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A comparison on the Length-Weight relationship and relative condition factor of *Parambassis ranga* (Hamilton, 1822) and *Chanda nama* (Hamilton, 1822) of Dora Beel (wetland) of Assam, India

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Abstract
The present study reports the length-weight relationship, relative condition factor of two fish species *Parambassis ranga* (Hamilton, 1822) and *Chanda nama* (Hamilton, 1822) commonly known as Chanda in Assamese of Dora beel (wetland) of Assam. The growth performance of length-weight relationship is found moderate since the correlation coefficient 'r' reveals moderate degree of relationship and also shows negative allometric growth. The negative allometric growth may be due to poorer feeding ability; environmental inappropriateness including physicochemical parameters; seasonal incompatibility including breeding seasons for proper growth of fishes etc. The present findings also indicate that the value of 'b' in all cases is lower than 3.0, being a constant for an ideal fish. The range of Kn value of *Parambassis ranga* and *Chanda nama* are 0.49-2.28 and 0.60-1.52 respectively. In both the cases the Kn value decreases from lighter to heavier fish first to attain minimum in medium sized fish samples and increase steadily to attain maximum near to the heavier fish.

Keywords: Length-Weight relationship, relative condition factor, *Parambassis ranga*, *Chanda nama*

1. Introduction
Growth is an inherent and unique property of every living organism in nature along with time. As the growth is a function of length and weight, therefore, growth is accompanied with increases of length, weight or both. The study of length-weight relationship of fishes is a basic tool for assessing the production, growth, stocking density, maturity, productivity of a particular habitat etc.

According to Brody, 1945 [3] and Lagler, 1952 [11], in an ideal environment the growth of fishes obeys the Cube law ($W=L^3$), where isometric growth of fishes occurs. However in natural environment, owing to various environmental factors, the length and weight relationship may deviate from the Cube law. Therefore, Le Cren, 1951[12] used a satisfactory formula modifying Cube law as $W = aL^b$ to calculate the length - weight relationship throughout the life history stages of fishes.

Chanda nama Hamilton, 1822 [8] is commonly known as elongate glassy perchlet of asiatic glassfish under family Ambassidae. It is native to an area of south Asia from Pakistan to Burma and reaches a maximum total length of 11 centimetres. The species inhabits canals, ponds, streams, and flooded rice paddies, beels (wetland) etc. The other species *Parambassis ranga* Hamilton, 1822 [8] of the present study formerly classified under genus *Chanda*, which is commonly known as Indian glassy fish. However, in Assam both are commonly known as Chanda and are important species for aquarium.

2. Materials and Methods
A total number of 140 and 104 of *Parambassis ranga* and *Chanda nama* respectively were collected randomly from Dora Beel (Wetland) located at 91^0 $27^/99^{//}$East longitude and $26^0 53^/ 76^{//}$ North latitude from February 2017 – April, 2017. Total length of the fishes were measured with digital slide caliper from tip of the snout to tip of the caudal fin and body weight were measured nearest to 0.01 g with the help of standard digital balance individually. The length–weight relationships were estimated by the following formula $W = aL^b$ (Le Cren, 1951[12]) and this formula is expressed logarithmically as $\text{Log } W = \text{Log } a + b \text{ Log } L$

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)[12] formula is expressed as follows:

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

Where W^o = observed weight

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

The mean, standard deviation and Correlation coefficient of total length and body weight were calculated with the help of Microsoft Office 7 software.

3. Results

In the present study total length and body weight of *Parambassis ranga* and *Chanda nama* having size ranges from 3.48 to 7.83 and 4.28 and 7.29 cm respectively. In *Parambassis ranga* the weight ranges from 1.10 to 7.10 g and in *Chanda nama* it is from 1.01 to 4.02 g. The value of initial growth index 'a', growth index 'b' and mean ±SD of total length and body weight for *Parambassis ranga* and *Chanda nama* are given in the Table-1. In both species the value of 'b' is lesser than 3 which indicate negative allometric growth. The value of 'r' and mean±SD of Kn are given in the Table-2. The regression graph of length-weight relationship and relative condition factor (Kn) are depicted in Figure-1 and Figure-2. The result of logarithmic length-weight relationship for *Parambassis ranga* and *Chanda nama* under the present study is as follows during the period of investigation in Dora Beel.

Parambassis ranga – Log W = -0.61 + 1.36 Log L

Chanda nama – Log W = -0.93 + 1.62Log L

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

Species	Stage	Weight range(g)	Size range(cm)	Mean±SD BW(g)	Mean±SD TL(cm)	Value of 'a'	Value of 'b'
Parambassis ranga	Adult (n=140)	1.10-7.10	3.48-7.83	2.55±0.89	5.42±0.74	-0.61	1.36
Chanda nama	Adult (n=104)	1.01-4.02	4.28-7.29	2.19±0.60	6.02±0.60	-0.93	1.62

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

Species	Stage	Value of 'r'	Kn range	Mean ± SD of Kn
Parambassis ranga	Adult (n=140)	0.65	0.49-2.28	1.04±0.29
Chanda nama	Adult (n=104)	0.59	0.60-1.52	1.01±0.22

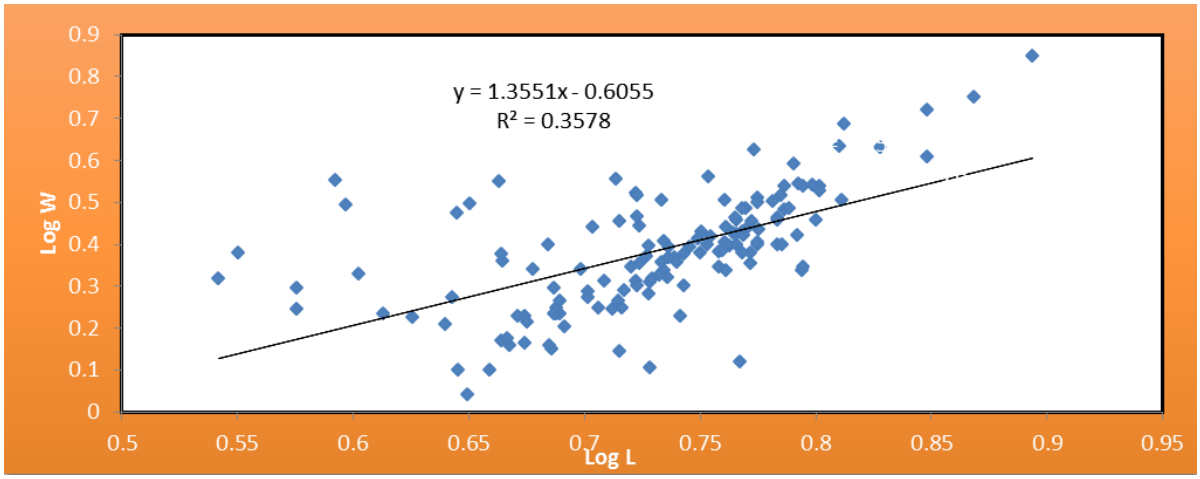

Fig 1: (a): Relation between Log TL (cm) and Log BW (g) of *Parambassis ranga*

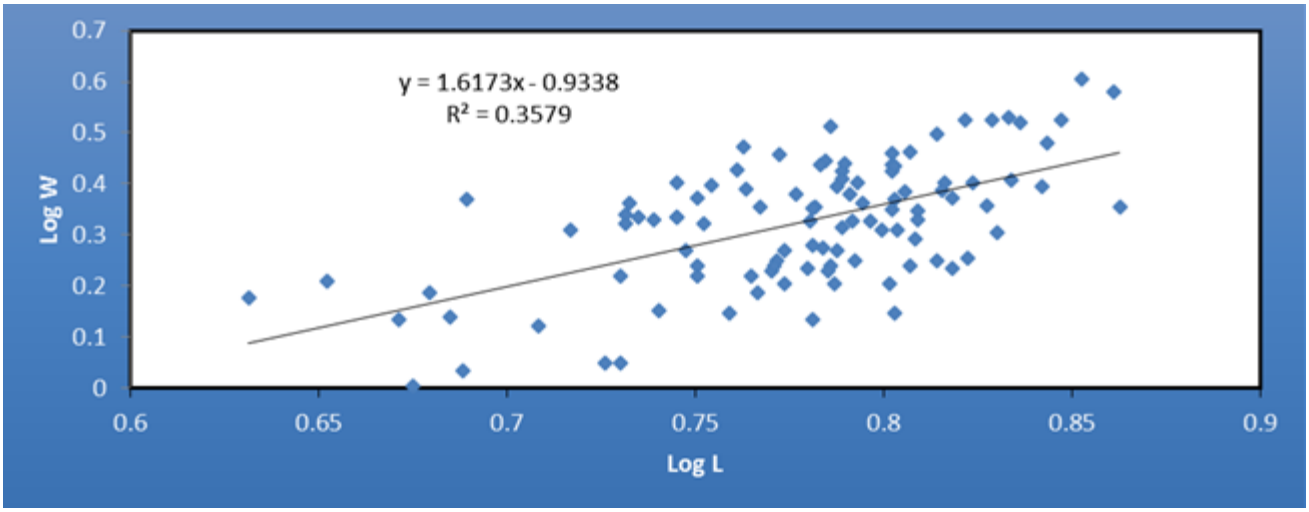

Fig 1 (b): Relation between Log TL (cm) and Log BW (g) of *Chanda nama*

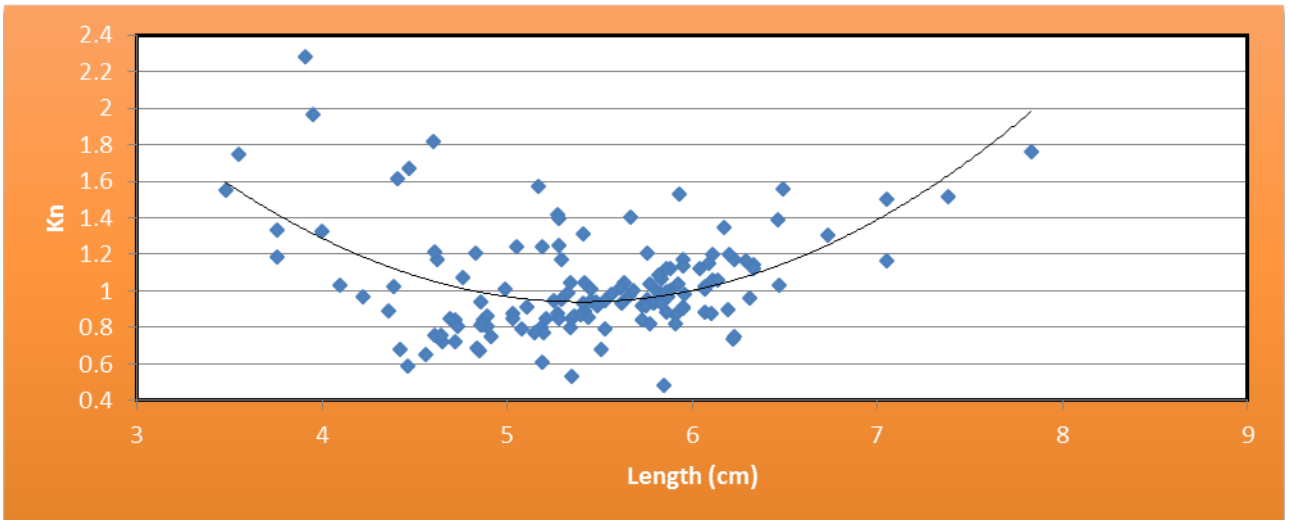

Fig 2 (a): Relative condition factor (Kn) in relation to total length (cm) of *Parambassis ranga*

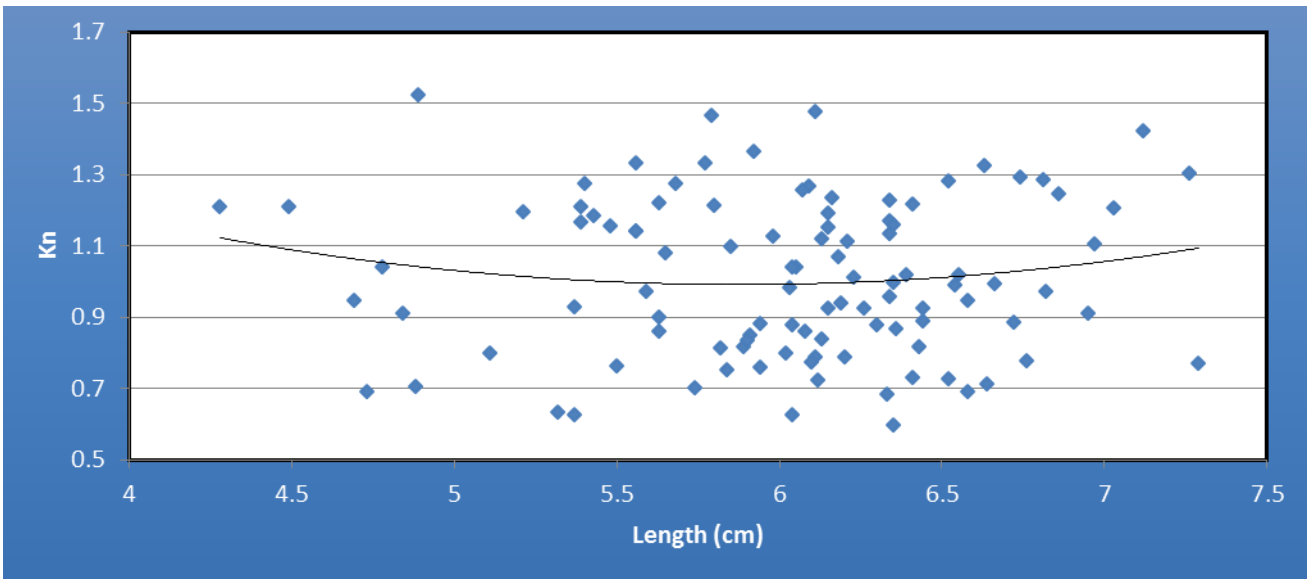

Fig 2 (b): Relative condition factor (Kn) in relation to total length (cm) of *Chanda nama*

4. Discussion

The present investigation reveals that the growth performance of the two species of fishes are found moderate since the correlation coefficient 'r' exhibits moderate degree of correlation between the total length- body weight relationship and the growth being negative allometric in both cases (Table-1&2). The negative allometric growth observed may be due to poorer feeding ability; environmental

inappropriateness including physicochemical parameters; seasonal incompatibility including breeding seasons for proper growth of fishes etc. The higher proficiencies in feeding, availability of food and other associated factors for positive allometric growth in different fishes has been reported from earlier worker on length-weight relationship Soni and Kathal, 1953 [17]; Kaur, 1981 [10]; Saikia *et al.*, 2011 [16]; Bura Gohain and Goswami, 2013 [5]; Deka and Bura Gohain, 2015 [7].

The variation of exponential value of length-weight relationship indicated by 'b' value in *Chanda nama* (1.62) is little more than *Parambassis ranga* (1.36). The correlation coefficient 'r' in *Parambassis ranga* (0.65) and *Chanda nama* (0.59) is not close to 1.0 which indicates the two species do not have a good degree of relationship in growth performance. In both cases the value of exponent 'b' are not found in the normal ranges between 2.5 and 4.0 (Hile, 1936[9] and Martin, 1949[13]). The present study of both the species of Chanda also indicates that the value of 'b' deviate from 'cube law' as it remains constant at 3.0 for an ideal fish Allen, 1938 [1] in a particular environmental condition.

The well-being or condition of fish expressed by Kn- factor, which is an index to monitor feeding intensity and growth rate Oni *et al.*, 1983 [14] is based on hypothesis that heavier fish for a given length are in better condition (Bagenal and Tesch, 1978[2]). Fish with high value of 'Kn' are heavy for its length, while with low 'Kn' are lighter Bagenal and Tesch, 1978 [2]. 'Kn' value greater than 1 indicates better condition of fish Le Cren, 1951 [14]. The Kn value of *Parambassis ranga* is in between the range of 0.49 and 2.28 with an average of 1.04±0.29 and in *Chanda nama* 0.60 and 1.52 with an average of 1.01±0.22. However, the relative condition factor (Kn) observed in the Figure-2 suggest that in both the cases it decreases from lighter to heavier fish first to attain minimum in medium sized fish samples and increase steadily to attain maximum near to the heavier fish (Figure-2). In case of *Parambassis ranga* (Figure-2a), the deviation of graph of relative condition factor (Kn) is very prominent than *Chanda nama* (Figure-2b) and maximum value of the same is recorded in the heaviest fish. This finding does not corroborate with the result of Bhatta and Goswami, 2014[3] who observed a reverse phenomenon where peak Kn value is recorded in medium sized fishes of *Channa aurantimaculata.* However, Das *et al.*, 2015 [6] in male *Heteropneustes fossilis* and Rahman *et al.*, 2015 [15] in female *Anabas testudineus* reported a more or less similar trend where 'Kn' is observed to be decreased from lighter fish exhibiting the lowest value at medium weight fish and thereafter steadily increase to get the highest value in bigger fishes.

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