

## Length-Weight Relationship of Common Carp (*Cyprinus carpio* L., 1758) from Taqtaq Region of Little Zab River, Northern Iraq

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### Abstract

In this study, total length-weight relationship (LWR) of common carp (*Cyprinus carpio* L., 1758) from Taqtaq Region of Little Zab River, Northern Iraq were determined. For this purpose, totally 100 carps (56 female and 44 male) were used. Total lengths and weights of them were measured. The total length and weight ranges were 40-52 cm and 1300-2620 g, respectively. The logarithmic and linear equations for total length-weight relationships (LWRs) were found as  $\text{Log}W = -1.007+2.574\text{Log}TL$  ( $r^2=0.939$ ) for combined sexes,  $\text{Log}W = -0.971+2.553\text{Log}TL$  ( $r^2=0.925$ ) for females and  $\text{Log}W = -1.61+2.607\text{Log}TL$  ( $r^2=0.958$ ) for males. The “b” values calculated for combined sexes (2.574), for females (2.553) and for males (2.607) were smaller than 3. According to “b” values, common carp population living in the Taqtaq Region of the Little Zab River of Northern Iraq shows a negative allometric growth.

**Keywords:** *Cyprinus carpio*, common carp, Little Zab river.

### Kuzey Iraktaki Küçük Zap Suyunun Tagtag Bölgesinden Elde Edilen Sazan Balığı (*Cyprinus carpio* L., 1758) Boy-Ağırlık İlişkisi

#### Özet

Bu çalışmada, Kuzey Iraktaki Küçük Zap Nehrinin Tagtag bölgesinden elde edilen sazan (*Cyprinus carpio* L., 1758)'in toplam boy-ağırlık ilişkisi (LWR) incelendi. Bu amaçla, toplam olarak 100 adet sazan (56 dişi ve 44 erkek) kullanıldı. Balıkların toplam boy ve ağırlıkları ölçüldü. Toplam boyları 40-52 cm, ağırlıkları ise 1300-2620 g arasındadır. Toplam boy-ağırlık ilişkisinin logaritmik doğrusal denklemleri tüm bireyleri için  $\text{Log}W = -1.007+2.574\text{Log}TL$  ( $r^2=0.939$ ), dişiler için  $\text{Log}W = -0.971+2.553\text{Log}TL$  ( $r^2=0.925$ ) ve erkekler için ise  $\text{Log}W = -1.61+2.607\text{Log}TL$  ( $r^2=0.958$ ) olarak bulundu. Tüm bireyler ( ), dişiler ( ) ve erkekler ( ) için hesaplanan “b” değerleri 3’den daha küçük bulundu. “b” değerlerine göre, Kuzey Iraktaki Küçük Zap Nehrinin Tagtag bölgesinde yaşayan sazan popülasyonunun negatif allometrik bir büyüme gösterdiği görülmektedir.

**Anahtar Kelimeler:** *Cyprinus carpio*, sazan balığı, Küçük Zap suyu.

#### 1. Introduction

Common carp, *Cyprinus carpio*, is one of the most widely cultured freshwater fish species in the World [1]. It appears in ponds, lakes and slow moving rivers [2]. Although it likes warm water, it also tolerates cold, several pollutants and low dissolved oxygen concentration in water. Common carp has been successfully introduced into most fresh waters throughout the world because of fast growing and adapting to poor environmental conditions [3, 4]. It is an important animal protein source for human around the world due to be available round the year. In Turkey,

common carp is a popular cultured freshwater fish after rainbow trout.

Length-weight relationships (LWRs) allow estimation of fish weight from length or vice versa [5, 6]. LWRs are important for fisheries biology and population dynamics where many stock assessment models require the use of length-weight parameters [7]. LWR equations are also useful to assess the fitness, healthy status and life history parameters like reproduction in fishes [7]. Although LWRs are of fundamental importance in fisheries science, recent data from Northern Iraq freshwater fishes are generally lacking. The present study describes the LWRs of the most abundant fish species, common carp, living in

Taqtaq Region of Little Zab River, Northern Iraq. The data is believed to be the first published reference on LWRs for this river.

## 2. Materials and Methods

A total of 100 common carp samples were caught from Taqtaq Region of Little Zab River, Northern Iraq (Fig. 1) between March 2017 and April 2017. The sampling was made by gill nets with various mesh sizes. Total length (TL) and weight (W) were measured to the nearest 1cm and 1g respectively. Length-weight relationships (LWRs) were calculated using the linear regression analysis,  $\text{Log}W = \text{Log} a + b \text{Log} TL$ , where W is body weight (g), TL is the total length (cm), a is

the intercept of the regression curve (coefficient related to body form) and b is the regression coefficient (exponent indicating isometric growth) [8]. The 95% confidence interval (CI) was also determined for parameters “a” and “b” [7].

Student t-test was used to find the significant differences in length and weight between females and males and to demonstrate the significant differences of the obtained “b” values from the expected isometric value (i.e.  $b = 3$ ). Chi-square test was used to find the significant differences of sex ratio from expected rate 1/1. All statistical analyses were performed by using SPSS software version 22.



Figure 1. Map of the Little Zab River, Northern Iraq from where common carps were sampled.

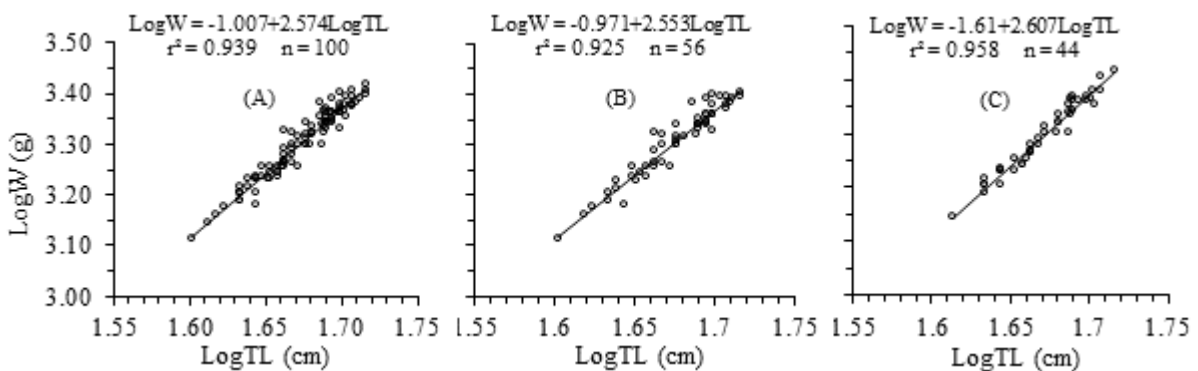
## 3. Results and Discussion

In the present study, total 100 mirror carps (56 females and 44 males) were examined. Overall sex ratio (female/male) was 1/0.79, which is not significantly different from expected rate 1/1 ( $X^2=0.23$  at  $P>0.05$ ). Minimum, maximum, mean, standard deviation and standard error of total length and body weight for combined sex, female and male are presented in Table 1. The differences between females and males in term of total length and body weight were not significant statistically (student t-test,  $P>0.05$ ).

The data were transformed in logarithm and linear relationship obtained with a high degree of determinant coefficient (Fig. 2). The determinant coefficients ( $r^2$ ) were highly significant for combined sexes (0.939), females (0.925) and males (0.958). The value of regression coefficient ‘b’ from pooled data showed an negative allometric growth of the common carp in the Little Zab River as the values were smaller than 3 (Table 2).

**Table 1.** Total lengths (TL, cm) and body weights (W, g) of *C. carpio* population from Taqtaq Region of Little Zab River, Northern Iraq.

	Combined Sex		Female		Male	
	TL (cm)	W (g)	TL (cm)	W (g)	TL (cm)	W (g)
Min.	40	1300	40	1300	41	1400
Max.	52	2620	54	2540	52	2620
Mean	47.38	2041.3	47.59	2065.0	47.11	2011.1
SD	2.78	310.2	2.87	318.9	2.66	299.6
SE	0.28	31.02	0.38	42.6	0.40	45.2
N	100	100	56	56	44	44

**Figure 2.** Length-weight relationships (LWRs) in combined sex (A), female (B) and male (C) of *C. carpio* from Taqtaq Region of Little Zab River, Northern Iraq.**Table 2.** Descriptive statistics and estimated parameters of total length–weight relationships for *C. carpio* from Taqtaq Region of Little Zab River, Northern Iraq

N	Total length (cm)		Length-weight relationship parameters					
	Min	Max	<i>a</i>	95% CL of <i>a</i>	<i>b</i>	SE ( <i>b</i> )	95% CL of <i>b</i>	<i>r</i> <sup>2</sup>
100	40	52	0.098	0.063-0.173	2.574	0.066	2.428-2.691	0.939

The results of the present study indicate that common carp stocks from Taqtaq Region of Little Zab River, Northern Iraq showed negative allometric growth ( $b = 2.574$  which is smaller than 3). Similar results have been found for the common carp population of Altinkaya Reservoir (2.825) [9], Lake İznik (2.830) [10], Lake Tödürge (2.306) [11], Gölhisar Lake (2.874) [12] and Bafra Fish Lake (2.822) [13]. However, some population of the common carp showed isometric growth ( $b \cong 3$ ) (i.e. Gelingüllü Dam Lake (3.023) [14], Kemer Dam Lake (3.037) [15], Bayramiç Reservoir (3.010) [16] and Sakarya River (2.98) [17]. Moreover, positive allometric growth ( $b > 3$ ) was also observed for some

populations of common carp (i.e., Almus Dam Lake (3.319) [18], Ömerli Reservoir (3.140) [19]).

These variations could be attributed to differences in age, maturity and sex. Geographic location and associated environmental conditions, such as seasonality, stomach fullness, disease and parasite loads, can also affect the value of  $b$  [20].

## 5. References

1. FIGIS (2011). Fisheries Global Information System (FAO-FIGIS)-FIGIS Institutional Websites. In: FAO Fisheries and Aquaculture

- Department [online]. Rome. (available at: [www.fao.org/fishery/figis/en](http://www.fao.org/fishery/figis/en)).
2. Vostradovisky, J. (1973). Freshwater fishes. The Hamblyn Publishing Group Limited, London.
  3. Welcomme, R.L. (1988). International introductions of inland aquatic species. *FAO Fish.Tech. Pap.* **285**, 237-278.
  4. Seegers, L., De Vos, L. and Okayo, D.O. (2003). Annotated checklist of the freshwater fishes of Kenya from Lake Victoria. *J.E. Afr. Nat. Hist.* **92**, 11-47.
  5. Xiong, W., Tao, J., Zhang, D.C., Liu, C.L., He, D.K. and Chen, Y.F. (2015). Length-weight relationships for four small fish species caught in wetlands of central Yangtze River, *China. J. Appl. Ichthyol.* **31**, 219-220.
  6. Zhu, T.B., Yang, D.G., Liu, Y. and Li, F. (2015). Length-weight relationships of six fish species from the Zengqu River and the Ouqu River, Southwest China. *J. Appl. Ichthyol.* **31**, 1153-1154.
  7. Froese, R. (2006). Cube law, condition factor and weight-length relationships: history, meta-analysis and recommendations. *J. Appl. Ichthyol.*, **22**, 241-253.
  8. Froese, R. (1998). Length-weight relationships for 18 less-studied fish species. *J. Appl. Ichthyol.* **14**, 117-21.
  9. Bircan, R., Erdem, M. (1994). Altınkaya Baraj Gölü'ndeki sazan balığının (*Cyprinus carpio* L., 1758) gelişmesine ilişkin bir araştırma. XII. Ulusal Biyoloji Kongresi, 6-8 Temmuz, Edirne: 12-20.
  10. Tarkan, A.S., Gaygusuz, Ö., Acıpınar, H., Gürsoy, Ç., Özuluğ, M. (2006). Length-weight relationship of fishes from the Marmara region (NW-Turkey). *J. Appl. Ichthyol.*, **22**(4), 271-273.
  11. Erdem, Ü. (1988). Tötürge Gölü'ndeki sazan (*Cyprinus carpio* L., 1758) populasyonunun bazı biyolojik özelliklerinin incelenmesi. *Doğa Tr. Zool. Der.*, **12**: 32-47.
  12. Alp, A., Balık, S. (2000). Growth conditions and stock analysis of the carp (*Cyprinus carpio* Linnaeus, 1758) population in Gölhisar Lake. *Turk. J. Zool.*, **24**: 291-304.
  13. Yılmaz, S., Yazıcıoğlu, O., Polat, N. (2012). Bafra Balık Gölleri (Samsun, Türkiye)'ndeki sazan (*Cyprinus carpio* L., 1758) 'ın yaş ve büyüme özellikleri. *Karadeniz Fen Bilimleri Dergisi* **2**: 1-12.
  14. Kırankaya, Ş.G., Ekmekçi, F.G. (2004). Gelingüllü Baraj Gölünde yaşayan aynalı sazan (*Cyprinus carpio* L., 1758)'ın büyüme özellikleri. *Tr. J. Vet. Anim. Sci.*, **28**: 1057-1064.
  15. Özcan, G., Balık, S. (2007). Kemer Baraj Gölü'ndeki *Cyprinus carpio* L., 1758'nun bazı biyolojik özellikleri. *Türk Sucul Yaşam Dergisi*, **5**: 170-175.
  16. Çolakoğlu, S., Akyurt, İ. (2011). Bayramiç Baraj Gölündeki (Çanakkale) aynalı sazan balıklarının (*Cyprinus carpio* L., 1758) populasyon yapısı ve büyüme özellikleri. *İstanbul Univ. J. Fish. Aqua. Sci.*, **26**: 27-46.
  17. Ölmez, M. (1992). Yukarı Sakarya havzası Sakaryabaşı bölgesi balıklarının populasyon dinamiği üzerinde bir araştırma. [PhD Thesis]. Ankara University, Graduate School of Natural and Applied Sciences, 239p.
  18. Karataş, M., Çiçek, E., Başusta, A., Başusta, N. (2007). Age, growth and mortality of common carp (*Cyprinus carpio* Linnaeus, 1758) population in Almus Dam Lake (Tokat-Turkey). *J. Appl. Biol. Sci.*, **1**: 81-85.
  19. Vilizzi, L., Tarkan, A.S., Ekmekçi, F.G. (2013). Stock characteristics and management of insights for common carp (*Cyprinus carpio*) in Anatolia: a review of weight-length relationships and condition factors. *Turkish Journal of Fisheries and Aquatic Sciences* **13**:759-775.
  20. Bagenal, T.B., Tesh, F.W. (1978). Age and Growth. In: T.B. Bagenal, (Ed.) *Methods for Assessment of Fish Population in Fresh Waters*. IBP Handbook No: 3, Blackwell Scientific Publications, Oxford: 101-136.