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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 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 on the echosounder deeper than 60 m.

Survey tracks and hydrographical stations are given in Fig.1. Trawl stations with and without catch are given on the distribution charts in Figs.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 conditions of the Barents Sea and adjacent waters showed a cooling in the upper homogenous 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 homogenous 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-year class. 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 preceding 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 preceding 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.

Greenland 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 preceeding years.

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- TORSESEN, 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 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°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)							
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	Long rough dab	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	2279324	6	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

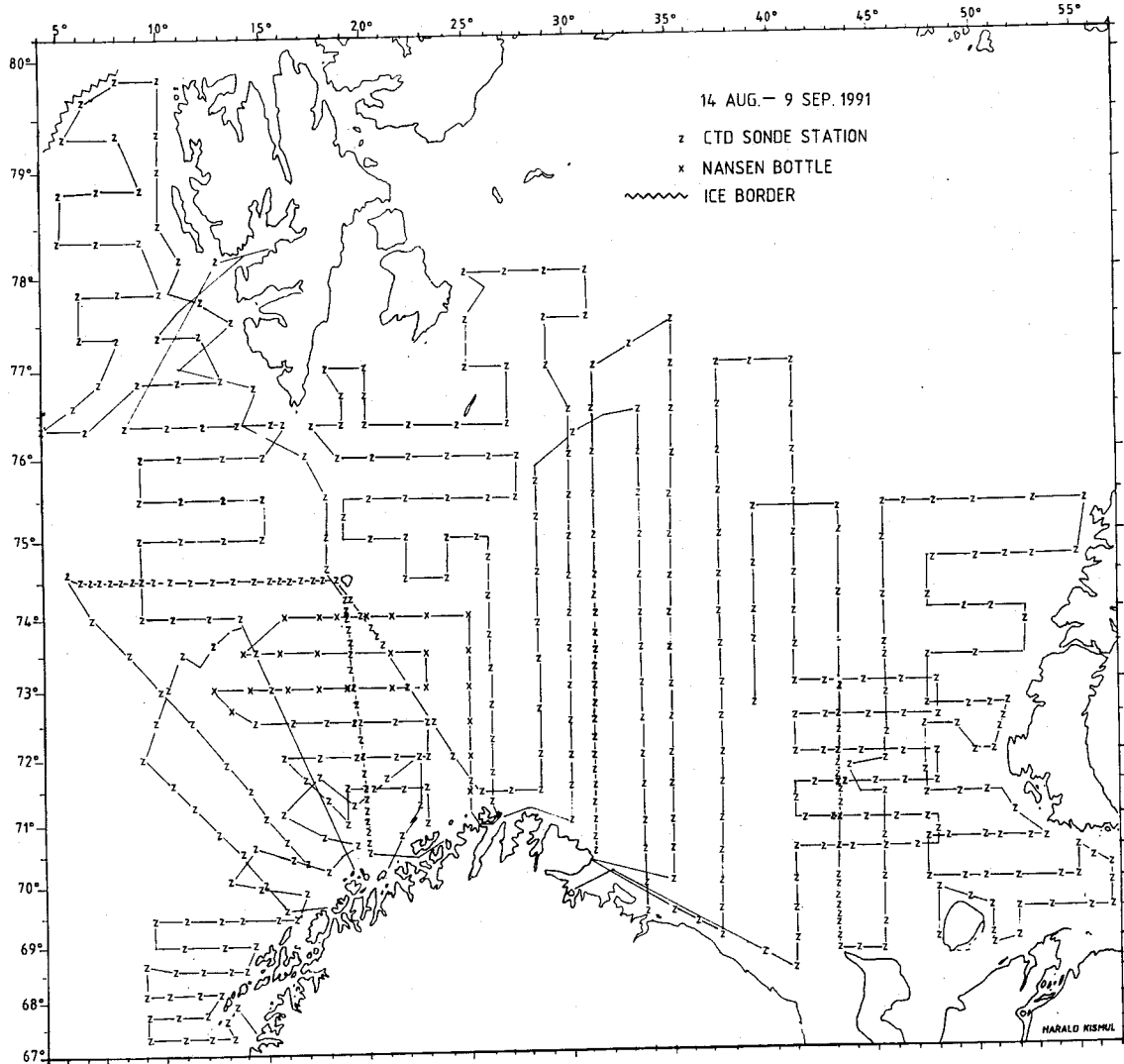


Fig. 1. Survey tracks of the ships and the grid of hydrographic stations.

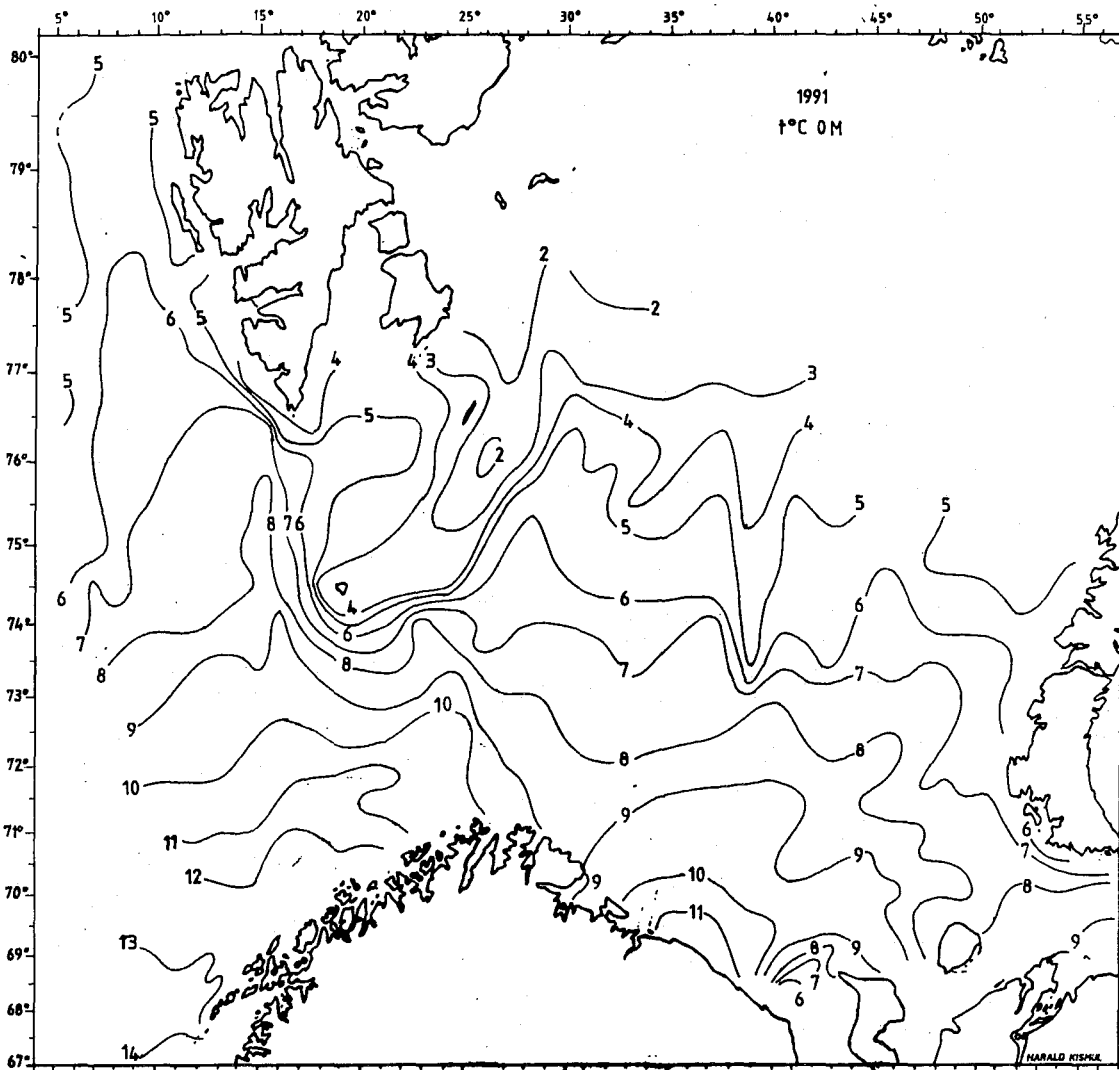


Fig. 2. Isotherms at 0 m.

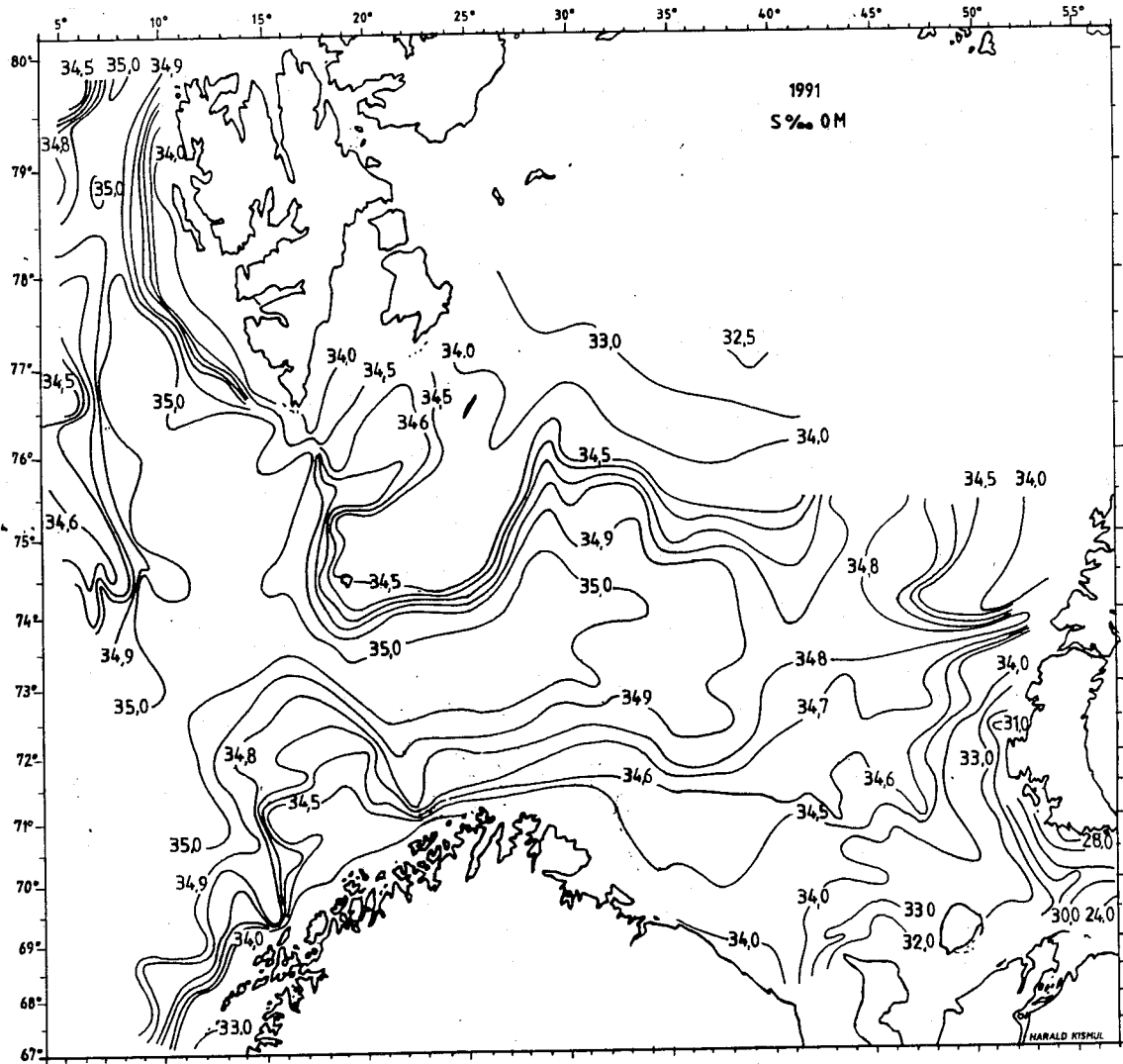


Fig. 3. Isohalines at 0 m.

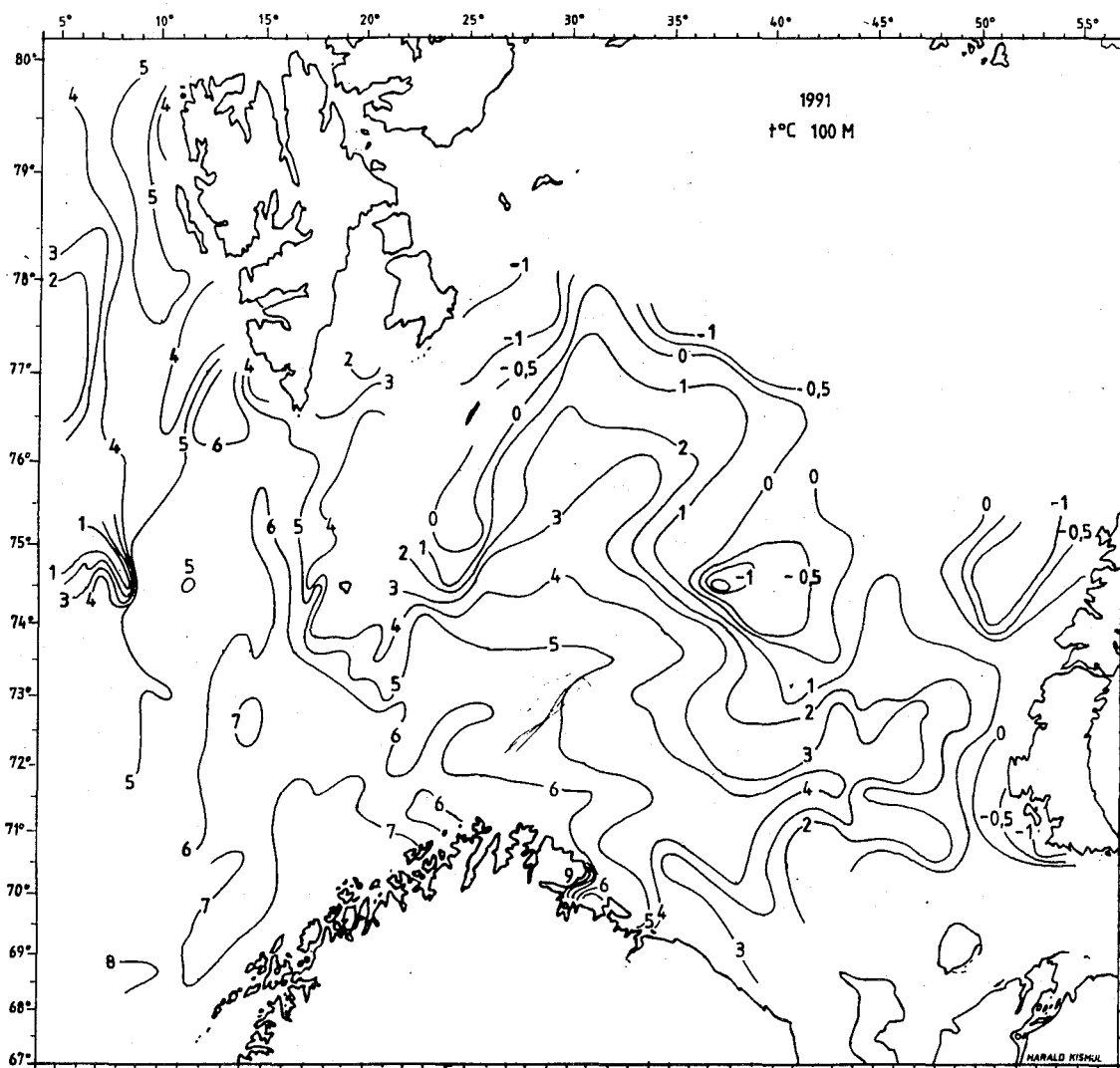


Fig. 6. Isotherms at 100 m.

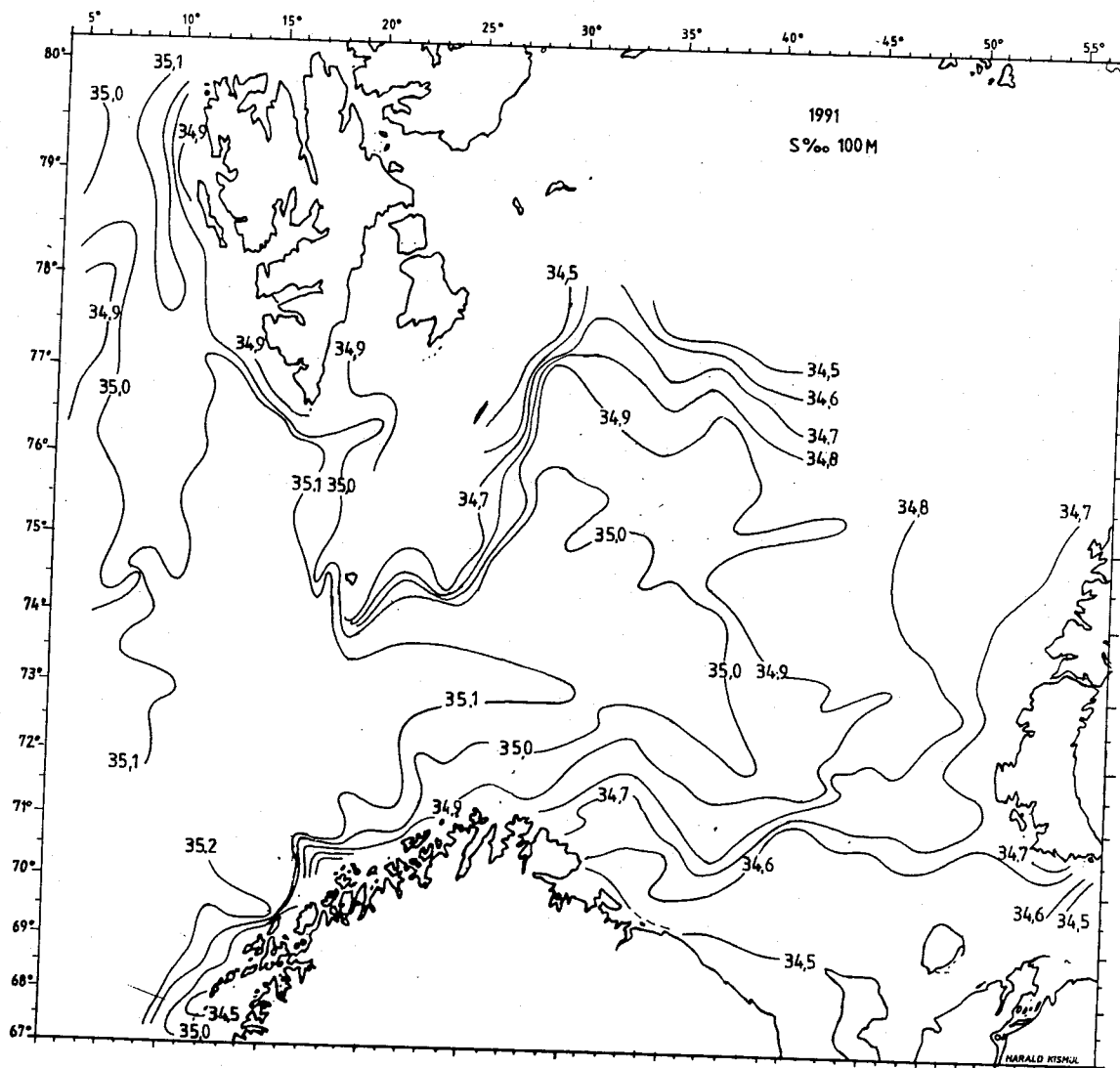


Fig. 7. Isohalines at 100 m.

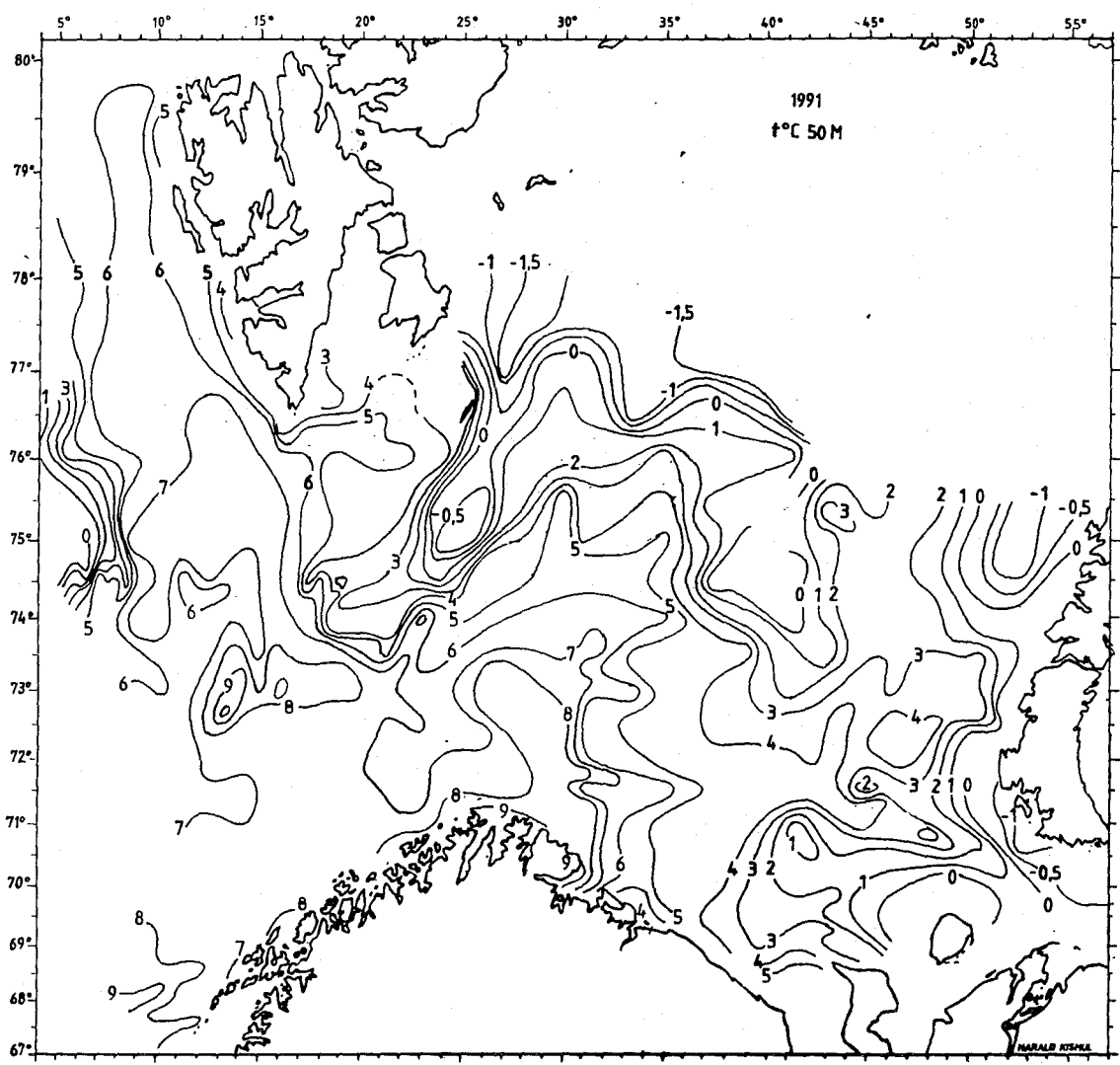


Fig. 4. Isotherms at 50 m.

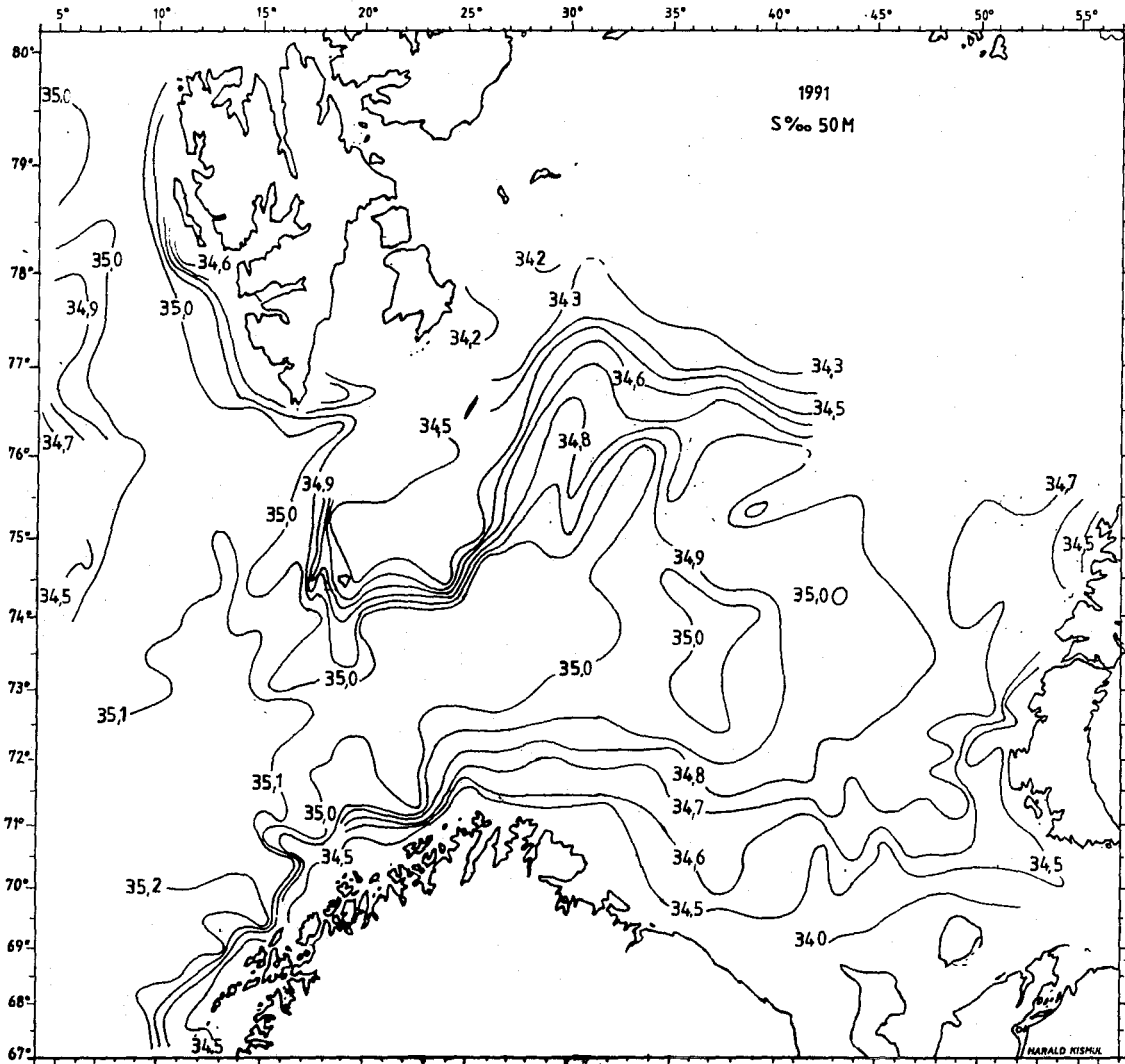


Fig. 5. Isohalines at 50 m.

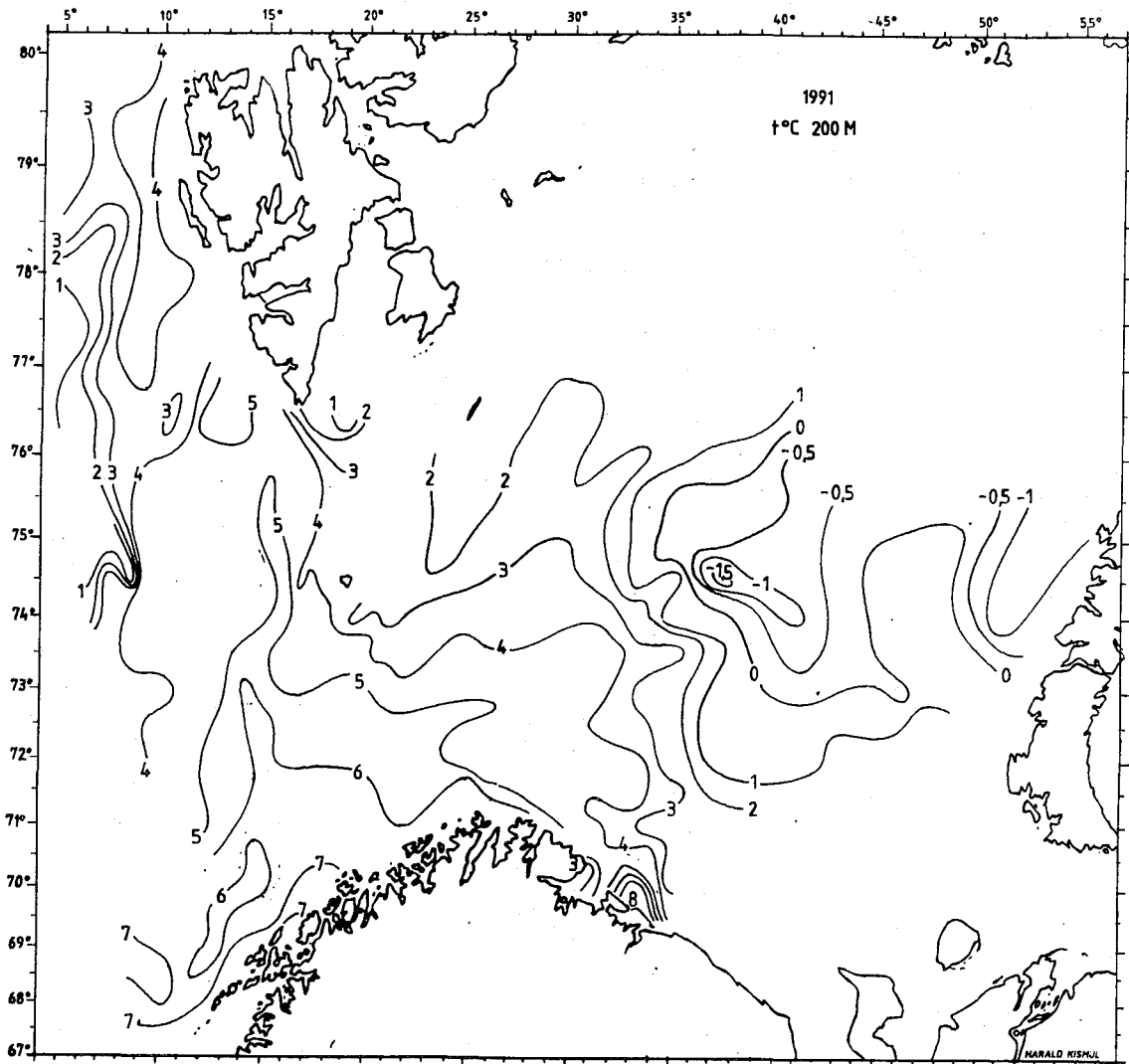


Fig. 8. Isotherms at 200 m.

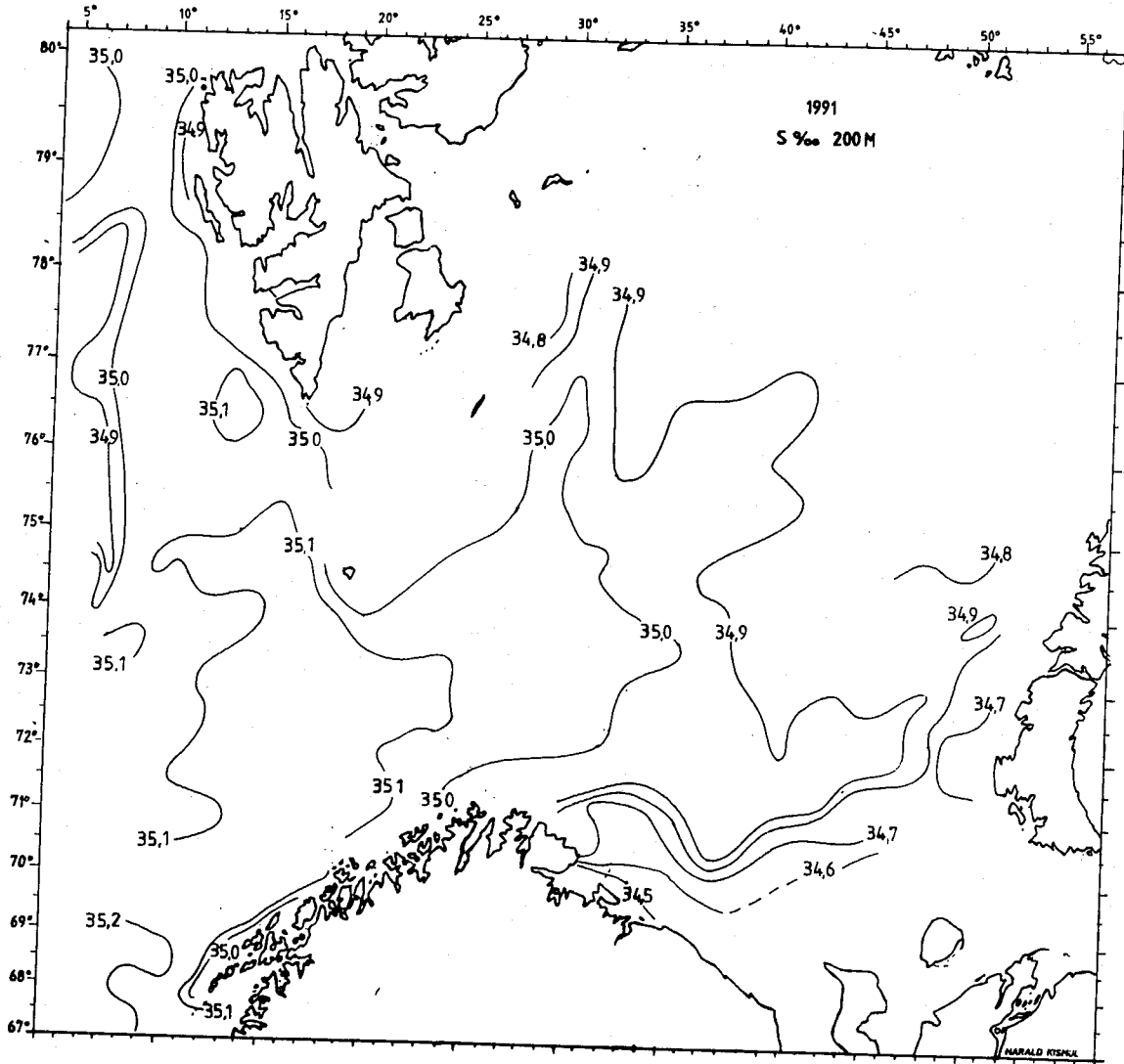


Fig. 9. Isohalines at 200 m.

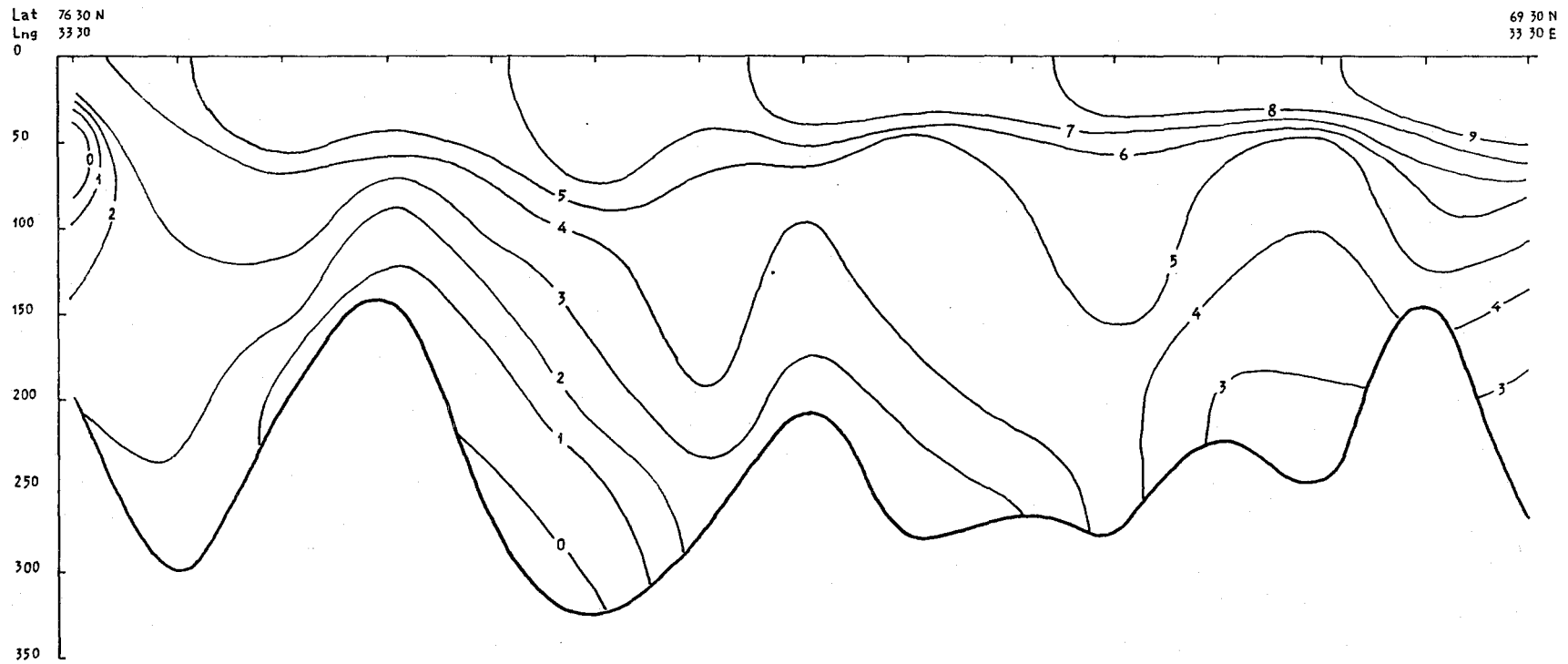


Fig. 10. Hydrographic section along the Kola meridian
Temperature.

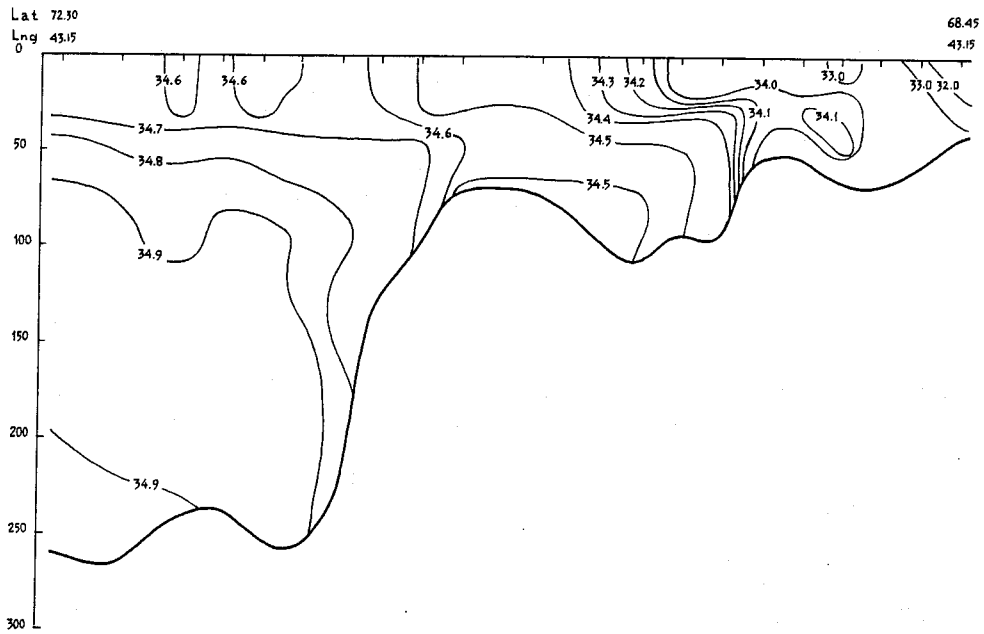
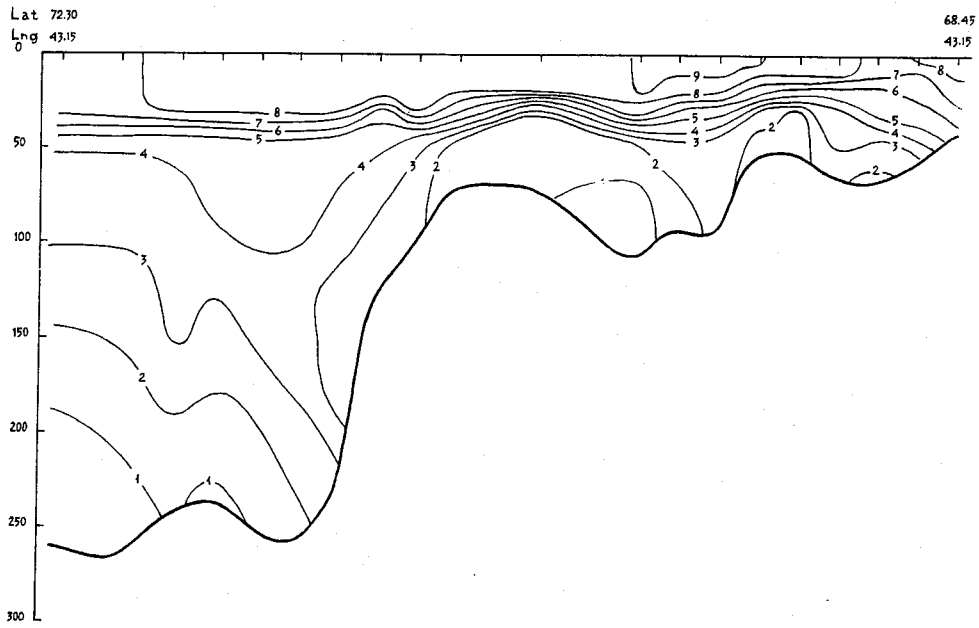


Fig. 11. Hydrographic section Cape Kanin-North.
Temperature and salinity.

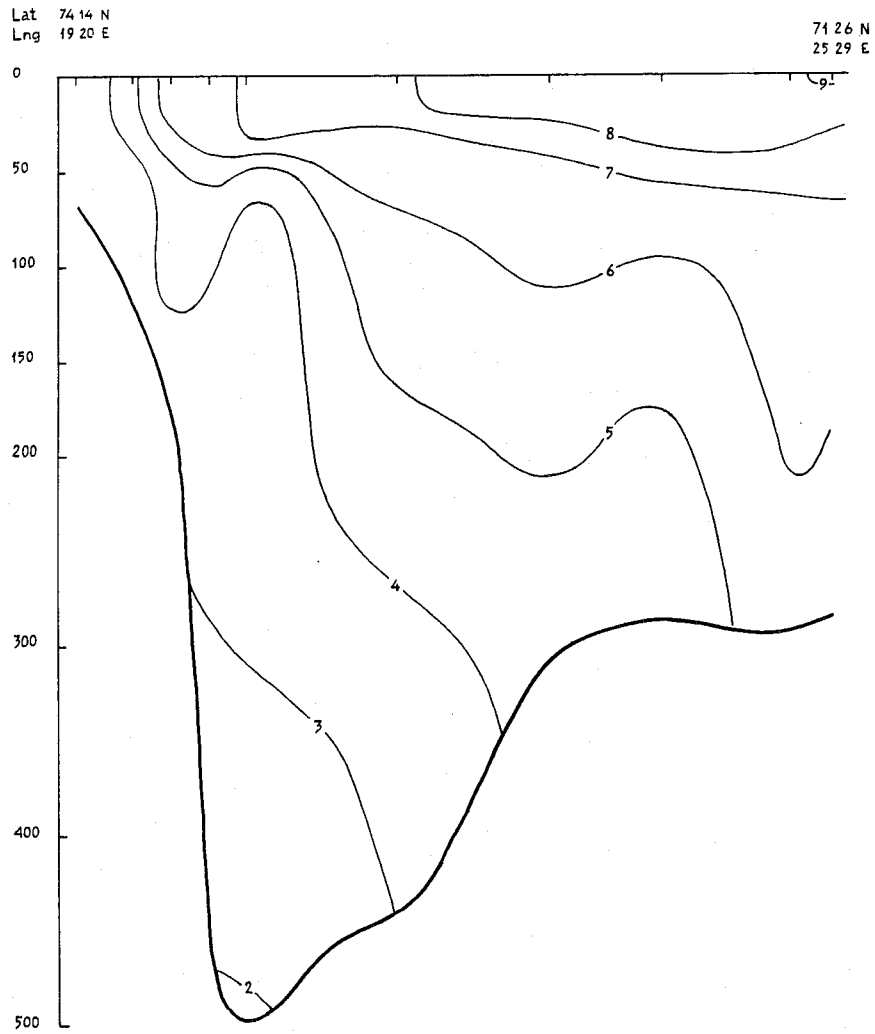


Fig. 12. Hydrographic section Bear Island - North Cape.
Temperature.

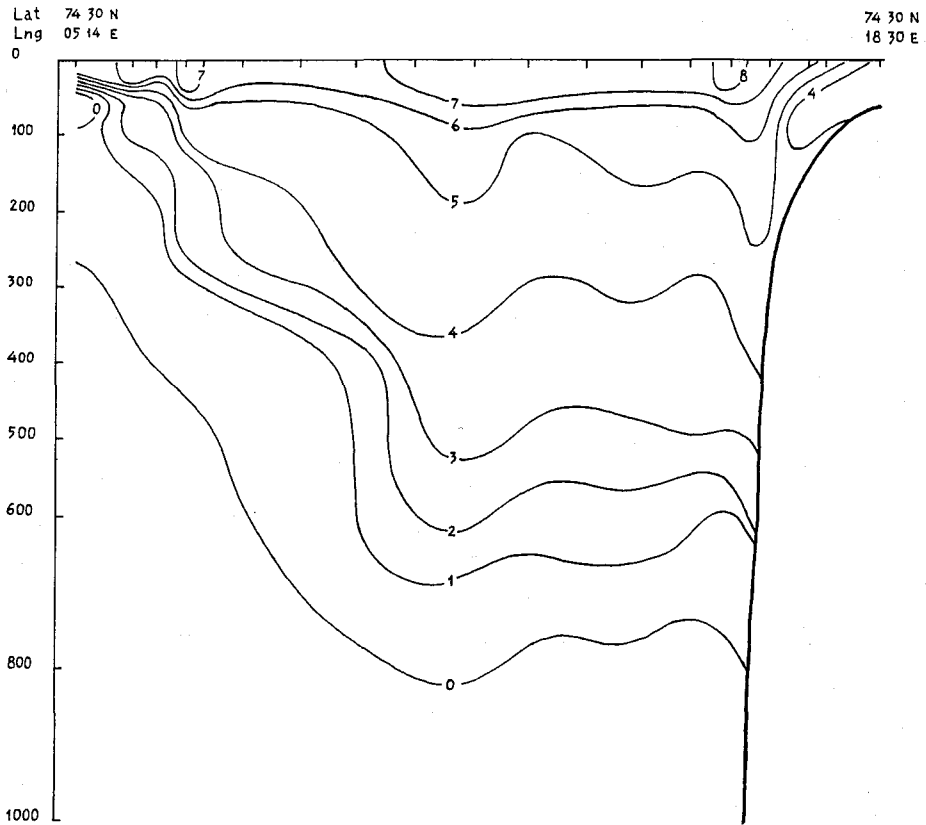


Fig. 13. Hydrographic section Bear Island-West.
Temperature.

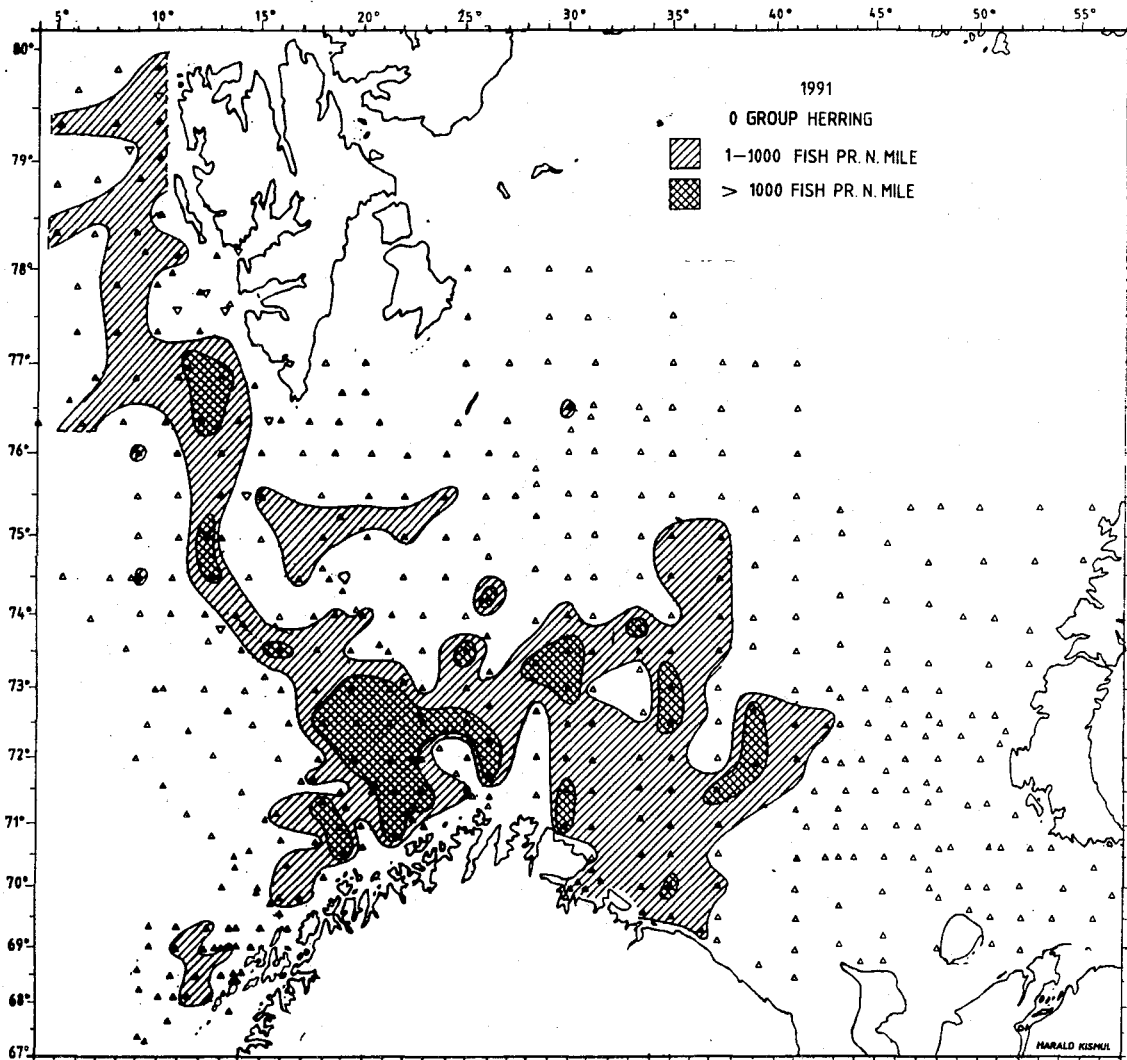


Fig. 14. Distribution of 0-group herring.

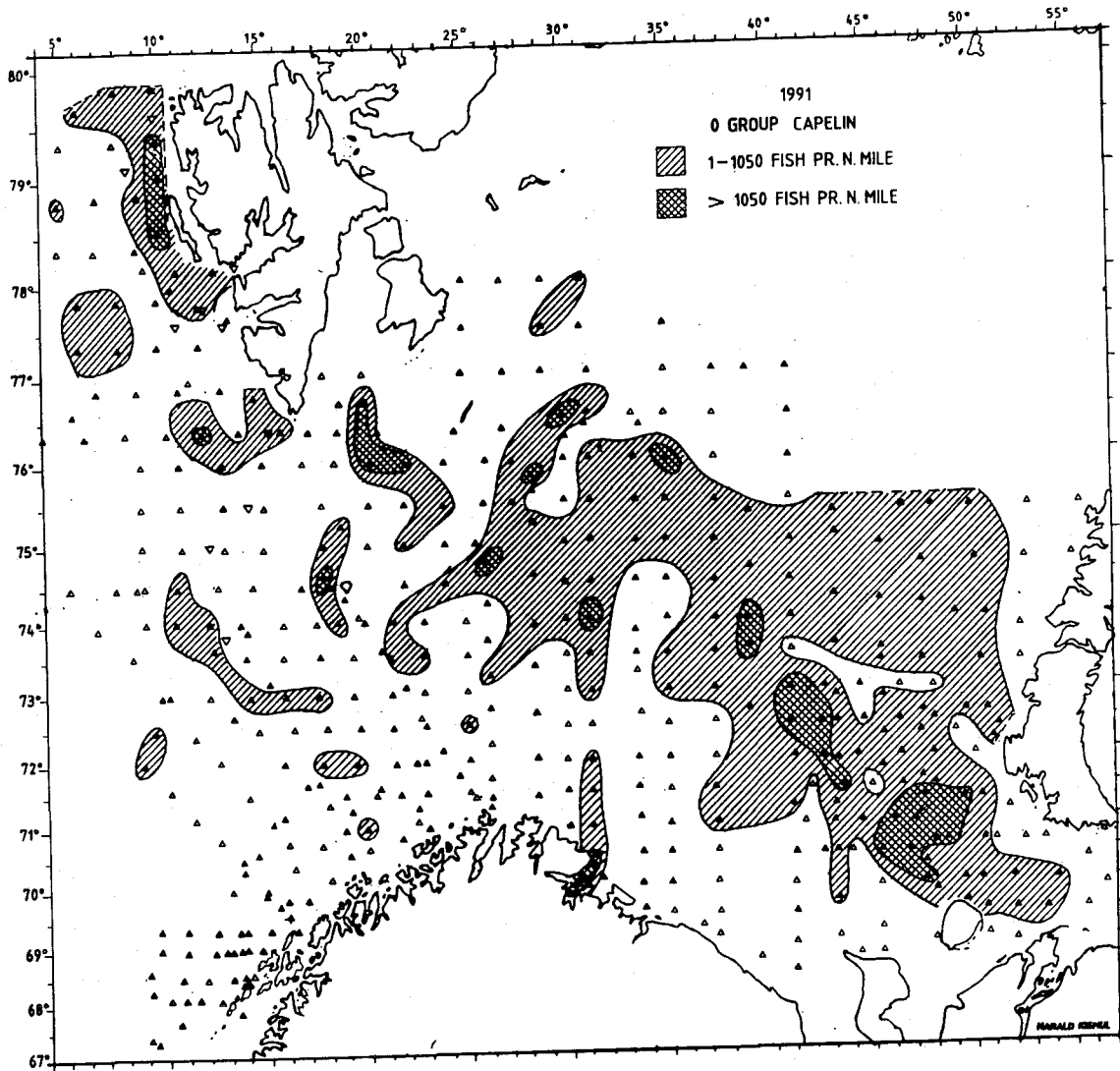


Fig. 15. Distribution of 0-group capelin

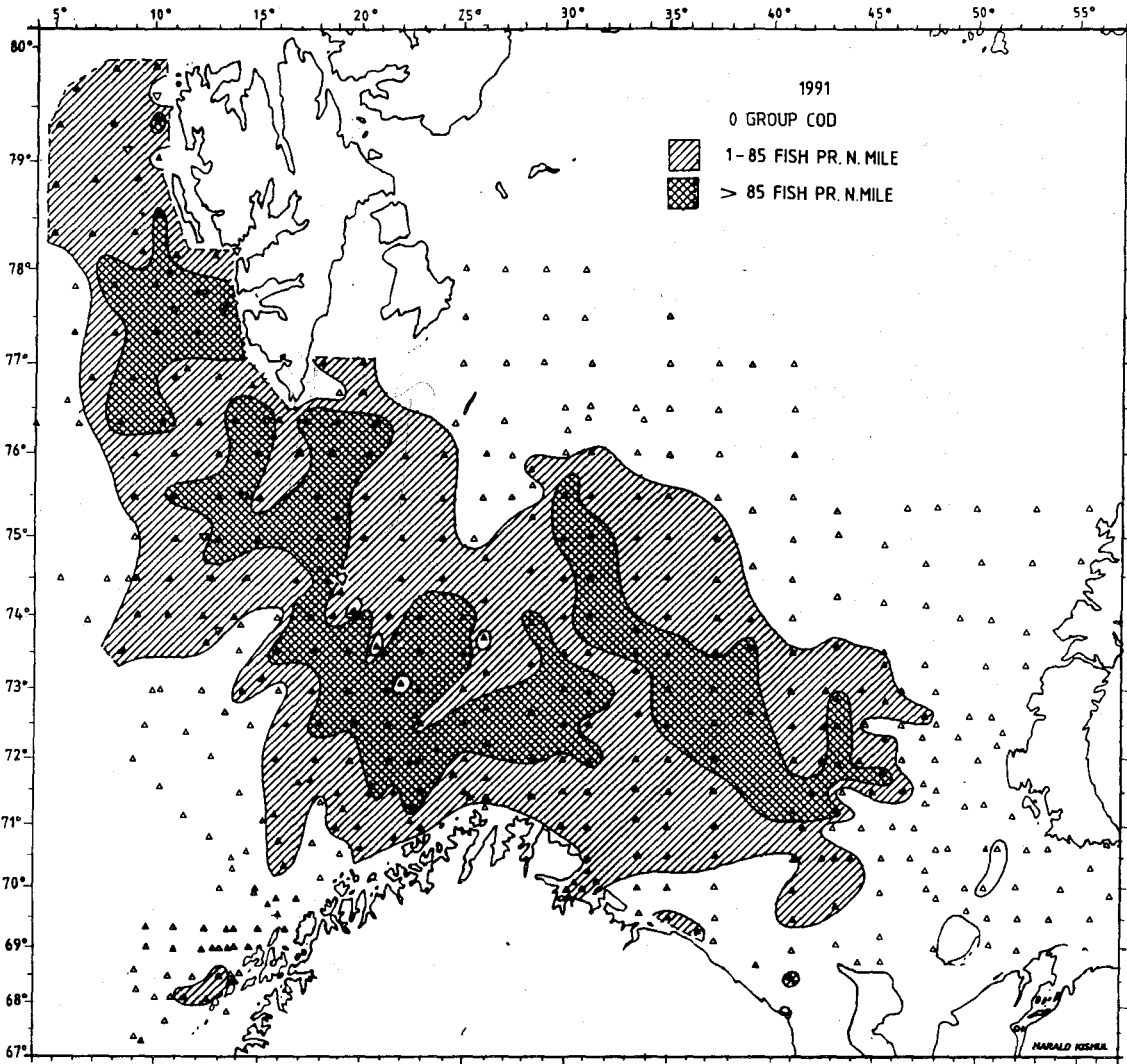


Fig. 16. Distribution of 0-group cod.

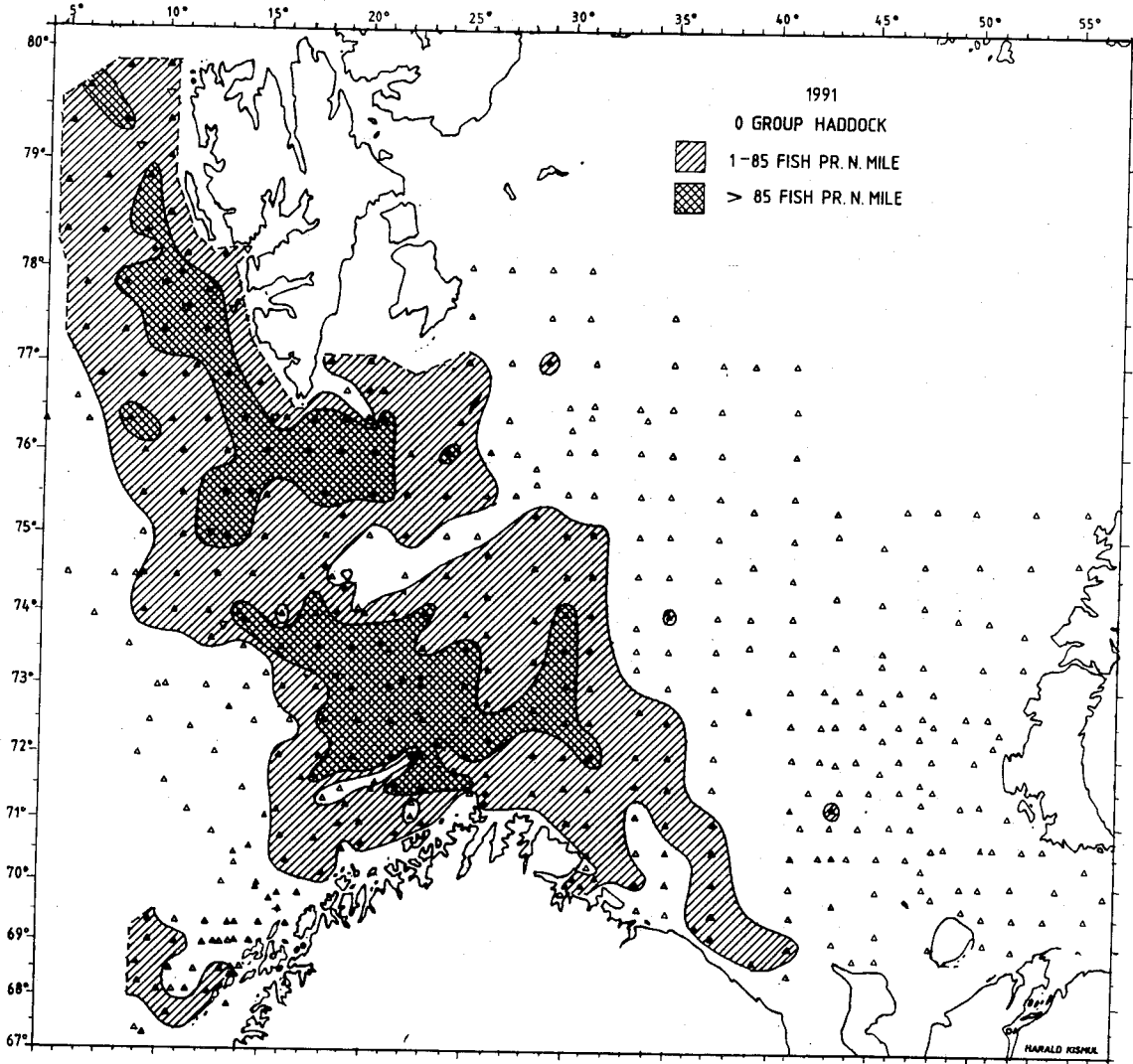


Fig. 17. Distribution of 0-group haddock.

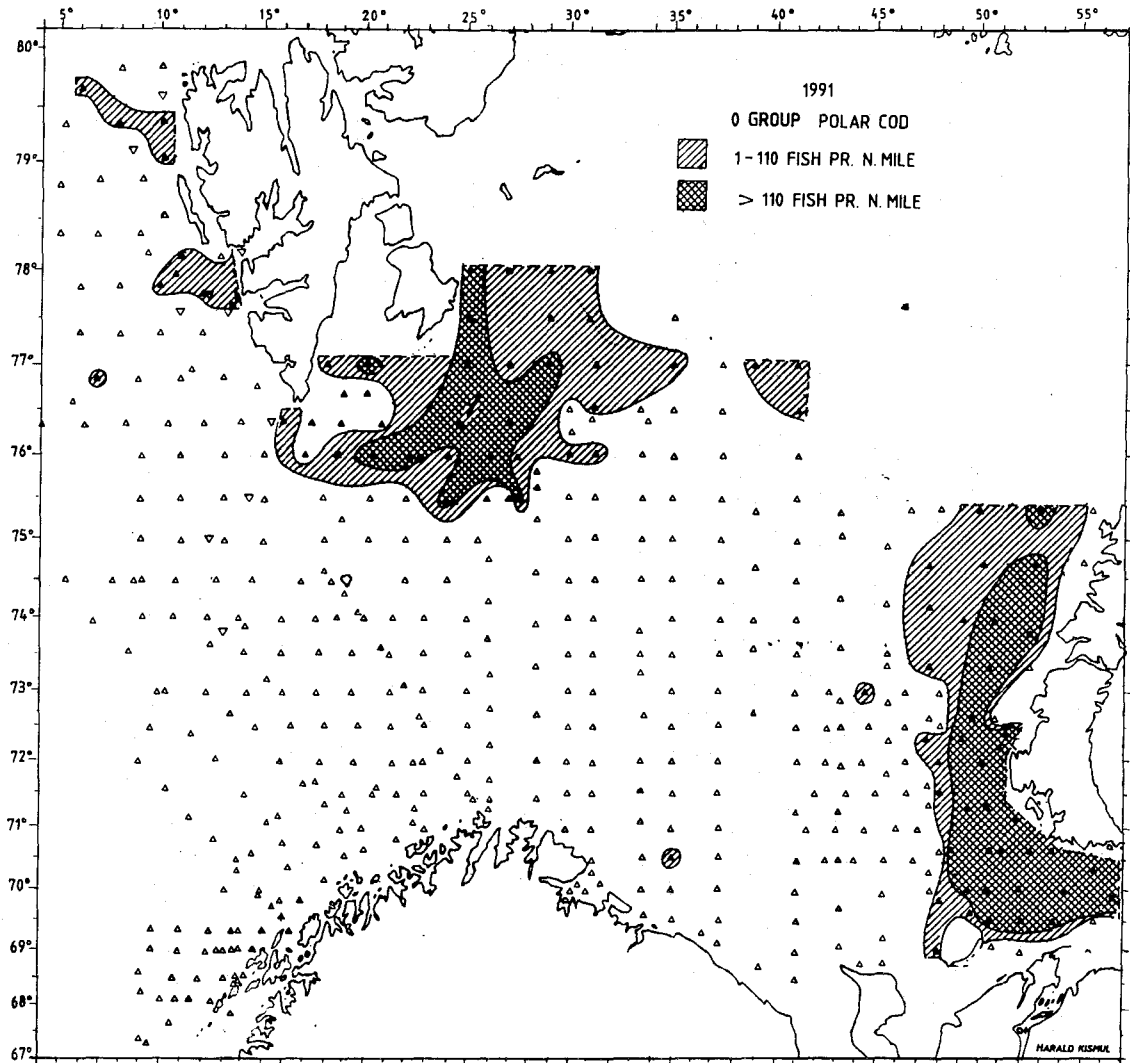


Fig. 18. Distribution of 0-group polar cod.

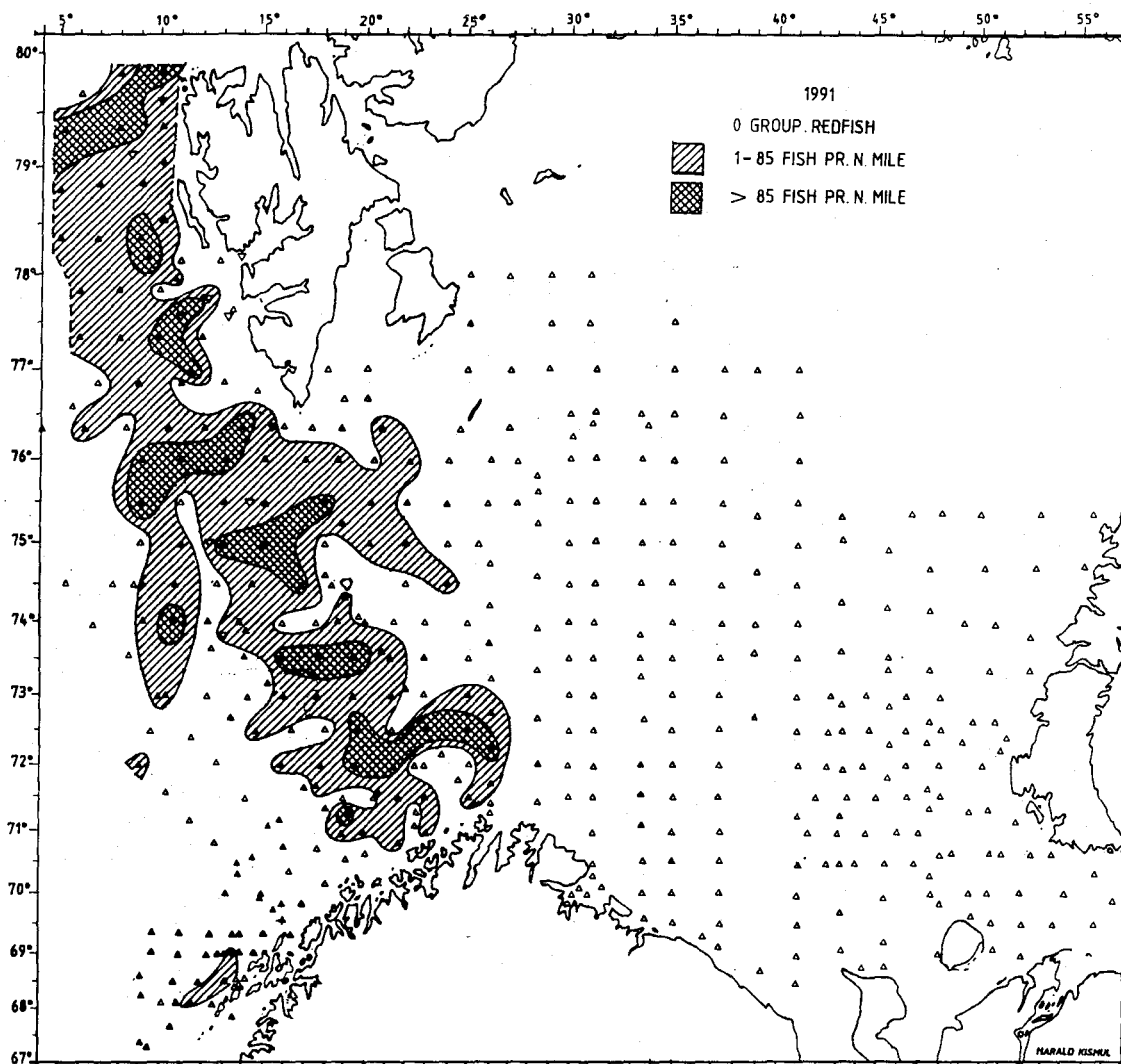


Fig. 19. Distribution of 0-group redfish.

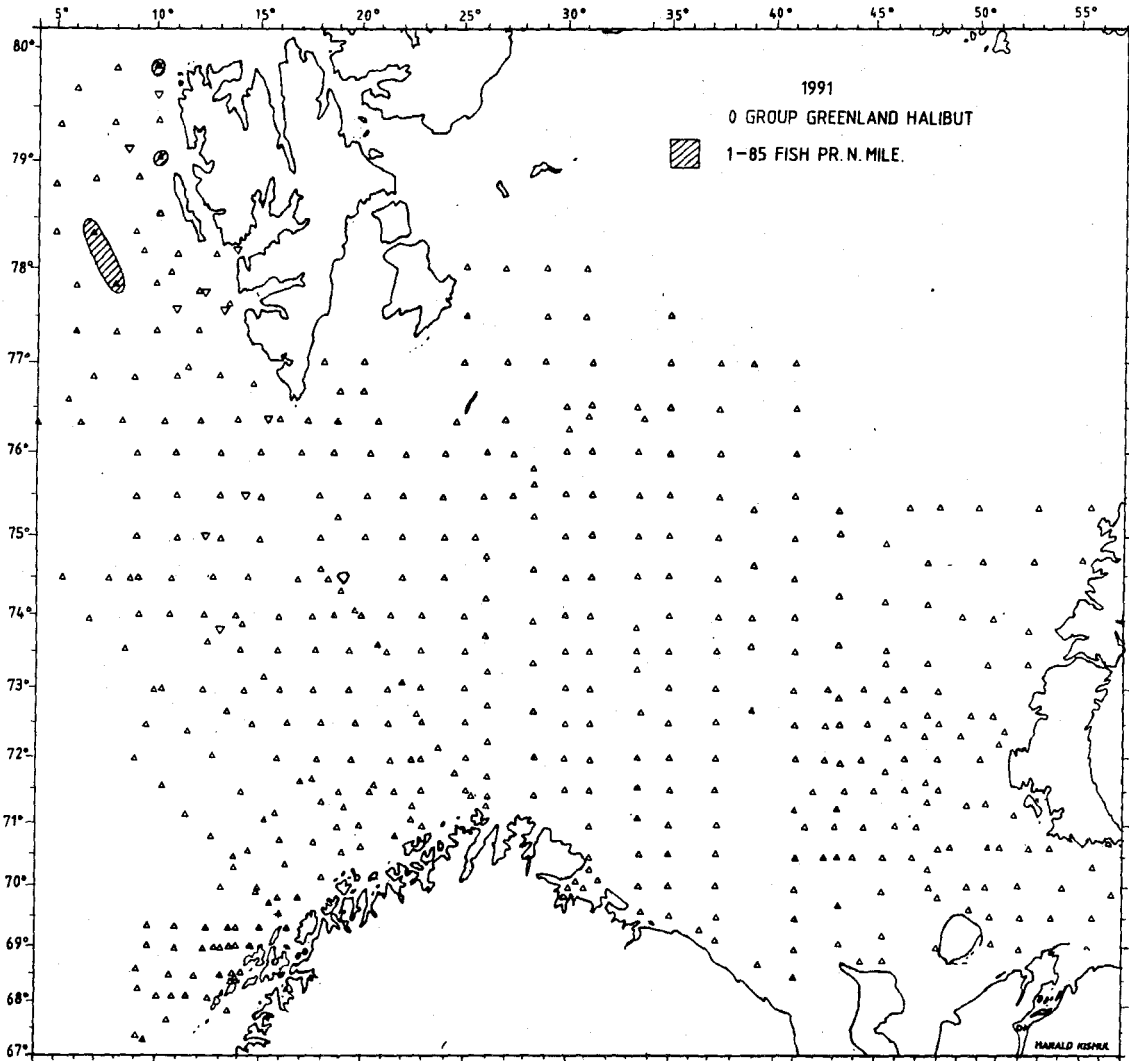


Fig. 20. Distribution of 0-group Greenland halibut.

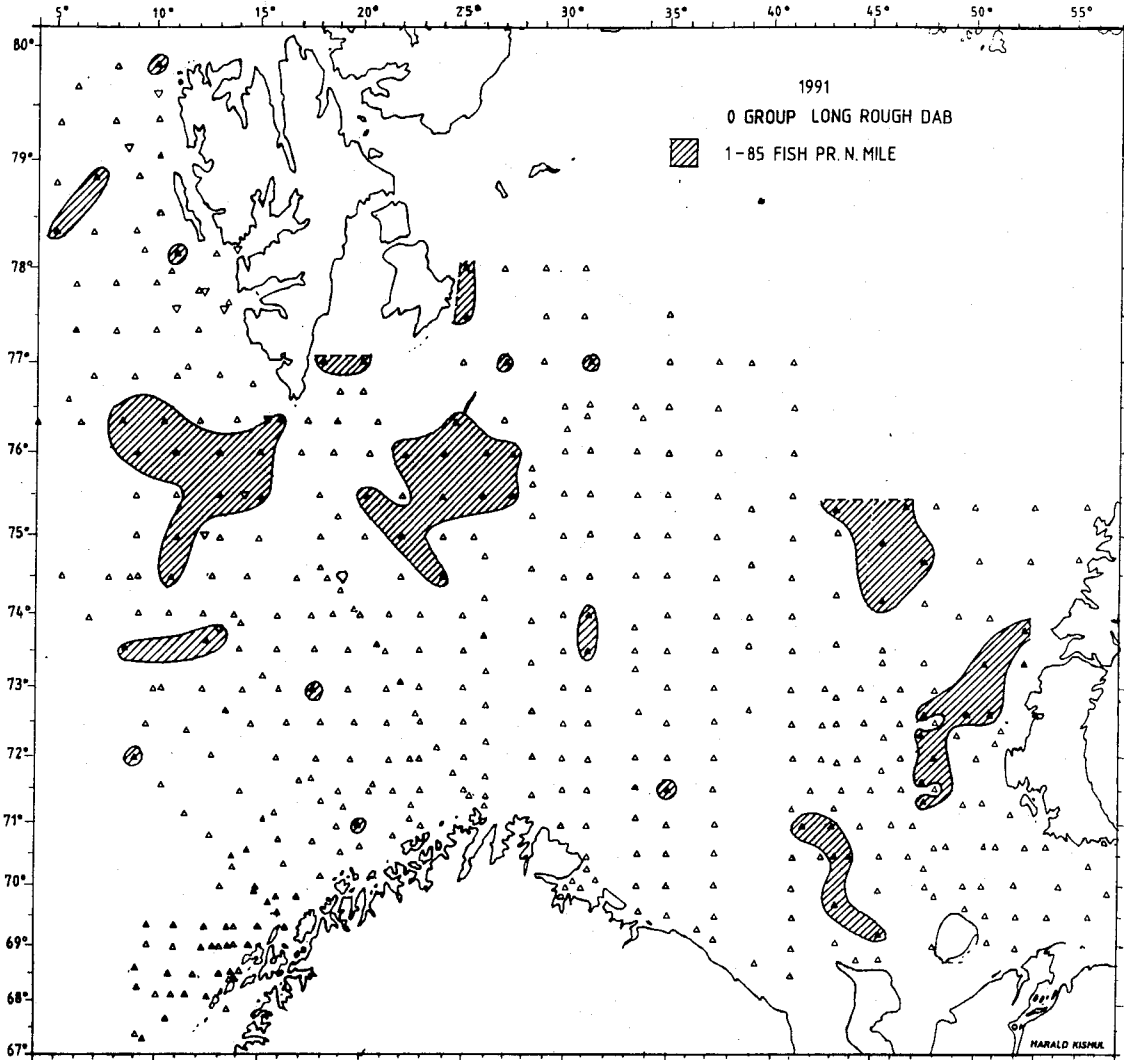


Fig. 21. Distribution of 0-group long rough dab.

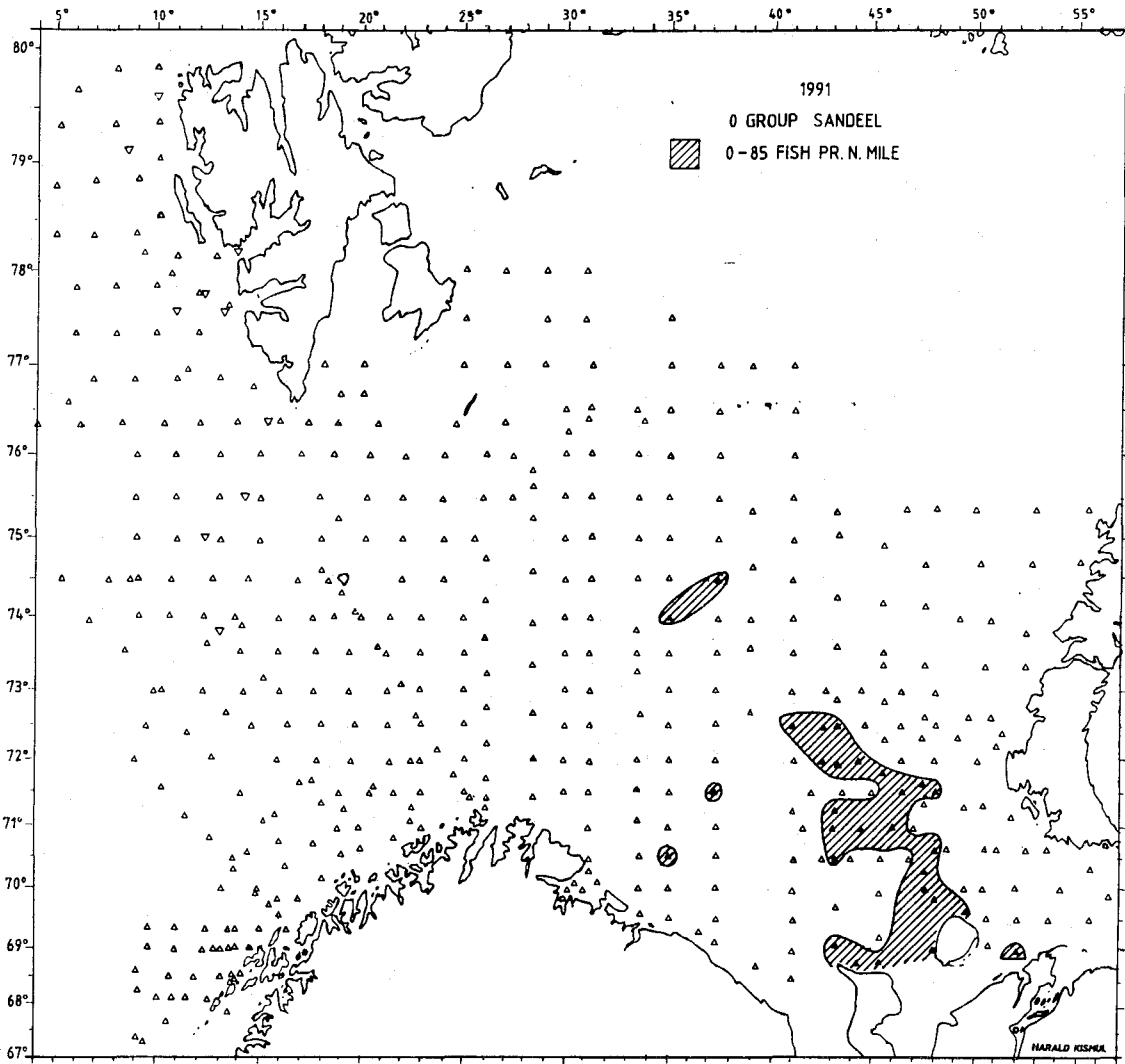


Fig. 22. Distribution of 0-group sandeel.

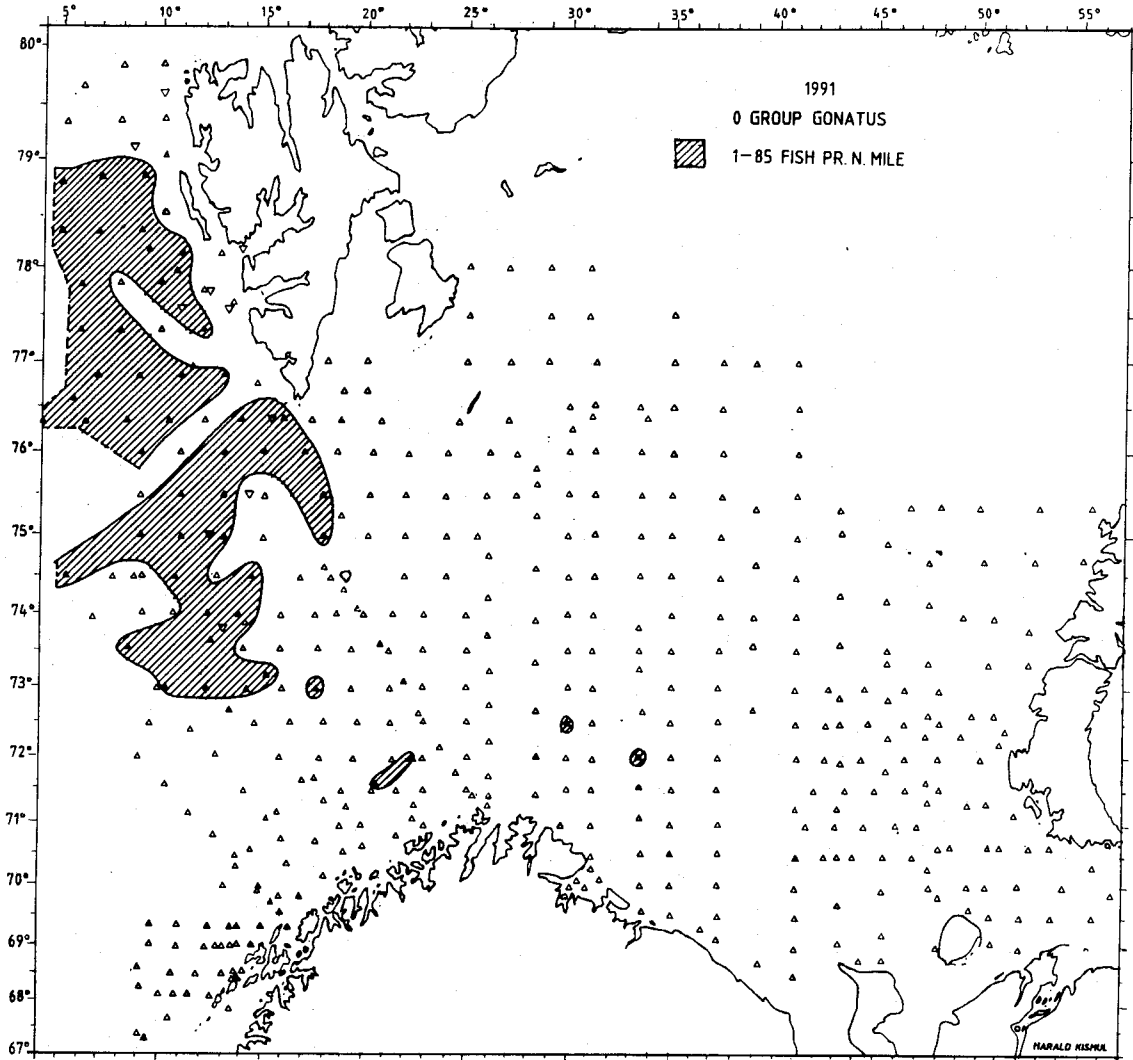


Fig. 23. Distribution of 0-group *Gonatus fabricii*.

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.Lepeceovich, V.Ozhigin, B.Shein, V.Tretyak, 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.Tarassov, 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.Bjørke, H.Grøsdal, A.Hylen, L.Kalvenes, H.Kismul, K.Lauvås, L.Løvheim, L.Solbakken, Ø.Torgersen, A.Totland