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Portuguese Research Report, 1958

by Mario Ruivo and Glicinia V. Quartin

The present report summarizes the results of sampling from Portuguese cod-fishing vessels operating in the ICNAF area, Subarea 1 (Greenland) and 2 (Labrador) during the 1958 fishing campaign.¹⁾

The gear used, the system of sampling and the methods for the study of the material and data collected, are the same as those described in earlier reports (see Portuguese Research Report, 1956, ICNAF, Annual Proceedings, Vol. 7).

I. Observations on the cod, *G. callarias* L. in Subarea 1 (Greenland).

A number of 14 samples were collected (3 from dory fishing vessels and 11 from trawlers). The samples comprised ca. 1500 individuals; from 1300 of these, otoliths were taken for age-determination. For the consideration of the material the samples were grouped as follows:

Sample Group	No. of samples	Subdivision	Date
A	1,2,3	1D	29-V/12-VI-1958
B	4,5,6,7,8	1C	4-19-VI-1958
C	11,12,13	1D	12-14-VI-1958
D	14	1C	17-VI-1958

The localities sampled are shown on the map in Figure 1.

1. Age-distribution.

a. Dory vessels (May-June, Figure 1). Three samples from the line fishery by dories (Sample Group A) in Subdivision 1D in May-June showed a predominance of the age-groups XI (34%) and VIII (23%). All the other age-groups were each represented by less than 10%.

b. Trawlers, 1st campaign (June, Figure 1). In Subdivision 1C (June, Sample Groups B and D) a clear predominance of age-group V was observed (35-52%). It was followed by age-groups VIII (10-15%) and VI (10-13%). Age-group XI which was very poor (2%) in sample group D appears with 12% in sample group B.

In Subdivision 1D (June) age-group VIII is the strongest with 29%; it is followed by XI (19%) and VII (16%); age-group V was only present with 10%.

c. Summary. In Subdivision 1D the 1947 year-class continued to predominate in the line fishery from the dories, and to a minor extent in the trawl fishery; this different degree of predominance of the year-class is probably due to the different selectivity of the two types of gear.

The samples from the trawl fishery as well as from the line fishery showed a rich occurrence of the 1950 year-class. Also the 1951 year-class was fairly well represented. These results are in conformity with those obtained from the 1957 observations from the same season of the year.

1) The detailed data from the samples considered in this report will be published in tabular form in the Sampling Yearbook for 1958.

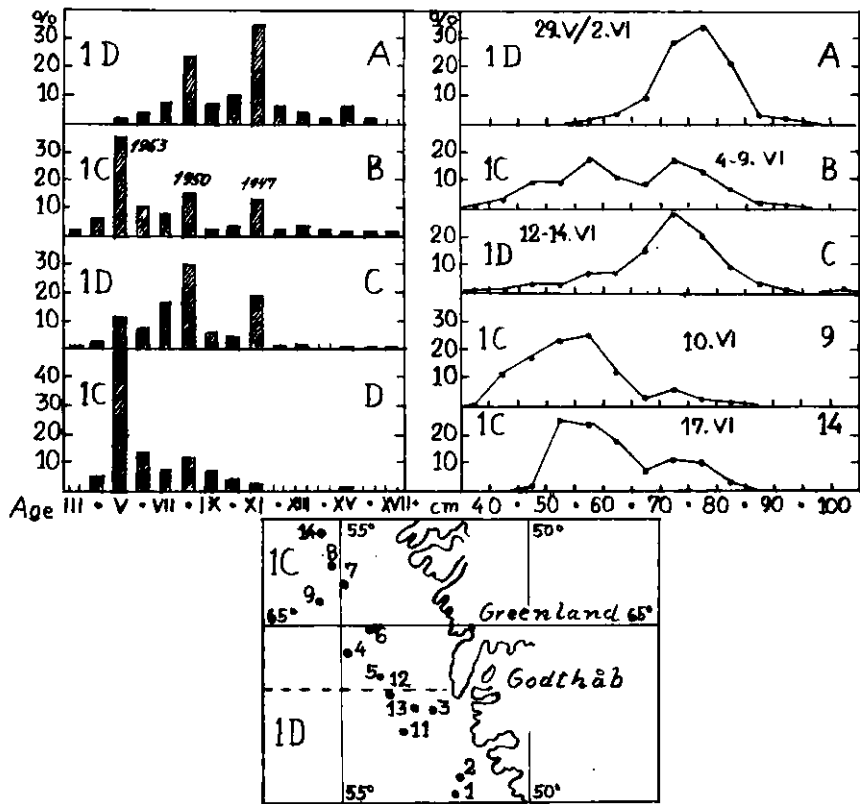


Figure 1. Age and length distribution of samples of cod caught by Portuguese vessels in West Greenland waters, 1958. Left age distribution, right - length distribution. On the map are shown the positions of the samples.

TABLE 1. Greenland, 1958 - South region. Mean growth of males and females, and annual growth of the richer year-classes based on the sample groups A,B,C, and D, 29 May - 17 June, 1958.

Year-class	Age (1958)	M. Length (cm)		♂♂ + ♀♀		Annual Growth
		♂♂	♀♀	1957	1958	
1955	III	41.5	38.0	-	39.8	-
54	IV	45.2	48.0	36.6	47.7	11.1
53	V	55.1	55.5	44.6	55.3	10.7
52	VI	61.0	64.1	50.2	62.3	12.5
51	VII	66.4	69.7	58.3	69.4	11.1
1950	VIII	73.0	71.9	66.4	72.4	6.0
49	IX	73.8	73.3	70.7	73.5	3.5
48	X	76.5	77.9	72.9	76.7	3.8
47	XI	75.5	79.2	73.3	76.9	3.6
46	XII	77.1	80.5	78.6	78.8	0.2
45	XIII	81.4	81.1	78.6	81.3	2.7

In Subdivision 1C the 1953 year-class (which seems to be a rather rich one), and the 1950 year-class predominated; this is in accordance with previous observations.

2. Size-composition (Figure 1).

The samples from the dory fishery in Subdivision 1D showed a regular, unimodal distribution with the peak in the 77 cm group, corresponding to the predominance of the age-group XI (1947 year-class); the range of the length distribution was from the 57 to the 92 cm group.

For the same subdivision the samples from the trawl fishery presented a far larger size range (37-92 cm), with a peak for the 72 cm group corresponding to age-group VIII.

For Subdivision 1C the trawl samples presented several peaks of the length-distribution curve, and a fairly large range of lengths; this especially was the case with the sample group B (range: 37-92 cm) with peaks at 57 and 72 cm corresponding to the V- and the VIII-groups.

Sample group D is bimodal with the 52 cm group being the largest; this in accordance with the predominance of the V-group. The sample no. 9 showed the same type of length-distribution curve, with the peak in the 57 cm group.

3. Growth.

The average lengths of males and females from Subdivisions 1C-1D are presented in Table 1 and Figure 2, based on data from both the trawl fishery and the dory fishery. In the same figure is also shown the annual growth of the more abundant age-groups. The growth figures observed for 1958 were considerably larger than those observed in the year 1957.

4. Sex-ratio.

In the samples from the trawl fishery the percentages of males varied between 48-53% with the exception of sample no. 9 (Subdivision 1C) where the males accounted for as much as 60%. In the sample group A, from the dory fishery the females predominated strongly with 68%.

5. Maturity (Table 2 and Figure 3).

Males. In May and the beginning of June the majority of the males investigated were in the developing stage (47-68%) or in the resting stage (20-39%); a small number (11%) were post-spawners. A sample from the middle of June showed the majority (56%) to be in the resting stage, 33% in the developing stage, only few, 10%, were post-spawners; still fewer, only 2%, were in the spawning stage.

Females. In May and beginning of June all females were either in the post-spawning stage (60%) or in the resting stage 40%. By the middle of June the number in the post-spawning stage had decreased to 30%, and the resting stage predominated with 70%.

6. Age at First Maturity (Table 3 and Figure 4).

The study of the spawning rings showed, as was the case in the previous years, that first maturity is reached at ages 6 to 10, more especially at age 7 and 8. No significant difference as to age at first maturity was found between males and females. Compared to the previous year there was some disagreement as far as the age-groups younger than IX (inclusive) were concerned, obviously due to the difficulties in evaluating the marginal rings; for the older year-classes the results are in better agreement.

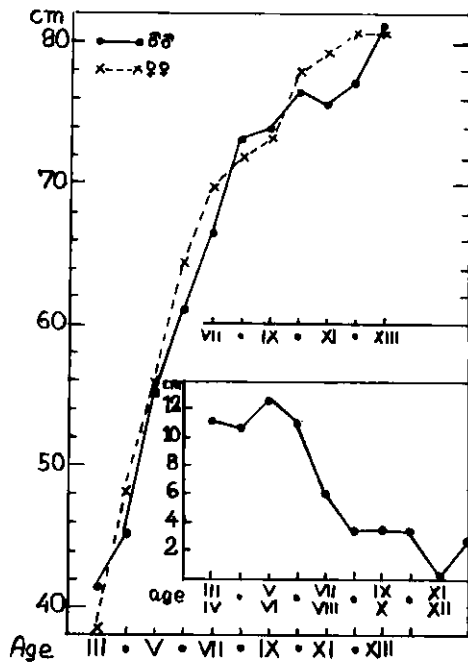


Figure 2. Cod - W. Greenland. Growth curves for males and females. Inserted: annual growth of age-groups III-XII.

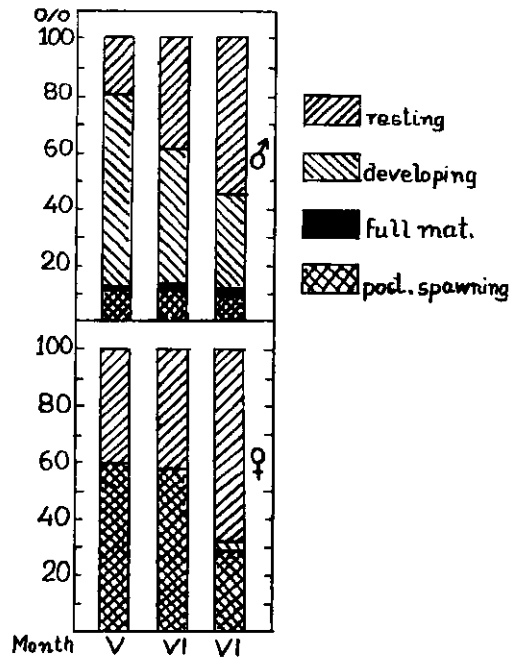


Figure 3. Cod - W. Greenland. Percentage numbers of males and females of different stages of maturity during May - June.

TABLE 2. Stages of maturity of gonads determined by macroscopic observations in the months May-June for all samples.

Stages of maturity	Dory Vessel				Trawler	
	29/30 May 1958		2 June 1958		4/17 June 1958	
	♂♂ %	♀♀ %	♂♂ %	♀♀ %	♂♂ %	♀♀ %
Resting	20.0	39.3	38.9	40.6	55.6	69.3
Developing	68.3	-	47.2	-	32.6	0.2
Spawning	1.7	-	2.8	-	2.2	-
Post-spawning	10.0	60.7	11.1	59.4	9.6	30.5
No. of specimens	60	140	36	64	509	489

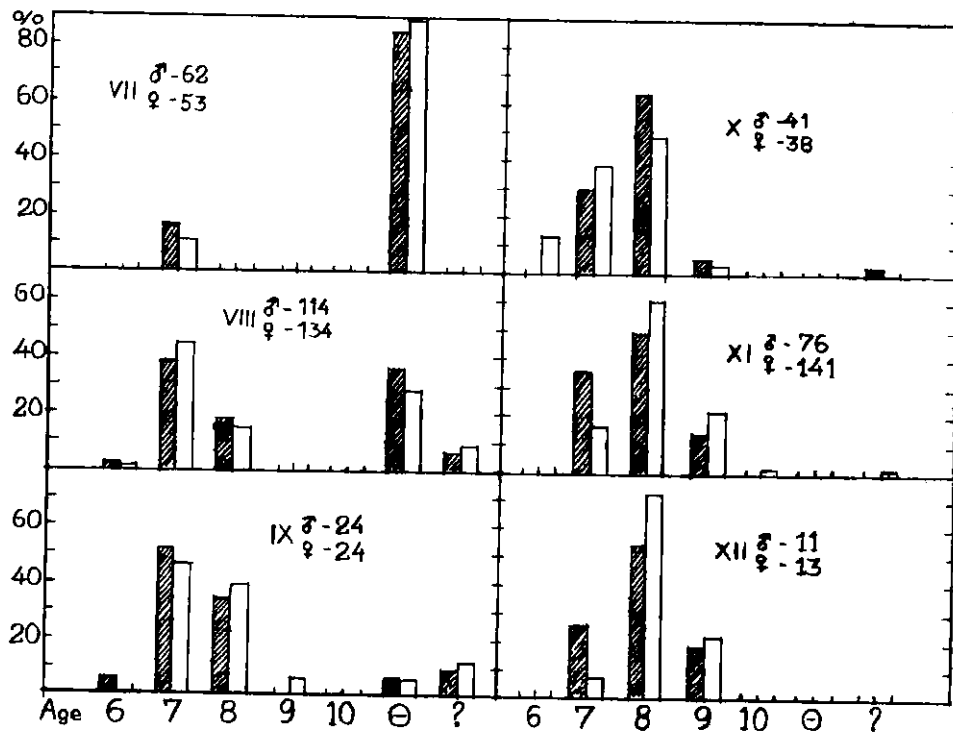


Figure 4. Cod, West Greenland, 1958. Percentage number of males (dark columns) and females (light columns) of the various ages VII-XII spawning for the first time; ⊕ - indicates no spawning mark.

TABLE 3. Greenland, 1958. Age at first maturity of males and females of the more abundant age-groups (VII-XIII) in samples from May-June (Subdivisions 1C - 1D).

Year-Class	♂♂ Age at 1st spawning								♀♀ Age at 1st spawning										
	VI	VII	VIII	IX	X	XI	⊕	∑	Total	VI	VII	VIII	IX	X	XI	⊕	∑	Total	
VII	No.	-	9	-	-	-	-	53	-	-	6	-	-	-	-	-	47	-	53
	%	-	14.5	-	-	-	-	85.5	-	-	11.3	-	-	-	-	-	88.7	-	100.0
VIII	No.	2	44	19	-	-	41	8	-	1	60	21	-	-	-	-	40	12	134
	%	1.8	38.6	16.7	-	-	36.0	7.0	-	0.8	44.8	15.7	-	-	-	-	29.9	9.0	100.2
IX	No.	1	12	8	-	-	-	1	2	-	11	9	1	-	-	-	1	2	24
	%	4.2	50.0	33.3	-	-	-	4.2	8.3	-	45.8	37.5	4.2	-	-	-	4.2	8.3	100.0
X	No.	-	12	26	2	-	-	-	1	5	14	18	1	-	-	-	-	-	38
	%	-	29.3	63.4	4.9	-	-	-	2.4	13.2	36.8	47.4	2.6	-	-	-	-	-	100.0
XI	No.	-	27	38	11	-	-	-	-	-	21	86	32	1	-	-	-	1	141
	%	-	35.5	50.0	14.5	-	-	-	-	-	14.9	61.0	22.7	0.7	-	-	-	0.7	100.0
XII	No.	-	3	6	2	-	-	-	-	-	1	9	3	-	-	-	-	-	13
	%	-	27.3	54.6	18.2	-	-	-	-	-	7.7	69.2	23.1	-	-	-	-	-	100.0
XIII	No.	-	3	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
	%	-	60.0	40.0	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	100.0

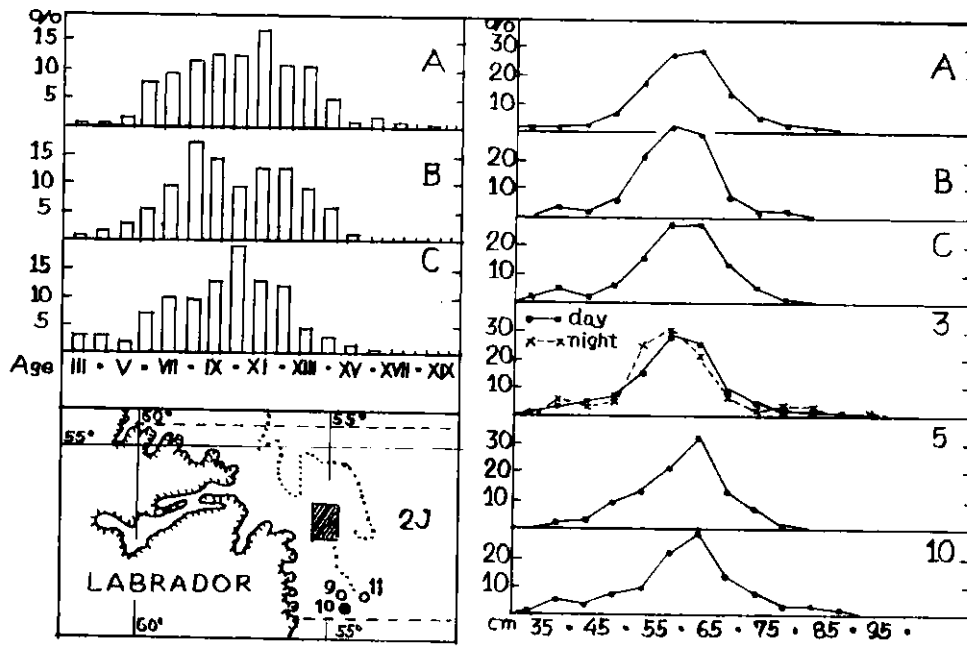


Figure 5. Age and length distribution of groups of samples and separate samples of cod caught by Portuguese trawlers in Labrador waters in 1958; all samples except nos. 9, 10 and 11 were taken in the hatched area.

TABLE 4. Labrador, 1958. Mean growth of males and females and annual growth of the more abundant age-groups based on Sample Groups A, B, and C (21 Sept. - 5 Oct. 1958).

Year-class	Age (1958)	M. Length (cm)		♂♂ & ♀♀		Annual Growth
		♂♂	♀♀	1957	1958	
1955	III	36.3	35.2	-	-	-
54	IV	38.4	38.7	-	-	-
53	V	42.7	40.9	-	-	-
52	VI	50.4	50.6	44.9	50.5	5.6
51	VII	52.2	55.0	48.1	53.6	5.5
1950	VIII	54.5	57.8	53.0	56.2	3.2
49	IX	57.1	58.6	54.2	57.9	3.7
48	X	57.7	60.2	58.7	59.0	0.3
47	XI	60.0	62.2	60.3	61.1	0.8
46	XII	61.0	64.2	62.1	62.6	0.5

7. Weight Data.

Data on total weight, weight of liver, gonads and intestines were collected from 200 individuals. The data will be published in the Sampling Yearbook for 1958.

II. Observations on the Cod in Subarea 2 (Labrador).

Eleven samples were collected from trawlers in Subdivision 2J in September-October. The samples included about 2,000 cod. Otoliths were collected from 8 of the samples (800 cod).

The samples, all from Subdivision 2J, were grouped as follows:

Sample Group	No. of samples	Subdivision	Date
A	1,2,4,6	2J	21-29 Sept. 1958
B	7,8	2J	1-2 Oct. 1958
C	9,11	2J	3-5 Oct. 1958

1. Age-distribution (Figure 5).

The age-group XI dominated in Subdivision 2J in September (sample group A) with 17% followed by the IX and X groups (12%); the groups XII and XIII account for 10%.

The samples from October (Sample groups B and C) differed in some characters from those of September. In sample group B the VIII-group was the best represented (17%), followed by IX (14%), XI and XII (13%). In sample group C the X-group predominated with 19%, the IX, XI and XII groups were found in about even quantities (12%).

Summary. The investigations from the area off Labrador continue to show the lack of strongly dominating year-classes. As in the previous years the 1946, 1947 and 1950 year-classes are the best represented, occurring with about the same relative abundance as in 1957.

2. Size-composition (Figure 5).

Sample group A (September) represents a fairly regular size-distribution; the sizes observed ranged between 32 and 82 cm; the peak was at 62 cm, corresponding to the dominating 1947 year-class.

Also in sample groups B and C (from October) the size-distribution was fairly regular, with a peak at 57 cm, and the 62 cm class being nearly as abundant; this is in agreement with the predominance of the age-groups X, XI and XII.

The samples 3, 5 and 10 present in general a size-composition similar to that of the sample groups A, B and C.

3. Growth.

The average lengths and the annual growth of males and females in the samples from Subdivision 2J are presented in Table 4 and Figure 6.

The growth was virtually the same as that observed in 1957. However, it is to be noted that the growth curves for males and females diverge from age 6 and onwards.

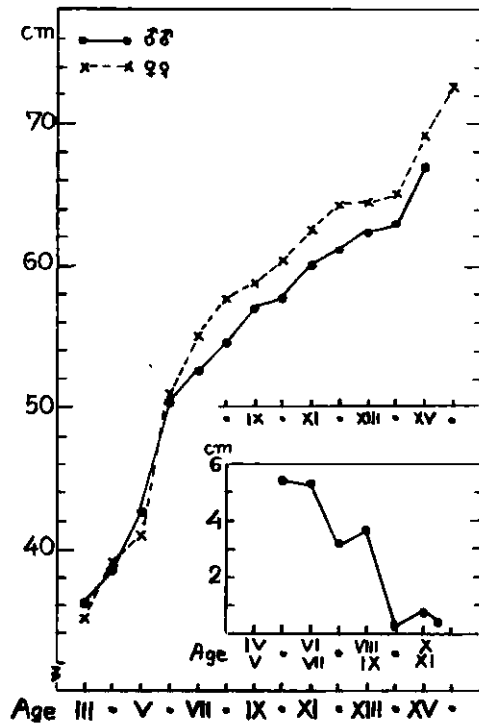


Figure 6. Cod - Labrador. Growth curves for males and females. Inserted: Annual growth of age-groups V-XI.

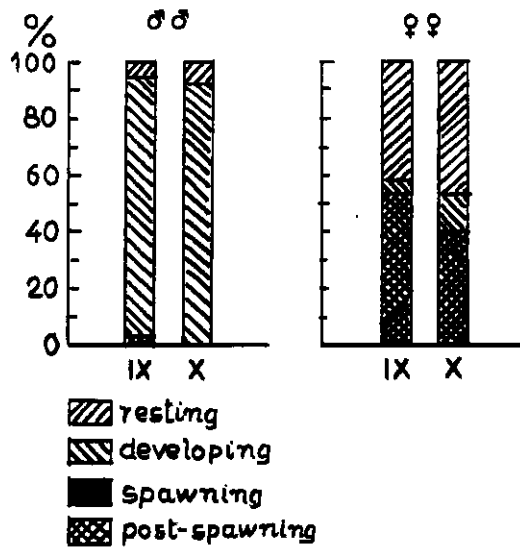


Figure 7. Cod - Labrador. Percentage numbers of males and females of different stages of maturity during Sept. - Oct. 1958.

4. Sex-ratio.

The samples show some variation as far as sex-ratio is concerned. In sample groups A and C and in sample no. 5, males and females were present in equal numbers. In sample group B the females dominated with 57%, and in sample no. 10 the males with 57%.

Sample no. 3 included observations during day and night separately. In the day-catch males and females were present in equal quantities (50%); in the nightly fishery the females dominated with 55%.

5. Maturity (Table 5 and Figure 7).

Males. In September-October nearly all cod (93%) were in the developing stage; a small number (4-8%) were in the resting stage, and barely 2% were post-spawners.

Females. In September the majority (53%) were in the post-spawning stage; 43% were in the resting stage and only 4% in the developing stage. In October the number in the post-spawning stage had decreased to 40%; the resting stage now accounted for 47%, and the developing stage for 13%.

6. Age at first maturity (Table 6 and Figure 8).

Based on the interpretation of the "spawning rings" first maturity was found to occur between ages 6 and 9, most commonly between 7 and 8.

7. Weight Data.

Data on total weight, weight of liver, gonads and intestines, were collected from ca. 100 specimens. The data will be published in the Sampling Yearbook for 1958.

TABLE 5. Stages of maturity of gonads determined by macroscopic observations in the months September - October, 1958.

Stages of maturity	Trawlers			
	21/29-IX-58		1/5-X-58	
	♂♂	♀♀	♂♂	♀♀
	%	%	%	%
Resting	4.6	42.6	8.0	47.4
Developing	92.9	3.9	92.0	12.7
Spawning	0.5	-	-	-
Post-spawning	2.0	53.4	-	39.9
No. of specimens	196	213	187	213

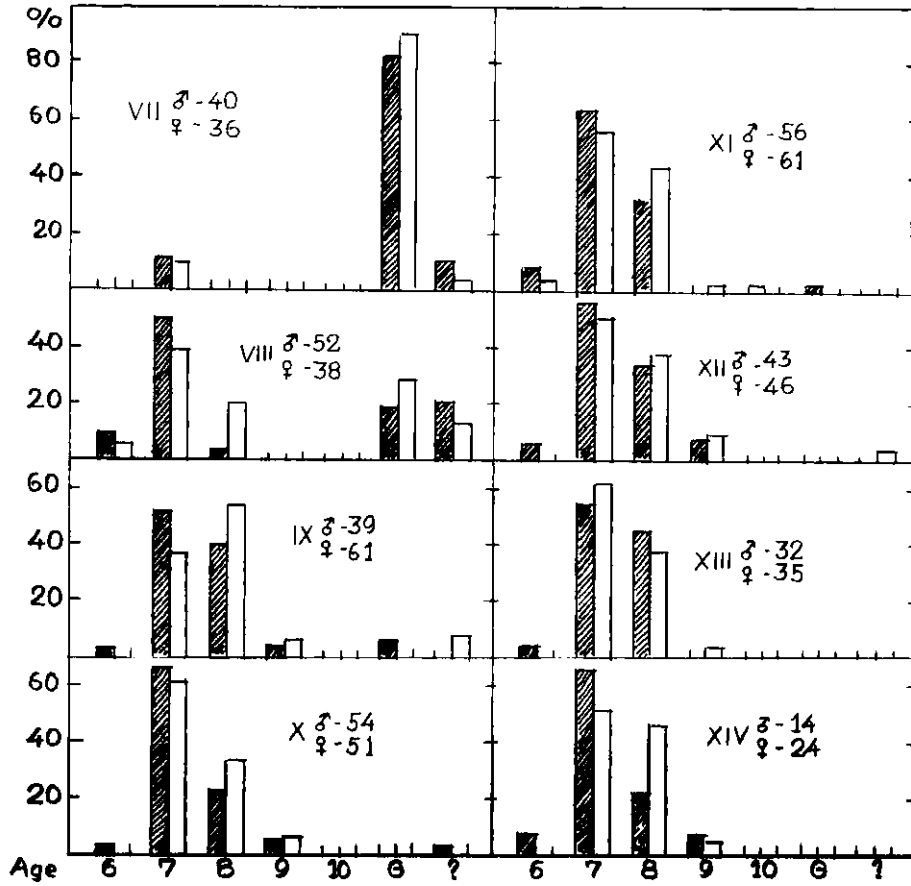


Figure 8. Cod - Labrador. Percentage numbers of males (dark columns) and females (light columns) of the various ages (VII-XIV) spawning for the first time. 0 - indicates no spawning mark.

TABLE 6. Labrador, 1958. Age at first maturity of males and females of the more abundant age-groups (VII-XIV) in samples from September-October in Subdivision 2J.

Year-Class	♂♂ Age at 1st spawning								♀♀ Age at 1st spawning							
	VI	VII	VIII	IX	X	0	?	Total	VI	VII	VIII	IX	X	0	?	Total
VII	No.	4	-	-	-	32	4	40	-	3	-	-	-	32	1	36
	%	10.0	-	-	-	80.0	10.0	100.0	-	8.3	-	-	-	88.9	2.8	100.0
VIII	No.	5	26	2	-	9	10	52	2	15	7	-	-	10	4	38
	%	9.6	50.0	3.8	-	17.3	19.2	99.9	5.3	39.5	18.9	-	-	26.3	10.5	100.0
IX	No.	1	20	15	1	2	-	39	-	22	32	3	-	-	4	6.1
	%	2.6	51.3	38.5	2.6	5.1	-	100.1	-	36.1	52.5	4.9	-	-	6.6	100.1
X	No.	2	35	12	3	-	2	54	-	31	17	3	-	-	-	51
	%	3.7	64.8	22.2	5.6	-	3.7	100.0	-	60.8	33.4	5.9	-	-	-	100.1
XI	No.	4	37	17	-	-	1	56	-	34	26	1	-	-	-	6.1
	%	7.0	60.7	30.4	-	-	1.8	99.9	-	55.7	42.6	1.6	-	-	-	99.9
XII	No.	2	24	14	3	-	-	43	-	23	17	4	-	-	2	46
	%	4.6	55.7	32.6	7.0	-	-	99.9	-	50.0	37.0	8.7	-	-	4.4	100.1
XIII	No.	1	17	14	-	-	-	32	-	21	13	1	-	-	-	35
	%	3.1	53.1	43.8	-	-	-	100.0	-	60.0	37.2	2.9	-	-	-	100.1
XIV	No.	1	9	3	1	-	-	14	-	12	11	1	-	-	-	24
	%	7.1	64.3	21.4	7.1	-	-	99.9	-	50.0	45.8	4.2	-	-	-	100.0