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Estimation of Length-weight relationship with relative condition factor of *Mystus tengara* (Hamilton, 1822) of Lechia-Pavomari beel (wetland) of Dhemaji District of Assam, India

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Abstract
The present study reveals about the length-weight relationship of *Mystus tengara* (Hamilton, 1822) of Lechia-Pavomari beel of Dhemaji District of Assam. The district is situated between longitude 94°12′18″ & 95°14′32″ E and latitude 27°05′27″ & 27°57′16″ N. In the present evaluation it is found that the correlation coefficient 'r' indicates strong positive correlation between the total length and the body weight, with coefficient correlation 'r' approaching almost towards 1. The relative condition factor of *Mystus tengara* is observed to increase from lighter to heavier fish. The negative allometric pattern of growth may be due to unsuitable feeding proficiencies and/or may be environmental and/or seasonal incompatibility for proper growth of fishes. In this investigation, it is found that the value of 'b' *of Mystus tengara* is 2.07 and the Kn value ranges from 0.74-1.39 with an average of 1.00±0.125.

Keywords: Length-Weight relationship, relative condition factor, *Mystus tengara, Lechia pavomari beel*

1. Introduction
Growth is the fundamental and functional unit of length and weight. The length and weight of every organism on this universe increases simultaneously with the growth of the organism, as both the parameters are being positively correlated with each other. Study of length-weight relationship has good significance in the field of fishery science as it acts as a significant parameter in assessing growth rate, evaluation of weight, appearance of first maturity, onset of spawning, variation of status of stocking of fishes etc.
In general, when fishes grow isometrically, the Cube law ($W=L^3$) Brody, 1945 [3]; Lagler, 1952 [15] is followed. However, there is every chance of deviation of expected length-weight relationship from Cube's law due to various factors prevailing in the environment including the characteristics of water, where fishes inhabit. Thus, Le Cren in 1951[16] modified Cube's law as $W = aL^b$ which finally gives an acutely precise result for easy calculation of length - weight relationship for the entire life history stages of fishes.
Mystus tengara is a brown to yellow coloured elongated fish with slightly compressed body and has a black dark spot on the shoulder. Head is compressed with four pairs of barbells and the dorsal spine is long up to the head. The pectoral spine of the fish is stronger than that of the dorsal spine and the fish used the former spine as a defensive organ. It is commonly used as food fish in India, Nepal, Pakistan and Bangladesh.

2. Materials and Methods
For evaluating the length-weight relationship, 100 live samples of *Mystus tengara* of different age groups were randomly collected from Lechia-Pavomari beel of Dhemaji district of Assam (located at $94^0 12' 18''$-$95^0 14' 32''$ East longitude and $27^0 05' 27''$ to $27^0 57' 16''$ North latitude) from March, 2017 to May, 2017. The total length and body weight of the fishes were measured individually. For measuring the total length, a digital slide caliper was used and the fishes were measured from tip of the snout to the tip of the longest ray of caudal fin. For measuring the body weight, a standard digital balance (Systronic make) was used. The weight of each fish was taken individually after blot drying, keeping the value nearest to 0.01 g. The length – weight relationships were estimated by following the formula $W = aL^b$ Le Cren, 1951 [16] and this formula is expressed logarithmically as Log W = Log a + b Log L
Where, W is body weight of the fish; L is total length of the fish; 'a' is a constant showing the

initial growth index and 'b' is growth coefficient. Parameter 'a' and 'b' were calculated by the method of least square regression:

$$\text{Log a} = \frac{\sum \text{Log W}.\sum(\log \text{L})^2 - \sum \text{Log L}.\ \sum(\text{Log L}.\ \text{Log W})}{\text{N}.\ \sum(\text{Log L})^2 - (\sum \text{Log L})^2}$$

$$\text{Log b} = \frac{\sum \text{Log W} - \text{N}.\ \text{Log a}}{\sum \text{Log L}}$$

Relative condition factor (Kn) were estimated by following Le Cren (1951) [16] formula and is expressed as follows:

$$\text{Kn} = \frac{\text{W}}{\text{\^{}W}}$$

Where W = observed weight

^W = calculated weight derived from length-weight relationship.

The mean, standard deviation (SD) and correlation coefficient (r) of total length and body weight were calculated with the help of SPSS software (version-16) and Microsoft Office 7.

3. Results

In this investigation total length and body weight of *Mystus tengara* is found in range from 4.44 to 11.56 cm in length and 1.62 to 12.84 g in weight. The value of 'a', 'b', mean with standard deviation (SD) of total length and body weight for *Mystus tengara* are given in the Table-1. The value of 'r' and mean with standard deviation of Kn are given in the Table-2. The Kn value is found in the range from 0.74 to 1.39 with an average of 1.00±0.125. The regression graph of length-weight relationship and relative condition factor (Kn) are depicted in Figure-1 and Figure-2 respectively. The result of logarithmic length-weight relationship for *Mystus tengara* under the present study is as follows during the period of investigation in Lechia-Pavomari beel.

Mystus tengara - Log W = -1.127+2.07LogL

Table 1: Mean ± Standard deviation of Body weight (BW) and Total length (TL), value of 'a' and 'b'.

Fish Species	Total no. of fish sample	Weight Range (g)	Size Range (cm)	Mean±SD of BW (g)	Mean±SD of TL (cm)	Value of 'a'	Value of 'b'
Mystus tengara	100	1.62-12.84	4.44-11.56	8.16±1.24	5.97±2.01	-1.13	2.07

Table 2: Value of Correlation coefficient 'r', Kn range and Mean ± Standard deviation of condition factor 'Kn'.

Fish Species	Total no.of fish sample	Value of 'r'	Kn range	Mean ± SD of Kn
Mystus tengara	100	0.92	0.74-1.39	1.00±0.125

**.Correlation is significant at the 0.01 level (2-tailed).

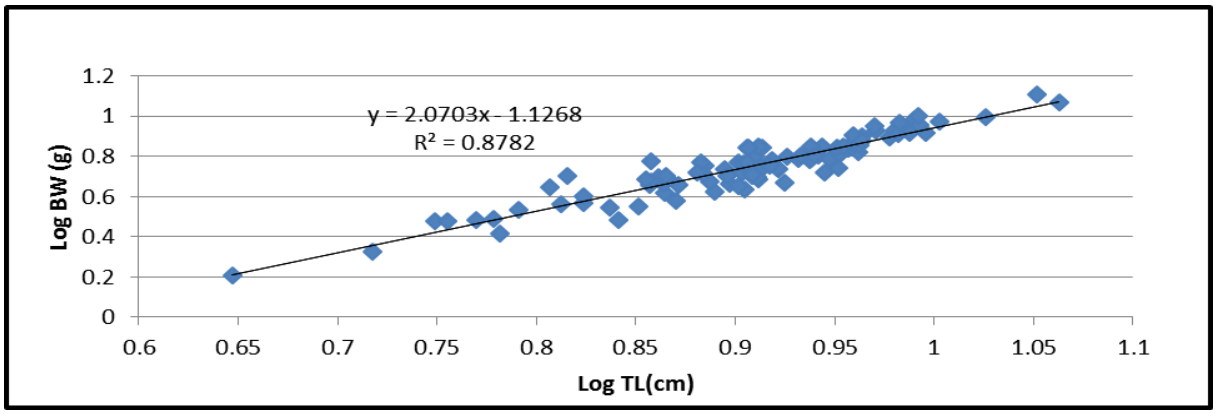

Fig 1: Relation between Log TL(cm) and Log BW (g) of *Mystus tengara*

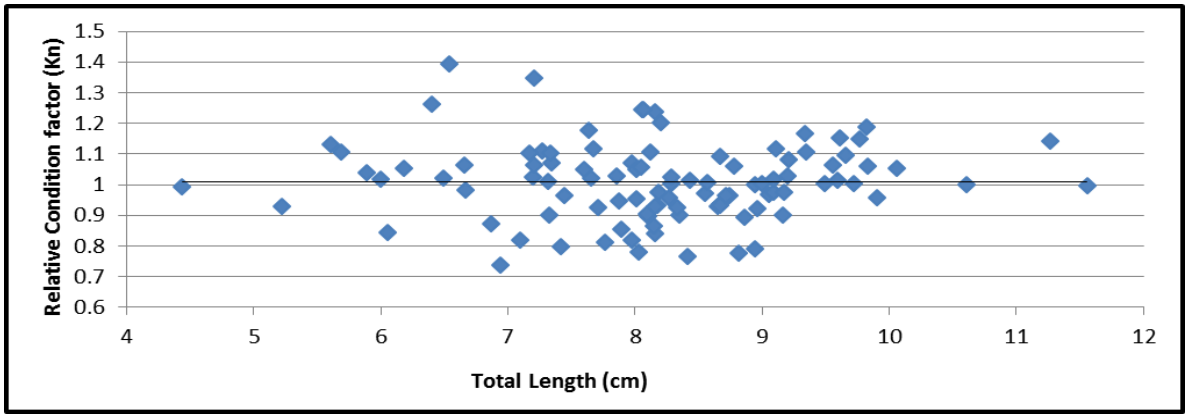

Fig 2: Relative condition factor (Kn) in relation to total length (cm) of *Mystus tengara*

4. Discussion

The present study reveals that the growth performance in *Mystus tengara* is quite high since the correlation coefficient 'r' exhibits strong positive correlation between the length-weight relationships but with negative allometric growth which may be due to lower feeding proficiencies and/or the environmental condition including physico-chemical parameters and/or the breeding season of experiment are not suitable for proper growth of fishes. Soni and Kathal, 1953 [21]; Kaur, 1981 [14]; Saikia *et al.,* 2011 [20]; Bura Gohain and Goswami, 2013 [4]; Deka and Bura Gohain, 2015 [8]; Das *et al.,* 2015 [5]; Rahman *et al.,* 2015 [19]; Kalita *et al.,* 2016 [13] observed the higher proficiencies in feeding, availability of food and other associated factors for positive allometric growth in different fishes.

Degree of variation of exponential value of length-weight relationship indicated by 'b' value in *Mystus tengara* is 2.07. Thus 'b' value in *Mystus tengara* is not found to be in normal range between 2.5 and 4.0, as recommended by Hile, 1936 [12] and Martin, 1949 [17] and not even between 2.5 and 3.5 as reported by Froese, 2006 [9] for most fishes. Variation in 'b' value may be due to feeding Le Cren, 1951 [16], sex (Hile and Jobes, 1940 [12], developmental stages of gonads Weatherly, 1972 [22] and Hile 1936 [11], effect of ovary on the weight and state of maturity (Frost, 1945) [10] etc. In the present investigation of *Mystus tengara* the 'b' value is found to deviate from cube law as it remains constant at 3.0, which shows isometric growth indicating the fish gets heavier as it grows larger.

Kn is an index to monitor feeding intensity and growth rate of fish (Oni *et al.,* 1983) [18], which indicates the well-being of the fish; is based on hypothesis that heavier fish for a given length are in better condition (Bagenal and Tesch, 1978) [1]. Fish with high value of 'Kn' are heavy for its length, while with low 'Kn' are lighter (Bagenal and Tesch, 1978) [1]. 'Kn' value greater than 1 indicates better condition of fish (Le Cren, 1951) [16]. In the present study on *Mystus tengara,* Kn value ranged from 0.74-1.39 with an average of 1.00±0.125. Kn value for most of the fishes were more than 1 which indicates that the fishes were in a favorable condition. However, the relative condition factor is observed to be more or less static from lighter to heavier fish, which indicate clearly about the well-being and the status good health of the fishes. Bhatta and Goswami, 2014 [2] noticed reverse phenomenon in their study where peak Kn value is recorded in medium sized fishes of *Channa aurantimaculata*.. Notwithstanding, Rahman *et al.,* 2015[19] in female *Anabas testudineus* and Das *et al.,* 2015 [7] in male *Heteropneustes fossilis* recorded a trend where 'Kn' decrease from lower sized fish exhibiting the lowest value at medium fish and thereafter steadily increase to get the highest value in bigger fishes.

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