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Length-weight relationship and condition of *Mystus cavasius* (Hamilton) from lower Indus River at Thatta District, Sindh, Southern Pakistan

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Abstract
Mystus cavasius a Bagirid catfish is one of the commercially important fish. Paper presents the first report on any biological aspect of this important catfish. Studies on Length-weight relationship and condition factor of M. cavasius at downstream of Indus River near Thatta District were carried out from March to July 2013. A total of 391 specimens including 177 male and 214 female were used for the study. The total length of male population ranged between 7.5 to 18.5 cm and in female population ranged 7.8 to 23.5 cm. The female population dominated over the male in the number, and it also attains larger size than male. The exponent b values of male, female and combined population were calculated as 2.51, 2.57 and 2.54 respectively, that indicate the negative allometric growth. This research reports the first study on Length-weight relationship of M. cavasius from Indus River.
Keywords: *Mystus cavasius, Catfish, Length-weight relationship, condition factor, Indus River.*

Introduction

Mystus cavasius is a bagirid catfish, domestically referred as Tengara. It is a vital silurid catfish, which is widely distributed in Pakistan Bangladesh, India, Myanmar, Sri Lanka and Nepal (Jayaram 1977; Jhingran 1991; Rahman *et al*., 2012*). M. cavasius* is known for its hardy nature, it can survive in tough environmental conditions such as wide ranges of temperature and low oxygen concentration (Akhteruzzaman *et al*., 1991). Among the small fishes *M. cavasius* contributes the considerable size catch at Thatta fish market and Kotri barrage fish landing center (Personal observation) however, in Bangladesh *M. cavasius* population is gradually decreasing (Hussain and Azadi, 1999). To the best of our knowledge length-weight relationship and condition factor of *M. cavasius* are not known from Indus River or any other water body of Pakistan.

In fisheries science length-weight relationship studies of a fish are of prime importance for fish production and biomass estimations (Anderson and Gutreuter, 1983; Safran, 1992; Petrakis and Stergiou, 1995; Dulcic and Kraljevic, 1996). Length-weight relationship is one of the scientific tool for demonstrating the survival, growth, maturity, reproduction, and general well-being of fishes (Le Cren 1951; Jatoi *et al*., 2013).

Present study is the first report on growth parameters of *M. cavasius*, which will be helpful to support the management efforts for this small

catfish and other fishes in Indus River. The study aims to document the well-being of *M. cavasius* population in Indus River.

Materials and Methods

Samples were obtained from fish landing center Thatta (Latitude: 24° 43' 53" N and Longitude 67° 58' 37" E) during March -July 2013 (Fig 1). A total of 391 specimens were used for this study. Fish samples were brought to laboratory of the department of Fresh Water Biology and Fisheries, University of Sindh, Jamshoro for further observations.

In the laboratory male and female specimen were separated based on the present and absent of papillae, the males were exhibiting the prominent papillae. The total length (TL)of each specimen was measured on centimeter (cm) scale with the help of measuring tap and the total weight (TL) was recorded to the nearest 0.01 g on digital balance (Ohaus precision-GT400).

Length–weight relationships calculations were made by Le Cren (1951) $W = aL^b$, where W is the total weight in grams, L is the total length in centimeters, *a* is coefficient related to body form and *b* is an exponent indicating isometric growth when equal to 3.0, positive allometric growth is indicated when b is > 3 and negative allometric growth is indicated when *b* is < 3.

The parameters *a* and *b* were estimated by linear regression on the log transformed equation: log W = a+b log L.

The relative condition factor Kn was estimated by Le Cren = $W/ a L^b$ given (1951). Fulton's condition factor (K_F) was calculated using the equation: $K_F = 100 \times (W/L3)$.

Results and Discussion

Out of total 391 fish specimen, 177 were male and 214 were females, contributing (45.26 %) for male and (54.73 %) for females (Table 1). The female population dominated in numbers over male, previously female population dominating over male is reported by different authors in genus *Mystus* (Rao and Sharma, 1984; Roy and Hossain, 2006; Musa and Bhuiyan, 2007; Gupta and Baneerji, 2013). Dominance of female population was also observed in other catfish species from Indus River (Soomro *et al*. 2007). Total length of observed specimen of *M. cavasius* ranged between 7.5 to 18.5 cm and 7.8 to 23.5cm for male and female, respectively (Table 1). Maximum size of *M. cavasius* recorded during the study is greater than the maximum size recorded in Jamuna River (11. 29 cm), indicating that the species grow larger in the Indus River (Hossain *et al*. 2012), which can be attributed to the low exploitation pressure in the studied habitat (Soomro *et al*. 2012). Our results also indicate that the males of *M. cavasius* are significantly larger than the females, similar findings were observed for *Mystus gulio* from Bangladesh (Islam *et al*. 2008). Difference between the total length of male and female can mainly be attributed to sexual dimorphism (Soomro *et al*. 2012).

Regression parameters including exponent *b* and a, 95% confidence intervals for *a* and *b* are given in table 2. The values of exponent *b* for male, female and combine population are 2.51, 2.57 and 2.54, respectively (Table 2). The values of exponent *b* for all three populations are < 3, suggesting the negative allomatric growth for all populations of *M. cavasius*. However, the value of *b* for male, female and combine population is within the expected range (2.5 to 3.5), (Pauly and Gayanilo, 1997; Jatoi *et al*., 2013). Previously the values of "*b*" of *M. cavasius* was reported 3.21 from Ganges (Hossain *et al*., 2012), this result is contradictory with our findings. Various factors including gonadal status, maturation, sex differences, feeding status could be reason for such differences (Tesch 1971; Begnal and Tesch, 1978).

The values of relative condition factor *Kn* and fultons condition factor K_F are given in tables 3. The mean values of relative condition factor for combine sexes, male and female populations are calculated as 0.85±0.44, 0.68±0.28 and 0.86±0.45 respectively, suggesting that female population of *M. cavasius* is comparatively in better condition; previously similar findings were observed for *Sperata seenghala* in Indus River (Jatoi *et al*., 2013).

The mean values of Fultons condition factor K_F for combined, male and female population are calculated as 0.92±0.23, 0.92±0.28 and 0.94±0.20, respectively (Table 3). These results also indicating the sex specific differences between male and female populations, where female show slightly better condition than male population. The condition factor is a tool to measure the changes in food reserves, food uptake and the health of fish. On the other hand, seasonal data on condition factor indicate the gonadal cycle of the fish (Hossain *et al*. 2013). Although, our study lack the seasonal data, in future studies condition factor based on the seasonal data can be studied to clear the reproductive seasonality and gonadal cycle of this species.

This study reports the first information regarding the length-weight relationship of the *M. cavasius* in lower Indus River. This will be useful to understand the health and fisheries status of fish in the River Indus.

Table 1. Regression parameters of *Mystus cavasius* from lower Indus River, Thatta district.

Sex	No.	Total Length (cm)	W aL^b			
		Min-Max	10^a	b	95 % CL of b	r^2
Combine sex	391	7.5-23.5	0.03	2.54	2.36-2.77	0.94
Male	177	7.5-18.5	0.058	2.51	2.13-2.68	0.87
Female	214	7.8-23.5	0.028	2.57	2.33-2.80	0.95

No. = Number; Min = minimum; Max = Maximum; a = intercept; b = slope;
r^2 = Coefficient of determination; CL = Confidence limit

Table 2. Descriptive statistics of total length (TL) and Total weight (TW) of *Mystus cavasius* from lower reaches of Indus River at Thatta district

Sex	Parameters	Minimum	Maximum	Mean ± STD	C l (95 %)
Male	length (cm)	7.5	18.5	13.70±0.38	0.38
	weight (g)	7.6	50	22.47±11.01	1.63
Female	length (cm)	7.8	23.5	16.25±3.74	0.5
	weight (g)	7	94	43.07±24.55	3.3

Table 3. Condition factor of *Mystus cavasius* from Lower Indus River at Thatta District

Condition factor	Number	Minimum	Maximum	Mean ± SD
Combine sex				
Relative conditions factor Kn	391	0.37	1.56	0.85±0.44
Fultons condition factor K_F		0.73	1.54	0.92±0.23
Male				
Relative conditions factor	177	0.41	1.19	0.68±0.28

Kn				
Fultons condition factor K_F		0.68	1.67	0.92±0.28
Female	214			
Relative conditions factor *Kn*		0.34	1.6	0.86±0.45
Fultons condition factor K_F		1.42	0.74	0.94±0.20

No. Number.

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