

Reproduction Biology of *Mastacembelus simack* (Walbaum, 1792) inhabiting Karakaya Dam Lake (Malatya, Turkey)

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Abstract

In this study, the sexual maturity, spawning season and fecundity of *Mastacembelus simack* (Walbaum, 1792) inhabiting Karakaya Dam Lake, Malatya were determined between February 2002 and January 2003. It has been found that males reached the first sexual maturity in II. age groups, whereas female reached in I. age groups and thus their spawning period was in June – July. The correlation coefficients between egg numbers and body weight ($r = 0.78$), egg numbers and body length ($r = 0.83$). Egg diameters ranged between 0.22 and 2.10 mm with 1.05 ± 0.09 average.

Key words: *Mastacembelus simack*, Reproduction, fecundity, egg diameter, Sexual maturity age.

INTRODUCTION

This species generally carries the whole characteristics of the Mastacembelidae with a thin and long body structures. On its prolonged head, there is a dangling trunk like, three leveled salient flesh on the brink of the nose. They have well-developed sharp teeth on the jaws. There are 32 to 34 separately located spines between dorsal fin and the head. Three of these spines are also seen in front of the anal fin. They have no ventral fin [1]. The one before the last spine on the dorsal and the one right in the middle of the anal, respectively, the longest spines of all. Their scales, though small, can be seen all over the body, particularly under their eyes and rear nasal holes [2]. Their general habitat is muddy and sandy environments where there is plenty of vegetation. In the day time, they hide inside the vegetation or bury themselves in the mud on the bottom, while in the nights, they come out of their nests and wander around. Detailed information about their biology is quite limited. The furthest boundary of the distribution point for this species in West Asia is the Eastern Anatolia Region, and they live in River Tigris and River Euphrates [1]. *Mastacembelus simack* with related to systematic information [3-10], heavy metal accumulation [11] and some biological features [12] have been studied. But there is not any study on its reproduction biology. So the present study is to fill a gap on this subject.

MATERIAL AND METHODS

Karakaya Dam Lake (Fig. 1), is the third largest dam lake on the River Euphrates (in respect to the surface area of lake) right after Keban Dam Lake and Karakaya Dam is situated 166 km downstream Keban Dam, in the locality of Seki Bağları, near the country of Çüngüş of Diyarbakır province. Apart from Euphrates as the main river, Sultansuyu, Tohma Brook, and other small brooks and streams join Karakaya Dam Lake [13].

This study was carried out between February 2002 and January 2003. During this time, 187 specimens of *Mastacembelus simack* (Walbaum, 1792) were examined. Fish specimens were caught by gill-nets with mesh-size ranging from 22 to 36 mm.

After measuring the total length (mm) and weight (g) of the fish, vertebra samples were taken with the purpose of age determination, and their ages were determined under a microscope (Nikon YS2-H) according to method in [14]. Gonads were taken and weighed, and egg counting was performed [15], and egg diameter (mm) was measured [16]. In order to find out spawning period of the fish, the following equation given by Avşar, [17] was used;

$$\text{Gonado-somatic index (IG)} = \left[\frac{\text{Gonad weight}}{\text{Body weight} - \text{Gonad weight}} \right] \times 100$$

Office Excel 2003 package program (Microsoft Corporation Inc.) was used to perform the statistical analysis of the data obtained during the research.

Egg numbers and body length relation, and body weight, ovary weight and egg diameter relation, and age and egg diameter relations were studied, and the correlation coefficient of these relations were interpreted according to Hayran & Özdemir, [18].

RESULTS

During the study, 187 *Mastacembelus simack* specimens were gathered from Karakaya Dam Lake, and the distribution of these based on age groups and sexes are shown in Table 1. It has been seen that 47.06% of the specimens are females, while 52.94% are males. Age groups of the population ranged from I to IX, and male fish in the age group IV compose the majority of the population. In general, male fish numbers were more than female fish numbers in all age groups.

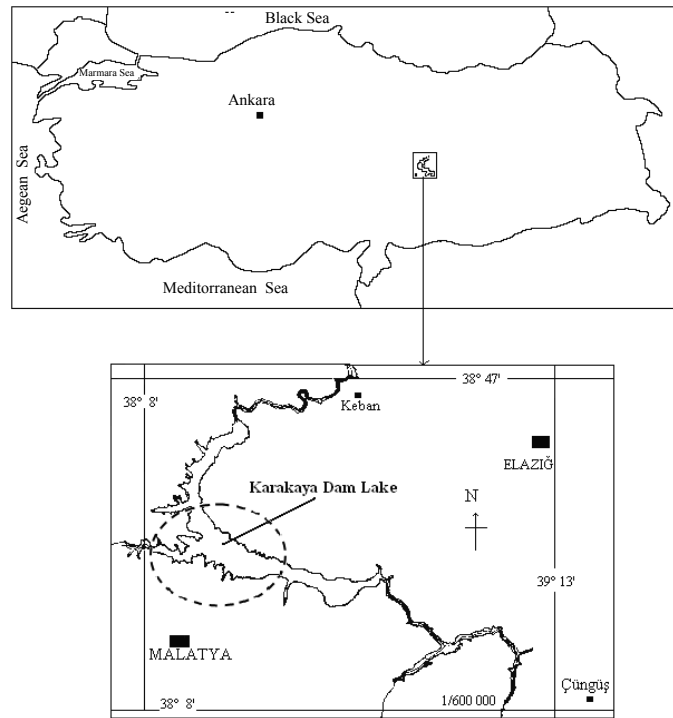


Figure 1. Study area Karakaya Dam Lake, Malatya.

Table 1. Age and sex compositions of *M. simack* population inhabiting Karakaya Dam Lake.

Age groups	Female		Male		Female + Male		Male / Female Rate
	N	%	N	%	N	%	
I	4	2.14	1	0.54	5	2.67	0.25 : 1
II	24	12.83	5	2.67	29	15.51	0.21 : 1
III	18	9.63	13	6.95	31	16.58	0.72 : 1
IV	18	9.63	25	13.37	43	22.99	1.39 : 1
V	14	7.48	17	9.09	31	16.58	1.21 : 1
VI	6	3.21	21	11.23	27	14.44	3.5 : 1
VII	2	1.07	10	5.35	12	6.42	5 : 1
VIII	2	1.07	5	2.67	7	3.74	2.5 : 1
IX	-	-	2	1.07	2	1.07	-
Total	88	47.06	99	52.94	187	100	1.12 : 1

Gonado-somatic Index (IG)

In order to determine the reproduction period of *M. simack* population, the average gonado-somatic index (IG) values of each sex and every individual were calculated on a monthly basis, and these values are shown in Table 2 and Figure 2. It has been found that the IG values of female individuals ranged from 0.012 to 21.48%, and the mean value was estimated to be 1.13 ± 0.46 , while IG values of male individuals ranged from 0.06 to 3.65%.

It has been observed that IG values of *M. simack* individuals reached the maximum level at the beginning and then they scattered their eggs and sperms in June and July (Table 2, Fig. 2). The secondary sex feature has not been seen in the fish during the reproduction period.

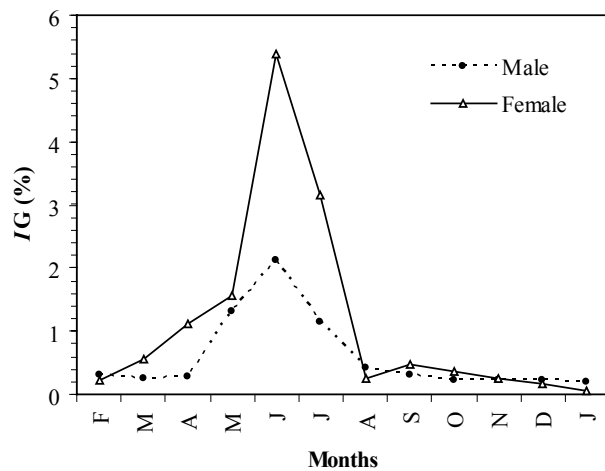


Figure 2. Monthly distribution of mean IG values of *M. simack* population inhabiting Karakaya Dam Lake.

Table 2. Gonadosomatic Index (IG) values of male and female individuals of *M. simack* population inhabiting Karakaya Dam Lake.

Months	IG (Male)					IG (Female)				
	N	Min.	Max.	Avr.	S.E.	N	Min.	Max.	Avr.	S.E.
February	3	0.272	0.344	0.301	0.022	7	0.073	0.416	0.236	0.042
March	5	0.114	0.363	0.261	0.043	7	0.225	1.552	0.569	0.188
April	5	0.193	0.389	0.279	0.045	6	0.357	2.376	1.115	0.343
May	11	0.191	2.496	1.322	0.267	11	0.100	6.227	1.573	0.557
June	18	0.343	3.656	2.131	0.215	18	0.012	21.487	5.374	1.328
July	31	0.381	2.829	1.135	0.117	10	0.143	21.389	3.146	2.030
August	6	0.061	1.199	0.425	0.171	3	0.089	0.418	0.248	0.095
September	8	0.069	1.082	0.313	0.249	9	0.050	0.966	0.485	0.105
October	2	0.129	0.307	0.217	0.063	8	0.131	1.281	0.369	0.131
November	4	0.122	0.412	0.225	0.065	7	0.192	0.296	0.249	0.014
December	3	0.144	0.256	0.212	0.034	1	0.165	0.165	0.165	-
January	3	0.067	0.251	0.191	0.062	1	0.067	0.067	0.067	-

Egg diameters of only 28 females of 87 females from *M. simack* population were measured. The monthly changes in the egg diameters are shown in Table 3 and Fig. 3. The biggest egg diameter of *M. simack* individuals was measured as 2.10 mm in June, while the smallest average egg diameter was measured as 0.22 mm in September. However it was not possible to determine the egg diameters of females in February, August, November, December and January.

Table 3. Monthly distribution of egg diameters of *M. simack* individuals (mm) inhabiting Karakaya Dam Lake.

Months	Fish Number	Minimum (mm)	Maximum (mm)	Average±S.E. (mm)
March	2	0.67	0.74	0.71±0.035
April	3	0.66	0.74	0.71±0.027
May	5	0.70	1.30	0.94±0.103
June	15	0.60	2.10	1.24±0.122
July	1	1.80	1.80	1.80 -
September	1	0.22	0.22	0.22 -
October	1	0.70	0.70	0.70 -

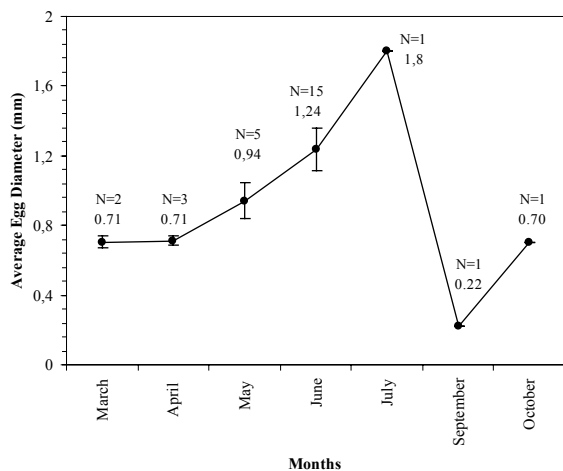


Figure 3. Monthly changes in the mean egg diameter of *M. simack* inhabiting Karakaya Dam Lake.

Egg Production (Fecundity)

With the purpose of establishing the fecundity, the total number of eggs present in the ovaries of 28 females was used. A positive, strong correlation was found between number of eggs and body weight ($Y = 27.048X + 2079.1$, $r = 0.78$) (Fig. 4). Also it has been seen that number of eggs ranged from 1517 to 27944, and the average number is 6135 ± 1097.43 . A positive, strong correlation was found between number of eggs and body length (Fig. 5). The equation explaining this correlation and the correlation coefficient were calculated as $Y = 41.886X - 9462.9$ and $r = 0.83$, respectively.

A positive, strong correlation was found between number of eggs and age group (Fig. 6). The equation explaining this correlation and the correlation coefficient were calculated as $Y = 3954.4X - 4641.6$ and $r = 0.90$, respectively.

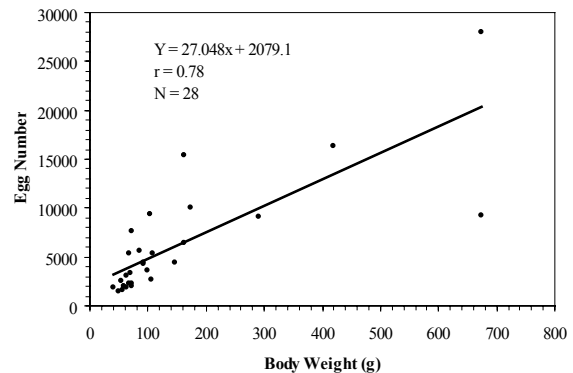


Figure 4. Relationships between body weight and egg number of female *M. simack* inhabiting Karakaya Dam Lake.

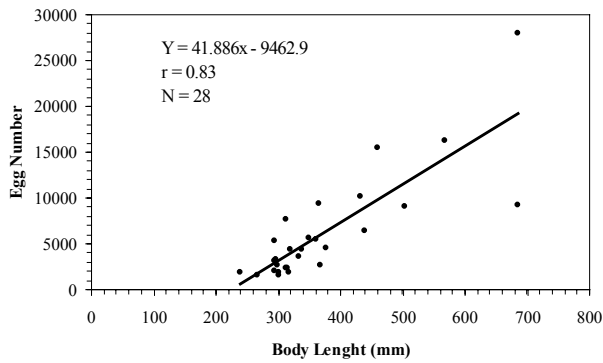


Figure 5. Relationships between body length and egg number of female *M. simack* inhabiting Karakaya Dam Lake.

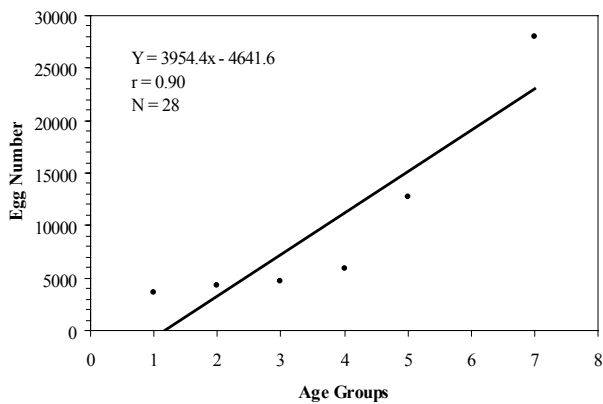


Figure 6. Relationships between age groups and egg number of female *M. simack* inhabiting Karakaya Dam Lake.

DISCUSSION

In this study, 187 individuals from *M. simack* population in Karakaya Dam Lake, Malatya were examined in February 2002 and January 2003. It has been seen that the age groups ranged from I to IX. While 47.06% of specimens consists of female individuals, 52.94% of them consist of male individuals. The specimens range from age group II, III, IV and V with age group IV forming the majority.

Kılıç, [12] examined the biologic features of *Mastacembelus simack* living in Sultansuyu Stream, Beyler Stream and Karakaya Dam Lake, and found that total 66 fish specimens consisted of females, males and indefinite sex by rates of 28.79%, 57.58% and 13.36% respectively, and the age groups of specimens ranged from 0 to VII. The majority of the specimens taken in 0 age group with 26 fish and followed by age groups III and IV.

The term sexual maturity is used for those fish spawning for the first time. The age when the ratio of sexually mature fish to the immature ones reaches to 50% indicates the first sexual maturity age for that stock [17].

It has been seen that all of 4 (100%) female individuals at the age of I. caught from *M. simack* population have reached sexual maturity. It has also been seen that all of 5 (100%) male *M. simack* individuals at the age of II. caught in the lake have reached the sexual maturity and male individuals of the population reach sexual maturity at the age of II.

Lagler et al., [19] have reported that the age of reaching sexual maturity is influenced by some factors such as species difference, length and physiological condition of the fish. Bircan, [20] has reported that photoperiod and water temperature are two significant factors controlling the reproduction rhythm of the fish spawning on a seasonal basis. It has been seen that individuals from *M. simack* population lay eggs and sperms in June and July, and reproduction continues in August as well. Looking at the Figure 2, it is monitored that *IG* values show a slow decrease in male individuals from February until April, while the same values show a rapid increase from April until June. It has been seen that *IG* value showing a rapid decrease from June until August takes a slow downward trend from August until January, and there is a slow increase in female individuals from February until May. The *IG* value takes rapid upward trend from May until June while it sees a rapid decrease from May until August since the fish start laying eggs. A steady increase is seen from August until September while there is a slow decrease from September until January. The egg diameter changing from species to species may also vary according to the size of fish. Despite that fact, individuals from the same species living in different environments may lay eggs varying in size [21].

In this study egg diameters of 28 individuals have been measured, and it has been seen that egg diameter ranges from 0.22 to 2.10 mm. The biggest egg diameter (2.10 mm) was measured in June and the smallest egg diameter (0.22 mm) in September. Looking into the egg diameter values and *IG* values determined, increases and decreases observed are in parallel to each other. However, the biggest average egg diameter was measured in July since only one female individual whose egg diameter was measured was gathered in July and the egg diameter was above the average of other months.

It has been seen that number of eggs of 28 individuals whose eggs were counted range from 1517 and 27944, and the average number of eggs is 6135. Bircan & Polat, [21] have reported that egg productivity of various fish species change from one year to another due to environmental factors. Demirsoy, [22] has reported that number of eggs formed in a female fish may change depending on the species and size of the fish, and number of eggs may vary greatly not only amongst the different species but also the same species.

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