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AGE AT FIRST SEXUAL MATURITY OF *TRACHURUS MEDITERRANEUS* (STEINDACHNER, 1868) FROM ROMANIAN BLACK SEA WATERS, INDICATOR OF GOOD STATUS OF THE POPULATION

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Abstract

The horse mackerel is a pelagic marine species of commercial interest at the Romanian Black Sea coast. The present study presents the analysis of the age of horse mackerels at the first sexual maturity. For the determination of age, the method used was the interpretation of the otoliths, these are bone structures located in the inner ear. Age of sexual maturity of horse mackerel is 1-2 years. As a general rule, a fish population is considered to be in a good condition when the age at first sexual maturation exceeds 30% of the individuals present in the catch. The analyzed periods were 2012-2015 and 2016-2017. In the period 2012-2015, the percentage of the age of the first sexual maturation exceeded the 30% threshold compared to the 2016-2017 period when a decrease was recorded. The reduction is mostly due to fishing pressure on these species. In conclusion, it can be said that the horse mackerel population on the Romanian Black Sea coast is not in good condition status, and measures are needed to conserve the population.

Key words*: age, biodiversity, conservation, otoliths, sexual maturation.*

INTRODUCTION

The Black Sea ichtyofauna has undergone major changes over the last decades, both in the qualitative and quantitative structure that's why the population parameters are very important to be analyzed (Nicolae et al., 2018).

Trachurus mediterraneus - horse mackerel is a pelagic, migratory species living in schools. It is spread in the Black Sea, the Azov Sea (except its fresh water parts), and the Marmara Sea (especially in winter) and also in the Eastern Atlantic. In the Black Sea it is spread mostly in the northern part and wintering in the eastern and southern areas at depths of 80-100 m (Radu and Radu, 2008).

The good environmental status (GES) of the Marine Strategy Framework Directive (MSFD) is achieved when the number, demographic characteristics (fertility, mortality) and the state of health of naturally occurring populations allow their maintenance and survivor on a long term, depending on the existing natural environmental conditions (Borges et al., 2010).

Within the ichtyofauna, the demographic characteristics of populations of fish species (eg. size and age structure, sex ratio, fecundity and survival rates) are healthy population indicators that are not adversely affected by anthropogenic pressures (Simeanu et al., 2015).

Thus, the aim of the study is to highlight by the analysis of the age at the first sexual maturity, the state of the horse mackerel population at the Romanian Black Sea coast.

Reproduction of horse mackerel takes place during the summer, from May to August, with maximum intensity in July when approaching the shore.

They spawn gradually and sexual maturity is reached in males at 1 year old and in females at 1 or 2 years old (Radu and Radu, 2008).

Age determination in fish is an important element contributing to the study of dynamics population of a species.

Despite the enormous importance and value, fisheries resources suffer the combined effect of overexploitation and environmental degradation (Nicolae et al., 2011).

MATERIALS AND METHODS

For the purpose of this study, samples were collected from the stationary (pound net) installed at fishing points along the Black Sea coastal area between Midia and VamaVeche, in the period 2012-2017 (Figure 1).

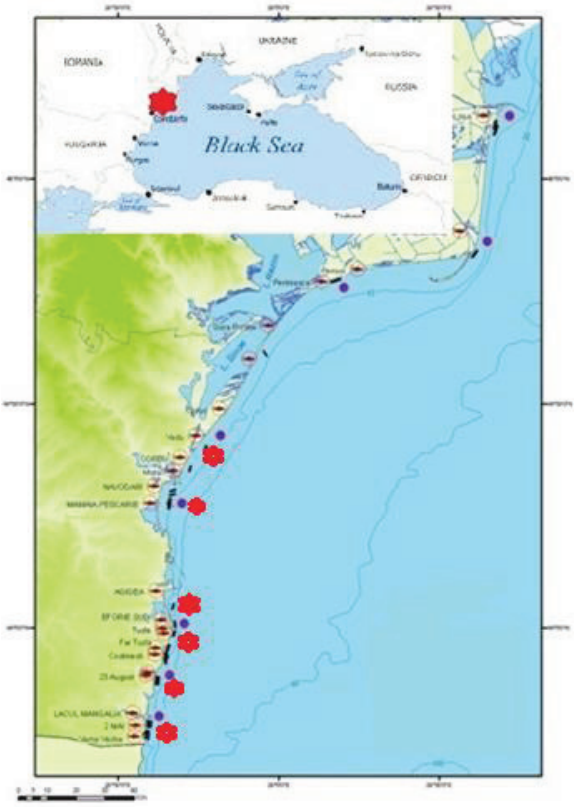

Figure 1. Map with sampling stations

After collecting, the samples were analyzed in the laboratory where measurements of length, weight, sexual maturity and age determination by otoliths analyses were performed (Figures 2, 3, 4).

Figure 2. Horse mackerel capture (Original photo)

Figure 3. Horse mackerel analyzed in the laboratory (Original photo)

Sexual maturity in fish has a great practical importance in the analysis of many population parameters. In general, fish are considered to be

mature when they reach the middle of their maximum size (Holden and Raitt, 1974).
Also, determining fish age is one of the most important elements in the study of population dynamics, being the basis for the study of growth, mortality, recruitment and other basic population parameters (NIMRD, 2018).

Figure 4. Otholithsprelevation of Horse mackerel analyzed in the laboratory (Original photo)

Determination of age in horse mackerel was done by identifying the growth rings on the otoliths surface using a binocular microscope (Figure 5).

Figure 5. Sampling and analysis of otoliths in horse mackerel (Original photo)

The otoliths are three-dimensional structures, concentric areas appear on their surface and depending on the organic matter deposited on each area, and the circles can be opaque or transparent.
Thus, an annual growth ring is considered to consist of an opaque area followed by a transparent one (Galatchi et al., 2017).

RESULTS AND DISCUSSIONS

During the analyzed period, were identified horse mackerel individuals with a length between 8 - 15.5 cm and with an average of 12.6 ± 0.5 cm (Figure 6).

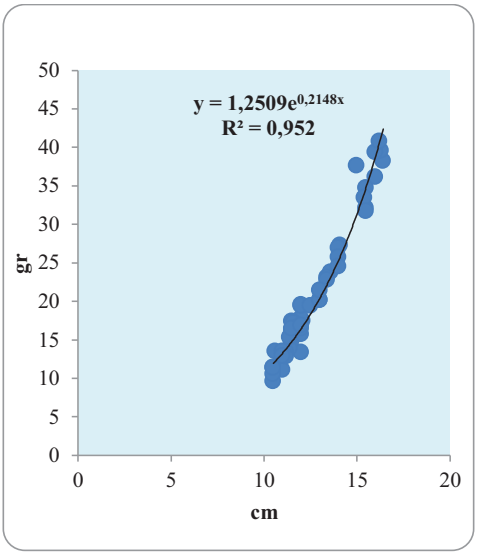

Figure 6. Length - weight relation of horse mackerel, analyzed in 2017

The length - weight correlation is positive, so the individuals analyzed have evolved both in length and in weight, with a higher increase in length in the first part of their life.
However, individuals were smaller than those identified on the Bulgarian Black Sea coast, up to 19 cm (Yankova, 2013).
In terms of weight, specimens from 9.62 g to 39.45 g have been identified with an average value of 19.12 g ± 0.5; a situation similar to that identified by weight.
Also, studies conducted for horse mackerel taken from the Turkish Black Sea region revealed a spectrum of length between 6.9 cm and 19.2 cm, weighing between 3.32 g and 59.98 g (Aydin and Karadurmuş, 2012).
Thus, horse mackerel specimens from the Romanian Black Sea coast have a growth rate different from those in other areas of the sea, most likely due to different living conditions and availability of food.
In May-September 2012-2017, fresh material was also analyzed in the ichthyology laboratory for determination of maturation rates.

In most samples analyzed, the females are predominated (Figure 7).

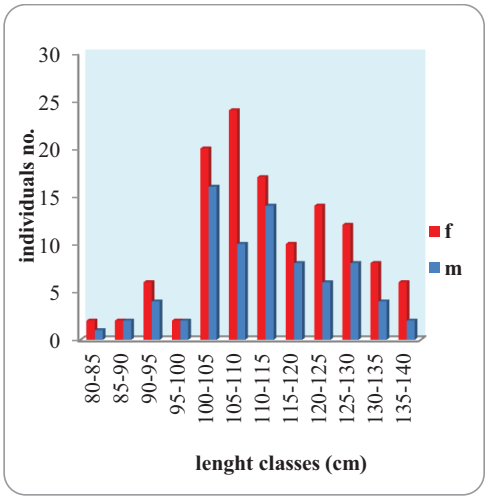

Figure 7. Distribution by length and sex classes for horse mackerel, 2017

Regarding maturation rates, young specimens predominated in the first part (May), followed in June by the predominance of specimens with maturation classes III and IV, which are in full reproductive process (Figure 8).

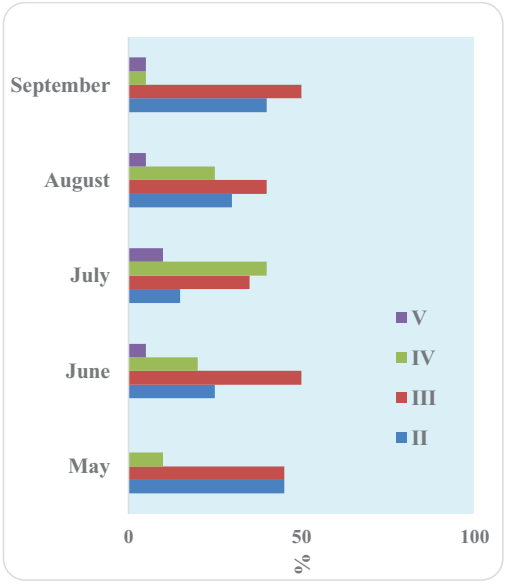

Figure 8. The distribution of degrees of maturation on months at the horse mackerel

Horse mackerel reproduction takes place during the summer and is located mainly in the area of shoreline more likely due to abundant food resources (Radu and Radu, 2008).

Regarding the age of horse mackerel, prevailed the individuals of 2^+ and 3^+ years in the first part of the analyzed period and then it was observed an increase in the percentage of specimens of 1^+ (Figure 9).

Specimens of 4^+ and 5^+ years have been underrepresented where we conclude a high pressure from fishing activities.

In addition, studies on the age of the horse mackerel caught at Bulgarian Black Sea coast have revealed a predominance of over 20% of individuals at the first sexual maturity stage (Yankova et. al, 2010).

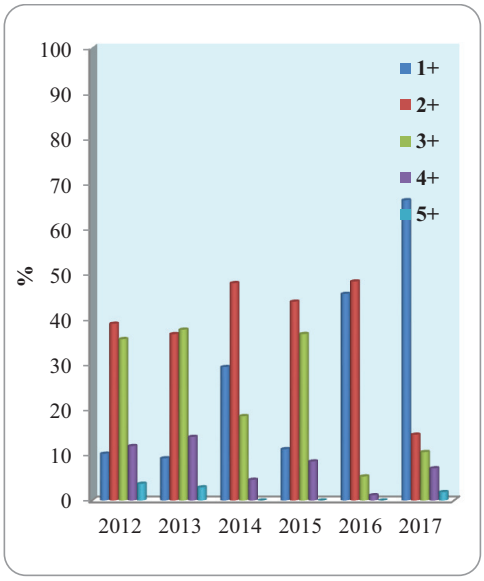

Figure 9. Distribution of age groups

Regarding the individuals analyzed in present study, has been observed in the period 2012-2015 that the percentage of the horse mackerel age at first sexual maturity stage has exceeded the threshold value of 30% but in the period 2016-2017 was registered a decrease; most likely as a result of pressure by fishing (Figure 10).

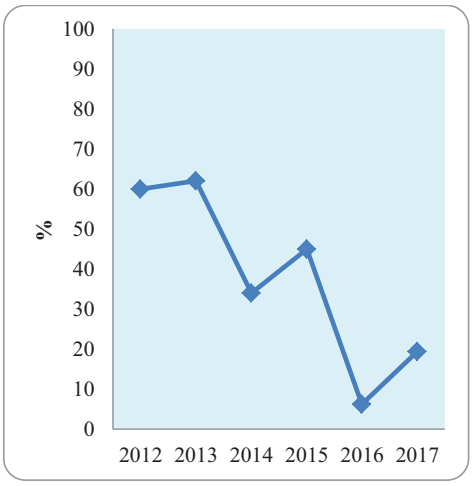

Figure 10. The proportion of the catch over the age at first maturity stage for horse mackerel

CONCLUSIONS

In the analyzed period were identified individuals of horse mackerel with a total length between 8-15.5 cm with an average of 12.6 cm ± 0.5 cm and in terms of weight, have been identified specimens between 9.62 to 39.45 g, with a mean value of 19.12 g ± 0.5. Length-weight relationship was a positive one.

Concerning maturation rates, the young specimens predominated in the first part (May) for the analyzed period, with individuals of classes III and IV, which are in full reproductive process, prevailing in June.

Analysis of the age of horse mackerel, it's revealed a dominance of specimens of 2^+ and 3^+ years old in the early part of studied period and then we observed an increase in the percentage of specimens of 1^+ years old, this situation corresponds to a rejuvenation of population.

Specimens of 4^+ and 5^+ years have been underrepresented where we conclude a high pressure made by fishing activities.

Regarding the age at first sexual maturity, it was observed that during the period 2012-2015 the percentage of the age of the female at the first sexual maturity exceeded the 30% threshold, but there was a decrease between 2016-2017; most likely as a result of fishing pressure on the species. It is therefore necessary to continue the research to highlight the state of health of the horse mackerel population at the Romanian Black Sea coast.

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