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A study on length-weight relationship and relative condition factor (Kn) of *Labeo calbasu* (Hamilton) from Keenjhar Lake (Distt. Thatta), Sindh, Pakistan

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Abstract

The relationship between length, weight and relative condition factor (Kn) of *Labeo calbasu* (Hamilton) from Keenjhar Lake (Distt. Thatta) Sindh, were studied by measurements of 227 specimens collected during June to November, 2004. These fishes ranged from 18.2 – 52.8 cm in length (TL) and 150 - 2150 g in weight. The relation between the total length and weight of male, female and combined sexes of *L .calbasu* is described as Log W= - 0.92 + 2.42 × Log L for males, Log W= -1.83 + 3.05 × Log L for females and Log W= - 0.95 + 2.46 × Log L for sexes combined. The mean relative condition factor (Kn) values ranged from 0.98 to 1.09 (Mean 1.02 SD ± 0.11) for males, 0.85 to 1.92 (Mean 1.09 SD ± 0.85) for females and 0.96 to 1.32 (Mean 1.06 SD ± 0.26) for combined sexes. The length- weight relationship and relative condition factor shows that the growth of *L. calbasu* from Keenjhar Lake (District Thatta), Sindh is isometric.

Keywords: *Labeo calbasu*, Length-weight relationship, Condition factor.

Introduction

Among the various biological aspects of fish, the total length, standard length and length-weight relationship of fish are of importance in fishery management, culture, regulation and also ascertaining the environmental suitability of a particular fish in a particular area (Medawar, 1945).

Labeo calbasu (Hamilton-Buchanan) locally known as Dahi, is a medium sized, bottom feeder. It is a commercially important carp, which can attains a length of 71 cm and a weight of 5.5 kg (Rahman, 1989). *L. calbasu* supports an important commercial fishery in rivers and reservoirs of Pakistan, India, Bangladesh and Myanmar. The species is of special biological interest as it is one of the constituents of the compatible-complex of the major carp species employed in aquaculture practices (Pathak and Jhingran, 1977).

Presently no information is available on any aspect of the biology of this important fish from Pakistan. The results of the present studies have practical value and would be useful in future for the development of culture techniques of this species in ponds. *L. calbasu* is a suitable candidate for the artificial culture in future, so, knowledge of various aspects of biology is considered as pre-requisite. Earlier workers have reported some information on the biology of *L. calbasu* from India and Bangladesh. Ramamohana and Rao (1972) studied biology of *L. calbasu* from the river Godavari. Gupta and Jhingran (1973) published information on aging of *L. calbasu* from their scales. Pathak (1975)reported length-weight relationship and condition factor of *L. calbasu* from Loni reservoir. Pathak and Jhingran (1977) worked on maturity and fecundity of *L. calbasu* from Madhya Pradesh, India. Vinci and Sugunan (1981) reported biology of *L. calbasu* from Nagarjunasagar reservoir, Andhra Pradesh, India. Azadi and Kuddus (1995) studied age and growth of *L. calbasu* from Kaptai Lake, Bangladesh and Alam *et al.*, (2000) published information on

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population dynamics of *L. calbasu* from Sylhet basin, Bangladesh. The present investigations were carried out to ascertain length-weight relationship and condition factor of *L. calbasu* from Keenjhar Lake.

Materials and methods

Fish samples were obtained monthly during June to November, 2004 from the catch of fishermen of the Keenjhar Lake (Distt. Thatta). A total of 227 specimens of *L. calbasu* (96 males and 131 females), ranging from 18.2 to 52.8 cm in total length (TL) and 150 to 2150g in weight were used for the length –weight analysis.

Length of fish was measured to the nearest mm and weight up to 0.1g. The fishes were then sexed by observing the gonads after dissecting the abdomen. The length-weight relationship of the fish has been calculated from the logarithmic formula:

$$\text{Log } W = \text{Log } a + b \times \text{Log } L.$$

The smoothed mean weights W, for each length group have been computed from this Log formula. LeCren's (1951) modified formula: $Kn = W/aL^n$ has been adapted for the calculation of the relative condition factor.

This can be expressed as $Kn = W/\hat{W}$, where W is observed weight and $\hat{W}$ is calculated weight as determined from the length- weight equations. The relative condition factor (Kn) has been calculated separately for males, females and combined sexes for each 5 cm length interval.

Results

a. Length- weight relationship

Length-weight equations were calculated separately for males and females and combined sexes. The fish samples were divided into 2 cm length groups (Table 1). When empirical values of lengths were plotted against their respective weight on an arithmetic scale, smooth curves were obtained (Fig. 1). A plot of weight against length on double logarithmic paper however, yielded a straight line (Fig. 2) as expected. The regression coefficients, when calculated using the methods of least squares for male, female and combined sexes of *L. calbasu* in the size range 18.2 to 52.8 cm gave the following equations:

$$\text{Log } W = -0.92 + 2.42 \times \text{Log } L \text{ (for males)}$$
$$(r = 0.98,\ t = 61.80)$$

$$\text{Log } W = -1.83 + 3.05 \times \text{Log } L \text{ (for female)}$$
$$(r = 0.99,\ t = 61.60)$$

$$\text{Log } W = -0.95 + 2.46 \times \text{Log } L \text{ (sexes combined)}$$
$$(r = 0.99,\ t = 61.70)$$

As may be noted from the equations the exponential values for males and combined sexes were practically identical, while it was ideal in case of female. The co-efficient of correlation 'r' for males, females and combined sexes for the regression of total length and body weight were estimated to be 0.99, which is highly significant at 0.1% level. The agreement between the empirical weight and computed weight from regressions can be termed as satisfactory and the growth of *L. calbasu* in Keenjhar Lake (Distt. Thatta), Sindh is found to be isometric.

b. Relative condition factor

The values of Kn showed fluctuation in all size groups of males, females and combined sexes. When t- test was applied on data of Kn for males, females and combined sexes ($P > 0.05$), it was found that the values are statistically non- significant (Table 2).

The Kn values of males, females and combined sexes were calculated for various length groups. Table 2 shows values of Kn at different sizes ranged from 0.98-1.09 (SD± 0.11 mean Kn 1.02) in males, 0.85- 1.92 (SD± 0.85 mean 1.09) in females and 0.96- 1.32 (SD± 0.26 mean 1.06) in combined sexes respectively. On average, the females were in a slightly better condition (i.e. mean Kn = 1.09) than males (mean Kn = 1.02) (Fig. 2).

Discussion

The value of length-weight regression co-efficient "b" for males (2.42) and sexes combined (2.46) were significantly different from the cube law, while females (3.05) followed the cube law. Hile (1936) and Martin (1949) observed that the value of regression co-efficient (b) usually lies between 2.5 and 4.0. Tesch (1968) reported that value of 'b' might be in between 2.0 and 4.0. However, a variation in 'b' value may occur due to different environmental factors. Various workers from Indian waters have calculated values of regression co-efficient (b) in *L. calbasu* and found the value of b> 3. Rao and Rao (1972) from River Godavari (b= 3.18), Pathak (1975) from Loni reservoir (b= 3.0) and Vinci and Sugunan (1981) from Nagarjunasagar (b= 3.31). These values are different from those obtained for *L. calbasu* in the present study, it might be due to the different environmental conditions. These values were within the range as reported by Hile (1936), Martin (1949) and Tesch (1968). The values of relative condition factor Kn show fluctuations in all size groups of males and females. The highest Kn values were found in small length groups of fishes in the present study, which agreed with Shafi and Quddus (1974) for *Catla catla* and *Cirrhinus mrigala*.

The present investigation on length-weight relationship and relative condition factor of *L. calbasu* from Keenjhar Lake (District Thatta), Sindh indicate that the growth rate is quite satisfactory and found to be isometric type.

Table 1: Data on length and weight of *Labeo calbasu* from Keenjhar Lake (District Thatta), Sindh.

Male				Female				Sexes combined							
Length group (cm)	No. of males	Mean length (cm)	SD±	Mean weight (g)	SD±	No. of females	Mean length (cm)	SD±	Mean weight (g)	SD±	No. of Speci-mens	Mean length (cm)	SD±	Mean weight (g)	SD±
15.1-20.0	12	18.9	1.10	139.5	3.88	6	19.3	0.70	147.3	4.11	18	19.1	0.20	143.4	4.0
20.1-25.0	11	22.9	1.75	226.3	8.40	14	23.1	1.25	392.8	9.45	25	23.0	0.20	309.5	8.80
25.1-30.0	29	27.7.2	1.64	398.3	22.7	29	28.3	1.55	419.2	33.8	58	28.0	0.50	408.7	27.5
30.1-35.0	12	32.8	2.55	555.8	45.80	17	33.1	2.75	580.5	61.7	29	32.9	0.99	568.0	51.7
35.1-40.0	11	37.4	1.35	764.5	19.90	14	37.8	1.25	810.3	49.9	25	37.6	0.20	787.4	38.7
40.1-45.0	12	42.1	1.12	1011.6	49.9	17	42.8	1.62	1178.2	70.5	29	42.4	0.40	1094.9	55.3
45.1-50.0	9	46.6	1.55	1241.1	41.3	18	47.2	1.85	1666.6	41.3	27	46.9	0.30	453.8	51.7
50.1-55.0	Nil	Nil	Nil	Nil	Nil	16	51.5	1.12	2035.3	55.5	17	51.5	1.12	2035.3	55.5
Total	**96**					**131**					**227**				

Table 2: Relative condition factor (Kn) values for male, female and combined sexes of *Labeo calbasu* from Keenjhar Lake (Distt. Thatta), Sindh.

	Male			Female			Sexes combined		
	Observed Weight (g)	Calculated Weight (g)	Kn	Observed Weight (g)	Calculated Weight (g)	Kn	Observed Weight(g)	Calculated Weight (g)	Kn
15.1-20.0	139.5	141.2	0.98	147.3	117.4	1.25	143.4	147.9	0.96
20.1-25.0	226.3	218.7	1.03	392.8	204.1	1.92	309.5	234.4	1.32
25.1-30.0	398.3	363.0	1.09	419.2	389.0	1.07	408.7	389.0	1.05
30.1-35.0	555.8	537.0	1.03	580.5	588.8	0.98	568.0	575.4	0.98
35.1-40.0	764.5	741.3	1.03	810.3	891.2	0.90	787.4	812.8	0.96
40.1-45.0	1011.6	1000.0	1.01	1178.2	1380.3	0.85	1094.9	1071.5	1.02
45.1-50.0	1241.1	1230.2	1.00	1666.6	1819.7	0.91	453.8	1348.9	1.07
50.1-55.0	-	-	-	2035.3	2398.8	0.84	2035.3	1778.2	1.14
		Mean Kn=	1.02		Mean Kn =	1.09 ±0.5		Mean Kn=	1.06 ±0.4

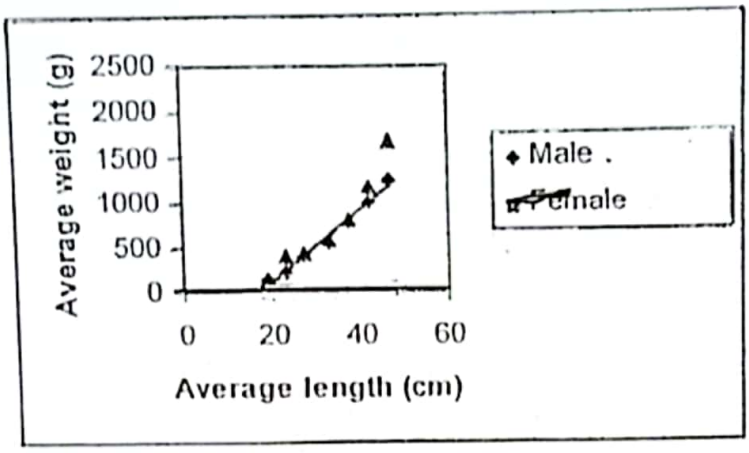

Fig.1. Length-weight relationship of male, female and combined sexes of *Labeo calbasu* from Keenjhar Lake (Distt. Thatta), Sindh. (empirical values)

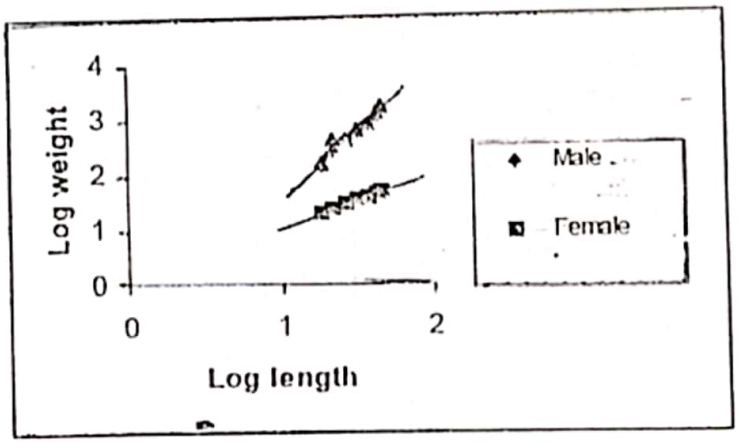

Fig. 2. Logarithmic length-weight relationship of *Labeo calbasu* from Keenjhar Lake (Distt. Thatta), Sindh.

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