Some Biological Aspects of the Crucian Carp, *Carassius gibelio* Bloch, 1782 Inhabiting in Eğirdir Lake

Derya BOSTANCI*[1] Nazmi POLAT[2] Mahmut AKYÜREK[3]

[1] Department of Biology, Faculty of Science and Arts, Ordu University, Perşembe, 52750, Ordu, Turkey

[2] Department of Biology, Faculty of Science and Arts, Ondokuz Mayıs University, Kurupelit, 55139, Samsun, Turkey

[3] Fisheries Research Institute, Elazığ, Turkey

* Corresponding Author
e-mail: deryabostanci@gmail.com

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Abstract

This study was carried out between March 2001 to January 2003 in Eğirdir Lake. A total of 283 *Carassıus gibelio* specimens were monthly collected and examined. It was determined that 40.64% of the samplings were females (n=115) and 59.36% males (n=168). The measured mean fork length and weight values for females, males and combined sexes were 19.29±0.46cm, 236.6±15.8g; 19.34±0.37cm, 217.9±10.5g; 19.32±0.28cm, 225.5±8.97g respectively. In addition to this, the calculated length-weight relationships were $W=0.012*FL^{3.266}$ for females, $W=0.0174*FL^{3.121}$ for males, $W=0.0151*FL^{3.177}$ for pooled data. According to montly changes of Gonadosomatic Index and Fulton's Condition factor values spawning were occurred between April and December.

Key words: *Carassius gibelio*, Length-weight relationship, Gonadosomatic Index, Condition Factor, Eğirdir Lake

INTRODUCTION

The crucian carp, *Carassius gibelio* Bloch, 1782 have distributed in East Asia-Siberia and widely spread throughout Europe [1] and also in Turkey. In Turkey, an omnivorous freshwater fish feeding on plants, detritus and animals has lived in freshwater and lagoon lakes, ponds and streams[2]. Crucian carp is a polycyclic species with multiple spawning periods at different sites; the number of portions of spawned eggs varies from two to five [3-5].

This species has commercial importance for fishing and has been distributing fastly in Turkey. Despite its importance, there is inadequate published information about biology of fish on different water systems. The number and structure of chromosomes of *C. auratus* have been investigated, and karyotype has been determined living Kızılırmak [6]. Özuluğ [7] and Şaşı and Balık [8] have evaluated some taxonomic characteristics inhabiting Basin of Büyükçekmece Dam Lake and Topçam Dam Lake, respectively. Additionally, meat yield and shelf-life have been determined by Ünlüsayın *et al.* [9]. Some biological characteristics have been investigated in Eğirdir Lake population by İzci [10] and Balık *et al.* [11]. Bostancı [12] evaluated age determination and the effects of water temperature, feeding, spawning activity on annulus formation period of bony structures from the two ecologically different lakes, Eğirdir and Bafra Fish Lakes. In addition to this, three age readings were done in five bony structures obtained from Bafra Fish Lakes and in six from Eğirdir Lake; vertebra was found to be the reliable bony structure for Bafra Fish Lake population and sagitta for Eğirdir Lake [12]. Therefore this study aims to determine the gonadosomatic index, condition factor and length-weight relationship of the Crucian carp, *Carassıus gibelio* Bloch, 1782 inhabiting Eğirdir Lake.

MATERIALS AND METHODS

The samples of crucian carp were collected from Eğirdir Lake (38º15' N–30º52' E) that is a secondary biggest freshwater lake in Turkey (Figure 1). This lake is tectonic and oligotrophic in the region with a total area of 46.800 ha, a maximum depth of 15 m, and is located 918 m above sea level. The monthly mean water temperatures were measured at the time of sampling in Eğirdir Lake (Figure 2).

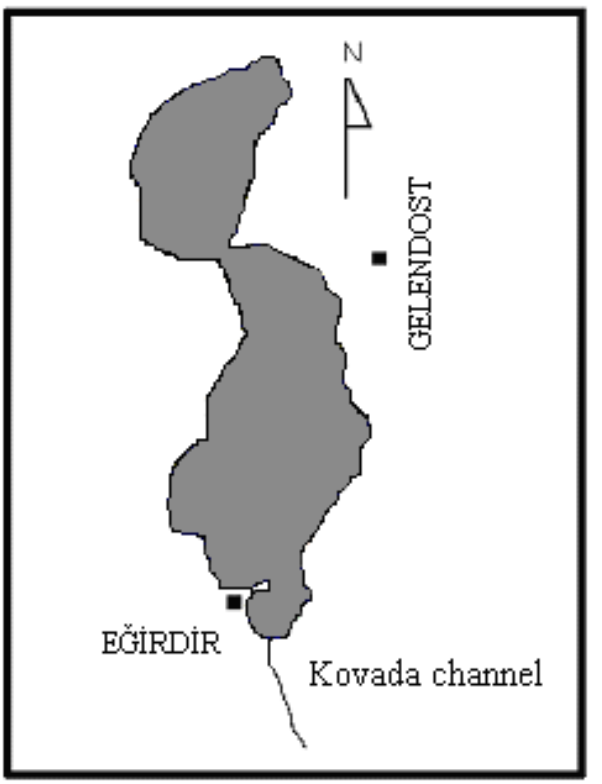


Figure 1. The map of Eğirdir Lake

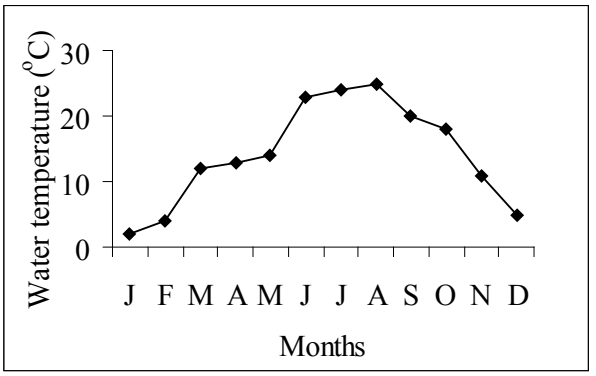


Figure 2. The mean water temperatures of Eğirdir Lake

A total of 283 specimens from Eğirdir Lake between March 2001-January 2003 were caught by nets with a mesh size ranging from 18 mm to 32 mm at monthly intervals. The captured fish numbers were given in Table 1. All specimens were measured to the nearest millimeter in fork length (FL) and to the nearest gram in body weight (BW). The sex of all specimens was recorded by macroscopic examination of the gonads and the masses of the gonads (GW) were determined to the nearest 0.1 g from the specimens.

Table 1. The distribution of specimens according to months

	♀	♂	♀+♂
January	5	3	8
February	7	5	12
March	6	30	36
April	16	18	34
May	8	10	18
June	6	6	12
July	13	17	30
August	12	23	35
September	23	29	52
October	7	7	14
November	2	12	14
December	10	8	18
Total	115	168	283

The length-weight relationship, the Fulton's Condition Factor (CF) and the Gonadosomatic Index (GSI) was calculated by using the formula for females, males and combined sexes [13]:

$W = a*L^b$

$CF=(W/L^3)*100$

$$\% GSI = \frac{GW}{BW - GW} \times 100$$

RESULTS

A total of 283 individuals was sampled during the study period. The smallest individual at 8.2 cm and 17 g was obtained September 2001; the biggest at 28.1 cm and 732 g was found in April 2002. It was determined that 40.64% of the samplings were females (n=115) and 59.36% males (n=168).

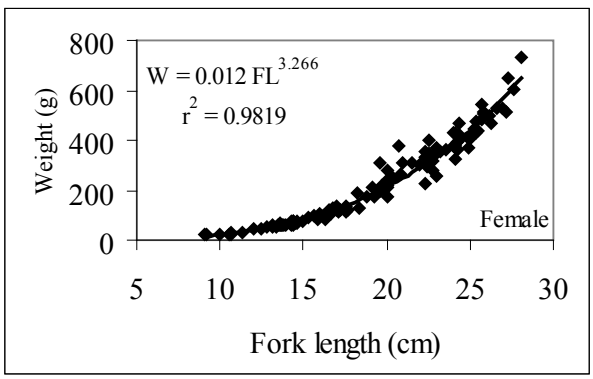
Mean fork length and weight were presented in Table 2. As can be seen table 2, fork length ranged from 9.1 to 28.1 cm for females, 8.2 to 26.7 cm for males and 8.2 to 28.1 cm for combined sexes. The weight ranged from 19 to 732 g for females, 17 to 495 g for males and 17 to 732 g for combined sexes.

The equations of the length-weight relationship (Figure 3) were determined by using the length and weight of the samples as follows:

For females $W=0.012*FL^{3.266}$ $r^2=0.98$

For males $W=0.0174*FL^{3.121}$ $r^2=0.98$

For the combined sexes $W=0.0151*FL^{3.177}$ $r^2=0.98$



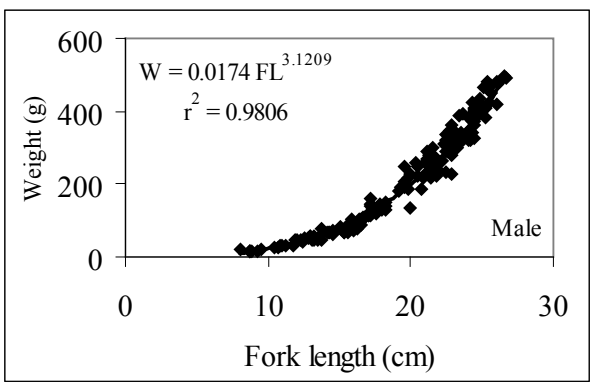


Table 2. Fork length (cm), weight (g) and length-weight relationship parameters for females, males and combined sexes

	n	Mean fork length±s.e (min-max)	Mean weight±s.e (min-max)	a	b	r^2
♀	115	19.29±0.46 (9.1-28.1)	236.6±15.8 (19-732)	0.012	3.266	0.98
♂	168	19.34±0.37 (8.2-26.7)	217.9±10.5 (17-495)	0.0174	3.121	0.98
♀+♂	283	19.32±0.28 (8.2-28.1)	225.5±8.97 (17-732)	0.0151	3.177	0.98

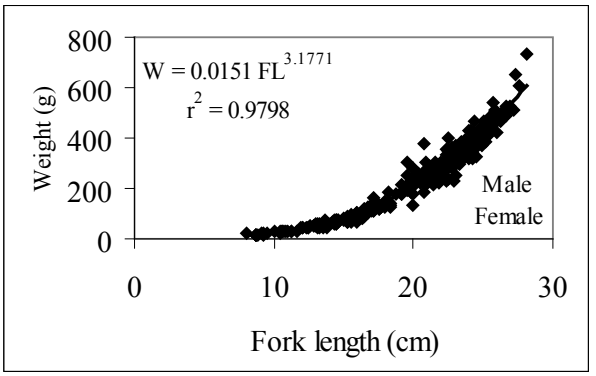


Figure 3. Length-weight relationships of females, males and combined sexes

Montly changes of the Gonadosomatic Index values have been showed in Figure 4. Male, female and combined sexes have the maximum and minimum values in March and August, respectively. The hightest GSI in March means that spawning activity is going to start after this month. In the following months, GSI value decreased slowly but after the August it increased again until January. Females with flowing eggs were found in this lake throughout the year, however, the majority of spawning activity occurred from April to December.

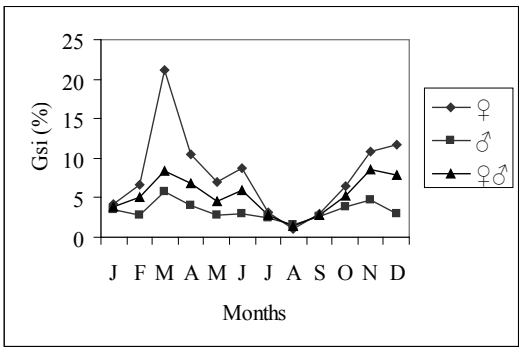


Figure 4. Monthly changes of gonadosomatic index

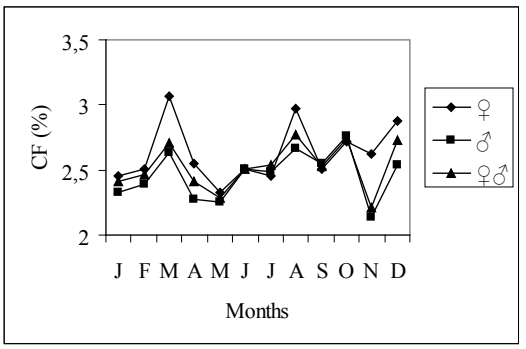


Figure 5. Monthly changes of condition factors

The mean condition factor was calculated as 2.631 for females, 2.461 for males and 2.525 for combined sexes. The condition factors of all specimens according to their monthly changes have been showed in Figure 5. The differences in the condition factors between males and females were not statistically significant (P>0.05).

DISCUSSION

The crucian carp was introduced into the Eğirdir Lake at the beginning of the 1990s [11] and the population increased rapidly in the lake. In addition, it is known that this fish distributed rapidly in Turkey and during this study it was the dominant fish species.

The slope (b) values of the length-weight relationship in both sexes (b=3.266 for females, b=3.121 for males and b=3.177 for combined sexes) have been showed that weight increased allometrically with length. Length-weight relationship data obtained for *Carassius gibelio* inhabiting the different area have been showed in Table 3. It is seen that "b" values varied from 2.8748 to 3.1771 and it is determined that there was no significant differences (P>0.05). It is known that geographic location, environmental condition, stomach fullness, disease and parasite loads can effect length-weight relationship [14].

The GSI for Eğirdir Lake specimens ranged from 1.13% to 21.16% (Figure 4). The hightest GSI in March (21.16%) means that spawning activity is going to start after the this month. In the following months, GSI value decreased slowly but after the August it increased again until January. Kizina [3], Gudkov [4], Pipoyan and Rukhkyan [5] reported that the crucian carp had the multiple spawning periods at different sites and the number of portions of spawned eggs varies from two to five. In this study, females with flowing eggs were found in this lake throughout the year and the fluctuation of GSI along the year supported this conception.

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Table 3. Estimated length-weight relationships for *Carassius gibelio* from different area

Location	n	Length	a	b	r^2	Author
Volga Delta	710	10-31	0.0667	2.8748	-	Kizina, 1986
Eğirdir Lake	616	9-33	0.0165	3.152	0.99	Balık et al, 2004
Eğirdir Lake	342	-	0.0210	3.0598	0.94	İzci, 2004
Bafra Fish Lake	173	16.9-30	0.0265	2.978	0.94	Unpublished data
Eğirdir Lake	283	8.2-28.1	0.0151	3.1771	0.98	This study

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