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LENGTH-WEIGHT RELATIONSHIP OF *CLARIAS GARIEPINUS* IN ORONTES RIVER AND GÖLBAŞI LAKE, TÜRKİYE

ABSTRACT

In this study, the length-weight relationship (LWR) and condition factor of *Clarias gariepinus* (Burchell, 1822) in Orontes River and Gölbaşı Lake, Hatay, Türkiye were determined. The fish samples were monthly collected by nets from May 2011 to May 2012. Based on the b-value of LWR, the growth type of *C. gariepinus* is isometric for both sexes and positive allometric (b>3) for juveniles in Gölbaşı Lake. The positive allometric growth was observed for both sexes and isometric (b=3) for juveniles in the Orontes River. The value of condition factor ranged from 0.230 – 1.322 for both areas. The results showed that Orontes River has better environmental conditions for the *C. gariepinus* in Gölbaşı Lake.

Keywords: *Clarias gariepinus*, Length-Weight Relationship, Condition Factor, *Orontes River*, Gölbaşı Lake

1. INTRODUCTION

North African catfish, *Clarias gariepinus* (Burchell, 1822) is a member of the family Clariidae. *C. gariepinus* is distributed in freshwater river, lakes, and pools of almost Pan-African, Asia (Jordan, Israel, Lebanon, Syria), and southern Türkiye and widely intoruced to other parts of Africa, Europe and Asia [1 and 2]. Several countries report adverse ecological impacts after introduction the of local freshwater systems [2]. Members of this species have specialified pseudo-lungs that can survive in a wide range of environments from swamps to shallow lakes or deeper freshwaters [3]. *C. gariepinus* is found the Orontes (Asi), Seyhan, Ceyhan, Göksu, Aksu and was recently reported in the Sakarya River system in Turkey [3, 4, 5, 6, 7, 8 and 9]. Length-weight relationships (LWR) and condition factor are one of the most important biological parameters in the study of a fish species. It is supply information to us about growth level [10]. Evaluation of length-weight relationship is important for fisheries ecology and stock assessment, and results in the convertion of growth-in-length to growth-in-weight which is highly important for estimating condition factor and geographic comparisons of life histories [11, 12 and 13]. Besides, this relationship enables the

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comparison of the between-region of life histories of species [14]. The present study aims at providing information on the length-weight relationship (LWR) and condition factor (K) of *Clarias gariepinus* in Gölbaşı Lake and Orontes River, Hatay, Türkiye.

2. RESEARCH SIGNIFICANCE

In this study, the length-weight relationship and condition factor of *C. gariepinus* species in Orontes River and Gölbaşı Lake were revealed.

Highlights:

- The study examined the total length-weight relationship of *C. gariepinus* species from Orontes River and Gölbaşı Lake, Hatay, Türkiye.
- It provides the male/female ratio of *C. gariepinus* species in Orontes River and Gölbaşı Lake. It shows the growth type of *C. gariepinus* species.
- The condition factor relationship of *C. gariepinus* species was examined in detail.

3. MATERIALS AND METHODS

The fish samples were collected monthly using nets between May 2011 and May 2012. The number of specimens obtained from Gölbaşı Lake and Orontes River were 252 and 297, respectively. Total length and weight measured to the nearest 1mm and 0.01g, respectively. Sex was identified macroscopically and microscopically by the examining of gonads. The length-weight equation was worked out through the least-squares method on logarithmic transformed data by means of the equation $W=a.L^b$, where W is the total weight, L is the total length, and a and b are parameters to be estimated [15]. This analysis was performed both on the whole sample and on the sample subdivided by sex. Standard error was calculated for the slope (b): the hypothesis of isometric growth was tested through Student's t-test, with values of $p<0.05$ considered significant. Fulton's condition factor (K) was calculated using the equation; $K=(W/L^3)*100$, where W is total weight (g), L is total length (cm)[16].

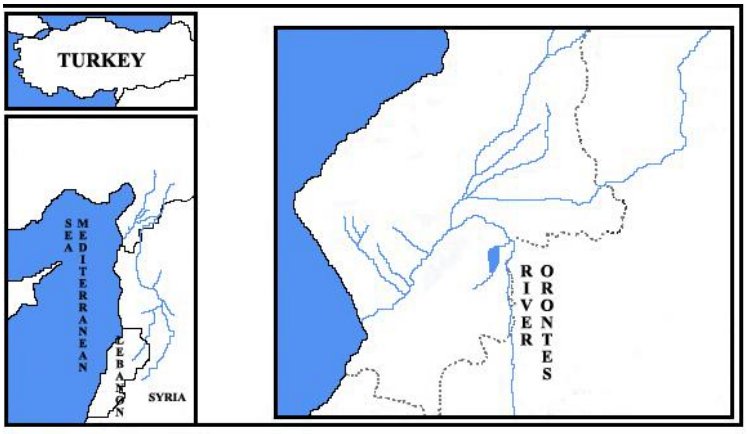

Figure 1. Map of the study area

4. RESULTS AND DISCUSSION

A total of 549 individuals of *Clarias gariepinus* were obtained from Gölbaşı Lake (252) and Orontes River (297). Total lengths of males and females ranged from 12.8 to 54.0cm and from 16.0 to 50.0cm for Gölbaşı Lake, ranged from 9.8 to 49.3cm and from 11.9 to 43.4cm

for Orontes River, respectively. The weight of *C. gariepinus* in Gölbaşı Lake ranged between 15.0 and 1145.0g (male) and between 28.0 and 873.0g (female), while the weight varied from 3.0 to 645.8g (male) and from 5.75 to 573.24g (female) in Orontes River. The estimated parameters of the length-weight relationship, the coefficient of determination (R^2), type of growth, ranges of size and weight are given in Table 1.

General length-weight relationships for *C. gariepinus* were found as $W=0.0092TL^{2.9209}$ ($R^2=0.9597$) for all specimens from Gölbaşı Lake. In Orontes River, length-weight relationships of *C. gariepinus* were found as $W=0.0016TL^{3.3449}$ ($R^2=0.9581$) for all specimens. Besides general consideration, LWRs of male, female and juvenile specimens were separately determined for detailed information. A significant relationship with the high regression coefficient ($R^2=0.9171$) was found between the length and weight of *C. gariepinus*. The type of growth was isometric (*b*=3) for both sexes and positive allometric (b>3) for juveniles in Gölbaşı Lake and it was positive allometric (*b*>3) for both sexes and isometric (b=3) for juveniles in Orontes River (Table 1).

Table 1. Length-weight relationship of *Clarias gariepinus*

Locality	Sex	TL (cm)	W (g)	LWR		Type of growth	R^2
				a±CI	*b*±CI		
Gölbaşı Lake	M	12.8-54.0	15-1145	0.0123±0.0063	2.8281±0.189	I	0.9346
	F	16.0-50.0	28-873	0.0083±0.0026	2.9534±0.111	I	0.9531
	J	13.3-29.1	15-209	0.0040±0.0013	3.198±0.154	A^+	0.9811
	All	12.8-54.0	15-1145	0.0092±0.0020	2.9209±0.075	I	0.9597
Orontes River	M	9.8-49.3	3.0-645	0.0013±0.0006	3.4136±0.138	A^+	0.9488
	F	11.9-43.4	5.75-573	0.0015±0.0010	3.3835±0.179	A^+	0.9171
	J	4.5-21.7	0.33-34.3	0.0040±0.0010	2.9303±0.137	I	0.9843
	All	4.5-49.3	0.33-645	0.0016±0.0003	3.3449±0.081	A^+	0.9581
M=Male, F=Female, J=Juvenil, All= All Samples, I=Isometric, A^+=Positive Allometric							

Table 2. Condition factor of *Clarias gariepinus*

Locality	Sex	n	K (min-max)	K mean
Gölbaşı Lake	M	68	0.230-0.995	0.695±0.015
	F	144	0.311-1.322	0.720±0.011
	J	40	0.593-0.852	0.731±0.011
	All	252	0.230-1.322	0.715±0.008
Orontes River	M	133	0.276-0.806	0.443±0.013
	F	130	0.283-0.952	0.504±0.015
	J	34	0.245-0.477	0.349±0.009
	All	297	0.245-0.952	0.459±0.009
M=Male, F=Female, J=Juvenil, All=All Samples, n=Sample Size, K=Condition Factor				

Fulton's condition factors of *C. gariepinus* was observed between 0.230 and 1.322 (average 0.715±0.008) for all specimens in Gölbaşı Lake, while average condition factors was observed as 0.459 (min-max 0.245-0.952) for the specimens from Orontes River (Table 2). The maximum total length and weight were 54cm and 1145.0g in Gölbaşı, and 49.3cm and 645.8g in Asi (Orontes) River. Küçük [4] found the maximum total length as 47cm in Aksu River (Antalya). In Aksu and Köprüçay River, Küçük [17] found the maximum standard length as 38.5cm. For Akgöl and Paradeniz Lagoon, length and weight were reported as 68.7cm and 1688.0g, respectively [18]. In Orontes River, Yalçın [19] claimed maximum length as 82.6cm and weight as 2003.2g. Kındır [5] reported a maximum length of 54.50cm and maximum weight of 1253.43 g in Sakarya River. Narin [20] found the maximum length and weight of 50.4cm and 899g in Gölbaşı Lake. Kara et al., [6] claimed maximum length as 34.4cm and weight as 314g in Upper and middle River Basin in Ceyhan

Region. Bostancı [21] reported a maximum length of 32.5cm (SL) in Gölbaşı Lake and 14.3cm (SL) in Aksu Creek (Ceyhan). In Hatay region maximum length and weight were 47.0cm and 842g [22]. Kaya [7] found the maximum length as 25.8cm in Göksu Delta. Maximum length in Aslantaş Dam Lake (Osmaniye) was found to be 47.0cm [23]. Gözler [24] found the maximum total lengths as 62.46cm and maximum weight of 1874.20g in Orontes River (Hatay). Findings of this study revealed that the data gave smilirlar results to those of Kındır [5] and Narin 20]. Nevertheless, these results were lower than the measures reported by others research [18, 19 and 24]. However, our results were higher than the results reproted by the others [4, 6, 7, 17, 21 and 23].

Table 3. Length-weight relationship of *C. gariepinus* in different areas, Turkey (Sample size (N), coefficient of determination (R^2), total length (TL), weight (W) and equation parameters for a and b)

Locality	Sex	N	TL (min-max)	W (min-max)	a	b	R^2	K	References
Akgöl-Paradeniz Lagoon	M	146	13.5-58.4	16.0-1547				0.26-1.24	Karahan, 1999
	F	160	14.0-68.7	10.0-1688				0.24-1.82	
	All	307	13.5-68.7	10.0-1688				0.24-1.82	
Orontes River	All	720	12-82.6	14.8-2003.2	0.0127	2.817	0.97	0.31-1.18	Yalçın, 1999
Sakarya River	M	69	29-52.80	133.33-889.02	0.0166	2.7203	0.9301	0.29-0.89	Kındır, 2000
	F	62	31-54.50	165.47-1253.4	0.0032	3.1931	0.9537	0.55-0.87	
	All	131	29-54.50	133.3-1253.4	0.0061	3.0053	0.9373	0.29-0.89	
Gölbaşı Lake	M	154			0.0097	2.906	0.947	0.602-0.739	Narin, 2003
	F	330			0.0075	2.987	0.948	0.637-0.768	
	All	566	12.5-50.4	15.0-899	0.0076	2.983	0.961	0.632-0.762	
Hatay	All	179	18.2-47.0	79-842	0.008	2.967	0.959		Özcan, 2008
Orontes River	M	92			0.013	2.83	0.91		Gözler, 2019
	F	87			0.0079	2.98	0.96		
	All	185	20.5-62.46	73.5-1874.20	0.0092	2.94	0.93		
Gölbaşı Lake	M	68	12.8-54.0	15.0-1145.0	0.0123	2.8281	0.9346	0.23-0.99	This Study
	F	144	16-50.0	28.0-890.0	0.0083	2.9534	0.9531	0.31-1.32	
	All	252	12.8-54.0	15.0-1145.0	0.0092	2.9209	0.9597	0.59-0.85	
	J	40	13.3-29.1	15-209.0	0.0040	3.198	0.9811	0.23-1.32	
Orontes River	M	133	9.8-49.3	3.0-645.8	0.0013	3.4136	0.9488	0.28-0.81	
	F	130	11.9-43.4	5.75-573.24	0.0015	3.3835	0.9171	0.28-0.95	
	All	297	4.5-49.3	0.33-645.8	0.0016	3.3449	0.9581	0.25-0.48	
	J	34	4.5-21.7	0.33-34.25	0.004	2.9303	0.9843	0.25-0.95	

Fulton's condition factors were calculated as 0.230-1.322 (average 0.715±0.008) in Gölbaşı Lake, and 0.245-0.952 (0.459±0.009) in Orontes River. Our observations are similar to those given for Sakarya River (0.29-0.89), Orontes River (0.31-1.18) and Gölbaşı Lake (0.632-0.762), while Karahan [18] report higher results for condition factors (0.24-1.82). The condition factors in fish population may vary according to age, sex, fat reserve level, species, season, locality and year [15]. Results have shown that *C. gariepinus* living in the River Orontes were longer in length and had a better condition compare to the ones inhabiting Gölbaşı Lake.

NOTICE

This study was presented as a poster presentation at the International Symposium on Fisheries and Aquatic Sciences (FABA 2016) held in Antalya on 3-5 October 2016.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

FINANCIAL DISCLOSURE

The authors received no financial support for the research.

DECLARATION OF ETHICAL STANDARDS

The authors of the article declare that the materials and methods used in this study do not require ethics committee approval and/or legal special permission.

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