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REPORT ON THE 0-GROUP FISH SURVEY IN ICELAND AND EAST GREENLAND WATERS, AUGUST 1994

by

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1. Abstract

This paper is a continuation of annual reports on routine investigations on hydrography and the distribution and abundance of 0-group fish in Icelandic and East Greenland waters in August - September.

The 1994 abundance index of cod was low. The abundance index of haddock was very low and that of capelin very high. The abundance index of redfish, was low.

2. Introduction

Annual surveys on the distribution and abundance of 0-group fish in the Iceland - East Greenland area have been carried out since 1970. The main aim has been to obtain a first index of the year class strength of the most important commercial species, i.e. cod, haddock, capelin and redfish. Methods and data handling have been described by Vilhjálmsson and Friðgeirsson (1976).

In 1994 two vessels covered the survey area as follows:

Vessel	Period	Area
Bjarni Sæmundsson	3.8.-19.8.	Off SW-Iceland, the Irminger Sea, the East Greenland shelf area north of 60° 00 N and the Dohrn Bank Area.
Árni Friðriksson	3.8.-31.8.	The shelf area off SE,- E-, N-, NW-,SW- and W- Iceland.

Survey routes and stations are shown in Figure 1. Acoustic records of 0-group fish were obtained and the density assessed by a 38 kHz Simrad EK 500 split-beam sounder/integrator system. Species composition as well as abundance was, however, primarily assessed by trawling in the scattering layer for a set distance at a time. For the 0-group capelin and redfish echo abundance was obtained and an index based purely on echo integration was calculated for the 0-group capelin as in previous years.

During the survey, the distribution and relative abundance of the deep scattering layers in the Irminger Sea was observed and recorded. Scouting for whales was carried out continuously on both vessels during the cruise when visibility and weather permitted.

Hydrographic observations as well as measurements of phytoplankton abundance and productivity were done on standard hydrographic sections in Icelandic waters, supplemented with XBT observations. In the East Greenland - Irminger Sea - Dohrn Bank area XBT observations were made at approx. 40 n.m. intervals.

Greenland authorities kindly granted permission for carrying out survey work in East Greenland waters.

Scientific staff on RV Árni Friðriksson was: Sveinn Sveinbjörnsson, Þorsteinn Sigurðsson, Viðar Helgason, Kristín Valsdóttir, Sólveig Ólafsdóttir, Einar Jónsson,

Kristinn Guðmundsson, Sverrir D. Halldórsson, Magnús Daníelssen, Sigurbjörn Árnason, Albert Stefánsson, Hörður Andrésson, Reynir Njálsson, Arna Garðarsdóttir og Gísli Ólafsson.

Scientific staff on RV Bjarni Sæmundsson was: Jutta V. Magnússon, Jakob Magnússon, Jón Jónsson, Þórður Viðarsson, Ásgeir Guðmundsson, Guðmundur Sv. Jónsson, Sigurður Gunnarsson, Hrefna Einarsdóttir, Þorvaldur Gunnlaugsson and Þórður Sigurðsson.

Svend-Aage Malmberg compiled and commented upon the hydrographic data.

3. Hydrography

In August the main features of the hydrographic conditions (Figs. 2-4) in the Irminger Sea and in Icelandic waters were as follows:

Drift ice was only observed off SE Greenland and the cold water of the East Greenland Current was in general not very pronounced in the study area this year. The flow of the Irminger Current westwards to Greenland waters seemed not to be very distinct either and it was farther off East Greenland than usual. In the Central Irminger Sea and south of Iceland temperatures were in general high or above normal, together with a strong heating-up in the surface layers.

The flow of the warm Irminger water into North Icelandic waters was observed to be quite extensive north and eastwards. It was though covered by cold surface water from the East Greenland Current as last year, which reached as far east as off Siglunes. Farther east heating up in the surface layer was quite pronounced.

It is concluded that in general in the summer of 1994 temperatures were relatively high in the survey area, with a strong warming-up in the surface layers likely due to a warm and calm summer, with the exception of the intrusion of cold surface water into North Icelandic waters as in summer 1993.

4. Distribution and abundance of 0-group fish

Since 1987 no trawl stations have been worked along the S- and SE coast. This year some exploratory trawl stations in this area were taken. For the purpose of comformity with later years the catches in those trawl stations are not included in the index calculations but they are shown in figures of the distribution for information.

In the Icelandic area the distribution of 0-group cod was more or less normal. Thus, the greatest abundance was recorded off North- and West- Iceland. No drift of 0-group cod, was observed across the Irminger Sea. The distribution of the 0-group haddock was characterized by an unusually low proportion of the abundance being found off N-Iceland. Some westward drift of capelin larvae had taken place across the Dohrn Bank.

The 0-group redfish were mainly abundant in the central and western part of the Irminger Sea.

In comparative terms the 0-group index of cod was low, that of haddock was very low and the abundance index of capelin very high. The 0-group index of redfish was rather low.

4.1. Cod

The 1994 distribution and relative abundance of 0-group cod is shown in Figure 5 and the total abundance index as well as the contribution by the various subareas in Table 1.

Table 1. Abundance indices of 0-group cod.

East Greenland	Iceland				
Dohrn bank	SW	W	N	E	Total
0	0	1	71	2	74

As usual most of the 0-group cod were recorded off north Iceland. The total abundance index ranks among the lower in the series although the size of the distribution area of the 0-group cod is normal. No drift of 0-group cod across the Irminger Sea was observed. The condition of the 1994 cod brood as judged by the length distribution was very poor as the mean length was the second lowest on record. (Fig. 6).

4.2. Haddock

The distribution and relative abundance of 0-group haddock is shown in Figure 7 and the indices by subareas and the total index are given in Table 2.

Table 2. Abundance indices of 0-group haddock

E-Greenland	Iceland				
Dohrn Bank	SW	W	N	E	Total
0	2	1	+	0	3

The 0-group index of haddock is among the lowest on record. The overall mean length of the 0-group haddock (Fig. 6) was high whereas the size of the 0-group in the area north of Iceland was well below the long term mean.

4.3. Capelin

The distribution of 0-group capelin is shown in Figure 8. The highest numbers were recorded off N- Iceland but on the whole the 0-group capelin was rather widely and evenly distributed in the W-, N-, and E- Icelandic region. Some larval drift was observed across the Dohrn Bank to East Greenland. The abundance indices in different areas are given in Table 3.

Table 3. Abundance indices of 0-group capelin.

East Greenland	Iceland				
Dohrnbank	SW	W	N	E	Total
3	3	9	69	10	94

The abundance index is the highest since 1974 and the third highest on record but the mean length of the 0-group capelin was low compared to the long term average (Fig. 9). The acoustic abundance index of 0-group capelin (Reynisson and Vilhjálmsson, 1983) was about 51 which is the third highest on record.

The acoustic abundance indices in the period 1981 - 1993 are given together with the corresponding Cpue indices in Table 4.

Table 4. Abundance indices of 0-group capelin 1981 - 1994.

Year	Acoustic index (m^2x10^5)	Cpue index
1981	15.2	29
1982	2.8	13
1983	7.8	22
1984	3.5	28
1985	5.6	33
1986	37.1	37
1987	21.2	14
1988	91.8	52
1989	33.3	40
1990	24.7	21
1991	40.2	54
1992	56.8	35
1993	44.9	51
1994	50.5	94

4.4. Redfish

In 1994, the area covered in the Irminger Sea extended from 60°N to 66°20'N and in the southernmost part of the survey area from 36°W west to 42°W (Fig. 10). 0-group redfish were widely distributed in the Irminger Sea like in 1993 but the areas with greatest abundance differed. The main abundance was observed in two zones, i.e. in the central and western Irminger Sea. Areas with more than 10 000 sp. per n.m. trawled were mainly observed in the more westerly zone and in the East Greenland shelf area. These areas were more extensive than in the preceding year. No redfish fry were observed south of 61°N and west of 38°W. On the whole, the observations on the occurrence of 0-group redfish in the Irminger Sea point to a continuation af the distribution area to the south and southeast, i.e. an area which was not covered by the

survey.
In the Icelandic area, few 0-group redfish were exclusively observed in the W and SW Sub-areas.

The abundance index for the Irminger Sea/East Greenland shelf area was 5.8 x 10^6 fish per n.m.^{2} in 1994 which is somewhat higher than in 1993 (4.0 x 10^6 fish per n.m.^{2}). However,compared to the indices of previous years which were obtained from a similar coverage of the investigated area, the 1994 year class of redfish classifies as small.

The difference in length of 0-group redfish within the northen and southern Sub-areas was much more pronounced in 1994 than in previous years. The av. length in the Dohrn Bank area was 16.5 mm higher than in the southern part of the Central Irminger Sea (Fig. 11). Also in the southern part of the East Greenland shelf area, 0-group redfish were small, i.e. about 35 mm av. length. Compared to the preceding year, 0-group redfish were 3 to 5 mm smaller (av.length) in the Central Irminger Sea and in the southern part of the East Greenland shelf area, in 1994.

In the Icelandic Sub-area SW, the av. length of 0-group redfish was the lowest one of the preceding 5 years of observation.

In 1994, the percentage of 0-group *Sebastes marinus* was 52% of a total of 5577 0-group redfish identified to species (Magnússon, 1981) which means a considerable increase since 1993 (27%). The relative abundance of *S. marinus* was highest in the northern part of the East Greenland area (62%). In the southern part of the Central Irminger Sea, *S. mentella* were most abundant (99%). Some 0-group *S. viviparus* were observed during the survey.

The overall length of *S. mentella* in 1994 was 35.17 mm which is about 3 mm less than the one observed in 1993 while the overall length of *S. marinus* was about the same in both years, i.e. 44.91 mm, in 1994 and 44.82 mm, in 1993.

Of the stations with 0-group catches, 48% were taken during the hours 2000 - 0759. About one third of the total no. of redfish per n.m. trawled was obtained during that time interval.

4.5. Other species

During the 0-group survey in 1994 23 species besides the four ones discussed above were recorded.

The fry, juveniles and adults of the **sand eel** species(*Ammodytidae* spp.) were most numerous represented in many of the 0-group catches. They were recorded in the Icelandic region at 61 stations, off the S, E, NE, N, NW and W coasts. Unusually big catches e.g. about 200 kg per n.m.tr. of juvenile *Ammodytidae* spp. were taken in the Faxa Bay. In the Irminger Sea/East Greenland shelf area, sand eel were recorded at 14 stations most of them taken in the Central Irminger Sea and in the Dohrn Bank area. The highest catch in no., i.e. 17240 specimens per n.m. trawled was recorded at one station in a fjord of N Iceland. The length range in the Icelandic region was 37 - 169 mm,av. length 91.36 mm. In the Irminger Sea/East Greenland region, it was 52 - 117 mm, av.

length 74.37 mm.

0-group **Greenland halibut** were much more abundant in 1994 than in the preceding year and they were also distributed over a wider area similar to that in 1992, i.e. on the East Greenland banks as well as offshore and in the Central Irminger Sea, as far east as 29°37'W. They were recorded at 20 stations mainly south of 64°N (Fig. 12). The length range was exceptionally wide: 24 - 84 mm. and the av. length was therefore rather low (63.53 mm). In the Icelandic area, no 0-group Greenland halibut were observed.

0-group **long rough dab** were less frequently observed in the Icelandic region than in the preceding two years but in the Irminger Sea/East Greenland region, they were much more numerous than in 1993. Off Iceland, they were recorded at 17 stations which were mainly taken off the N coast. The length range was 20 - 46 mm, the av. length 32.93 mm. In the Irminger Sea/East Greenland region, long rough dab were recorded at 15 stations, mainly taken in the nothern part of the East Greenland shelf region and in the Dohrn Bank area. The length range was 23 - 43 mm, the av. length 33.28 mm.

Juvenile **blue whithing** were again recorded in 1994, after 2 years' absence in the 0-group catches. They were observed at 3 stations in the Icelandic area (Faxa Bay and off S Iceland) and at 2 stations in the Central Irminger Sea. The length range was 85 - 180 mm, the av. lengt 147 mm.

Few 0-group **blue ling** were recorded, at 3 stations all taken in the Central Irminger Sea region, in a length range of 55 - 73 mm, the av. length being 65.67 mm. 0-group and juvenile **polar cod** were recorded in the southern part of the East Greenland shelf and off NW Iceland, in a length range of 29 - 122 mm, av. length 70.11 mm. In the Faxa Bay and off S and SE Iceland, 0-group **whiting** were recorded, at 8 stations, in a length range of 49 - 96 mm, av. length 67.95 mm. 0-group **Norway pout** were only recorded at 3 stations off the S coast of Iceland, in a length range of 35 - 65 mm, av. length 54.26 mm. A **fork beard** specimen was recorded in the Central Irminger Sea, 40 mm in length.

The 0-group of the **five- bearded rockling** have been recorded in previous years but never before in such frequencies than in 1994. They were observed at 27 stations mainly in the Central Irminger Sea region and in the northern part of the Greenland shelf area but none in Icelandic waters. The length range was rather wide: 21 - 82 mm (av. length 55.77 mm).

0-group and juvenile **herring** were observed at 5 stations in two fjords of N Iceland. The length range was 48 - 190 mm, the av. length 177.46 mm.

Myctophidae spp. were more frequently recorded in the 0-group catches than in the preceding year although not yet in such quantities known from previous years. They were recorded off W and SW Iceland, at 11 stations and in the Irminger Sea/East Greenland region, at 20 stations mainly in the Central Irminger Sea. The lanternfish species, i.e.**Benthosema glaciale** and **Protomyctophum arcticum** were recorded in a length range of 20 - 68 mm. the av. length was 36.33 mm.

0-group **catfish** were much more abundant in 1994 than in the preceding year, both in the Icelandic and in the Irminger Sea/East Greenland region. Off Iceland, 0-group catfish were recorded at 22 stations mainly off the E, NE and N coasts, in a length range of 31 -

85 mm, av. length 69.45 mm. In the Irminger Sea/East Greenland area, they were recorded at 14 stations. There, they were larger than in the Icelandic area, i.e. 69 to 83 mm and the av. length 75.50 mm. Off E Iceland and on the Dohrn Bank, 0-group **Moustache sculpin** were recorded in a length range of 26 - 30 mm, av. length 27.5 mm. 0-group **Atlantic seapoacher** was recorded in the northern part of the East Greenland shelf area, at 3 stations and off E and N Iceland, at 6 stations. The length range was 22 - 42 mm, av. length 30.53 mm.

Young stages and adults of **lumpsucker** were abundant and widely distributed in the Icelandic region. They were recorded at 40 stations in the E, NE, N and NW - Sub-areas but mainly off N Iceland. The length range of young stages of lumpucker was 40 - 107 mm (av. length 76.70 mm). Adults were recorded in a length range of 21 to 35 cm. In the Irminger Sea/East Greenland region, lumpsucker were only recorded at 5 stations of which juveniles at 3 stations, in the northern part of the East Greenland shelf area. The length range was 79 - 122 mm, the av. length 102.67 mm. The adult lumpsucker were 24 to 27 cm in length.

A **gelationeous sea-snail** *(Liparis fabrici)* was recorded off NW Iceland, 34 mm in length. Juvenile **Snake blenny** were entirely recorded in the Icelandic area mainly of the E and N coasts, in a length range of 48 - 124 mm (av. length 65.74 mm). A juvenile **anglerfish** was recorded at a station off SE Iceland, 63 mm in size. Off the S coast of Iceland, at 2 stations **pearlside** *(Maurolicus mülleri)* were recorded in a length of 45 - 47 mm. In one of the special trawls aimed at the layer af deep water species in the Irminger Sea, in depths of 400 to 500 m, at 63°58'N 28°45'W, a specimen of the **Hatchetfish** family, i.e. *Polyipnus polli*, 55 mm in length, was recorded. This is a new species in the Icelandic fish fauna. Finally, it should be mentioned that a **sea lamprey** of 70 cm in size was caught in an 0-group haul, at a depth of 30 m, off SW Iceland.

5. References

Magnússon, J.V., 1981: Identification of *Sebastes marinus, S. mentella and S. viviparus* in 0-group redfish. Rapp. R.-V Réun. Cons. Int. Explor. Mer, 178, 571-574.

Magnússon, J.V. and S. Sveinbjörnsson, 1992: Report on the 0-group Fish Survey in Iceland and East-Greenland Waters, Aug.-Sept. 1992. ICES, C.M. 1992/G:50.

Magnússon, J.V. and S. Sveinbjörnsson, 1993: Report on the 0-group fish survey in Iceland and East Greenland waters, August 1993. JCES, C.M. 1993/G:67.

Reynisson, P. and H. Vilhjálmsson, 1983: Acoustic index of 0-group capelin in the Iceland-Greenland area. ICES, C.M. 1983/B:3.

Vilhjálmsson, H. and E. Friðgeirsson, 1976: A review of 0-group surveys in the Iceland-East Greenland area in the years 1970-1975. Coop. Res. Rep. 54 ICES.

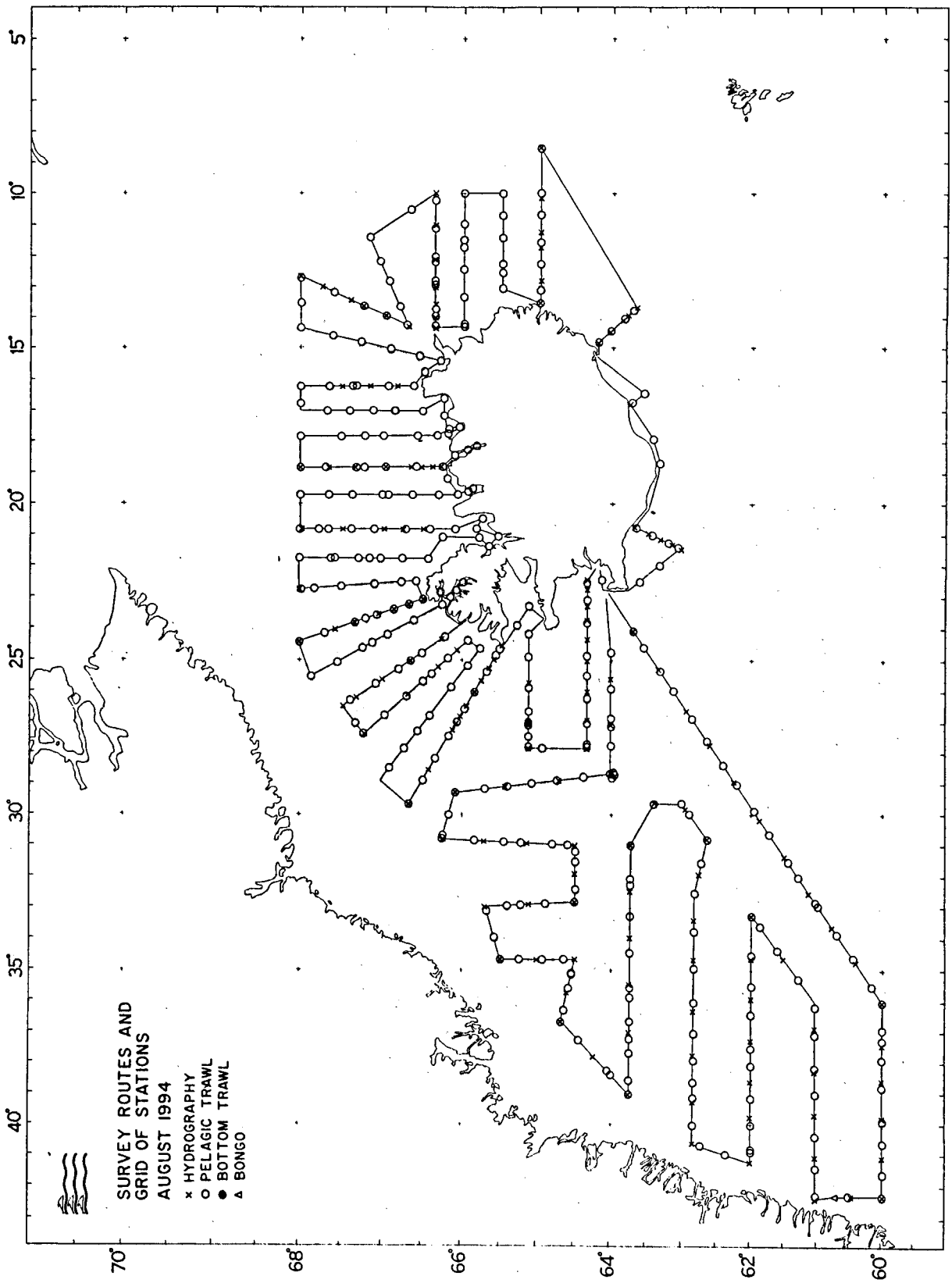

Figure 1. Survey routes and grid of stations, August 1994.

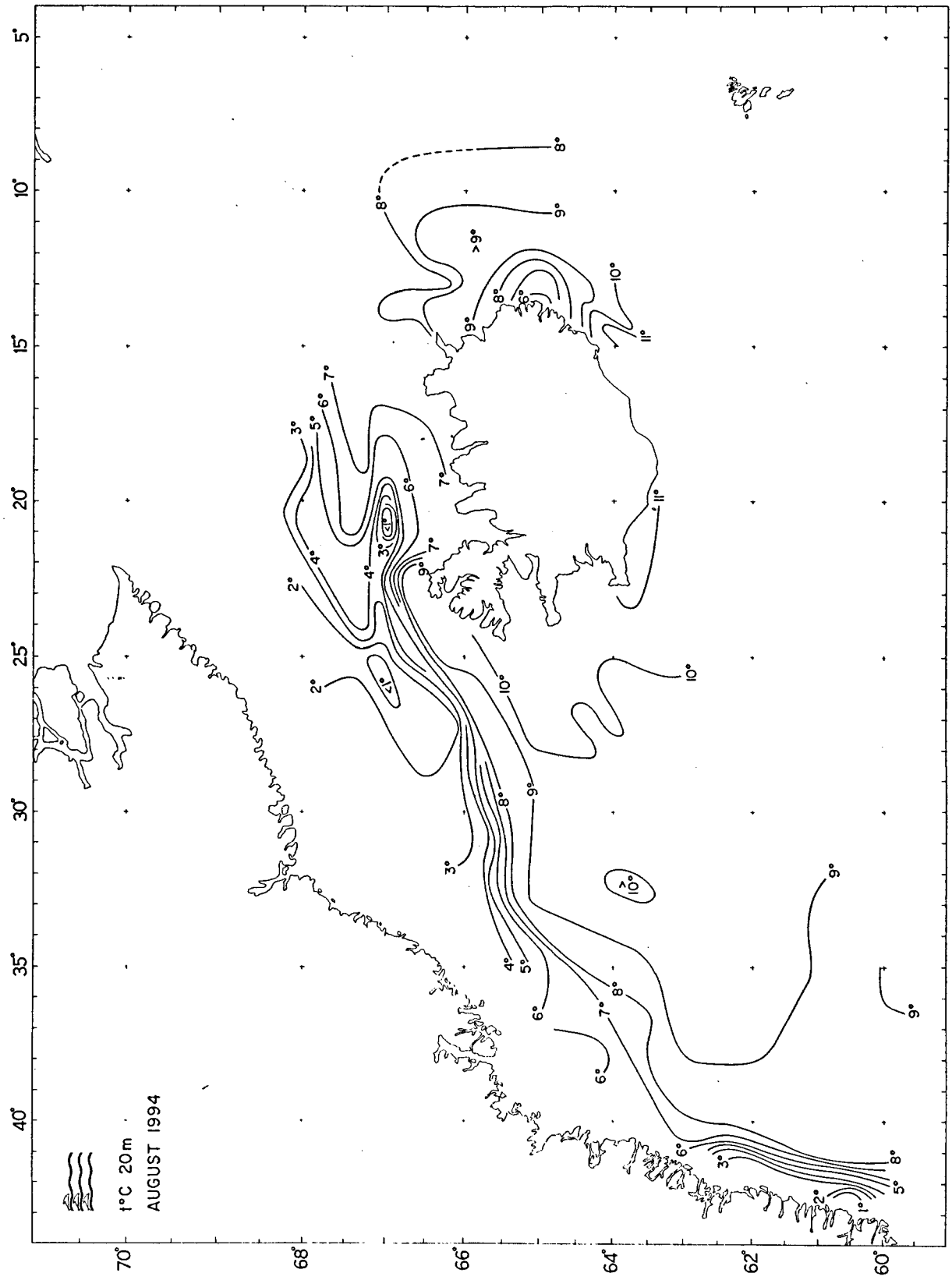

Figure 2. Temperature at 20 m depth, August 1994.

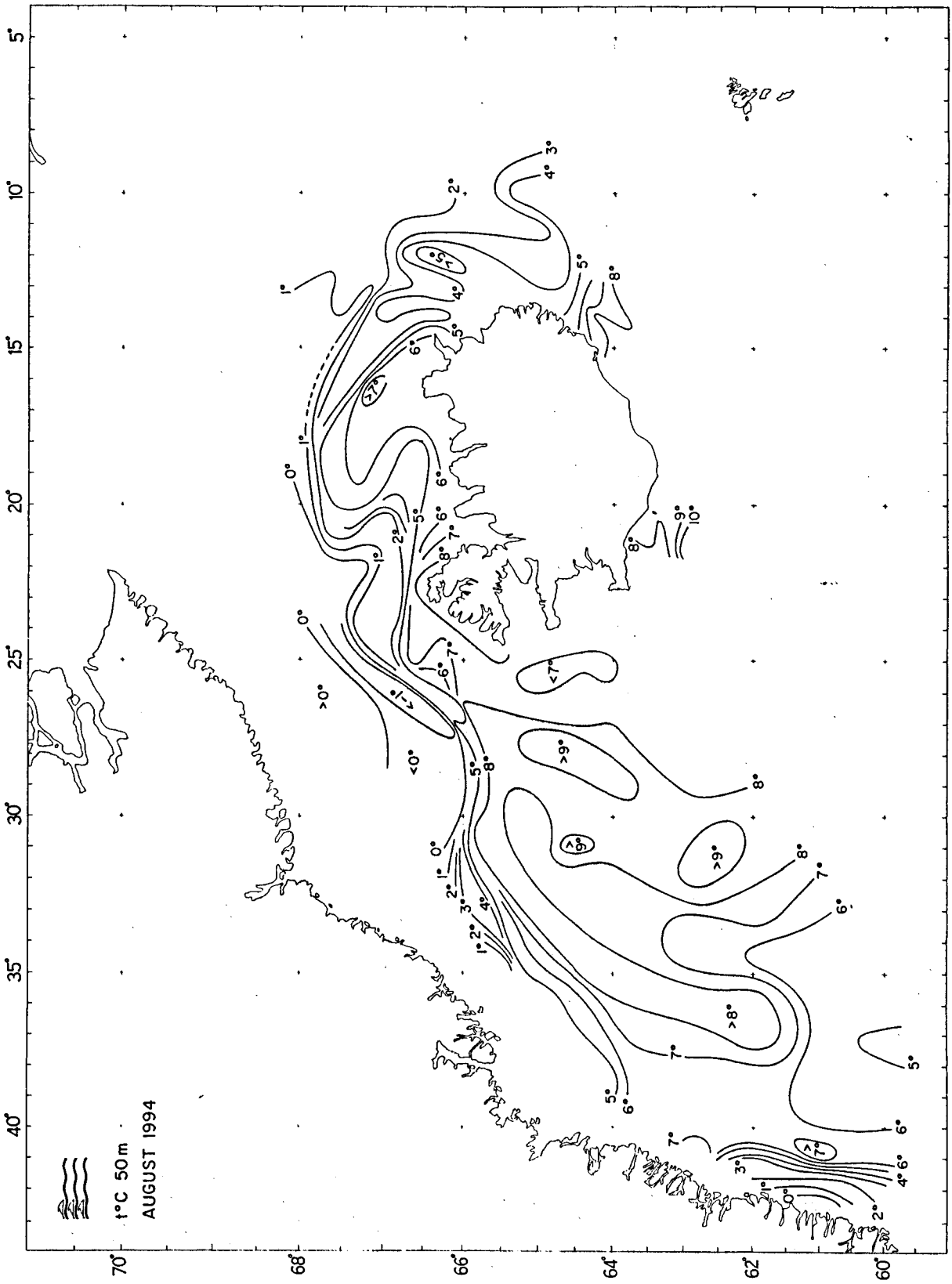

Figure 3. Temperature at 50 m depth, August 1994.

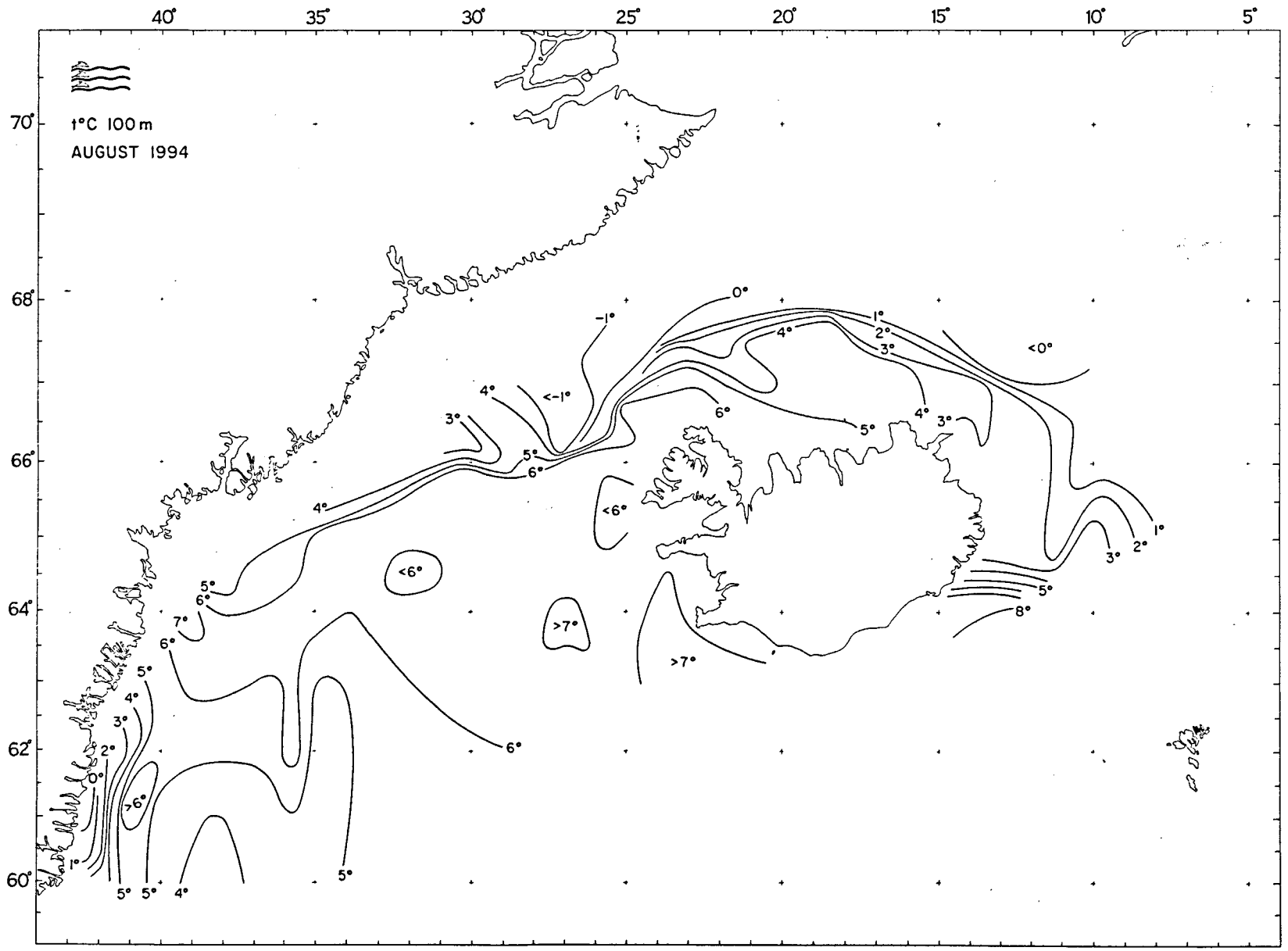

Figure 4. Temperature at 100 m depth, August 1994.

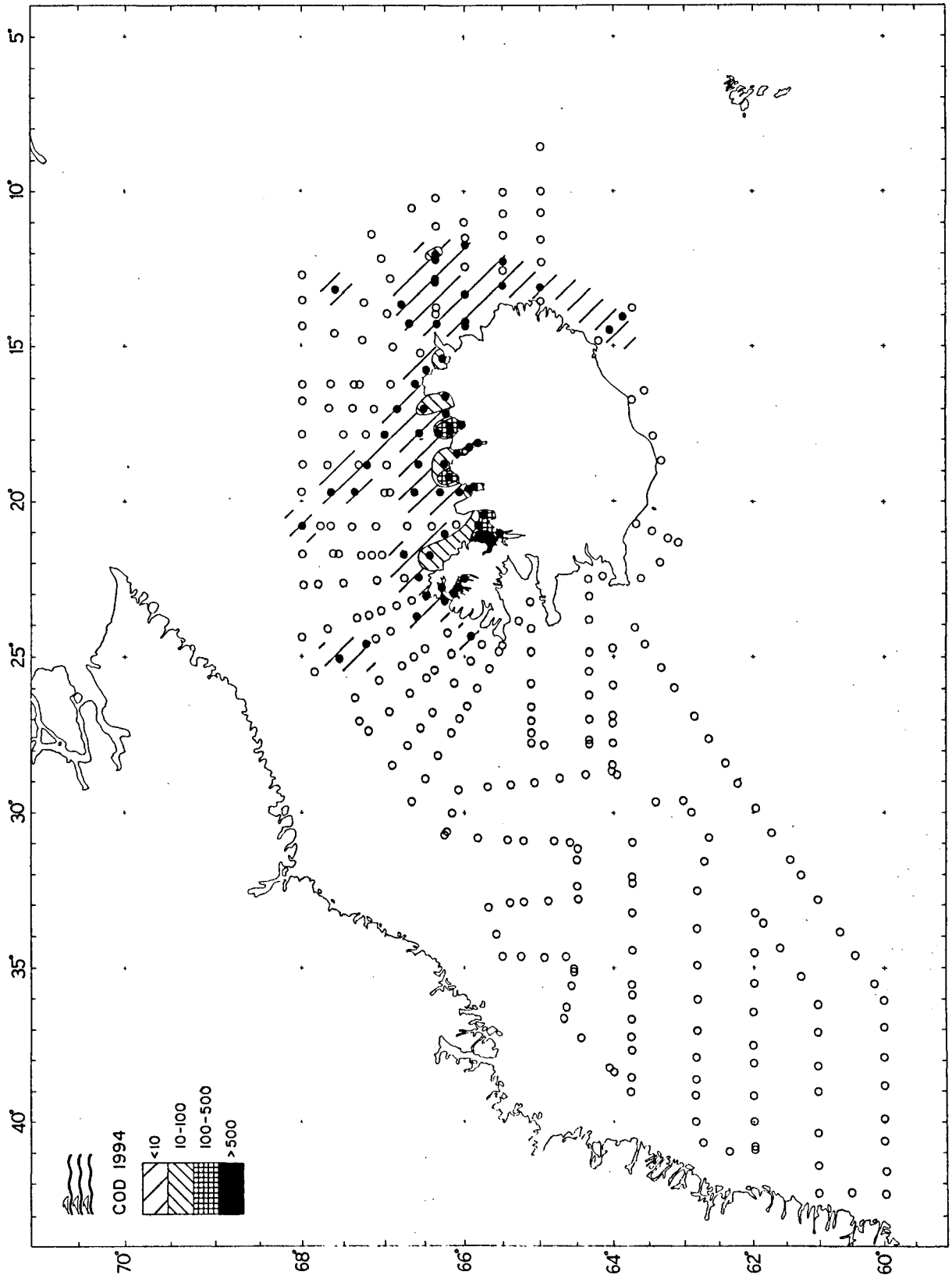

Figure 5. Distribution and density of 0-group cod (n/1 n.m.), August 1994.

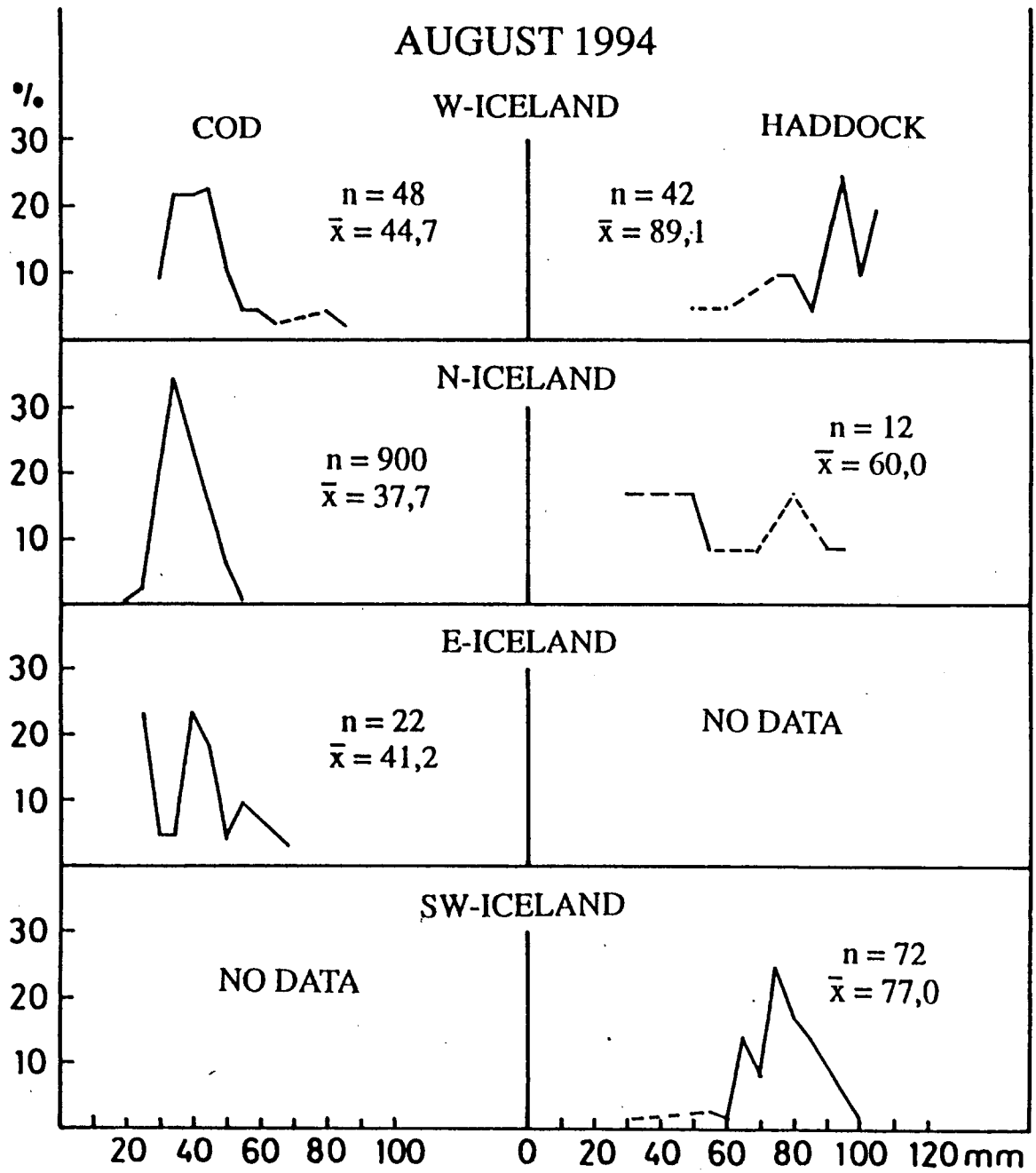

Figure 6. Length distribution of cod and haddock, August 1994.

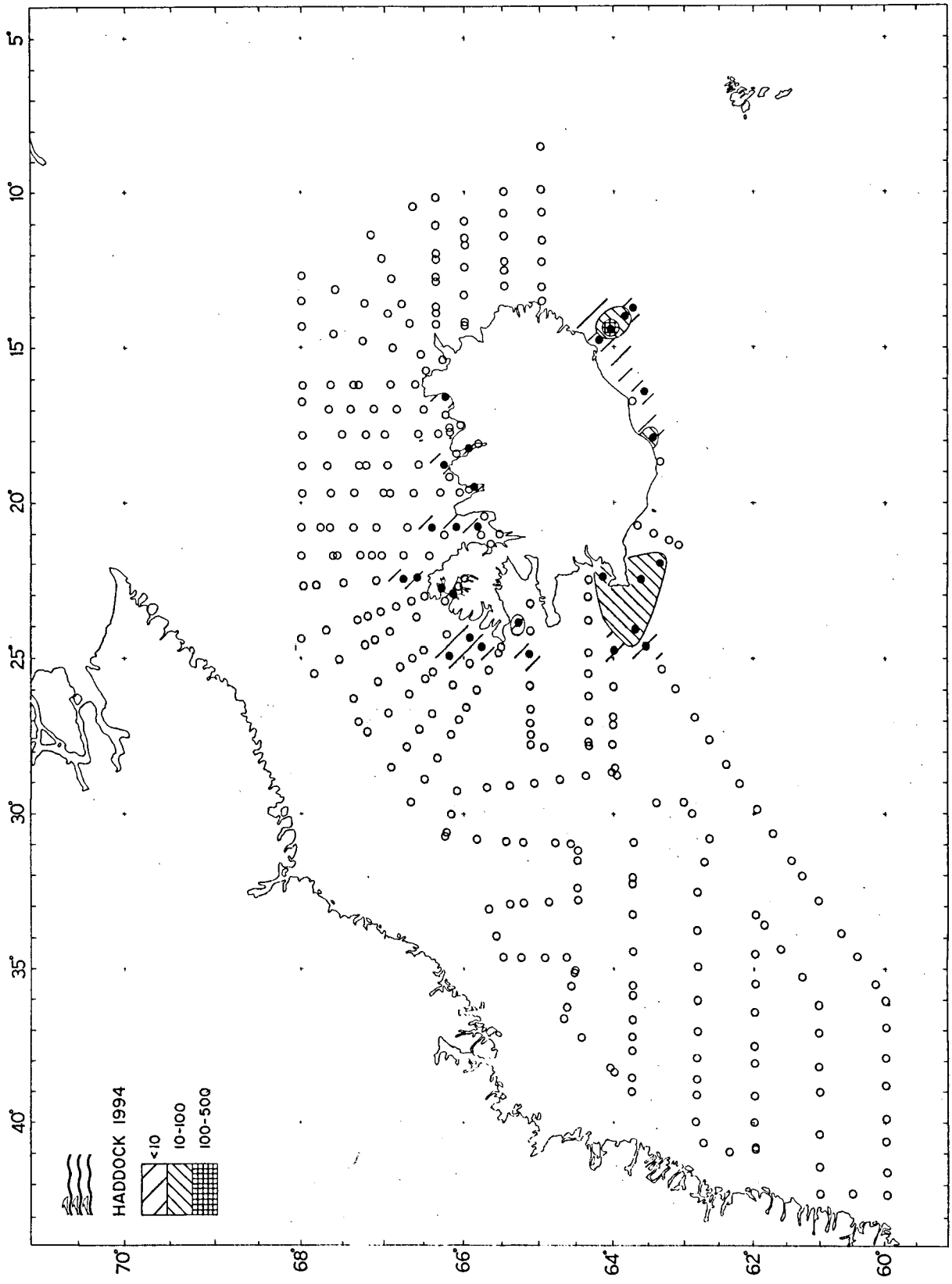

Figure 7. Distribution and density of 0-group haddock (n/1 n.m.), August 1994.

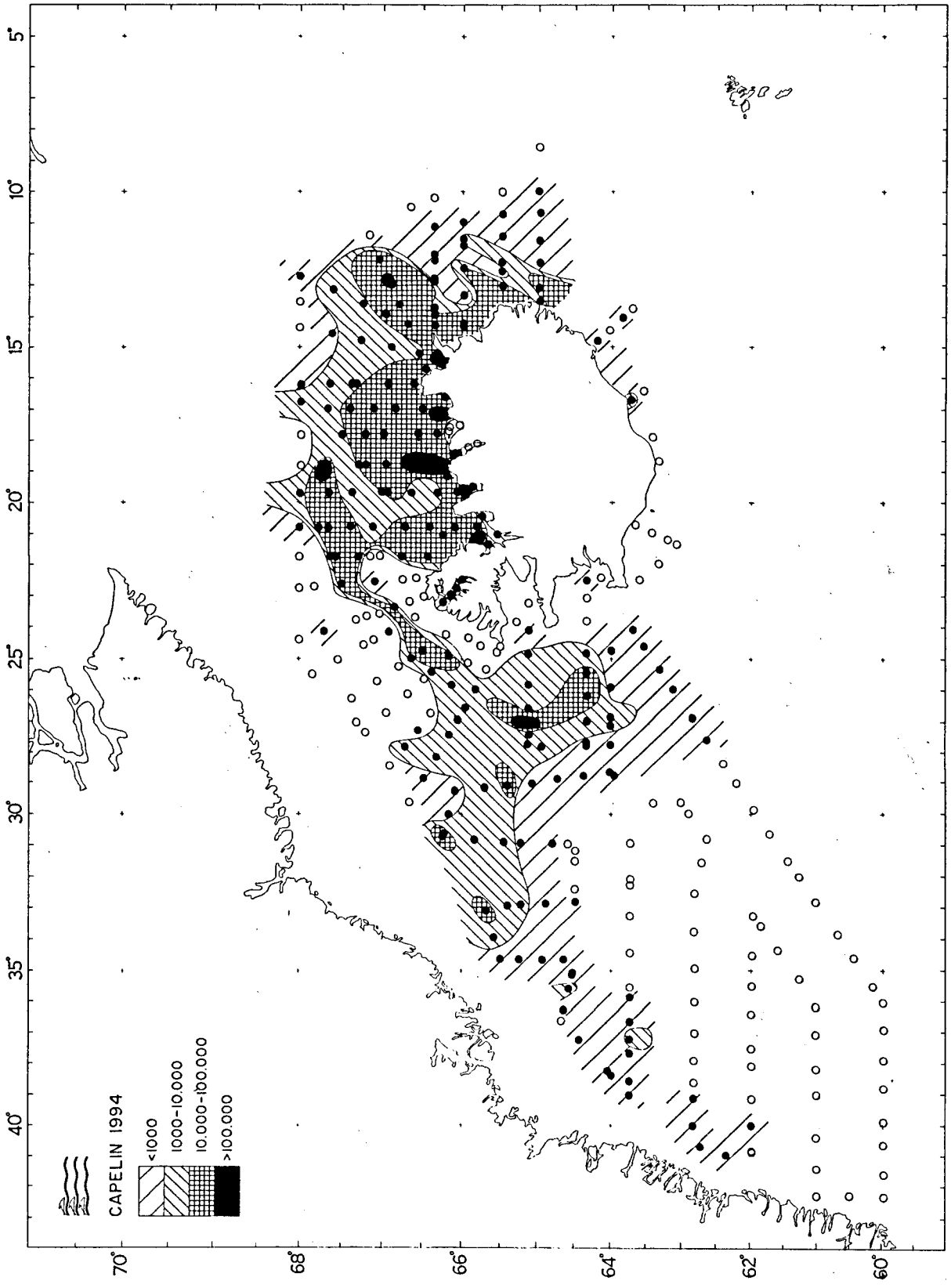

Figure 8. Distribution and density of 0-group capelin (n/1 n.m.), August 1994.

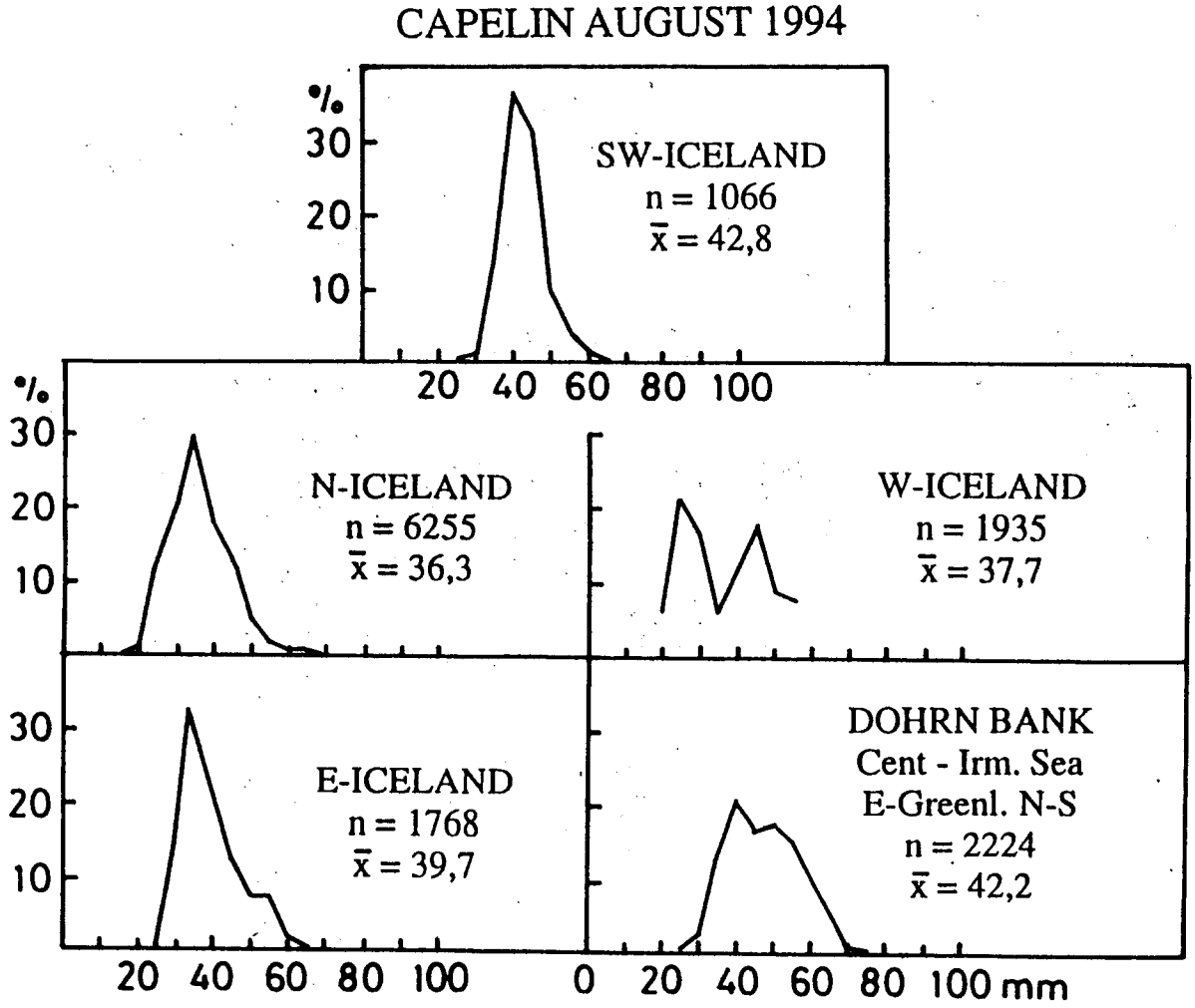

Figure 9. Length distribution of 0-group capelin, August 1994.

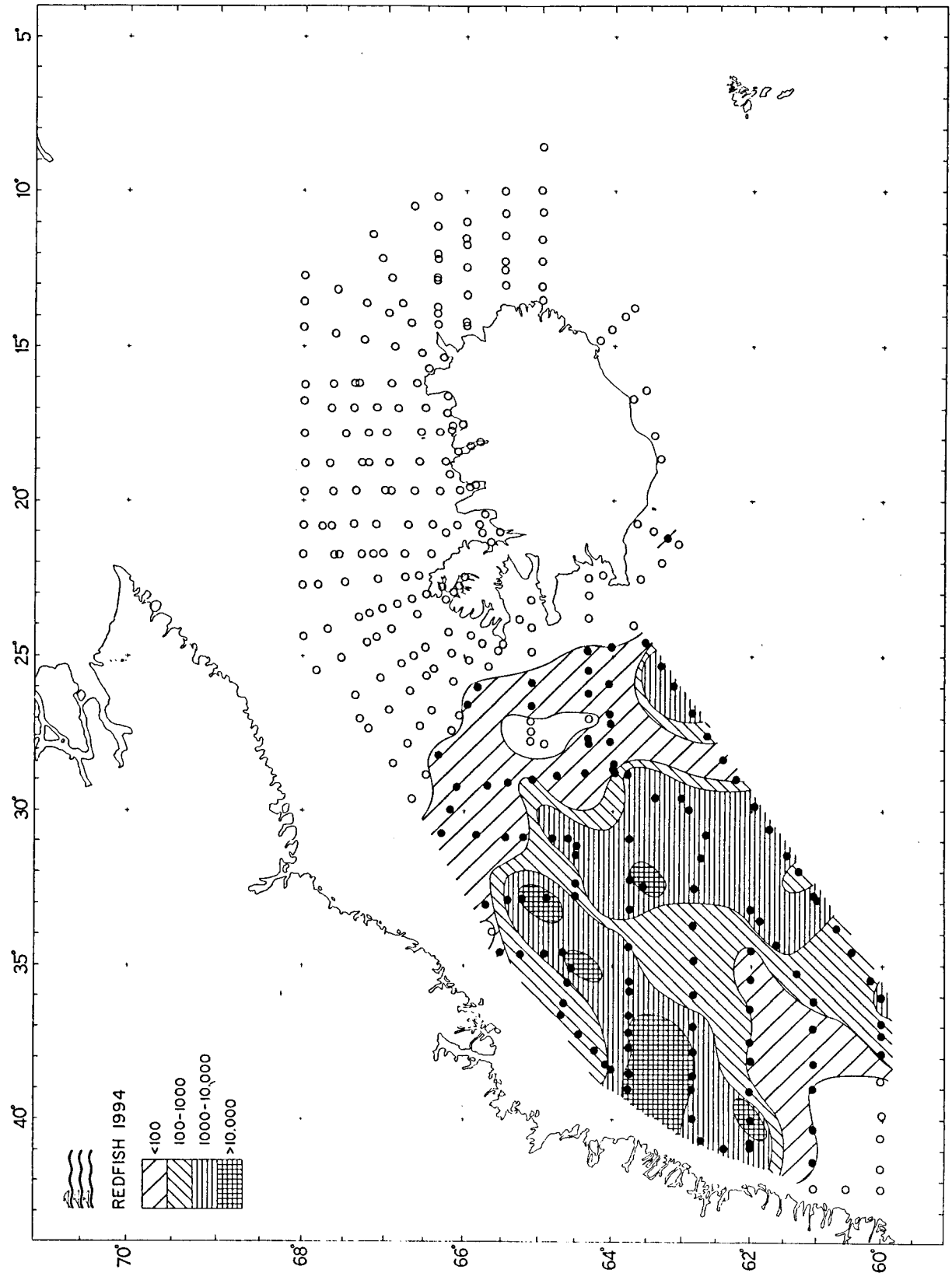

Figure 10. Distribution and density of 0-group redfish (n/1 n..m.), August 1994.

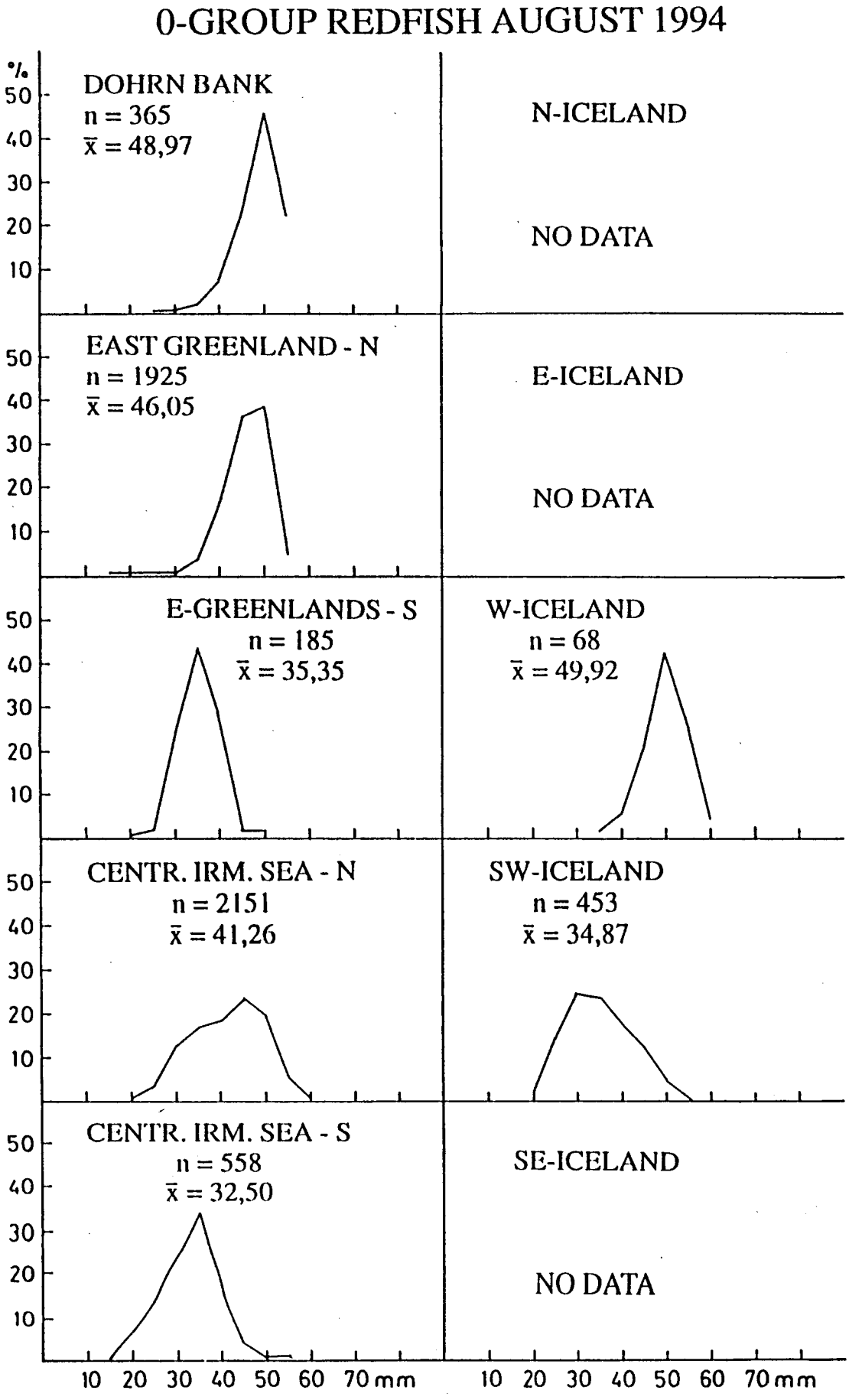

Figure 11. Length distribution of 0-group redfish, August 1994.

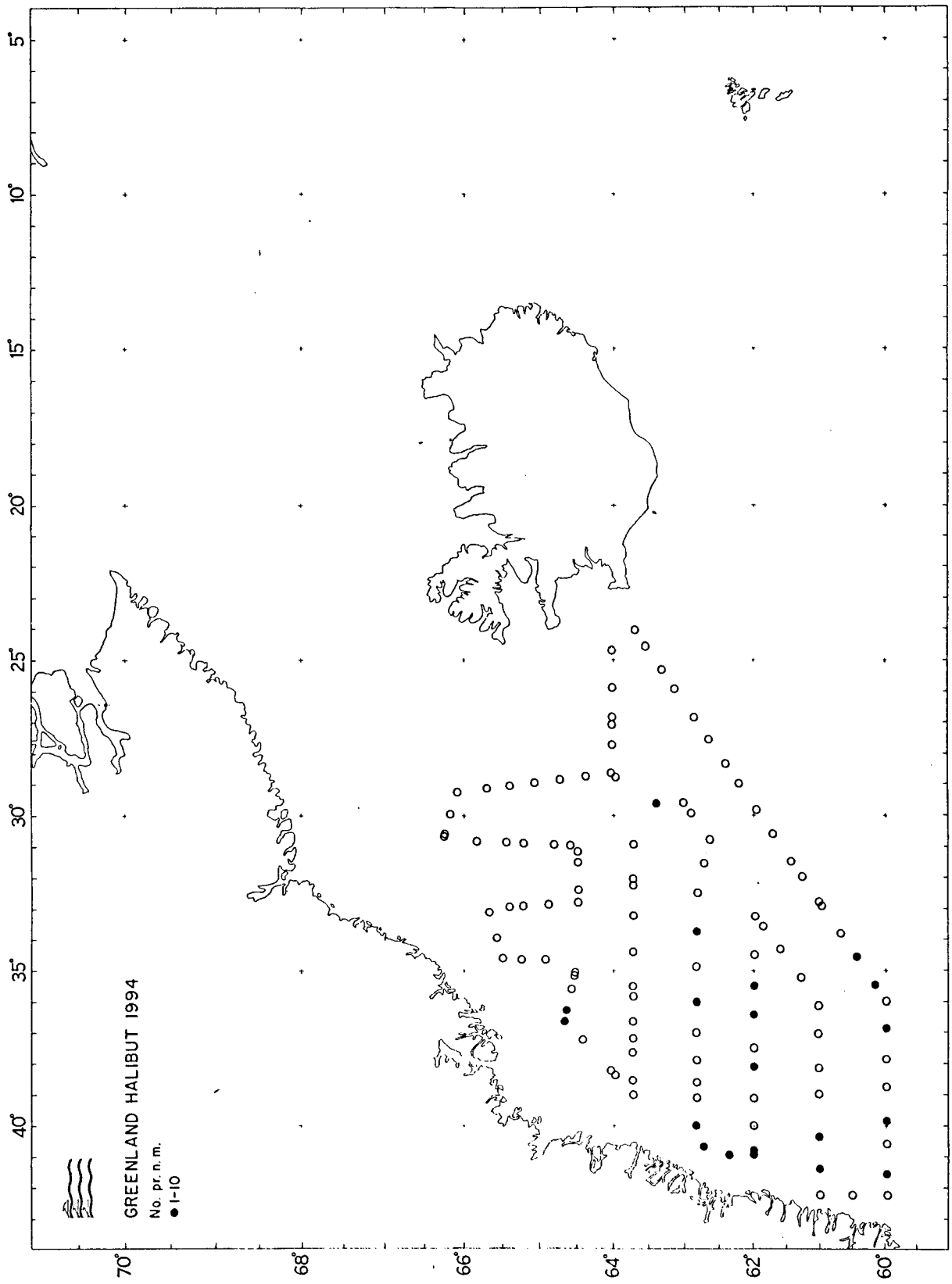

Figure 12. Distribution of 0-group Greenland halibut, August 1994.