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A Comparison on Length-Weight relationship and relative condition factor of two species of *Trichogaster* of Nitai Beel of Kamrup District of Assam, India

[1] Barasha Kalita, [2] Shikha Rani Sarma, [3] Parag Deka

[1] B.Sc. Student, Department of Zoology Department, Pandu College, India

[2] Assistant professor (Part time), Department of Zoology, Pandu College, India

[3] Assistant Professor, Department of Zoology, Pandu College, India

Abstract
The present study reports the length-weight relationship, relative condition factor of two fish species *Trichogaster fasciata* (Bloch and Schneider, 1801) and *Trichogaster lalius* (Hamilton, 1822) of Nitai Beel (wetland) of Kamrup district of Assam. The growth performance of length-weight relationship is found high since the correlation coefficient 'r' exhibits high degree of relationship where *Trichogaster lalius* shows positive allometric correlation and *Trichogaster fasciata* negative allometric correlation. The positive allometric growth in *Trichogaster lalius* may be due to higher feeding proficiencies and proper environmental condition whereas the negative allometric growth performance shown by *Trichogaster fasciata* may be due to lower feeding proficiencies and/or may be due to environmental or seasonal inappropriateness for proper growth of fishes. Interestingly *Trichogaster lalius* maintains higher degree correlation coefficient and higher value of 'b' than *Trichogaster fasciata.* The Kn value of *Trichogaster fasciata* is from 0.78 to 1.43 with an average of 1.02±0.08 and *Trichogaster lalius* from 0.85 to 1.30 with an average of 0.99±0.1 respectively. The relative condition factor are observed to be more or less similar both in numerical value and trend of fluctuation with increasing weight or length of the fish.

Keywords: Length-Weight relationship, relative condition factor, *Trichogaster fasciata, Trichogaster lalius*

1. Introduction
Growth and development is a natural phenomenon of all living creature in the world. In respect to aquatic organism, it is highly observed that as the fishes grow in length, their weight also increases simultaneously. Therefore this length-weight relationship could be taken as an important tool to assess their growth rate, timing of maturity and spawning and general well-being of fishes.
It has already been ascertained by the Cube law ($W=L^3$) that in an ideal environment the growth pattern of fishes is highly isometric. But as the environmental parameters fluctuates the length- weight relationship is calculated by modifying Cube law i.e., $W=aL^b$ proposed by Le Cren, where W= weight of the fish (g) and L=length of the fish (cm).

2. Materials and Methods
A total of 83 and 85 number of live individual of two species *Trichogaster fasciata* (Bloch and Schneider, 1801) and *Trichogaster lalius* (Hamilton, 1822) respectively were collected randomly from Nitai Beel (22.00 ha water area) of Hajo Block of Kamrup District of Assam. Total length of the fishes was 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 calculated by the following formula $W = aL^b$(Le Cren, 1951) and this formula is expressed logarithmically as

Log W = Log a + b Log L
Where, W = body weight of the fish
L = 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) formula follows:

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

Where W = observed weight
^W = 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 SPSS software (version-16) and Microsoft Office 7.

3. Results
In the present study total length and body weight of *Trichogaster fasciata* and *Trichogaster lalius* having size ranges from 5.20 to 8.14 cm and 5.86 to 8.87 cm and having

weight ranges from 3.12 to 9.80 and 3.76 to 13.30 gram in weight respectively. The value of 'a', 'b', mean ±SD of TL and BW for *Trichogaster fasciata,* and *Trichogaster lalius* are given in the Table-1. The value of 'r' and mean±SD of Kn are given in the Table-2. The regression graph of LWR and relative condition factor (Kn) are depicted in Figure-1 and Figure-2. The result of logarithemic length-weight relationship for *Trichogaster fasciat* and *Trichogaster lalius* under the present study are as follows during the period of investigation in Nitai Beel of Kamrup District of Assam:

Trichogaster fasciata– Log W = -1.39 + 2.58 Log L

Trichogaster lalius - Log W = -1.83 + 3.14 Log L

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

Species	Weight range(g)	Mean±SD BW(g)	Size range(cm)	Mean±SD TL(cm)	Value of 'a'	Value of 'b'
Trichogaster fasciata (n=83)	3.12 - 9.80	5.77±1.32	5.20 - 8.14	6.80 ± 0.51	-1.39	2.58
Trichogaster lalius (n=85)	3.76 -13.30	6.97±1.99	5.86 - 8.87	7.01±0.60	-1.83	3.14

Table 2: Value of Correlation coefficient 'r', Kn range with Mean ± Standard deviation

Species	Value of 'r'	Kn range	Mean ± SD of Kn
Trichogaster fasciata (n=83)	0.88**	0.78-1.43	1.02 ± 0.08
Trichogaster lalius (n=85)	0.96**	0.85 - 1.30	0.99 ± 0.11

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

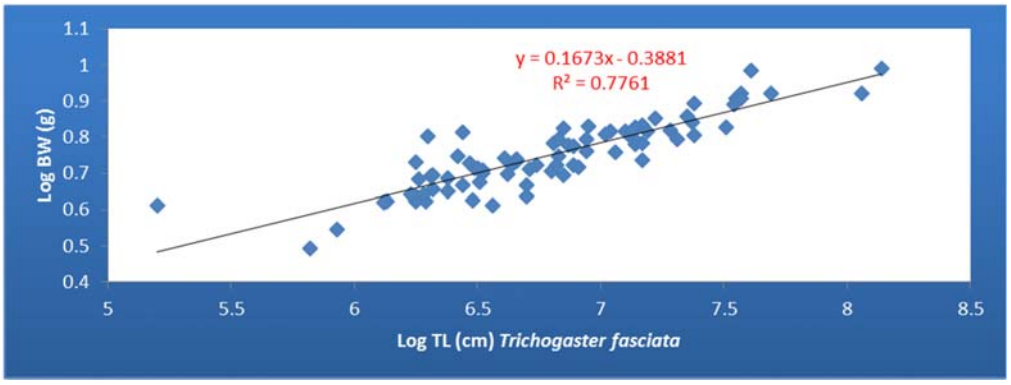

Fig 1: Relation between Log TL (cm) and Log BW (g) of *Trichogaster fasciata*

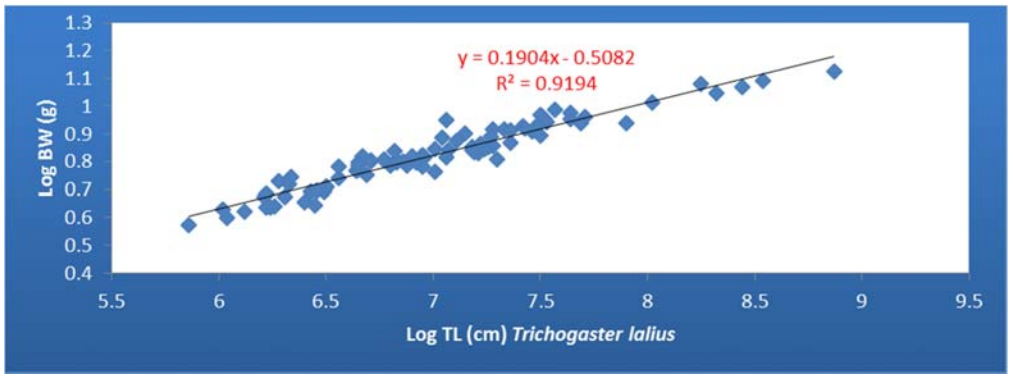

Fig 2: Relation between Log TL (cm) and Log BW (g) of *Trichogaster lalius*

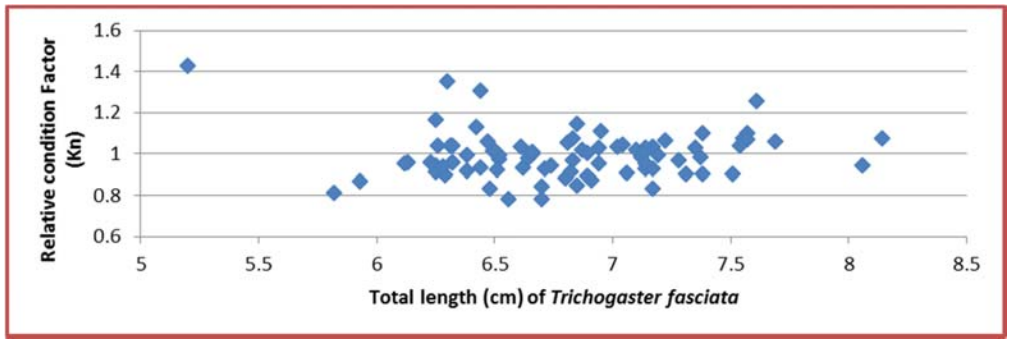

Fig 3: Relative condition factor (Kn) in relation to total length (cm) of *Trichogaster fasciata*

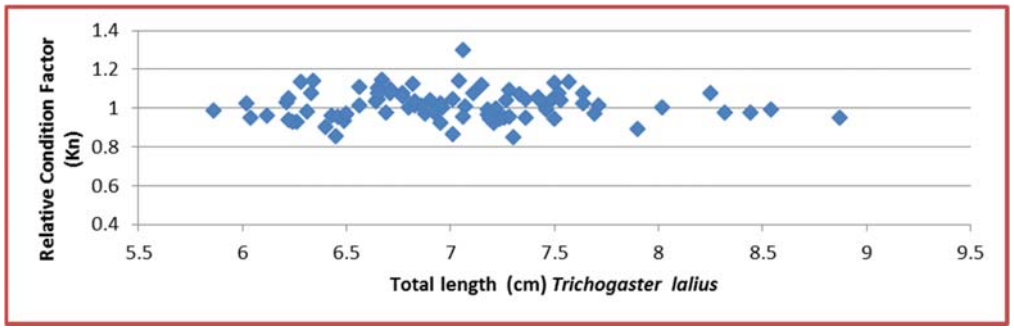

Fig 4: Relative condition factor (Kn) in relation to total length (cm) of *Trichogaster lalius*

4. Discussion

The present investigation reveals that the growth performance of the two species are found high since the correlation coefficient 'r' exhibits high degree of allometric correlation between the L-W relationship where positive allometric growth is shown by *Trichogaster lalius* and negative by *Trichogaster fasciata* (Table-1&2). Soni and Kathal, 1953; Kaur, 1981; Saikia *et al.,* 2011; Bhatta and Goswami, 2014; Deka and Bura Gohain, 2015; Das *et al.,* 2015 [4] also reported the higher proficiencies in feeding, availability of food and other associated factors for positive allometric growth in different fishes. The negative allometric growth recorded in *Trichogaster fasciata* may be due to lower feeding proficiencies and/or may be due to environmental or seasonal inappropriateness for proper growth and development of fishes (Das *et al.,* 2015) [5].

The correlation coefficient 'r' in *Trichogaster lalius* is closer to 1.0 (0.96) which indicates that *Trichogaster lalius* has high degree of relationship in growth performance than *Trichogaster fasciata* (0.88). The value of exponent 'b' is found in the normal ranges between 2.5 and 4.0 in both the species as suggested by Hile, 1936 and Martin, 1949 and between 2.5 and 3.5 as reported by Froese, 2006 for most fishes.

It is interesting to note that both 'b' (value of exponent) (Table-1) and 'r' (correlation coefficient) (Table-2) remain higher in *Trichogaster lalius*. The study also shows that the value of 'b' in both species deviate from 'cube law' as it remains constant at 3.0 for an ideal fish (Allen, 1938) in a particular environmental condition.

Kn-factor is an index used to monitor feeding intensity and growth rate (Oni *et al.,* 1983). The 'Condition', 'fatness' or well-being of fish determined by Kn-factor is based on the hypothesis that heavier fish for a given length are in better condition (Bagenal and Tesch, 1978). 'Kn' value greater than 1 indicates good general condition of fish (Cren, 1951). Fish with high value of 'Kn' are heavy for its length, while with low 'Kn' are lighter (Bagenal and Tesch, 1978). However, the relative condition factor (Kn) is interestingly observed to be similar (Table-2) in both the species studied in Nitai Beel of Kamrup District of Assam.

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