Table 3. Coefficients of growth equation for the period 2017-2019.

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VARIOUS ASPECTS OF THE DISTRIBUTION AND THE ABUNDANCE OF TURBOT IN BULGARIAN BLACK SEA COAST

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INTRODUCTION

Turbot, *Psetta maxima* (Linnaeus, 1758), is a flatfish of the family Scophthalmidae, which is widespread in the North Atlantic, Mediterranean and Black Seas (Nielsen, 1986). The species inhabits European coastal waters in the North Atlantic from Norway to Morocco, including the Baltic, Mediterranean and the Black Sea (Blanquer et al., 1992). It is a benthic marine species, inhabiting a sandy and muddy bottom, in the shallower part of the continental shelf up to about 110 meters (Karapetkova, 1964). Sahin & Gunes (2011) state that *Psetta maxima* is widespread in the coastal zone at a depth of 20-60 m.

AIM

The present study aims to address various aspects of the distribution and the abundance of turbot through landing data. Based on the analysis of the information from turbot catches, we obtained information which is crucial for science and it is useful for the management of fishing activities and quotas.

MATERIAL AND METHODS

The data for the study is collected from the Bulgarian ports in the Black Sea in the period 2017-2019. Samples from 2062 fish are collected.

The total length (TL, cm) is measured from the tip of the mouth to the elongated tip of the caudal fin, with an accuracy of 0.1 cm. The body weight (BW, kg) is measured with an electronic scale with resolution of 0.1 g. The sex is determined after dissection by simple visual observation of the physical appearance of the gonads.

The following parameter are calculated:

- relative value of the degree of variation (Mishev, 2008);
- coefficient of variation according (Mishev, 2008);
- universal growth equation (Le Cren, 1951);
- conditioning factor (Fulton, 1902).

The observed differences are statistically assessed using one-way ANOVA and a Student's t-test. The minimum significant level for the respective test is set at $P<0.05$.

RESULTS

On average, 22 fish are caught per ship, with a maximum of 111 and a minimum of 3.

The mean total length and weight of the fish are 52.63 ± 6.12 cm and 2600 ± 910 g respectively.

The length-weight ratios are determined by the following equations: 2017–$W=0.02.\ L^{2.98}$, n=566, ($R^2=0.88$); 2018–$W=0.04.L^{2.80}$, n=783, ($R^2=0.85$); 2019–$W=0.34.L^{2.25}$, n=713, ($R^2=0.71$); 2017–2019: $W=0.08.L^{2.60}$, n=2062, ($R^2=0.80$).

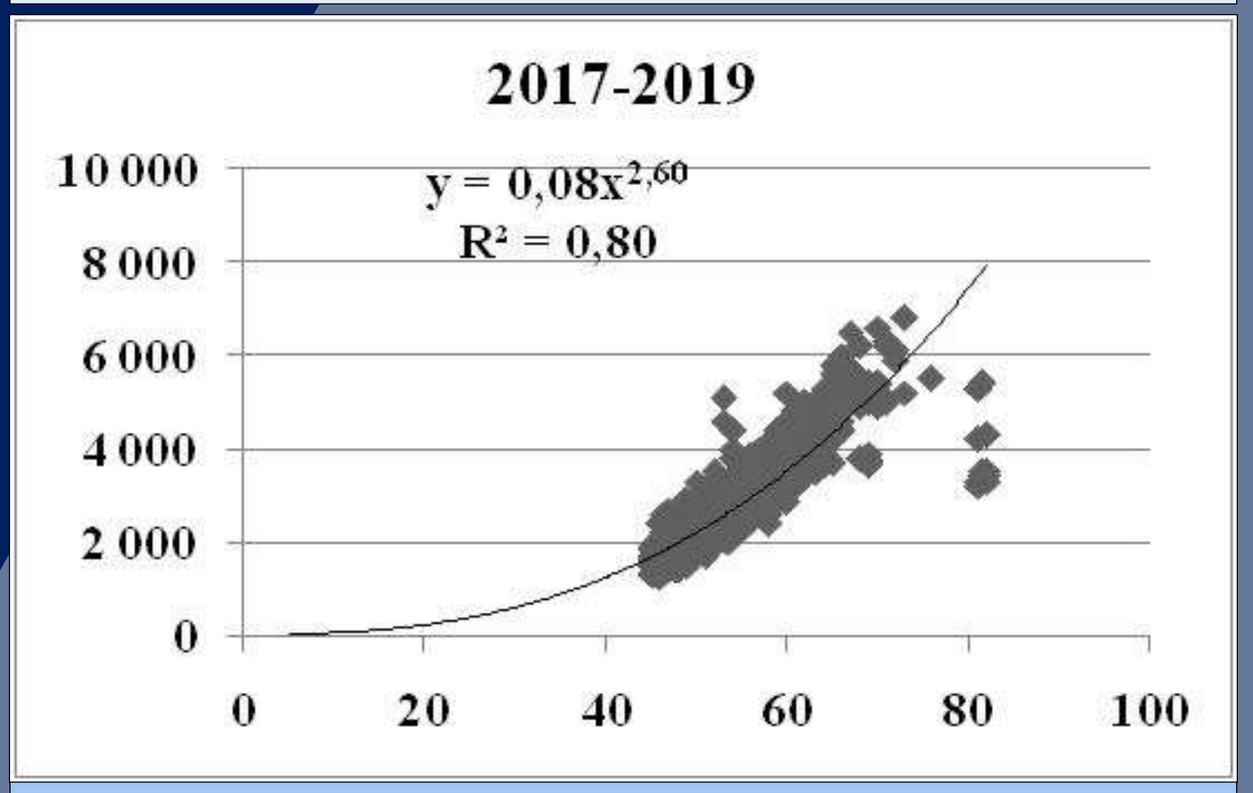

Fig. 1. Relationship between turbot size and weight for the period 2017-2019 (n=2062).

Year	N	a	b	R^2
2017	566	0.02	2.98	0.88
2018	783	0.04	2.80	0.85
2019	713	0.34	2.25	0.71
Overall	2062	0.08	2.60	0.80

Table 1. Coefficients of growth for the period 2017-2019 (n=2062).

CONCLUSION

The mean values of the body weight and total length of female fish are higher than those of male fish and the differences are statistically significant ($P<0.05$).

The size-weight parameters show a relatively small variation in the body weight (4%) and a small variation in the total length (2%) of the measured specimens.

The exponent (value "b") of the growth equation varies between 2.25 and 2.98. According to Tesch (1971) the value of "b" is between 2 and 4 for most fish. The stability of the turbot population is also confirmed by the values of the Fulton's ratio. The fish in the study had a total average value of K higher than one.

In conclusion, based on the data analyzed in the study *Psetta maxima* has healthy population in the Bulgarian coast of the Black Sea.

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