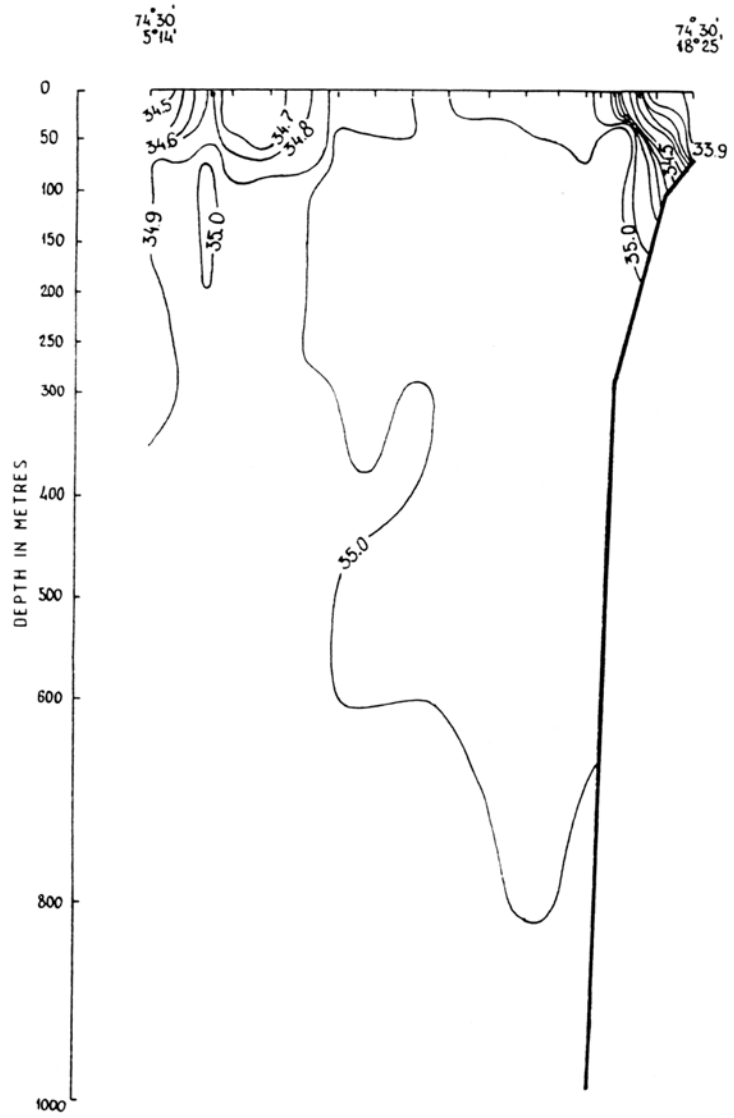

Fig. 15b. Hydrographic section Bear Island-West. Salinity

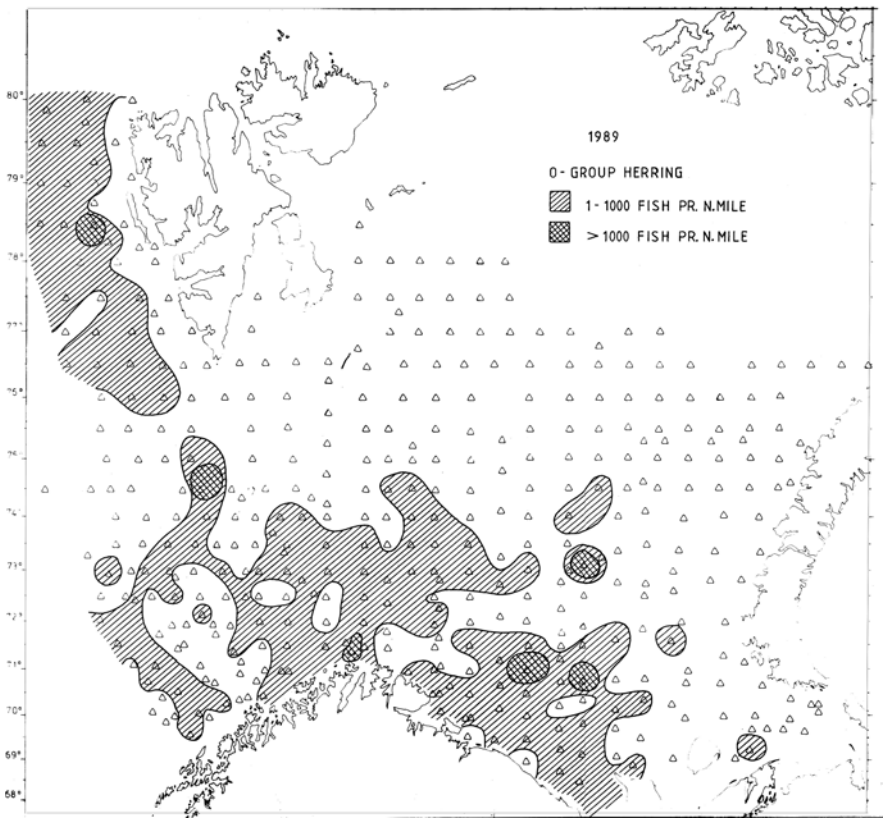

Fig. 16. Distribution of 0-group herring

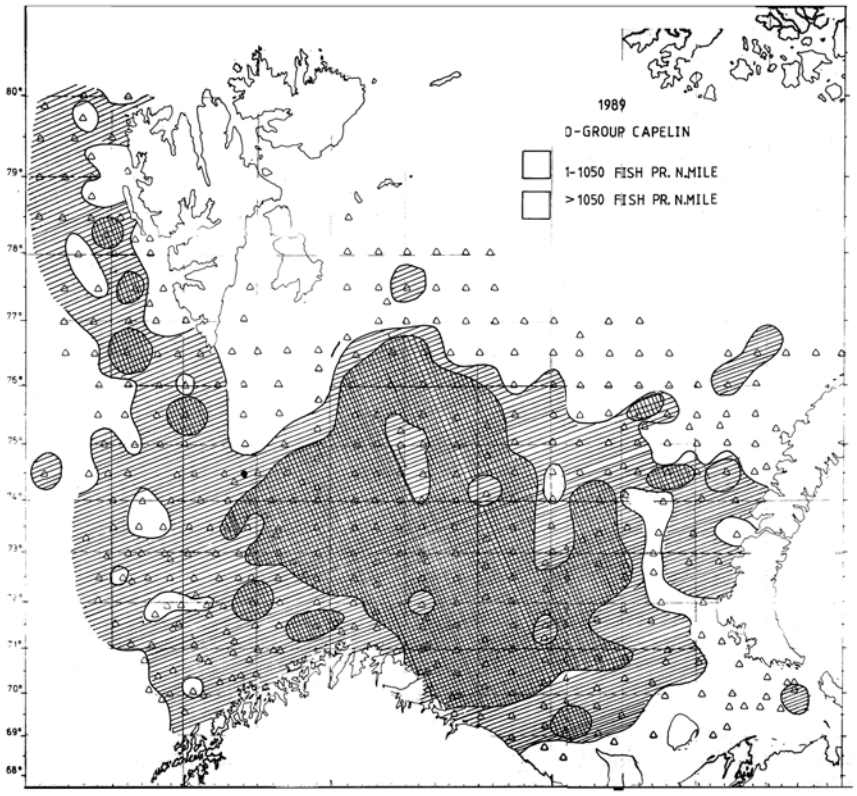

Fig. 17. Distribution of 0-group capelin

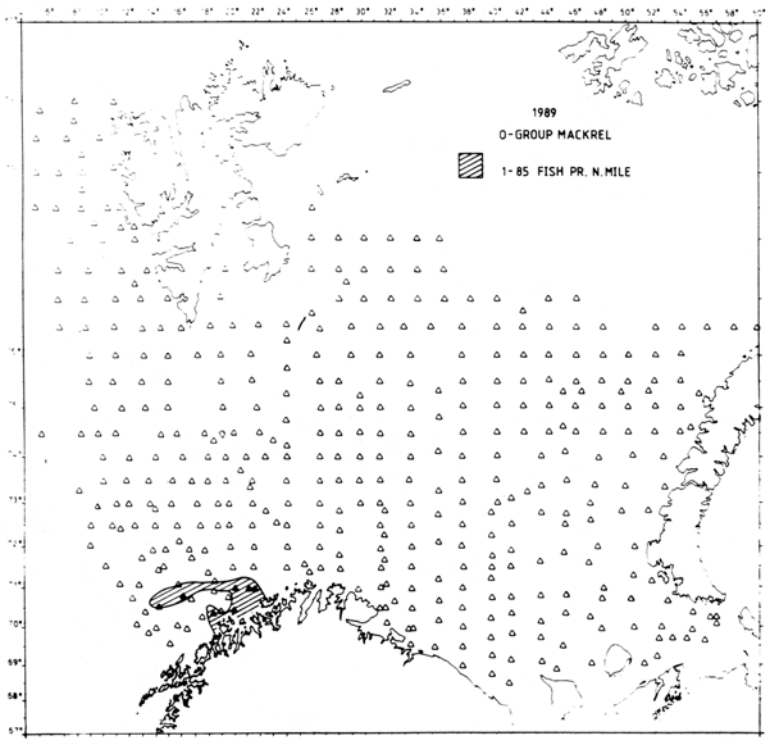

Fig. 18. Distribution of 0-group mackerel

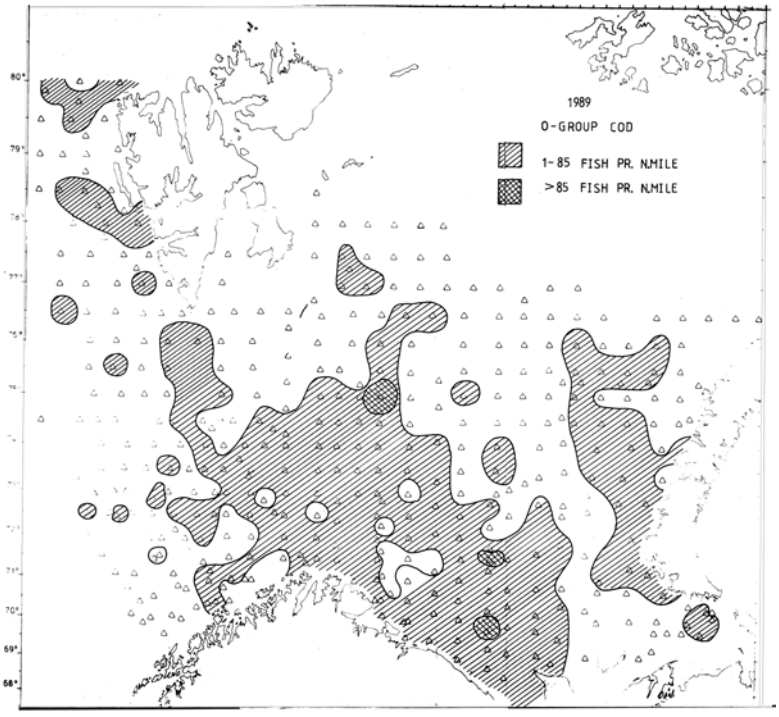

Fig. 19. Distribution of 0-group cod

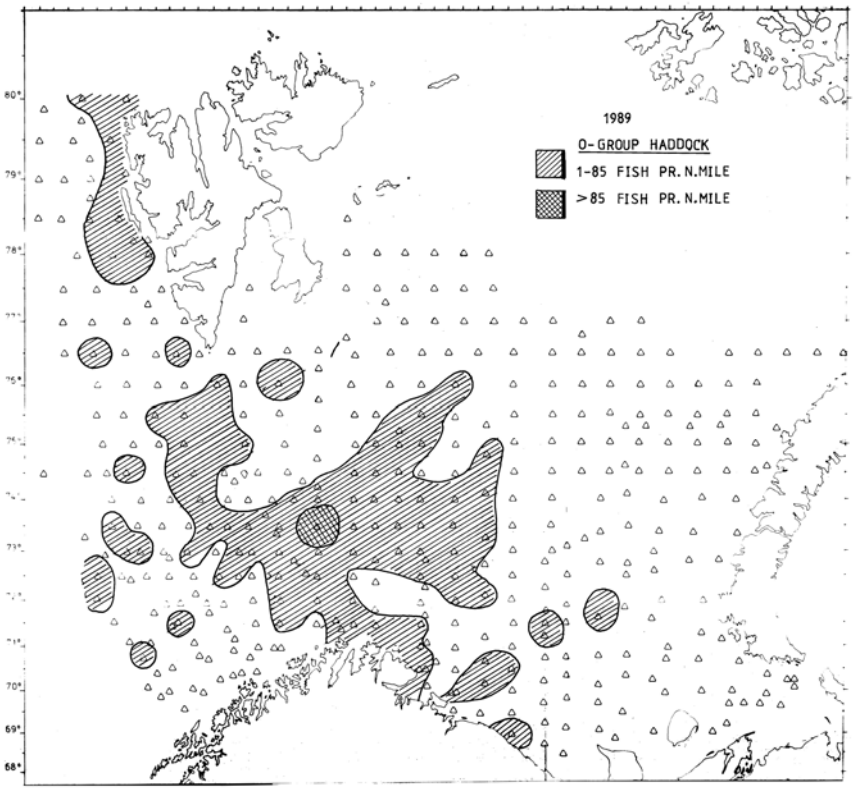

Fig. 20. Distribution of 0-group haddock

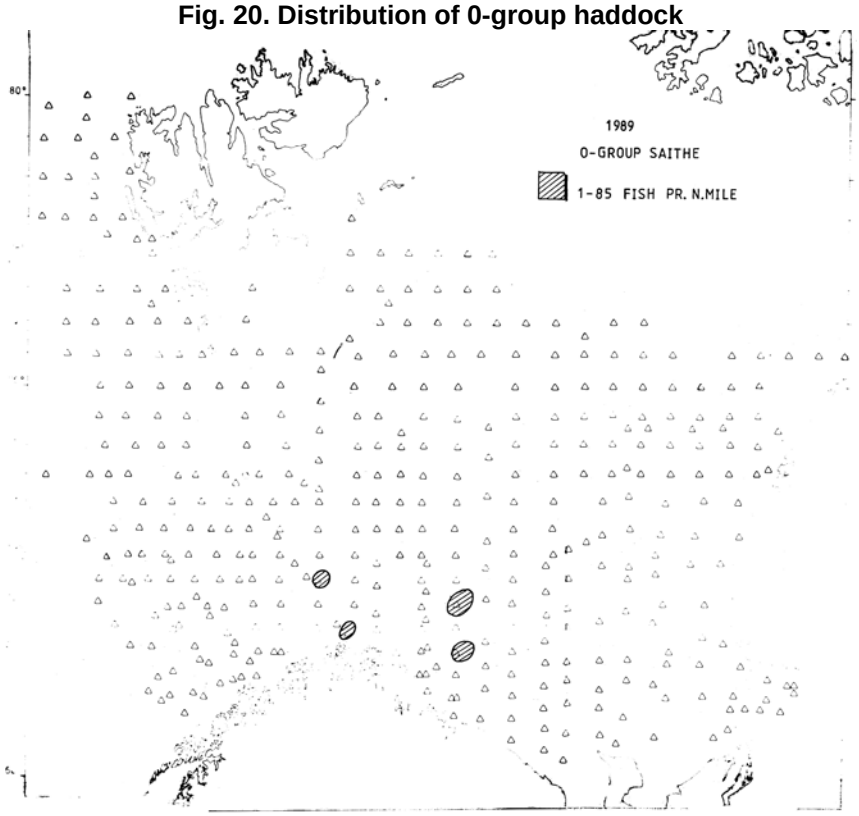

Fig. 21. Distribution of 0-group saithe

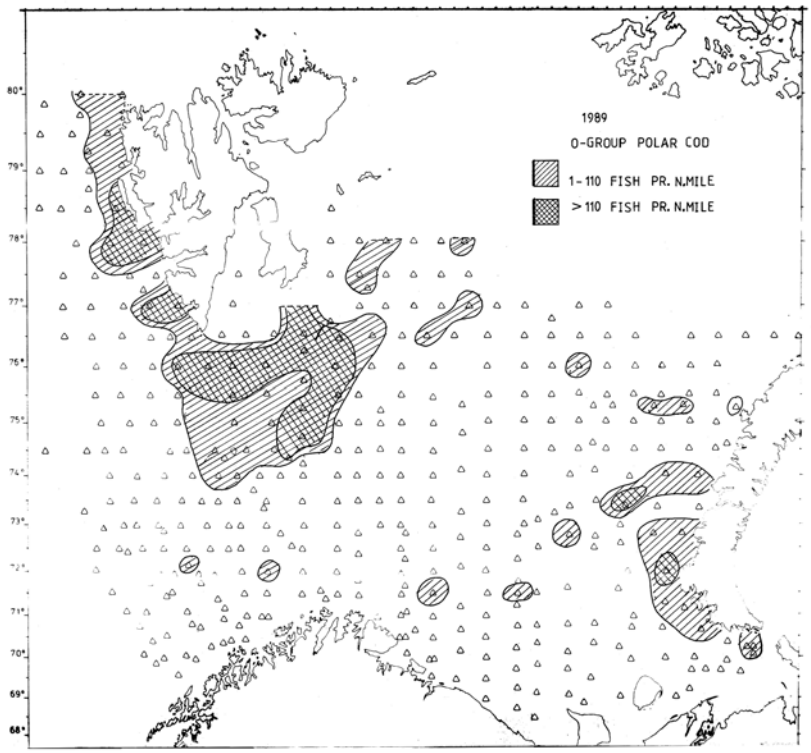

Fig. 22. Distribution of 0-group polar cod

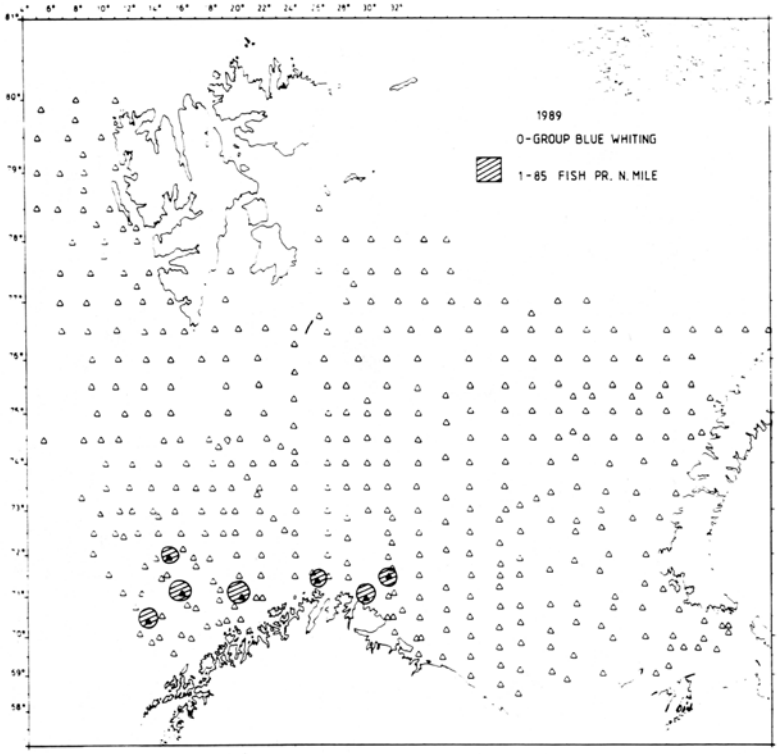

Fig. 23. Distribution of 0-group blue whiting

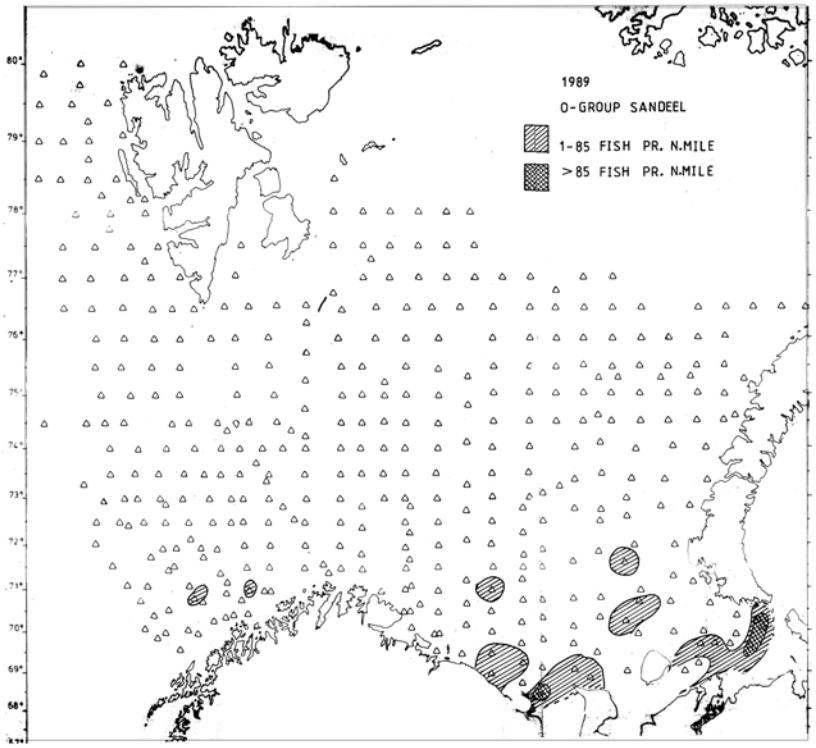

Fig. 24. Distribution of 0-group sandeel

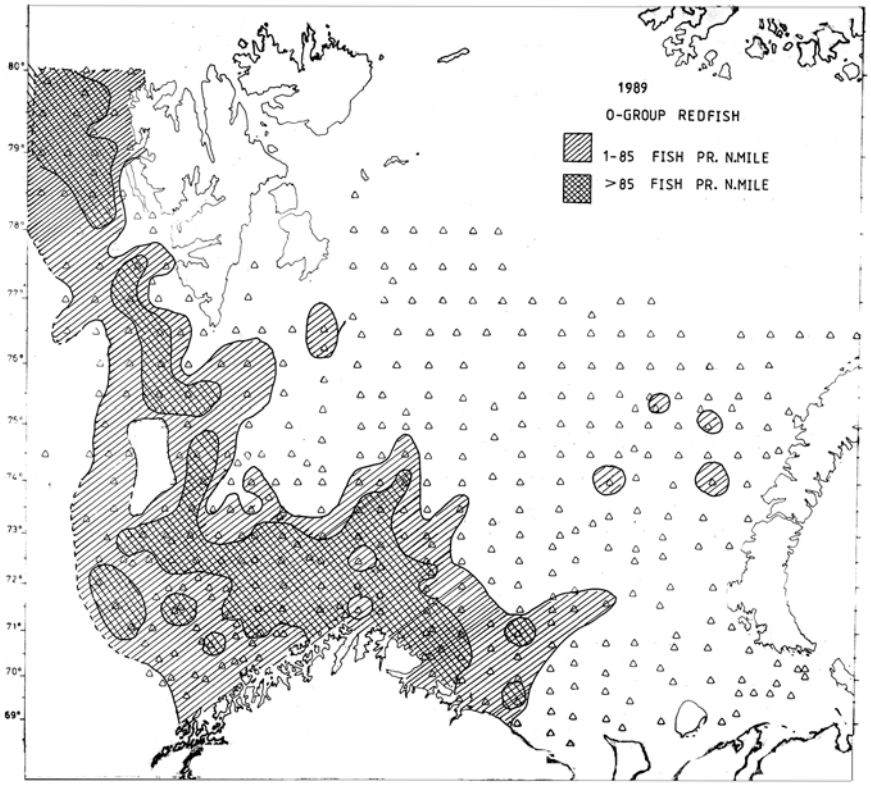

Fig. 25. Distribution of 0-group redfish

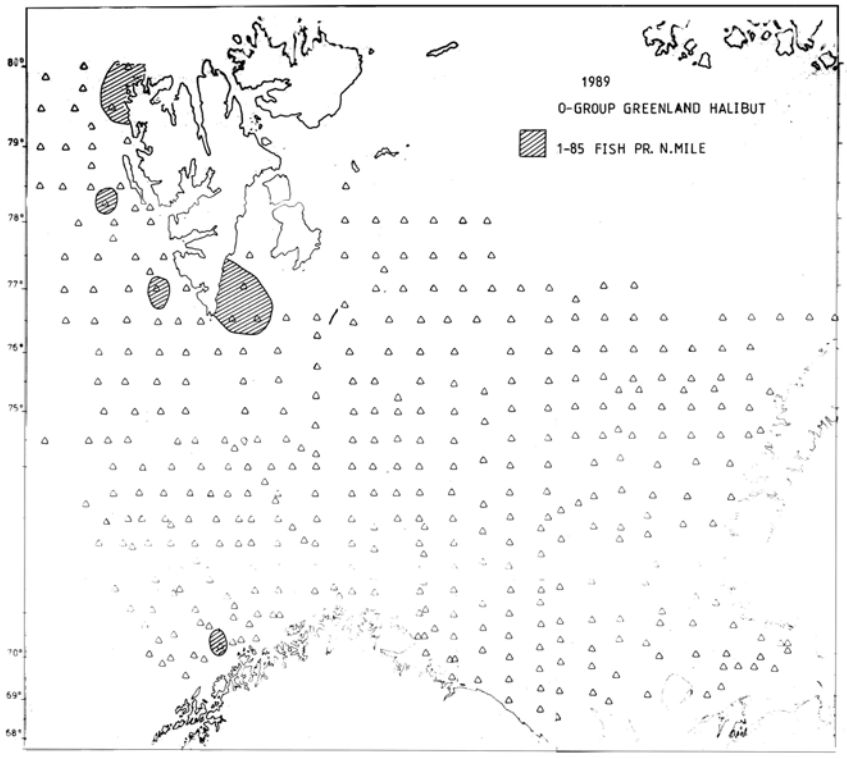

Fig. 26. Distribution of 0-group Greenland halibut

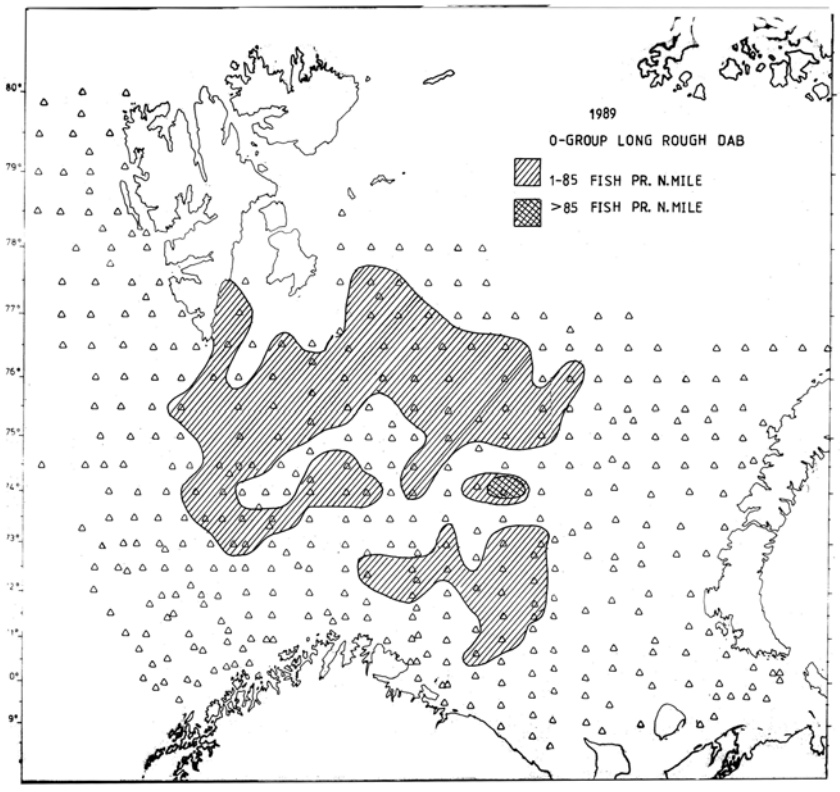

Fig. 27. Distribution of 0-group long rough dab

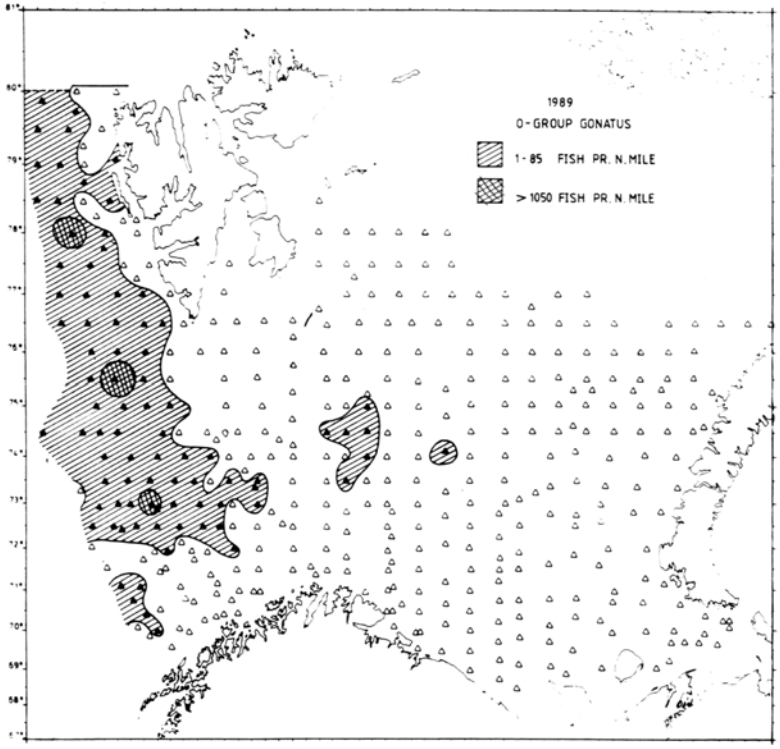

Fig. 28. Distribution of 0-group Gonatus fabricii

International Council for
the Exploration of the Sea

C.M. 1990/G:46
Demersal Fish Committee
Ref.H. Pelagic Fish Committee

Preliminary report of the international 0-group fish survey in the Barents Sea and adjacent waters in August-September 1990

The twenty-sixth annual International 0-group fish survey was made during the period 16 August-5 September 1990 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"	21 August-5 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	21 August-5 September	"
Norway	"Michael Sars"	16 August-5 September	"
USSR	"Professor Marty"	16 August-4 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk

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 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 hydrographical 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 which participated in the survey in 1990, 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 30-40 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 hydrographical stations are given in Fig. 1. Trawl stations with and without catch are given on the distribution charts in Figs. 14-25, as filled and open symbols respectively. The density grading is based on catch in number per 1.0 nautical mile trawling.

Hydrography

Observations were made along all the survey tracks with 5 to 40 nautical miles between stations. Horizontal distribution of temperatures and salinities is shown for 0, 50, 100, 200 m and bottom (Figs. 2-9). Figs. 10-13 show the temperature and salinity conditions along the

Kola, Cape Kanin, Bear Island - North Cape and Bear Island - West sections. The mean temperatures in the main parts of these sections are presented in Table 1.

The mean temperatures in the Barents Sea and adjacent waters as found during the survey, were higher than the long-term means (1965-1990) by 0.6-1.2 °C. This was the case for all sections. However, compared to 1989 the temperature anomalies were less pronounced. Table 1 shows mean temperatures in different layers by section. The features of temperature pattern in the 0-20 m layer over the whole sea should be emphasized. First of all they are associated with the favourable conditions of the spring-summer heating and the absence of considerable wind stirring. This resulted in development of a thermohaloclyne with higher vertical gradients than in previous years. The position of frontal zone of warm Atlantic waters and cold waters of the Barents Sea corresponded to the previous year.

Distribution and abundance of 0-group fish and Gonatus fabricii

Geographical distributions of 0-group fish are shown as shaded areas in Figs. 14-24, and of Gonatus fabricii in Fig. 25. 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 weighed by 10, are given in Table 2. Another set of abundance indices are 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 distribution of 0-group herring in the central part of the area, was to a great extend similar to the distribution pattern in 1989. In the southwestern and northwestern part, however, it occurred more rarely. Although some trawl hauls had high numbers of 0-group herring, most of the stations had low numbers, and hence the logarithmic index for 1990 became only 0.31. This is at the same level as in 1988, but lower than in 1989, and considerably lower than the index in 1983, which was 1.77.

Observations made during the survey indicated that the 0-group herring had already started the schooling behaviour, and this may, reduce the reliability of the calculated abundance index.

Capelin (Fig. 15)

The area of distribution is more limited than in 1989. In the western and northwestern part of the survey area there are practically no capelin observed. The area of dense concentrations is considerably smaller than in 1989, being located in the central part of the Barents Sea. According to great variation in numbers of 0-group capelin in the catches, an abundance index is less reliable compared with other species. Anyhow, the abundance of 0-group capelin is considered to be considerably lower than in 1989 but higher than the average for the 1985-1988 year-classes.

Cod (Fig. 16)

The distribution of cod follows the 1989 pattern in the central and western part of the survey area. However, a larger area of dense concentration is observed in the central part of the distribution area. The patch of 0-group cod close to Novaya Zemlya in 1989 was missing

this year. The logarithmic abundance index is below those found for the 1983-1986 year-classes (Table 3) while the distribution index is at the 1984 and 1986 level (Table 2), but above that for 1983. At this stage the year-class is estimated to be a strong one.

Haddock (Fig. 17)

Haddock is distributed more to the southwest than in 1989, and the distribution is disrupted in the southern part of the Spitsbergen area. The area with high concentrations are larger than in the previous year, and both abundance indices are at the same level as the 1984, but above that for the 1983, indicating a strong year-class at this stage.

Saithe (Fig. 18)

Saithe is distributed in two limited areas in the central part of the survey area. Outside these areas, 1-2 specimens were recorded in a few hauls.

Polar cod (Fig. 19)

The 0-group polar cod is also this year separated in two components, off Spitsbergen and in the southeastern part of the Barents Sea. In the Spitsbergen area the distribution is very much the same as in 1989, but less abundant. In the northern part of the area east of Spitsbergen, there is a rather large area of scattered concentration.

Off Novaya Zemlya the distribution area is small, with mainly scattered concentration.

The abundance index for the Spitsbergen component (i.q. west of 40° E) is calculated to 144, which is lower than in 1989, but at the same level as in 1988, close to the average. In southeast, the abundance index is estimated to 47, close to the 1989 level, which is low.

Blue whiting (Fig. 20)

The blue whiting was located in a limited area from the coast of Finnmark to the central part of the Barents Sea. Only low numbers were caught per haul, but more frequently than in the previous year.

Sandeel (Fig. 21)

The 0-group sandeel was located in the southeastern part of the Barents sea. The area of distribution was significantly larger than in 1989, and the density by far above.

Redfish (Fig. 22)

As observed in 1989, the main concentrations are found off West-Spitsbergen and in the current going east along the Norwegian coast. In general, the distribution pattern is similar to that in the previous years. The abundance index is at the 1987 and 1989 level, indicating a year-class of about average strength.

Greenland halibut (Fig. 23)

Few Greenland halibut were caught in the western part of the survey area. The abundance index is very low, indicating a poor year-class, even less than the 1989 year-class.

Long rough dab (Fig. 24)

The distribution is somewhat more to the west than in 1989 and separated in several patches. Also this year the abundance index is low, indicating a poor year-class.

Gonatus fabricii (Fig. 25)

As in previous year, Gonatus fabricii is distributed in the western part of the survey area. In general, the number caught per trawlhaul is less than in 1989, indicating a reduced abundance.

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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 1990

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
1988	7.1	3.7	4.5	3.9	2.9	5.5	4.2
1989	8.6	4.8	5.8	6.5	3.4	6.9	4.9
1990	8.1	4.4	5.3	5.0	4.2	6.3	5.7
Average 1965-1990	7.3	3.7	4.6	4.2	3.3	5.7	4.5

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	2	69
1980	49	54	79		247	651	12	108
1981	65	30	149		73	861	3	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
1987	102	72	17		155	631	41	174
1988	133	86	144		120	949	8	72
1989	202	112	206		41	698	5	92
1990	465	227	144		48	670	2	35

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	- -		2.15	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
1988	0.32	0.16	0.53	0.33	0.22	0.47	0.13	0.05	0.34
1989	0.59	0.49	0.76	0.38	0.30	0.48	0.14	0.10	0.20
1990	0.31	0.16	0.50	1.23	1.04	1.34	0.61	0.48	0.75

[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							+			
15-19							0.1			
20-24		+	+			+	0.8		0.6	
25-29	+	0.1	+		1.0	6.3	1.8		10.8	
30-34	+	2.7	+	+	23.4	21.3	4.8		24.8	
35-39	+	8.7	0.1	+	9.2	29.8	19.7	50.0	38.6	
40-44		19.6	0.1	0.2	5.1	27.7	27.7		17.8	0.1
45-49		23.8	0.3	0.4	15.0	11.0	21.7		7.1	1.1
50-54	+	22.1	0.7	0.4	41.4	3.8	15.0		0.3	4.5
55-59	0.1	15.8	1.9	1.1	4.7	0.1	6.5			4.8
60-64	0.2	5.9	4.6	2.6	0.2	+	1.4			6.9
65-69	1.4	1.1	7.4	3.5	+	+	0.5			10.0
70-74	3.7	0.2	10.6	5.4		+	+			22.4
75-79	5.1	+	12.6	7.4			+	50.0		25.4
80-84	5.0		14.3	8.1						19.5
85-89	18.2		15.4	9.1			+			4.5
90-94	36.4		12.8	8.0			+			0.7
95-99	20.7		9.3	6.9			+			0.1
100-104	5.7		5.7	6.2						
105-109	2.0		2.7	7.7						+
110-114	1.1		0.9	7.6						
115-119	0.2		0.4	7.1						
120-124	0.1		0.1	6.7						
125-129	0.1		+	4.9						+
130-134			0.1	3.1						
135-139			+	1.8						
140-144			+	1.1						
145-149				0.7						
150-159				+						
Total numbers	32184	207740	37891	6923	1682	187185	617224	5	371	8227
Mean length, cm	8.9	4.9	8.4	9.9	4.5	3.9	4.5	6.0	3.7	7.4

Appendix

Survey period	Research vessel	Research Institute	Participants
16 August- 4 September	"Professor Marti"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk	I. Altynov, A. Dorchenkov, V. Kapralov, V. Komlichenko, A. Kuzmichev, L. Kuzmin, Yu. Lepesevich, N. Makeeva, V. Ryazantsev, M. Shevelev, V. Tretyak, A. Vlakhno
20 August- 4 September	"Pinro"	"	S. Boranov, A. Cheremovsky, I Dolgolenko, V. Doronin, A. Gordov, V. Khvastov, Yu. Perepechaev, N. Plokhikh, E. Shamrai, N. Ushakov, V. Zhuravlev
21 August- 5 September	"G.O. Sars"	Institute of Marine Research, Bergen	O.J. Gullaksen, K. Hansen, K.A. Hansen, T. Haugland, A.Hylen, H. Kismul, M. Mögster, T. Wickström.
16 August- 5 September	"Michael Sars"	"	J. Alvsväg, B. Hoffstad, K. Lauväs, T. Mörk, K. Nedreaas, Ø. Navdal, J. E. Nygärd.
20 August- 5 September	"Eldjan"	"	T.I. Halland, J.C. Hoist, E. Molvær, T. Monstad, A. Romslo, E. Skoglund, Ø. Tangen

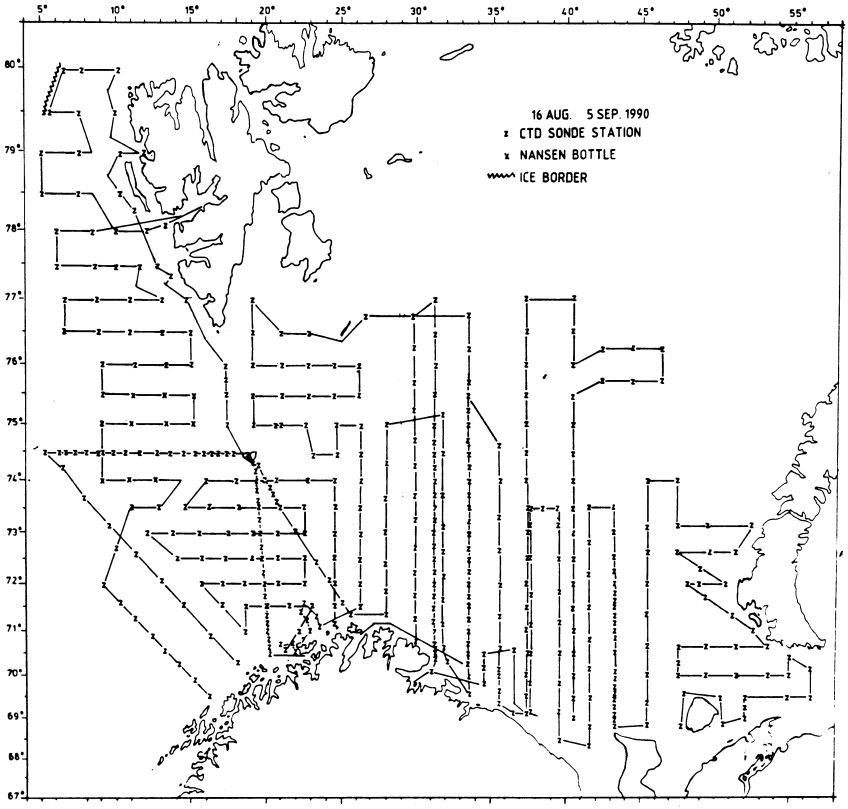

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

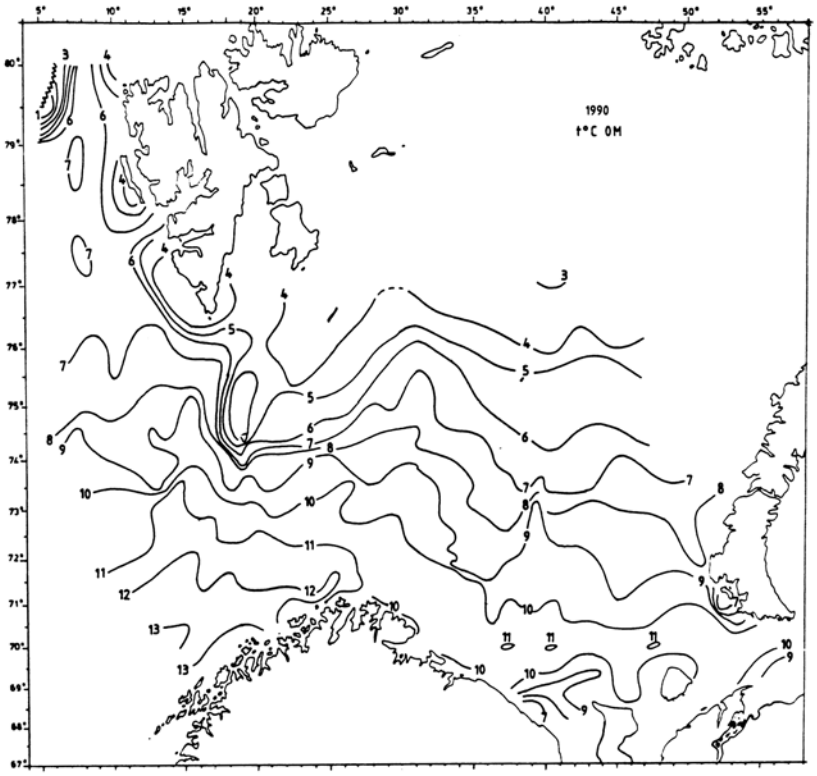

Fig. 2. Isotherms at 0 m

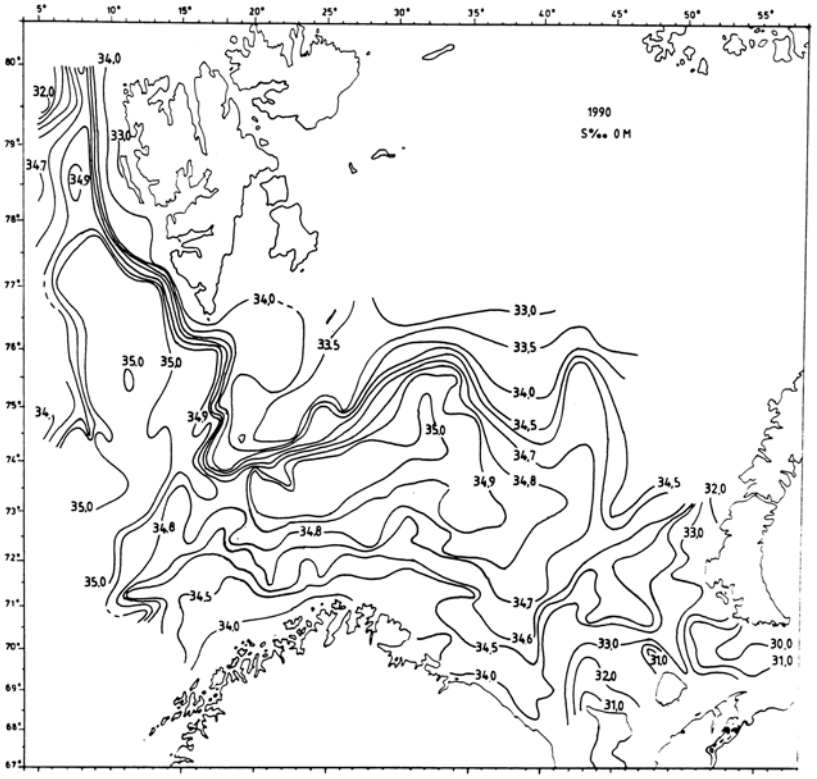

Fig. 3. Isohalines at 0 m

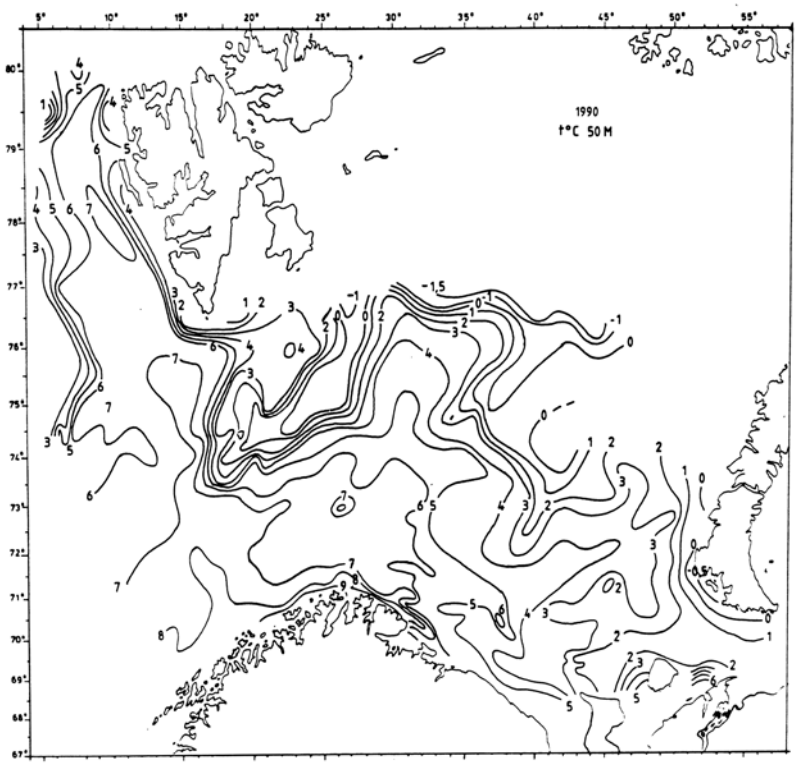

Fig. 4. Isotherms at 50 m

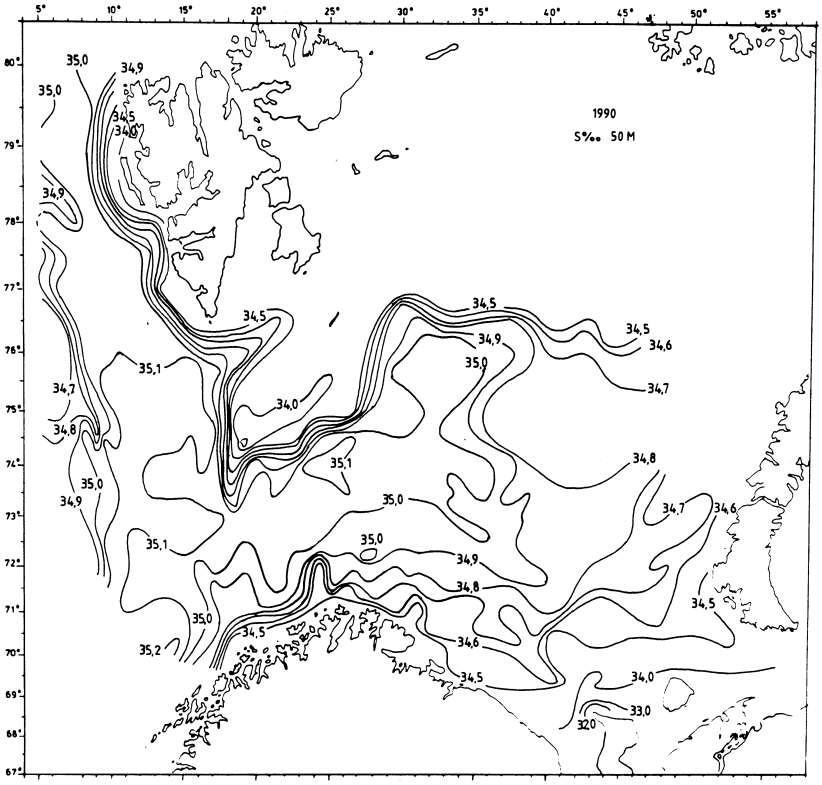

Fig. 5. Isohalines at 50 m

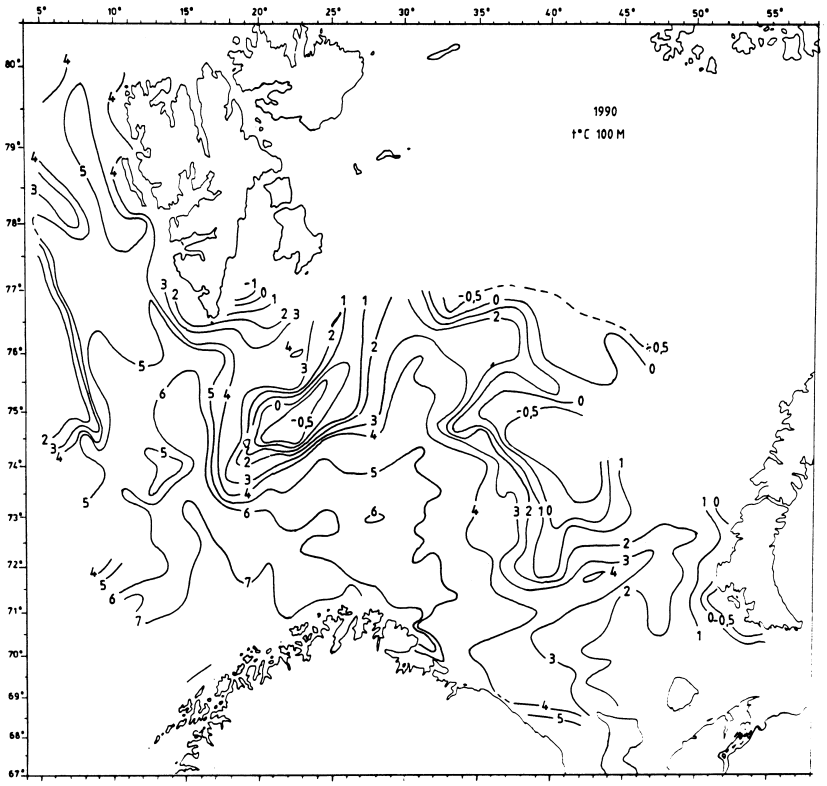

Fig. 6. Isotherms at 100 m

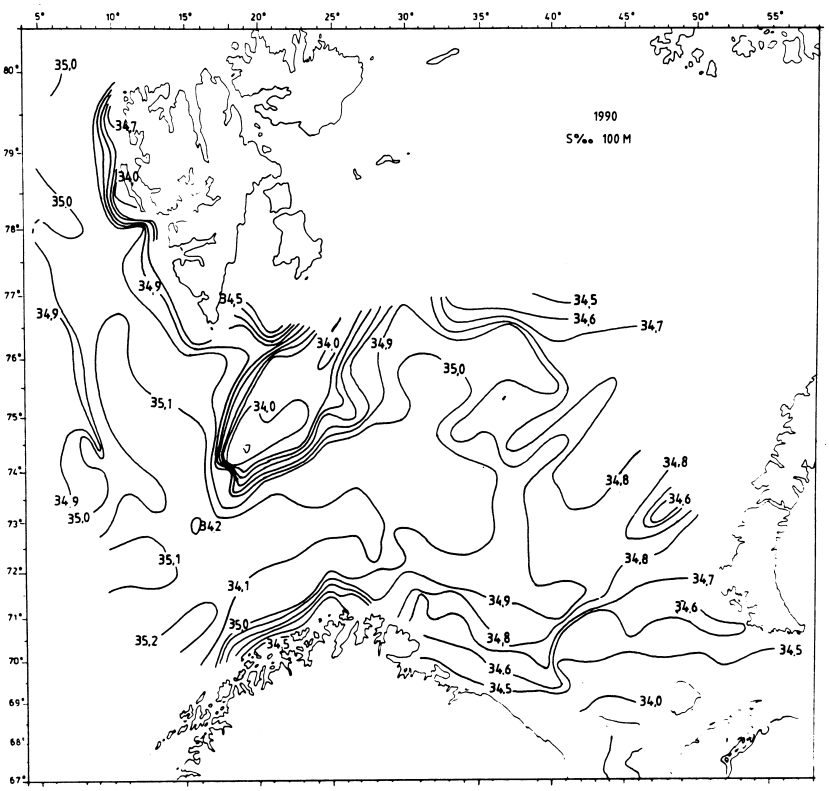

Fig. 7. Isohalines at 100 m

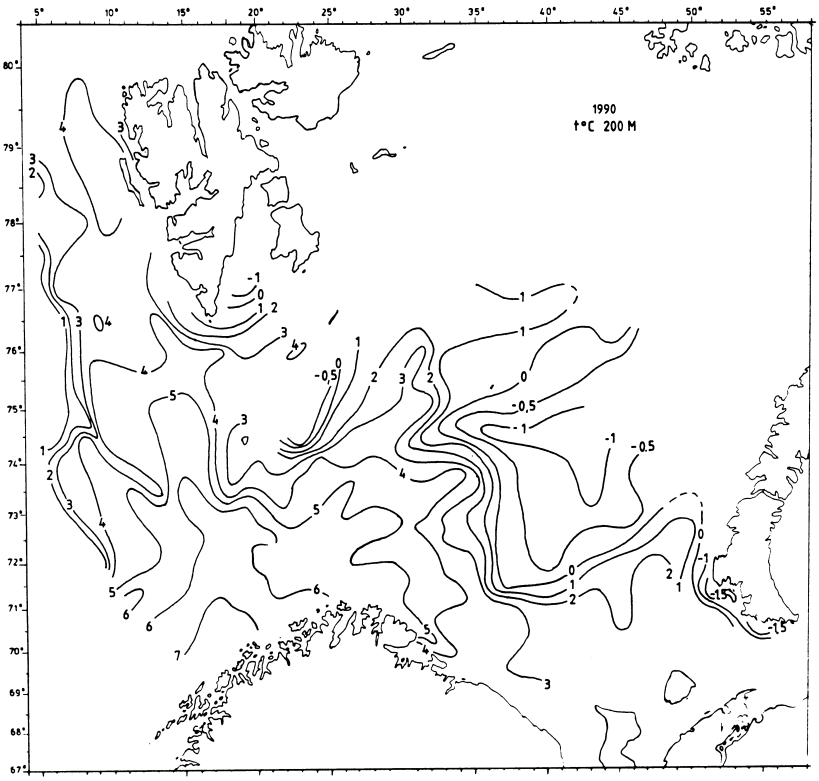

Fig. 8. Isotherms at 200 m

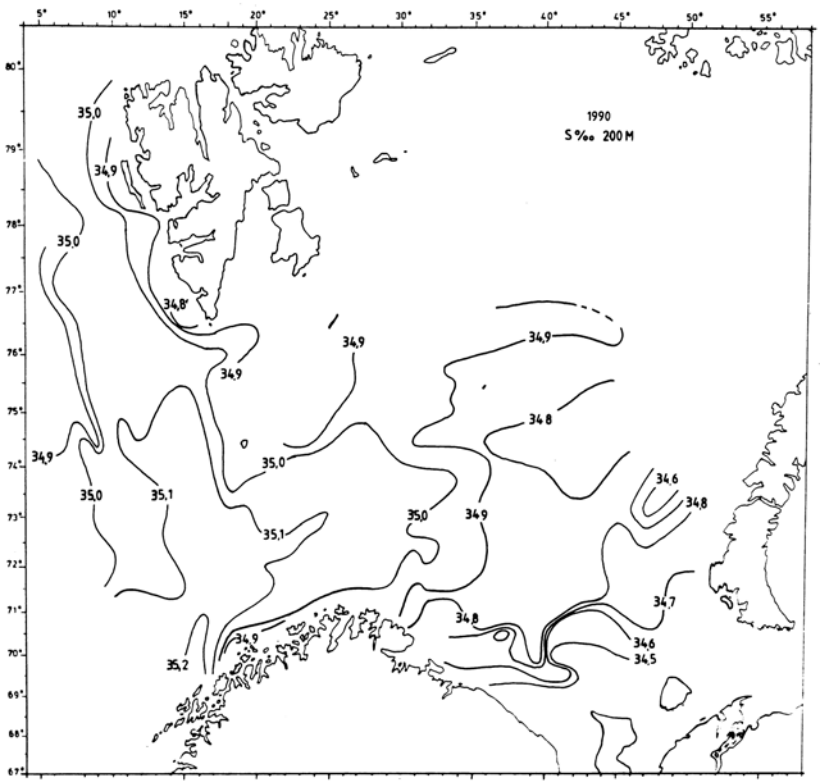

Fig. 9. Isohalines at 200 m

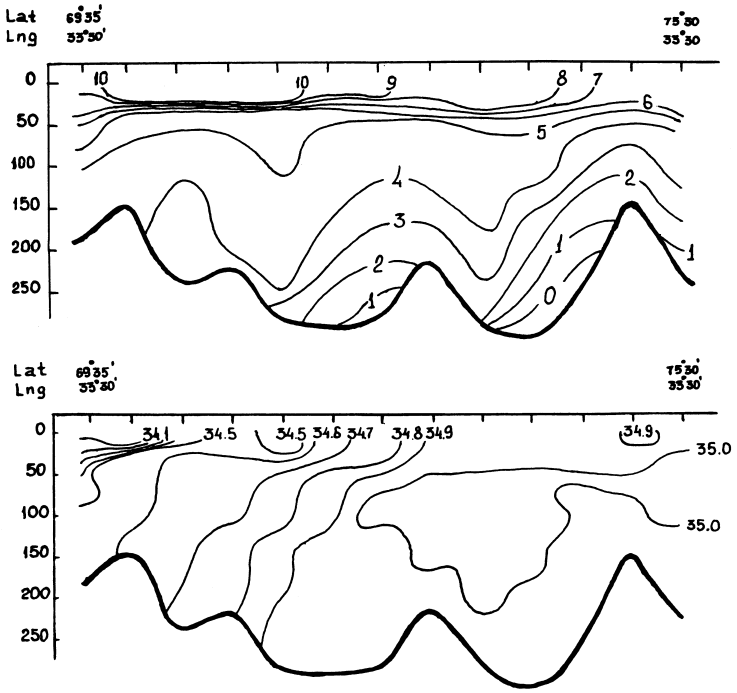

Fig. 10. Hydrographic section along the Kola meridian. Temperature and salinity

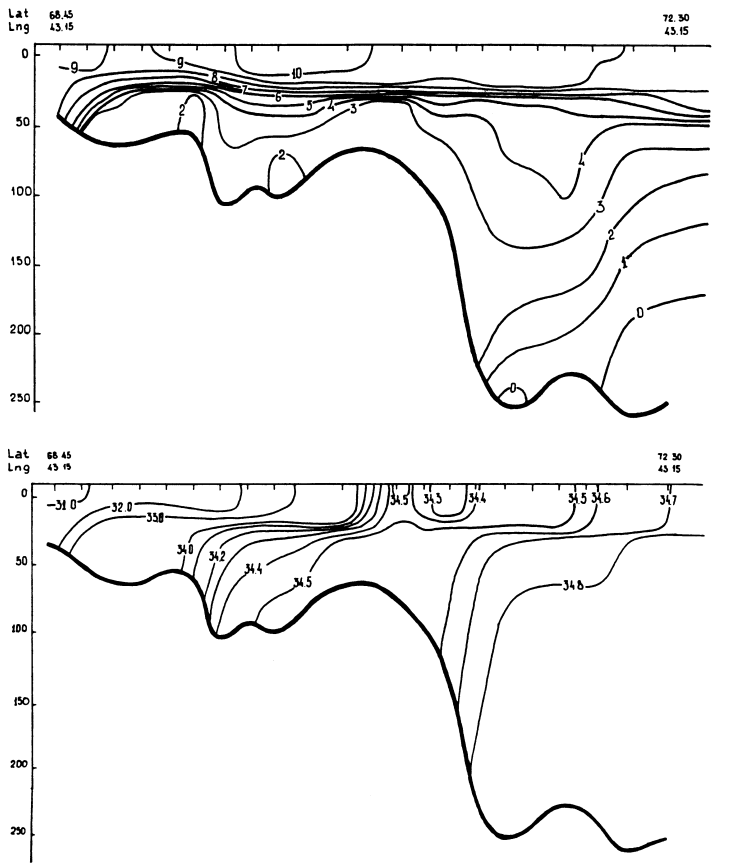

Fig. 11. Hydrographic section Cape Kanin-North. Temperature and salinity

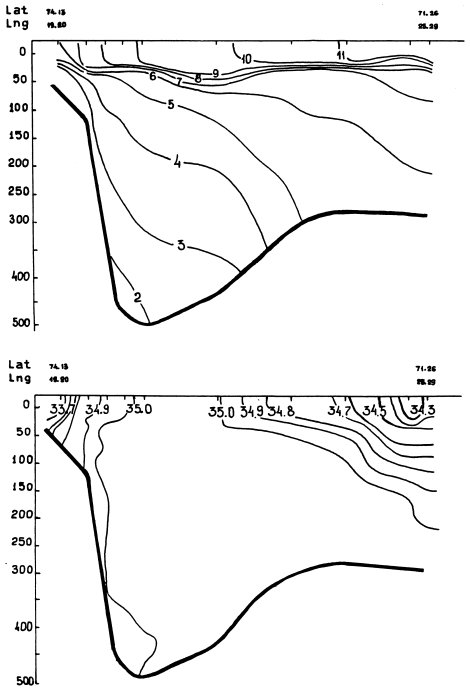

Fig. 12. Hydrographic section Bear Island-North Cape. Temperature and salinity

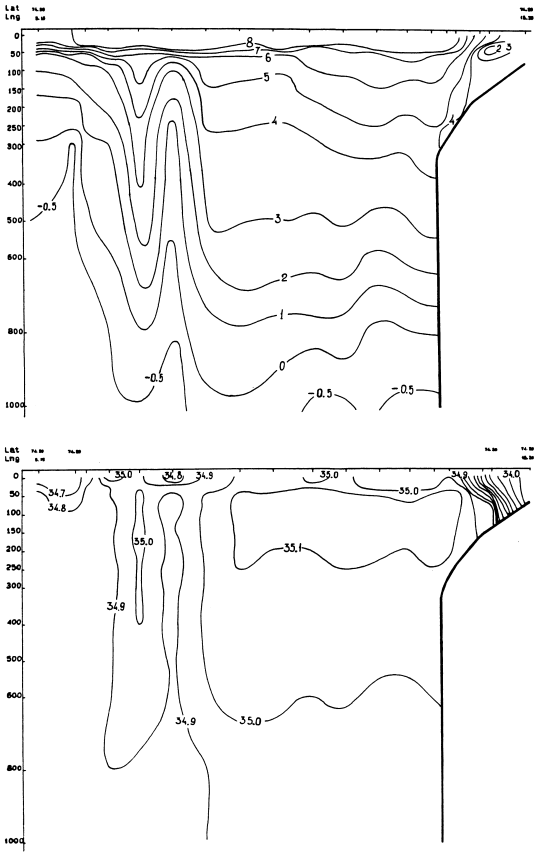

Fig. 13. Hydrographic section Bear Island – West. Temperature and salinity

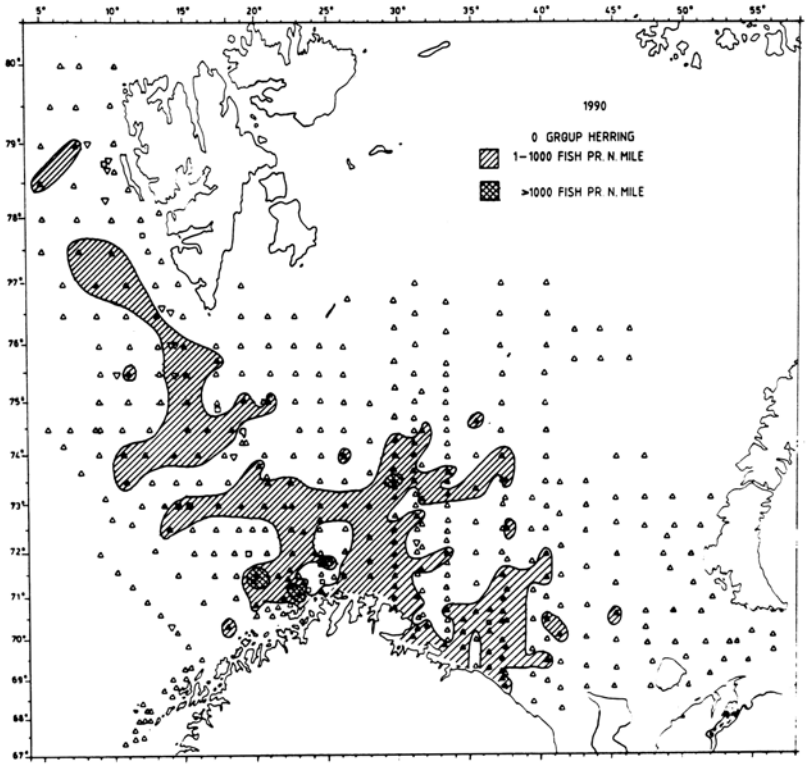

Fig. 14. Distribution of 0-group herring

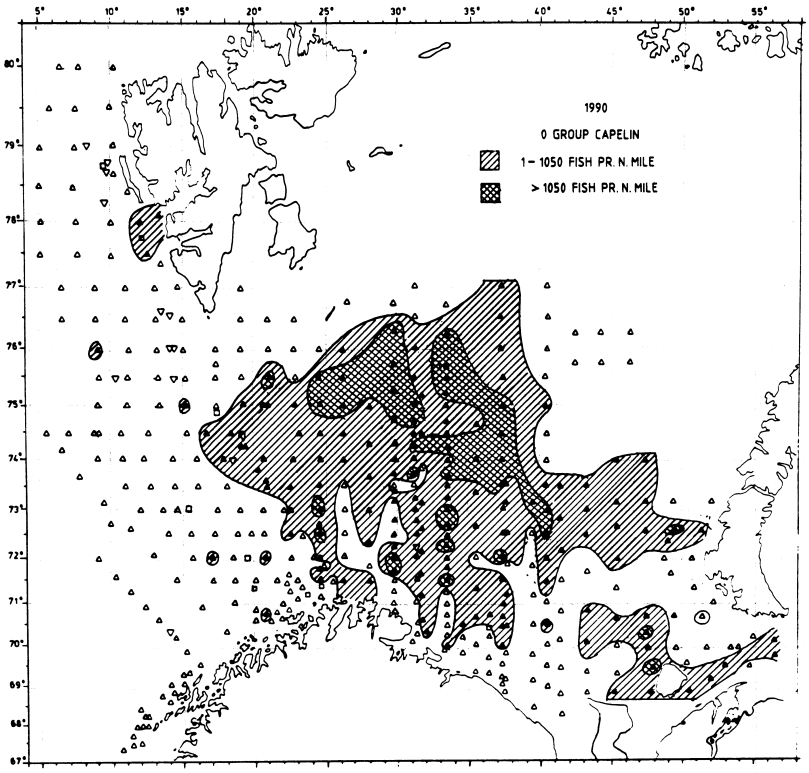

Fig. 15. Distribution of 0-group capelin

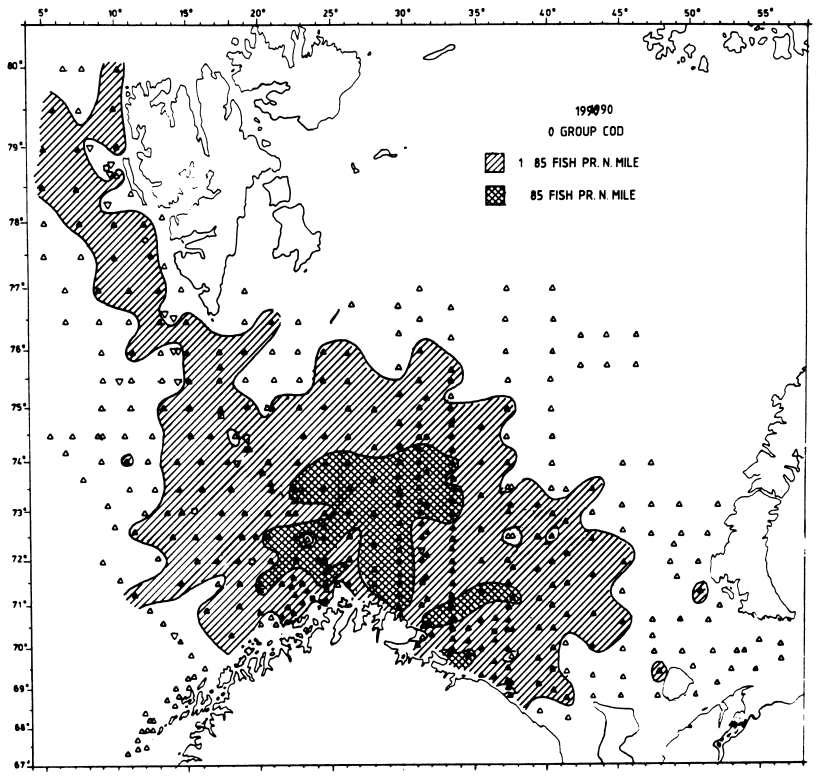

Fig. 16. Distribution of 0-group cod

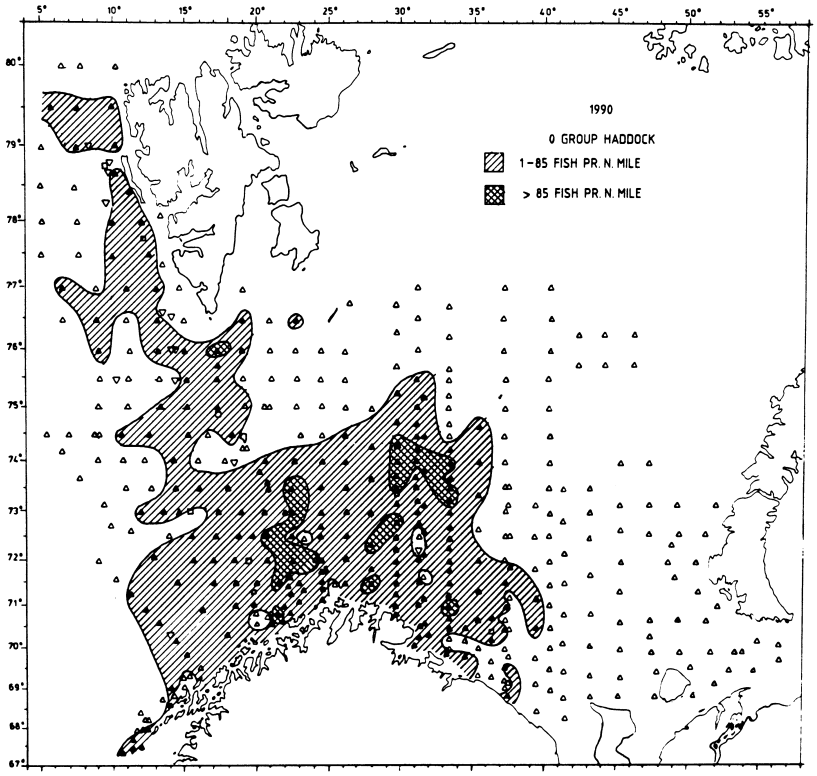

Fig. 17. Distribution of 0-group haddock

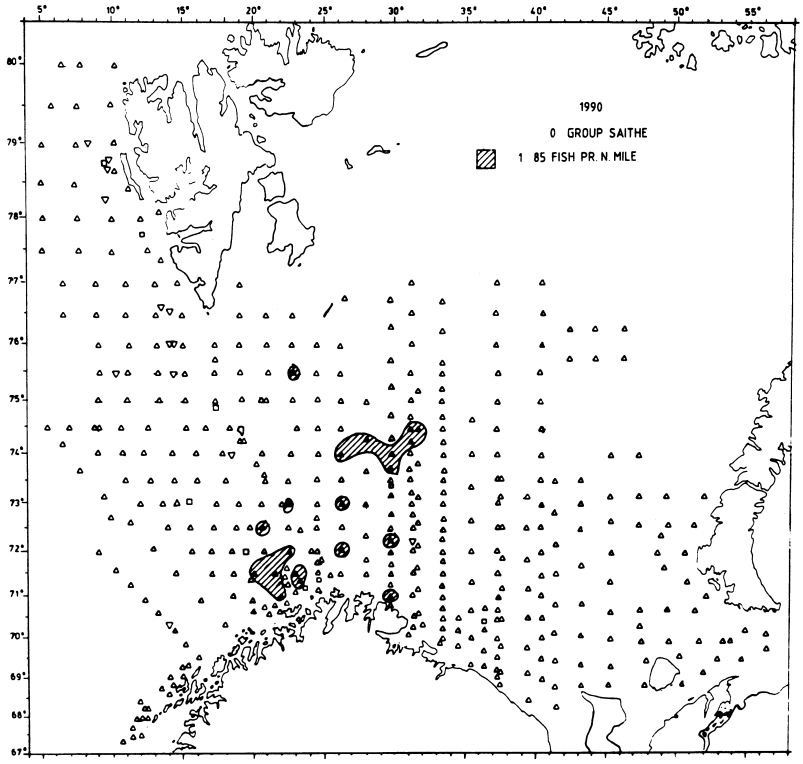

Fig. 18. Distribution of 0-group saithe

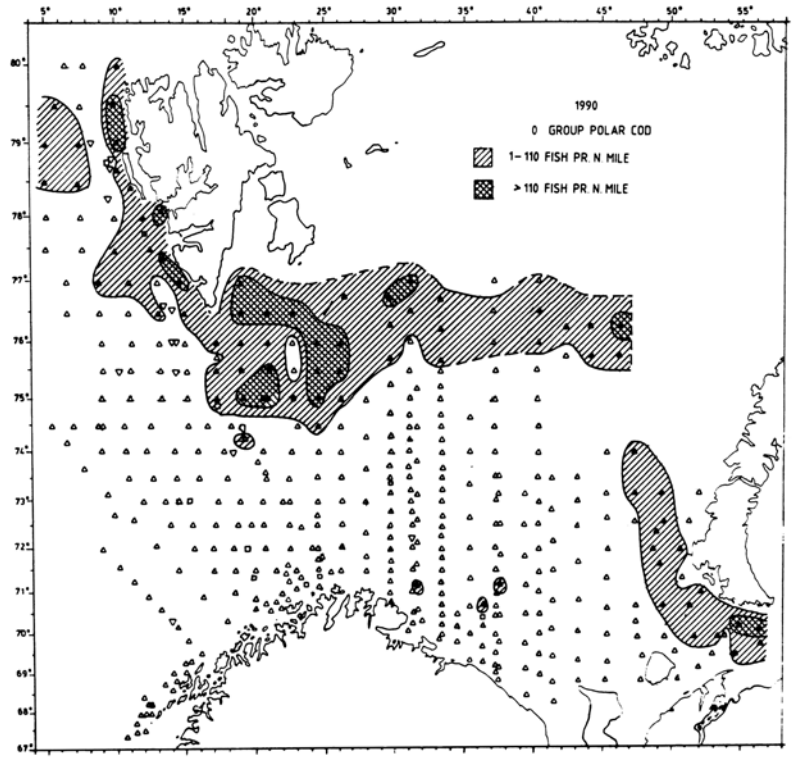

Fig. 19. Distribution of 0-group polar cod

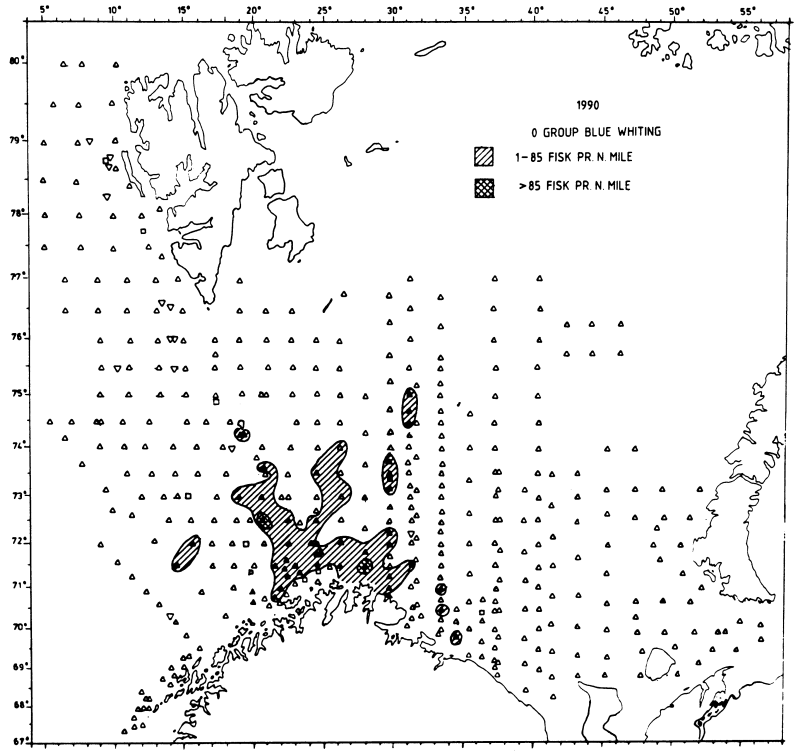

Fig. 20. Distribution of 0-group blue whiting

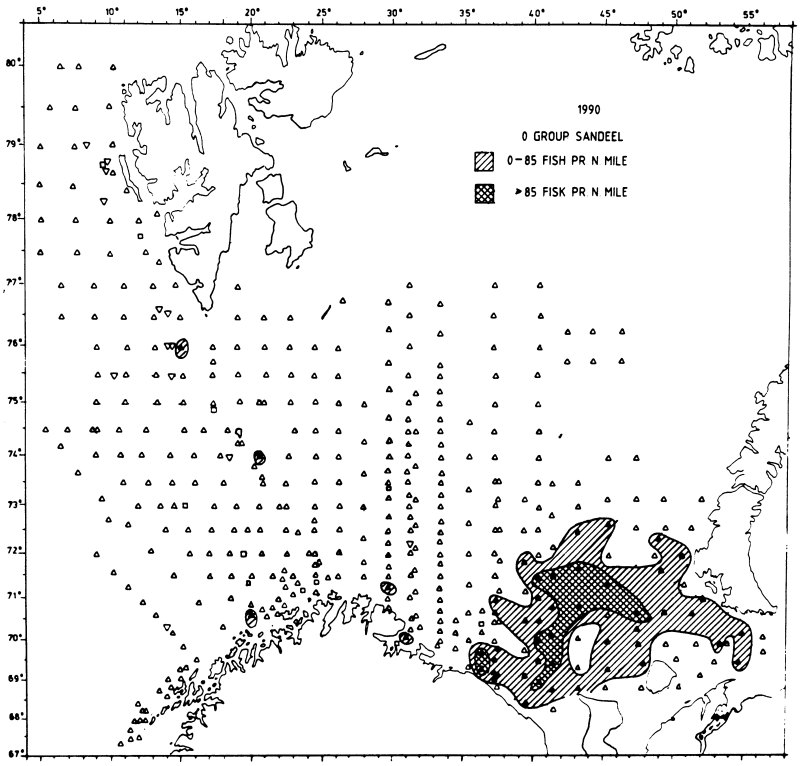

Fig. 21. Distribution of 0-group sandeel

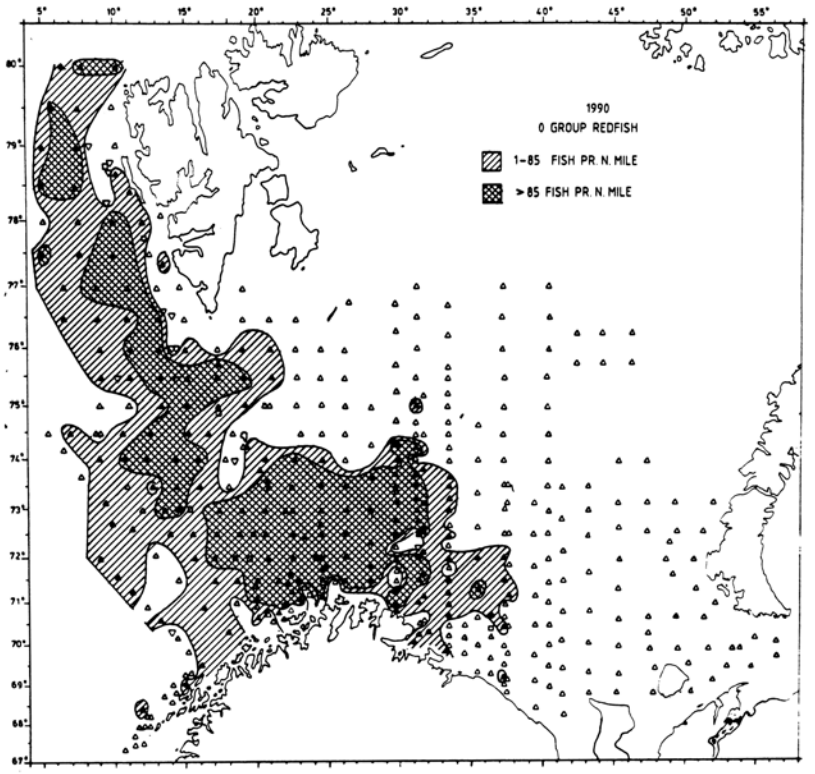

Fig. 22. Distribution of 0-group redfish

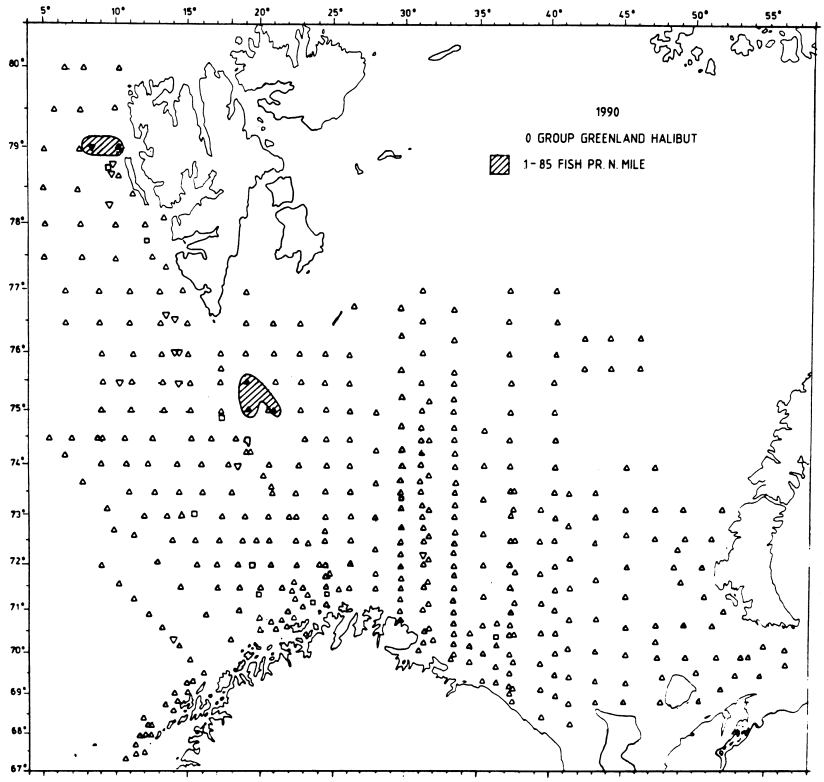

Fig. 23. Distribution of 0-group Greenland halibut

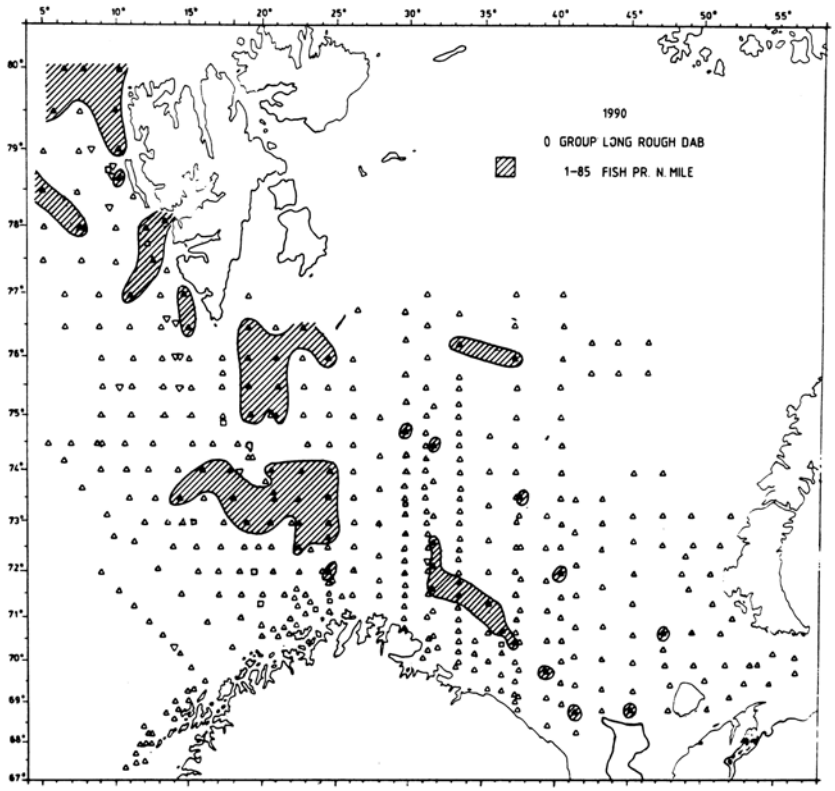

Fig. 24. Distribution of 0-group long rough dab

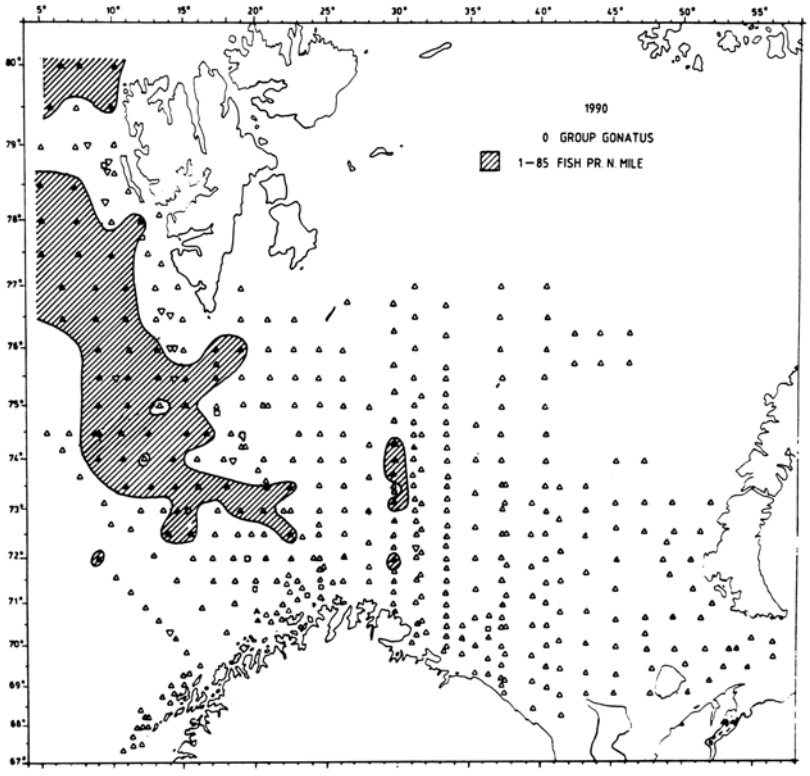

Fig. 25. Distribution of 0-group Gonatus fabricii

International Council for
the Exploration of the Sea

C.M. 1991/G:50 Ref. H
Demersal Fish Committee

Preliminary report of the international 0-group fish survey in the Barents Sea and adjacent waters in August-September 1991

The twenty-seventh annual International 0-group fish survey was made during the period 15 August-9 September 1991 in the Barents Sea and adjacent waters. The following research vessels participated in the survey:

State	Name of vessel	Survey period	Research Institute
Norway	"Johan Hjort"	8 August-9 September	Institute of Marine Research, Bergen
Norway	"G.O. Sars"	19 August-9 September	"
Norway	"Michael Sars"	15 August-9 September	"
USSR	"Professor Marty"	15 August-6 September	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
USSR	"Fridtjof Nansen"	18 August-6 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 10 - 11 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 hydrographical 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 which participated in the survey in 1991, 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 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 mile was made when 0-group fish layer was recorded on the echo-sounder deeper than 60 m.

Survey tracks and hydrographical stations are given in Fig. l. Trawl stations with and without catch are given on the distribution charts in Figs. 14-23, as filled and open symbols respectively. The density grading is based on catch in number per 1.0 nautical mile trawling.

Hydrography

Observations were made along all the survey tracks with 5 to 40 nautical miles between stations. Horizontal distribution of temperatures and salinities is shown for 0, 50, 100 and 200 m (Figs. 2-9). Figs.10-13 show the temperature conditions along the Kola, Cape Kanin, Bear Island-North Cape and Bear Island - West sections and Fig.11 the salinity conditions along the Cape Kanin section. The mean temperatures in the main parts of these sections are presented in Table 1.

Mean water temperatures in 0-200 m along all standard sections covered during the survey, were above the long-term average (1965-1991) by 0.3-0.9 °C. Compared to 1990 a minor increase in temperature was recorded in 50-200 m on the Kola section. In the Western Spitsbergen and the North Cape Currents (0-200 m) as well as in the Murmansk Current (0-50 m), mean water temperature was 0.3 to 0.5 °C colder than last year. The thermal conditons of the Barents Sea and adjacent waters showed a cooling in the upper homogenious layer. In 1991 the 10 °C isotherm in 0 m was recorded only as far as North Cape, while in 1990 it reached southern Novaya Zemlya. Distribution of water temperatures in the layer from the seasonal thermocline down to bottom in the survey area was close to that observed last year. The seasonal thermocline was weak over nearly the whole Barents Sea, which seems to be associated with cooling in the upper homogeneous layer. The frontal zone position corresponds to the long-term mean.

Distribution and abundance of 0-group fish and Gonatus fabricii

Geographical distributions of 0-group fish are shown as shaded areas in Figs. 14-23, and of Gonatus fabricii in Fig.24. 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 weighed by 10, are given in Table 2. Another set of abundance indices are 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)

In general, the distribution of herring was similar to that of 1989. However, in the south-western part more dense concentrations were recorded. Herring occurred mainly in the western Barents Sea along the edge of the shelf between the Norwegian coast and up to 80° off Western Spitsbergen. In southern areas, herring was found from the coast up to 75° N and eastwards as far as 43° E. The logarithmic abundance index is estimated to be 1.19, which is considerable higher than the 1990 index (0.31) and slightly below the 1983 index (1.77). The estimated index indicates that the 1991 year-class is relatively strong.

Capelin (Fig. 15)

The distribution area was much smaller than in 1989 and 1990. Capelin occurred mostly in the eastern and central areas and partly west of Spitsbergen. Dense concentrations were seen as separate patches, but the overall catch in numbers were smaller than in recent years. The 1991 year- class may therefore be estimated as poor or below average.

Cod (Fig. 16)

Cod was distributed over a large area, extending from Norway and Murman coast to 80° N off Western Spitsbergen and to 76°30' N in central parts. In the east it was recorded north to 73°30' N and west of 46° E. Compared to the last 5 years, dense concentrations were recorded over much larger areas in the central and western parts of the survey area. The abundance index for the 1991 year-class is at the same level as the 1985 and above the 1983--. At this stage the 1991 year-class has been classified as a very strong one.

Haddock (Fig. 17)

Haddock was mainly distributed in western areas from the Norwegian coast to 80° N of Western Spitsbergen. The eastern limit in the Barents Sea was at about 37° E. Dense concentrations were found in most of the western areas and the area with high concentrations was by far larger than in all preceding years. The abundance index is the highest observed since the 0-group investigations started in 1965 and the 1991 year-class may be classified as rich.

Saithe

Like in previous years only single fish occurred in a few hauls, mainly in the central part of the Barents Sea.

Polar cod (Fig. 18)

Like previous years, polar cod was distributed in two separated areas – in the south-east along Novaya Zemlya, and in the north-west off Eastern Spitsbergen. In the north-western area, the 1991 year-class was estimated to be weaker than those of the three proceeding years, but close to that of 1985. The 0-group index for this area indicate a rather poor year-class.

In the south-east the area of dense and scattered concentrations were larger than in the three proceeding years, but smaller than in 1985. The abundance index indicates that the 1991 year-class in this component may be considered as a strong one.

Blue Whiting

Only a few specimens of blue whiting were caught this year.

Redfish (Fig. 19)

The main concentrations of redfish occurred along the western edge of the shelf. The distribution pattern showed several separate patches. However, the area of scattered and dense concentrations were much smaller than in previous years. The abundance index is the lowest since 1972 and the 1991 year-class may be considered as poor.

Green1and halibut (Fig. 20)

Single fish occurred in hauls west and east of Spitsbergen. The abundance index indicates that the 1991 year-class is very poor.

Long rough dab (Fig. 21)

This species occurred in patches almost over the whole area. Only few fish were found in the catches. The abundance index is the lowest recorded, and the year-class is considered to be poor.

Sandeel (Fig. 22)

Like in previous years sandeel was distributed in the south-eastern part of the survey area, but the concentrations in 1991 were less than in previous years.

Gonatus (Fig. 23)

Only a few squids occurred in hauls in the western areas. The distribution area was smaller than in the three proceeding 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.

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. 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 August-September 1991

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
1987	6.2	3.3	3.9	2.6	2.5	5.2	3.9
1988	7.1	3.7	4.5	3.9	2.9	5.5	4.2
1989	8.6	4.8	5.8	6.5	3.4	6.9	4.9
1990	8.1	4.4	5.3	5.0	4.2	6.3	5.7
1991	7.6	4.6	5.3	5.0	4.2	6.0	5.2
Average 1965-1991	7.3	3.7	4.6	4.2	3.3	5.7	4.5

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	2	69
1980	49	54	79		247	651	12	108
1981	65	30	149		73	861	3	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
1987	102	72	17		155	631	41	174
1988	133	86	144		120	949	8	72
1989	202	112	206		41	698	5	92
1990	465	227	144		48	670	2	35
1991	766	472	90		239	200	1	28

Table 3. Estimated indices with 90 % confidence limits of year-class abundance for 0-group herring, cod and haddock in the survey 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	-	-	2.15	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
1988	0.32	0.16	0.53	0.33	0.22	0.47	0.13	0.05	0.34
1989	0.59	0.49	0.76	0.38	0.30	0.48	0.14	0.10	0.20
1990	0.31	0.16	0.50	1.23	1.04	1.34	0.61	0.48	0.75
1991	1.19	0.90	1.52	2.30	1.97	2.65	1.17	0.98	1.37

[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							+			
15-19							+		0.2	
20-24					0.2	+	0.4		0.3	
25-29		+	+		4.9	+	5.5		0.9	2.0
30-34		0.2	+	0.1	24.1	1.0	33.8		9.2	1.1
35-39		3.1	0.1	0.1	41.1	7.5	31.6		29.9	20.2
40-44	+	12.7	0.3	0.4	26.5	31.2	19.2		34.2	39.1
45-49	+	31.3	1.4	0.9	3.1	54.8	7.9		22.6	19.9
50-54	+	22.1	3.8	2.0	0.1	4.6	1.6		2.8	2.4
55-59	0.9	19.9	5.6	3.5		0.9	0.1	16.7		3.0
60-64	8.7	5.2	7.4	5.8		+		16.7		6.6
65-69	13.6	2.4	9.3	8.7				16.7		3.3
70-74	19.5	1.6	11.6	9.2						0.9
75-79	15.7	1.0	9.3	9.9				50.0		0.9
80-84	14.0	0.3	11.4	13.4						0.1
85-89	8.8	0.1	10.8	11.5						0.1
90-94	6.7	+	12.0	10.3						
95-99	4.3		8.6	6.5						0.3
100-104	3.5		5.3	6.5						
105-109	3.4		2.1	4.1						
110-114	0.9		0.7	3.1						
115-119	0.1		0.2	1.5						
120-124	+		+	1.3						
125-129	+			0.6						
130-134				0.4						
135-139				0.1						
140-144				+						
Total numbers	366708	315736	63209	29497	3050	240430	22793246		579	1084
Mean length, cm	7.9	5.2	8.0	8.4	3.7	4.5	3.7	7.0	4.1	4.6

Appendix

Survey period	Research vessel	Research Institute	Participants
15 August- 6 September	"Professor Marti"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk	A. Cheremovsky, I. Dolgolenko, A. Gordov, V. Khastov, A. Krysov, Yu. Lepecevich, V. Ozhiguin, B. Shein, V. Tretyiak, D. Tyan, V. Zhuravlev
18 August- 6 September	"Fridtjof Nansen"	"	Yu.Ablyassov, V. Chizhikov, V. Formichev, S. Kuzetsov, V. Makhonin, A. Mukhin, E. Shamrai, A. Shatilov, A. Tarasov, S. Ustinov
19 August- 9 September	"G.O. Sars"	Institute of Marine Research, Bergen	P. de Barros, T. Haugland, G. Iversen, M. Møgster, T. Mørk, B. Røttingen, R. Toresen
15 August- 9 September	"Michael Sars"	"	E. Holm, R. Johannessen, B. Kvinge, S. Mehl, G. Nyhammer, A.M. Skorpen, R. Sundt, B.V. Svendsen
8 August- 9 September	"Johan Hjort"	"	H. Bjø rke, H. Græsdal, A. Hylen, L. Kalvenes, H. Kismul, K. Lauvås, L. Løvheim, L. Solbakken, Ø Torgersen, A. Totland

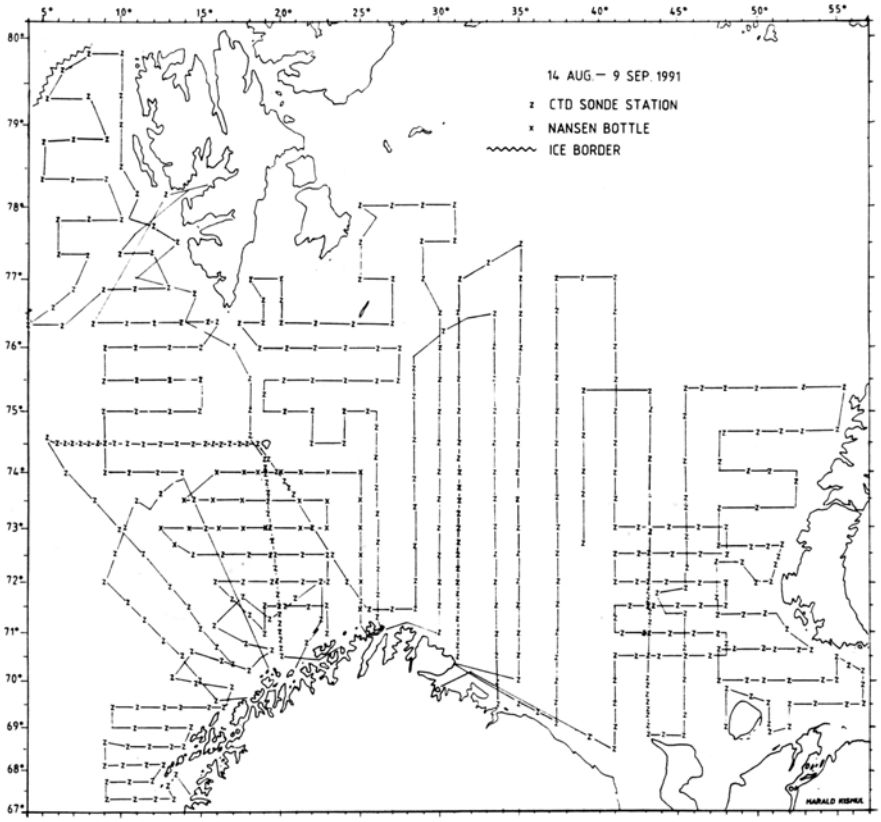

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations

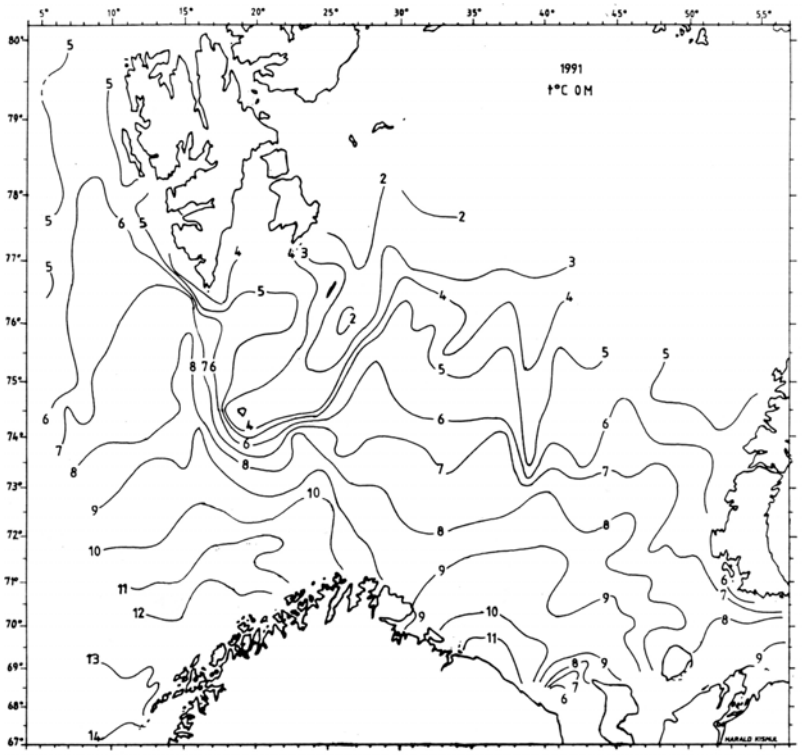

Fig. 2. Isotherms at 0 m

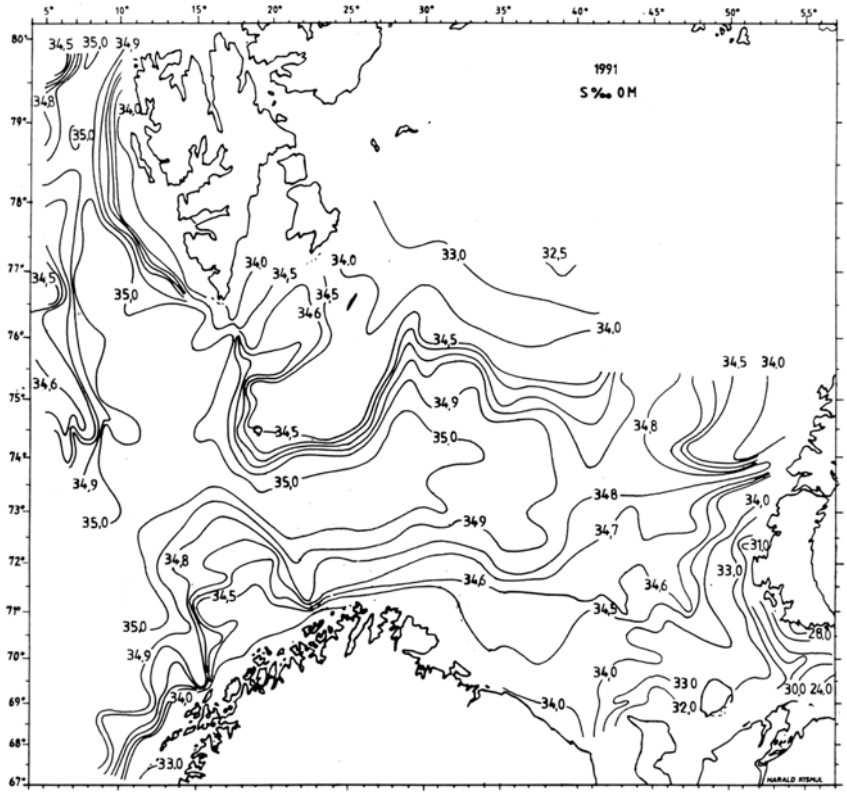

Fig. 3. Isohalines at 0 m

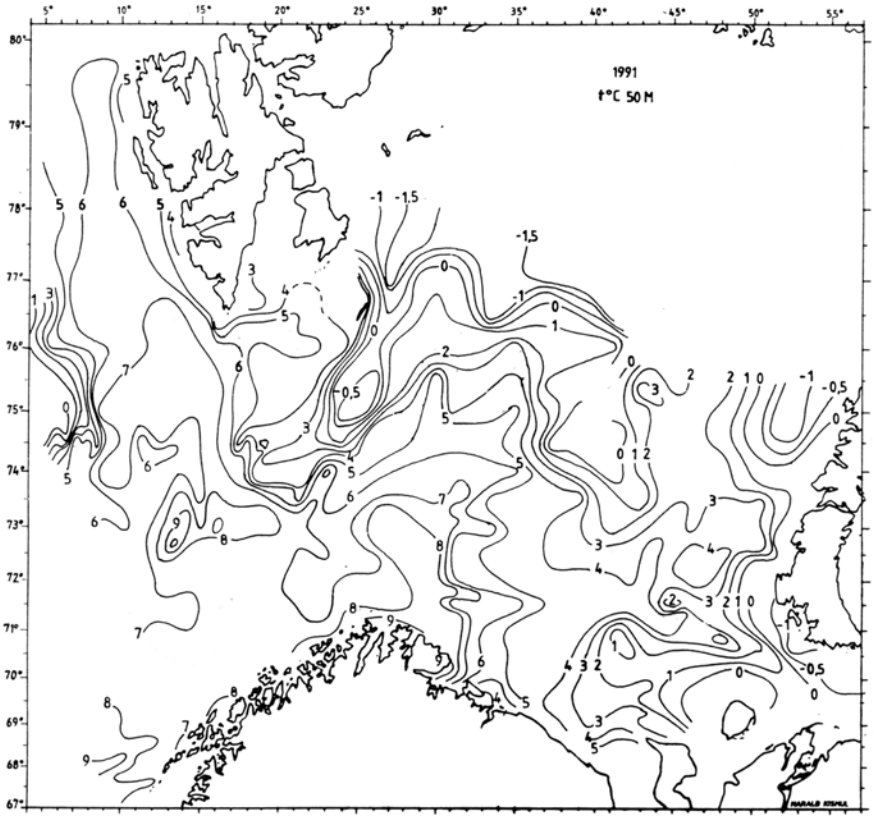

Fig. 4. Isotherms at 50 m

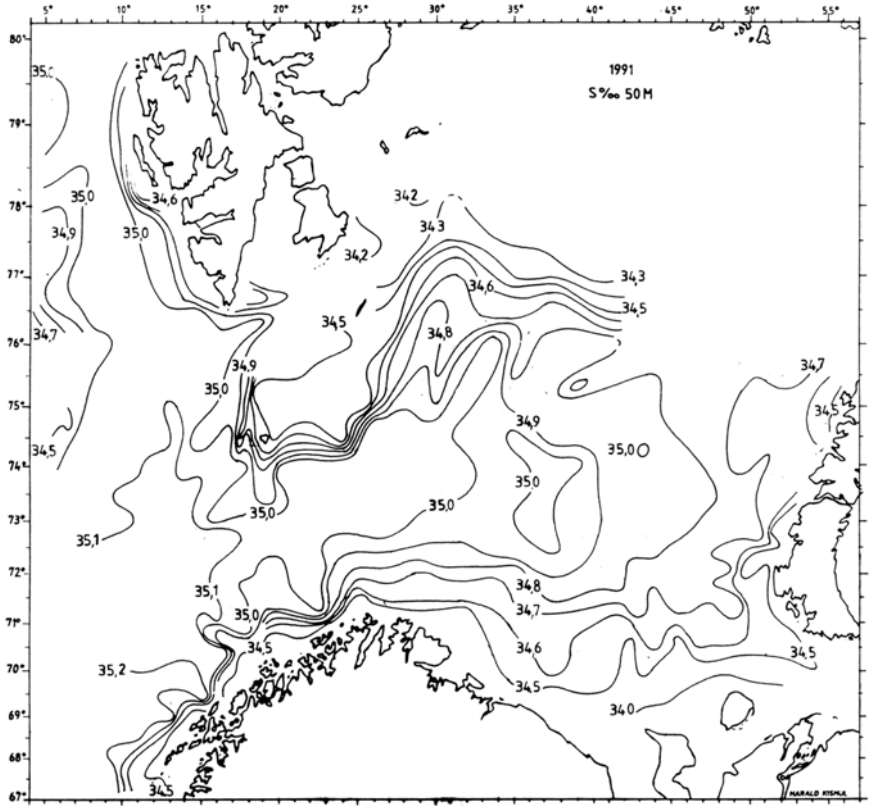

Fig. 5. Isohalines at 50 m

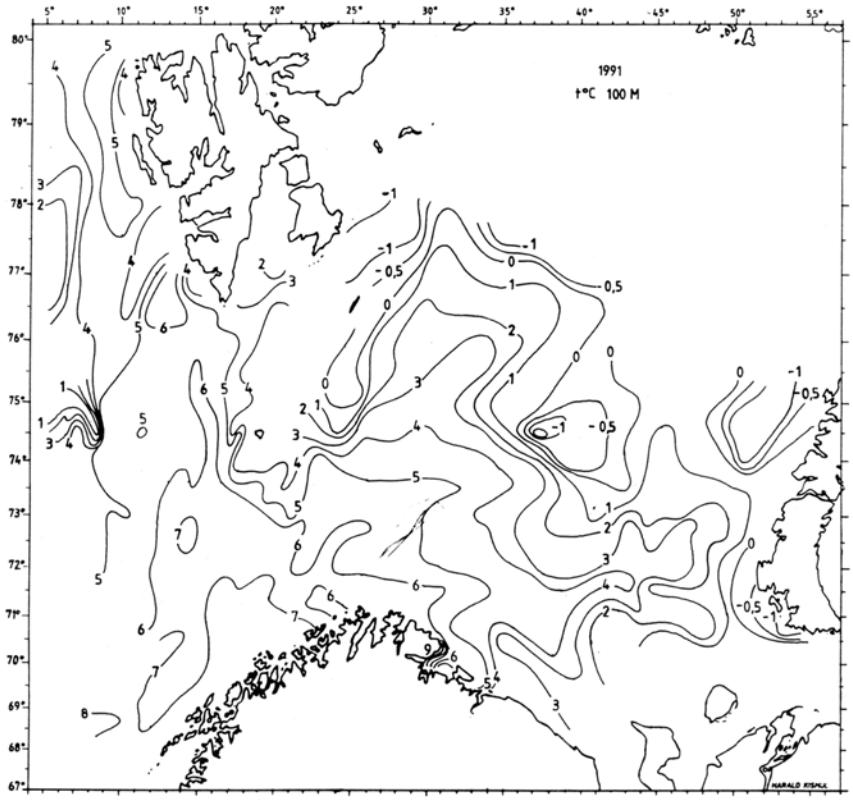

Fig. 6. Isotherms at 100 m

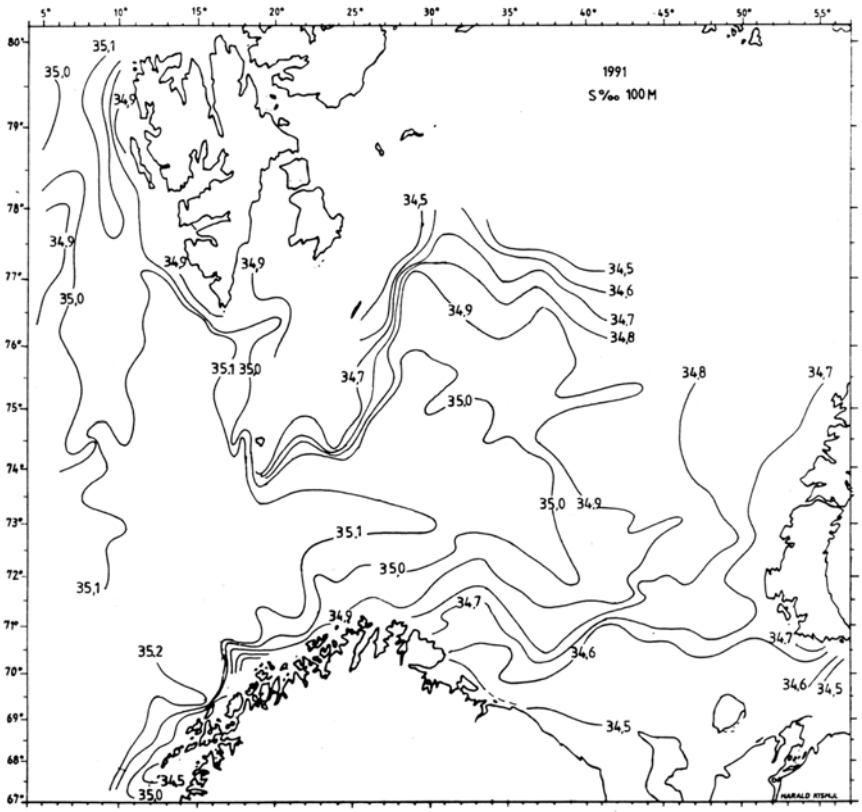

Fig. 7. Isohalines at 100 m

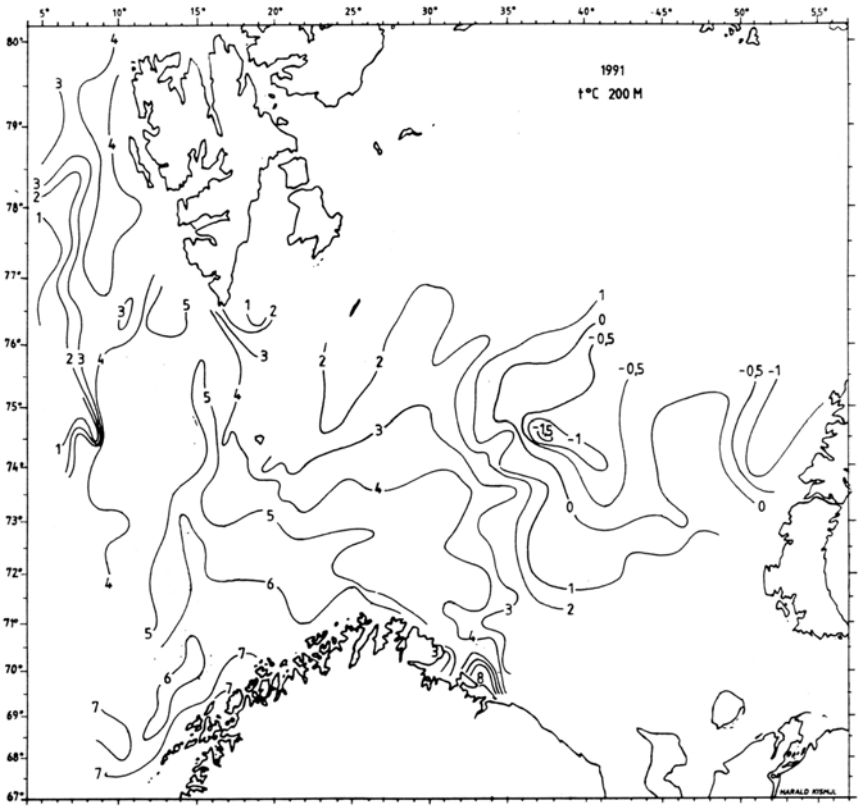

Fig. 8. Isotherms at 200 m

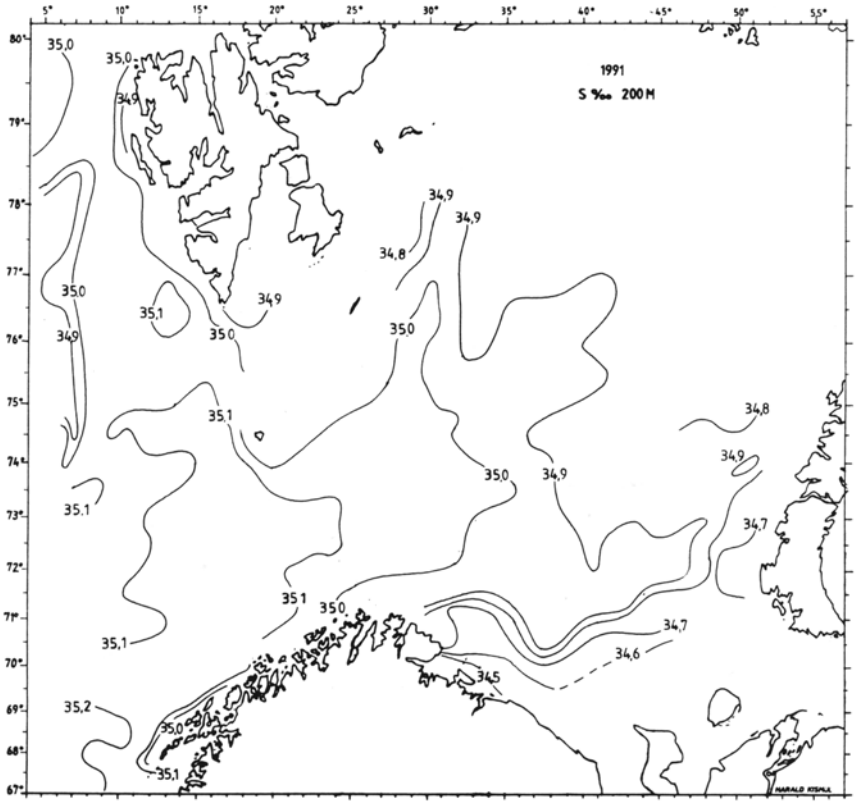

Fig. 9. Isohalines at 200 m

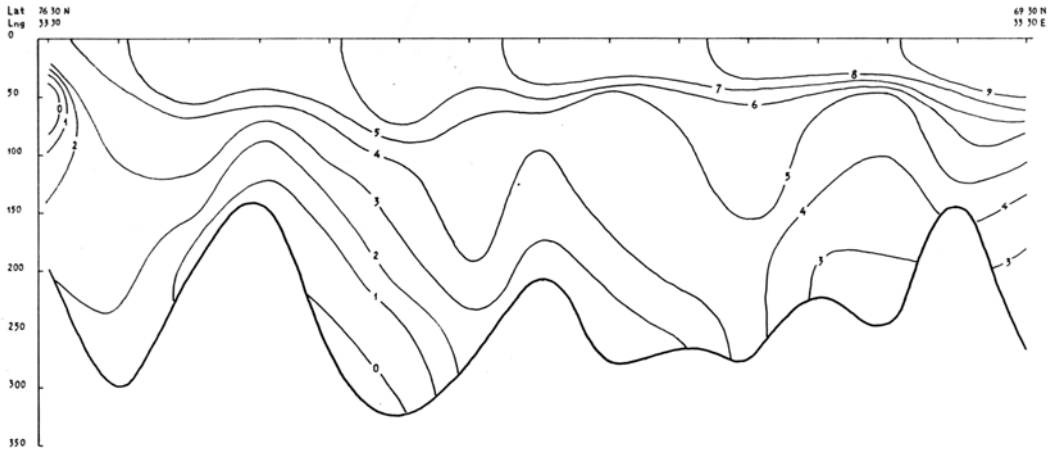

Fig. 10. Hydrographic section along the Kola meridian. Temperature

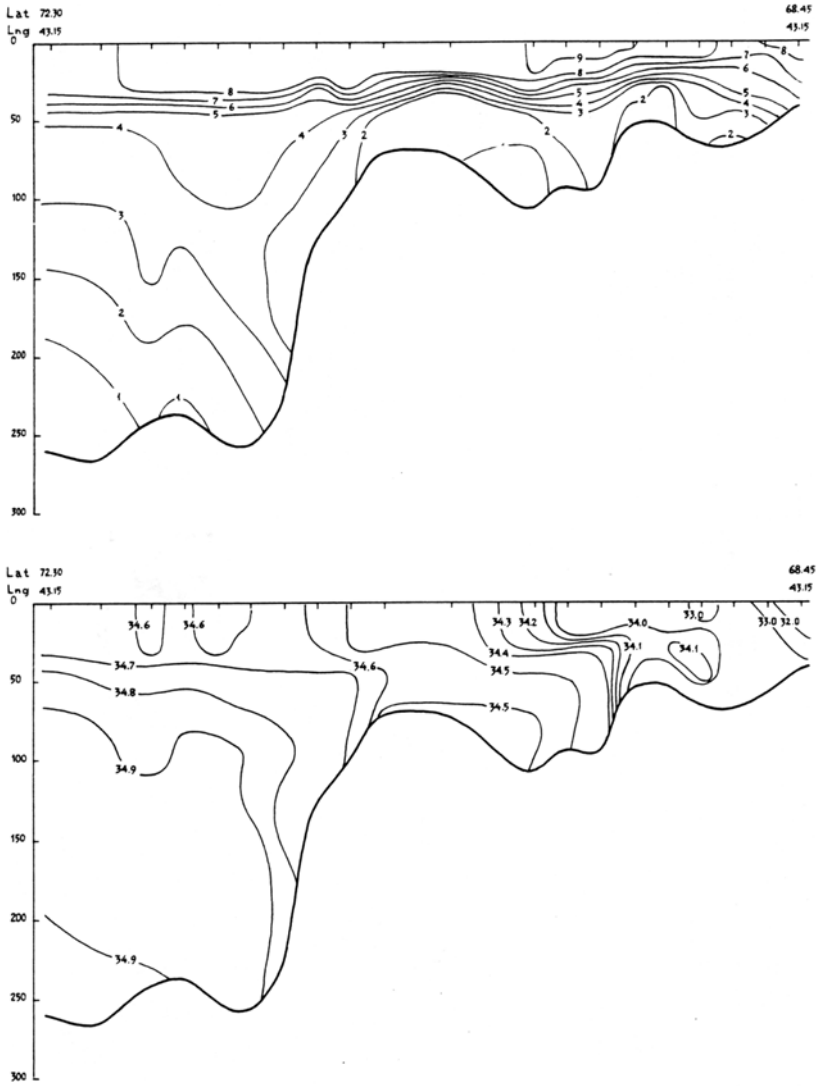

Fig. 11. Hydrographic section Cape Kanin-North. Temperature and salinity

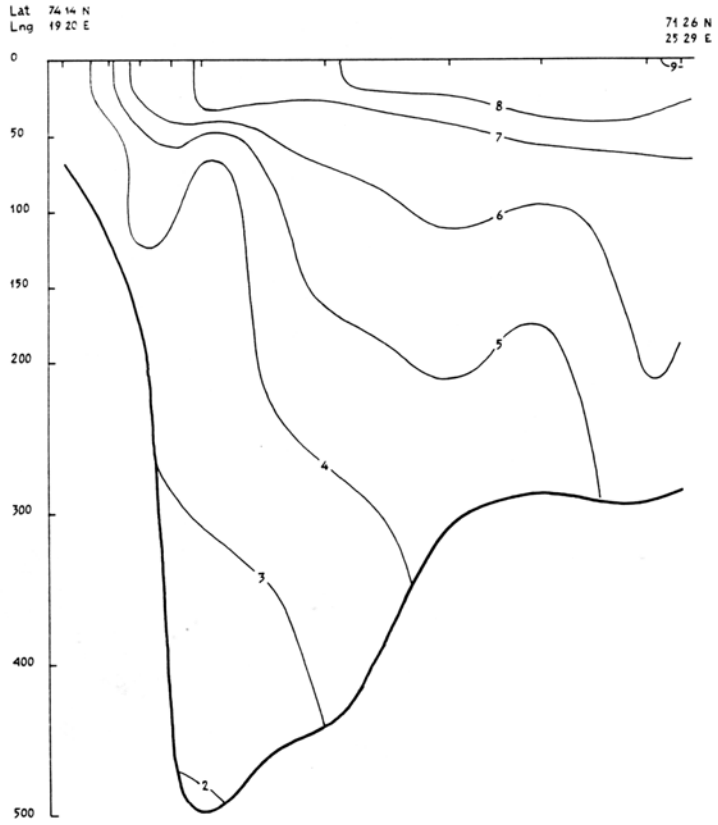

Fig. 12. Hydrographic section Bear Island-North Cape. Temperature

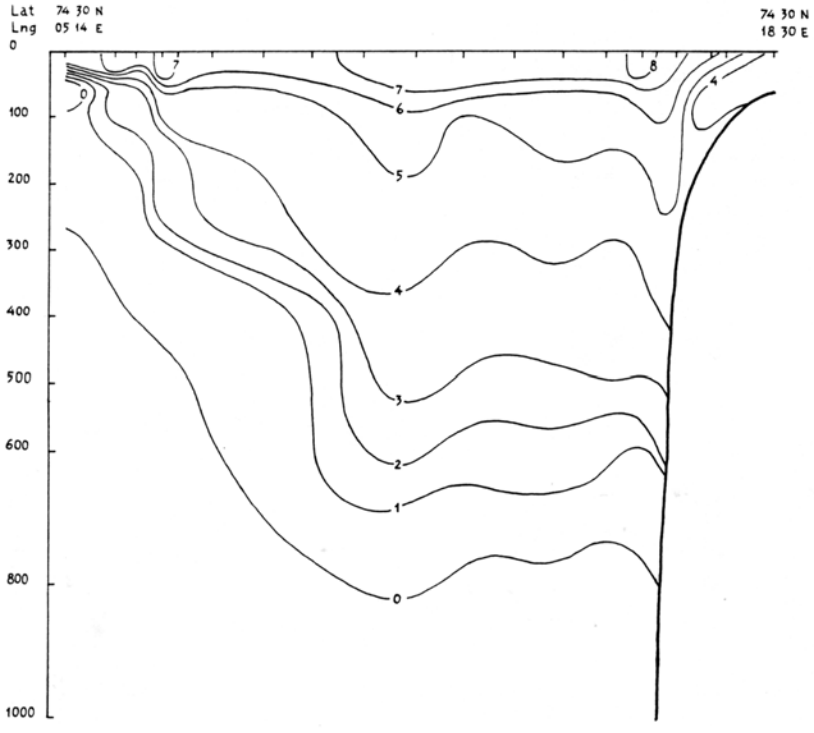

Fig. 13. Hydrographic section Bear Island-West. Temperature

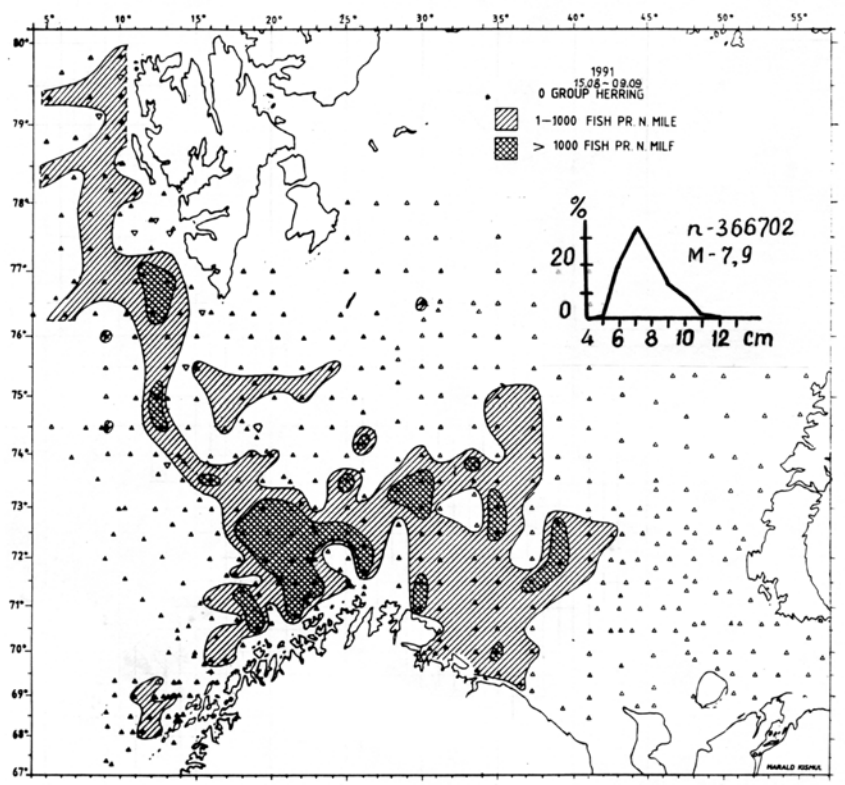

Fig. 14. Distribution of 0-group herring

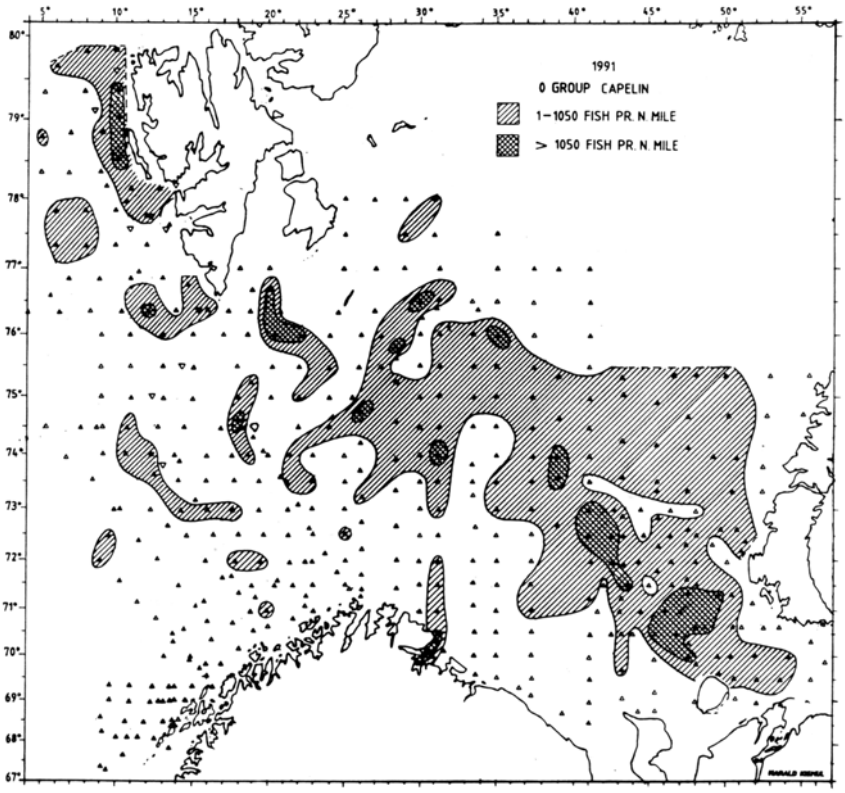

Fig. 15. Distribution of 0-group capelin

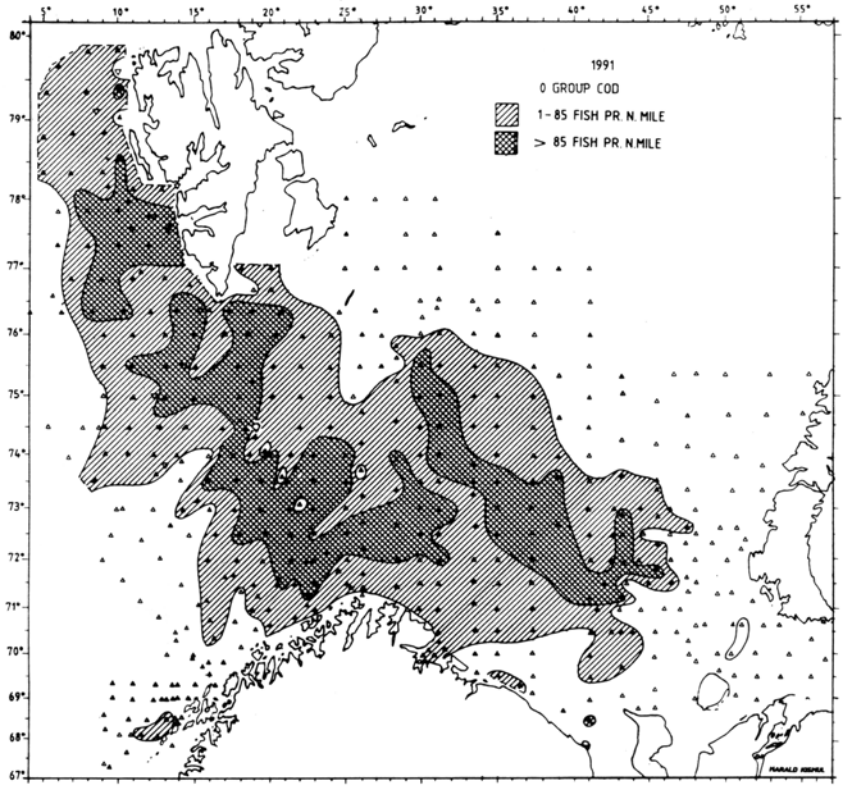

Fig. 16. Distribution of 0-group cod

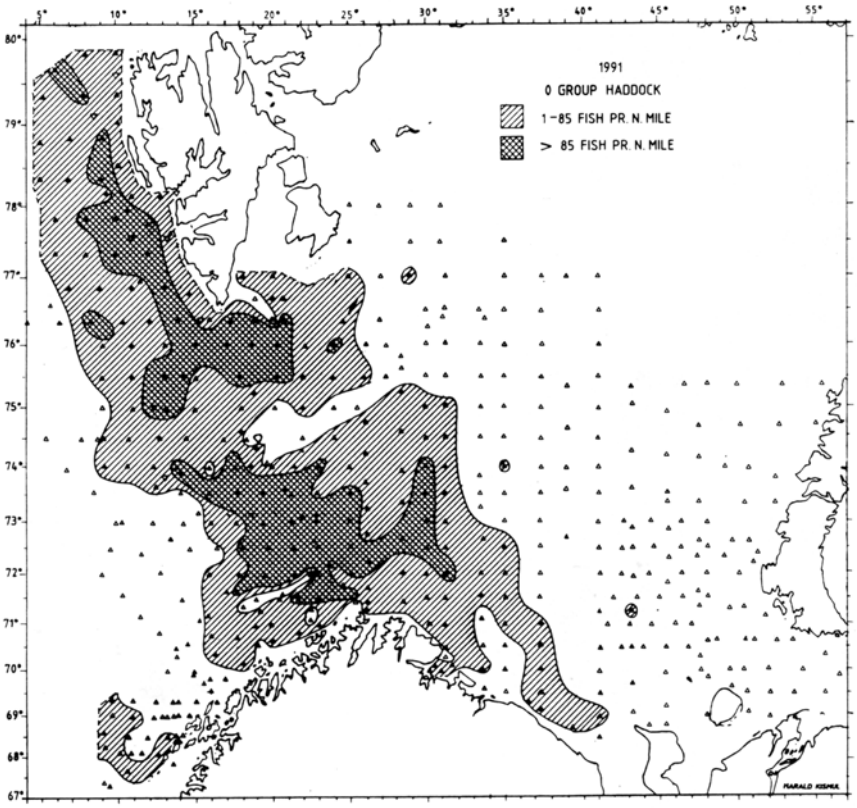

Fig. 17. Distribution of 0-group haddock

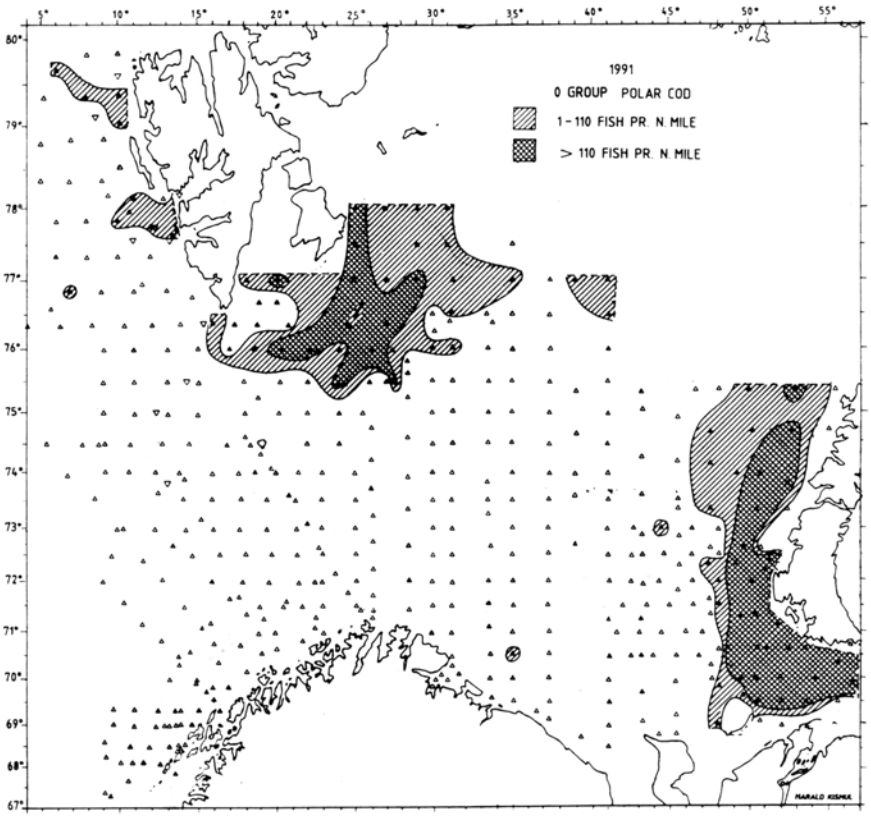

Fig. 18. Distribution of 0-group polar cod

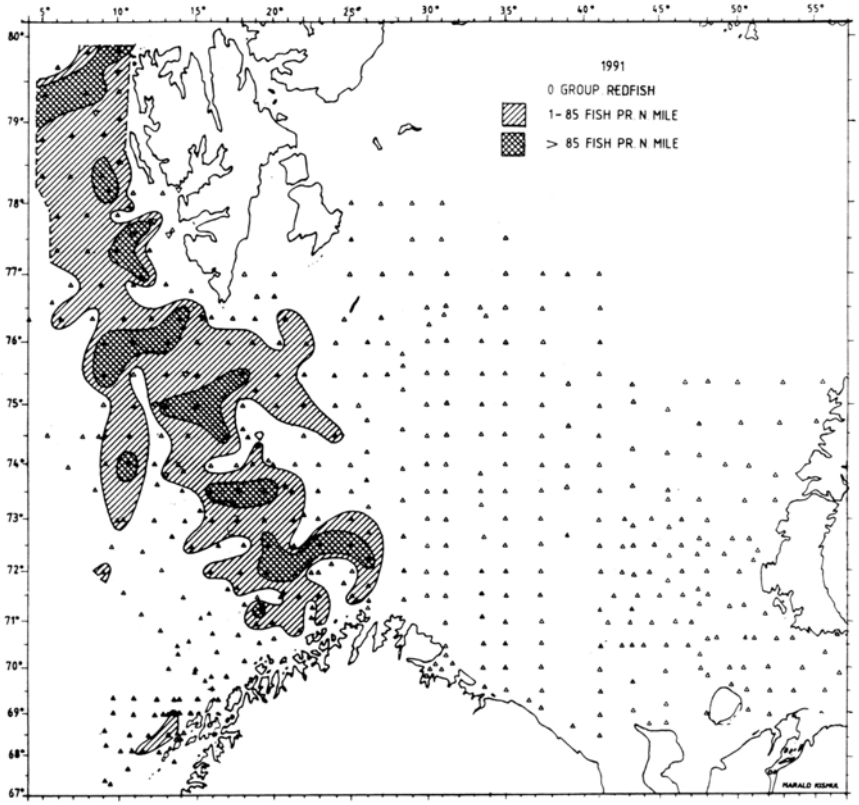

Fig. 19. Distribution of 0-group redfish

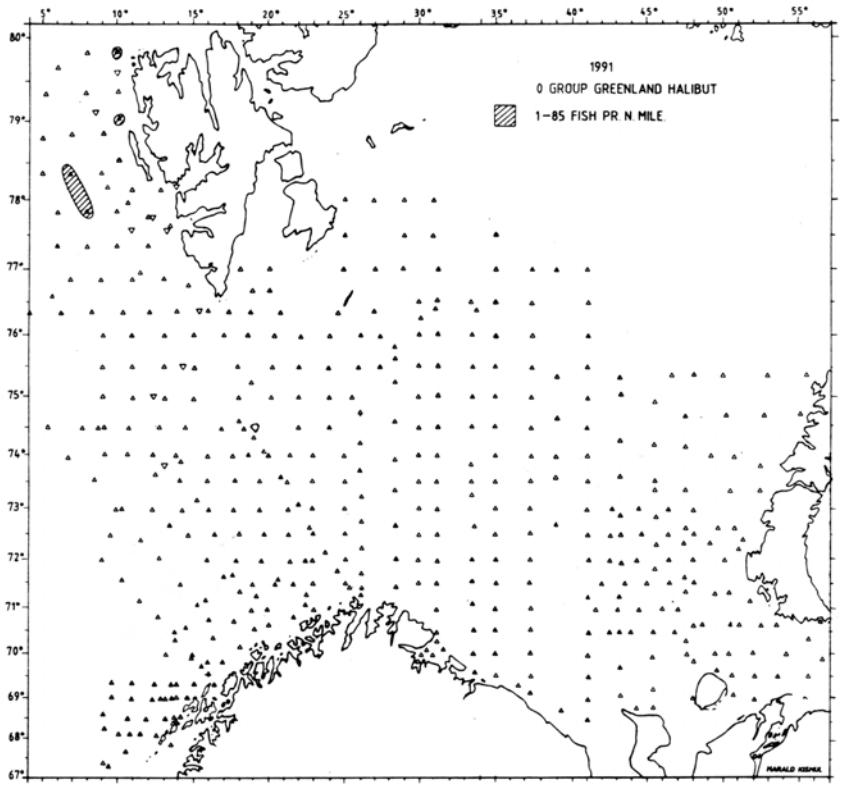

Fig. 20. Distribution of 0-group Greenland halibut

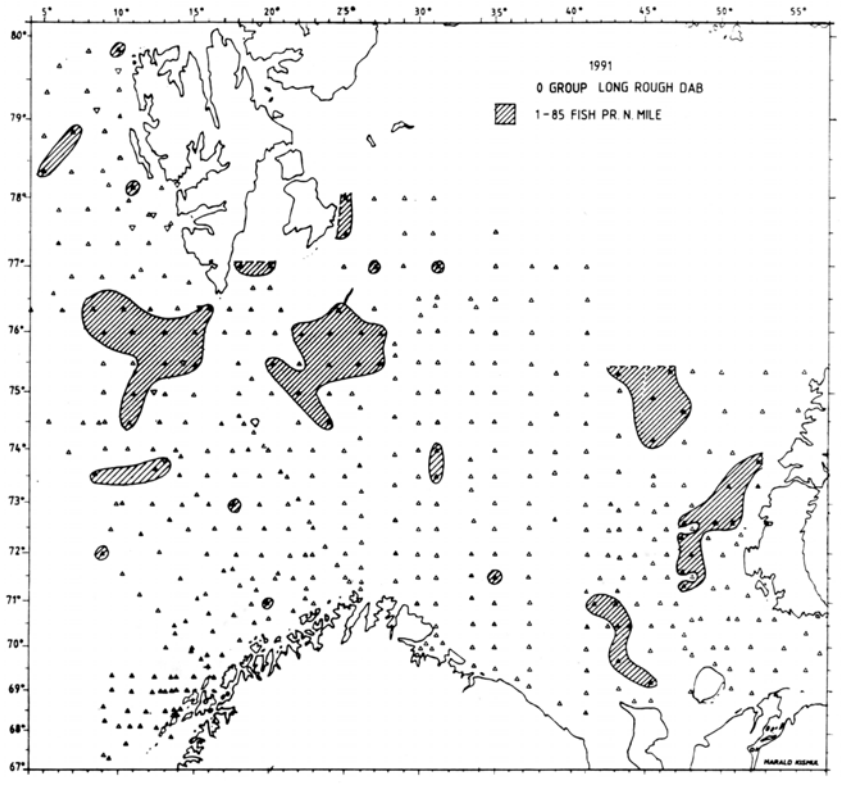

Fig. 21. Distribution of 0-group long rough dab

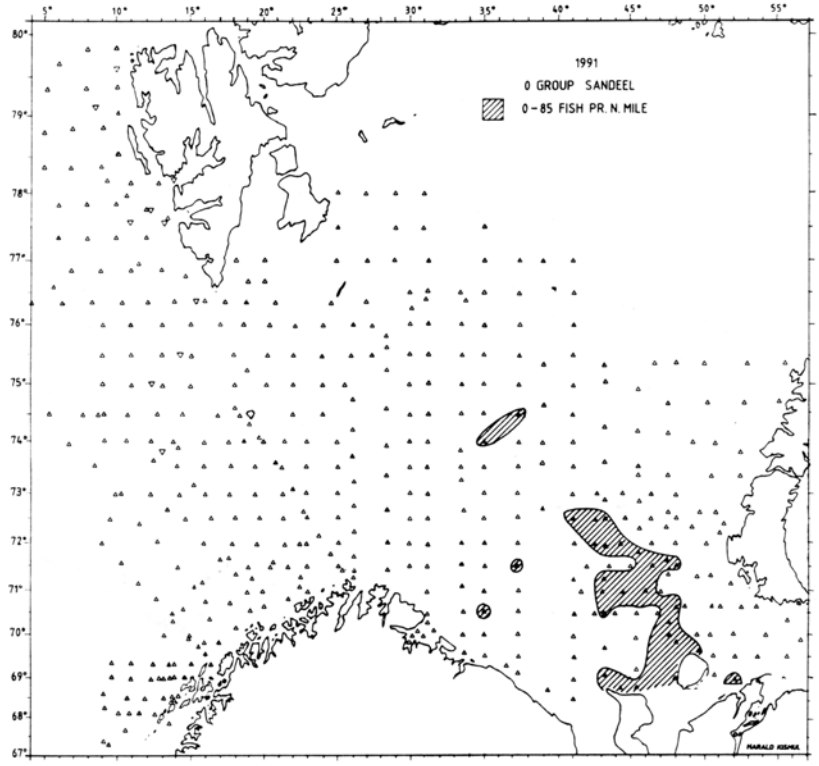

Fig. 22. Distribution of 0-group sandeel

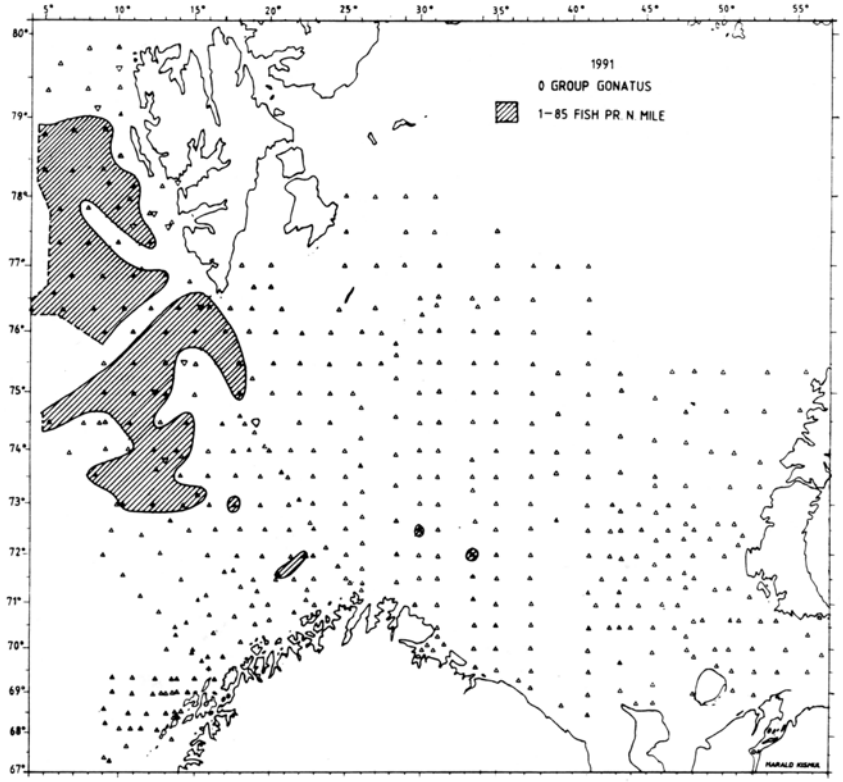

Fig. 23. Distribution of 0-group Gonatus fabricii

International Council for
the Exploration of the Sea

C.M. 1992/G: 82 Ref. H
Demersal Fish Committee

Preliminary report of the international 0-group fish survey in the Barents Sea and adjacent waters in August-September 1992

The twenty-eight annual International 0-group fish survey was made during the period 12 August-8 September 1992 in the Barents Sea and adjacent waters. The following research vessels participated in the survey:

State	Name of vessel	Survey period	Research Institute
Norway	"Johan Hjort"	17.08 - 03.09	Institute of Marine Research Bergen
Norway	"G.O. Sars"	18.08 - 07.09	"
Norway	"Michael Sars"	13.08 - 07.09	"
Russia	"Professor Marty"	17.08 - 28.08	The Polar Research Institute of Marine Fisheries and Oceanography, Murmansk
Russia	"Fridtjof Nansen"	24.08 - 05.09	"
Russia	"Akhill"	13.08 - 15.08	"

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

Preliminary analysis of the survey data were planned to take place during a meeting 8-9 September in Hammerfest. Since none of the Russian vessels were able to call at Hammerfest data were analysed at IMR, Bergen and PINRO, Murmansk and the results exchanged by correspondence (telefax and telemail).

Observations concerning the geographical distribution of 0-group fish and their abundance are given in this report together with a brief description of the hydrographical conditions in the area.

Material and methods

The geographical distribution of 0-group fish were estimated with a small mesh midwater trawl. The vessels, which participated in the survey in 1992, 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 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 40m. An additional tow at 60 and 80m for 0.5 nautical mile was made when 0-group fish layer was recorded on the echo-sounder deeper than 60m.

Survey tracks and hydrographical stations are given in Fig. 1. Trawl stations with and without catch are indicated on the distribution charts in Figs. 14-23, as filled and open symbols respectively. The density grading is based on catch in number per 1.0 nautical mile trawling.

Hydrography

Observations were made along all the survey tracks with 5 to 40 nautical miles between stations. Horizontal distribution of temperatures and salinities is shown for 0, 50, 100 and 200 m (Figs. 2-9). Figs. 10-13 show the temperature and salinity conditions along the Kola, Bear Island - North Cape, Bear Island - West and Cape Kanin sections. The mean temperatures in the main parts of these sections are presented in Table 1.

It appears that mean sea temperatures from 0 to 200 m were high and well above (0.4 °C to 0.7 °C) the long term average in all parts of the surveyed area, and 1992 is the fourth "warm year" in succession. The positive anomalies were mainly caused by large contents of heat in intermediate and deep layers and thus associated with water masses of Atlantic origin flowing into the Barents Sea from west. Surface layer temperatures (0-50 m) in the central and southeastern parts of the area were significantly lower in 1992 than in 1991 and just slightly above the long-term average.

Distribution and abundance of 0-group fish and Gonatus fabricii

Geographical distribution of 0-group fish is shown as shaded areas in Figs. 14-22, and of Gonatus fabricii in Fig. 23. Double shading indicates dense concentrations. The criteria for discriminating between dense and scattered concentrations are the same as used in earlier reports (Anon., 1980). Abundance indices, estimated as the area of distribution with areas of high densities weighed 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 distribution of herring was similar to that of 1991 in the Barents Sea, but with fewer observations along West-Spitsbergen. The main concentrations were found in the Western Barents Sea along the edge of the shelf between the Norwegian coast and up to South Cape (76° N), and eastwards as far as 50° E. The logarithmic abundance index is estimated at 1.06, which is only slightly below the 1991 index (1.19) and indicates that the 1992 year-class is relatively strong.

Capelin (Fig.15)

There were very few observations of 0-group capelin and dense concentrations were observed at one station only in the southeastern part of the Barents Sea. The overall catch in numbers is among the lowest ever recorded since the 0-group investigations started in 1965 and the 1992 year-class seems to be very poor.

Cod (Fig.16)

0-group cod had one of the widest distributions ever observed, similar to that of 1991, extending from Norway and Murman coast to at least 80°30' N off West-Spitsbergen (into the drift ice) and to 77° N in central parts. In the east it was recorded north to 73° N and east to Novaya Zemlya (52° E). The abundance indices for the 1992 year-class are the highest in the

time-series and well above both the 1983, 1985 and 1991 year-classes. At this stage the 1992 year-class must be classified as a very strong one.

Haddock (Fig.17)

Haddock was, as in 1991, mainly distributed in western areas from the Norwegian coast to 80° N off West-Spitsbergen. The eastern limit in the Barents Sea was at about 42° E. Dense concentrations were found in a smaller area than in 1991, mainly north of Cape North to 74° N. The abundance indices is the second highest ever observed, and the 1992 year-class may be classified as rich.

Saithe (Fig.18)

Unlike in previous years, 0-group saithe occurred in many hauls in most of the survey area. This may indicate good saithe recruitement in 1992.

Polar cod (Fig.19)

0-group polar cod is distributed in two separate areas, with one component west and southeast of Spitsbergen and one component in east along the western coast of Novaya Zemlya. During the 0- group survey the total area of distribution is not completely covered.

In the north-western area, the distribution was wider than in 1991, mainly off West-Spitsbergen, and the index about twice that of 1991. The 1992 year-class of polar cod in this area seems to be at least of average abundance.

In the southeastern area along Novaya Zemlya the distribution was similar to that of 1991, but the area with dense concentrations was smaller and the index only half of that in 1991. The 1992 year-class in this component of the polar cod stock may therefore be considered to be of average strength or slightly below average.

Redfish (Fig.20)

The main distribution of redfish was along the western edge of the shelf, from 73° N to 80°30' N off West-Spitsbergen. The area both scattered and dense concentrations were smaller than in 1991 and the index 25 % lower, the lowest since 1968. The 1992 year-class of redfish may therefore be considered as poor.

Greenland halibut (Fig.21)

Only single fish occurred in hauls west and east of Spitsbergen and, as in the previous four years, the abundance index indicates that the year-class is very poor.

Long rough dab (Fig.22)

This species occurred mainly southeast of Spitsbergen. The abundance index is the lowest recorded since 1970 and the 1992 year-class is considered to be poor

Blue whiting, sandeel and catfish.

Only a few specimens of these species were caught this year.

Gonatus (Fig.23)

Specimens of 0-group Gonatus fabricii were found over a larger area than in 1991. The distribution is westerly, from the Norwegian coast at 28° E and west into the Norwegian Ocean and north to about 80° N off Western Spitsbergen.

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Table 1. Mean water temperature1 in main parts of standard sections in the Barents Sea and adjacent waters in august-September 1965-1992

[1)] Earlier presented temperatures have been slightly adjusted (Tereshchenko, 1992).
[2)] 1-3: Murmansk Current; Kola Section (70°30' N-72°30' N, 33°30' E)
4: Cape Kanin section (68°45' N - 70°05' N, 43°15' E)
5: Cape Kanin section (71°00' N – 72°00' N, 43°15' E)
6: North Cape Current; North Cape - Bear Island section (71°33' N ,25°02' E - 73°35' N, 20°46' E)
7: West Spitsbergen Current; Bear Island-West section (74°30' N, 06°34' E – 15°55' E)

Year	Section[2] and layer (deep in meter)						
	1	2	3	4	5	6	7
	0-50	50-200	0-200	0-bot.	0-bot.	0-200	0-200
1965	6.7	3.9	4.6	4.6	3.7	5.1	-
1966	6.7	2.6	3.6	1.9	2.2	5.5	3.6
1967	7.5	4.0	4.9	6.1	3.4	5.6	4.2
1968	6.4	3.7	4.4	4.7	2.8	5.4	4.0
1969	6.7	3.1	4.0	2.6	2.0	6.0	4.2
1970	7.8	3.7	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	5.3	5.7	4.2	5.9	5.0
1974	8.1	3.9	4.9	4.6	3.5	6.1	4.9
1975	7.0	4.6	5.2	5.6	3.6	5.7	4.9
1976	8.1	4.0	5.0	4.9	4.4	5.6	4.8
1977	6.9	3.4	4.3	4.1	2.9	4.9	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	1.4	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	2.2	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	4.5	3.6	5.9	5.0
1985	7.1	3.5	4.4	3.4	3.4	5.3	4.6
1986	7.5	3.5	4.5	3.9	3.2	5.8	4.4
1987	6.2	3.3	4.0	2.7	2.5	5.2	3.9
1988	7.0	3.7	4.5	3.8	2.9	5.5	4.2
1989	8.6	4.8	5.8	6.5	4.3	6.9	4.9
1990	8.1	4.4	5.3	5.0	3.9	6.3	5.7
1991	7.7	4.5	5.3	4.8	4.2	6.0	5.4
1992	7.5	4.6	5.3	5.0	4.0	6.1	5.0
Average 1965-1992	7.3	3.7	4.6	4.1	3.2	5.7	4.5

Table 2. Abundance indices of 0-group fish in the Barents Sea and adjacent waters in 1965-1992

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	22	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
1987	102	72	17		155	631	41	174
1988	133	86	144		120	949	8	72
1989	202	112	206		41	698	5	92
1990	465	227	144		48	670	2	35
1991	766	472	90		239	200	1	28
1992	1159	313	195		118	150	3	32

Table. 3. Estimated logarithmic indices with 90 % confidence limits of year class abundance for 0-group herring, cod and haddock in the Barents Sea and adjacent waters 1965-1992

Year	Herring[1)]			Cod			Haddock		
	Index	Confidence limits		Index	Confidence limits		Index	Confidence limits	
1965				+					
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	-	-	2.15	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
1988	0.32	0.16	0.53	0.33	0.22	0.47	0.13	0.05	0.34
1989	0.59	0.49	0.76	0.38	0.30	0.48	0.14	0.10	0.20
1990	0.31	0.16	0.50	1.23	1.04	1.34	0.61	0.48	0.75
1991	1.19	0.90	1.52	2.30	1.97	2.65	1.17	0.98	1.37
1992	1.06	0.69	1.50	2.94	2.53	3.39	0.87	0.71	1.06

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

Table 4. Length distribution of 0-group fish[1] in percent in the Barents Sea and adjacent waters in August-September 1992

Length, mm	Herring	Capelin	Cod	Haddock	Polar cod		Redfish	Greenland halibut	Long rough dab	Sandeel
					East	West				
15-19						0.1				
20-24						0.8	+		0.6	
25-29				+		6.3	0.3		1.7	
30-34					6.3	16.2	0.9		14.9	
35-39		33.3			6.3	31.5	12.2	7.3	40.5	2.3
40-44		45.5	+	+	22.6	32.0	53.1	7.3	39.3	29.3
45-49	+	9.1	0.1		25.0	8.8	30.1	12.5	3.1	36.1
50-54	+	3.0	0.7	0.1	31.3	3.7	3.1			27.1
55-59	0.1	3.0	2.0	0.4	7.8	0.6	0.3			4.5
60-64	0.7		5.1	1.0	0.9	0.2				
65-69	2.4		8.1	2.0		0.1		2.1		
70-74	6.1	3.0	11.3	5.2				35.4		
75-79	12.0		16.8	8.0						
80-84	14.5		20.4	12.1				17.7		
85-89	14.8		18.0	13.0				17.7		
90-94	13.7	3.0	9.8	11.5						
95-99	12.5		4.4	10.6						
100-104	10.7		2.0	9.8						0.8
105-109	6.7		0.8	10.1						
110-114	3.7		0.1	5.8						
115-119	2.0		0.2	4.4						
120-124	0.2			2.5						
125-129	0.1			1.7						
130-134				1.1						
135-139	+			0.6						
140-144	+			0.1						
Total numbers	162-002	33	179-354	3795	116	68-621	80-474	8	169	132
Mean length	90.0	44.0	80.2	94.3	46.8	38.7	43.1	68.5	38.3	47.5

[1)] Based on Norwegian observations only.

Appendix

Research vessel	Participants
"Professor Marty"	N. Bolshakova, S. Boychuk, V. Chizhikov, I. Dolgoleko, A. Gordov, T. Jusupov, L. Kuzmin, S. Ratushny, V. Ryazantsev, N. Ushakov
"Fridtjof Nansen"	S. Baturin, S. Boranov, A. Dorchenkov, V. Kapralov, O. Leontovich, S. Ostrovsky, A. Pedchenko, T. Shamray, Y. Shamray
"Akhill"	A.L. Karsakov, A.G. Nikiforov, V.K. Ozhigin, V.A. Tataurov, V.P. Vorontsov, N.S. Vovchuc
"Johan Hjort"	I.M. Beck, M. Dahl, H. Grædal, S. Lygren, S. Mehl, E. Meland, E. Ona, L. Solbakken, I.Svellingen
"G.O. Sars"	J. Erices, H. Hammer, A. Hylen, R. Johannessen, L.Kalvenes, H. Larsen, K. Lauvås, M. Møgster, O. Nakken, A. Raknes, S. Wilhelmsen, V.Serebryakov
"Michael Sars"	O. Gullaksen, T.I. Halland, K. Hansen, G. Iversen, K. Korsbrekke, B. Kvinge, M. Mjanger, Ø.Nævdal

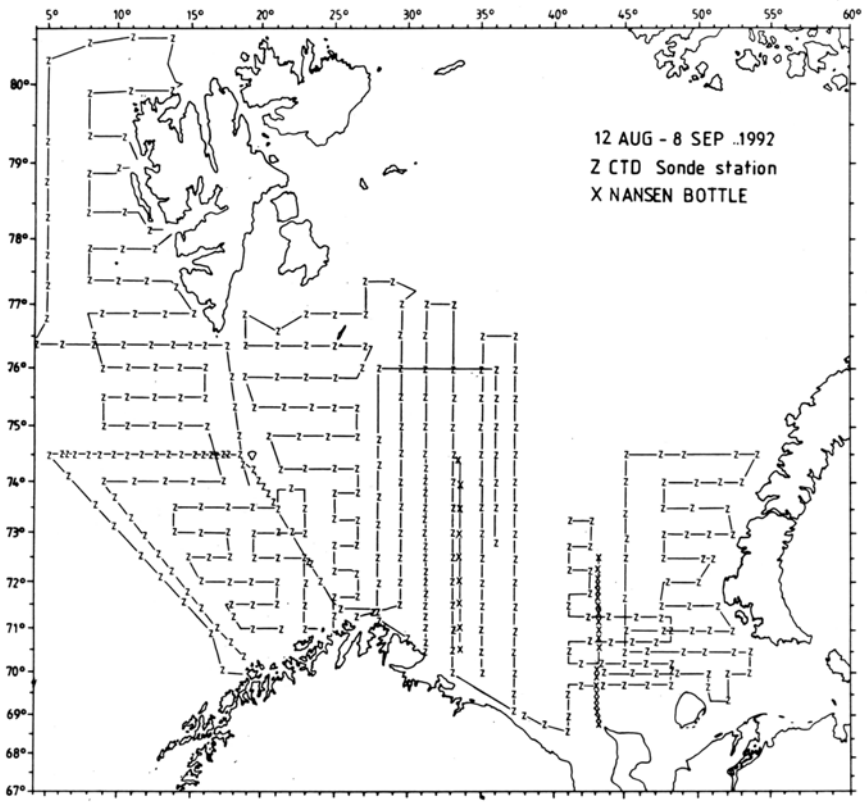

Fig. 1. Survey tracks and hydrographic stations

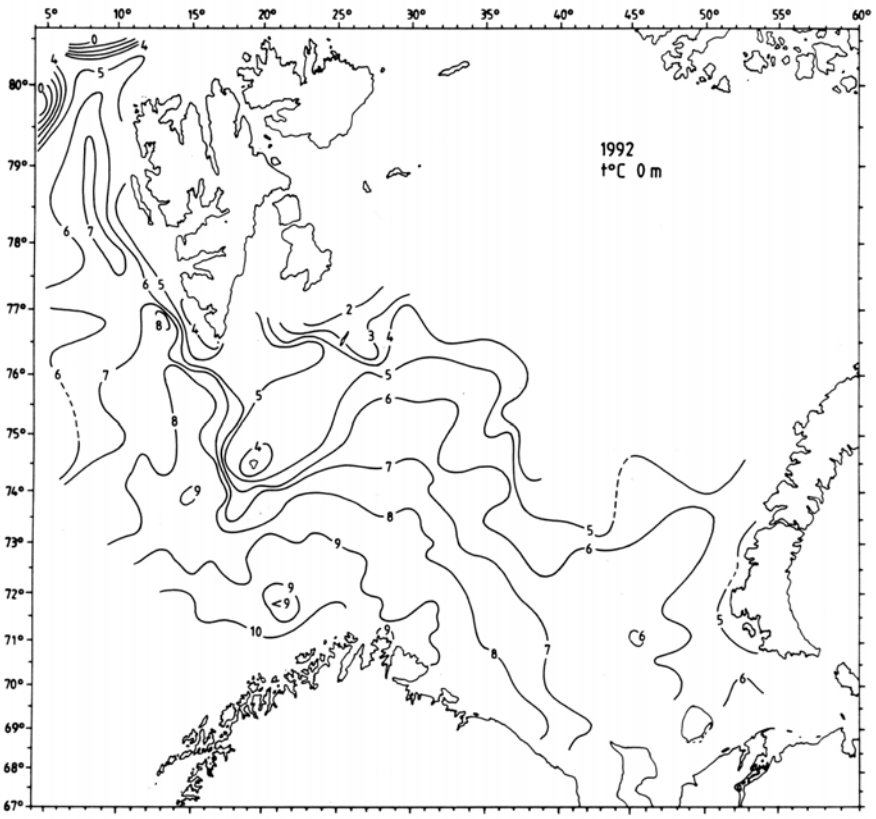

Fig. 2. Isotherms at 0 m

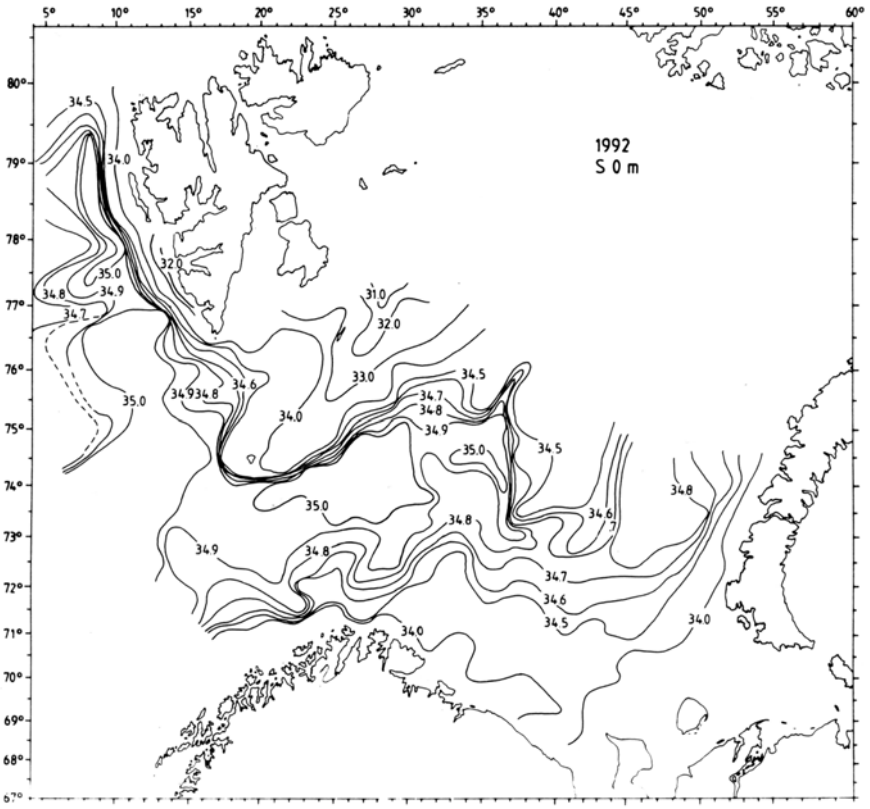

Fig. 3. Isohalines at 0 m

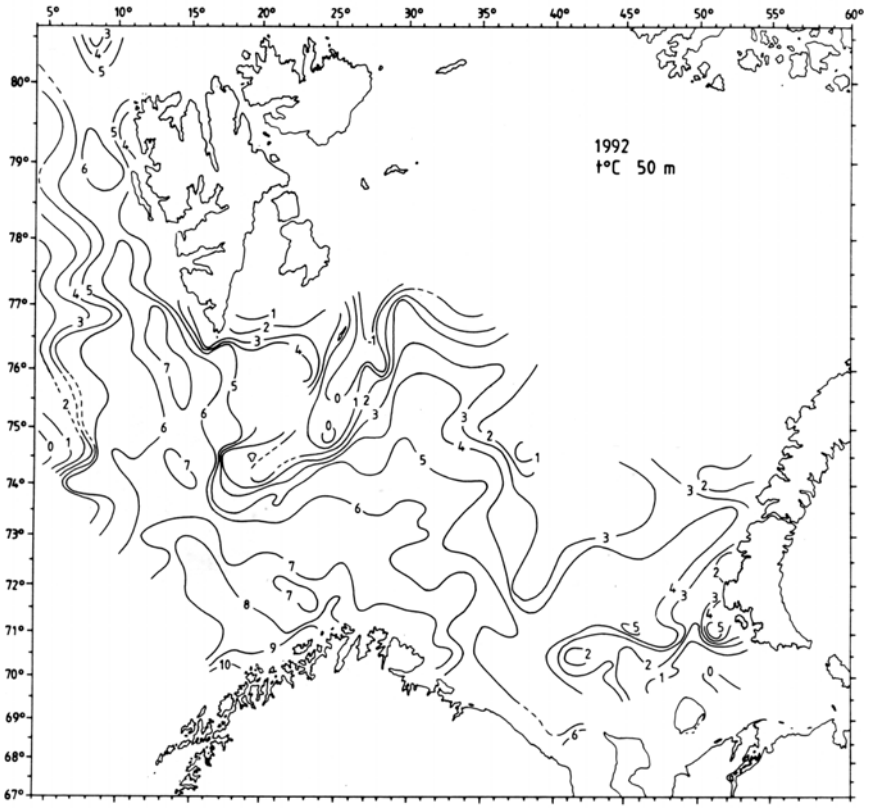

Fig. 4. Isotherms at 50 m

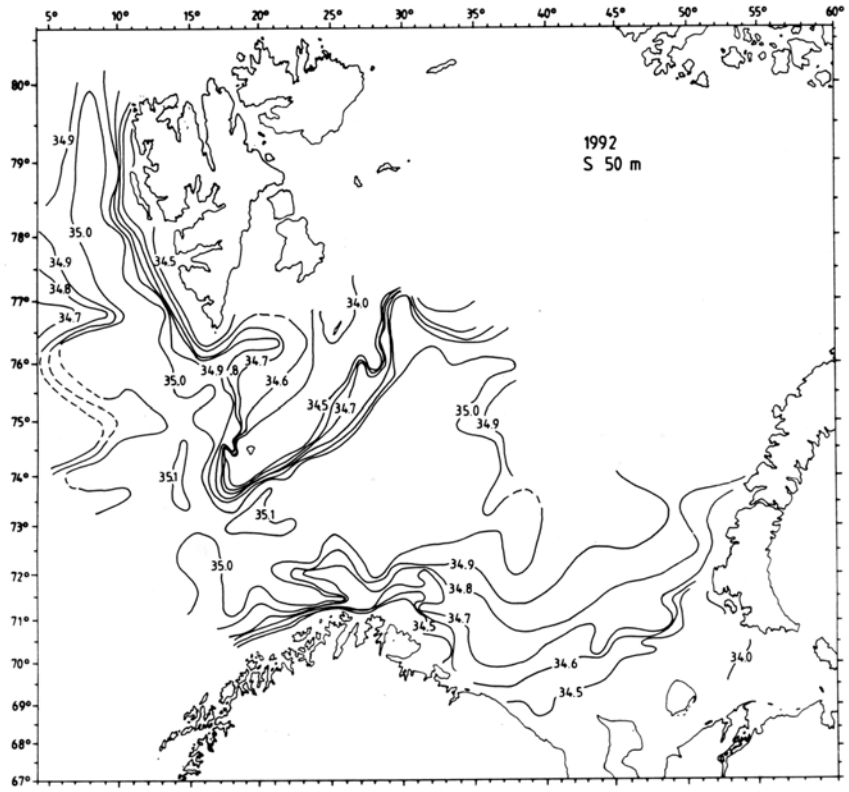

Fig. 5. Isohalines at 50 m

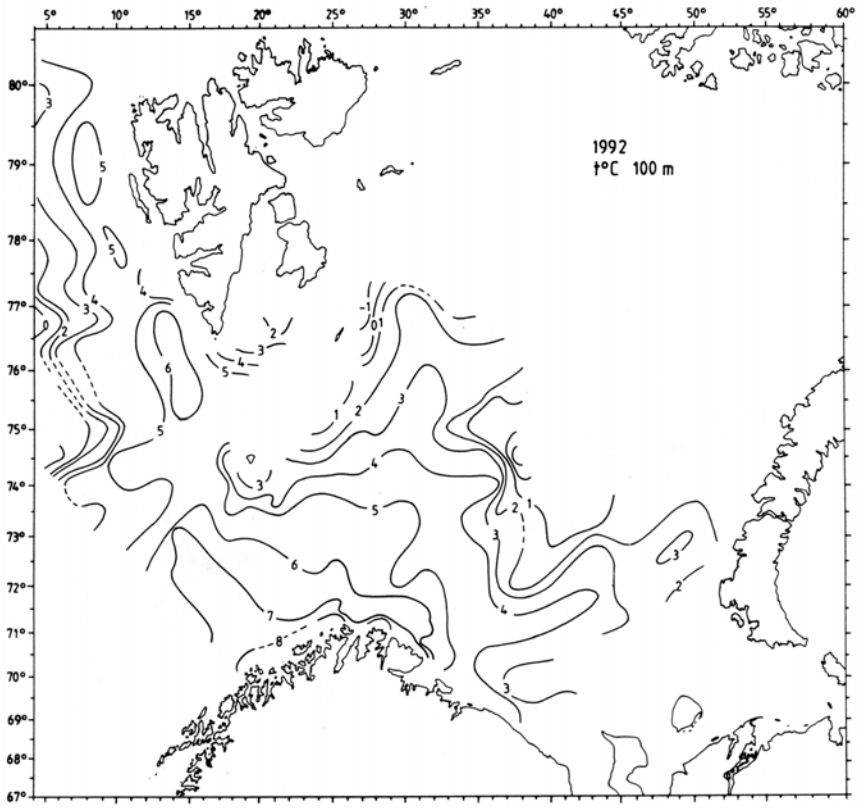

Fig. 6. Isotherms at 100 m

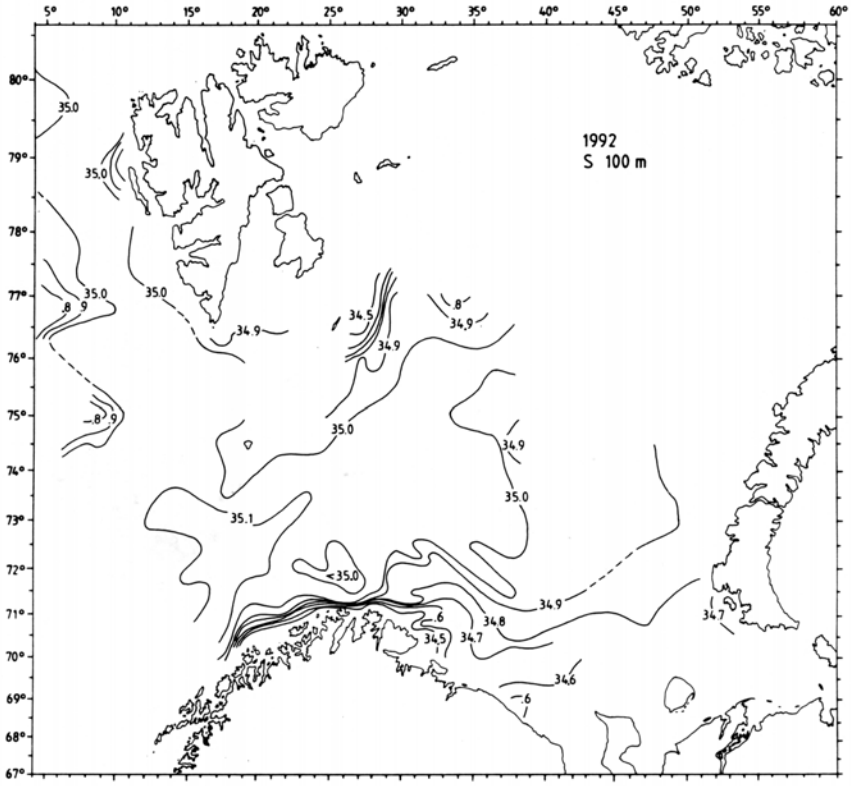

Fig. 7. Isohalines at 100 m

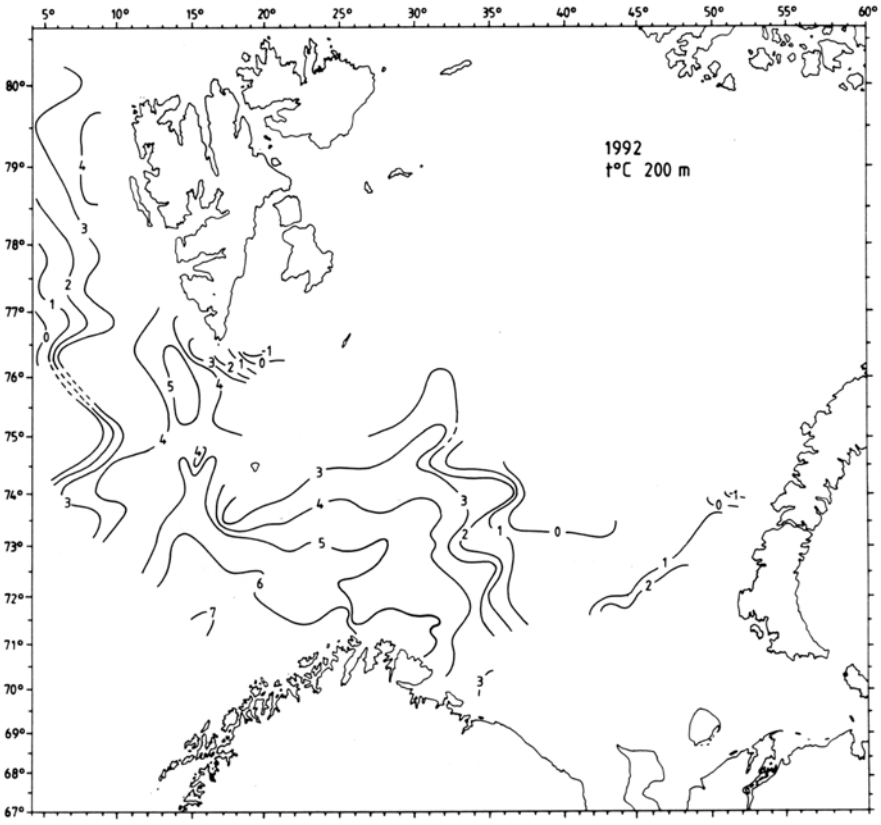

Fig. 8. Isotherms at 200 m

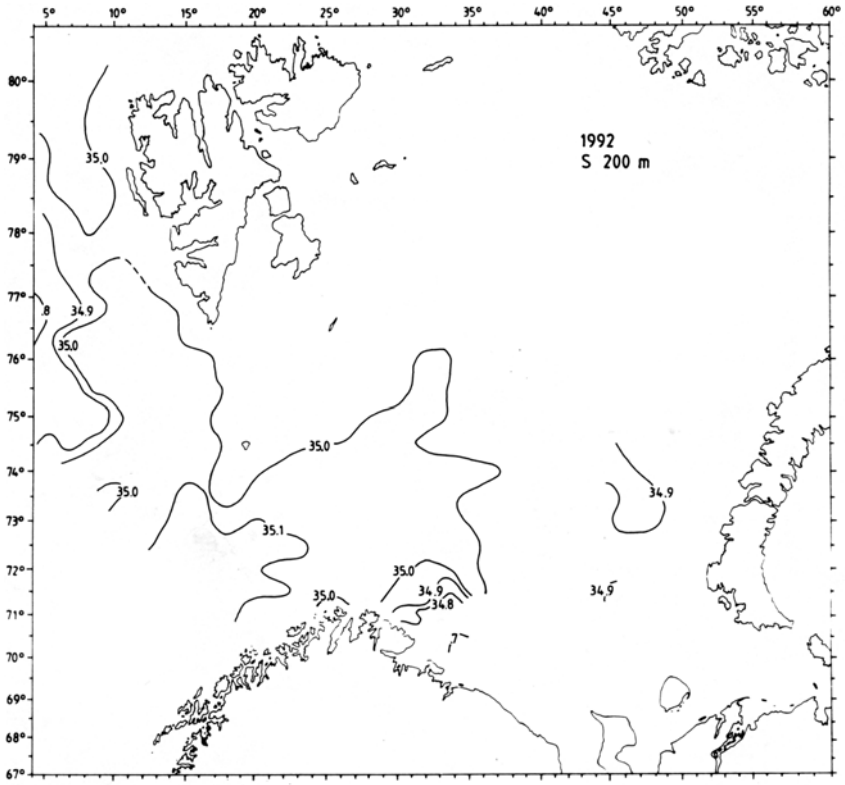

Fig. 9. Isohalines at 200 m

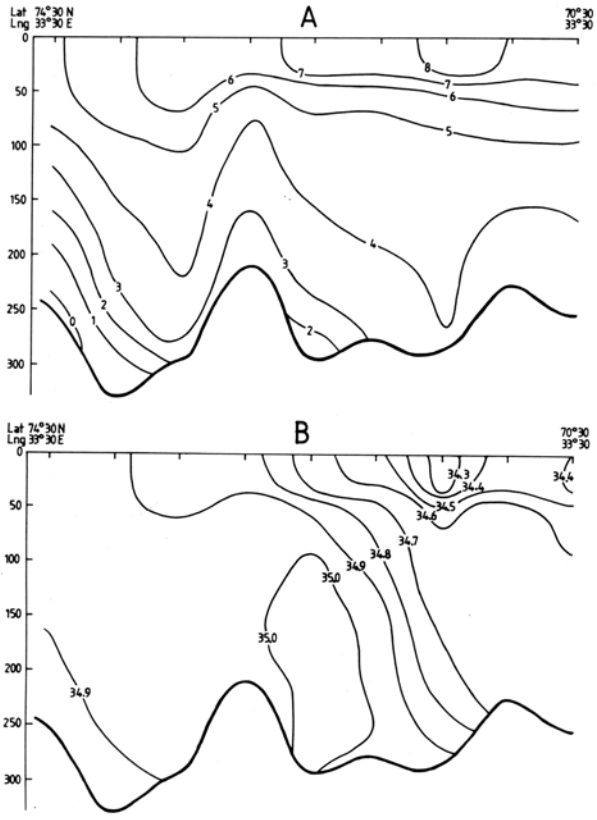

Fig. 10. Hydrographic section along the Kola meridian. Temperature (A) and salinity (B)

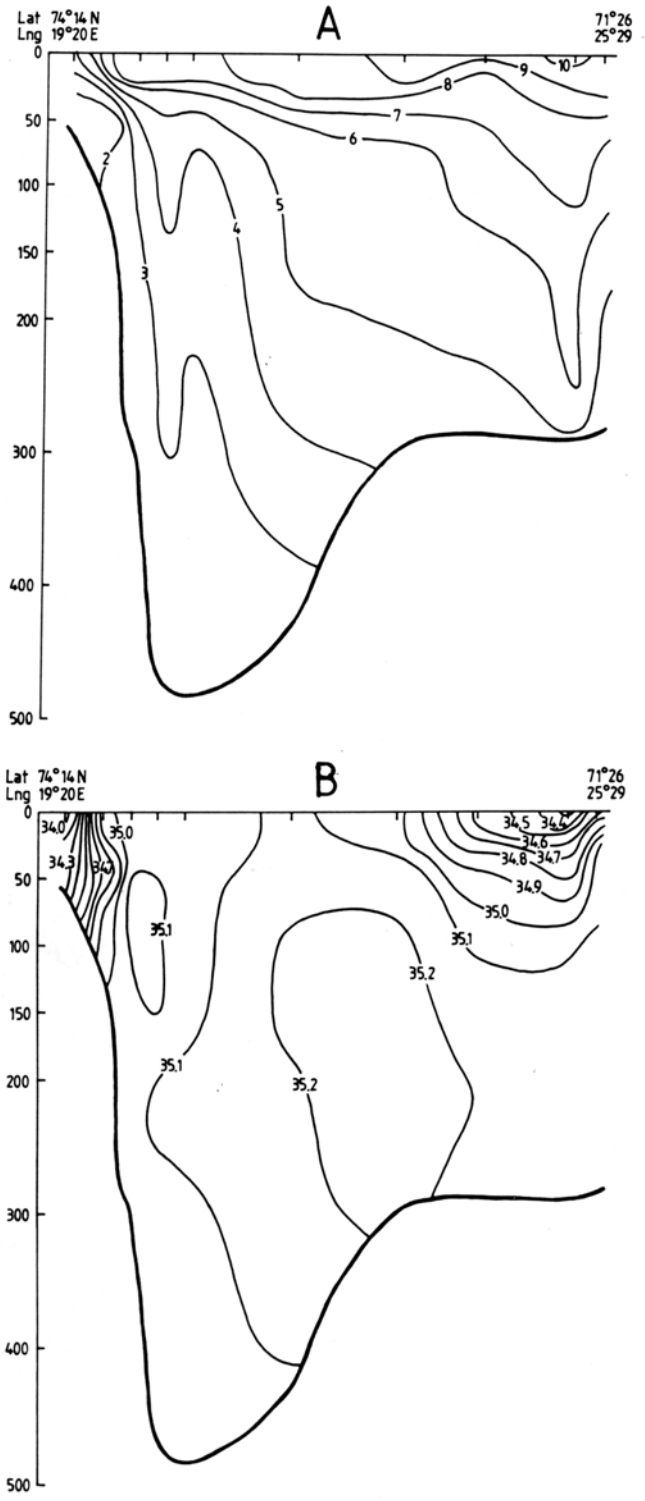

Fig. 11. Hydrographic section North Cape-Bear Island. Temperature (A) and salinity (B)

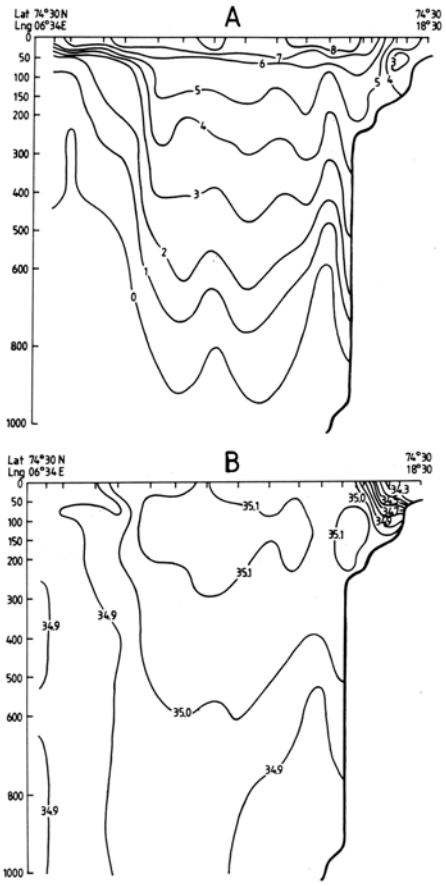

Fig. 12. Hydrographic section Bear Island-West. Temperature (A) and salinity (B)

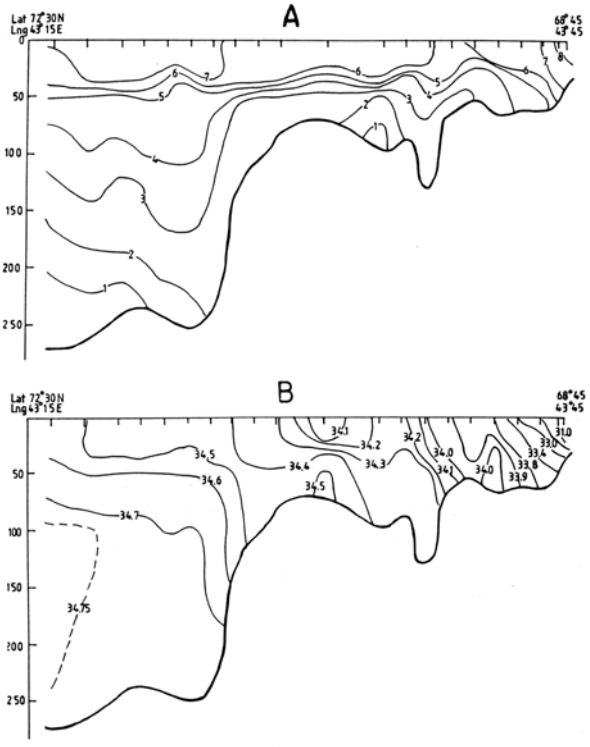

Fig. 13. Hydrographic section Cape Kanin-North. Temperature (A) and salinity (B)

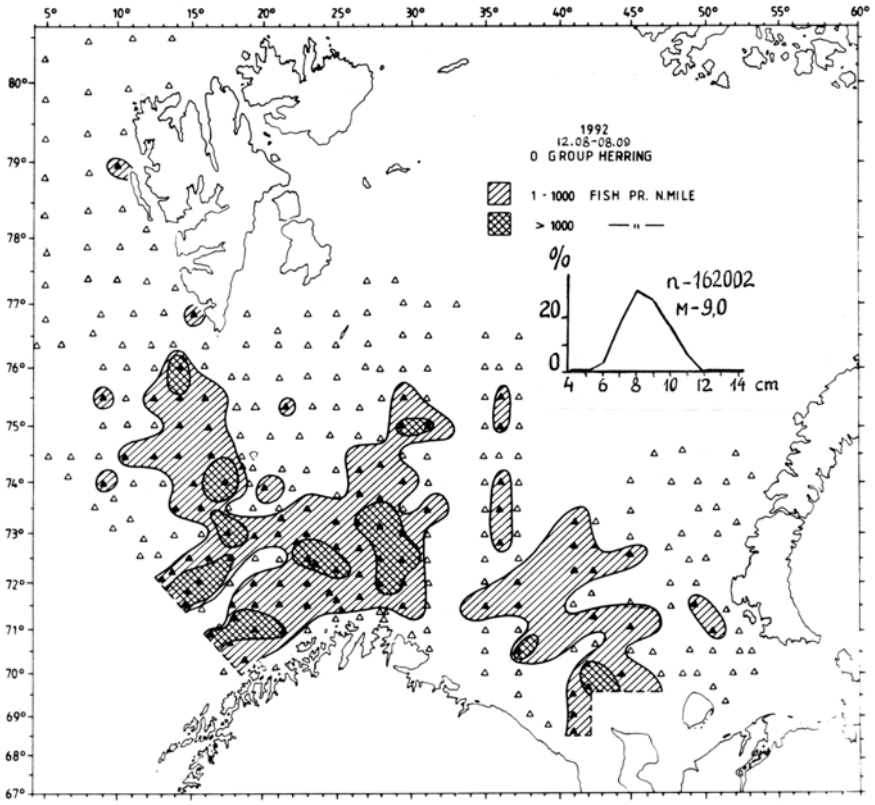

Fig. 14. Distribution of 0-group herring

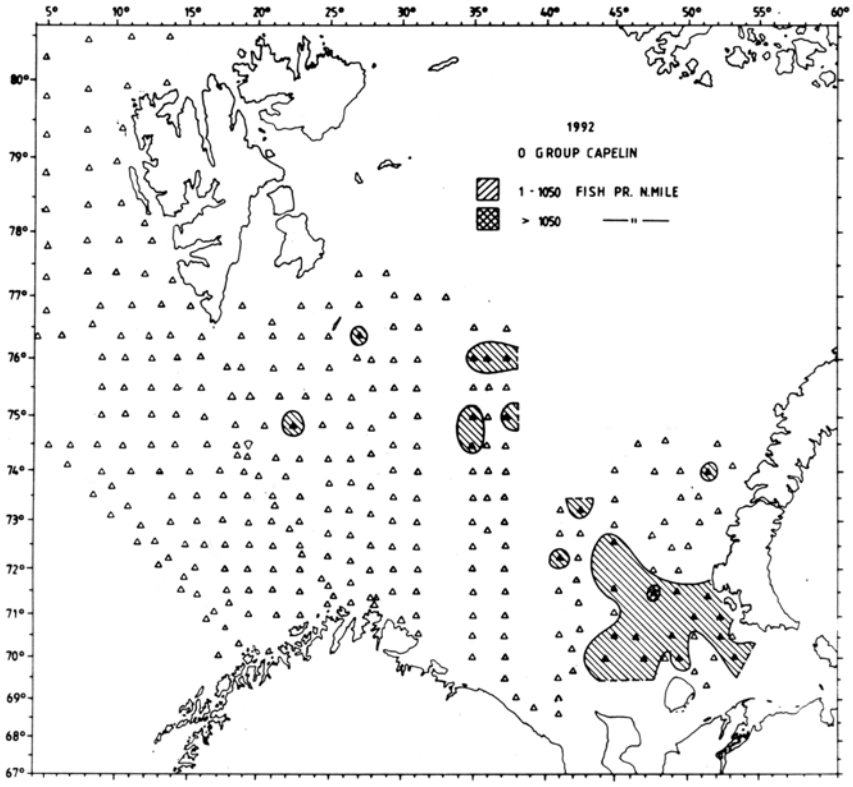

Fig. 15. Distribution of 0-group capelin

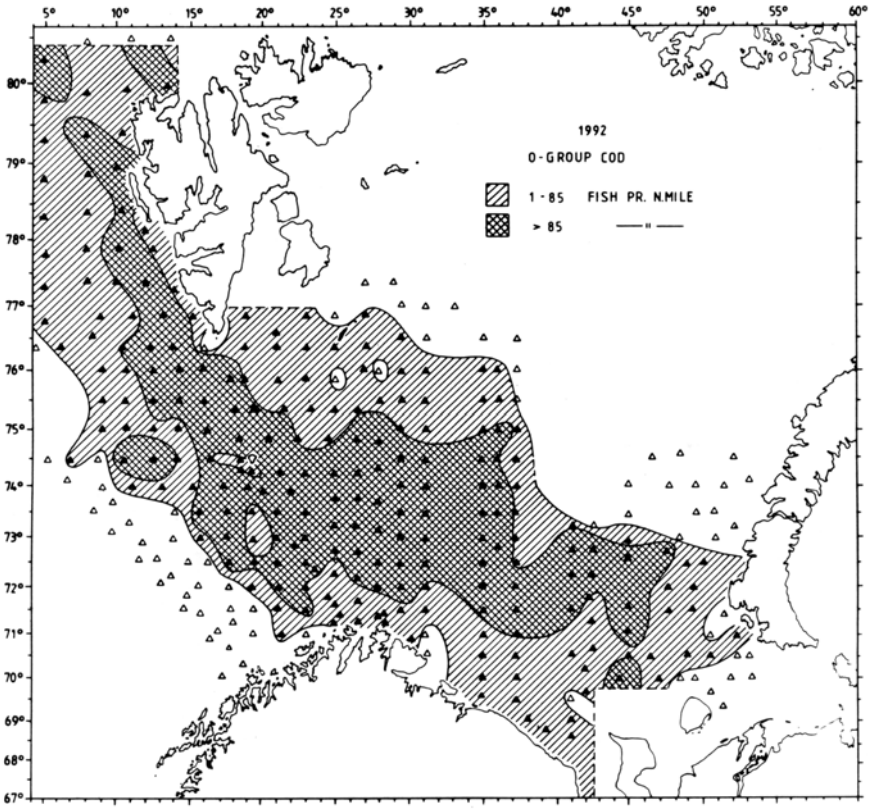

Fig. 16. Distribution of 0-group cod

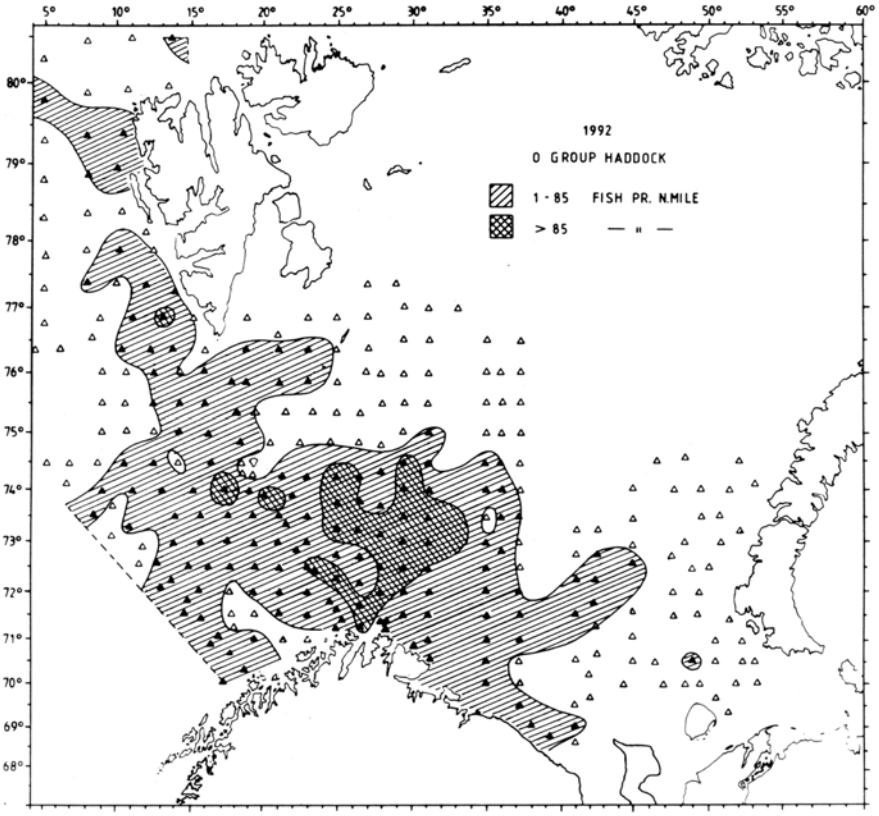

Fig. 17. Distribution of 0-group haddock

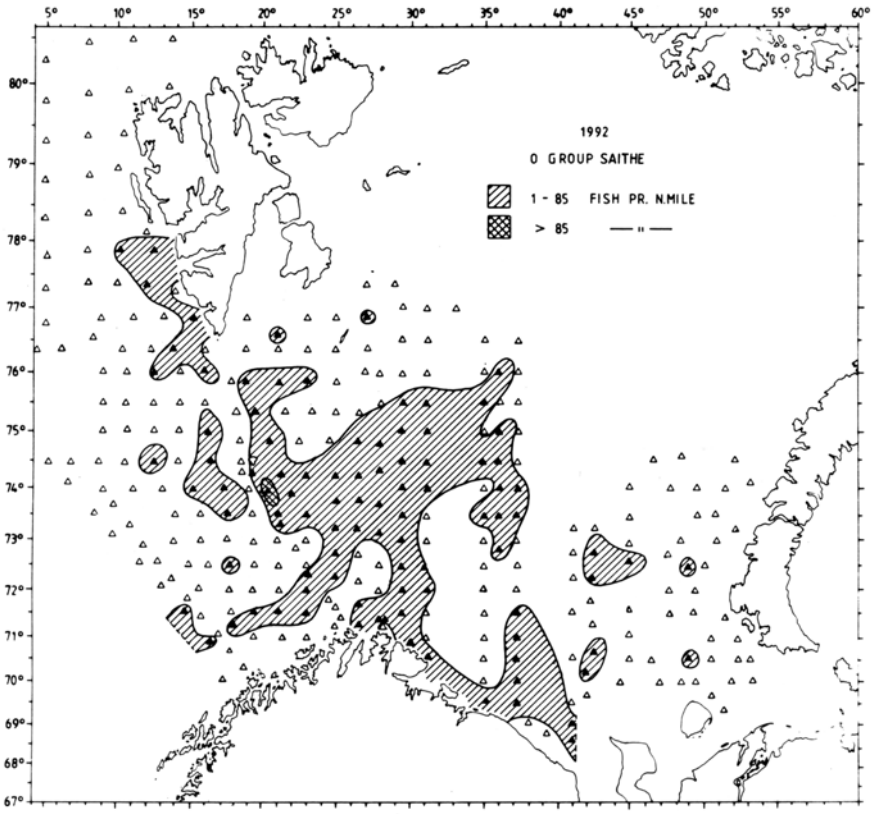

Fig. 18. Distribution of 0-group saithe

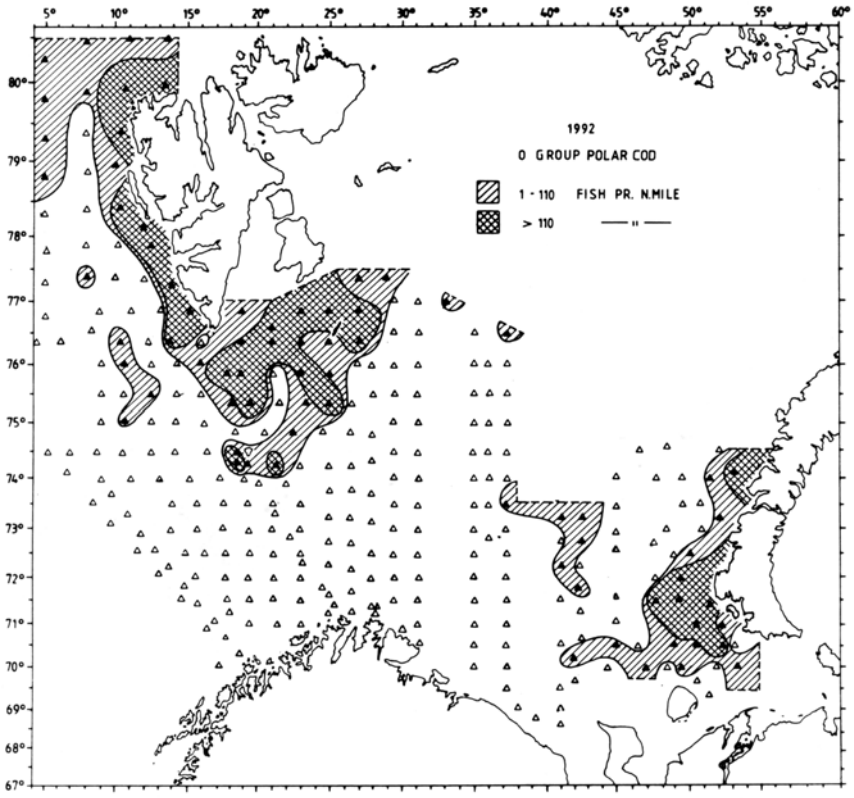

Fig. 19. Distribution of 0-group polar cod

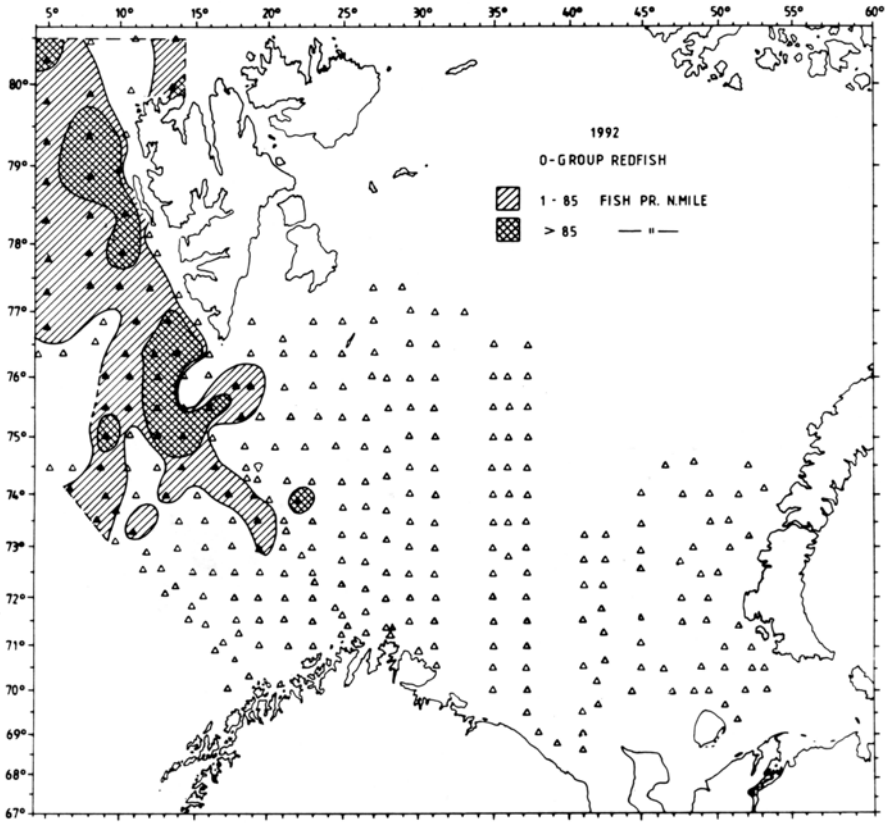

Fig. 20. Distribution of 0-group redfish

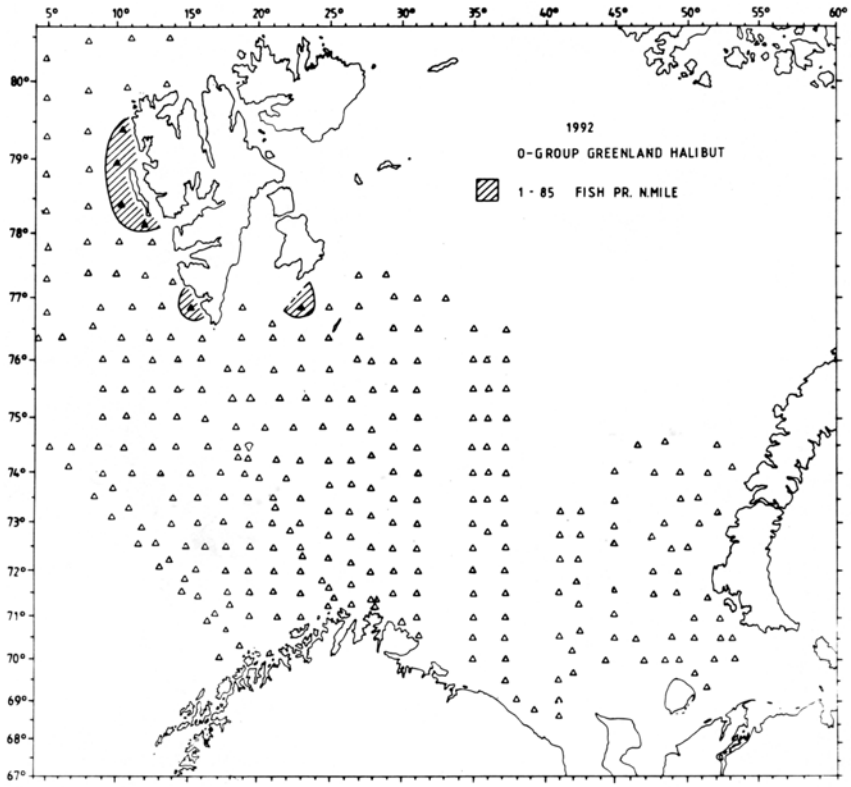

Fig. 21. Distribution of 0-group Greenland halibut

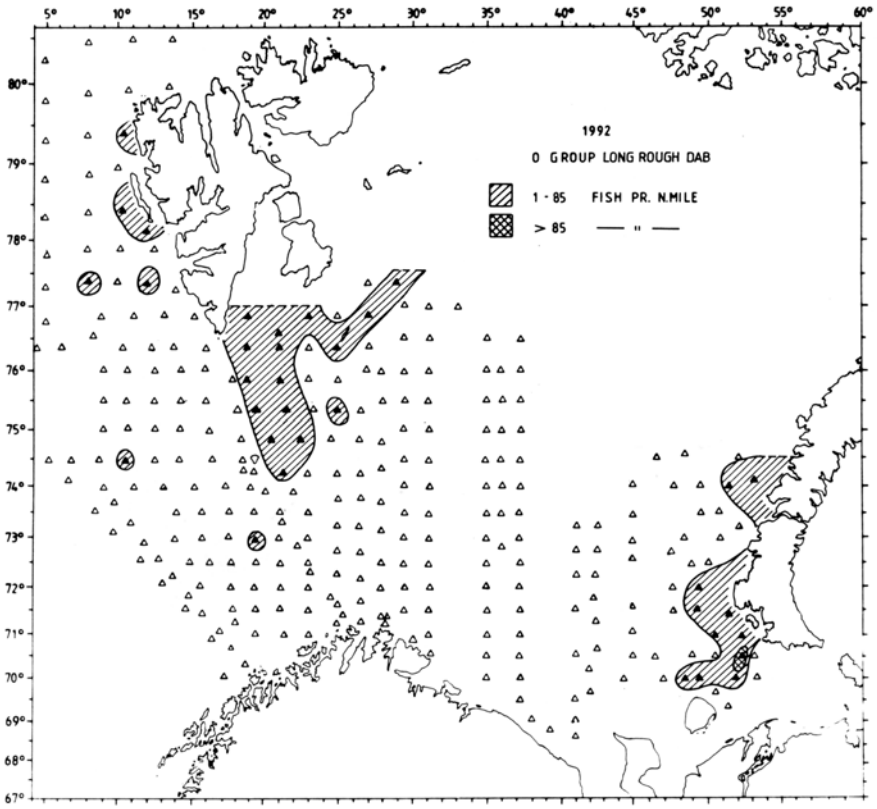

Fig. 22. Distribution of 0-group long rough dab

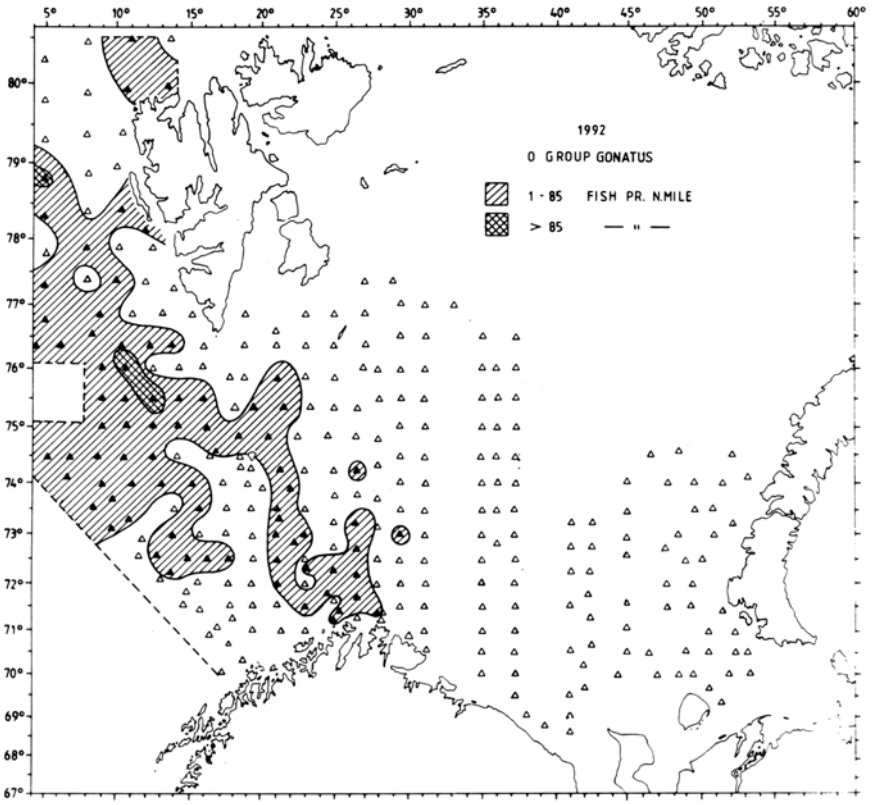

Fig. 23. Distribution of 0-group Gonatus fabricii