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Distribution of Larval and 0-Group Fish off West Greenland
in Summer and Autumn 1989 and 1990

by

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ABSTRACT

Accompanying to a research project focussed on the interaction of fish stocks off West Greenland pilot studies on the distribution of larval and 0-group fish have been carried out in summer 1989 and in summer and autumn 1990.

In both years, larvae and 0-group fish of cod as well as redfish larvae were nearly absent in the samples taken. Greenland halibut larvae were found in summer 1989 and 1990 and seemed to occur exclusively in the upper 50 m preferring temperatures not below 2 °C. In autumn 1990 considerable numbers of young redfish occurred. Off Southwest Greenland they were most abundant close to the coast, whereas in the northern region high densities were observed predominantly at the outermost stations.

INTRODUCTION

In recent years, increasing attention has been paid on the interrelationships between West Greenland and East Greenland/Iceland fish stocks. For cod, it has been proposed that recruitment to the West Greenland stock derives considerably, at least in some years, from larval drift from Iceland and East Greenland to West Greenland (Anon. 1990a) and also from immigration of immature fish (Rätz 1990). Redfish recruitment is believed to depend exclusively on larval drift from the Irminger Sea (Pavlov et al. 1989) since no "spawning" at West Greenland have 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. 1990b). Basic information on the occurrence and distribution of fish larvae in West Greenland waters is given by the NORWESTLANT surveys carried out in 1963 (Anon. 1968) but no direct observations on the drift of larval and young fish towards West Greenland exist and even the information on the offshore distribution of 0-group fish at West Greenland is limited. In this context, accompanying to bottom trawl surveys for investigating interactions of fish stocks off West Greenland, pilot studies on the distribution of pelagic young fish stages have started in 1989. In this paper the results of these studies concerning the distribution of larval and 0-group cod, Greenland halibut and redfish are presented.

MATERIALS AND METHODS

Ichthyoplankton and young fish samples have been taken concurrently with the collection of hydrographic data along transects off West Greenland on cruises with RV Poseidon 6.7.-4.8.89 and 12.7.-12.8.90 and RV Walther Herwig 20.10.-28.11.90 (Fig.1). During the first study discrete depths were sampled with the

MOCNESS (Multiple Opening Closing Net and Environmental Sensing System, Wiebe et al. 1976). In summer and autumn 1990 oblique tows were carried out with an Isaac Kidd Midwater Trawl (Isaacs & Kidd 1953, Anon. 1986) at NAFO standard hydrography stations. The towing depth of the IKMT was monitored by an acoustic net sonde and a flowmeter was attached in the center of the net opening. The specifications of the sampling gears are summarized in Tab.1. The towing speed was 3 knots for both gears.

The samples were preserved in a 4 % buffered formaldehyd/freshwater solution. In the laboratory fish larvae and young fish were sorted from the samples and length measurements (total length in mm) were made.

The density of fish larvae and young fish (in number per nautical square mile) was computed from the number per unit volume of water filtered and the maximum towing depth (IKMT). For the MOCNESS samples following equation was used:

$$d = 1852 * 10^6 * \sum n_i/v_i * z_i,$$

d density (n/nm²)
n number of individuals
v volume of water strained (m³)
z depth range covered (m).
i net number

RESULTS

Cod

In both years no cod larvae had been found and only one 0-group cod was caught (autumn 1990, Holsteinsborg transect at 66°50'N and 54°42'W).

Greenland halibut

In summer 1989 some Greenland halibut larvae were observed at Fyllas Bank (Fig.2). They concentrated in 20 to 40 m depth, where the temperature amounted about 2 °C. No individuals were found below 50 m depth in the colder water. The length ranged from 24 to 31 mm (Fig.4). In the southern area only two individuals were caught (transect 6, Fig.1). In summer 1990 Greenland halibut larvae occurred at each of the three transects occupied (Fig.1). Mean lengths were 35.3 mm at the Holsteinsborg transect and 33.7 mm at Fyllas Bank (Fig.4). In contrast to those similiarities considerable numbers of larger larvae with a mean length of 45.1 mm were found 50 and 75 nm offshore from Kap Desolation. There, the temperature in the upper 200 m of the water column did not fall below 3 °C. In autumn 1990 in total four 0-group Greenland halibut were caught off Holsteinsborg and at Fyllas Bank. The length range of these individuals was 62 to 72 mm.

Redfish

Redfish larvae were nearly absent in both years. In summer 1989 just one larva was caught (transect 4 at 61°30'N and 52°00'W, Fig.1). In 1990 no larvae were found in summer but considerable numbers of young (probably 0-group) redfish occurred in autumn (Fig.5). Off Southwest Greenland they had been most abundant close to the coast. Maximum densities of about one million individuals per nautical square mile were found at the innermost stations off Kap Farvel and Kap Desolation, where the water temperature did not exceed 3 °C. At Fyllas Bank 0-group redfish was more widely distributed whereas in the northern area maximum

abundance was recorded predominantly at the outermost stations 40 to 75 nm offshore. Corresponding length distributions are given in Fig.6. In the beginning of the sampling period the mean length ranged between 56.6 and 57.5 mm (Kap Farvel, Kap Desolation and Sukkertoppen transects). At Fyllas Bank the mean length amounted 60.8 mm and the length of the individuals caught off Frederikshaab at the end of the cruise was from 54 to 64 mm, averaging 59.4 mm.

DISCUSSION

Although the sampling was rather limited in space and time the absence of cod larval and 0-group stages seems to reflect that recruitment due to spawning off West Greenland as well as due to larval drift from Iceland and East Greenland to West Greenland was negligible in 1989 and 1990.

The results concerning the vertical distribution and temperature preference of Greenland halibut larvae are in accordance with previous studies, which showed that the larvae have a wide horizontal distribution offshore but avoid the cold coastal water off Southwest Greenland (Smidt 1970).

The pronounced differences in abundance of 0-group redfish in autumn 1990 along the several transects and between the stations of a single transect are striking. The low abundance found at Fyllas Bank and especially off Frederikshaab might be related to the late sampling date since redfish is believed to descend to bottom living at a length of about 60 mm (Pedersen 1990). No age readings have been made but considering recent age/length relationships of Northeast Atlantic redfish (Nedraas 1990) and the uniform length distribution the individuals caught are believed to belong to the 0-group. The absence of larvae in summer and the occurrence of considerable numbers of young fish in autumn elucidates the importance of larval drift for the recruitment of redfish at West Greenland. Concerning to Pavlov et al. (1989) and based on trajectories of satellite-tracked drifters (Wieland & Brügge 1990) it appears that larvae "spawned" in the Irminger Sea in April to May drift towards East Greenland, where high densities of 0-group redfish (mean length appr. 45 mm) can be found in August/September (Magnusson & Sveinbjörnsson 1990). Subsequently, they might be carried southward with the East Greenland current, passing Southwest Greenland in September/October and continuing with a northward displacement during October and November at West Greenland. This would explain the occurrence of large quantities of small redfish (age 1+, 7 to 15 cm length) as by-catch in the shrimp fishery in the Davis Strait (Pedersen 1990, Anon. 1990b). However, direct observations on the drift of larval and postlarval stages as well as more detailed information on the abundance and distribution of 0-group fish off West Greenland seem to be highly desirable.

ACKNOWLEDGEMENTS

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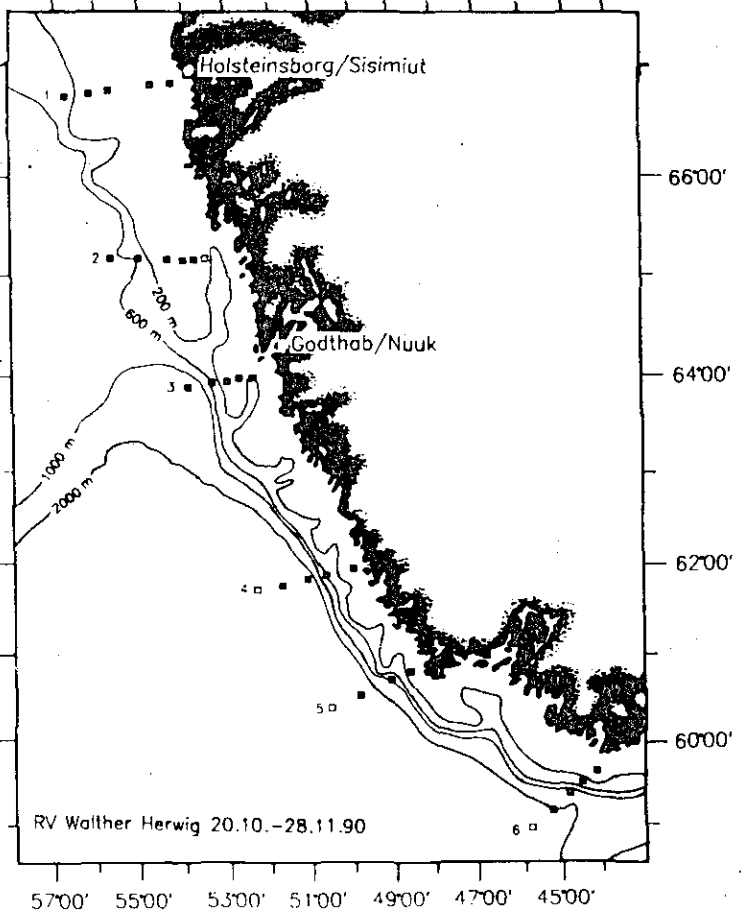
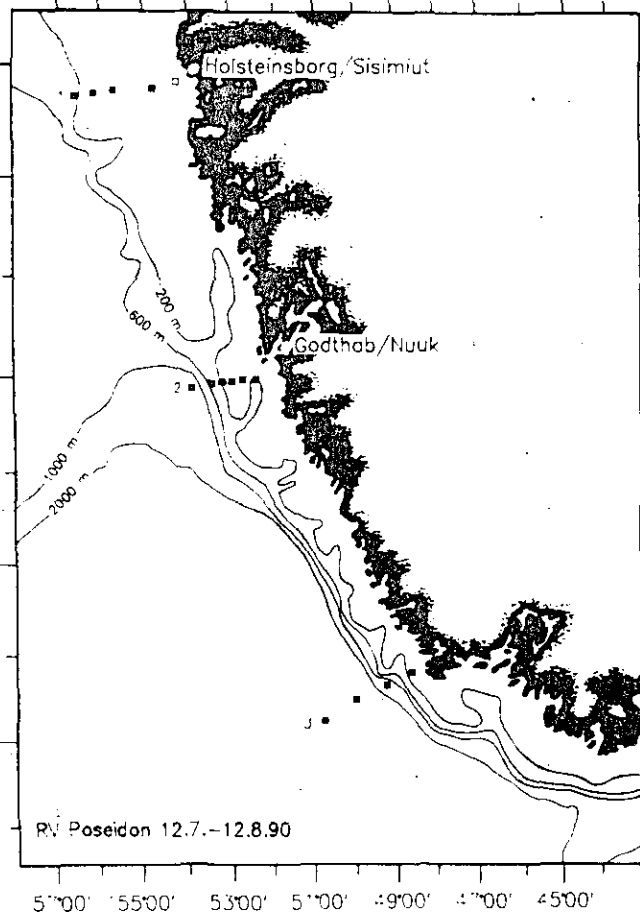
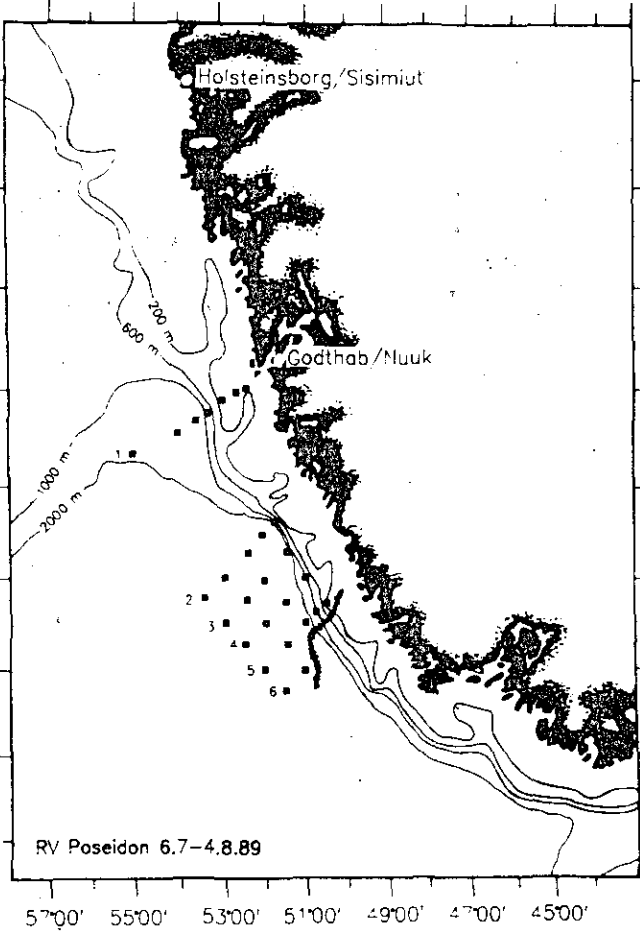
Tab. 1: Sampling dates and gear specifications

cruise	gear	net opening	mesh size	maximum depth of tow *
RV Poseidon 06.07.-04.08.89	MOCNESS	1 m ²	0.3 mm	200 m
RV Poseidon 12.07.-12.08.90	KMT	10 m ²	4.5 mm	175 m
RV Walther Herwig 20.10.-28.11.90	KMT	10 m ²	5.0 mm (cod end) 20 mm (main part)	200 m

*: minimum distance from bottom 15 m. tows directed along isobaths

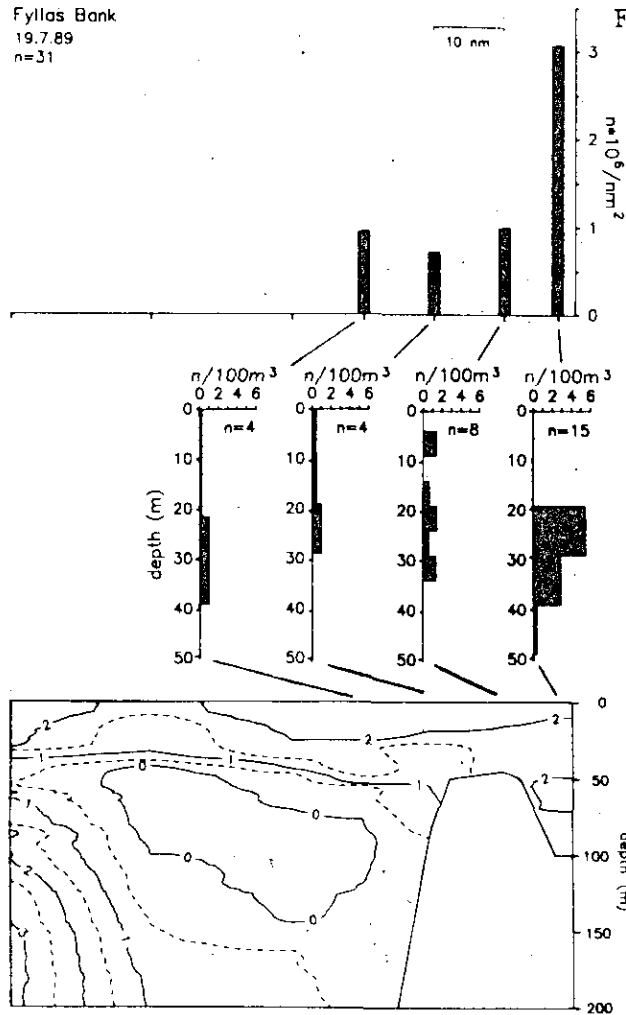
Fig.1: Sampling locations

- MOCNESS (RV Poseidon '89) or IKMT (RV Poseidon '90, RV Walther Herwig '90) and CTD
- only CTD



1 Fyllas Bank
19.7.89
n=31

Fig. 2: Abundance and vertical distribution of Greenland halibut larvae and temperature at Fyllas Bank in summer 1989



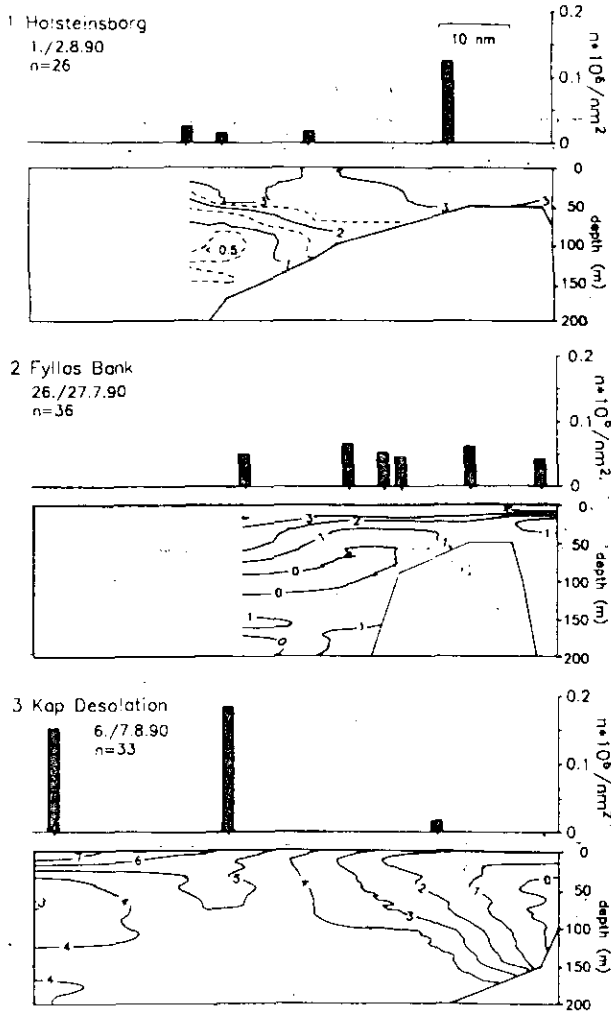


Fig.3: Distribution of Greenland halibut larvae and temperature conditions off West Greenland in summer 1990

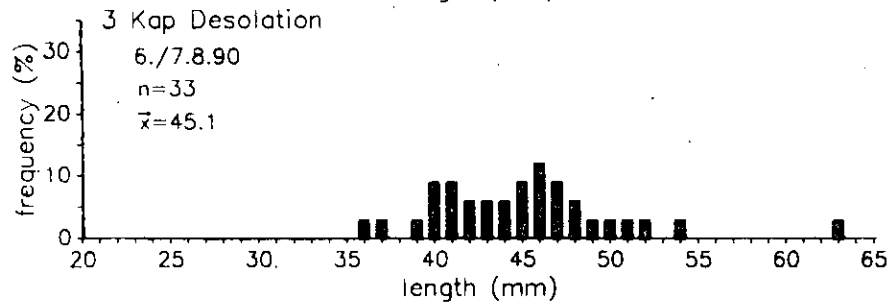
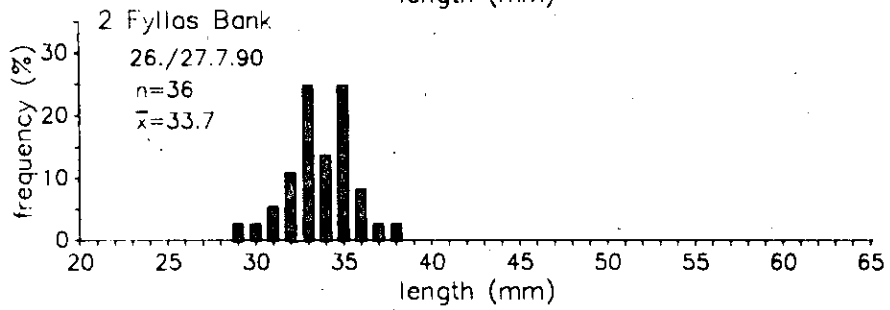
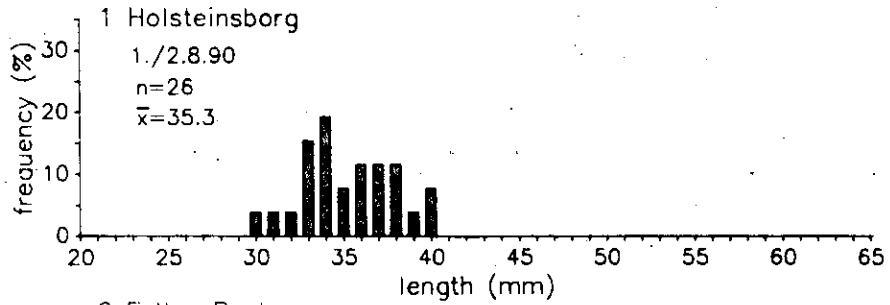
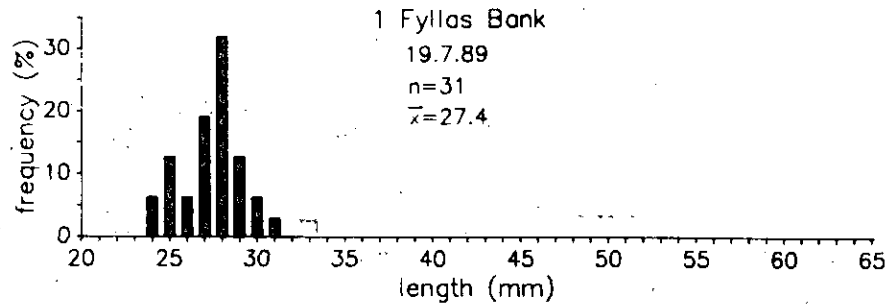
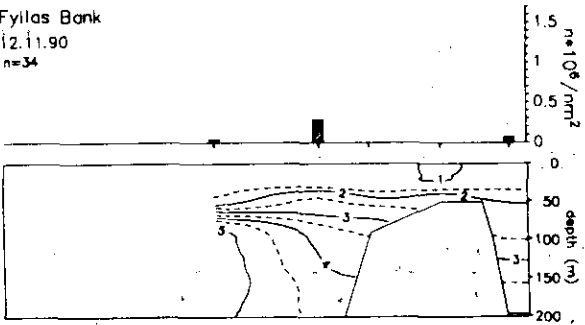
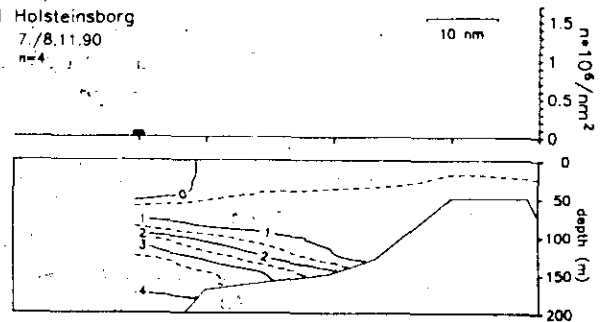


Fig.4: Length distribution of Greenland halibut larvae off West Greenland in summer 1989 and 1990 (n: total number, \bar{x} : mean length in mm)

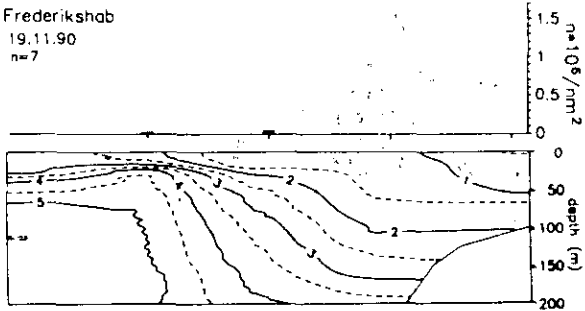
3 Fyllas Bank
12.11.90
n=34



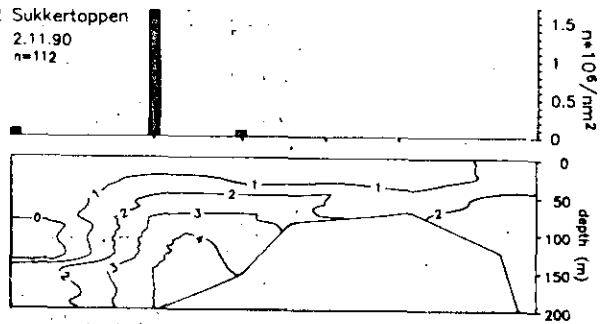
1 Holsteinsborg
7./8.11.90
n=4



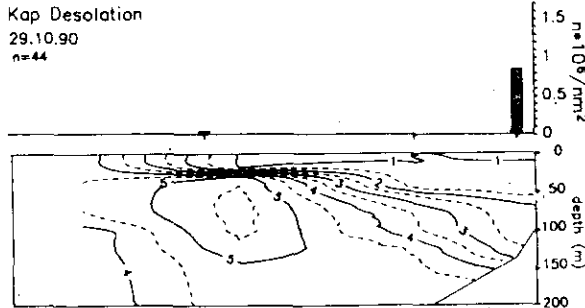
4 Frederikshab
19.11.90
n=7



2 Sukkertoppen
2.11.90
n=112



5 Kap Desolation
29.10.90
n=44



6 Kap Farvel
23.10.90
n=112

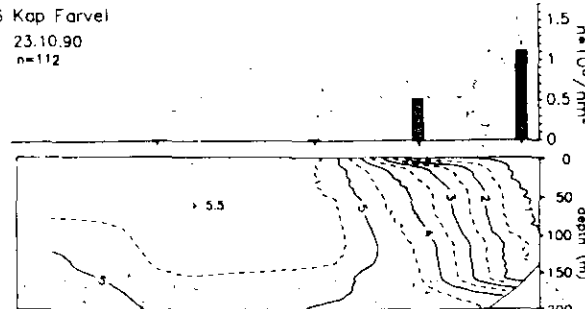


Fig.5: Distribution of young redfish and temperature conditions off West Greenland in autumn 1990

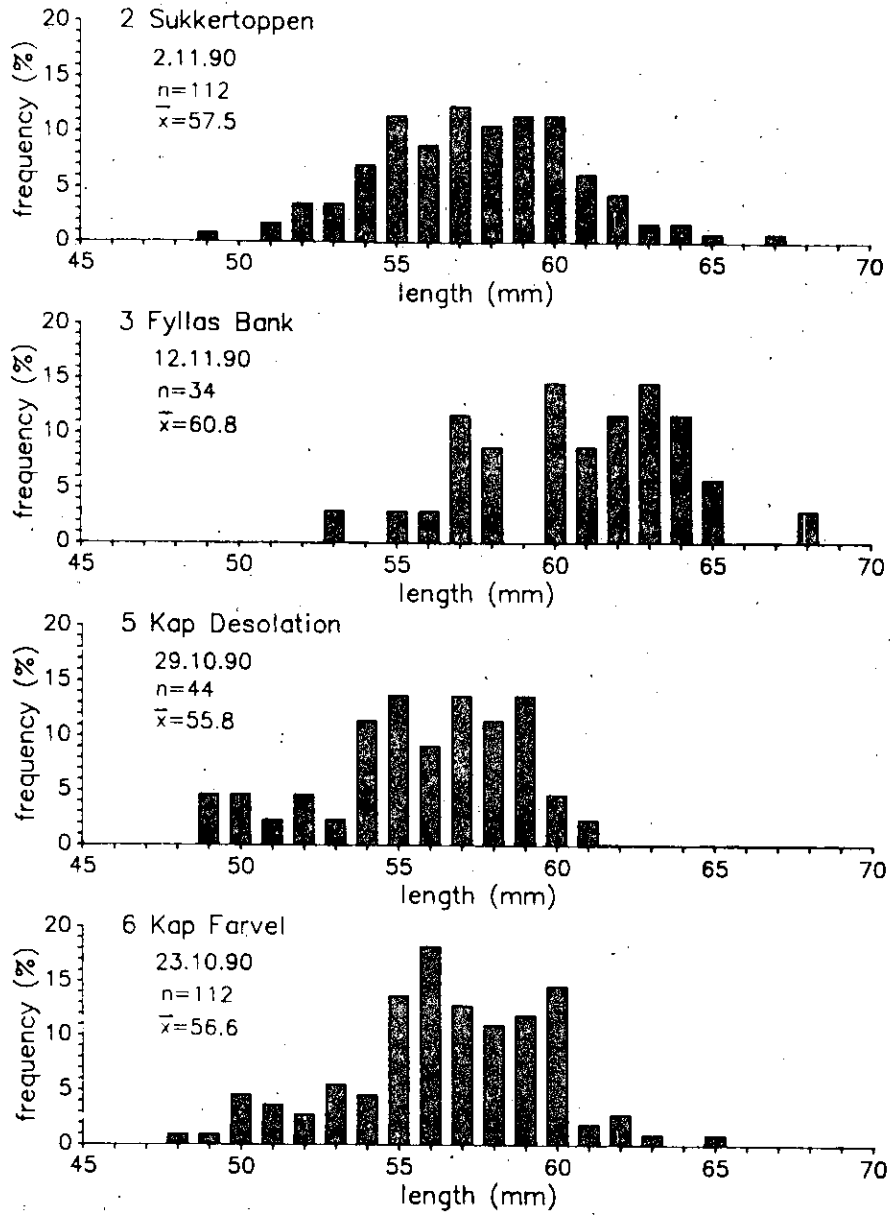


Fig.6: Length distribution of young redfish off West Greenland in autumn 1990 (n: total number, \bar{x} : mean length in mm)