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## Length-Weight relationship and relative condition factor of *Anabas testudineus* (Bloch) of Deepar Beel (wetland) of Assam, India

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### Abstract

The present study reports the length-weight relationship of male and female *Anabas testudineus* (Bloch) of Deepar Beel (wetland) of Assam. The fishes are separated into both male and female for calculation of length weight relationship and relative condition factor. The growth performance of length-weight relationship are found high since the correlation coefficient 'r' exhibits high degree of relationship with positive allometric correlation in both male and female *Anabas testudineus*. The Kn value of Male *Anabas testudineus* ranges between 0.79 and 1.42 with an average of  $0.98 \pm 0.13$  while in female it ranges between 0.71 and 1.29 with an average of  $1.02 \pm 0.11$ . The relative condition factor in male is observed to increase from lighter to heavier fish. However, in female the relative condition factor initially declines from lighter to heavier fish and exhibits the lowest value at medium sized fish and thereafter steadily inclines to get the highest value in bigger fish having size range of  $\pm 13$  cm TL.

**Keywords:** Length-Weight relationship, relative condition factor, *Anabas testudineus*.

### 1. Introduction

Growth is an inherent property of all living creatures in the universe. When an organism grows, its length and weight increases simultaneously; as growth is a function of length and weight. Length-weight relationship is a very significant biological parameter in aquaculture as it helps in easy assessment of growth rate, appearance of first maturity, time of spawning, status of stock variation, growth dynamics, general well-being of fishes etc.

In a healthy environment where fishes grow isometrically, obeys the Cube law ( $W=L^3$ ) (Brody, 1945<sup>[3]</sup>; Lagler, 1952)<sup>[10]</sup>. But there is every possibility of deviation of length-weight relationship from Cube's law due to different environmental factors that changes the physico-chemical parameters of water where different species of fishes reside. Thus Le Cren in 1951 modified Cube's law as  $W=aL^b$  to get a satisfactory result to calculate the length - weight relationship throughout the life history stages of fishes.

*Anabas testudineus* (climbing perch) is a very important species of fish possessing a pair of accessory respiratory organ that enables it to thrive in low DO and survive out of water for prolong period. Presence of a black spot at the base of pectoral and caudal fin is a characteristic feature of this fish. The fish is available in all Beels (wetlands) of Assam.

### 2. Materials and Methods

A total number of 120 live samples of *Anabas testudineus* of various age groups were randomly collected from Deepar Beel (Wetland) located at  $91^{\circ}36'$  to  $91^{\circ}42'$  East longitude and  $26^{\circ}6'$  to  $26^{\circ}09'$  North latitude; from March, 2015 to June, 2015. Length-weight relationships were calculated after separating the male and female. After separation, 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 a standard digital balance individually. The length - weight relationships were estimated following the formula  $W=aL^b$  (Le Cren, 1951)<sup>[11]</sup>, which 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 method of least square regression as follows.

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

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

Relative condition factor (Kn) was also estimated by following Le Cren (1951) formula as expressed bellow

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

Where W = observed weight

$\hat{W}$  = calculated weight derived from length-weight relationship.

The mean, standard deviation, Correlation coefficient of total length and body weight and relative condition factor were

calculated with the help of 16<sup>th</sup> version SPSS software and Microsoft Office 7.

### 3. Results

In the present study total length and body weight of *Anabas testudineus* ranges from 7.4 to 12.7 cm in length and 5.21 to 36.5 g in weight in males; while total length in females ranges from 9.6 to 13.4 cm and total weight from 10.41 to 39.66 gram. The value of ‘a’, ‘b’, mean±SD of total length and body weight for *Anabas testudineus* (male & female) 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 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 *Anabas testudineus* (male & female) under the present study is as follows during the period of investigation in Deepar Beel.

*Anabas testudineus* (Male) -  $\text{Log } W = -2.45 + 3.56 \text{ Log } L$   
*Anabas testudineus* (Female) -  $\text{Log } W = -2.63 + 3.73 \text{ Log } L$

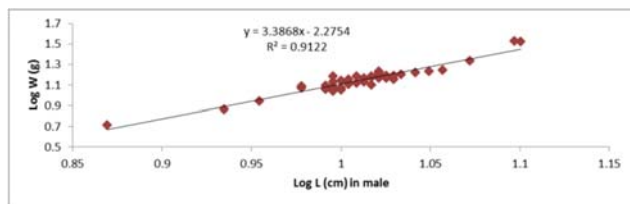
**Table1:** Mean ± Standard deviation of Body weight (BW) and Total length (TL), value of ‘a’ and ‘b’

Species	Sex	Weight range (g)	Size range (cm)	Mean ± SD BW (g)	Mean ± SD TL (cm)	Value of ‘a’	Value of ‘b’
<i>Anabas testudineus</i>	Male (n=50)	5.21-36.5	7.4-12.7	15.58±6.20	10.39±0.94	-2.45	3.56
	Female (n=70)	10.41-39.66	9.6-13.4	19.16±7.53	11.03±0.98	-2.63	3.73

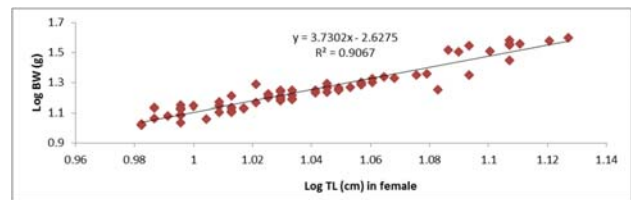
**Table2:** Value of Correlation coefficient ‘r’, Kn range and Mean ± Standard deviation of condition factor ‘Kn’

Species	Sex	Value of ‘r’	Kn range	Mean ± SD of Kn
<i>Anabas testudineus</i>	Male (n=50)	0.913**	0.79-1.42	0.98±0.13
	Female (n=70)	0.931**	0.71-1.29	1.02±0.11

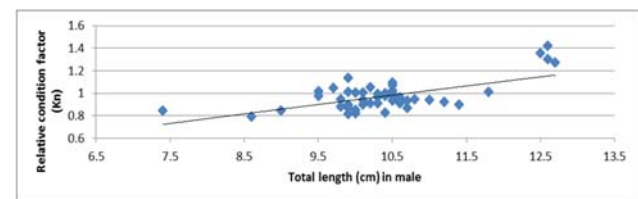
\*\*Correlation is significant at the 0.01 level (2-tailed).



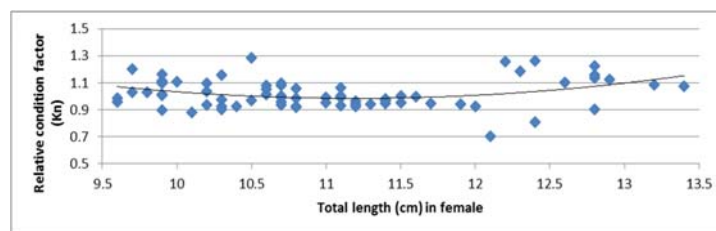
**Fig1 (a):** Relation between Log TL (cm) and Log BW (g) of *Anabas testudineus* (Male)



**Fig1 (b):** Relation between Log TL (cm) and Log BW (g) of *Anabas testudineus* (Female)



**Fig 2 (a):** Relative condition factor (Kn) in relation to total length (cm) of *Anabas testudineus* (Male)



**Fig 2 (b):** Relative condition factor (Kn) in relation to total length (cm) of *Anabas testudineus* (Female)

### 4. Discussion

The present study reveals that the growth performance in both male and female *Anabas testudineus* are found high since the correlation coefficient ‘r’ exhibits high degree of positive allometric correlation between the length-weight relationship of *Anabas testudineus* in both sexes (Table-1&2). The positive allometric growth can be due to higher

proficiency in feeding (Soni and Kathal, 1953 [15]; Kaur, 1981 [9]; Saikia *et al.*, 2011) [14] and better environmental condition for survival for the species. Bura Gohain and Goswami, 2013 [4]; Deka and Bura Gohain, 2015 [5] also observed the effect of availability of food and other associated factors responsible for positive allometric growth.

Degree of variation of exponential value of length-weight relationship indicated by 'b' value in male *Anabas testudineus* is 3.56 and in female *Anabas testudineus* is 3.73. The value of exponent 'b' is found to be in normal range between 2.5 and 4.0 as suggested by Hile, 1936<sup>[7]</sup> and Martin 1949. Variation in 'b' value can be attributed due to feeding (Le-Cren, 1951)<sup>[11]</sup>, sex (Hile and Jobes, 1940)<sup>[8]</sup>, developmental stages of gonads, specially the ovary affect the weight (Weatherly, 1972<sup>[16]</sup> and Hile, 1936)<sup>[7]</sup> and state of maturity (Frost, 1945)<sup>[6]</sup>. The present study also reveals that the value of 'b' in both male and female *Anabas testudineus* deviated from 'Cube law' as it remains constant at 3.0 showing isometric growth pattern in an ideal environment (Bura Gohain and Goswami, 2013)<sup>[4]</sup>. 'Condition', 'fatness' or well-being of fish expressed by Kn-factor, is an index to monitor feeding intensity and growth rate (Oni *et al.*, 1983)<sup>[13]</sup> is based on hypothesis that heavier fish for a given length are in better condition (Bagenal and Tesch, 1978)<sup>[1]</sup>. Fish with high value of 'Kn' are heavy for its length, while with low 'Kn' are lighter (Bagenal and Tesch, 1978)<sup>[1]</sup>. 'Kn' value greater than 1 indicates better condition of fish (Le Cren, 1951)<sup>[11]</sup>. In the present study Kn value in *Anabas testudineus* (Male) ranges from 0.79-1.42 with an average of 0.98±0.13 and in Female ranges between 0.71 and 1.29 with an average of 1.02±0.11 shows better condition of the experimental fish. The relative condition factor in male is observed to increase from lighter to heavier fish (Figure-2 a), which clearly indicate that the general wellbeing and growth is good in heavier fish. The increase of Kn value with increase of length and weight is also observed by Yousuf and Khurshid, 2008<sup>[17]</sup>. However, in female the relative condition factor declines from size range ±10 cm TL and exhibit the lowest value at medium sized fish (11-12 cm TL) and thereafter steadily incline to get the highest value in bigger fish having size range of ±13 cm TL [(Figure-2 (b)), which is not corroborate with the result of Bhatta and Goswami, 2014 where peak Kn value is recorded in medium sized fishes of *Channa aurantimaculata*.

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