

MORPHOMETRIC SEX DIFFERENCES OF THE ROUND SARDINELLA, *SARDINELLA AURITA* (VALENCIENNES, 1847), IN THE MIDDLE EASTERN ADRIATIC SEA

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Abstract

A total of 2,004 round sardinella, *Sardinella aurita* (Valenciennes, 1847) specimens were caught between November 2007 and January 2009 to analyse their nine morphometric characteristics. Monthly sampling was done from the purse seine catches in the middle eastern Adriatic Sea. The total length of males ($N=983$) varied from 11.5 to 28.0 cm (mean \pm SD = 21.8 \pm 3.21 cm), while it ranged from 11.0 to 32.5 cm (mean \pm SD = 22.5 \pm 3.67 cm) for females ($N=1,021$). A significant difference between the mean lengths of males and females was observed.

Keywords: Biometrics, Fishes, Central Adriatic Sea

Introduction : Biometry is one of the most important biological characteristics in fish population dynamics and management purposes. Since data on morphometric characteristics of round sardinella from the Adriatic Sea are sporadic, the aim of this study was to analyse its various length amounts in order to gain a better understanding of this species. Round sardinella is not an autochthonous species in the Adriatic Sea. However, nowadays due to climate change, round sardinella specimens are becoming more numerous and have widened their habitat (1,2,3,4).

Material and methods : Round sardinella specimens were collected from November 2007 to January 2009 by monthly random sampling of commercial purse seine catches in the middle eastern Adriatic Sea. The total length (LT) of the fish was measured to the nearest millimetre. Sex was determined macroscopically on the basis of the shape, appearance and structure of gonads (5). Nine morphometric (LT, LS, LF, LA, LH, LF, H, PE, ED; Tab. 1) characteristics were used for biometrical analysis. To analyse sex differences, variability (V) and two sampled *t*-test was used.

Results : Mean values of all analysed meristic characteristics for both sexes of round sardinella ($N=2,004$) are shown in Table 1. Total length of males ($N=983$) varied from 11.5 to 28.0 cm ($\bar{X} \pm SD = 21.8 \pm 3.21$ cm.) while it ranged from 11.0 to 32.5 cm ($\bar{X} \pm SD = 22.5 \pm 3.67$ cm) for females ($N=1,021$). As presented in Table 1, females had significantly greater mean values of all analysed morphometric characteristics than males, except the eye diameter ($t=1.59$). Variability was high for all length parameters, within both sexes. The greatest variability coefficient (V) was observed in males length of dorsal fin base (LA=16.48%), while the head length of males (LH=13.45 %) slightly varied.

In general, mean monthly length values of females were greater than those of males, although during the February smallest total length values for both sexes were noticed (Fig.1).

Tab. 1. Morphometric characteristics of male and female round sardinella caught in the middle eastern Adriatic Sea during the period November 2007 - January 2009

| Sex: | Male | | Female | | |
|--------------------------------|------------------|-------|------------------|-------|----------|
| Morphometric: | $\bar{x} \pm SD$ | V(%) | $\bar{x} \pm SD$ | V(%) | <i>t</i> |
| Total length (LT) | 21.8 \pm 3.2 | 14.71 | 22.5 \pm 3.7 | 16.31 | 4.41 |
| Fork length (LF) | 19.1 \pm 2.8 | 14.72 | 19.7 \pm 3.1 | 15.76 | 4.38 |
| Standard length (LS) | 18.2 \pm 2.7 | 14.67 | 18.8 \pm 3.1 | 16.28 | 4.59 |
| Anal length (LA) | 13.3 \pm 1.9 | 14.65 | 13.8 \pm 2.3 | 16.36 | 4.67 |
| Head length (LH) | 4.09 \pm 0.5 | 13.45 | 4.17 \pm 0.6 | 14.38 | 3.11 |
| Length of dorsal fin base (DF) | 2.67 \pm 0.4 | 16.48 | 2.77 \pm 0.5 | 17.33 | 4.85 |
| Maximum body height (H) | 3.73 \pm 0.6 | 16.08 | 3.87 \pm 0.7 | 17.31 | 4.92 |
| Preorbital length (PE) | 1.29 \pm 0.2 | 13.95 | 1.32 \pm 0.2 | 15.15 | 3.52 |
| Eye diameter (ED) | 0.95 \pm 0.1 | 14.73 | 0.96 \pm 0.1 | 14.58 | 1.59 |

$p < 0.0001$

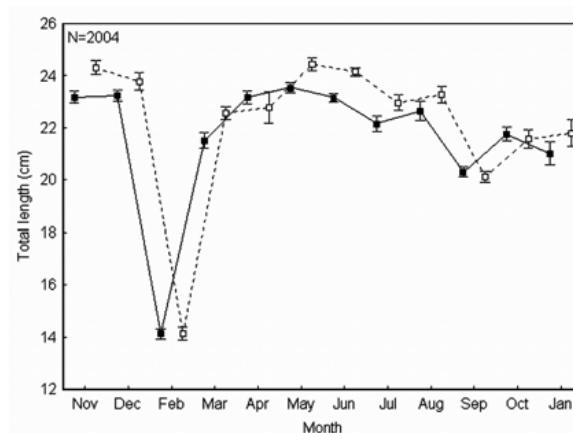


Fig. 1. Mean total length distribution (\pm SE) of male (plain black square : $N=983$) and female (empty white square : $N=1,021$) round sardinella from catches realized in the middle eastern Adriatic Sea during the period November 2007 - January 2009.

Discussion : The presented analyses showed that females ($N=1,021$) had significantly greater values of all analysed body lengths than males ($N=983$), except the eye diameter. Observed significant differences between sexes of the analysed mean lengths are in accordance with the results previously reported by for this species from the other seas (6). To reveal round sardinella sexual dimorphism, further and more detailed investigations, especially of genetic ones should be done.

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