

THIRD ANNUAL MEETINGSummary of Research Work  
by Norway in Panel 1 in 1952

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Norwegian Fishery Investigations in Greenland Waters 1952.

During the summer of 1952 Mr. Leif Øyen Erichsen went to West Greenland waters to collect material for the Institute of Marine Research. He worked on board the commercial long-liner "Havmann" which left the port of Faeringehavn for the fishing grounds on August 7.

The Fishery and Sea Temperatures.

During the first half of August most Norwegian vessels obtained only poor catches on all the banks with their bottom long-lines. In early August the Norwegian fleet was mainly fishing the northern grounds from the Disko Bank southwards to the northern edge of Lille Hellefisk Bank. The majority of the vessels had gathered on the Holstenborg Deep, situated between Store Hellefisk Bank and Lille Hellefisk Bank, where a fishery with pelagic long-lines was carried out. In this locality schools of cod were swarming in the upper strata of the sea in depths between 20 and 90 metres with greatest concentration at 40-60 metres. The surface temperature here was about 4°C decreasing to 2.3°C at a depth of 90 metres. From the depth of 100 metres to the bottom (210 m.) the temperatures were 1.3 - 1.0°C.

"Havmann" was fishing with pelagic long-lines on the Holstenborg Deep during the period August 8 - 16. Altogether 25 skates of long-lines were hauled, the long-lines being held in position in depths of 25-75 metres by means of buoys. One skate of the pelagic gear usually contained 5,000 hooks. While fishing in this area the observer worked 8 hydrographic stations with bathythermograph and 6 stations with Nansen reversing thermometers. In table I has been listed the yield of the fishery in relation to the temperatures observed. The temperatures are as far as possible taken at the mean depth of the Long-lines, usually at 50 metres.

Table I

Temperature °C	No. of hooks	No. of cod per 1,000 hooks
2.1 - 2.5	2,000	35.0
2.6 - 3.0	20,000	90.0
3.1 - 3.5	43,000	150.3
3.6 - 4.0	40,000	150.8
TOTAL	105,000	134.6

The figures in the table indicate that upon leaving the bottom and entering the upper strata of the sea the cod seem to prefer considerably higher temperatures than those usually found near the bottom. During the pelagic swarming the greatest concentrations of fish are found in temperatures between 3 and 4°C. Also the temperature interval 2.5 - 3.0°C seems to offer a satisfactory habitat. At lower temperatures the density of cod was found to be rather small. Large schools of cod were at times observed swarming near the surface, and catches made by hand-lines indicated the presence of large numbers of fish in depths of 20-40 metres.

The fact that the cod in a certain period during the summer often seek a pelagic existence cannot be seen only on the background of temperature conditions. The swarming may also be induced by the rich occurrence of food organisms in the warm upper layers. An examination of the stomach content of the cod proved that they in this period largely were feeding on pelagic organisms, particularly euphausiids, pteropods, fish larvae, sandeels, octopus and small jellyfish.

The schools of pelagic cod gradually thinned out, and by August 20 most of the fishing vessels had resumed their fishery with bottom lines. From now on till the end of the season the "Havmann" was fishing together with other Norwegian long-liners in the area near Disko. The "Havmann" made two trips to that area, one during August 17 - 30, the second during September 8 - 29. The fishery was carried out with bottom long-lines in depths from 35 to 370 metres. Temperature conditions were noted by means of bathythermograph (40 stations) and reversing thermometres (18 stations).

In table II are listed the catches made at various temperature intervals. Where temperature readings at both ends of the long-line are at hand the mean value of the two readings have been used. In cases where bottom temperatures are lacking we have used observations taken near by on the same day. With the changes in bottom temperatures often encountered on the northern banks such a procedure may of course give room for some error.

Table II

Temperature °C	No. of hooks	No. of cod per 1,000 hooks
0.6 - 1.0	48,000	78.4
1.1 - 1.5	96,000	70.3
1.6 - 2.0	113,500	84.6
2.1 - 2.5	151,500	100.8
2.6 - 3.0	23,000	86.8
3.1 - 3.5	10,000	91.8
3.6 - 4.0	8,000	84.5
4.1 - 4.5	10,500	74.3
TOTAL	466,500	86.2

Catches above average are made at temperatures between 2.1 and 3.5°C, the largest quantities being taken at the interval 2.1 - 2.5°C. In bottom water below 1.5°C or above 4.0°C the occurrence of cod is apparently less dense. The food organisms consumed by the cod roaming over the bottom have a different character than those of the pelagic cod previously mentioned. In the stomach contents of the bottom fish particularly the deep sea prawn dominate, but also crabs, amphipods, fish and sea cucumbers form part of the food.

From the material at hand we may also gain a picture of the temperature situation in general in the Disko Bank area in September. Above the shallow section of the bank, where the depths are less than 100 metres, the sea was clearly stratified. The surface temperatures were generally 4-5°C, at 50-60 metres there was a sharply defined transition layer where the temperature dropped from 4 to 2°C. On some spots the transition layer touched the bottom, and here the cod seemed to be concentrated in larger numbers. On other spots the bank was covered with water of temperatures below 1°C, and here the fishery mostly gave poor results. On the southern slope of the Disko Bank was found a thin surface layer with temperatures above 5°C. Between 30 and 100 metres the temperature range was 2.5 - 2.0°C, and the bottom temperature at 150-180 metres about 1.7°C. In this northern area no pelagic schools of cod were observed.

Intensity and Yield of Fishery.

In 1952 the majority of the Norwegian long-liners started their fishery off West Greenland in early June. Faroese vessels reported to have fished very well with long-lines on Fiskenes Bank and Banan Bank in May. In June the line-caught cod were rather small-sized and in poor condition. From early July to the end of the season the Norwegian vessels were mostly engaged in fishing on the northern banks where the cod were larger and the condition of the fish steadily improving.

Vessels fishing out from ports in Norway generally make two trips to Greenland waters, while those fishing from the base at Faeringehavn make 4-5 trips on the banks. The long-line fishery is carried on with great intensity. A single skate of long-lines carry 3-5,000 hooks and stretches over 3-5 miles of ground. Ordinarily 4-5 skates, or 16-20,000 hooks are fished every day.

To indicate the yield of the fishery at different temperatures the term "catch per 1,000 hooks" has been used. It seems natural to use the same term as a unit of effort in discussing the yield of the fishery in the various localities and at different periods. In table III are listed the catches per unit of effort on the last two trips made by the "Havmann".

Table III

Locality	August 8-30		Sept. 7-29	
	No. of hooks	No. of cod per 1,000 hooks	No. of hooks	No. of cod per 1,000 hooks
Holstenborg Deep	105,000	135	-	-
Store Hellefisk	23,500	79	-	-
Disko Deep	60,000	114	16,000	86
South Disko Bank	31,000	79	-	-
West Disko Bank	56,000	92	96,000	58
North Disko Bank	-	-	192,000	85
TOTAL	275,500	110	304,000	77

In August the best yield per unit of effort was obtained during the pelagic long-lining on the Holstenborg Deep. Here the daily catch of the vessel averages 2,700 fish using 20,000 hooks. Disregarding the pelagic fishery, the yield on bottom lines averages 95 cod per 1,000 hooks, or 1,520 - 1,900 cod during an average day's fishing.

In September the yield of the long-line fishery shows a decreasing tendency. The average catch per day's fishing is between 1,230 and 1,540 cod. However, the fish caught on the last trip were large and fat which still could make the fishery remunerative. During the second trip a total of 23,265 cod were caught which yielded 40 tons of cured fish. If we apply the conversion factors used in Norway (cured weight + 70% gives gutted weight. The latter + 40% gives round fresh weight) the mean weight of the freshly caught cod should be 4.1 kg. This figure, however, seems somewhat too high. The question of a correct conversion factor for Greenland cod will be more closely examined during next year's fishery.

Size and Age of Line-Caught Cod 1952.

From the northern banks a total of 2,500 otoliths and length measurements were collected. At present, however, only about half the age material has been read. The age-composition and the mean lengths of the different age groups found among the line-caught cod are listed in table IV.

Table IV.

Age	Holstenborg Deep		Store Hellefisk Bank		Disko Deep		South Disko Bank		West Disko Bank		Total	
	%	cm.	%	cm.	%	cm.	%	cm.	%	cm.	%	cm.
5	0.5	53.0	-	-	0.3	52.0	1.4	47.5	-	-	0.5	50.6
6	0.9	59.0	-	-	1.9	62.7	2.0	60.0	0.8	60.0	1.3	60.9
7	8.3	69.4	-	-	6.0	67.3	4.8	63.3	3.3	66.0	6.2	67.9
8	4.6	72.4	10.0	69.5	5.7	69.7	2.0	74.0	2.5	75.0	4.5	71.5
9	9.4	72.8	12.5	70.0	13.3	71.9	17.0	73.3	14.0	72.4	12.3	72.4
10	37.2	75.9	35.0	74.8	46.5	75.2	26.6	77.6	33.0	76.4	30.0	75.8
11	8.3	77.1	5.0	85.0	8.9	77.9	13.0	81.4	13.2	78.8	9.5	78.5
12	7.1	78.7	-	-	6.2	78.8	4.8	82.9	7.4	82.6	6.2	79.7
13	4.6	78.9	12.5	76.2	3.5	81.5	8.2	83.1	6.6	83.5	5.3	80.8
14	-	-	-	-	-	-	-	-	-	-	-	-
15	2.3	80.5	2.5	72.0	0.6	78.5	1.4	84.0	0.8	83.0	1.6	80.3
16	10.3	83.1	15.0	85.7	3.8	83.6	8.2	84.3	5.8	84.7	7.8	83.7
17	1.6	84.7	-	-	1.0	88.3	2.0	84.3	1.7	86.5	1.4	85.6
18	4.7	85.9	5.0	87.0	2.9	85.0	8.8	89.1	9.1	89.1	5.2	87.3
19	-	-	2.5	137.0	-	-	-	-	0.8	100.0	0.2	118.5
20	-	-	-	-	-	-	0.7	90.0	0.8	85.0	0.2	87.5
21	-	-	-	-	-	-	0.7	98.0	-	-	0.1	98.0

From the table it can be seen that large and old fish can still be found on the northern banks. The tendency of the old fish to gather on the northern banks has also been noted in previous year (see Norw. Rep. to ICNAF 1951). In 1952 we find a distinct division in regard to the mean age of the fish on Disko Bank and cod caught further south. The mean age of the Disko cod is 11.5 years. In the Disko Deep the figure is 10.3, at Holstenborg Deep 11.1 years. A corresponding difference is also found in the mean size of the fish. The cod from Disko Bank have a mean length of 78.5 cm., those from other localities about 76 cm.

In fig. 1 is illustrated the age composition of line-caught cod in the years 1948-1952. In 1948 the two year-classes 1934 and 1936 dominated the fishery. These cod were by then respectively 14 and 12 years of age. In the subsequent years these two year-classes decreased in strength. In 1952, when the same fish are respectively 18 and 16 years old, they are, however, still able to contribute materially to the fishery. Of particular interest is the fact that the pelagic cod from Holstenborg contained a total of 15 per cent of these year-classes. In last year's report it was mentioned that the Holstenborg cod differed from the ordinary bank cod in their general appearance. It was this particular type of fish which also made up the pelagic catches in 1952.

Fig. 1 further shows that it is the year-class 1942 which has dominated in the line catches during the last years. In 1951 this year-class contributed 31 per cent to the total catch. In 1952 its contribution increases to 38 per cent. Thus it is still the 1942-class which more than ever is the bearing factor in the line fishery.

Fig. 2 shows the size distribution of the line-caught fish, both totally and for the most important year classes. It is the solid strength of the year-class 1942 which chiefly determines the total mean size of the line-caught fish. The five year-classes shown in fig. 2, viz. 1941, 1942, 1943, 1934 and 1936 constitute altogether 72.8 per cent of the catch in 1952.

The total Norwegian catch at Greenland in 1952 was approximately 9,400 tons of cured cod, of 22,400 tons of cod in fresh round weight. This corresponds to a catch of about 5.5 million cod. Of these numbers the 1942-class is responsible for its share of 2.1 million cod.

In last years report mention was made of the 1947 year-class. This brood was deemed to be unusually rich and is expected to give a large yield in the future. The year-class is by now 5 years old, but the fish have not as yet reached such a size that they readily take the hooks. In two years, from 1950 to 1952, this brood has grown from 30 to 51 cm. With a similar rate of growth the 1947-class can be expected to enter the catches in higher degree by 1953:

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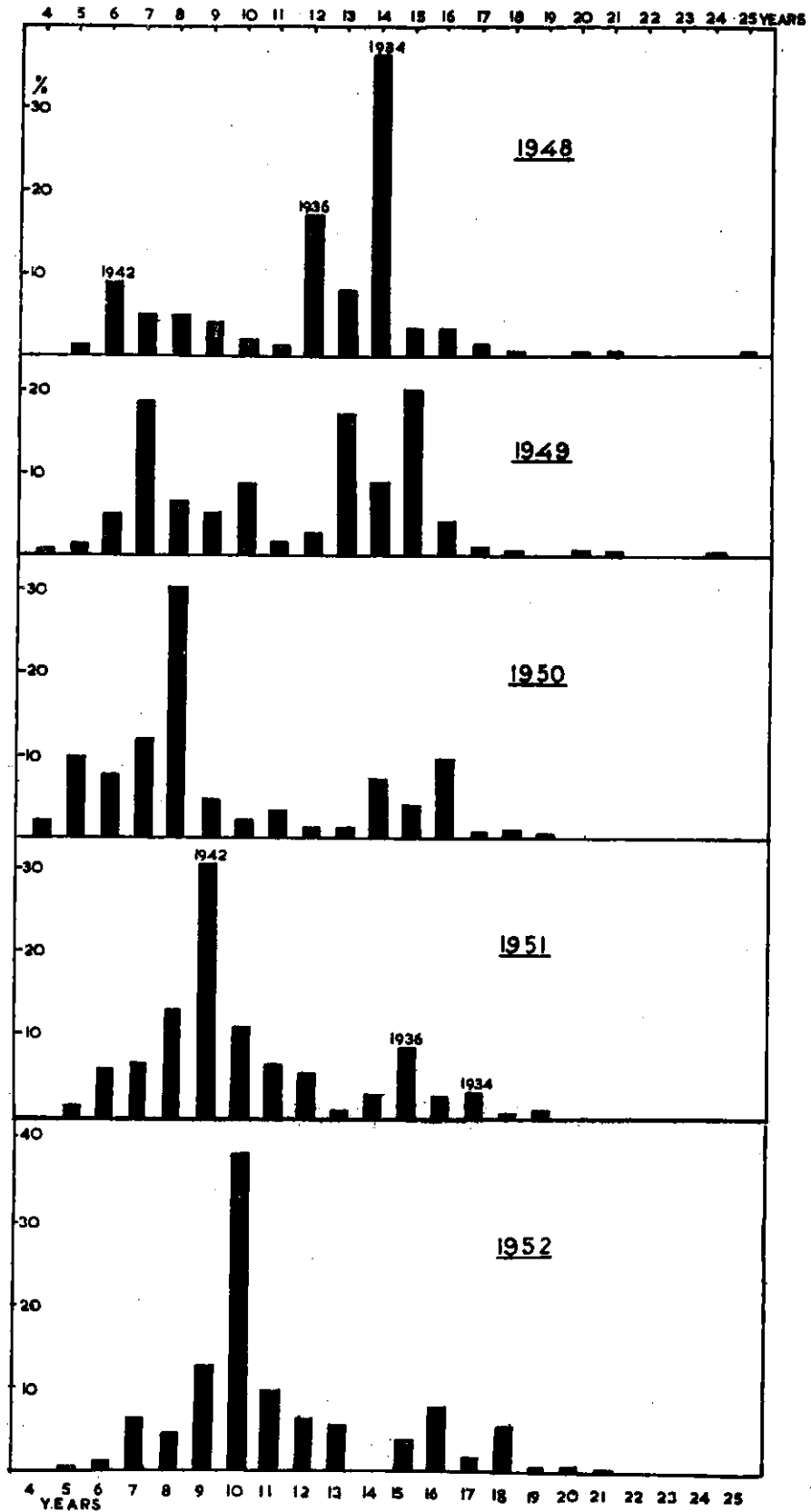


Figure 1. AGE COMPOSITION OF LINE-CAUGHT COD  
FROM WEST GREENLAND BANKS 1948-1952

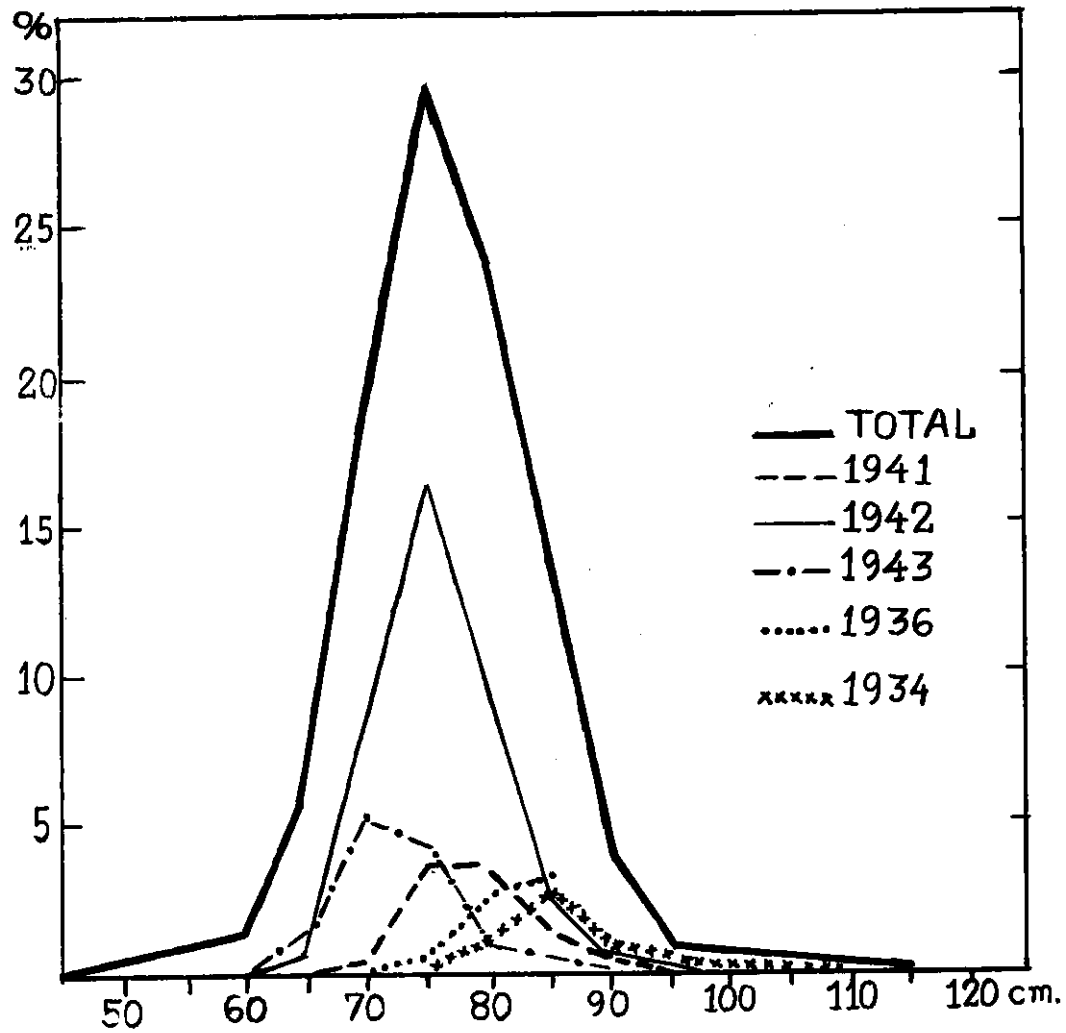


Figure 2. Size-distribution in various year-classes of line-caught cod from West Greenland banks 1952.