

<p>Growth and Age of <i>Trachurus mediterraneus</i> (Steindachner, 1868) on the Romanian Black Sea Coast</p> <p>(Cătălin Păun, Mădălina Galațchi, George Țiganov, Cristian Sorin Danilov, Alexandru Nicolaev, Valodia Maximov, Victor Niță, Carmen Georgeta Nicolae)</p>	<p>“Cercetări Marine“ Issue no. 49</p> <p>Pages 116 - 124</p>	<p>2019</p>
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GROWTH AND AGE OF *Trachurus mediterraneus* (STEINDACHNER, 1868) ON THE ROMANIAN BLACK SEA COAST

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ABSTRACT

The Mediterranean horse mackerel *Trachurus mediterraneus*, (Steindachner, 1868) is one of the most exploited commercial species of the fisheries in the Black Sea basin. Their economic importance and the need of adequate measures for conservation and management of this resource, require more information about their population dynamics. This paper presents results on temporal variations of total length and weight, age composition, growth parameters and sex ratio of the Mediterranean horse mackerel populations, on the Romanian Black Sea coast. Their mean total length was higher in 2018 than in 2017. One and two year old individuals dominated during the period 2017 to 2018. Females dominated in both 2017 (63%) and 2018 (57%).

Key-Words: horse mackerel, length, weight, growth, age

AIMS AND BACKGROUND

The Mediterranean horse mackerel belongs to the Carangidae family, which includes many important commercial species worldwide, and represent an important resource for the fisheries in Black Sea area (Bektas and Belduz, 2009). The Mediterranean horse mackerel is a predatory species, consuming considerable amounts of sprat and anchovy, but also annelids and zooplankton (Yankova *et al.* 2008; Bănaru *et al.*, 2009). It is considered as one of the important predatory species in the Black Sea ecosystem. The main

goal of this paper was to identify several biological parameters of the Mediterranean horse mackerel population along the Black Sea coast. This paper also presents the length and weight class structure, age and sex ratio of this species. The relationship between body length and weight are of great importance in fishery biology as they allow estimating fish growth parameters (Gulland, 1983). Since the growth of teleosts is linked to the foraging behavior (Lloret et al. 2014) and the diet may change temporally, then growth may also vary temporally (Albo-Puigserver *et al.* 2017). Growth and sex ratio are important parameters for fisheries management.

EXPERIMENTAL

For the purpose of this study, 3329 individuals were collected from the traps net catches along the Black Sea coastal area between Midia and Vama Veche, from 2017 to 2018 (Fig.1).

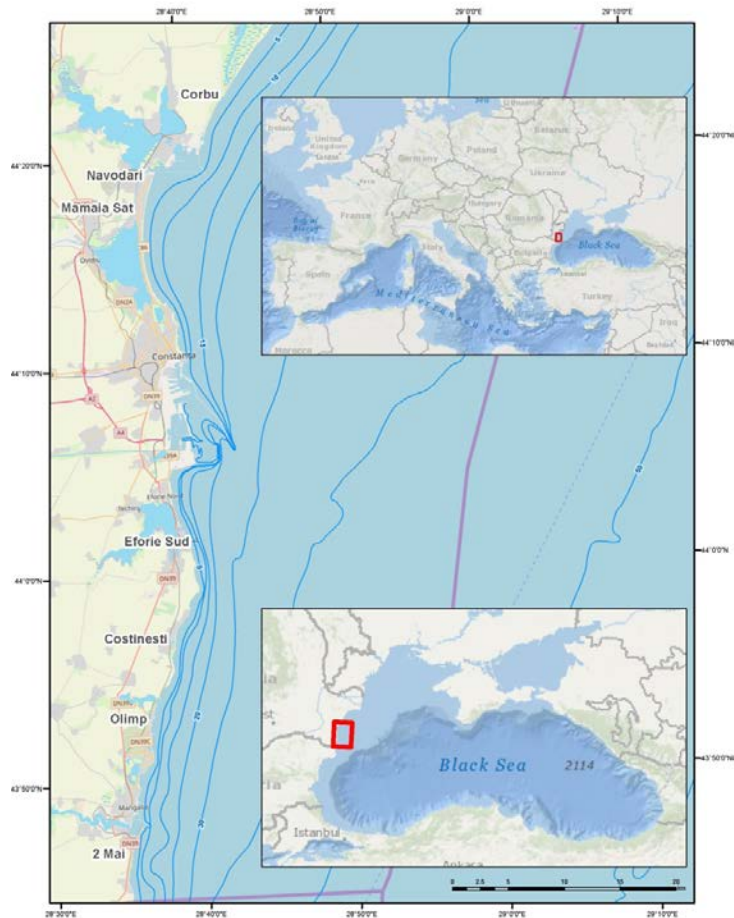


Fig. 1. Romanian coastal area (*original map NIMRD - A. Spinu*).

In order to study the biological parameters of the Mediterranean horse mackerel, samples were collected for each sampling station (Fig.1) and analysed in the laboratory (Fig. 2). A particular focus was made on length class structure, weight, age and sex, elements required to estimate the growth parameters. The otoliths of all individual were extracted, and their age was established by counting the growth rings (Fig. 3). Biometric measurements were made for total length (L_t), with a precision of ± 0.1 centimetres. The weight was determined in grams, with an accuracy of ± 1 g.



Fig 2. Mediterranean horse mackerel analyzed in the laboratory (original photo).



Fig 3. Otoliths sampling of Mediterranean horse mackerel (original photo).

For the determination of the total length (L_t) - weight (W) ratio, the following relation was used (Carlander, 1977):

$$W = a \cdot L_t^b$$

where:

W = fish body weight (g);

L_t = total length of the fish (mm);

a and b = regression constants.

RESULTS AND DISCUSSION

In 2017 were analyzed 1529 individuals and in 2018 was analyzed 1800 individuals, ranging between 65-150 mm, and the weight ranging between 3.1 -45.1 g.

In the year 2017 the predominant class was 80-85 mm with a number of 360 individuals (Fig. 4a) compared to the year 2018 were the predominant class was 105-110 mm with a number of 322 individuals (Fig. 4b). The

observed variability in the relative abundance of the sizes is explained by the migratory character of the species.

Mediterranean horse mackerel individuals sampled between 2017 and 2018 were comprised in 5 age classes, namely 0 - 4 years. The samples were dominated by 1+ and 2+ years old cohorts with 32% and 31% respectively (Fig. 5).

The sex ratio was 63% female and 37% male in 2017 (Fig. 6a) and 57% female and 43% male in 2018 (Fig. 6b). Females were observed more frequently than males within all length groups and the difference was significant according to the χ^2 test ($P < 0.05$).

The length of a fish is proportional with weight, being strongly connected to development stages (juvenile and adults, and adults different reproduction related stage; size at first maturity, gonad development and spawning) (Serajuddin *et al.*, 2013). Studying the length-weight relationship allows comparing population spatially and temporally (Pandev *et al.*, 1974). Related to biomass data, this relationship may also allow establishing the recruitment yield (Richter, 1958; Beverton *et al.*, 1957) and estimating the biomass of potential exploitable fishes. Length and weight parameters are used in calculating fishing gear selectivity and mainly in sizing the mesh, aiming at improving the catch per unit effort. The b index values express the type of growth and, according to literature sources, its values range between 2 and 4 (Bagenal and Tesch, 1978), and most often around 3 (Năvodaru, 1997). In addition, this index can be considered as a measure of the environmental living conditions of fish (Battes *et al.*, 2008), being a generalization of the Fulton coefficient (Pitcher, 1990; Moreau, 1979). The values of the $a = 0.0121$ and $b = 2.8633$ growth coefficients and the weight/length relationship for horse mackerel (aggregately for the entire period covered) were indicated in the Fig.7. In this study, when $b < 3$ the fish growth positively allometric and fish grows faster in length than in weight as most other species (Froese, 2006). Differences in allometric growth may be related to the environment and to the food availability, but also to disease and parasite that can affect the value of b (Bagenal, 1978; Tesch, 1978). It can also vary according to many factors such as season, sex and maturity stages (Le Cren, 1951).

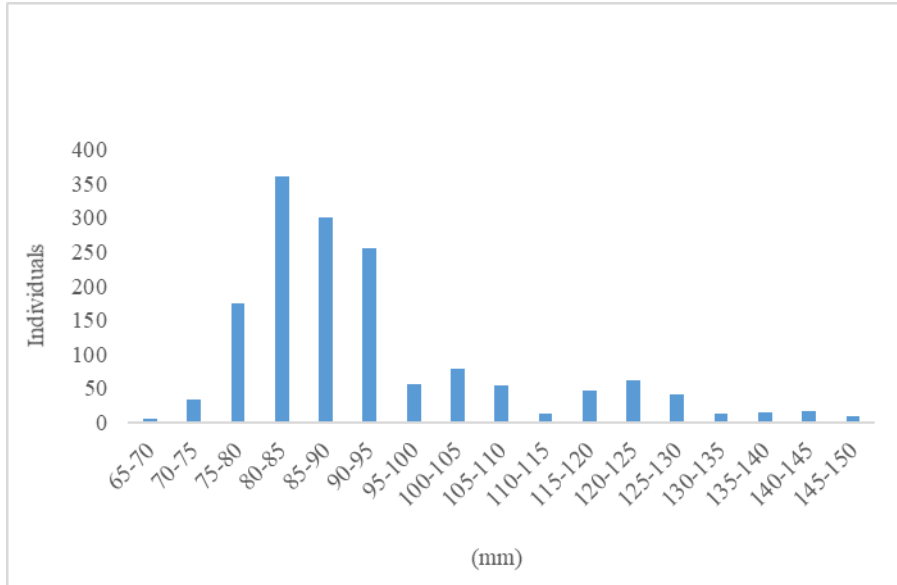


Fig.4 a). Length class structure in Mediterranean horse mackerel in 2017.

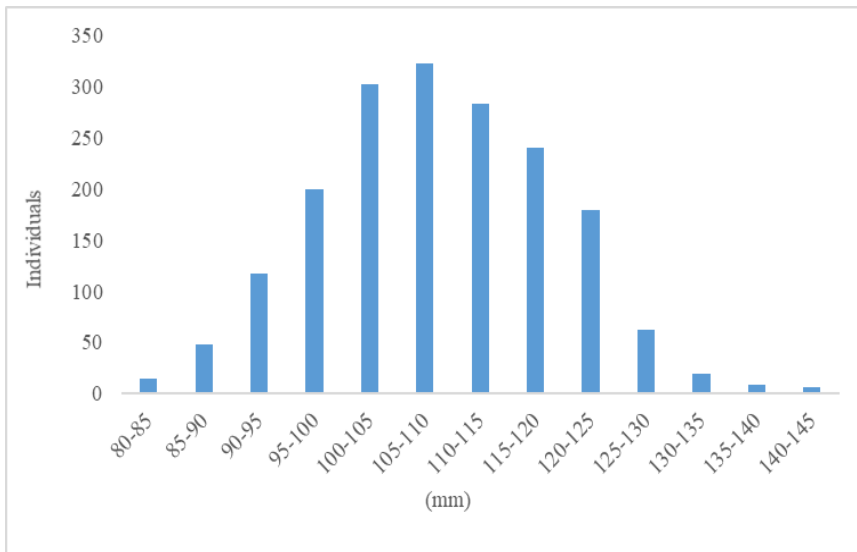


Fig.4 b). Length class structure in Mediterranean horse mackerel in 2018.

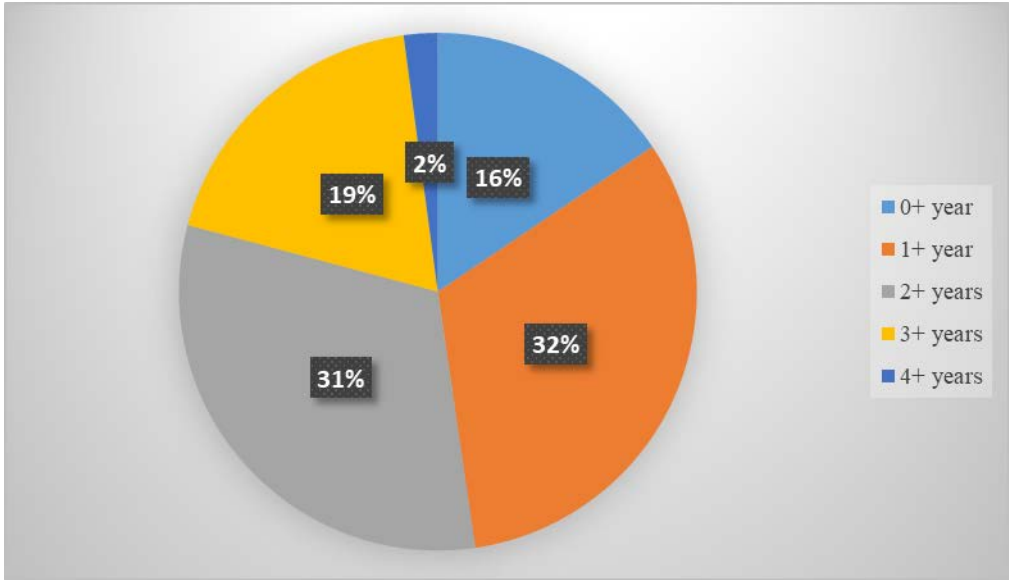


Fig. 5. Age class structure in Mediterranean horse mackerel in the analyzed period 2017-2018.

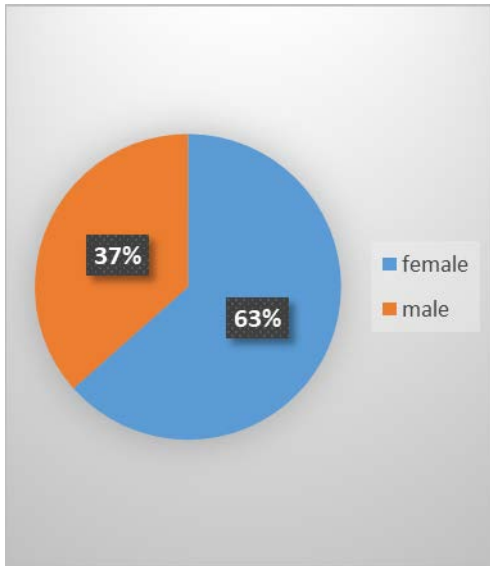


Fig. 6 a. Sex ratio Mediterranean horse mackerel in 2017.

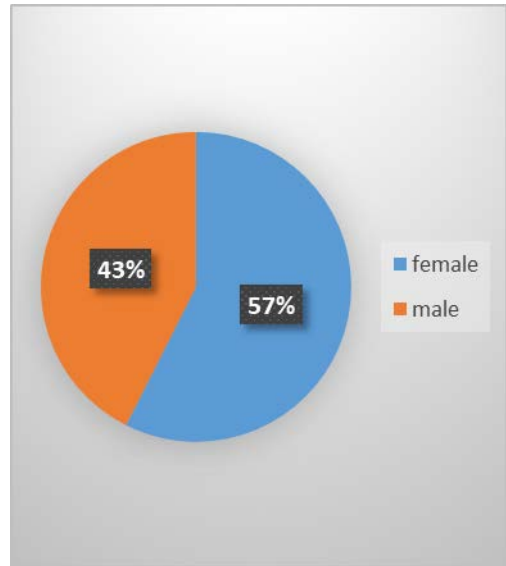


Fig. 6 b. Sex ratio Mediterranean horse mackerel in 2018.

The Length/weight relationship indicated a positive allometric growth in Mediterranean horse mackerel for both sexes. The determination coefficients (R^2) for length / weight relationship were greater than 0.97.

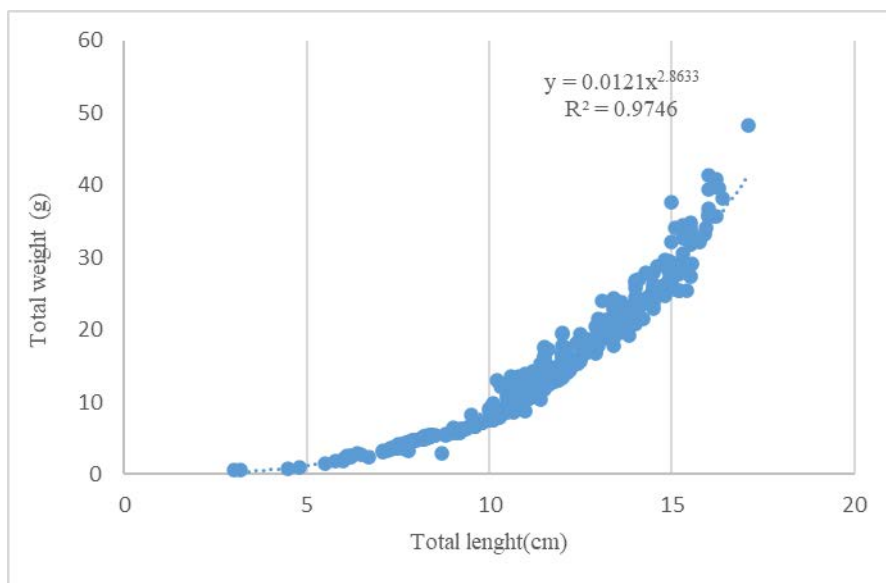


Fig.7. Length/weight relationship of the Mediterranean horse mackerel during the analyzed period 2017-2018.

CONCLUSIONS

In the present study, the Mediterranean horse mackerel showed positive allometric growth. Females were observed more frequently than males within all length groups. The population structure comprises 0-4 year old generations. The observed variability in the relative abundance of the sizes is explained by the migratory character of the species and/or by the variability of the recruitment. These results will contribute at the development of sustainable management programs for the fishing of horse mackerel on the Romanian coast.

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