

Short Communication

Length-weight relationship of *Mystus tengara* (Ham.-Buch., 1822), a freshwater catfish of Indian subcontinent

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Abstract: Length-weight relationship is the most commonly used analysis which has been used for several purposes in fisheries field among which estimation of weight from length is the most popular one. The present study has been performed to analyze the length-weight relationship of *Mystus tengara*, a freshwater catfish of Indian subcontinent. Total Length and Body Weight of the studied specimens have been observed to vary from 7.2-11.3 cm (male), 7.3-11.7 cm (female) and 3.43-13.63 g (male), 2.83-14.88 g (female). The calculated regression coefficient (b) values are 2.941, 3.119 and 3.071 for male, female and combined sex, respectively; thus depicting negative allometric growth for male; while positive allometric growth for female and combined sex of this fish species. The correlation coefficient values (0.94, 0.95 and 0.95 for male, female and combined sex, respectively) are suggesting a significant relationship between length and weight of the studied fish. The present study provides the first baseline information on the length weight relationship of *M. tengara* which will be beneficial for future management of this fish species.

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Introduction

Length-Weight Relationship (LWR) is one of the most commonly used analyses of fisheries data (Mendes et al., 2004). It has been widely used in fish biology with several purposes: to predict weight from length measure for yield assessment, to calculate the standing crop biomass, to estimate weight at age, stock assessment, to evaluate index of well-being of fish population, to assess age structure and function of fish populations, growth studies, to assess fish population dynamics and growth, to make morphometric comparisons between species and populations and life history comparisons between regions (Pauly, 1993; Petrakis and Stergiou, 1995; Goncalves et al., 1997; Haimovici and Velasco, 2000; Morato et al., 2001; Stergiou and Moutopoulos, 2001; Moutopoulos and Stergiou, 2002; Ozaydin et al., 2007). Thus this parameter is of great importance in fishery assessments, more

importantly for proper exploitation and management of fish population (Haimovici and Velasco, 2000).

Mystus tengara is a freshwater species which is distributed throughout the Indian subcontinent including India, Bangladesh, Pakistan, Nepal and Afghanistan (Talwar and Jhingran, 1991; Petr, 1999). This fish species is a popular food fish due to its high nutritional value with good amount of protein and mineral content (Siddiqui et al., 2010; Gupta and Banerjee, 2013). Recently it has also made its entry in domestic ornamental fish markets of India (Gupta and Banerjee, 2012) and has been reported to have moderate export price too (Gupta and Banerjee, 2014). Earlier, some works have been carried out on LWR of different species of the genus *Mystus* in India, Bangladesh and Pakistan (Hossain et al., 2006, 2009, 2012; Krishna Rao, 2007; Begum et al., 2010; Venkateshwarlu et al., 2007; Sani et al., 2010; Karna and Panda, 2012; Naeem et al., 2012;

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Table 1. Descriptive statistics and estimated parameters of length-weight relationships for male, female and combined sex of *Mystus tengara*.

Sex	No.	Body Weight (gm)		Total Length (cm)		Regression Parameters		95% CI of <i>a</i>	95% CI of <i>b</i>	<i>r</i> ²
		Max.	Min.	Max.	Min.	<i>a</i>	<i>b</i>			
Female	197	14.88	2.83	11.7	7.3	2.159	3.119	2.016-2.301	2.974-3.264	0.95
Male	203	13.63	3.43	11.3	7.2	1.992	2.941	1.844-2.141	2.788-3.094	0.94
Combined	400	14.88	2.83	11.7	7.2	2.115	3.071	2.014-2.214	2.968-3.173	0.95

Srivastava et al., 2013; Victor Raj et al., 2014), but no such work so far has been reported on LWR of *Mystus tengara*. Therefore, to put the first basic information on LWR of *Mystus tengara* the present study has been performed.

Materials and methods

Data collection: Specimens of *M. tengara* have been collected on monthly basis from an undisturbed wetland at Baruipur, South 24 Paraganas, West Bengal (Latitude N 22°34', Longitude E 88°43') for one year, from February, 2011 to January, 2012. Samplings have been carried out during early morning in between 6.00 am to 8.00 am. In total 400 specimens of *M. tengara* have been collected during the entire study period to study the LWR. After collection, fish specimens have been transferred to ice-box and morphometric study has been performed after reaching the laboratory. Total Length (TL) in cm and Total Body Weight (TBW) in gram have been measured to the nearest of 0.1 cm and 0.01 g, respectively.

Data analysis: LWR has been calculated for male, female and combined sex using the conventional formula described by Le Cren (1951) as follows:

$$W = aL^b,$$

Where, *W* is the Total Body Weight (g), *L* is the Total Length (cm), *a* is the intercept of the regression and *b* is the regression coefficient (slope or better to say growth rate). The parameters *a* and *b* have been estimated using the least-square linear regression method (Zar, 1999) after log-transforming the above equation as follows:

$$\log W = a + b \log L$$

The significance of the regression has been assessed by ANOVA. The determination coefficient (*r*²) has

been used as an indicator of the quality of the linear regression (Zar, 1999). In order to check if the calculated value of *b* is significantly different from 3 (isometric value), Student's t-test has been used. The value of *b* gives information on the kind of growth of fish; growth is isometric (no change of body shape as the fish grows) if *b* = 3 and the growth is allometric if *b* ≠ 3; negative allometric (fish becomes more slender as it grows) if *b* < 3 and positive allometric (fish becomes relatively stouter or deeper-bodied as it grows) if *b* > 3 (Bagenal and Tesch, 1978). All statistical analysis have been considered at significance level of 1% (*P* < 0.01). Statistical analysis was performed using statistical software SPSS version 10.0 for Windows (SPSS Inc. Chicago, USA).

Results and discussion

Sample size, weight and length range and calculated LWR parameters *a*, *b* and *r*² has been represented in Table 1. The linear relationships calculated for female, male and combined sex are as follows: $\log W = -2.159 + 3.119 \log L$, $\log W = -1.992 + 2.941 \log L$ and $\log W = -2.115 + 3.071 \log L$. The values of regression coefficient *b* are 2.941, 3.119 and 3.071 for male, female and combined sex, respectively, which are suggesting negative allometric growth for male, and positive allometric growth for female and combined sex. As till now no such information is available on LWR of *M. tengara*, it is not possible to compare the current result with previous data. However, they have been compared with results of the earlier studies on the same aspect in different species of the genus *Mystus* as follows: Hossain et al. (2006) have reported 2.96, 3.13 and 3.05 as “*b*” values for male, female and combined

sex of *M. vittatus* while Victor Raj et al. (2014) have reported values of 2.405, 2.873 and 2.732 for the same. Hossain et al. (2009) and Srivastava et al. (2013) have documented “*b*” values of 3.27 and 2.88 for combined sex of *M. vittatus*, respectively. Krishna Rao (2007), Sani et al. (2010), Hossain et al. (2012) and Karna and Panda (2012) have documented “*b*” values of 2.83, 2.91, 3.21 and 3.009, respectively, for combined sex of *M. cavasius* while Venkateshwarlu et al. (2007) have reported “*b*” values of 2.493 and 2.7402 for male and female of the same species. Karna and Panda (2012) have reported “*b*” value of 3.032 for combined sex of *M. gulio* while “*b*” values of 1.388 and 1.468 for male and female specimen have been reported by Begum et al. (2010) for the same species. Naeem et al. (2012) have reported “*b*” values of 2.64, 2.70 and 2.62 for male, female and combined sex of *M. bleekeri*, respectively. Among the earlier documented information on “*b*” value of different species of *Mystus* other than *Mystus tengara*, only values reported by Hossain et al. (2006) on *M. vittatus* are somehow close to the value of the current study.

LWR parameters (*a* and *b*) of the fish have been reported to be affected by a number of factors like season, habitat, gonad maturity, sex, diet, stomach fullness, health, annual differences in environmental conditions, differences in the length range of the caught specimens, sampling procedure etc. (Bagenal and Tesch, 1978; Froese, 2006). Even though the change of “*b*” values depends primarily on the shape and fatness of the species, such differences in values “*b*” can be due to one or combination of most of the above listed factors including differences in the number of specimens examined, area/season effects and duration of sample collection etc. (Moutopoulos and Stergiou, 2002). According to Bagenal and Tesch (1978), Goncalves et al. (1997) and Ozaydin et al. (2007), the parameter *b*, unlike the parameter *a*, may vary seasonally, and even daily, and between habitats. Muchlisin et al. (2010) have assumed that the *b* values are mostly affected by the availability of food and environmental conditions such as

temperature, pH and dissolved oxygen. Thus, LWR in fish can be affected by a number of factors discussed above; none of which has been considered in the present study.

Therefore, the present study provides first ever baseline information on the LWR of *M. tengara* which will be beneficial for future management of this fish species.

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