

*Sex and Size Structure of Roach (*Rutilus rutilus*) and Bleak (*Alburnus alburnus*) Populations in Zhrebchevo Dam*

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Abstract. The purpose of the present study is to analyze the sex and size structure of roach (*Rutilus rutilus*) and bleak (*Alburnus alburnus*) populations from carp family (Cyprinidae) in Zhrebchevo Dam. The survey was conducted in February 2013. The main task of the Dam visit was to collect representatives of all fish species active in the season and caught by the fishermen. In order to obtain a representative samples of fish, was taken specimen of each species, fishermen had caught. Were got 26 sexually mature roach (7♂ and 19♀) and 27 sexually mature bleak (12♂ and 15♀). A specific feature of roach sex structure is the bigger number of females (73.08%) than males (26.92%) in the population. In the bleak (*Alburnus alburnus*) population the number of males and females is almost equal with a small predominance of the females (55.55%) over the males (44.45%). The analysis of the size structure of roach and bleak populations inhabiting Zhrebchevo Dam indicates that males are relatively smaller than females and these differences apply with accuracy of ($P \leq 0.001$) for the total body length and with accuracy of ($P \leq 0.01$) for the live weight of the examined fish species. The trend is the same within the bleak population where the differences apply with accuracy of ($P \leq 0.01$) for the total body length and with accuracy of ($P \leq 0.001$) for the live weight. Bleak's yield is 88% which is higher than the one of the roach - 16%.

Key words: population structure, roach, bleak, *Rutilus rutilus*, *Alburnus alburnus*.

Introduction

The carp family (Cyprinidae) is the richest one of freshwater species, inhabiting European water basins (KARAPETKOVA & ZHIVKOV, 2010). Roach and bleak are ones of the most common and widely spread fish species in Europe (BRYLIŃSKA, 2000). They inhabit almost every type of water basin - from large lakes and dams, coastal brackish lagoons and rivers, to micro dams and ballast pits (RACZYŃSKI *et al.*, 2008). Within the Republic of Bulgaria they are present in almost every water basin - in the Danube River and the downstream of its tributaries, in the dams: Dospat, Batak, Ovcharitsa, Koprinka, Zhrebchevo and many others.

As a result of the increased fishing activity, the density of the fish populations in the highly exploited water basins could be significantly decreased, could lead to a break into the food chain and even to extinction of some species. That occurs in most of the water basins in Bulgaria, including in the biggest artificial dam in the country - Zhrebchevo, which is not an exception.

The overfishing or the selective fishing of certain species or size (age) groups leave the other species and groups, insufficiently used. With poor management and low control over the fishing activity in the dams, lakes and rivers, some negative changes in

the fish stocks could happen (LEOPOLD & BNIŃSKA, 1987), which will also affect the biological features of the highly exploited fish populations (like the carp family, including roach, bleak, bream and crucian carp).

The growth is one of the most important features of the living creatures. There are many definitions of growth, but still it could be defined as a change or a development of a community or a single organism for a certain time period (GUNEL, 1978). Fishes grow in length and increase their weight by the end of their life. The assessment of their age and growth rate is necessary from theoretical and practical point of view. All studies show that females from Carps family grow faster, than males (WIĘSKI & ZAŁACHOWSKI, 2000).

The purpose of the present study is to analyze the sex and size structure of roach (*Rutilus rutilus*) and bleak (*Alburnus alburnus*) populations from carp family (Cyprinidae) in Zhrebchevo Dam.

Material and Methods

The Zhrebchevo Dam is located in Southeastern Bulgaria and its geographic coordinates are 42° 36' 56" N, 25° 51' 33". Its surface area is 25 km² and the maximum depth is 50.50 m. Its waters have been used as a source of irrigation and as a place for recreation. There are more than 15 freshwater fish species, including roach and bleak.

The survey was conducted in February 2013. The main task of the Dam visit was to collect representatives of all fish species active in the season and caught by the fishermen. During the season observed, because of the wintering, fishes are grouped in some specific areas in the water basins which areas form also the places of sampling. The samples were collected from the farm cages of company "Forest Group" Ltd., the town of Shivachevo, in the "Zhaltata stena" region, near the village of Panicherevo, the municipality of Gurkovo. (Fig. 1).

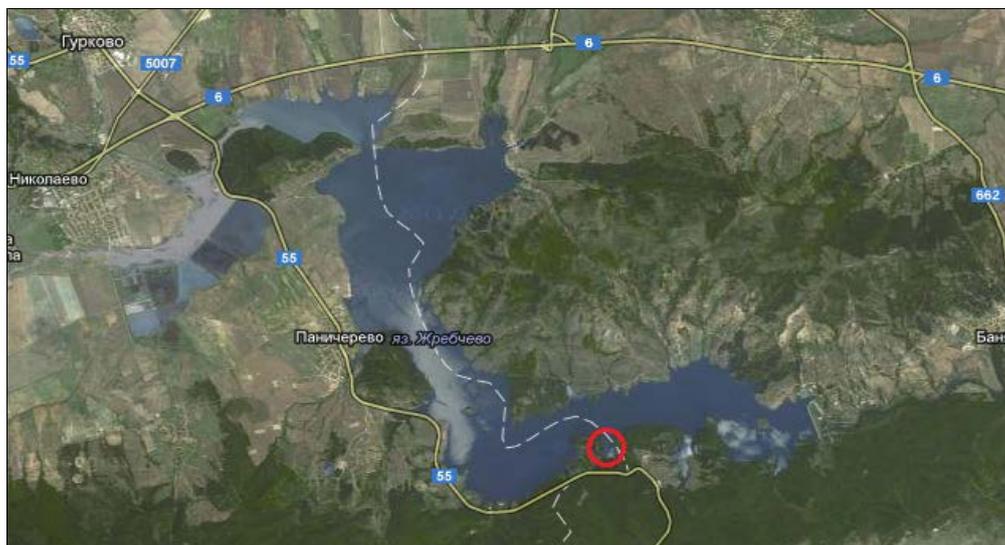


Fig. 1. Map of Zhrebchevo Dam

In order to obtain a representative samples of fish, was taken specimen of each species, fishermen had caught. Were got 26 sexually mature roach (7♂ and 19♀) and 27 sexually mature bleak (12♂ and 15♀). During the collection process, the samples of each species were put in polyethylene bags with labels, indicating the place and date of collection. All collected and labeled

samples were transported to the laboratory in a fridge bag, full of ice (GEORGIEV *et al.*, 2003; MATEV & GEORGIEV, 2007).

The sex of the fishes was defined in the lab and the total body length (longitudo totum corporis-L, mm), the standard body length (longitudo corporis-l, mm), the trunk length (T, mm), the head length (longitudo capitis-C, mm), the body height (altitudo

corporis maxima-H, mm), the body width (latitudo corporis-D, mm) and the circumference (O, mm) were measured with accuracy up to 1 mm. The body measurements of the roach and bleak were conducted, according to Pravdin's scheme, proposed in 1966 for measuring of carp species. The live weight of the fishes (W, g) was weighed, using an electronic scale, with accuracy up to 0,1g so was the yield (%). The linear measurements (mm) were carried out, using a measuring board, a triangle and a tape.

The Statistical processing of the data was made, using software Statistica 7 (STATSOFT INC., 2004).

Results and Discussion

A specific feature of the sex structure of roach population, shown on Fig. 2 is the bigger number of females (73.08%), than males (26.92%) in the population. In the bleak (*Alburnus alburnus*) population, the number of males and females is almost equal, with a small predominance of the females (55.55%) over the males (44.45%). The trend in both studied populations supposes an increase, dynamic changes and growth of the number of the respective individuals. The examined sex structures of roach and bleak populations in Zhrebchevo Dam is in compliance with the values, defining the size structure of the roach populations in "Modrac" lake in Bosnia and Herzegovina, obtained by [ADROVIC et al. \(2009\)](#).

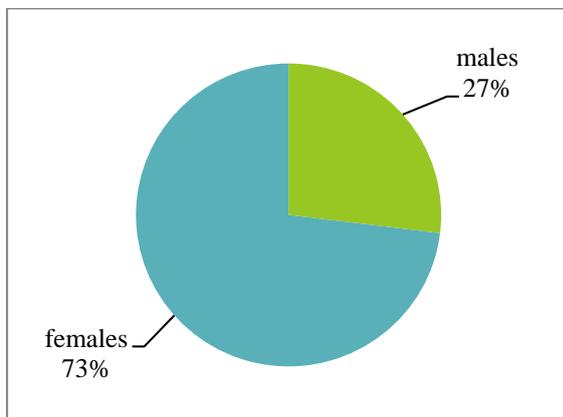


Fig. 2 Sex structure of roach population in Zhrebchevo Dam

The average body measurements of roach (*Rutilus rutilus*) population, inhabiting Zhrebchevo Dam are presented in Table 1. The total body length of the studied roach is 206.90 ± 22.20 mm and the respective values vary between 155-258 mm. The longest body height is 64.20 ± 8.40 mm, with a variation between 45 and 85 mm. The largest body width is 28.00 ± 4.40 mm, where the minimum is 20 mm and the maximum - 38 mm. The average live weight of the roach is 127.15 ± 43.70 g, where the minimum is 44 g and the maximum is 250 g. The yield obtained by the roach population is $72.19 \pm 2.85\%$.

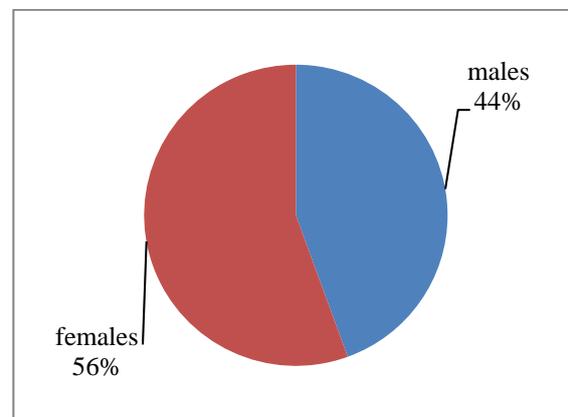


Fig. 3 Sex structure of bleak population in Zhrebchevo Dam

The linear measurements of the males in the roach population are significantly smaller, than those of the females (Table 1). Male's total body length is 16.22% smaller, than the one of the females and these differences apply with accuracy of ($P \leq 0.001$). The same is valid for the standard body length, the trunk length, the body height and circumference. Males' live weight is 64.50% lower, but their yield is approximately 4% bigger, than the one of the females with accuracy of ($P \leq 0.01$).

The data presented in Table 1 show that the studied body measurements and their average values are within the range, observed also and reported by other authors with no significant deviations. The results of the present study are comparable to those of [ADROVIC et al. \(2009\)](#), who studied the roach

population in "Modrac" lake (Bosnia and Herzegovina) and of MARKOVIC *et al.* (1996),

who studied the roach population in Western Morava River (Serbia).

Table 1. Body measurements of roach (*Rutilus rutilus*) populations in Zhrebchevo Dam

Parameters	n	Average for population Mean±SD	n	Males		Females	
				Mean±SD	n	Mean±SD	n
Total body length, mm	26	206.90±22.20	7	185.00±19.24	19	215.00±17.49***	
Standard body length, mm	26	169.70±18.20	7	151.29±18.24	19	176.47±12.93***	
Trunk length, mm	26	87.20±10.00	7	76.00±7.39	19	91.37±7.38***	
Head length, mm	26	35.30±3.60	7	32.14±3.58	19	36.42±2.85**	
Body height, mm	26	64.20±8.40	7	55.86±6.79	19	67.32±6.77***	
Body width, mm	26	28.00±4.50	7	24.57±3.41	19	29.32±4.91*	
Circumference, mm	26	142.70±18.70	7	124.4±14.80	19	149.37±15.31***	
Live weight, g	26	127.15±43.73	7	86.42±30.88	19	142.16±38.16**	
Live weight without scales, internal organs and gills, g	26	91.58±31.34	7	64.85±23.61	19	101.42±28.25**	
Yield, %	26	72.19±2.85	7	74.94±2.63	19	71.18±2.24**	

*** P≤0.001; ** P≤0.01; * P≤0.05.

The average body measurements of bleak (*Alburnus alburnus*) population, inhabiting Zhrebchevo Dam are presented in Table 2. Bleak's total body length is 156.60±7.00 mm and the respective values vary between 145-170 mm. The longest body height is 34.80±1.60 mm, with a variation between 30 and 37 mm. The largest body width is 15.40±0.90 mm, where the minimum is 13 mm and the maximum - 17 mm. Bleak's average live weight is 32.63±4.73 g, where the minimum is 23 g and the maximum is 42 g. The yield obtained from bleak's population is 88.00±2.26%.

The differences in the body measurements of bleak's population from Zhrebchevo Dam are relatively smaller, than the ones from the roach population (Table 2), but still males remain smaller, than females. Males' total body length is 5.14% smaller, than the one of the females and the differences apply with accuracy of (P≤0.01). The same is valid for the standard body length and the trunk length. Males' live weight is 18.10% lower with accuracy of (P≤0.001). In view of the yield, males' predominance is not as distinctive as it is in the roach population. It's less than 1%.

Table 2. Body measurements of bleak (*Alburnus alburnus*) population in Zhrebchevo Dam

Parameters	n	Average for population Mean±SD	n	Males		Females	
				Mean±SD	n	Mean±SD	n
Total body length, mm	27	156.60±7.00	12	152.25±5.89	15	160.07±5.81**	
Standard body length, mm	27	131.00±7.20	12	126.92±6.30	15	134.27±6.33**	
Trunk length, mm	27	55.40±4.10	12	52.92±3.18	15	57.47±3.58**	
Head length, mm	27	25.70±1.30	12	25.33±0.98	15	26.00±1.41	
Body height, mm	27	34.80±1.60	12	34.67±1.61	15	34.93±1.67	
Body width, mm	27	15.40±0.90	12	15.00±0.95	15	15.73±0.70*	
Circumference, mm	27	75.50±5.20	12	73.17±4.59	15	77.40±4.93*	
Live weight, g	27	32.63±4.73	12	29.50±3.61	15	35.13±4.03***	
Live weight without scales, internal organs and gills, g	27	28.70±4.20	12	26.08±3.09	15	30.80±3.84**	
Yield, %	27	88.00±2.26	12	88.49±1.92	15	87.61±2.49	

*** P≤0.001; ** P≤0.01; * P≤0.05.

The results for bleak's total body length and live weight, compared with those of RAIKOVA-PETROVA (2009) (L=130 mm and W=19 g) from the study of the "Chepintsi" ballast pit show that bleak, collected from Zhrebchevo Dam have much bigger size.

The analysis of the size structure of roach and bleak populations, inhabiting Zhrebchevo Dam indicates that males are relatively smaller, than females and these differences apply with accuracy of ($P \leq 0.001$) for the total body length and with accuracy of ($P \leq 0.01$) for the live weight of the examined fish species. The trend is the same within the bleak population, where the differences apply with accuracy of ($P \leq 0.01$) for the total body length and with accuracy of ($P \leq 0.001$) for the live weight.

Bleak's yield is 88% which is higher, than the one of the roach - 16%.

Conclusions

A specific feature of roach sex structure is the bigger number of females than males in the population. In the bleak population the number of males and females is almost equal with a small predominance of the females over the males.

The analysis of the size structure of roach and bleak populations inhabiting Zhrebchevo Dam indicates that males are relatively smaller than females.

With regard to the ecological importance of the bleak and roach, which are the main target species of the fishing in Zhrebchevo Dam, especially during the winter and spring season, more attention should be paid to the study of their ecological features. More attention deserves also the meat quality since a significant part of the catches are being consumed. Roach and bleak in Zhrebchevo Dam, just like many other fish species in Bulgaria, have not been studied enough in this aspect.

The further researches should pay more attention to these and other fish species due to their environmental and general features. In order to obtain more accurate information, some additional studies should be performed with a focus on the

morphology, nutrition, growth and meat quality of these species.

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