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Danish Research Report, 1971.
Part I

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SUBAREA 1

A. Status of the Fisheries

I. General trends.

The nominal catches taken by Denmark (Greenland) in 1971 are given in the following table.

Table 1. Nominal catches by Denmark (G), Subarea 1, 1971. (Provisional figures).

Species	Nominal catch (metric tons)	Increase or Decrease from 1970 (%)
Cod	19,890	- 1
Redfish	324	+89
Wolffish	2,615	- 3
Greenland halibut	1,162	- 4
Halibut	4	0
Capelin	2,578	-17
Atlantic salmon	1,375+)	+ 9
Arctic char	123	+11
Lumpsucker roe (not converted to round, fresh fish)	244	-41
Industrial fish	181	-35
Other fish	14++)	0
Deep sea prawns (Pandálus borealis)	9,029	+ 7
Total (excl.lumpsucker roe)	37,295	0

+) Excl. catches by Denmark (M) and (F) of 645 tons and 255 tons respectively.

++) Estimated equal to 1970.

The three most important species (in terms of income) for the Greenland fishermen in 1971 were Pandalus (34% of landed value), Atlantic salmon (34%) and cod (26%). Landings (in terms of weight) of these three showed a minor increase for the two former and a nearly stable catch of the latter as compared to 1970 landings. Landings of species of minor importance fluctuated more widely. Total landings were nearly exactly as in 1970. Further details for the major fisheries are given in the following.

II. Cod.

1. The fisheries. Catches remained stable at the very low level of last year. It must be emphasized, however, that further development in the fleet of trawlers has taken place, and that the catch has been maintained at the 1970 level only by this increase in effort. One 450 GRT otter trawler operated throughout the year, two new trawlers in the 501-900 tonnage class started fishing in April and August respectively. The three trawlers took about 30% of total landings of cod by Denmark (G). Considering this it is quite clear that the downward trend in the small boat inshore fishery has continued through 1971 by about 7% compared to 1970. The inshore fishery in 1971 (app. 14,000 tons) is only 40% of the fishery in the peak year 1962 (35,380 tons). No good measures of effort in the inshore fishery exist, but all evidence point to less abundance and catchability (ice hindrance) of cod as the main cause for the decline.

The trawlers operated mainly in Divs. 1C - 1E. Inshore fishery was rather evenly distributed between Divs. 1B - 1F but compared to 1970 the inshore catches in Divs. 1D - 1F decreased, mainly in Div. 1F (by 45%), were rather stable in Div. 1C and increased by about 25% in Div. 1B.

2. Forecast for 1972-73. Considering year-class fluctuations and distribution as described in Section B,IIand that further development in the Greenlandic fleet of big otter trawlers will occur within 1972 and 1973 the fishery by Denmark (G) is expected to increase somewhat in 1972 and 1973 both absolutely as well as in relation to other fleets fishing in Subarea 1. In fact, for the first quarter of 1972 cod landings are 3619 tons (nominal catch) compared to 1274 tons at the same time in 1971. 3507 tons of the 3619 tons are taken by the three trawlers of which only one operated in the first quarter of 1971.

However, the prospect for the total international cod fishery in Subarea 1 is not good. With the exception of year-class 1968 the year-classes to recruit to the fishery in the first half of the 1970'ies seem poor. In the northern divisions (Divs. 1B - 1D) the 1966 and 1968 year-classes are expected to be the most important probably leading to good fishing in the Banana Bank region in the first half of the year. In Divs. 1E - 1F and off Southeast Greenland the stock may be less abundant than in the last couple of years. Nevertheless, good fishing for otter trawlers fishing on schooling cod may still occur here in and around the spawning period, especially as such schools will consist of relatively big fish belonging to year-classes 1963, 1964, 1965 and 1966, the latter expected gradually to increase its relative importance in the southern divisions partly due to some immigration from Div. 1D and partly due to other (older) year-classes emigrating to East Greenland-Iceland.

III. Atlantic salmon.

The total international catch in 1971 of about 2615 tons is the highest so far recorded, approximately 20% over the 1969/70 level. Catches by Denmark

(G) amounted to 1375 tons (9% more than in 1970). Although no figures for trends in effort and efficiency in the Greenlanders' salmon fishery exist, it was the general impression that abundance of salmon was good in all districts and that fishing conditions were rather favourable. For further details on trends in fishing see Report of the ICES/ICNAF Joint Working Party on North Atlantic Salmon as distributed for this Annual Meeting.

No forecast for salmon fishery in 1972 can be given.

IV. Other fish.

Catches of redfish have increased due to by-catches by the trawlers. As the trawler fleet continues to increase by-catches of redfish may increase further in the coming years.

Catches of capelin may increase in future if pelagic trawling experiments planned for 1972 are successfully.

V. Deep sea prawn.

The general increase in this fishery in the last decade continued through 1971. This reflects an increase in effort (number of boats) and efficiency parallel to an increase in industrial capacity. No signs of overfishing are reported, and unexploited or lightly exploited grounds (stocks) are still found, so that the stocks may be able to support increased fishing, and future catches may well increase further. However, adverse climatic conditions, e.g. ice coverage of the important grounds in Disko Bay may in some years stop fishing entirely for several months leading to lower catches even if abundance is not affected.

B. Special Research Studies

I. Environmental Studies.

1. Hydrography. Again in 1971 the inflow of cold polar water and ice from East Greenland to West Greenland was remakably high. For further details see Section II of DanishResearch Report by F. Hermann.

2. Plankton. In continuation of previous years hauls with 2 m stramin net were taken at the standard hydrographic sections in the Davis Strait in May-October. Oblique hauls were taken from approximately 50 m to surface (wire length 225 m). Displacement volume of plankton was measured and fish eggs and larvae were sorted and counted in all samples. Further, invertebrates (medusae, siphonophora, chaetognatha, polychaeta, crustacea, gastropoda) in most part of the samples were also sorted and counted.

Average volume of samples and average numbers of crustaceans from the Fylla Bank section in July during the last decade are presented in Table 2, which shows that plankton catches in the last two years are relatively poor.

This corresponds to the colder surface water conditions and small amounts of cod eggs and larvae observed in the latest years. It should be noted that an essential part of the volume is constituted by medusae.

Table 2. Average volume and number of crustaceans in stramin net samples taken on Fylla Bank section in July in different years.

Year	Volume ml/30 min.	Crustacean no./30 min.	No. of stations on sections
1961	2100	1272	3
1963	820	403	5
1964	463	1575	5
1966	331	855	5
1968	760	-	5
1969	225	-	5
1970	323	118	5
1971	209	102	5

II. Biological Studies.

1. Cod.

a) Eggs and larvae. As mentioned above, eggs and larvae were taken by 2 m stramin net at the standard hydrographic sections in the Davis Strait. The number of eggs taken in May, June and July is shown in Fig. 1. In most years concentrations of eggs have been found on the western part of the Sukkertoppen section. In 1969 and 1970, however, few eggs occurred on these stations. In 1971 no eggs at all were observed on stations north of Godthåb, whereas a concentration was found over the western slope of Fylla Bank. Unfortunately the Frederikshåb section was not fished due to ice.

As in 1969 and 1970 the number of cod larvae taken (Fig. 2) was very small. For stations north of Godthåb the 1971 seems to be a new, low record. On these stations larvae were found in July only, and these are thought to originate from more southerly areas as for example west of Fylla Bank, where the highest numbers were found in May, less in July.

The distribution and numbers of larvae as well as the hydrographic conditions indicate that the 1971 cod year-class of West Greenland origin is very poor.

b) Occurrence of pre-recruit cod (age-groups I, II and III). Age-groups I-III are normally observed by means of fine meshed beach-seine, fine meshed otter trawls (prawn trawl), in commercial pound-nets and by visual observations on shallow water. In 1971 visual observation and beach-seine fishing have not been carried out, and samples from commercial pound-nets have generally been taken after small cod have been discarded. No information exist on the magnitude of discarding except that age-group III is known to have occurred to some extent in pound-net catches in the Godthåb Fjord (Div. 1D). The best but still rather limited information on pre-recruits is from fine meshed otter trawl catches on a standard station for groundfish survey in

Div. 1D offshore, see Fig. 3, samples Nos. 13 and 14. As will be seen the age-group III (year-class 1968) is by far the predominating one accounting for 58% and 83% respectively in the two samples in 1971. Age-group III has also been found in research catches by fine meshed otter trawl in Div. 1E, offshore (sample No. 15). If the hauls on the standard station in 1971 are compared to hauls in previous years it is not unlikely that the year-class is comparable to the rather good 1966 year-class in the northern part of Subarea 1. For further details see Research Doc. 72/19.

c) Age and size distribution of cod in landings. Samples of commercial landings are shown in Fig. 4. Cod below app. 40 cm will normally have been discarded before catches are landed. Relatively highest discarding rate will normally occur for pound-net catches, but no good information for this gear exist for 1971. Discarding by commercial otter trawlers in 1971 is negligible.

The age distribution seems to be markedly different between the area north and the area south of Godthåb. Samples from Banana Bank, southern Div. 1C (samples Nos. 1-3) clearly show year-class 1966 and 1965 to account for nearly the whole catch here, and inshore samples from Divs. 1B-1D (samples Nos. 10-12) confirm that the 1966 year-class is highly important in the northern part of West Greenland. The inshore samples contain considerable numbers also of the 1967 year-class, which is less abundant in the offshore samples, but this difference may to some extent be ascribed to difference in selectivity between small meshed pound-nets and large meshed otter trawls.

In areas off Godthåb, northern part of Div. 1D, the 1966 and 1965 year -classes still make up a considerable part of the catch, but also the year -class 1963 and to some extent also the 1964 year-class have been of great importance for the 1971 fishery, see samples Nos. 4-6.

In Div. 1E (sample No. 7) the 1965 and 1963 year-class predominate, the latter being even more important in Div. 1F (samples Nos. 8-9) where the 1963 and 1964 year-classes account for practically the whole catch sampled.

In general it could thus be said that two year-classes (1965 and 1966) dominates in Div. 1C (and probably farther north), and that another older couple of year-classes dominate in Div. 1F (1963 and 1964) whereas Divs. 1D-1E catches have been mixed of the four year-classes mentioned.

With the difference in age-distribution between northern and southern samples one would expect to find mean weight of fish in the southern samples considerably higher than for the northern samples. This is, however, not the case. Thus for samples Nos. 1-3 (Fig. 4) observed mean weight of fish is 2.32 - 2.05 - 2.93 kg round, fresh respectively whereas for samples Nos. 8-9 the mean weight is 2.39 and 2.05 kg respectively. Highest mean weight is generally found for the samples in Div. 1D-1E with 2.68 - 4.15 - 3.86 and 3.28 kg for samples Nos. 4-7 respectively. This higher mean weight could be due to some occurrence of big cod belonging to year-class 1961 in these samples. This and older year-classes have also been observed in research catches with long-lines (Fig. 3, No. 16).

Cod in the southern part of the subarea thus seem to have a slower growth rate in recent years, but the problem needs further investigations.

d) Tagging experiments. A total number of 2322 cod was tagged as shown in the following table. Cod below 50 cm total length are here called small cod.

Div.	Inshore		Offshore	
	small cod	big cod	small cod	big cod
1B			63	316
1C			70	340
1D	1449		1	83
Total	1449	0	134	739

2. Atlantic salmon.

The international team-work on salmon carried out in Greenland waters since 1965 continued in the 1971 season. The British-Danish team on board the R/V ADOLF JENSEN tagged 108 salmon, and a further 21 salmon were tagged from the research cutter TORNAQ. The material on salmon has been presented to the ICES/ICNAF Joint Working Party on North Atlantic Salmon at its meeting in Dublin, March 1972, and is incorporated in the report of that meeting.

Fresh water studies aiming at elucidating the possibility of planting salmon in Greenland rivers have been carried out in the area between Sukkertoppen and Frederikshåb (Divs. 1C-1E). These studies will be continued through 1972 to cover also southernmost Greenland. In the Kapisigdlit River (Godthåb Fjord) 136 parr were tagged.

3. Pelagic fish.

Small catches of capelin were taken by a pelagic trawl in inshore waters near Godthåb (Div. 1D) in August. Samples were taken for length and age measurements and for quality examination.

The distribution of sand eel (Ammodytes lancea) larvae taken by stramin net is shown on Fig. 5. By far the biggest numbers were observed in May indicating an early spawning on the offshore banks. Normally sand eel larvae are the most numerous fish larvae in the samples and in 1971 even seemed to be relatively more numerous than in previous years in the decade 1961-1971. The adult fish is a most important food-chain link over the offshore fishing banks in West Greenland, where it plays the same role as the capelin in the inshore area as food for cod, salmon and other fish. The sand eel larvae were not included in the report of the NORWESTLANT survey in 1963.

It is worth to note that in a dredge sample of bottom material taken in July 1971 west of Store Hellefiske Bank (depth 740 m) several partly decomposed sand eels were found. This makes us raise the point if there is a mass death of spent sand eels as it is the case with the capelin in the coastal area.

4. Other fish.

Material (lengths, weights, otoliths) of Greenland halibut and American plaice has been collected at the standard stations for groundfish

and prawn surveys, mainly in Div. 1D. In Div. 1A off Umanak Fjord considerable numbers of small Greenland halibut (age-groups II-III mainly) were found on deep water (580-600 m). From these nursery grounds recruitment to the exploited stocks of Greenland halibut in the Umanak region is thought to take place.

51 Greenland halibut and 395 American plaice were tagged, all in Div.1D.

4. Crustaceans.

Continuous research catches of deep sea prawn (Pandalus borealis) were taken on offshore grounds in Divs. 1C and 1D. New fishing experiments on offshore grounds were conducted in Div. 1A off Umanak Fjord, in Div. 1B west of Store Hellefiske Bank and in Divs. 1D-1E in deeps between the fishing banks. Best of these new experiments were those in Div. 1A, but unfortunately ice will prevent fishing the stocks on this ground most of the year.

Small scaled trap fishing experiments for the crab Chionoecetes opilio were conducted in coastal waters near Godthåb. Preliminary results encourage that further experiments be done.

5. Seals.

The hunting of hooded seal in southernmost Greenland (Div. 1F) was observed in May, and material for age determination was obtained from 231 animals and for maturity studies of 94 animals. From the Greenland east coast and from northwestern districts seal hunters supplied jaws of 58 hooded and 46 harp seals. Also ringed seal is included in the seal studies.

III. Gear and Selctivity Studies.

Apart from salmon fishing with drift-nets of different mesh-sizes and material no special selectivity studies were undertaken. As mentioned above fishing experiments with traps for crabs were initiated and will be continued. A fine meshed one-boat pelagic trawl was tried for capelin fishing, but further experiments are necessary.

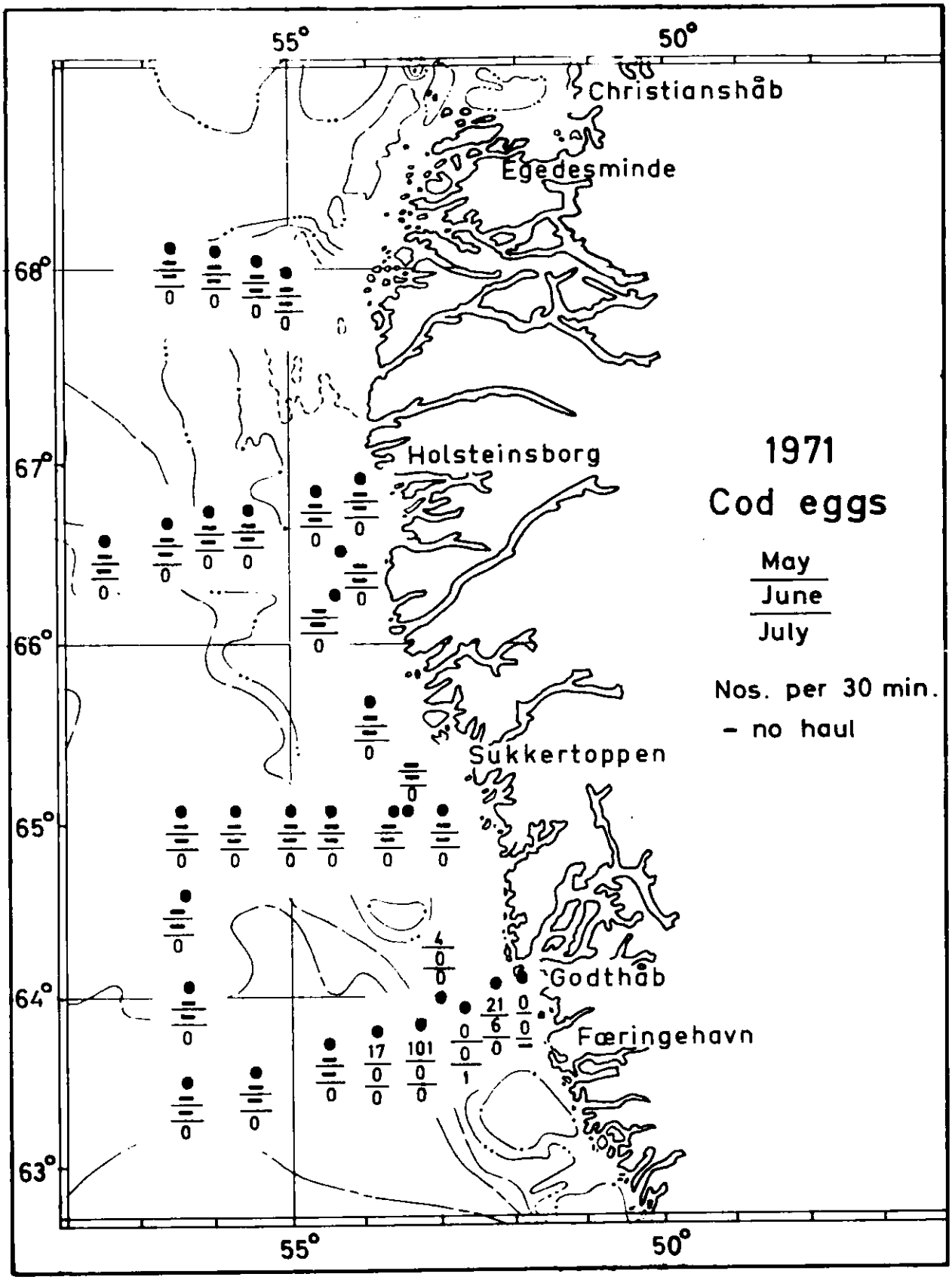

Fig. 1. Cod eggs (number per 30 min.) taken by 2 m stramin net in the upper water layers (maximum depth about 50 m).

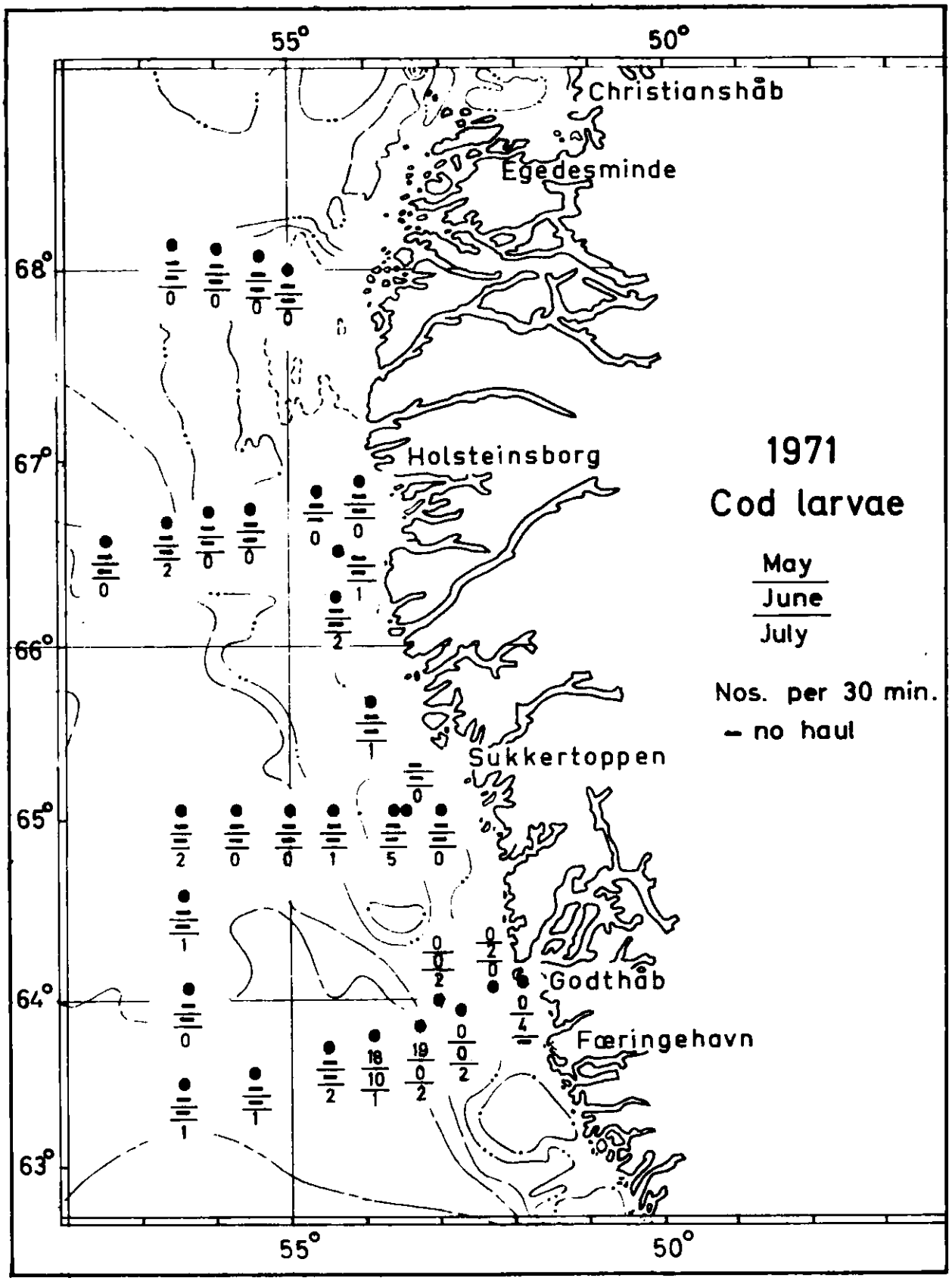

Fig. 2. Cod larvae (number per 30 min.) taken by 2 m stramin net in the upper water layers (maximum depth about 50 m).

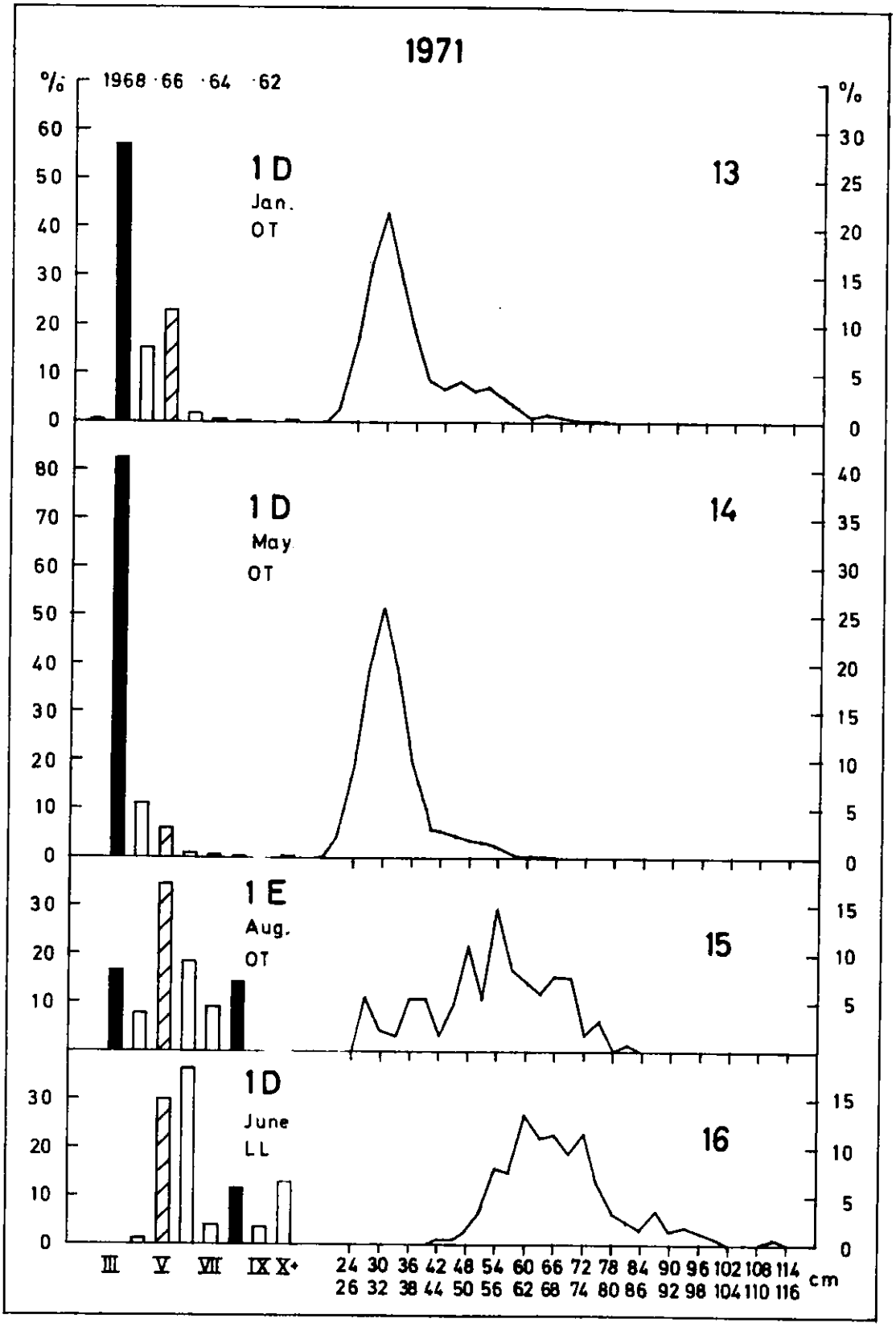

Fig. 3. Age and length composition of cod from some of the research catches. OT = otter trawl with 36 mm codend mesh-size, LL = long-line. Samples Nos. 13 and 14 taken in the Godthåb Deep between Fylla Bank and the coast, No. 15 in the Frederikshåb Deep, No. 16 on the western slope of Fylla Bank.

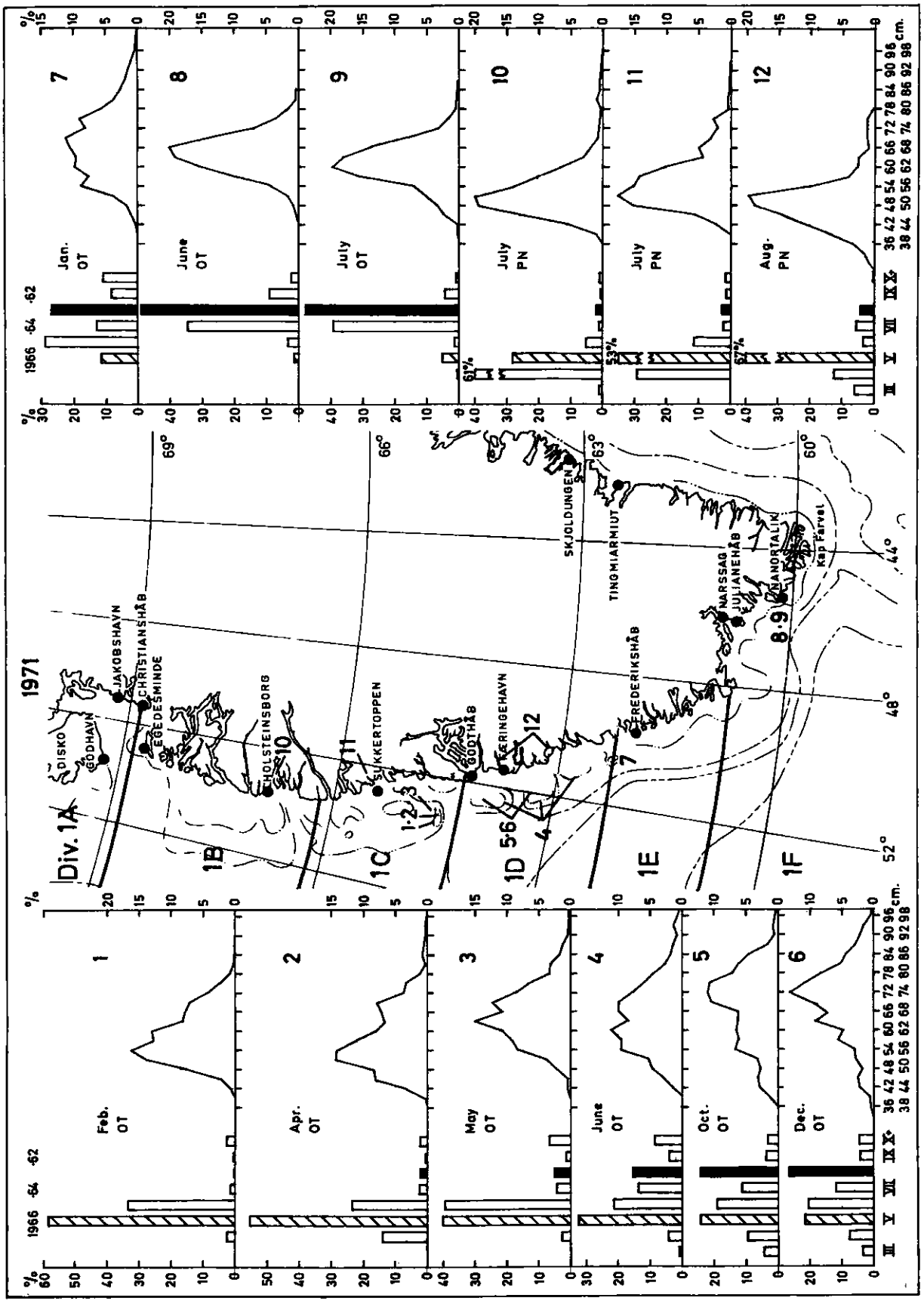

Fig. 4. Age and length composition of cod sampled from commercial landings. Samples Nos. 1-9 all offshore, Nos. 10-12 in fjords. OT = otter trawl with codend mesh-size at least 130 mm, PN = pound net.

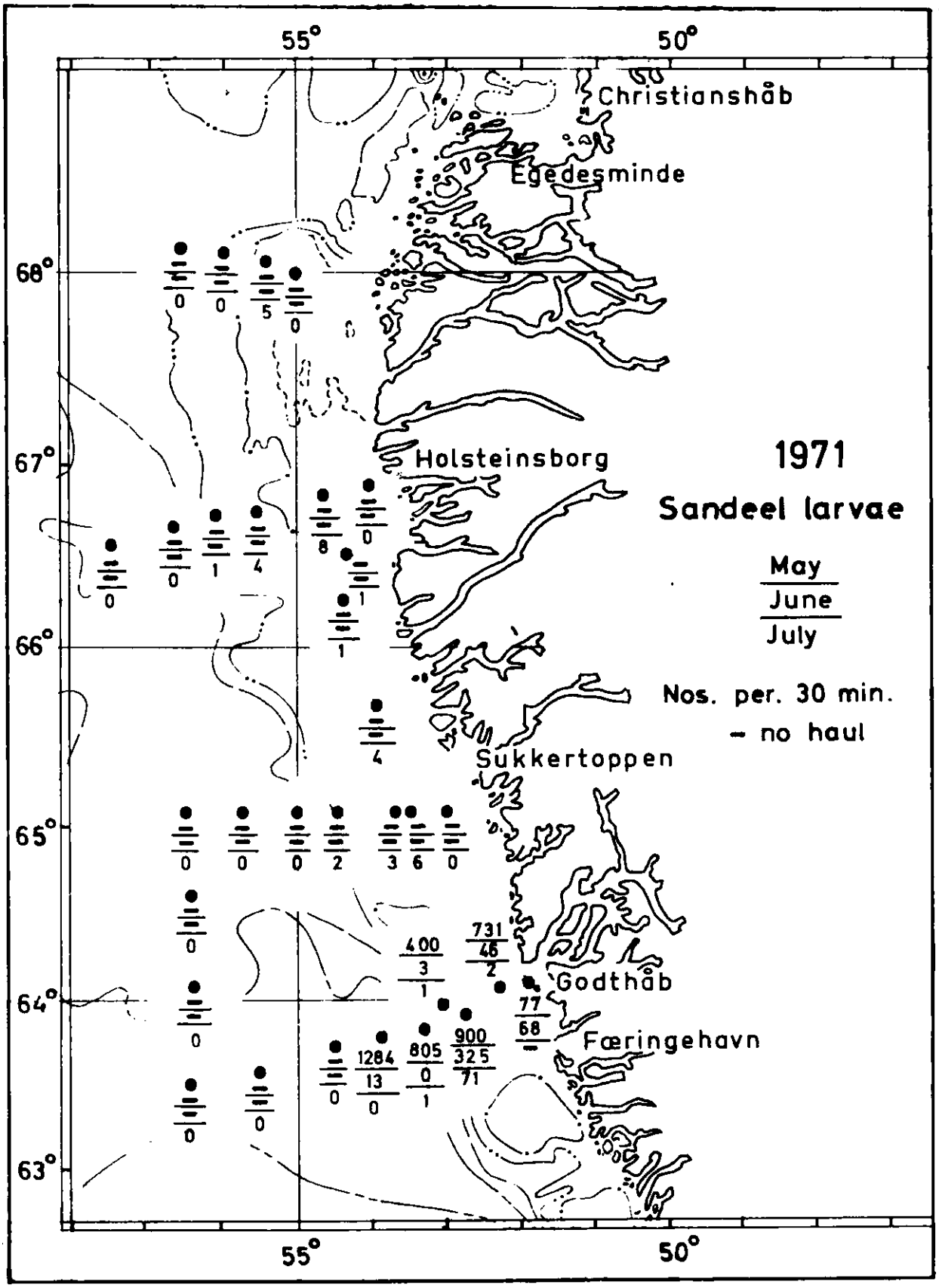

Fig. 5. Sand eel larvae (number per 30 min.) taken by 2 m stramin net in the upper water layers (maximum depth about 50 m).

Danish Research Report, 1971

Part II

Hydrographic Conditions off West Greenland during 1971

by

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As in the two previous years the ice conditions were rather severe off West Greenland in 1971. During its maximum extension in July the "storis" reached from Cape Farewell to the latitude of Godthåb (64°N). The westward extension was extremely great, more than 120 naut. miles from the coast at 62°N in July, but in many periods icefree land water was found along the coast.

The location of the sections which were worked from "Adolf Jensen" and "Dana" is shown in fig. 1. "Dana" worked the sections II to IV in July and section I in August. "Adolf Jensen" worked section II in January, May and October, section III in January and June and section IV in November.

The sections are shown in figs. 2 to 11. In the sections until June very cold conditions were found in the upper 100 metres as a result of strong winter cooling and inflow of cold polar water from the East Greenland Polar Current.

As temperature in June over the shallow part of Fylla Bank was below 1° and earlier experience indicated that good cod year-classes only occur, when the temperature here exceeds 1°.8 C in June, it is hardly probable that the 1972 cod year-class will be great.

In July water masses with sub-zero temperature was still found west of Fylla Bank, but the core of the cold water was situated further westwards than usual.

The table below shows the deviations of temperature and salinity from the mean values for the years 1950-66 (Hermann 1967) for the station at 63°53'N-53°22'W west of the slope of Fylla Bank in July.

Depth Interval (m)	Mean Temperature 1950-66	Mean S o/oo 1950-66	T C July-72	S o/oo July-72.
0- 50	2.07	33.29	+0.46	⁄0.63
50-100	1.33	33.65	-0.99	-0.48
100-200	1.85	34.00	-1.55	-0.52
200-300	2.88	34.39	-1.18	-0.33
300-400	3.79	34.67	-0.49	-0.07
400-500	4.22	34.81	+0.14	+0.03
0-500	2.89	34.27	-0.67	-0.29

In the upper 300 metres negative anomalies prevail both in the temperature and the salinity distribution, indicating great inflow of polar water. The temperature anomaly was highest in the layer between 100 m and 300 m.

In the area north of Fylla Bank a strong summer heating of the upper 20 m had occured in July causing relatively high surface temperatures over the northern banks.

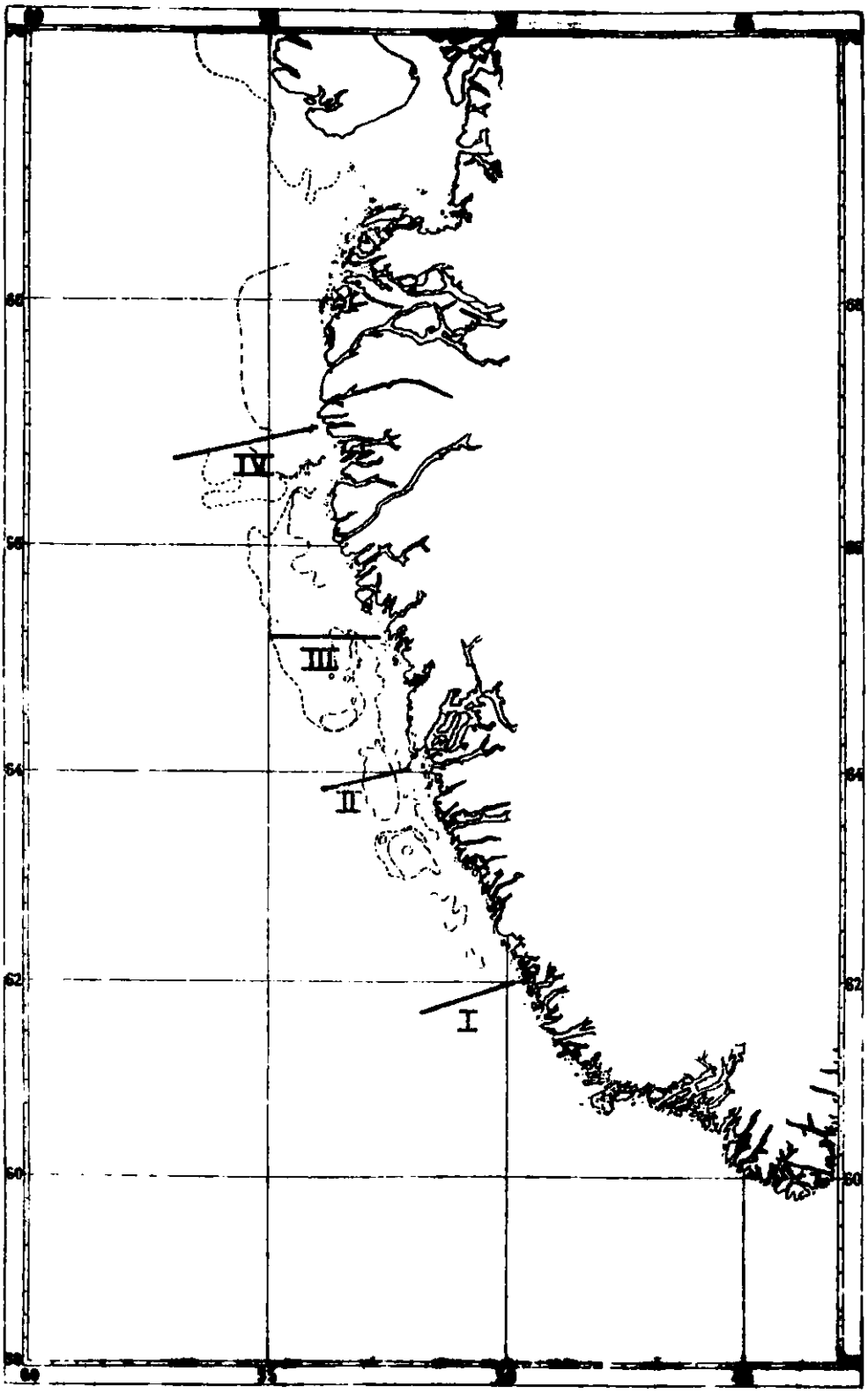

Fig. 1. Location of sections.

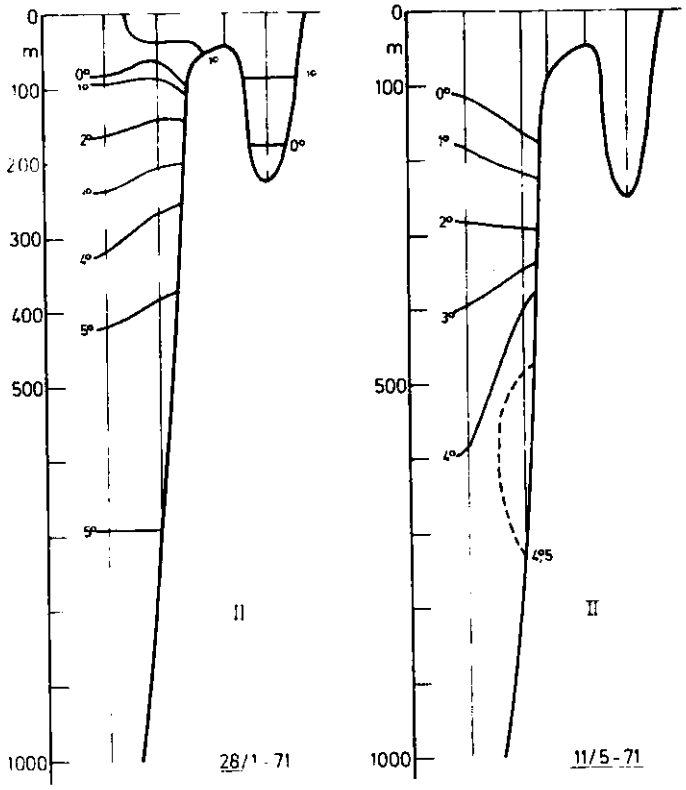

Fig. 2. Sections across Fylla Bank (II) in January and May.

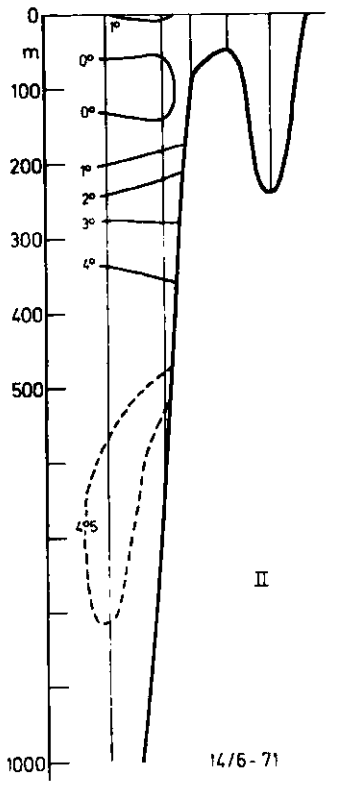

Fig. 3. Section across Fylla Bank (II) in June.

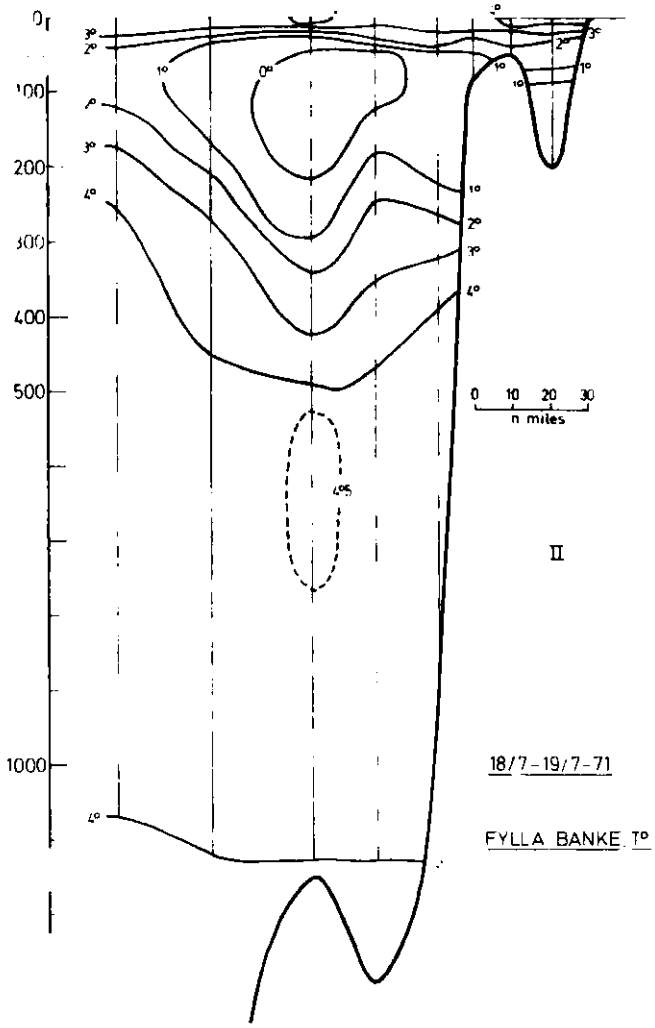

Fig. 4. Section across Fylla Bank (II) in July.

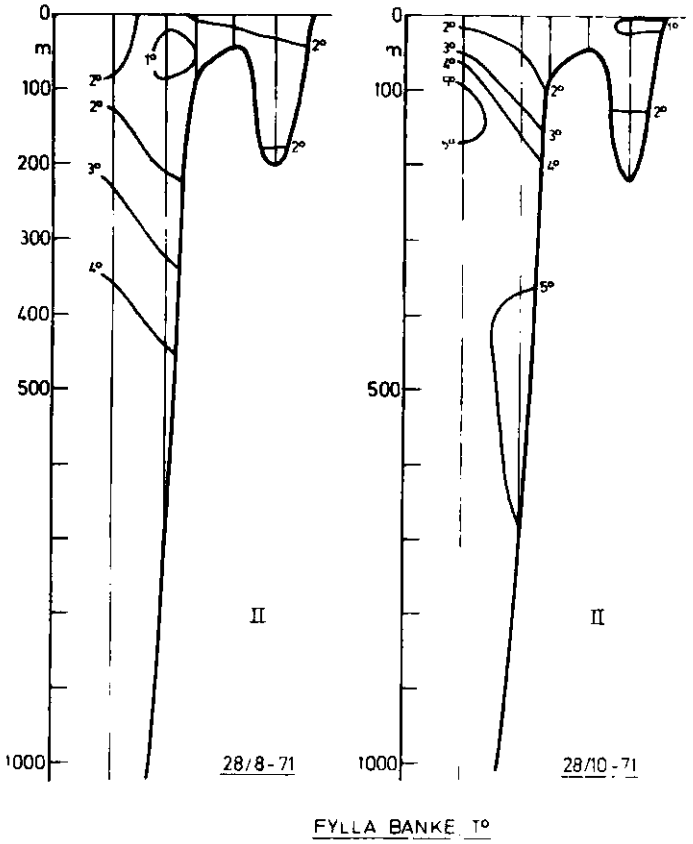

Fig. 5. Section across Fylla Bank (II) in August and October.

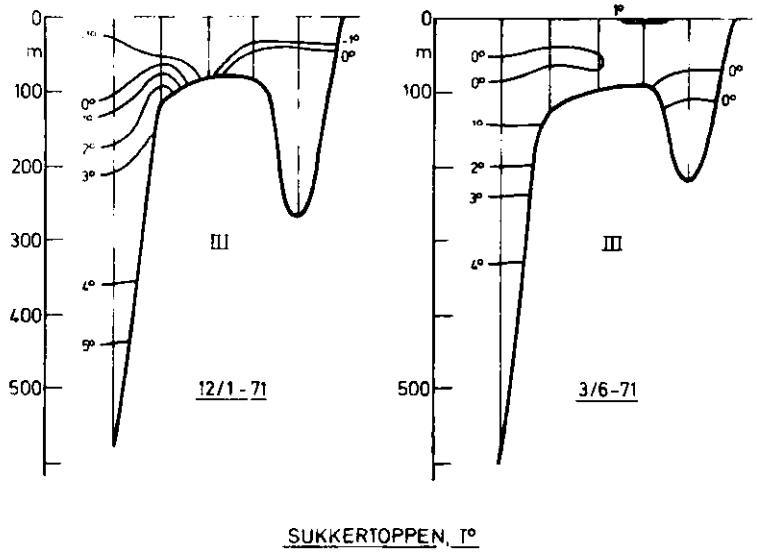

Fig. 6. Sections across Lille Hellefiske Bank (III) in January and June.

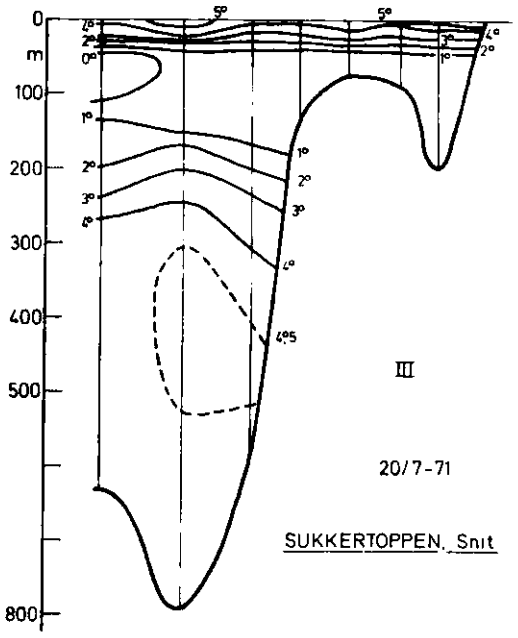

Fig. 7. Sections across Lille Hellefiske Bank (III) in July.

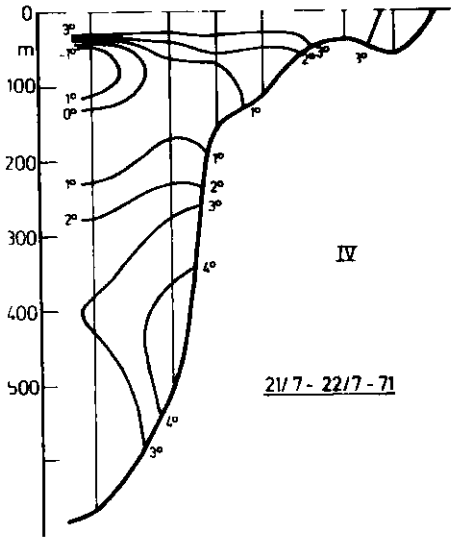

Fig. 8. Section off Holsteinsborg (IV) in July.

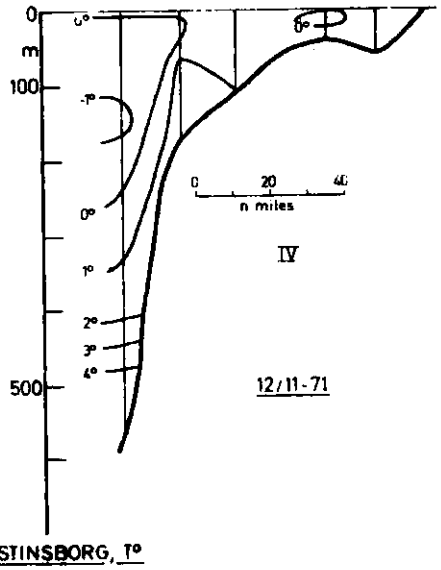

Fig. 9. Section off Holsteinsborg (IV) in November.

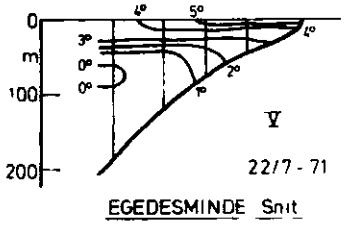

Fig. 10. Section off Egedesminde (V) in July.

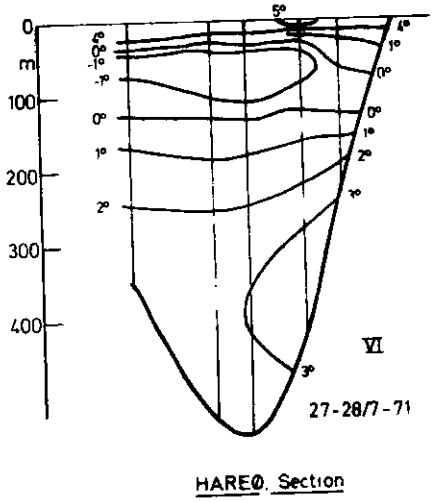

Fig. 11. Section from Hare Island (North of Disko Island) towards NW.

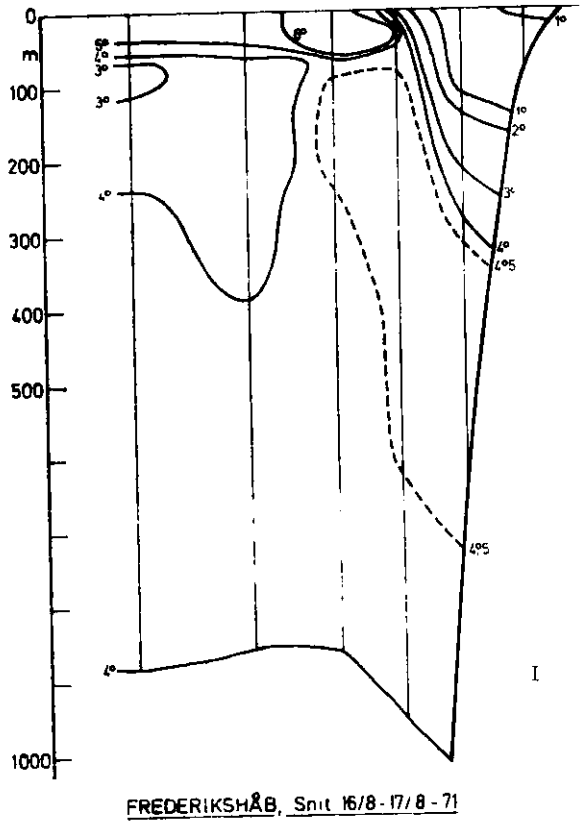

Fig. 12. Section Frederikshab (I) August.