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Distribution of 0-group Redfish (*Sebastes* spp.) off West Greenland in Autumn 1991

by

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ABSTRACT

The distribution of 0-group redfish (*Sebastes* spp.) off West Greenland in autumn 1991 is described. Along several transects pelagic trawling was carried out concurrently to the recording of hydrographic data.

Off Southwest Greenland 0-group redfish were most abundant close to the coast in the transition zone between the East Greenland and the Irminger Sea component of the West Greenland Current at a temperature of about 3 °C and a salinity of about 34. Along with their northward displacement 0-group redfish submerged to slightly warmer water and in the northern region maximum densities were found further offshore at the slope of the shelf.

INTRODUCTION

The recruitment of redfish at West Greenland is believed to depend exclusively on larval drift from the Irminger Sea (Pavlov et al. 1989) because no "spawning" at West Greenland itself had been observed so far (Anon. 1984) but large quantities of small redfish occur as by-catch in the shrimp fishery in the Davis Strait (Pedersen 1990, Anon. 1990). Basic information on redfish larval drift is available from the NORWESTLANT surveys carried out in 1963 (Anon. 1968). But in contrast to East Greenland where the abundance of 0-group fish is monitored annually since 1970 (Magnusson & Sveinbjörnsson 1991) information on the offshore distribution of young fish off West Greenland is limited. In this context pilot studies started in 1989 (Wieland 1991).

This paper describes the distribution of 0-redfish along several transects off West Greenland and the corresponding hydrographic conditions in autumn 1991.

MATERIALS AND METHODS

The sampling was carried out during the annual groundfish survey with RV Walther Herwig 17.10.-28.11.91. Young fish samples have been taken with an Isaac Kidd Midwater Trawl (Isaacs & Kidd 1953, Anon. 1986) and a pelagic "krill" trawl designed by Moderhak & Kerpa (Sea Fisheries Institute Gdynia, Poland) concurrently with the collection of hydrographic data along five transects off West Greenland. The sampling locations are shown in Fig.1.

With the IKMT (area of net opening 10 m²; meshsize 20 mm in the main part and 5 mm in the cod end) oblique tows were made to a depth of 15 m off the bottom or to a maximum depth of 175 m. Additionally, at one station subsequent oblique tows to depths of 175 m, 100 m and 50 m were carried out. The towing depth was monitored by an accoustic net sonde. The volume of water filtered was calculated from net opening area, towing time and towing speed. The density of 0-group redfish (in number per nautical square mile) was computed from the number per unit volume of water filtered and the maximum depth of the tow.

For the pelagic "krill" trawl (height of net opening 6 to 8 m, meshsize 10 mm in the cod end) the standard procedure consisted of towings in the scattering layer for 15 min. The validity of this strategy was checked by tows made subsequently within and above the scattering layer. If no traces were recorded with the 33 kHz echo sounder stepped hauls to a maximum depth of 150 m were carried out. During these hauls the trawl was towed horizontally for 5 min at depth intervals of 25 m including semipelagic trawling at the bottom. The catches were standardized to number per nautical mile trawled.

For both gears the towing speed was 3.5 kn and the tows were directed along the isobaths.

The samples were preserved in a 4 % buffered formaldehyd/freshwater solution. In the laboratory 0-group redfish were sorted from the samples and length measurements (total length in mm) were made. Due to methodological uncertainties concerning the correct classification of 0-group redfish (Magnusson 1981, Anon. 1992, Nedraas et al. 1992) it was neither distinguished between the two species *Sebastes marinus* and *Sebastes mentella*, nor between the two stocks "oceanic" and "deep-sea" *Sebastes mentella*.

RESULTS

Fig.2 shows the distribution of 0-group redfish along two transects off Southwest Greenland as well as the corresponding temperature and salinity conditions. Off Kap Farvel the maximum density of 0-group redfish of 0.85 million individuals per nautical square mile was found at the innermost station. At Nanortalik the highest concentration of 0-group redfish amounted to 1.84 million specimens per nautical square mile and was recorded 30 nm offshore. In that region, as illustrated in Fig.3, the center of mass of the vertical distribution was located between 50 and 100 m depth. In this water layer temperature and salinity ranged from 2.57 to 3.40 °C and 33.76 to 34.20, respectively. The length of the inviduals caught off Southwest Greenland in the beginning of the sampling period ranged from 46 to 66 mm, averaging 54.6 mm (Fig.4).

As displayed in Fig.5, along the three transects occupied with the pelagic "krill" net 0-group redfish occurred predominantly at the shelf edge. Off Sukkertoppen, Fyllas Bank and Kap Desolation the highest numbers of individuals per nautical mile trawled amounted to 3699, 9864 and 2477, respectively. From south to north the maximum

density shifted from 10 to 42.5 nm offshore. On the banks as well as in the trench off Sukkertoppen no 0-group redfish were observed, and also at the innermost stations at Fyllas Bank and off Kap Desolation the density of 0-group redfish was low. The depth range of the scattering layer increased from 45-70 m off Kap Desolation to 80-100 m at Fyllas Bank and to 100-120 m off Sukkertoppen. Along with the change in depth the ambient temperature increased from 2.9 to 4.0 °C, whereas the salinity remained at 34.1 in all cases. It is noteworthy that the catches made at high echo densities consisted nearly exclusively of 0-group redfish.
The length distributions of redfish as obtained from the sampling with the pelagic "krill" net are given in Fig.6. The mean lengths for the three transects ranged from 53.0 to 55.8 mm.

DISCUSSION

In general, the results from 1991 confirm the observations made in the previous year concerning the occurrence of 0-group redfish with highest densities close to the coast off Southwest Greenland, whereas further north they were most abundant offshore at the slope of the shelf. But additionally some information on their vertical distribution and the ambient temperature and salinity conditions could be drawn from the material collected in 1991.
In the southern region 0-group redfish appear to occur predominantly at shallow depths in the transition zone between water of artic origin supplied by the East Greenland Current (T: -1.8 °C, S: < 34.5; Clarke 1984) and the warmer and saltier water of the Irminger Current (T: 4-6 °C, S: 34.95-35.1; Clarke 1984). Subsequently, 0-group redfish seem to submerge down to 80 to 120 m depth during their northward displacement.
During the annual icelandic 0-group fish survey redfish were extraordinary abundant in the Irminger Sea and in the East Greenland shelf area but only low densities were recorded at the innermost stations off Southeast Greenland in August and September 1991 (Magnusson & Sveinbjörnsson 1991). At a first view, this seems to be not entirely consistent with the results of the present study. But considering the current regime it can not be rejected that 0-group fish occurring at East Greenland in August/September would have been transported to West Greenland until October/November (Wieland & Brügge 1990). Anyhow, even in the lack of direct observations it appears reasonable to assume that the drift of the larval and 0-group stages is highly important for the recruitment of redfish at West Greenland.

ACKNOWLEDGEMENTS

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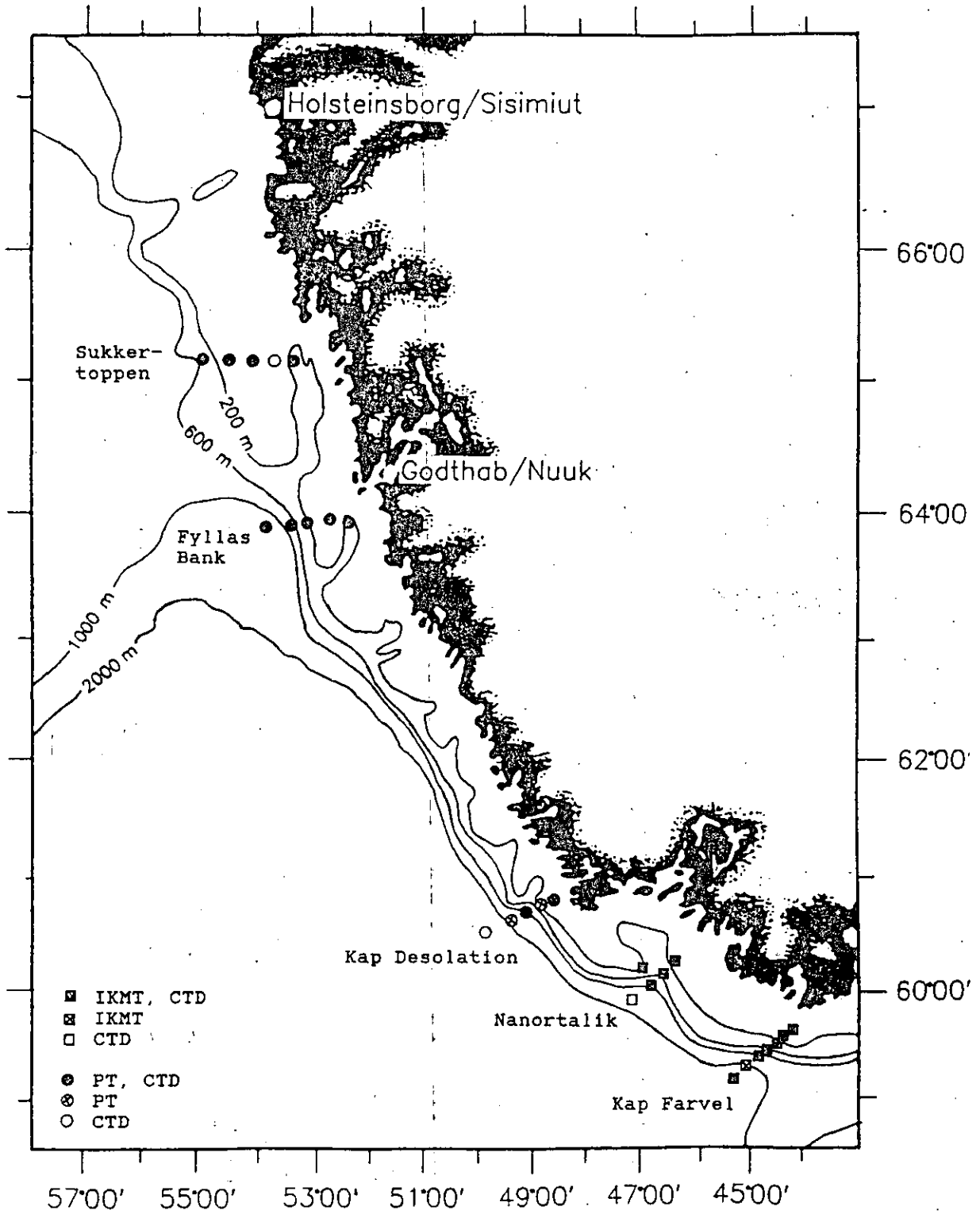

Fig. 1: Sampling locations

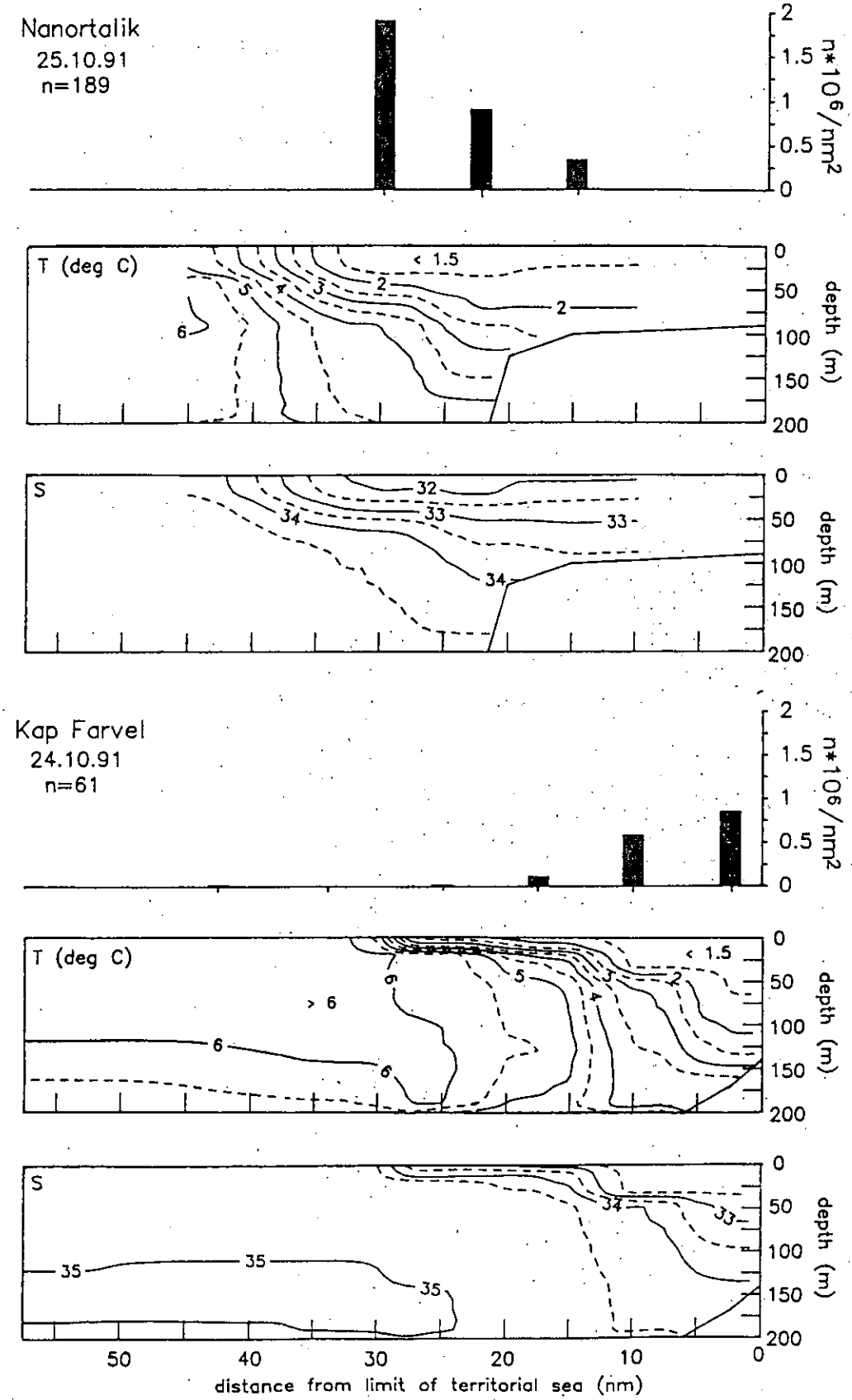

Fig. 2: Distribution of 0-group redfish and hydrographic conditions off Southwest Greenland (n: total number of individuals caught)

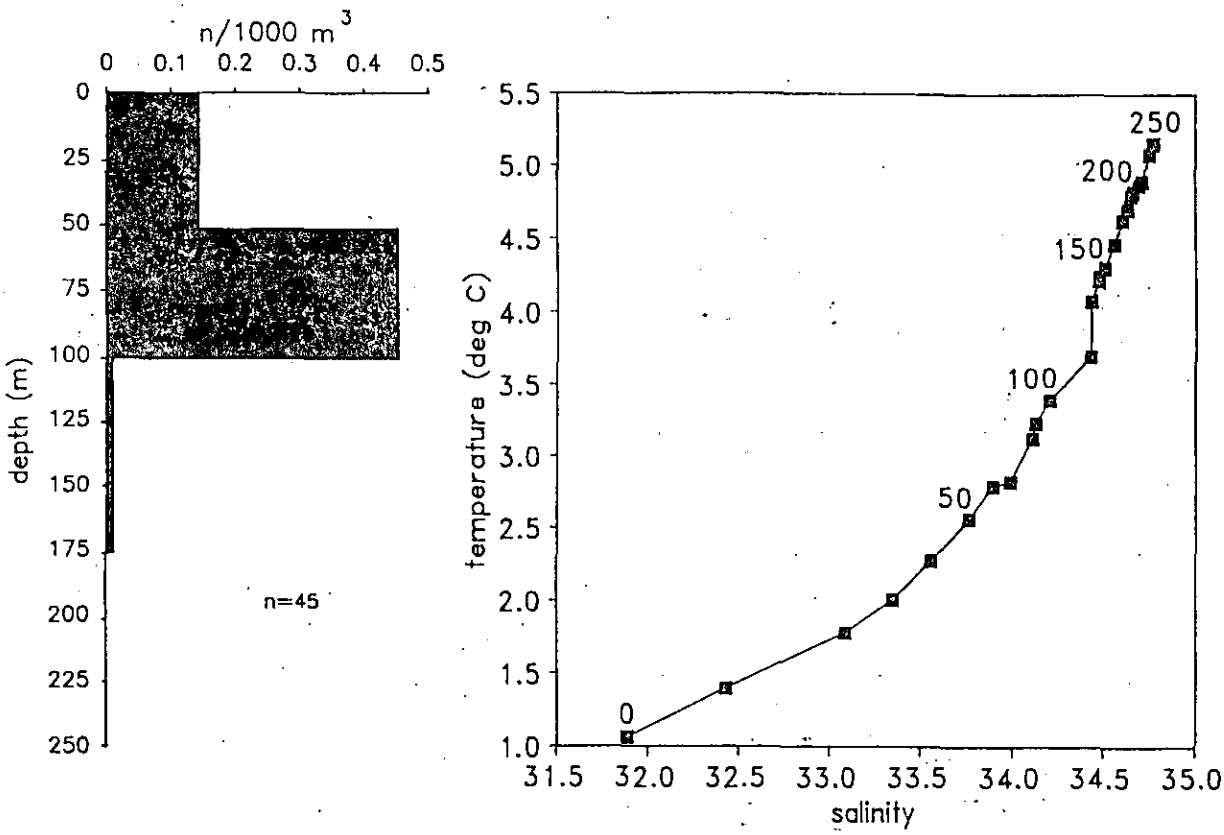

Fig. 3: Vertical distribution of 0-group redfish and corresponding T/S-diagram north from Nanortalik transect (see Fig. 1 for location, n: total number of individuals caught in 3 stepped oblique tows; bottom depth 250 m)

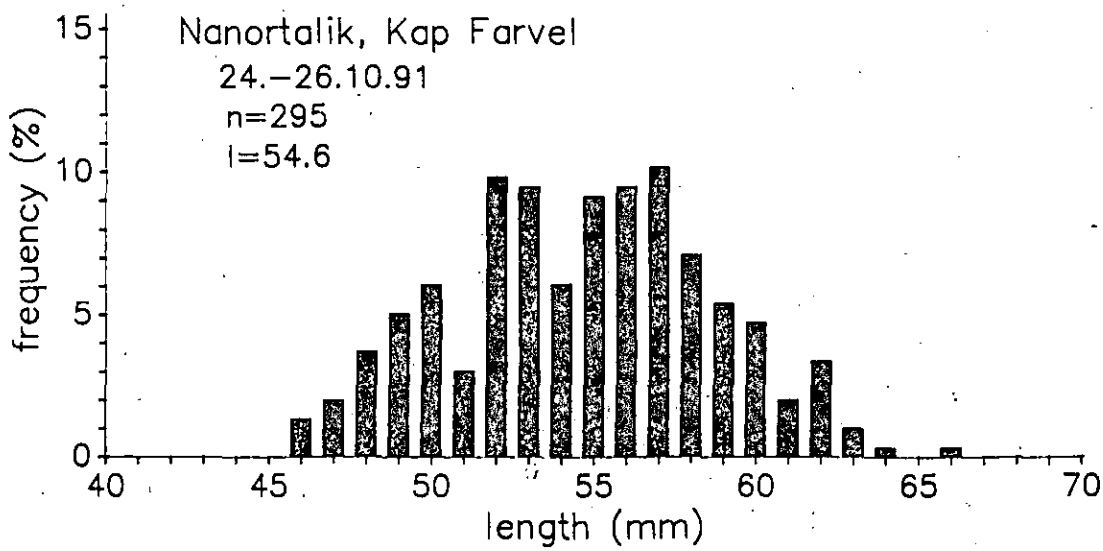

Fig. 4: Length distribution of 0-group redfish off Southwest Greenland (IKMT, n: number of individuals measured, l: mean total length in mm, all stations pooled)

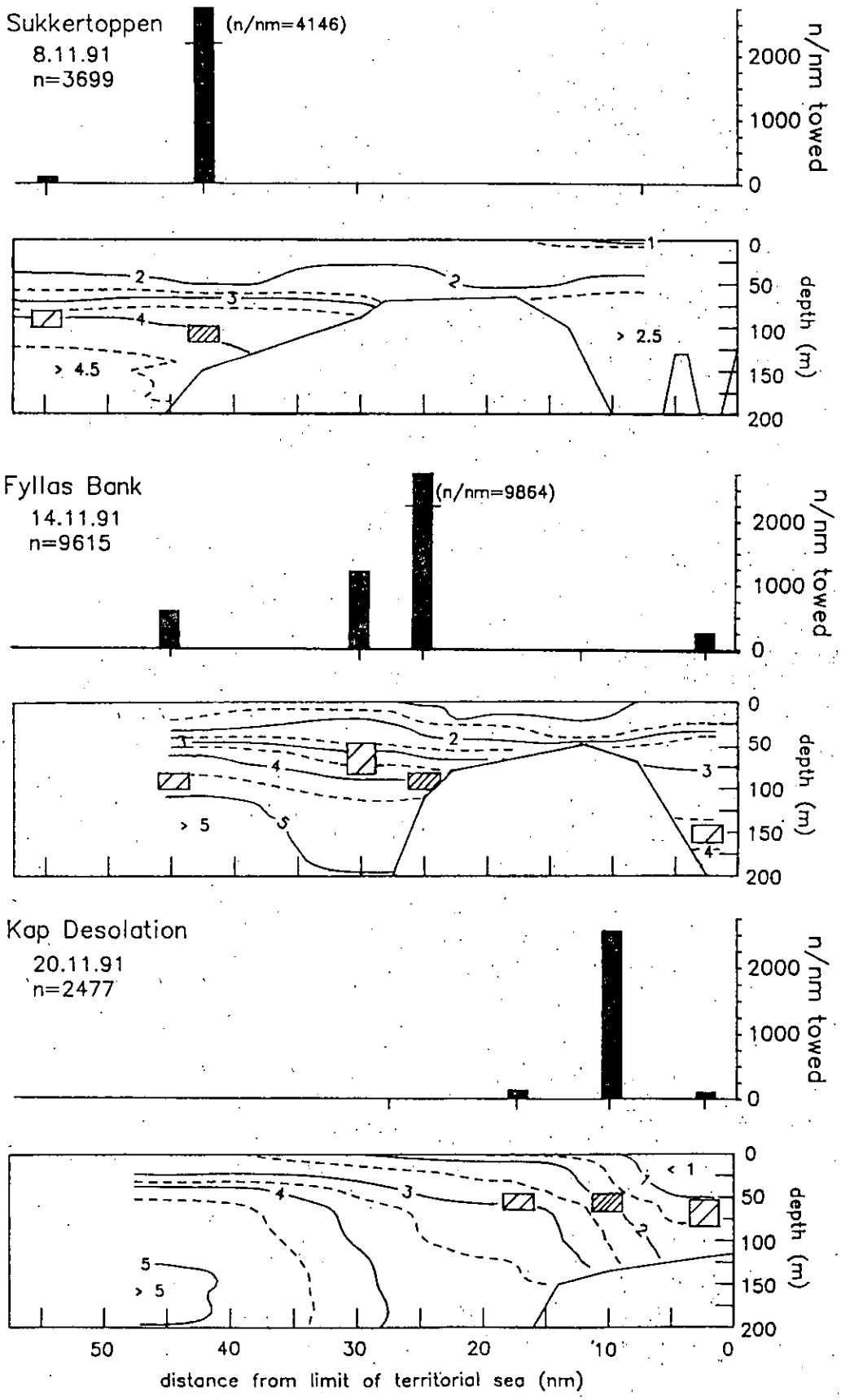

Fig. 5: Distribution of 0-group redfish (n: total number caught), depth of the scattering layer (echo density levels: ▨ high, ▨ moderate, ▨ low) and temperature conditions off West Greenland

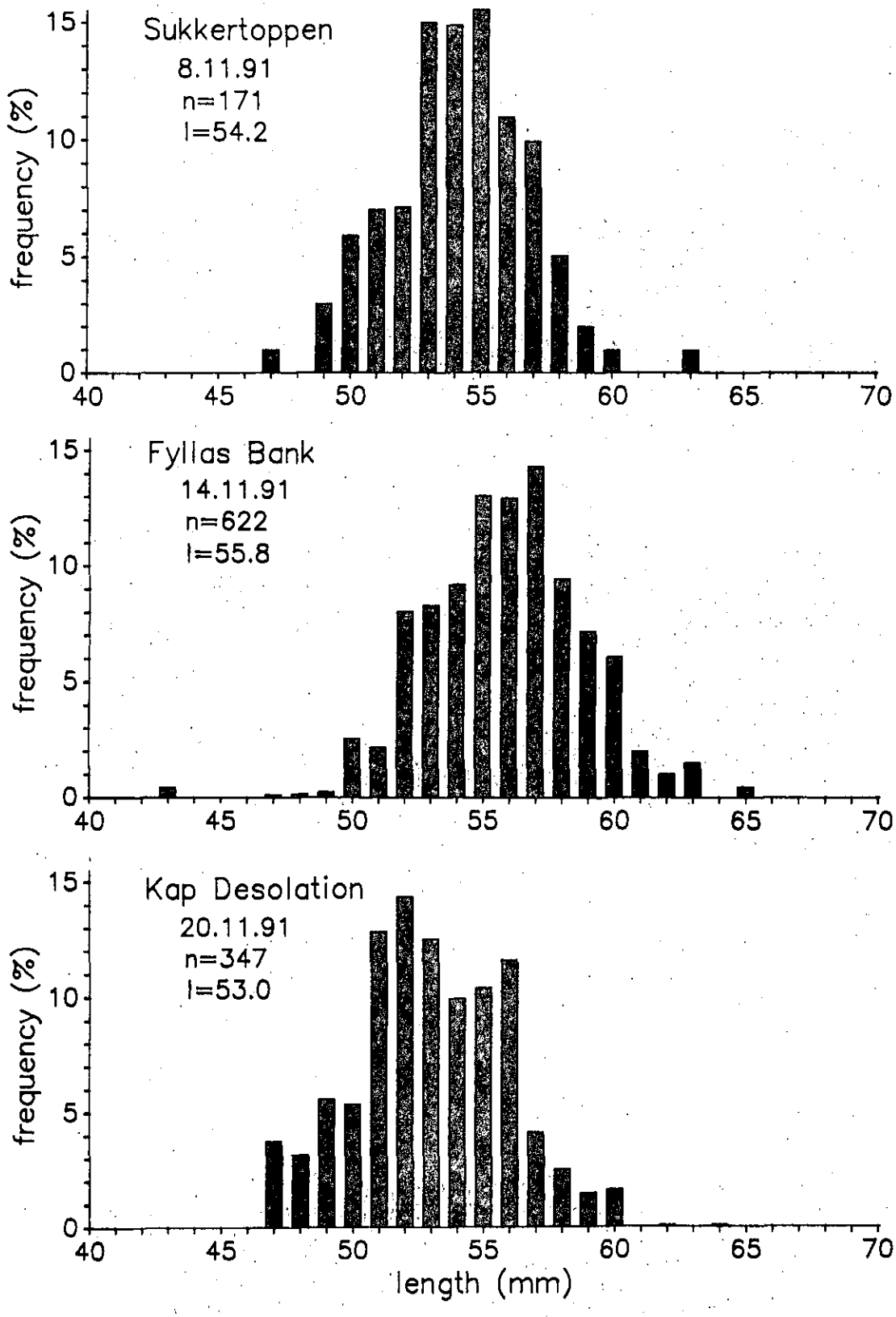

Fig. 6: Length distribution of 0-group redfish off West Greenland (PT, n: number of individuals measured, l: mean total length in mm, transect stations pooled)