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Length-Weight relationship and condition factor of *Channa aurantimaculata* (Musikasinthorn, 2000) studied in a riparian wetland of Dhemaji District, Assam, India

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ABSTRACT:

Present study reports the length-weight relationship, condition factor and relative condition factor of *Channa aurantimaculata* (Musikasinthorn, 2000), a hole dwelling snakehead endemic fish species (Goswami *et al.,* 2006, Vishwanath and Geetakumari, 2009) of a riparian wetland habitat of Dhemaji district, Assam. Length-weight relationship, condition factor and relative condition factor of the species was evaluated during the feeding cycle (December - March/April) in the year November 2008 to October 2009. The relative growth coefficient (b) values for male was found to be 4.18 and for female was 2.65, the condition factor (K) value was 1.29 ± 0.27 for male and 1.66 ± 0.28 for female, relative condition factor (Kn) value 1.05 ± 0.42 in male and 1.00 ± 0.40 in female were observed. The coefficient of correlation (r) in both the sexes exhibit allometric growth (negative in female and highly positive in male).

Keywords:
Channa aurantimaculata, L-W relationship, condition factor, Dhemaji district

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INTRODUCTION:

The growth performance and well-being of any fish species in relation to habitat diversity are determined through the measure of its length- weight relationship and condition factor. Such a knowledge on length and weight is useful in the assessment of fish stock and population to predict the potential yield of the species. The size variation in relation to growth in biomass of fish is expressed in length-weight statistics. In the natural population the growth dynamics of any fish species is dependent on its habitat variability. The growth pattern in fishes follow the cube law (Brody 1945; Lagler, 1952). As the fish grows isometrically exhibiting the exponential value exactly at 3.0, such relationship is considered valid. However, in reality, it may deviate from this ideal value due to environmental condition or condition of the fish (Le Cren, 1951). Therefore, as suggested by Le Cren (1951) this relationship is expressed by an equation- $W= aL^b$ or W= Log a + b Log L.

Channa aurantimaculata (Musikasinthorn, 2000), one of the burrowing members of the Asian snakehead exhibits its habitat range in the riparian wetlands of upper Assam districts as distributed in Tinsukia Dibrugarh Dhemaji districts. The dual life cycle of the fish (living in burrows and enjoying free swimming life) is a special behavioral character within the riparian range of the habitat. This species endemic to the upper Assam zone (Goswami *et al.,* 2006; Vishwanath and Geetakumari, 2009) is of special interest for its assessment of growth dynamics and natural population stock. The growth performance of the natural population of the species needs to be examined to ascertain its overall relationship of length and weight. The general well-being of the species in the present habitat characters is expressed in terms of its mathematical expression of condition factor. The present study deals with computing the length- weight relationship, condition factor and relative condition factor of *Channa aurantimaculata* from the natural stock of Lachia beel, a riparian wetland (Longitude 94°57 / 27// E and Latitude 27°38/ 33// N) located in Dhemaji District of Assam.

MATERIALS AND METHODS

A total of 42 specimens with size ranges 21.4 - 39.6 in length and 150.25 – 769.82 in weight of both sexes of *Channa aurantimaculata* were collected randomly from a riparian weltand namely Lachia beel (Longitude 94°57 /27// E and Latitude 27°38/ 33// N) of Dhemaji district of Assam, India during Nov, 2008 – Oct, 2009. Since sex of the collected samples could not be distinguished by secondary sexual characters, all fishes were dissected and identified the sex based on gonadal structures following Mackie and Lewis, 2001. The male specimens (15 number) and female specimens (27number) were separated for their length and weight. Total length (TL) were measured from tip of the snout to tip of the caudal fin nearest to 0.01 mm by digital vernier caliper and Body weight (BW) of the fish samples were measured nearest to 0.01 gm by digital balance (Sartorius BA 610, Germany) individually. Length-weight relationship were estimated by the equation $W=a\ L^b$ (Le Cren, 1951) which further expressed logarithmically as

$$\text{Log } W=\text{Log } a + b \text{ Log } L$$

Where, W= Weight of the fish, L=length of the fish and 'a' and 'b' are constant. Parameter 'a' and 'b' were calculated by the method of least square regression:

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

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

The value of correlation 'r', standard deviation (SD) between total length and body weight were calculated with the help of SPSS software (version-16)

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

Sex	Weight range (gm)	Size range (cm)	Mean±SD BW(gm)	Mean±SD TL (cm)	Value of 'a'	Value of 'b'	'r' value
Male N=15	180.42 - 750.01	28.2 - 39.6	443.12 ± 180.97	32.42 ± 3.147	-3.68	4.186	0.898
Female N=27	150.25 - 769.82	21.4 -38.9	492.57 ± 193.85	30.47 ± 5.23	-1.26	2.651	0.959

□□ Significant level at 0.05

and Microsoft Office Excel. The Log transformed regression was used to test the growth.

RESULTS AND DISCUSSION

In the present study the body weight of male and female have been ranged between 180.42 and 750.01 gm and 150.25 and 769.82 gm respectively and the total length between 28.2 and 39.6 cm in male and 21.4 and 38.9 cm in female. The value of 'a', 'b', 'r' and mean ± SD of male and female are given in the Table 1. The 'K' and 'Kn' values are depicted in Table 2. The regression graphs of LWR and condition factor (K) are depicted in Fig.1 and Fig.2. Logarithmic form of Length-weight relationship is expressed by the following equations for male and females as

For Male, -Log W = - 3.68 + 4.18 Log L

For Female, -Log W = - 1.26 + 2.61Log L

Channa aurantimaculata is a hole dwelling snakehead species enjoying aestivation of life during the dry season (December – March/April) and free living life during rest of the period (May- November). The growth performance of the fish during the free living period is an important part of its life cycle. In the present investigation the growth performance of both the sexes are found high since the correlation coefficient 'r' exhibits a high degree of positive allometric correlation in male and feebly negative allometric correlation between the L-W relationship (Table-1). Degree of variation of exponential value of L-W relationship indicated by ' b' value in male (4.186) is higher than the female (2.651). However, correlation coefficient 'r' value in female is found to be more closer to 1.0 (0.959) than the ' r' value in male (0.898). This indicates that the female has higher degree of relationship in growth performance than the male in spite of lower degree of exponential growth than the latter. Notwithstanding the value of exponent 'b' usually ranges between 2.5 and 4.0 (Hile, 1936, Martin, 1949) and remains constant at 3.0 for an exactly ideal fish (Allen,1938), the present study indicates that the value of 'b' in case of *Channa aurantimaculata* is found to be deviated from 'Cube law' in both the cases of male and female. Considerably the growth coefficient 'b' of *Channa aurantimaculata* is positively allometric, but within the value (slightly higher in upper limit) as suggested by Hile and Martin. Saikia *et al.,* (2011) also observed the allometric growth in *Channa punctatus* from Assam. The higher 'b' value may be indicated by

Table. 2: Mean ± standard deviation of Condition factor (K) and Relative condition factor (Kn)

Sex	Weight range (gm)	Size range (cm)	Range of K	Range of Kn	Mean ± SD K	Mean ± SD Kn
Male N=15	180.42 - 750.01	28.2 - 39.6	0.78 - 1.66	0.41 - 1.69	1.29± 0.27	1.05 ± 0.42
Female N=27	150.25 - 769.82	21.4 - 38.9	1.31- 2.33	1.00 - 1.56	1.66 ± 0.28	1.00 ± 0.40

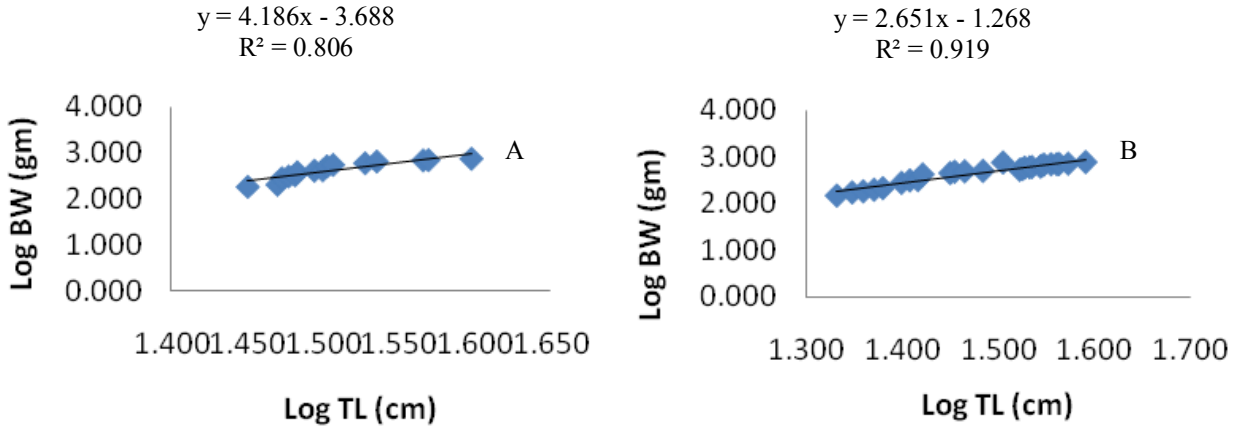

Fig.1: Relationship between Log Total length (cm) and Log body weight (gm) of *Channa aurantimaculata* (A = Male and B= Female).

the higher feeding proficiencies (Soni and Kathal, 1953; Kaur, 1981; Saikia *et al.,* 2011), which is observed with the present study. The free moving period of *Channa aurantimaculata* is marked as the best feeding period, which reflects in correlation coefficient of L-W relationship (r) and high degree of exponential growth (b).

It is observed that *Channa aurantimaculata* lives in burrows, which is followed by a free living life as soon as the riparian swamp habitats are inundated with flood water. The fish starts its feeding cycle overcoming the non-feeding life of aestivation. As the feed intensity increases during the feeding period the fish undergoes enhancement of growth. As a result, it follows favorably a normal growth showing positive allometric relation which is reflected in the Length-Weight relationship.

'Condition', 'fatness' or well being of fish expressed by K-factor is based on hypothesis that heavier fish of a given length are in better condition (Bagenal and Tesch, 1978). For monitoring of feeding intensity and growth rate in fish in general K-factor is an essential index (Oni *et al.,*1983). However, the condition factor (K) and relative condition factor (Kn) in the free living stage of *Channa aurantimaculata* (Table) clearly indicate that the general well being and the status of maturity and growth are favourably good. High K-value in both the species suggests that condition factor increased with increasing length and weight of the fish (Yousuf and Khurshid, 2008). However in case of *Channa aurantimaculata* it exhibits highest peak in

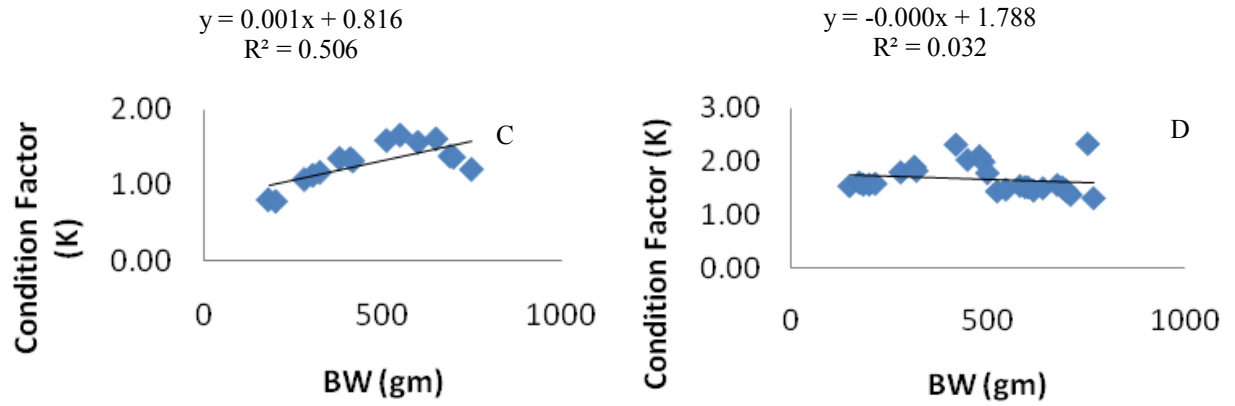

Fig.2: Condition factor (Kn) in relation to body weight (gm) of *Channa aurantimaculata* (C=Male and D=Female

K-factor in relation to BW within the weight range of 400-600 gm BW and thereafter steady decline is noticed (Figure 2). This may be due to completion of free swimming stage and initiation of burrowing /aestivation cycle.

CONCLUSION

Channa aurantimaculata is found to endemic in the upper Assam zone (Goswami *et al.,* 2006, Vishwanath and Geetakumari, 2009) and dwindling in the natural wetland habitat. The feeding and breeding cycle of the fish is unidentical from the other common snakeheads of the region. Due to rampant habitat destruction the fish is dwindling and struggling for survival in nature. For the conservation of the species the basic data for growth, breeding and feeding behavior are considered pre requisite. Steps related to conservation of the habitat for the species is highly recommended.

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