International Council for the Exploration of the Sea

C.M. 1994/G:3 Ref.H Demersal Fish Committee





PRELIMINARY REPORT OF THE INTERNATIONAL O-GROUP FISH SURVEY IN THE BARENTS SEA AND ADJACENT WATERS IN AUGUST-SEPTEMBER 1993

The twenty-ninth annual International 0-group fish survey was made during the period 16 August - 8 September 1993 in the Barents Sea and adjacent waters. The following research vessels participated in the survey:

State	Name of vessel Per	iod	Research Institute			
Norway Norway Russia Russia	"Johan Hjort" "G.O. Sars" "Professor Marty" "Pinro"	16.8 - 17.8 - 22.8 - 23.8 -	7.9 8.9	Institute of Marine Research, Bergen The Polar Research Institute of Marine Fisheries and Oce- anography, 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 5-7 October in Murmansk. 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 1993, 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 mile 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 echosounder deeper than 60m.

A procedure starting with the trawl in the deepest layer would probably be preferable. The trawl would then be "fishing" more efficient troughout the whole trawl haul and maintain the correct geometry. It is recommended that this is further investigated.

Survey tracks and hydrographical stations are given in Fig. 1. Trawl stations with and without catch are indicated on the distribution charts in Figs. 16 - 27, 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 tracs with 5 to 40 nautical miles between stations. Horizontal distributions of temperatures and salinities are shown for 0, 50, 100, 200m and bottom (Figs. 2-11). Figs. 12 - 15 show the temperature and salinity conditions along the Bear Island - West, Bear Island - North Cape, Kola and Cape Kanin sections. The mean temperatures in the main parts of these sections are presented in Table 1.

According to temperature conditions, 1993 is the fifth "warm year" in succession. However this year the mean sea temperatures from 0-200m in the Barents Sea were only 0.1-0.2°C above the long term average (1965-1993). Compared to 1992 a significant fall in temperature (0.3-0.6°C) was observed. The reduced positive anomalies in the hydrographical standard sections are mainly due to lower heat content in the layer below the seasonal thermoclyne. The temperature in 50-100m layer along the Kola section was the same as observed in 1992. Upper mixed layer temperature was significantly (0.5-1.5°C) higher than previous year. This is associated with the favourable conditions of the summer heating. In the West Spitsbergen Current (0-200m) temperature was 0.8°C above long term average and 0.4°C higher than in 1992. Upper mixed layer temperature in this area was

also 1.0-1.5°C higher than previous year. Observed thermal conditions were caused by decrease of Atlantic inflow into the Barents Sea and increase into the area west of Bear Island and West of Spitsbergen.

DISTRIBUTION AND ABUNDANCE OF 0-GROUP FISH AND GONATUS FABRICII

Geographical distribution of 0-group fish are shown as shaded areas in Figs: 16 - 26, and of Gonatus fabricii in Fig. 27. 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 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.

The main distribution of 0-group fish were more westerly orientated in 1993 than in previous years.

Herring (Fig. 16)

Scattered concentrations with small dense patches were observed more westerly than last year and approched 80°N west of Spitsbergen. The main concentrations were found in the central part of the Barents Sea, and herring was distributed eastwards to 38°E. The logarithmic abundance index is astimated at 0.75, which is somewhat below the 1991 and 1992 indices, but still the fourth highest in the time-series. This indicates that the 1993 yearclass is relatively strong.

Capelin (Fig. 17)

As in last year 0-group capelin was distributed mainly near Novaya Zemlya and in small quantities, and it seems to be the second very poor yearclass in succession. The length distribution indicates that this 0-group comes from summer spawners.

Cod (Fig. 18)

Along west off Spitsbergen dense concentrations were recorded in a wider area than previous year. The largest area with dense concentrations was found in the central part of the Barnts Sea, from about 20-40°E and north to 76°N. In the southeastern part of the Barents Sea mainly scattered concentrations were observed. 0-group cod was absent in the south east off the

Murman coast until Kolguev island. The logarithmic abundance index for the 1993-yearclass (2.09) is the fifth highest in the time-series, above that of 1983, and the yearclass must be classified as strong.

Haddock (Fig. 19)

To the west of Spitsbergen 0-group haddock was distributed in a smaller area than last year. In the western and central part of the Barents Sea the distribution was similar to that of 1992, but with few observations east of 35°E. The logarithmic index was estimated at 0.64, which is the third highst since 1965, indicating another good yearclass of haddock.

Saithe (Fig. 20)

In the central part of the investigated area saithe was less abundant than in 1992, while to the west of Spitsbergen the species was observed over a larger area and in higher quantities. In most years there are relatively few observations of 0-group saithe in the Barents Sea and therefore no index is calculated.

Polar cod (Fig. 21)

0-group polar cod is distributed in two seperate areas, with one component west and southeast of Spitsbergen and a second 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 similar to previous year. The index was just a little lower than in 1992 and the 1993 yearclass of polar cod in this area seems to be of average abundance.

Dense concentrations of the eastern component were distributed over a wider area than in 1992. During the following pelagic fish survey in September it was found that this component covered a much wider area towards northeast, but since this area normally is not investigated during the 0-group survey, it was not included in the calculations of the abundance index. Still the index increased by 32% and the 1993 yearclass in the eastern area may be considered to be at least of average strength.

Redfish (Fig. 22)

Similar to 1992, 0-group redfish was only distributed in the western areas, along the western edge of the shelf and off West-Spitsbergen. The area with dense concentrations was larger this year, and the index slightly higher (8%), but still the yearclass must be considered to be poor, as in the two previous years.

Greenland halibut (Fig. 23)

Only scattered concentrations were recorded in limited patches mainly to the west of Spitsbergen. The index increased with a factor of more than 3 compared to previous year, but the yearclass is still poor (the sixth in succession).

Long rough dab (Fig. 24)

The 0-group was mainly distributed in the central part of the Barents Sea over a wider area than previous year and with some scattered patches in the eastern and southeastern areas. No dense aggregations were observed. The index increased by over 40%, but still the yearclass is considered to be another poor one.

Sandeel (Fig. 25)

Sandeel was mainly observed nearby Novaya Zemlya as in 1987, but further to the north.

Catfish (Fig. 26) and blue whiting.

Only a few specimens of catfish and blue whiting were caught.

Gonatus (Fig. 27)

0-group *Gonatus fabricii* was found in the western part of the investigated area, but in smaller quantities than in 1992.

REFERENCES

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- 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. Pp. 189-209 in Godø, O.R. and Tilseth, H. (eds.): Reproduction and recruitment of Arctic cod. Proceedings of the first Soviet-Norwegian symposium, Leningrad, 26-30 September 1983. Institute of Marine Research, Bergen, Norway.
- Tereshchenko, V.V. 1992. Some results from long-term oceanographic observations during 0-group surveys in the Barents Sea. ICRS CM 1992/C:18.
- Toresen, R. 1985. Recruitment indices of Norwegian springspawning herring for the period 1965-1984 based on the international 0-group fish surveys. ICES CM 1985/H: 54.

Table 1. Mean water temperature in main parts of standard sections in the Barents Sea and adjacent waters in august-September 1965 - 1993.

		Section ² and layer (deep in meter)						
Year	1	2	3	4	5	6	7	
	0-50	50-200	0-200	0-bot.	0-bot.	0-200	0-200	
1965 1966 1967 1968 1969 1970 1973 1974 1975 1977 1978 1978 1981 1981 1983 1984 1988 1988 1989 1991 1993	66.76.6.78.78.78.66.67.6.17.152.0617.55 7.10196546117.152.0617.55 7.10196546117.152.0617.55	32.07.17.20.59.60.4.59.57.08.1.55.37.84.5.60 3.33.34.34.32.23.24.8.33.33.44.6.0	4.66940722392036857860450583339 4.10722392036857860450583339 4.10554.10554.10583339	4.69176001766914037515497850804 4.104.104.104.104.104.104.104.104.104.10	3.24.80321256497402826425939204 4334.2113224.333224.34.33	1564017391769037383938259301855556655545555555555666655	-6202 29099801494910649297404 43544.44445544.3445555555555	
Aver. 1965- 1993	7.3	3.8	4.7	4.2	3.2	5.7	4.6	

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)

Tabell 2. Abundance indices of 0-group fish in the Barents Sea and adjacent waters in 1965 - 1993.

Year	Cod	Had- dock	Polar cod		Red- fish	Green- land	Long rough
		dock	West	East	LISH	halibut	dab
1965 1966 1967 1968 1969 1970 1971 1972 1973 1975 1977 1978 1977 1981 1983 1984 1988 1988 1988 1988 1988 1988 1989 1990 1991 1993	6 1 34 25 6 157 6 157 148 168 1186 1186 1130 1130 114 130 130 146 1159 1159 1159	7 42 82 173 46 147 1116 1116 1116 1116 1116 1116 11	10 20 19 11 14 (2 2	0 29 55 50 87 31 40 26) 27 75 31 70 444 302 247 73 50 39 16 334 366 155 120 41 48 239 118 156	159 236 44 295 177 177 385 417 472 468 472 468 472 468 472 468 472 468 479 479 479 468 479 479 479 479 479 479 479 479 479 479	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	66 97 73 17 26 12 81 67 81 92 67 69 195 195 195 195 195 195 195 195 195 19

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 - 1993.

	Н	erring¹	<u> </u>		Cod		Haddock		
Year	Index		Confidence limits		Confidence limits		Index	Confidence limits	
1965 1966 1967 1968 1969 1971 1972 1973 1974 1975 1978 1978 1981 1981 1984 1988 1988 1988 1988 198	0.14 0.00	0.04 - 0.00 - 0.03 0.01 - 0.00 0.01 - 1.29 0.20 0.18 - 0.02 0.16 0.49 0.16 0.90 0.69 0.45	0.31 - 0.04 - 0.08 0.01 - 0.03 0.05 0.20 - 2.33 0.52 0.28 - 0.03 0.53 0.76 0.50 1.52 1.50 1.14	+ 0.02 0.04 0.02 0.25 2.51 0.77 0.52 1.48 0.90 0.13 0.49 0.40 0.13 0.10 0.59 1.69 1.55 2.46 1.37 0.38 1.23 2.94 2.99	0.02 0.01 0.02 0.01 0.02 0.03 1.18 0.06 0.03 1.02 0.03 1.18 0.03 1.22 0.23 0.34 1.22 0.34 1.25 1.70 1.70 1.70 1.70 1.70 1.70 1.70 1.70	0.04 0.04 0.03 0.03 0.05 0.03 0.05 0.05 0.05 0.05	0.08 0.09 0.29 0.264 0.251 0.332 0.332 0.382 0.382 0.382 0.39 0.13 0.14 0.14 0.161 0.64	0.03 0.00 0.20 0.42 0.18 0.15 0.24 0.21 0.12 0.12 0.10 0.38 0.28 0.05 0.48 0.28 0.05 0.48 0.28 0.19	0.03 0.13 0.02 0.41 0.91 0.36 0.27 0.48 0.20 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.52 0.53

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

Table 4. Length distribution of 0-group fish in percent in the Barents Sea and adjacent waters in August - September 1993.

Length	Her-	Cap-	Cod	Had-	Polar	cod	Red-	Green	Long	Sand-
(mm)	ring	elin	000	dock	East	West	fish	land halib	roug dab	eel
15-19								Hallb	1.1	
20-24 25-29 30-34 35-39 40-44 45-49 50-54 55-59 60-64 65-69 70-74 75-79 80-84 85-89 90-94 95-99 100-104 105-119 120-124 125-129 130-134 135-139 140-144	0.1 0.6 3.8 8.0 12.7 25.5 16.8 3.0 0.1 0.1	0.1 0.4 3.0 10.8 11.2 14.2 3.3 5.3 5.3 10.9 0.9	+ 125301975215936 1.301975217.5936 + + + +	0.1 0.2 0.3 0.5 0.8 1.1 2.9 3.1 2.9 6.3 15.2 15.4 2.3 1.3 4 2.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1	1.9 3.7 10.8 13.3 12.6 18.6 22.6 9.7 6.4 0.3 +	0.2 4.9 29.6 40.5 22.7 0.1 +	5.3 24.4 45.4 21.0 3.8 0.1 +	4.3 - 8.7 30.4 30.4 13.0 4.3	5.7 44.3 38.6 10.2	0.8 12.3 19.9 17.3 9.1 9.2 10.8 10.3 3.2 2.3 1.4 0.1
Total numbers	327- 193	702	134- 724	5810	278- 129	48- 055	34- 018	23	176	7431
Mean length	74.6	54.1	81.8	101.5	45.8	36.4	31.7	53.2	35.0	48.4

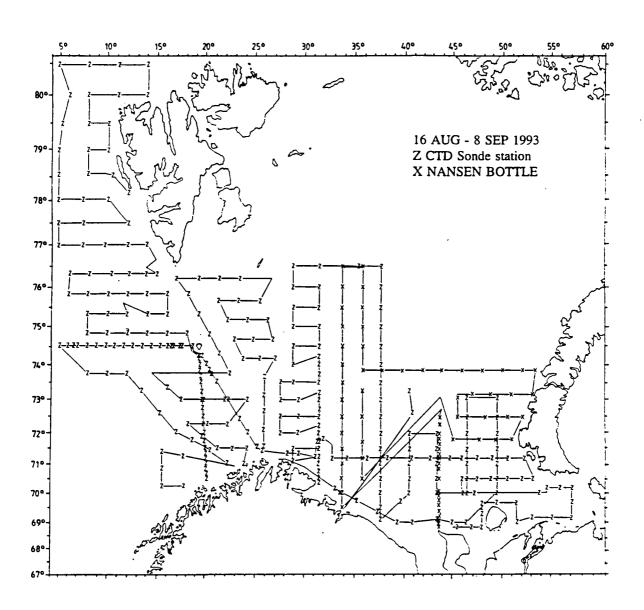


Fig. 1. Survey tracks and hydrographic stations.

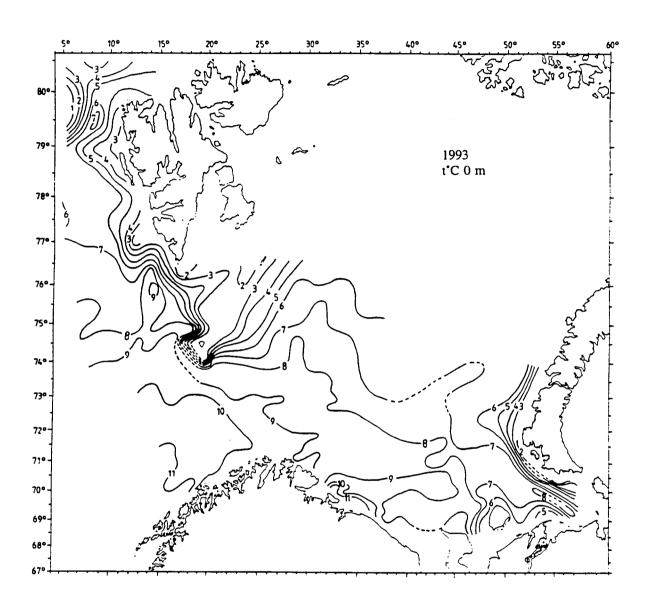


Fig. 2. Isotherms at 0 m.

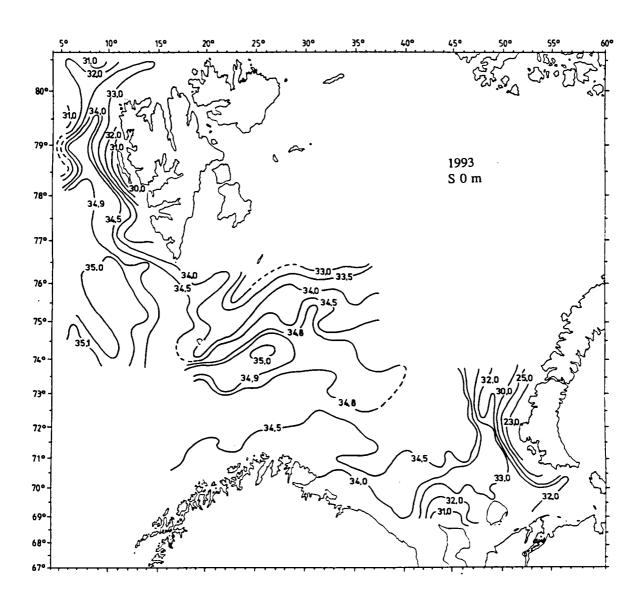


Fig. 3. Isohalines at 0 m.

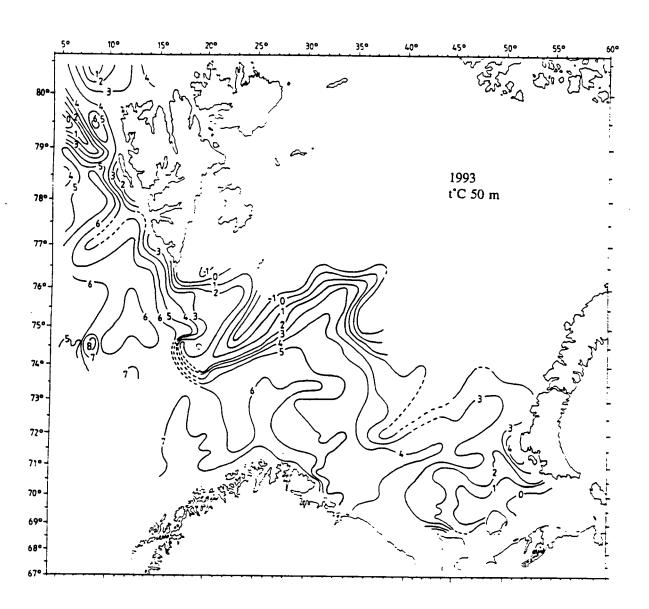


Fig. 4. Isotherms at 50 m.

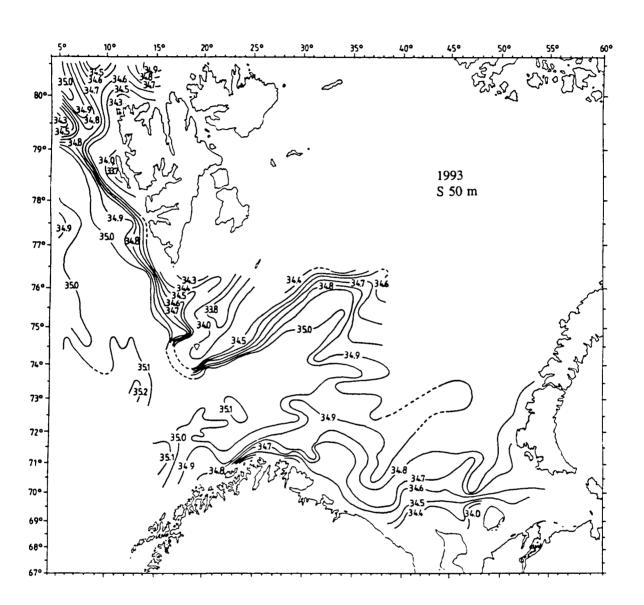


Fig. 5. Isohalines at 50 m.

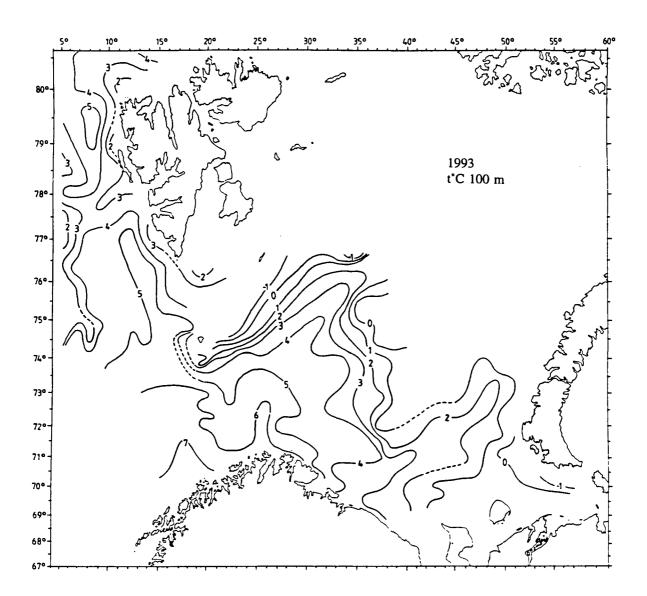


Fig. 6. Isotherms at 100 m.

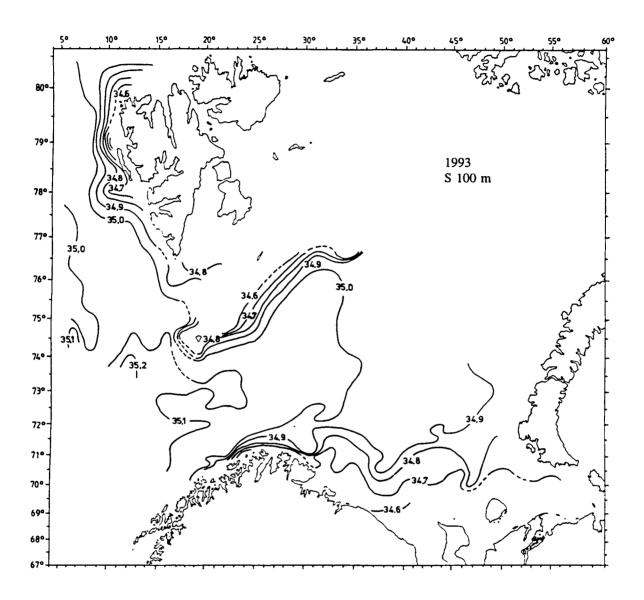


Fig. 7. Isohalines at 100 m.

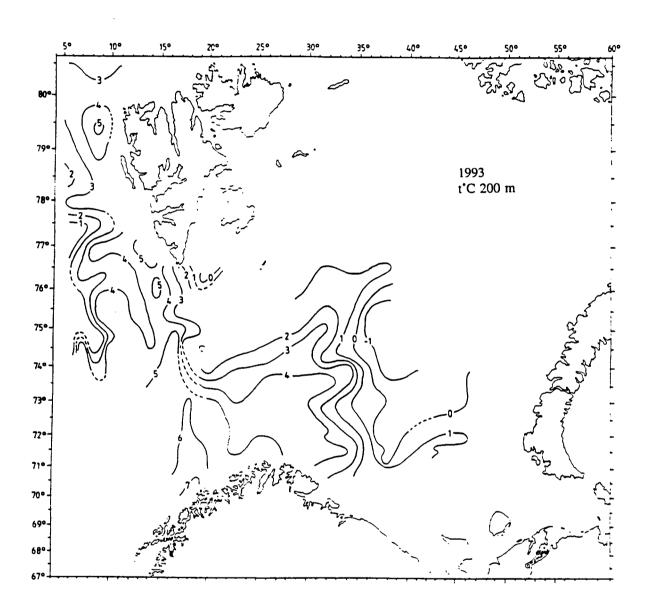


Fig. 8. Isotherms at 200 m.

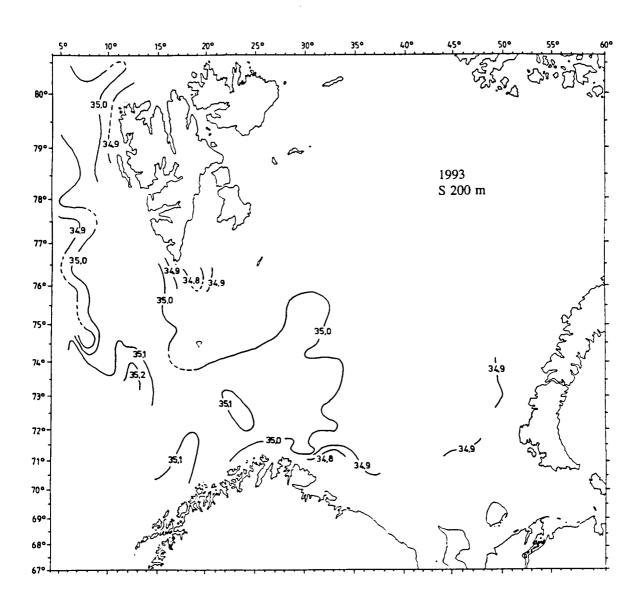


Fig. 9. Isohalines at 200 m.

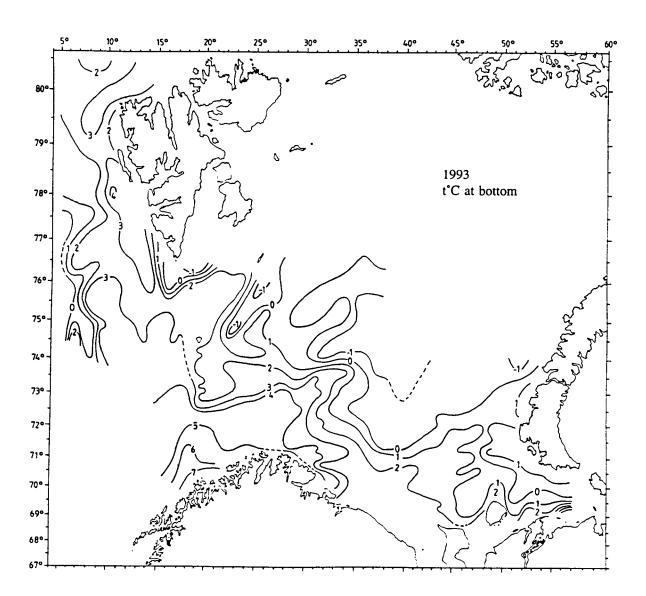


Fig. 10. Isotherms at the bottom.

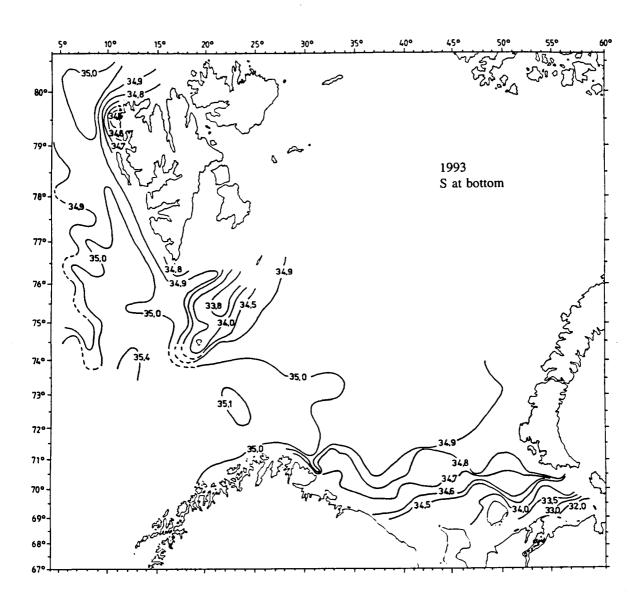
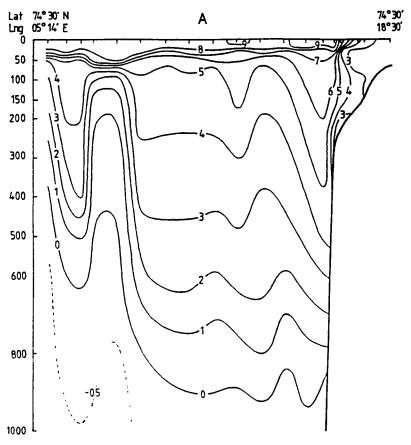


Fig. 11. Isohalines at the bottom.



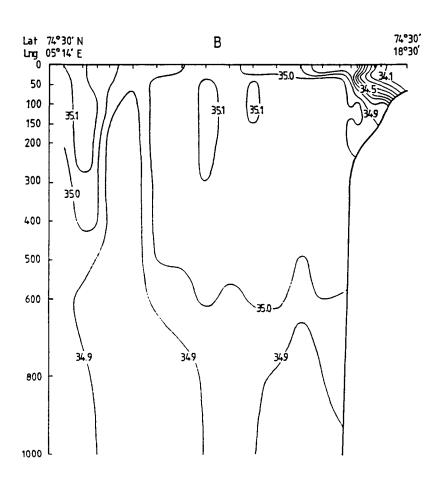
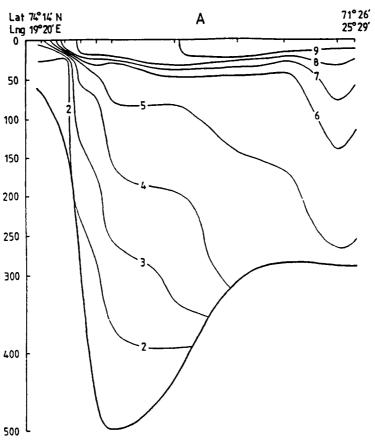


Fig. 12. Hydrographic section Bear Island - West. Temperature (A) and salinity (B).



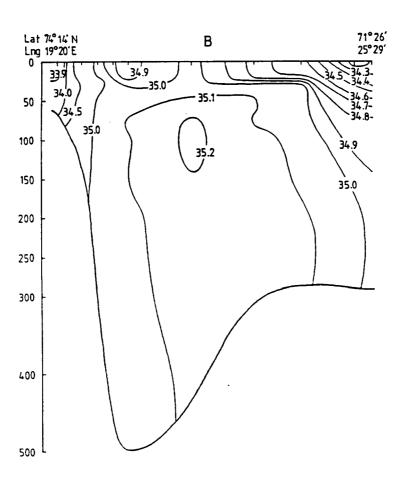
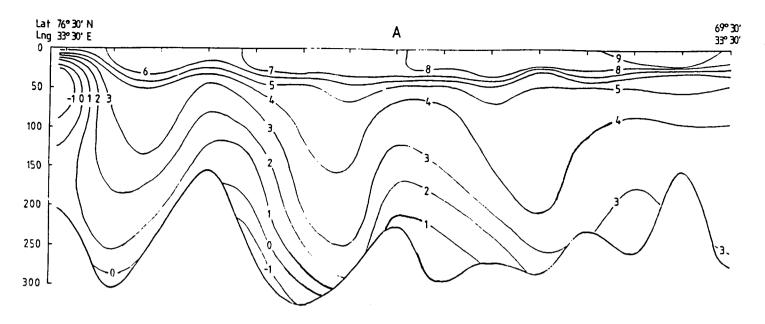


Fig. 13. Hydrographic section North Cape - Bear Island. Temperature (A) and salinity (B).



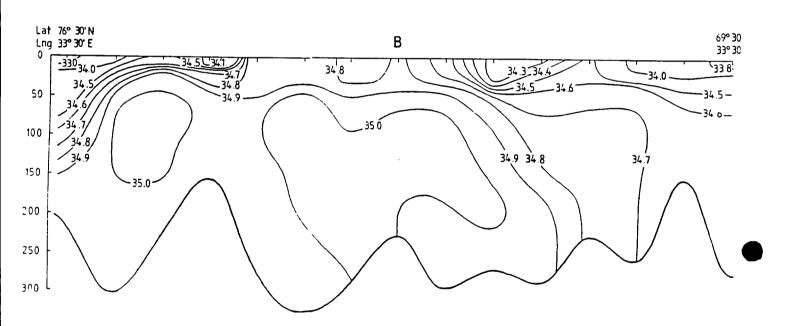
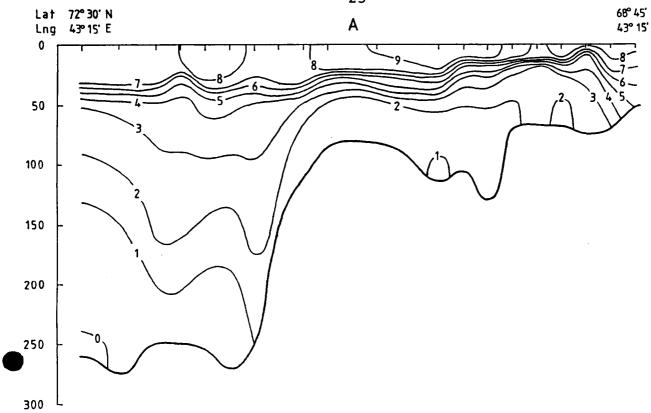


Fig. 14. Hydrographic section along the Kola meredian. Temperature (A) and salinity (B).





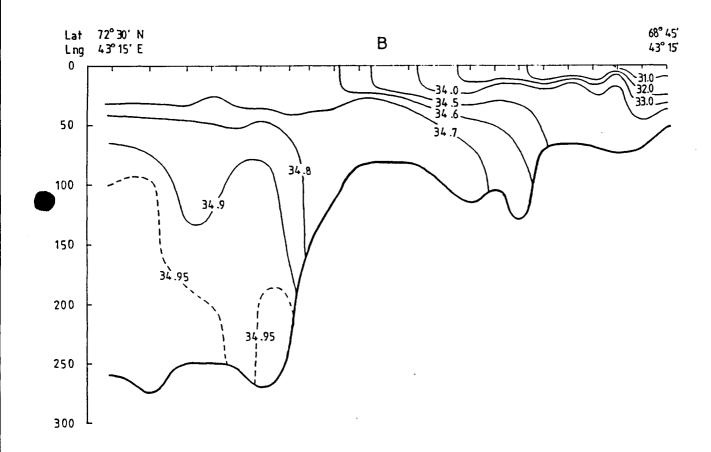


Fig. 15. Hydrographic section Cape Kanin - North. Temperature (A) and salinity (B).

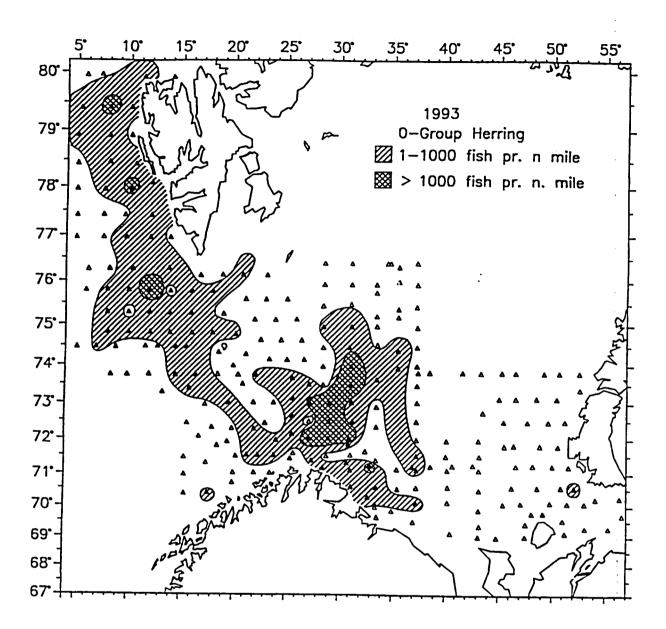


Fig. 16. Distribution of 0-group herring.

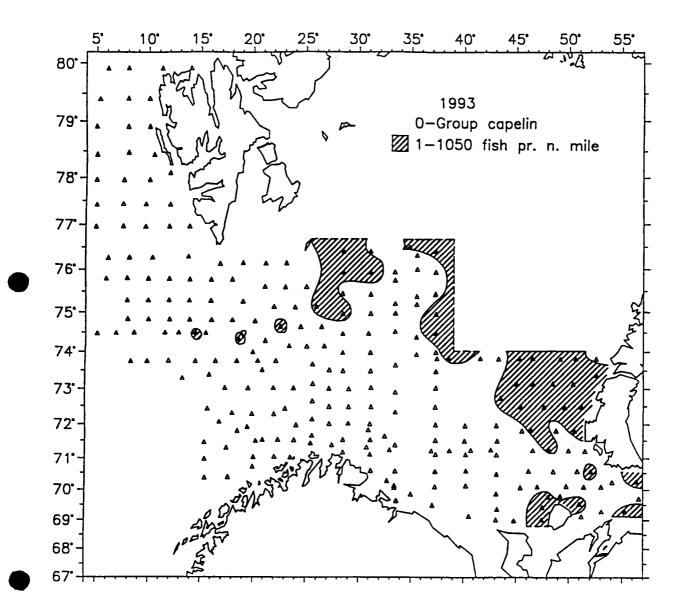


Fig. 17. Distribution of 0-group capelin.

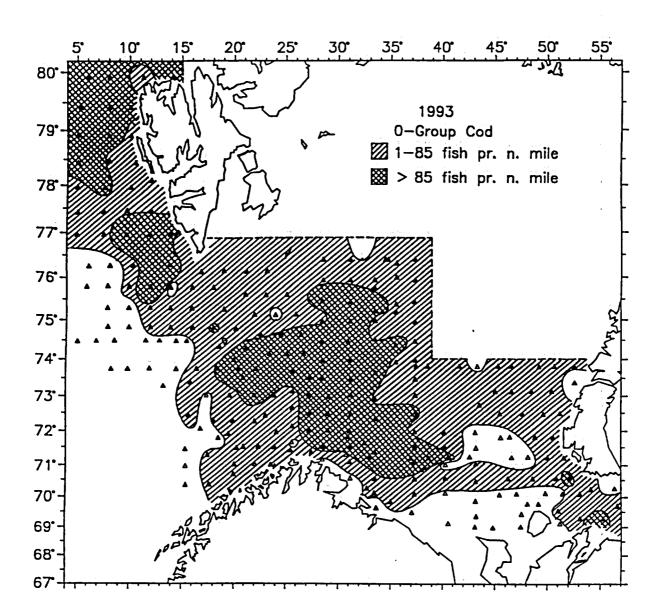


Fig. 18. Distribution of 0-group cod.

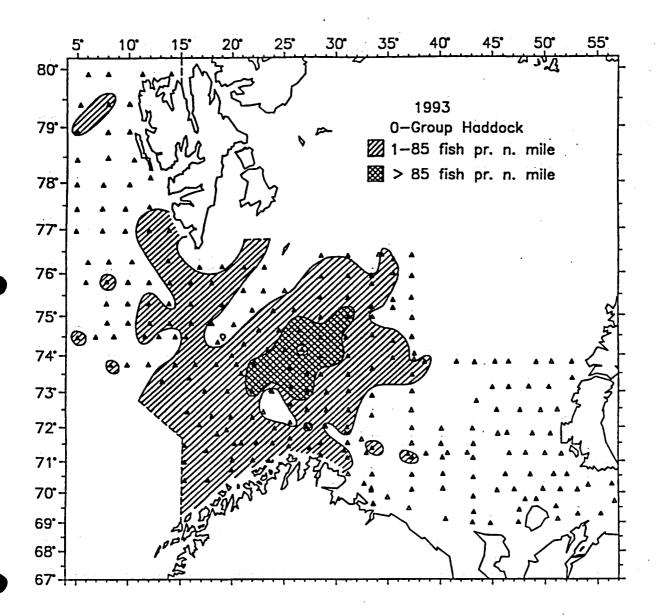


Fig. 19. Distribution of 0-group haddock.

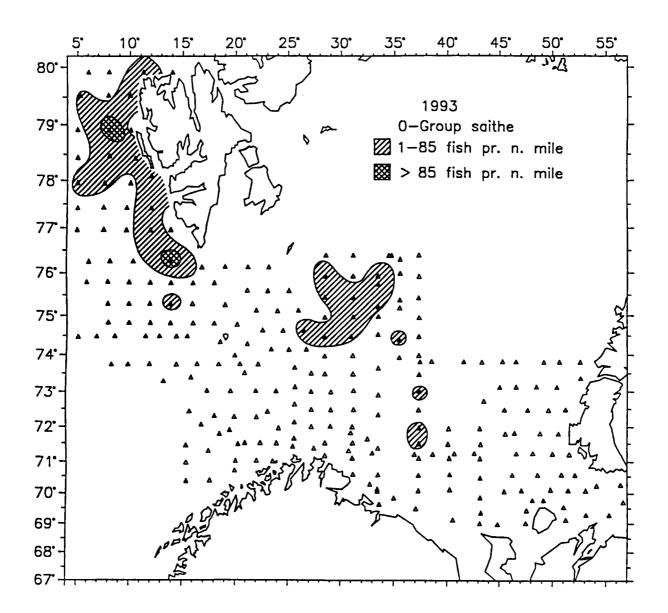


Fig. 20. Distribution of 0-group saithe.

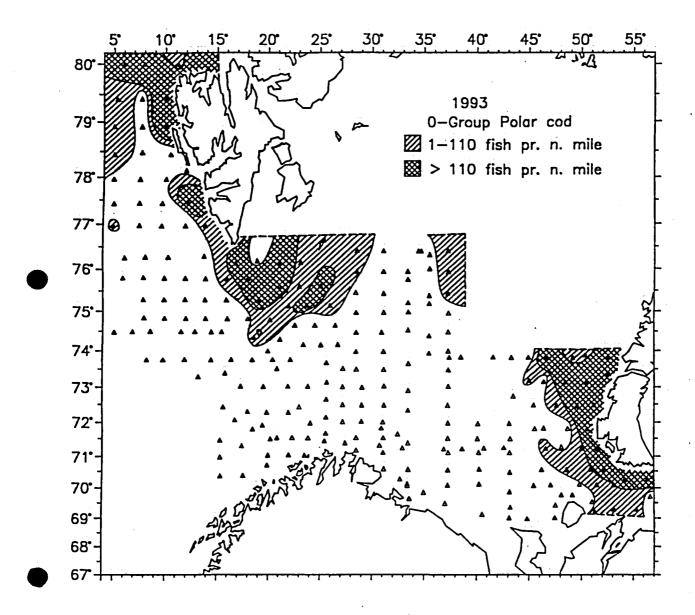


Fig. 21. Distribution of 0-group polar cod.

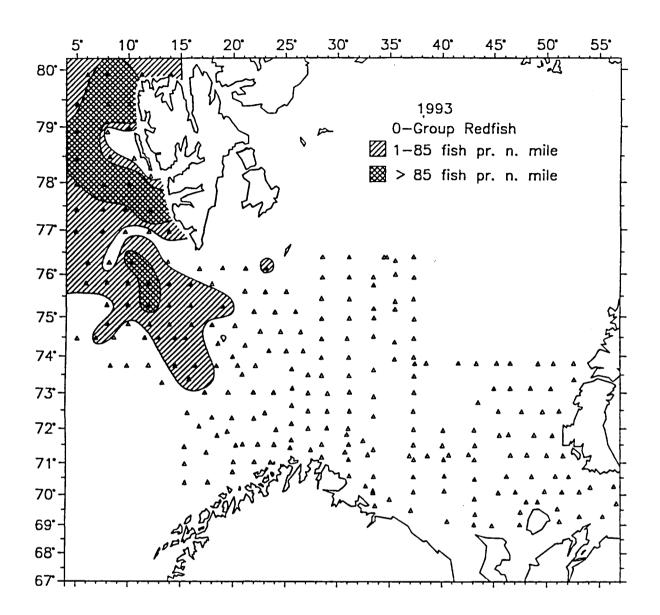


Fig. 22. Distribution of 0-group redfish.

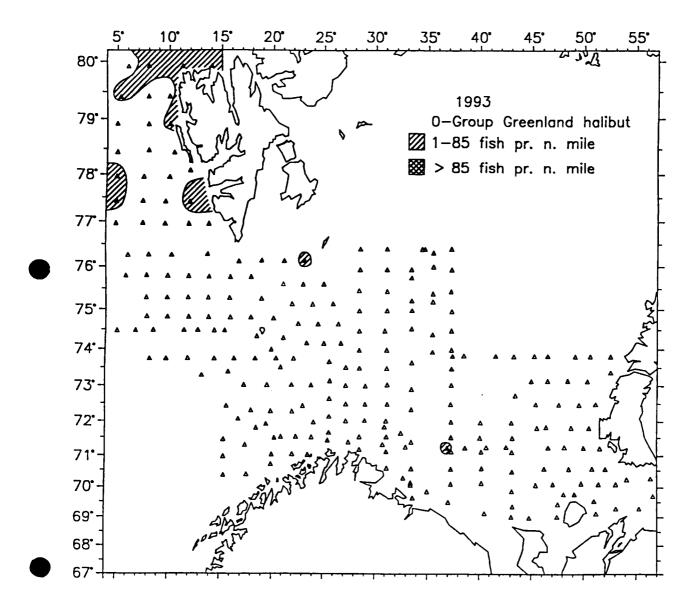


Fig. 23. Distribution of 0-group Greenland halibut.

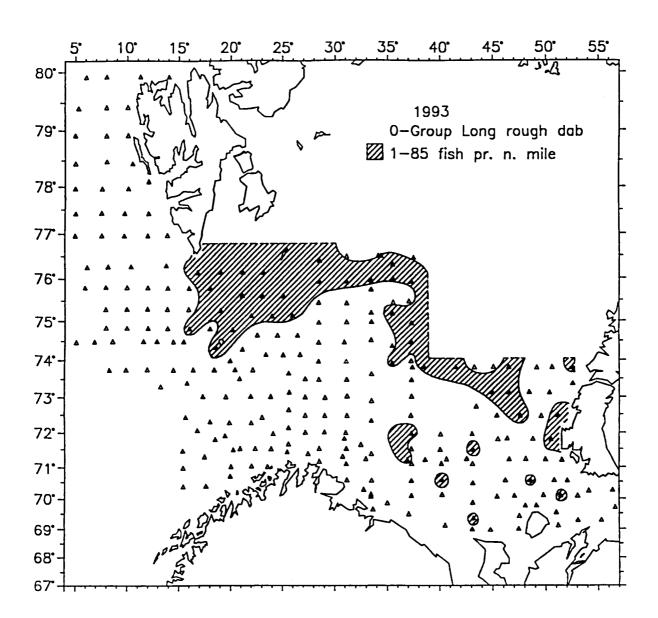


Fig. 24. Distribution of 0-group long rough dab.

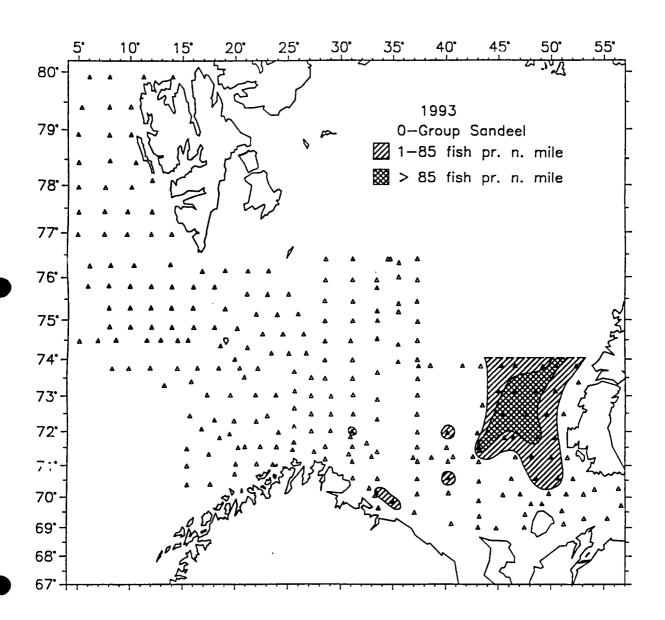


Fig. 25. Distribution of 0-group sandeel.

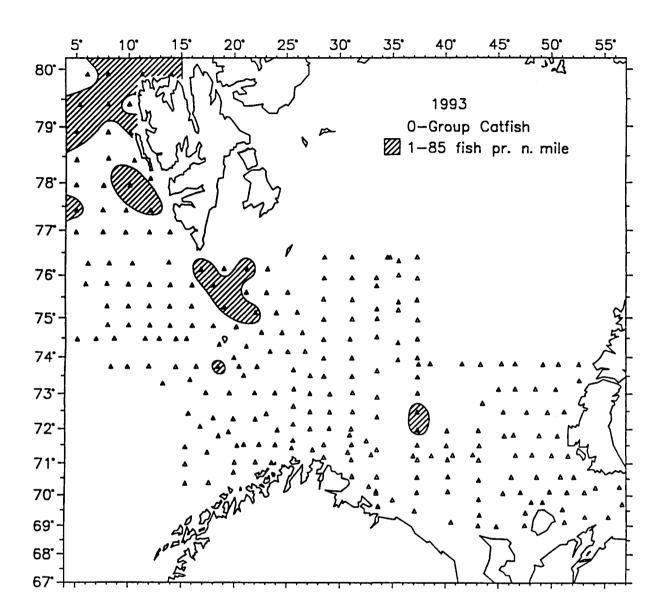


Fig. 26. Distribution of 0-group catfish.

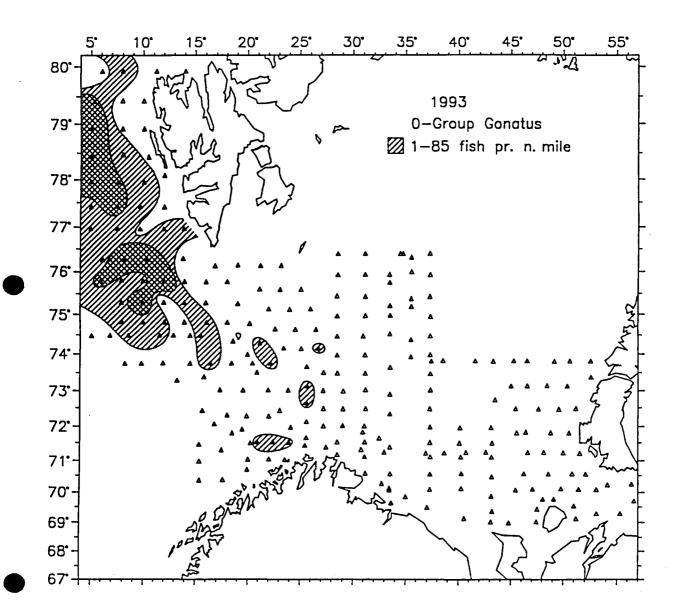


Fig. 27. Distribution of 0-group Gonatus fabricii.

APPENDIX

Research vessel	Participants
"Professor Marty"	S.Boychuk, V.Donetskov, Yu.Garbut, A.Gordov, S.Ratushny, E.Shamray, V.Tretyak
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