



Serial No. 3908
(D.a.75)

ICNAF Summ.Doc. 76/VI/32

ANNUAL MEETING - JUNE 1976

Denmark (Greenland) Research Report, 1975

Part I

Statistical Area 0, Subarea 1 and East Greenland

by

Sv. Aa. Horsted
Gronlands Fiskeriundersøgelser
Charlottenlund, Denmark

STATISTICAL AREA 0

A. STATUS OF THE FISHERIES

A commercial fishery for Greenland halibut was conducted by some of the Greenland trawlers in June. Total catch was about 360 tons (provisional). The only other Greenland activity in the area was a scouting trip by one of the 500-999 GRT trawlers in November for roundnose grenadier. Fishing was carried out around 62°N.lat., 61°W.long. at depths of 600-800 meters. Total catch was 8.5 tons of grenadiers and 10 tons of Greenland halibut. Total catch per hour was 348 kg. Total nominal catch by Denmark (G) in the area for 1975: Greenland halibut 368 tons, roundnose grenadier 9 tons, redfish 2 tons and wolffish 1 ton, all taken by stern trawlers in the 500-999 GRT class.

B. SPECIAL RESEARCH STUDIES

No special research cruises have been made in the area. From the above mentioned scouting trip, however, some information has been submitted. The best concentrations of grenadiers were found on depths of about 650-670 meters. On greater depths (down to about 750 meters) by-catch of sponges was common, and in such cases the catch of fish could be more or less damaged by the sponges. On more shallow water Greenland halibut was the predominant species. Few redfish and wolffish (A.latifrons) were the only other fish observed.

By far most grenadiers were roundnose grenadier (C.rupestris) but about 10-20 specimens of routhead grenadier (M.berglax) were taken in each haul. Stomach content of grenadiers consisted of crustaceans, worms and smal redfish.

SUBAREA 1

A. STATUS OF THE FISHERIES

1. General trends

The nominal catches by Denmark(G) in 1975 are given in Table 1 (provisional figures).

Total nominal catch decreased by about 8% from 1974 to 1975 primarily due to a decrease in catches of the major groundfish species (cod, Greenland halibut, wolffish and redfish) the only remarkable exception being a further increase in catches of the cold-water fish Greenland cod (Gadus ogac), fished nearly exclusively in the small boat inshore fishery.

Table 1. Denmark(G) nominal catch, Subarea 1, 1975 (provisional figures).

Species	Nominal catch 1975 (metric tons)	Increase or decrease from 1974 (%)
Cod	19 218	- 4
Greenland cod	4 631	+ 37
Redfish	1 642	- 32
Wolffish	5 485	- 5
Roundnose grenadier	6	+ 20
Greenland halibut	3 270	- 19
Halibut	115	- 15
American plaice	3	- 96
Capelin	1 035	- 70
Atlantic salmon	1 187	+ 2
Arctic char	137	+ 17
Lumpsucker (roe only, not converted to round, fresh fish)	30	+173
Herring	10	- 64
Industrial fish and fish not specified	163	- 10
Shrimp	9 893	- 3
TOTAL (excl.lumpsucker roe)	46 795	- 8

The smallest (150-499 GRT class) of the seven Greenlandic stern trawlers was under reconstruction (being converted to shrimp trawling) in 1975. In spite of this the total catch by trawlers was virtually the same in 1975 (18.2 thousand tons) as in 1974 (18.4 thousand tons), when all seven trawlers fished. Thus the local small boat fishery has faced a further decrease in catches by about 13% (28 600 tons in 1975, 32 900 in 1974), mainly due to decrease in catches of cod (by 2100 tons) and capelin (by 2400 tons).

The important fishery for shrimp decreased slightly (by 3%). The catch is taken nearly exclusively by small boats. For further details of this fishery see Res.Doc. 76/VI/16.

The three most important species in terms of gross income for the Greenland fishermen (including the trawlers' landings) were cod by 35%, shrimp by 33% and salmon by 16%, virtually the same values as in 1974. The landings by the trawlers accounted for about 27% of the total landed value of fish, and since their landings consist mainly of cod and other groundfish the relative importance of shrimp and salmon for the local fishermen is considerable higher than the said figures. For the local fishermen shrimp fishing is by far the most important source of income, accounting for about half their gross income in 1975 followed by salmon and cod.

Further details of the major fisheries are given below.

2. Cod

a) The fisheries. Nominal catch was slightly (4%) below that of 1974. However, a further decrease from 1974 by about 2100 tons (about 24%) occurred for the coastal and inshore small boat fishery. This decrease was to some extent counterbalanced by an increase (by about 1400 tons or 12%) in the trawlers' landings although their number was reduced from seven to six in 1975. For these six trawlers the mean annual catch of cod increased by about 400 tons or 22% from 1974 to 1975, taken mainly in the first half of the year. About 2/3 of their total catch was taken in February, March and April.

b) Forecast for 1976-77. The 1968 year-class which contributed significantly - although relatively less than expected (see Res.Doc. 76/VI/17) - to the catch in 1975 seems to have been somewhat overestimated previously. Furthermore, it may have had a significant spawning migration to waters off East Greenland and Iceland. Thus it is expected to have a rapidly decreasing importance for the West Greenland fisheries.

The 1973 year-class seems to be the most important one for the fisheries from 1977 and onwards. The actual output of the fisheries will, of course, be determined by the management policy of the Commission.

For 1976 the prospect for the fishery by the Greenland fishermen, including the trawlers, seems poor, although their quota is unchanged from 1975 to 1976.

The winter 1975/76 has been so cold and formation of ice so extraordinary that fishing by trawlers as well as by local fishermen has been severely hampered. By the end of April 1976 catches were less than half those at the same time in 1975, and it seems very unlikely that this shortfall can be counterbalanced by the fishery in the rest of the year.

For further details see Res.Doc. 76/VI/17 and the Report of the Subcommittee on Assessment (Summ.Doc. 76/VI/22)

3. Atlantic salmon.

The quota for the Greenlanders was again fully utilized although the opening of the fishery was postponed until 20 August. This postponement was made in order to ensure that all Greenland districts had a chance to catch salmon (salmon occur later in the northern than in the southern part of Greenland).

Under the present regulations 1975 was the last year for the Danish and Faroese drift netting. Logbook records received from some of the Danish drifters indicate that catch per net shot was less than in the extreme good year 1974, although still well above the mean for 1970-73.

Unless catch rates drop considerably no shortfall in the Greenlanders' catch compared to the quota is expected.

4. Shrimp (*Pandalus borealis*)

The catch by the Greenlandic fleet was slightly (3%) less than in 1974. This seems to be explainable by the physical conditions for fishing in the Disko Bay, the most important area for shrimp fishing. Conditions were extremely good in 1974 but fishing was to some extent hampered by bad weather and ice in the first part of 1975. In the Disko Bay the landings decreased by about 15% compared to 1974, whereas fishing at other parts of the coast generally increased somewhat, to some extent due to landings from offshore grounds.

Prognoses of the shrimp fishery are difficult to give at present. For example it is not known to what extent the expanded fishery on offshore grounds influences coastal and inshore stocks, nor are mechanisms behind possible year-class fluctuations and many other factors known at present.

The 1976 fishery by the Greenlanders by the end of April is only about half of that by the same time in 1975. As for a similar decrease in the cod fishery this decrease is due to the ice situation following the extreme cold winter 1975/76, the Disko Bay being nearly completely covered with ice in the first four months of 1976. Although it is expected that the conversion of a trawler from cod fishing to shrimp fishing will increase catches in the last half of 1976, when the trawler comes into operation, it is doubtful whether the recent decrease can be more than just counterbalanced. Also offshore fishing by non-Greenlandic vessels must have been severely hampered in the first four months of 1976.

5. Other fish

Due to the better catches of cod in 1975 than in 1974 the trawlers seem to have concentrated more on that species than on a mixed groundfish fishery. However, in the last part of 1975 groundfish species other than cod, especially wolffish and redfish have made up the major part of catches by trawlers, but the total catch of these secondary species has dropped slightly.

The small boat fishery has had a nearly steady fishery of Greenland halibut but a significant decrease (by 70%) in catches of capelin. The most remarkable feature is the steady increase in catches of Greenland cod (*Gadus ogac*). The landings of this species by small boats is gradually approaching the same level as their landings of cod, in 1975 4500 tons of Greenland cod and 6500 tons of cod, these two species superseeded only by shrimp. Catches of Greenland cod will probably increase further.

B. SPECIAL RESEARCH STUDIES

1. Environmental studies

a) Hydrography. Work has been carried out on the standard hydrographic sections off West Greenland and is reported separately by Frede Hermann in Part II of this document.

It should be noted that temperatures in June-July over the shallow part of the Fylla Bank were higher than in the recent cold years and probably high enough to allow for a relatively good survival of cod larvae.

b) Plankton. Oblique hauls with 2 m stramin net (each haul half an hour, 225-0 m wire) were taken in July at the standard sections off Godthåb, Sukkertoppen and Holsteinsborg, and at a standard station at Godthåb from April to August.

On the Fylla Bank section the mean volume of plankton per half hour's haul was 613 ml, a considerable increase over 1974 and 1973, when the volume was 265 and 155 ml, respectively, and close to the mean of 895 ml for the 1961-68 period.

c) Benthic studies. As part of a study of the environment in areas where drilling for oil can be expected in the nearest future samples of the benthic fauna were taken in Divs. 1B-1D. Samples were taken on 81 stations in this area depth range being 20 to 600 meters. Samples for chemical analyses of hydrocarbons were taken of the bottom material and of various animals. On most stations it proved rather impossible to use quantitative gear, but qualitative samples were obtained on all stations. Those samples which have been worked up show a great number of species and of specimens especially on soft bottom. Thus, in the the Holsteinsborg Deep, the mean number of specimens per 1/10 m² is about 400, representing about 30 species.

In the Umanak Fjord studies of the environment at the lead and zinc mine has been continued in April and in September, including sampling and analyses of the benthic fauna.

d) Observations on ice. Regular aerial observations on the ice round Greenland is carried out by the Danish Meteorological Institute. It is hoped to have a special description of the ice situation during 1975 in time for the Annual Meeting of the Commission as Part III of this document.

e) Other environmental studies. In connection with the forthcoming drilling for oil on the West Greenland shelf a great number of observations on the environment have been made through 1975. These observations are carried out both by the oil companies and by various research institutes. The oil companies concentrate mainly on physical factors such as formation and movement of ice, current, wind and waves. The research institutes conducting surveys for the government also study physical factors but have also included biological studies, see for example paragraph c) above.

2. Biological studies

a) Cod, Eggs and larvae. The number of cod larvae found in the plankton is shown in Fig.1. The number is somewhat greater than in the preceding cold years 1969-74. The mean for all stations per half hour's haul was 3.2 in 1975 but only 1.2 for the years 1969-74. Together with the relatively high June-July temperatures this points to the possibility of the 1975 year-class as a moderately good year class. It does, however, remain to be seen what influence the extreme cold winter 1975/76 may have had on the further survival of the young cod. It should also be noted that the statement about cod larvae in the plankton should be taken with some reservation since the difference between larvae of cod and those of *Gadus ogac* is not sufficiently well known. With the apparent increase of the stock of *Gadus ogac* the possibility exists that some of the larvae may belong to the latter species.

Occurrence of pre-recruit cod. After several years without significant number of small cod in the research catches small cod, especially 2-years olds, were observed both in research catches with small meshed otter trawl and as undersized fish (discarded) in the commercial pound net catches. A comparison of the research catches in 1975 with those of former years is given in Table 13 of Res.Doc. 76/VI/17 for the standard station Godthåb Dybet. Even greater numbers of small cod were taken throughout the year in research catches off Frederikshåb Isblink (Table 14 of Res.Doc. 76/VI/17), this locality now being included in the list of regularly fished standard stations.

Examples of the influence of the 1973 year-class in the commercial pound net fishery are given in Fig.2. The year class seems to be especially frequent in the southern divisions and is likely to be of East Greenland origin (see Res.Doc. 76/VI/17).

Cod in commercial landings. The most important material has been sampled from the trawlers' landings (Figs. 3a and 3b). As expected the year-class 1968 dominated in most samples, but it is remarkable that samples taken in January-May, when about 84% of the trawlers' 1975 catch of cod were taken, contained a considerable number of age-group 6 (year-class 1969) or younger fish (see sample taken in Div. 1C in January, Fig. 3a). The predominance of the 1969 year-class in Div. 1C in 1975 was predicted in last year's Research Report (Summ.Doc.75/31) and can possibly be taken as a sign of spawning emigration of the 1968 year-class to more southern divisions and to East Greenland-Iceland. The 1968 year-class is not expected to contribute much to future catches in Divs. 1B-1D but will probably still contribute to gill net catches in the southern divisions of Subarea 1 and to catches off East Greenland.

Tagging experiments. 1852 cod were tagged in 1975, the majority being small cod (discards from pound net catches) tagged inshore in Div. 1D.

b) Atlantic salmon. Off West Greenland about 500 salmon were caught in August by the R/V DANA. Blood and scales were sampled for further studies on the stock separation (European and North American components) by Canadian scientists who participated in the cruise.

See also section on East Greenland.

c) Lumpsucker. A material has been collected to study the relation between weight of roe and of whole fish. Only roe is incorporated in the catch statistics and no conversion to nominal catch has been made in previous years. The result of the analyses will be reported in a separate research document.

d) Capelin. Samples have been obtained from a number of locations by pelagic trawling and by beach seining.

e) Other fish. Age and/or length samples of exploited species other than those already mentioned above have been taken from research vessels' catches. Especially samples of American plaice, redfish and Greenland halibut are of a considerable size. 95 Greenland halibut were tagged.

A sample of roundnose grenadier was taken from the catches on the scouting trip mentioned in Paragraph A, Statistical Area O. A material has been collected to study the relation between total length and the length from the tip of the snout to the anal fin. The results will be reported in a separate research document.

f) Shrimp (*Pandalus borealis*). The greatest research activity in 1975 was in the Disko Bay, where about 80% of the inshore fishing is taking place. A number of standard stations for trawling have been established here and will be fished regularly. About 2000 photographs of the sea bed were taken in the Disko Bay. The technique seems promising for obtaining an index of the density of shrimp, and further work will be done, especially on offshore grounds in 1976-77. About 10 000 shrimps were tagged in the Disko Bay in 1975, but returns have been very limited probably due to high tagging (handling) mortality and/or poor returning. The reward for returns was increased (from 5 to 25 D.kr.) by 1 May 1976.

Also on the offshore grounds a number of standard stations for trawling have been established. These were fished more or less frequently in 1975.

From the research catches on the standard stations samples for length frequencies (by sex and maturity stages) are taken. These samples are supplemented by samples of commercial landings taken regularly by industry people.

A program is being initiated to collect catch/effort statistics by small area units (7½ minutes lat. by 15 minutes long.) by means of log books.

g) Queen crab (*Chionoecetes opilio*). Trap fishing experiments have been continued in the Godthåb area (Div. 1D inshore) and in some fjords in the Sukkertoppen district (Div. 1C). Also some localities in the Disko Bay have been included in the experiments.

The results indicate that the possibility of establishing a special crab fishery and industry in waters south of the Disko Bay is very small although fishing for a local market may be possible. In the Disko Bay queen crab is frequently caught by the shrimp trawlers, and the possibility of using this by-catch possibly supplemented with direct catches by traps or crab trawls should be considered.

h) Seals. The activity in 1975 was directed mainly at studies of the ringed seal population in the northern Upernavik district. Samples of jaws are obtained from the Greenlanders' catch and is likely to be in the order of 3000 specimens for the 1975/76 season. Visual observations (by telescope from the mountains) together with interviews with hunters are used to obtain indices of abundance at the various localities.

Sampling of Greenlanders' catch of harp and hood seals has been continued. Results of age analyses of hood seals from previous sampling have been reported directly to the meetings of the Scientific Advisers to Panel A (Res.Doc.75/123).

3. Gear and selectivity studies. Nothing to report.

EAST GREENLAND

A. STATUS OF THE FISHERIES

The only commercial fishing conducted by Denmark(G) at East Greenland in 1975 has been the local fishery in the Angmagssalik area. Nominal catch in 1975 was 178 tons of cod, few tons more than in 1974. Also 2 tons of Greenland halibut, 1 ton of capelin and 94 tons of Greenland shark (Somniosus microcephalus) was purchased by the Trade Department in 1975 (nothing reported in 1974). For the quantity of Greenland shark mentioned only the net weight of meat is given.

B. SPECIAL RESEARCH STUDIES

Salmon. In the Irminger Sea the R/V DANA carried out drift net fishing to study distribution and abundance of salmon. The cruise was severely hampered by bad weather and only three out of ten planned stations were fished. These are shown in Fig.4 together with all previous results of salmon fishing by the DANA in this part of the North Atlantic. It will be seen that salmon has a wide distribution in the Irminger Sea, but the concentration (catch per unit effort) is much less than in the West Greenland salmon season.

SUBAREAS 2-5, STAT. AREA 6

No fishing and no research in these areas by Denmark(G) in 1975.

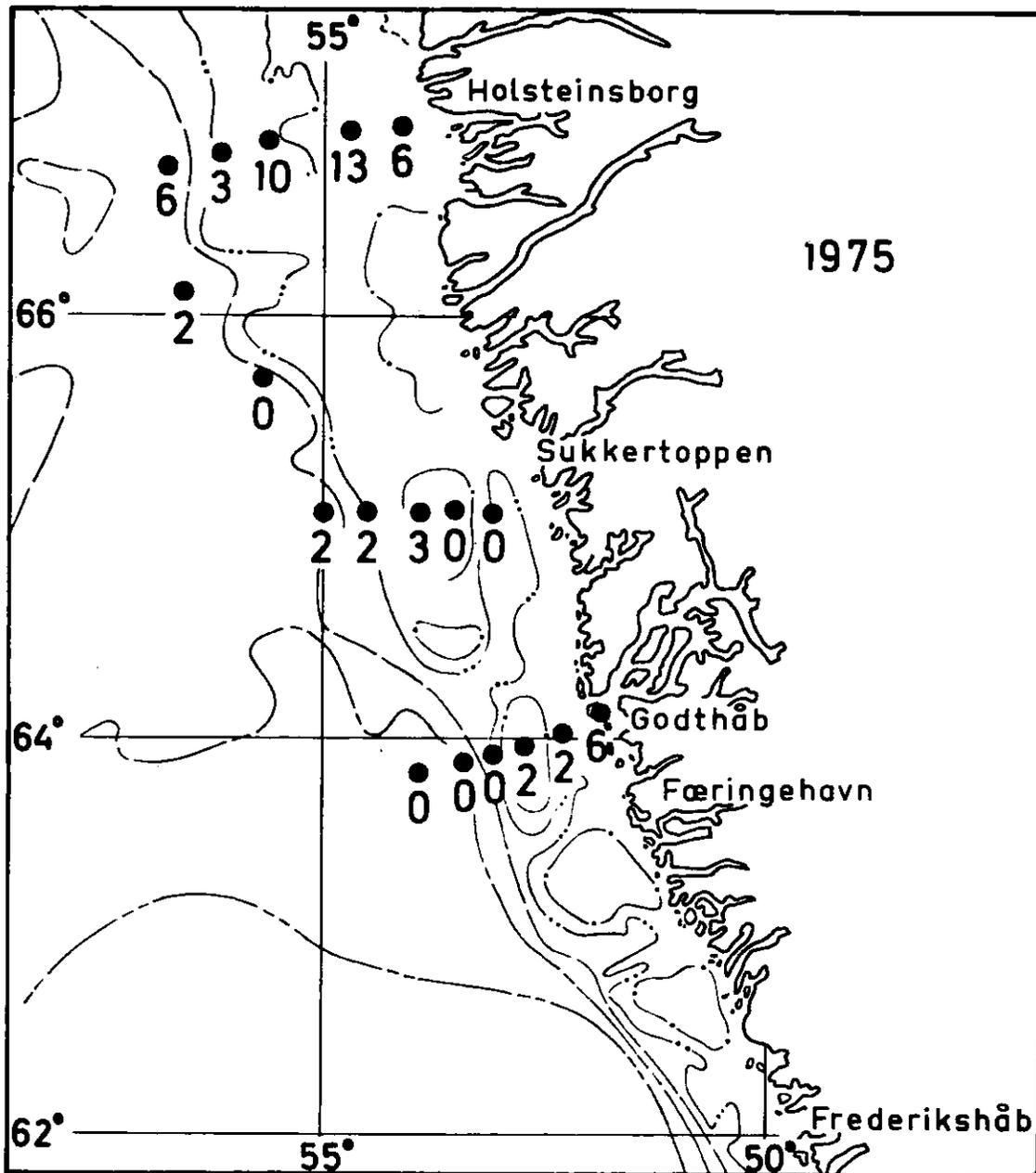


Figure 1. Cod larvae (number per 30 min.) taken by 2 m stramin net in the upper water layers (max. depth 50 m) in July 1975.

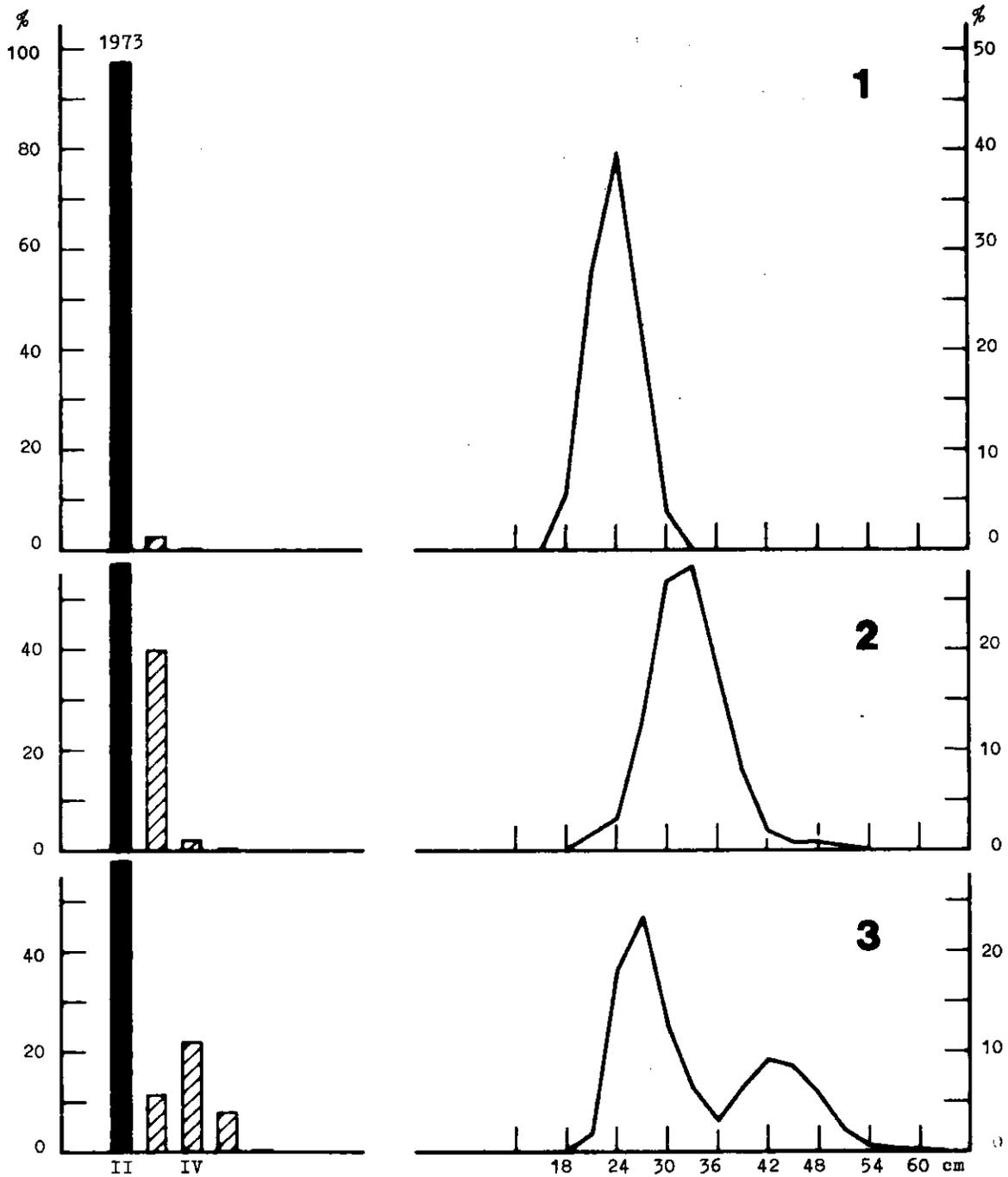


Figure 2. Examples of age and length distribution of cod taken by small meshed otter trawl (research catches) in Div.1E, April (No.1), Div.1E, November (No.2), and by commercial pound net in Div. 1D, May (No.3). Year-class 1973 shown by black column.

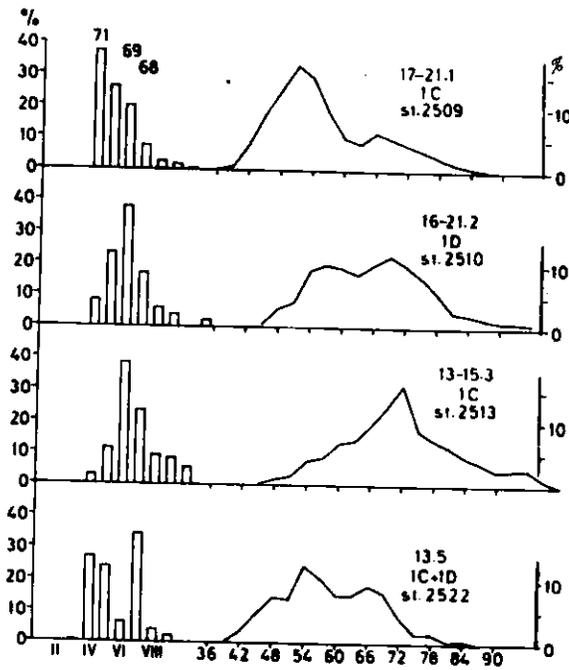


Figure 3a. Age and/or length distribution of cod in commercial landings by otter trawlers, 1975. Dates for the trip and divisions fished during the trip are given at each sample together with a reference number (station number).

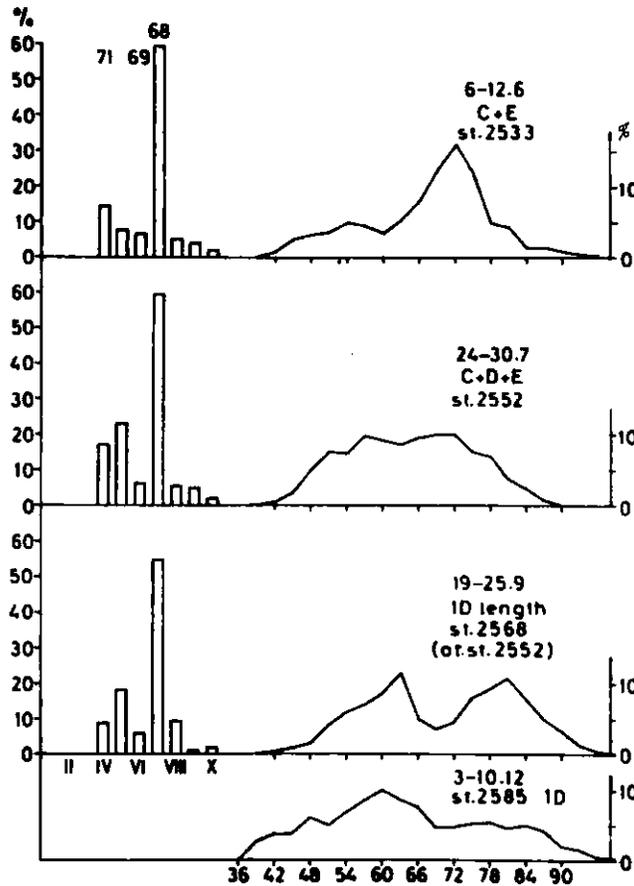


Figure 3b. Age and/or length distribution of cod in commercial landings by otter trawlers, 1975. Dates for the trip and divisions fished during the trip are given at each sample together with a reference number (station number).

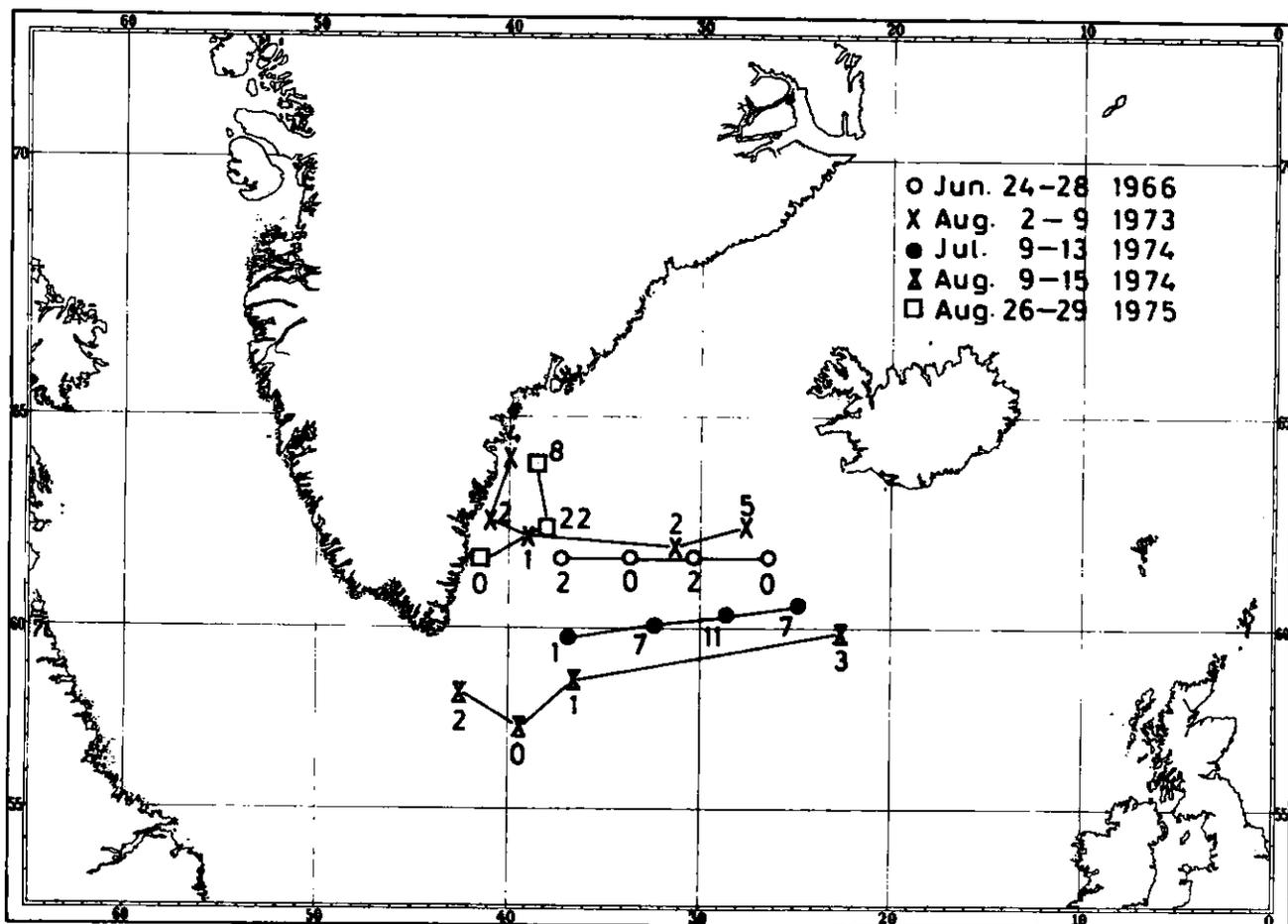


Figure 4. Drift net fishing by the R/V DANA in the Irminger Sea 1966 and 1973-75. Figures show number of salmon caught at each station.

PART II

Hydrographic conditions off West Greenland in 1975

by

F.Hermann

Danish Institute of Fisheries and Marine Researches
Charlottenlund, Denmark

The location of the hydrographic sections worked by R/V ADOLF JENSEN is shown in Fig.5. Section II across Fylla Bank was worked in January, February, April, May, June, July, August, October, and November. The Sections III and IV across Lille Hellefiskebanke and Store Hellefiskebanke were worked in July. The temperature sections are shown in Figs. 6-11.

The winter cooling was very strong. In February the water over the shallow part of Fylla Bank was cooled to the freezing point and sea ice formed. In the deeper layers off the western slope of the bank relatively high temperatures were found. Still in the middle of April negative temperatures were found down to 100 meters off the western slope of the bank. In May, June and July a relatively strong heating occurred in the upper 50 meters. In the middle of June the mean temperature in the upper 40 meters over the shallow part of Fylla Bank was 1:9.

The temperature is probably high enough to allow some cod larvae to survive and contribute to the recruitment of the stock of cod at West Greenland provided that the small spawning stock produces eggs in sufficient numbers.

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 are shown below

Depth interval m	Mean temperature	Mean salinity	Δ T		Δ S	
	°C 1950-66	o/oo 1950-66	July 1975	July 1975	July 1975	July 1975
0-50	2.07	33.29	-0.03		-0.40	
50-100	1.33	33.65	-0.13		-0.45	
100-200	1.85	34.00	-0.96		-0.50	
200-300	2.88	34.39	-0.44		-0.12	
300-400	3.79	34.67	+0.05		+0.03	
400-500	4.22	34.81	-0.34		-0.21	
0-500	2.89	34.27	-0.36		-0.21	

Negative temperature anomalies still are dominating, but are found now mainly in the water between 50 m and 300 m. For the whole water column 0 to 500 meters the temperature has increased by 0:5 since 1974. Negative salinity anomalies still are dominating in the upper 300 m, indicating strong inflow of polar water to the West Greenland area. In August an inflow of cold polar water took place. Negative water temperatures were found at 50 m west of Fylla Bank which is very unusual at this time of the year.

In the autumn an inflow of warm water from the Irminger Current took place as usual in the deeper layers off the western slope of the banks. West of Fylla Bank the temperature exceeded 5° at depths between 300 and 500 m in November.

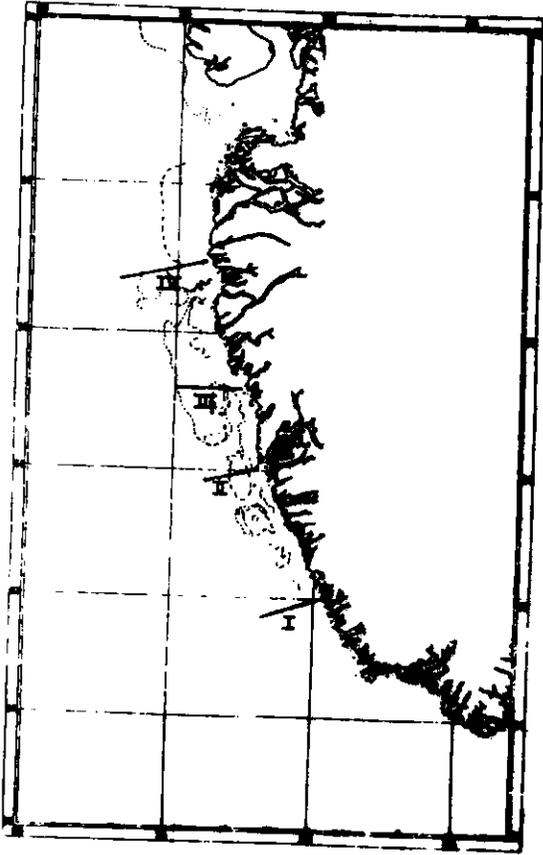
In July the temperature in the upper layers over Lille and Store Hellefiskebank were approximately as in 1974. Over Store Hellefiskebank the temperatures were 1° to 2° higher than in 1972 and 1973. Fig.12 shows the 5-years running mean of surface temperature anomalies in the West Greenland areas (A₁) and the South Greenland area (B) based on surface anomalies up to 1973 (Smed up to 1973). The mean values 1969-73 are now 0:4 and 0:5 respectively below the mean values for the cold period 1876-1915.

It is, however, probable that the temperature curves will raise again, when the relatively high temperatures from the years 1974 and 1975 are included.

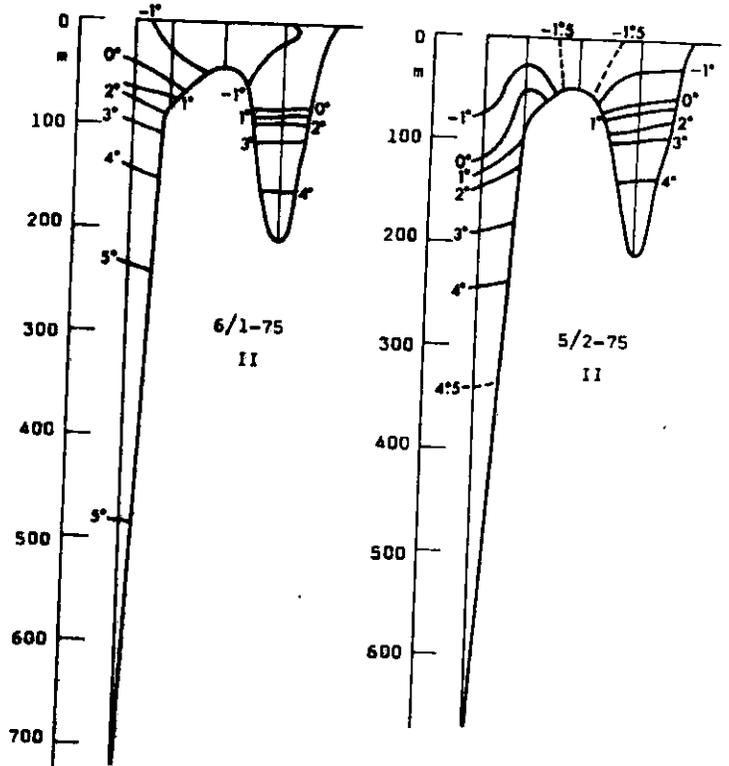
References

Hermann, F. 1967. Temperature variations in the West Greenland area since 1950
Int.Comm.NW Atl.Fish. redbook 1967, Part IV : 76-85.

Smed, J. up to 1973. Monthly anomalies of the surface temperature of areas of
the North Atlantic. Ann.Biol. Int.Council Expl.Mer.



Figur 5. Location of hydrographic sections off West Greenland.



Figur 6. Temperature sections across Fylla Bank in January and February, 1975.

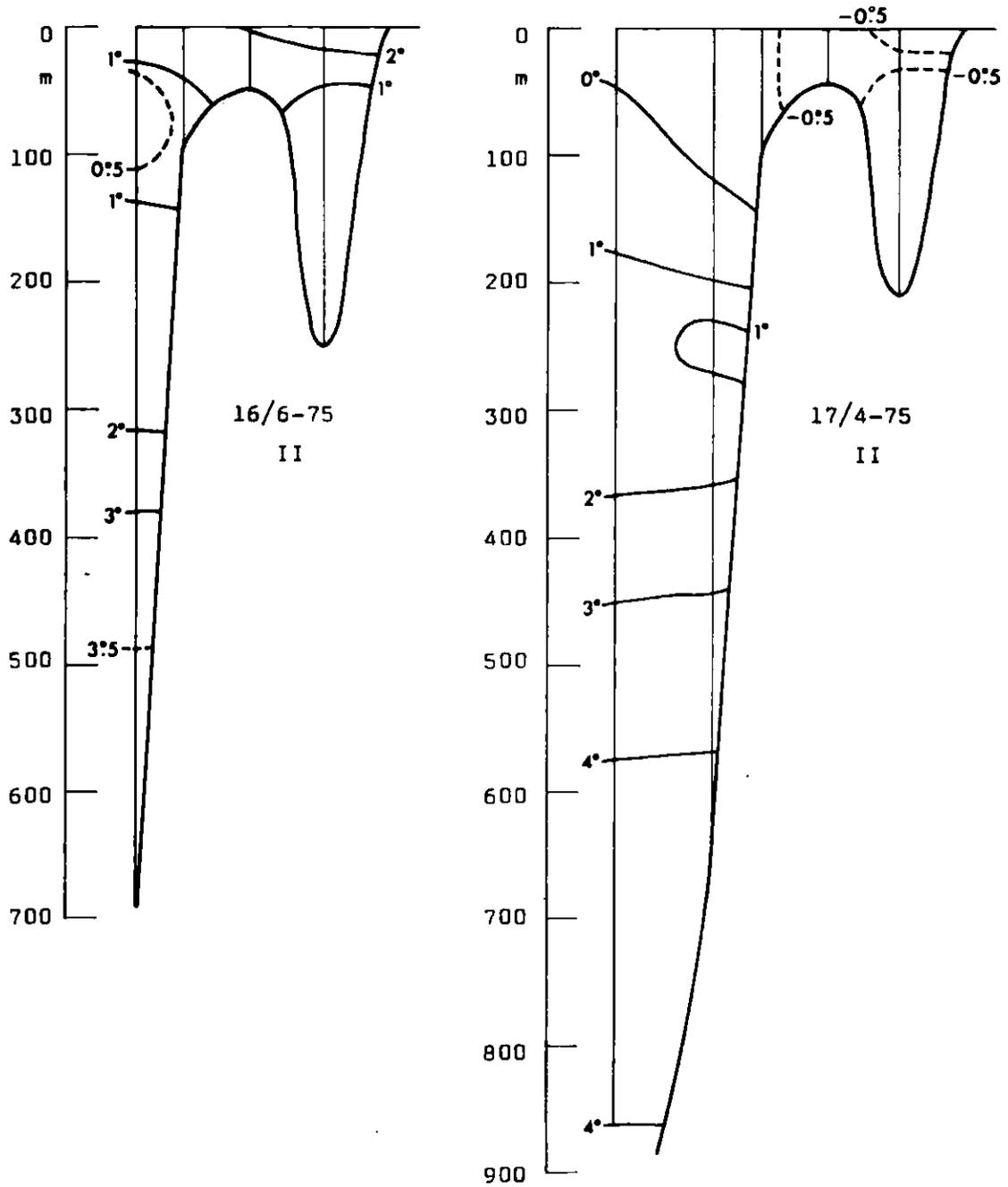


Figure 7. Temperature sections across Fylla Bank in April and June, 1975.

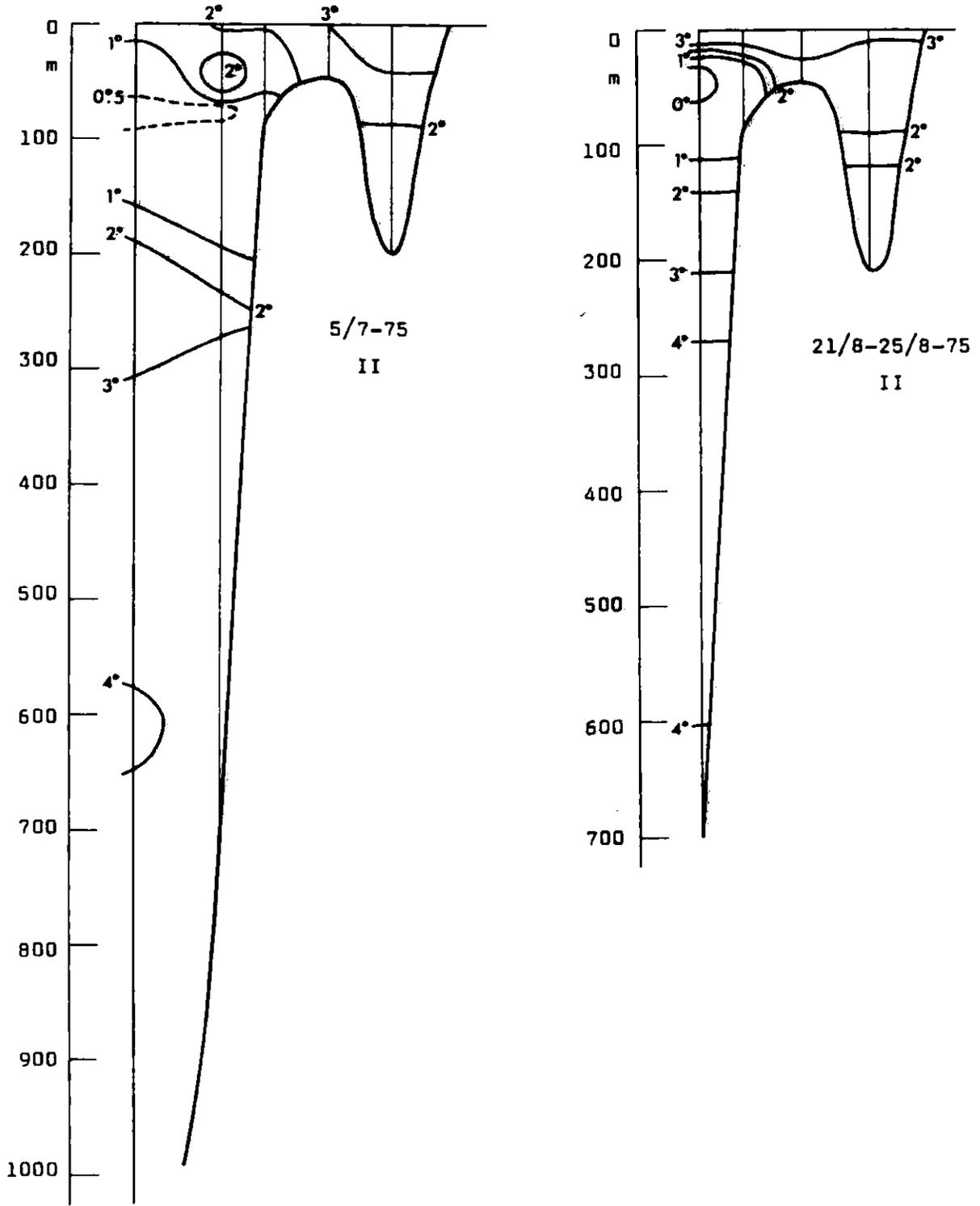


Figure 8. Temperature sections across Fylla Bank in July and August, 1975.

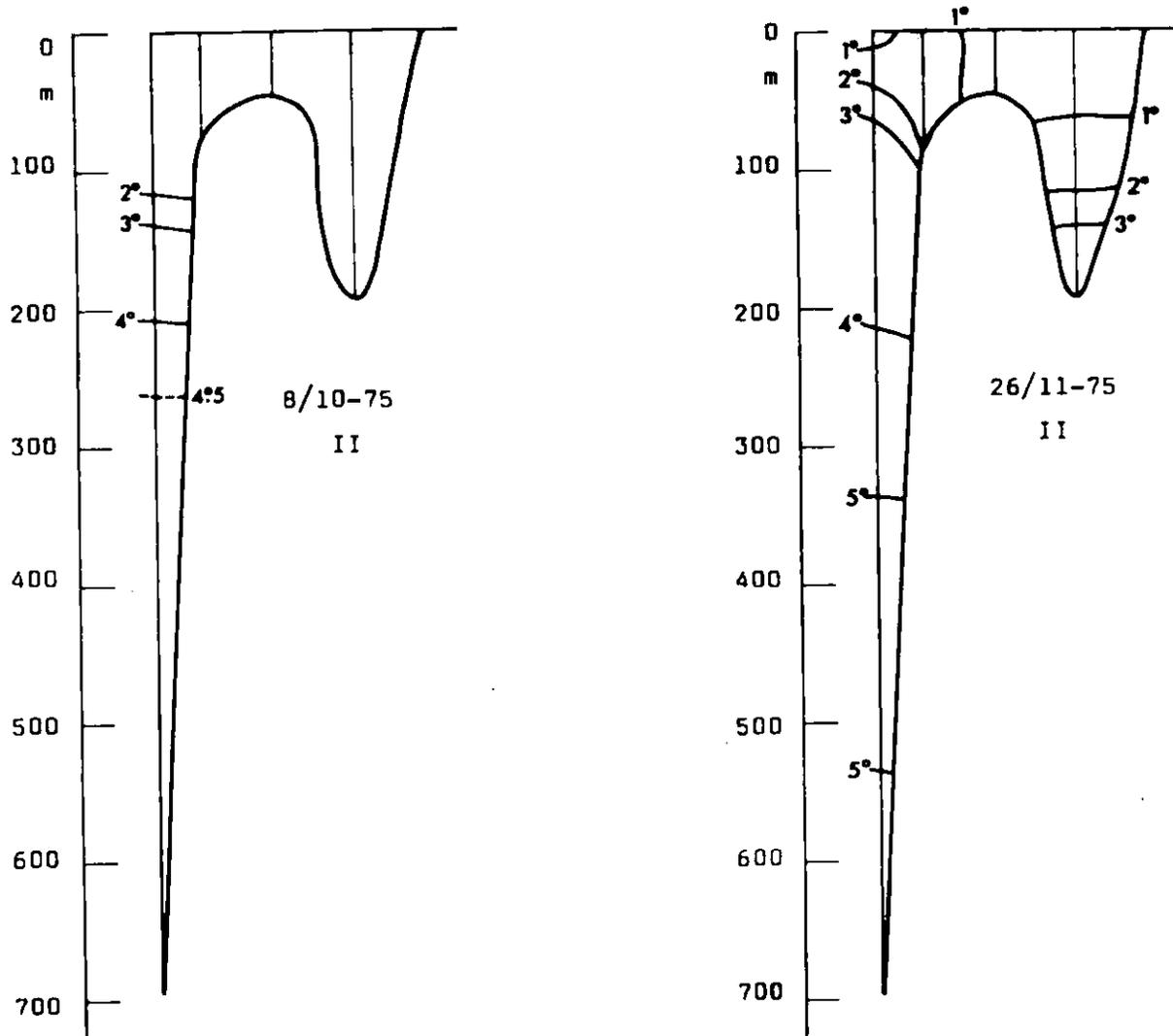
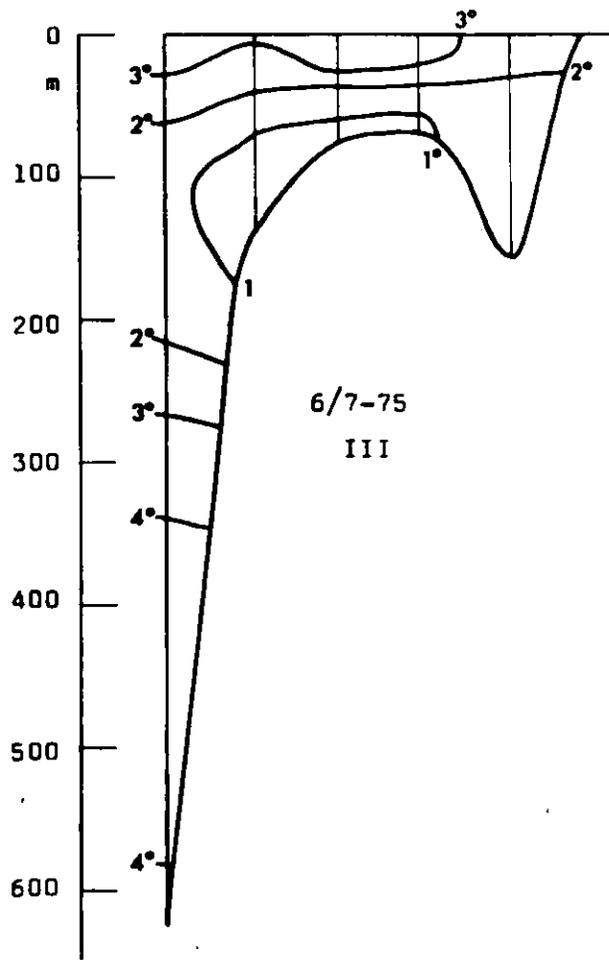


Figure 9. Temperature sections across Fylla Bank in October and November, 1975.



Figur 10. Temperature section across Lille Hellefiskebank in July, 1975.

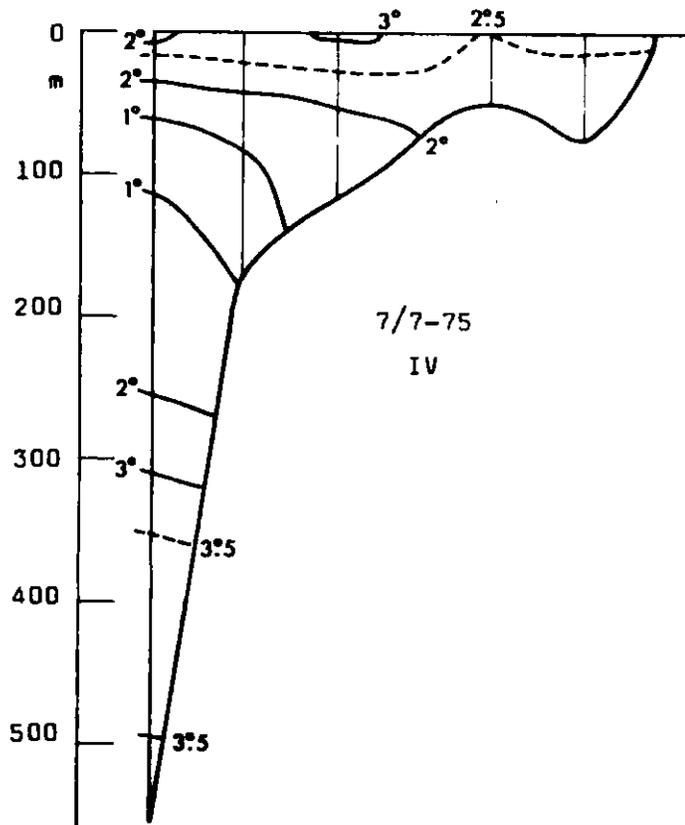


Figure 11. Temperature section across Store Hellefiskebank in July, 1975.

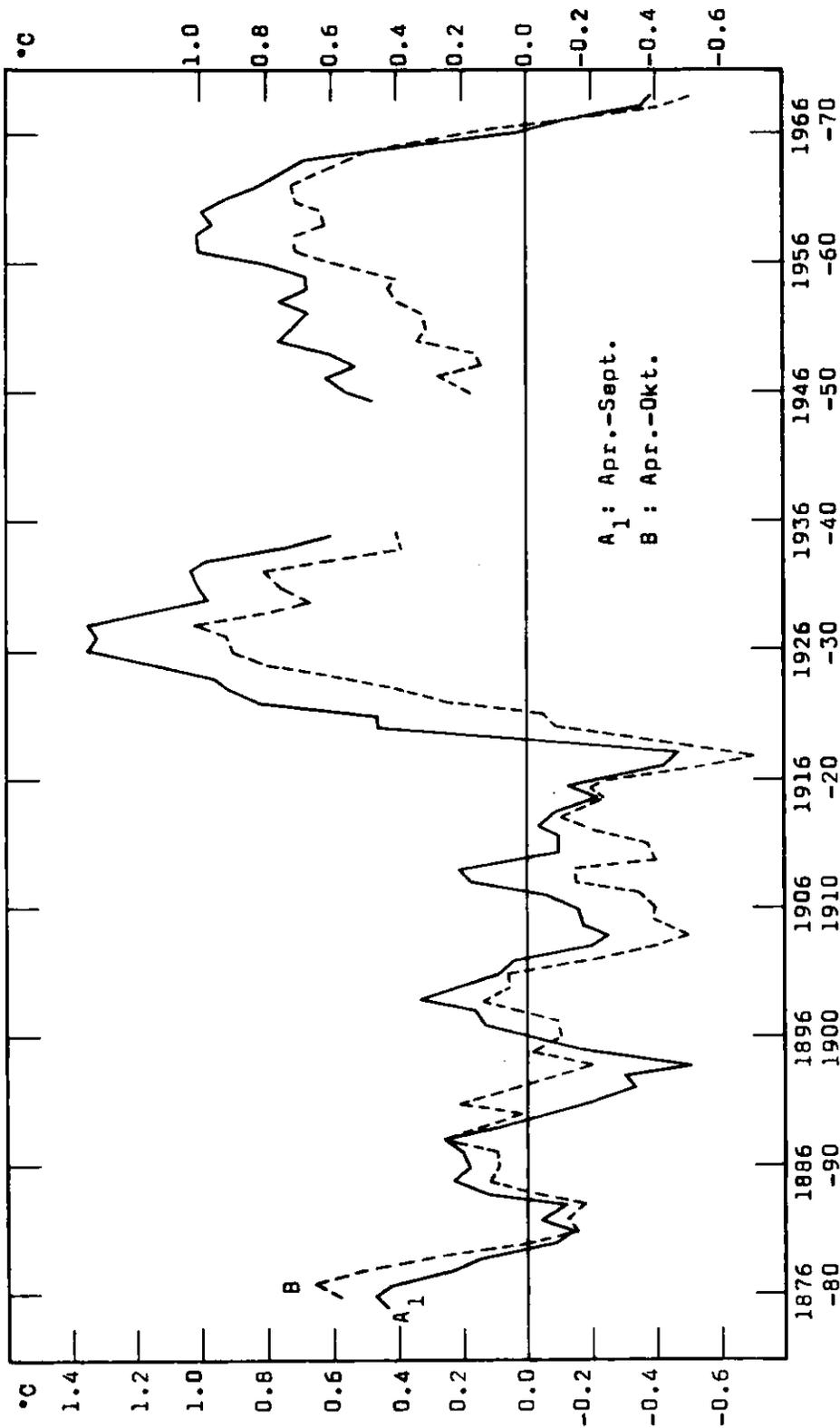


Figure 12. Sea surface temperature anomalies, 5-years running means up to 1973.

A₁ (solid line) West Greenland Area, April-September.

B (dotted line) South Greenland Area, April-October.

Base period 1876-1915.

