Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(2): 2418-2421

Received: 13-01-2018
Accepted: 15-02-2018

Maria Latif
Assistant Director Fisheries, Fisheries Research & Training Institute, Manawan, Lahore, Department of Fisheries, Punjab, Pakistan

Muhammad Zafar Ullah
Director Fisheries, Fisheries Research & Training Institute, Manawan, Lahore, Department of Fisheries, Punjab, Pakistan

Imtiaz Begum Minhas
Director Fisheries, Department of Fisheries, Punjab, Pakistan

Samavia Latif
M. Phil Student, College of Statistical and Actuarial Sciences, University of the Punjab, Quaid-E-Azam Campus, Lahore, Pakistan

Correspondence
Maria Latif
Assistant Director Fisheries O/O Directorate Fisheries Research & Training Institute. PO Batapur G.T Road Manawan Lahore, Punjab, Pakistan

Length-weight relationships of *Mystus cavasius* with special reference to body morphometric characters from river Chenab, Punjab, Pakistan

Maria Latif, Muhammad Zafar Ullah, Imtiaz Begum Minhas and Samavia Latif

Abstract
The present study focused on the length-weight relationships of freshwater catfish, *Mystus cavasius* in relation to their different morphometric characters. 100 specimens of *M. cavasius* were collected from downstream of Qadirabad barrage, Chenab river, Pakistan. The total length ranged from 5.90-17.80cm with mean 12.13±0.22 and body weight ranged from 2.00-42.0g with mean 17.75±0.70. The regression coefficient (b) was 2.71 indicating negative allometric growth of this fish. Standard, fork length; head length, width; body depth, girth; pre, post-dorsal lengths and length of caudal peduncle were found to be highly correlated with increasing total length and body weight (r= 0.866; $p<0.01$). This small sized catfish is heavily targeted by local fisher community and fishermen. To the author's best knowledge, the results of this study will provide baseline information on this potentially important small indigenous catfish.

Keywords: *Mystus cavasius*, Chenab river, allometric growth, length-weight relationships, morophometry

1. Introduction
Mystus cavasius (Hamilton, 1822) is a small sized freshwater catfish locally known as Kanghar/ Tengra in Pakistan. It belongs to the order Siluriformes and family Bagridae. It is reported from rivers, streams, lakes, dams and barrages of Pakistan by various workers [1-6]. Among small indigenous species, it gives significant size catch at Thatta fish markets and Kotri barrage fish landing sites of Pakistan [7]. It is a hardy fish tolerating wide ranges of environmental factors such as temperature and low oxygen level [8]. It is eury-omnivorous fish having more inclination towards the carnivorous feeding habits [9]. Female dominance over males is reported in the populations of this species [7, 10].
Among small sized catfishes, it has relatively high market price due to good protein contents in its flesh [11-12]. It is also being exported as an ornamental fish from India [13]. Small indigenous fish species are valuable source of protein and minerals in the diet of developing countries peoples, such as the proximate composition of *M. cavasius* showed muscle protein contents to be 16.16% on fresh matter basis and Calcium to Phosphorous ratio 1.44% on dry matter basis [14]. High levels of vitamin A, Fe and Zn are reported from locally available small fish species and thus are potential sources of micronutrients in the diets of developing countries peoples [15].
Knowledge of Length-weight relationships (LWRs) and condition factor (K) are extensively used in fish biology for assessing population sizes, growth patterns, physiological states and for comparing life histories of different populations of same species in response to varying food availability, climatic conditions and other environmental factors [16-17]. Most of the data available on LWRs of *M. cavasius* populations is from Bangladesh and Indian water bodies, [18-22] only fewer studies reported LWRs of this species from Pakistan [5, 7]. The population of *M. cavasius* is reported to gradually declining from Bangladeshi water bodies [23].
As data about biological aspects of catfish species such as morphometric measurements involving LWRs is scarce from Pakistan. Therefore, present study was aimed to investigate LWRs of *M. cavasius* with special reference to their morphological characters. To the best knowledge of authors, this is the first report on the LWRs of this species from Qadirabad barrage, river Chenab and will be useful for the proper management and conservation of this species in its natural habitat.

2. Materials and Methods

Punjab is the land of five rivers, among these Chenab River is a life line for Pakistan. Qadirabad barrage is situated at Chenab river, about 45 Km away from district Gujranwala. The total wetland area is 2816 ha supporting diversified fauna and flora of both aquatic and terrestrial ecosystems. Fish sampling was mainly done from downstream of the Qadirabad barrage (32º19'33 N, 073º40'57 E, 200 M) by using cast nets of varying mesh sizes from January to June 2017.

Collected samples were immediately preserved in 10% formaldehyde solution to prevent any deterioration and then were brought to the laboratory at Fisheries Research and Training Institute, Manawan, Lahore for their further study. After tagging, each fish was weighed nearest to 0.1g by using digital weighing balance and total length was noted by using scale nearest to 0.01cm. For each individual other morphometric characters such as Standard Length, Fork Length, Head Length, Head Width, Body Depth, Body Girth, Pre-dorsal Length, Post-dorsal Length and Length of Caudal Peduncle were also measured.

2.1 Statistical analysis

The LWRs were estimated by using the equation $W = aL^b$ (Where W= Body weight; a= Constant; L= Total length and b= Regression coefficient). Collected data was tested for normality by using Kolmogorov-Smirnov test. Additionally, data was subjected to regression analysis for estimating 95% Confidence Interval (CI) of a and b, and the coefficient of determination (r^2). All statistical analyses were considered significant at $p<0.01$.

3. Results

In the present study, a total of 100 fish samples were collected from downstream of Qadirabad barrage, river Chenab. The data for all the studied morphometric characters includes their minimum and maximum values, mean, standard error and standard deviation (Table 1). The total length ranged from 5.90-17.80 cm with mean 12.13±0.22 and body weight ranged from 2.00-42.0 g with mean value of 17.75±0.70. The other morphometric characters such as standard, fork length, head length, width; body depth, girth; pre and post dorsal lengths and length of caudal peduncle mean (±SE) values were 9.554±0.17, 9.749±0.18, 2.366±0.03, 1.500±0.02, 2.431±0.04, 2.596±0.04, 3.629±0.06, 4.991±0.11 and 1.775±0.04 respectively.

Table 1: Central tendency values including Mean, standard error and standard deviation of different body morphometric measurements of *M. cavasius*.

Body Measurement	Minimum	Maximum	Mean± S.E	S.D
Total Length (TL)	5.90	17.80	12.13±0.22	2.303
Body Weight (BW)	2.00	42.00	17.75±0.70	7.233
Standard Length (SL)	4.50	13.70	9.554±0.17	1.799
Fork Length (FL)	4.60	14.00	9.749±0.18	1.829
Head Length (HL)	1.30	3.30	2.366±0.03	0.391
Head Width (HW)	0.70	2.20	1.500±0.02	0.285
Body Depth (BD)	1.40	3.50	2.431±0.04	0.441
Body Girth (BG)	1.60	3.70	2.596±0.04	0.451
Pre-Dorsal Length (Pr. L)	1.70	5.00	3.629±0.06	0.627
Post-Dorsal Length (Ps. L)	2.00	7.20	4.991±0.11	1.094
Length of Caudal Peduncle (L.C.P)	0.50	3.00	1.775±0.04	0.465

Length in (cm), Weight in (g), S.E= Standard Error, S.D= Standard Deviation

When total length of *M. cavasius* was taken on x-axis and other morphometric measurements were taken on y-axis then LWRs was found highly significant (r=0.866; $p<0.01$) with slope value 2.718 (2.412to3.024). The regression analysis was also found significant for other morphometric characters such as; standard length-total length, fork length-total length, head length-total length, head width-total length, body depth-total length, body girth-total length, pre-dorsal length-total length, post-dorsal length-total length and length of caudal peduncle-total length (Table 2). Among these studied characters maximum correlation was observed for standard length-total length and fork length-total length (r= 0.973).

Table 2: Descriptive statistics and regression parameters of total length (cm) with different morphometric characters of *M. cavasius*.

Equation	a	b	95% CI of a	95% CI of b	r	r^2
BW = a + b TL	-15.21	2.718	-18.98 to -11.43	2.412 to 3.024	0.866**	0.749
SL = a + b TL	0.390	0.756	-0.039 to 0.820	0.721 to 0.790	0.973**	0.947
FL = a + b TL	0.375	0.773	-0.062 to 0.811	0.738 to 0.808	0.973**	0.948
HL = a + b TL	0.724	0.135	0.478 to 0.970	0.115 to 0.155	0.798**	0.636
HW = a + b TL	0.447	0.087	0.235 to 0.659	0.070 to 0.104	0.701**	0.492
BD = a + b TL	0.574	0.153	0.297 to 0.851	0.131 to 0.176	0.798**	0.638
BG = a + b TL	0.684	0.158	0.406 to 0.962	0.135 to 0.180	0.806**	0.649
Pr. L =a + b TL	0.623	0.248	0.354 to 0.892	0.226 to 0.270	0.911**	0.830
Ps. L= a + b TL	-0.413	0.446	-0.808 to -0.818	0.414 to 0.478	0.938**	0.880
L.C.P = a + b TL	-0.340	0.174	-0.584 to -0.097	0.155 to 0.194	0.864**	0.747

a= intercept; b= regression coefficient; CI= confidence interval; r= coefficient correlation. **Correlation is significant at the 0.01 level (2-tailed).

A significant correlation was observed, when body weight was taken on x-axis and all other morphometric characters on y-axis (Table 3). The maximum observed value of correlation was for standard length-body weight (r = 0.879; 95% CI of 0.194 to 0.240) and minimum for head width-body weight (r = 0.638 95% CI of 0.019 to 0.031).

Table 3: Descriptive statistics and regression parameters of body weight (g) with different morphometric characters of *M. cavasius*.

Equation	a	B	95% CI of a	95% CI of b	r	r^2
SL = a + b BW	0.569	0.217	5.257 to 6.136	0.194 to 0.240	0.879**	0.772
FL = a + b BW	5.808	0.222	5.357 to 6.259	0.198 to 0.246	0.878**	0.771
HL = a + b BW	1.644	0.041	1.511 to 1.777	0.034 to 0.048	0.752**	0.566
HW = a + b BW	1.053	0.025	0.940 to 1.166	0.019 to 0.031	0.638**	0.407
BD = a + b BW	1.582	0.048	1.440 to 1.723	0.040 to 0.055	0.783**	0.614
BG = a + b BW	1.697	0.051	1.562 to 1.832	0.044 to 0.058	0.813**	0.661
Pr. L =a + b BW	2.294	0.075	2.134 to 2.455	0.067 to 0.084	0.868**	0.753
Ps. L= a + b BW	2.754	0.126	2.443 to 3.006	0.110 to 0.142	0.833**	0.694
L.C.P = a + b BW	0.937	0.047	0.775 to 1.099	0.039 to 0.056	0.735**	0.540

a= intercept; b= regression coefficient; CI= confidence interval; r= coefficient correlation. **Correlation is significant at the 0.01 level (2-tailed).

The maximum value of coefficient of determination was found for fork length-total length (r^2 = 0.948) and minimum for head width-body weight (r^2 = 0.407). The b values for all the studied morphometric characters was below 3, indicating negative allometric growth of different body parts of this fish in relation to its total length and body weight. The b value does not wholly depends on length-weight of a fish but also on other factors such as salinity, temperature, sex, stage of maturity, food availability, feeding habits and seasonal changes.

4. Discussion

Information on length-weight in reference to body morphometric characteristics of *M. cavasius* is quite insufficient. The present study recorded the maximum size of *M. cavasius* in the river Chenab as 17.80 cm TL which was lower than the maximum recorded value 23.5 cm TL in Pakistan [7]. Several authors reported different maximum recorded values of total length of *M. cavasius* collected from different water bodies such as 14.8 cm, 15.0 cm and 22.6 cm from Pakistani, Bangladeshi and Indian water bodies respectively [5, 21, 18]. The size differences observed for *M. cavasius* might have some biological reasons but mainly are due to some technical reasons such as different gears selectivity, sample sizes and shrinkage in body sizes of formalin preserved specimens.

In the present study, b value was 2.63 indicating negative allometric growth of *M. cavasius*. Similar growth pattern was reported for this species from Indus river, Pakistan [7]. In their study the b values for male, female and combined sexes were 2.51, 2.57 and 2.54 respectively supporting the results of the present study. *M. cavasius* specimens collected from Bhadra reservoir, India indicated negative allometric growth [18]. The result of their study also supports the present findings. The isometric growth of *M. cavasius* from Taunsa barrage, Pakistan was reported [5]. The results of their study contradicted with present findings.

The length-weight relationship of *M. cavasius* was found highly significant supporting the results of our study [21]. However, the length and weight of *M. cavasius* (5.0-15.0 cm, 1.3-30.4 g) recorded in their study were smaller than present study. The length-weight relationship of *M. cavasius* collected from fish markets of Bangladesh reported positive allomeric growth of this fish [22]. In another study, *M. cavasius* specimens collected from Jamuna river, Bangladesh indicated positive allometric growth for this species [20]. The results of these studies are contradicting to our findings. Various factors such as population sizes, food and feeding habits, sex differences, maturational stages, seasons and sampling procedures could be reasons for such observed differences [24]. The allometric growth pattern of Mystus species were reported from different water bodies [20, 22, 25-27]. The specimens of *M. bleekri* were collected from Chenab river, Pakistan for estimating their length-weight relationships [25]. The value of b was 2.62 indicating negative allometric growth of this species. The result of their study also supports present findings. The values of regression slope (b) for different Mystus species are presented in Table 4.

Table 4: Regression coefficient (b) for length-weight relationships of some Mystus species collected from different localities.

Species	(Slope) b	Location	References
M. cavasius	2.92	Indus river, Pakistan	[5]
M. cavasius	2.54	Indus river, Pakistan	[8]
M. cavasius	3.21	Jamuna river, Bangladesh	[20]
M. cavasius	3.07	Fish markets, Bangladesh	[22]
M. bleekeri	2.62	Chenab river, Pakistan	[25]
M. vittatus	3.05	Mathabhanga river, Bangladesh	[26]
M. tengara	3.07	Baruipur wetland, India	[27]
M. cavasius	2.72	Chenab river, Pakistan	Present study

5. Conclusion

The results of the present study provide baseline information's regarding length-weight relationships with reference to different morphometric characters of *M. cavasius*. This data will be useful for fishery researchers, conservationist and policy makers for proper management and exploitation of this species from river Chenab, Pakistan.

6. Acknowledgement

The authors are grateful to the field officer and officials of Qadirabad barrage, Department of Fisheries, Punjab, for their assistance during field work. We also wish to acknowledge private fishermen for their cooperation in collecting specimens.

7. References

1. Latif M, Siddiqui S, Minhas IB, Latif S. Diversity and abundance of fish fauna at head Marala, Chenab river, Punjab, Pakistan. Canadian Journal of Pure and Applied Sciences. 2016; 10(3):3971-3979.
2. Latif M, Siddiqui S, Minhas IK, Latif S. Studies on icthyofaunal diversity of head Qadirabad, river Chenab, Punjab, Pakistan. International Journal of Fisheries and Aquatic Studies. 2016; 4(6):25-29.
3. Latif M, Pervaiz K, Minhas IB, Latif S. Current status of fish fauna at head Khanki, river Chenab, Pakistan. Journal of Biodiversity and Environmental Sciences. 2016; 9(4):279-285.
4. Latif M, Minhas IB, Ullah MZ, Latif S. Icthyofauna of river Chenab at head Trimmu, district Jhang, Pakistan. International Journal of Biosciences. 2017; 11(6):200-207.
5. Muhammad H, Iqbal Z, Bashir Q, Hanif MA. Length-

weight relationship and condition factor of catfish species from Indus River, Pakistan. Punjab University Journal of Zoology. 2017; 32(1):35-38.
6. Khan AM, Ali Z, Shelly SY, Ahmad Z, Mirza MR. Aliens; a catastrophe for native freshwater fish diversity in Pakistan. The journal of Animal and Plant Sciences. 2011; 21(2):435- 440.
7. Soomro AN, Baloch WA, Laghari ZA, Palh ZA, Lashari KH, Mastoi GM *et al*. Length-weight relationship and condition of *Mystus cavasius* (Hamilton) from lower Indus River at Thatta District, Sindh, Southern Pakistan**.** International Journal of Emerging Trends in Science and Technology. 2015; 2(2):1875-1879.
8. Akhteruzzaman M, Kohinoor AHM, Shah MS, Hussain MG. Observations on the induce breeding of *Mystus cavasius* (Hamilton). Bangladesh Journal of Fisheries. 1991; 14:101-105.
9. Chaturvedi J, Saksena DN. Diet composition, feeding intensity, gastrosomatic index and hepatosomatic index of a catfish Mystus cavasius from Chambal river (near Rajghat) Madhya Pradesh. International Journal of Recent Scientific Research. 2013; 4(9):1350-1356.
10. Bhatt VS. Studies on the biology of some freshwater fishes part VI. *Mystus cavasius* (Ham.). Hydrobiologia. 1971; 38(2): 289-302.
11. Ashashree HM, Venkateshwarlu M, Sayeswara HA. Seasonal changes of protein in the tissues of male catfish *Mystus cavasius* (Ham) in Bhadra reservoir, Karnataka, India. International Journal of Applied Biology and Pharmaceutical Technology. 2013; 4(4):264-267.
12. Gupta S. A review on *Mystus cavasius*, a popular food fish of Indian subcontinent. International Journal of Fauna and Biological Studies. 2014; 1(6):27-31.
13. Gupta S, Banerjee S. Indigenous ornamental fish trade of West Bengal. Narendra Publishing House, New Delhi, 2014, 63.
14. Hossain MA, Afsana K, Shah AKMA. Nutritional value of some small indigenous fish species (SIS) of Bangladesh. Bangladesh Journal of Fisheries Research. 1999; 3(1):77-85.
15. Kawarazuka N, Bene C. The potential role of small fish species in improving micronutrient deficiencies in developing countries: building evidence. Public Health Nutrition. 2011; 14(11):1927-1938.
16. Froese R. Cube law, condition factor and weight-length relationships: History, meta-analysis and recommendations. Journal of Applied Ichthyology. 2006; 22:241-253.
17. Latif M, Ullah MZ, Minhas IB, Latif S. Morphometric study of *Puntius sophore* (Hamilton, 1822) with special reference to body length-weight from Chenab River, Punjab, Pakistan. Journal of Entomology and Zoology Studies. 2017; 5(6):2032-2035.
18. Venkateshwarlu M, Srigowri J, Somashekar DS, Ashashree HM. Length-weight relationship and condition factor of freshwater catfish *Mystus cavasius* (Hamilton-Buchanan) from Bhadra reservoir, Karnataka. Environment and Ecology. 2007, 49-53.
19. Muralidharan M, Arunachalam M, Raja M. Length-weight relationships for fish species from Cauvery River at Hogenakkal in South India. Journal of Applied Ichthyology. 2011; 27(3):968-969.
20. Hossain MY, Rahman MM, Fulanda B, Jewel MAS, Ahamed F, Ohtomi J. Length-weight and length-length relationship of five threatened fish species from the Jamuna (Brahmaputra river tributary) river, northern Bangladesh. Journal of Applied Ichthyology. 2012; 28(2):275- 277.
21. Hossain MY, Hossen MA, Sharmin S, Nawer F, Naser SMA, Bahkali AH *et al*. Length-weight and length-length relationship of five Mystus species from the Ganges and Rupsha rivers, Bangladesh. Journal of Applied Ichthyology. 2016; 32(5):994-997.
22. Akther S, Akhter M, Hossain M. Length-weight relationship and condition factor of two Gangetic Mystus species, *Mystus tengra* (Hamilton, 1822) and *Mystus cavasius* (Hamilton, 1822). Journal of Entomology and Zoology Studies. 2017; 5(2):979-982.
23. Hussain MG, Azadi MA. Brood stock management status and some suggestions to control negative selection inbreeding in hatchery stocks Bangladesh. Naga. The ICLARM Quarterly. 1999; 22:24-27.
24. Bagenal TB, Tesch FW. Age and growth. Methods of assessment of fish production in freshwaters. In: T.B. Bagenal (Ed.), Oxford Blackwell Scientific Publication, 101-136.
25. Naeem M, Zuberi A, Hasan Z, Salam A, Khalid M *et al*. Length-weight and length-length relationships of freshwater wild catfish *Mystus bleekeri* from nala Daik, Sialkot, Pakistan. African Journal of Biotechnology. 2012; 11(50):11168-11172.
26. Hossain MY, Ahmed ZF, Leunda PM, Jasmine S, Oscoz J, Miranda R *et al*. Condition, length–weight and length–length relationships of the Asian striped catfish *Mystus vittatus* (Bloch, 1794) (Siluriformes: Bagridae) in the Mathabhanga River, southwestern Bangladesh. Journal of Applied Ichthyology. 2006; 22(4):304-307.
27. Gupta S, Banerjee S. Length-weight relationship of *Mystus tengara* (Ham.- Buch., 1822), a freshwater catfish of Indian subcontinent. International Journal of Aquatic Biology. 2015; 3(2):114-118.