

Length-weight relationship of five native fish species from Chashma Barrage at the Indus River, Pakistan

Muhammad Mohsin, Yong Tong Mu*, Muhammad Noman, Aamir Mahood Memon & Ana Mehak

College of Fisheries, Ocean University of China, Qingdao, 266003, China

*[E-mail: ytmu@ouc.edu.cn]

Received 05 April 2016 ; revised 08 April 2016

Length-weight relationships (LWRs) of *Wallago attu*, *Hypophthalmichthys molitrix*, *Catla catla*, *Ctenopharyngodon idella* and *Mastacembelus armatus* were estimated as $W = 0.141 L^{2.384}$, $W = 0.041 L^{2.654}$, $W = 0.014 L^{2.966}$, $W = 0.011 L^{2.952}$ and $W = 0.013 L^{2.565}$ correspondingly in this study.

[**Keywords:** Length, Weight, Relationship, Fish, Chashma Barrage, Pakistan]

Introduction

Length-weight relationships (LWRs) have many applications in the field of fishery science and therefore are, frequently, regarded as very useful tools¹. Their role is diverse such as they are used in biomass assessment, individual fish weight, species distribution, condition indices, life history comparison and fishery management²⁻³.

The Indus River originates in the Tibetan Plateau and finally flows into the Arabian Sea. It is the longest river, 3180 km, in Pakistan⁴. Its waters are rich in ichthyo-faunal diversity⁵, which plays an important role in blue economy. Various studies have been conducted on the faunal diversity of this river but LWRs of only few fish species have been investigated⁶.

This study is the first recording of LWRs of five commercially important native fish species i.e. *Wallago attu* (Bloch & Schneider, 1801), *Hypophthalmichthys molitrix* (Valenciennes, 1844), *Catla catla* (Hamilton, 1822), *Ctenopharyngodon idella* (Cuvier & Valenciennes) and *Mastacembelus armatus* (Lacepede, 1800) by using descriptive statistics found in the Indus River waters.

Materials and Methods

In total 273 fish samples, both sexes combined, belonging to five different species viz. *W. attu* (52), *H. molitrix* (57), *C. catla* (59), *C. idella* (56) and *M. armatus* (49) and three families viz. Siluridae, Cyprinidae and Mastacembelidae were analyzed in order to collect length-weight data for each specimen.

Total length (cm) and total weight (g) measurements, June to November 2015, were taken at Chashma Barrage landing site.

Chashma Barrage is the major landing site on the Indus River. Total length was taken nearest to cm whereas total weight to g. Collected samples were identified according to Talwar and Jhingaran⁷. LWRs were investigated by using linear regression equation $W = aL^b$. In this mathematical expression W stands for weight in g, a represents the intercept, L indicates length in cm and b stands for slope. Log graphs were employed to remove outliers before performing descriptive statistics analysis. Microsoft Excel 2007 was used to execute statistical analysis.

Table 1— Computed LWRs parameters of five native fish species from Chashma Barrage at the Indus River, Pakistan

Family/Species	n	Length range (cm)	SD (L)	Weight range (g)	SD (W)	Regression parameters		
		Min. - Max.		Min. - Max.		a	b	r ²
Siluridae								
<i>W. attu</i>	52	22.9 - 83.3	15.5	100 - 4100	1220.2	0.141	2.384	0.951
Cyprinidae								
<i>H. molitrix</i>	57	32 - 71.5	11.8	720 - 4150	1105.7	0.041	2.634	0.948
<i>C. catla</i>	59	30 - 71.3	12.4	350 - 5000	1382.1	0.014	2.966	0.988
<i>C. idella</i>	56	50.5 - 83.8	11.1	900 - 5100	1300.7	0.011	2.952	0.967
Mastacembelidae								
<i>M. armatus</i>	49	35.6 - 73.7	12.7	120 - 800	232.1	0.013	2.565	0.972

Note: n, sample size; SD, standard deviation; L, length; W, weight; a, intercept; b, slope; r², goodness of fit.

Results

LWRs for *W. attu*, *H. molitrix*, *C. catla*, *C. idella* and *M. armatus* were computed as $W = 0.141 L^{2.384}$, $W = 0.041 L^{2.654}$, $W = 0.014 L^{2.966}$, $W = 0.011 L^{2.952}$ and $W = 0.013 L^{2.565}$ respectively. Other observations and calculations are listed in Table 1.

Discussion

This pioneer study reveals LWRs of some commercially important native species from the Indus River waters which have not been reported previously. Weight and length of all the sampled fish species fall into the expected range⁸. However, values of *a* and *b* showed sometimes deviations from the predicted ones. These differences may be due to the sampling techniques applied. It should be noted that readings were taken from fresh samples. In addition to this, local environment and hydro-biological characters are probably responsible for observed differences which should be further investigated. However, these findings provide baseline data for further research on the assemblage structure of ichthyofauna of the Indus River. The results of this research can also be used for life history comparison and to investigate population morphological characters⁹.

Conclusion

This study concludes that the LWRs of five fish species i.e. *W. attu*, *H. molitrix*, *C. catla*, *C. idella* and *M. armatus* is computed as $W = 0.141 L^{2.384}$, $W = 0.041 L^{2.654}$, $W = 0.014 L^{2.966}$, $W = 0.011 L^{2.952}$ and $W = 0.013 L^{2.565}$ correspondingly.

Acknowledgements

This study was funded by the special research fund of China Agriculture Research System (CARS-49).

References

- 1 Xiong, W., Tao, J., Zhang, D. C., Liu, C., He, D. K., Chen, Y. F., Length-weight relationships for four small fish species caught in wetlands of central Yangtze River, China. *J. Appl. Ichthyol.* 31(2015): 219–220.
- 2 Moutopoulos, D., Stergiou, K., Length-weight and length-length relationships of fish species from the Aegean Sea (Greece). *J. Appl. Ichthyol.* 18(2002): 200–203.
- 3 Froese, R., Tsikliras, A. C., Stergiou, K. I., Editorial note on weight-length relations of fishes. *Acta Ichthyol. Piscat.* 41(2011): 261–263.
- 4 https://en.wikipedia.org/wiki/Indus_River. Retrieved on 4-3-2016.
- 5 Rafique, M., Khan, N. U. H. Distribution and status of significant freshwater fishes of Pakistan. *Rec. Zool. Surv. Pakistan.* 21(2012): 90-95.
- 6 Naeem, M., Salam, A., Gillani, Q., Ishtiaq, A., Length-weight relationships of *Notopterus notopterus* and introduced *Oreochromis niloticus* from the Indus River, southern Punjab, Pakistan. *J. Appl. Ichthyol.* 26(2010): 620.
- 7 Talwar, P. K., Jhingran, A. G., Inland fishes of India and adjacent countries, Vol. 1. Oxford & IBH Publishing Co., New Delhi (1991).
- 8 Froese, R., Cube law, condition factor and weight-length relationship: history, meta-analysis and recommendations. *J. Appl. Ichthyol.* 22(2006): 241-253.
- 9 Cherif, M., Zarrad, R., Gharbi, H., Missaout, H., Jarbout, O., Length-weight relationships for 11 fish species from the Gulf of Tunis (SW Mediterranean Sea, Tunisia). *Panam J. Aquat. Sci.* 3(2008): 1–5.