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Morphological Observation and Length-weight Relationship of Critically Endangered Riverine Catfish *Rita rita* (Hamilton)

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Abstract: The experiment was conducted to investigate the morphological status of the critically endangered riverine catfish *Rita rita* using morphometric and meristic traits. About 158 species of *Rita* were collected from the old Brahmaputra river in Mymensingh district and were studied in the laboratory of the Fisheries Biology and Genetics Department, Bangladesh Agricultural University. Measurement of length and weight of *Rita* were recorded by using measuring scale and electric balance respectively. Significant curvilinear relationship existed between total length and other morphometric characters and between head length and other characters of the head. Relationships between total length and various body measurements of the fish were highly significant ($p < 0.01$) except the relationship between total length and pelvic fin length of male fish ($p < 0.05$). In case of meristic characters-dorsal fin rays, pelvic fin rays, pectoral fin rays, anal fin rays, caudal fin rays, number of vertebrae and branchiostegal rays were found to be more or less similar except slight differences. The values of condition factors (k) in the total length body-weight relationships for female and male were found to be 0.41 and 0.38, respectively. The mean values of relative condition factors (k_n) were 1.0 and 1.005 for female and male, respectively.

Key words: Morphometric, meristic, catfish, *Rita rita*

INTRODUCTION

Bangladesh has diverse array of water resources including 260 freshwater fish species, 24 freshwater prawn, 475 marine fish, 36 marine or brackish water shrimp and 12 exotic fish species (DoF, 2009). Among the freshwater fishes catfish is a rich and exceptionally diverse group of fishes constituting the order Siluriformes. At least 55 species of catfishes belonging to 35 genera have been recorded so far in Bangladesh and widely distributed in the rivers, haors, baors, beels and floodplains (Rahman, 2005).

Once the catfishes were very available in the nature but in the recent times, they have become scarce due to modification of habitats, loss of breeding and nursery grounds, blocking of migratory channels by construction of flood control drainage, diseases and parasitic infestations, irrigation schemes, over fishing of juveniles and brood fish, short term leasing of baors and beels etc. All these causes have limited the natural recruitment process of the species. IUCN (2000) has documented 54 freshwater fish species of Bangladesh are now vulnerable, endangered and critically endangered. *R. rita* is categorized as critically endangered situation. It is a

tasty fish demanding comparatively high price in the market. Devi *et al.* (1991) mentioned that it is an important commercial catfish of Aligarh fish market forming 8 to 12% of total catch of catfish. Once the abundance of *R. rita* was very rich in Afghanistan, Pakistan, India, Nepal, Bangladesh and Myanmar. But its abundance has been reported to be declined day by day for various reasons.

It is a slimy, highly carnivorous catfish with the body colour greenish brown above and brownish white below. In the natural habitat, it prefers clean water and it has the hiding tendency and lives between the rocks. The fish attains up to 1200 mm in total length (Rahman, 2005).

Very little work have been done regarding the biological aspects of this fish. However, some attempts have been made to study its length-weight (Lal and Dwevedi, 1969) age and growth (Devi *et al.*, 1990), environmental impact assessment (Mukhopadhyay *et al.*, 1994), morphometric characters (Devi *et al.*, 1991), food (Devi *et al.*, 1992), maturity and fecundity (Saxena, 1972), structure of the skin (Mital, 1968), embryonic development (Mollah *et al.*, 2011), induced breeding (Taslima and Mollah, 2012) and effect of starvation on some blood constituents of *R. rita* (Pandey and Pandey 1997).

The information on morphological characters i.e, morphometric and meristic characters of fishes and the statistical relationship among them are essential for taxonomic work (McConnel, 1978). Moreover to know the origin of stock, separation of stocks or identification of commercially important species of fishes morphological characters are frequently used (Devi *et al.*, 1991; Kohinoor *et al.*, 1995; Narejo *et al.*, 2000). On account of these, the present study was designed to identify the morphometric and meristic characters and length-weight relationships of *R. rita*. This work would contribute to the existing knowledge by acting as a baseline data for carrying out research especially on taxonomy, racial study, morphology and genetic diversity of other fish species in Bangladesh.

MATERIALS AND METHODS

Samples of *R. rita* were obtained from the river old Brahmaputra in Mymensingh (Fig. 1) district through fishermen and were brought to the laboratory of the Fisheries Biology and Genetics Department, Bangladesh Agricultural University, Mymensingh. A total of 158 *R. rita* fishes (78 male and 80 female) ranging from 160 mm to 955 mm were studied. Different lengths of the fish were measured on a measuring board to the nearest mm and weights were recorded to the nearest mg on an electric balance (Model No.CT, 1200-S, Made in USA).

Morphometric measurements of *R. rita* were made with a fine pointed divider up to the nearest mm following the conventional method described by Hubbs and Lagler (1958), Fig. 2. On the otherhand, meristic characters like number of vertebrae, branchiostegal rays (BrSR), dorsal fin rays (DFR), anal fin rays (AFR), pectoral fin rays (PcFR), pelvic fin rays (PvFR), caudal fin rays (CFR) were studied following Hubbs and Lagler (1958). A magnifying glass was used to count the fin rays and dorsal spines.

The length-weight relationships of the fish were calculated from the logarithmic formula described by Le Cren (1951). The relationships between various parameters were determined by the method of least square.

Several morphological characters were analyzed by Microsoft Excel (MS Excel) computer package as descriptive values such as mean and percentage. Length and other morphological relationships and condition factors were analyzed by MS Excel. Coefficient of co-relation (Pearson-two tailed) was analyzed by SPSS (Statistical Package for Social Science).

RESULTS AND DISCUSSION

The comparative data relating to various body measurements of both female and male Rita were studied to compare the various morphometric relations. Regressions of various measurements have been



Fig. 1: Map of Bangladesh showing the place from where (Old Brahmaputra river) experimental fish were collected

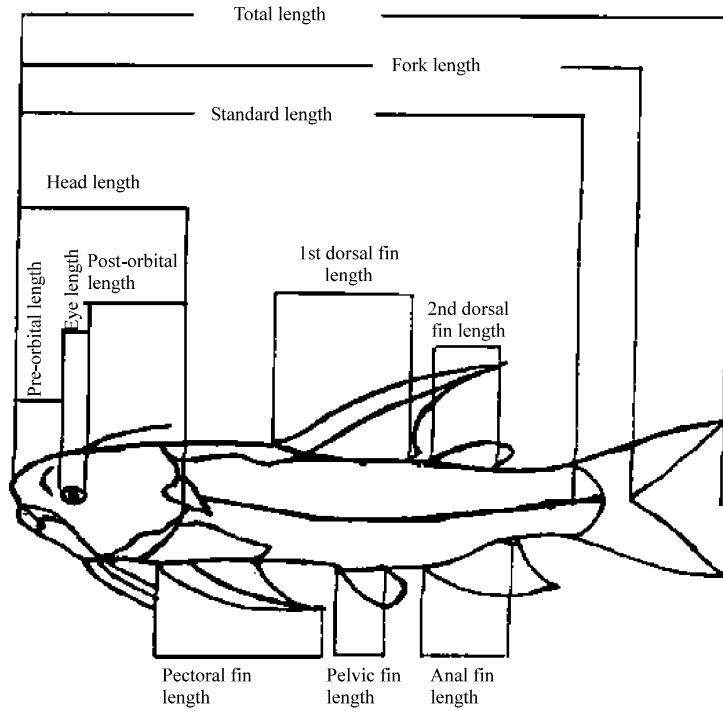


Fig. 2: The measurement of different parts of body (TL: Total length, FL: Fork length, SL: Standard length, HL: Head length, EL: Eye length, PROL: Pre-orbital length, POOL: Post-orbital length, DFL-1: First dorsal fin length, DFL-2: Second dorsal fin length, PCFL: Pectoral fin length, PVFL: Pelvic fin length, AFL: Anal fin length of *Rita rita*

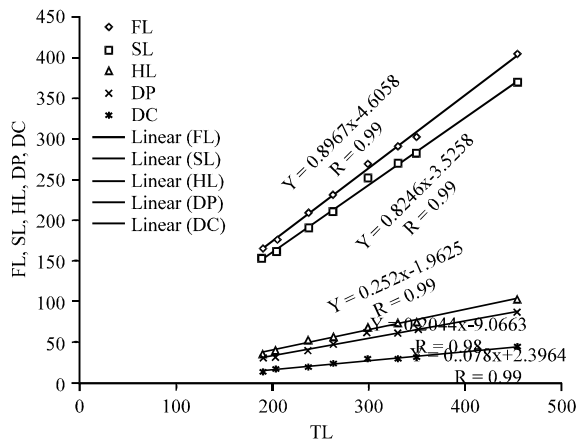


Fig. 3: Relationship between FL, SL, HL, DP, DC and the total length of *Rita rita* (female)

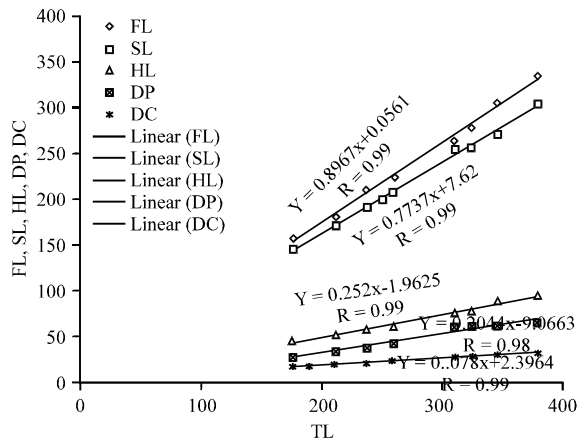


Fig. 4: Relationship between FL, SL, HL, DP, DC and the total length of *Rita rita* (male)

calculated from the collected data. In various body measurement relationship studies the dependent variables for both female and male (Fork length, Standard length, Head length, Eye length, Pre-orbital length, Post-orbital length, First dorsal fin length, Second dorsal fin length, Pectoral fin length, Pelvic fin length, Anal fin length, Depth of pectoral fin base, Depth of caudal fin base) were

found to be highly correlated with an independent variable, the total length of the fish (Fig. 3, 4, 5, 6, 7 and 8). Regression co-efficients varied in a very small range. Regression co-efficients of female were comparatively larger than male. From this experiment it was observed that percentage of values of fork length (88.10) and standard length (80.84) of females was higher than fork

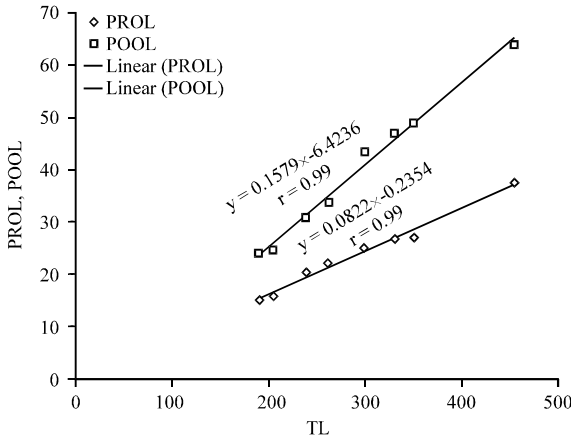


Fig. 5: Relationship between PROL, POOL and the total length of *Rita rita* (female)

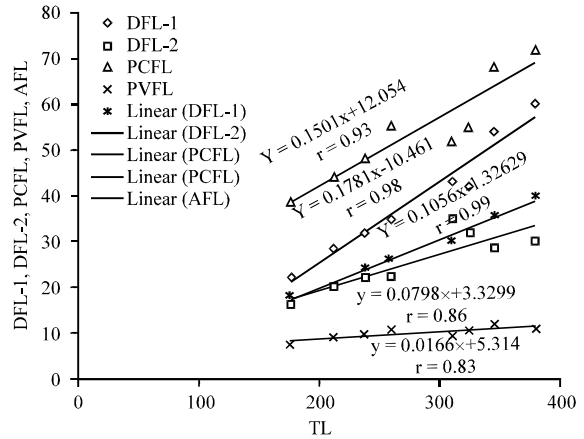


Fig. 8: Relationship between DFL-1, DFL-2, PCFL, PVFL, AFL and the total length of *Rita rita* (male)

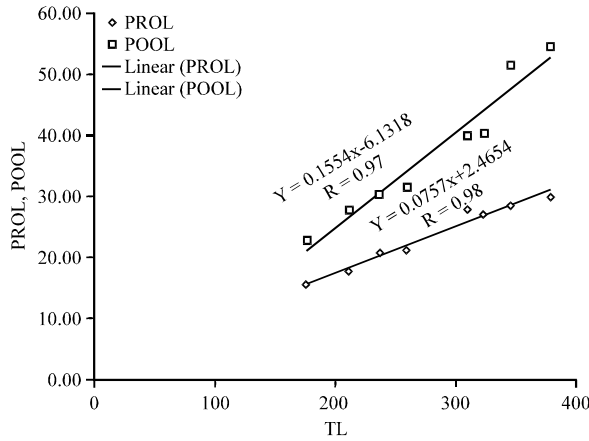


Fig. 6: Relationship between PROL, POOL and the total length of *Rita rita* (male)

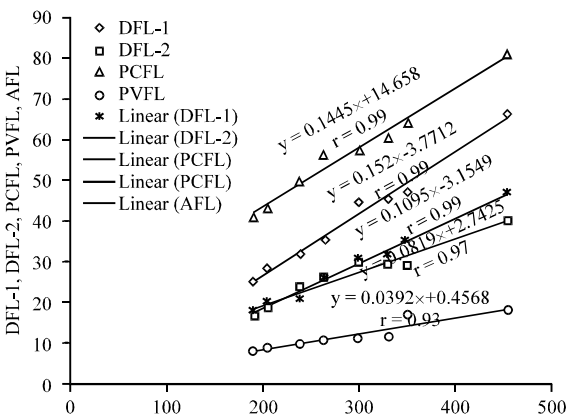


Fig. 7: Relationship between DFL-1, DFL-2, PCFL, PVFL, AFL and the total length of *Rita rita* (female)

length (86) and standard length (80.15) of males. Again, value of depth of body at pectoral fin-base in females (17.85) was higher than those of males (16.53). A close examination of the values of the characters reveals a strong heterogeneity between male and female fish. The females were broader in anterior part of the body at pectoral fin than the males. The males were having longer head than the females. Regarding other characters viz, fork length and standard length of the females were longer than those of the males. Thus it may be inferred that males show faster linear growth in anterior part and females show faster linear growth in posterior part of the body. Devi *et al.* (1991) reported the value of head length (24.91) of males to be higher than those of females (22.91) and the value of depth of body at pectoral fin-base in females (21.09) to be higher than those of males (19.50). This finding is similar to the present study.

The comparative study of the eye length, snout length, gape of mouth (the dependent variables) with head length (the independent variable) showed a higher degree of correlation for both female and male (Fig. 9 and 10). Chatterjee *et al.* (1977) and Tariq *et al.* (1977) has reported linear relationship of various body measurements with the total length in other fish species. Pritchard (1931) and Tandon (1962) reported the existence of different ratios between various parts and total length of males and females in the fish species studied by them. Thus, various body characters of *Rita rita* are dependent variates on total length of the fish unlike those fish species as observed by Pritchard (1931) and Tandon (1962).

It was evident that the FL, SL, HL, EL, PROL, POOL, DFL-1, DFL-2, PCFL-PVFL, AFL, DP and DC were highly correlated with TL. While EL, SNL and GM were also

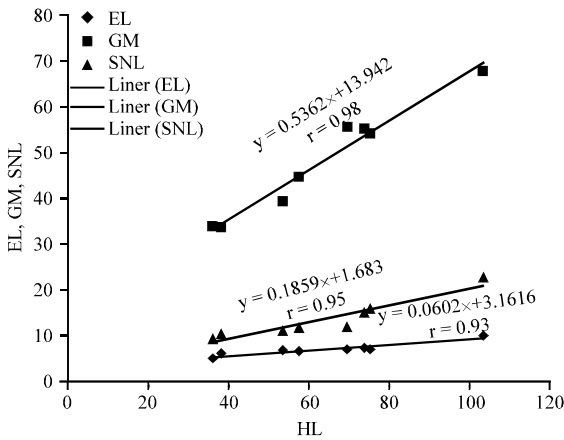


Fig. 9: Relationship between EL, GM, SNL and the head length of *Rita rita* (female)

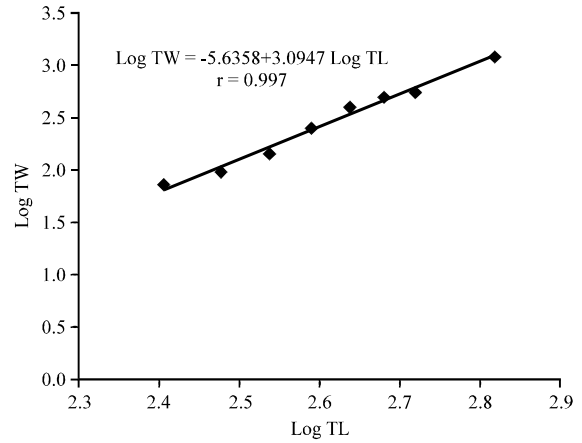


Fig. 11: Logarithmic relationship between the total length and total weight of *Rita rita* (female)

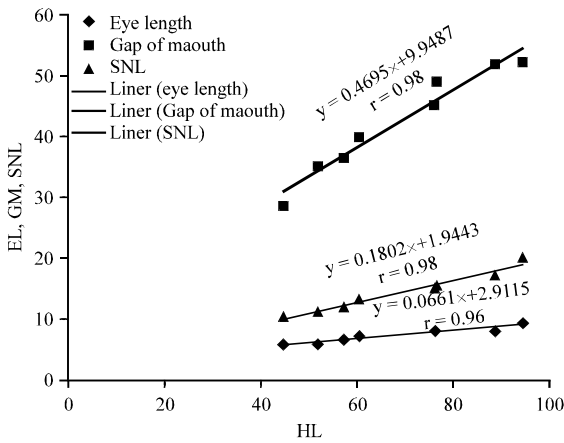


Fig. 10: Relationship between EL, GM, SNL and the head length of *Rita rita* (male)

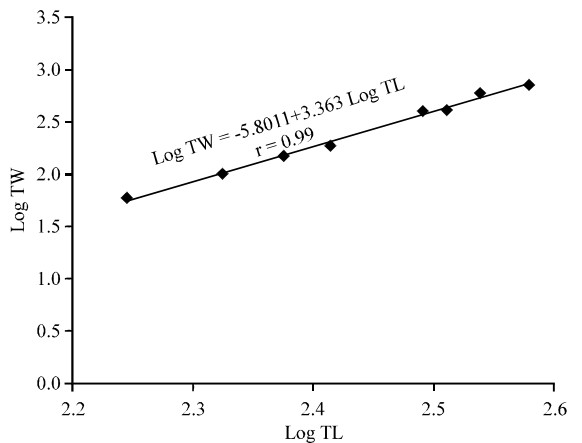


Fig. 12: Logarithmic relationship between the total length and total weight of *Rita rita* (male)

highly correlated with HL. The higher values of 'r' showed that the variables were highly correlated. The value of the coefficient of correlation showed that the relationship between total length and various body measurements of the fish was highly significant ($p < 0.01$) except the relationship between total length and pelvic fin length of male fish ($p < 0.05$). Kohinoor *et al.* (1995) stated that SL, BD, Pel. FL, Pect, DF, AF and HL were highly correlated with TL, while ED and POHL were highly correlated with HL in red tilapia (mutant *Oreochromis mossambicus* × *Oreochromis*).

Meristic characters obtained from this experiment showed comparatively little difference and these were found to be nearly similar in male and female except a few differences and this results agreed with that described by Boulenger (1915).

Length bears a strong positive relation with the weight (Fig. 11 and 12). The exponential values for males

and females were practically identical and close to ideal value of $b = 3$. In this experiment the value of 'r' was 0.99 for both female and male, respectively. The value of coefficient of correlation showed that the relationship between length and weight of the fish was highly significant ($p < 0.01$). Various workers have calculated values of regression co-efficient (b) in different fish species and found the value of $b > 3$. Narejo *et al.* (1999) calculated value of regression co-efficient b in *Tenualosa ilisha* as 3.0246 for males and 3.0345 for females. However, a variation in 'b' value may occur due to species variation, differences in environmental factors, sex variation etc.

In this experiment, the values of condition factor (K) was found to vary from 0.35-0.49 for female and 0.32-0.48 for male and the mean values were 0.41 and 0.389 for

female and male respectively. The values of relative condition factor (Kn) ranged from 0.99-1.01 in female and 0.98-1.021 in male and the mean values of the same were 1.0 for female and 1.005 for male. General physiological condition, seasonal changes, feeding intensity and environmental suitability were noted to be the factors that might have reasonably changed the K and Kn. More or less similar values was recorded by Mondal (2001) for *A. mola* and *C. carpio*.

CONCLUSION

This experiment was undertaken to study some morphological feature of *R. rita* (Ham.) including total length-total weight relationship, condition factor (K) and relative condition factor (Kn) of male and female specimens. The value of the co-efficient of correlation showed that the relationship between total weight with various body measurements of the fish was highly significant ($p > 0.01$) except the relationship between total length and pelvic fin length of male fish ($p > 0.05$). Again the relationship between head length and other characters of head was highly significant ($p > 0.01$). In this experiment, there is a highly significant relation ($p < 0.01$) between length and weight of the fish. In meristic characters comparatively few differences was observed. The value of condition factor (k) have been found to be 0.41 for female and 0.389 for male. The mean values of relative condition factor (Kn) have been obtained as 1.0 for female and 1.005 for male. From the present investigation, it is inferred that there was a single homogenous stock of species. Similar investigation may be conducted taking samples from different locations to have comprehensive information.

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