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A. Biology
by Erich Biester and Jürgen Voss

In 1961 the Sea Fisheries and Fish Processing Institute has carried out researches on cod and redfish in Subareas 1 and 3.

Subarea 1 West Greenland

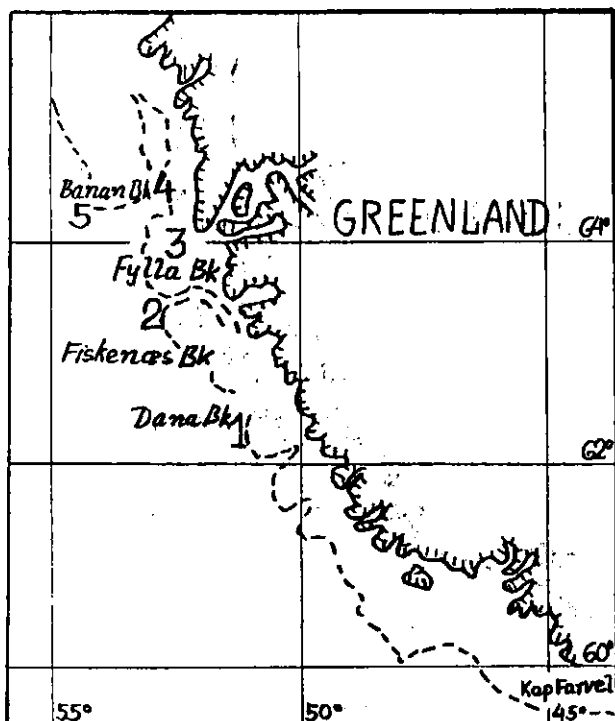
In March, April and August/September the R.V. "Eisenach" made two cruises to West Greenland (1 C-1 F). In August a comprehensive hydrographic material was collected.

The R.V. "Eisenach" is a trawler with a length of 56 m. The diesel-engine has 900 HP.

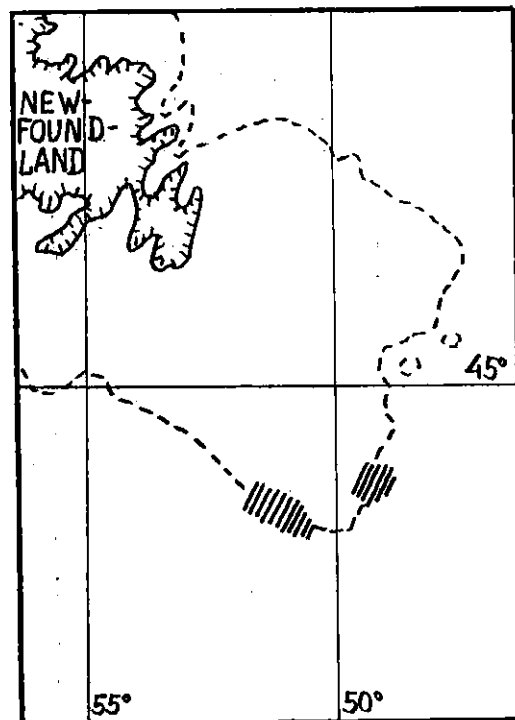
Cod

The largest catches of cod were made in Division 1C (west of Banana-Bank and 1E (Danas Bank). The catches differed very much, and, except for the fishing ground west of Banana Bank, cod and redfish were usually caught together.

On April 1, at position 1 (fig. 1) the catch was 7.1 t per hour's fishing with 5 t of cod. The average length was in the 70-85 cm group with predominance of the 1953 year-class, which was represented by 50% of the total catch with an average length of 76.4 cm. The 1954 year-class was the second with 25%. 4% of the males were spent and 63% mature, whereas 29% were pre-spawners and 4% juveniles. In contrast



A Fig. 1. Areas with the most important catches on the first research cruise of the R.V. "Eisenach", April 1961.



A Fig. 2. Areas with the best catches. Trawler "Brandenburg", September 1961.

no females had spent, 24% were mature and 60% pre-spawners. The rest of 16% were juveniles. The water-temperature at the bottom was 4.2°C at a depth of 320 m. 15 days later the rate of cod was 8 t per hour's fishing in a total catch of 11 t. The length distribution was corresponding to that two weeks before. The 1953 year-class dominated with 56% and an average length of 78.5 cm. The second was the 1954 year-class with only 17%. 79% of the males and 70% of the females were spent. 12% of the males and 6% of the females were mature, whereas the remainder were pre-spawners or juveniles, (Fig. 3 and 4).

Another region with concentrations of fish was found near the NW-edge of the Fiskehaes Bank (position 2). Here redfish predominated. Catches were mainly made in depths of 230 to 300 m. The best result was 1.5 t of cod per hour's fishing, the total catch was 5.6 t per hour's fishing. The length distribution of the cod showed a peak in the 60-80 cm group. The 1953 year-class predominated with 31%, followed by the 1956 year-class with 23%, (fig. 5). 4% of the males were spent, 59% mature, and the remainder were pre-spawners (9%) or immature (28%). The females were not yet spent, only 3% were mature, the remainder were pre-spawners 81% and immature 16%. The water temperature at the bottom was 3.5°C at a depth of 280 m.

At the eastern part of Fylla Bank (position 3) several hauls (trawl-catches) were made at a depth of 180-200 m to catch cod for tagging experiments. Catches resulted in only 0 - 1 t per hour's fishing. All fish taken were cod, mainly in the 35 cm - 50 cm group. The 1957 year-class was predominating with an average length of 46.9 cm and a 35% rate of the total catch. The next was the 1958 year-class with 27%, 95% of the males and 85% of the females were juveniles. (Fig. 6).

Banana Bank was nearly the northernmost fishing ground. At the inner edge of this bank (position 4) the best catch was only 2.6 t per hour's fishing with 1.5 t of cod.

At the west side of the Banana Bank (position 5) large concentrations of cod were found at a depth of 450 m. The catch per hour's fishing was approximately 11 t of cod. Most fishes were in the 70-80 cm group. Again the 1953 year-class was most abundant with 47% of the total catch, its average length was 76.2 cm, 28% of the males were spent and almost all the remainder were spawners. 11% of the females were spent, 35% spawners and 53% pre-spawners. (fig. 7)

In August the catch of cod was very poor, except on Fyllas Bank where concentrations were worth mentioning. The peak of the length distribution was in the 60-90 cm group. The 1956 year-class dominated with 28%, its average length was 66.8 cm; it was followed by the 1953 year-class with 16% of the total catch. The 1953 year-class shows an average length of 83.9 cm. Thus this year-class might have grown about 7 cm in 4 summer months. Of all cod caught, about 45% were juveniles and about 55% were of maturity stage II, (Fig. 8). The cod on the bank at a depth of 40-80 m had fed intensively. Almost all stomachs were heavily filled with *Ammodytes*. The water temperature at the bottom was 3.7°C at a depth of 40 m.

On all other fishing grounds off West Greenland no concentrations of cod were found in August.

Redfish (Figs. 9-14)

In April redfish were caught at the west side of the banks and in deeper water between the banks. In the region of Dana Bank and Frederikshaab Bank (position 1) the total catch averaged to 10 t with about 3 t redfish. The bottom water temperature was 4.2°C at a depth of 320 m.

At the NW-edge of Fiskenaes Bank (position 2) up to 7 t of redfish were caught per one hour's fishing, the total catch being 7.6 t. The temperature of the bottom water was 3.5°C at a depth of 280 m. Figs. 10 and 11 show one sample from the same place taken on April 2, and another from April 3, 1961.

Westward and eastward of the Banana Bank (position 4 and 5) good catches were made. The best results amounted to 4.5 t of redfish per hour's fishing. The temperature of the bottom water was 2.7°C at a depth of 300 m.

The second cruise in August was carried out to record the fishing situation off West Greenland from 62°30'N to 65°N. Concentrations of redfish were found in two areas only. First in the region of Dana Bank (Fig. 13), the best result being 3 t of redfish per hour's fishing. The second area, where only moderate concentrations of redfish were found, was at the eastern edge of the Fyllas Bank (Fig. 14). The best result here was 1.8 t of redfish per hour's fishing.

The catches of redfish consisted only of the "marinus" type redfish, with immature gonads at every time; however, one "mentalla" type female was caught in April with highly developed ovaries.

In the laboratory, experiments were carried out in order to find the most promising method for age determination. Scales showed better results than otoliths with various methods of treatment. A sample of 250 individuals was studied in order to ascertain the age composition, the 13-18 years old were most abundant in the fishing. The following preliminary growth curve gives the results when using scales, (Fig. 15).

Eggs and larvae

Fishing was carried out with a 2 m "Stramin" net. The net was hauled for 20 minutes and fished rather regularly in depths of 0 to about 60 m. In April the largest concentrations of cod-eggs were found west of Banana Bank, Fiskenaes Bank, and some smaller concentrations were found west of Fylla Bank, where the surface temperature of the water was in the 0.1 - 1.6°C range. No cod larvae were caught, but some larvae of Ammodytes.

From August 1 to 15, no larvae of redfish were caught in a section from the Faroe Islands to Reykjavik (stations at every 50 miles). From Reykjavik to Cape Farvel 9 redfish larvae with a mean length of 28 mm (measured when preserved in formol 5%) were caught, the largest being 47 mm, the smallest 18 mm.

As it was already late in the season only a few cod larvae were caught off West-Greenland - especially in the south - with surface water temperatures in the 4.2 - 8.6°C range. The length varied between 23 and 48 mm, average 39 mm. One single redfish larva was caught at about 64°N. Only single individuals of cod larvae were caught especially further north with surface temperatures from 4.2° to 6°C. The length was in the 22 to 49 mm group with an average of 36 mm.

Tagging of cod

1216 cod were tagged, 592 of them in April, especially in the region of Fiskenaes and Fylla Banks and 624 in August especially in the region of Fylla Bank. A hydrostatic tag of our own construction was used. To make it more visible a little white flag was attached to the tag. So far 20 recoveries are reported.

Technical experiments with an underwater-television-camera were carried out to observe the survival of tagged redfish during their release in larger depths.

Subarea 3 Newfoundland (Fig. 2)

In March/April a commercial trawler carried out an exploratory fishery in the St. Lawrence Gulf, the Cabot Strait the Nova Scotia Shelf and the southern Grand Bank. It was possible to locate cod concentrations in several regions.

In September/October an exploratory cruise was carried out with the trawler "Brandenburg" in Divisions 3K, 3L, 3O, 3P and 3N. Cod was found in 3K only in small quantities. Approximately 1.3 t were caught per one hour's fishing.

The largest concentrations of redfish were found at the SW-edge of the Grand Bank. Here catches up to 13 t per one hour's fishing were made. Unfortunately the fish caught was generally too small to be sold on the market. (Fig. 16).

Very good catches of redfish were made on the southern part of the eastern edge of the Grand Bank. Here the best result was about 11 t of redfish per one hour's fishing. In this area the length composition was better. The well known fact that length of redfish varies with different depths was confirmed. (Fig. 17 and 18).

B. Hydrographic Research off West Greenland by Walter Ranke

From August 16 to 26, six hydrographic sections were carried out between Cape Farvel and the Lille Hellefiske Bank (Fig. 1). At all stations serial measurements in the standard depths were made. The isotherms of the sections are to be seen in the figures 2 to 6. In the South-Cape Farvel-and Nanortalik - the cold Arctic and the warm Atlantic current were well developed. (Fig. 2 and 3). The Arctic water had a relatively high temperature of 2° to 3°C. While the upper parts of the banks, down to 100 m, were covered by Arctic water, the deeper slopes of the banks were overflowed by deep going Atlantic water as usual.

A different situation was found on the northerly banks. (Fig. 4 to 6). There the upper parts of the banks were generally covered by warm water of more than 3°C. At the western slopes or in their surroundings - partly also on the banks (Danas Bank) - there lay a "Kern" of colder water. But the temperature of this coldest water was not below 2.5°C. The "Kern" of the colder water was most distinct at the Lille Hellefiske Bank. The cold water is supposed to be from the Baffin Island Current.

C. The Trawl-Fishery
by Erich Biester and Werner Graef

In 1961 the fleet of the GDR caught nearly 30,000 t of ground-fish in the ICNAF-Area...

14,215 t were caught by the trawler-fleet and landed fresh in the home-port of Rostock. The other part of the fish was delivered from the trawlers at sea to a transporting-and factory ship or caught by a factory-sterntrawler.

The last two ships are working in the Subareas 2J, 3K, 3L and 3M mainly together with other trawlers.

In this paper the catch of the trawlers are only taken in account, because it is possible to take samples of redfish and cod on the market.

At West Greenland-Banks fishing was for the first time carried out during a longer period (April and from September to December). In April, fishery was concentrated on Subdivision 1C, the part of cod and redfish totalling to about 70% and 30%. From September to October fishery was carried out in Subdivision 1D, later on also in 1C. In 1C redfish predominated, in 1D cod.

At Labrador fishery was limited to Subdivision 2J. In January three times as many redfish as cod were caught, and in May twice as many, whereas in June concentrations of cod were found, and almost no redfish were caught. From July onwards large amounts of redfish were caught.

In Division 3K fishing was carried out only in the spring and the late autumn. Here redfish always predominated. During the second half of the year fishing was especially concentrated in Divisions 3L and 3M. Mainly redfish were caught; generally cod was only in the 7% - 10% range.

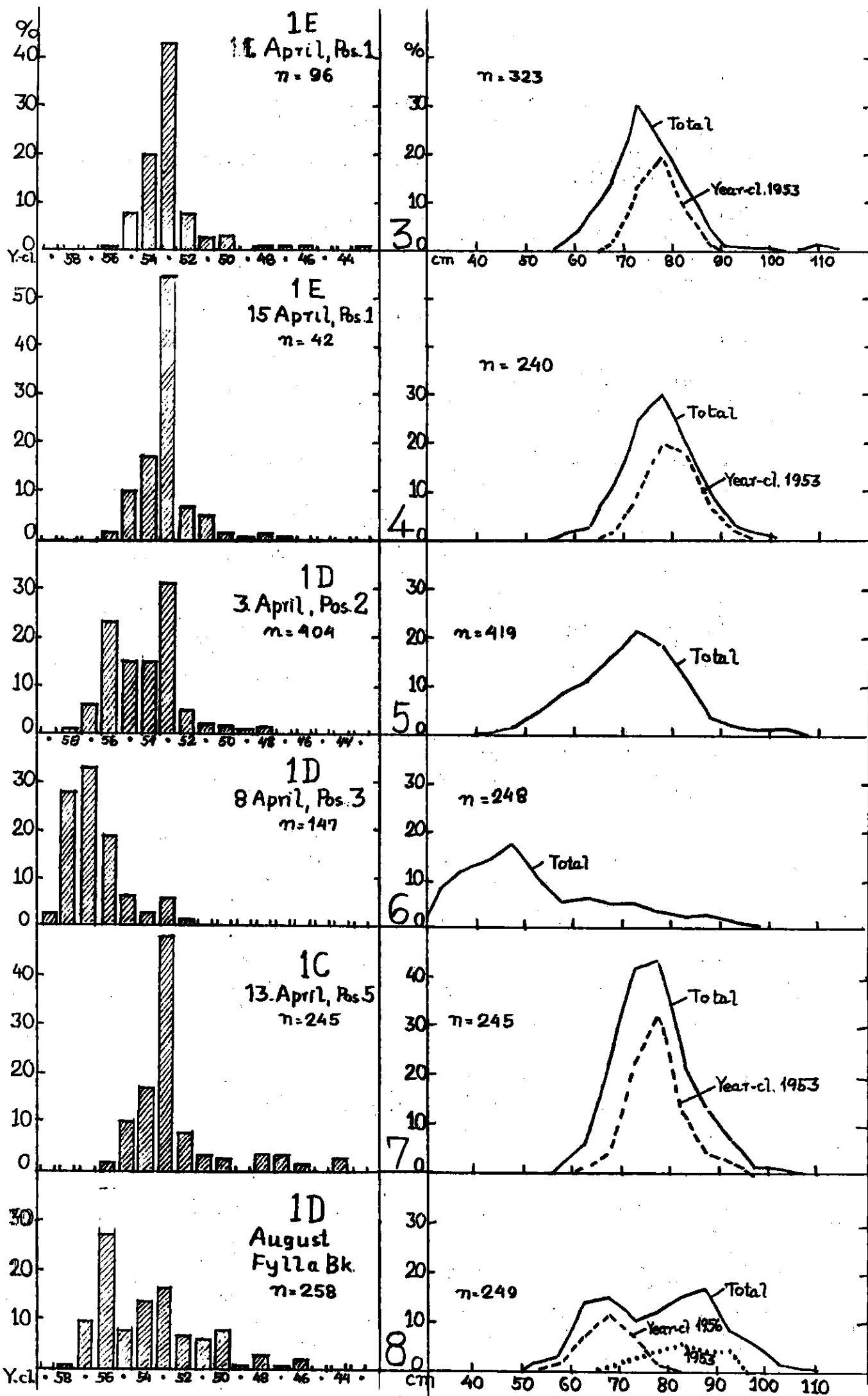
At the Banana-Bank (1C) the cod stocks predominantly showed a length of 60 to 85 cm (April). Maximum always was in the 70 to 75 cm range, (Fig. 1). (In the graphs very low extreme values were neglected. L_t means the total length and n the number of fish).

In autumn the cod on the fishing grounds of Fylla Bank and Fiskenaes Bank (1D) showed the largest frequency (22% of the total catch) in the 65 to 70 cm range. About 50% of the total catch were longer than 70 cm. The 1953 and 1956 year-classes were predominating (Fig. 3), and the 1954 year-class was fairly frequent.

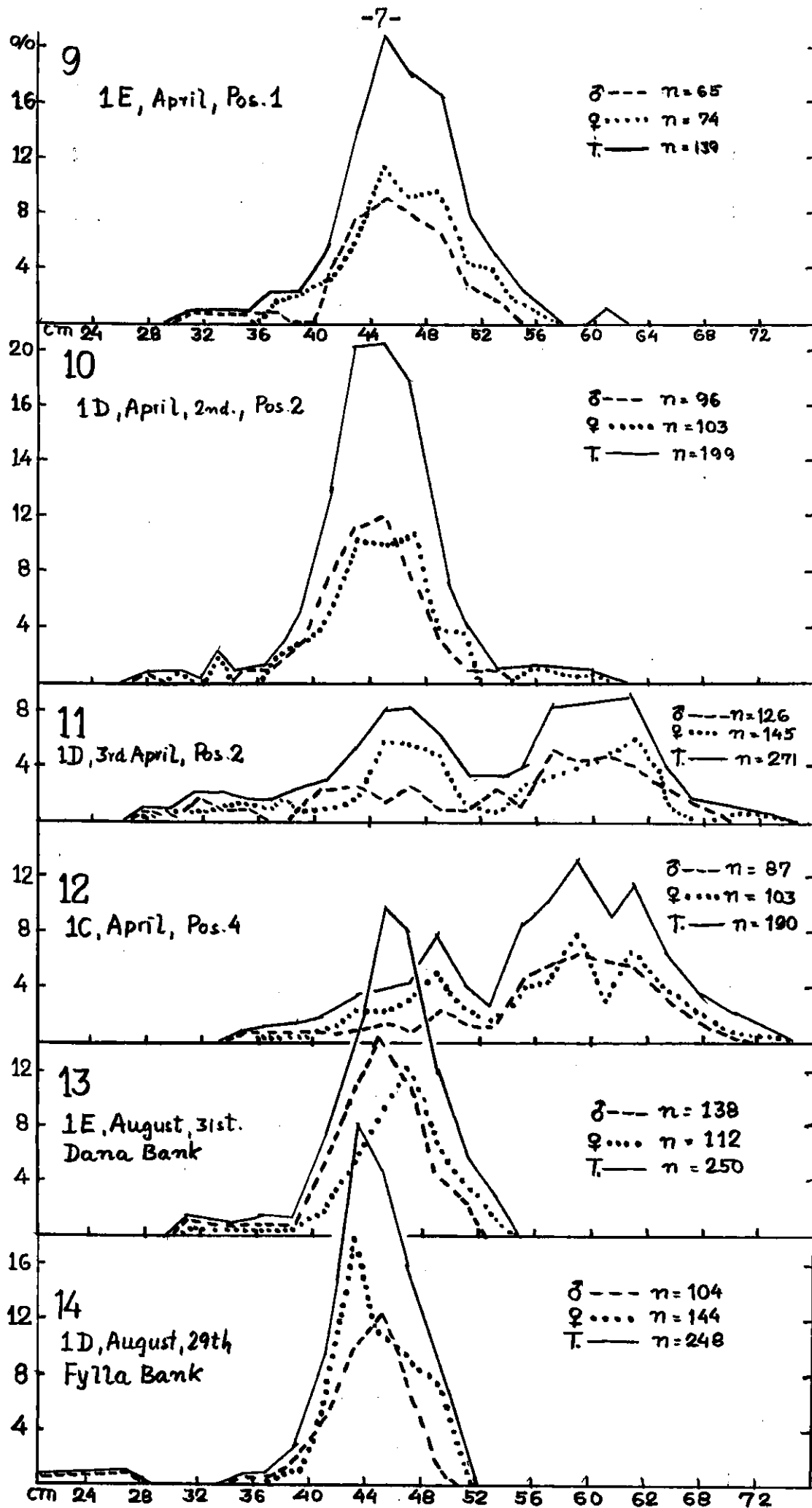
The lengths of the redfish were mainly in the 32 to 56 cm range on the same fishing ground (Fiskenaes-Bank) and the maximum length was 69 cm. The largest percentage was found in the 42 to 44 cm range. For distribution of lengths and sex see Fig. 5.

Contrary to the cod caught at West Greenland the Labrador cod (Division 2J) showed notably smaller lengths. In January the largest frequency was found in the 60 to 70 cm range, in May and June in the 50 to 60 cm range (Fig. 2). Age determinations proved that the 1953 and 1952 year-classes were predominating, but not to the same degree as in 1D, (Fig. 4). Figure 4 shows also the low growth-rate of Labrador cod. The 32 to 36 cm length range groups were the most common in the redfish catches of Division 2J. The proportion of females considerably exceeded that of males (Fig. 6).

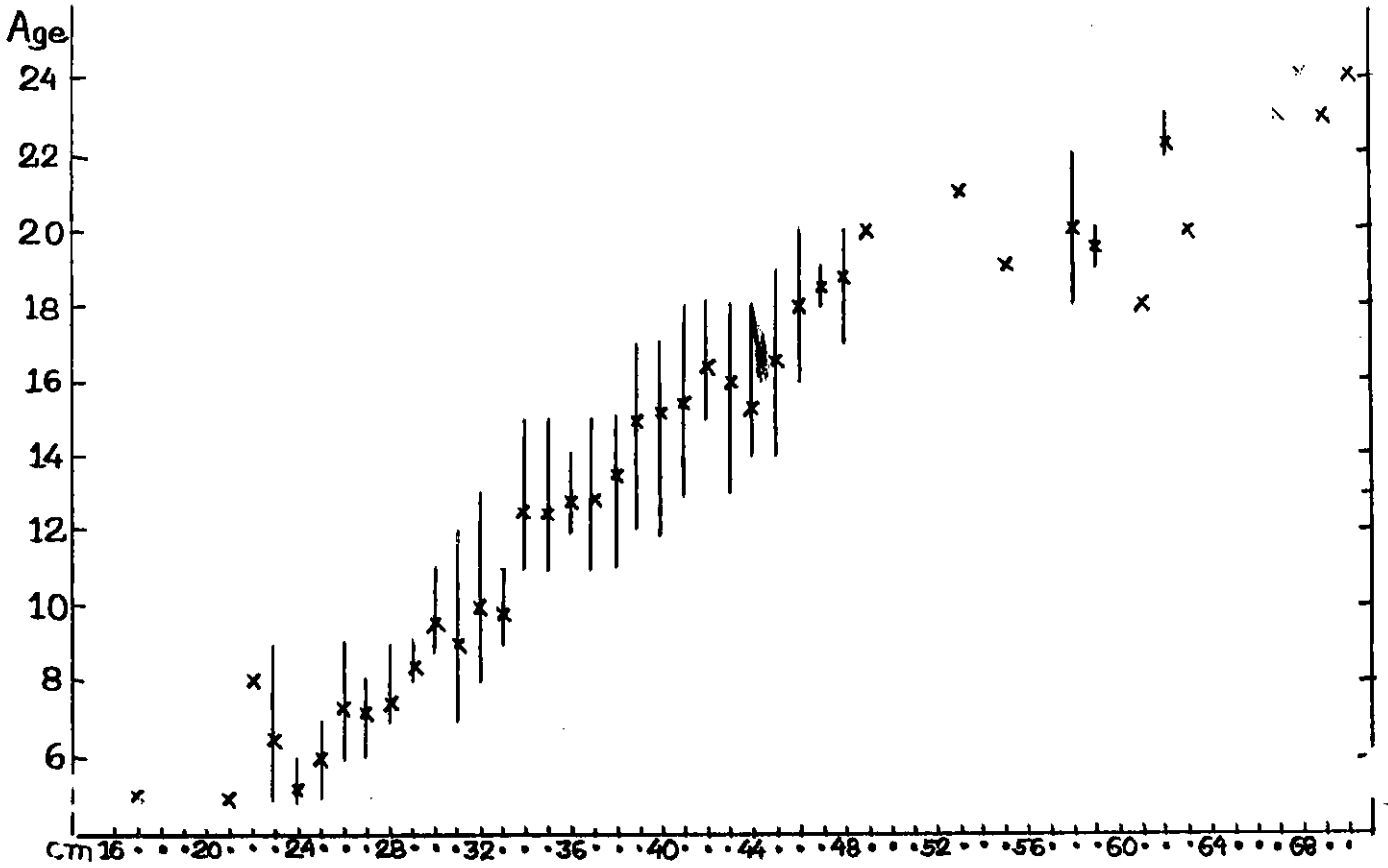
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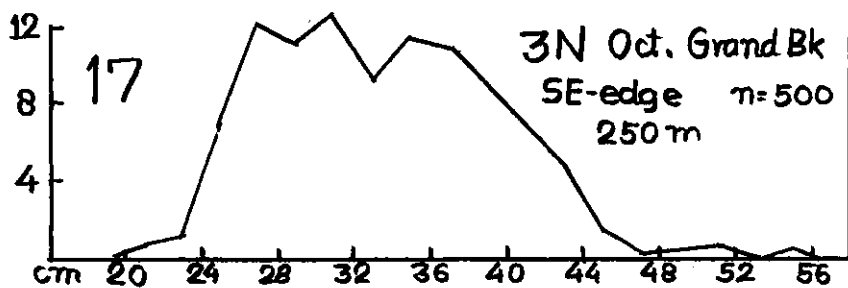
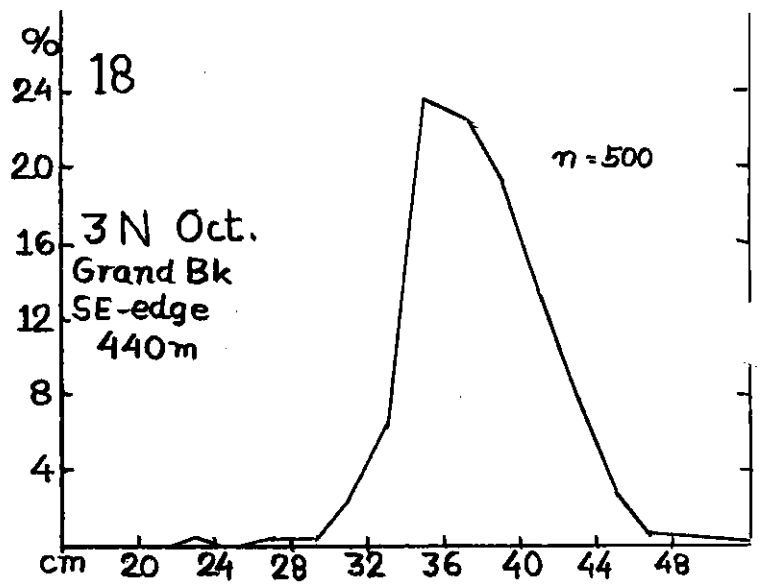
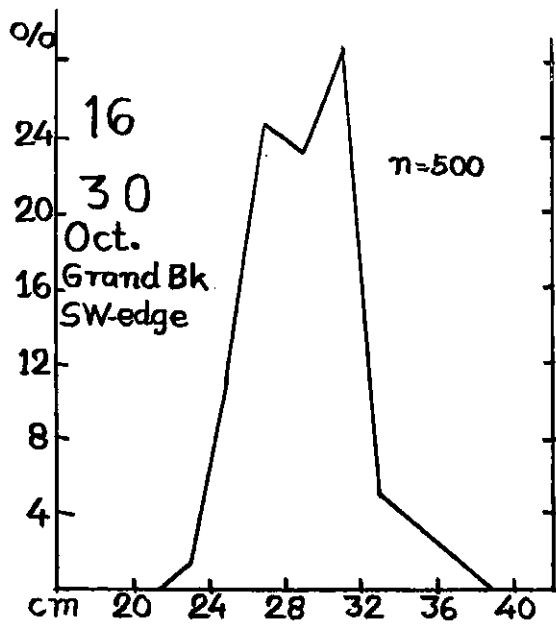
A Figs. 3 - 8. Cod, Subarea 1, 1961. Age distribution - left length distribution - right in %



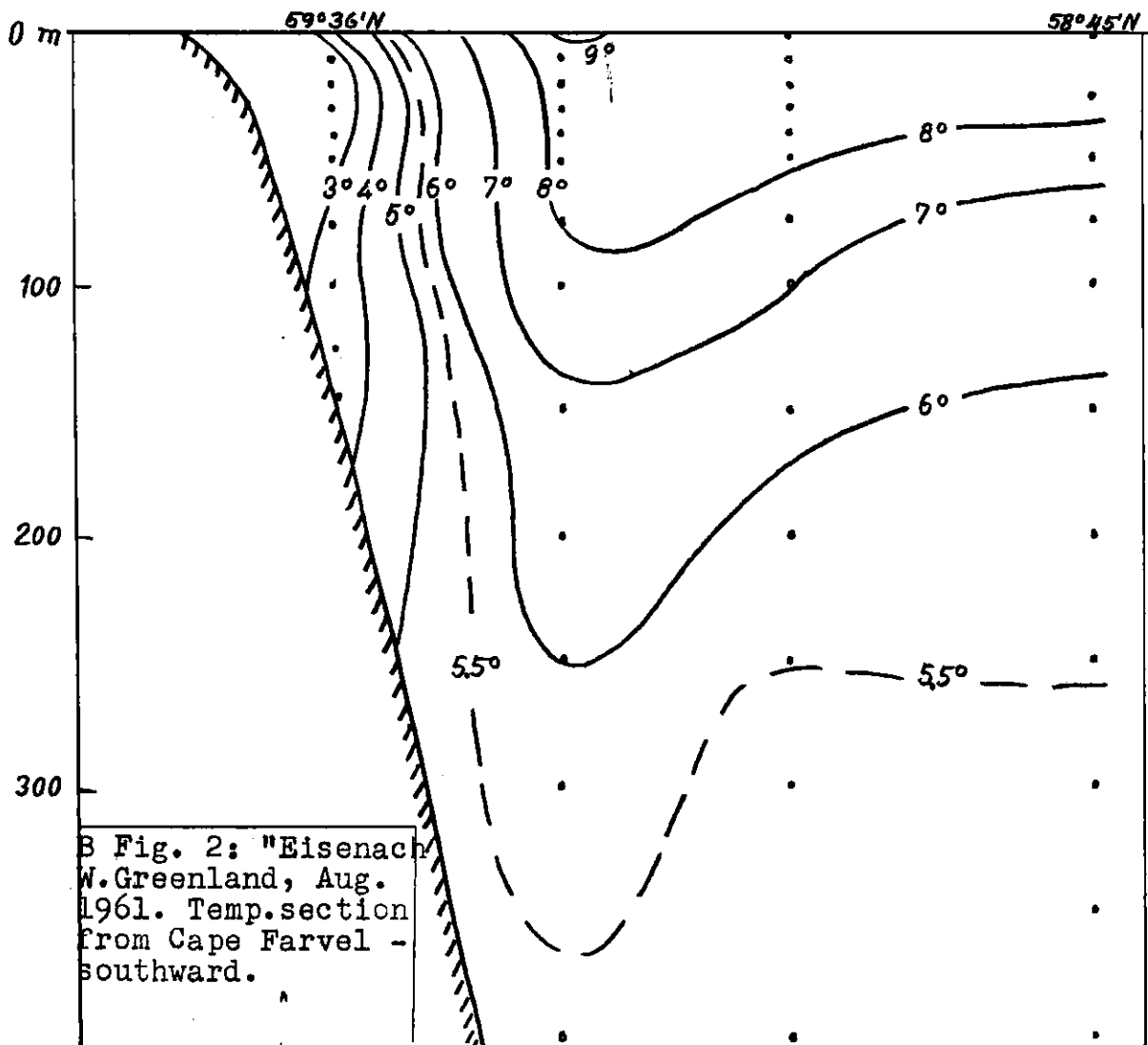
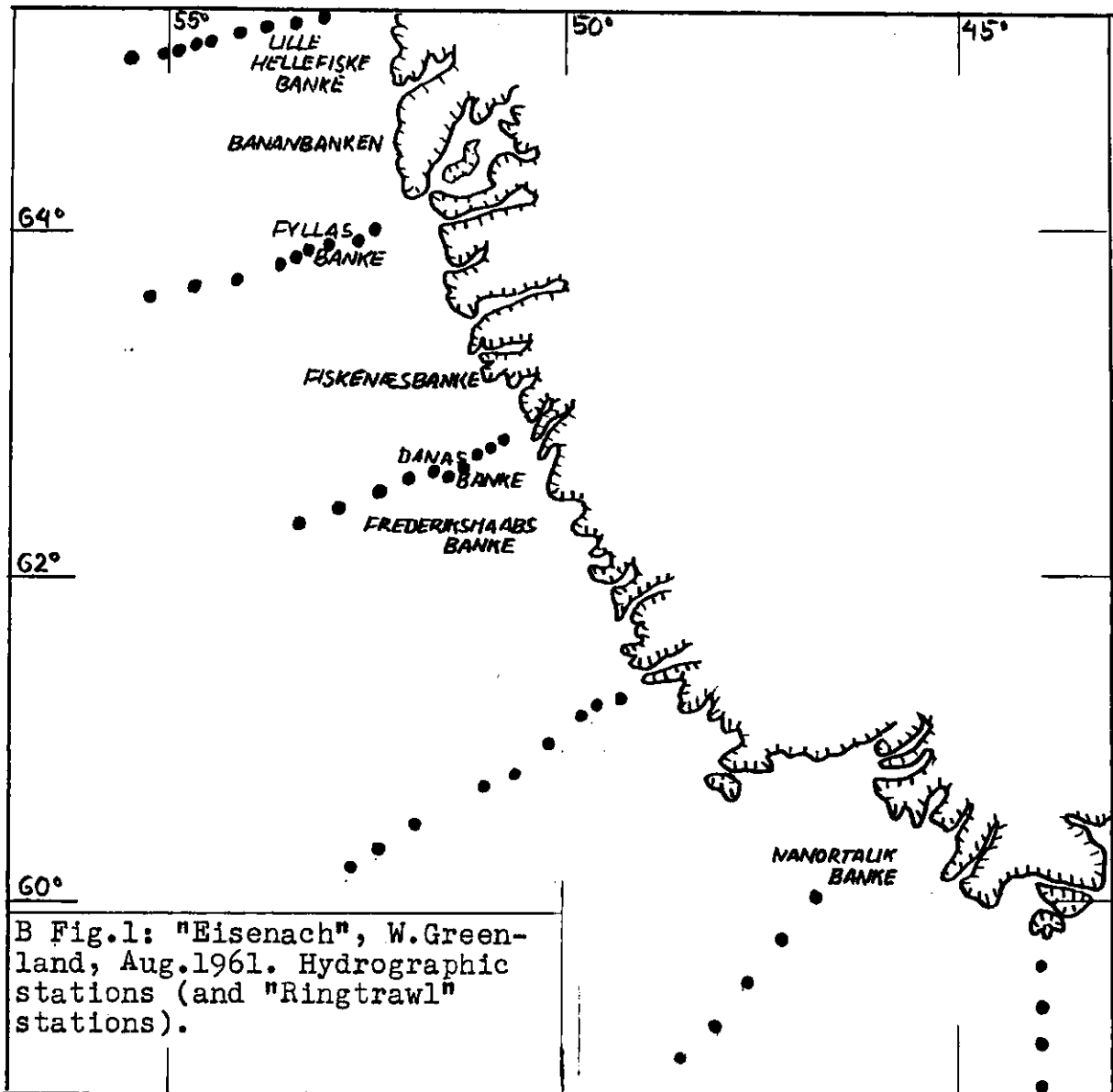
A Figs. 9 - 14. Redfish, Subarea 1, 1961, length distribution in %

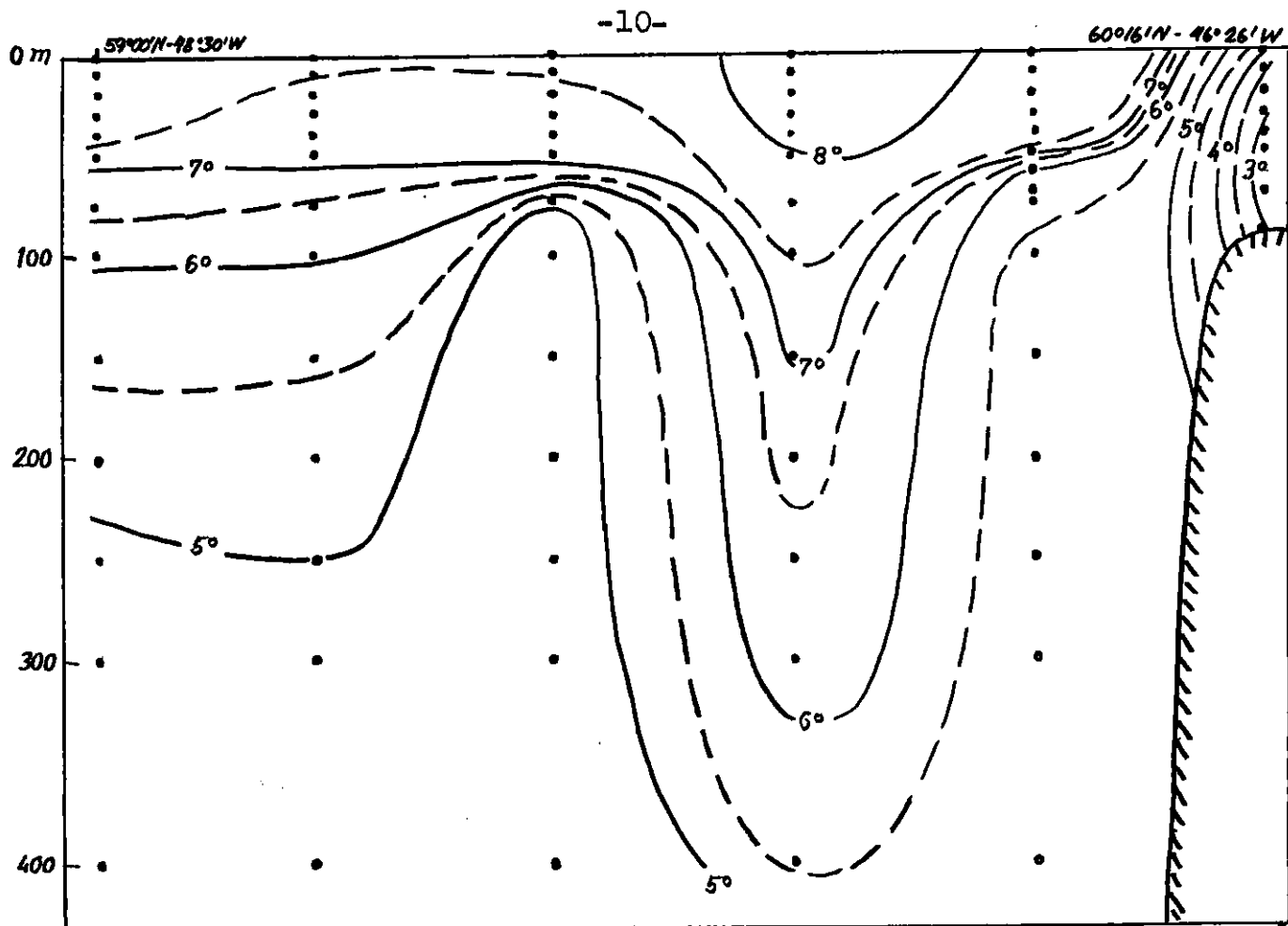


A Fig. 15. Redfish - Subarea 1 1961. Age - length relation. Age - determination on scales. x = average age of the length group. I = scattering of age.

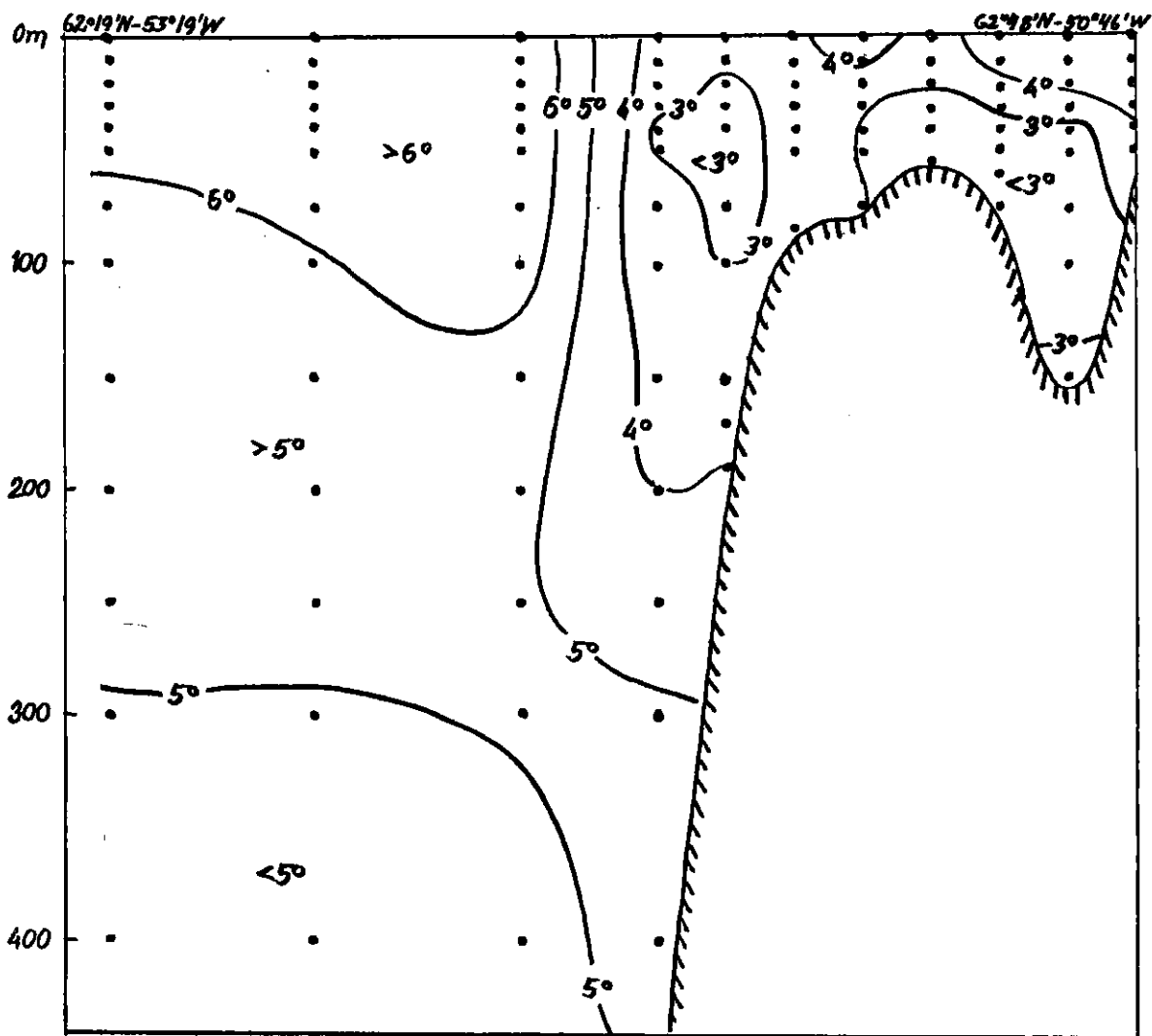


A Figs. 16 - 18. Redfish, Subarea 3, October 1961, length distribution in %.

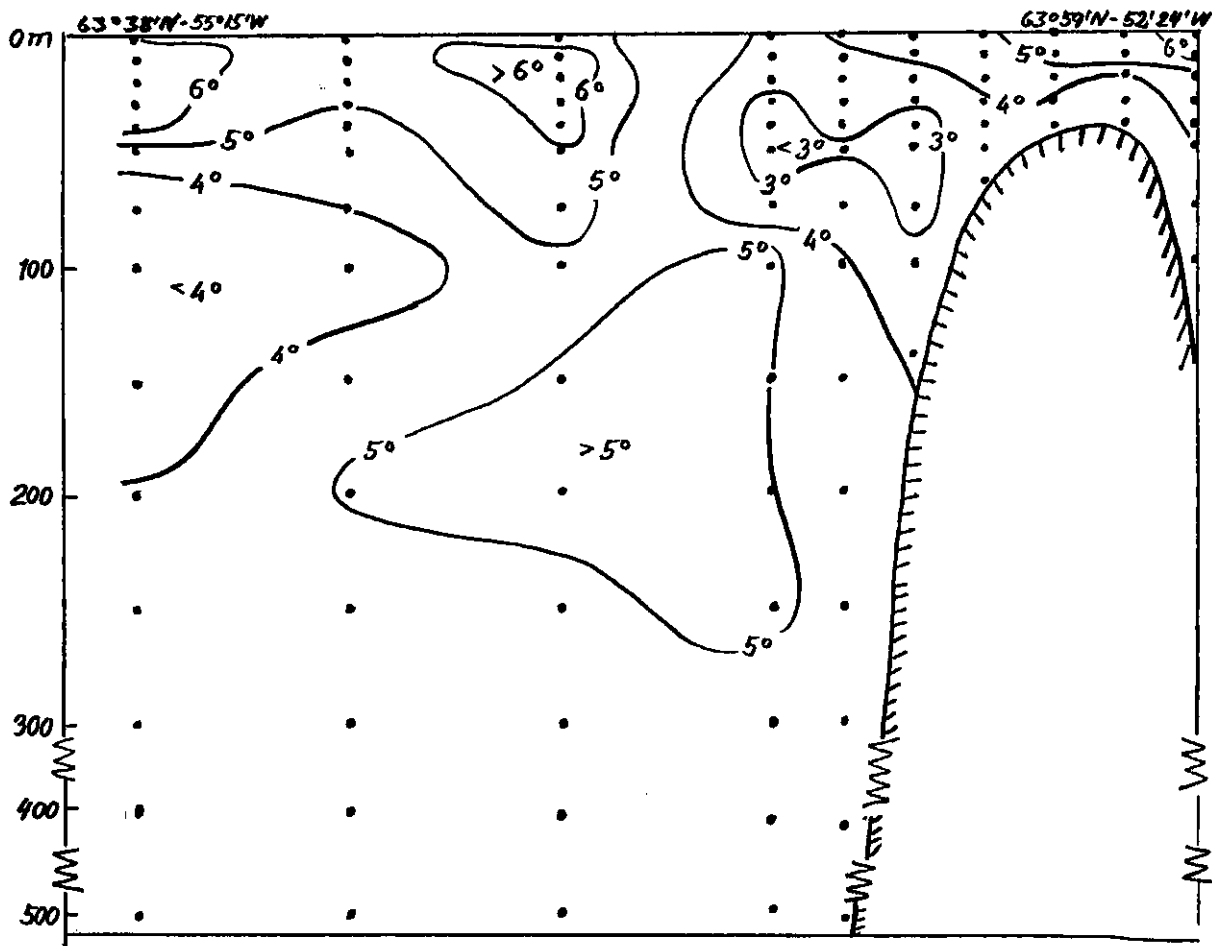




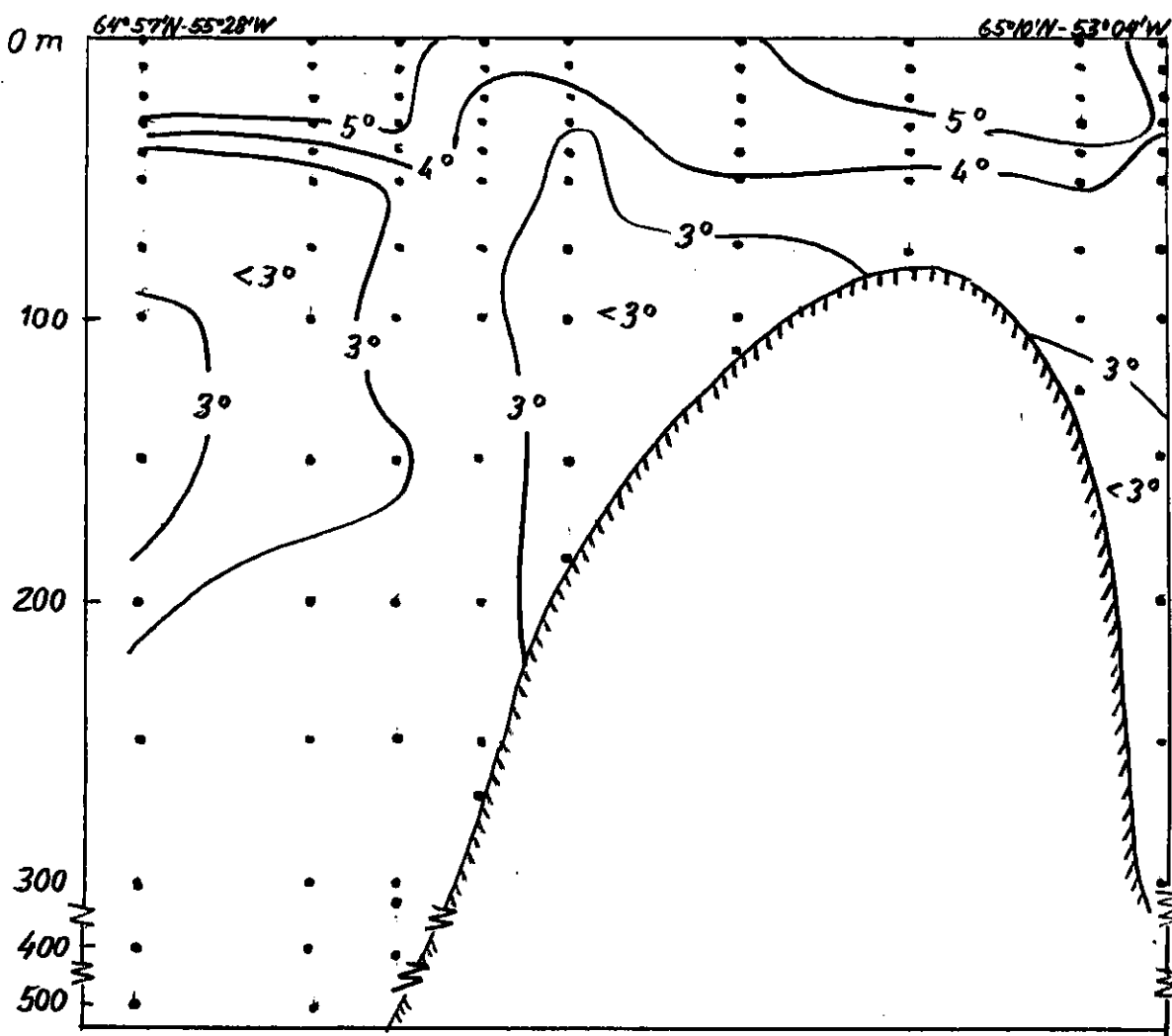
B Fig. 3: "Eisenach" West Greenland, August 1961.
Temperature section from Nanortalik Bank - southwestward.



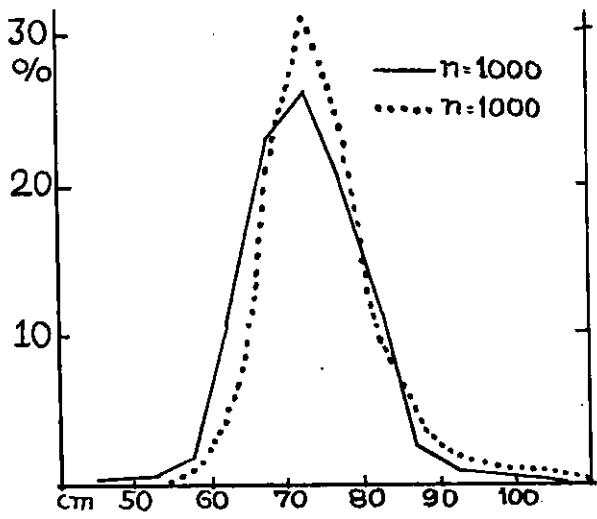
B Fig. 4: "Eisenach" West Greenland August 1961.
Temperature section from Danas Bank - westward.



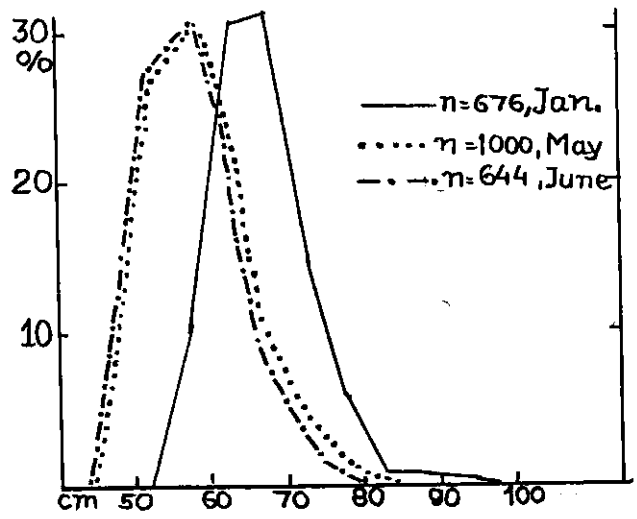
B Fig. 5: "Eisenach" West Greenland, August 1961.
Temperature section from Fylla Bank - westward



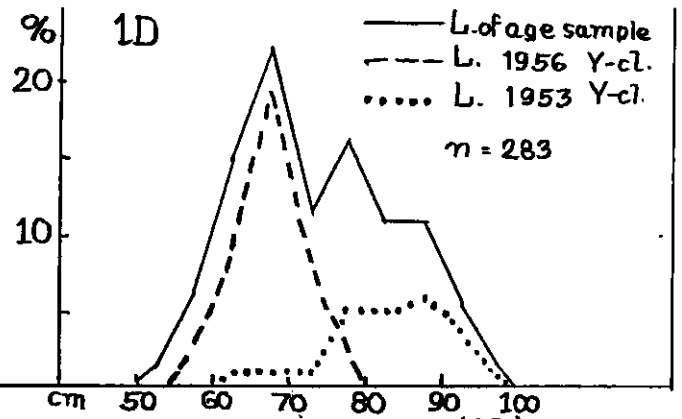
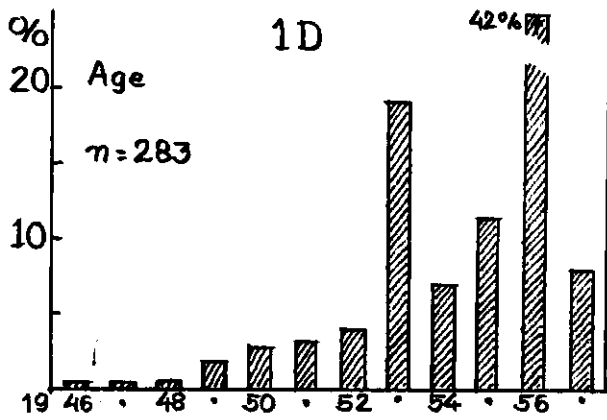
B Fig. 6: "Eisenach" West Greenland, August 1961.
Temperature section from Little Halibut Bank - westward.



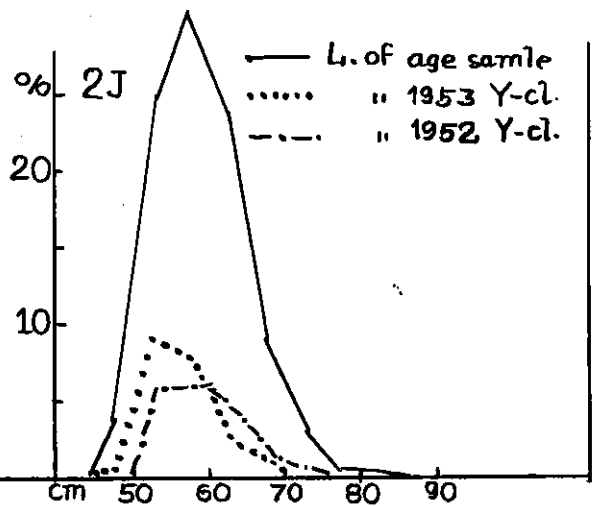
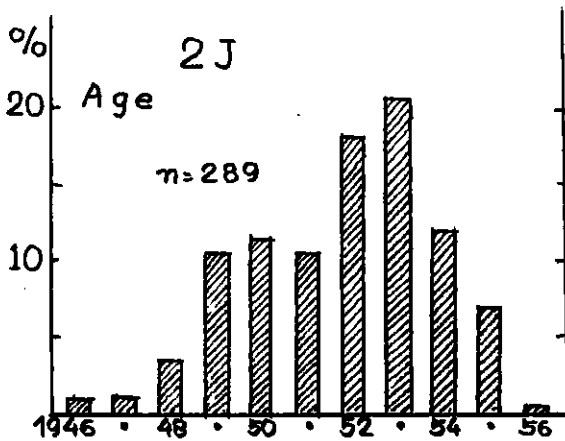
C Fig. 1: Length distribution of cod, Banana-Bank (1C) April 1961.



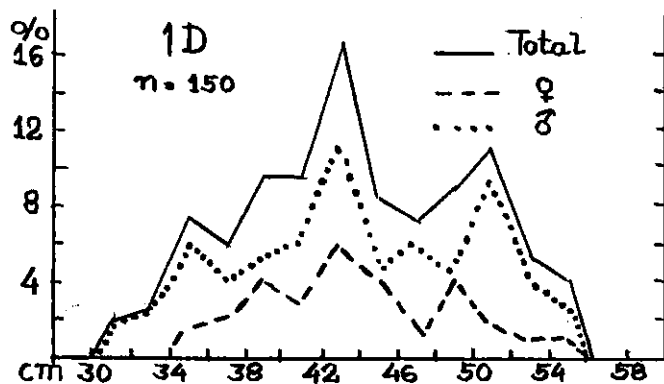
C Fig. 2: Length distribution of cod, Labrador (2J), 1961



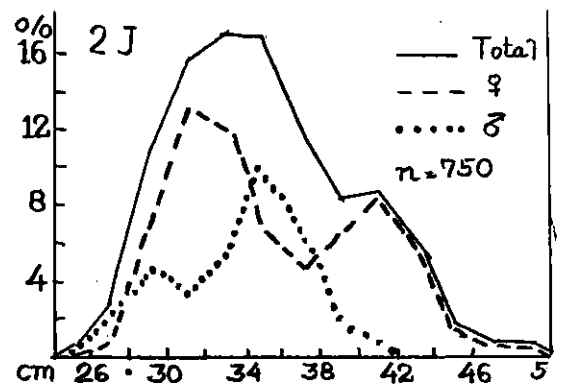
C Fig. 3: Age and length distribution of cod, Fiskenaes Bank (1D) October 1961.



C Fig. 4: Age and length distribution of cod, Labrador (2J) May 1961.



C Fig. 5: Length and sex distribution of redfish, Fiskenaes Bank (1D) October 1961.



C Fig. 6: Length and sex distribution of redfish, Labrador (2J) October 1961.