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BIOLOGICAL MONITORING OF TURBOT (*SCOPHTHALMUS MAXIMUS*) LANDINGS AT THE BULGARIAN BLACK SEA IN THE THIRD QUARTER OF 2019

Institute of Fisheries and Aquaculture, Plovdiv

Agricultural Academy, Sofia

2019

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Проект № BG14MFP001-3.003-0001-C01, „Събиране, управление и използване на данни за целите на научния анализ и изпълнението на Общата политика в областта на рибарството за периода 2017-2019 г.“, финансиран от Програмата за морско дело и рибарство, съфинансирана от Европейския съюз чрез Европейския фонд за морско дело и рибарство.



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1. Aim and objectives

The aim of the biological monitoring of the turbot catches at the Bulgarian Black Sea is to collect biological data which will be used for analysis of the catches and for the development of database for tracking the changes in their structure over the years.

The collection of biological samples, from landings of turbot, during the third quarter of 2019, included the following main objectives:

1. Collecting data for landing ports, vessels selected for sampling, number of collected samples, number of studied specimens, geographical data for the catches;
2. Determination of size-weight structure of the landings of turbot;

2. Material and methods

2.1. Collection of biological data from landings

The biological data collection is performed in the fourth quarter of 2019 at the Bulgarian Black Sea coastal zone.

2.1.1. Ports for collection of biological data

Ports where landings of turbot are permitted (Varna, Balchik, Kavarna, Pomorie, Sozopol and Tsarevo ports) are used for biological data collection.

2.1.2. Vessels for sample collection

Biological data is collected from landings from 10 vessels – 3 from Varna, 1 from Balchik, 2 from Kavarna, 2 from Sozopol, 1 from Pomorie and 1 from Tsarevo, listed in **Table 1**.

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Table 1. Ports and vessels used for monitoring and biological data collection from landings of turbot in the third quarter of 2019.

№	Ships
Port Varna	
1.	Bumerang/Vn 8250
2.	Annal/Vn 8265
3.	Egeo3/Vn 8339
Port Balchik	
4.	Vn 8112
Port Kavarna	
5.	Kv 6295
6.	Kv 6262
Port Sozopol	
7.	RK403/Bs 111
8.	Valnobor/Bs 2330
Port Pomorie	
9.	Ns997
Port Tsarevo	
10.	Karabatak/Cr 281

2.1.3. Number of collected samples

The biological data is collected from 10 turbot landings from vessels at the ports Varna, Balchik, Kavarna, Sozopol, Pomorie and Tsarevo.

2.1.4. Number of measured turbots

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The total number of fish used for biological data collection is 208, with required minimum of 300 specimens for the third and fourth quarter of 2019 under contract № Д-160/28.05.2018 with EAFA, Burgas.

2.1.5. Geographical data of the turbot catch locations

The coordinates and depth of the catch locations for each ship are shown in Table 2.

Table 2. Coordinates and depth of the turbot catch locations.

№	Ship	Coordinates of catch locations		Depth of catch locations (m)
		latitude	longitude	
1.	Bumerang/Vn 8250	43°40'55"	28°57'03"	50
2.	Anna1/Vn 8265	43°33'01"	28°48'07"	60
3.	Egeo3/Vn 8339	43°32'50"	28°48'04"	60
4.	RK403/Bs111	42°33'24"	27°55'28"	50
5.	Karabatak/Cr 281	42°13'38"	28°06'03"	50
6.	Valnobar/Bs 2330	42°35'18"	27°51'16"	40-50
7.	Vn 8112	43°28'80"	28°36'10"	60-65
8.	Kv 6295	43°38'13"	28°48'26"	60
9.	Kv 6262	42°50'32"	28°07'55"	60-65
10.	Ns 997	42°35'14"	27°51'15"	50

2.1.6. Determination of the size-weight structure of turbot landings

The measurements of the fish are made on board of the ships, immediately after docking at the port, on fresh ice-cooled subjects. The weight measurements are done with a precision of 0.1 g and the measurements of the total and standard lengths – with a precision of 0.1 cm.

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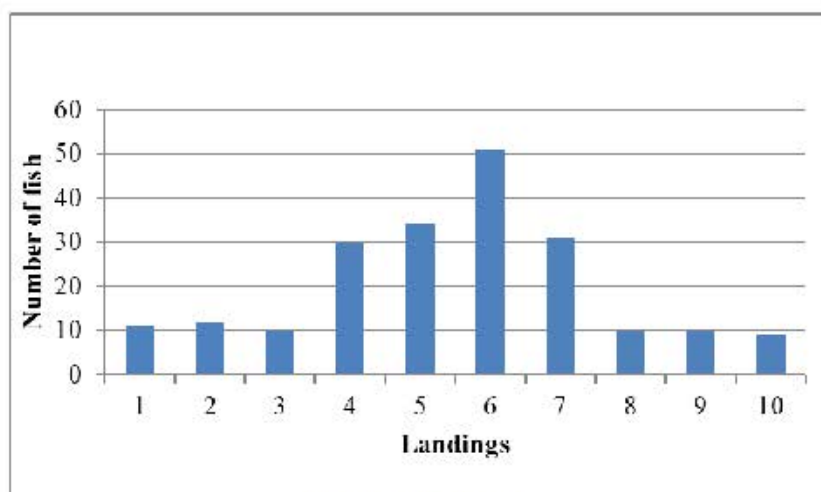
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3. Results

3.1. Number of fish caught

The total number of fish, used for biological data collection, is 208. The number of fish caught from each vessel is presented in **Fig. 1**. An average of 21 fish were caught from each ship or 50 kg/ship. The maximum catch for a ship is 51 fish (137.00 kg) and the minimum - 9 fish (19.80 kg).



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Fig. 1. Number of fish landings at ports.

3.2. Weight structure of the fish catches

The average weight of the measured specimens is 2.40 kg, the maximum measured weight is 4.60 kg and the minimum measured weight is 1.40 kg.

In **Figure 2** is presented the percentage distribution of the fish weight. It can be observed that 56 specimens, or 27% of the total number of individuals, have weight up to 2 kg, and 128 individuals, or 62%, are fish with weight from 2 kg to 3 kg. Therefore, in the landings of the monitored ports, 89% of all turbot weigh up to 3 kg within the study period. The weight group of 3 kg to 4 kg is represented by 7% and that of over 4 kg is represented by 4% of the total number of the studied fish.

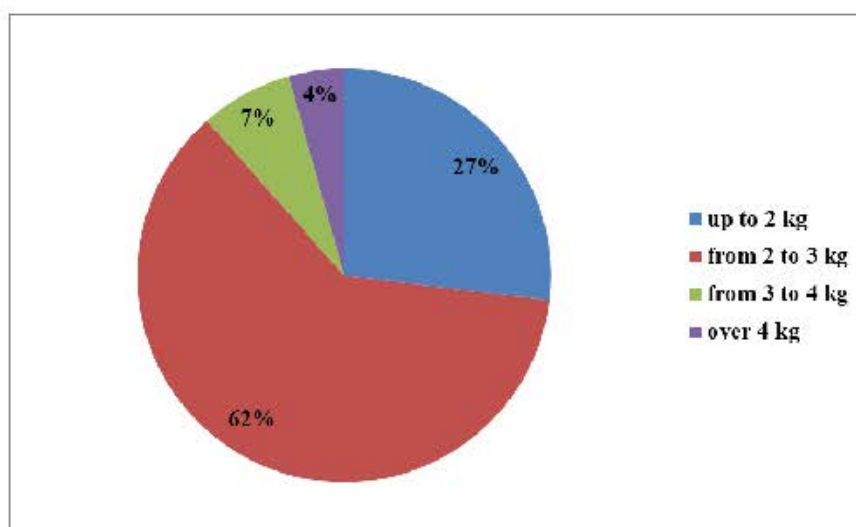


Fig. 2. Distribution of landings according to the weight of the measured fish.

3.3. Body size structure (total and standard body lengths) of turbot catches

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The average total length of the measured fish is 52.51 cm, the maximum is 82.00 cm and the minimum - 46.00 cm. The dynamics of the distribution of the values of the total length (TL, cm) of the measured specimens (at 3.0 cm intervals) is presented in **Figure 3**.

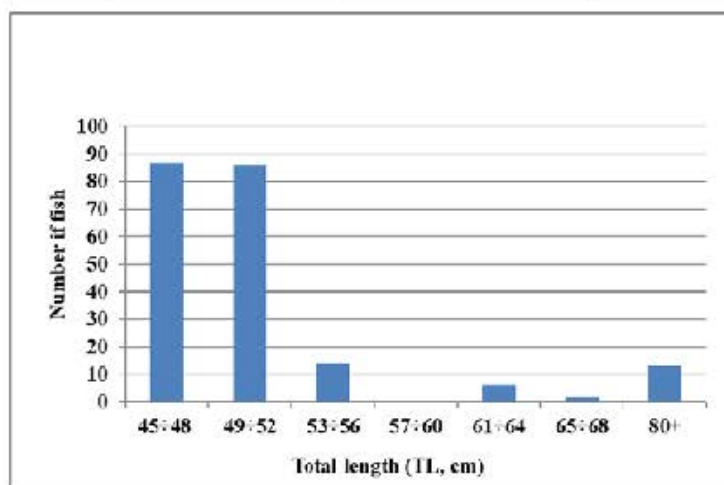


Fig. 3. Distribution of fish in different size groups (3 cm intervals) by total body lengths (TL, cm).

From the distribution of the specimens by size groups (at 3 cm intervals), it is established that the most represented are the size groups of 45-48 cm and 49-52. These groups represent 83% (173 fish) of the studied specimens.

The dynamics of distribution of the average standard length (SL, cm) of the measured specimens is presented in **Figure 4**. The average value of the standard body length (SL, cm) is 41.24 cm. The maximum measured standard length is 70.00 cm and the minimum measured standard length - 35.50 cm.

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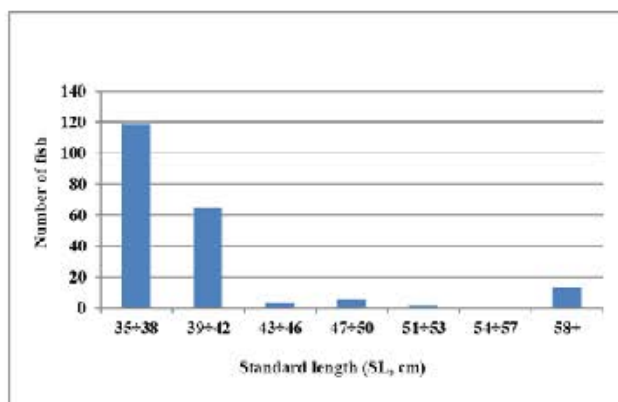


Fig. 4. Distribution of specimens in different size groups (at 3 cm intervals) by standard body length (SL, cm).

From the distribution of the specimens by size groups (at 3.0 cm) by standard lengths, it is established that the most frequently encountered is the size 35-38 cm. The largest groups are those of specimens with standard body length (SL, cm) in the range of 35-38 cm (57%) and 39-42 cm (31%). 184 fish are with standard body lengths in the 35-42 cm range are (88%).

From the results, it can be concluded that the total body length (TL, cm) of the measured fish ranged from 46.00-82.0 cm and the body weight from 1.40-4.60 kg (Fig. 5). The dominant group has a total body length from 45.10 cm to 52.00 cm and a body weight from 1.40 to 2.20 kg.

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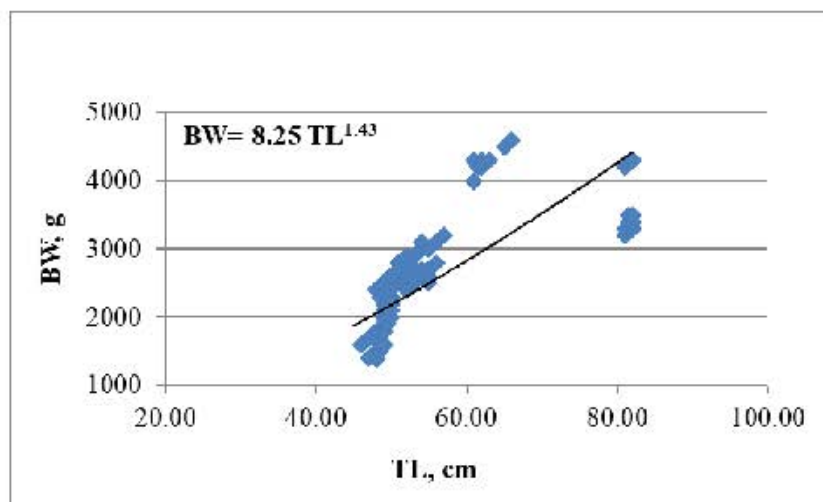


Fig. 5. Correlation between total body length (TL, cm) and weight (BW, g) of turbot (n=208).

The correlation between the total body length and weight of the turbot landings is expressed with the equation: $BW = 8.25 TL^{1.43}$.

4. Conclusions and recommendations

Based on the results of the biological monitoring of turbot landings, carried out at the Bulgarian Black Sea coast in the third quarter of 2019, we can make the following conclusions and suggest the following recommendations:

1. During the study period in 2019, the landings from the fishing ships have an average value of 21 specimens of turbot and an average of 50 kg per day. The maximum number of fish from the landings of the monitored ports is 51 fish and the minimum is 9 fish.

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2. From a total of 10 landings of the monitored ports, 208 specimens are measured with an average weight of 2.40 kg, an average total body length of 52.51 cm and an average standard body length of 41.24 cm.
3. The maximum measured weight is 4.60 kg and the minimum measured - 1.40 kg.
4. The maximum measured total length is 82.00 cm and standard length - 70.00 cm. The minimum measured total length and standard length are respectively 46.00 cm and 35.50 cm.
5. 56 specimens, or 27% of the total number of fish, have weight up to 2 kg and 128 specimens, or 62% of all studied fish, have weight from 2 kg to 3 kg. 15 specimens, or 7% of all studied fish, have weight from 3 kg to 4 kg. Specimens with weight over 4 kg are 4% of all measured fish. Therefore, from the landings of the monitored ports, around 89% of all turbot weigh up to 3 kg during the carried out monitoring.
6. From the distribution of the fish by size groups (at 3 cm) by total length, it is established that the largest size groups are those of 45-48 cm and 49-52. These groups represent 83% (173 fish) of all studied specimens.
7. The average value of the standard body length (SL, cm) is 41.24 cm. The maximum standard length measured is 70.00 cm and the minimum measured - 35.50 cm.
8. From the distribution of the fish by size groups (at 3 cm) by standard length, it is established that the largest size group is the 35-38 cm size group (57%), followed by the 39-42 cm group (31%). The specimens with standard body length in the range of 35-42 cm are 91 (31%).
9. The correlation between the size and the weight structure of the turbot landings is described with the equation: $BW = 8.25 TL^{1.43}$.

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We express our gratitude to EAFA, Burgas, Agricultural Academy, Sofia and the commercial fishing sector for their assistance during the research activities under contract № 160/25.05.2018 г. with EAFA.

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