

JOINT



REPORT

**REPORT OF THE INTERNATIONAL 0-GROUP  
FISH SURVEY IN THE BARENTS SEA  
AND ADJACENT WATERS  
IN AUGUST - SEPTEMBER 2000**



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**REPORT OF THE INTERNATIONAL 0-GROUP FISH SURVEY IN  
THE BARENTS SEA AND ADJACENT WATERS  
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The thirty-sixth annual International 0-group Fish Survey was conducted during the period 10 August - 6 September 2000 in the Barents Sea and adjacent waters. The following research vessels participated in the survey:

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<b>State</b>	<b>Name of vessel</b>	<b>Period</b>	<b>Research Institute</b>
Norway	“Johan Hjort”	18.08 – 06.09	Institute of Marine Research, Bergen
Norway	“G. O. Sars”	19.08 – 06.09	“
Russia	“AtlantNIRO”	10.08 – 04.09	The Polar Research Inst. of Marine
Russia	“Fridtjof Nansen”	10.08 – 04.09	Fisheries and Oceanography, Murmansk

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Names of scientists and technicians who participated are given in the Appendix.

Preliminary analysis of the survey data were made on board the "G.O.Sars" and "AtlantNIRO" and the final report was finished by correspondence. 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 survey area.

## MATERIAL AND METHODS

The geographical distributions of 0-group fish were estimated based on samples from a small mesh midwater trawl. All vessels that participated in the survey in 2000 used a type of midwater trawl recommended in 1980 (Anon. 1983). The standard procedure consisted of tows of 0.5 nautical mile at each of 3 depths with the headline of the trawl located at 0, 20 and 40m, respectively. Additional steps at 60 and 80m per 0.5 nautical mile were made when the 0-group fish layer was recorded deeper than 60m or 80m on the echosounder. Trawling procedures were standardised in accordance with the recommendations made in 1980.

Most of the stations were spaced 35 nautical miles apart. Hydrographical observations were made at each trawl station and at several permanent hydrographical sections (Fig. 1). Horizontal distributions of temperatures and salinities are shown for 0, 50, 100, 200m and at the bottom in Figs. 2-11. Figs. 12-15 show the temperature and salinity conditions along the hydrographical sections: Bear Island - West, Bear Island - North Cape, Kola and Cape Kanin-North. The mean temperatures in the main parts of these sections are presented in Table 1.

Trawl stations with and without catch are indicated on the distribution charts (Figs. 16 – 27) as filled and open symbols, respectively. The density grading is based on catch in numbers per 1.0 nautical mile trawling. 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 are given in Table 2. All area based abundance indices were estimated using standard computer programs (Fotland *et al.* 1995). Logarithmic transformed abundance indices are given for 0-group herring, cod and haddock (Table 3), calculated according to Randa (1984). These are based on the number of fish caught during a standard trawl haul of one nautical mile. Mean values of the abundance indices were only calculated for the period 1985 to 2000 (Table 2), since Nakken and Raknes (1996) show that previous surveys might not be comparable for methodological reasons. Estimated length frequency distributions for the main species are given in Table 4.

## HYDROGRAPHY

The surface temperature was on average 0.5°C higher than the long-term mean in the western Barents Sea. In the central and eastern parts, the average temperatures were 1.0 and 2.0°C higher than the long-term mean, respectively. The extremely high temperatures in the east were likely caused by the weather conditions, i.e. stable anticyclones in this area for a long period. However, advection of warm Atlantic water into the central and eastern parts of the sea can also be an explanation for the high sea surface temperatures. This is also reflected in the temperatures, which were above the long-term mean, in the standard sections shown in Table 1. The only exception is the small negative anomaly (-0.1°C) in the North Cape –Bear Island section. The coastal water and the watermasses in the southeastern Barents Sea had lower salinity, while the central watermasses had higher salinity than normal.

## **DISTRIBUTION AND ABUNDANCE OF 0-GROUP FISH AND *GONATUS FABRICII***

### **Herring (Fig. 16)**

0-group herring were distributed similarly to that in previous years. In the central part of the Barents Sea there were some small areas with dense concentrations, but to a lesser extent than last year. The abundance index was lower than the indices in the period 1996 through 1999, and also somewhat below the long-term mean (Table 3). The estimated mean length of 0-group herring was 63.3 mm, which is almost 30 mm smaller than the mean length observed in 1999.

### **Capelin (Fig. 17)**

Most of the 0-group capelin were between 73-75°N, from Bear Island to 40°E. The abundance index was 303, which is much smaller than the index for the last three years, and close to the long-term mean for capelin. It should be noted that there was incomplete coverage of the spatial distribution towards the north. The estimated mean length was somewhat smaller than last year (Table 4).

### **Cod (Fig. 18)**

Cod occurred over a large part of the survey area, from 80°N northwest of Spitsbergen to Novaya Semlja. The abundance index was 870, which is higher than the long-term mean and much higher than what was observed in 1998 and 1999. The logarithmic index is close to the long-term mean. This implies that the 2000 year-class is relatively abundant and widespread. The estimated mean length of 0-group cod was smaller than the mean length in 1999 (Table 4).

### **Haddock (Fig. 19)**

Haddock recruitment has been relatively high and stable. The total distribution area of 0-group haddock was larger than last year and the abundance index, 417, is the third largest, and only the indices in 1998 and 1991 are larger. Dense concentrations were found over a large area in the central Barents Sea. The logarithmic index was 0.64, which is significantly above the long-term mean. The estimated mean length of 0-group haddock was more than 20mm smaller than that in 1999 (Table 4).

### **Polar cod (Fig. 20)**

As in previous years, there were two separate areas (components) occupied by 0-group polar cod. Both components were smaller than last year. Both polar cod components were incompletely covered towards the north. The estimated mean length of polar cod was somewhat larger than last year (Table 4).

### **Saithe** (Fig. 21)

0-group saithe were scattered in clusters over most of the southern parts of the survey area. No abundance index was calculated, but based on the spatial distribution, it seems that the 2000 year-class might be somewhat higher than in 1999.

### **Redfish** (Fig. 22)

The recruitment of redfish has deteriorated over the last years. This year, however, recruitment appears to have improved, with 0-group redfish in areas to the west of Spitsbergen and in the central Barents Sea. The abundance index is 195, which is still below the long-term mean (Table 2) but is higher than the index for the very poor year-classes since 1995. The estimated mean length of 0-group redfish was somewhat higher than last year.

### **Greenland halibut** (Fig. 23)

There was a slight increase in the abundance of 0-group Greenland halibut, which were found in two areas – one to the south and one to the west of Spitsbergen. The abundance index (Table 2) is low but the highest since 1987. The estimated mean length of 0-group Greenland halibut was close to the mean in 1999.

### **Long rough dab** (Fig. 24)

0-group long rough dab were in scattered concentrations over large parts of the survey area. Patches of long rough dab were observed west of Spitsbergen, in the northern part of the central Barents Sea, and west of Novaya Semlja. Compared with last year, the spatial distribution was larger and the abundance index of 0-group long rough dab (Table 2) increased somewhat. The estimated length distribution was similar to the distribution in 1999.

### **Sandeel** (Fig. 25)

The bulk of the distribution of 0-group sandeel was in the southeastern Barents Sea, with high density over a much larger area than last year. Scattered concentrations were also observed in the central Barents Sea. Total abundance seems to be much larger than last year. No abundance index was calculated for this species.

### **Catfish** (Fig. 26)

0-group catfish had a more northwest spatial distribution than last year and were in scattered concentrations from 79°N west of Spitsbergen to the central Barents Sea. No abundance index was calculated for this species.

## **Gonatus** (Fig. 27)

0-group *Gonatus fabricii* had a similar distribution to those in previous years, i.e., in the western parts of the survey area from the Norwegian coast to Spitsbergen. No abundance index was calculated.

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Table 1. Mean water temperature<sup>1</sup> in selected subsections of the standard transects in the Barents Sea and adjacent waters during August-September 1965 – 2000.

Year	Section <sup>2</sup> and layer (depth 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
1993	7.5	4.0	4.9	4.4	3.4	5.8	5.4
1994	7.7	3.9	4.8	4.6	3.4	6.4	5.3
1995	7.6	4.9	5.6	5.9	4.3	6.1	5.2
1996	7.6	3.7	4.7	5.2	2.9	5.8	4.7
1997	7.3	3.4	4.4	4.2	2.8	5.6	4.1
1998	8.4	3.4	4.7	2.1	1.9	6.0	<sup>3)</sup>
1999	7.4	3.8	4.7	3.8	3.1	6.2	5.3
2000	7.6	4.5	5.3	5.8	3.9	5.7	5.1
1965-2000	7.4	3.8	4.7	4.2	3.2	5.8	4.6

<sup>1)</sup> Earlier values have been slightly adjusted (Tereshchenko, 1992).

<sup>2)</sup> 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).

<sup>3)</sup> In 1998 only the central branch and the eastern branch of the West Spitsbergen Current were covered, and the mean temperatures were 5.4 and 4.5°C, respectively.

Table 2. Abundance indices for 0-group fish in the Barents Sea and adjacent waters in 1965-2000.

Year	Capelin <sup>1</sup>	Cod	Haddock	Polar cod		Redfish	Greenland halibut	Long rough dab
				West	East			
1965	37	6	7	0		159		66
1966	119	1	1	129		236		97
1967	89	34	42	165		44		73
1968	99	25	8	60		21		17
1969	109	93	82	208		295		26
1970	51	606	115	197		247	1	12
1971	151	157	73	181		172	1	81
1972	275	140	46	140		177	8	65
1973	125	684	54	26		385	3	67
1974	359	51	147	227		468	13	93
1975	320	343	170	75		315	21	113
1976	281	43	112	131		447	16	96
1977	194	173	116	157	70	472	9	72
1978	40	106	61	107	144	460	35	76
1979	660	94	69	23	302	980	22	69
1980	502	49	54	79	247	651	12	108
1981	570	65	30	149	93	861	38	95
1982	393	114	90	14	50	694	17	150
1983	589	386	184	48	39	851	16	80
1984	320	486	255	115	16	732	40	70
1985	110	742	156	60	334	795	36	86
1986	125	434	160	111	366	702	55	755
1987	55	102	72	17	155	631	41	174
1988	187	133	86	144	120	949	8	72
1989	1300	202	112	206	41	698	5	92
1990	324	465	227	144	48	670	2	35
1991	241	766	472	90	239	200	1	28
1992	26	1159	313	195	118	150	3	32
1993	43	910	240	171	156	162	11	55
1994	58	899	282	50	448	414	20	272
1995	43	1069	148	6	0	220	15	66
1996	291	1142	196	59	484	19	5	10
1997	522	1077	150	129	453	50	13	42
1998	428	576	593	144	457	78	11	28
1999	722	194	184	116	696	27	13	66
2000	303	870	417	76	387	195	28	81
Mean 1985-2000	299	671	238	107	281	373	17	118

<sup>1)</sup> Assessment for 1965-1978 in Anon. 1980 and for 1979-1993 in Ushakov and Shamray (1995).

Table 3. Logarithmic abundance indices along with 90% confidence limits for 0-group herring, cod and haddock in the Barents Sea and adjacent waters 1966-2000.

Year	Herring <sup>1</sup>			Cod			Haddock		
	Index	Confidence limits		Index	Confidence limits		Index	Confidence limits	
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	0.48	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	0.61	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	2.37	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
1993	0.75	0.45	1.14	2.09	1.70	2.51	0.64	0.48	0.82
1994	0.28	0.17	0.42	2.27	1.83	2.76	0.64	0.49	0.81
1995	0.16	0.07	0.29	2.40	1.97	2.88	0.25	0.13	0.41
1996	0.65	0.47	0.85	2.87	2.53	3.24	0.39	0.25	0.56
1997	0.39	0.25	0.54	1.60	1.35	1.86	0.21	0.12	0.31
1998	0.59	0.40	0.82	0.68	0.48	0.91	0.59	0.44	0.76
1999	0.41	0.25	0.59	0.21	0.11	0.34	0.25	0.11	0.44
2000	0.30	0.17	0.46	1.49	1.21	1.78	0.64	0.46	0.84
Mean 1985-2000	0.45			1.55			0.46		

<sup>1)</sup> Assessment for 1965-1984 made by Toresen (1985).

Table 4. Length distribution (%) of 0-group fish in the Barents Sea and adjacent waters in August - September 2000. The length distributions of Herring, Capelin, Cod, Haddock, Redfish, Greenland halibut and Long rough dab are based on Norwegian data. The length distribution of Polar cod and Sandeel are based on Russian data.

Length (mm)	Herring	Capelin	Cod	Haddock	Polar cod	Redfish	Sandeel	Greenland halibut	Long rough dab
10- 14						0.01			
15- 19						0.05			
20- 24		0.01			0.58	1.05	0.31		0.95
25- 29		0.19			2.48	8.98	2.57		4.43
30- 34		6.77		0.01	10.86	22.85	9.35		28.00
35- 39	0.04	23.33		0.03	21.54	31.92	13.32		45.24
40- 44	0.22	33.77	0.12	0.23	27.41	20.96	15.33	1.18	20.74
45- 49	2.84	31.15	0.19	0.63	18.83	10.89	11.55	1.57	0.63
50- 54	12.06	4.19	1.49	1.81	11.46	3.29	14.54	12.55	
55- 59	25.27	0.54	5.06	3.34	4.04		15.27	15.29	
60- 64	22.02	0.04	9.97	7.60	1.43		16.49	25.49	
65- 69	17.92	0.01	15.22	10.45	0.83		0.86	22.75	
70- 74	7.50		17.11	14.11	0.29		0.31	7.84	
75- 79	4.23		14.20	13.94	0.20		0.12	9.41	
80- 84	2.64		13.98	11.74	0.02			3.92	
85- 89	2.51		11.02	9.30					
90- 94	2.50		7.66	7.62					
95- 99	0.23		2.43	6.05					
100-104			0.97	3.92					
105-109	0.01		0.54	2.95					
110-114			0.04	2.56					
115-119				2.00					
120-124				0.91					
125-129				0.56					
130-134				0.22					
135-139				0.02					
140-144									
No. measured	2513	2708	4345	3353	4475	1442	1637	126	153
Total catch	231630		103826	13187		36011		126	302
Mean length, mm	63.3	42.2	75.5	81.0	43.2	37.4	48.4	63.6	36.1

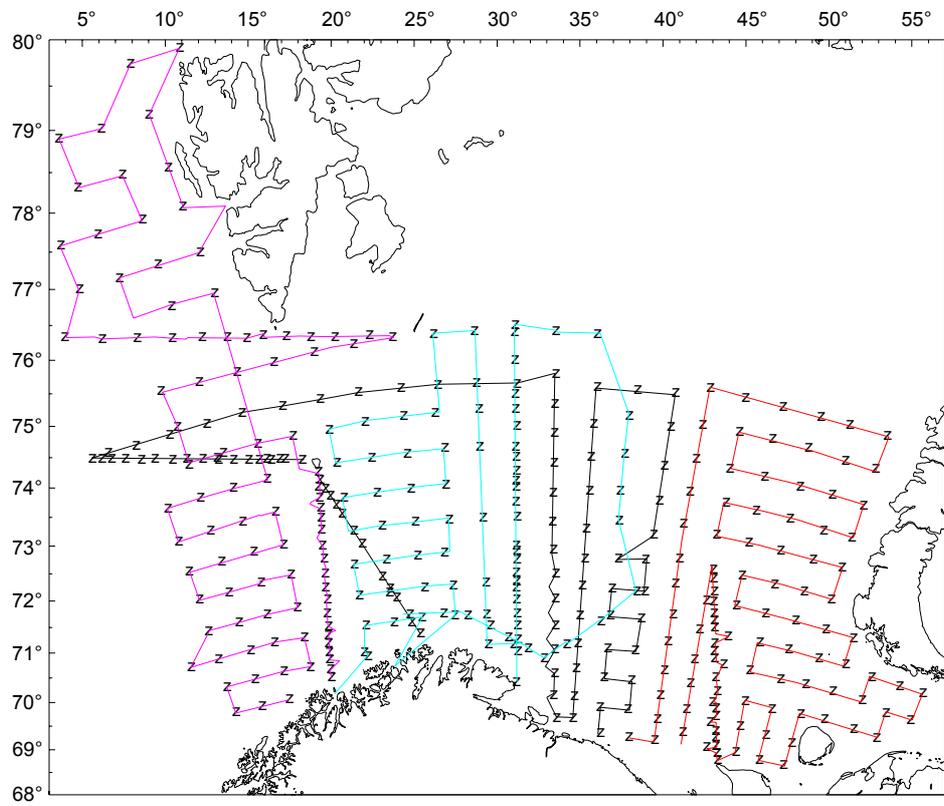


Fig.1. Ctd-stations taken by the four vessels in the Barents Sea during the period 10.08-06.09.00

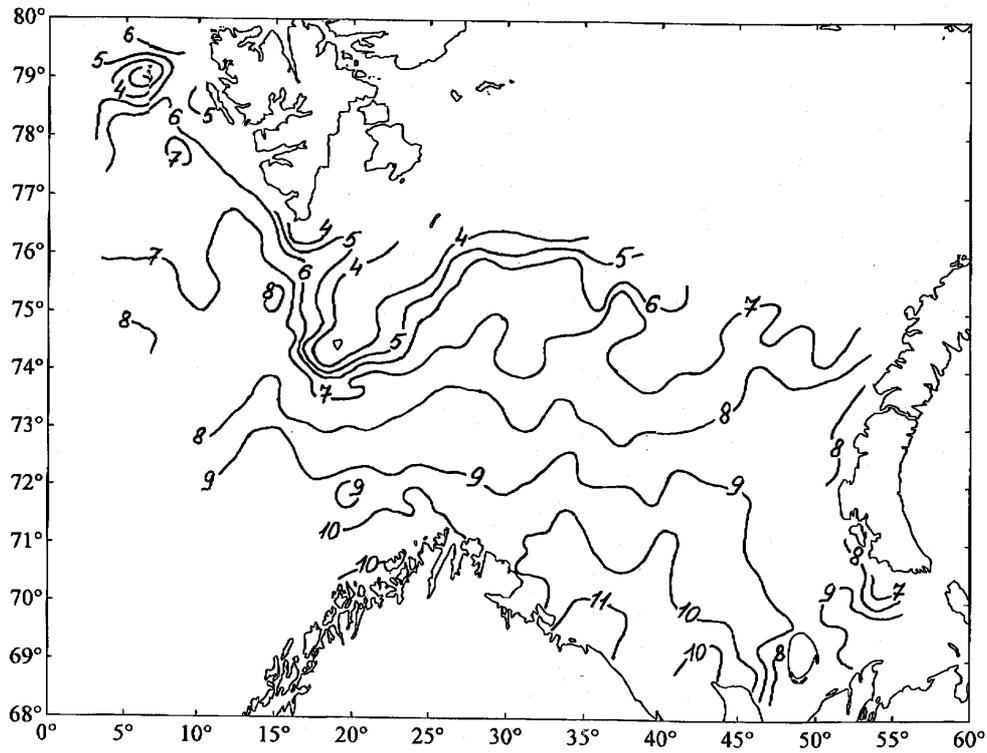


Fig 2. Isotherms (°C) at 0m

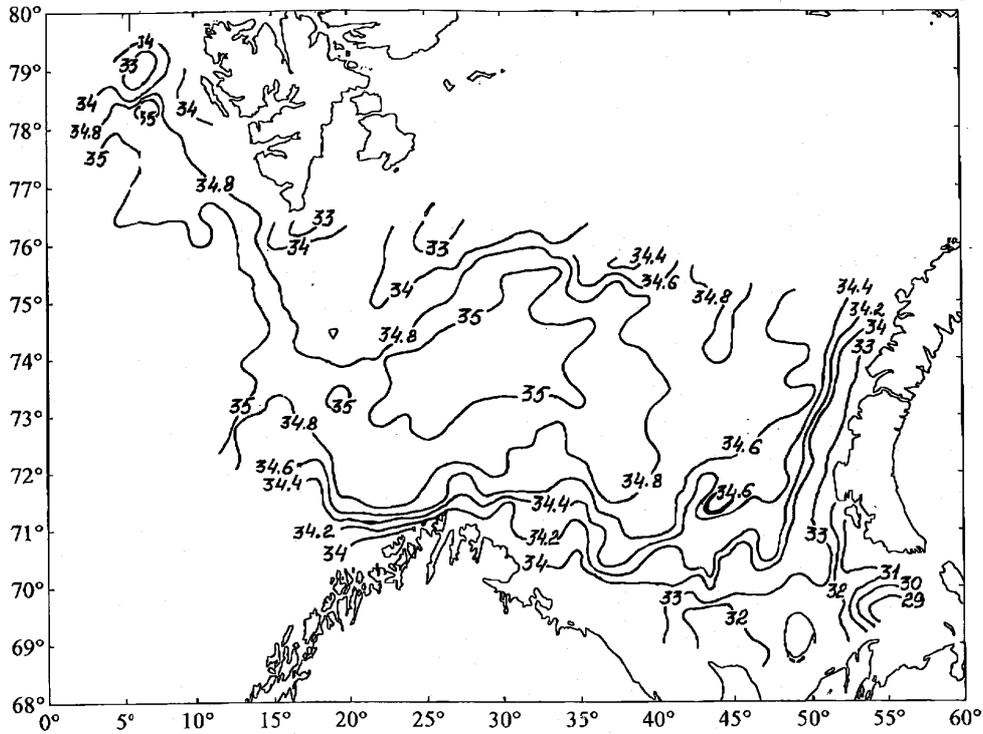


Fig. 3. Isohalines (PSU) at 0m

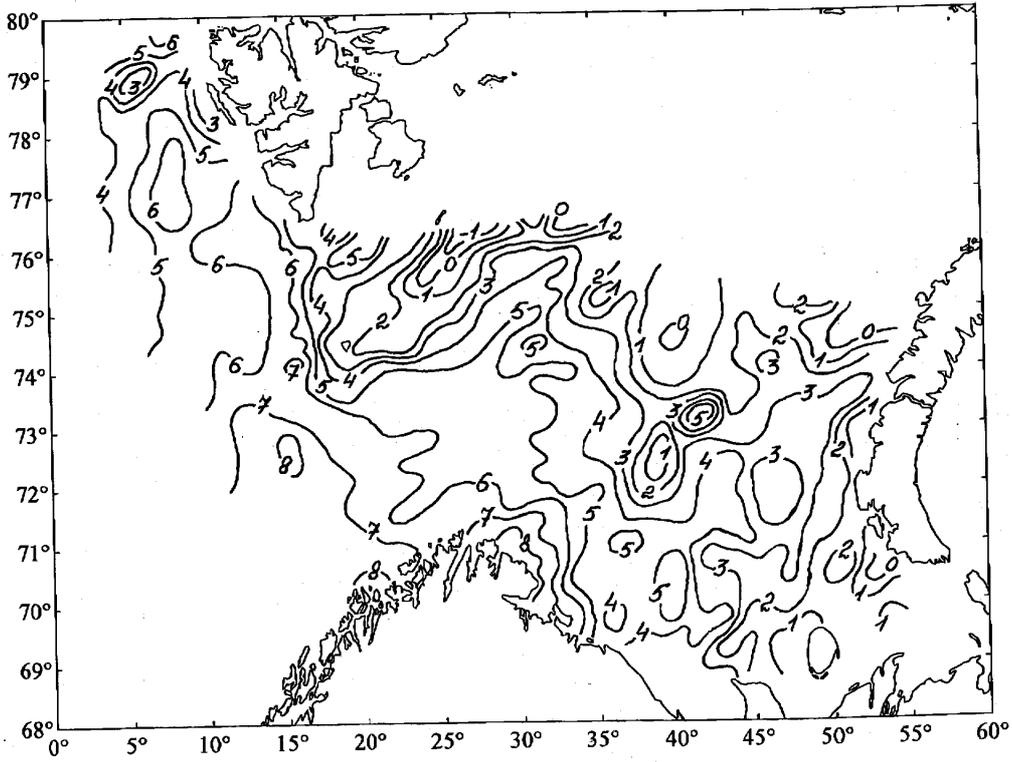


Fig. 4. Isotherms (°C) at 50m depth

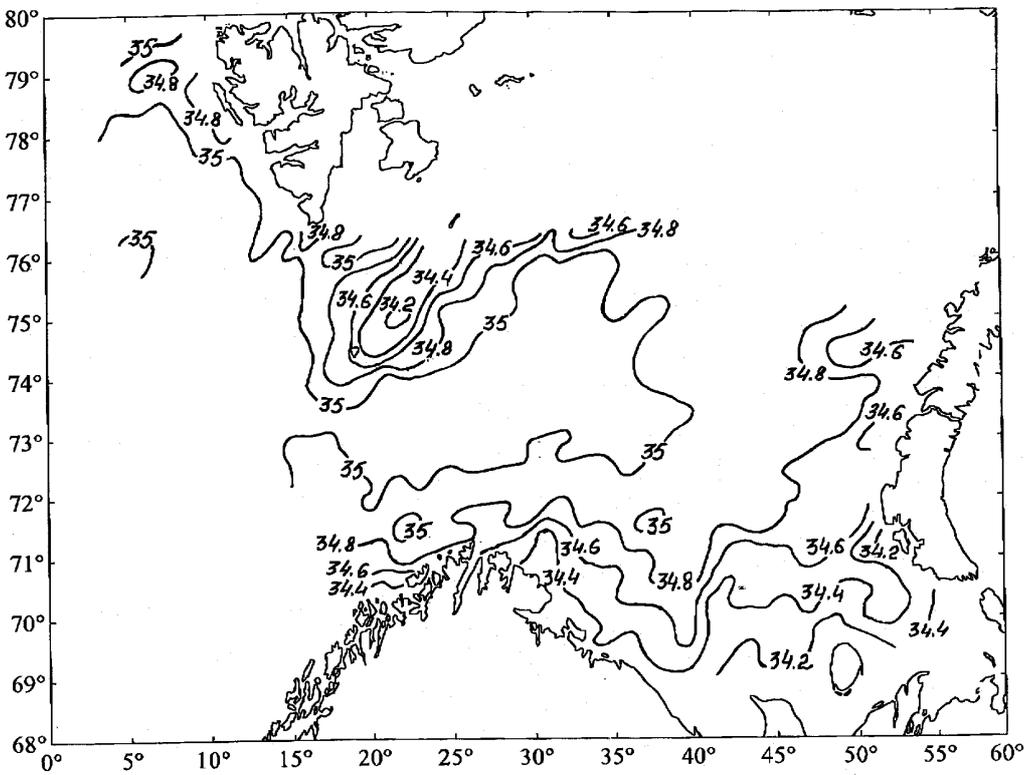


Fig. 5. Isohalines (PSU) at 50m depth

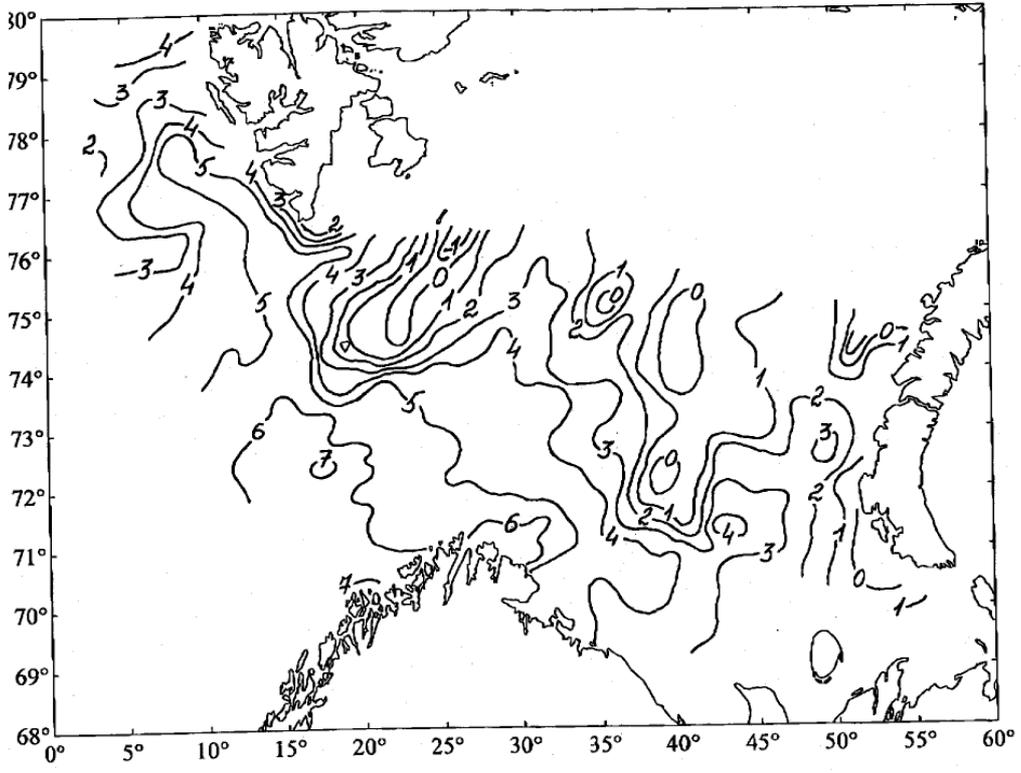


Fig. 6. Isotherms (°C) at 100m depth

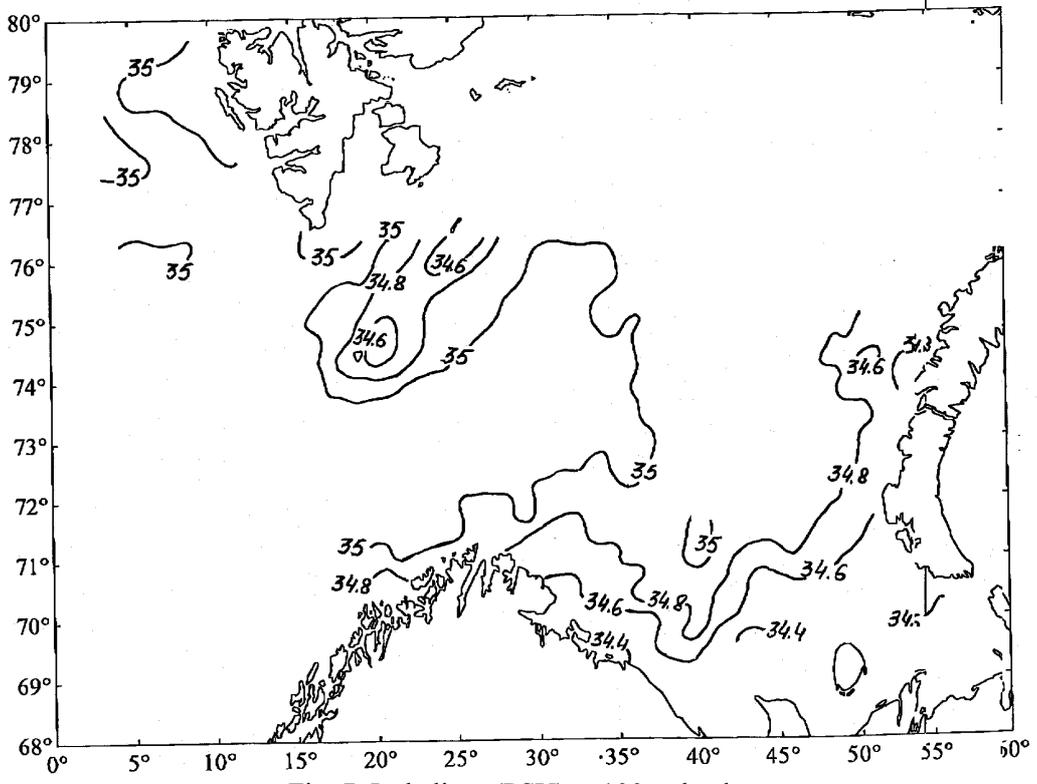


Fig. 7. Isohalines (PSU) at 100m depth

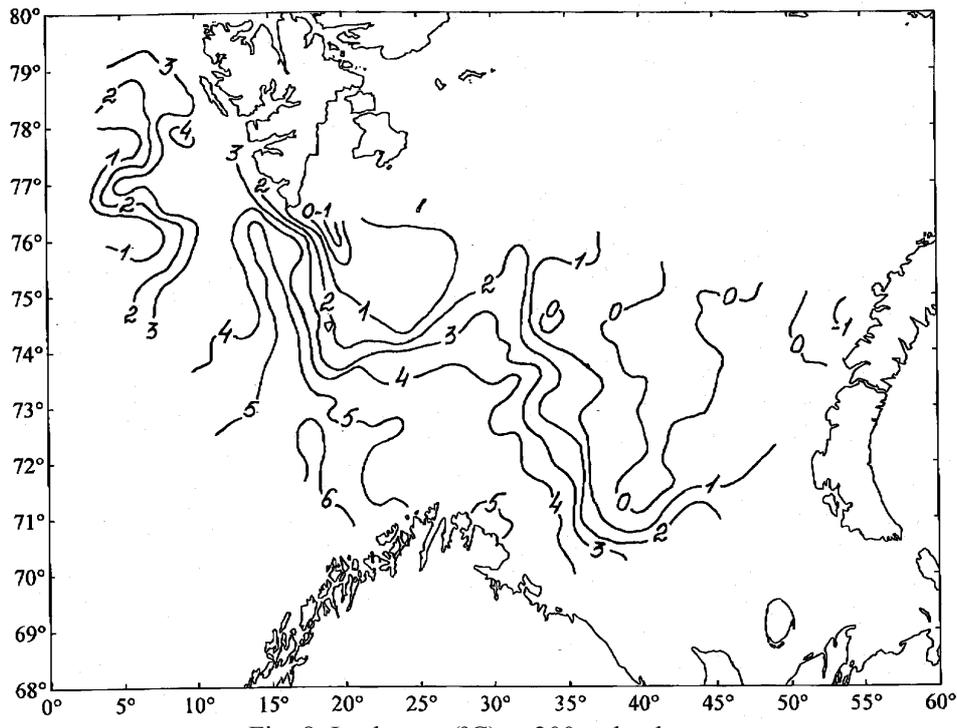


Fig. 8. Isotherms (°C) at 200m depth

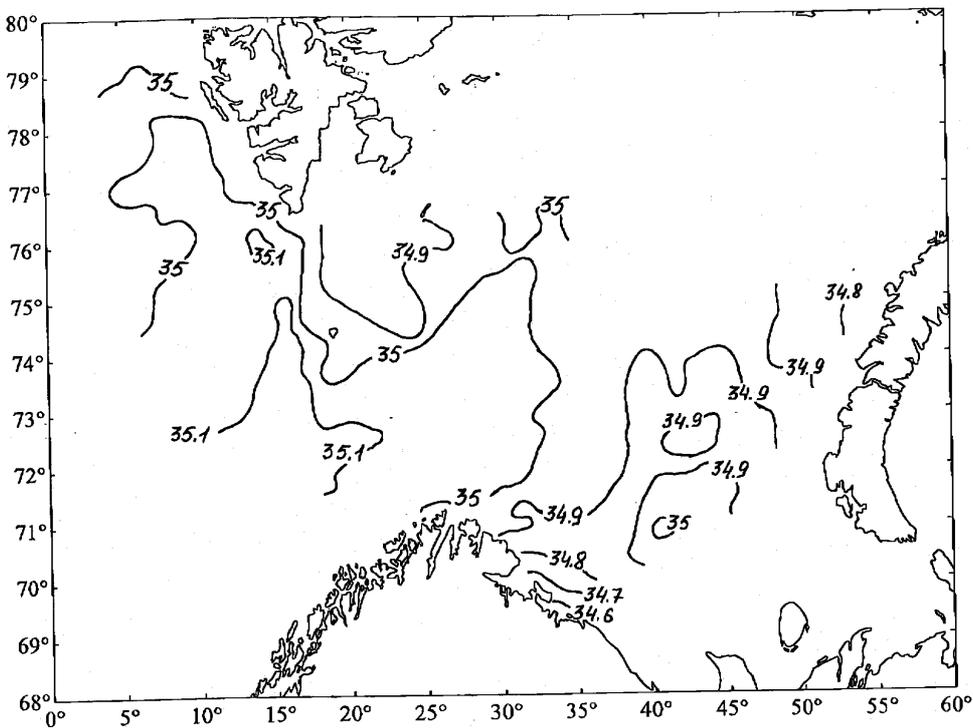


Fig. 9. Isohalines (PSU) at 200m depth

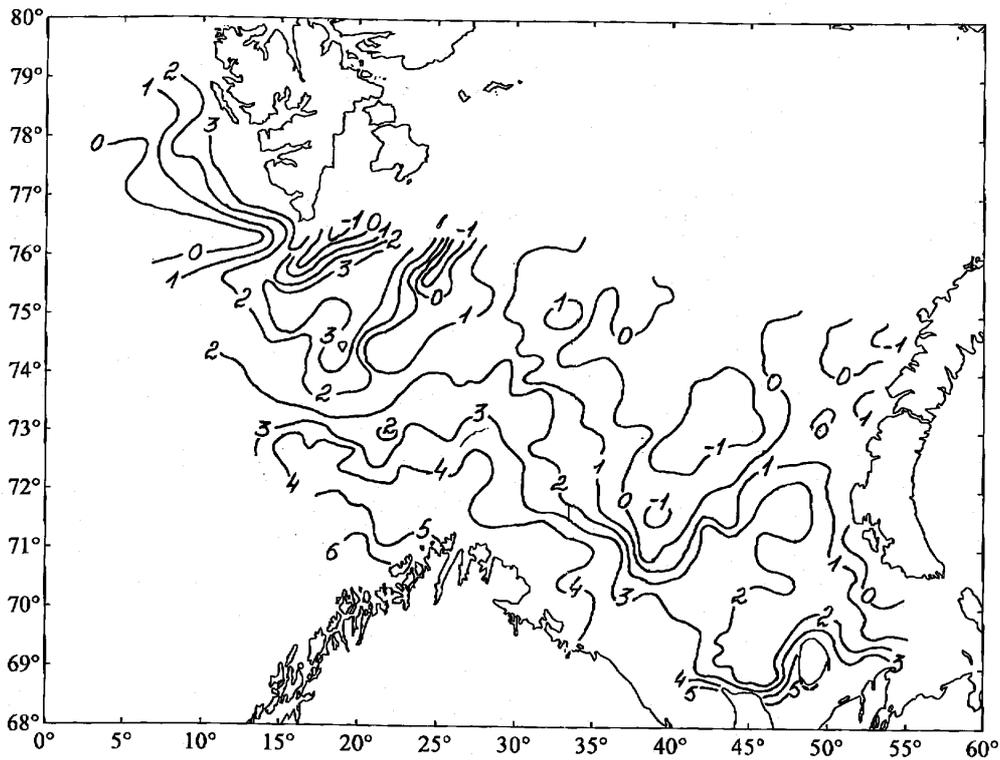


Fig. 10. Isotherms (°C) at the bottom

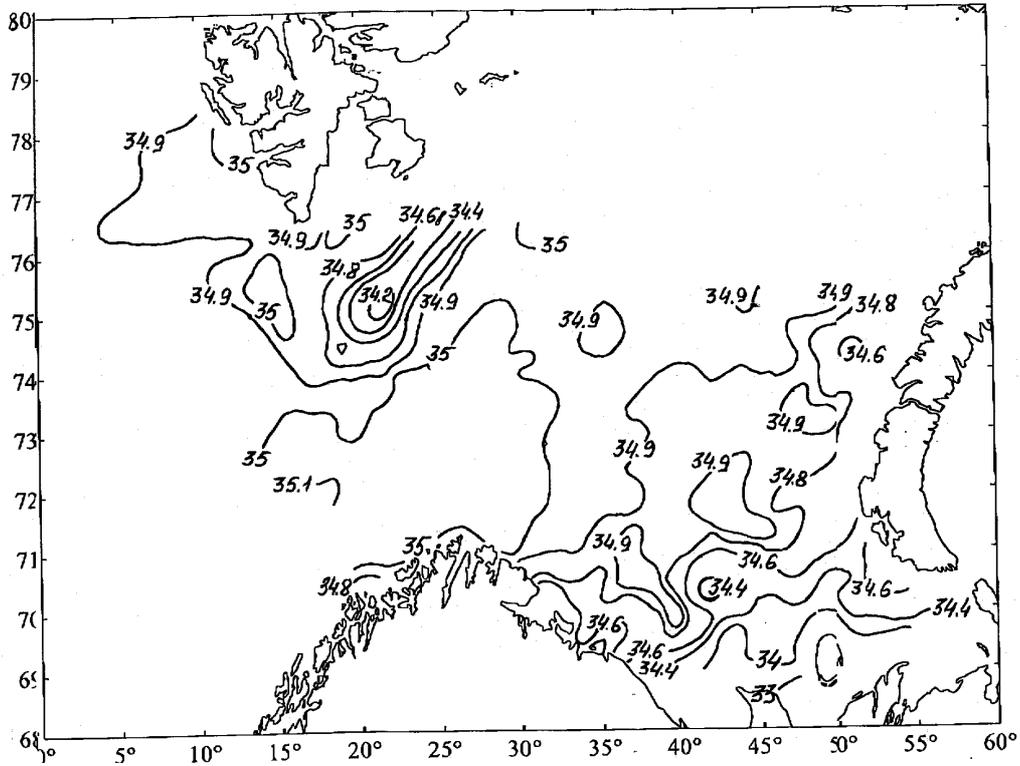


Fig. 11. Isohalines (PSU) at the bottom

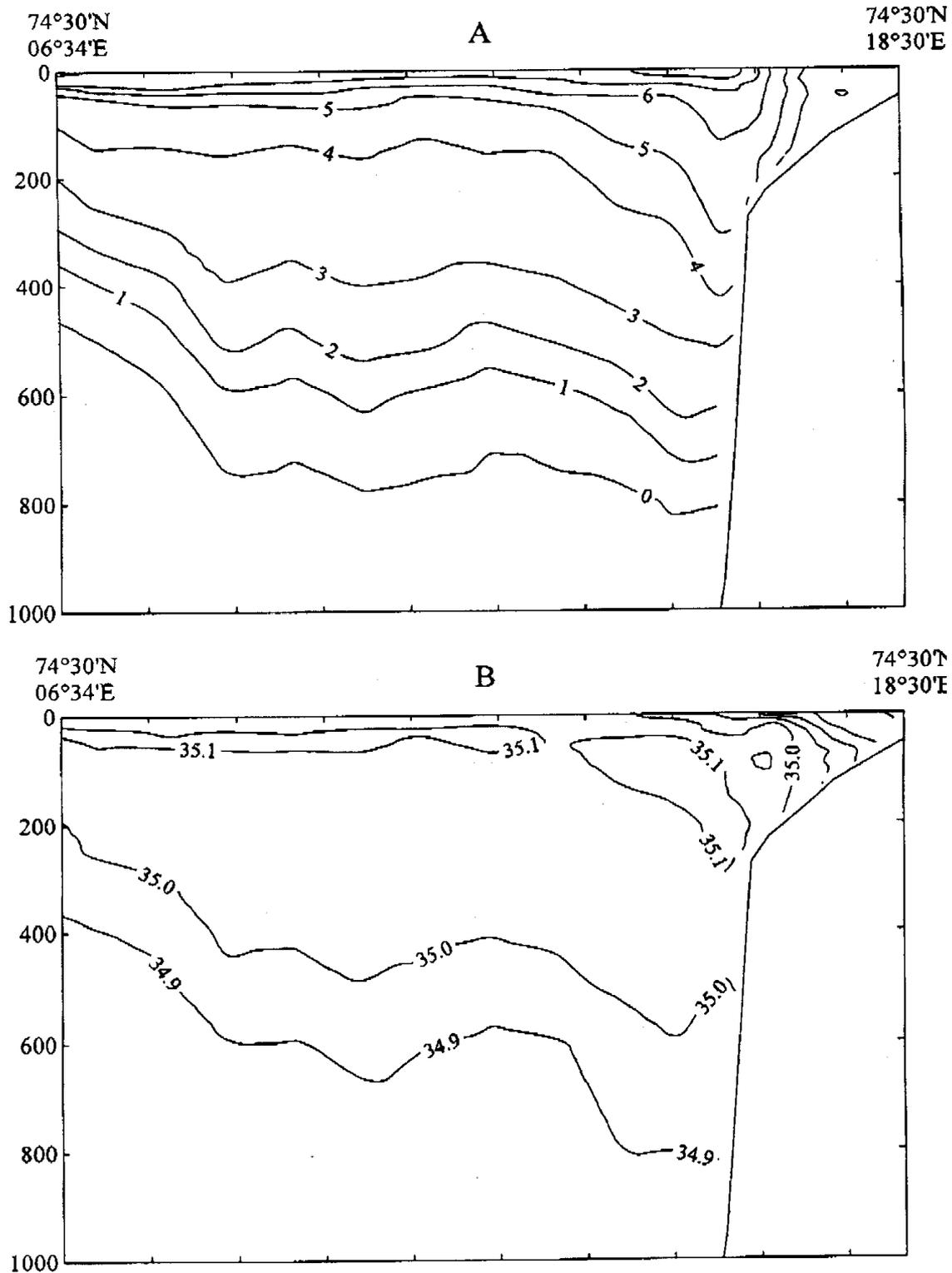


Fig. 12. Temperature (A) and salinity (B) through the hydrographic section Bear Island -West

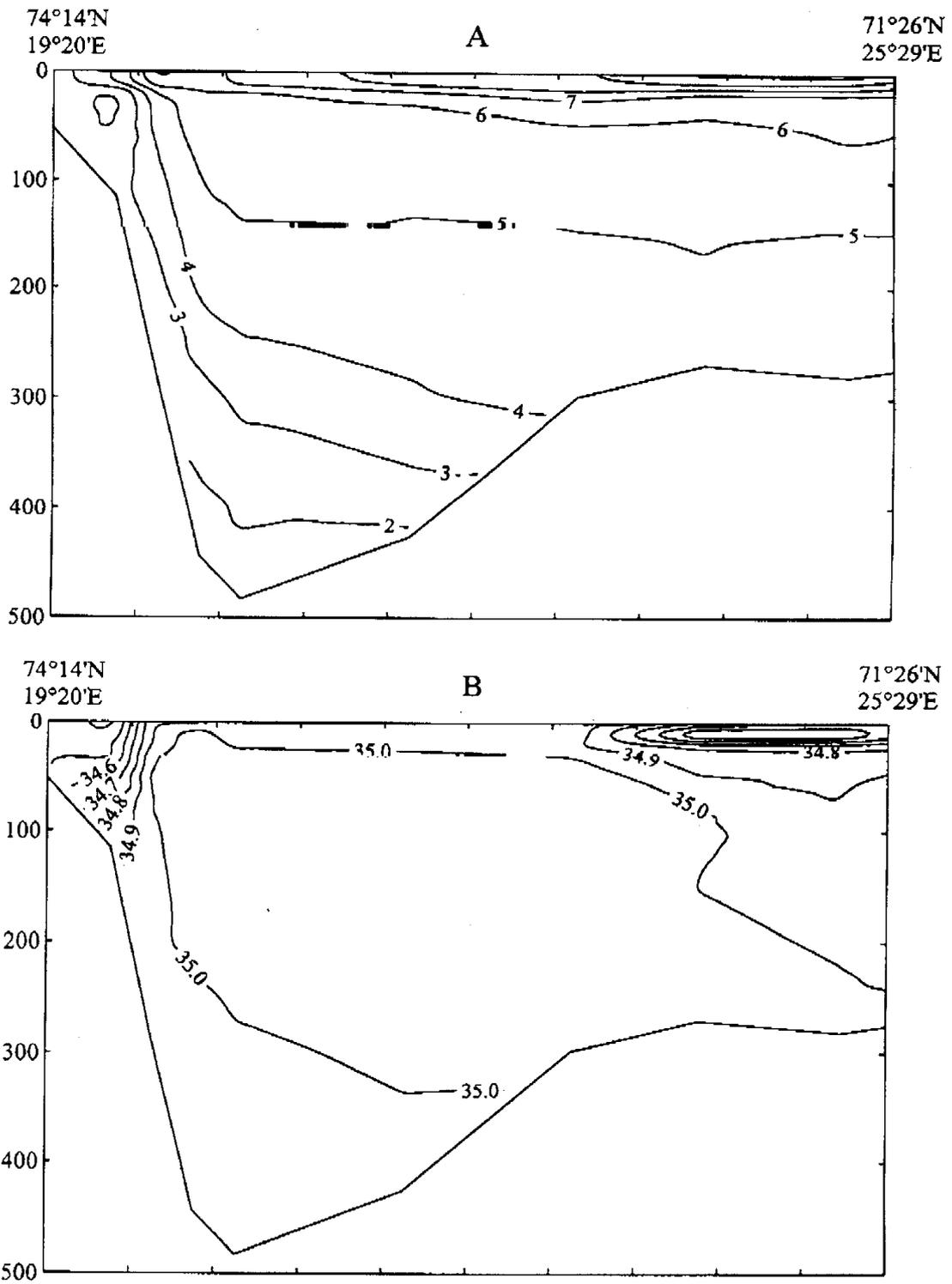


Fig. 13. Temperature (A) and salinity (B) through the hydrographic section North Cape – Bear Island

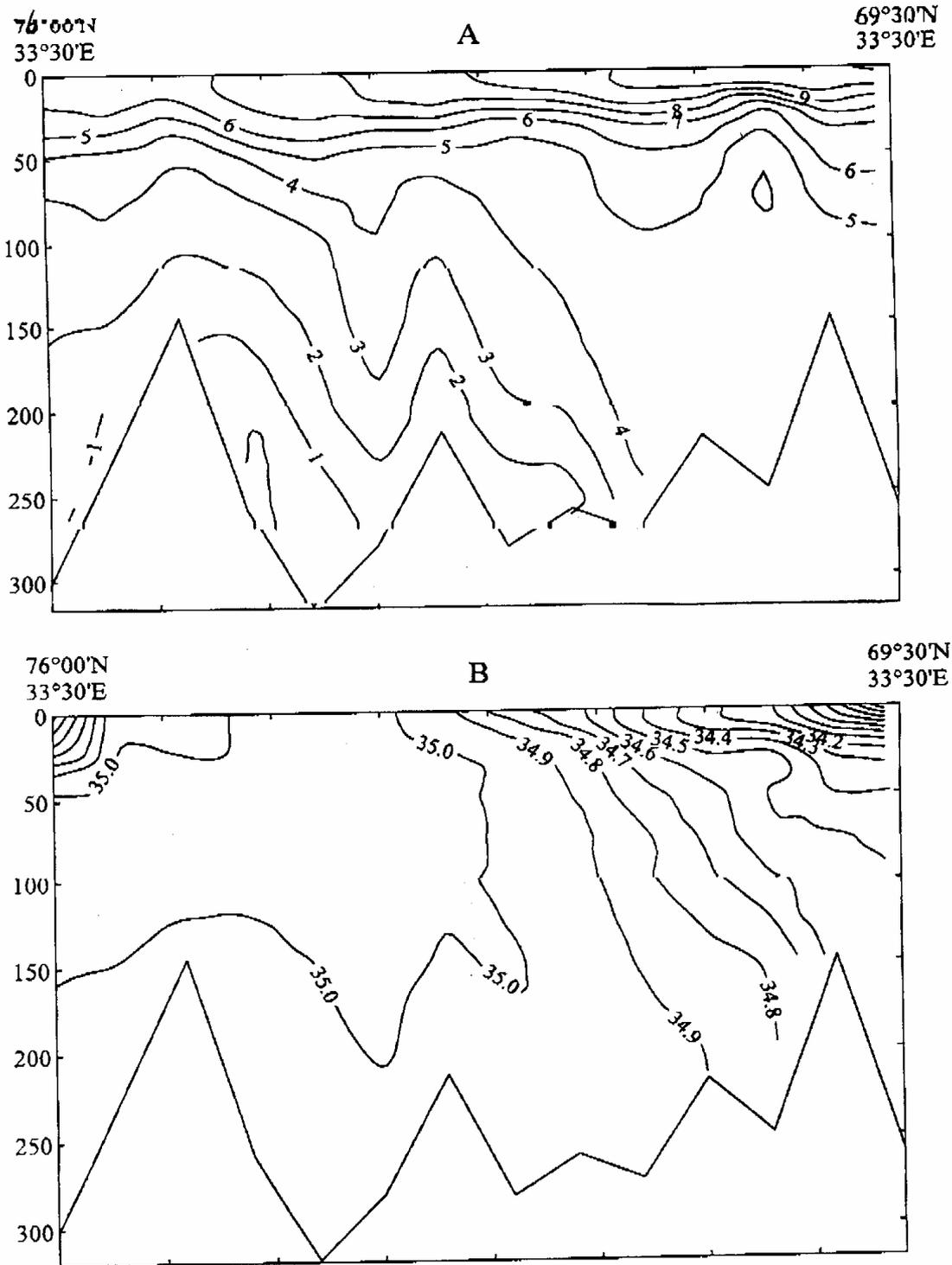


Fig. 14. Temperature (A) and salinity (B) through the hydrographic section along the Kola meridian

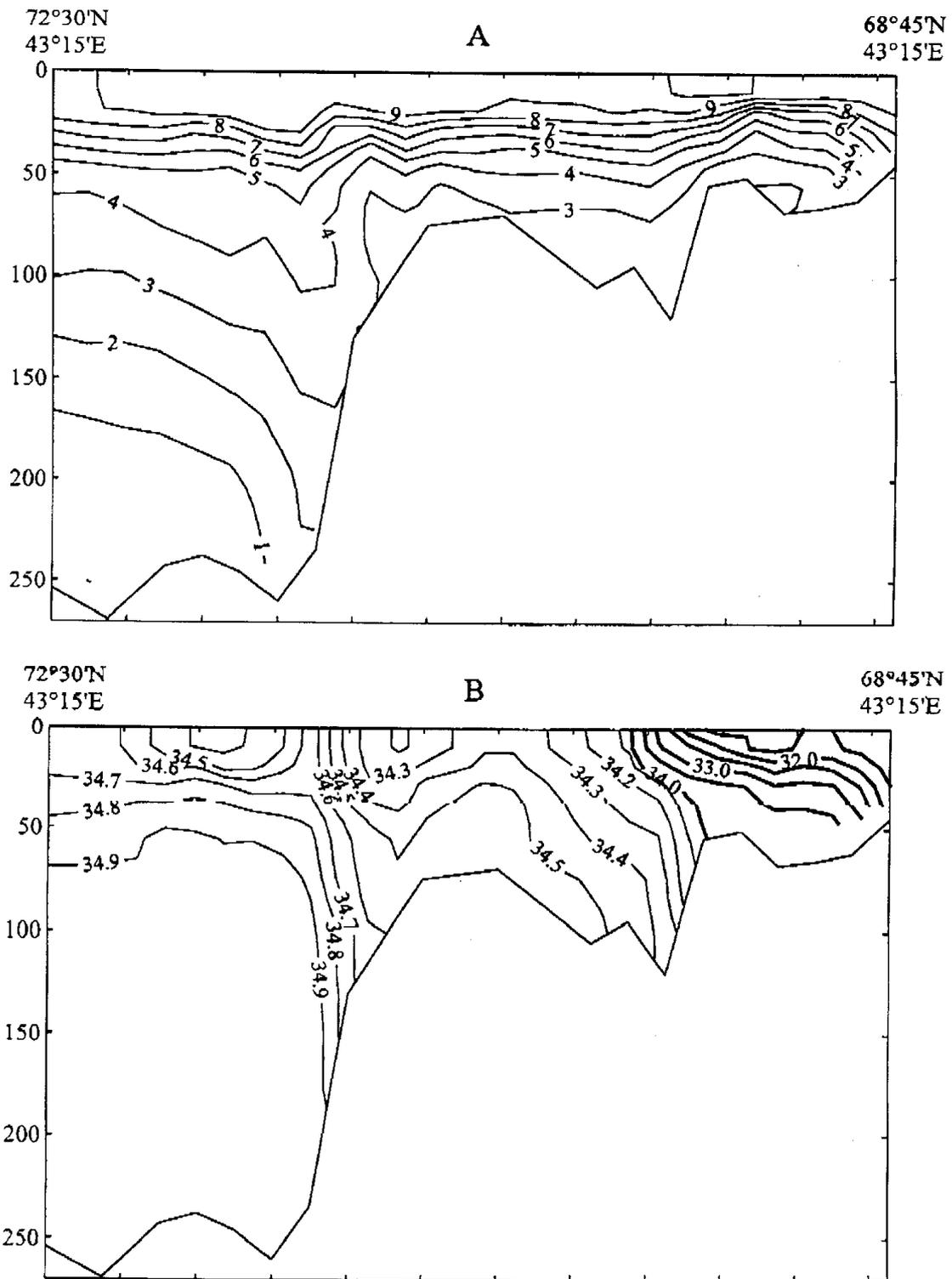


Fig. 15. Temperature (A) and salinity (B) through the hydrographic section Cape Kanin - North

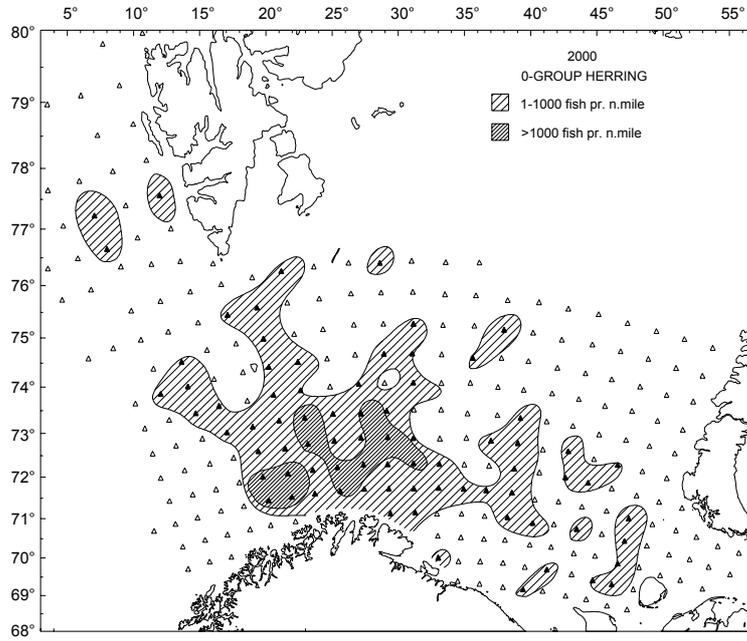


Fig. 16. Distribution of 0-group herring

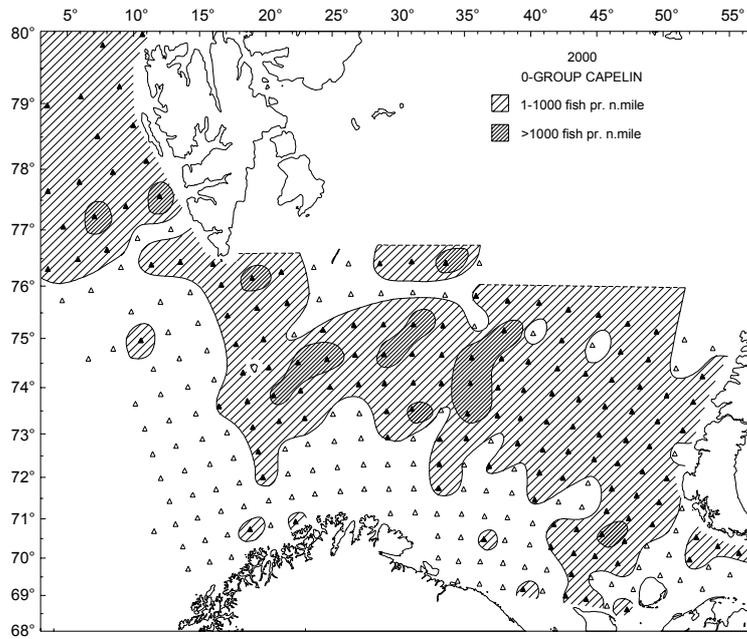


Fig. 17. Distribution of 0-group capelin

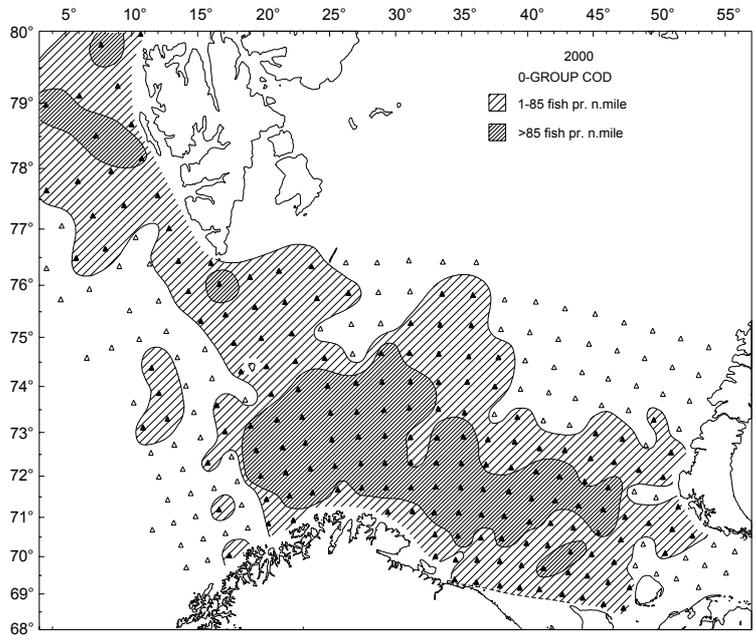


Fig. 18. Distribution of 0-group cod

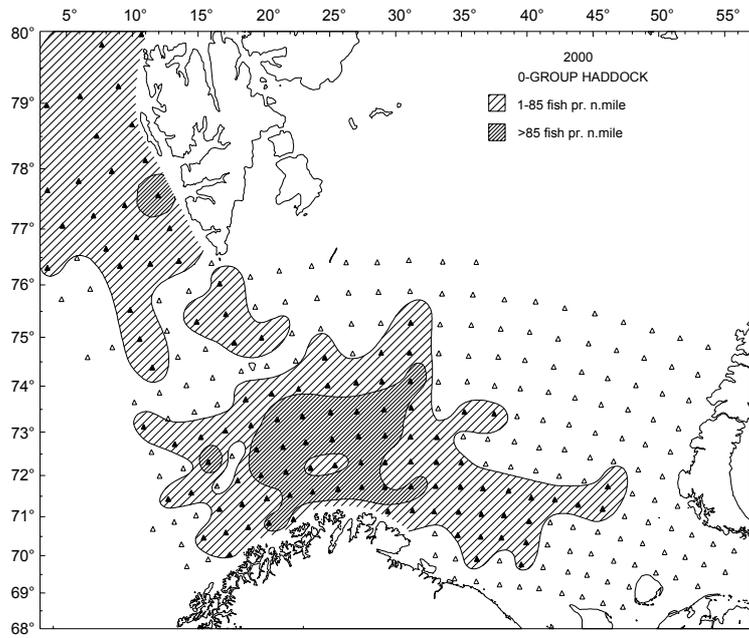


Fig. 19. Distribution of 0-group haddock

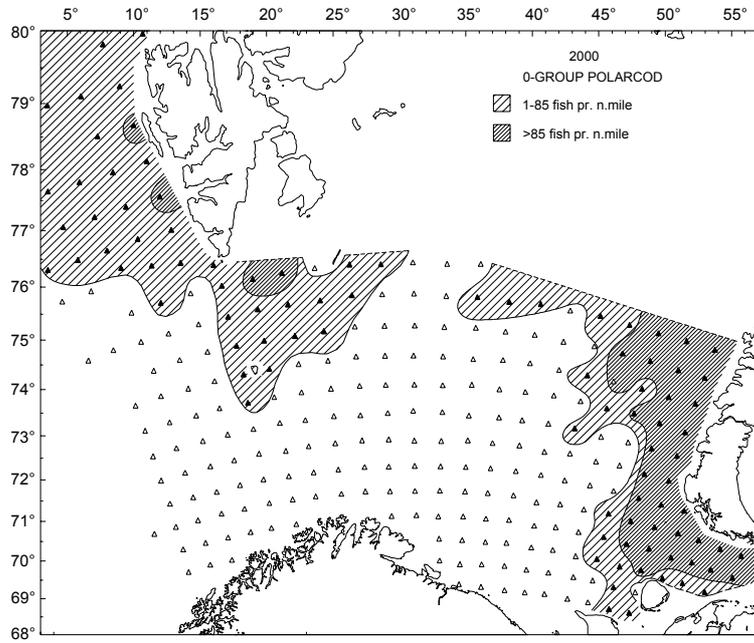


Fig. 20. Distribution of 0-group polar cod

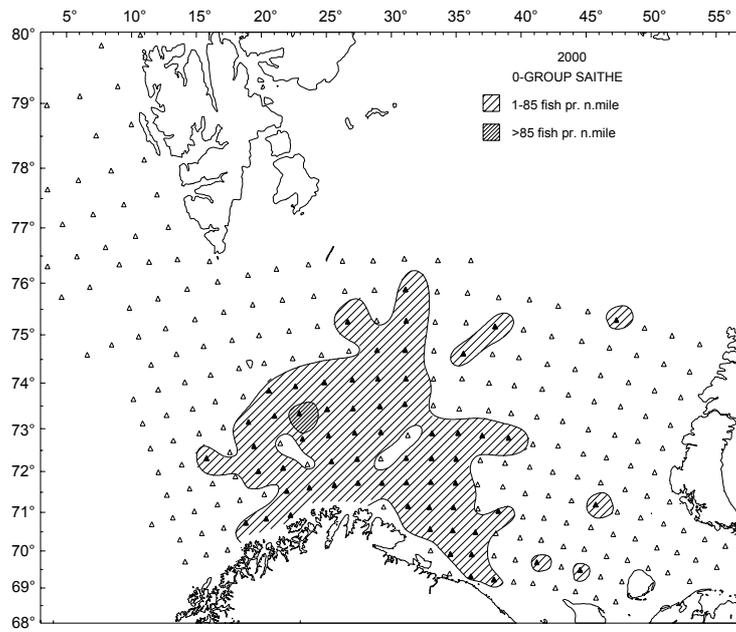


Fig. 21. Distribution of 0-group saithe

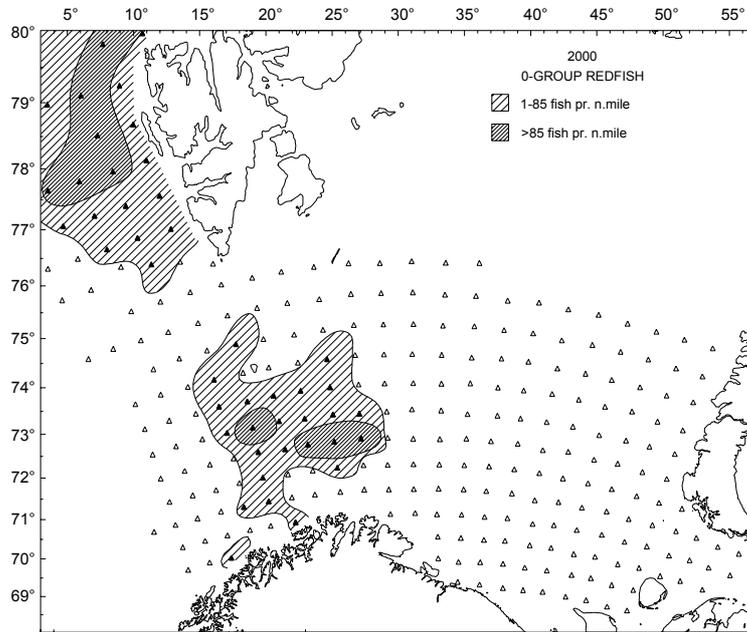


Fig. 22. Distribution of 0-group redfish

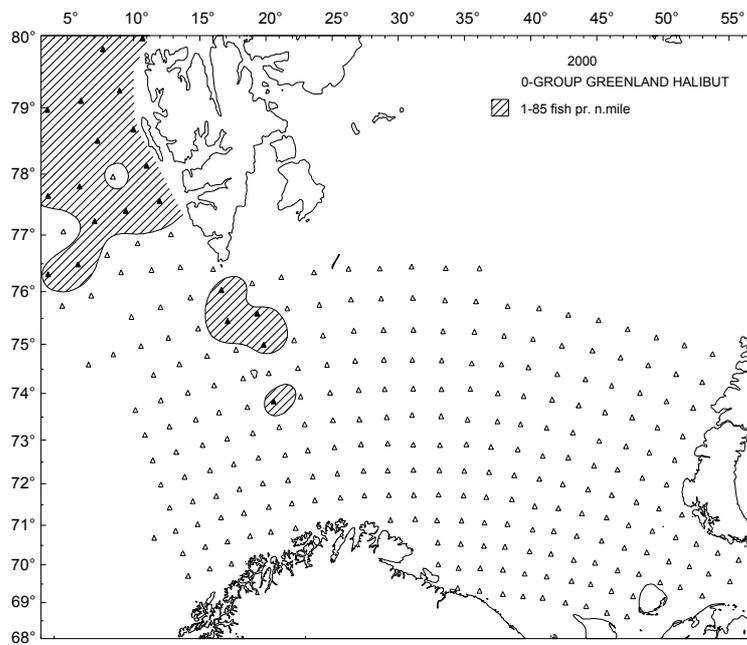


Fig. 23. Distribution of 0-group Greenland halibut

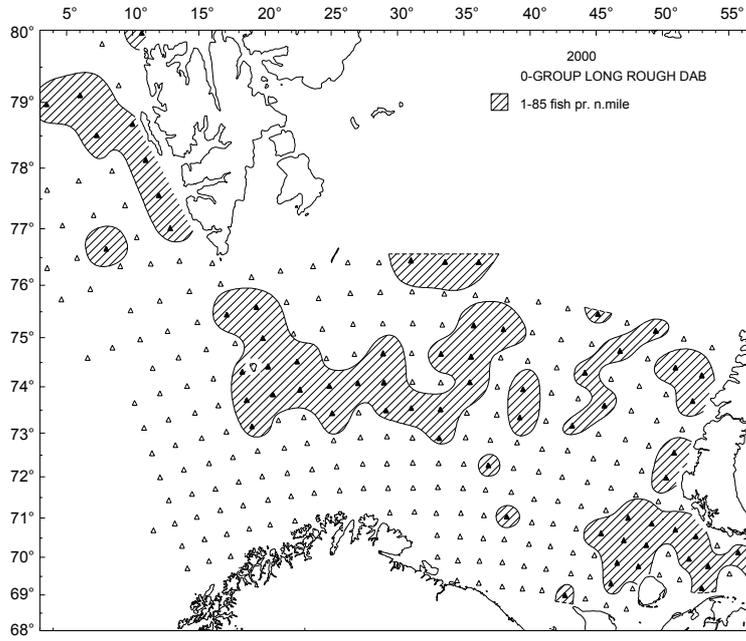


Fig. 24. Distribution of 0-group long rough dab

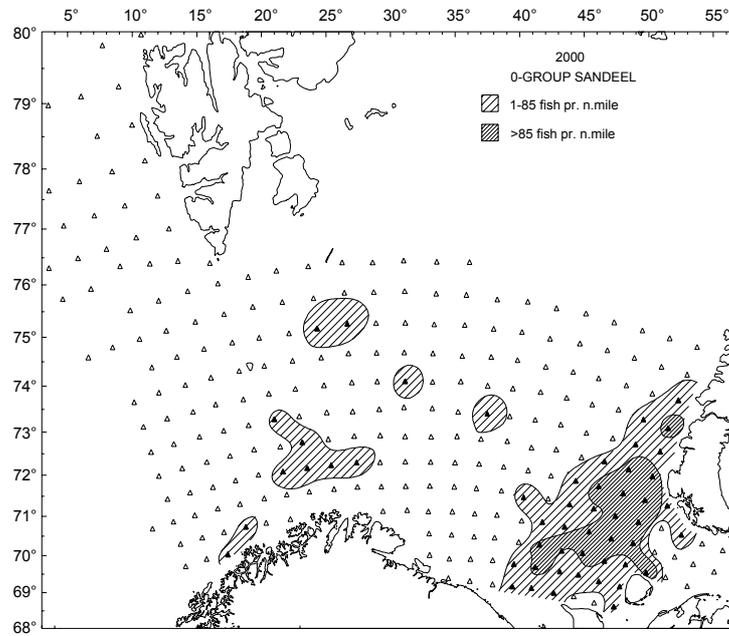


Fig. 25. Distribution of 0-group sandeel

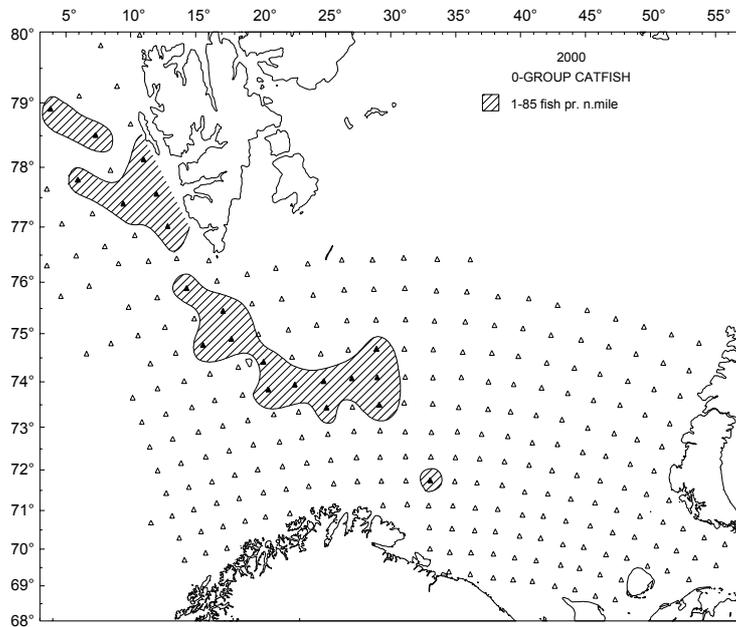


Fig. 26. Distribution of 0-group catfish

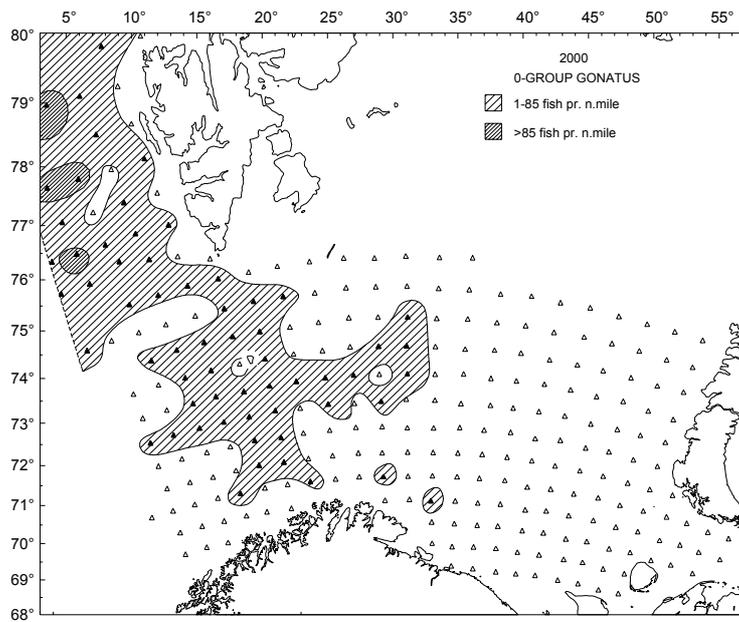


Fig. 27. Distribution of 0-group *Gonatus fabricii*

## APPENDIX

<b>Research vessel</b>	<b>Participants</b>
<b>"AtlantNIRO"</b>	D. Prozorkevich (cruise leader), S. Ratyshniy, A. Bendik, V. Mamylov, T. Usupov, M. Kalashnikova, T. Gavrilik, A. Rudoy, A Trofimov
<b>"F. Nansen"</b>	I. Dolgolenko (cruise leader), T. Sergeeva, O. Vavilina, V. Guzenko, V. Il'in, V. Kapralov, V. Sergeev, A. Astakhov, T. Prokhorova
<b>"G.O. Sars"</b>	P. Fossum (cruise leader), B. Endresen, M. Fonn, H. Græsdal, B. Kvinge, J. de Lande, J. Træland, J.F. Wilhelmsen
<b>"J. Hjort"</b>	H. Gill (cruise leader), I.M.Beck, I. Henriksen, J. A. Horne, H.J. Skaug, H. Sagen, R. Ingvaldsen, K. Gjertsen, A. Fossum, J. Johannessen, Ø. Torgersen

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