Length-weight relationship of ribbon fishes: *Trichiurus lepturus* (Linnaeus, 1758) and *Lepturacanthus savala* (Cuvier, 1829) from Visakhapatnam coast

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Short Communication

Abstract

The length-weight relationship in *Trichiurus lepturus* was found to be $W = 0.000012 L^{2.9925}$ (r =0.698) in males, $W = 0.000013 L^{2.9329}$ (r=0.878) in females and $W = 0.000013 L^{3.0348}$ (r=0.746) for sexes pooled data. In *Lepturacanthus savala* it was $W = 0.000011 L^{2.8948}$ (r = 0.856) in males, $W = 0.000014 L^{2.5170}$ (r = 0.825) in females and $W = 0.000013 L^{2.7146}$ (r = 0.815) for sexes pooled. Analysis of covariance revealed no significant difference in growth in relation to length between the sexes in *T. lepturus*, whereas in *L. savala* it was significant between the sexes.

Keywords: *Trichiurus lepturus, Lepturacanthus savala*, length-weight relationship, Visakhapatnam coast.

Introduction

Studies on length-weight relationship (LWR) of fishes are mainly directed towards two objectives, namely to provide a mathematical relationship between two measurements (length and weight) as a means of inter-conversion and to calculate the condition factor (Le Cren, 1951). The notable works in this direction on ribbon fishes are by Prabhu (1955), Misu (1964), Dawson (1967), Narasimham (1970), James *et al.* (1978), Sastry (1980), Reuben *et al.* (1997), Swain (1993), Khan (2006), Ghosh *et al.* (2009), Al-Nahdi *et al.* (2009), Rizvi *et al.* (2010).

Material and methods

Fishes of the species *T. lepturus* and *L. savala* were collected from Visakhapatnam fishing harbour twice a month from June 2006 to May 2007 except in April 2007. A total of 204 specimens of *T. lepturus* (102 males and 102 females) and 206 fishes of *L. savala* (105 males and 101 females) were brought to the laboratory. Length and weight of the fishes were recorded in centimeters and grams to the nearest 0.01g of accuracy respectively. The individual fishes were later dissected for the determination of sex.

The LWR of males and females and for sexes pooled was derived by the least square method of Le Cren (1951) using the formula

$$W = a L^b,$$

Where W = total body weight (g), L = total length (cm), 'a' is a coefficient related to body form and 'b' is an exponent reflecting the isometric growth (Beverton and Holt, 1957). The logarithmic form of the same is

Log W = Log a + b Log L.

The analysis of covariance was performed to determine variation in 'b' values between the sexes at 5% level of significance following Snedecor and Cochran (1967). To test 'b' value against the ideal value of '3', student's t-test was employed to predict any significant deviation. The t- statistic was calculated as follows:

$t = (b-3) / S_b$

Where, S_b = Standard error of 'b' = $S_b = \sqrt{(1/ (n-2))*[(S_y / S_x)^2 - b^2]}$, S_x and S_y are the standard deviations of x and y respectively. The t- value was compared with t- table value for (n-2) degrees of freedom at 5% and 1% significant level.

Results and discussion

The total length and weight of *T. lepturus* varied from 13.5 cm to 36 cm and 30 g to 850 g whereas the same of *L. savala* ranged from 15 cm to 40 cm and 80 g to 950 g respectively. The parabolic equations and the logarithmic regression equations obtained were as follows:

T. lepturus: (Fig. 1)
Male: $W = 0.000012 L^{2.9925}$ (r = 0.698)
         Log W = - 4.9399 + 2.9925 log L (r = 0.835)

Female: $W = 0.000013 L^{2.9329}$ (r = 0.878)
         Log W = - 4.7914 + 2.9329 log L (r = 0.847)

Pooled: $W = 0.000013 L^{3.0348}$ (r = 0.746)
         Log W = - 5.0341 + 3.0348 log L (r = 0.838)

L. savala: (Fig. 2)

Male : $W = 0.000011 L^{2.8948}$ (r = 0.857)
         Log W = - 4.715 + 2.8948 log L (r = 0.858)

Female: $W = 0.000014 L^{2.5170}$ (r = 0.825)
         Log W = - 3.7508 + 2.5170 log L (r = 0.76)

Pooled: $W = 0.000013 L^{2.7146}$ (r = 0.815)
         Log W = - 4.3183 + 2.7146 log L (r = 0.763)

In both the species 'r' was significant in males and females. Whenever the regression coefficient deviated from '3', the t-test was applied. In males of *T. lepturus* the 't'- value was found to be 9.12 (d.f. = 101, t 1% = 2.58, t 5% = 1.96) and in females it was found to be 7.35 (d.f. = 101, t 1% = 2.58, t 5% = 1.96), whereas in *L. savala* the correlation coefficient was 8.36 (d.f. = 104, t 1% = 2.58, t 5% = 1.96) for males and 6.24 (d.f. = 100, t 1% = 2.58, t 5% = 1.96) for females. The 'b' value was significantly different between males and females of both the species.

Hile (1936) and Martin (1949) proposed that the value of exponent (b) usually ranges between 2.5 and 4.0. The value of 'b' remains constant at '3' in an ideal fish (Allen, 1938). According to Misu (1964) significant difference has been found within sexes between the two populations of *T. lepturus* from East China Sea and Yellow Sea Po-hai Bay and no significant difference within the same population. Narasimham (1970) attributes high 'b' values to the feeding habits of the fish in case of *T. lepturus*. Sastry (1980) reports that the 'b' value is nearer to 3 in case of *L. gangeticus* and *T. russelli* except in females of *T. russelli* (3.4925). In other species like *T. haumela* (Prabhu, 1955), *T. pantulii* (Gupta, 1967 & 1968), *E. intermedius* (James, 1967) and *T. lepturus* (Narasimham, 1970) the regression coefficient varied from 3.0819 to 3.5233.

Table 1: Comparison of length – weight relationship of *T. lepturus* and *L. savala* from different study areas.

| Species	Author (s)	Area of study	'a' value		'b' value		Pooled	
			Male	Female	Male	Female	'a' value	'b' value
T. lepturus	Narasimham (1970)	Kakinada	0.0001131	0.0001109	3.4169	3.4367	-	-
	Swain (1993)	Gopalpur	-	-	-	-	0.00695	2.3980
	Prabhu (1995)	Maharashtra	-	-	-	-	0.004935	3.0819
	Reuben *et al.* (1997)	Visakhapatnam	0.00273	0.000223	3.2458	3.9862	-	-
	Khan (2006)	North- West coast	-	-	-	-	3.8448	3.3520
	Ghosh *et al.* (2009)	North- West coast	-	-	-	-	0.00000001	3.6117
	Present study	Visakhapatnam	0.000012	0.000013	2.9925	2.9329	0.000013	3.0348
L. savala	Rizvi *et al.* (2010)	Mumbai	-	-	-	-	0.00000001	3.6117
	Present study	Visakhapatnam	0.000011	0.000014	2.8948	2.5170	0.000013	2.7146
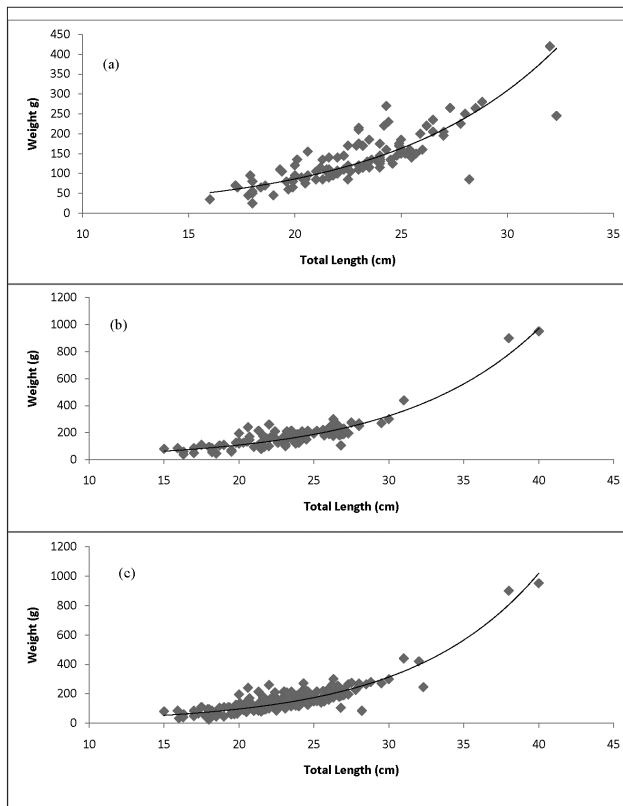
Fig.2 Scatter diagram showing length-weight relationship of *L. savala* (a. male, b. female & c.sexes pooled)

The 'b' value lower than '3' *i.e.*, 2.802 has been observed by Narasimham (1983) in *Eupleurogrammus glossodon*. Khan (2006) has found the 'b' value to be more (3.352) in *T. lepturus* collected from the north-west coast of India. Ghosh *et al.* (2009) have observed the positive allometric growth in *T. lepturus* and found no significant difference between the sexes from Veraval waters. Table 1 shows the length-weight relationships of *T. lepturus* and *L. savala* reported from earlier studies. Al-Nahdi *et al.* (2009) have observed a positive allometric growth in *T. lepturus* with the 'b' value 3.3155 from Oman. All these studies clearly elucidate that regression coefficient of the length-weight relations in fishes vary with geographical locations. The present study postulates isometric growth in *T. lepturus* and negative allometric growth in *L. savala.*

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