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Mithun SarkarDepartment of Fishery Resource
Management, Chakgaria,
Kolkata, West Bengal, India**Sudhir Kumar Das**Department of Fishery Resource
Management, Chakgaria,
Kolkata, West Bengal, India**Anandamoy Mondal**Department of Fishery
Economics and Statistics;
Faculty of Fishery Sciences,
Chakgaria, Kolkata, West
Bengal, India**Dibakar Bhakta**Regional Research Centre,
ICAR-CIFRI, Vadodara,
Gujarat, India

Length-weight relationship and relative condition factor of carps *Labeo bata* and *Labeo rohita* from Kulia beel (wetland) of Nadia district of West Bengal

Mithun Sarkar, Sudhir Kumar Das, Anandamoy Mondal and Dibakar Bhakta

Abstract

An investigation was carried out to study length-weight and relative condition factor of two carps such as *Labeo bata* and *Labeo rohita* occurring in a wetland called Kulia beel, a closed beel adjacent to the Ganga river basin in the Nadia district of West Bengal. The study was based on 197 samples of *Labeo bata* with size ranged from 180 to 240 mm and 165 samples of *L. rohita* with size ranged from 180 to 280 mm in total length for a period of 9 months (March to November). The length-weight relationship was recorded $W = 0.0171 L^{2.904}$ and $W = 0.0179 L^{2.890}$ for bata and rohu respectively. The monthly mean Kn values varied from 0.907 to 1.076 and 0.959 to 1.012 for the species *Labeo bata* and *L. rohita* respectively.

Keywords: *Labeo bata*, *Labeo rohita*, length-weight relationship, condition factor, wetland

1. Introduction

Labeo bata (Hamilton, 1822) locally known as 'bata' is a freshwater medium size Indian minor carp, predominantly a bottom feeder and herbivour in nature. It is distributed in West Bengal, Assam, Odisha and Andhra Pradesh. *Labeo rohita* (Hamilton, 1822) locally known as 'rohu' is a column feeder and herbivore having fast growth and well distributed throughout north India. Both of them are extensively cultured in tanks, ponds, beels and reservoirs and have very good consumer demands in local markets.

Biological studies are required for proper management of fisheries. The length-weight relationship of several species of the Indian fishes has been studied by [1-5]. According to [6], a little information is available on the length-weight relationship of majority of tropical and sub-tropical fish species in India. Very limited works have been done at length-weight relationships of *Labeo bata* which was carried out by [7-10]. But several works have been carried out on *Labeo rohita* in different water bodies by [11-17]. But information on length-weight relationship of *Labeo bata* and *L. rohita* is scanty in wetlands like beels in West Bengal. Studies on biology of such species will be useful for bio-management of their fisheries.

2. Materials and methods

A total sample of 197 number of *Labeo bata* and 165 specimen of *Labeo rohita* were examined during 9 months of study (March to November) during the period of investigation. Samples of the both species were collected from Kulia beel (wetland), a closed beel adjacent to Ganga river basin in Nadia district of West Bengal. The beel (22° 55' N, 88° 25') has an average water spread area of about 25 ha. The samples were usually caught by cast net and drag net from it. The specimens were brought to the laboratory to study length-weight relationship and other biological features. The length of fish was measured with millimeter scale to the nearest millimeter and body weights were measured by mono-pan balance to the nearest gram.

Le Cren [18] proposed a non-linear equation in the form of $W = aL^b$, which explains the relationship between length (L) and weight (W) of fish. The t test was employed to test significant variation of 'b' value from cube or isometric value of 3.

Correspondence**Dibakar Bhakta**Regional Research Centre,
ICAR-CIFRI, Vadodara,
Gujarat, India

The relative condition factor (Kn) was calculated by using the formula $Kn = W_0 / \bar{W}$, where W_0 is observed weight and \bar{W} is calculated weight. Kn value was recorded for male and female separately in different months. The data used for length-weight relationship were used for the calculation of monthly mean values of Kn for each species.

Table 1: Length-weight relationship of *Labeo bata* and *Labeo rohita*.

Name of the species	No. of samples	Length-weight relationship (Non linear equation)	Length-weight relationship (Linear Equation)
<i>Labeo bata</i>	197	$W = 0.0171 L^{2.904}$	$\text{Log } W = -1.7670 + 2.904 \text{ log } L$
<i>Labeo rohita</i>	165	$W = 0.0179 L^{2.890}$	$\text{Log } W = -1.7471 + 2.890 \text{ log } L$

The 'b' value of fish was found 2.904 in bata and 2.890 in rohu in the present study which did not differ significantly ($P < 0.05$) from cube (3) and thus fish exhibited isometric growth. Khan *et al.* [8] reported isometric growth pattern of *Labeo bata* from river Ganga with 'b' value as 3.02 and highly significant length-weight relationship (R^2 value as 0.99). Naeem *et al.* [9] observed isometric growth of *Labeo bata* with 'b' value was 2.92 from Head Panjnad, Pakistan. Das *et al.* [10] could found 'b' value of *Labeo bata* was 3.06 and 2.89 for male and female species respectively from Deepar beel (wetland) of Assam. A positive allometric growth was observed by male and negative by female, the positive allometric growth in male may be due to higher feeding proficiency and negative allometric growth in female may be the result of loss of energy due to gonad development during breeding season. Chatterji *et al.* [7] during their study revealed that *Labeo bata* did not strictly follow the cube law and the increased of weight was slightly more than the length increased from river Kali. They found the 'b' values as 3.31, 3.20, 3.3.8 and 3.17 for male, female, juveniles and combined *Labeo bata* species respectively. Jhingran [11] expressed length-weight relation of *Labeo rohita* and found 'b' values was 3.01 and correlation coefficient 0.994. According to [12] there were no significant differences in length-weight relationship of *Labeo rohita* for different size, sex and maturity stages. He reported 'b' value as 3.23, 3.14, 3.36 and 3.17 for male, female, juvenile and combined specimens. Ahmed and Saha [13] reported 'b' value of *L. rohita* was 3.14 from Kaptai lake, Bangladesh. The 'b' value of 2.451 for *Labeo rohita* with the size ranged from 22.0 to 50.0 cm and 217.0 to 1900.0 g were reported by [19] from the Sylet basin, Bangladesh. Ujjania *et al.* [14] have estimated value of 'b' for catla (3.275), rohu (3.376) and mrigal (3.362) in Mahi Bajaj Sagar (India). Ujjania *et al.* [15] also reported 'b' value ranged from 2.97 to 3.13 in *Labeo rohita* of different types of water bodies in southern Rajasthan. Mir *et al.* [16] observed pooled 'b' values ranged from 3.158 to 3.500 of *Labeo rohita* from six drainages of the river Ganga basin of India with positive

3. Results and discussion

3.1 Length-weight relationship

The study on Length weight relationships was based on 197 samples of *Labeo bata* with size ranged from 180 to 240 mm and 165 samples of *L. rohita* with size ranged from 180 to 280 mm in total length. The non linear equation on length-weight relationship was recorded as $W = 0.0171 L^{2.904}$ and $W = 0.0179 L^{2.890}$ for bata and rohu respectively (Table-I).

allometric growth pattern. Muhammad *et al.* [20] observed b values of 3.13, 2.72, 3.03, 3.24 and 2.50 of the species of *Labeo calbasu*, *L. rohita*, *L. gonius*, *L. boggut* and *L. dyocheilus* respectively from the Indus river of Pakistan. Balai *et al.* [17] observed 'b' values were 2.6, 3.16 and 3.02 for *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* from Jaisamand Lake, India, with isometric growth for mrigal and allometric growth for catla and rohu. Haroon *et al.* [21] mentioned that 'b' values were 3.109 and 3.47 of *Labeo calbasu* during the year 1998 and 1999 respectively from the Sylet basin, Bangladesh. Khan *et al.* [22] could establish length-weight relationship of $\text{Log } W = -7.8037 + 2.9323 \text{ Log } TL$ and $\text{Log } W = -2.3467 + 3.3099 \text{ Log } TL$ for *L. calbasu* and *L. gonius* in 'Haor' area of Kishoregong in Bangladesh. Sani *et al.* [23] reported 'b' value of 2.94 of *Labeo calbasu* from the Betwa (Yamuna River tributary) and Gomti (Ganga River tributary) rivers. Naeem *et al.* [9] reported 'b' value of 3.27 of *Labeo calbasu* from the River Chenab, Punjab, Pakistan. Froese [24] mentioned the value of 'b' of family cyprinidae was ranged from 2.5 to 3.5. However, the 'b' value in the present work bears similarity with most of the workers and differs with few studies which might be due to local ecological conditions. The smaller size groups have the higher 'b' value compared to the larger fishes resembling the works of [5] in *Chelon planiceps*.

3.2 Relative condition factor

The monthly mean Kn values varied from 0.907 to 1.076 with an average value of 1.059 and 0.959 to 1.012 with an average value of 1.059 for the species *Labeo bata* and *L. rohita* respectively (Fig. 1). The mean Kn value was minimum (0.907) during the month of August and maximum (1.076) during the month of June for *Labeo bata*. In case of *Labeo rohita* mean Kn value was minimum (0.959) during the month of March and maximum (1.012) during the month of June. The condition factor indicates an important aspect on feeding, spawning and other aspects related to the well being of the fish.

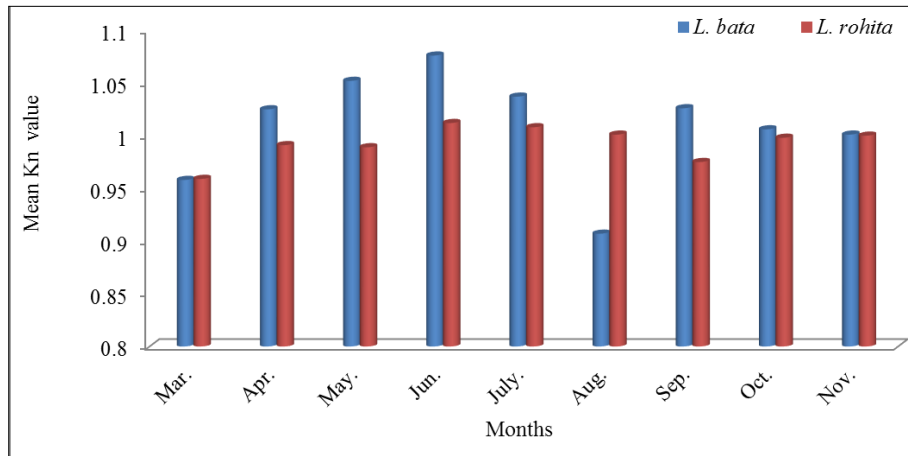


Fig 1: Monthly mean variations of relative condition factor (Kn)

Rao and Rao [25] and Choudhary *et al.* [26] observed high Kn values of *Labeo calbasu* from Godavari river and Brahmaputra river respectively. Condition factor (K) for *Labeo calbasu* varied from 0.79 to 1.81 in River Chenab of Punjab in Pakistan [27]. Das *et al.* [10] observed Kn value in male *Labeo bata* was 0.88 to 1.22 with an average of 1.01 ± 0.05 and that of female being 0.87 to 1.26 with an average of 1.01 ± 0.06 of in Deepor beel, a Ramsar site of Assam in India. Balai *et al.* [17] found Kn values as 1.005 ± 0.012 , 1.010 ± 0.013 and 1.008 ± 0.012 for catla, rohu and mrigal respectively from Jaisamand Lake, India. Condition factor in fishes is generally influenced by several factors like availability and types of food abundance, physico-chemical characters of the environment, age and sex of the individual, spawning, sex and maturity, onset of maturity, environmental condition, breeding, feeding etc. [28-31]. In the present study the Kn values were found to be high in smaller size fishes which are in agreement with the earlier workers like [5, 32]. However, Kn values exhibiting around 1.0 indicates better condition of fish in the wetland.

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