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International Council for
the Exploration of the Sea

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 were 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 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 mile was made when 0-group fish layer was recorded deeper than 60 m on the echosounder.

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 inceased and all temperatures are close to 1965 - 1988 Norms (Table 1). The increased advection, especially of less saline water assosiated with the Norwegian Coastal Current, has led to a distinct decrease in salinity mainly of the upper 0 - 50 (100) meters. The horisontal temperature distribution at 50 m (Fig 3) indicate 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-yearclass 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 yearclass 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

consentrations this year than last year. The abundance index (Table 2) indicate that the 1988-yearclass is stronger than the 1987-yearclass but considerably lower than the yearclasses 1983-1986, possibly not far from the 1972 or 1982 yearclass. The logarithmic index (Table 3) show a similar pattern although at a level somewhat lower than the 1972 and 1982 yearclass. 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 yearclasses. The logarithmic index (Table 3) is sligthly above the 1987 yearclass, at the 1979-1980 level, but far below the 1982-1986 yearclasses. 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 yearclasses 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.

Redfish (Fig. 23)
The area of distribution is this year enlarged towards the east, with dense consentrations 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 yearclass, 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 yearclass.

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 yearclass.

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

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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-gr up 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 (70^0,30'N - 72^0,30'N)
5 - Cape Kanin section (68^0,45'N - 70^0,05'N)
6 - Cape Kanin section (71^0,00'N - 72^0,00'N)
7 - North Cape Current: North Cape - Bear Island section (71^0,33'N; 25^0,02'E - 73^0,35'N; 20^0,46'E)
8 - West Spitsbergen Current: Bear Island - West section (06^0,34'E - 15^0,55'E)

Layer/ Year	0-50m	50-200m	0-200m	0-bottom	0-bottom	0-200m	0-200m
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
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 West	Polar cod East	Redfish	Greenland halibut	Long rough dab
1965	6	7	0		159		66
1966	1	1	129		236		97
1967	34	42	165		44		73
1968	25	8	60		21		17
1969	93	82	208		295		26
1970	606	115	197		247	1	12
1971	157	73	181		172	1	81
1972	140	46	140		177	8	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) Logarithmic index	Confidence limits		Cod Logarithmic index	Confidence limits		Haddock 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 East	Polar cod West	Redfish	Greenland halibut	Long rough dab	Sandeel
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

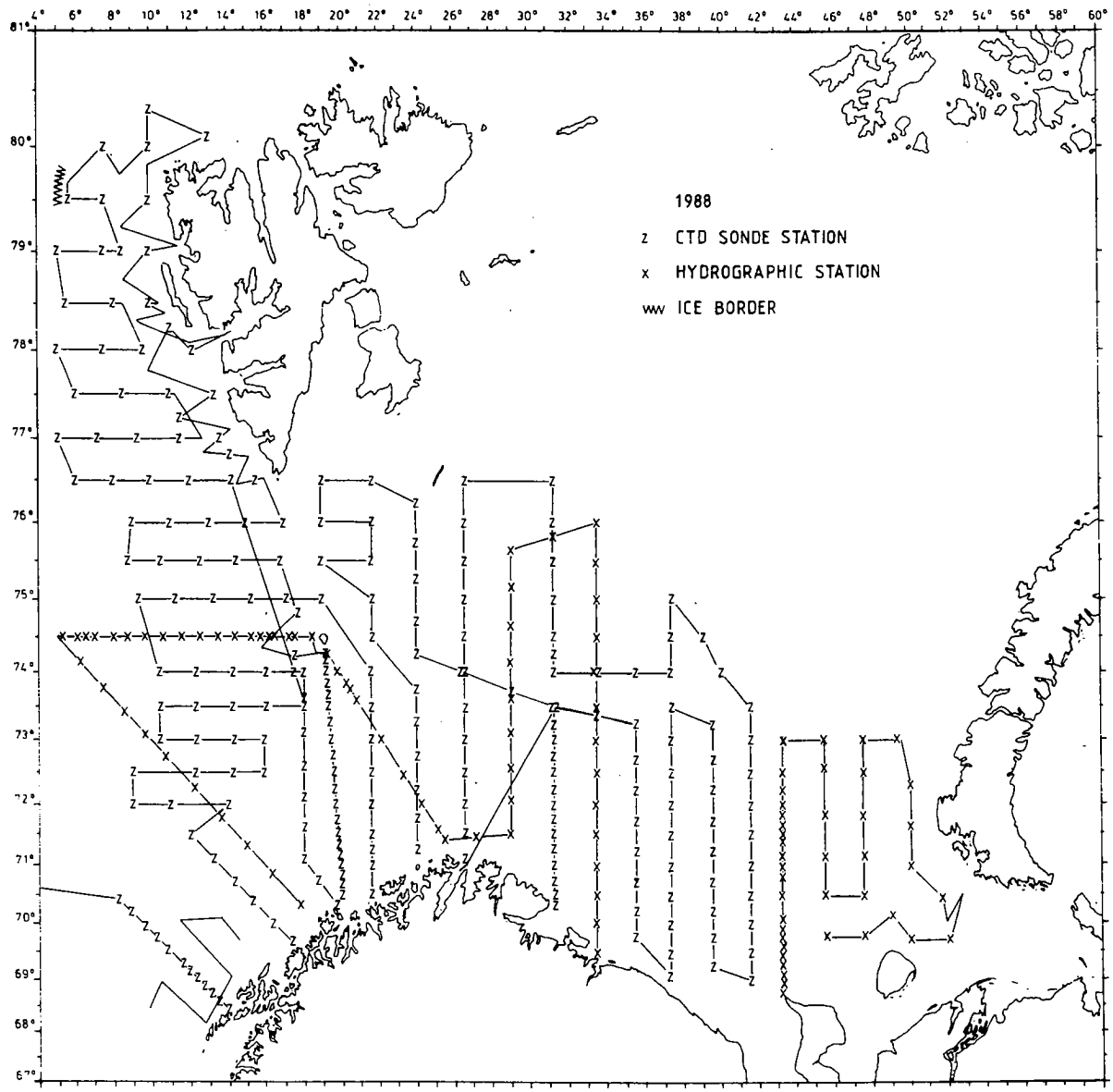

Fig. 1. Survey tracks of the ships and the grid of hydrographic stations.

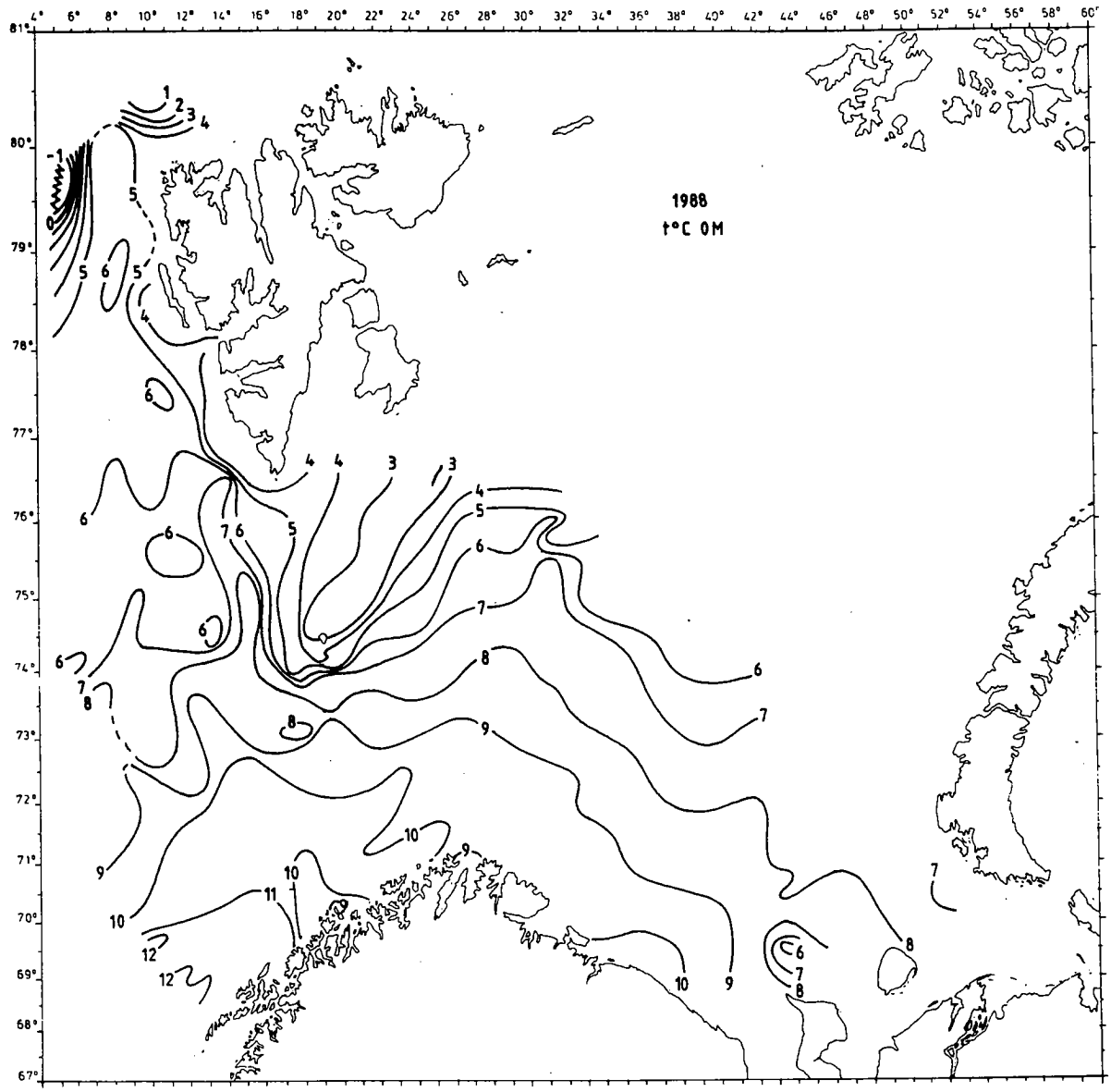

Fig. 2. Isotherms at 0 m.

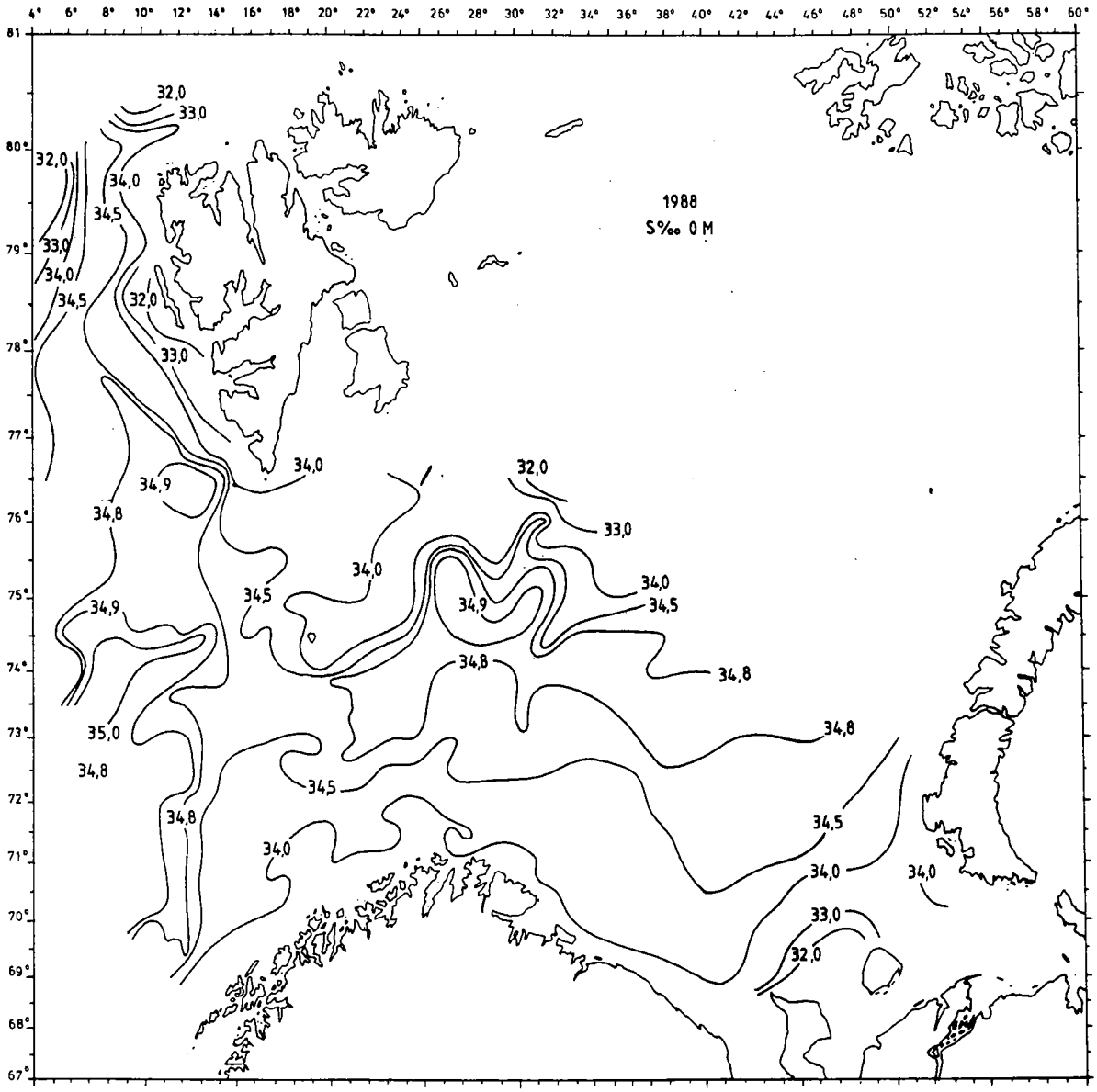

Fig. 3. Isohalines at 0 m.

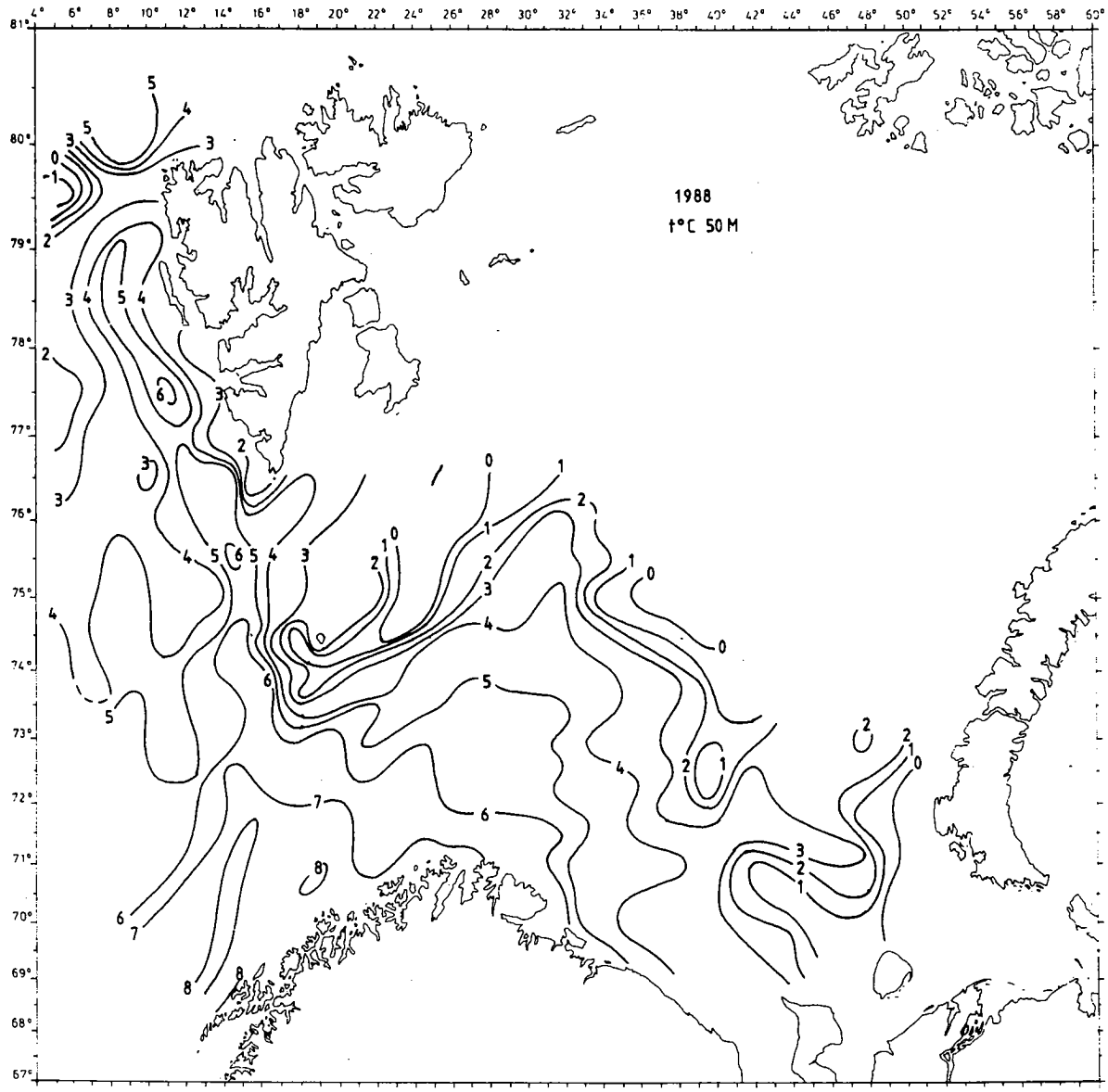

Fig. 4. Isotherms at 50 m.

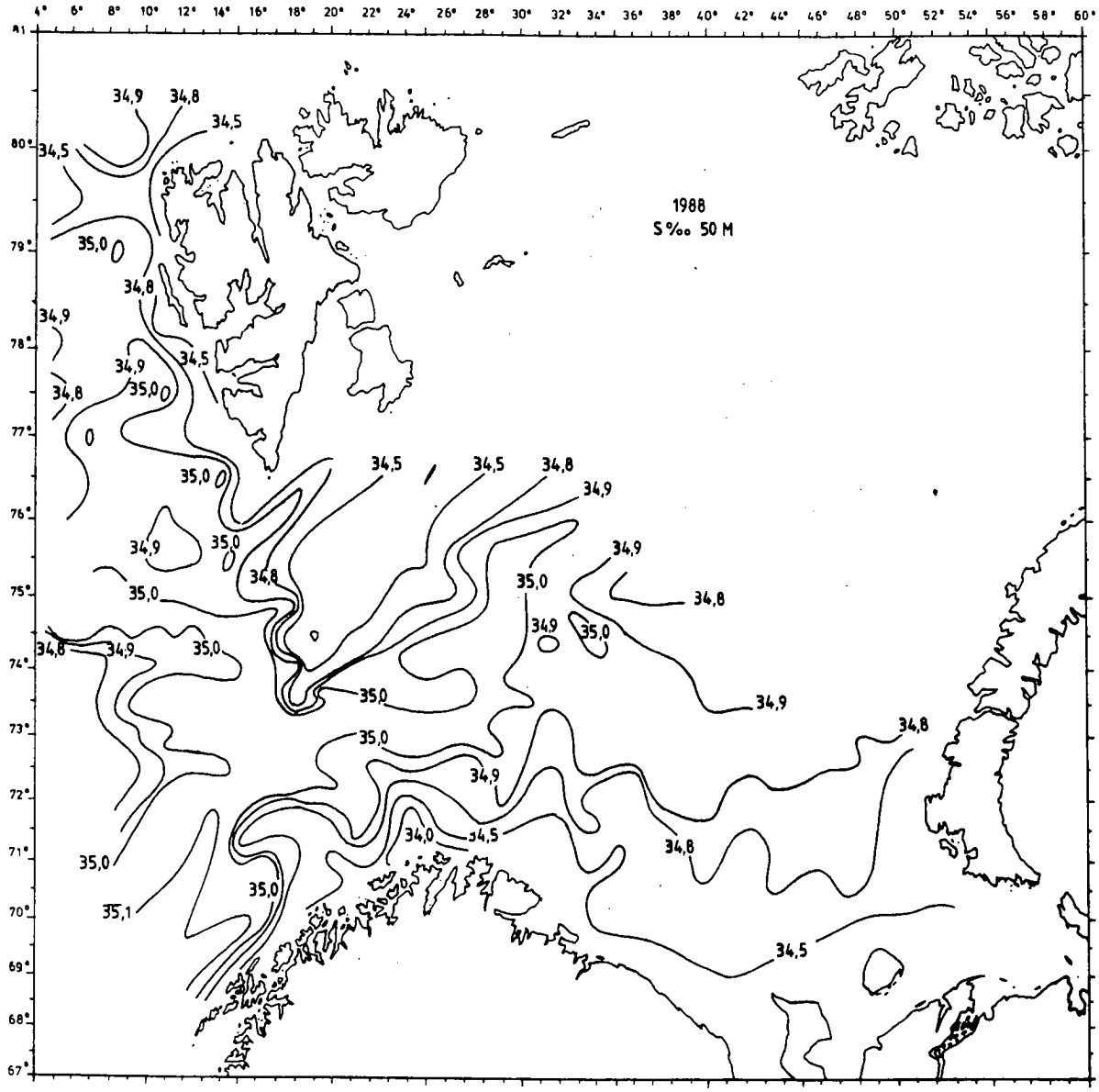

Fig. 5. Isohalines at 50 m.

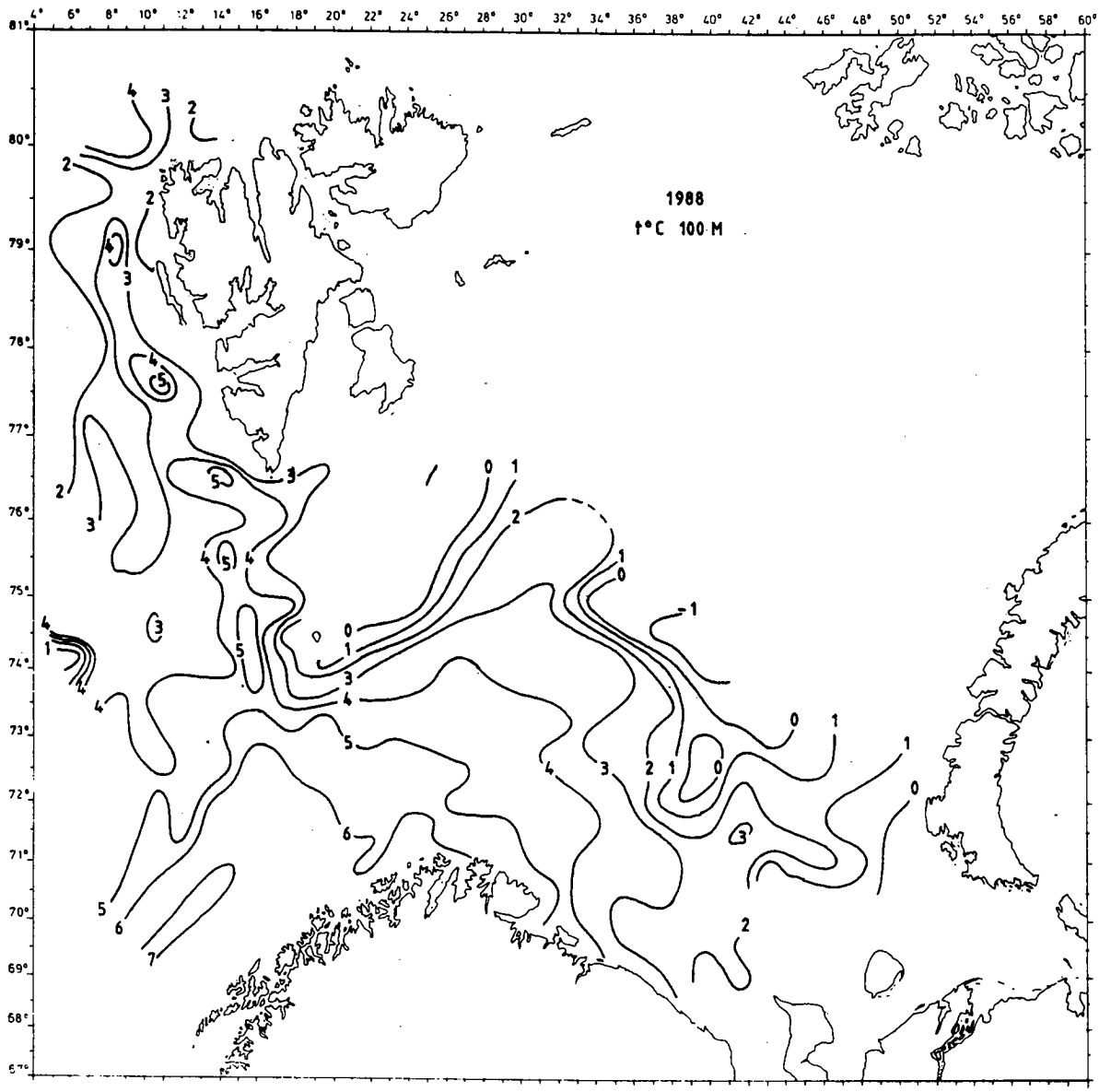

Fig. 6. Isotherms at 100 m.

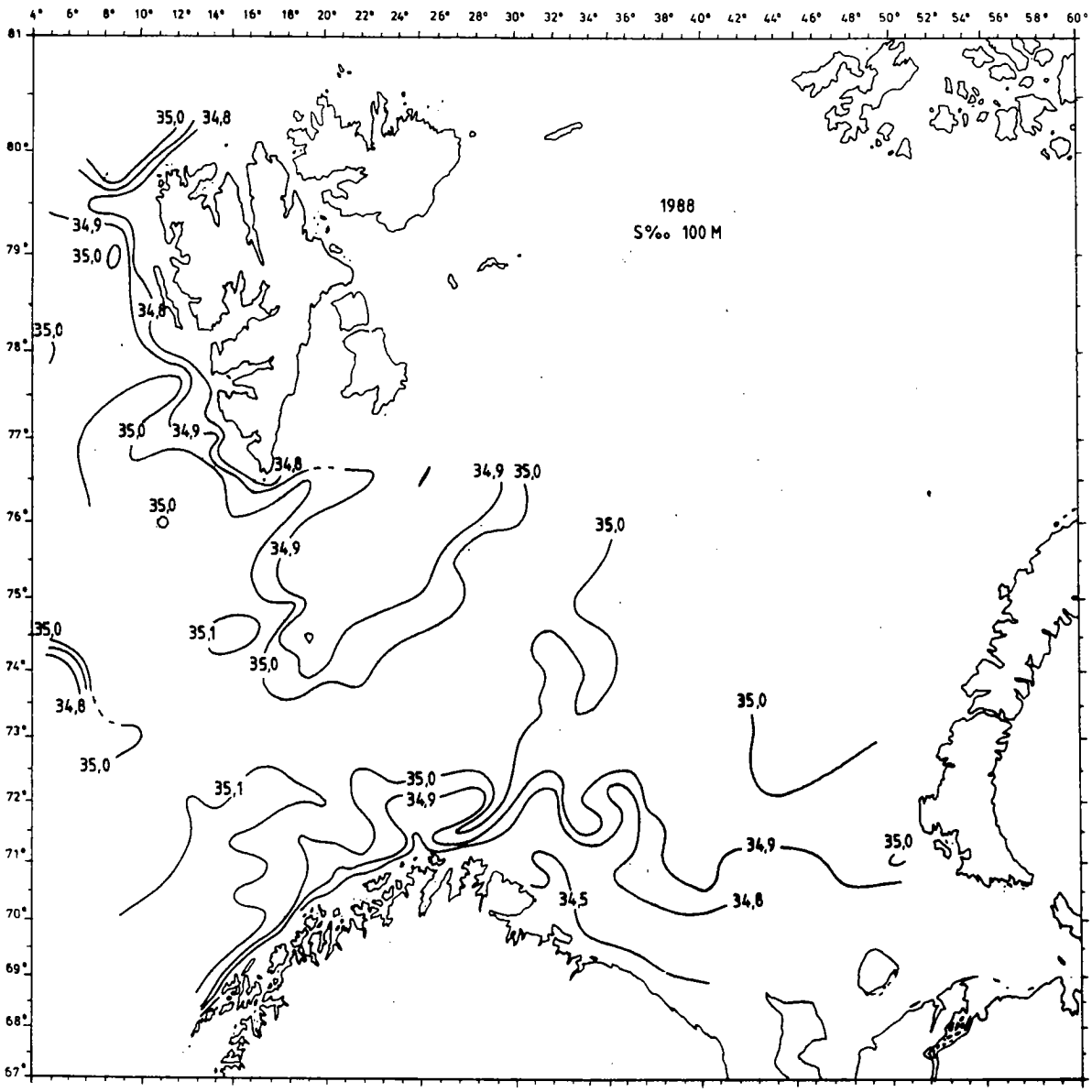

Fig. 7. Isohalines at 100 m.

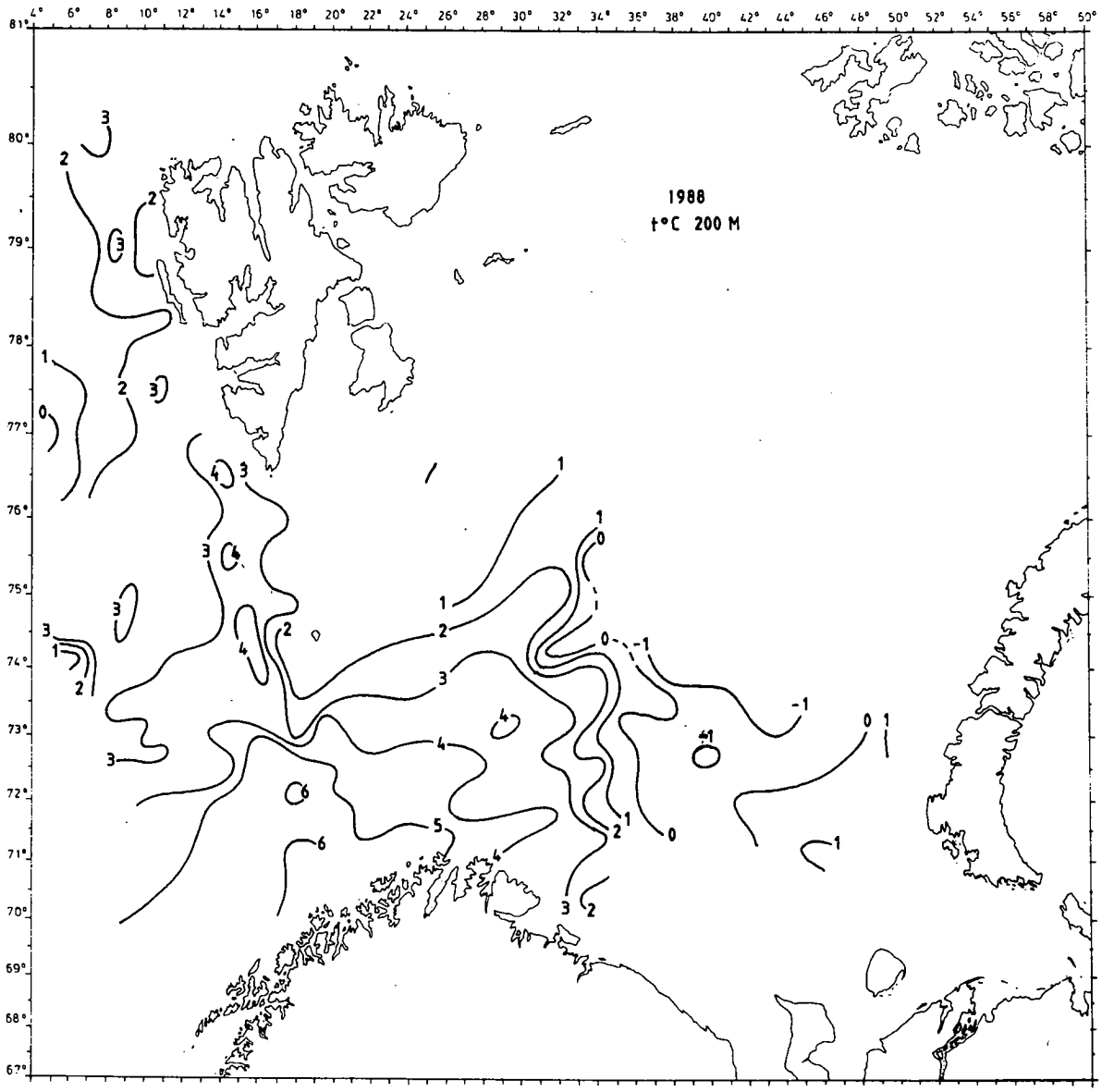

Fig. 8. Isotherms at 200 m.

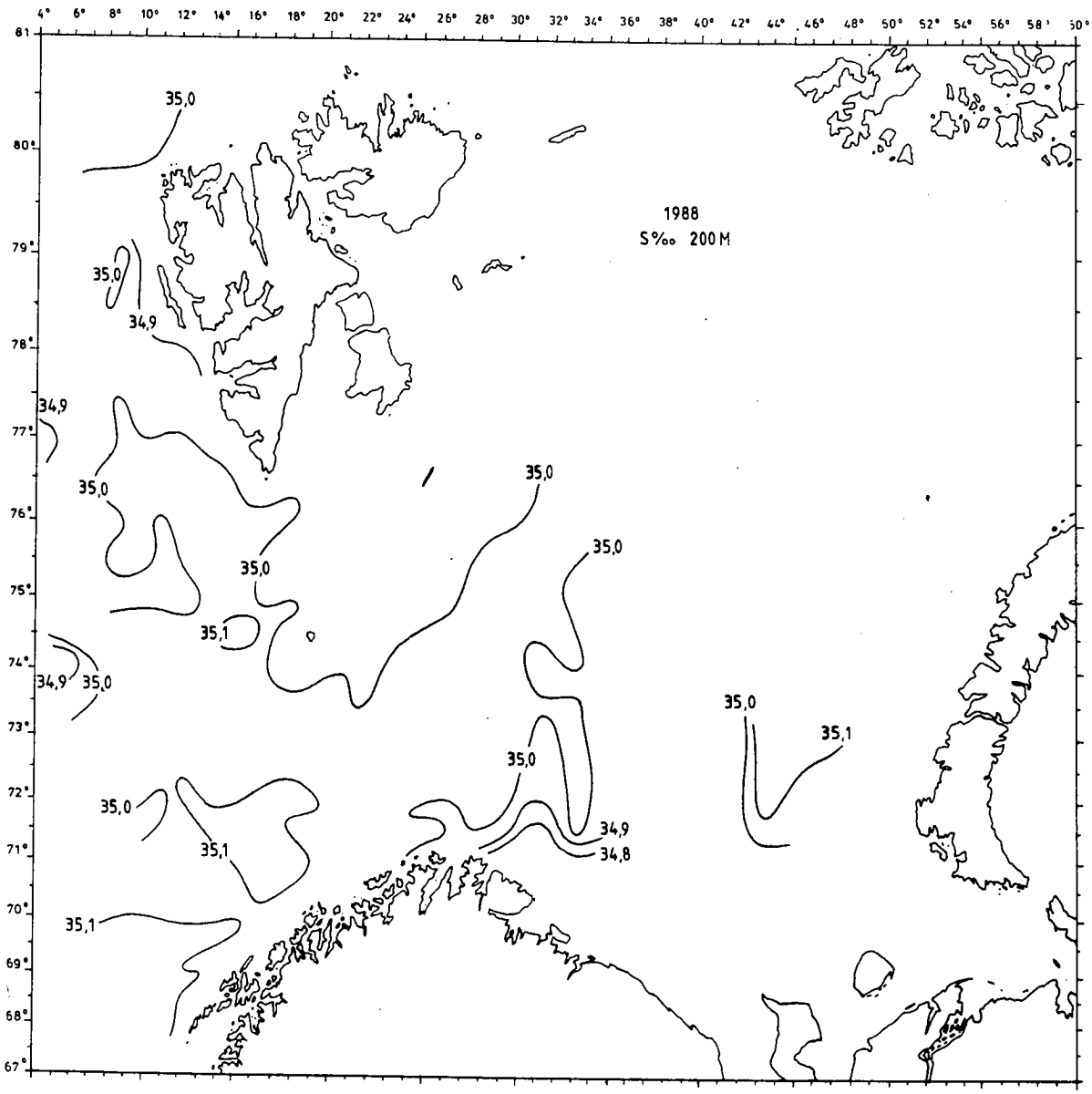

Fig. 9. Isohalines at 200 m.

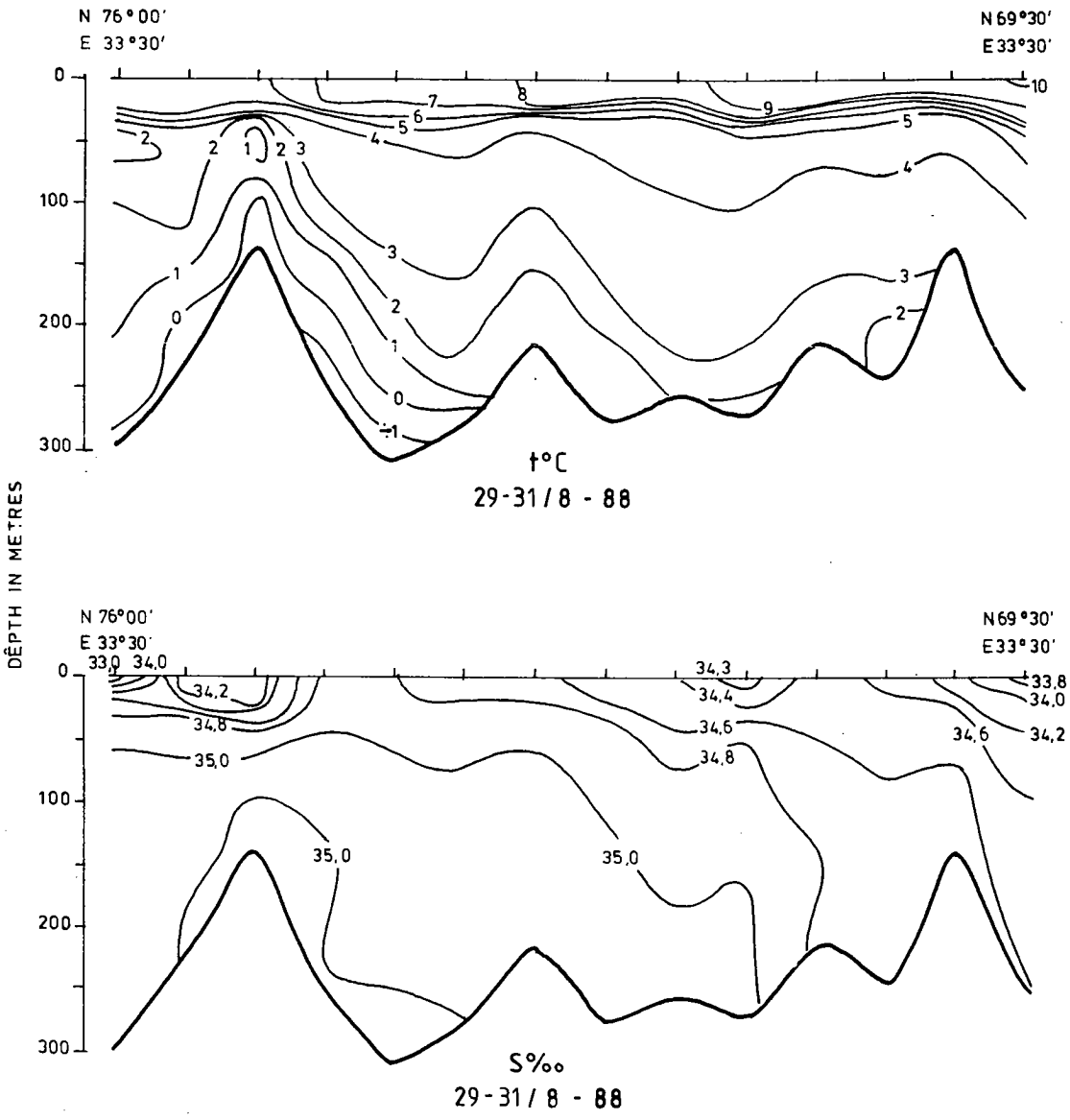

Fig. 10. Hydrographic section along the Kola meredian. Temperature and salinity.

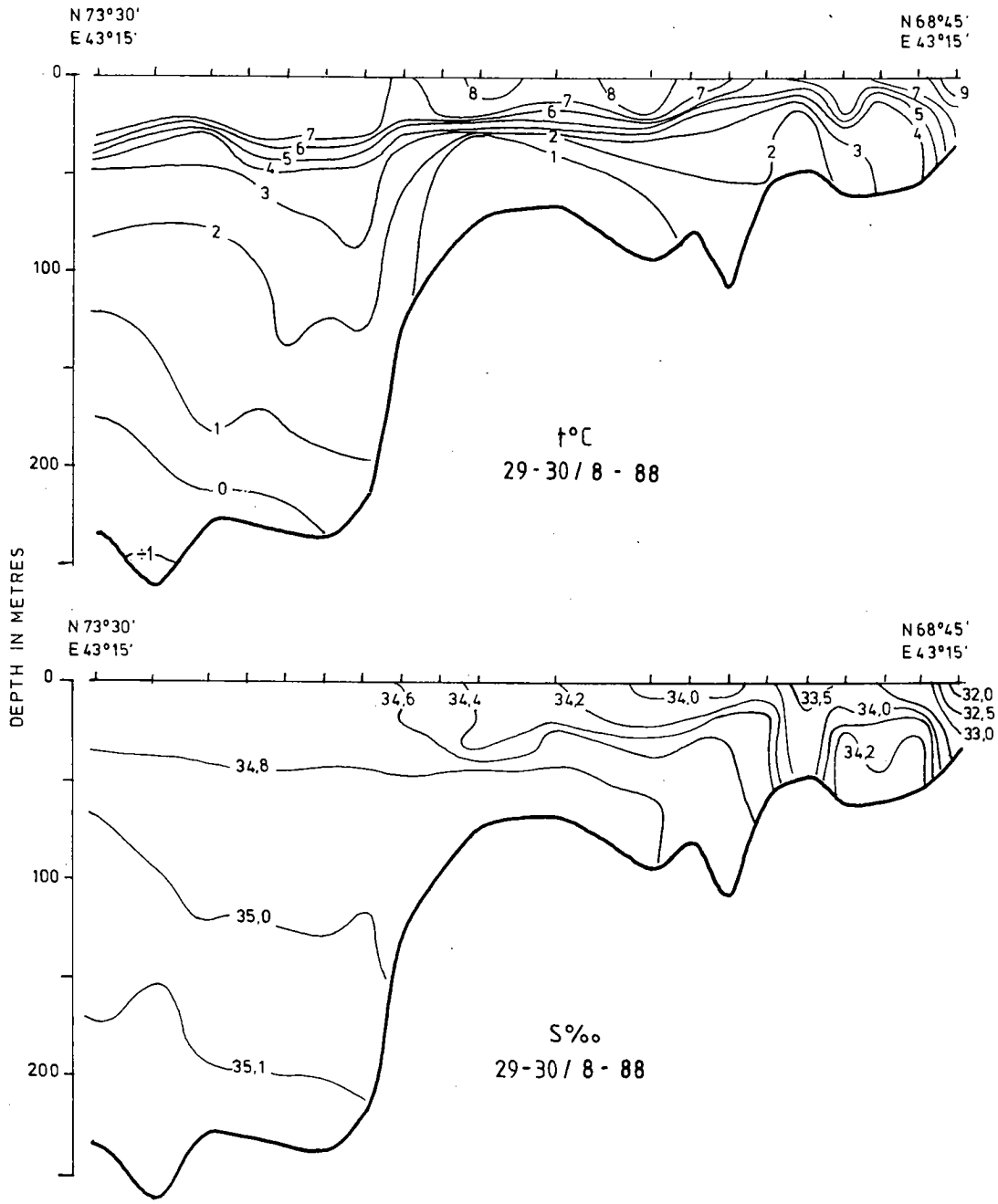

Fig. 11. Hydrographic section Cape Kanin-North.
Temperature and salinity.

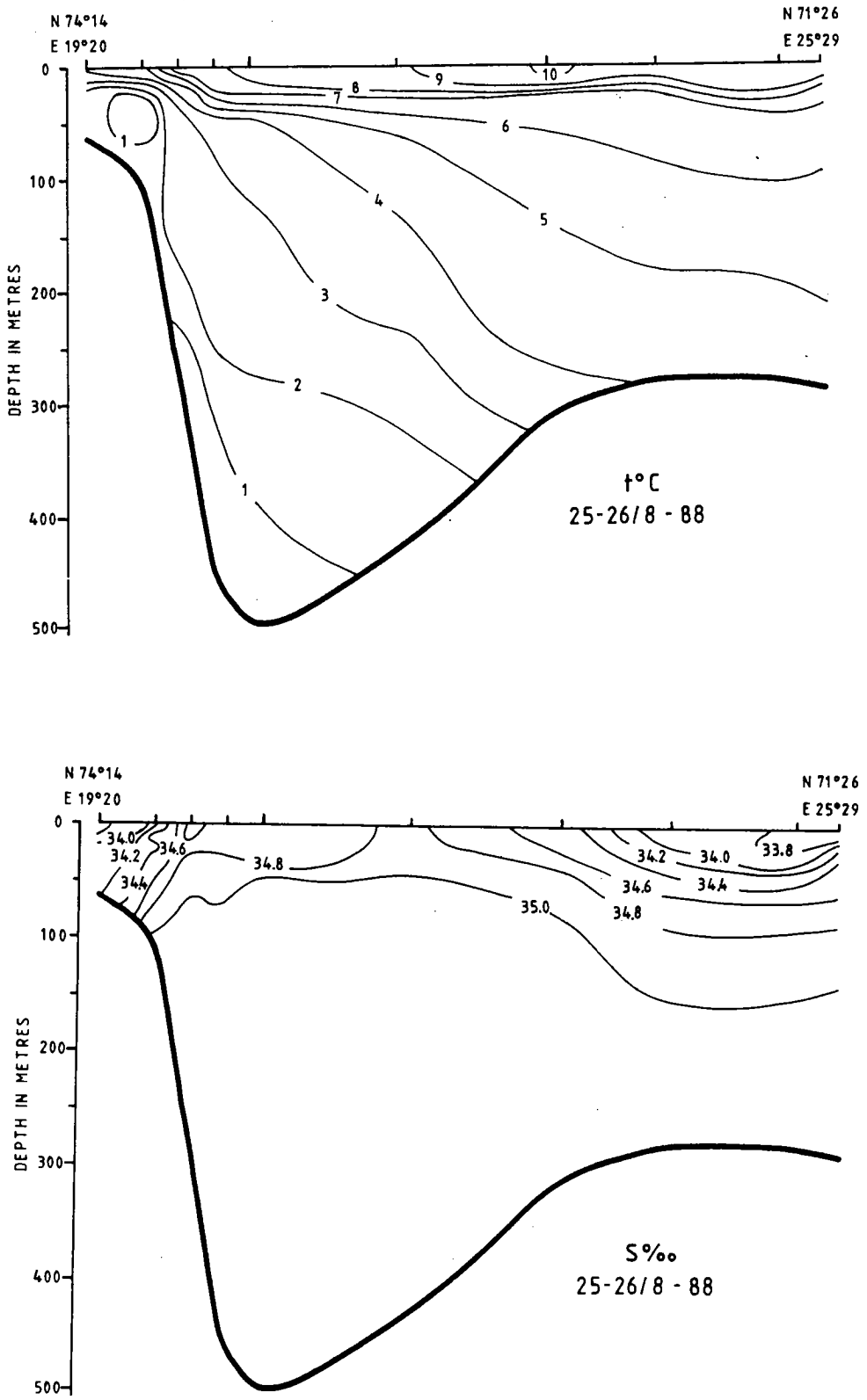

Fig. 12. Hydrographic section Bear Island - North Cape. Temperature and salinity.

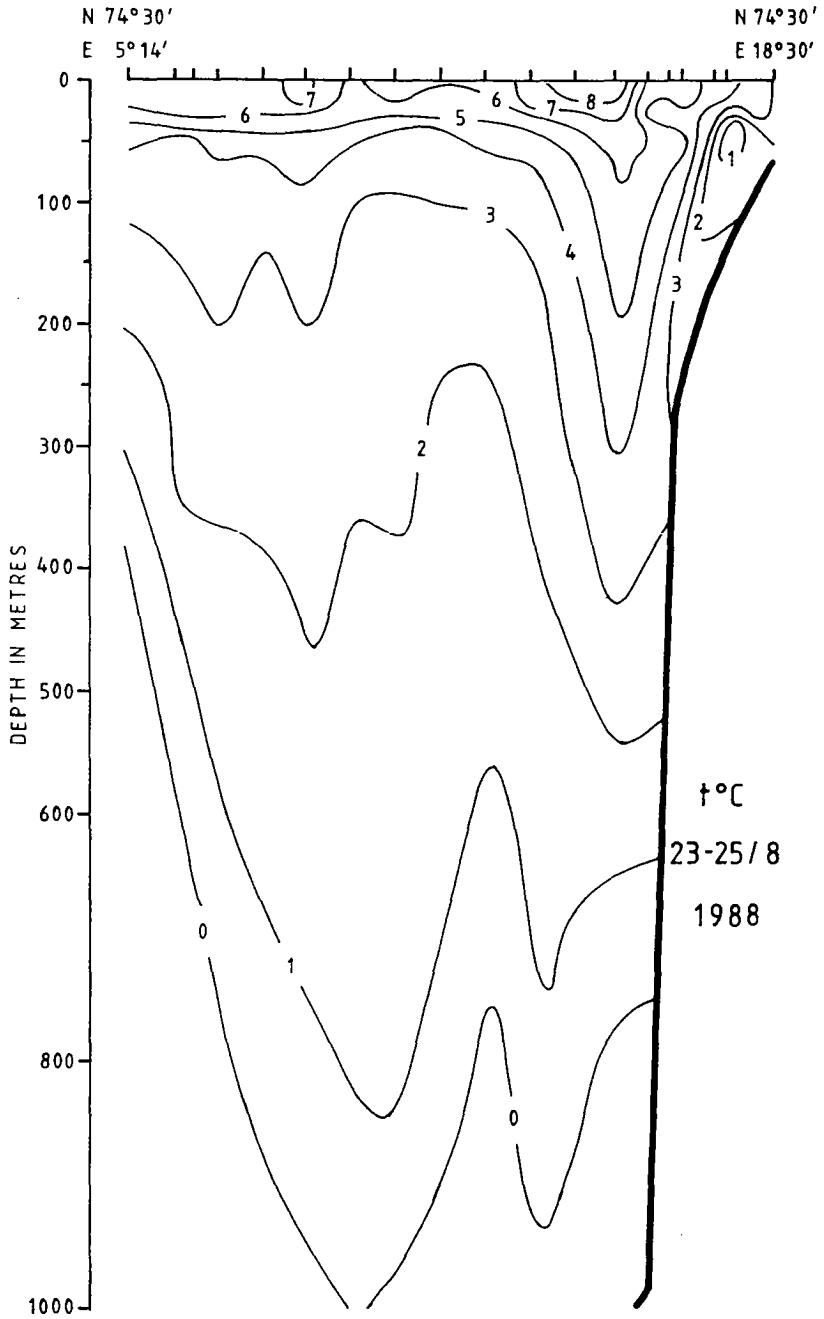

Fig. 13a. Hydrographic section Bear Island-West. Temperature.

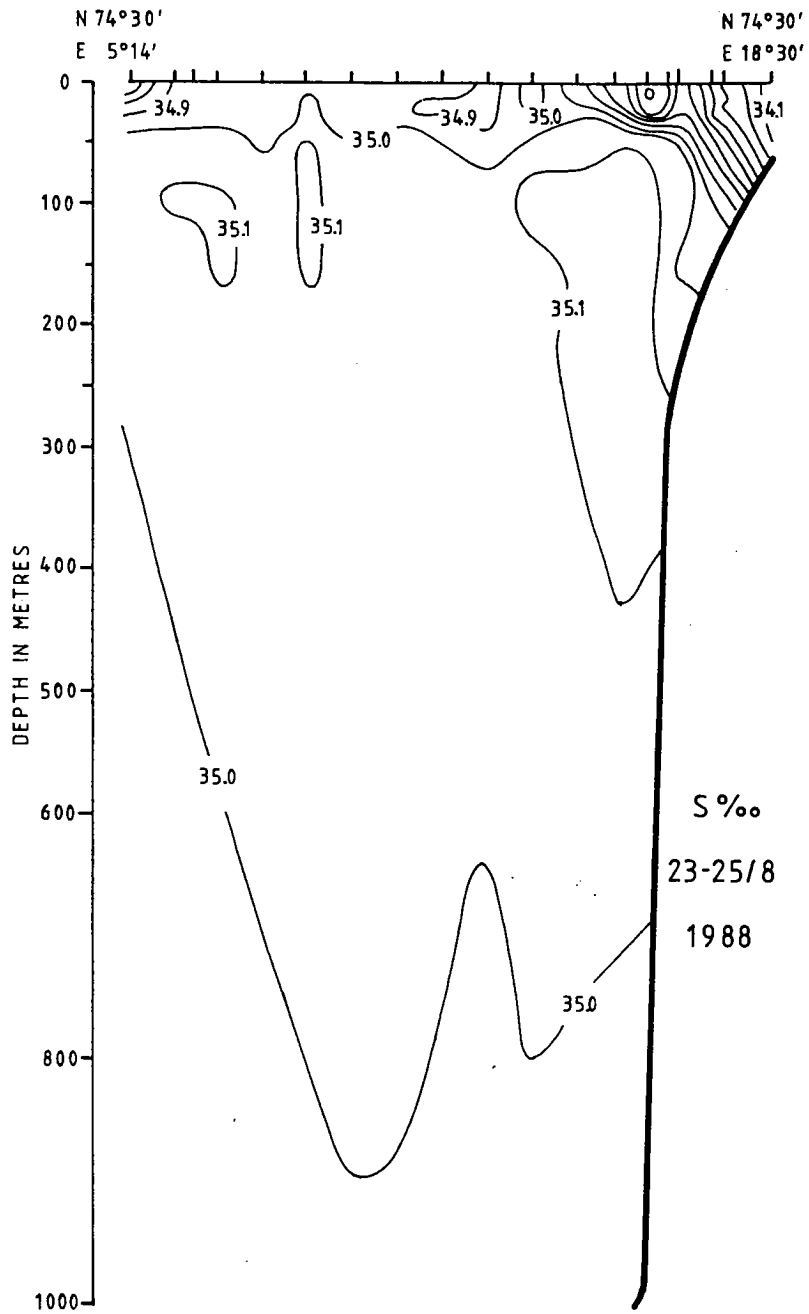

Fig. 13b. Hydrographic section Bear Island-West. Salinity.

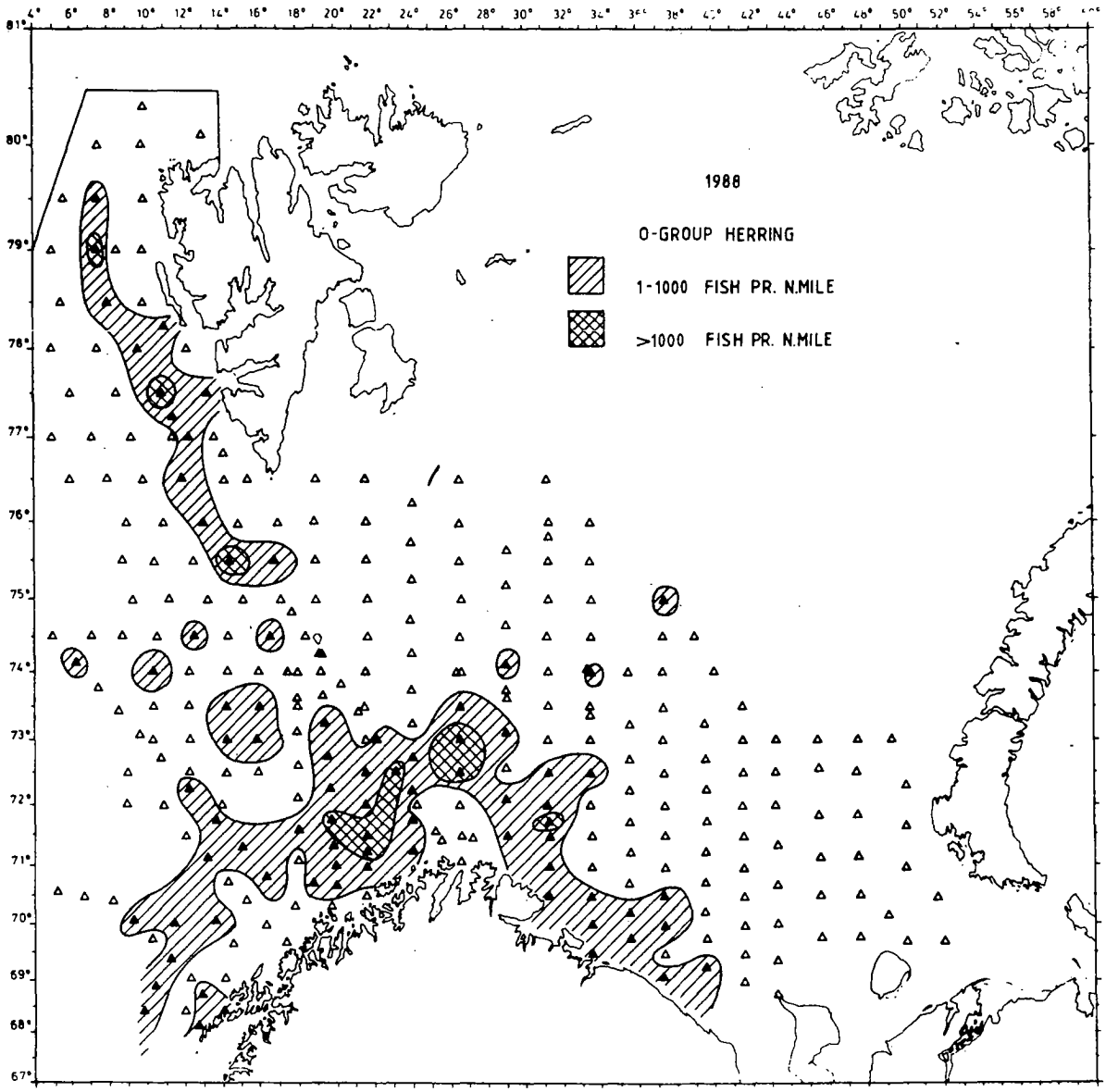

Fig. 14. Distribution of 0-group herring.

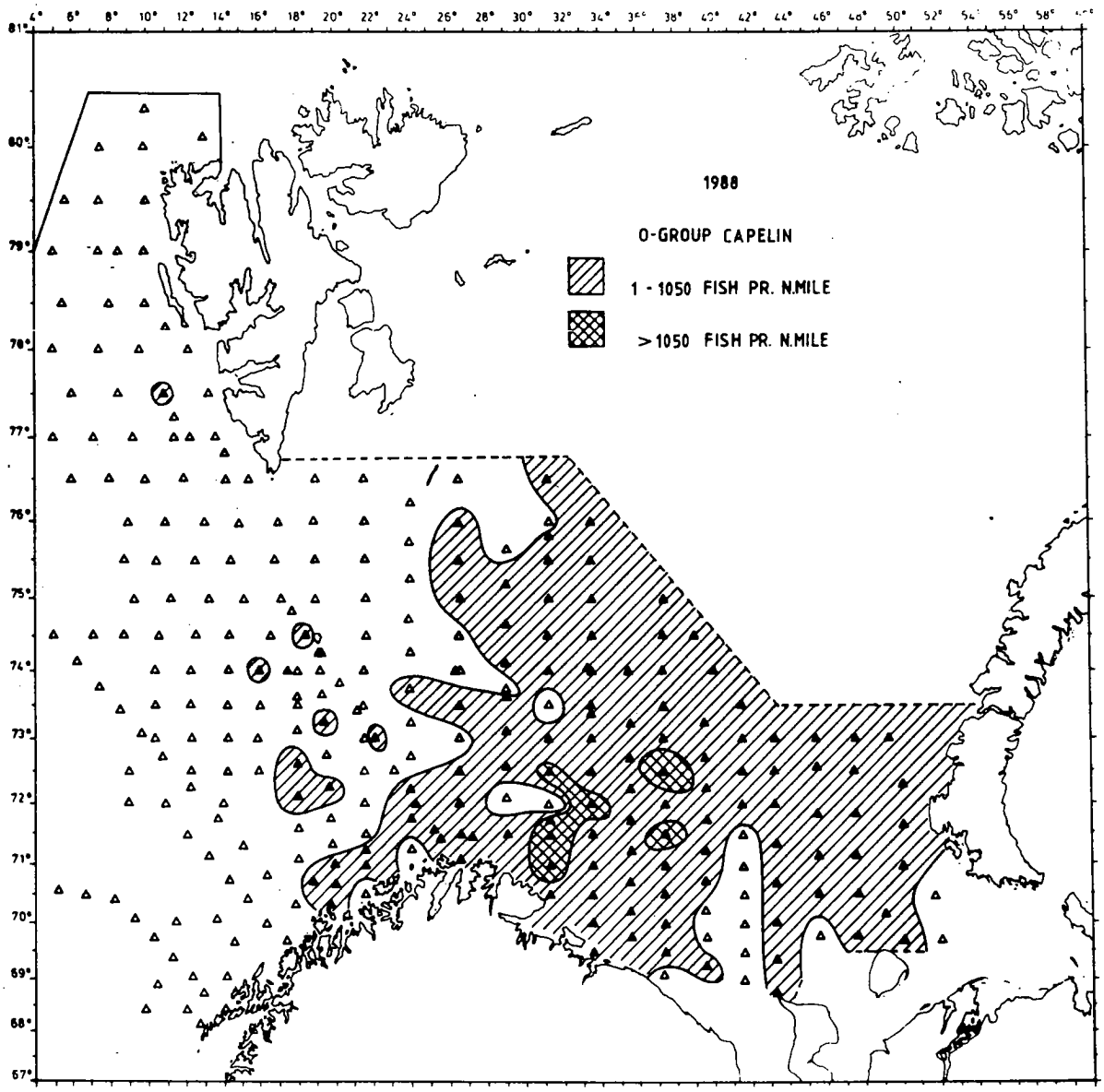

Fig. 15. Distribution of 0-group capelin.

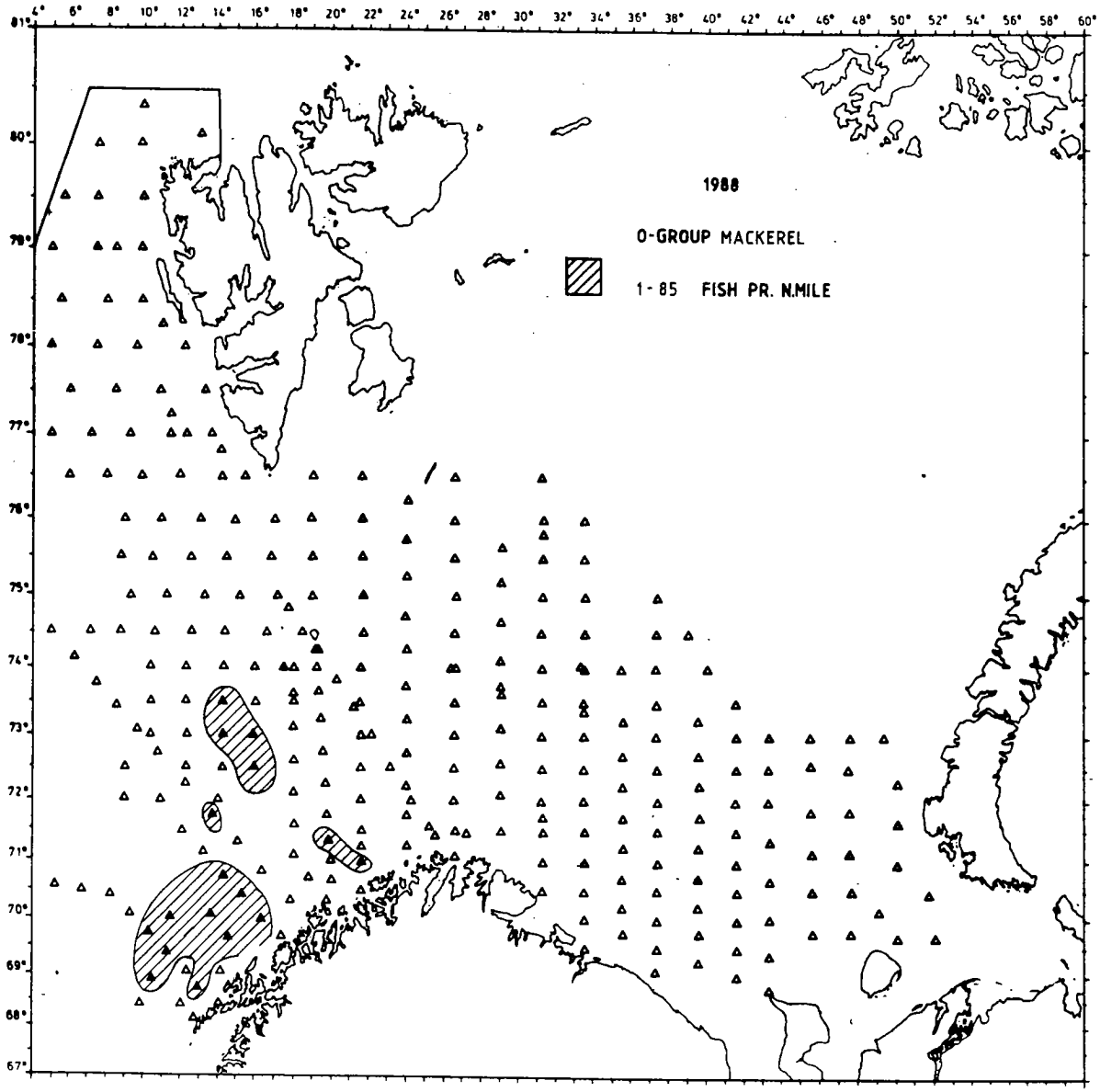

Fig. 16. Distribution of 0-group mackerel.

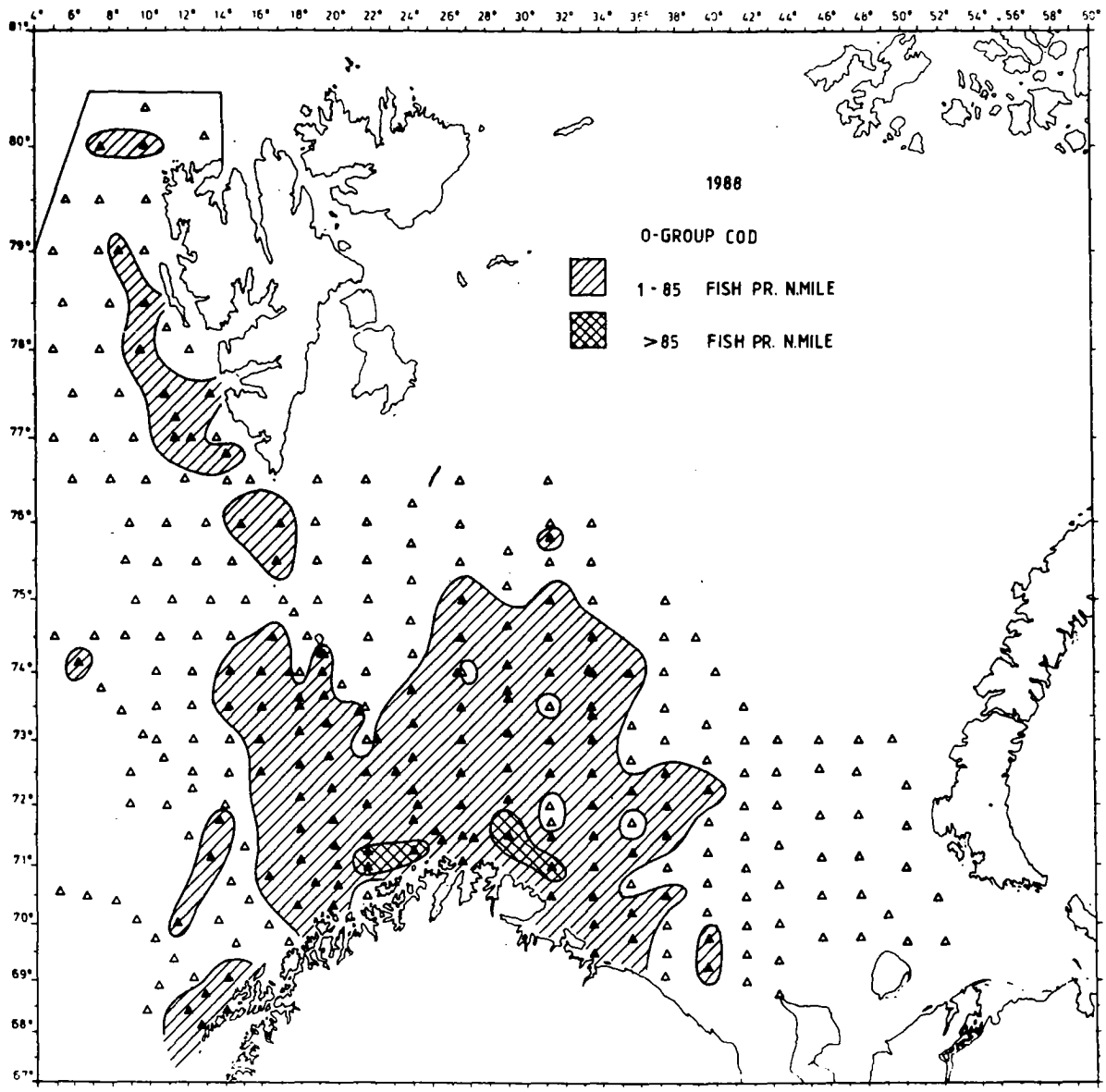

Fig. 17. Distribution of 0-group cod.

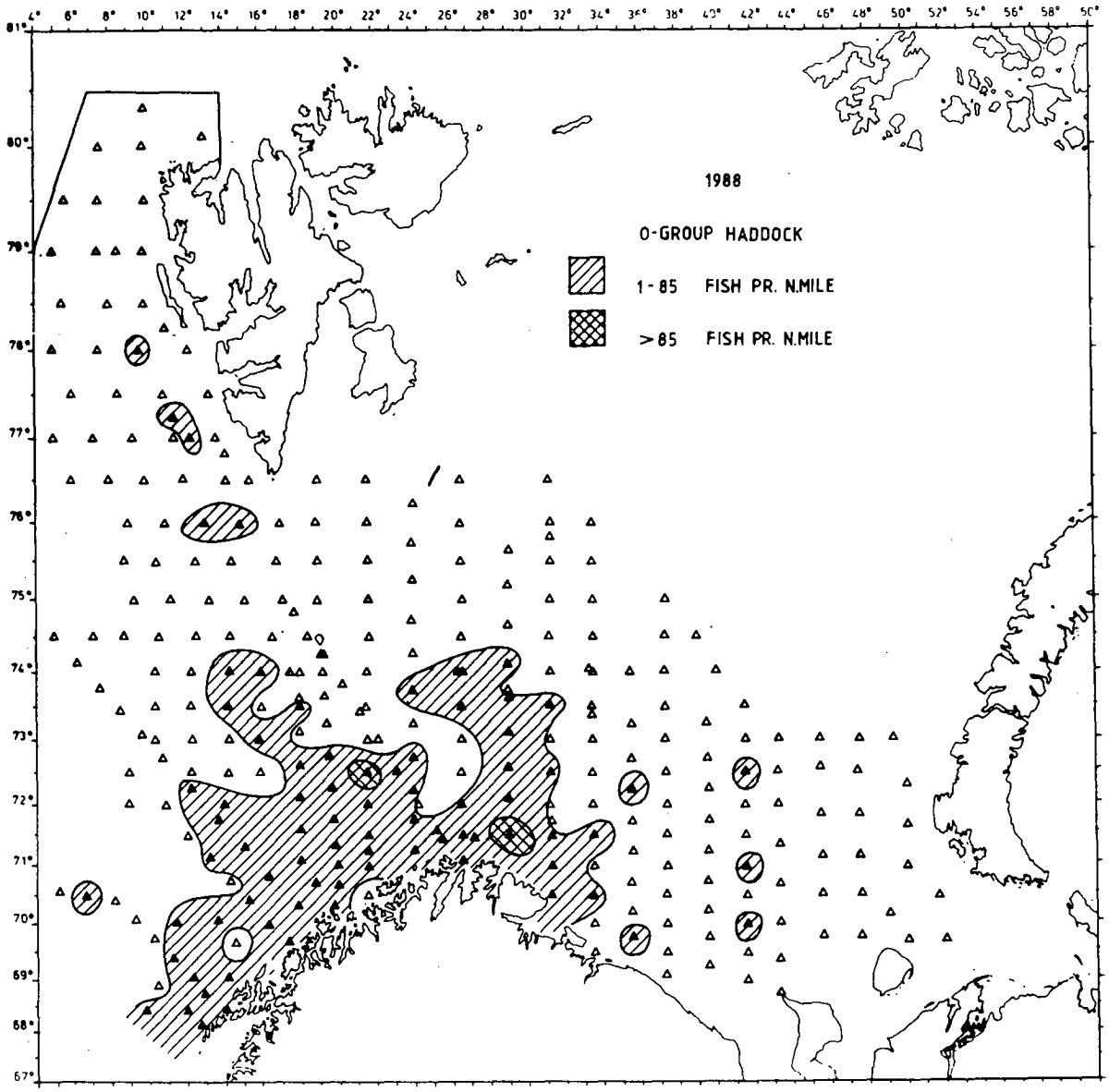

Fig. 18. Distribution of 0-group haddock.

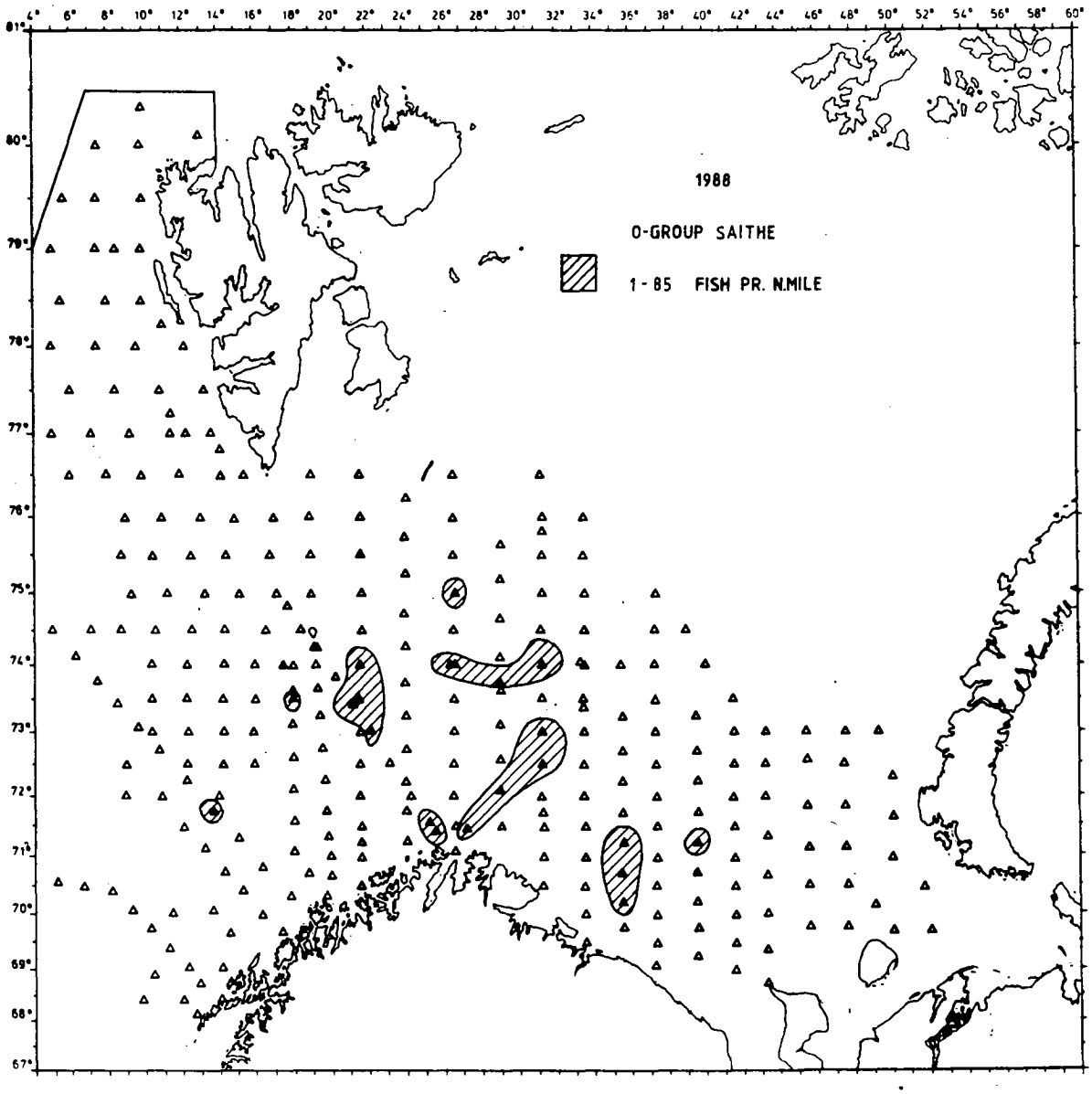

Fig. 19. Distribution of 0-group saithe.

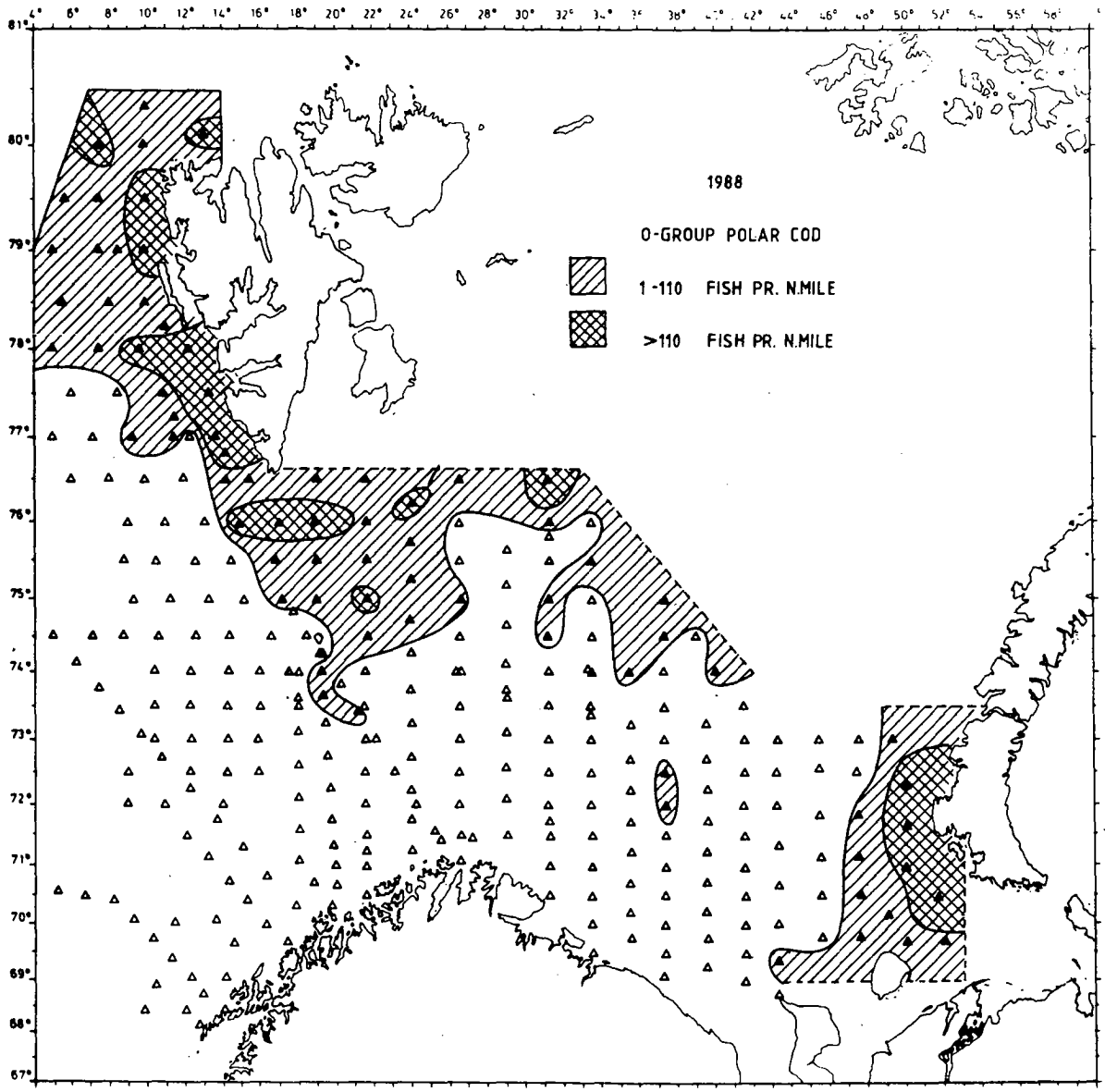

Fig. 20. Distribution of 0-group polar cod.

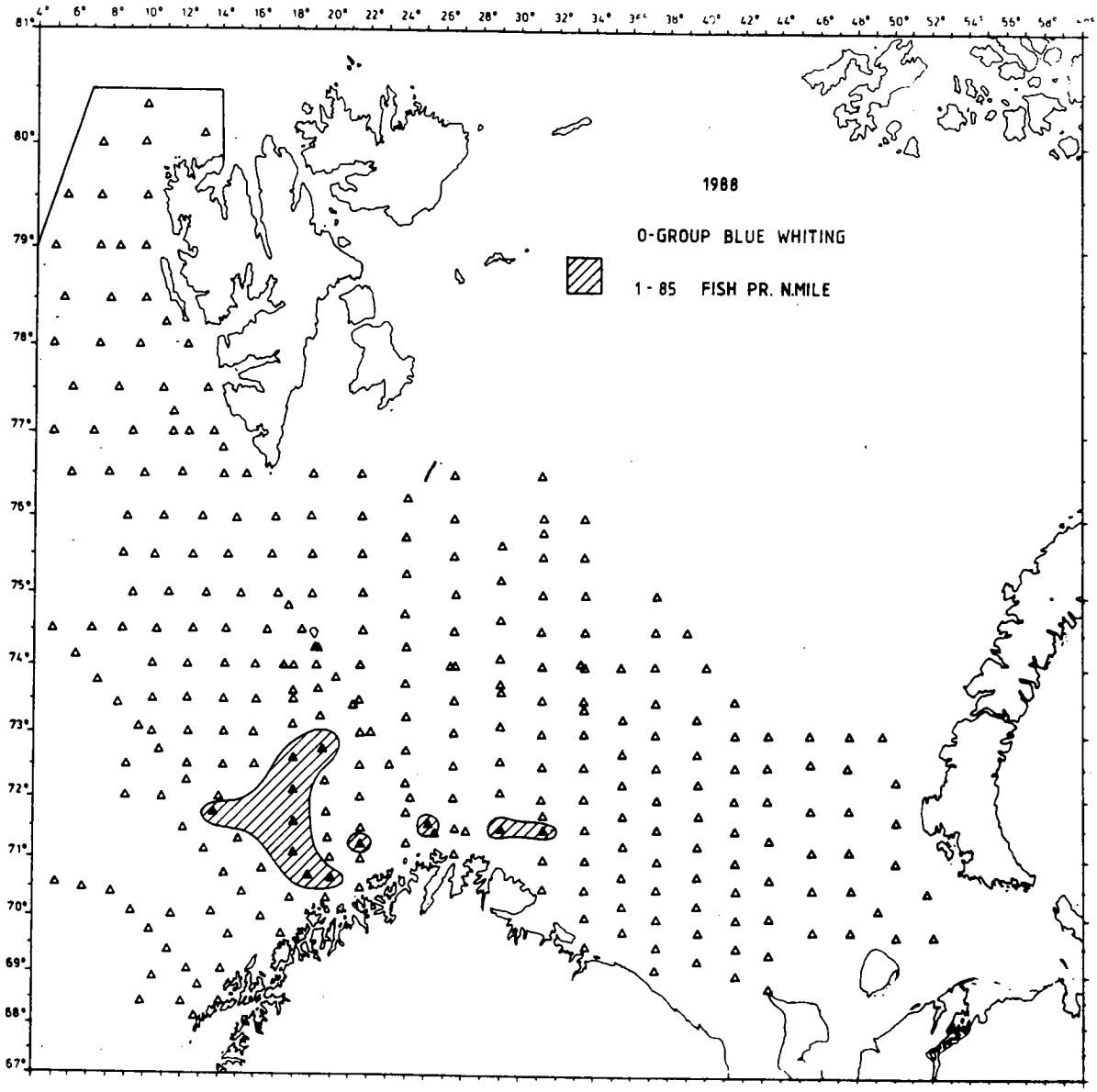

Fig. 21. Distribution of 0-group blue whiting.

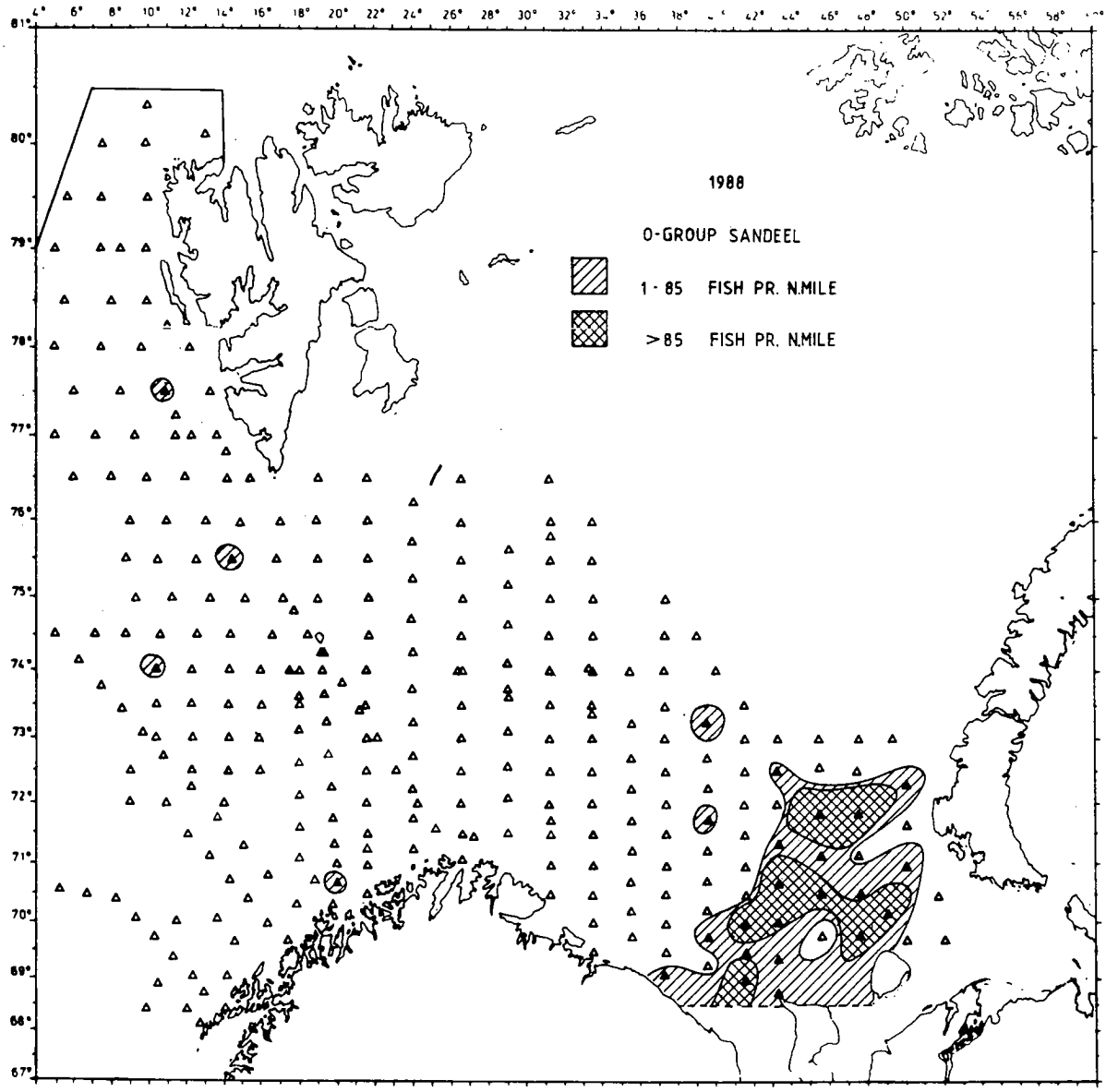

Fig. 22. Distribution of 0-group sandeel.

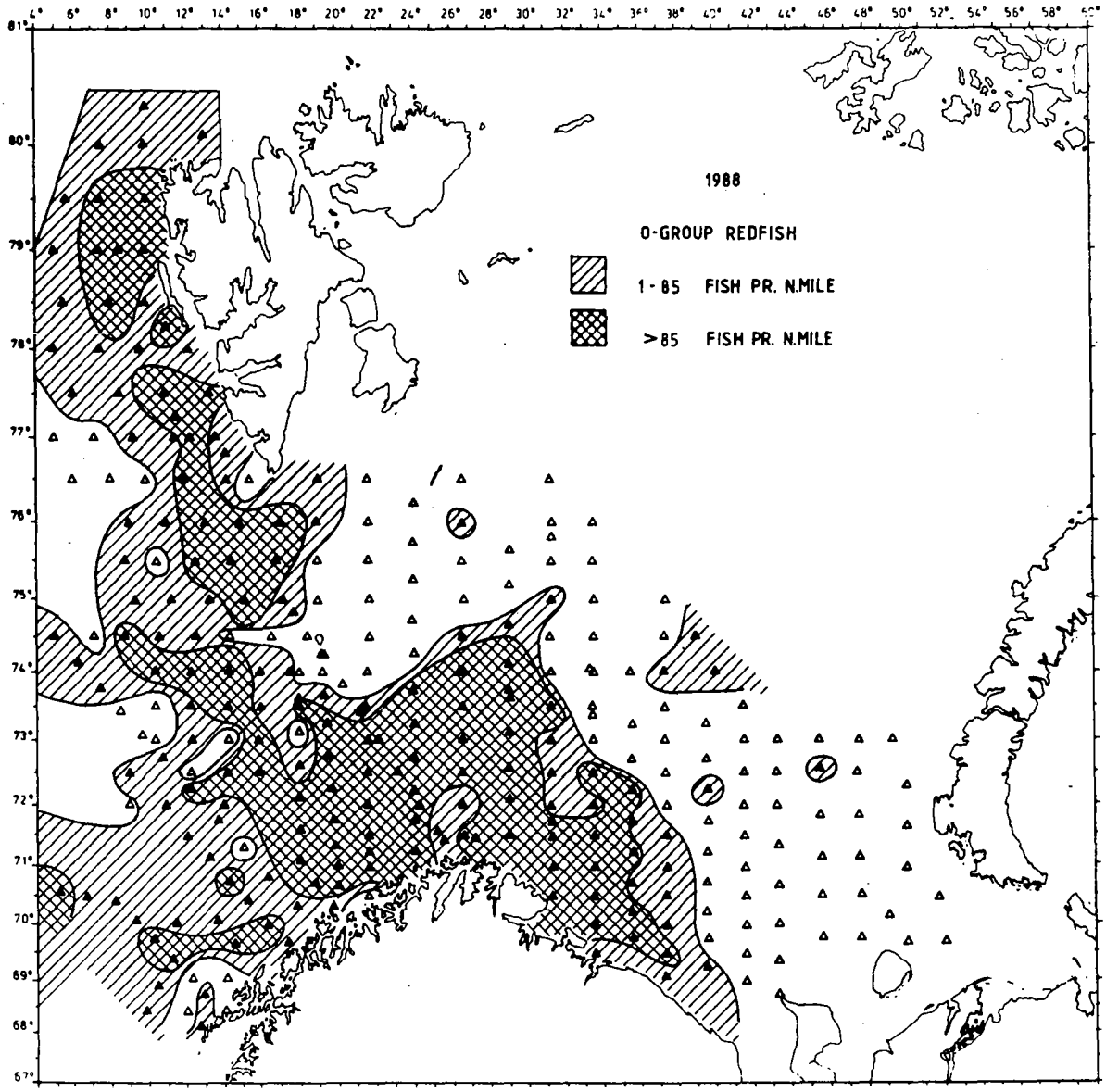

Fig. 23. Distribution of 0-group redfish.

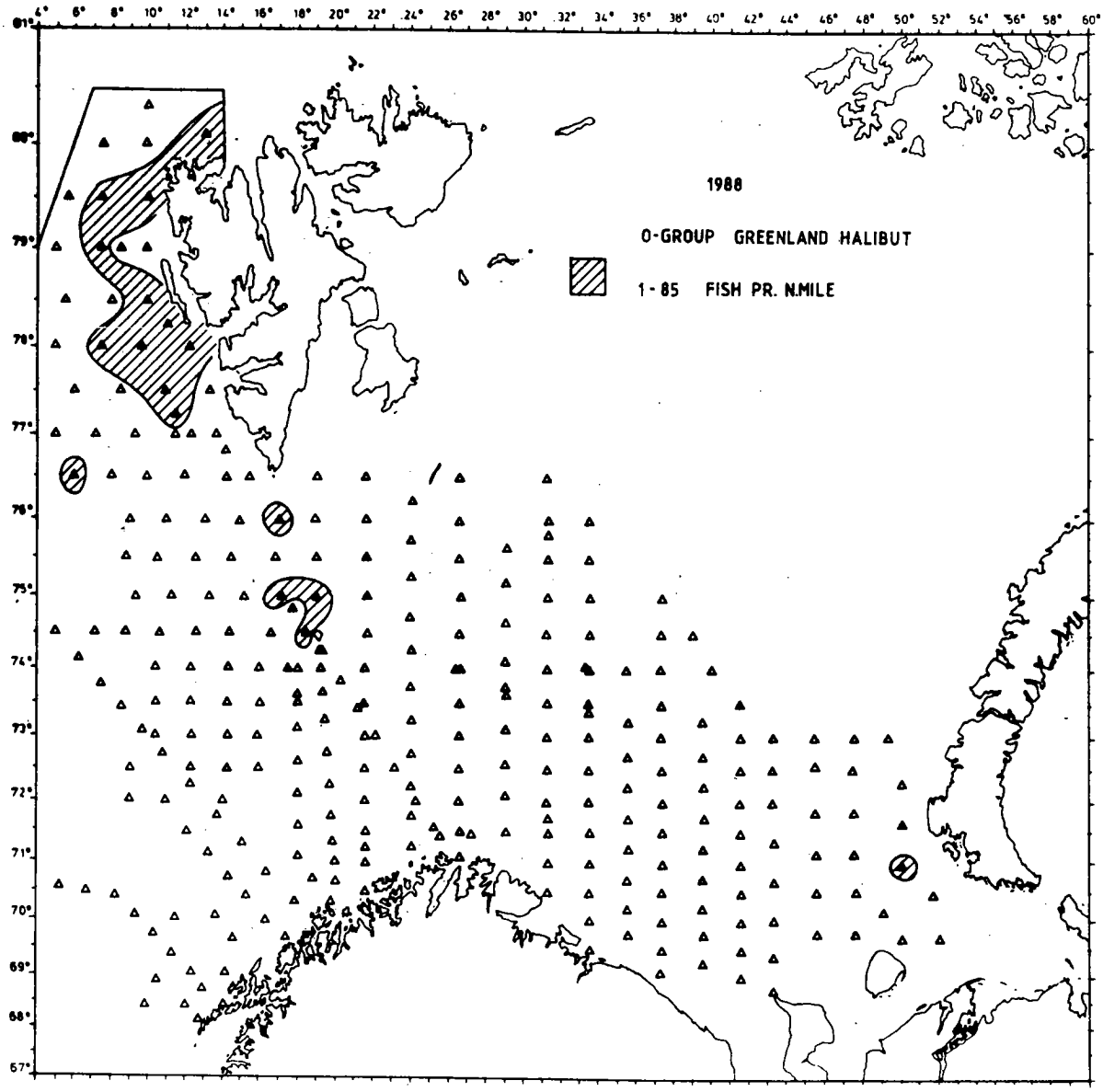

Fig. 24. Distribution of 0-group Greenland halibut.

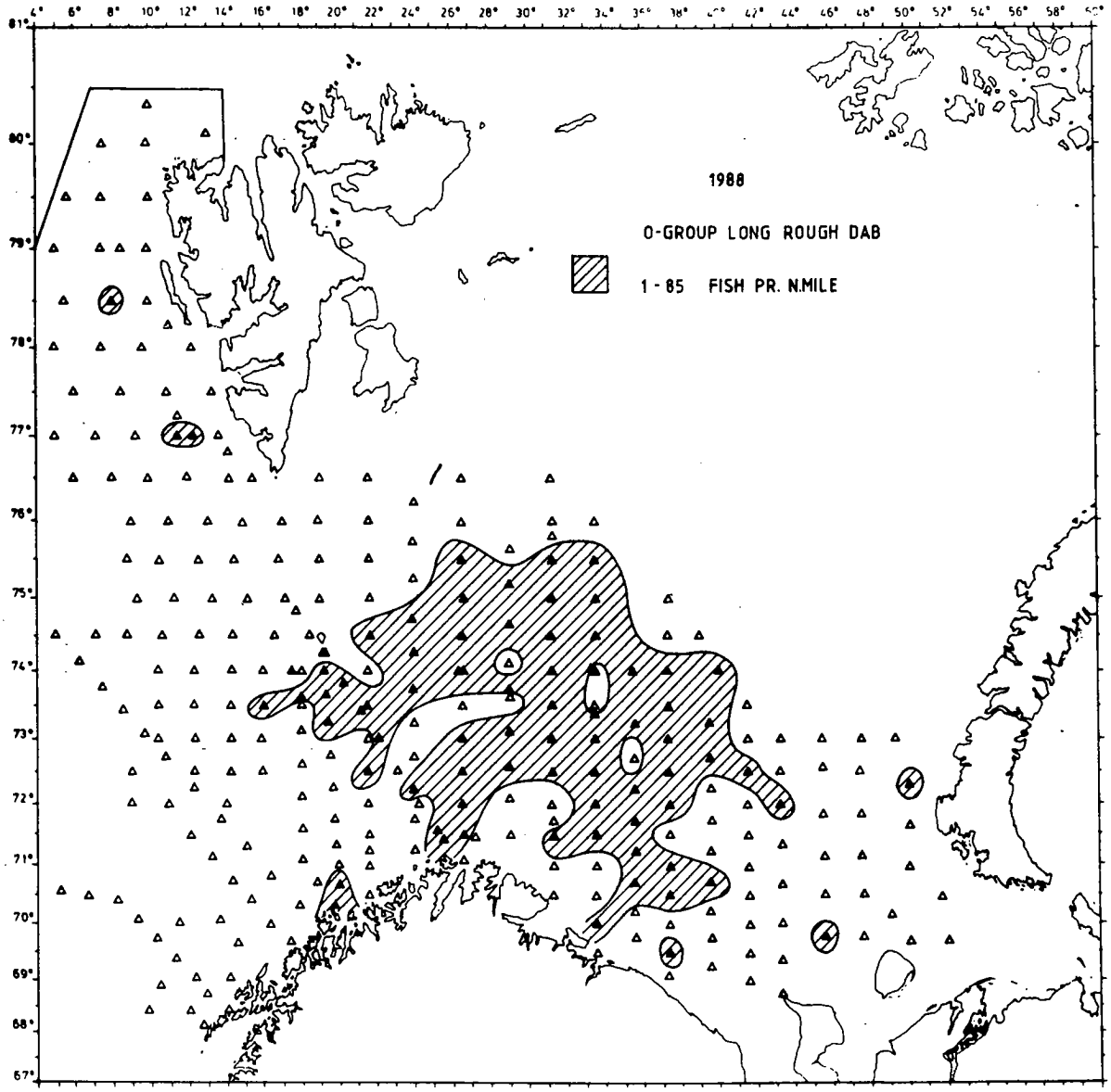

Fig. 25. Distribution of 0-group long rough dab.

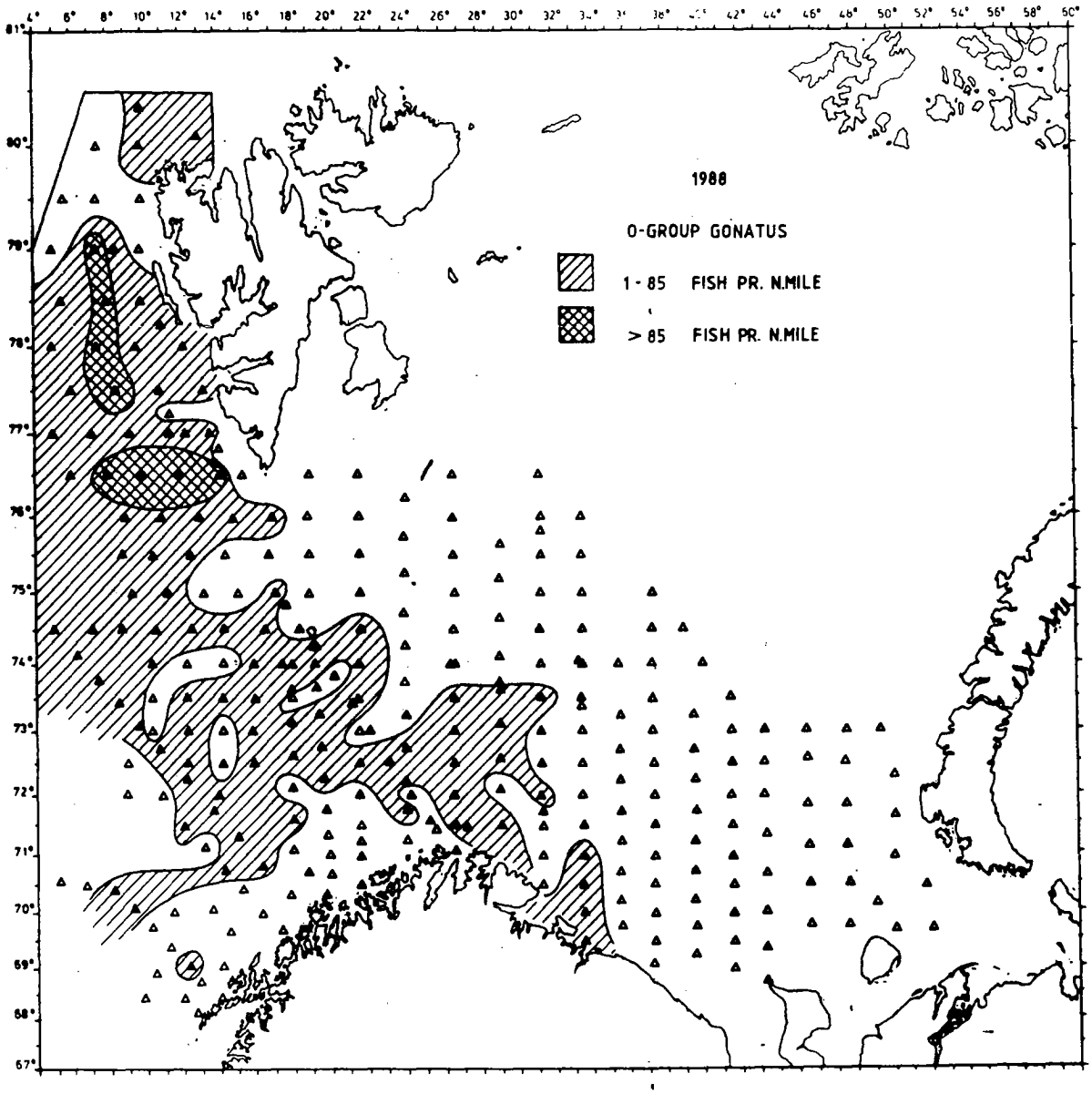

Fig. 26. Distribution of 0-group Gonatus fabricii.

Appendix

Survey period	Research vessel	Research Institute	Participants
26 August - 4 September	"Professor Marti"	Polar Research Institute fo 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	"Håkon Mosby"		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.