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LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF *HORABAGRUS BRACHYSOMA* (SILURIFORMES: HORABAGRIDAE) FROM THE RIVERINE STRETCHES OF VEMBANAD LAKE, INDIA

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Abstract: *Horabagrus brachysoma*, commonly known as Golden catfish, is an endemic species of the Western Ghats, India. The length-weight relationship of the species was determined by using the formula $W = a L^b$ and the results implies that *H. brachysoma* found in Vembanad lake has isometric growth. The *b* values ranged between 2.96 and 3.18, *b* value was higher in case of males. The determination coefficient between length and weight was found to be very high, r^2 = 0.863, 0.843 and 0.854 for males, females and sexes combined respectively. The condition factor was found to be approximately similar in both females (1.30±0.291) and males (1.28±0.315) and this indicated a better general condition of fishes in this system.

Key words: Length-weight relationship, *Horabagrus*, Vembanad lake, condition factor

INTRODUCTION

Catfishes are particularly adapted to shallow depths, low oxygen concentration and high turbidity and are preferred over carps due to excellent flesh quality and flavour. *Horabagrus brachysoma* (Gunther 1864), commonly known as Golden catfish or Asian sun catfish, belongs to the family Horabagridae (Sullivan *et al.*, 2006), is endemic to Western Ghats, is reported from the rivers of Kerala and South and North Canara (Raghavan and Ali, 2011). This species contributed high in commercial market while the other smaller species of the family *H. nigricollaris*, is restricted to the Chalakkudy river system of Central Kerala (Shaji *et al.*, 2000; Bhat, 2001). Length-weight relationship is used to evaluate the relative condition of fish among populations (Lai and Helser, 2004) and the condition factor is used as an index of wellbeing of fishes (Parida *et al.*, 2015). In length-weight relationship, the length is converted into weight and used for studying taxonomic differences and different stages in their life histories of fishes (Pradeep, 2018). In this study, length-weight relationships were estimated for this ûsh species from the Vembanad lake and the information on their length-weight relationships is mostly limited to a few reports (Kumar *et al.*, 1999; Ali *et al.*, 2008; Prasad *et al.*, 2012; Katwate *et al.*, 2012).

MATERIALS AND METHODS

The study was carried out in the Vembanad wetlands (09°31´ & 09°41´N and 76°21´ & 76°26´E) in Kerala, India. A total of 1682 fish samples were collected monthly for an year and the total length (L_T) from tip of the snout to the tip of the caudal fin ray and total weight (W_T) of the fish was measured from the fish landing centre itself. They were captured using gillnets. The length of the specimens was taken to the nearest mm using a measuring scale and the weight to the nearest gram using a weighing balance. They were grouped into different classes based on size and the percentage of occurrence in each class was assessed. Since sexual dimorphism was not

prominent externally, the sexes were determined by dissecting the fishes (n=443; 156 males and 287 females).

Length weight relationship

The length-weight relationship was calculated separately for males, females and sexes pooled, using the expression given by Le Cren (1951) as given below:

$W = a L^b$

where, W= Weight of fish in grams, L= Length of fish in centimeters, *a* is the intercept and *b* is the power. The degree of adjustment of the model studied was assessed by the determination coefficient (r^2).

The length-weight relationship obtained in the exponential form as above was transformed to linear logarithmic form by taking the logarithm of the values on both the sides of the above equation. The equation was derived as follows:

$\log W = \log (a L^b)$

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

Length frequency

For length frequency analysis a total of 1682 fishes were taken and were grouped into 5.0 cm size class starting from 5.0 – 10.0 cm to 40.0 – 45.0 cm respectively.

Condition factor

The relationship between length and weight for individual fish was used to calculate Fulton's condition factor index (K) and was estimated using the following equation given by Le Cren (1951).

$$K = (W/L^3) \times 100$$

where,

K = Condition factor

L = Length of fish in centimeters

W = Weight in gram

Statistical analysis

Statistical parameters like range, mean, standard deviations and determination co-efficient (r^2) were estimated for the characters under study. In all cases a statistical significance of 5% was adopted. Results were expressed as mean $\pm$ standard deviation. The parameters *a* and *b* of the length-weight relationship were estimated by the least squares regression method using software SPSS version 20. The 95% confidence of the limits of *b* was determined .

RESULTS AND DISCUSSION

The fishery of *H. brachysoma* is almost year-round and is supported predominantly by gill netting and drag netting. Assessment of the exploited catches indicated that the species contribute only a small component (1.5%) in the local fishery in the riverine stretches upstreams the Vembanad lake (Bindu, 2006). Size of *H. brachysoma* in the catches varied from 9.5cm(15g) to 42cm(800g). The maximum size of the fish in the exploited catches during the period of study was 42cm.

Length –weight relationship

Linear regression equations between standard length and weight of male, female and juveniles are plotted in Fig. 1. The *b* value of length-weight relationship ranged between 2.96 and 3.18, *b* value was higher in case of males (table 1). This showed an isometric growth indicating the better environmental conditions of Vembanad for this species. They were within the 2.5-3.5 limit (Froese, 2006) whereas Kumar *et al.* (1999), and Ali *et al.* (2008) reported higher *b* values from Achencoil and Periyar rivers. The determination coefficient (r^2) ranged from 0.863 for male, 0.843 for female and 0.854 for sexes pooled, which indicates a good quality of the prediction of a linear regression model for this fish species. Differences in the *b* value from same fish species is perhaps caused by a number of factors, including sex, gonad maturity, growth phase, season, stomach fullness, sampling size and a narrow length range (Froese *et al.*, 2011).

Length frequency

Length-frequency distribution of fishes from 5.0 – 45.0 cm, revealed that only fishes between 15cm and 30cm were vulnerable to commercial gears. Medium sized specimens of 20.0 - 25.0 cm (45.3%) were dominated followed by 15.0-20.0 cm (24.5%) in the population.

Condition factor

In females the condition factor varied between 0.58 and 3.07 and in males it was 0.59 and 3.56. Pooled condition factor varied between 0.58 to 3.56 (1.29 ± 0.299). Monthly variations in the mean condition factor of both the sexes was given in the table 2. Similarly higher K values were reported in *Labeo rohita* (Pandey and Sharma, 1998) and

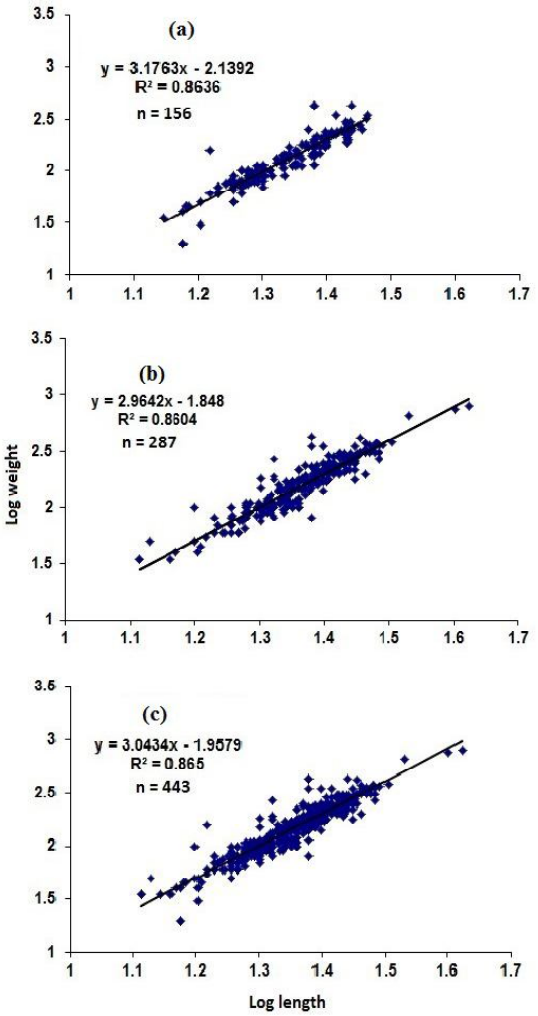

Fig. 1. Length-weight relation relationship in *Horabagrus brachysoma* from Vembanad lake, Kerala (*a: male; b: female c: pooled*)

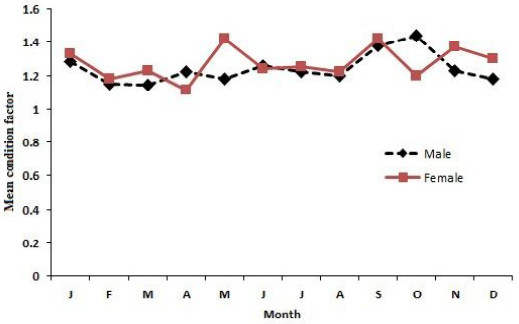

Fig. 2. Monthly variations in the condition factor of *Horabagrus brachysoma* from Vembanad lake, Kerala

Osteogeneiosus militaris (Parida *et al.*, 2015). Except slight variations in May and October, the values of K showed almost similar pattern in both males and females which may be related to reproductive cycle and feeding (Parida *et al.*, 2015). The present study acts as a tool to implement laws to regulate over exploitation of this species by implementing minimum catch size in the lake.

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Table 1. Estimated parameters of Length-weight relation in *H. brachysoma* from Vembanad lake, Kerala (*a, b* : parameters of Length-weight relationship; *N* : Sample size; CL: confidence limit; r^2: coefficient of determination)

Sex	L_T Range (cm)	W_T Range (g)	*a*	*b*	95% CL of *b*	*N*	*SE of b*	r^2
Male	14.0-29.1	20.0- 350	0.118	3.176	2.975-3.377	156	0.102	0.863*
Female	13.0-42.0	35.0-800	0.165	2.964	2.781-3.076	287	0.075	0.843*
Pooled	13.0-42.0	20.0-800	0.146	3.043	2.902-3.136	443	0.059	0.854*

*P<0.05

Table 2. Monthly variation in condition factor of *H.brachysoma* from Vembanad lake (N: sample size; SD :standard deviation, min: minimum, max: maximum)

Month	Male (N=156)				Female (N=287)			
	Range		Mean	SD	Range		Mean	SD
	Min.	Max.			Min.	Max.		
January	1.13	1.43	1.28	0.15	1.18	1.48	1.33	0.15
February	0.98	1.32	1.15	0.17	0.9	1.46	1.18	0.28
March	0.86	1.42	1.14	0.28	1.08	1.37	1.23	0.15
April	0.97	1.47	1.22	0.25	0.99	1.23	1.11	0.12
May	0.96	1.4	1.18	0.22	1.13	1.71	1.42	0.29
June	1.08	1.44	1.26	0.18	1.06	1.42	1.24	0.18
July	1.09	1.36	1.22	0.14	0.97	1.52	1.25	0.28
August	1.08	1.33	1.2	0.13	1.11	1.34	1.22	0.12
September	1.27	1.49	1.38	0.11	1.04	1.81	1.42	0.39
October	0.69	2.19	1.44	0.75	0.93	1.48	1.2	0.27
November	0.9	1.56	1.23	0.33	1.11	1.64	1.37	0.26
December	0.97	1.39	1.18	0.21	0.96	1.64	1.3	0.34

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