

## SEVERAL BASIC POPULATION PARAMETERS OF SPRAT (*SPRATTUS SPRATTUS* L.) IN FRONT OF THE BULGARIAN BLACK SEA COAST IN 2014

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**Abstract:** This article calculates some basic population parameters of the Black Sea sprat (*Sprattus sprattus* L.) as size, age composition, growth, weight, length and Fulton index. For the whole year 2014 were processed 9929 individual. The results indicate that the linear structure of sprat (*Sprattus sprattus* L.) during the period is a recovers.

**Key words:** Marine biology, Ichthyology, sprat (*Sprattus sprattus* L.), basic population parameters, Bulgarian Black Sea Coast

### Introduction

Sprat (*Sprattus sprattus* L.) is marine pelagic species, usually inshore schooling. In the daytime, it keeps to higher depths and in the night it comes to surface. It forms important agglomerations and performs unregulated migrations between nutrition areas and spawning places determined by temperature conditions. In the spring there is a tendency of movement of the shoals toward coast and northwards and toward offing in the autumn, but there are not specific migrations of spawning or feeding [1].

Mostly, adults tend to remain under the thermocline, penetrating above only in the spring and autumn. Juveniles occupy a large spread area at surface in the warm water [1].

Due to its large multiplicity of number they have a crucial role in the ecosystem of the sea, being an intermediary between zooplankton and representatives of higher trophic level - large predatory fish, dolphins and birds [4].

Sprat fishing takes place on the continental shelf on 15-110 m of depth. The harvesting of the Black Sea sprat is conducted during the day time when its aggregations become denser and are successfully fished with trawls. The main fishing gears are mid-water otter trawl pelagic pair trawls and uncovered pound nets [3].

### Material and Methods

In 2014 9931 sprat species were collected. The sampling was carried out by pelagic trawls, cast nets and traps from different regions on Bulgarian Black sea coast. For the determining the total number and biomass of sprat (*Sprattus sprattus*) and establishing population parameters annual surveys of catches of that species are carried out. The samples were collected in accordance with the theory of variation statistics. Analysis of size - age and sex structures is conducted to a standard method. The otoliths were observed under the microscope of the conductive light measured absolute length and data processing was done, both through the construction of a variation series with class interval 0.5 cm and as individuals. The samples represent the random sample of the total catch, particular specimen are not selected. Each sample contained at least 200 specimens. The conditioning factor (K) was determined by size classes, and also individually.

The condition factors (c.f.) were computed by Fulton s index [2].

$$c.f.=W*100/L^3$$

Where: W – average weight by size groups; L – average length by size groups.

For establishment of weight-length relationship the following equation was used:

$$W = a * L^n$$

Where: W – weight (in g); L – length (in cm); a – coefficient; n – coefficient, characterizing the growth rate.

## Results and discussion

A recovery of the linear increase of sprat (*Sprattus sprattus* L.) during the period was observed in the study. When comparing the data with previous surveys in 2013 there is a recovery of average size and prevalence of 2 years old specimens: December 2013 - 83.22%, in February 2014 - 57.33%, March 2014 - 71.73%, April 2014 - 61.93% and in May 2014 - 77.78%. The age structure during the research period of 2014 shows an initial dominance of 2 years old, in the early summer of 2014, 1 year old fish in the samples rapidly increasing.

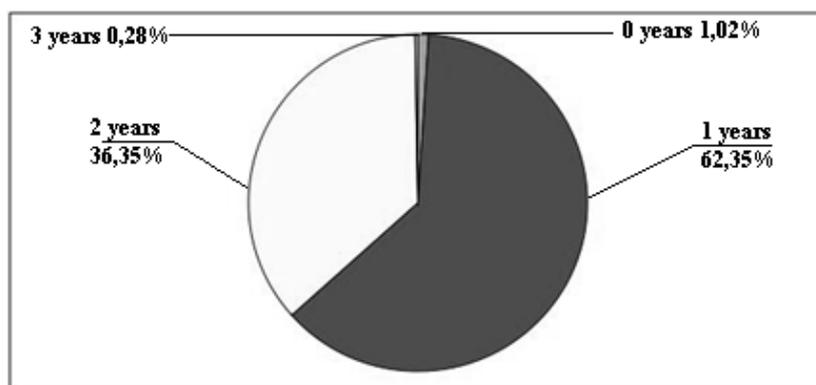
In November 2013 and January 2014 the proportion of 1 year old, caught with fishing vessels - pelagic trawl are 74.92% respectively 79.78%. During this period there is a 0 annual age 6.94% and 0.54%.

In the second decade of March in the beginning of the spring, with rising sea temperatures sprat have a tendency of movement to the shoals toward coast when it is easy prey to the pound net. In the catches in this month prevailing share of the 2 annual age 74.55% and small percentage of 1 years old individual - 25.45%.

In the next months into the catches were presented these ages - 0 (0.11%), 1 (36.82%), 2 (61.93%), 3 (1.09%) and 4 (0.05 %).

During the next months of the 2014 year the percent of 1 year age increases expense of 2 years old sprat, 80.1%, 94.23% - 70.93%.

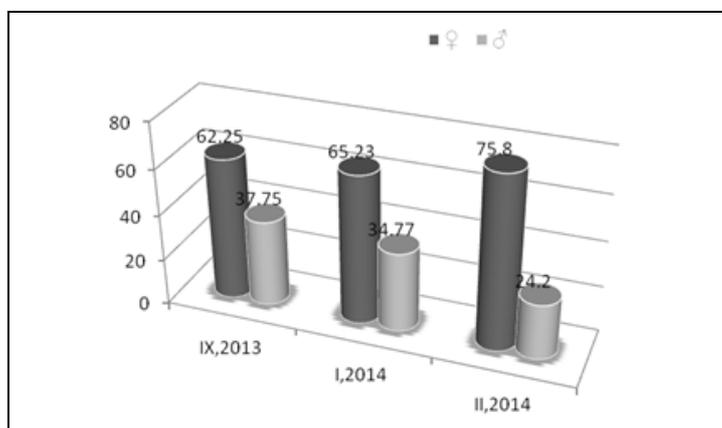
However the age composition of catches indicates the presence of 0-3 year old individuals. Most of the individuals caught are 1 year old (62.35%), followed by those of 2 years (36.35%) 0 years (1.02%) and 3 years (0.28%),(fig.1).



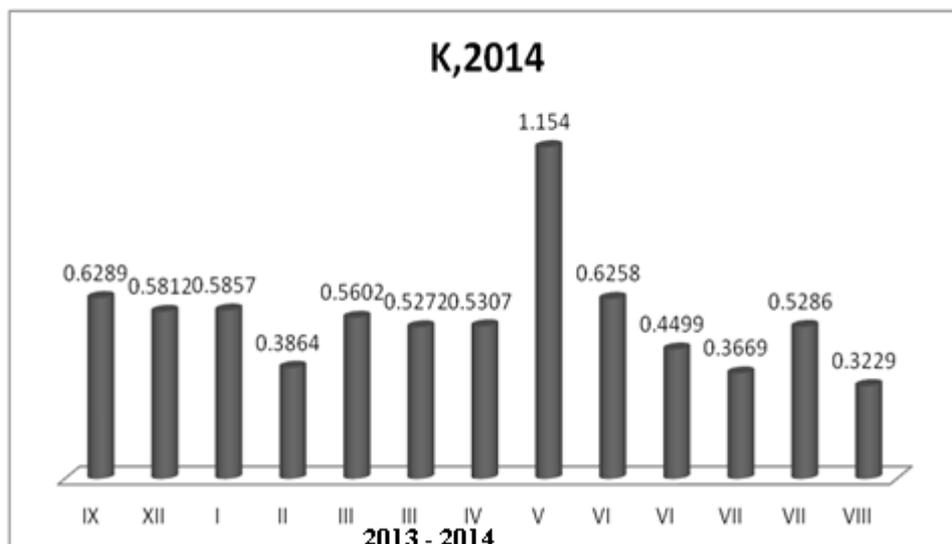
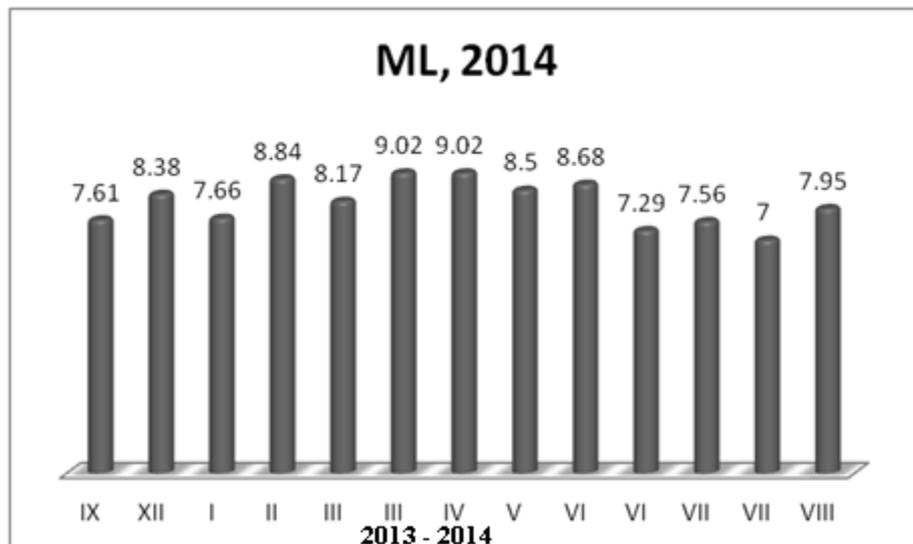
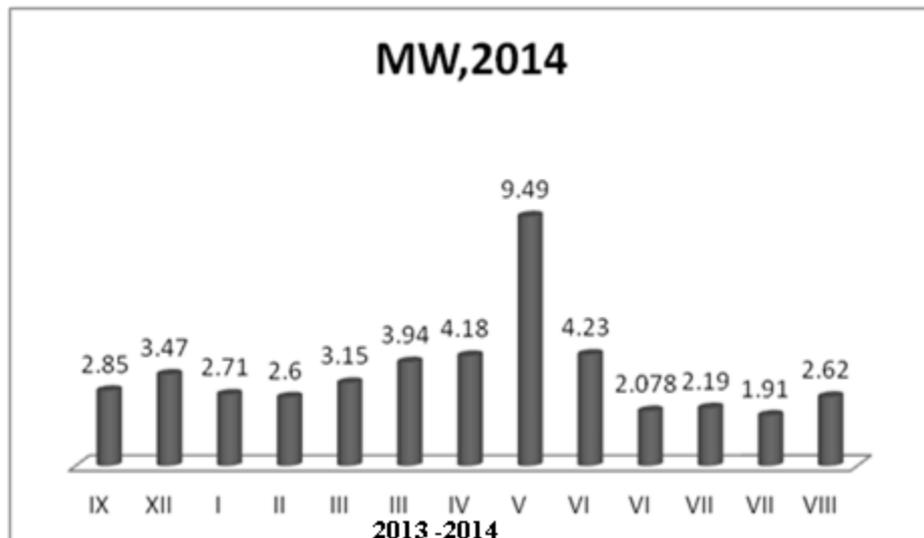
**Fig.1 Structure by age composition of sprat for 2014**

Sprat (*Sprattus sprattus* L.) reaches maturity at the age of one..

Female fish predominate above the males during November 2013 to January 2014 65%: 35%, and in February 2014 has enormous preponderance of female specimens have 76%: 24% (fig.2).

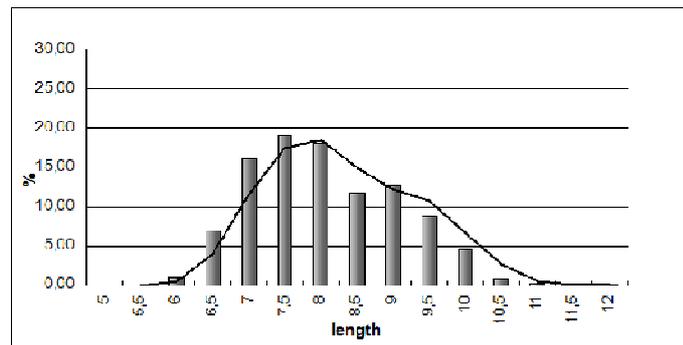


**Fig.2 Sex structure**



**Fig.3 Length, weight and condition factor K frequency distributions of sprat for 2014**

Length frequency distribution of sprat in the winter and spring months of this year is improving on a fig 4.



**Fig.4 Length frequency distribution of sprat for 2014**

Size structure of sprat catches during the study encompasses fish with total lengths between 6.0 and 11.3 cm. The most abundant size classes were between 7.0 cm and 9.5 cm (fig. 4),

In November the low values on average size 6.28 cm - 1.55 g were preserved. It follows a rise in the average size during the winter of 2013 - 2014, as a witness in February and three years respectively 11.34 cm and a weight of 6.42 g. Sprat enters the coastal area in March, earlier than previous years and the linear size is 8.17 cm and 3.15 g.

In April 2014 linear size and weight were 9.02 cm and 4.18g. In May, the average values of the sizes are 8.5 cm long and 9.49 g.

Condition factor is used as a criterion to the physiological condition of the fish. From Figure 3, we see that the condition is  $K = 0.52$  to  $1.15$  is with higher values.

The values of  $K$  are high. This may be due to the good trophy base and powerful generation of 2012 and 2013.

In late 2013 and early 2014, we observe a very good condition  $K$  within values  $0.58$ - $0.62$ . During the February 2014 the condition is reduced to  $0.38$  and this may be due to long spawning during the winter of 2013-2014. In early spring season 1 and 2 years old have an excellent condition reaches to  $1.15$  as it was shown in a fig.3. During the summer months of 2014,  $K$  gradually decreased from  $0.52$  to  $0.32$ .

According to data from lengths (cm) and average weight (g) the coefficients  $a$  and  $n$ , characterizing weight-length relationship, were estimated. The results are presented:

$$W = 0.005 * L^{3.0}$$

## Conclusions

Based on the analysis of the most important biological indicators of sprat (*Sprattus sprattus*) for the period 2013 -2014 the following conclusions can be made:

1. Increase in the age structure and observing of 3 and single 4 years old specimens.
2. There is a restoration of the linear growth of sprat (*Sprattus sprattus* L.) during the period. When comparing the data with the previous survey period is observed recovery of average size and predominance of one year's old specimens.
3. Especially good condition during the period of study.
4. The results show extreme improvements the basic population parameters of the sprat *Sprattus sprattus* and good recovery of the stock.

**References:**

1. Radu G., E. Anton, V. Raykov, Maria Yankova, Marina Panayotova, 2010. Sprat and turbot fisheries in the Bulgarian and Romanian Black Sea areas. International Multidisciplinary Scientific Geoconference & Expo SGEM. 20 – 26 June 2010. Albena, Bulgaria. ISBN 10: 954-91818-1-2. ISBN 13: 978-954-91818-1-4
2. Ricker, W. E., 1975. Computation and interpretation of biological statistics of fish populations. Bull. Fish. Res. Board Can., 191: 382.
3. Shlyakhov, V. A., Mikhaylyuk A. N., Bondarenko I. V., Evchenko O. V., Ershova O. V., Korkosh V. V., Merzlikin V. L., Chashchin A. K., Shlyakhova O. V. 2012. Fishery and biological indices of Ukrainian fishery in the Black Sea in 2002-2011. – The collection of works of YugNIRO, vol. 50, 2012. – P. 12-29. (in Russian).
4. Zuyev G.V., V.A. Bondarev, Yu.V. Samotoi. 2015. Geographical variability of length-age structure of the Black Sea sprat *Sprattus sprattus phalericus* (Risso)(Pisces: Clupeidae) and intraspecific differentiation. Marine Sciences Journal. 597.553.1:577.73 (262.5).

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