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PRELIMINARY REPORT OF THE INTERNATIONAL O-GROUP FISH SURVEY IN THE BARENTS
SEA AND ADJACENT WATERS IN AUGUST-SEPTEMBER 1990

The twenty-sixth annual International O-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
USSR	"Pinro"	20 August - 4 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 6 - 7 September in Hammerfest. Observations concerning the geographical distribution of O-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 tows 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 - 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 - 1.2⁰C. 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 O-GROUP FISH AND *GONATUS FABRICII*

Geographical distributions of O-group fish are shown as shaded areas in Fig. 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 O-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 O-group herring in the central part of the area, was to a great extent 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 O-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 O-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 are considerably smaller than in 1989, being located in the central part of the Barents Sea. According to great variation in numbers of O-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 yearclasses.

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 yearclasses (Table 3) while the distribution index is at the 1984 and 1986 level (Table 2), but above that for 1983. At this stage the yearclass 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 yearclass 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 specimen 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 Nowaya Zemlya the distribution area is small, with mainly scattered concentration.

The abundance index for the Spitsbergen component (i.g. west of 40⁰E) 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 yearclass 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 yearclass, even less than the 1989 yearclass.

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 yearclass.

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 1983, 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.
- TORSEN, 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 O-group fish survey in the Barents Sea and adjacent waters in late August - early September 1990.

Layer/ Year	0-50m	50-200m	0-200m	0- bottom	0- bottom	0-200m	0-200m
1	2	3	4	5	6	7	8
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)							
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) Logarithmic index	Confidence limits	Cod Logarithmic index	Confidence limits	Haddock Logarithmic index	Confidence limits ¹⁾
1965			+			0.01
1966	0.14	0.04 0.31	0.02	0.01	0.01	0.00 0.03
1967	0.00	-	0.04	0.02	0.08	0.03 0.13
1968	0.00	-	0.02	0.01	0.00	0.00 0.02
1969	0.01	0.00 0.04	0.25	0.17	0.29	0.20 0.41
1970	0.00	-	2.15	2.02	0.64	0.42 0.91
1971	0.00	-	0.77	0.57	0.26	0.18 0.36
1972	0.00	-	0.52	0.35	0.16	0.09 0.27
1973	0.05	0.03 0.08	1.48	1.18	0.26	0.15 0.40
1974	0.01	0.01 0.01	0.29	0.18	0.51	0.39 0.68
1975	0.00	-	0.90	0.66	0.60	0.40 0.85
1976	0.00	-	0.13	0.06	0.38	0.24 0.51
1977	0.01	0.00 0.03	0.49	0.36	0.33	0.21 0.48
1978	0.02	0.01 0.05	0.22	0.14	0.12	0.07 0.19
1979	0.09	0.01 0.20	0.40	0.25	0.20	0.12 0.28
1980	-	-	0.13	0.08	0.15	0.10 0.20
1981	0.00	-	0.10	0.06	0.03	0.00 0.05
1982	0.00	-	0.59	0.43	0.38	0.30 0.52
1983	1.77	1.29 2.33	1.69	1.34	0.62	0.48 0.77
1984	0.34	0.20 0.52	1.55	1.18	0.78	0.60 0.99
1985	0.23	0.18 0.28	2.46	2.22	0.27	0.23 0.31
1986	0.00	-	1.37	1.06	0.39	0.28 0.52
1987	0.00	0.00 0.03	0.17	0.01	0.10	0.00 0.25
1988	0.32	0.16 0.53	0.33	0.22	0.13	0.05 0.34
1989	0.59	0.49 0.76	0.38	0.30	0.14	0.10 0.20
1990	0.31	0.16 0.50	1.23	1.04	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	Long rough dab	Sandeel
	+		+			East	West	+					
10-14										0.1			
15-19			+		+					0.8		0.6	
20-24			0.1		+					1.8		10.8	
25-29	+		2.7		+			6.3		4.8		24.8	
30-34	+		8.7					21.3		19.7		38.6	
35-39			19.6		0.1			29.8		27.7	50.0	17.8	
40-44			23.8		0.1		0.2	27.7		21.7		7.1	0.1
45-49			22.1		0.3		0.4	11.0		15.0		0.3	1.1
50-54	+		15.8		0.7		0.4	3.8		6.5			4.5
55-59	0.1		5.9		1.9		1.1	0.1		1.4			4.8
60-64	0.2		1.1		4.6		2.6	+		0.5			6.9
65-69	1.4		1.1		7.4		3.5	+		+			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		371	8227		
Mean length (cm)		8.9	4.9	8.4	9.9	4.5	3.9	4.5		3.7	7.4		

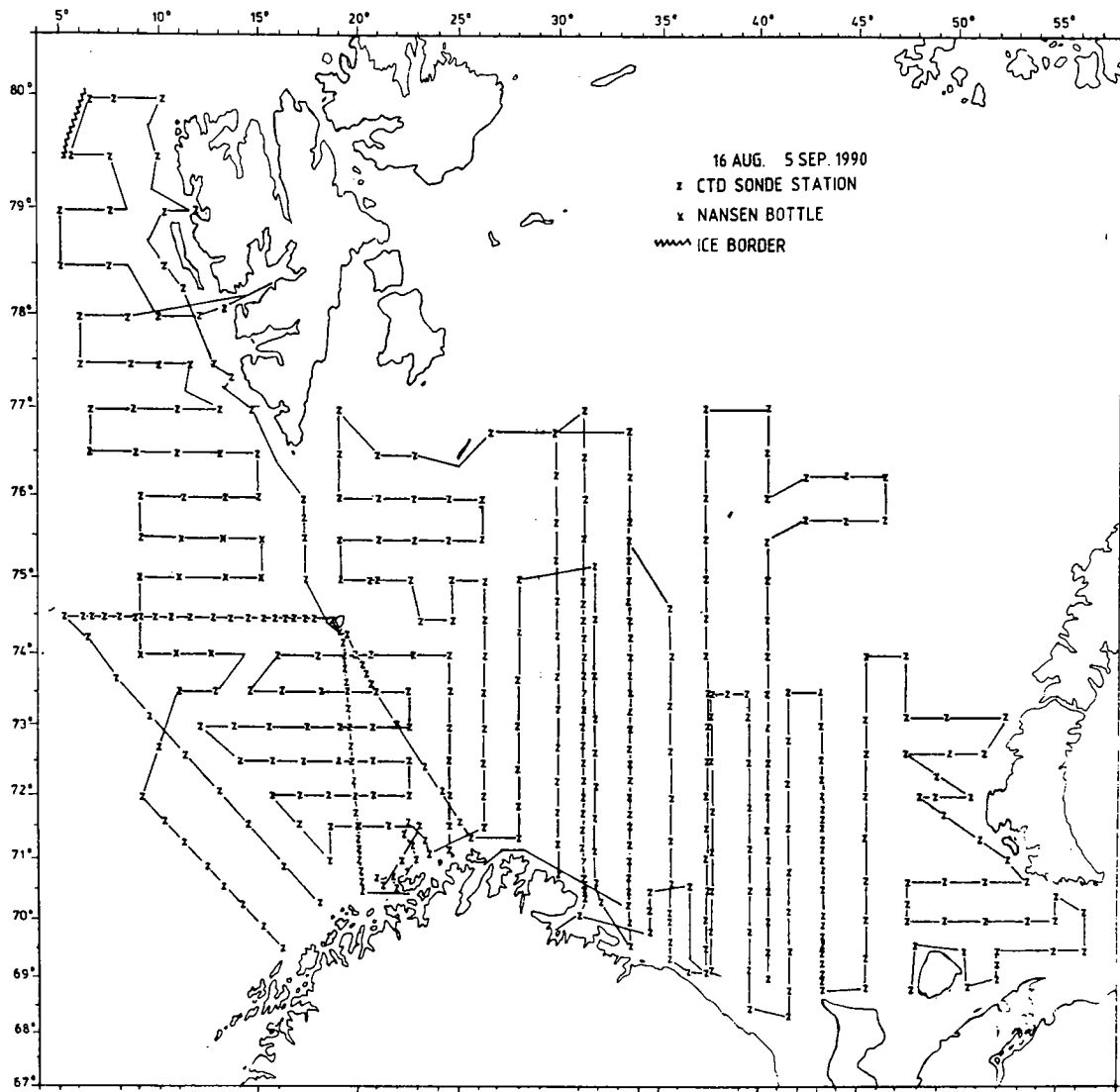


Fig. 1. Survey tracks of the ships and the grid of hydrographic stations.

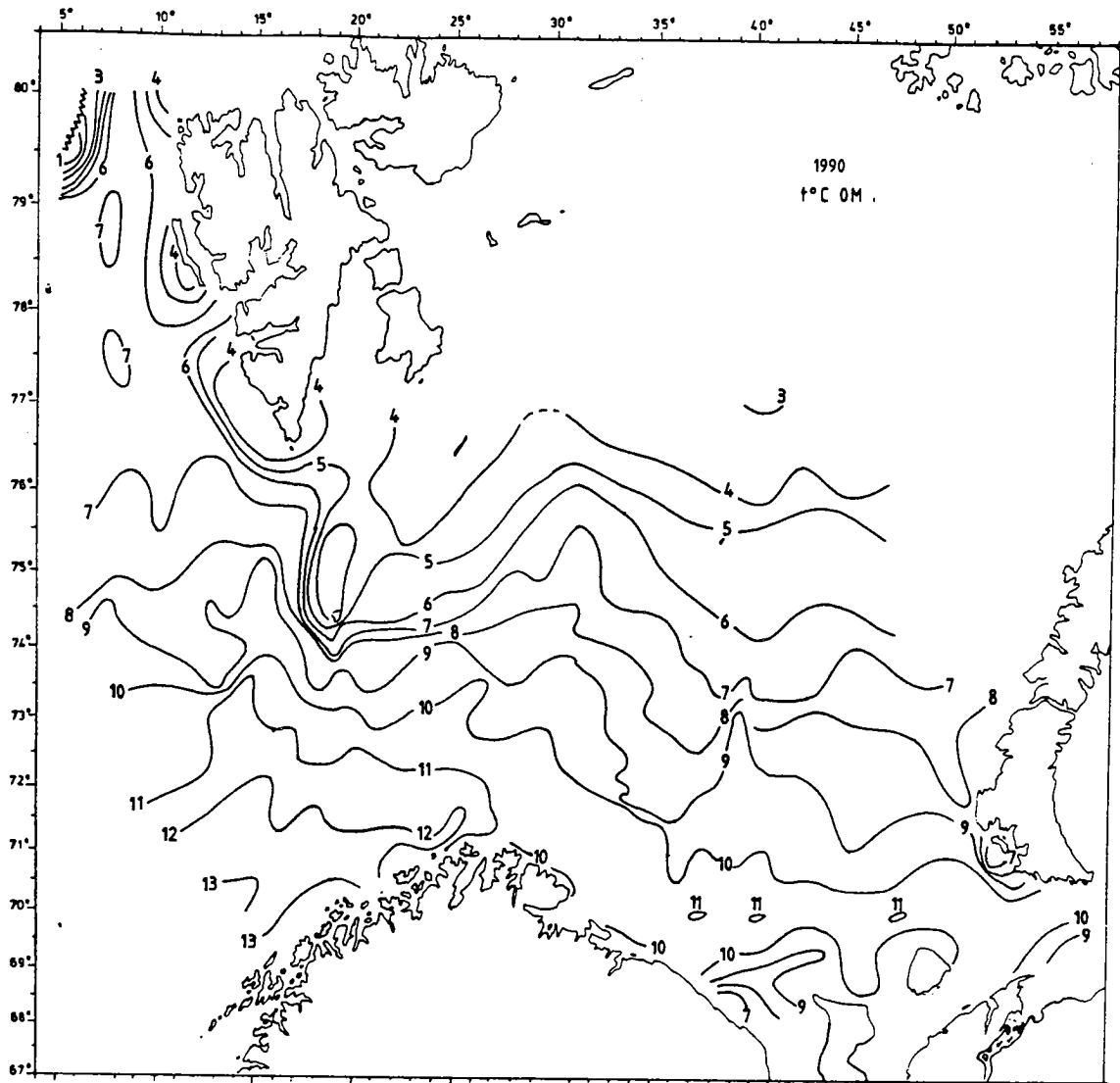


Fig. 2. Isotherms at 0 m.

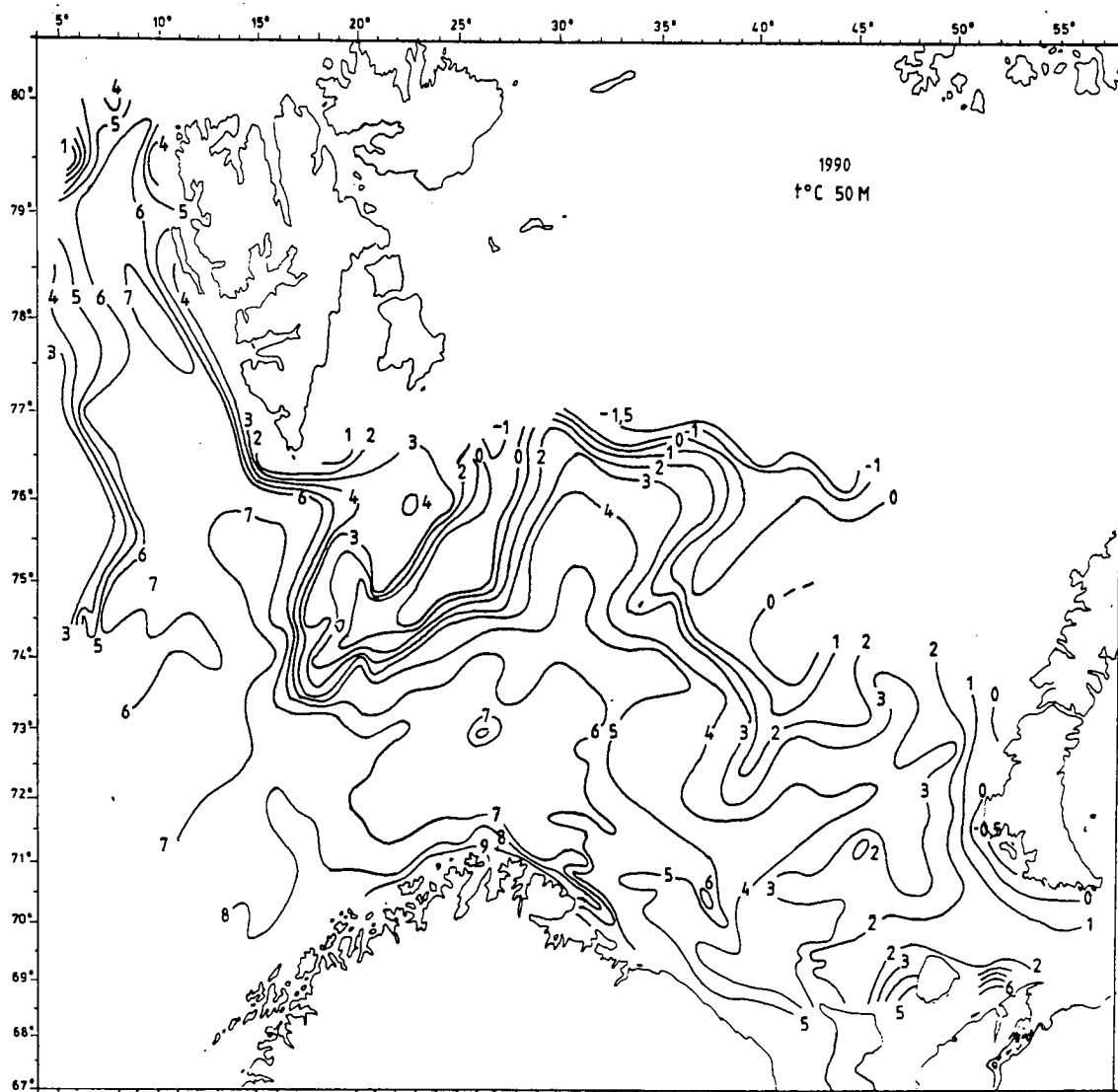


Fig. 4. Isotherms at 50 m.

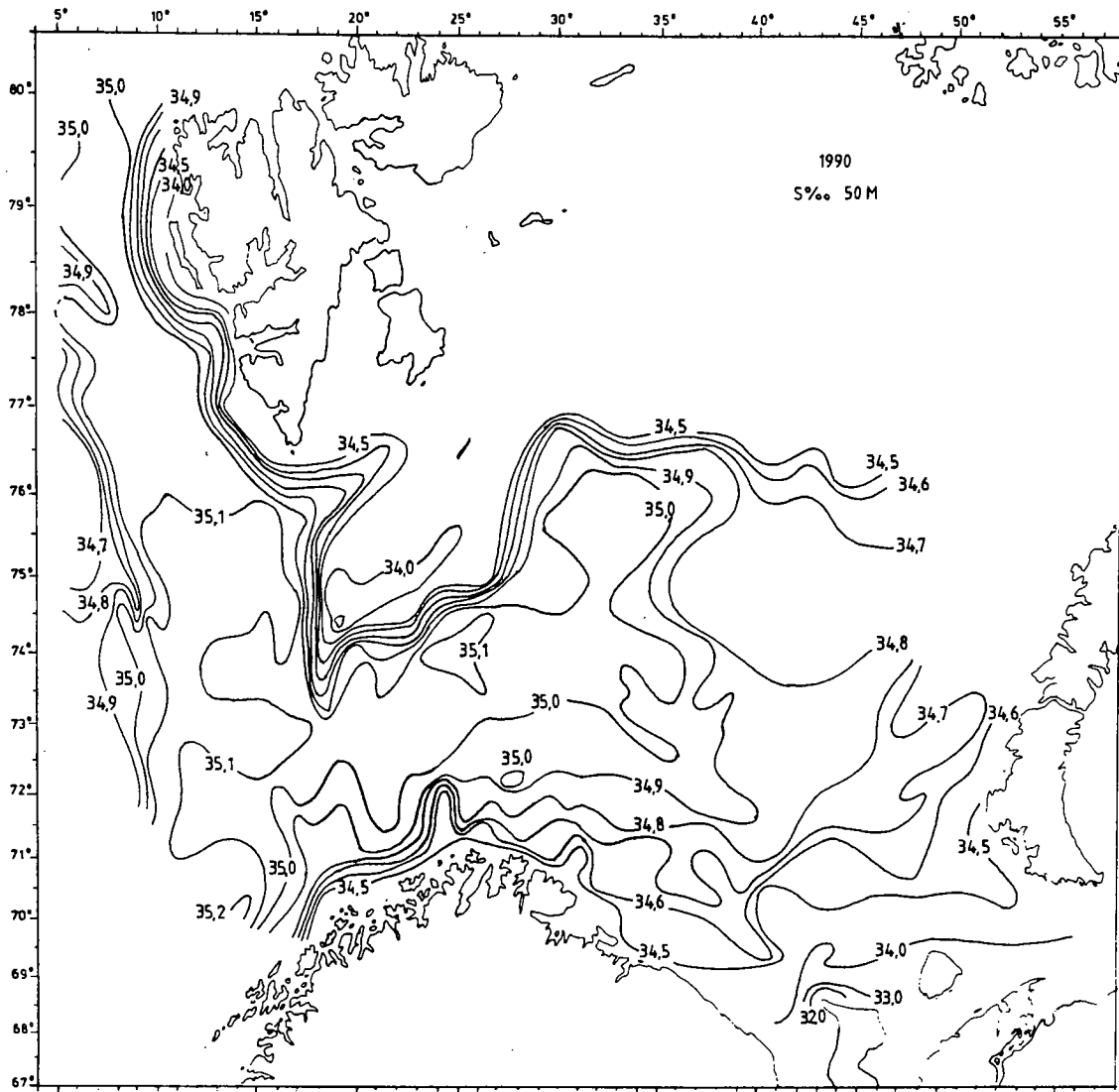


Fig. 5. Isohalines at 50 m.

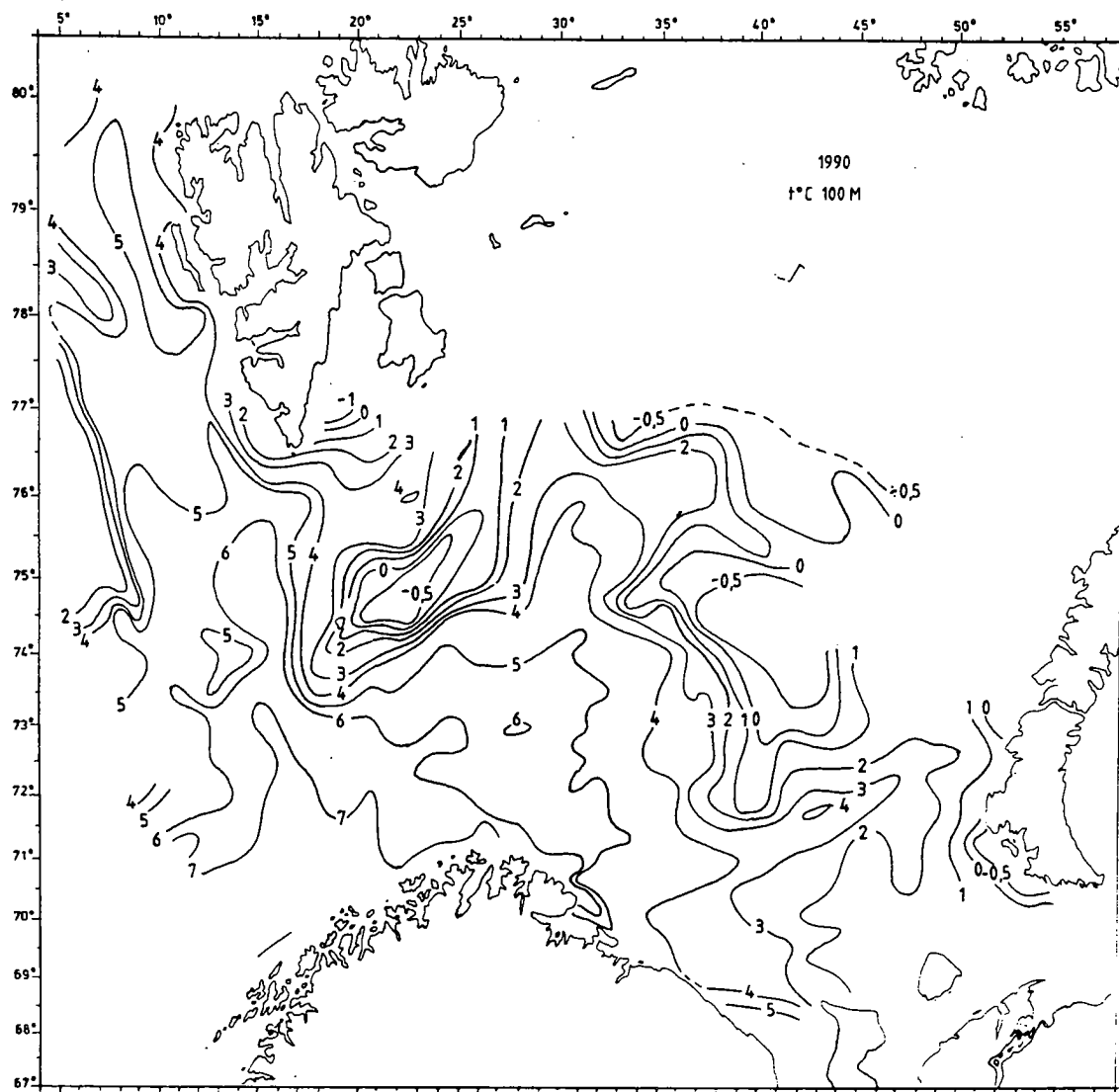


Fig. 6. Isotherms at 100 m.

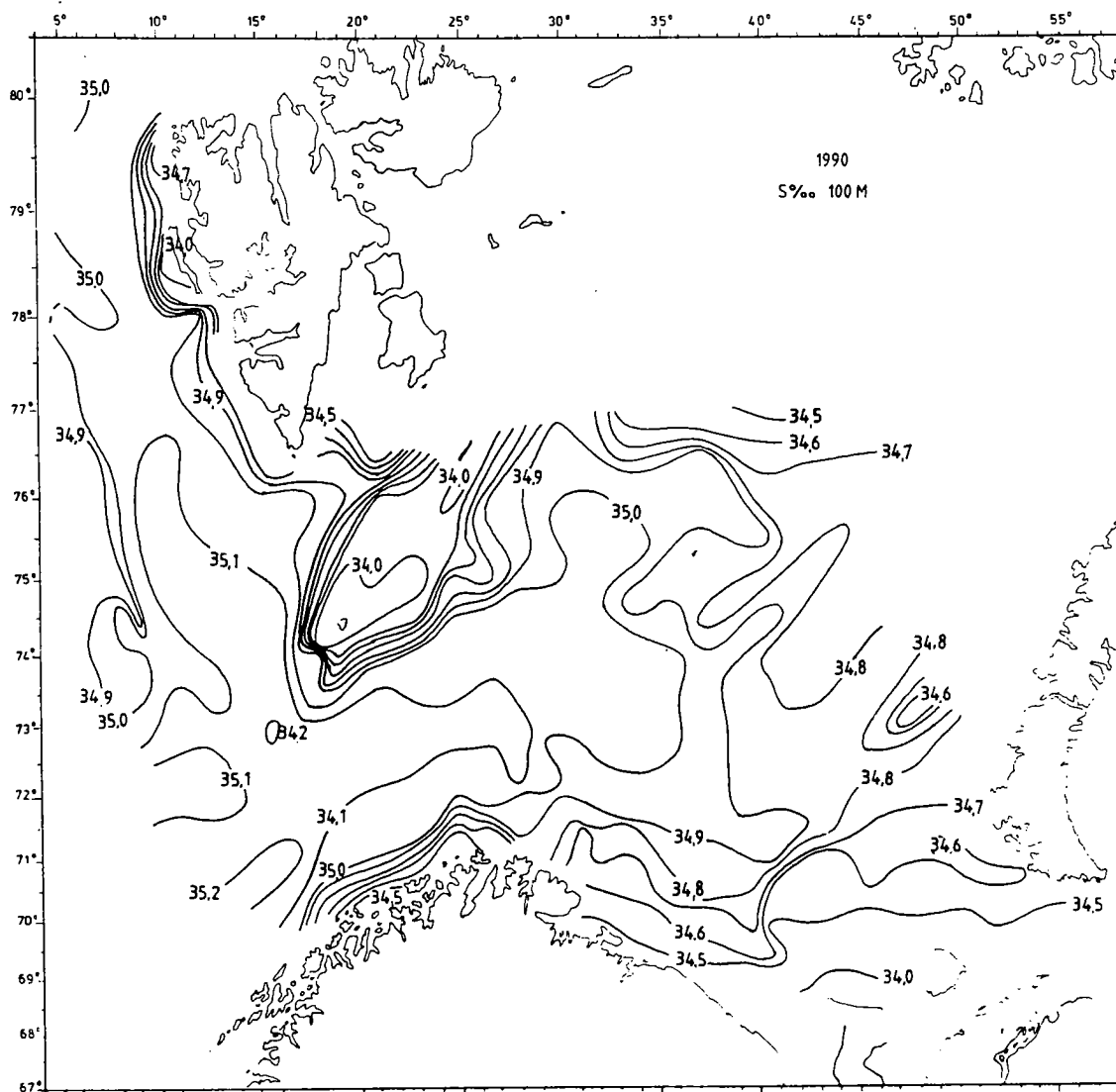


Fig. 7. Isohalines at 100 m.

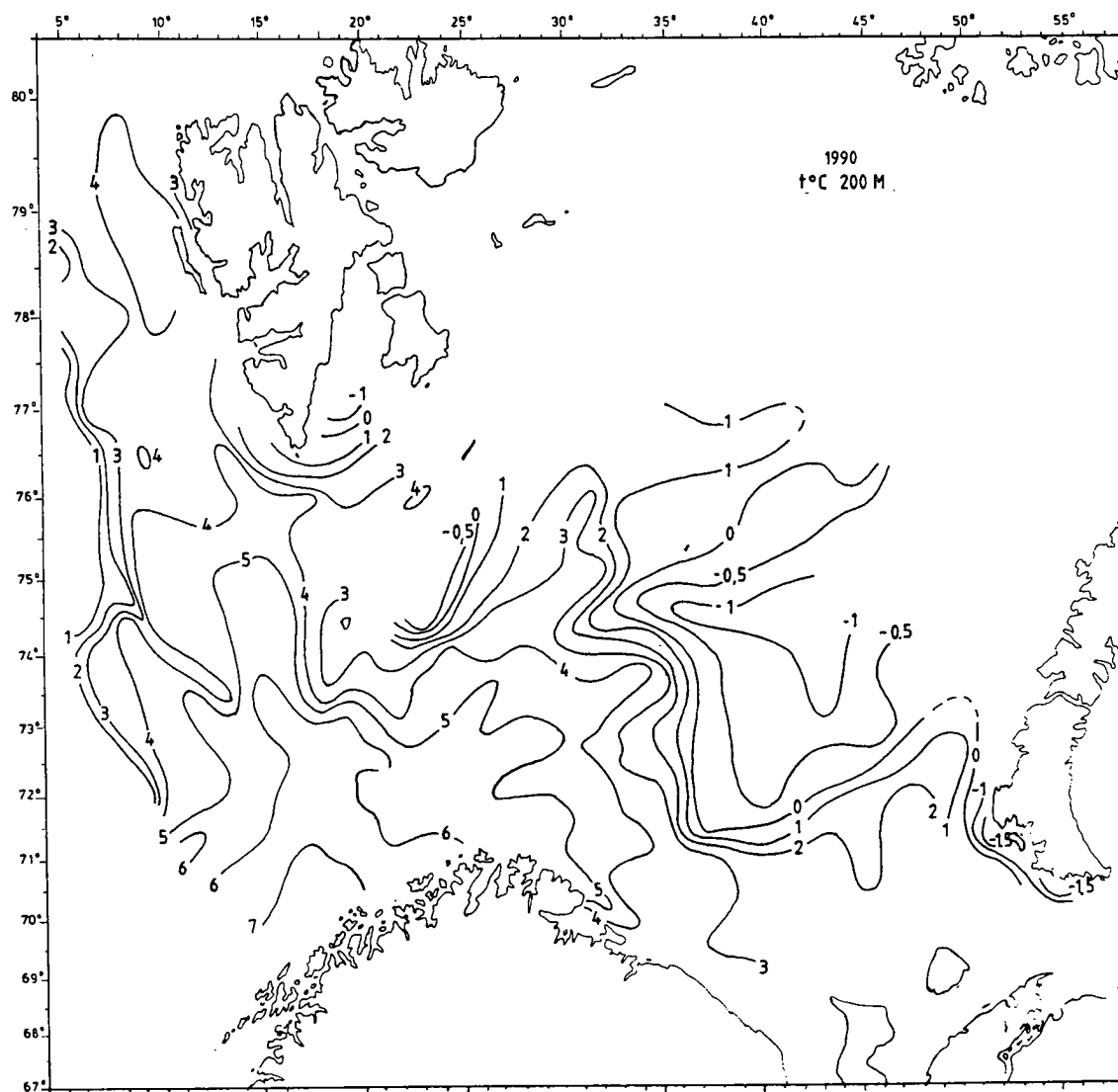


Fig. 8. Isotherms at 200 m.

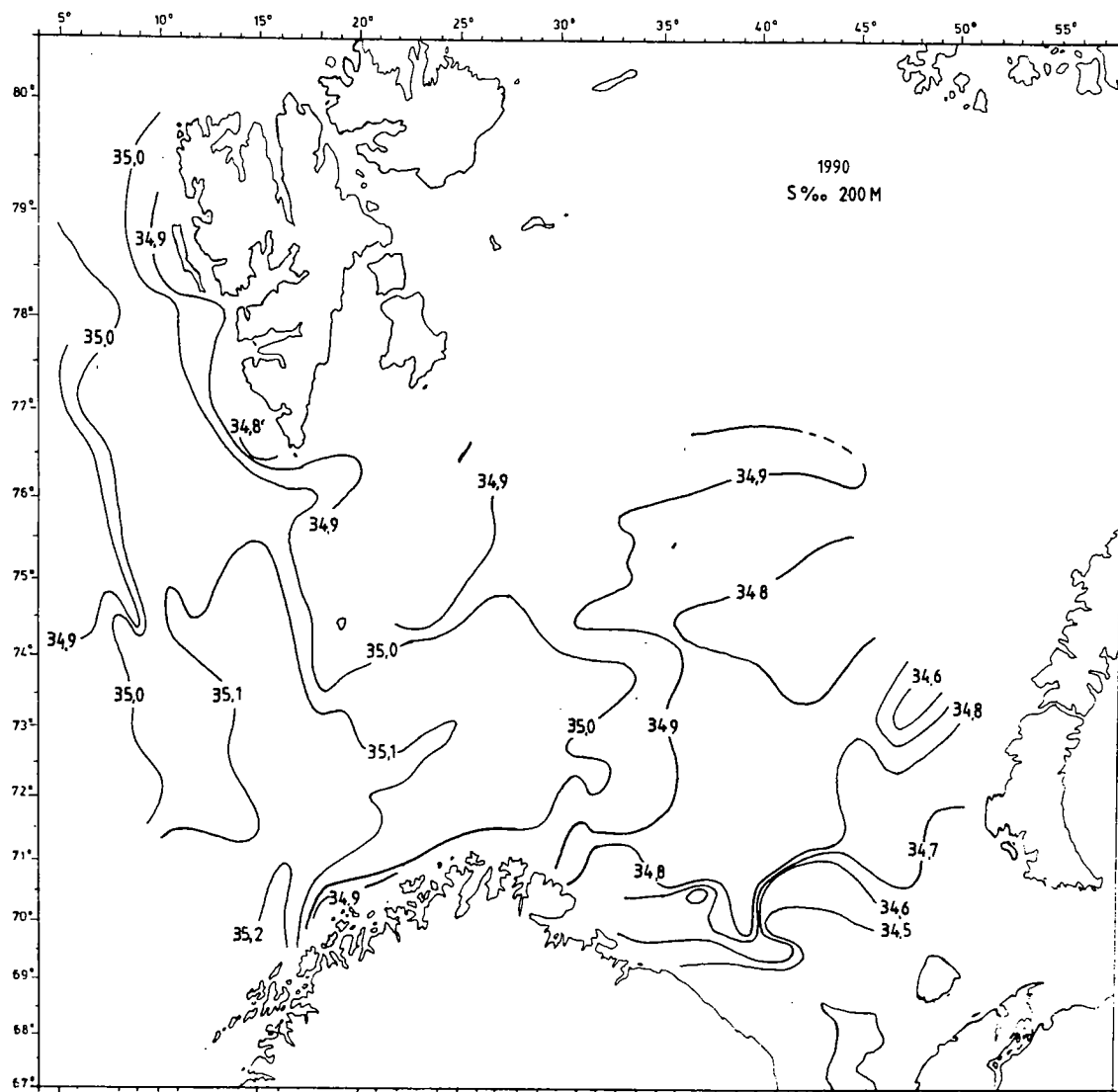


Fig. 9. Isohalines at 200 m.

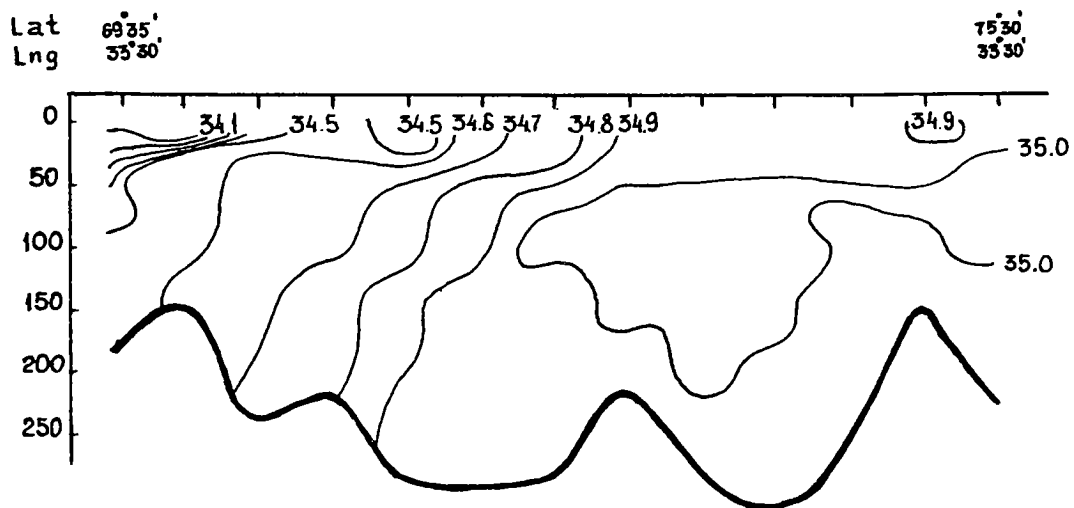
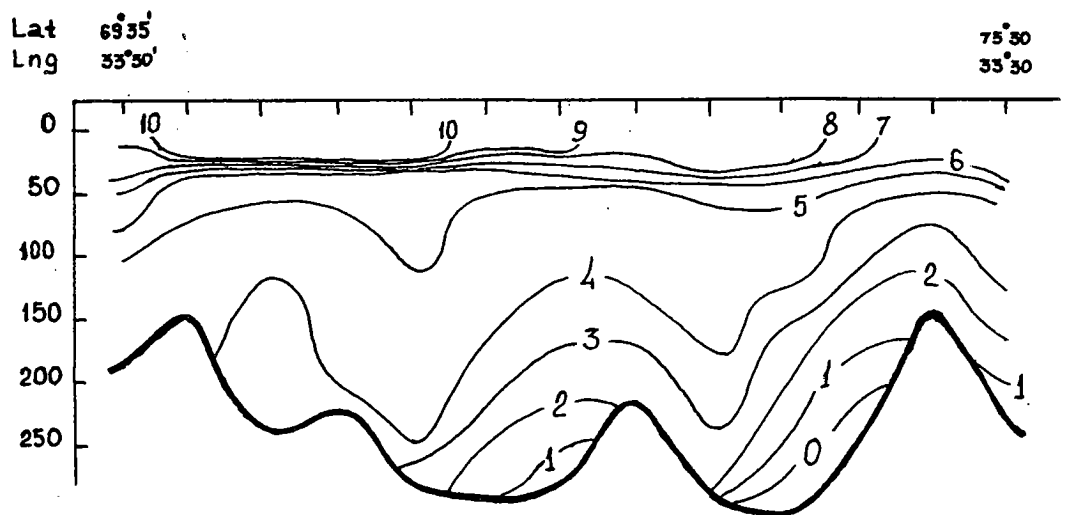


Fig. 10. Hydrographic section along the Kola meridian.
 Temperature and salinity.

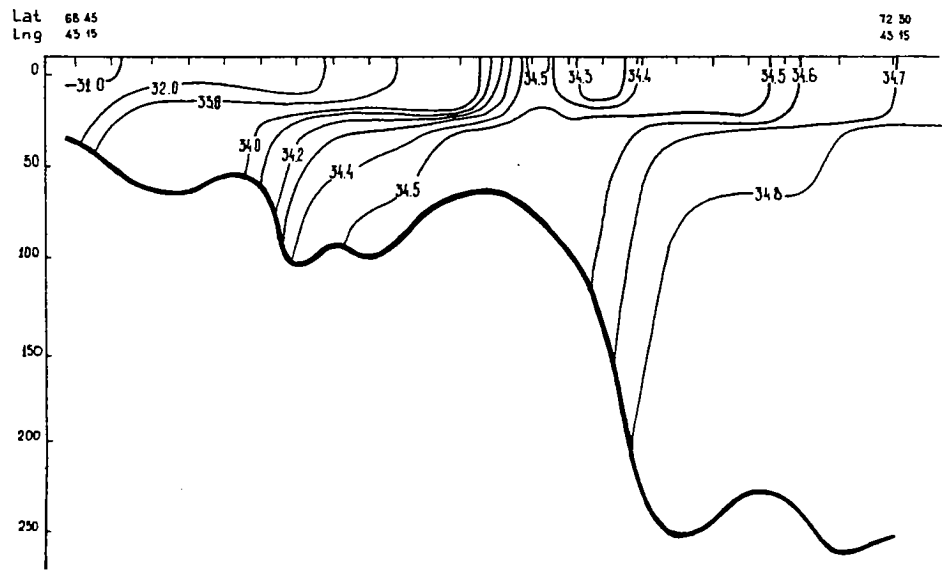
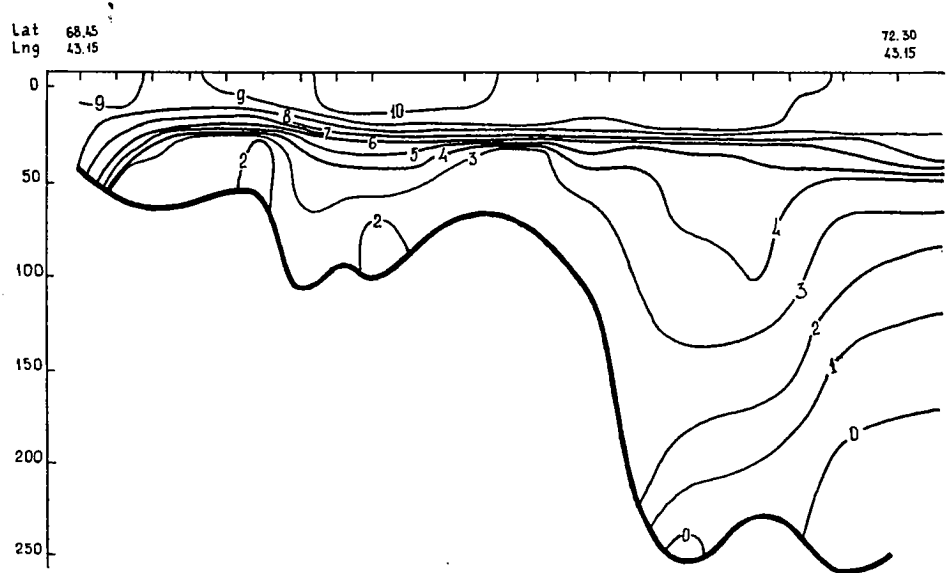


Fig. 11. Hydrographic section Cape Kanin-North. Temperature and salinity.

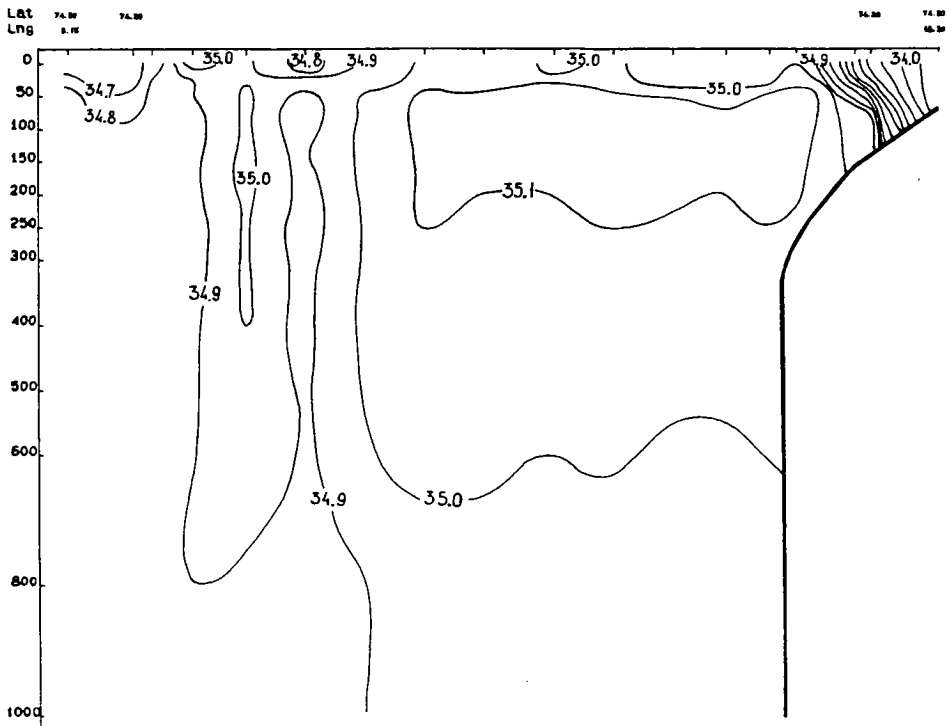
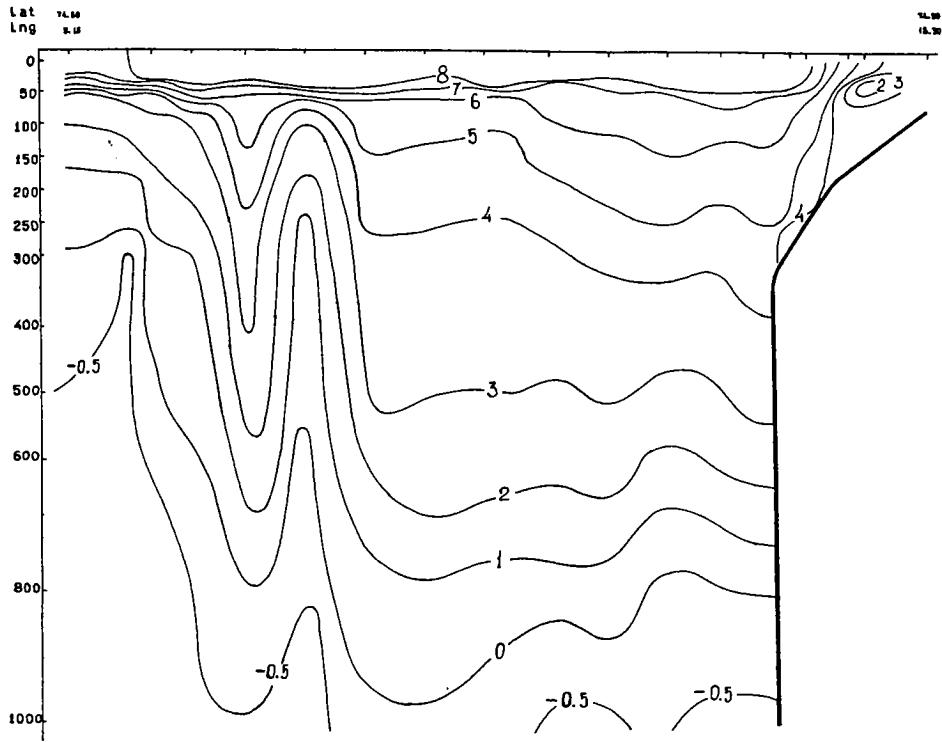


Fig. 13. Hydrographic section Bear Island-West. Temperature and salinity.

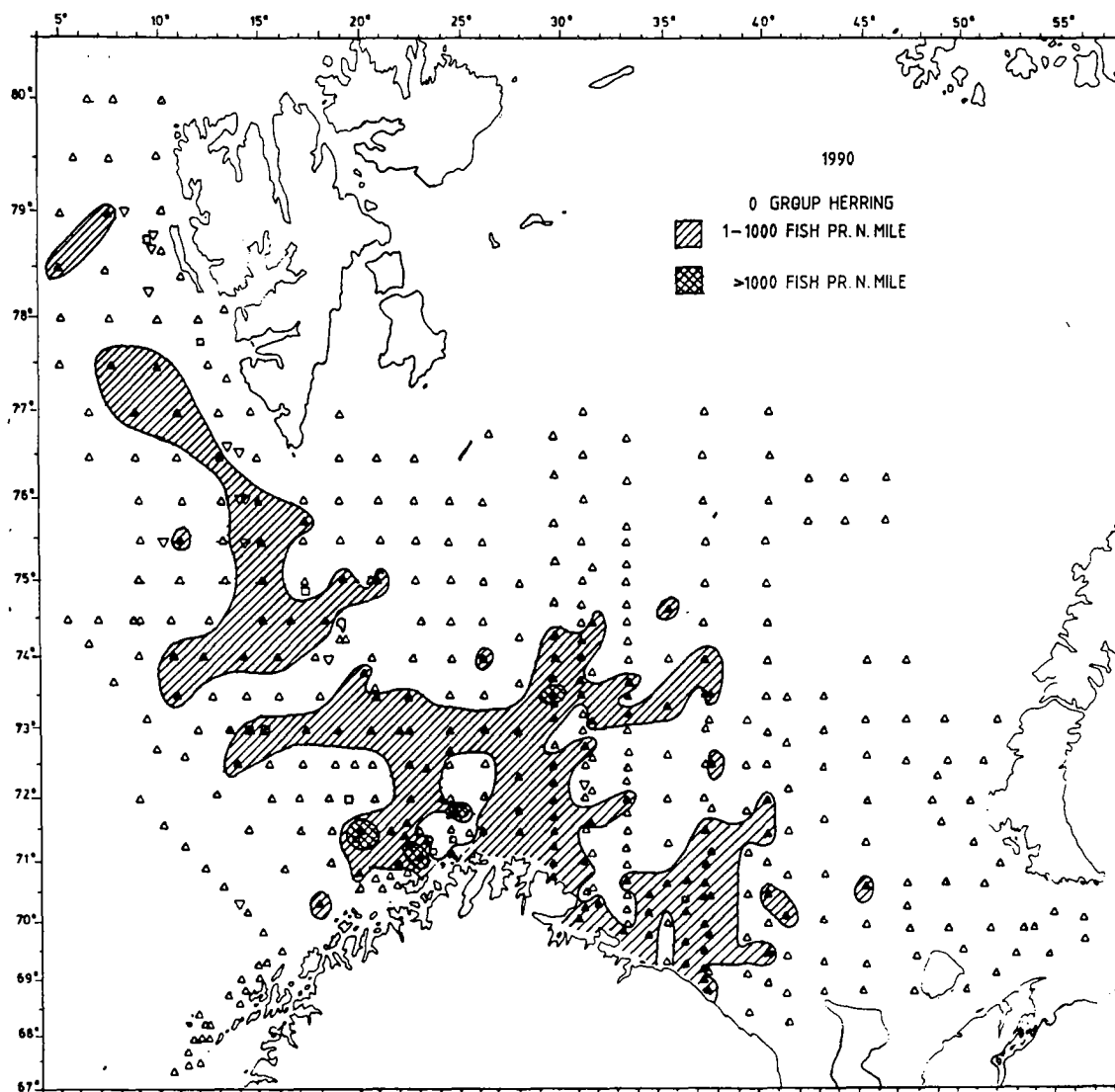


Fig. 14. Distribution of 0-group herring.

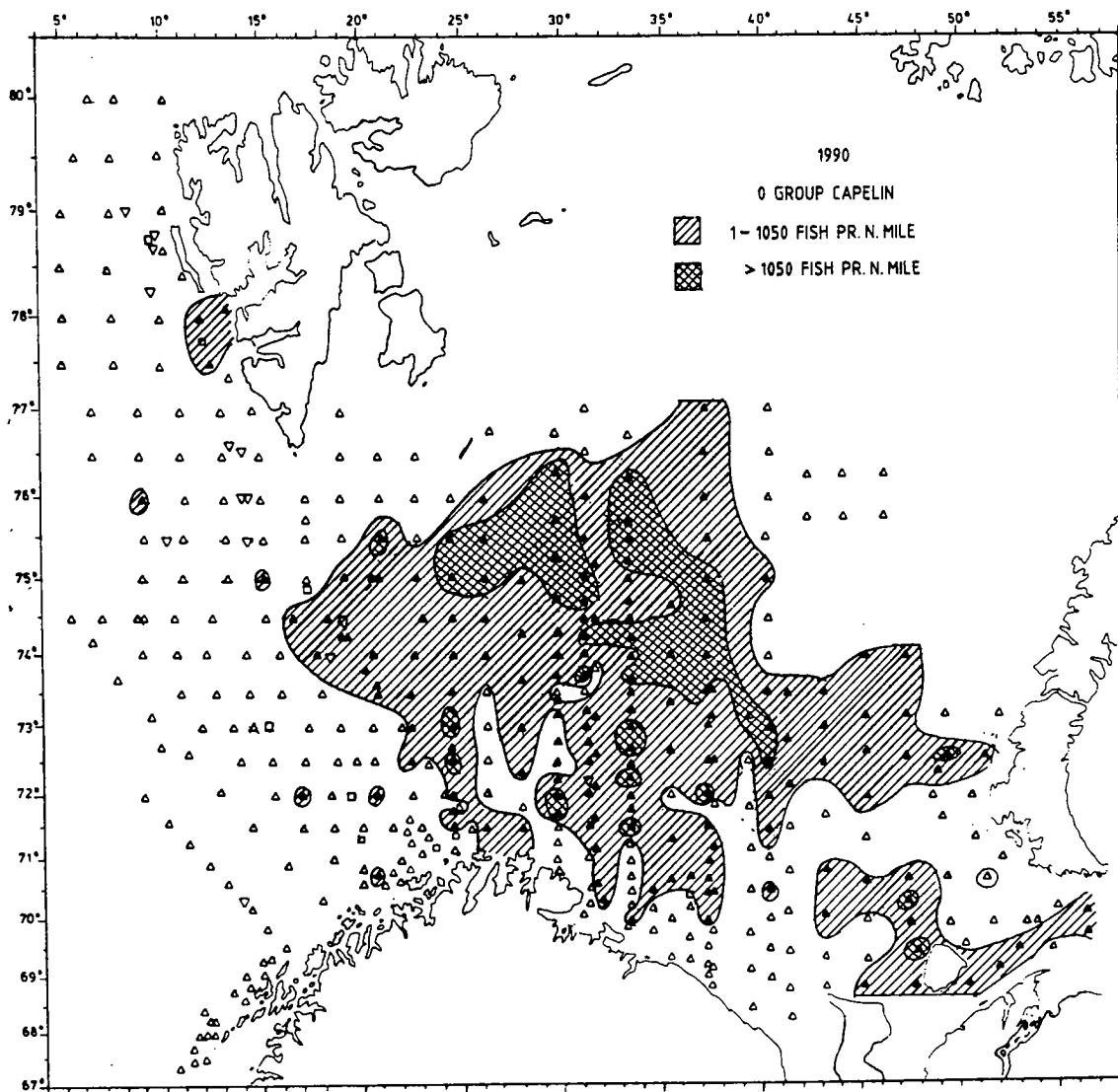


Fig. 15. Distribution of 0-group capelin.

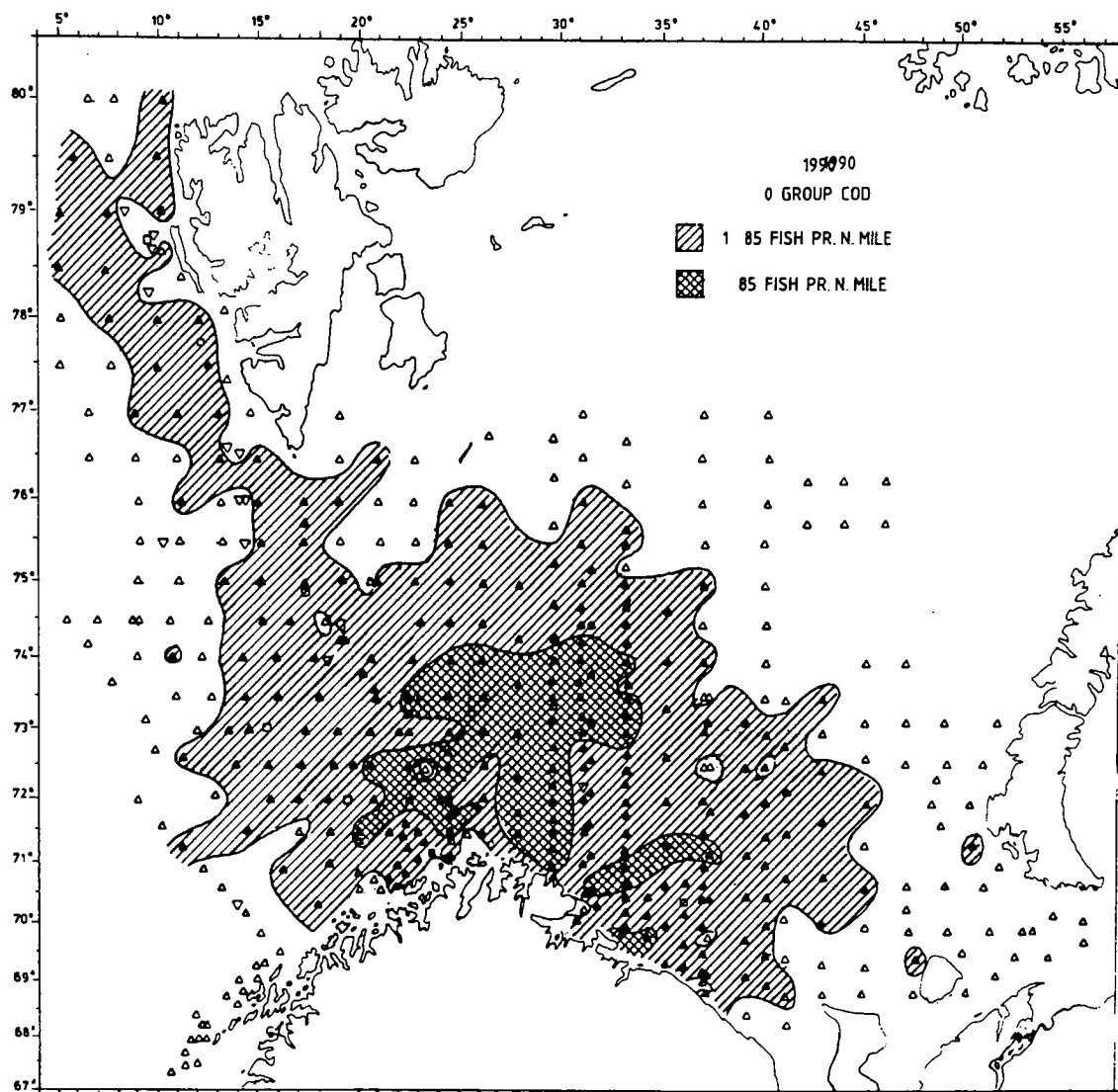


Fig. 16. Distribution of 0-group cod.

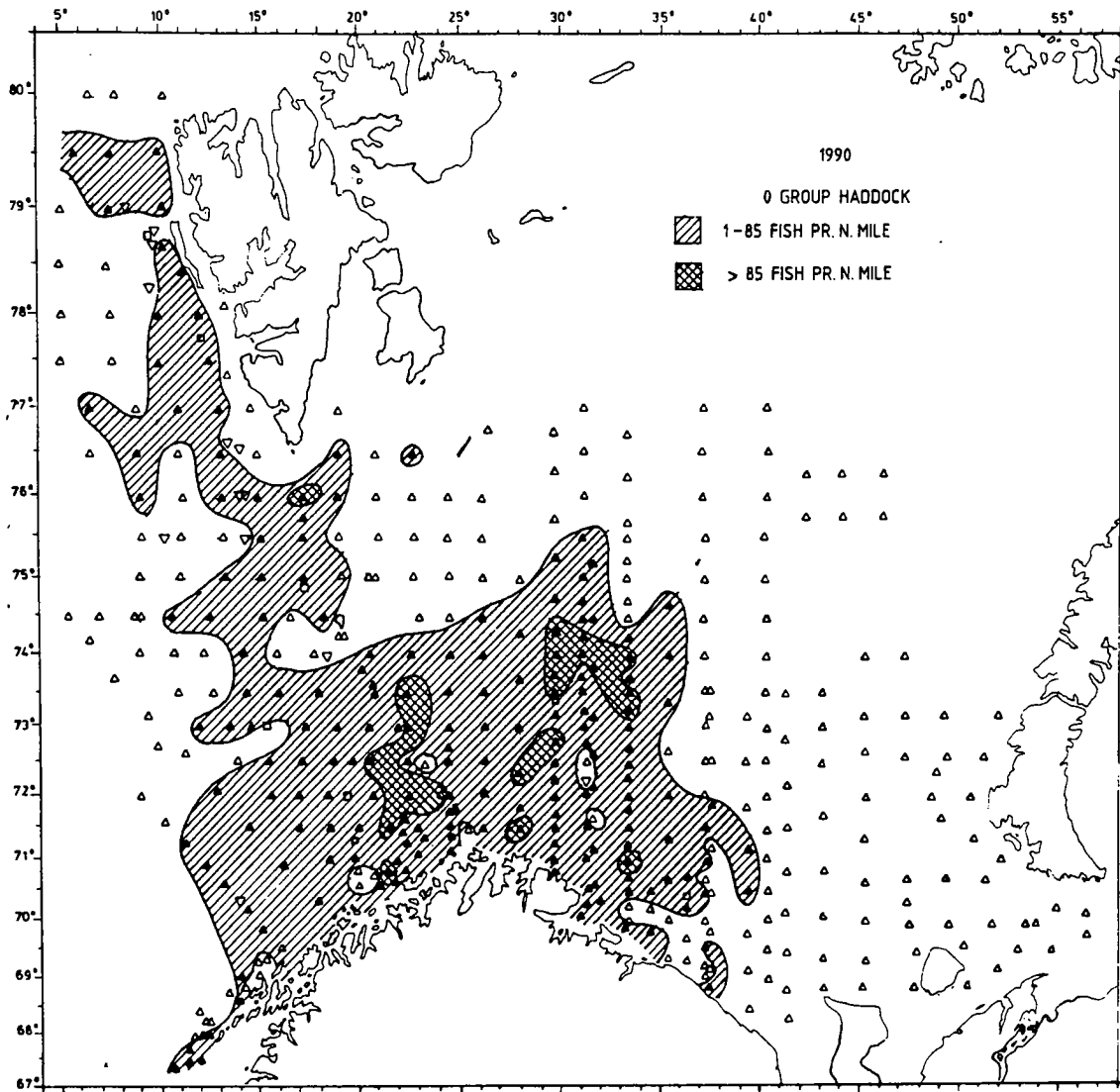


Fig. 17. Distribution of 0-group haddock.

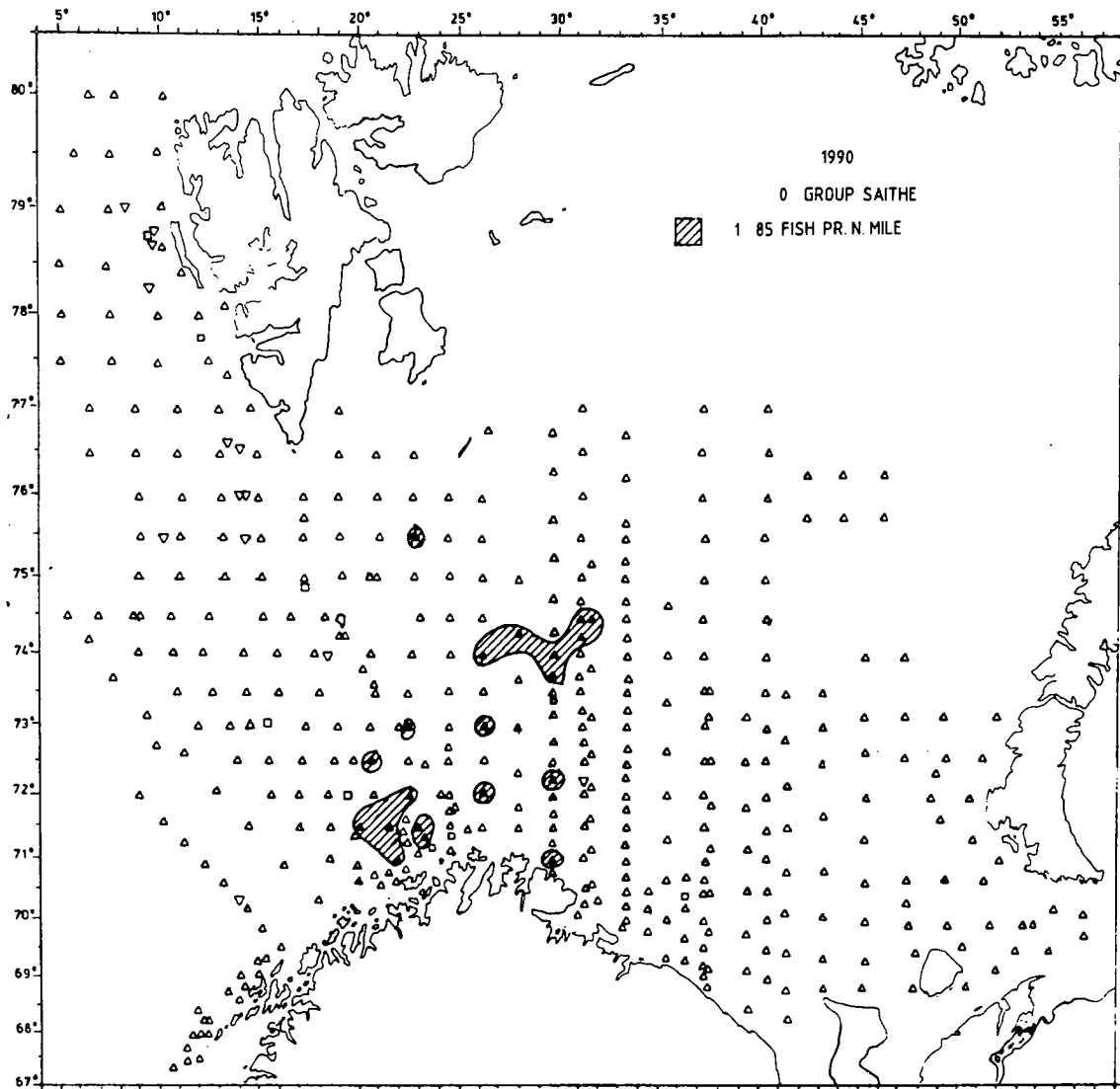


Fig. 18. Distribution of 0-group saithe.

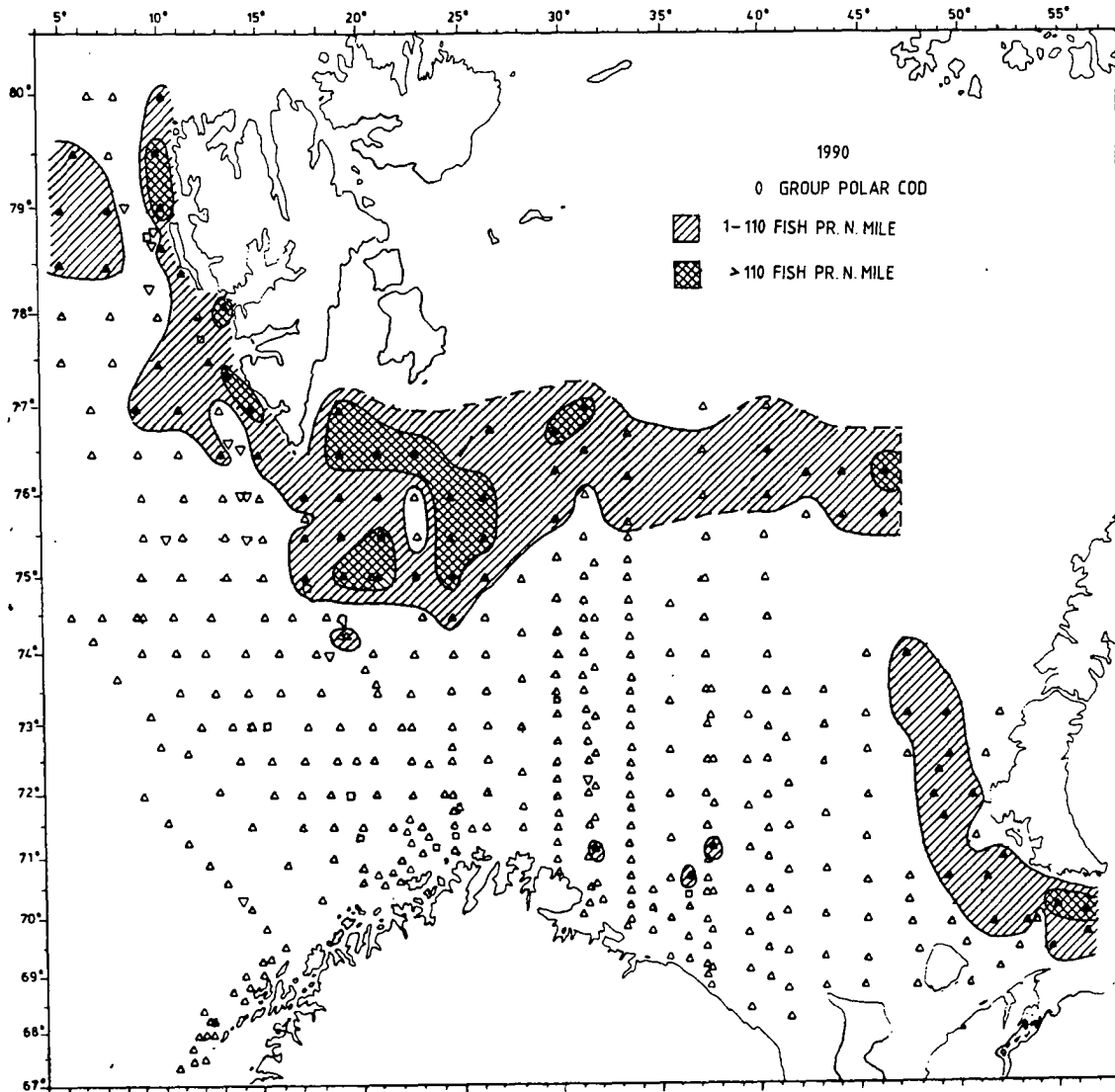


Fig. 19. Distribution of 0-group polar cod.

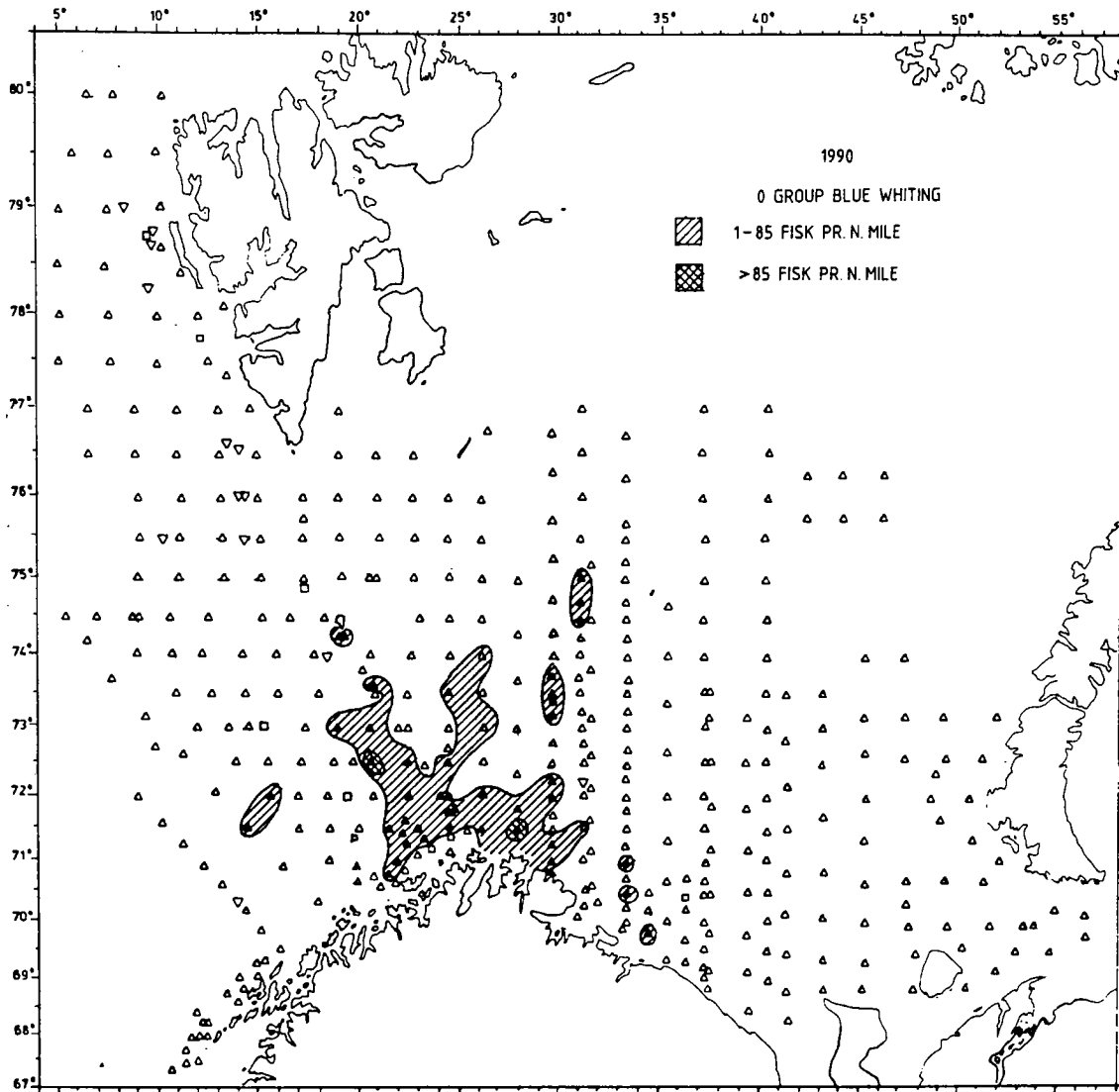


Fig. 20. Distribution of 0-group blue whiting.

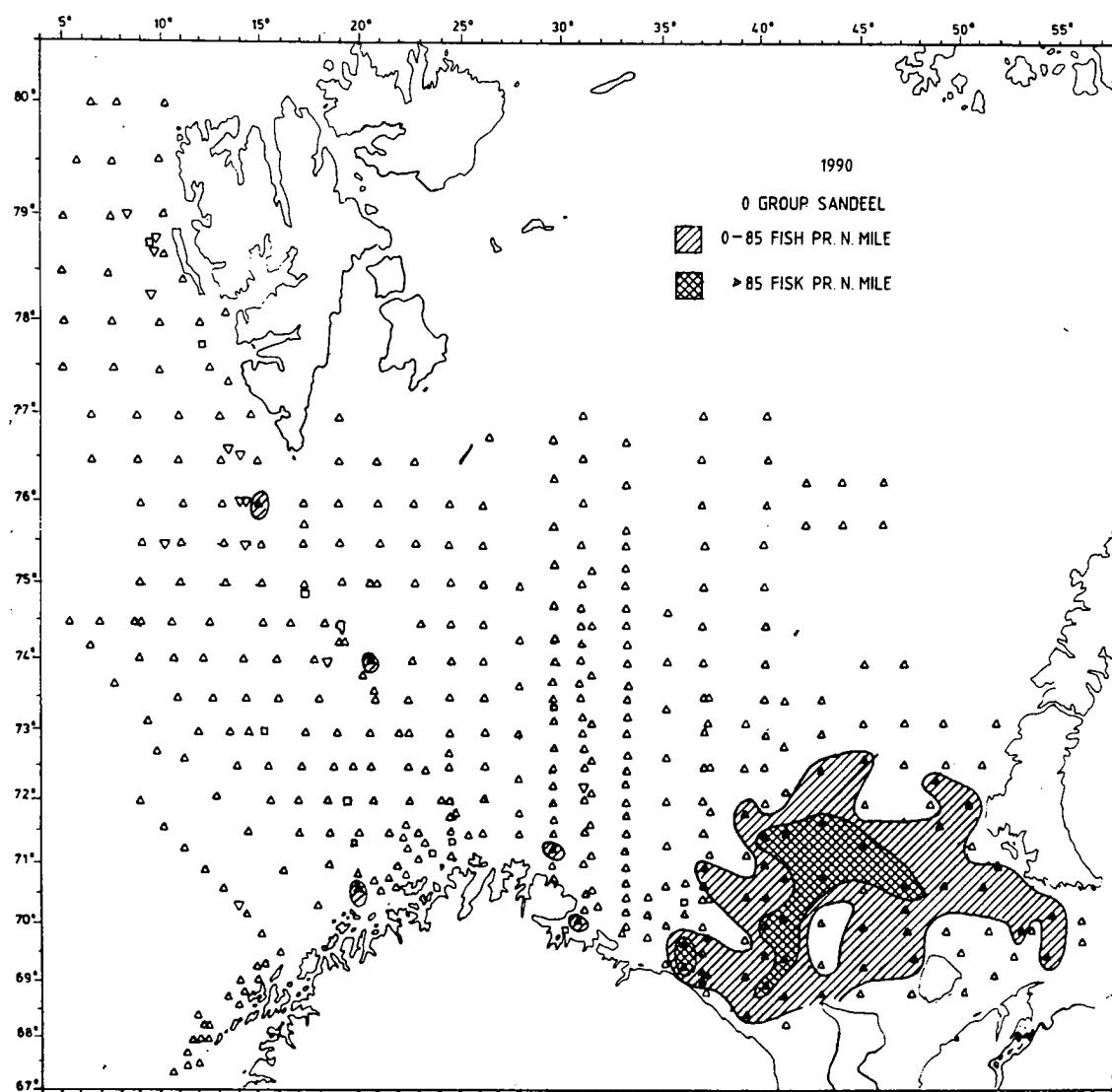


Fig. 21. Distribution of 0-group sandeel.

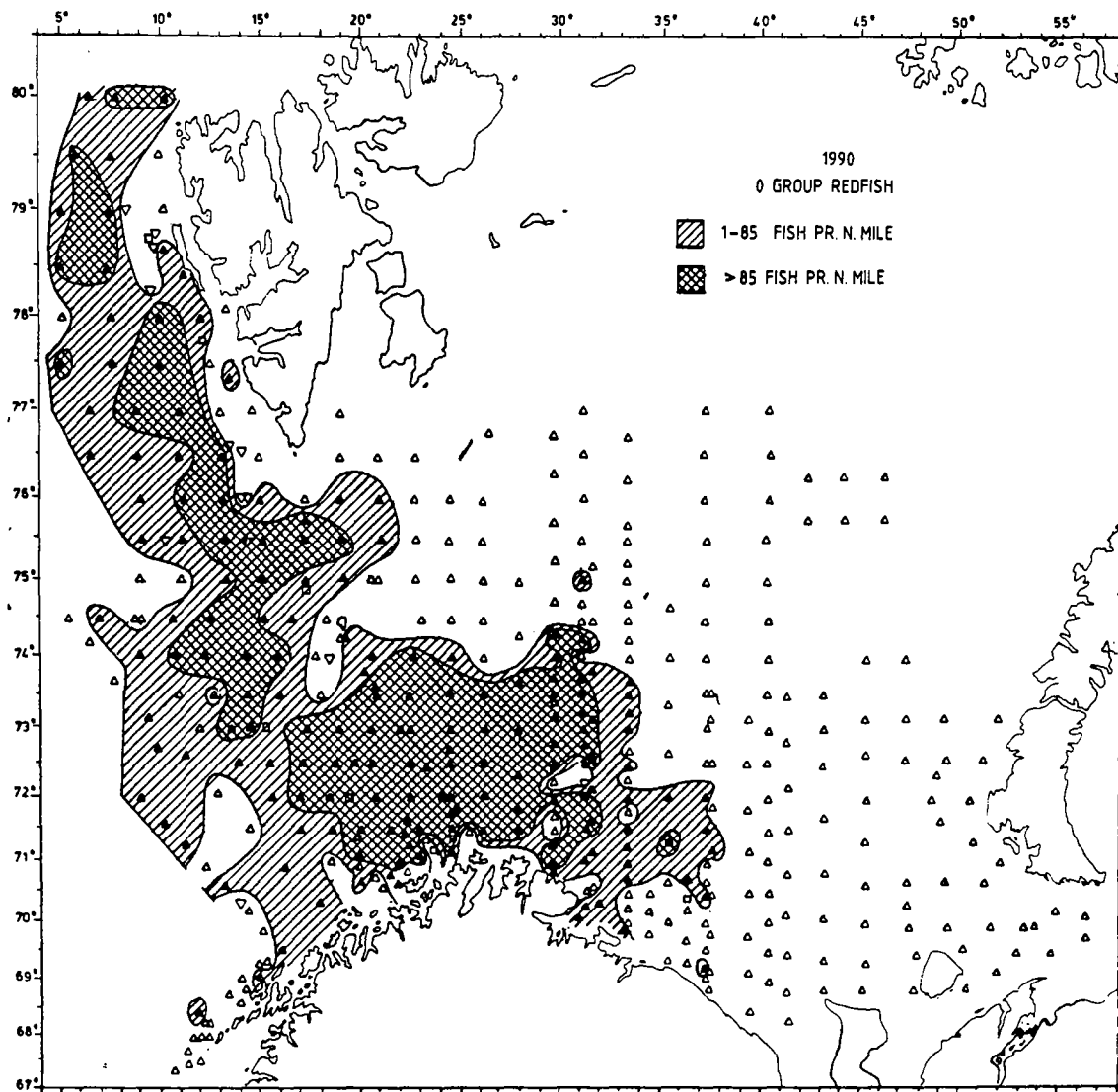


Fig. 22. Distribution of 0-group redfish.

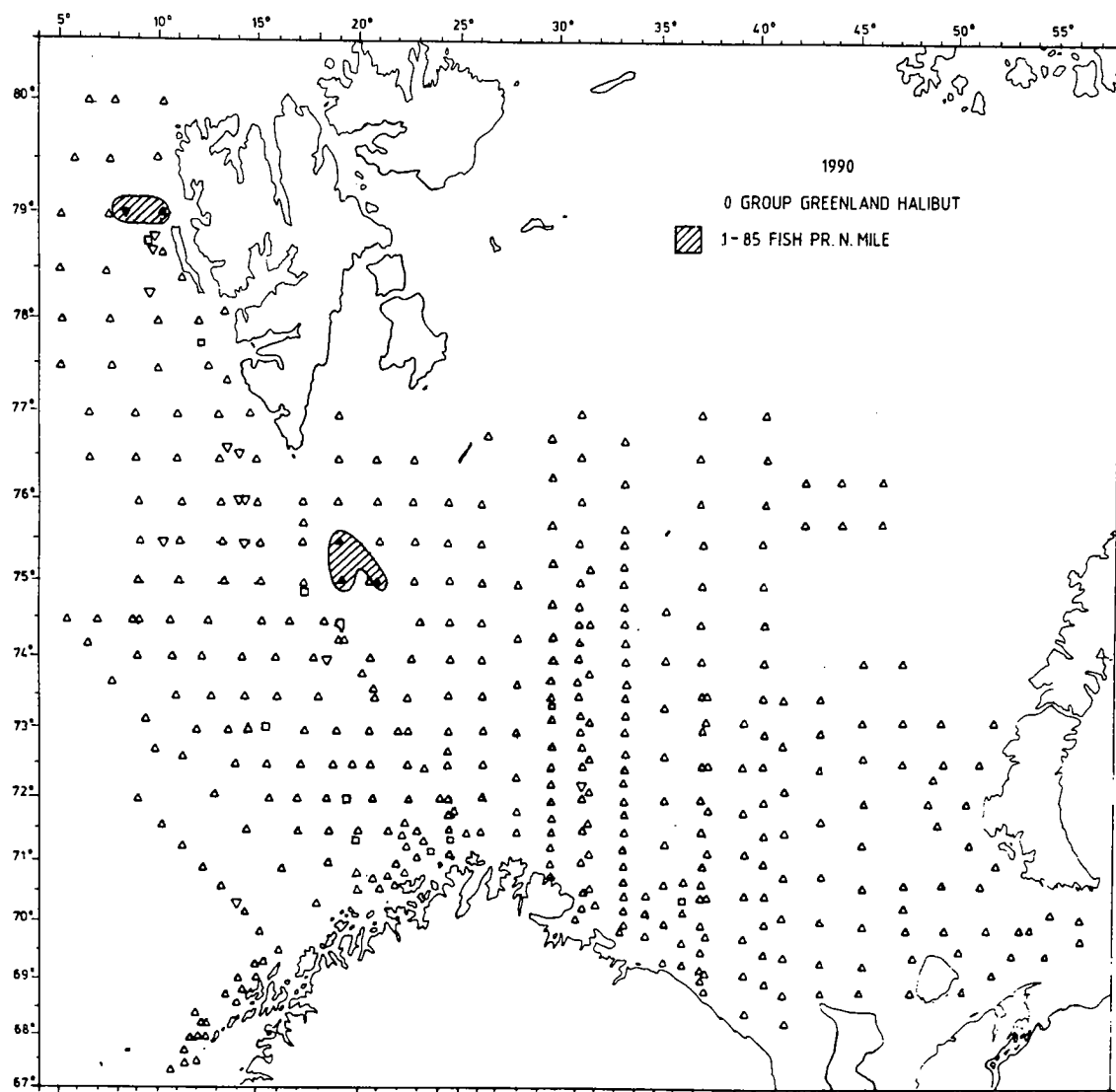


Fig. 23. Distribution of 0-group Greenland halibut.

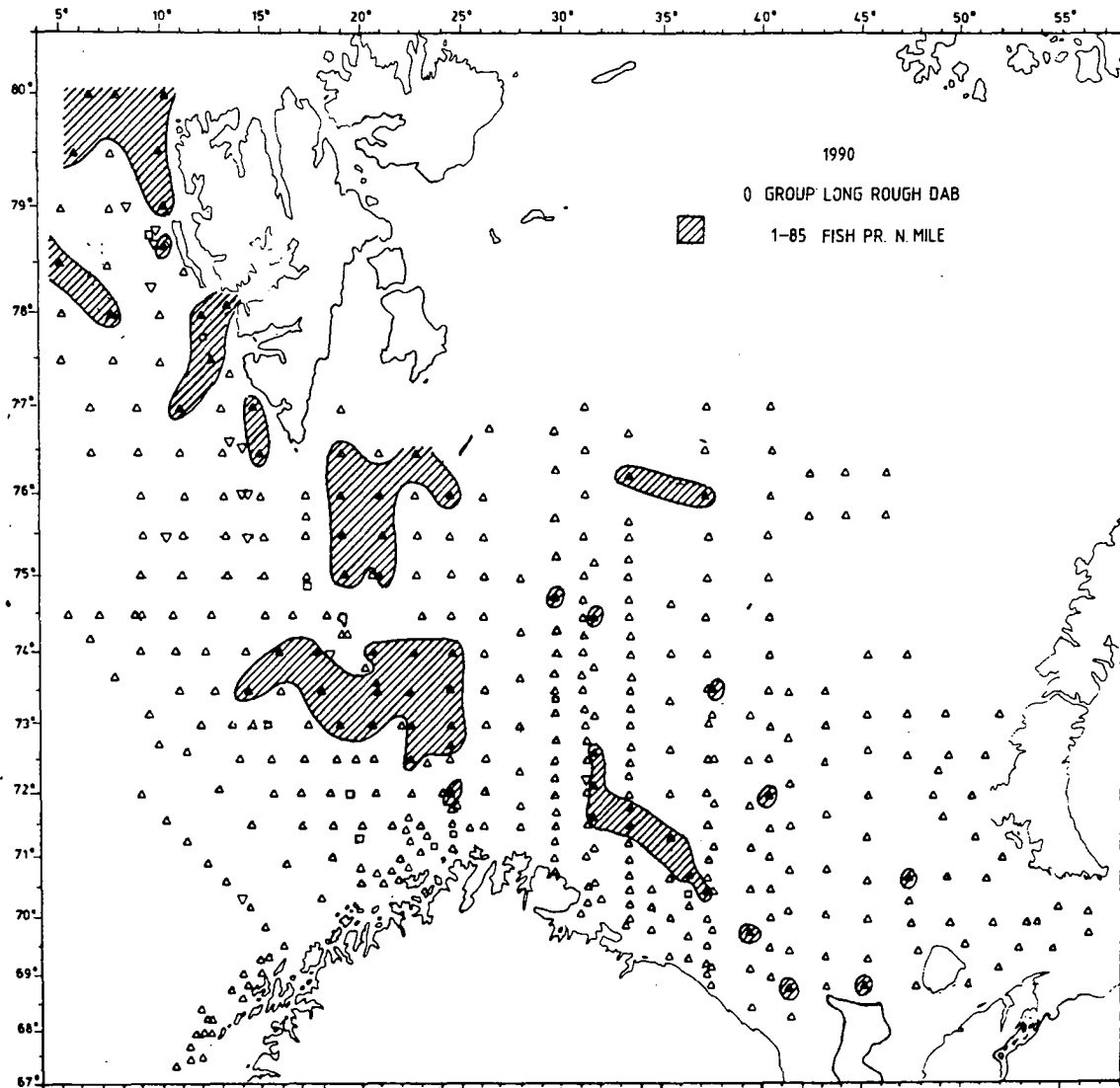


Fig. 24. Distribution of 0-group long rough dab.

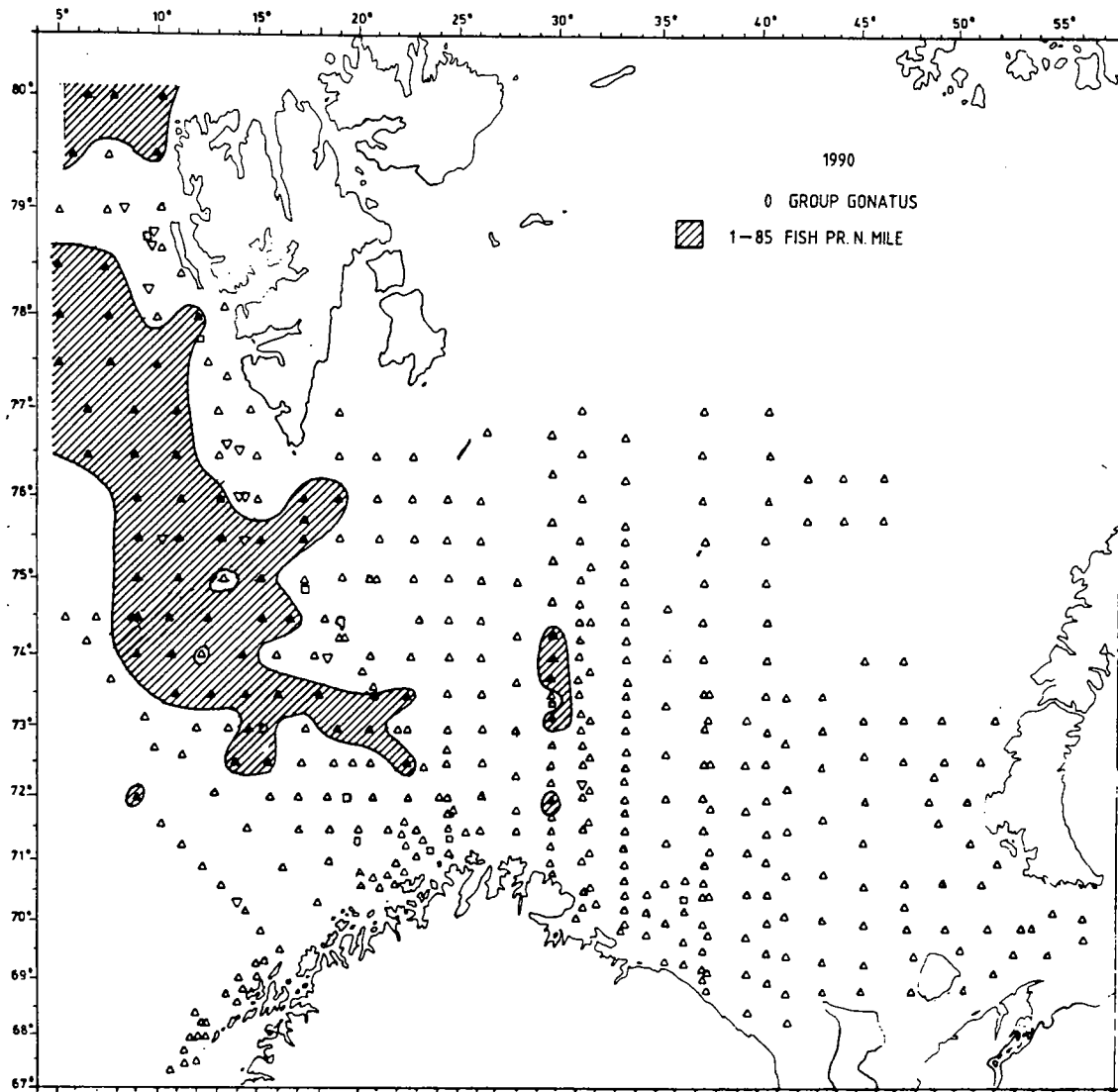


Fig. 25. Distribution of 0-group Gonatus fabricii.

Appendix

<u>Survey period</u>	<u>Research vessel</u>	<u>Research Institute</u>	<u>Participants</u>
16 August - 4 September	"Professor Marti"	Polar Research Institute of Marine Fisheries and Oceanography, Murmansk	I. Altnov, A. Dorchenkov, V. Kapralov, V. Komlichenko, A. Kuzmichev, L. Kuzmin, Yu. Lepesevich, N. Makeeva, V. Ryazantsev, M. Shevelev, V. Tretyak, A. Vlahkno.
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. Hysten, H. Kismul, M. Møgster, T. Wickstrøm.
16 August - 5 September	"Michael Sars"		J. Alvsvåg, B. Hoffstad, K. Lauvås, T. Mørk, K. Nedreaas, Ø. Nævdal, J. E. Nygård.
20 August - 5 September	"Eldjarn"		T.I. Halland, J.C. Holst, E. Molvær, T. Monstad, A. Romslo, E. Skoglund, Ø. Tangen.