INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES

Serial No.455 Document No.14

ANNUAL MEETING - MAY 1957

PORTUGUESE RESEARCH REPORT - 1956

Observations on the Cod (Gadus callarias L.) in Subarea 1 (Greenland)

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The present paper is a preliminary summary of observations on cod during the 1956 campaign in Greenland waters (Subarea 1).

1. Material and Methods

50 samples, or around 7,500 individuals, were studied. The samples were collected on board trawlers (indicated in the text by the sign ') and on dory vessels (indicated in the text by the sign ").

The mean size of the meshes of the codend used by the trawlers is around 117mm. The hooks of the dory vessels are No.1½.

The trawler samples are from the fish destined for landing after discarding into the sea of individuals without commercial interest (of a size below 35-40 cm.). The liner samples are from fish brought on board by the dories.

In Table 1 (Fig.1) the positions of the samples and the observations made for each sample are shown; for the convenience of the study some samples were united in larger groups in accordance with geographical distribution and season of the year (Table 2).

Sample Group	Samples	Subdivision	Dates
A'	1-2-3-5-6-20	1D-1E (Danas)	10 May- 5 June/56
B'	9-10-11-13	1C (Banana)	22-28 May/56
C'	15-16-18-21	1D	30 May-6 June/56
D'	22-23-24-26	1D	8-15 June/56
E'	37-39	1D (Fyllas)	27-29 August/56
F'	40-41-42-44	1B (Store)	30 Aug.-5 Sept/56
G'	48-50-51	1B (Store)	10-13 Sept./56

Table 2. The grouping of the samples from trawlers, Greenland 1956.

The total length is the size of the fish from the point of the snout to the end of the middle rays of the caudal fin. The measurements are made to the nearest cm.

The age was determined by means of the otoliths of around 2,700 individuals. The age at first maturity was determined from the first spawning ring.

The stage of maturity was found through macroscopic observation of the gonads, using a scale of classification of seven stages. For the convenience of tabulation, the data and the interpretation of the results were grouped in four stages: I) Resting (immature individuals and individuals after-spawning), II) Developing maturity, III) Full maturity (spawning), IV) After-spawning.

All weights were carried out on board. Therefore they are subjected to possible errors from the scale used and from the movements of the vessels. Total weight is the weight of the whole fresh fish (with all the intestines).

We wish to mention, and also to thank for, the efficient collaboration given to the work carried out in connection with the Portuguese investigations in the ICNAF area by our assistant, Glicinia Quartin and by the Technician Aldino Victorino.

2. Age Distribution

a) Trawl, 1st Campaign (May-June). The samples collected (A', 8', B', C', D' and 25'; Table 3, Fig.1), from trawlers in Subdivisions 1C, 1D and 1E, from 10 May to 13 June 1956, show in general a pronounced predominance of age-group IX (1947; 38-56%), followed by the group VI (1950; 17-24%, being only around 10% in samples C' and D'), and group VIII (1948; 10-12%). Age-group VII (1949) accounted for 8-10%. All the other age-groups are below 5%.

Sample 8', from the area between Dana and Fiskenaes Bank, must be considered by itself. Age-group VI predominates in this sample (1950;24%), followed by age-groups IX (15%) and VII (10%).

Sample 25', from the west slope of Banana Bank in depths around 500m., shows a less pronounced predominance of group IX (35%), followed by VI (32%) and by VIII (18%). All the other groups are very poorly represented or not present.

b) Trawl, 2rd Campaign (August-September). The samples collected during the second campaign (Table 3, latter part, Fig.1) were from Subdivision 1D - Fylla Bank (E', 27-29 August 1956) and from Subdivision 1B - Stone Hellefiske Bank (F', 46' and G'; 30 August-13 September 1956).

Sample E' shows a predominance of age-groups VI (28%) and V (21%). Group VII is 15% and group IV 11%. Groups IX and X are represented by around 10%.

The samples from Subdivision 1B show, on the contrary, a very marked predominance of age group VI (41-59%); it is followed by age-group V (in samples F' and G', 21-24%; in sample 46', only 13%). Age-group VII accounts for around 17% in samples F' and 46', being much less abundant in sample G' (6%). Age-group IX varies between 5 and 10%. In sample G' the 1952 year-class (age-group IV) is represented by 13%.

Summary: In the first campaign in Subdivisions 1C-1D-1E the 1947, 1950, and, in some cases, the 1948 year-classes predominate. In the second campaign, in Subdivision 1B, the 1950 and 1951 year-classes predominate, followed by the 1949 year-class and in a single sample by the 1952 year-class.

3. Size Distribution

a) Trawlers, 1st Campaign. These fisheries were carried out in Subdivisions 1C-1D-1E (Samples A', 4', 7', B', 12', 14', 17', 19', 25'; Table 3 and Table 5, Fig.1). In the majority of the samples, the peaks of the size curves are around 72cm. (25-40%) and 67 cm. (20-30%). In sample 7' the peak is as low as 62 cm. for morning and afternoon catches, even as low as 57 cm. in night catches. In sample 8', from a very nearby locality, between Dana and Fiskenaes Bank, the length frequency curve is bimodal with peaks in the classes 52 and 57 cm.

Thus the size composition corresponds to the age composition with a predominance of age-group IX, and in samples 7' and 8' of groups VI and V. In cases with observations from fisheries in the mornings, in the afternoons and at night, the corresponding size compositions do not differ significantly. There is, however, an indication of the catching of smaller fish at night than during the day.

b) Line Fishing (Samples 28", 36", 24 June-19 August 1956, Table 6, Fig.2). In sample 28" from Fylla Bank (Subdivision 1D), the peak is at the 72cm. class (38%); the same is found for sample 29", which was taken a little more to the north (Helders Bank, Subdivision 1C); here the peak also falls in the 72cm. class (24%), which corresponds to the predominance of age-group IX already observed in samples from the trawlers.

In the remaining samples from Subdivision 1B, the peaks are in the smaller size group, 62cm. (25-30%), which coincides with the predominance of age-groups VI and V.

c) Trawlers, 2nd Campaign (Samples E', 38', F', 43', G', 46' and 52'; 27 August-14 September 1956, Table 3 and Table 7; Fig.1). The peaks are in the 62 and 67cm. classes, in a single case in the 57cm. class (sample G'), which corresponds with the predominance of age-groups VI and V.

Summary: From the total of these samples, it is seen that the peaks fall on larger size groups in fisheries carried out in the central and southern region of Greenland, corresponding to the predominance of age-group IX. The cod of the Store Hellefiske Bank are somewhat smaller, corresponding to the predominance of age-groups VI and V in this region. Although the samples of the fisheries from the three periods of the 24 hours (morning, afternoon and night), do not show any significant difference in size composition, there is perhaps a small tendency for smaller fish to be caught during the night than in day.

4. Growth

In Table 3 the mean sizes of the age groups are given. Based on these data the mean growth was determined for males and females in Subdivisions 1C-1D-1E (Table 8, Fig.3) and 1B (Table 9,Fig.4)

In both regions (north and south) the growth of the males is just a little lower than that of the females. The difference is a little more pronounced in Subdivision 1B than elsewhere. The crossing of the growth curves is between Gr.VI-VII which corresponds to the age at first maturity.

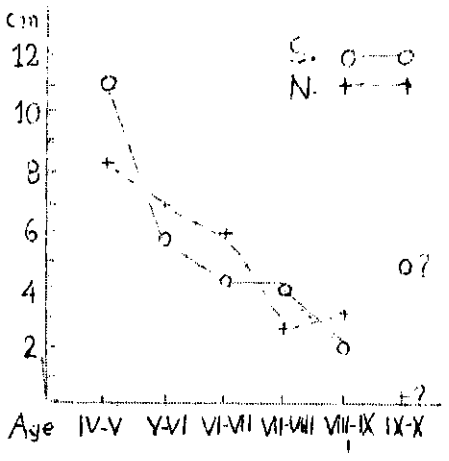

Fig.5. Cod. West Greenland. Annual Growth, 1955-56, in the southern (S) and northern (N) region.

Tables 8-9 (Fig.5) show also the annual growths of the more abundant year-classes. The results are rather doubtful for the year-classes older than 1946 owing to the small number of otoliths investigated.

The annual growth is a little more marked in the northern zone.

5. Sex Ratio

a) The samples from Subdivision 1D and the southern part of 1C (Sample A'-38', Table 3) show a great irregularity as far as sex ratio is concerned. The percentage of males is particularly high in the samples 8' (59%), C' (55%), in sample 4', from the morning, (57%) and in sample 12' - morning and night - (57%); the females show a high percentage in the afternoon in sample 4' (60%), in sample 7' (53-59%), in sample B' (58%), in the afternoon sample 14' (62%) and also in sample 25' (57%) and E' (53%).

These data seem to suggest that the males have a tendency to predominate in the area south of Subdivision 1D, and the females in Subdivisions 1D-1C. The variation of the sex ratio during the various periods of the 24 hours cannot be determined; apparently it is quite irregular.

b) The samples from Subdivision 1B (Sample F' to 52', Table 3 and Table 7) show nearly equal sex ratios. Only in sample F', slope of the Store Hellefiske Bank, is there a predominance of females (56%).

6. Stage of Maturity

For the study of the development of the gonads, the samples were arranged according to time of the year (Table 10, Fig.6). The majority of the samples are from Subdivisions 1C and 1D with the exception of the samples F', 46' and G', from Subdivision 1B.

Males. In May the majority were in the resting stage (40-57%) and in the after-spawning stage (27-41%). A small percentage were in the developing stage (15%) or still showing signs of full maturity (2-3%).

In June the individuals in the resting stage are more abundant (40-60%), the stages of after-spawning are less frequent (16-32%); a small percentage (2%) is still in full maturity.

There are no observations from the month of July. In August and September the great majority of the individuals are in the resting stage (more than 85%); the rest are in the after-spawning stage (15%).

Females. In May, with the exception of sample 8', collected between Dana and Fiskenaes Bank, where practically all females were in the resting stage (97%), a predominance of the after-spawning stage (55-70%) occurs. The remainder are in the resting stage (29-42%). Only one sample shows a small percentage (0.4%) in the spawning stage.

In June the majority were in the after-spawning stage (55-84%), the remainder in the resting stage.

In August-September the majority were in the developing stage (54-80%), and the remainder in the resting stage.

These results are obviously influenced by the age composition of the samples as there is a pronounced precocity of the males with respect to the females and a different age at first maturity.

7. First Maturity

The age at first maturity (Table 11, Fig.7) is found by determining the first spawning ring in the otoliths. Only those age groups best represented in the samples will be considered. These were regionally arranged in two groups: Subdivision 1B (northern region) and 1C-1D (southern region).

All cases with difficulties in interpretation of the existence or position of the first spawning ring were included in the doubtful category.

Generally the first spawning ring occurs between the 6th and 9th year of age, only very rarely in the 5th or in the 10th year.

The majority of males spawn in the 8th and especially in the 7th year. The females spawn for the first time in the 7th and the 8th year, mostly in the 8th year; they thus mature later than the males.

The data do not show any clear difference as to age of first maturity between cod from the north and the south regions.

The high number of individuals of age-groups VII and VIII which, from the reading and interpretation of the rings in the otoliths, were considered as having not yet reached the first maturity,

may result from the difficulty of interpretation of the peripheral ring, yet only badly developed. In fact, in cases where these were still under formation and where more peripheral rings to compare were lacking, the definition of the spawning ring is not very clear.

Thus the results obtained for Groups VII and VIII contradict the results of the macroscopic observation of the gonads and the results obtained through the reading of the otoliths of the older year-classes.

8. Weight Data

Weight observations carried out on a number of individuals are summarized in Table 12.

No difference between males and females was found as to the weight by size-classes. The weights by size-classes are slightly smaller than those found in 1955.

The weights obtained for gonads are low, which confirms that we are not dealing with spawning stages.

Table 1. Portugal. List of Fish Samples Taken During 1956.

Sample Number	Species	Month	Subdivision	Position	In Port or at Sea	Gear	No. of Specimens	Observations Made: Lengths	Weights	Sexes	Maturity	Otoliths or Scales Collected	Ages Determined	1st Maturity	Parasit.
1'	Cod	V	1D	62°34'N,51°10'W	Sea	Trawler	100	x		x	x	OT	x	x	x
2'	"	"	1E	62°24'N,50°54'W	"	"	100	x		x	x	OT	x	x	x
3'	"	"	1E	62°29'N,51°10'W	"	"	99	x		x	x	OT	x	x	x
4'	"	"	1D	62°31'N,51°10'W	"	"	300	x		x					
5'	"	"	1E	62°29'N,51°15'W	"	"	100	x		x	x	OT	x	x	x
6'	"	"	1D	62°35'N,51°20'W	"	"	59	x	x	x	x	OT	x	x	x
7'	"	"	1D	62°56'N,51°46'W	"	"	300	x		x					
8'	"	"	1D	62°50'N,51°50'W	"	"	100	x		x	x	OT	x	x	x
9'	"	"	1C	64°21'N,53°23'W	"	"	100	x		x	x	OT	x	x	x
10'	"	"	1C	64°21'N,53°20'W	"	"	100	x		x	x	OT	x	x	x
11'	"	"	1D	64°13'N,53°10'W	"	"	98	x	x	x	x	OT	x	x	x
12'	"	"	1D	64°10'N,53°10'W	"	"	300	x		x					
13'	"	"	1D	64°12'N,53°10'W	"	"	100	x		x	x	OT	x	x	x
14'	"	"	1D	63°49'N,53°05'W	"	"	200	x		x					
15'	"	"	1D	62°50'N,51°51'W	"	"	100	x		x	x	OT	x	x	x
16'	"	"	1D	62°50'N,51°51'W	"	"	75	x	x	x	x	OT	x	x	x
17'	"	VI	1D	62°53'N,51°51'W	"	"	300	x		x					
18'	"	"	1D	62°48'N,51°50'W	"	"	75	x		x	x	OT	x	x	x
19'	"	"	1D	62°36'W,51°48'W	"	"	300	x		x					
20'	"	"	1D	62°30'N,51°48'W	"	"	100	x		x	x	OT	x	x	x
21'	"	"	1D	62°48'N,51°52'W	"	"	100	x		x	x	OT	x	x	x
22'	"	"	1D	63°25'N,52°50'W	"	"	100	x		x	x	OT	x	x	x
23'	"	"	1D	63°30'N,52°30'W	"	"	50	x	x	x	x	OT	x	x	x
24'	"	"	1D	63°30'N,52°30'W	"	"	100	x		x	x	OT	x	x	x
25'	"	"	1C	64°27'N,54°55'W	"	"	100	x		x	x	OT	x	x	x
26'	"	"	1D	63°33'N,52°15'W	"	"	100	x			x	OT	x	x	
28"	"	"	1D	63°55'N,52°20'W	"	Line	200	x							
29"	"	VII	1C	66°07'N,54°40'W	"	"	200	x							
30"	"	VII	1B	67°32'N,54°40'W	"	"	200	x							
31"	"	VII	1B	66°55'N,54°55'W	"	"	200	x							
32"	"	VII	1B	67°32'N,55°20'W	"	"	200	x							
33"	"	VIII	1B	67°58'N,54°40'W	"	"	200	x							
34"	"	VIII	1B	67°40'N,55°00'W	"	"	200	x							
35"	"	VIII	1B	67°55'N,55°04'W	"	"	200	x							
36"	"	VIII	1B	67°50'N,54°20'W	"	"	200	x							
37'		VIII	1D	64°02'N,52°36'W	"	Trawler	100	x		x	x	OT	x	x	
38'		VIII	1D	64°04'N,52°41'W	"	"	300	x		x					
39'		VIII	1D	64°02'N,52°36'N	"	"	75	x		x	x	OT	x	x	
40'		VIII	1B	66°41'N,54°53'W	"	"	50	x		x	x	OT	x	x	
41'		VIII	1B	66°43'N,55°00'W	"	"	100	x		x	x	OT	x	x	
42'		IX	1B	66°43'N,54°39'W	"	"	75	x	x	x	x	OT	x	x	
43'		IX	1B	66°43'N,54°39'W	"	"	300	x		x					
44'		IX	1B	66°42'N,54°30'W	"	"	75	x		x	x	OT	x	x	
45'		IX	1B	66°46'N,54°30'W	"	"	75	x	x	x	x	OT	x	x	
46'		IX	1B	67°55'N,55°25'W	"	"	75	x		x	x	OT	x	x	
48'		IX	1B	67°57'N,55°09'W	"	"	75	x	x	x	x	OT	x	x	
49'		IX	1B	67°50'N,54°20'W	"	"	196	x		x					
50'		IX	1B	67°50'N,54°20'W	"	"	75	x		x	x	OT	x	x	
51'		IX	1B	67°55'N,54°20'W	"	"	75	x		x	x	OT	x	x	
52'		IX	1B	66°46'N,54°30'W	"	"	300	x		x					

TABLE 3. Cod. Greenland. Percentage Age Distribution, Average Length cm. of Males, Females and Total, and Sex Ratio. From Trawlers

Year-Class	Age Gr.	SAMPLE - GR.A' Subd.1D-E 10 May-5 June 1956 M+F %	M+F cm.	M %	M cm.	F cm.	SAMPLE NO.8' Subd. 1D, 25 May 1956 M+F %	M+F cm.	M %	M cm.	F cm.
1953	III	-	-	-	-	-	1.0	42.0	-	-	42.0
1952	IV	1.1	48.0	33.3	52.5	43.5	5.0	43.0	60.0	44.0	41.5
1951	V	3.6	50.4	65.0	49.5	51.2	24.0	50.8	54.2	50.8	50.8
1950	VI	17.4	61.0	67.0	60.7	61.2	23.0	56.7	65.2	56.9	56.5
1949	VII	9.7	67.4	53.7	67.7	67.4	14.0	64.1	57.1	64.9	63.3
1948	VIII	12.1	69.5	47.7	68.8	70.3	9.0	68.1	66.6	66.7	69.7
1947	IX	42.5	72.0	44.1	71.5	72.4	15.0	69.5	66.6	69.7	69.4
1946	X	4.8	76.0	33.3	75.3	74.6	1.0	81.0	100.0	81.0	-
1945	XI	4.1	74.2	39.1	75.4	72.9	-	-	-	-	-
1944	XII	1.0	73.4	-	-	73.4	-	-	-	-	-
1943	XIII	2.0	79.5	18.1	78.0	81.1	2.0	84.5	50.0	83.0	86.0
1942	XIV	1.4	90.2	25.0	93.0	87.3	5.0	78.4	40.0	76.5	80.3
1941	XV	-	-	-	-	-	-	-	-	-	-
>1940	XVI	0.4	84.0	50.0	82.0	80.0	1.0	77.0	-	-	77.0
		No. of Spec. 556		48.6%			No. of Spec. 100		59.0%		

Year-Class	Age Gr.	SAMPLE - GR.B' Subd.1D, 22/28 May 1956 M+F %	M+F cm.	M %	M cm.	F cm.	SAMPLE - GR.C' Subd.1D, 30 May-6 June 1956 M+F %	M+F cm.	M %	M cm.	F cm.
1953	III	-	-	-	-	-	-	-	-	-	-
1952	IV	-	-	-	-	-	-	-	-	-	-
1951	V	5.5	53.6	37.8	53.3	53.9	1.4	54.5	40.0	55.0	54.0
1950	VI	24.4	61.5	49.5	61.4	61.6	12.3	61.6	53.4	61.6	61.6
1949	VII	9.8	68.1	43.6	69.2	66.9	8.6	61.5	50.0	66.7	66.2
1948	VIII	10.6	71.0	45.2	69.3	72.0	12.6	68.7	59.1	69.2	68.1
1947	IX	38.3	72.0	42.8	70.9	72.8	50.0	72.0	53.1	71.2	72.7
1946	X	2.8	72.5	9.1	73.0	72.0	5.1	73.7	72.2	75.6	71.8
1945	XI	3.2	77.1	33.3	76.3	77.9	4.2	77.9	60.0	76.4	79.3
1944	XII	1.0	75.5	50.0	76.5	74.5	2.8	75.5	70.0	75.1	76.0
1943	XIII	2.0	77.3	50.0	76.0	78.5	1.4	80.3	40.0	75.5	85.0
1942	XIV	1.7	83.5	28.6	82.0	85.0	1.2	80.0	50.0	78.5	82.5
1941	XV	0.3	79.0	-	-	79.0	0.3	84.0	100.0	84.0	-
>1940	XVI	0.6	86.0	53.0	86.0	86.0	-	-	-	-	-
		No. of Spec. 397		42.8%			No. of Spec. 350		55.4%		

Year-Class	Age Gr.	SAMPLE - GR.D' Subd.1D, 8/15 June 1956 M+F %	M+F cm.	M %	M cm.	F cm.	SAMPLE NO.25' Subd.1C, 13 June 1956 M+F %	M+F cm.	M %	M cm.	F cm.
1953	III	-	-	-	-	-	-	-	-	-	-
1952	IV	-	-	-	-	-	-	-	-	-	-
1951	V	0.9	51.3	33.3	51.0	51.5	3.0	51.3	33.3	50.	52.5
1950	VI	7.5	62.0	61.5	61.3	62.6	32.0	62.5	40.6	62.2	62.8
1949	VII	3.7	65.1	38.4	64.6	65.6	6.0	65.3	66.6	69.0	61.5
1948	VIII	9.8	70.0	47.1	69.8	70.2	18.0	71.5	38.8	70.0	73.0
1947	IX	55.8	72.0	51.0	70.4	72.8	35.0	71.3	42.8	71.3	71.3
1946	X	5.2	75.5	44.4	72.6	78.4	1.0	66.0	100.0	66.0	-
1945	XI	0.9	76.0	50.0	74.1	77.7	3.0	75.8	33.3	73.0	78.5
1944	XII	4.3	78.0	60.0	77.3	78.5	-	-	-	-	-
1943	XIII	2.6	80.1	66.6	78.8	81.3	1.0	92.0	100.0	92.0	-
1942	XIV	2.9	81.2	30.0	80.0	82.3	1.0	85.0	-	-	85.0
1941	XV	0.6	85.5	-	-	85.5	-	-	-	-	-
>1940	XVI	-	-	-	-	-	-	-	-	-	-
		No. of Spec. 348		50.3%			No. of Spec. 100		43.0%		

TABLE 3. Cod. Greenland. Percentage Age Distribution, Average Length cm. of Males, Females and Total, and Sex Ratio. From Trawlers.
(cont'd)

Year-Class	Age Gr.	SAMPLE - GR.E' Subd.1D, 27/29 Aug. 1956 M+F %	M+F cm.	M %	cm. M	cm. F	SAMPLE - GR.F' Subd.1B, 30 Aug.-15 Sept 1956 M+F %	M+F cm.	M %	cm. M	cm. F
1953	III	4.0	42.9	71.4	43.2	42.5	1.0	43.3	33.3	42.0	44.5
1952	IV	11.4	47.7	45.0	46.8	48.5	4.0	49.5	50.0	49.8	49.2
1951	V	21.1	54.2	48.6	53.2	55.2	21.0	56.8	36.5	56.5	57.1
1950	VI	28.0	62.4	40.8	61.6	63.1	40.7	61.2	45.1	62.4	59.9
1949	VII	15.4	67.3	44.5	66.5	68.1	16.7	67.7	40.0	65.8	69.6
1948	VIII	7.4	70.5	53.8	71.0	70.0	6.0	72.1	50.0	72.0	72.1
1947	IX	10.9	73.1	52.6	73.1	71.9	8.3	72.9	56.0	71.0	74.1
1946	X	0.6	93.0	-	-	93.0	0.7	76.0	100.0	76.0	-
1945	XI	-	-	-	-	-	1.0	76.3	33.3	79.0	73.5
1944	XII	0.6	97.0	100.0	97.0	-	0.7	84.5	50.0	89.0	80.0
1943	XIII	0.6	74.0	100.0	74.0	-	-	-	-	-	-
1942	XIV	-	-	-	-	-	-	-	-	-	-
1941	XV	-	-	-	-	-	-	-	-	-	-
≥1940	XVI	-	-	-	-	-	-	-	-	-	-
		No. of Spec. 175		47.4%			No. of Spec. 300		44.0%		

Year-Class	Age Gr.	SAMPLE NO.46' Subd.1B, 7 Sept. 1956 M+F %	M+F cm.	M %	cm. M	cm. F	SAMPLE - GR.G' Subd.1B, 10/13 Sept. 1956 M+F %	M+F cm.	M %	cm. M	cm. F
1953	III	-	-	-	-	-	0.5	41.0	100.0	41.0	
1952	IV	2.7	47.5	50.0	48.0	47.0	12.5	48.2	53.6	48.5	47.9
1951	V	13.3	55.6	40.0	53.5	57.7	24.1	56.0	40.8	56.0	55.8
1950	VI	58.7	65.0	47.7	65.3	64.6	43.7	62.7	55.1	62.2	63.2
1949	VII	16.0	68.8	58.3	69.1	68.4	5.8	64.2	30.8	61.8	66.0
1948	VIII	4.0	67.5	33.3	67.0	68.0	5.8	70.7	53.8	70.4	71.0
1947	IX	5.3	77.0	75.0	72.0	82.0	6.7	72.0	60.0	69.2	74.5
1946	X	-	-	-	-	-	0.9	74.5	50.0	76.0	73.0
1945	XI	-	-	-	-	-	-	-	-	-	-
1944	XII	-	-	-	-	-	-	-	-	-	-
1943	XIII	-	-	-	-	-	-	-	-	-	-
1942	XIV	-	-	-	-	-	-	-	-	-	-
1941	XV	-	-	-	-	-	-	-	-	-	-
≥1940	XVI	-	-	-	-	-	-	-	-	-	-
		No. of Spec. 75		49.3%			No. of Spec. 224		50.1%		

Sample Group or Number	A	8	B	C	D	25	E	F	46	G
Subd.	1D + 1E	1D	1D	1D	1D	1C	1D	1B	1B	1B
Date 1956	10 May 6 June	25 May	22/28 May	30 May 6 June	8/15 June	13 June	27/29 Aug.	30 Aug 15 Sept.	7 Sept.	10/13 Sept.
42cm	0.5	5.0	-	-	-	-	4.6	0.7	-	0.9
47	1.8	12.0	1.0	-	0.3	-	10.9	2.7	2.7	7.6
52	3.2	17.0	3.0	1.4	0.6	3.0	12.0	7.3	4.0	10.7
57	5.4	16.0	8.3	3.4	2.9	7.0	15.4	19.0	8.0	24.5
62	12.1	13.0	16.1	13.7	7.5	19.0	15.4	26.7	33.3	23.2
§ 72	30.2	11.0	28.0	35.7	30.2	26.0	16.0	12.7	14.7	10.2
77	15.8	5.0	15.4	15.4	23.6	10.0	6.3	5.3	2.7	1.8
82	3.8	4.0	4.0	4.0	6.9	3.0	-	2.3	1.3	-
87	1.4	1.0	1.5	2.4	2.6	2.0	-	0.3	-	0.5
92	0.2	-	0.5	0.3	-	1.0	0.6	-	-	-
97	0.2	-	-	-	-	-	0.6	-	-	-
102	-	-	-	-	-	-	-	-	-	-
§ 67	23.3	16.0	21.9	23.4	25.5	29.0	18.3	23.0	33.3	20.5
§No. of Specimens:	556	100	397	350	348	100	175	300	75	224

TABLE 4 Cod Percentage. Length composition by 5 cm. groups. Portuguese samples, Subarea 1., 1956.

	4'			7'			12'			14'			17'			19'		
CLASS	Morn	Aft	Night	Morn	Aft	Night	Morn	Aft	Night	Morn	Aft	Morn	Aft	Night	Morn	Aft	Night
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
42	-	-	-	-	1.0	-	4.0	-	2.0	-	-	-	-	-	-	-	-
47	1.0	-	1.0	4.0	8.0	2.0	1.0	3.0	2.0	-	2.0	-	-	-	-	1.0	3.0
52	-	1.0	-	10.0	12.0	9.0	3.0	4.0	5.0	3.0	1.0	-	-	5.0	-	1.0	3.0
57	3.0	13.0	2.0	17.0	12.0	20.0	10.0	9.0	[illegible]	3.0	6.0	10.0	1.0	5.0	1.0	3.0	8.0
62	9.0	[illegible]	15.0	20.0	21.0	14.0	17.0	16.0	18.0	5.0	17.0	12.0	9.0	21.0	10.0	15.0	15.0
67	26.0	26.0	30.0	19.0	16.0	22.0	15.0	21.0	25.0	30.0	23.0	21.0	27.0	24.0	16.0	25.0	23.0
72	36.0	20.0	34.0	14.0	15.0	14.0	25.0	21.0	22.0	39.0	28.0	30.0	28.0	18.0	41.0	20.0	14.0
77	20.0	15.0	13.0	8.0	10.0	10.0	16.0	13.0	14.0	13.0	15.0	19.0	26.0	13.0	22.0	19.0	5.0
82	3.0	13.0	5.0	4.0	4.0	4.0	2.0	6.0	4.0	9.0	5.0	7.0	3.0	9.0	9.0	11.0	4.0
87	-	2.0	-	-	-	3.0	4.0	4.0	1.0	2.0	2.0	3.0	4.0	3.0	5.0	5.0	-
92	2.0	-	-	2.0	1.0	2.0	2.0	-	1.0	-	1.0	1.0	2.0	1.0	-	2.0	-
97	-	-	-	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-
102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
No. of Specimens																	
600	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
%	57.0	42.0	50.0	47.0	46.0	41.0	57.0	50.0	55.0	50.0	38.0	48.0	49.0	52.0	51.0	53.0	46.0

TABLE 5. Cod, GREENLAND, Size distribution and sex-ratio of six samples from trawlers (4', 13-V-56, 7', 20-V-56, 12', 26-V-56, 14', 29-V-56, 17', 1-VI-56, 19', 4-VI-56) from Subdivision 1D

	28+	29+	30+	31+	32+	33+	34+	35+	36+
CLASS	%	%	%	%	%	%		%	%
42	-	-	1:0	-	-	-	-	-	-
47	-	2.0	4.0	2.0	1.5	1.0	-	5.5	0.5
52	-	2.5	8.5	5.5	3.0	7.0	3.0	7.5	4.5
57	1.5	6.0	20.5	11.0	13.0	21.0	18.0	13.0	7.0
62	6.5	11.0	30.o	19.0	15.5	30.5	26.5	15.0	24.0
67	23.0	15.5	18.0	19.5	16.5	18.5	20.5	27.5	23.5
77	21.5	22.5	5.	14.5	17.0	8.0	10.0	6.5	13.0
82	11.0	10.5	4.5	6.0	6.0	2.5	5.5	3.5	3.0
87	3.0	4.5	1.0	3.0	5.0	1.0	2.0	2.5	0.5
92	-	-	0.5	2.0	3.0	-	1.0	-	-
97	-	0.5	-	-	3.0	0.5	-	0.5	0.5
102	-	0.5	-	-	0 5	-	-	-	-
107	-	-	-	-	-	-	-	-	-
112	-	-	-	0.5	-	-	-	-	-
No. of. Spec.	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0

Table 6 Greenland Size Distribution of 9 samples from liners (28+,24--VI-56-,29+,2-VII-56,30+,13-VII-56,31-21-VII-56, 32+26-VII-56,33+,3 from Subdivision ID, IC, and IB

	38'		43'		49'		52'	
CLASS	day	night	day	night	day	night	day	night
CM.	%		%	%	%	%	%	%
42	4.0	3.0	1.8	-	8.1	0.4	-	
47	10.0	7.0	1.6	0.4	8.2	4.2	0.4	
52	9.0	9.5	6.4	5.2	16.3	4.	-	
57	13.5	15.0	6.4	11.6	14.3	1 .2	4.8	
62	21.5	25.0	20.8	28.4	36.7	31.2	21.6	
67	21.0	19.0	36.0	30.4	9.2	32.4	43.6	
72	11.0	15.0	13.2	17.2	8.2	13.2	21.6	
77	5.5	3.5	10.8	6.0	2.0	3.2	7.6	
82	4.0	2.0	2.8	0.8	-	-	-	
87	-	0.5	0.4	-	-	-	0.4	
92	0.5	0.5	-	-	-	-	-	
No. of. Spec.	250	250	250	250	196	250	250	
	500	530	490	490	480	490	520	

Table 7 Greenland-Size distribution and sex-ratio of 4 Samples from trawlers(38',28-VIII-56,43'2-IX-56,49'11-IX-56,52'14-IX-56)from Subdivisions ID-IB.

YEAR-CLASS	AGE (1956)	♂♂	♀♀	1955	1956	ANNUAL GROWTH
1951	V	53.6	52.7	41.3	52.3	11.0
1950	VI	61.8	61.4	55.2	61.1	5.9
1949	VII	67.1	65.6	61.3	65.6	4.3
1948	VIII	69.5	70.5	65.8	69.9	4.1
1947	IX	70.4	71.9	69.7	71.7	2.0
1946	X	75.1	78.0	71.9	76.8	4.9

TABLE 8. Cod, GREENLAND Southern Region. Mean size of males and females and annual growth (in cm.) of the more richly represented year-classes, based on sample groups or numbers A, B, 8, C, D, 25 and E (Trawlers).

YEAR-CLASS	(1956)	♂♂	♀♀	1955	1956	ANNUAL GROWTH
1952	IV	48.8	48.0	-	48.4	-
1951	V	55.3	56.9	48.8	56.1	8.3
1950	VI	63.3	62.6	55.9	62.8	6.9
1949	VII	65.6	68.0	60.7	66.7	6.0
1948	VIII	69.8	70.4	67.4	70.1	2.7
1947	IX	71.7	76.9	70.7	73.8	3.1
1946	X	76.0	73.1	75.2	75.3	0.1
1945	XI	79.0	73.6	79.3	76.3	3.0
1944	XII	81.0	80.0	80.5	84.5	4.0

TABLE 9. Cod, GREENLAND, Northern Region. Mean size of males and females and annual growth (in cm.) of the more richly represented year-classes, based on sample groups or numbers F, 46 and G in Subdivision 1B, Trawlers.

Stage of Maturity	A' 1●-V/5-VI-56		Ø' 21-V-56		B' 22-V/28-V-56		C' 30-V/6-VI.56	
	M %	F %	M %	F %	M %	F %	M %	F %
Resting	37.7	29.7	57.7	97.6	40.2	42.8	41.4	23.0
Developing	19.0	-	15.3	-	17.8	0.8	23.8	-
Spawning	1.8	-	-	-	3.6	0.4	2.1	-
After Spawning	41.6	70.0	27.1	-	38.5	55.9	32.6	76.4
Doubtful	-	0.3	-	2.4	-	-	-	0.6
%	100.1	100.0	100.1	100.0	100.1	99.9	99.9	100.0
No	279	330	59	41	169	231	193	157

Stage of Maturity	D' 8-VI/15-VI-56		25' 13-VI-56		E' 27/-29-VIII-56		F' 30-VIII/5-IX-56		46' 7-IX-56		G' 10/13-IX-56	
	M %	F %	M %	F %	M %	F %	M %	F %	M %	F %	M %	F %
Resting	52.0	16.0	59.1	42.9	80.0	45.9	83.3	19.7	86.5	21.1	83.0	30.1
Developing	14.3	-	2[illegible].7	-	-	54.1	-	80.3	-	78.9	-	69.9
Spawning	1.7	-	2.3	-	-	-	-	-	-	-	-	-
After Spawning	32.0	84.0	16.0	55.4	20.0	-	16.7	-	13.5	-	17.0	-
Doubtful	-	-	-	1.8	-	-	-	-	-	-	-	-
%	100.0	100.0	100.1	100.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No	175	175	44	56	90	85	168	132	37	38	112	113

Table 10 Cod. Greenland May to Sptember 1956. Stage of maturity determined by macroscopic observation of the gonads.

			Age at first spawning - M									Age at first spawning - F								
			V	Vl	Vll	Vlll	lX	X	θ	?	T	V	Vl	Vll	Vlll	lX	X	θ	?	T
Vl	S	Nº	-	3	-	-	-	-	163	9	175	1	5	-	-	-	-	135	11	152
		%	-	1.7	-	-	-	-	93.1	5.1	99.9	0.7	3.3	-	-	-	-	88.8	7.2	100.0
	N	Nº	-	2	-	-	-	-	128	-	130	-	2	-	-	-	-	128	4	134
		%	-	1.5	-	-	-	-	98.5	-	100.0	-	1.5	-	-	-	-	95.5	8.2	100.0
Vll	S	Nº	-	10	1	-	-	-	73	7	91	1	6	7	-	-	-	58	17	89
		%	-	11.0	1.1	-	-	-	80.2	7.7	100.0	1.1	6.7	7.9	-	-	-	65.2	19.1	100.0
	N	Nº	-	2	4	-	-	-	25	-	31	-	-	3	-	-	-	30	11	44
		%	-	6.5	12.9	-	-	-	80.6	-	100.0	-	-	6.8	-	-	-	68.2	25.0	100.0
Vlll	S	Nº	-	10	61	20	-	-	15	10	116	-	3	74	10	-	-	15	12	114
		%	-	8.6	52.6	17.2	-	-	12.9	8.6	99.9	-	2.6	64.9	8.8	-	-	13.1	10.5	99.9
	N	Nº	-	1	11	1	-	-	3	1	17	-	1	5	4	-	-	6	1	17
		%	-	5.9	64.7	5.9	-	-	17.7	5.9	100.1	-	5.9	29.4	23.5	-	-	35.4	5.9	100.1
lX	S	Nº	-	13	166	191	6	-	4	12	392	1	3	133	254	7	-	5	28	431
		%	-	3.3	42.4	48.7	1.5	-	1.0	3.1	100.0	0.2	0.7	30.9	59.0	1.6	-	1.0	6.5	99.9
	N	Nº	-	1	8	9	2	-	5	1	26	-	-	3	4	6	-	2	3	18
		%	-	3.8	30.8	34.6	7.7	-	19.2	3.8	99.9	-	-	16.7	22.2	33.3	-	11.1	16.7	100.0
X	S	Nº	-	1	15	13	4	-	1	-	34	-	1	14	20	7	-	1	1	44
		%	-	2.9	44.1	38.4	11.8	-	2.9	-	100.1	-	2.3	31.8	45.5	15.9	-	2.3	2.3	100.1
Xl	S	Nº	1	3	18	4	3	-	2	-	31	-	3	15	19	7	-	1	-	45
		%	3.2	9.7	58.1	12.9	9.7	-	6.5	-	100.1	-	6.7	33.3	42.2	15.6	-	2.2	-	100.0
Xll	S	Nº	-	4	8	4	2	-	-	1	19	-	2	7	6	2	-	-	-	17
		%	-	21.1	42.1	21.1	10.5	-	-	5.3	100.1	-	11.8	41.2	35.3	11.8	-	-	-	100.1
Xlll	S	Nº	-	1	13	1	1	-	1	-	17	-	3	7	8	1	1	-	-	20
		%	-	5.9	76.5	5.9	5.9	-	5.9	-	100.1	-	15.0	35.0	40.0	5.0	5.0	-	-	100.0
XlV	S	Nº	-	-	8	2	-	-	-	1	11	-	1	12	8	3	-	-	-	24
		%	-	-	72.7	18.2	-	-	-	9.1	100.0	-	4.2	50.0	33.3	12.6	-	-	-	100.1

TABLE 11. Cod, GREENLAND, Age at first maturity of males and females of the more abundant age-groups (Vl - XlV) in samples from May to September 195..

Length	No of Spec	Whole Fish	Liver 0'0'	Gonads	Intestines	No of Spec	Whole Fish	Liver 0'0'	Gonads	Intestines
42	1	780	40	10	70	2	675	50	10	70
47	3	1055	58	10	95	6	988	54	10	94
52	9	1302	92	11	117	16	1303	81	12	117
57	31	1693	103	19	138	29	1643	105	19	141
62	51	2113	126	28	166	44	2058	144	28	165
67	63	2556	133	38	168	64	2548	158	42	177
72	45	2975	158	47	178	60	2956	149	77	190
77	22	3588	163	63	194	35	3681	164	83	230
82	6	4321	154	55	216	13	4150	159	92	267
87	1	4420	70	20	220	4	4680	143	98	1200
	232					273				

Table 12 Cod. Greenland. Weight in grams by size-groups of whole fish livers, gonads, and intestines- Sample Nos:(6',15-V-56;11',25-V56; 16', 31-V-56; 23',9-VI -56;42', 1-IX-56; 45', 6-IX-56; 48'-10-IX-56.

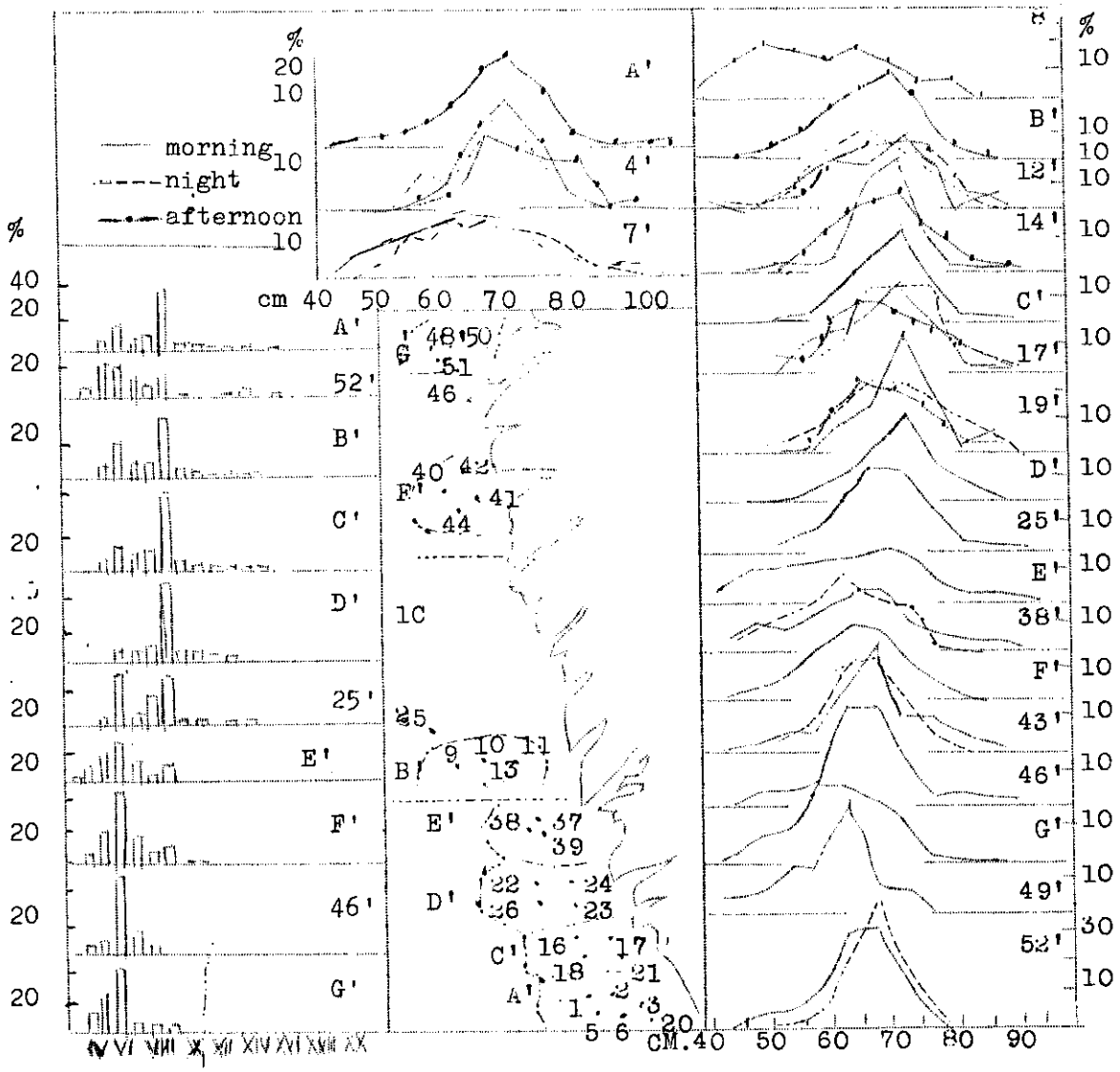

Fig. 1. Greenland. 1956. Cod. Samples; localities; age and lenght distribuition.

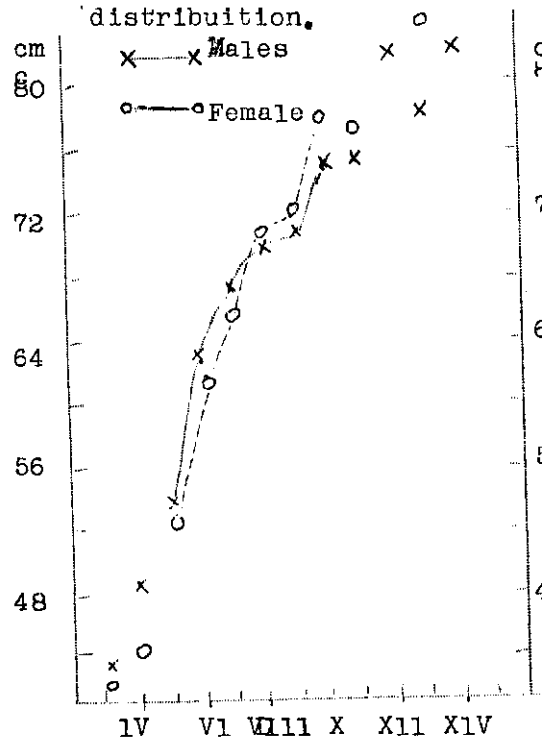

Fig. 3. Cod. West Greenland. 1956 Growth in the southern region.

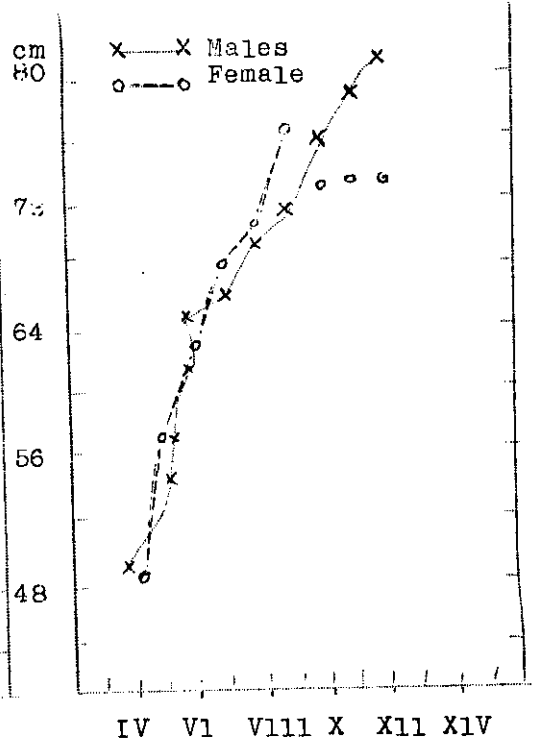

Fig. 4. Cod. West Greenland. 1956. Growth in the northern region.

C 4

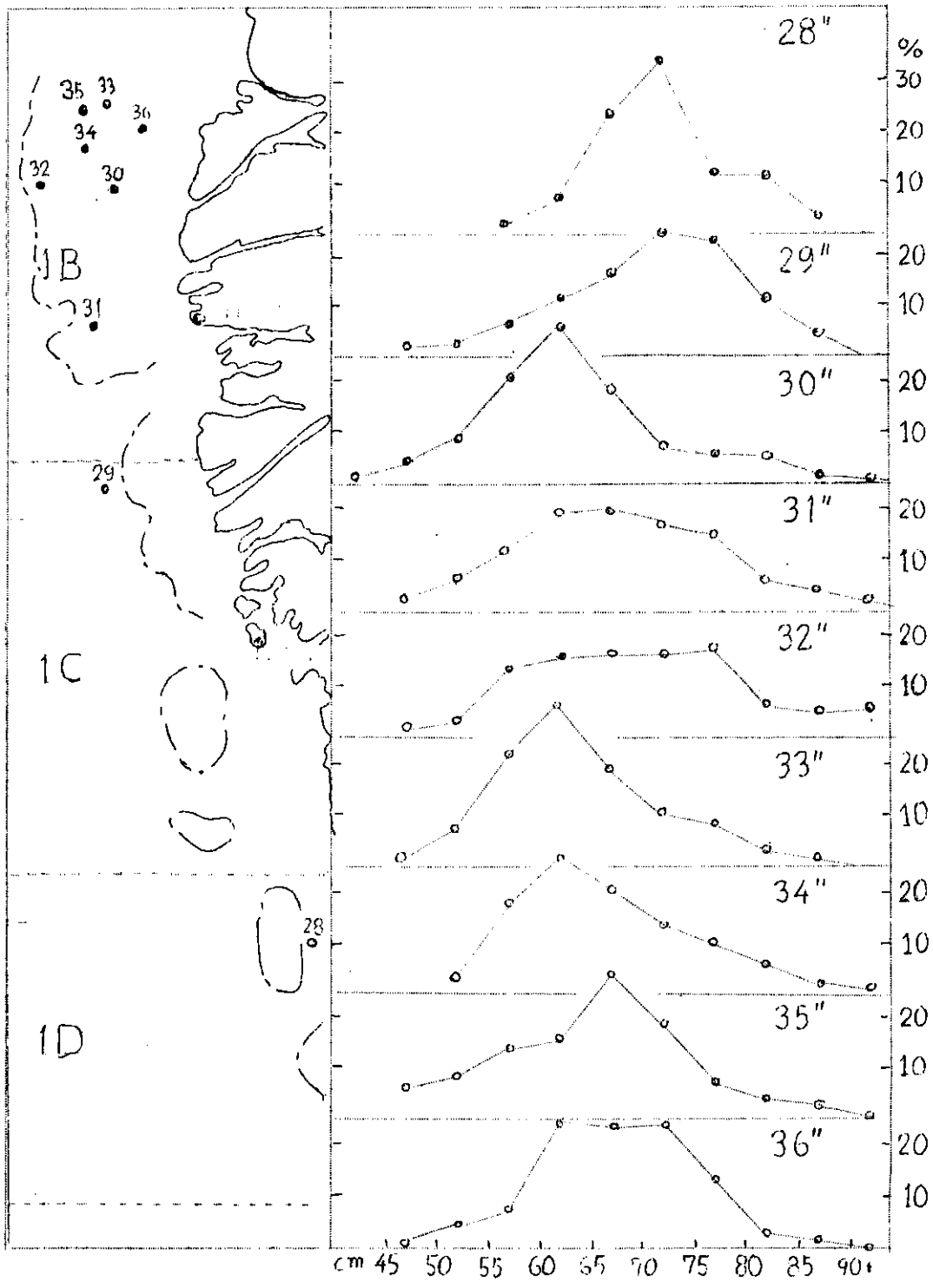

Fig. 2. Cod. West Greenland, 1956. Length distribution of line-caught cod.

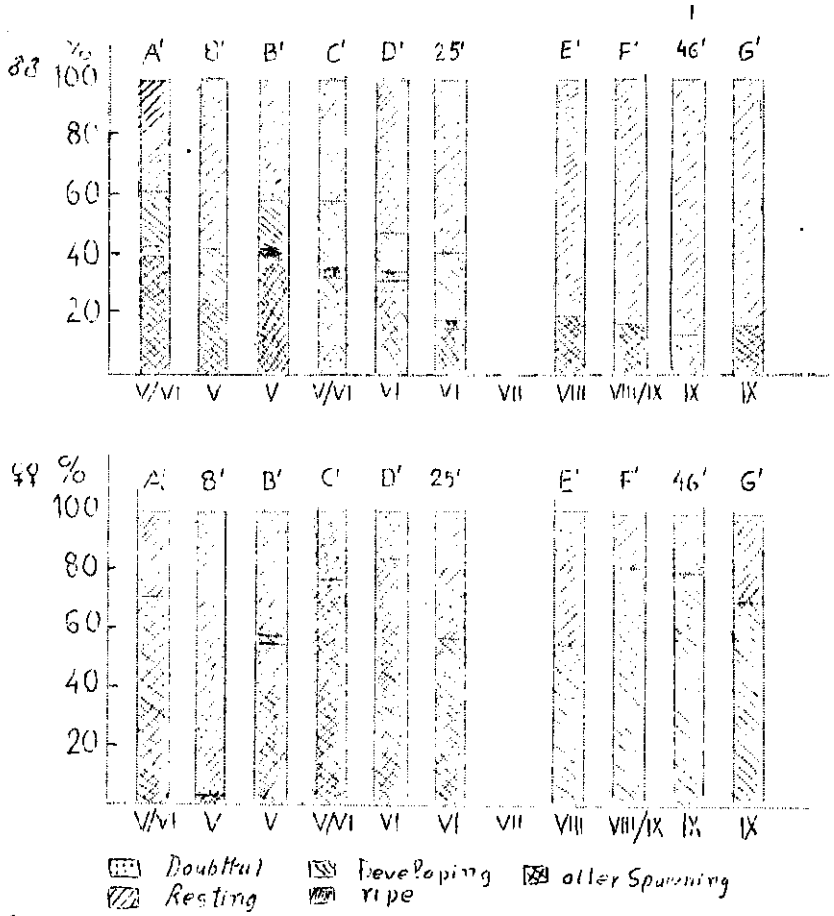

Fig.6 - Cod. West Greenland. 1956. Percentage number of the various stages of maturity in males and females of the various age-groups. Sample-gr. or sample no. indicated above

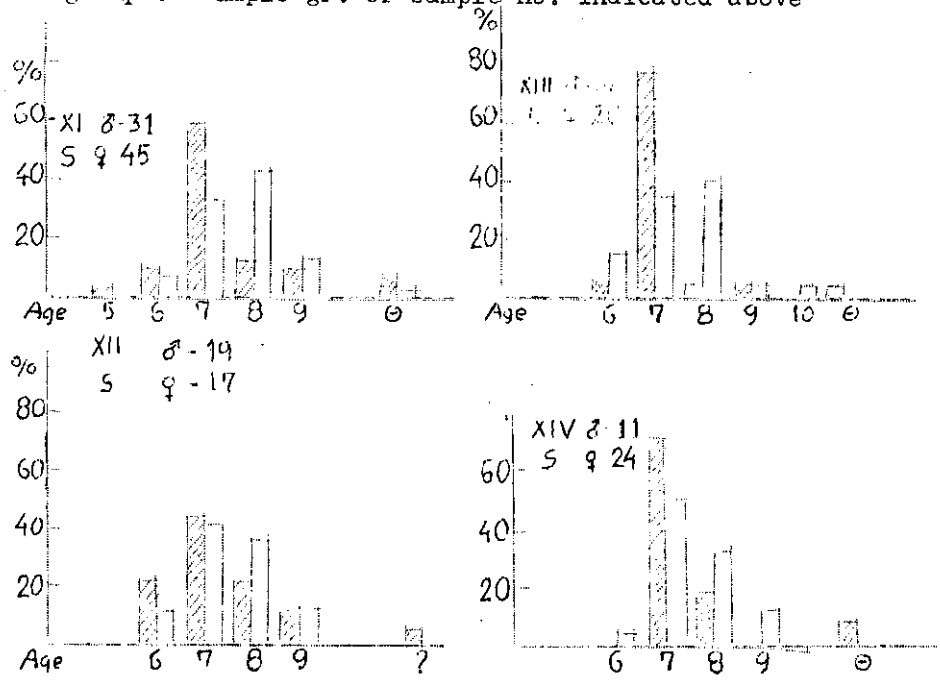

Fig.7 cont'd (see next page)

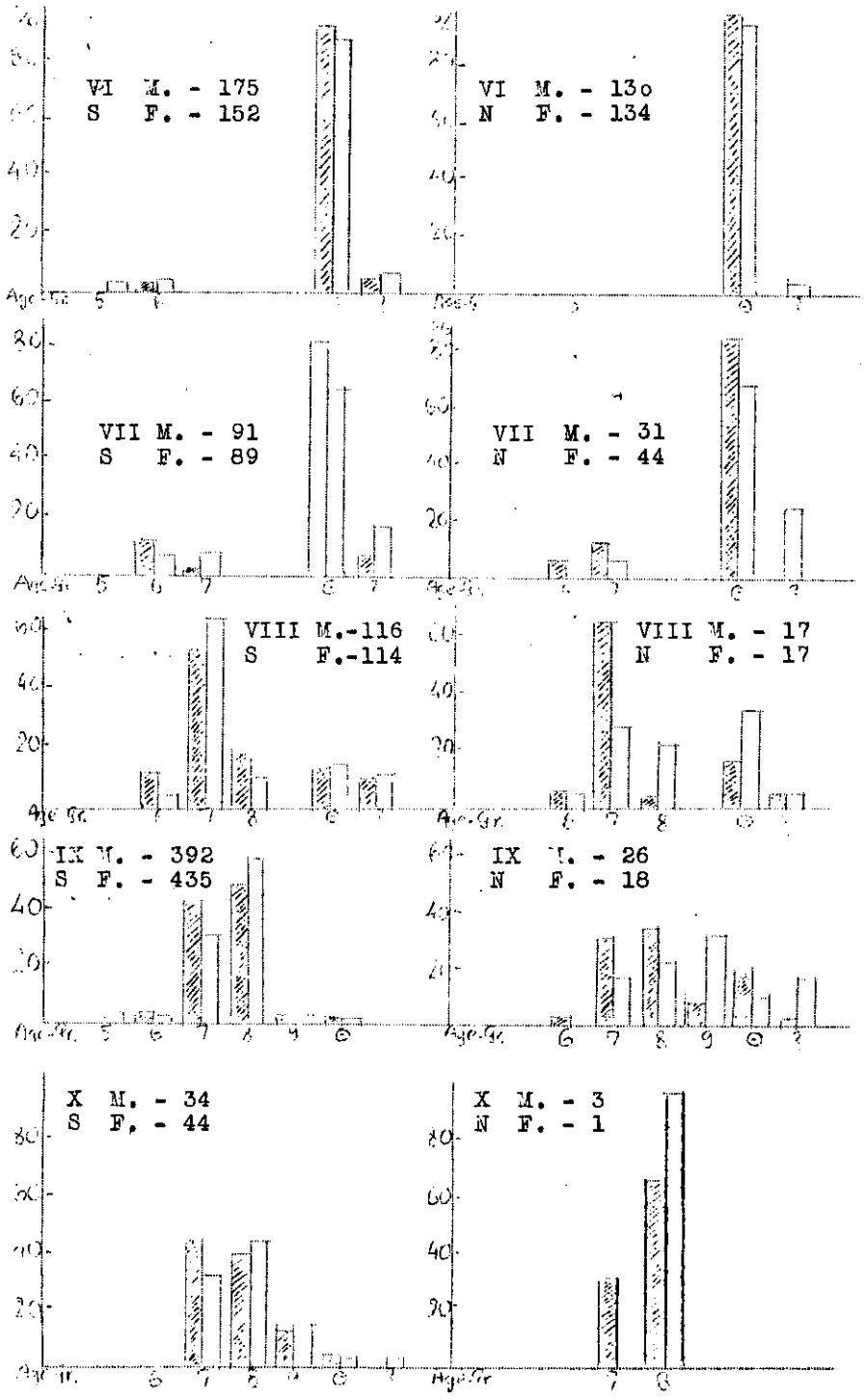

Fig. 7. Cod. Greenland. Percentage number of males (striated columns) and females (white columns) spawning for the first time at various ages (age-groups) of the abundant age-groups (VI,VII,VIII,IX,X,XI,XII,XIII, and XIV). S=southern, N=northern region. 0 indicates no spawning mark.