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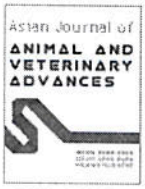

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Age, Growth and Some Biological Characteristics of White Bream (*Blicca bjoerkna* L., 1758) in Uluabat Lake, in Northwestern of Anatolia

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ABSTRACT

In this research, age, sex compositions, mortality, age-length, age-weight, length-weight relations, condition factors of white bream, *Blicca bjoerkna* (L., 1758), were determined from 183 specimens between April 2002 and March 2003 caught in Uluabat lake, in the northwest of Turkey. The age compositions of specimens were between 1-7 years and sex percentages were found as 50.27% for females and 49.73% for males. The mean forked length varied between 8.35 and 17.85 cm while mean weight ranged from 9.56 to 122.68 g. Growth of population was the most rapid at the first years of life afterwards growth ratio was slower. The weight of white bream increased allometrically for all sexes as seen b = 2.58. It was determined that the average condition factor of ages was between 1.62 and 2.51. The population has shown better growth performance than other habitats because the lake is low in latitude. We have given some of the population parameters and characters from Uluabat lake in northwestern part of Anatolia.

Key words: White bream, *Blicca bjoerkna,* age, growth, sex ratio, Uluabat lake

INTRODUCTION

Blicca bjoerkna (L., 1758), known as white bream and minnows or carp, is very common in brackish and freshwater. It is demersal and potomodromous. White bream is common from Europe to the Caspian sea basin including Iran (Kottelat, 1997). *B. bjoerkna* is native to the northwestern part of Turkey, the Marmara Region (Welcomme, 1988). Also, there are some studies of fisheries and distribution of white bream from Central and West Europe. The study has from Raba, Dunajec and Poprad River and in Romania (Epler *et al.*, 2009). Ichthyofauna and distribution of Serbia and Montenegro is given (Soric, 2006). The largest lakes contain the richest ichthyofauna. The number of non-native fish species in Poland has already passed 30 and to say that most of them have negatively affected indigenous biocenoses (Nowak *et al.*, 2008). *B. bjoerkna* is important in minor commercial fisheries, aquarium and bait. Their importance is in the food chain, due to its small size and competition with economical fish. *B. bjoerkna* is lower risk least concerned (LR/1c) for international union for conservation of nature (IUCN) (Smith and Darwall, 2006). Uluabat lake, as known Apolyont lake, is located to the northest of the Anatolian and Marmara region and it is connected by one canal to the Marmara Sea. The lake is valuable as a

wetland with various ecological functions (Magnin and Yarar, 1997). Uluabat lake has been designated as one of the 9 Ramsar wetland area in Turkey by Turkish Ministry of Environment, in 1998. This global protection status needed the development of an environmental management plan for Uluabat lake.

The present situation of the lake can not provide the essential to sustain the biodiversity because of habitat loss. It has been previously seen that the lake area has reduced by approximately 15% in 15 years, with the effect of drainage waters from agricultural lands and industry and sediment load from rivers (Anonymous, 2010).

There is a lack of reliable biological information on the growth parameters and population characteristics of *B. bjoerkna* from Anatolia. The main purpose of the present study is to describe some biological and ecological characters of white bream from a lake in the Northwestern Anatolia.

MATERIALS AND METHODS

The study was carried out on bio-ecological characteristics of white bream from Uluabat lake of Northwestern Anatolia. The study was conducted in the lake from April 2002 to March 2003. Specimens were captured monthly using gill nets (15-45 mm mesh sizes). Fish was fixed in a 4% formalin solution immediately and carried to the laboratory and measured Fork Length (FL), total weight (WT) and recorded sex. Age was determined from microscopic examination of scales. Ten or twelve scales from the left side of the body between the lateral line and dorsal fin were taken and mounted dry between two slides for binocular microscopic study after they are prepared with some processing (Lagler, 1966).

The ratio of males and females was given. Length-weight relations were calculated by applying regression analysis by taking in FL to WT of each fish and the equations were as follows:

$$WT = q \times FL^{b}$$

where, q and b are the parameters to be estimated (Bagenal, 1978).

Growth parameters; L_∞, k and t_o, were found and von Bertalanffy growth equations for all of the fish were as follows:

$$L_t = L_\infty (1\text{-}\exp^{-K(t-to)})$$

$$W_t = W_\infty (1\text{-}\exp^{-K(t-to)})^{n}$$

where, "L_t" and "W_t" are total length and total weight at age t; "L_∞" and "W_∞" are the asymptotic fork length and total weight, respectively; "K" is Brody growth coefficient which determines how fast the fish approaches L_∞ and W_∞; "t" the age (years) and "t_o" the hypothetical age at zero length.

The condition factor of *B. bjoerkna* was estimated with $C = (WT/FL^3) \times 100$ by using body weights (WT, g) and Fork Lenghts (FL, cm) (Nikolsky, 1969).

In the studied area; the water level decreases in the late spring and summer every year because of irrigational use. When the rainfalls begin in winter, water level increases again. The mean depth of Uluabat lake is 2.5 m. This region has a warm climate.

RESULTS

The study gives the first information on some biological traits of *B. bjoerkna* from Anatolia. The age and sex distribution of specimens caught during this study is given in Table 1. *B. bjoerkna*

Table 1: The Age and sex composition of *B. bjoerkna* in Northwest of Turkey, (n; number of fish)

	Female		Male		Female+Male		
Age groups	N	N%	N	N%	N	N%	Ratio
I	2	1.09	10	5.47	12	6.56	1:5.02
II	40	21.68	49	26.78	89	48.64	1:1.23
III	18	9.84	15	8.20	33	18.04	1:0.33
IV	9	4.92	11	6.01	20	10.83	1:1.22
V	12	6.56	2	1.09	14	7.65	1:0.17
VI	10	5.46	3	1.64	13	7.10	1:0.30
VII	1	0.54	1	0.54	2	1.08	1:1
Total	92	50.27	91	49.73	183	100.00	1:0.99

Table 2: The fork length (FL) and total weight (WT) of *B. bjoerkna* (SD; standart deviation)

		Fork length (cm)			Total weight (g)		
Age group	N	Mean	Range (min-max.)	SD	Mean	Range (min-max)	SD
1	12	8.35	7.4-9.3	0.580	9.56	6.78-13.46	1.990
2	89	10.55	9.3-11.8	0.716	13.73	11.77-29.36	4.630
3	33	12.34	11.9-13.1	0.342	31.02	22.74-37.78	4.60
4	20	13.80	13.1-14.7	0.496	80.17	77.60-83.90	3.31
5	14	15.32	14.8-15.8	0.370	90.32	70.79-111.90	11.34
6	13	16.31	16.0-16.9	0.361	104.93	75.83-118.80	13.29
7	2	17.85	17.2-18.5	0.919	122.68	121.20-124.16	2.09

specimens sampled, 92 were females and 91 males. The sex composition percentage was 50.27% females and 49.73% males.

Females and males were distributed among age group I-VII. Two-year-old group was dominant in the population (48.64%).

B. bjoerkna fork lengths ranged from 7.40 to 18.50 cm and the weight from 6.78 to 124.16 g. The mean fork lengths and the mean total weights and standard deviation of the all age of white bream were calculated (Table 2).

The growth parameters were calculated as $L_\infty = 28.00$, $W_\infty = 625.15$, $k = 0.109$, $t_o = -3.853$. von Bertalanffy growth model of the *B. bjoerkna* population in Uluabat lake was described as:

$$L_t = 28.00\ (1\text{-}\exp^{-0.109\ (t+3.853\ )})$$

$$W_t = 625.15\ (1\text{-}\exp^{-0.109\ (t+3.853)})^{2.58}$$

The mean lengths and the mean weights in the age groups of white bream are presented in Table 2.

The length-weight relationship of the *B. bjoerkna* was estimated using 183 fish specimens. The explonent (b) was estimated b = 2.58. The relationship was found as:

$$W = 0.1154\ FL^{2.58},\ R^2 = 0.8068$$

In the present study, the exponent (b) in the length-weight relationships among the all (b = 2.58) indicated that weight growth of white bream was allometrically. The maximum

Table 3: The mean condition factors of *B. bjoerkna* for age groups

Age groups	Mean	Range (min-max)	SD
1	1.62	1.43-1.91	0.142
2	1.71	1.27-2.27	0.185
3	1.71	1.33-2.18	0.193
4	1.97	1.44-2.81	0.373
5	2.51	2.04-2.84	0.262
6	2.43	1.83-2.87	0.356
7	2.17	1.96-2.38	0.298

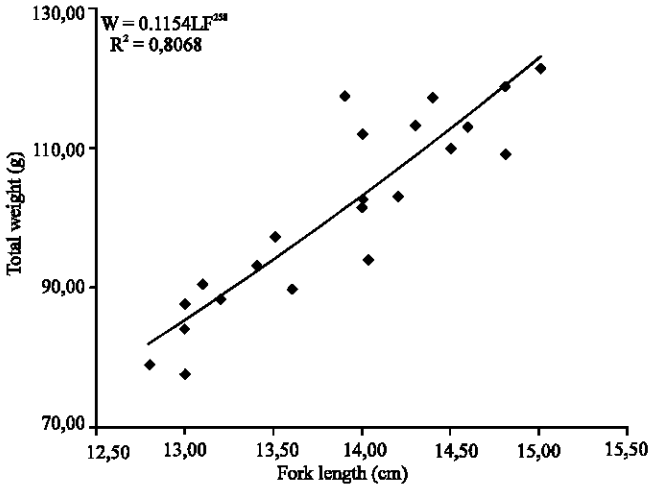

Fig. 1: Length-weight relationship in *B. bjoerkna* from in the Northwest of Turkey

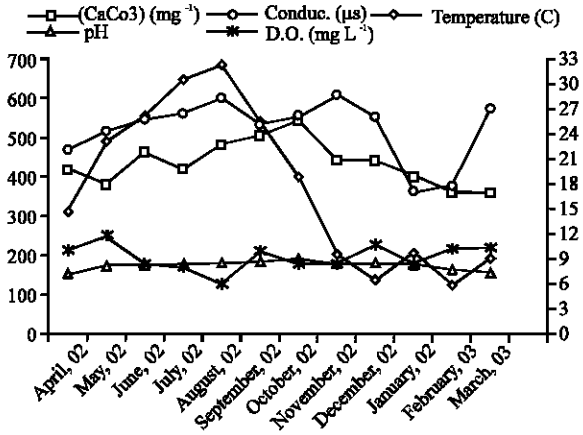

Fig. 2: The mean of some physical and chemical characteristics in Uluabat Lake

exploration population parameters (FL = 28.00 cm, W_{∞} = 625.15 g, k = 0.109 and t_0 = -3.853) were determined with von Bertalanffy growth curve in the study. The length-weight relationships are shown in Fig. 1.

The condition factors of *B. bjoerkna* were investigated for the mean of age groups and ranged from 1.62 to 2.51 and mean value of 1.83±0.369. It was determined that the mean condition factors

increased gradually with the highest at the age of 5 (2.51) and 6 (2.43) year and then decreased at the age of 7 (2.17) (Table 3).

The mean average depth of Uluabat lake is 2.5 m. This region has a warm climate. During the study period, water temperatures varied from 5.90 to 32.20°C. Dissolved oxygen was 6.10-11.80 mg L^{-1}; pH 7.41-9.15 and conductivity 360.50.10-610.20 μmhos cm^{-1} (Fig. 2).

DISCUSSION

Our study gives some population parameters of *B. bjoerkna* from a natural lake from Anatolia. There are few studies concerning this species which give biological traits and distribution. Uluabat lake is near the Marmara Sea. This fish is less commercial locally. The distribution and the presence of white bream in some areas as plain waters are given from Europe (Telcean and Cupsa, 2009). White bream populations are prevalent in plain and deep water but our study area is shallow.

We compared the diverse habitats growth parameters, L_∞ and k values of white bream in our study with that given from other localities. In Balaton lake population from Hungary is given as L_∞ = 35.90 cm (SL), k = 0.098 and b = 3.267. In the Gorkovsky reservoir population from Russia is maintained as L_∞ = 30.98 cm (FL) and k = 0.110 and b = 3.039. The length of *B. bjoerkna* from Russian Reservoir population was shown 8.60-23.30 cm. In Berounka River population (Czech Republic) is given as L_∞ = 23.40 cm (SL) and k = 0.270 and b = 3.328. In Manyas lake, for unsexed population (Turkey) is reported b = 3.180 and length ranged 12.0-21.2 cm. Also, this species was actually mentioned that the common length 20 cm (TL) and max weight 1.000 g (Specziar *et al*., 1997; Kottelat, 1997).

Our study, the length of *B. bjoerkna* from Anatolian population was shown 7.04-18.50 cm. In Uluabat population is as L_∞ = 28 cm (SL) and k = 0.101 and b = 2.58.

Uluabat lake which is eutrophic and relatively shallow, has shown lower value of the b parameter, this species is found in the shallows of warm lakes with vegetation and in the slower flowing parts of river.

These fish populations (Hungary and Russia) inhabiting the standing waters have shown a better growth performance than the one in Northwestern Anatolia, because of the climate changes cause the habitat loss and lack of the food.

In this study by giving some population parameters and characters, we determined that this fish constitutes a significant population in Uluabat lake.

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