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[Research]

## Studies on length-weight and length-length relationships of a catfish *Eutropiichthyes vacha* Hamilton (Schilbeidae: Siluriformes) from Indus river, Sindh, Pakistan

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### ABSTRACT

Present study describes the length-weight (LWR) and length-length (LLR) relationships of a freshwater catfish *Eutropiichthyes vacha* Hamilton from Indus River, Sindh, Pakistan. A total of 281 specimen of *E. vacha* were collected from fisherman's catch from February 2005 to January 2006, are used for this study. The parameters *a* and *b* of the length-weight relationship were calculated as  $W = aL^b$  are presented. The values for allometric coefficient *b* of the LWR were close to isometric value for male ( $b = 3.159$ ) and combined values for both sexes ( $b = 3.053$ ). However, it suggested negative allometric growth for females ( $b = 2.973$ ). Results for LLRs indicated that these are highly correlated ( $r^2 > 0.9$ )  $P < 0.0001$ .

**Keywords:** catfish, *Eutropiichthyes vacha*, Indus river, length-weight, length-length, relationships.

### INTRODUCTION

Catfish are most abundant group of fish. *Eutropiichthyes vacha* Hamilton, locally called as Challi, is one of the most important freshwater catfish of Pakistan. It belongs to order Siluriformes and family Schilbeidae. Among the small sized fishes it has high economic importance and market value. Locally it is sold from Rs.120-150/ Kg because of its export to Middle East countries like UAE (personnel survey). In Pakistan it is found in all type of freshwaters in warm areas (Mirza & Bhatti 1999). From Pakistan no work has yet been reported on any aspect of *E. vacha*.

The mathematical relationship between length and weight of fishes is a practical index suitable for understanding their survival, growth, maturity, reproduction and general well being (Le Cren 1951).

Length-weight relationships are useful in fishery management for both applied and basic use (Pitcher & Hart 1982) to (i) estimate weight from length observations; (ii) calc-

ulate production and biomass of fish population; and/or (iii) provide information on stock or organism condition at the corporal level. Length-length relationships (LLRs) are also important in fisheries management for comparative growth studies (Moutopoulos & Stergiou 2002). Present work will provide baseline information for the growth of catfish from Indus River and it can be supportive in future for the management of catfishes in Pakistan.

### MATERIALS AND METHODS

In total 270 fish specimen used for present study, were collected from River Indus, near G.M Barrage (Kotri Barrage) Jamshoro, Sindh, Pakistan. Regular monthly samples were obtained from fishermen's catch at fish landing center near Kotri Barrage during February 2005 to January 2006. Specimens were brought to the laboratory of the Department of Fresh Water Biology and Fisheries, University of Sindh, Jamshoro. Total length (TL) fork length (FL) and

Standard length (SL) were measured using measuring board (cm), while body weight was determined as total weight including gut and gonads, using a digital balance to the nearest 1g. Fish were dissected to determine their sexes on the basis of gonads. Minimum length of mature male was 15 cm, while for females it was >14 cm, hence smaller than 14 cm (females) and 15 cm (males) were considered immature and were not included in present study. The values of constants  $a$  and  $b$  were estimated from the log transformed values of length and weight i.e.  $\log W = \log a + b \log L$ , via least square linear regression (Zar, 1984). The coefficient  $a$  is the intercept, and the regression of coefficient  $b$  is an exponent, indicating isometric growth when equal to 3.0, a value larger or smaller than 3.0 shows allometric growth (Bagenal & Tesch 1978). Furthermore, relationships in between (i) TL v/s SL (ii) SL v/s FL (iii) FL v/s TL were also estimated by using the above least square linear regression equation.

## RESULTS AND AND DISCUSSIONS

From the total of 270 specimens of *E. vacha* used for the length-weight and length-length relationship studies 142 were males, while 128 were females, contributing (52.6%) and (47.4%) respectively. The results of length weight relationship (Table 1) indicated close to isometric growth for males ( $BW = 0.0039 TL^{3.159}$ ,  $r^2 = 0.955$ ) and negative allometric growth for females ( $BW = 0.0072 TL^{2.958}$ ,  $r^2 = 0.976$ ). The results for combine values of both sexes also indicated the positive allometric growth ( $BW = 0.0054 TL^{3.053}$ ,  $r^2 = 0.964$ ). The results of length-weight relationship are indicating difference between the male, females and combined values (Fig. 1). The value of  $b$  for females is below 3.0 that show the rate of increase in body length is not in proportional to the rate of increase in body weight. This change may be because of various factors which effect the growth of fish, those may be including season, habitat, gonadal maturity, sex, stomach fullness, health and preservation techniques (Tesch 1971; Begenal & Tesch1978). The  $b$  values for male and combined LWR were > 3.0 (Table 1), it indicates that the male *E. vacha* grow as the cube of the length.

All allometric coefficients ( $b$ ) estimated in this study were within the expected range 2.5-3.5. According to Pauly and Gayanilo

(1997),  $b$  values may range from 2.5 to 3.5 suggesting that result of this study is valid.

All the LLRs values are given in table 2. The values for coefficient of determination ( $r^2$ ) for all the length-length parameters of male, female and combine were > 0.9, and were highly significant ( $P < 0.0001$ ).

The present study provides baseline information on LWRs and LLRs for *E. vacha* Hamilton, that will be useful for researchers and fishery managers in future.

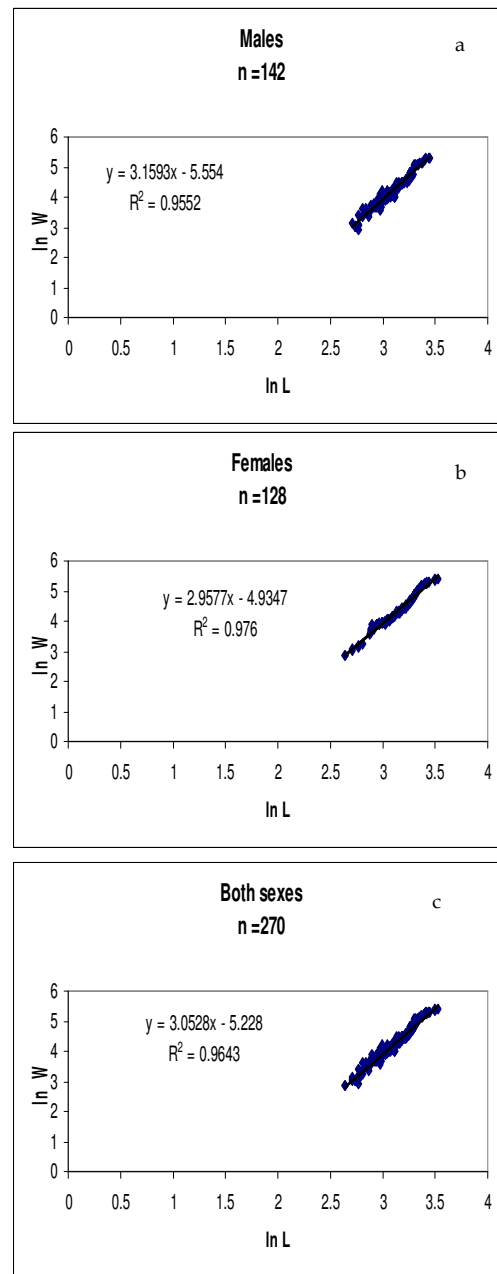


Fig 1. Relationship between standard length (mm) and body weight (g) for male (a), female (b) and combined of *E. vacha* (c).

**Table 1. Regression coefficient for length-weight relationships for some Siluriformes fishes.**

Species	Sex	<i>n</i>	<i>a</i>	<i>b</i>	<i>r</i> <sup>2</sup>	Authors
<i>Mystus baramensis</i>	B	41	0.004	2.875	0.917	Martin-Smith (1996)
<i>Mystus vittatus</i>	M	1407	0.023	2.959	0.953	Hossain et al., (2006)
<i>Mystus vittatus</i>	F	1031	0.018	3.134	0.965	Hossain et al., (2006)
<i>Mystus vittatus</i>	B	2438	0.020	3.058	0.958	Hossain et al., (2006)
<i>Eutropiichthyes vacha</i>	M	142	0.0039	3.159	0.955	present study*
<i>Eutropiichthyes vacha</i>	F	128	0.0072	2.958	0.976	present study*
<i>Eitropiichthyes vacha</i>	B	270	0.0054	3.053	0.964	present study*

B= both sexes; M= male; F= female; *n*= number of individuals; *a*= intercept; *b*= slope; *r*<sup>2</sup>= coefficient of determination; \*= *p*<0.0001.

**Table 2. Length-length relationships between total length (TL), fork length (FL) and standard length (SL) of *Eutropiichthyes vacha*.**

Sex	Equation	<i>n</i>	<i>a</i>	<i>b</i>	<i>r</i> <sup>2</sup>
Male	TL= a+bSL	142	1.2048	0.9062	0.9651*
	FL= a+bTL		0.9379	1.0145	0.9711*
	SL= a+bFL		0.9181	1.0489	0.9921*
Female	TL= a+bSL	128	1.1581	0.9377	0.9770*
	FL= a+bTL		0.9412	1.0113	0.9817*
	SL= a+bFL		0.9499	1.0230	0.9810*
Combined	TL= a+bSL	270	1.0167	0.9226	0.9712*
	FL= a+bTL		0.9403	1.0124	0.9767*
	SL= a+bFL		0.9342	1.0357	0.9864*

*n*= number of individuals; *r*<sup>2</sup>= coefficient of determination; *a*= intercept; *b*= slope; \*= *p*<0.0001.

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