



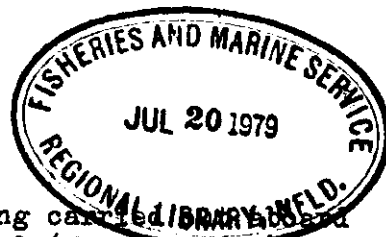
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Portuguese Research Report, 1959

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The present report summarizes the results of sampling carried out by Portuguese cod fishing vessels in Subarea 1 (Greenland), 3 (Newfoundland) and 4 (Misaine and Banquereau) during the 1959 fishing campaign.

The gears used, the system of sampling, and the methods for studying the data and the material collected, are the same as those described in earlier reports (ICNAF, Ann. Proc. Vol.7).

Further, the possibility of using the extent of parasitization of cod by copepods (Clavella, Caligus and Lernaeocera) as natural marks has been studied, with the purpose of identifying stocks and populations.

In May 1959, 250 drift bottles of plastic material were released for the study of surface currents along a line from the central part of the Grand Bank to Cape Race.

A number of preliminary data on selectivity experiments with hooks used by dories off W. Greenland are given as an appendix to this report.

I. Observations on the Cod (*Gadus morhua*) in Subarea 1 (Greenland).

A total of 59 samples (19 from trawlers and 40 from dory-fishing vessels) were collected. The samples comprised about 10,000 individuals; otoliths for age-determinations were taken from 3,400 of these cod.

Table 1 presents the position of the separate samples, and the kind of data collected.

The samples are, for each subdivision, grouped according to gear and month of capture (Table 2, Figure 1); in cases where the samples differ considerably no such grouping was made.

1. Age Composition

a. Trawlers (April-May, Table 3 - Figure 1).

In Subdivision 1D (April-May, sample groups A and B) a clear predominance of age groups VI (600°/oo) and VII (150-200°/oo) was observed. The remaining age-groups were represented by less than 100°/oo, the V-group being the best represented (90°/oo).

In Subdivision 1E (May, sample group C) the age composition was different; the VI-group was also here the predominating (400°/oo), but it was followed by the Group IX (125°/oo) and Group VII (100°/oo). It should be noted that the XII- and IV-groups were represented by 70°/oo.

b. Dory Vessels (June-August, Tables 4, 5 and 6 - Figure 2).

In Subdivision 1B (June-August, sample groups I, J, N) an absolute predominance of age-groups VI (400-600°/oo) and V (150-200°/oo) was found. The IV-group, which is only little abundant in most of the samples, accounted for no less than 160°/oo in the samples from July.

In Subdivision 1C (June-July, Groups H, L) also the VI-group is the most abundant (250-300°/oo), the second is the XII-group (125-180°/oo). The V-group accounts for about 100°/oo.

In August (sample group O) the age composition is different; the predominating age groups are: VI (300°/oo), V (200°/oo) and IV (150°/oo).

In Subdivision 1D (June, sample groups F, G) the samples show - in conformity with differences in fishing depth - a marked difference in age composition. Thus in sample group F - fishing depth 150 fathoms - the following age-groups predominate: XII (330°/oo), IX (200°/oo) and XI (115°/oo); the VI-group is almost non-existent (30°/oo). In sample group G, on the contrary, the VI-group clearly predominates with 575°/oo, the V-group accounts for 130°/oo; the remaining age-groups are hardly represented.

In July (sample group M) the dominating age-groups are: VI (200°/oo), IX and XII (150°/oo), V and VII (110°/oo).

In August (sample group P) predominate age-groups VI (350°/oo), VII (170°/oo), IX (150°/oo) and VIII (100°/oo). Group XII is represented with 90°/oo.

### c. Summary.

On the whole the 1953 year-class predominates in the samples (as it did the previous year in Subdivision 1C). The 1947 year-class, which for some years has dominated the fisheries in this region, appears still as rather abundant in 1C and 1D, especially in samples from the dories. In 1B it is, however, almost non-existent and in 1E (trawl fishery) it is very scarce.

In 1B the young year-classes 1953, 1954 and 1955 are predominating.

Noteworthy is the differing age composition in 1D of dory samples from various depths: The young year-classes (1953 and 1954) dominate in shallower water (25 fathoms), the older year-classes (1947) in deeper water (150 fathoms).

## 2. Size Composition (Tables 7-9, Figures 1-2)

The trawl samples show a size distribution ranging from the 37 to the 85 cm group, with a few specimens up to 103 cm. The peaks of the curves are around the 64 cm group, corresponding to age-group VI.

In Subdivision 1E the peaks are at 64-68 and 76 cm, corresponding to age-groups VI and IX.

In the dory vessel samples the range of variation is between 40 and 97 cm, in a few cases up to 110 cm. The peaks are generally around the classes 61-64-67 cm, in conformity with the dominating age group VI.

In Subdivision 1D (sample group F) the peak is, however, at 79 cm - age-group XII.

## 3. Growth (Table 10, Figures 3-5).

The mean length, by age groups, for all samples (trawl and line) is presented in Table 10.

The resulting growth curves show that the trawl-caught cod have a slightly slower growth than the cod caught on line (Figures 3-4). This fact ought to be especially studied as it may be caused by a different selectivity within each year-class after a certain length has been reached; or it may depend upon a different bathymetric distribution of the individuals due to a more or less rapid growth rate.

The growth-curve from the total of the samples (Figure 5) is in the main similar to that from 1958. However, from age group VIII the growth appears to be a little slower.

## 4. Sex Ratio (Tables 3-6)

In the samples from the dory vessels the male % varies between 45 and 50, except for sample group P (Subdivision 1D) with 60% males. In general there seems to be a tendency of a slight dominance of females in the northern part of the Subarea (1B).

In the trawl samples males account for about 52-53.5%.

5. Stage of Maturity (Table 11, Figure 6)

Males: In April the majority are in the developing stage (73%) and in the resting stage (26%). From April to July the % in the developing stage decreases to 31 and the % in the resting stage increases to 65.

In May-June post-spawners account for 8-9%; a very few cases (2%) of spawning cod were observed.

Females: In April almost all (98%) are in the resting stage, and scarcely 2% are post-spawners. In May-June the post-spawners have increased to 33-53%. In August post-spawners account for 29%, the remaining females are in the resting stage.

6. Age at First Maturity (Table 12, Figure 7)

The study of spawning rings, following the same method as in previous years, shows that first maturity appears normally at an age of 6-9 years, especially at 7-8 years. No noteworthy difference between males and females was found; this is in agreement with earlier observations.

7. Weight Data

Data on weight (total weight, weight of liver, gonads and intestines) were collected for 600 cod, and are published in the Sampling Yearbook.

II. Size Composition of Cod in Subarea 3 (Newfoundland).

The number of samples from trawlers were 22 and from dory vessels 12, a total of 34 samples - ca. 6000 individuals.

The material collected is being studied. At present only the following summary of length measurements from Subdivisions 3L, 3N and 3R is presented.

The samples were grouped by gear, subdivision and month (Table 1).

a. Trawlers

In Subdivision 3Ps, February-April (Sample groups A, B) the individuals caught varied in length between group 37 and 91 cm, most abundant were the groups 58-64 cm.

In Subdivision 3N, Sept. (Group D) the range of variation was much larger: 40-151 cm, most abundant were cod of groups 64-76 cm.

Results of further observations from 1959 will be reported later.

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| Sample Group | No. of Samples | Subdivision | Date        | Gear  |
|--------------|----------------|-------------|-------------|-------|
| A            | 3-7            | 3Ps         | 17-26/II-59 | Trawl |
| B            | 12-15-18       | 3Ps         | 3/9-IV-59   | "     |
| C            | 33             | 3L          | 9-X-59      | Liner |
| D            | 25-27-30       | 3N          | 6/12-IX-59  | "     |

Table 1 - Newfoundland, 1959. Sample groups of observations, without otoliths, from trawlers and dory vessels.

Table 2 - Greenland, 1959. Grouping of samples. \* indicates no otoliths

| Sample Group | No. of Samples | Subdivision | Date             | Gear    |
|--------------|----------------|-------------|------------------|---------|
| A            | 1-2            | 1D          | 25/26-IV-59      | Trawler |
| B            | 4-5            | 1D          | 2/3-V-59         | "       |
| C            | 7-13-15-16     | 1E          | 11/25-V-59       | "       |
| D*           | 3              | 1D          | 28-IV-59         | "       |
| E*           | 8-12-18        | 1E          | 12/27-V-59       | "       |
| F            | 20-21-22       | 1D          | 2/4-VI-59        | Line    |
| G            | 23-25          | 1D          | 7/10-VI-59       | "       |
| H            | 27-28-35-36    | 1C          | 16/28-VI-59      | "       |
| I            | 30-32-34       | 1B          | 20/25-VI-59      | "       |
| J            | 37-38-40       | 1B          | 2/5-VII-59       | "       |
| L            | 41-42          | 1C          | 8/9-VII-59       | "       |
| M            | 43-44-46       | 1D          | 13/16-VII-59     | "       |
| N            | 50-52-53       | 1B          | 10/13-VIII-59    | "       |
| O            | 55-57          | 1C          | 17/20-VIII-59    | "       |
| P            | 59             | 1D          | 24-VIII-59       | "       |
| Q*           | 24-26          | 1D          | 8/11-VI-59       | "       |
| R*           | 31             | 1B          | 21-VI-59         | "       |
| S*           | 39             | 1B          | 4-VII-59         | "       |
| T*           | 45-48          | 1D          | 15/19-VII-59     | "       |
| U*           | 51-54-58       | 1B          | 11/14/21-VIII-59 | "       |
| V*           | 56             | 1C          | 19-VIII-59       | "       |

Table 3 - Greenland, 1959. Mean growth of males and females and annual growth of the most abundant year-classes; trawlers and dory vessels.

| Year Class | Age  | Trawlers         |                  | Dory Vessels     |                  | Trawlers + Dory Vessels |        | Annual Growth |
|------------|------|------------------|------------------|------------------|------------------|-------------------------|--------|---------------|
|            |      | ♂ Mean Length cm | ♀ Mean Length cm | ♂ Mean Length cm | ♀ Mean Length cm | ♂ 1958                  | ♀ 1959 |               |
| 1956       | III  | 41.0             | 39.4             | -                | 44.0             | -                       | 40.5   | -             |
| 55         | IV   | 46.1             | 45.6             | 48.3             | 47.4             | 39.8                    | 47.4   | 7.6           |
| 54         | V    | 54.4             | 55.9             | 57.0             | 56.9             | 47.7                    | 56.7   | 9.0           |
| 53         | VI   | 62.7             | 62.1             | 64.0             | 65.0             | 55.6                    | 63.8   | 8.2           |
| 52         | VII  | 68.4             | 68.1             | 68.6             | 70.3             | 62.3                    | 69.0   | 6.7           |
| 51         | VIII | 72.4             | 74.0             | 74.5             | 75.3             | 69.4                    | 74.0   | 4.6           |
| 1950       | IX   | 76.4             | 76.5             | 77.5             | 78.8             | 72.4                    | 77.0   | 4.6           |
| 49         | X    | 75.7             | 79.0             | 78.2             | 80.9             | 73.5                    | 78.9   | 5.4           |
| 48         | XI   | 81.3             | 75.4             | 78.4             | 80.5             | 76.7                    | 79.6   | 2.9           |
| 47         | XII  | 75.8             | 83.4             | 79.7             | 83.2             | 76.9                    | 81.3   | 4.4           |
| 46         | XIII | 80.0             | 82.4             | 81.2             | 85.8             | 78.8                    | 83.7   | 4.9           |
| 1945       | XIV  | 85.0             | 86.5             | 82.0             | 82.8             | 81.3                    | 83.1   | 1.8           |
| 44         | XV   | -                | -                | 80.7             | 87.9             | -                       | -      | -             |
| 43         | XVI  | -                | -                | 86.8             | 90.9             | -                       | -      | -             |

|               | April                  |                        | May                    |                        | June                   |                        | July                   |                        | August                 |                        |
|---------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
|               | $\frac{\text{oo}}{\%}$ | $\frac{\text{oo}}{\%}$ | $\frac{\text{oo}}{\%}$ | $\frac{\text{oo}}{\%}$ | $\frac{\text{oo}}{\%}$ | $\frac{\text{oo}}{\%}$ | $\frac{\text{oo}}{\%}$ | $\frac{\text{oo}}{\%}$ | $\frac{\text{oo}}{\%}$ | $\frac{\text{oo}}{\%}$ |
| Resting       | 26.0                   | 98.0                   | 41.8                   | 66.2                   | 49.0                   | 46.3                   | 65.4                   | 52.3                   | 27.3                   | 71.0                   |
| Developing    | 73.0                   | -                      | 46.3                   | 0.7                    | 41.0                   | 0.3                    | 31.2                   | 0.3                    | 72.4                   | -                      |
| Spawning      | -                      | -                      | 2.6                    | -                      | 2.0                    | -                      | 1.7                    | -                      | 0.3                    | -                      |
| Post-spawning | 1.0                    | 2.0                    | 9.3                    | 33.0                   | 8.0                    | 53.4                   | 1.7                    | 47.5                   | -                      | 29.0                   |
| No.           | 104                    | 95                     | 311                    | 284                    | 583                    | 611                    | 356                    | 392                    | 293                    | 304                    |

Table 4. Greenland 1959. Stage of maturity, from macroscopic observations of gonads in April-August; samples from trawlers and dorry-vessels.

| Age-group | Age of first spawning |    |      |      |      |     |      |      |       | Age of first spawning |     |      |      |      |     |      |      |       |
|-----------|-----------------------|----|------|------|------|-----|------|------|-------|-----------------------|-----|------|------|------|-----|------|------|-------|
|           | V                     | VI | VII  | VIII | IX   | X   | e    | ?    | T     | V                     | VI  | VII  | VIII | IX   | X   | e    | ?    | T     |
| VI        | No                    | -  | 16   | -    | -    | -   | 268  | 403  | 687   | 1                     | 20  | -    | -    | -    | -   | 603  | 13   | 637   |
|           | %                     | -  | 2.3  | -    | -    | -   | 39.0 | 58.6 | 99.9  | 0.2                   | 3.1 | -    | -    | -    | -   | 94.6 | 2.0  | 99.9  |
| VII       | No                    | -  | 5    | 43   | -    | -   | 61   | 20   | 134   | -                     | 3   | 56   | -    | -    | -   | 72   | 21   | 152   |
|           | %                     | -  | 2.7  | 35.8 | -    | -   | 45.5 | 14.9 | 99.9  | -                     | 1.9 | 36.8 | -    | -    | -   | 47.4 | 13.8 | 99.9  |
| VIII      | No                    | -  | 10   | 85   | 11   | -   | 5    | 10   | 91    | -                     | 6   | 55   | 14   | -    | -   | 7    | 13   | 95    |
|           | %                     | -  | 11.0 | 60.4 | 12.1 | -   | 5.5  | 11.0 | 100.0 | -                     | 6.3 | 57.9 | 14.7 | -    | -   | 7.4  | 13.7 | 100.0 |
| IX        | No                    | -  | 19   | 85   | 37   | -   | 1    | 2    | 144   | -                     | 4   | 90   | 55   | -    | -   | 1    | 5    | 155   |
|           | %                     | -  | 13.2 | 59.0 | 25.7 | -   | 0.7  | 1.4  | 100.0 | -                     | 2.6 | 58.1 | 35.5 | -    | -   | 0.6  | 3.2  | 100.0 |
| X         | No                    | -  | 1    | 22   | 6    | 1   | -    | 1    | 32    | -                     | 3   | 15   | 14   | 2    | -   | -    | -    | 34    |
|           | %                     | -  | 3.1  | 71.9 | 18.8 | 3.1 | -    | 3.1  | 100.0 | -                     | 8.8 | 44.1 | 41.2 | 5.9  | -   | -    | -    | 100.0 |
| XI        | No                    | -  | 2    | 37   | 10   | -   | 1    | -    | 50    | -                     | 1   | 24   | 28   | 4    | -   | -    | -    | 57    |
|           | %                     | -  | 4.0  | 71.0 | 20.0 | -   | 2.0  | -    | 100.0 | -                     | 1.8 | 42.1 | 49.1 | 7.0  | -   | -    | -    | 100.0 |
| XII       | No                    | -  | 5    | 91   | 47   | 7   | -    | -    | 150   | -                     | -   | 74   | 67   | 13   | -   | -    | -    | 154   |
|           | %                     | -  | 3.3  | 60.7 | 31.3 | 4.7 | -    | -    | 100.0 | -                     | -   | 48.1 | 43.5 | 8.4  | -   | -    | -    | 100.0 |
| XIII      | No                    | -  | 1    | 29   | 11   | 2   | -    | -    | 43    | -                     | -   | 13   | 20   | 4    | 1   | -    | -    | 38    |
|           | %                     | -  | 2.3  | 67.4 | 25.6 | 4.7 | -    | -    | 100.0 | -                     | -   | 34.2 | 52.6 | 10.5 | 2.6 | -    | -    | 99.9  |

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Table 5. Crennland, 1959. Age at first spawning, males and females of the more abundant age-groups (VI-XIII), samples from April-August, Subdivisions 1E - 1B.

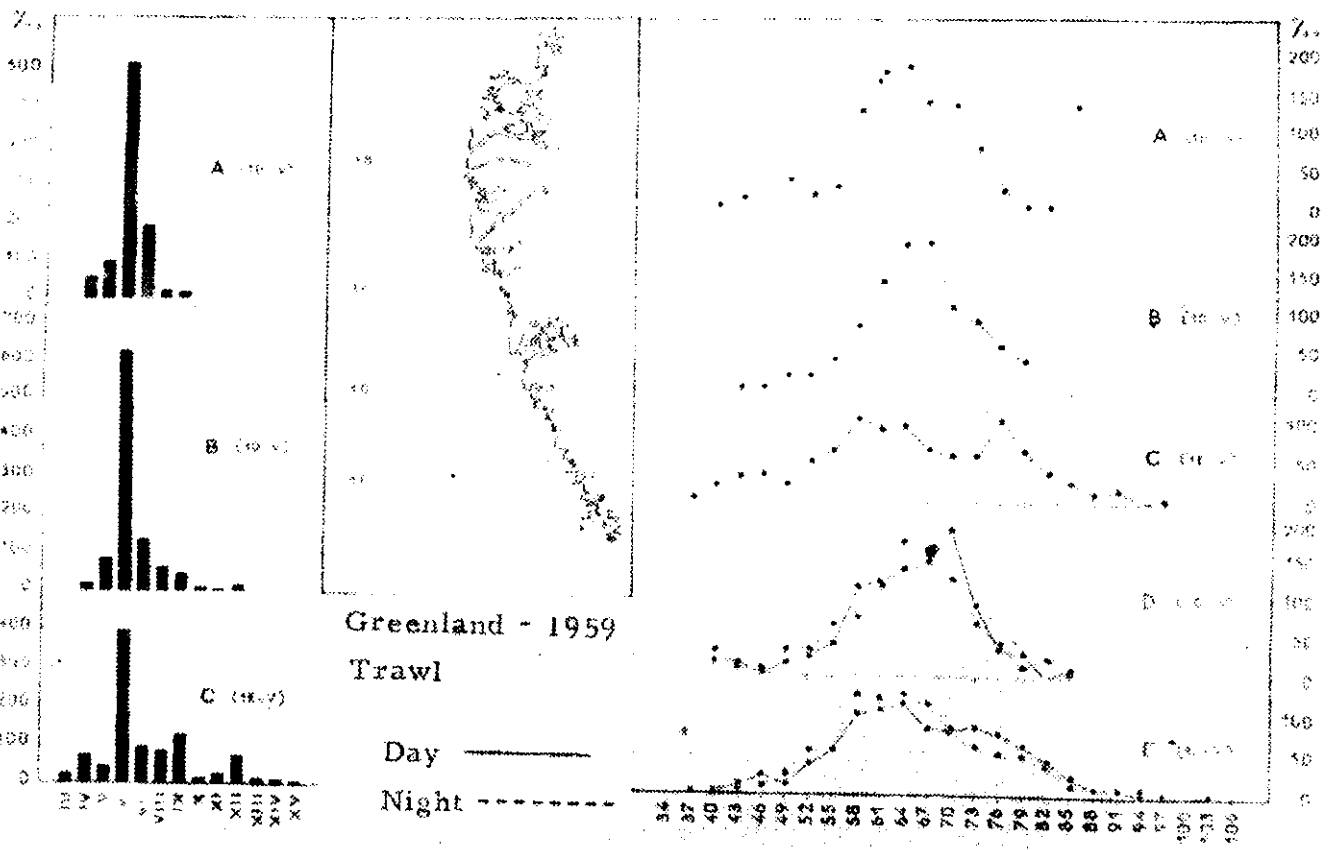


Figure 1.

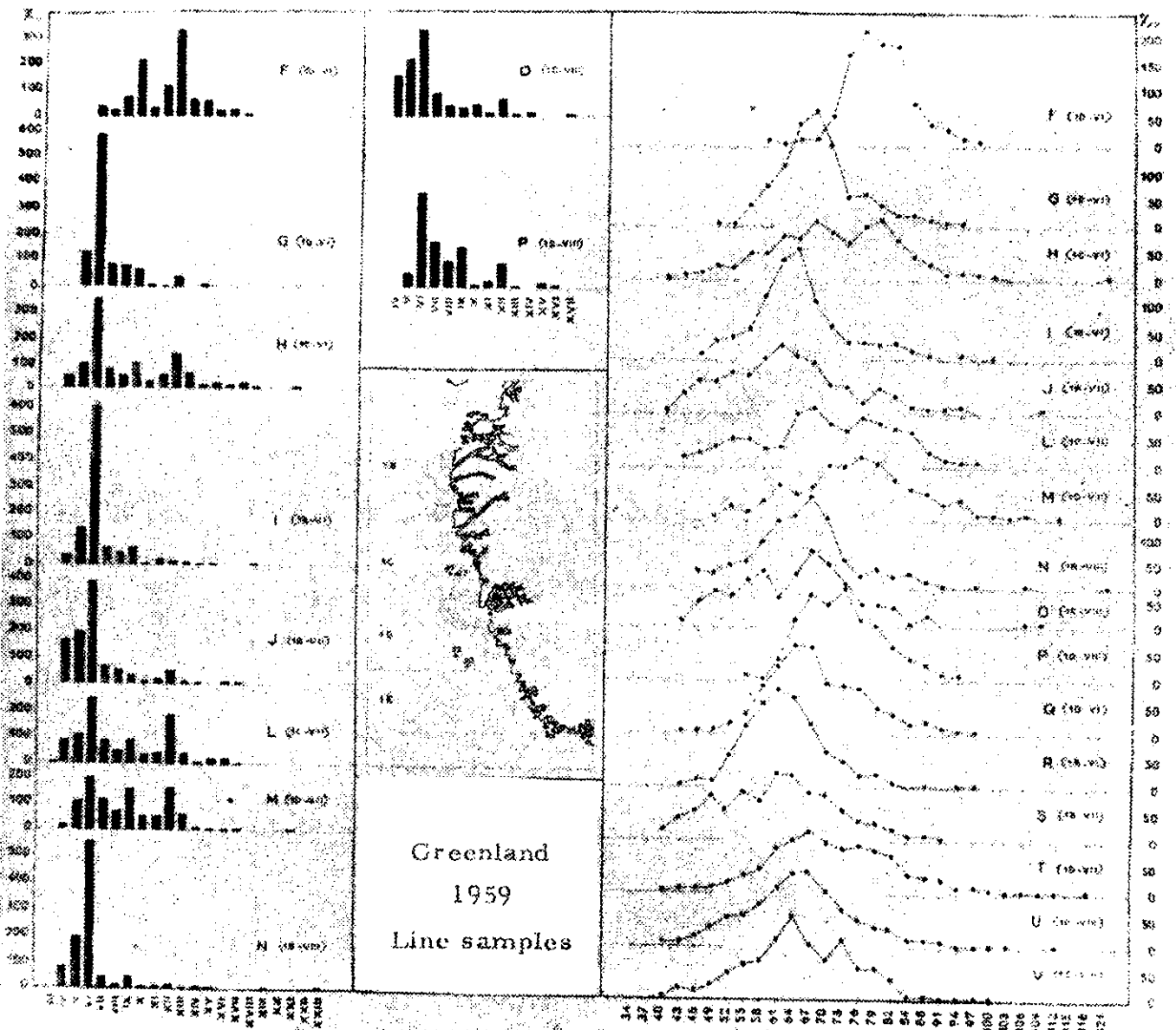


Figure 2.





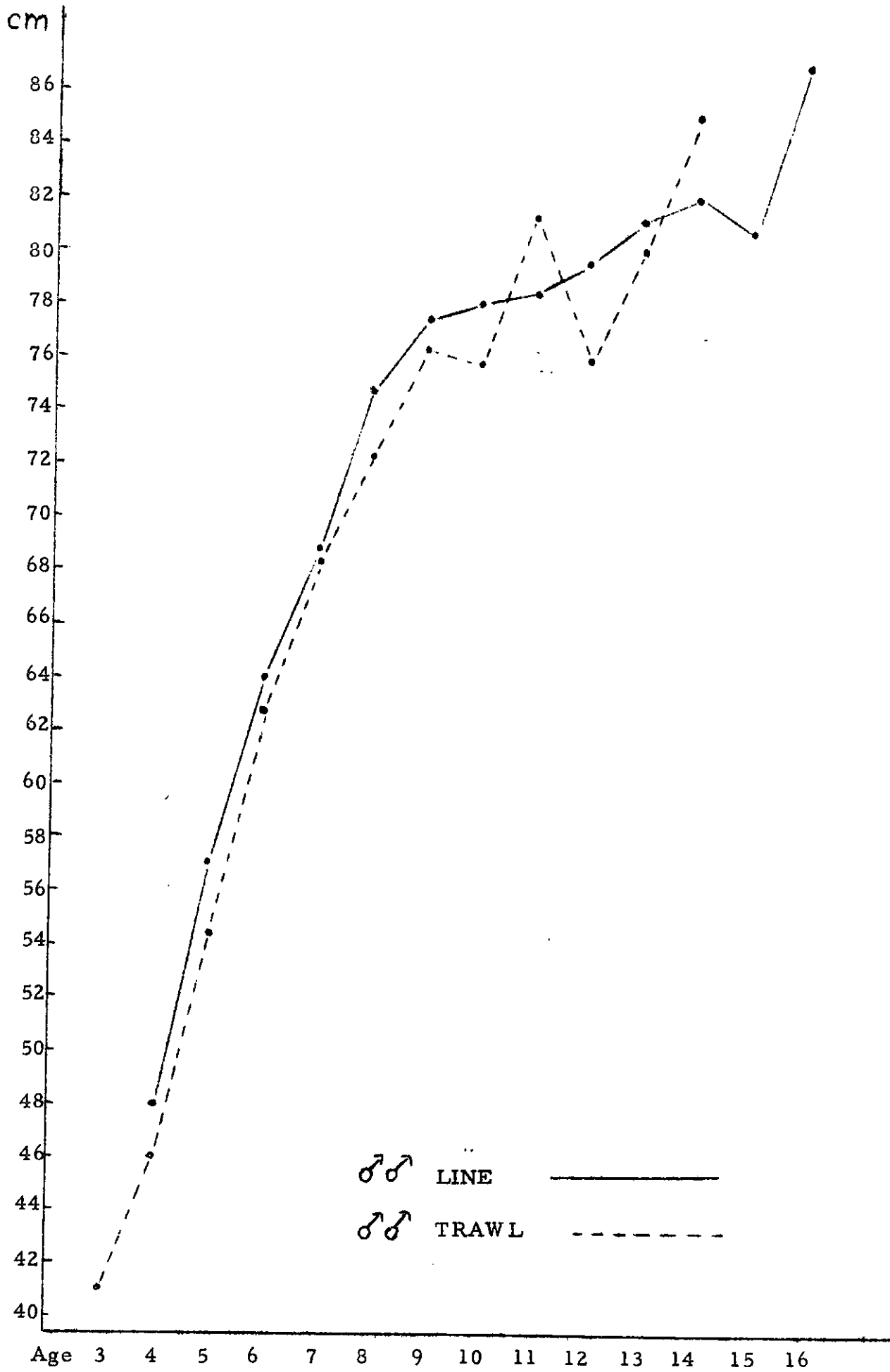


Figure 3.

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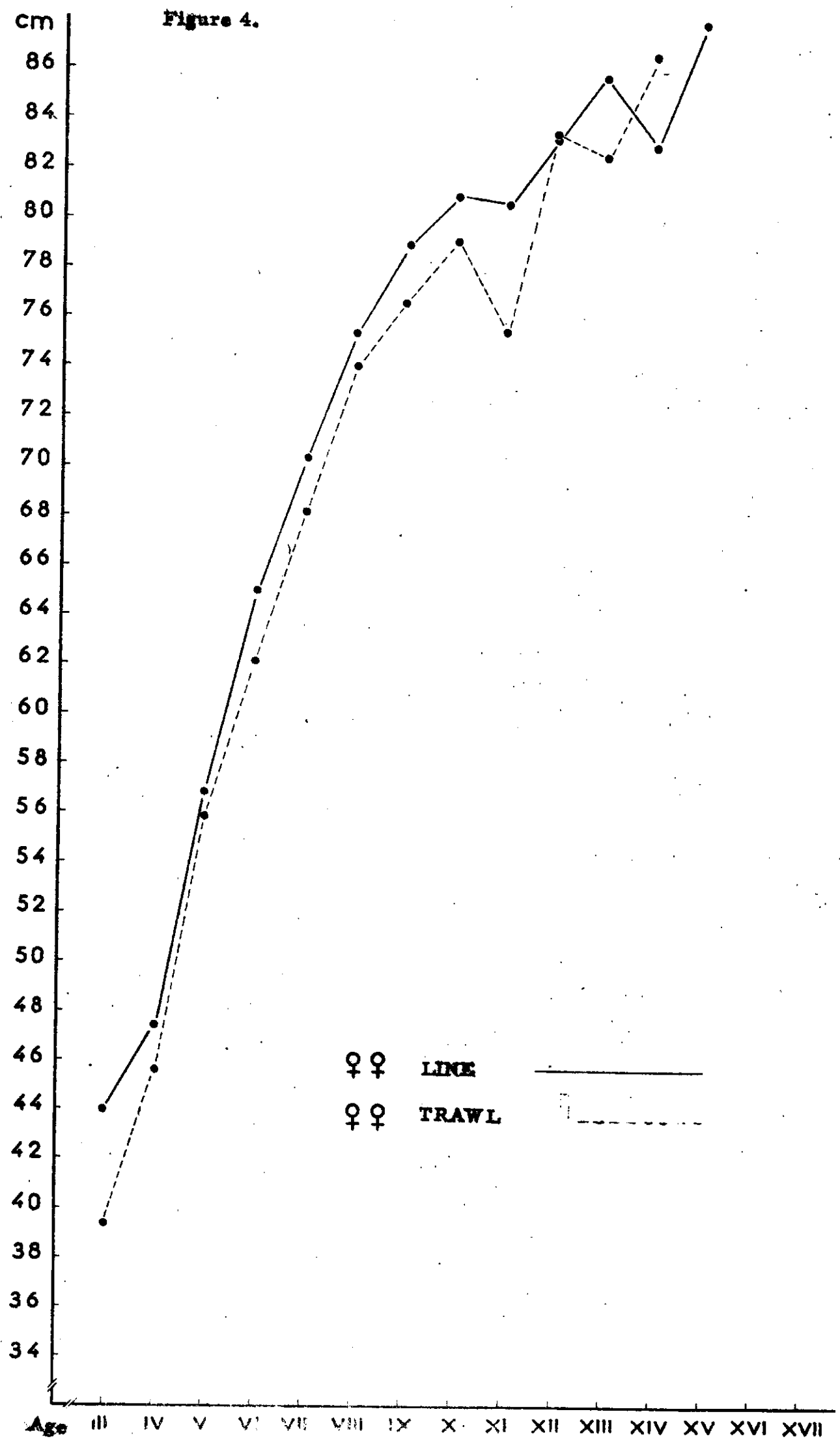
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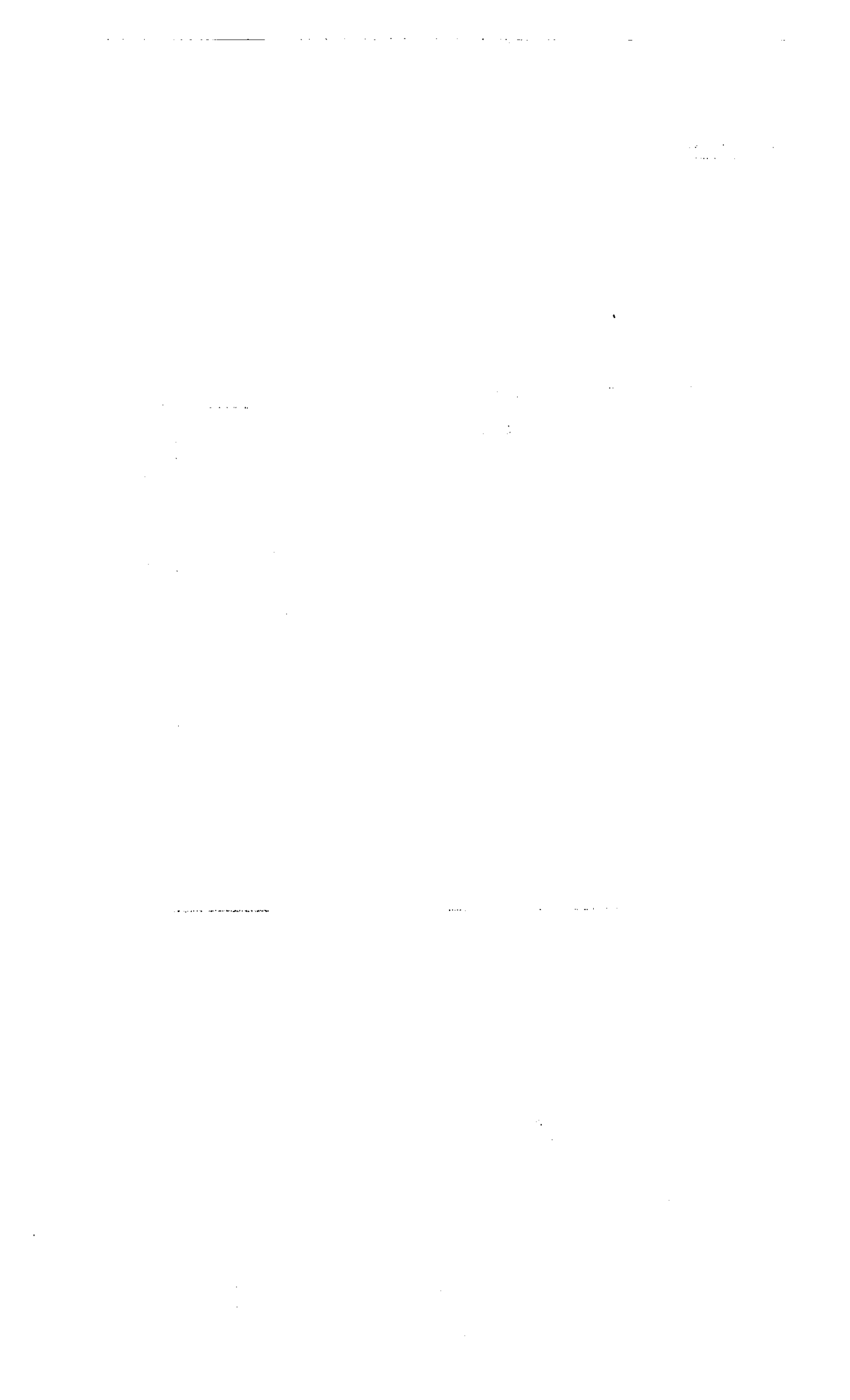


Figure 5.

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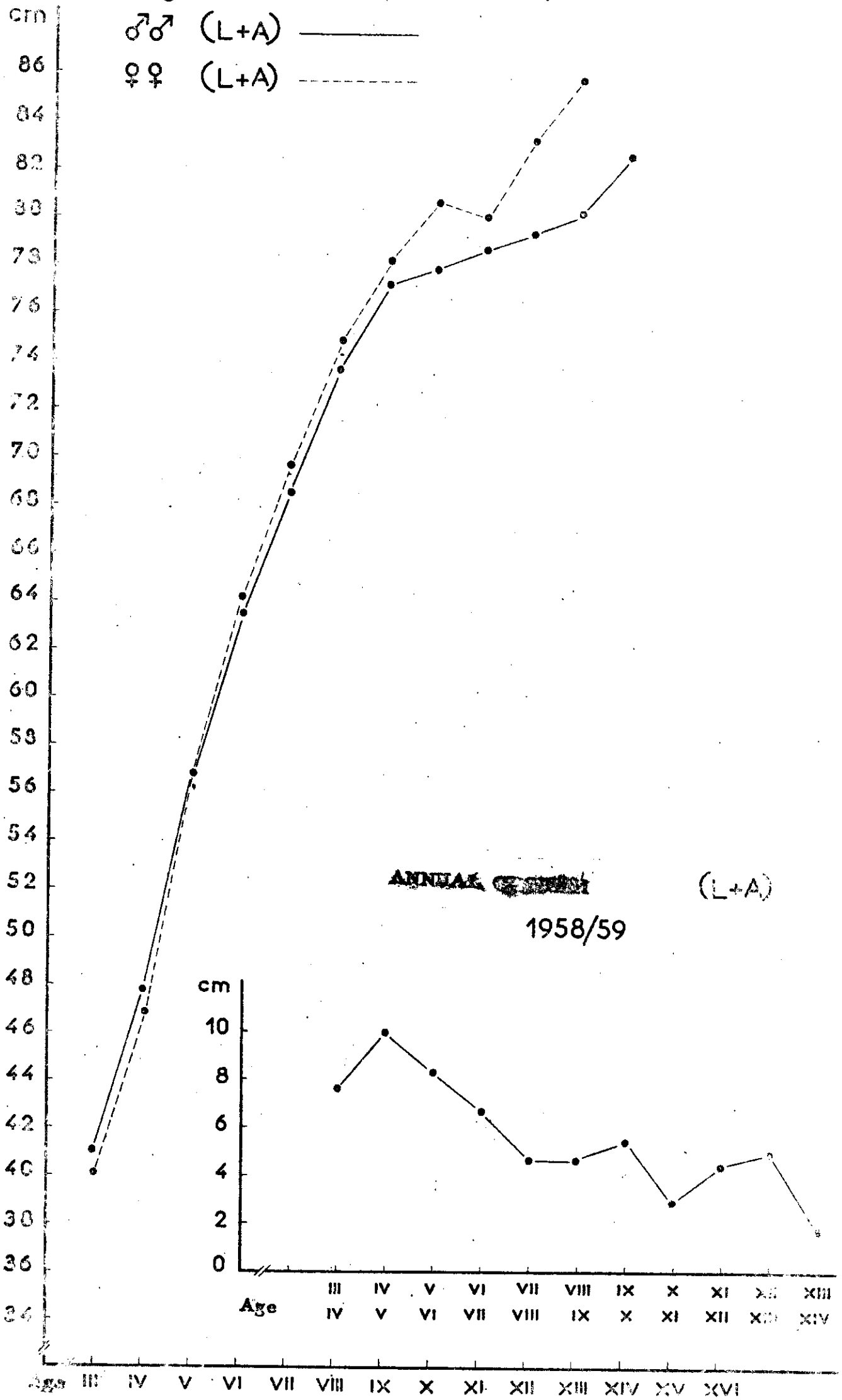
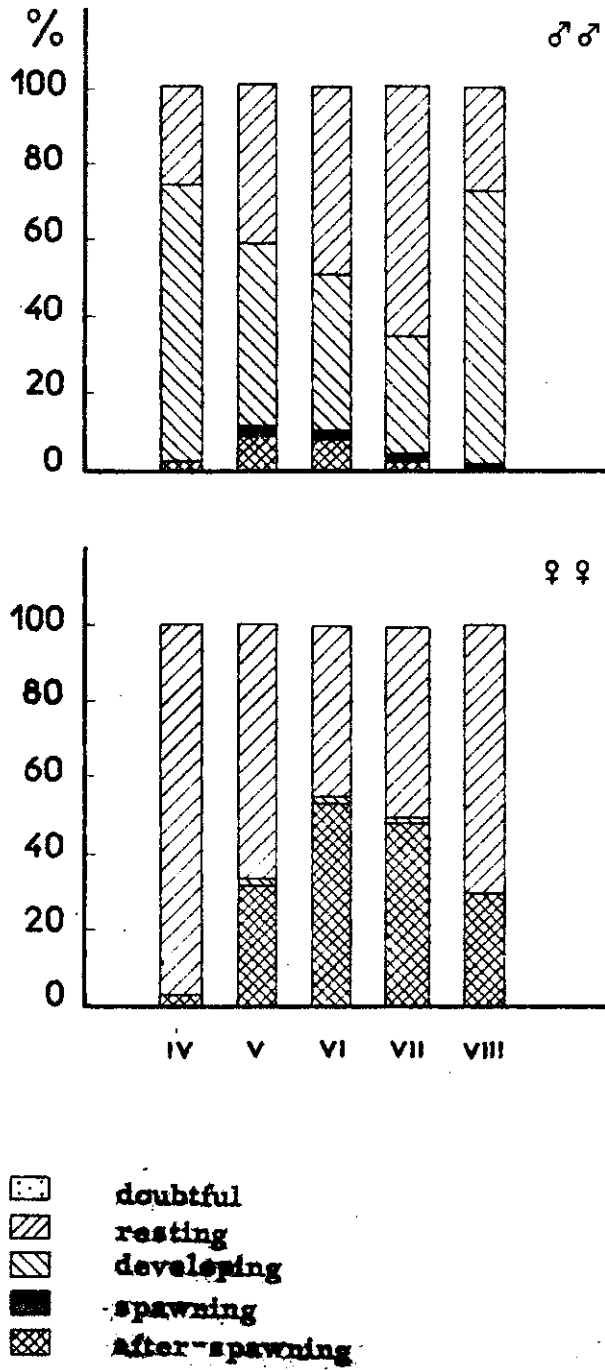




Figure 6.







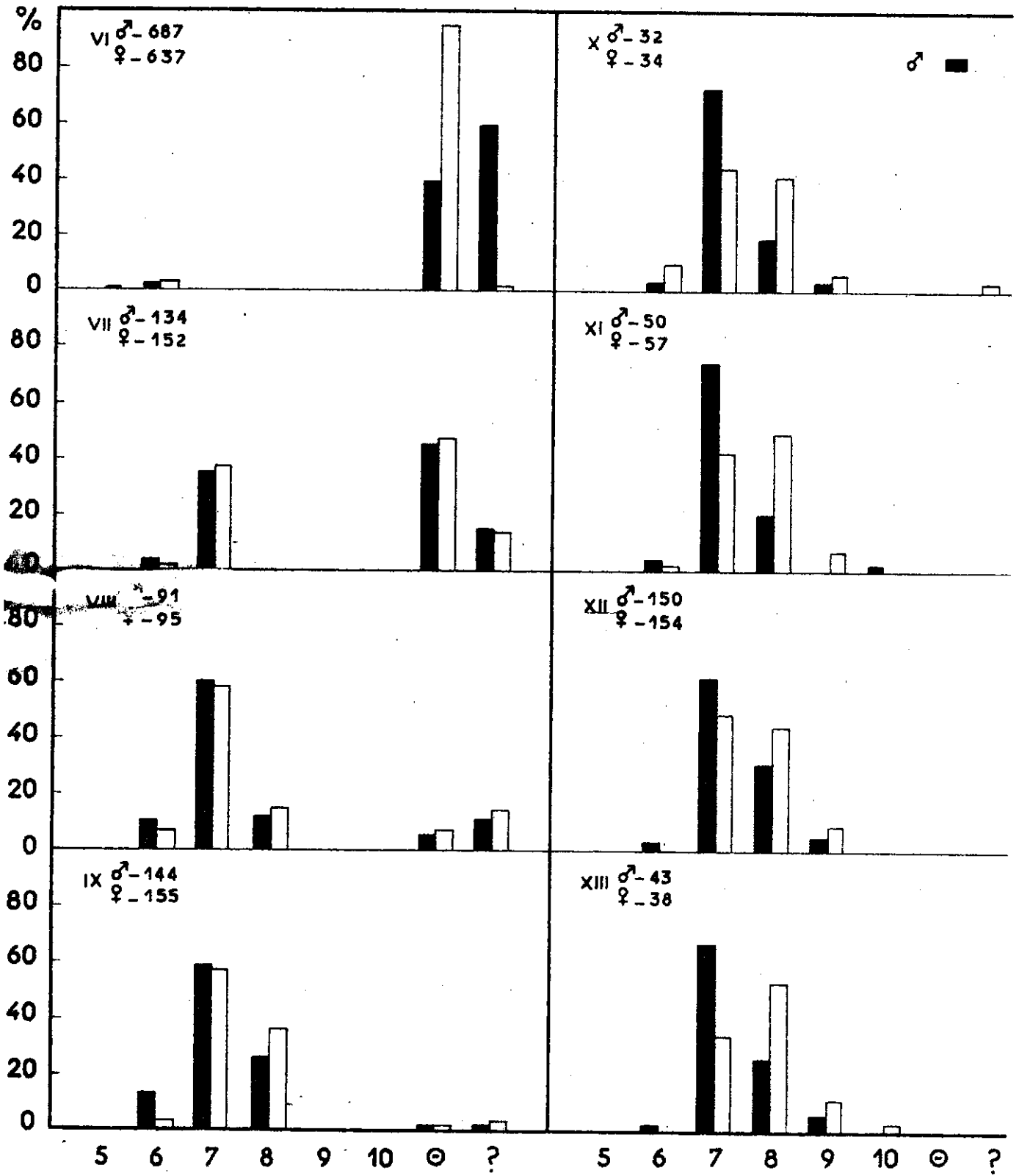


Figure 7.



Figure 1.

NEWFOUNDLAND (1959) TRAWL

Day  
Night

%

150

100

50

0

100

50

0

150

100

50

0

100

50

0

A (3Ps-II)

B (3Ps-IV)

(3 L - X)

(3 N - IX)

151  
148  
145  
142  
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