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STUDIES REGARDING THE MIGRATION BEHAVIOR OF ANCHOVY (*Engraulis encrasicolus*, Linnaeus 1758) FROM THE ROMANIAN BLACK SEA COAST

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Abstract. The study of the behavior of fish species (migration, feeding, reproduction) is important for understanding the impact on populations and finding sustainable solutions to manage these problems. Anchovy is a pelagic, gregarious species and plays a key role in the general circulation of organic matter in the Black Sea. As the main consumer of plankton, anchovy is, in its turn, food for other species such as mackerel, whiting, dolphins. In recent years, the anchovy stock in the Black Sea has suffered greatly, especially as a result of overexploitation.

The preference for certain areas of distribution, food and reproduction was determined by analyzing samples collected by passive fishing (seines from the Romanian Black Sea coast). Temperature, salinity and food supply are the main determinants of the migration phenomenon of anchovy, thereby the preferred grounds for feeding and breeding are coastal areas.

Key words: Anchovy, migration, the Black Sea, abundance.

INTRODUCTION

The anchovy *Engraulis encrasicolus* (Linnaeus, 1758) is one of the main commercial fish species in the Black Sea, whose stock has undergone a significant decline during past decades (Fig. 1).

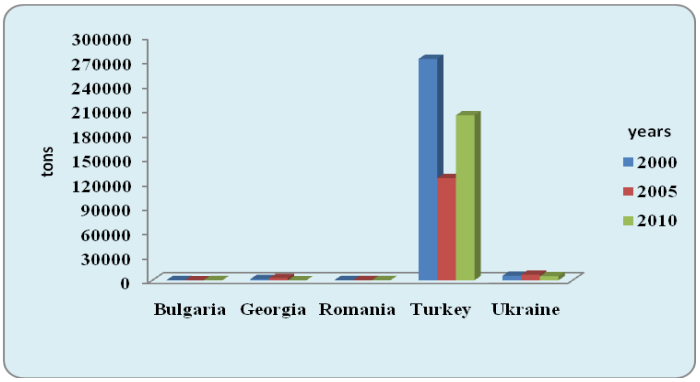

Figure 1. Anchovy biomass (tons) caught in the Black Sea (STECF data, 2014)

At the Romanian Black Sea Coast, anchovy represents the subject of artisanal fishery, whith coastal trap nets and beach seines.

In recent years, the biomass of anchovy caught in Romanian Black Sea water dropped dramatically (Fig. 2), as a follow-up of the influence of several factors, among which the reduction of the fishing fleet.

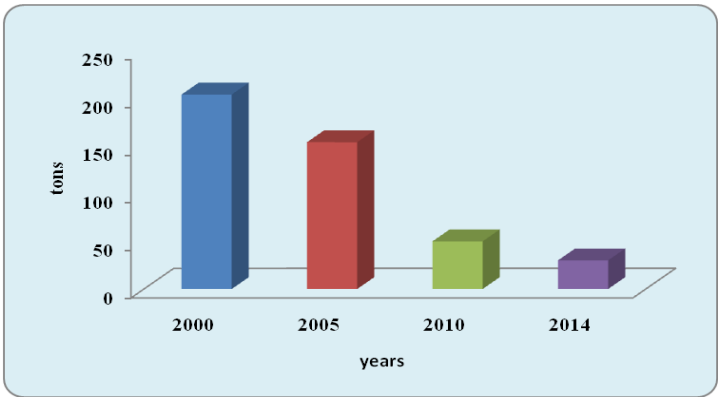

Figure 2. Anchovy biomass (tons) caught in Romanian marine waters (data from NIMRD & NAFA Romania)

MATERIALS AND METHODS

Within the National Fisheries Data Collection Programme, NDCP-NAFA-EU, surveys were organized for the collection of fishery samples along the Romanian Black Sea coast, in fixed fishery points, during 2013-2014 (Fig. 3).

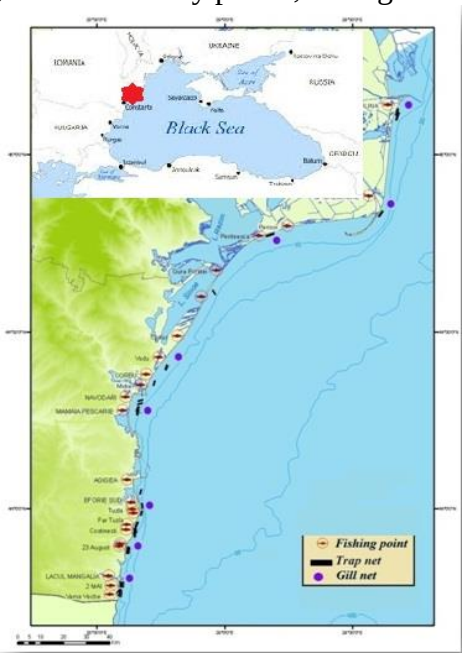

Figure 3. Locations of fixed fishery points along the Romanian Black Sea coast

The samples collected from stationary fishing points (10 m depth) were brought to the laboratory, where observations on the percentage composition by species and biometric measurements were made.

Additionally, population parameters such as abundance and dominance were analyzed, to determine the area preferred by anchovy for breeding and feeding.

According to the percentage value resulting by calculating the dominance, anchovy is a eudominat species, as in all the sampled stations it has been identified in amounts exceeding 30%.

RESULTS AND DISCUSSIONS

Because environmental fluctuations are believed to strongly influence the abundance of short-lived pelagic species and may also result in changes in life-cycle and growth patterns, correlations were made between the month with the higest abundance of anchovy in samples collected and the temperature and salinity concentations (Fig. 4, 5).

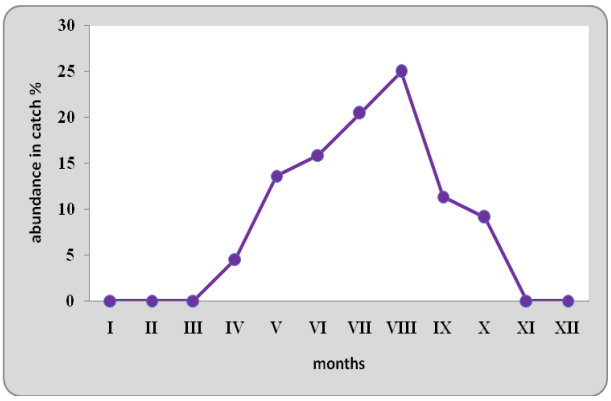

Figure 4. Abundance of anchovy in catches in Romanian Black Sea waters on months during 2013-2014

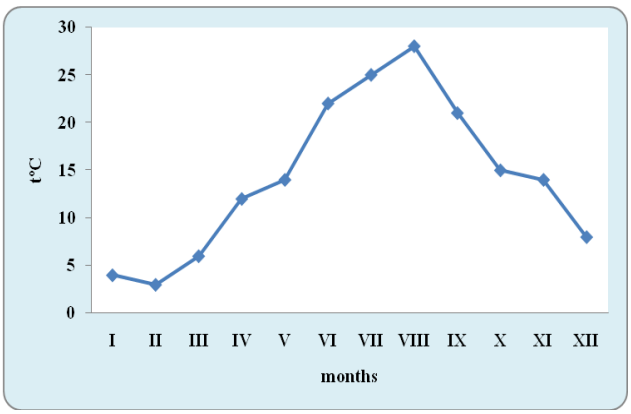

Figure 5. Mean values of seawater temperatures in Romanian Black Sea waters during 2013-2014

According to Figures 4 and 5, the positive correlation between anchovy biomass in catches and seawater temperature is very obvious: when temperature reaches the optimal mean value of 25ºC, the anchovy biomass increases in a similar trend.

With reference to anchovy biomass and salinity, no direct correlation has been reported, however the biomass increases at an optimal value between 9-16 PSU (Fig. 6).

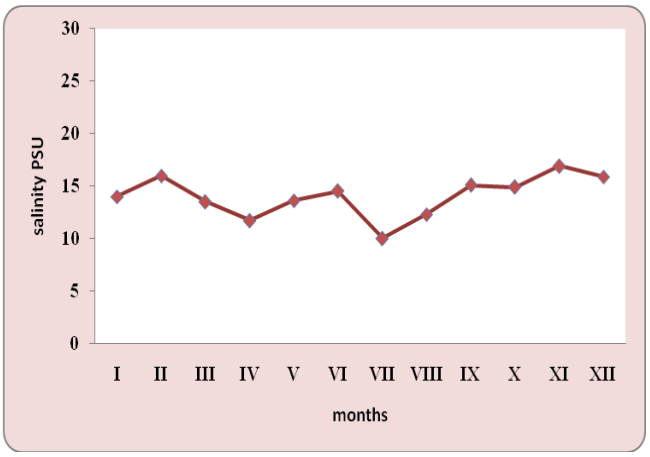

Figure 6. Mean salinity concentrations in Romanian Black Sea waters during 2013-2014

Investigations on the reproductive biology of the anchovy conducted during the 1987-1992 period in the northwestern Black Sea emphasize that the spawning takes place in summer in the warm upper layer, within a wide temperature range (16-28 °C). Reproduction occurs mostly in coastal waters, especially in estuarine areas with low salinity (7-18‰). Frequency of spawning depends on water temperature and varies during the spawning season, reaching its maximum -daily spawning- by the second half of June. On average, each female spawns more than 50 times a year. Individual batch fecundity depends on food availability, water temperature and body size (Lisovenko and Andrianov,1996).

Regarding the preferred areas the summer distribution area of the Black Sea, anchovy covers practically the whole sea. Under the influence of temperature decline the anchovy initiates migration to the southern Black Sea. According to Radu et al. (2013) the migration sphere usually takes place along the Romanian and Bulgarian coastlines, followed by the approach of the wintering schools to Turkish Anatolia and even Georgia (Fig. 7).

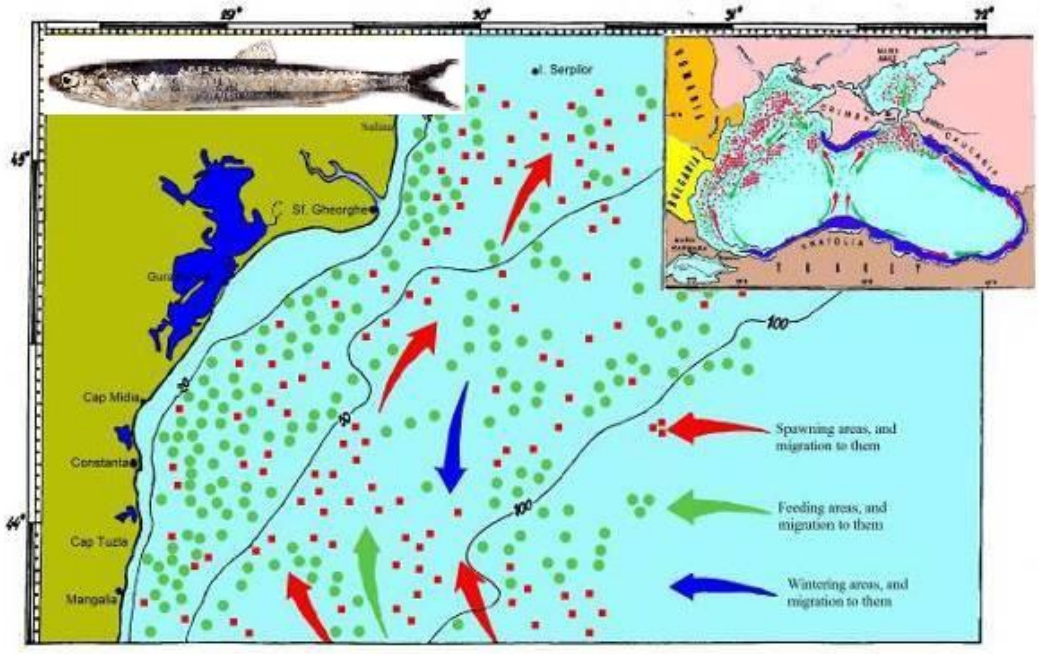

Figure 7. The anchovy migration behavior in Black Sea waters (after Radu et al., 2013)

According to Danilevsky (1964), the anchovy migration takes place from the northwestern Black Sea to the Southern Crimea. Black Sea anchovy in the eastern Black Sea spend the winter near the Georgian coast and can also form schools in Turkish waters.

CONCLUSIONS

The anchovy is a eudominant species in catches made along the Romanian Black Sea coast, being identified in shares higher than 30% in most samples analyzed.

This study emphsizes the strong inter-relations between environmental factors and the migration behavior of anchovy, for various purposes. As such, for breeding, anchovy comes near coastal zones where it find optimal temperatures (9-26º C) and salinities 9-18‰.

For anchovy, the first maturity age is considered year 1. It spawns during the summer, with a maximum intensity between May - August, which is also the main feeding and growth season.

Further joint studies are required, in order to point out more accurate biological and ecological features taking into account that European anchovy has a very high commercial importance and is extremely mobile species performing migrations all over the Black Sea basin, being exploited and consumed in all riparian countries.

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