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Demersal Fish (Northern) Committee
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Pelagic Fish (Northern) Committee

Preliminary Report
of the O-group fish survey in the Barents Sea
and adjacent waters in August-September 1969.

1. Introduction

This was the fifth of a series of surveys in the Barents Sea and adjacent waters to study the abundance and geographical distribution of the O-group fish of the main species of commercial importance: cod, haddock, herring, capelin, redfish, coalfish, polar cod and some others.

The five vessels taking part and the scientists in charge of each ship were as follows:

U.S.S.R.	R/V "Akademik Knipovich"	Yu.K.Benko
	R/V "Fritjof Nansen"	A.S.Seliverstov
Norway	R/V "Johan Hjort"	L.Midttun, B.Myrseth
	R/V "G.O.Sars"	P.T.Hognestad, T.Monstad
England	R/V "Ernest Holt"	B.W.Jones

Preliminary plans for the survey were made at a meeting in Bergen in May 1969, and final arrangements for the coordination of the survey were made in Murmansk 22-24 August before the survey commenced. The survey took place between 24 August and 7 September, and was followed by a meeting in Tromsø 8-12 September where exchange of data and analysis of the results took place.

2. Methods

The survey method was much the same as in previous years. The distribution and density of the pelagic scattering layer were estimated from the echo-sounder paper record, and the organisms forming the scattering layer were identified from samples taken with small meshed pelagic trawls. The area surveyed is shown in Fig.1, where the ships' tracks and trawl and hydrographic stations are also indicated.

3. Results

3.1. Hydrography

The first half of 1969 was characterized with low temperature in the Barents Sea. In May for example, the anomaly of average temperature of the 0-200 meter layer in the section North Cape - Bear Island was -0.8°C and in the section along the Kola meridian it was -0.9 .

In July and August 1969 the average temperature of the section along North Cape - Bear Island was 0.5°C above normal in 0-50 m layer and about normal in the 0-200 m layer, indicating and intensification of heat transport by the North Cape Current during the period of our investigation. In early September 1969 the temperature in 0-200 m layer of this section was higher than in 1965-1968 (Table 1).

Table 1.

Mean temperature in the section North Cape - Bear Island in the beginning of September 1965-1969 of 0-200 m layer.

Years	1965	1966	1967	1968	1969
$T^{\circ}\text{C}$	5.1	5.5	5.6	5.4	6.0

In the eastern Barents Sea great negative anomalies of water temperature were observed during the summer. In July, August and early September the anomaly along the Kola meridian in 0-200 m layer was close to -1°C . Comparing all the years 1965-1969 only in 1966 the temperature in 0-200 m layer was lower than in 1969 (Table 2).

Table 2.

Mean temperature in the section along the Kola meridian of 0-200 m layer in the end of August 1965-1969.

Years	1965	1966	1967	1968	1969
$T^{\circ}\text{C}$	4.45	3.6	4.9	4.4	4.0

In the beginning of September 1969 the eastern branch of the Norwegian Current in the section along $74^{\circ}30'\text{N}$ was characterized by higher temperature in 0-50 m layer than in the previous years (1965-1968). Thus, the temperature was this year 1.6°C higher than in 1968. In the central branch the temperature was 1.3°C warmer in the 0-50 m layer as compared to 1968.

The temperature in 0-200 m of both the eastern and central branches were higher than in 1965, 1966 and 1968, but very similar to the temperatures observed in 1967.

We may therefore conclude that along with a high heat content of the water masses in the western Barents Sea and the north-eastern Norwegian Sea, water masses of the eastern Barents Sea had low temperatures (Figs. 2-5) in the periode of the present investigations.

3.2. The distribution and abundance of 0-group fish

The variation in total density of the scattering layer is shown in Fig. 6. As in previous years the figure includes also traces from organisms other than 0-group fish, especially from certain invertebrate species of Medusae, Euphauciacea, Amphipoda which contribute to the uppermost scattering layers. However, since the target strengths of those scatterers are not sufficiently known, their contribution to the total echo-abundance is also difficult to estimate. The illustration also includes the contribution from fish of older age-groups when occurring in the midwater above 100 metres.

As in previous years the variation in echo-abundance has been expressed on a subjective scale from 0-4. In order to improve the quantitative estimates of the total echo-abundance, echo-integrator technique has been applied. (Dragesund and Olsen, 1965).

The results show that the main concentration of the scattering layer was confined to the central and western part of the Barents Sea between the meridians 18°E and 28°E . Subsidiary concentrations were found in eastern areas, i.e. off the East-Finnmark-Murman coast and near the Novaya Zemlya.

On the Svalbard shelf several dense concentrations were observed within limited areas.

In the westernmost part of the area surveyed the recordings are from adult blue whiting.

In contrast to previous years 0-group fish this year were very abundant in Spitsbergen waters.

In addition to the 0-group fish species discussed below, other less important species were also recorded, such as catfish, Leptagonus, Agonus, Cottidae etc.

3.2.1. Herring

0-group herring were almost entirely absent in the investigated area except for a few specimens distributed in a restricted area off the coast of North Norway between Lofoten and Sørøy. No 0-group herring was observed in the fjords of North Norway. This is the fifth successive year in which very low abundance of herring has been recorded in the joint surveys (Fig. 7).

3.2.2. Cod

0-group cod were distributed over a wide area in the central Barents Sea extending from the Norwegian coast north to 76°N and from Bear Island east to 40°E . The distribution also extended northwestwards from Bear Island along the western coast of Spitsbergen as far north as the northern limit of the survey at the polar ice edge (Fig. 8). The area of distribution was much more extensive than that recorded in 1968, particularly in the extension this year over the Svalbard shelf. The abundance of cod this year was also much greater than in 1968 or, in fact, than in any of the previous international 0-group fish surveys, and the indications are that the 1969 year-class is the most abundant in the North-East Arctic since the very strong year-classes of 1963 and 1964. However, the abundance of the 1969 year-class may not be as great as those year-classes.

3.2.3. Haddock

As with the cod the 0-group haddock were distributed over a wide area in the central Barents Sea, with extensions northwestwards from Bear Island along the coast of Spitsbergen as far north as the northern limit of the survey and also eastwards along the Murman coast (Fig. 9).

The abundance of 0-group haddock was much greater than in 1968 and the 1969 year-class is easily the most abundant recorded during the five year period covered by the joint surveys. One notable feature of the 0-group

haddock this year was the large length range recorded (27-145 mm). The length composition of the trawl catches is shown in Fig. 15.

3.2.4. Redfish

Compared with 1968 the O-group redfish this year had a wider distribution. The redfish were observed between the meridians 13°E and 32°E and from the Norwegian coast to 75°N with a narrow tongue eastwards along the Murman coast to 39°E . (Fig. 10). Further redfish were distributed northwards from Bear Island and along the coast of Spitsbergen and maybe beyond the limit of the investigated area which ended at appr. 80°N . The highest abundance was found between the Norwegian coast and $74^{\circ}20'\text{N}$ and between 15°E and 26°E . The total abundance was much higher than in 1968 and the 1969 year-class may be considered as a very good one. The average size of redfish was greater than in 1968 (length range 15-60 mm).

3.2.5. Capelin

The young capelin this year was much distributed in the same manner as the two previous years, but the distribution pattern had a few characteristic features. An area stretching from North Cape to $74^{\circ}30'\text{N}$ and between 25°E and 31°E was completely free of O-group capelin. As in 1967 and 1968 the young capelin this year was recorded close to the Murman coast, but near Novaya Zemlya there was only a local patch. Capelin were found around Bear Island as well as along the Vest Spitsbergen current occupying a more extensive area than in the previous years and reaching 80°N .

This year the highest concentrations of capelin were recorded to the east of North Cape. On the whole concentrations of O-group capelin were a little less dense than in 1968 but occupied a greater area. So we may conclude that 1969 year-class of capelin is as rich as in 1968. (Fig. 11).

3.2.6. Long rough dab

O-group long rough dab were mainly distributed from Bear Island northwards along Vest Spitsbergen as far north as the limit of the investigated area. The species this year was low in abundance (Fig. 12). The length range was 20-45 mm.

3.2.7. Polar cod

As previously this species was found in the north-eastern part of the Barents Sea, and this year O-group polar cod were also distributed in a second area stretching from Hope Island and along the Vest Spitsbergen up to the northern limit of the investigated area (Fig. 13). The strength of the 1969 year-class seemed to be very good, and the distribution was very similar to that observed in 1966.

3.2.8. Mackerel

This year O-group mackerel (length range 55-100 mm) were observed in the investigated area for the first time as far north as $72^{\circ}30'\text{N}$. The species were distributed in an area outside North Norway (Fig. 14).

3.2.9. Other species

O-group fish of several other species were observed during the survey. Most frequently occurred Cottidae, Liparis, Leptagonus, Agonus. Further a few Anarrhichas and Ammodytes were observed, besides a few Greenland halibut off Vest Spitsbergen. Only one coalfish was taken during this years survey.

4. Concluding remarks

Again a numerous year-class of redfish and capelin has been produced. This is the fifth successive years of rich year-classes of capelin and the third of redfish since 1965.

Concerning cod and haddock the 1969 year-class is by far the most numerous since the joint surveys started in 1965. But the cod seems to be less abundant than the 1963 year-class which was observed at the O-group stage by Dragesund and Olsen (1965).

Polar cod is obviously one of the best year-classes observed since 1965. On the other hand this year-class of herring was very poor, being the fifth successive year-class with very low abundance.

Coalfish was almost absent this year and the long rough dab was concentrated in a much smaller area than in previous years, indicating a poor year-class.

A striking feature this year was the location of mackerel in significant number off the coast of Norway as far north as 72°30'N.

The distribution pattern of the O-group fishes was this year characterized by high abundance in the Spitsbergen branch of the current system.

Length frequencies of the different species are shown in Fig. 15.

Literature

- Dragesund, O. and Olsen, S. On the possibility of estimating year-class strength by measuring echo-abundance of O-group fish.
Fiskdir. Skr. Ser. Havunders. 13(8):48-75.

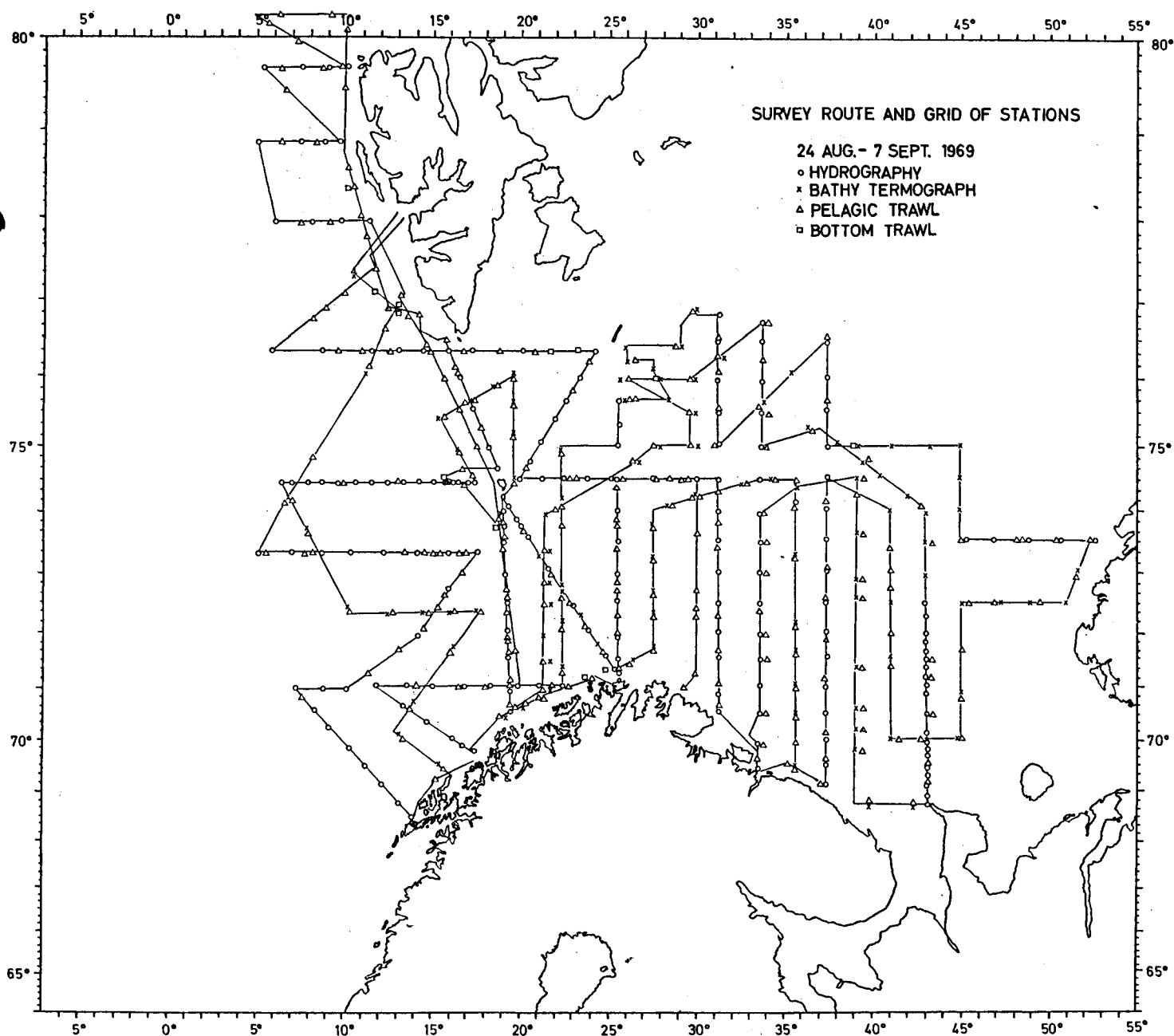


Fig.1. Survey routes and grid of stations.

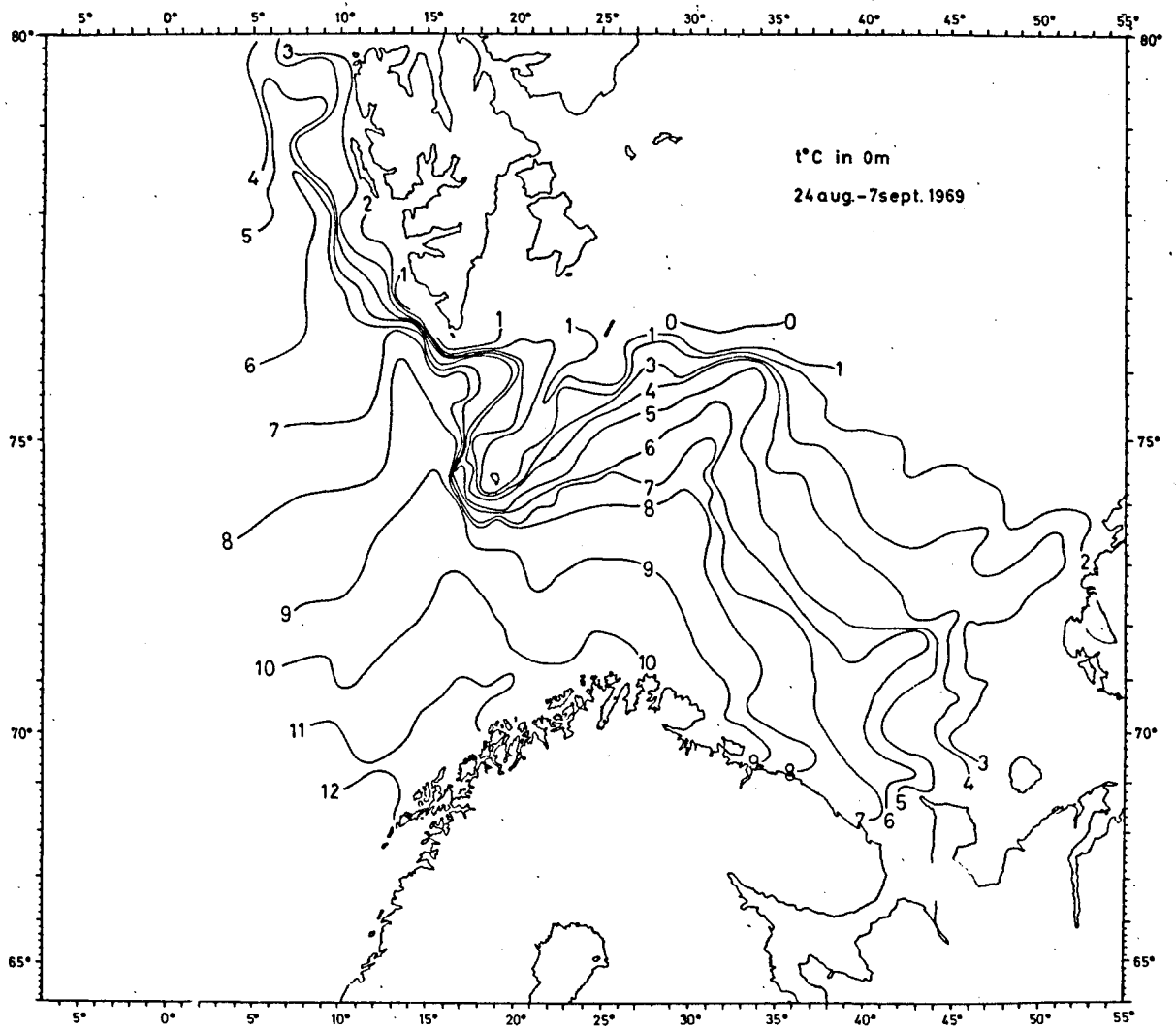


Fig. 2. Isotherms at 0m.

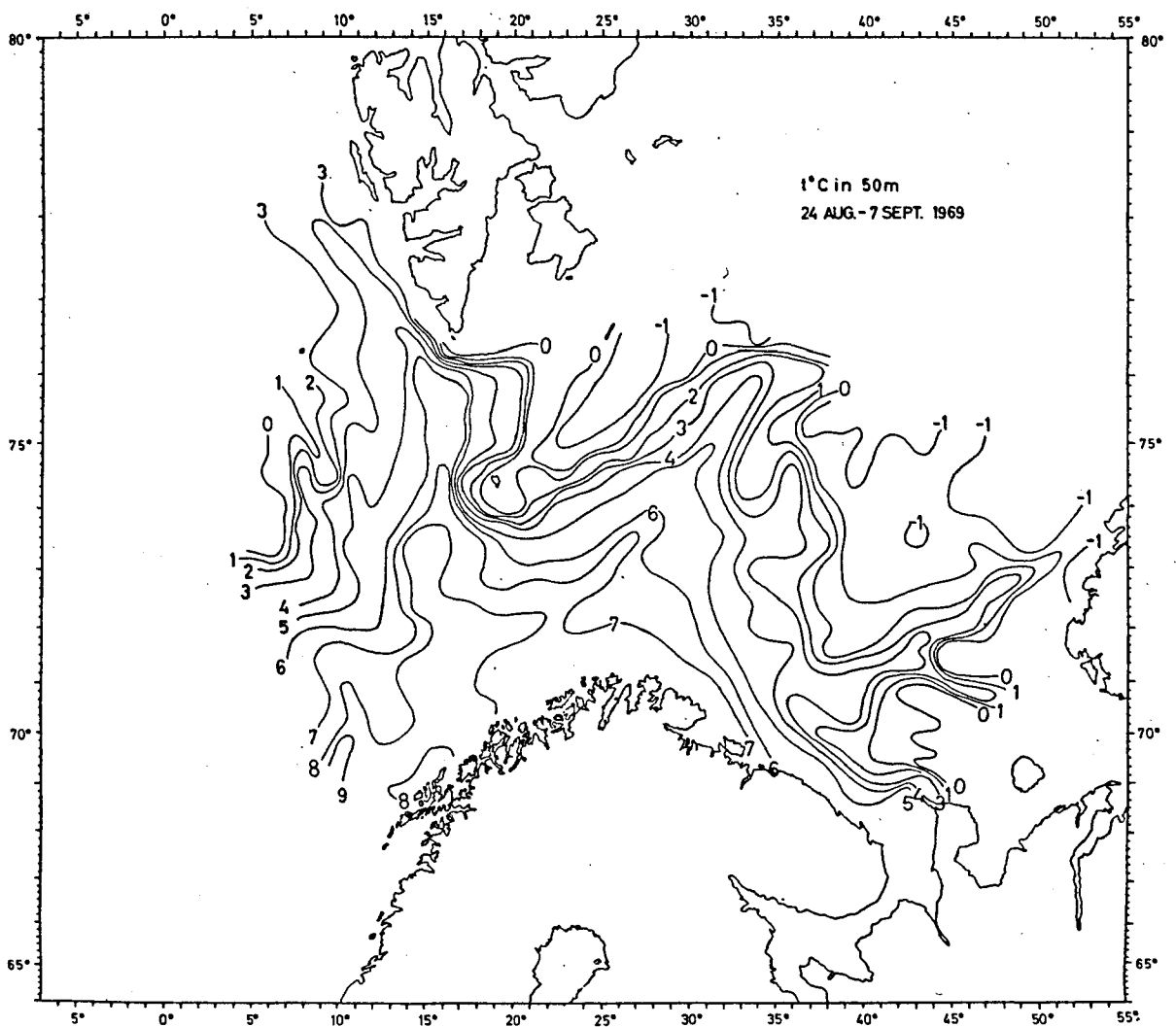


Fig. 3. Isotherms at 50m.

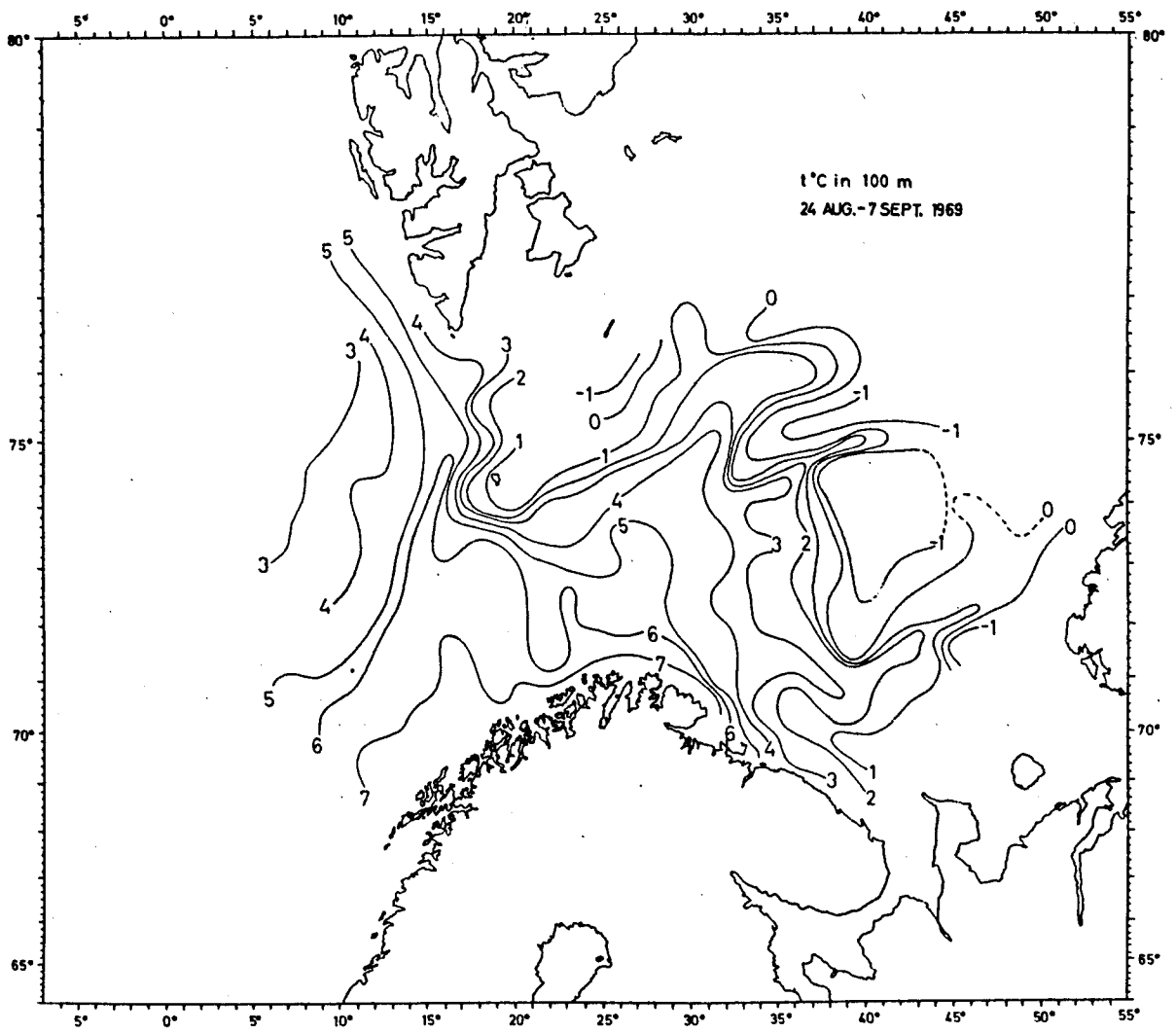


Fig. 4. Isotherms at 100m.

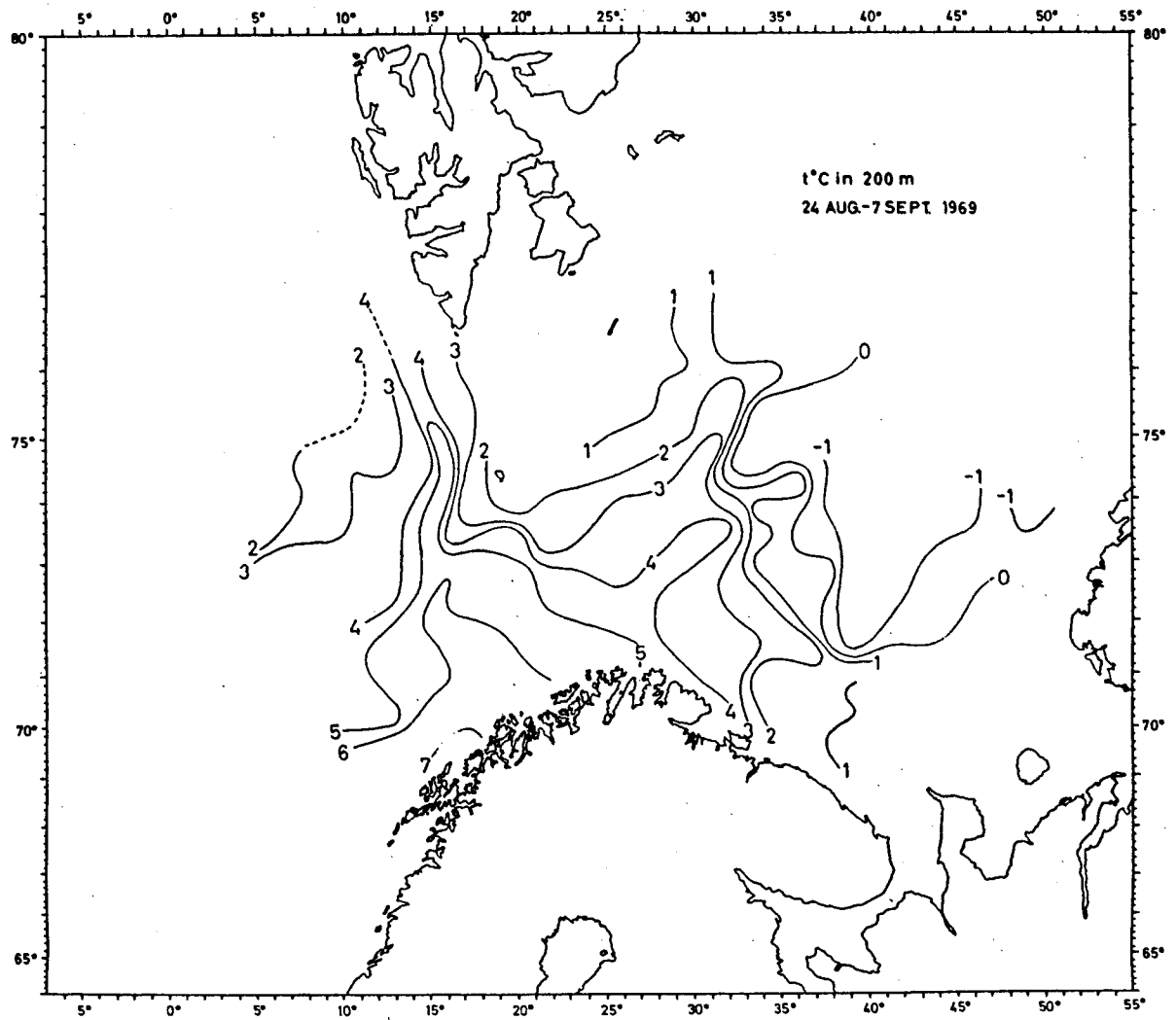


Fig. 5. Isotherms at 200m.

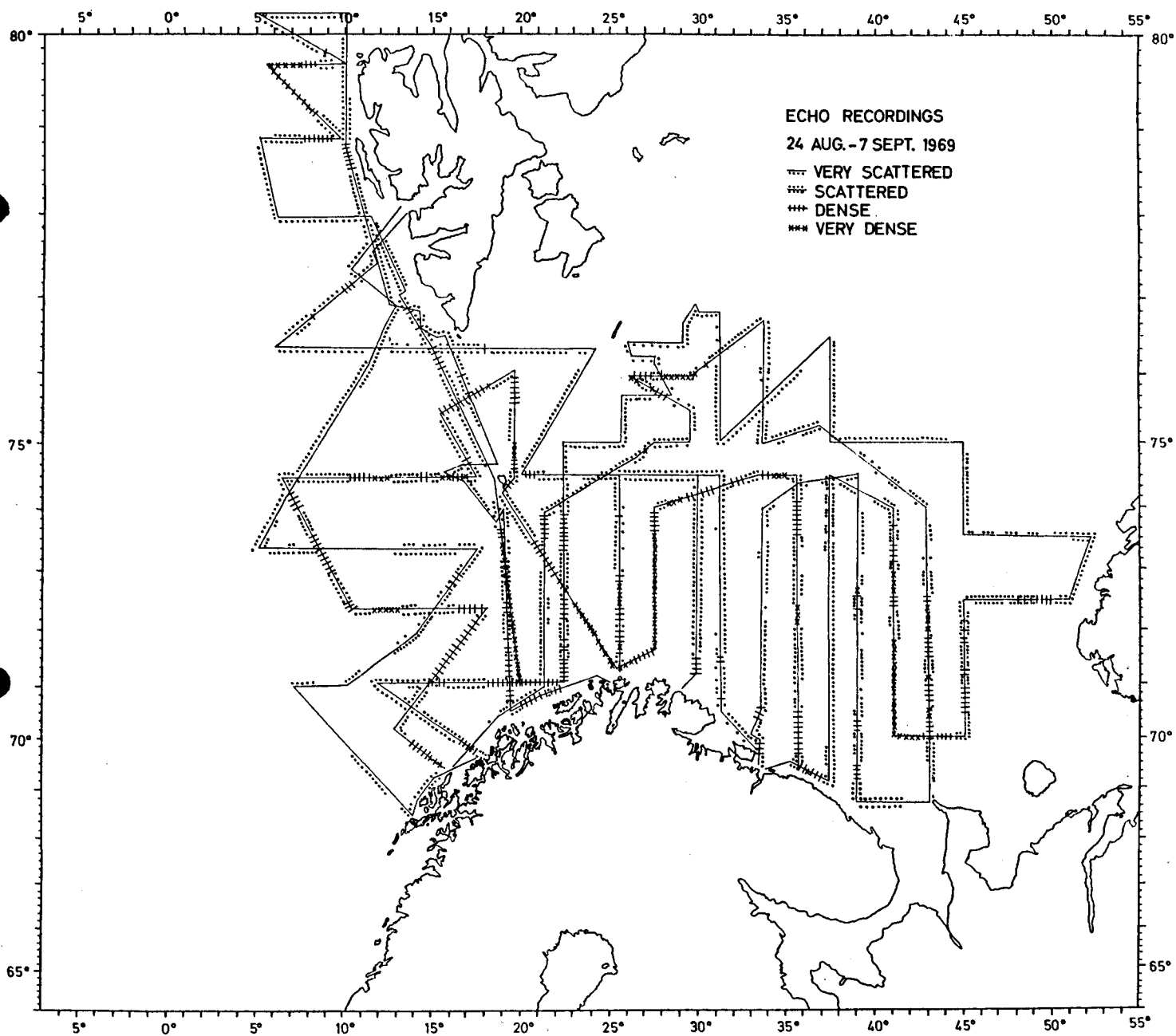


Fig. 6. Courses and echo recordings.

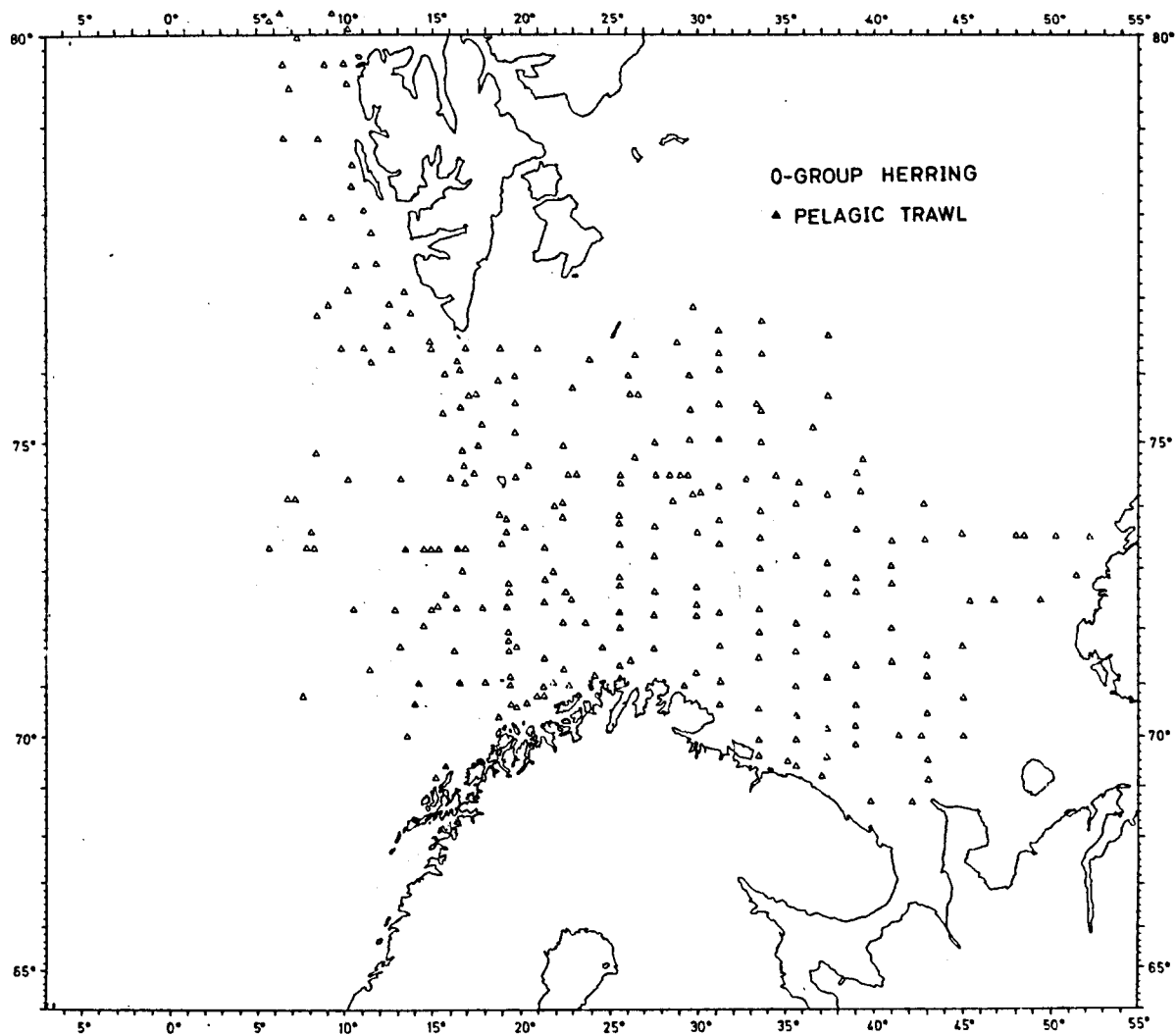


Fig. 7. Distribution of 0-group herring.

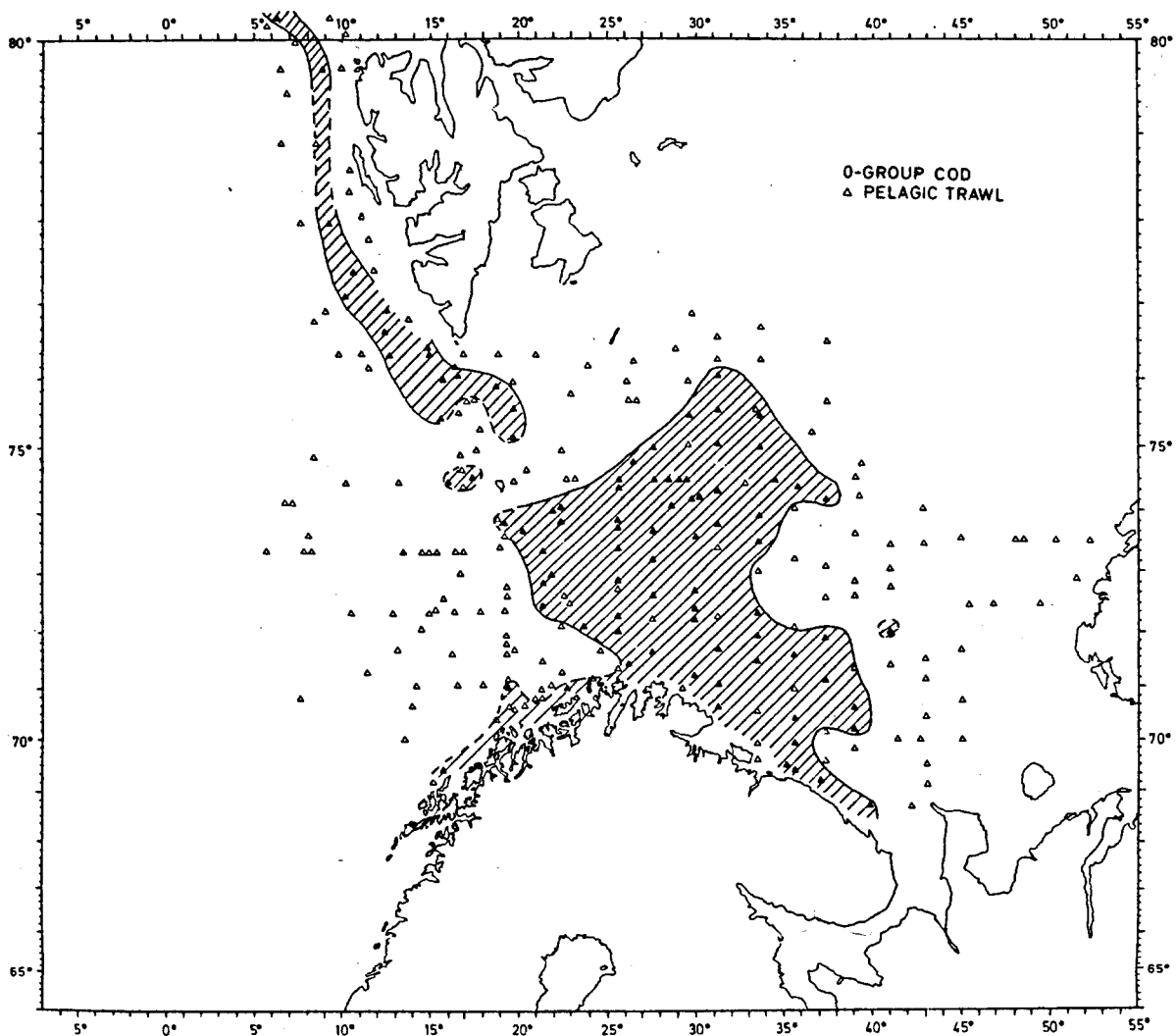


Fig. 8. Distribution of 0-group cod.

Fig. 10. Distribution of 0-group redfish.

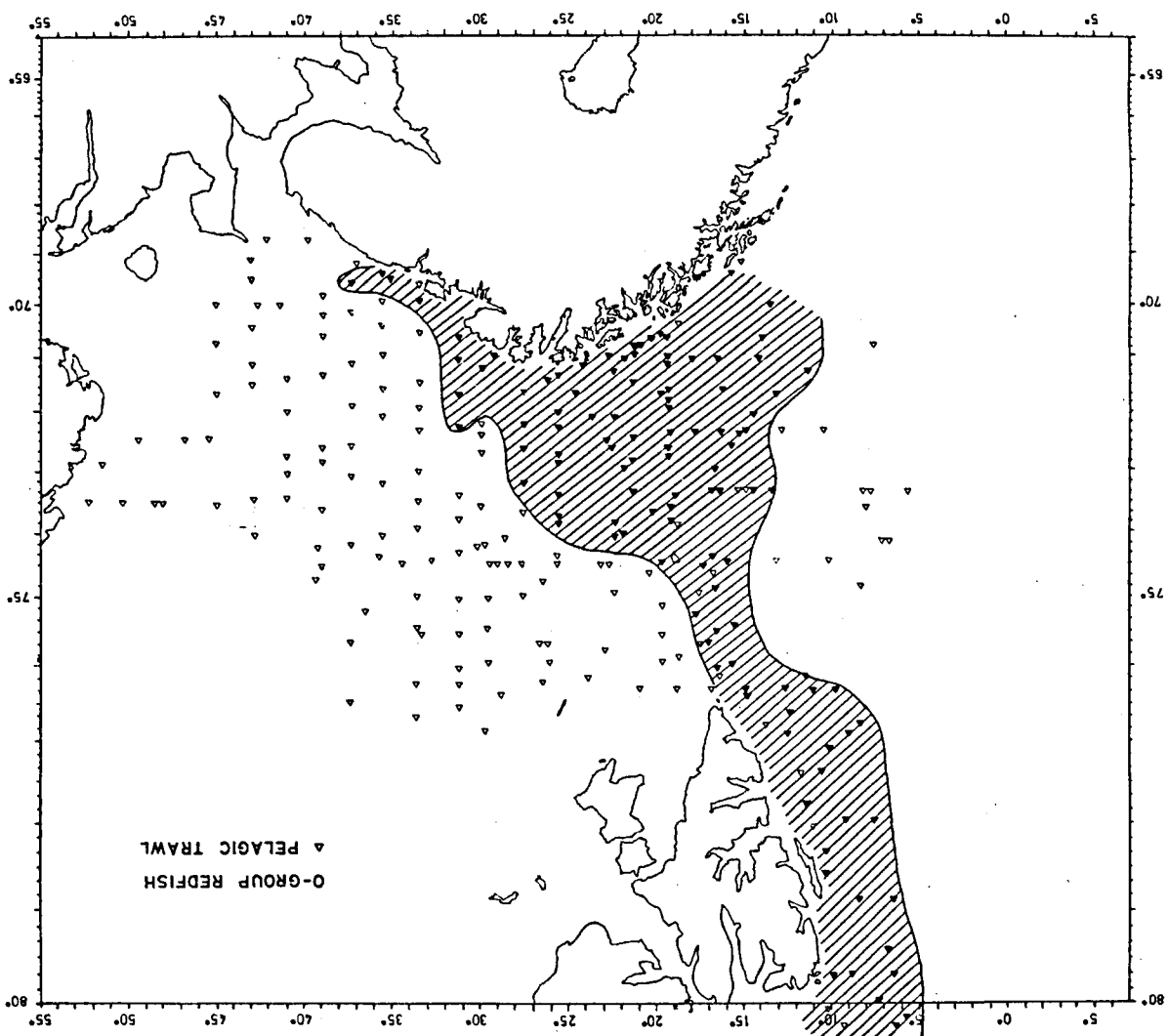
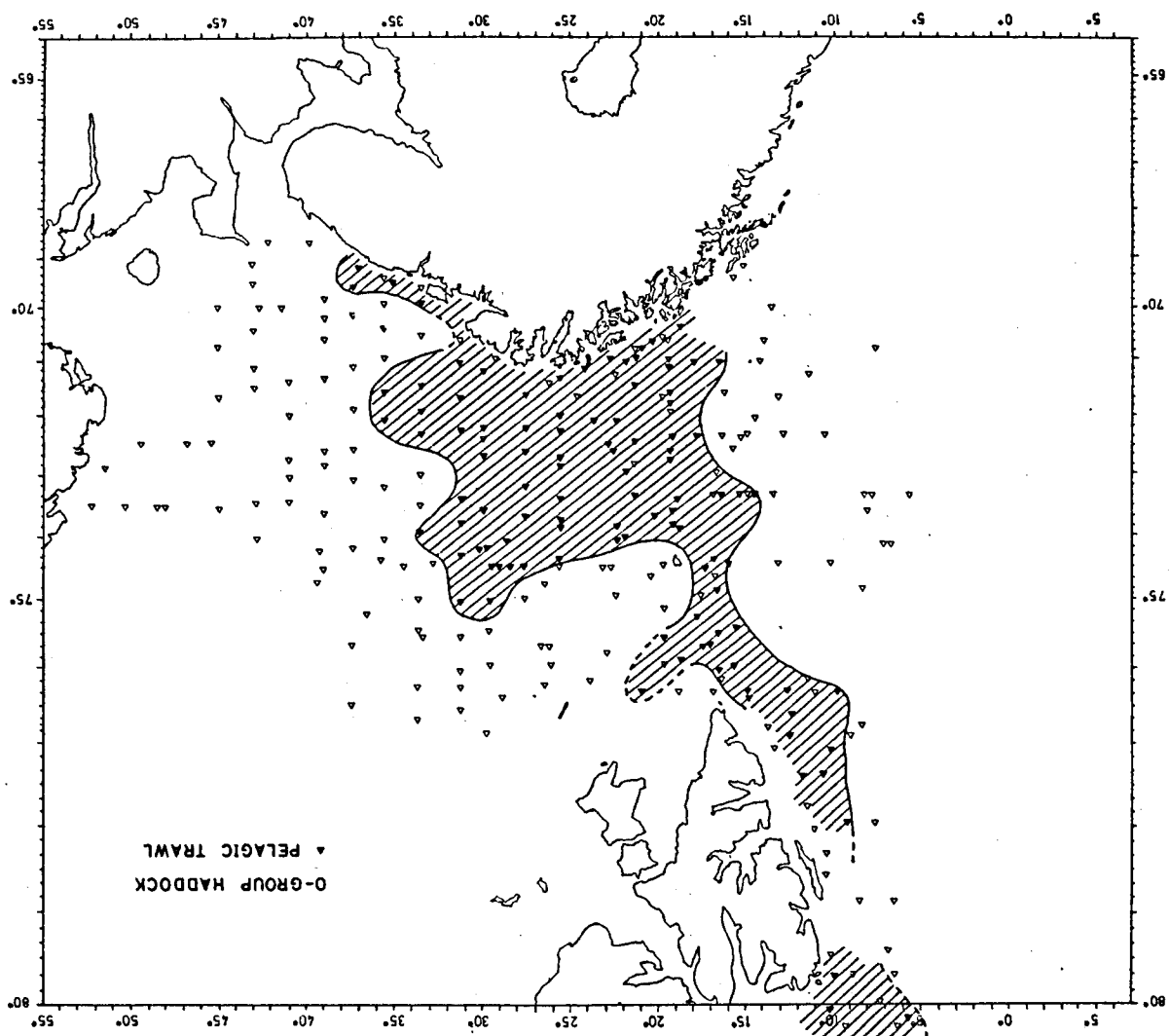


Fig. 9. Distribution of 0-group haddock.



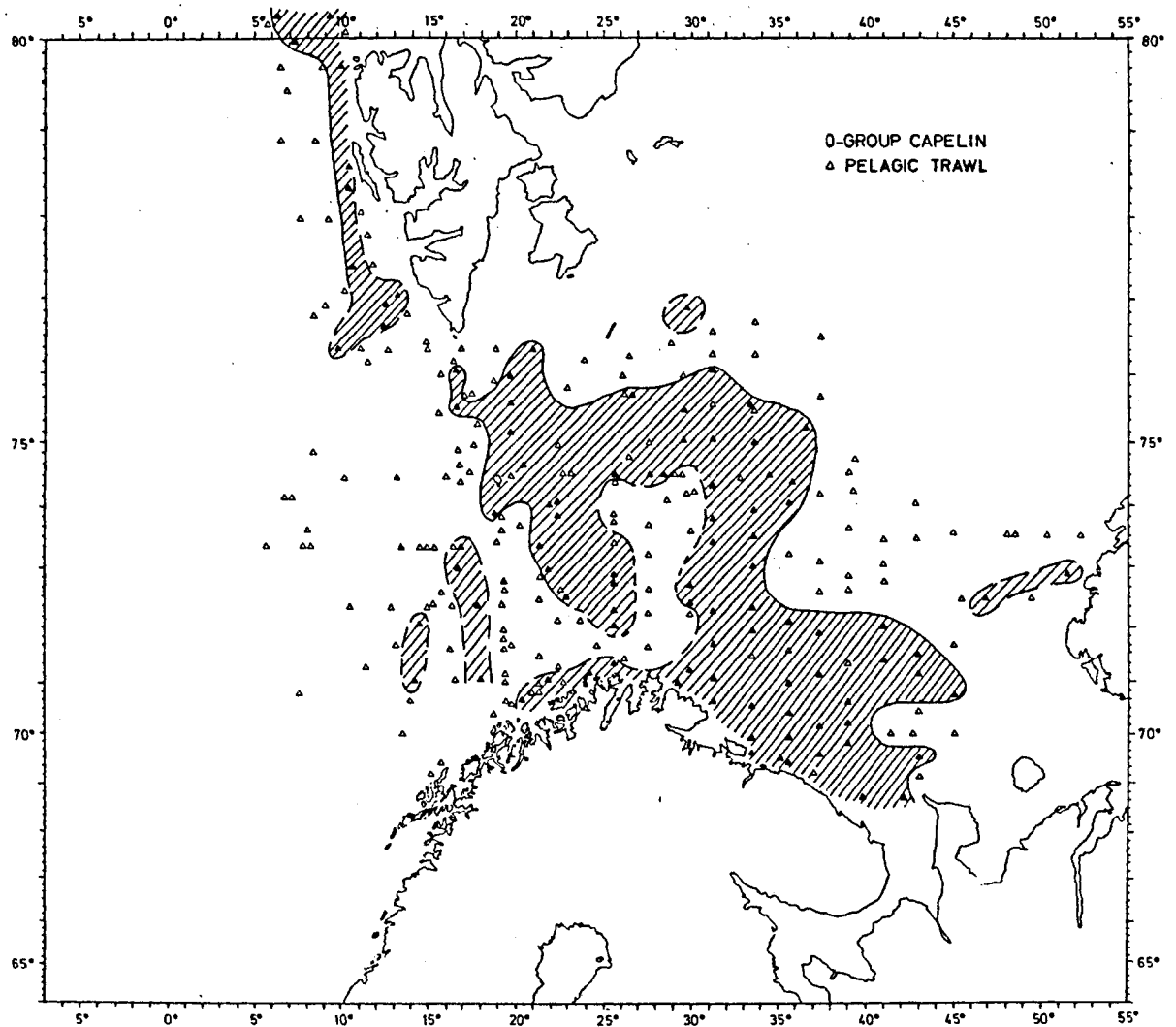


Fig. 11. Distribution of 0-group capelin.

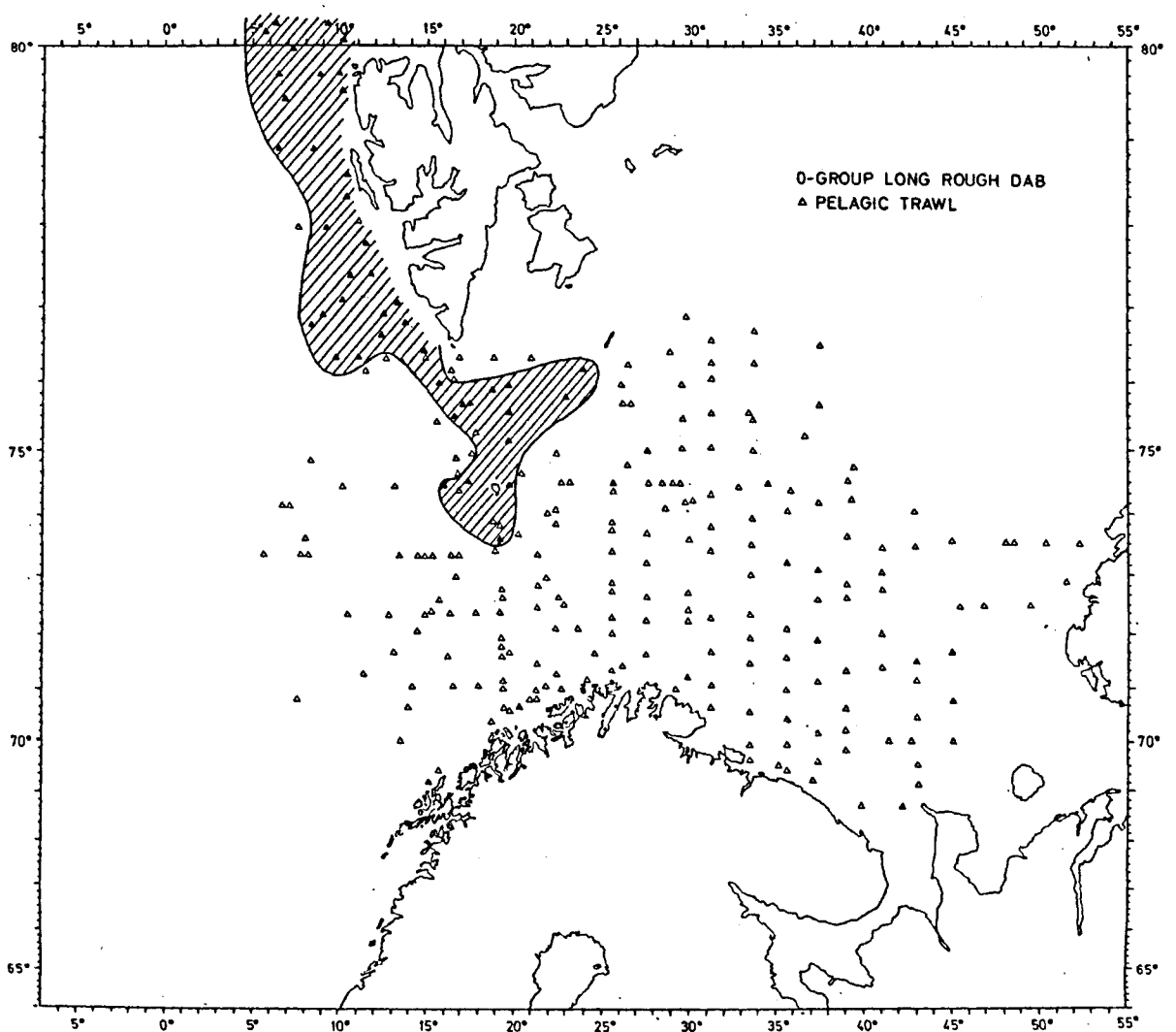


Fig. 12. Distribution of 0-group long rough dab.

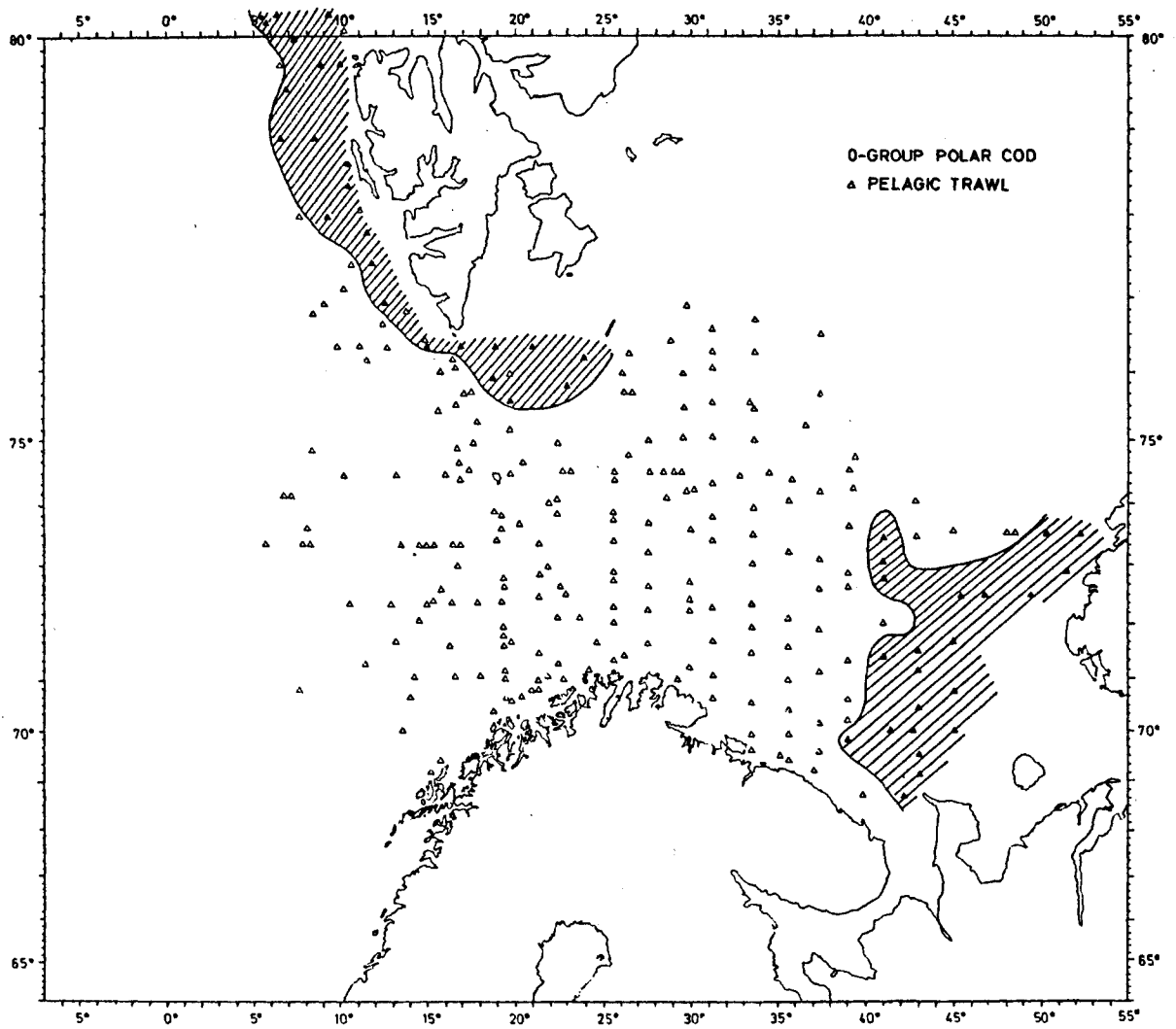


Fig. 13. Distribution of 0-group polar cod.

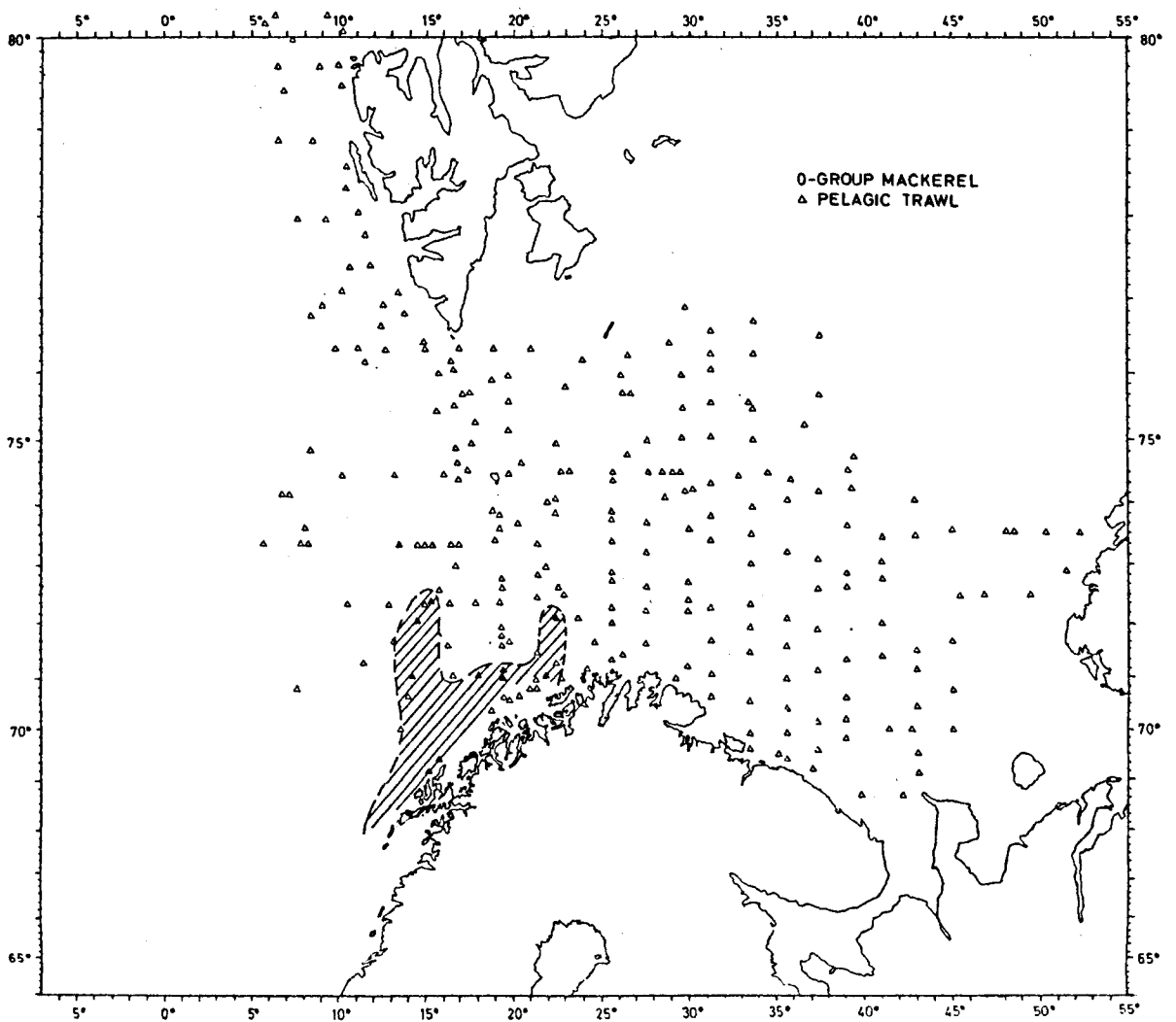


Fig. 14. Distribution of 0-group mackerel.

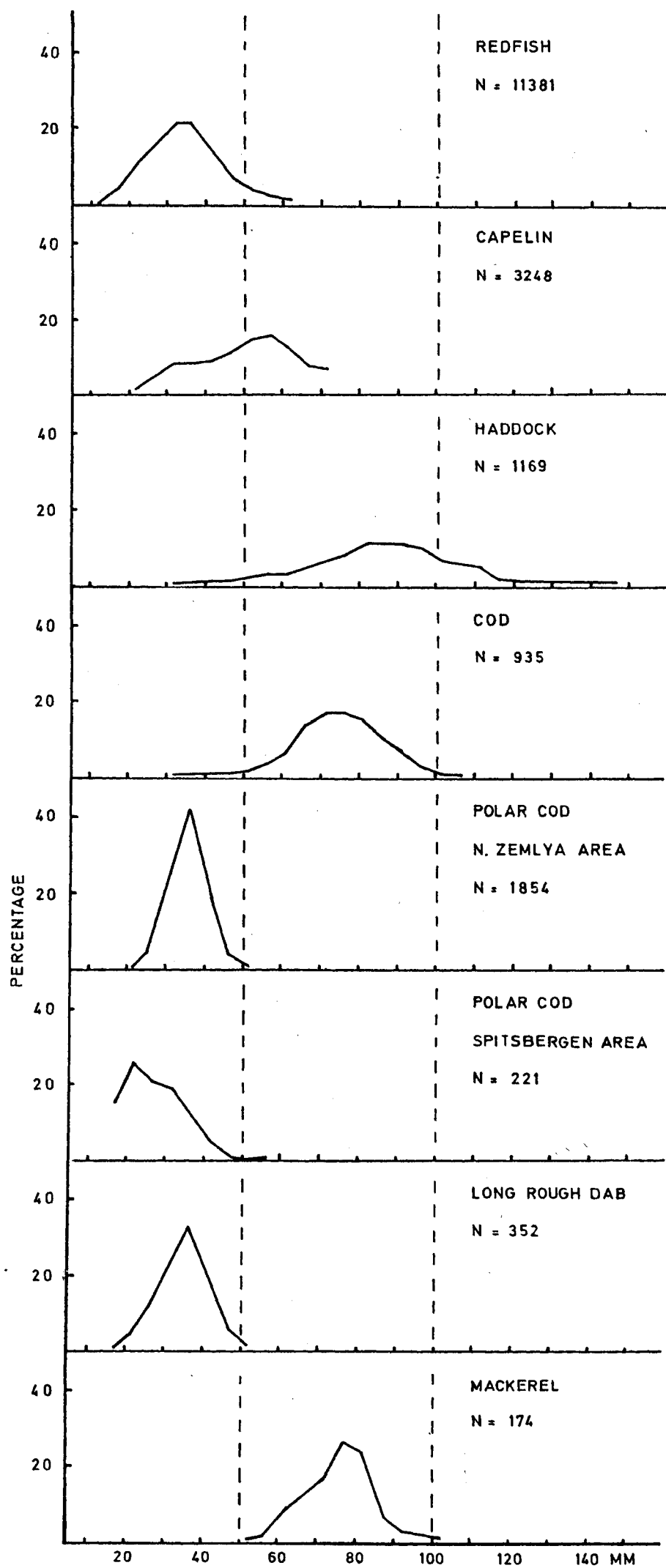


Fig. 15. Length frequencies.