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Investigations on capelin (*Mallotus villosus*) and sand eel (*Ammodytes* sp.) at West Greenland in June-July 1974

by

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INTRODUCTION

During the time intervall 6 June - 31 July 1974 a survey to West-Greenland was carried out with M/S "Havdrøn" with the aim to investigate the distribution, biology and abundance of capelin and to collect biological material on the sand eel species in the area.

In this report some preliminary results from this cruise will be presented.

Every year in May - July capelin concentrations congregate along the coast of West-Greenland to spawn. A small fishery for capelin at this time has been of great importance to the Greenlanders (HANSEN og HERMANN 1953), but compared to the stock size this fishery is supposedly insignificant. Indirectly the capelin stocks are of greater importance as one of the main food animals for the greenlandic cod stock, and during the capelin spawning time a coastal fishery on cod pursuing capelin takes place (HANSEN og HERMANN 1953, HORSTED and SMIDT 1964). The main distribution of capelin at West-Greenland is from Disko to Kap-Farvel. Inside this area, previous investigations (HANSEN og HERMANN 1953, JENSEN 1948) indicate that capelin is predominately found in the fjords and coastal areas. Outside the coast capelin has been recorded as far out as to the eastern edges of the banks. An investigation by Kanneworff (1968) suggests independant stocks in every fjord. The spawning time in southern West-Greenland is in Mai-June and in northern West-Greenland in June-July. The only known spawning areas are in shallow water in bays and fjords. The eggs are deposited on gravel and rocks and to a large extent also on algaes (HANSEN og HERMANN 1953, JENSEN 1948).

Two or three species of sand eel (Ammodytes sp.) are found in West-Greenland waters. These are so far practically unexploited but are aside capelin one of the main food animals for the cod stock (HANSEN 1949, HORSTED and SMIDT 1964).

The general biology of the sand eel stocks at West-Greenland is not known. An investigation on the larval distribution based on

plankton samples (EINARSSON 1951) indicates that the larvae are hatched in May-June. The morphological differences between the sand eel species found at West-Greenland are only small, and during the field work no attempt was made to separate them.

MATERIAL AND METHODS

The same methods which have been used in the capelin investigations in the Barents Sea during recent years (NAKKEN og VESTNES 1970, HAUG og MONSTAD 1974) were adopted for this survey.

The echo-integrator gave a measure of fish density, and the recordings were identified with pelagic trawls.

The following pelagic trawls were used: A "Bastrål" with 940 meshes á 300 mm in circumference and an "Engeltrawl" with 572 meshes á 560 in circumference. A full description of the trawls are given in ANON. (1972). In addition there was a fine meshed net placed in the codend of the trawls.

For hydrographic observations a bathy termograph, and reversing water bottles were used.

AREA OF INVESTIGATIONS

Because of the ice condition it was not possible to commence the investigations farther south then at Arsuk (N61°10', W 48°30'). On the way north the largest banks and some of the fjords north to Umanak (N71°00',W 52°00') were surveyed.

On the way south the investigation was concentrated mainly to the banks, but four fjords (Arsukfjord, Godthåpfjord, Amerdloqfjord and Sarquardloqfjord) which had been surveyed on the way north, were resurveyed in order to compare possible changes in density of capelin in the mean time.

Fig. 1 shows the survey grid on the banks, and Fig. 2 the first survey of the Godthåpfjord.

RESULTS AND DISCUSSION

Capelin

Distribution and quantity of capelin on the banks in metric tons/

(nautical mile)^2 recorded during the first and second part of the cruise are shown in Figs. 3 and 4, respectively.

During the first part of the cruise capelin was only recorded on a limited area at Fyllas Bank and the quantities were only small. During the second part capelin was distributed over a considerably larger area of the banks, and the quantities were also greater. The capelin was recorded as easily recognisable layers and small shoals (Fig. 5 and 6).

The recording of capelin in the fjords were on the average larger than on the banks. Young capelin, and during the first part of the cruise, also females which had recently spawned were distributed in the upper 50 metres over deeper water in the fjords. In some fjords, especially Godthåpsfjord, in very shallow water spent male capelin were found close to the shore.

In the four selected fjords a considerable reduction in recorded quantity took place between the first and second part of the cruise (Table 1). The reliability of the calculations will vary because of different survey coverage in the various fjords, and the recordings of spent male capelin during the first part of the cruise are not included in the estimates. The values in Table 1 must only be regarded as approximate values, and there are no attempts at variance estimations. The values should, however, give a correct picture of the changes that took place.

The length and age distribution of capelin caught during the cruise (Fig. 7) show a reduction of the largest length groups in the fjords in the second part of the cruise compared to the first. On the banks only the largest length groups were caught.

There are considerable difficulties in ageing capelin from West-Greenland, because the larval check ring (TEMPELMANN 1968) in many otoliths is laid down simultaneously with the first winterzone. This is caused by the late spawning (May-July) compared with February-April in the Barents Sea. The biological and statistical data on capelin at West-Greenland are insufficient, and the growth seems also to vary from fjord to fjord (KANNEWORFF 1968). It is therefore not possible by using growth parameters with material

from only one survey to distinguish between the larval check ring and a zone comprised of the larvae check ring and the first winter zone. In order to obtain a satisfying age determination it would be neccesary with samples throughout the year from a number of fjords. In the age distribution (Fig. 7) there is tentatively tried to distinguish between the larvae ring and the first winter zone, and this must only be regarded as a best possible approximation at this time.

Fig. 7 shows that while all agegroups of capelin (1-5 year) were found in the fjords, only 2-4 year old capelin were caught on the banks. The selektivity of the trawls is probably the main reason for the scarce amount of 1-group capelin caught. Another reason might be differences in vertical distribution (BELTESTAD, NAKKEN and SMEDSTAD 1975). The 1973 yearclass of capelin at West-Greenland might also be weak.

The survey was carried out immediately after the spawning and only few specimens with running sexual organs were caught. The distribution of maturity stages (Tab. 2) show, however, that during the first part of the cruise a significant part of the catches in the fjords and on the banks consisted of recently spent capelin. On the southern cruise this fish had dissapeard from the catches in the fjords, but were still found on the banks.

The wider distribution and greater concentrations of capelin on the banks in the second part of the survey compared to the first one indicates a migration to banks after the spawning. This migration has been reported earlyer (HANSEN og HERMANN 1953), but has not been recorded so far to the west. Most of the capelin dies after the spawning, but some that spawn at an age of 2-3 years survive (PROKHOROV 1960; VILHJALMSSON 1968). The catches on the banks indicate that it is these together with the largest immature 2-3 years old, that first migrate to the banks. In order to get better data on the migration and on the growth and recruitment it would be nesceccary to make similar investigations later in the year.

Because a significant part of the capelin stock was distributed in inshore areas and fjords, and further the density varied between the

fjords (Tab. 3) no attempt has been made to calculate the size of the stock at West-Greenland. A comparison with an investigation on the Barents Sea capelin stock in May-June 1974 (DALEN og DOMMASNES 1974) shows, however, that the West-Greenland stock is considerably smaller than the stock in the Barents Sea. Probably only 5-10 % of the Barents Sea stock.

Sand eel

Pelagic concentrations of sand eel were recorded on all the banks surveyed on both parts of the cruise. Distribution and relative echo abundance of sand eel recorded during the whole cruise is shown in Fig. 8. The target strength for sand eel is not known and in the figure the average integrator recording for every 5 nautical mile sailed is plotted. Sand eels are often found burrowing into the bottom sediment or very close to the bottom, and it is therefore not possible to make any acoustic abundance estimation of these species. The abundance of sand eels at West-Greenland is probably much larger than is indicated by the figure.

Mainly old specimens, 6 years and older, of sand eel were caught (Fig. 9). As with the capelin the selectivity of the trawl is probably the main reason for this. A majority of the sand eel caught had maturing gonads (Tab. 4). But the spawning had commenced on the southern banks.

Permission to extend the investigation into Greenland territorial waters was given by "Ministeriet for Greenland". Without this permission the cruise could not have been carried out satisfactorily. Invaluable help was given during the investigation by P. Kanneworff from "Grønlands Fiskeriundersøgelser" and from"Grønlands Kommando".

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Table 1. Calculated mean density of capelin (tons/(nautical miles)^2) in four fjords in West-Greenland, June - July 1974.

Locality	Date	Tons/(nautical miles)^2	
Arsukfjord	15/6	490	49
N 61°05' W 48°20'	21/7	169	17
Godthåpsfjord	22/6	146	15
N 64°10' W 51°50'	19/7	100	10
Amerdloqfjord	29/6	610	61
N 66°55' W 53°35'	13/7	114	11
Sarquardloqfjord	2/7	447	45
N 68°35' W 53°00'	11/7	138	14

Table 2. Distribution of maturity stages (percent) in catches of capelin from West Greenland in June-July 1974. (O= immature, 1-3 = maturing, 4 = running, 5-6 = spent.

Locality	Date	Maturity stages						
		0	1	2	3	4	5	6
Arsukfjord	15/6	56			5	6	33	
- " -	21/7	100						
Godthåsfjord	22-24/6	44			2	16	38	
- " -	19/7	98					2	
Amerdloqfjord	28/6	73			1	1	25	
- " -	13/7	100						
Sarquardloqfjord	2/7	65					35	
- " -	11/7	93					7	
Fyllasbank	25/6	72					28	
- " -	16/7	82	5				13	
Sukkertoppbank	17/7	96					4	

Table 3. Relative echo abundance per 5 nautical mile in some West-Greenland fjords and inshore areas. The area from Godthåp to Færingehavn is used as unit.

Locality	Relative echo abundance
Arsukfjord	0,91
Neriafjord	0, 52
Kvanefjord	0,71
Fiskenæsfjord	0,27
Grædefjord	0, 35
Buksefjord	0,14
Godthåp - Færingehavn	1,00
Godthåpsfjord	0,28
Hamborgersund	0,18
Ikertoq	0,62
Amerdloq fjord	0,75
Nordre Strømfjord	0,00
Sarquardloq fjord	0,49
Atasund	0,00
Kangersuneq	0,00
Umanak fjord	0,00

Table 4. Distribution of maturity stages (percent) in catches of sand eel from West-Greenland in June - July 1974. Legend as in Table 2.

Locality	Maturity stages						
	0	1	2	3	4	5	6
Fiskenæsbanken			50	31	15	5	
Fyllasbanken		2	64	26	1	8	
Sukkertoppbanken			80	20			
St. Hellefiskbanken		25	68	7			
Diskobugt		9	78	13			

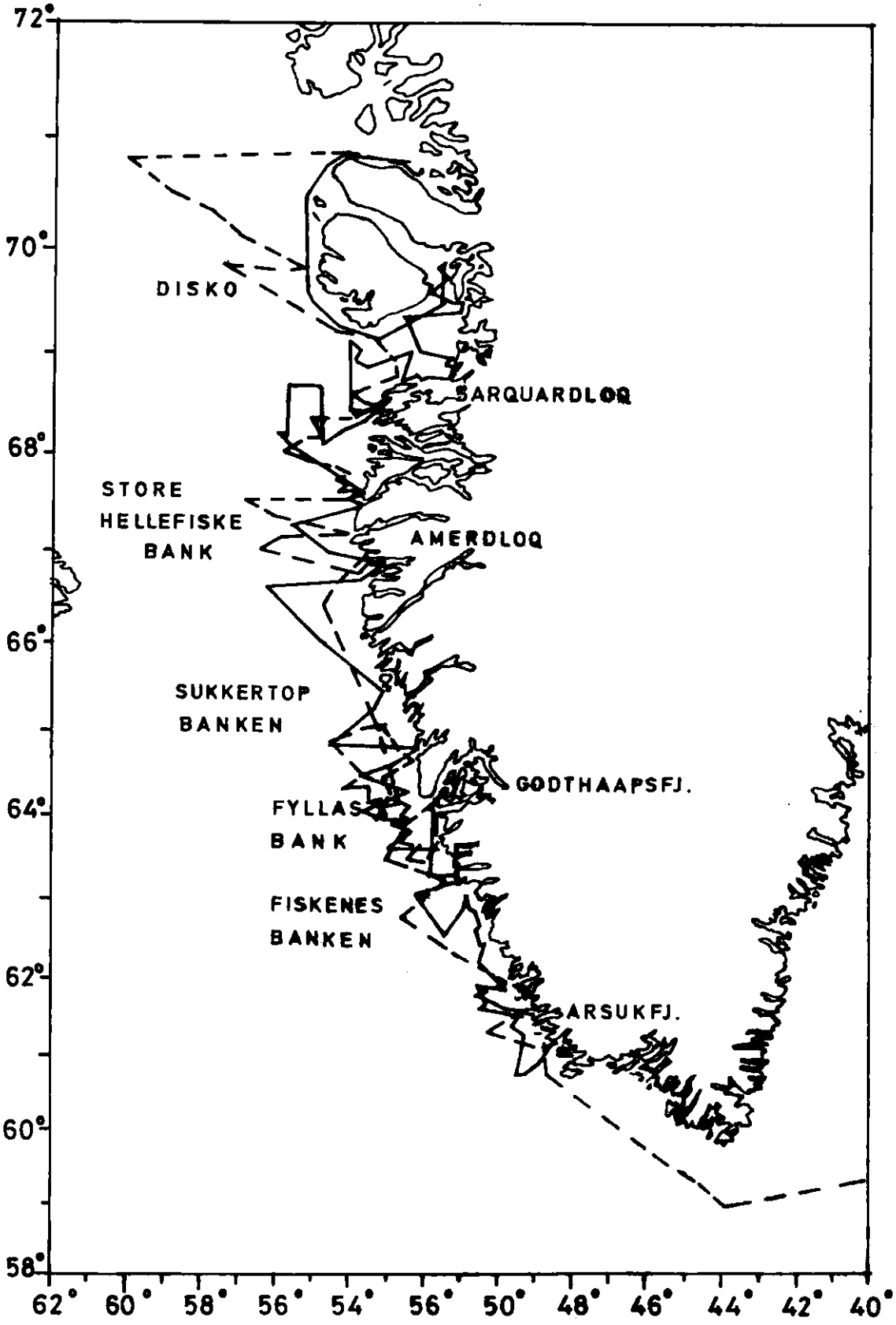

Fig. 1. Survey route 14 June - 22 July.

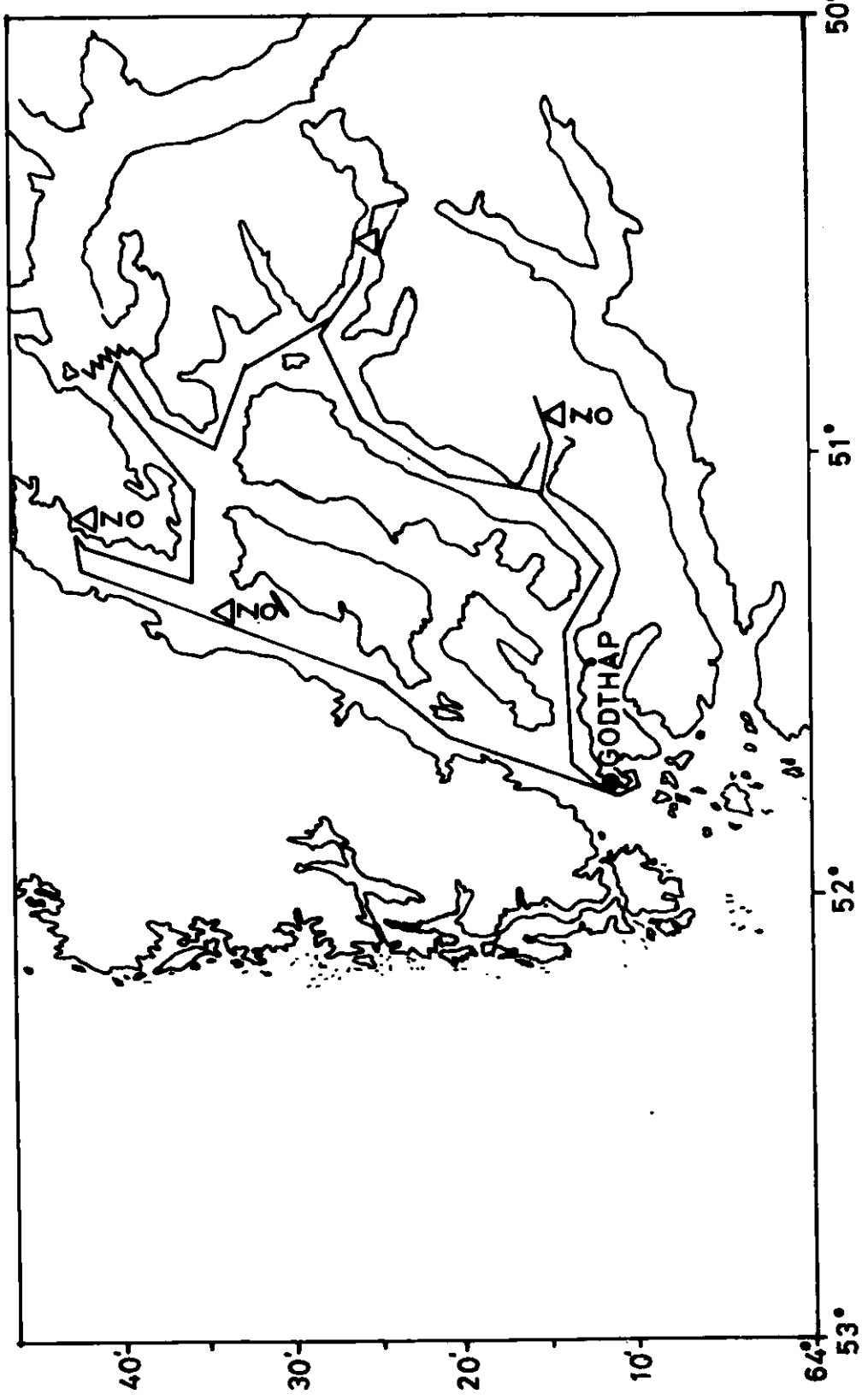

Fig. 2. Survey route and trawl stations in the Godthåpsfjord 22 - 23 June 1974.

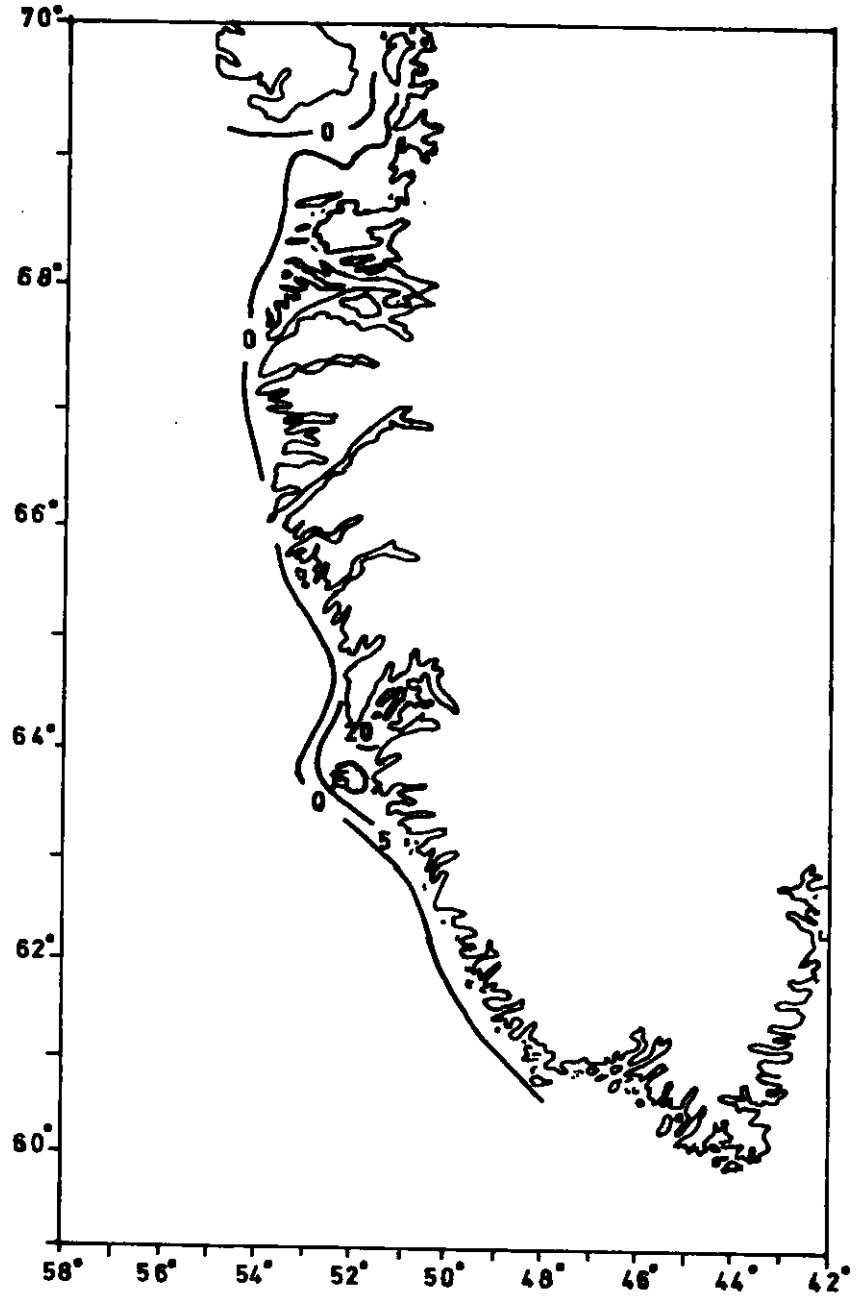

Fig. 3. Calculated density distribution of capelin (tons/(nautical mile)^2) 14 June - 6 July 1974.

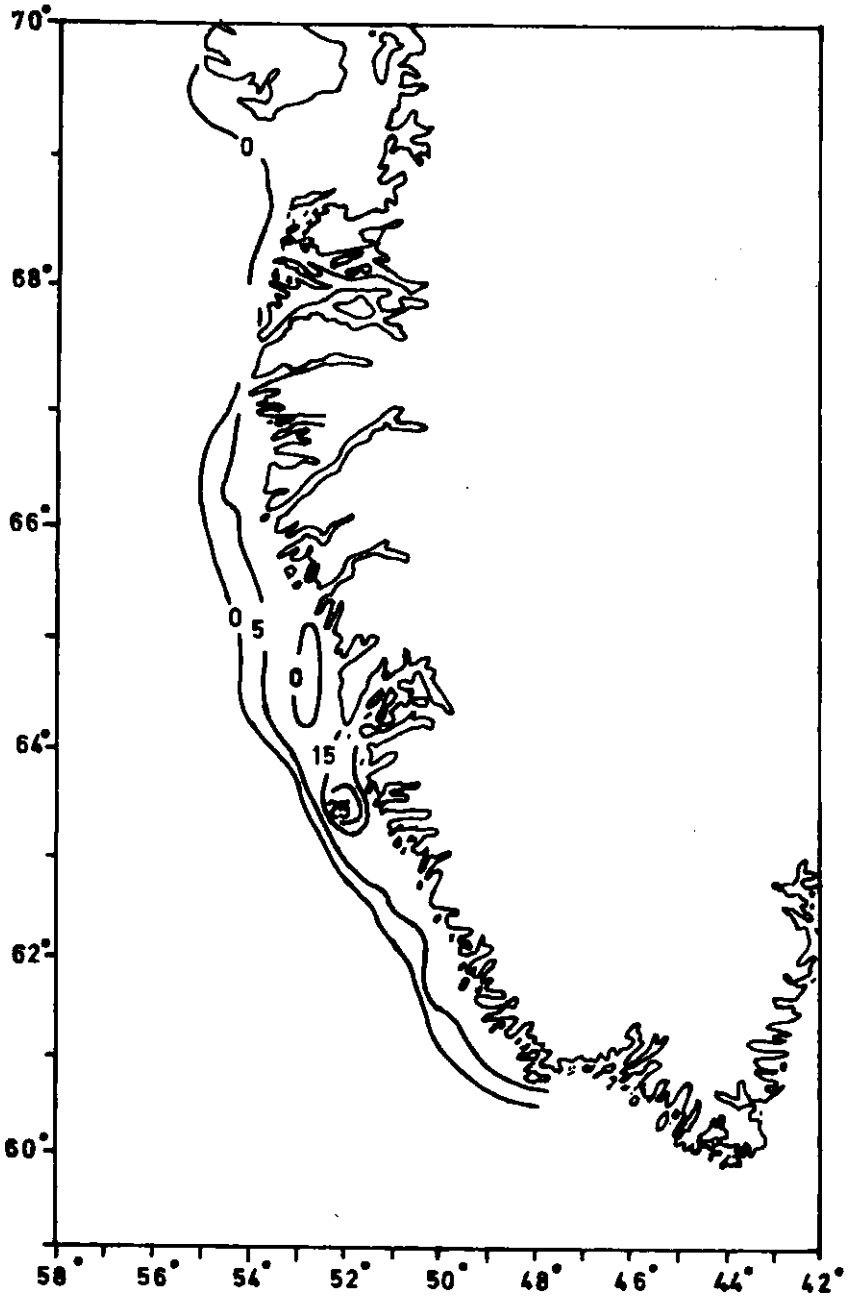

Fig. 4. Calculated density distribution of capelin (tons/(nautical mile)^2) 7 - 22 July 1974.

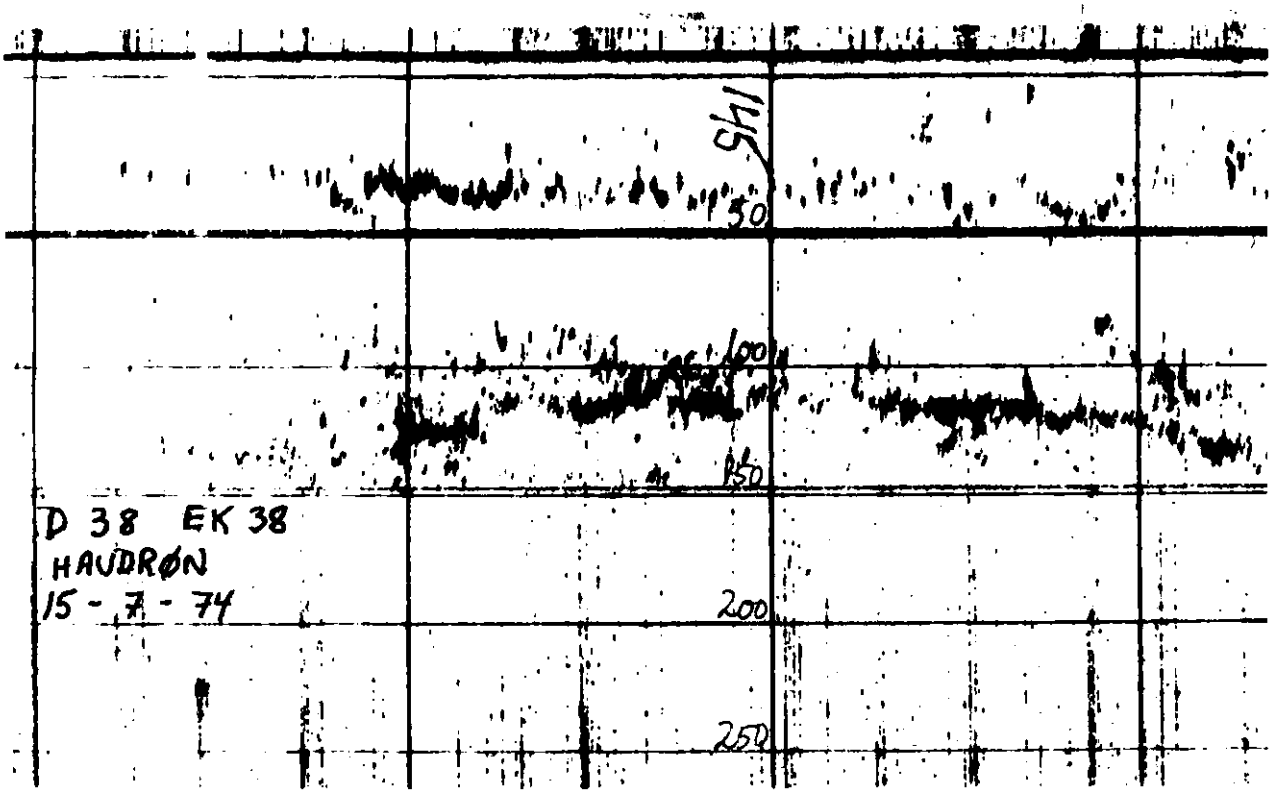

Fig. 5. Echo record showing capelin in 30-50 m and 80-150 m over the western slope of Fyllas Bank. Echo sounder 38 kHz, depth 0-250 m, effect 1/1, gain 20 log R + 0dB, recorder gain 7.

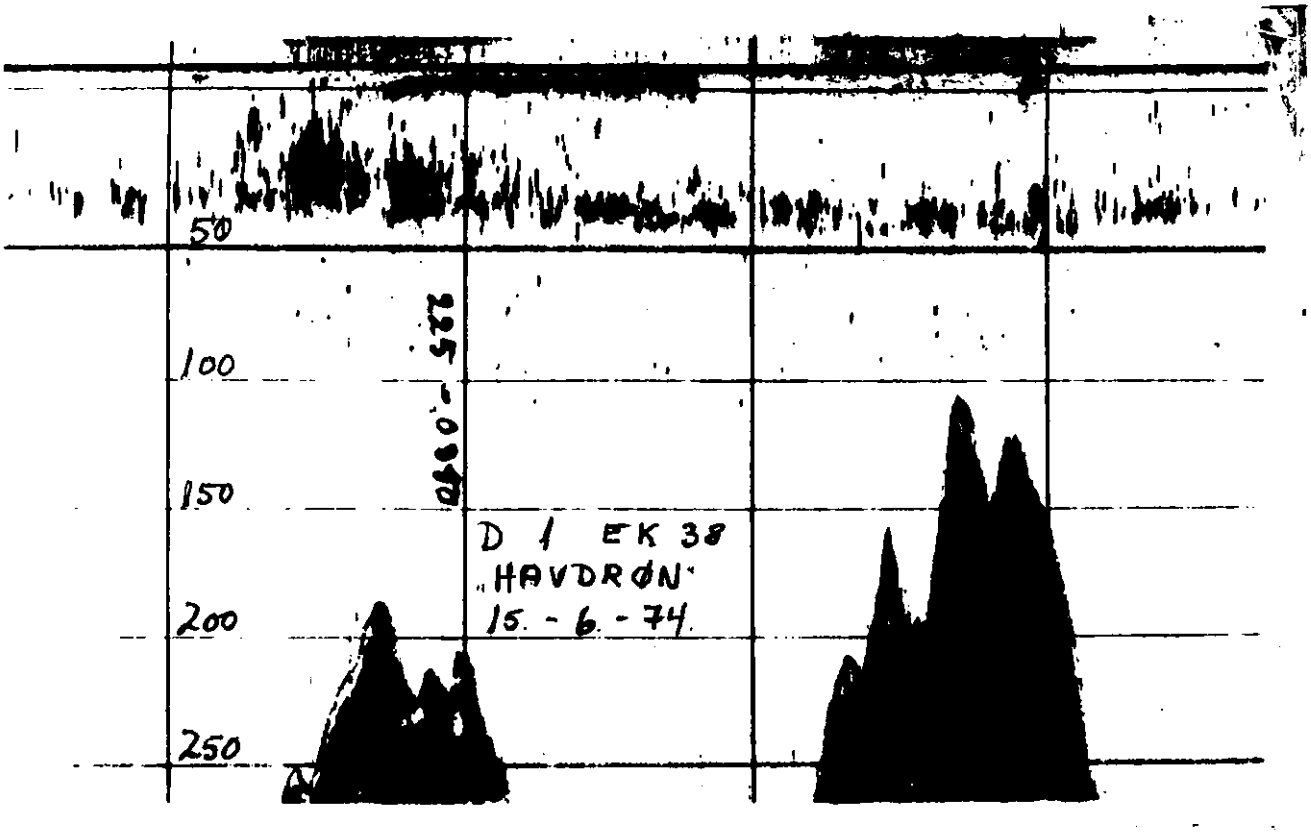

Fig. 6. Echo record showing capelin in 0-50 m in the Arsukfjord. Echo sounder and settings as in Fig. 5.

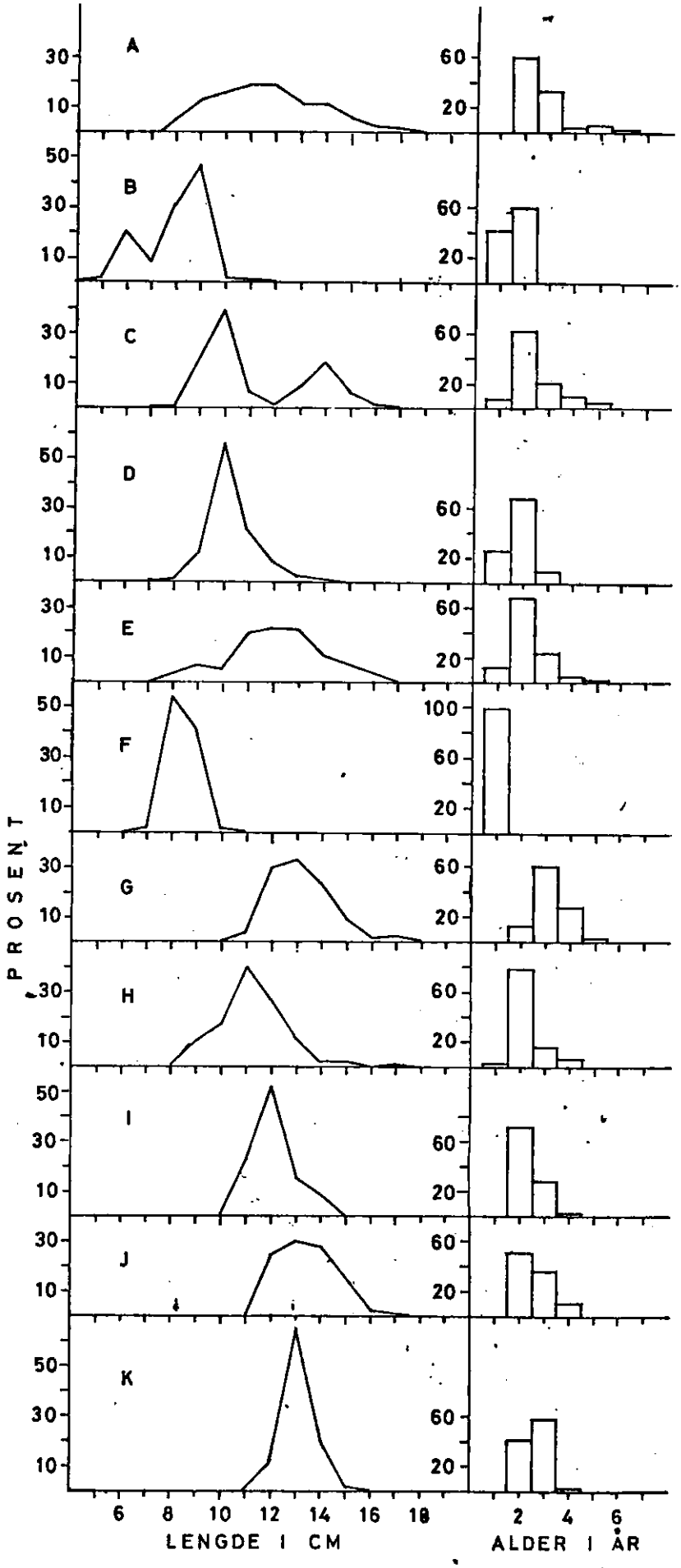

Fig. 7. Length and age distribution (percent).

A) Arsukfjord 15 June,
B) Arsukfjord 21 June,
C) Godthaapsfjord 22-23 June,
D) Godthaapsfjord 18 June,
E) Amerdloqfjord 29 June,
F) Amerdloqfjord 13 July,
G) Sarquardloqfjord 2 July,
H) Sarquardloqfjord 11 July,
I) Fyllasbank 24 June,
J) Fyllasbank 16 July,
K) Sukkertoppbank 17 July.

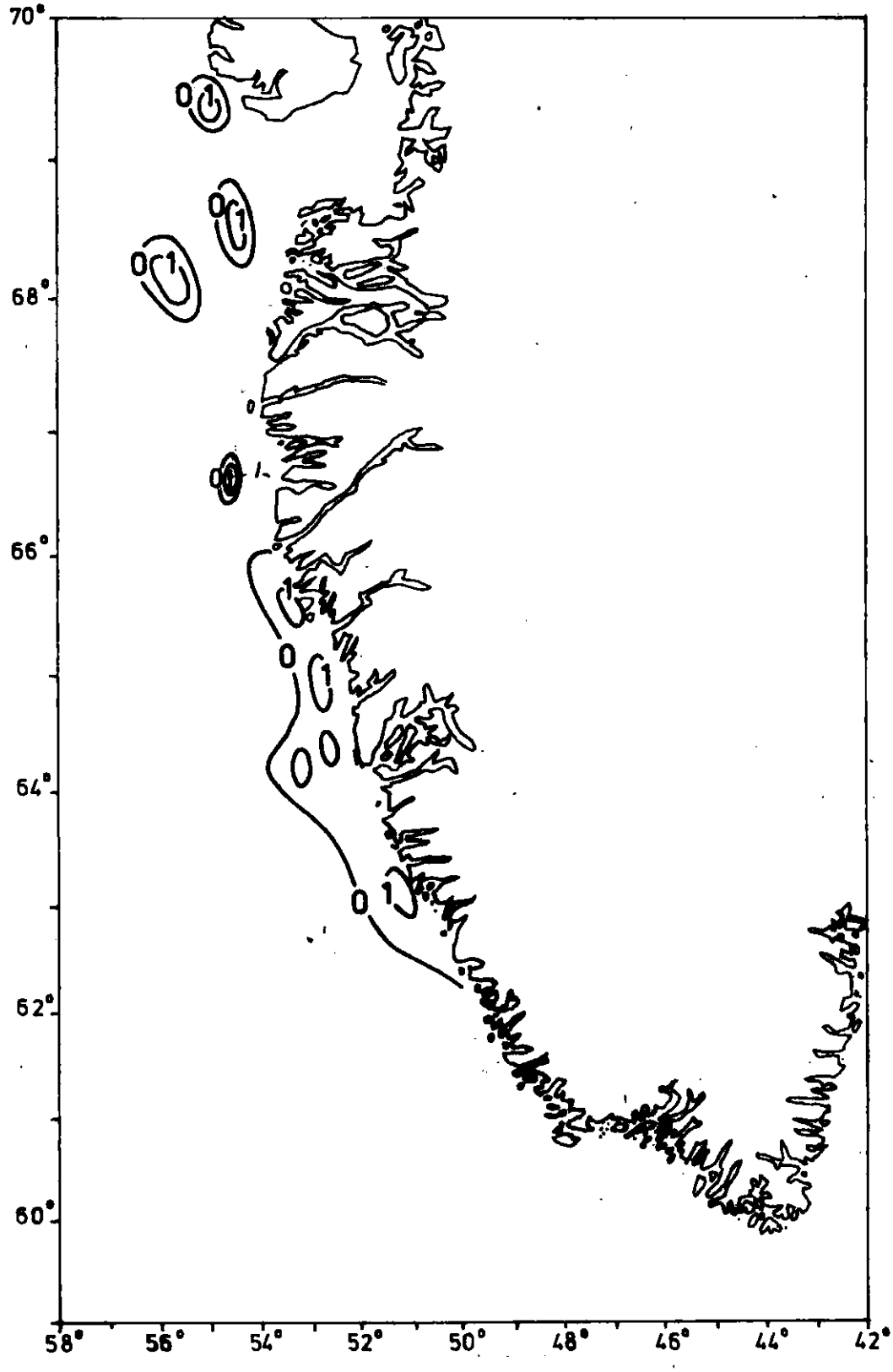

Fig. 8. Echo abundance of sand eel 14 June - 22 July.

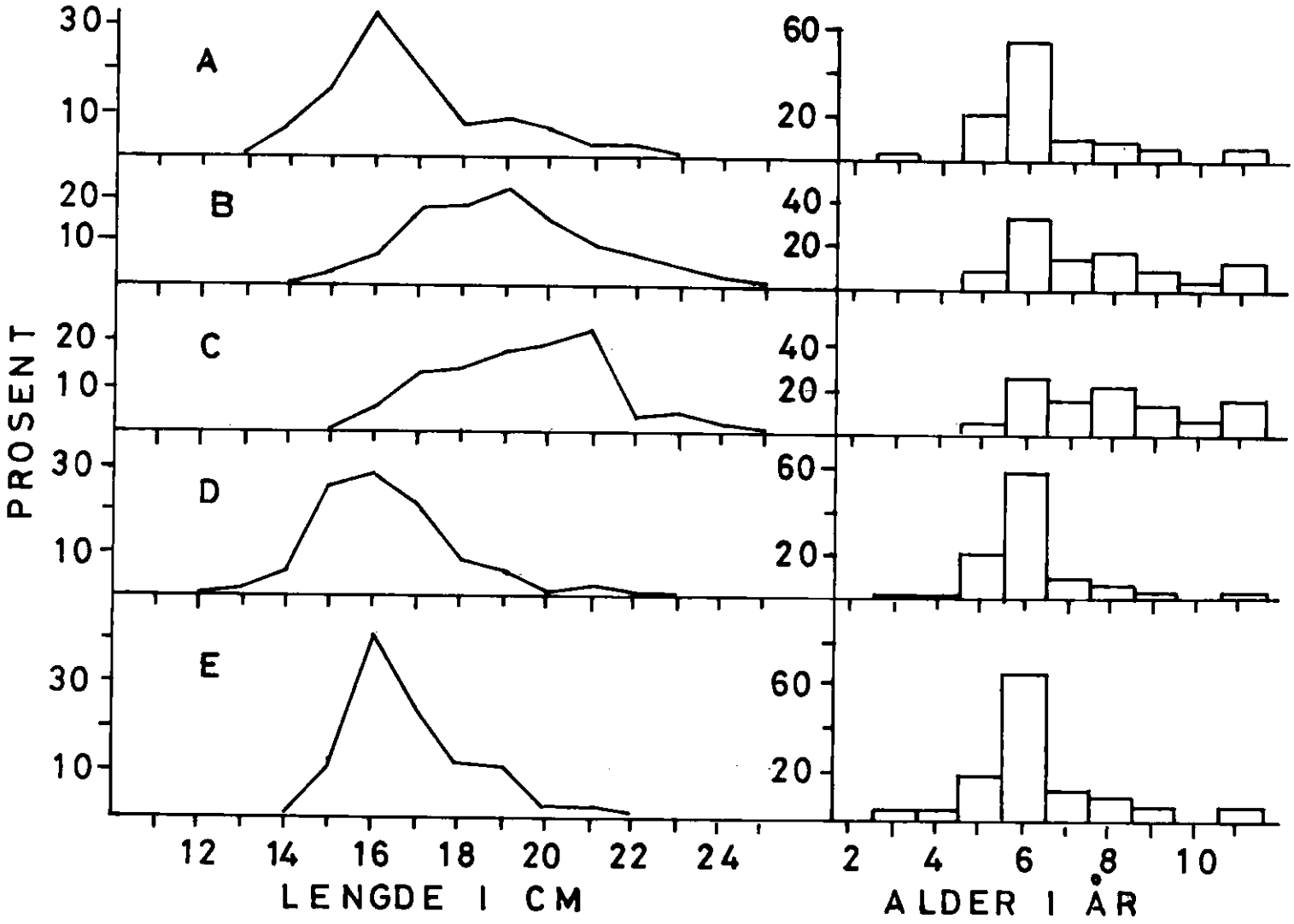

Fig. 9. Length and age distribution (percent) of sand eel.

A) Fiskenæsbank,
B) Fyllasbank,
C) Sukkertoppbank,
D) Store hellefiskbank,
E) Diskobukt.