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## Original Article

# Morphometric characters and condition factors of five freshwater fishes from Pagla river of Bangladesh

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**Abstract:** The research was aimed to carry out the length-length relationships, length-weight relationship and condition factor of five freshwater small indigenous fish species *i.e.* *Amblypharyngodon mola*, *Puntius ticto*, *Cirrhinus reba*, *Chanda nama* and *Aspidoparia morar* from the Pagla river Bangladesh. The relationships equations among different body length parameters of each species were found highly significant. The length-weight relationship equation were found as  $TW=0.0351 TL^{2.86}$  for *A. mola*,  $TW = 0.0104 TL^{3.10}$  for *P. ticto*,  $TW = 0.0261 TL^{2.96}$  for *C. reba*,  $TW = 0.0175 TL^{2.845}$  for *C. nama*  $TW= 0.0101 TL^{3.05}$  for *A. morar*. The “b” values ranged from 2.845-3.10 which remained on the expected range of optimum growth.

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## Introduction

The statistical analysis of morphometric characters is one of the vital factors for the proper management of a species. In recent years, significance of the statistical relationship of morphometric characters has also been recognized in all taxonomic and systematic studies to solve various problems concerned with the life history of fish. Morphometric measurements and statistical relationships of fishes are therefore imperative for both fishery biology (Sparre et al., 1989; Mustafa and Brooks, 2008) and taxonomic studies (Tandon et al., 1993; Simon et al., 2010). These relationships also give information on the condition and growth patterns of fish (Bagenal and Tesch, 1978; Oscoz et al., 2005). In addition, condition factors may be used to detect seasonal variations in the growth of fish, which may vary with food abundance and average reproductive stage of the stock (King, 1995). For proper management and conservation of the wild population of fish species morphometric study is necessary.

In Bangladesh, a total of 260 indigenous freshwater fish species (Rahman, 2005) of which small indigenous species of fishes are important target species for the small-scale fishermen of Bangladesh (Craig et al., 2004; Mustafa and Brooks, 2008) and serve as a major source of protein and vitamin for the rural community (Rubbi et al., 1978).

The present study aimed to find out the present status of length-length and length-weight relationship and condition factor of five species *i.e.* *Amblypharyngodon mola*, *Puntius ticto*, *Cirrhinus reba*, *Chanda nama*, *Aspidoparia morar*. Findings of the work will play an important role for the successful management of these species to conserve from probable depletion of their wild stock in future.

## Materials and Methods

The specimens were collected from the fishers of Pagla river, Chapai Nawabgonj district (lies between 24°40'N and 24°42'E latitude and between 88°08'N and 88.11°E longitudes) north-west end of

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Bangladesh during day time from October, 2011 to January, 2012. During the period a total of 260 specimens (each of 52) were collected and identified to the species level according to Rahman (2005) and preserved by date in plastic jars with 5% formalin to save from spoilage. For each individual different body lengths *e.g.* total length (TL), standard length (SL), dorsal length (DL), pectoral length (PL), pelvic length (PvL), anal length (AL), head length (HL) were measured using a digital slide caliper and the total weight (TW) was measured using a digital balance Model: KD-300KC with 0.01g accuracy according to Simon and Mazlan (2008) and Alam et al. (2012). The relationships among all body length parameters were determined using the method of least squares to fit a linear regression as:  $Y = a + bX$ . Where, Y = various body lengths, X = total length, a = Proportionality constant and b = Regression coefficient (Alam et al., 2012). The length-weight relationships were determined by the general equation of  $TW = aTL^b$  (LeCren, 1951), Where, TW is the total weight (expressed in g), TL is the total length (expressed in cm), “a” is a coefficient related to body form and “b” is an exponent indicating isometric growth when equal to 3 and indicating allometric growth when significantly different from 3 (Simon and Mazlan, 2008; Simon et al., 2009). The parameters “a” and “b” of the exponential curve were estimated by linear regression analysis over log-transformed data expressed as:  $\log TW = \log a + b \log TL$ . The values of the constant “a” and “b” of the linear regression was determined by following Rounsefell and Everhart (1953) and Lagler (1966). The Fulton’s condition factor, K was calculated by using the following formula-  $K = (TW/TL^3) \times 100$ , Where, K = Fulton’s condition factor, TW= Total weight, TL = Total length. Here, factor 100 is used to bring K close unity. The data were analyzed using software SPSS, version 15.0.

## Results and Discussion

The length-length relationships with total length among standard length, dorsal length, pectoral length, pelvic length, anal length, head length and the

coefficient of correlation of five fish species are presented in Table 1.

The body lengths were found highly significant with all “r” values being >0.900 and positively correlated with TL. The obtained regression equations clearly revealed that the lengths of the body parts are proportional to the total length. Such findings were also observed by Tandon et al. (1993) while working with the morphometry of *Cirrhinus reba* of Kanjli wetland of India. These relationships were also observed in *Puntius chola* (Bhuiyan and Biswas, 1982), *Mystus vittatus* (Hoque and Hossain, 1992; Hossain et al., 2006), *Parastromateus niger*, (Dadzie et al., 2008) and *Puntius sophore* (Alam et al., 2012). The findings are more similar to the findings of Hossain et al. (2009) on the length-weight and length-length relationship of 10 small fish species from the Ganges, Bangladesh; and Alam et al. (2013) on length-length relationship, length-weight relationship and condition factor of freshwater fish species of Bangladesh.

The range of length and weight parameters of the length-weight equations and values of Fulton’s condition factors were shown in Table 2.

The values of slope “b” of length-weight equations were obtained as 2.860 for *A. mola*, 3.10 for *P. ticto*, 2.960 for *C. reba*, 2.845 for *C. nama* and 3.051 for *A. morar*. The length-weight relationships were found highly significant with all “r” values being >0.900 where the parameter “b” remained mostly within the expected range of 2.5-3.5. Therefore, all the species seemed to be followed the cube law. The reason behind may be the observed specimens were the inhabitants of quite good environment and gravid females were more in the samples (LeCren, 1951). The equations are therefore applicable for the total population as a whole. While working with different morphometric characters of other fish species Bagenal and Tesch (1978), Hoque and Hossain (1992), Kiran et al. (2004), Oscoz et al. (2005), Froese (2006), Britton and Devies (2007), Aguirre et al. (2008), Arshad et al. (2008), Hossain et al. (2009) and Alam et al. (2013) observed similar results. The obtained values of Fulton’s condition factor were

Table 1. Relationships with total length among different body lengths of five species

Species (Ordinate TL)	Abscissa	Mean±SE of Abscissa	Regression equation	r
<i>A. mola</i> (TL = 5.87±0.09)	SL	4.53±0.07	SL = 0.4719+ 0.6918TL	0.972**
	DL	2.43±0.03	DL = 0.3203+ 0.3604TL	0.936**
	PL	1.24±0.04	PL = 0.1847+ 0.1799TL	0.934**
	PvL	2.23±0.04	PvL = - 0.3323+ 0.4375TL	0.979**
	AL	3.07±0.05	AL = - 0.0981+ 0.5392TL	0.964**
	HL	1.18±0.01	HL = 0.2949+ 0.1513TL	0.948**
<i>P. ticto</i> (TL = 6.98±0.08)	SL	5.39±0.06	SL = 0.276+ 0.7323TL	0.971**
	DL	2.72±0.02	DL = 1.0787+ 0.2345TL	0.918**
	PL	1.32±0.02	PL = 0.0176+ 0.1865TL	0.964**
	PvL	2.53±0.04	PvL = - 0.3683+ 0.4154TL	0.938**
	AL	3.87±0.06	AL = - 0.4028+ 0.6124TL	0.966**
	HL	1.51±0.02	HL = 0.0079+ 0.2149TL	0.952**
<i>C. reba</i> (TL = 9.64±0.16)	SL	7.39±0.11	SL = 0.6881+ 0.6949TL	0.986**
	DL	3.42±0.05	DL = 0.7073+ 0.2816TL	0.946**
	PL	1.67±0.03	PL = 0.1877+ 0.1536TL	0.963**
	PvL	3.59±0.05	PvL = 0.5637+ 0.3136TL	0.946**
	AL	5.73±0.09	AL = 0.1178+ 0.5816TL	0.987**
	HL	1.69±0.02	HL = 0.5561+ 0.1172TL	0.937**
<i>C. nama</i> (TL = 5.59±0.10)	SL	4.29±0.09	SL = - 0.4553+ 0.8487TL	0.992**
	DL	1.68±0.03	DL = 0.2454+ 0.2577TL	0.954**
	PL	1.34±0.01	PL = 0.7222+ 0.1100TL	0.918**
	PvL	1.42±0.03	PvL = 0.1017+ 0.2356TL	0.931**
	AL	2.40±0.05	AL = - 0.0827+ 0.4439TL	0.984**
	HL	1.30±0.02	HL = 0.1955+ 0.1981TL	0.956**
<i>A. morar</i> (TL = 6.04±0.06)	SL	4.84±0.05	SL = - 0.3242+ 0.8541TL	0.976**
	DL	3.25±0.04	DL = - 0.2049+ 0.5721TL	0.955**
	PL	1.05±0.02	PL = - 0.6239+ 0.2773TL	0.922**
	PvL	2.37±0.02	PvL = 0.1262+ 0.3706TL	0.933**
	AL	3.26±0.03	AL = 0.3886+ 0.4748TL	0.932**
	HL	0.91±0.01	HL = - 0.1073+ 0.1683TL	0.903**

Table 2. Length-weight relationships and Fulton's condition factors of five species

Species	Total length characteristics		Total weight characteristics		Parameters of the relationship			Fulton's condition factor
	Range (cm)	Mean±SE	Range (cm)	Mean±SE	a	b	r	(K)
<i>A. mola</i>	4.50-6.70	5.87±0.09	0.88-3.26	1.97±0.10	0.0351	2.860	0.935	0.97
<i>P. ticto</i>	5.10-8.00	6.98±0.08	1.50-8.11	5.36±0.20	0.0104	3.10	0.939	1.36
<i>C. reba</i>	7.00-12.00	9.64±0.16	3.76-13.20	8.69±0.35	0.0261	2.960	0.976	0.99
<i>C. nama</i>	4.50-6.80	5.59±0.10	1.40-3.60	2.39±0.07	0.0175	2.845	0.933	0.95
<i>A. morar</i>	4.90-6.80	6.04±0.06	0.68-1.78	1.24±0.04	0.0101	3.051	0.928	1.28

found >1 for *P. ticto* and *A. morar* which indicate good growth performance of these species whereas for the rest species the values were being <1 but very closer to 1. This fluctuation may occur due to age and stage of maturity of the species as well as environmental conditions of habitat such as

temperature, salinity and seasonality. Such findings were also observed in *P. chola* (Bhuiyan and Biswas, 1982), *H. fossilis* (Mia, 1984), *A. mola* (Afroze et al., 1992), *M. vittaus* (Hoque and Hossain, 1992), *P. stigma* (Islam and Hossain, 1992), *A. coila* (Alam et al., 1994), *B. canis* (Mir, 1996), *Chanda nama* and

*C. ranga* (Iqbal et al., 1995-1996), *B. lohachata* (Mortuza and Mokarrama, 2000), *T. mediterraneus* (Santic et al., 2006), *P. niger* (Dadzie et al., 2008) and *P. ticto* (Hossain et al., 2012).

Findings of the present study has provided some new and updated information on the morphometric characters of five freshwater fish species of Pagla river representing the status of other small indigenous fish species of Bangladesh. Outcome of the present investigation will play important role for the management and conservation of these species as well as other small indigenous fish species of Bangladesh.

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