Size and age of first maturation, and relative fecundity in Sardina pilchardus off Castellón (Spanish Mediterranean coast)

by

M. G. Larrañeta
Instituto de Investigaciones Pesqueras, Vigo, Spain

1 Introduction

Castellón sardine belongs to a stock unit isolated from Alicante sardine and Gulf of Lion sardine and, perhaps, also from Barcelona sardine (Larrañeta, 1968). The peak of the spawning season is in December (Larrañeta, 1960). Andreu and Rodríguez-Roda (1981) have determined that the spawning period of the Castellón sardine spreads from October to March. Some data about the size of first maturation has been reported by Andreu (1955).

The material of the present study consist of 1020 males and 1002 females of sardines fished between 15th November and 30th January, from November 1949 to January 1955. Samples were studied, in the same day that sardine was caught, by B. Andreu, J. López, J. Rodríguez-Roda and the author and the data kept in the Castellon Laboratory of the Instituto de Investigaciones Pesqueras.

2 Size of first maturation

Fish with gonads showing evident ripening features (Hjort's scale stages III-VII) was considered as "mature". Observed percentages of mature sardines at each size class are shown in table 1. In figure 1 maturation curves are drawn, being the 50% mature point 113 mm for males and 117 mm for females. These curves represent the theoretical percentages of mature sardines.

3 Age of first maturation

Suau (1973) has published age-length keys of the Castellón sardine for November and December, by collecting data from 1949 to 1969. Taking the
absolute number of these keys together, a new length frequency distribution was obtained for 0 and 1 age groups (Table 2). In Castellon sardine sex growth differences at ages 1 and 2 years are negligible.

Because of the selective recruitment, length frequency distributions in Table 2 must be considered as biased samples of the actual population. In fact, Larrañeta (1973) by studying scale rings has obtained the Berta-
lanffy's growth parameters of the Castellon sardine, according to these the average length at ages 1 and 2 years are, respectively, 110 mm and 135 mm, which compared with modal classes of 120 mm and 140 mm (Table 2), respectively, show an evident bias towards bigger sizes of these length frequency distributions, especially for age group 0.

To estimate the actual length frequency distributions in the 0 and 1 age groups, average lengths (110 mm and 135 mm) and right hand length frequencies of table 2 distributions were used to rebuild the left hand frequencies, as it is shown in figure 2, where the reader can judge the fortune of the author in constructing the all hypothetical frequency distributions. Perhaps, the 0 age group distribution is so conservative, keeping yet some bias towards bigger sizes.

In table 3 theoretical length frequency distributions (columns 3 and 5) for each age group are shown. Multiplying these frequencies by the ratio of mature females (column 2) the (intended) unbaised number of mature females at each size class are obtained (columns 4 and 6). From these final figures it is estimated that during the spawning season only 30% (239.72/806 = 0.30) of the females of the 0 age group and 95% (615.97/648 = 0.95) of ones of the 1 age group are mature.

These results represent a first estimation because the best study would be relating directly each fish of age known with its maturation stage, in a sufficient quantity of material.

From a practical point of view all individuals of the 2 age group are mature during the spawning season. Because the conservative criterium in constructing the hypothetical length distribution of 0 age group, 30% of mature females can be looked as a maximum, being the real percentage most likely minor.

4 Relative fecundity

An important item in applying or designing models on the relation between the spawning-stock size and the recruitment is the variation of the fecundity with the size or age of the spawner. The general feature of previous studies (Larrañeta, 1973) on the Mediterranean sardine is that the ratio between the gonad and total weights (x100 = gonosomatic index)
is roughly constant. A more precise study carried out with our material shows the variations of the gonosomatic index through the sizes of sardine (Table 4). In this study the body was weighted eviscerated, to eliminate the effect of the gonads. They were only take into account ovaries in stages V and VI of the Hjord's scale, a total of 142 fishes.

The linear regression between length (x) and gonosomatic index (y) is

\[ y = 1.58 + 0.02 \times \]

For 13 degrees of freedom \( t = 0.621 \) and probability 0.5 - 0.6, testing that the coefficient 0.02 is not significant, that is to say, no real relationship between length and gonosomatic index appears, and body weight can be used as an index of relative fecundity.

3 Summary

With a material of 1020 males and 1002 females of sardines caught off Castellon from November 1949 to January 1955, the following conclusions are obtained:

a) The length of first maturation (50% point) is 118 mm for males and 117 mm for females.

b) In spawning season ripen a 30% of females of the 0 age group and a 95% of ones of the 1 age group.

c) The eviscerated body weight of females can be used as an index of relative fecundity.

6 Résumé

On a employé un matériel de 1020 mâles et 1002 femelles de sardines capturées dans la pêcherie de Castellón de novembre 1949 à janvier 1955, et on est arrivé aux conclusions suivantes:

a) La longueur de la première maturation (point 50%) est de 118 mm pour les mâles et de 117 pour les femelles.

b) Pendant la saison de la frai un 30% de femelles du groupe d'âge 0 et un 95% de celles du group d'âge 1 deviennent mûres.

c) Le poids déviscéral des femelles peut être utilisé comme un index de la fécondité.
References


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Table 2  Number of sardines of 0 and 1 age groups in November-December, identified by scale reading

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Table 3  Estimated number of mature females according to frequencies in tables 1 and 2 and theoretical one in figure 2

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Figure 1
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