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RESEARCH PAPER

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Morphometric and Biometric Index Study of *Channa Punctatus* (Bloch) from Paddy Field of Sivsagar District, Assam

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ABSTRACT

In morphometry of Channa punctatus, the total length was recorded as 9.1cm to 16.3cm whereas total body weight ranged from 11.15g to 43.02g. The mean value of standard length in percentage of total length was found to be 84.25 and head length was found to be 29.6. Mean value of body depth expressed as percentage of total length was 17.6; head depth was 2cm and was calculated to be 15.14; girth length was found as 52.99; dorsal fin length was found to be 10.6 while the mean value of eye diameter in percentage of head length was 12.53. Mean biometric index reveals that growth of head length (HL) in relation to total length (TL) is isometric or having maintained an almost constant biometric index with the increase of length. The growth of head depth (HD) also shows more or less isometric growth. The other parameters such as standard length (SL), body depth (BD), girth length (GL) and eye-diameter (ED), show allometric growth and ratios are not constant with the increase of length. The growth of body depth (BD), girth length (GL), and dorsal fin height shows positive allometry in relation to total length while, eye diameter (ED) in relation to head length (HL) also shows a positive allometry. Again, head length (HL) in relation to total length exhibits negative allometry. The regression coefficient ('b') and coefficient of correlation ('r') value for various morphometric parameters of the Channa punctatus were studied.

Key words: Channa punctatus, Morphometry, Biometric Index, Sivsagar, Assam

INTRODUCTION

The family Channidae is represented by 26 species, of which 23 occur in Asia and the rest in Africa and as far as north- eastern part of India is concerned, 9 species of *Channa* have been

reported from this region (Musikasinthorn 2000). The spotted snakehead, *Channa punctatus* (Bloch), distributed throughout the South-East Asian countries and has been identified as a potential species for rearing in paddy fields, derelict and swampy water as it is a hardy and air-breathing fish. The fish is well known for its taste, high nutritive value and medicinal qualities and is recommended as a diet during convalescence (Haniffa *et al*., 2004). The fish species under family Channidae constitute lucrative item among them (Chakrabarty, 2006).

Various authors have referred to the morphological differences in fish as a result of adaptation to its new environment (Lindsay, 1954; Barlow, 1961; Grant and Spain, 1977). The morphology of *Channa* species in the context of species confirmation is well reviewed (Ram, 1975; Reddy, 1981; Kaur and Nasar, 1983; Rao and Reddy, 1984 and Sarkar, 1996) in most of the taxonomic literature. Rao and Reddy (1984) recorded abnormal specimen of *Channa punctatus* from Hussain Sagar Lake while Samad and Jafari (1996) worked on intra-specific relationship of *C. punctatus* and showed that both shape and size variation are due to the geographical location or of genotypic differentiation.

Taxonomy and phylogeny of the Channid fishes of the North-Eastern region is poorly understood. Hamilton (1822) reported *Ophicephalus* (*Channa*) *barca* from Brahmaputra River near Goalpara, Assam. Sen (1985) listed and gave diagnostic characters of 6 species of this genus. Two new species of *Channa* have been reported from Assam in the last part of the 20th century- *C. bleheri* (Vierke, 1991) and *C. aurantimaculata* (Musikasinthorn, 2000). Recently, Vishwanath and Geetakumari (2009) studied the morphological and osteological characters of the *Channid* fishes of Manipur.

Channa punctatus (Bloch) has been gaining importance not only as a food fish but also as an aquarium fish for its body shape and behavior. In local markets, they are kept in large bins or tubs in large numbers in little water without aeration. However, over the last 10 years, its population has undergone a steady decline due to over exploitation, loss of habitat, pollution as well as destructive fishing. According to IUCN status (Molur and Walker, 1998), it has been listed among the 66 low-risk near threatened fish species in India. The paper deals with the morphology and biometric index of *Channa punctatus* from the paddy field and wetland of Sivsagar district, Assam.

MATERIAL AND METHODS

The specimens of *C. punctatus* were collected from paddy fields and wetlands of Sivasagar district of Upper Assam during 2010-2011. Morphology and biometric index of *Channa punctatus* were studied by examining a total of 645 digestive tracts.

Morphometric measurement: The total length and weight of the fishes to the nearest centimeter and gram respectively were recorded and was fixed in 10% formaldehyde for further biological studies. For precision of measurement, divider and measuring board having graduation in mm was used. Similarly, the total weight of the fish was measured in electronic balance nearest to 0.01 gm. The morphometric parameters were measured from left side of each specimen. The morphometric characters were studied following Lowe McConnell (1971) and Grant and Spain (1977). The various morphometric measurements were as follows:

(a) Total length: - Total body length has been measured from tip of the pre-maxilla to the tip of the tail to the nearest cm.

(b) Standard length: - Distance from the tip of the pre-maxilla to the caudal fin base in cm

(c) Head length: - Distance from the tip of the pre-maxilla to the posterior most edge of opercular bone.
(d) Body depth: - Distance between the dorsal and ventral surface at the deepest point.
(e) Head depth: - Perpendicular distance from the end of the gape to the ventral side of the head.
(f) Eye diameter: - Distance from the anterior to the posterior rims of the eye in the longitudinal axis.
(g) Girth length: - Circumference of the body at its deepest point.
(h) Dorsal fin length height: - Length of the longest fin ray of the dorsal fin.

Biometric index: The number of time each body goes in total length of the fish was taken as a Biometric index (Tobor, 1974). For the present study the characters recorded were standard length (SL), body length (BL), head length (HL), girth length (GL), height of the dorsal fin (HD), eye diameter (ED), depth of the body (BD). For each parameter, the mean index of 5.0-10.0 cm, 10.1-15.0 cm, 15.1-20.0 cm group has been taken to find out whether the parameter was constant or fluctuating with increasing in the total length. All the above biometric measurement was made only left side of the fish. The regression method has been employed with the formula:

Y = a + bx, where Y is the variable character, such as total length, head length etc., 'a' is a constant value to be determined, 'b' is the regression co-efficient and 'x' is the total length. The value of 'a' and 'b' were determined by the following formula

$b = \frac{\Sigma xy - n\,\bar{x}\bar{y}}{\Sigma x^2 - n(\bar{x})^2}$, $a = \bar{y} - b\bar{x}$ where, n = total number of length groups; $\bar{x}$ = mean of x and $\bar{y}$ = mean of y.

RESULTS

Morphometric measurements: Average linear morphometric measurements of *Channa punctatus* have been given in Table 1. The total length was recorded as 9.1cm to 16.3cm whereas total weight ranged from 11.15g to 43.02g. The mean value of standard length in percentage of total length was found to be 84.25 and the mean value of head length was found to be 29.6. Mean value of body depth expressed as percentage of total length was 17.6 and mean value of the head depth was 2cm and the value in terms of percentage of total length was calculated to be 15.14. Mean girth length expressed as percentage of total length was found as 52.99, dorsal fin length expressed as a percentage of total length was found to be 10.6 while the mean value of eye diameter in percentage of head length was 12.53.

The regression coefficient or 'b' value for various morphometric parameters studied has been given in Table 2. The 'b' value of different variable characters (Y) on total length (X) of *C. punctatus* indicates that the rate of growth in body depth was highest (3.26) and the lowest (0.89) in girth length in relation to total length. On the other hand, 'b' was recorded as 0.35 in eye diameter in relation to head length and indicated a linear relationship. The linear relationship of various morphometric characters and total length was reported by Khumar and Siddiqui (1991), Rizkalla (1994), Pandey *et al.* (1995), Jaiswar *et al*. (2004) in various fish species. Again, it was observed that all the body parameters show higher values of correlation co-

efficient with total length and head length. High value of positive correlation has been found between variables of biometric indices such as standard length (0.93), head length (0.99) girth length (0.99), and body depth (0.98) with total length table (Table 2). Again head length on eye diameter shows a moderately high correlation (r = 0.69).

Biometric indices: For each character a mean biometric index for each 5cm length groups had been calculated to see whether it is constant or varying with increase in total length (Table 3). It has been observed that growth of head (HL) in relation to total length (TL) is isometric or having maintained an almost constant biometric index. The growth of head depth (HD) also shows more or less isometric growth. The other parameters such as standard length (SL), body depth (BD), girth length (GL) and eye-diameter (ED), show allometric growth. The growth of body depth (BD), girth length (GL) and dorsal fin height shows positive allometry whereas in relation to total length and eye diameter (ED) in relation to head length (HL) also shows a positive allometry. Again, head length (HL) in relation to total length exhibits a negative allometry growth.

Biometric study of *Channa punctatus* shows that eye diameter is relatively smaller in relation to head length. According to Bayagbona (1963), a constant index in any of the biometric indices indicates that the growth of the biometric character in relation to its reference length is isometric. A similar case was reported by Tobor (1974) for *Lates niloticus* and Kaur (1981) for *Channa gachua*. However, the biometric indices of head length and head depth were found more or less constant in the present study. The body depth and girth show positive allometry which means that *C. punctatus* becomes deeper as it grows in length. The ratio in different morphometric characters with increase in length at different size of life may not be having constant relative growth in various fish species (Pandey *et al.*, 1995; Jaiswar *et al*., 2004)

Table 1: Mean linear morphometric parameters of *C. Punctatus*

Parameters	Length Range (cm)	Mean (cm)	% of Total length
Total length	9.1-16.3	13.21	100
Standard length	7.3-13.6	11.13	84.25
Head length	2.5-5	3.91	29.6
Body depth	1.4-3.1	2.33	17.6
Head depth	1.2-2.7	2.0	15.14
Girth length	4.1-8.5	7.0	52.99
Dorsal fin height	0.8-1.8	1.4	10.6
Eye diameter	0.3-0.6	0.49	12.53

Table 2: Regression equation on various body parameters

Parameters	Regression equation	**'r'**
Standard length (Y) on total length (X)	Y= 0.08 + 1.0 X	0.93
Head length (Y) on Total length (X)	Y= 0.54 + 1.0 X	0.99
Girth length (Y) on Total length (X)	Y= 0.37 + 0.89.X	0.99
Body depth (Y) on Total length (X)	Y= - 0.08 + 3.26.X	0.98

Eye diameter (Y) on Head length (X)	Y= 0.25 + 0.35.X	0.69

Table 3: Mean biometric indices in different length groups of *C. punctatus*

Size Group Ratio	I 5-10 cm	II 10.1-15 cm	III 15.1-20 cm	IV 20.1 – 25 cm
TL/SL	1.20	1.19	1.20	1.20
TL/HL	3.49	3.48	3.42	3.42
TL/BD	5.73	5.57	6	5.73
TL/HD	6.21	6.23	6.28	6.25
HL/ED	7.19	7.8	7.99	8
TL/Girth	1.84	1.89	1.93	2.01
TL/Dorsal fin height	7.21	9.23	10	10.6

Air-breathing forms like murrels definitely have certain advantages to cope up with rice-field environment and this is why they become potential candidate for rice cum fish culture. Further, several smaller and more colourful local *Channa* species are sought after for aquarium trade (Mahapatra, 2007). They are of the view that the concept of size and shape are of basic importance to analyze the variation of all living beings. The results of the biometric characters reveal that growth of head (HL) in relation to total length (TL) is isometric and the growth of head depth (HD) also shows more or less isometric growth. The growth of body depth (BD), girth length (GL) and dorsal fin height showed positive allometry whereas in relation to total length and eye diameter (ED) in relation to head length (HL) also showed a positive allometry. Again, head length (HL) in relation to total length exhibits a negative allometry growth. The body parameters have a linear relationship with the total length and head length of the fish. In overall high value of positive correlation has been found between variables of morphometric parameters and total length/head length of both the species.

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