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Denmark (Greenland), Research Report for 1978

by

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This report contains information on the fisheries by Greenland vessels and on research carried out by the Greenland Fisheries Investigations (Grønlands Fiskeriundersøgelser) in the ICNAF Convention Area and at East Greenland in 1978. Various colleagues in the institute have made contribution to the report.

STATISTICAL AREA O

No commercial catches from this area reported by Greenland vessels.

In September one of the trawlers of the Royal Greenland Trade Department was directed at exploratory shrimp fishing in Div. 1A and 0B. Two scientists participated in the survey.

In Div. 0B only 6 hauls were made but catches did not compare to those in the fishing area of Div. 1B. Samples of shrimp were taken for further analyses.

SUBAREA 1

A. STATUS OF THE FISHERIES

1. General trends

The nominal catches by Greenland vessels in 1978 are given in Table 1. Figures are provisional but not likely to be changed to any noteworthy extent.

The nominal catch increased by 12% from 1977 to 1978, primarily, not to say entirely, due to improved catch rate for cod both offshore and inshore. Shrimp catches decreased by 13% while the catches of Greenland halibut were only slightly (2%) below those in 1977. Catches of Greenland cod and wolffish both decreased by about 1/4 from 1977-78. Thus most major species, except cod, showed a decrease in catches from 1977 to 1978, but the increase in cod catches more than counterbalanced the decrease of most other species. The good catch rate in the cod fishery may have created some change in effort, so that the decrease for other species may be seen in the light of the improved cod catches.

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Table 1. Nominal catches by Greenland vessels in Subarea 1, 1978 (provisional figures).

Species	Nominal catch 1978 (metric tons)	Increase or decrease from 1977(%)
Cod	37 694	+ 56
Greenland cod	4 418	- 25
Redfish	654	- 40
Wolffish	2 135	- 29
Roundnose grenadier	32	+ 220
Greenland halibut	5 971	- 2
Halibut	189	+ 48
Capelin	297	- 8
Atlantic salmon	992	- 30
Arctic char	138	- 57
Lumpsucker (roe only, not converted to round,fresh fish)	367	+ 180
Herring	7	+ 133
Industrial fish and fish not specified	139	- 14
Shrimp	12 884	- 13
TOTAL (excl.lumpsucker roe)	65 550	+ 12

Further details of the major fisheries are given below.

2. Cod

a. The fisheries. Nominal catch by Greenland vessels was 56% above that of 1977 despite a closure of the large trawlers' fishery by May. The offshore catches by trawlers increased from about 10 200 tonnes in 1977 to about 17 800 tonnes in 1978 while the inshore catches, mainly taken by pound nets, increased from 14 000 tons to about 19 900 tonnes.

Cod made up about 73% of the total landing by trawlers as compared to about 53% in 1977.

The major part (66%) of the offshore catch was taken in Div. 1C, the remainder in Div. 1D-1E while only small quantities were taken in Div. 1F and virtually nothing in Div. 1A-1B. Inshore catches were taken mainly in Div. 1E-1F, but with major contributions also from Div. 1C-1D.

b. Forecast for 1979-80. Catches in the first quarter of 1979 have been very good in the offshore fishery, especially in Div. 1C-1D. By the end of April the catch by trawlers was about 10 000 tonnes but some of the trawlers had already at that time been directed to shrimp fishery.

The improvement of catches in 1977-78 was based nearly entirely on the relatively good year-class 1973. Samples from the 1979 fishery indicate, that although the 1973 year-class still seems important it may have been fished relatively much, so that catches in 1979-80 may be as much dependent upon new year classes as upon the 1973 year-class. The 1975 year-class is likely to be the most important in the fisheries in 1979-80. Information on the distribution of this year class indicates, that especially the fisheries in Div. 1B-1D will be dependent upon the 1975 year-class, while fisheries in Div. 1E-1F may still have relatively many cod of the 1973 year-class mixed with the younger and smaller fish.

Further details on the cod stock and the fisheries are found in ICNAF Res.Doc. 79/VI/59 + Addendum, and in the Report of the Assessment Subcommittee (Sum.Doc. 79/VI/11).

3. Shrimp (*Pandalus borealis*)

a. The fisheries. Nominal catch by Greenland vessels decreased by about 13% from the record catch in 1977. The major part of the decrease is borne by the small-boat fishery (decrease from about 9300 tonnes to about 7700 tonnes) while offshore catches by large trawlers were more stable (5175 tonnes in 1978, 5542 tonnes in 1977).

b. Forecast for 1979-80. The stock situation on the offshore shrimp grounds was assessed by the ICNAF *ad hoc* Working Group on Shrimp in November 1978 (Sum.Doc. 79/VI/1). Information presented and discussed at that meeting pointed towards a decrease in overall stock abundance from 1977 to 1978, and it was advised that the 1979 quota be reduced by 20-32% from the 1978 quota of 40 000 tonnes.

4. Other fish

The catch of Greenland cod decreased by 25% from the record catch of 5730 tonnes in 1977. The fish is caught mainly inshore in the northern divisions.

Landings of Greenland halibut decreased only slightly (2%) from the record catch of 6100 tonnes in 1977. Also that fish is caught mainly inshore and in the northern divisions.

Catches of wolffishes (*A.minor* and *lupus*) decreased further to a level of 2100 tonnes. The decrease of about 800 tonnes falls nearly entirely on the offshore trawlers.

Catches of redfish decreased again to a low level of about 650 tonnes. The fish is landed nearly entirely by the larger, offshore trawlers.

Landings of lumpsucker roe showed a remarkable increase from 131 tonnes to about 370 tonnes, all caught inshore and mainly in Div. 1C-1D.

The quota for salmon (1191 tonnes) was not reached in 1978 contrary to previous years. Total catch amounts to 992 tonnes.

B. SPECIAL RESEARCH STUDIES

1. Environmental studies

a. Hydrografi. Work has been carried out on some of the ICNAF Standard Oceanographic Sections off West Greenland, especially the Fyllas Bank Section (Fig. 1). Fig. 1-4 illustrate the situation in 1978.

The relatively high temperatures observed in the last part of 1977 on the Fyllas Bank Section were also observed in January 1978, but thereafter the winter and a relatively cold summer seems to have resulted in lower temperatures. In June the mean temperature (0-40 m) over the shallow part of the bank was only 0.9°C as compared to 2.1°C in June 1977. This low temperature is well below the lowermost level (1.8°C) experienced when good year-classes of cod are produced. Also in July the temperatures in the upper water layers on all sections observed were below those in July 1977 and remained lower than the corresponding 1977 temperatures in the last part of the year on the Fyllas Bank Section.

In the deeper water layers west of Fyllas Bank the temperatures in 1978 were dominated by warm Irminger water although not as pronounced as in 1977 (Fig.4). In July the mean temperature for the whole water column 0-500 m was 0.21°C above the mean for the warm period 1950-66 (Hermann, 1967), but decreased to the normal level by the end of the year. The warm Irminger water was also observed in July west of Store Hellefiskebanke (Holsteinsborg Section, Fig.3), but no specific inflow of this warm water was observed in the Disko Bay, where temperatures in October-November in 300 m depth were at the normal level between 1° and 2°C.

b. Plankton. Oblique hauls with 2 m stramin net (each haul 30 min., 225-0 m wire) were taken in July on the same standard stations where hydrographic observations were made, and on two stations between the two northernmost sections (Fig.5). Furthermore, at the standard station close to Godthåb, plankton were made throughout the year. Plankton hauls were also made in the spring in the Godthåbsfjord (Div. 1D) in an unsuccessful attempt to catch larvae of Greenland cod (*Gadus ogac*).

The plankton on the Oceanographic Standard Sections in the Davis Strait was extraordinarily poor in 1978. The mean volume per 30 min. haul in July on the five stations operated on the Fyllas Bank Section was only 480 ml as compared to 1580 ml in the warm year 1977. Furthermore, as in 1977, a considerable part of the volume was made up of medusae and ctenophores, although not as pronounced as in 1977.

Fish larvae and especially shrimp larvae occurred in much less quantities than usually. Table 2 illustrates the number of shrimp larvae per 30 min. haul on the sections operated in the years 1971-72 and 1977-78.

Table 2. Mean number of shrimp larvae caught per 30 minutes haul with stramin net (2 m diameter) in the Davis Strait.

Year	Number of shrimp larvae per 30 min.	Number of hauls
1971	36	14
1972	152	15
1977	49	15
1978	2	15

c. Other environmental studies. Monitoring studies at a marine disposal site for tailings from a lead-zinc mine and mill in Umanakfjord (Div. 1A) have been continued on a routine basis, but have been extended to include chemical analyses of more fish species than earlier and of ringed seals. The main part of the monitoring studies consists of measuring the level of lead, zinc, cadmium and copper in the sea water, and in sediments and various marine organisms. As part of the study tagging experiments on fish have been made to evaluate to what extent they are stationary or migrate. 8 cod, 39 Greenland cod, 35 spotted wolffish and 20 Greenland halibut were tagged in 1978.

Baseline studies related to exploratory drilling for oil off West Greenland are being terminated (companies are giving up their licenses after unsuccessful drillings) but field and laboratory studies on microbial degradation of oil continued in 1978, the samples being from Div. 1D.

2. Biological studies

a. Cod

Eggs and larvae. The number of cod larvae found in the plankton samples was the lowest observed in ^{the} many years (since 1950) when these surveys have been made. The mean number per 30 min. haul on all stations in the Davis Strait was only 0.3 (a total of 5 larvae on 15 stations). The relatively low temperatures may account for part of the explanation for this low number, but it is also observed, that analyses of the cod stock indicate, that by 1978 the spawning stock was at a very low level, possibly the lowest since the present cod period started. The occurrence of the cod larvae in the plankton is illustrated in Fig.5.

Occurrence of pre-recruit cod. Cod of age-group 1 (the 1977 year-class) have not yet been observed in noteworthy numbers in Danish research hauls. However, recalling that temperatures in 1977 were relatively favourable, and that no special effort was made to observe the year class in 1978, it cannot be concluded, that the lack of observed 1-group fish in the samples in 1978 is a sign of a poor year class. Only further observations will allow a preliminary estimate.

2-year old cod (year-class 1976) have only occurred rather sparsely in research hauls, and the year class is considered a relatively poor one.

The 1975 year-class, on the contrary, seems to be relatively abundant and will undoubtedly be the successor of the 1973 year-class as the important one for the commercial fisheries.

Details on the observation of pre-recruit cod are found in ICNAF Res.Doc. 79/VI/59, including observations reported by other nations, especially by the Fed.Rep.of Germany.

Cod in commercial landings. The most important material has been sampled from the trawlers' landings and from some inshore pound-net catches and landings in Div. 1D-1E. Details of samples are given in Table 7 of ICNAF Res.Doc.79/VI/59.

As was expected, the major part (about 80% by number) of the fishery in 1978 was based on the 1973 year-class. Fig.6-8 show examples of the length and age distribution of commercial catches and landings.

Tagging experiments. A total of 736 cod were tagged in 1978. 8 of these in Div. 1A in connection with the monitoring studies in Umanakfjord (see Section B, 1, c, page 5), the remainder (728) in the coastal and fiord region of Div.1D.

b. Atlantic salmon. Scales of about 50 salmon were sampled from the small research cutter TØRNAQ from late September to mid November in the coastal area of Godthåb (Div. 1D), and about 394 fish were sampled from commercial landings in Div. 1B, 1D and 1E. The scales are analysed in Canada, and results are incorporated in material presented to the May 1979 Meeting of the ICES Working Group on North Atlantic Salmon.

A Danish biologist participated in the Canadian cruise at West Greenland in late August.

c. Capelin. Research hauls by midwater trawl were made in the Godthåb area (Div. 1D) in February-April and in September. Samples were taken from these catches.

d. Sand eel. Three Danish North Sea cutters were engaged in experimental fishing for sand eel in the months late May-mid September, covering the offshore area between Fiskenæs Bank and Disko Bank, i.e. Div. 1A-1D. A number of samples were taken. These are at present being worked up (counting of vertebrae, maturity, ageing and stomach content plus some samples for analyses of fat and proteins) and a special research document on the results is likely to be presented in 1980.

e. Lumpsucker. In the lumpsucker-roe season (March-May) in Godthåb, records were made of the number and weight of female lumpsucker and roe landed (and recorded in the official statistics), and of the number of male lumpsucker sold directly for local consumption without being registered in the statistics.

f. Other fish. Age and/or length samples of commercial species other than those already mentioned have been taken from research vessels' catches. The following species are sampled regularly: Greenland cod, redfish, species of wolffish, American plaice, halibut and Greenland halibut. Sampling of commercial catches in 1978 included (besides cod and shrimp) redfish and Greenland cod.

A total of 44 Greenland cod were tagged, 39 in Div. 1A (Umanakfjord) and 5 in Div. 1D. In Umanakfjord also 35 spotted wolffish and 20 Greenland halibut were tagged, while 7 Greenland halibut were tagged in Div. 1D.

g. Shrimp (*Pandalus borealis*). Research on shrimp in 1978 again had high priority in the program of the institute. The major part of the research and the results were presented in research documents and working papers to the November Meeting of STACRES, and only a list of the major activities is given here.

- i. Bottom photography on the offshore grounds in Div. 1A-1B to assess density of shrimp. About 1500 exposures were made (ICNAF Res.Doc. 78/XI/89)
- ii. Hauls by research vessel on a number of offshore standard stations of which some have been operated since 1968
- iii. Observations and sampling onboard commercial trawlers
- iv. Sampling of research as well as commercial catches of shrimp.

h. Queen crab (*Chionoecetes opilio*). Experimental fishing with various traps was carried out in the vicinity of Godthåb (Div. 1D), and length sampling (by sex) continued.

i. Marine mammals. The sampling program of harp and hooded seals was continued.

The sampling program of minke whale (ear plugs), initiated in 1977, was intensified in 1978 by stationing a technician in Godhavn (Div. 1A) in June. This resulted in 6 minke whales and 1 fin whale being sampled, somewhat less than anticipated. Sampling of minke whales was also carried out in Umanak district, Div. 1A (8 whales).

3. Gear and selectivity studies. Nothing special to report, except experience gained in the sand-eel experimental fishing, see below.

4. Practical fishing experiments

A survey for sand-eel was made by three Danish North Sea cutters in late May - mid September, covering offshore banks between Fiskeris Bank (Div. 1D) and Disko Bank (Div. 1A). The best catches were obtained by pair-trawling with mid-water trawl. Although some hauls resulted in good catches (25-30 tonnes per haul with a single haul of about 50 tonnes) the general impression was that shoals were too scattered and that too much time had to be spent searching for fishable concentrations. Furthermore, if shoals were found, these were not stable enough to support fishing for more than a very short time. Thus, the 1978 situation at any rate, does not indicate the possibility of an economically profitable industrial fishery based on sand eel, but the year may have been an odd year for a full evaluation of the possibilities due to the relatively cold water temperatures in the summer (see Section B, 1, a). Also sporadic surveys in previous years have indicated that July-August would be the main season, but the 1978 observations did not show specific concentrations in this period. In fact, the best catches in 1978 were obtained in June.

EAST GREENLAND

A. STATUS OF THE FISHERIES

Total Greenland landings from this area amount to about 1370 tonnes in 1978, a decrease of about 480 tonnes from 1977.

Besides the local fishing at Angmagssalik, which resulted in landings of 616 tonnes of cod (about 1000 tonnes in 1977) and 5 tonnes of Greenland halibut also some of the Greenland trawlers conducted fishing at East Greenland, especially at Kap Farvel, in the last part of the year after having been stopped in fishing cod at West Greenland. Their landings from East Greenland waters include 731 tonnes of cod, 11 tonnes of wolffishes and few tonnes of redfish, halibut and Greenland halibut.

B. SPECIAL RESEARCH STUDIES

No special research was carried out by the institute except that a couple of samples were taken of the commercial landings of cod taken by otter trawlers in August and September (see Table 7 in ICNAF Res.Doc.79/VI/59 and Fig. 8 of the present report).

SUBAREAS 2-5 and STAT AREA 6

No fishing and no research by Denmark(G) in 1978.

REFERENCES (not including references to Research Documents 1978-79)

Hermann, F. 1967. Temperature variations in the West Greenland Area since 1950. Int.Comm.Northw.Atlant.Fish. Redbook 1967/IV : 76-85.

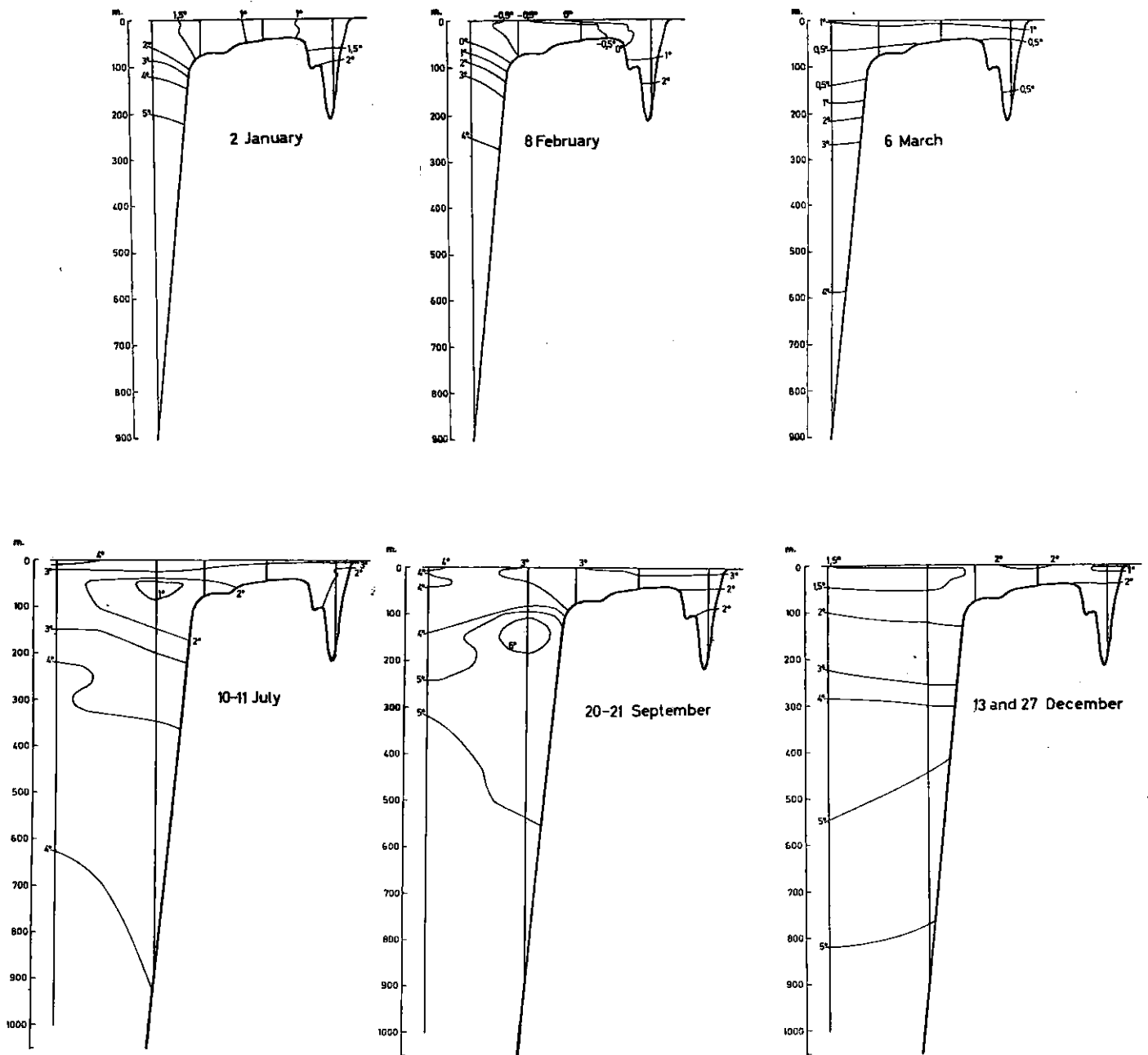


Fig. 1. Temperature sections across Fylla Bank (Div. 1D) 1978.

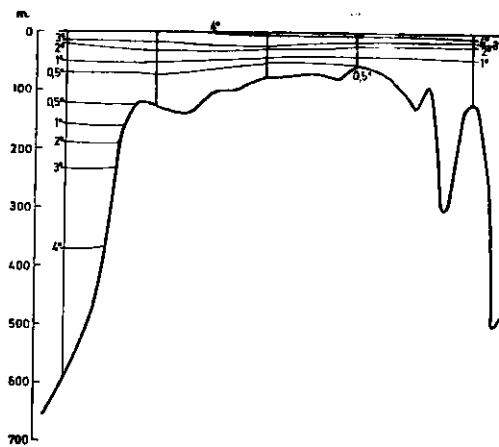


Fig. 2. Temperature section across Lille Hellefiskebanke off Sukkertoppen (Div. 1C), 11 July 1978.

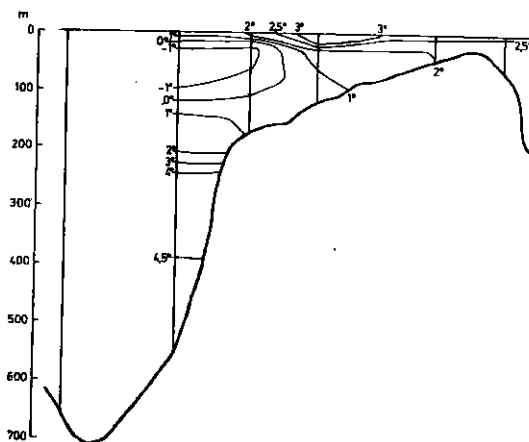


Fig. 3. Temperature section off Holsteinsborg (Div. 1B), 12-13 July 1978.

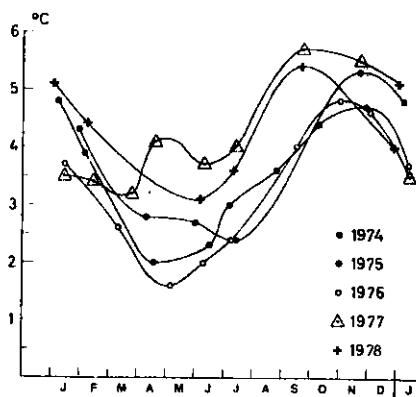


Fig. 4. Mean temperatures for the 100-600 m water column west of Fyllas Bank, 1974-1978.

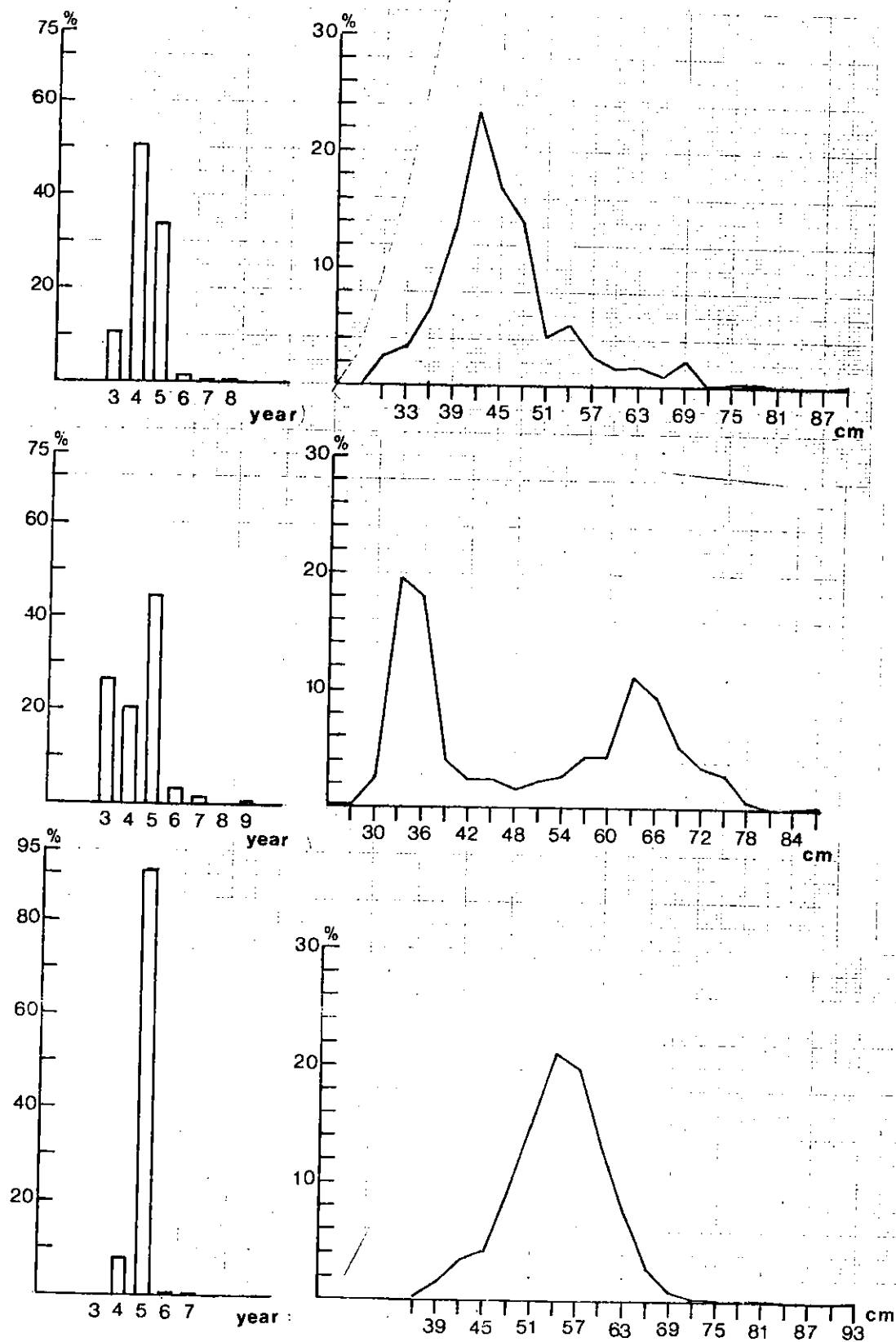


Fig.6. Age- and length-frequency diagrams of cod caught in pound net, 1979. Uppermost sample from a commercial landing, Div.1D, May (462 specimens measured), in the middle a sample from a commercial catch (including discards), Div.1D, July (316 specimens), lowermost sample from a commercial landing, Div.1E, September (1665 specimens).

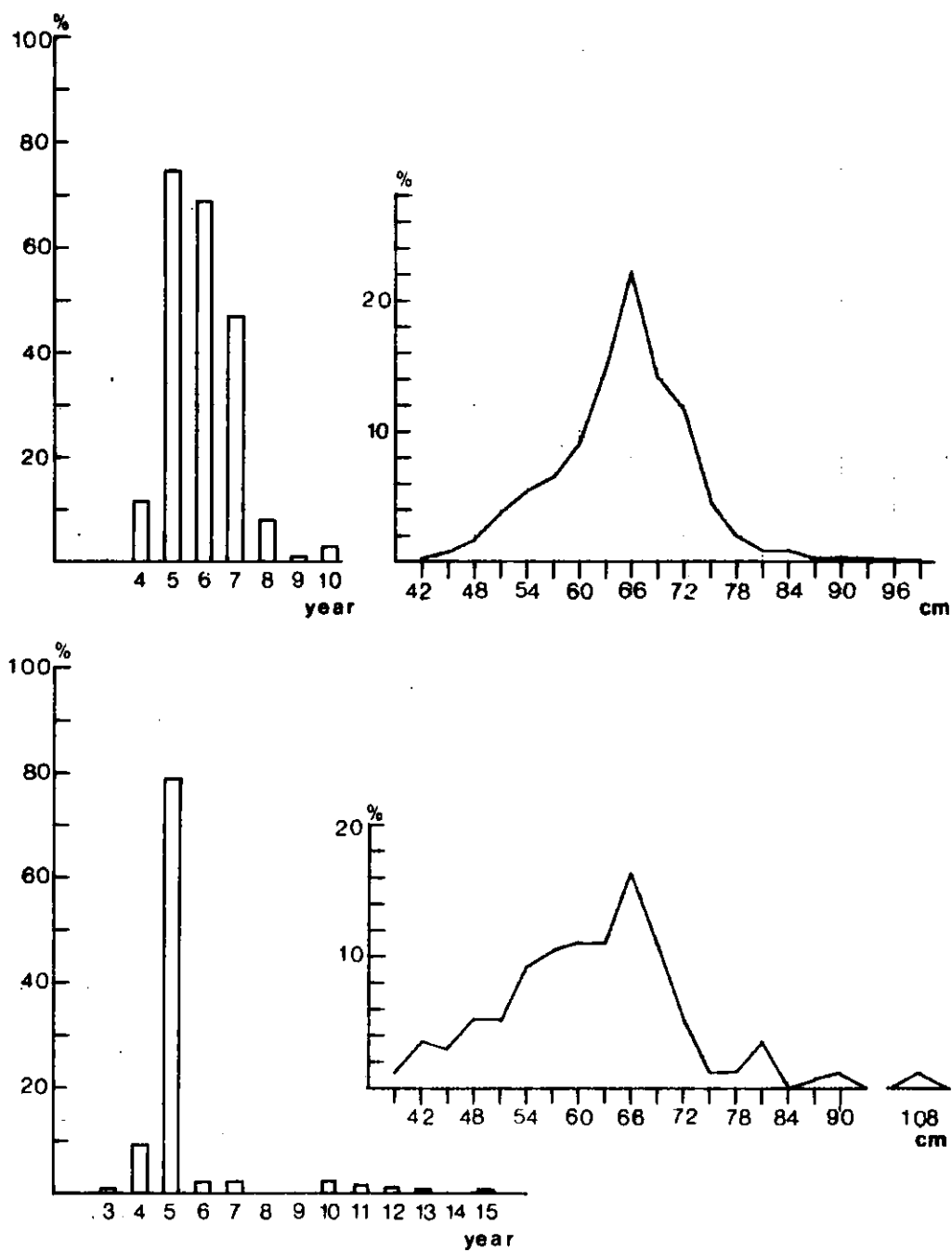


Fig.7. Age- and length-frequency diagrams of cod caught by bottom otter-trawl, 1979. Upper sample from a commercial trawlers landing, Div. 1C, February (971 specimens measured), lower sample from a research haul, Div. 1D, April (173 specimens).

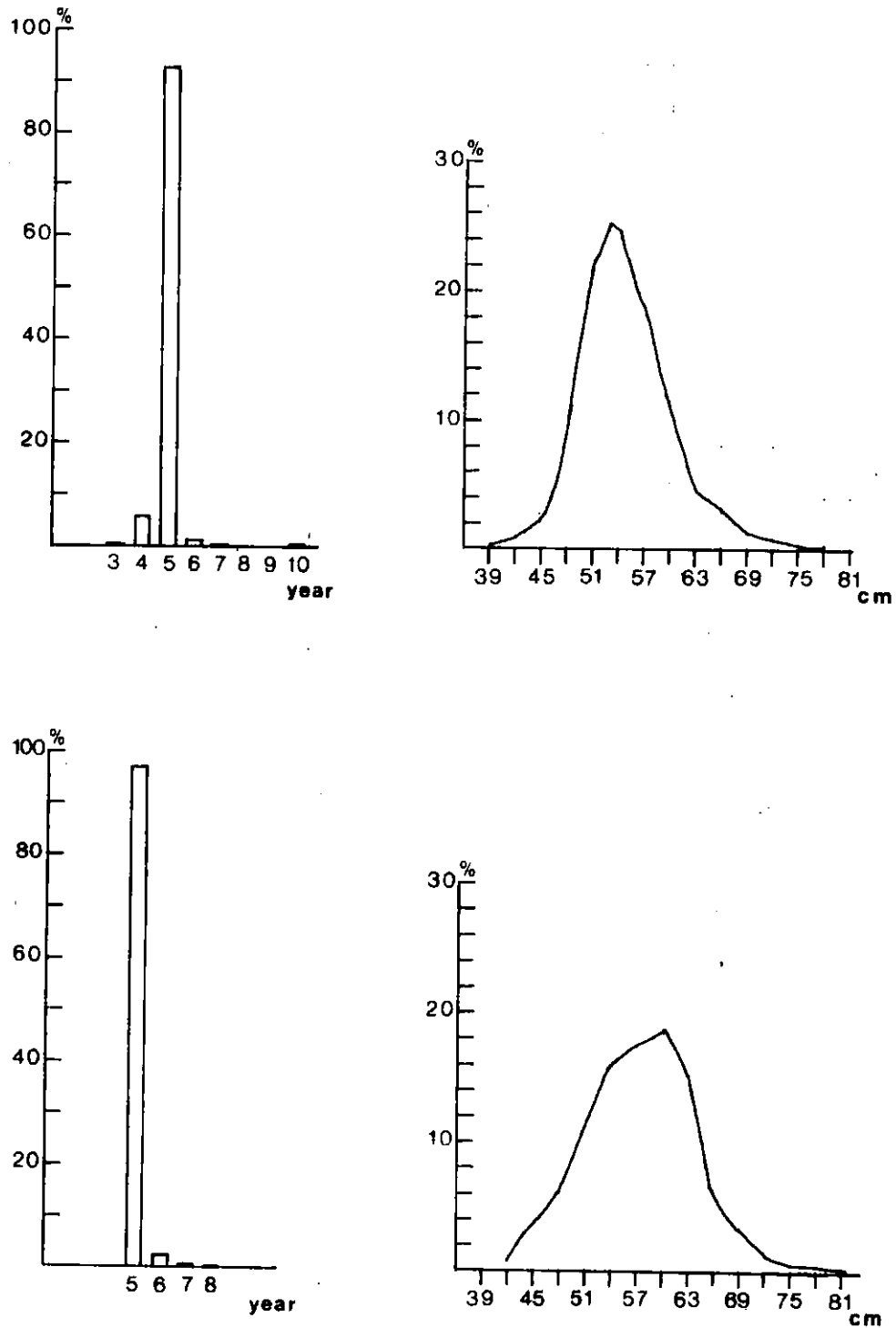


Fig.8. Age- and length-frequency diagrams of cod caught by commercial bottom otter-trawl, 1979. Upper sample from commercial landing, Div.1E, April (917 specimens measured), lower sample commercial landing from the region round Cape Farewell (ICNAF Div.1F, ICES Subarea XIV) in August (911 specimens).

