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SOME ASPECTS OF BIOLOGY OF THE BAR-EYED GOBY GLOSSOGOBIUS GIURIS (HAMILTON 1822) (PERCIFORMES: GOBIIDAE) FROM NETRAKONA

BIMAL KANTA SAHA[1], MD. FUAD HASSAN[2] AND APARNA SAHA
Fisheries Lab, Department of Zoology, Netrakona Govt. College, Netrakona-2400, Bangladesh
[2] Department of Agricultural Statistics, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

Abstract

The investigation was conducted on some aspects of biology viz. morphometrics, meristics, length-weight relationship and coefficient of condition of the Bar-eyed goby *Glossogobius giuris.* The mean of total length (TL) (94.42 ± 18.52 mm), standard length (SL) (73.13 ± 3.45mm), pre-dorsal length (PDL) (28.8 ± 7.32mm), head length (HL) (23.9 ± 4.87mm), snout length (SnL) (8.15 ± 1.9 mm) and height of body (HB) (14.17 ± 3.29mm) were determined.The relationships between the total length and other body parameters were found to be positively correlated and highly significant. The fin formula is D_1.6; D_2.1/9-10; P_1.17-21; P_2.1/5; A.1/9; C.17. The length-weight relationships of combined sex of *G. giuris* were determined as Log TW = -4.802 + 2.857 Log TL. The coefficient of conditions from the *ko* of combined sex and from the *kc* of combined sex was determined as 0.834 ± 0.132 and 0.827 ± 0.027, respectively. *Kn* values of combined sex were found to be 1.001 ± 0.156.

Key words: Bele, *Glossogobius giuris*, Morphometrics, Length-weight relationship, Coefficient of correlation

Introduction

The gobies (Family Gobiidae), a very prominent element in the fish fauna of Bangladesh, is a diversified group occurring in temperate and tropical zones throughout the world.They are mostly small, carnivorous, bottom-dwellers living along the shores of the bay, estuaries and river mouths and also in streams, lakes and swamps.The commonest of all the gobies in Bangladesh is the Bar-eyed goby, *Glossogobius giuris* (Hamilton 1822), locally known as Bele or Bailla. Bele occurs in esturine and freshwaters throughout Bangladesh (Rahman 1989). The species is distributed to East Coast of Africa, India, Pakistan, Ceylon, Burma, the Phillipines, China, Japan and New Caledonia (Srivastava 1968). *G. giuris* is somewhat hardy, but it can not survive in muddy water for long. The species is a good sport on rod and line with a bait of small prawn. Bele is highly esteemed as food and one of the varieties found in both freshwater and brackish water, largely caught and eaten (Bhuiyan 1964).

The morphometric and meristic characters of fishes and their relationships are used in taxonomy to prepare keys for identification in the fishery science. They are also helpful in differentiating stocks or subspecies. The morphometry of many fishes have been determined in India and used in taxonomy (Ganguly *et al.*1959, Prakash and Verma 1982, Tandon *et al.* 1993, Chunder 1997 and Mehta and Bapat 1977). Some works on the morphometry of some fishes have also been published in Bangladesh (Shafi and Quddus 1974, 1975, Azadi *et al.* 1992, Azadi and Naser 1996, Azadi *et al.* 1999 and Saha and Saha 2010, 2011).

The purpose of the length-weight analysis is to describe mathematical relationship between length and weight, primarily so that one may be converted into other and of condition factors to measure the variation from the expected weight for length of individual fish or groups of fishes as indication of relative robustness, plumpness or fatness, degree of well-being etc. (Le Cren 1951). Determination of ponderal index helps in the conversion of length into weight and vice versa (Doha 1970). Works on length-weight relationship and condition factor of freshwater small fishes have been done by Saha and Saha (2010, 2011).

Breeding of *G. giuris* has been studied (Le Cren 1951, Bhowmick 1965, Doha 1974, Haque 1983 and Saha & Saha 2009). But no study has been conducted on morphometrics, meristics, length-weight relationship and condition factors of *G. giuris* from Bangladesh.This type of study may have practical value in culture, management and further development of fishery relating to this fish species in Bangladesh.

Therefore, an investigation was conducted to determine some aspects of biology viz. morphometrics, meristics, length-weight relationship and coefficient of condition of the Bar-eyed goby *G. giuris* from Netrakona during the tenure from February 2004 to January 2005.

Materials and Methods

The samples of Bele for the present work were collected once a month from February 2004 to January 2005 from the fishermen of three fish markets of Netrakona district town. A total number of 299 individuals of Bele was collected for the study period. After collection, the fishes were preserved in 10% formalin.The samples were labelled monthwise in plastic jar and kept in the fisheries Laboratory. Different lengths of fishes were measured in the nearest mm by means of a measuring board fitted with a centimeter scale and the weights were recorded by means of a sensitive Pan balance (TG 928A, capacity 200g, China) in g. For fin formula, Rahman (1989) was followed.

Size frequency distribution: The size frequency distribution was calculated for each length group of 11.0 mm class interval by Peterson Polygon method. Statistical formulae were used to establish mathematical relationship between the total length and other lengths (Snedecor 1956 and Simpson *et al.*1960). The total length (TL) and total eight (TW) relationship of these fishes were determined by using the logarithmic transformation of the formula: W = aL (Le Cren 1951), where W = weight, L = length, a is a constant and an xponent. Values for a and n were found empirically.The value of the coefficient of condition (k) was calculated from the cube law equation $W = KTL^3 \times 10^5$ or $K = \frac{TW \times 10^5}{TL^3}$, where TW = total weight, TL = total length, and K = the factor of proportion.

Results and Discussion

Morphometrics

Size frequency distribution: The data on size frequency distribution of 306 individuals of males and females of Bele are presented in Fig. 1. The specimens were grouped into 12 size groups of 11.0 mm class intervals. Minimum number of male was found in one size group 125-136 mm while no male was found in five size groups viz. 136-147 mm, 147-158 mm, 158-169 mm, 169-180 mm and 180-191 mm. Maximum number of male was recorded in one size group (92-103 mm). On the other hand, minimum number of female was found in two size groups (136-147 mm and 180-191 mm) while maximum number of female was observed in 92-103 mm size group. Females were absent from three size groups (147-158 mm, 158-169 mm and 169-180 mm). According to Saha and Saha (2011), minimum number of male (132-138 mm and 138-144 mm size group) and female (150-156 mm and 156-162 mm size group) of *Nandus nandus* occurs in 2 size groups. Saha and Saha (2011) also reported that the highest number of male and female was available in 96-102 mm and 102-108 mm size groups, respectively in beel water of Netrakona.

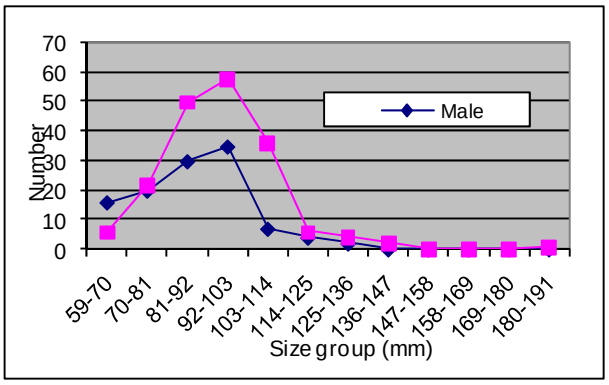

Fig.1. Size frequency distribution of male and female of Bele, *Glossogobius giuris* sampled from Netrakona.

Estimation of lengths: The total length (TL) of male individuals of *G. giuris* attained the range from 59 mm to 135 mm with the mean of 89.14 ± 14.77 mm. In females, it varied from 63 mm to 190 mm with an average of 97.67 ± 19.8 mm and in combined sex, the average being 94.42 ±18.52 mm. Information on maximum total length of *G. giuris* are achieved from different workers viz. 350 mm (Munro 1955), 170 mm (Bhuiyan 1964), 108-152 mm (Srivastava 1968), 450 mm (Day 1878) and 292 mm (Rahman 1989) from home and abroad.

The standard length (SL) of males attained the variation from 46 mm to 107 mm with the mean of 70.1 ± 12.03 mm. In females, it ranged from 50 mm to 152 mm with an average of 75.03 ± 13.92 mm and in combined sex, the mean being 73.13 ± 13.45 mm.

The head length (HL) of male *G. giuris* ranged from 14 mm to 35 mm with the mean of 22.67 ± 4.47 mm. In females, it varied from 15 mm to 50 mm with the mean of 24.68 ± 4.95 mm and in combined sex, the mean calculated to be 23.9 ± 4.87 mm.

The pre-dorsal length (PDL) of males showed a range from 19 mm to 38 mm with the average of 27.12 ± 5.07 mm. In females, it varied from 19 mm to 61 mm with the mean calculated 29.8 ± 8.23 mm and in combined sex, the average being 28.8 ± 7.32 mm.

The snout length (SnL) of males ranged from 2.5 mm to 13 mm with the mean of 7.71 ± 1.83 mm. In females, it varied from 05 mm to 15 mm with the mean of 8.42 ±1.9 mm and in combined sex, the mean calculated to be 8.15 ± 1.9 mm.

The height of body (HB) of males was found to range from 08 mm to 22 mm with the mean of 13.18 ± 2.97 mm. In females, it varied from 09 mm to 34 mm with an average of 14.74 ± 3.34 mm and in combined sex, the average calculated to be 14.17 ± 3.29 mm.

The total weight (TW) of male individuals of *G. giuris* was found to be 01.6 g to 23 g with the mean of 6.48 ± 3.58 g. In females, it varied from 1.8 g to 55.8 g with an average of 9.62 ± 8.91 g and in combined sex, the mean being 8.48 ± 7.56 g.

Total length (TL) and standard length (SL): Scattered diagram (Fig. 2) of total length and standard length of Bele (*G. giuris*) exhibits a positive and linear relationship between them. The coefficient of correlation is highly significant (r = 0.90). Saha and Saha (2011) determined the coefficient of correlation (r = 0.982) of *Nandus nandus* between total length and standard length which closely correlates with the present report.The relationships between the total length (TL) and standard length (SL) can be expressed by the following relations:

Log SL= -592+0.7877Log TL

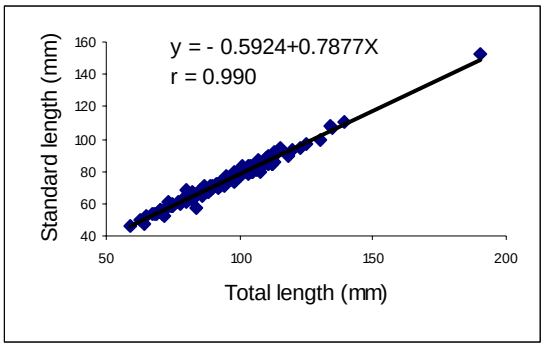

Fig. 2. Relationship between total length and standard length of Bele, *Glossogobius giuris*.

Total length (TL) and head length (HL): The relationships between total length and head length of Bele are linear, positive and highly significant (r = 0.962) between them. The coefficient of correlation (r = 0.962) between total length and head length of Bele shows maximum similarity with the finding (r = 0.951) of Saha and Saha (2011) who worked on *Nandus nandus* from Netrakona.The relationships between the total length (TL) and head length (HL) can be expressed by the following relations (Fig. 3):

Log HL = -2.0318+0.2772 Log TL

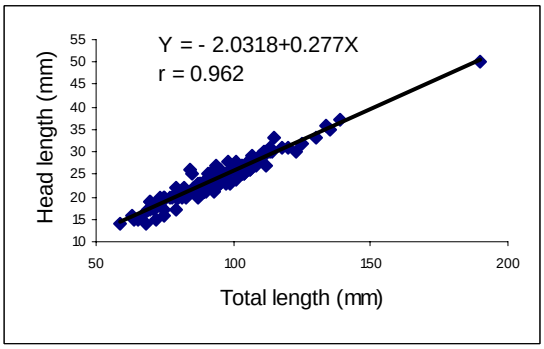

Fig.3. Relationship between total length and head length of Bele, *Glossogobius giuris.*

Total length (TL) and snout length (SNL): Scattered diagram (Fig. 4) of total length and snout length hints a positive and linear relationship between them. The coefficient of correlation was r = 0.882, which was strong and highly significant.The coefficient of correlation (r = 0.891) recorded by Saha and Saha (2011) closely coincides with this finding. The relationships between total length (TL) and snout length (SnL) were expressed by the following relations:

Log SnL = -4.4497+0.1297 Log TL

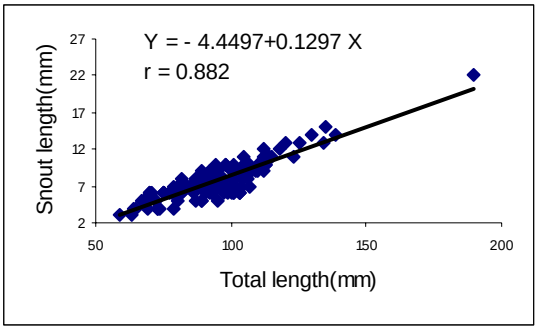

Fig.4. Relationship between total length and snout length of Bele, *Glossogobius giuris.*

Total length (TL) and pre-dorsal length (PDL): Scattered diagram of total length and pre-dorsal length of Bele (*G. giuris*) exhibits a positive and linear relationship between them (Fig. 5). The coefficient of correlation is highly significant (r = 0.90). The coefficient of correlation (r = 0.888) of *Nandus nandus* by Saha and Saha (2011) showed resemblance with the present study. The relationships between the total length (TL) and pre-dorsal length (PDL) were expressed by the following relations:

Log PDL = 1.8462+0.3233 Log TL

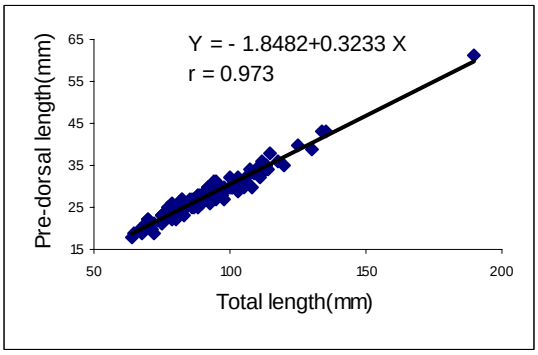

Fig. 5. Relationship between total length and pre-dorsal length of Bele, *Glossogobius giuris.*

Total length (TL) and height of body (HB): The relationships between total length and height of body of Bele are linear, positive and highly significant (Fig. 6). The correlation coefficient is 0.924. The coefficient of correlation (r = 0.839) of *Nandus nandus* (Saha and Saha 2011) is in conformity with this observation.The relationships between the total length (TL) and height of body (HB) were expressed by the following relations:

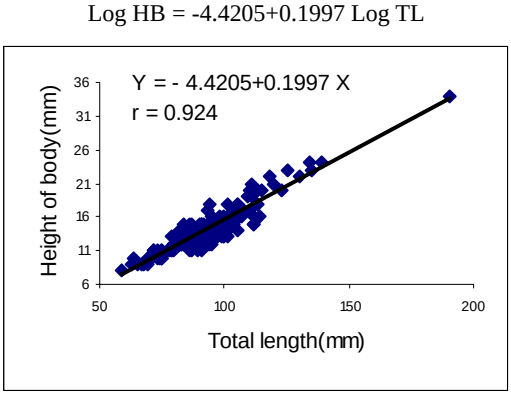

Fig.6. Relationship between total length and height of body of Bele, *Glossogobius giuris.*

Meristics: The lateral line of *Glossogobius giuris* is complete. Ist dorsal fin with 6 unbranched rays; 2nd dorsal fin with 1 unbranched and 9-10 branched rays; Pectoral fin with 17-21 branched rays; Pelvic fin with 1 unbranched and 5 branched rays; Anal fin with 1 unbranched and 9 branched rays; Caudal fin with 17 branched rays of *Glossogobius giuris* were determined. According to Rahman (1989), the fin formula is D_1.6; D_2.1/8-9; P_1.18-20; P_2.6 (1/5); A.1/8-9. Bhuiyan (1964) showed the fin formula of *G. giuris* as B.iv; D_1.6; D_2.9-10; A.9-10; V.6; C.17; L.l.32-34; L.tr.8/9 from Dacca.

The fin formula of Bele (*G.giuris*) from Netrakona stands as follows: D_1. 6; D_2. 1/9-10; P_1.17-21; P_2.1/5; A.1/9; C.17.

Length-weight relationship: The length-weight relationships for 306 individuals of Bele, *Glossogobius giuris* ranging in size from 59.0 mm to 190.0 mm and in total weight from 1.6 g to 55.8 g throughout the study period were determined. The length-weight relationships of male, female and combined sex were determined as Log TW = -4.704 + 2.811Log TL, Log TW = -4.910 + 2.909 Log TL and Log TW = -4.802 + 2.857 Log TL, respectively (Figs. 7-9). It is evident from Figs. 7- 9 that the weights bear a curvilinear relationship with the total length. Doha (1974) determined the equation from length-weight relationship of *G. giuris* as Log W= -4.657+2.816 log L from Mymensingh water which is in conformity with this study. Saha and Saha (2011) calculated the equations from the length-weight relationship of the freshwater percid fish, *Nandus nandus* as Log W=5.274+3.23 Log L in male, Log W=4.538+2.89 Log L in female and Log W= 4.751+2.39 Log L in combined sex from Netrakona.

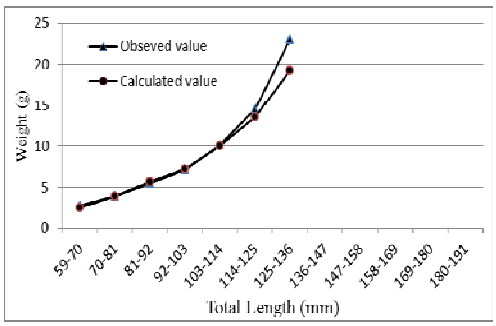

Fig.7. Relationship between total length and total weight in male *Glossogobius giuris.*

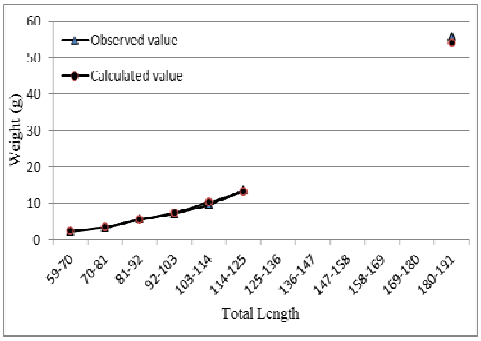

Fig.8. Relationship between total length and total weight in female *Glossogobius giuris*.

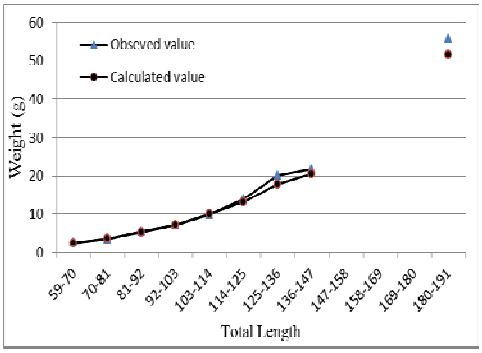

Fig.9. Relationship between total length and total weight in combined sex of *Glossogobius giuris.*

Coefficient of condition from the observed value (ko): The coefficient of condition from the observed value of *Glossogobius giuris* of male was found to range from 0.7906-0.8489 with an average of 0.8206; in case of female, it was 0.8274-0.9740 with the mean of 0.8697 and in combined sex, the mean and the range were 0.8564 and 0.8165-0.9042, respectively (Figs. 10, 11 and 12). Doha (1974) estimated the condition factor (*K*) of

Glossogobius giuris as 0.784-1.338 with the mean of 0.9991 which is in conformity with the present finding.

Coefficient of condition from the calculated value (kc): The coefficient of condition from the calculated value of *Glossogobius giuris* of male was estimated as 0.7522-0.8891 with the mean of 0.8564; in case of female, it varied from 0.8060-0.9234 with the mean of 0.8689 and in combined sex, it was found to range from 0.8411-0.8682 with an average of 0.8558 (Figs. 10-12).

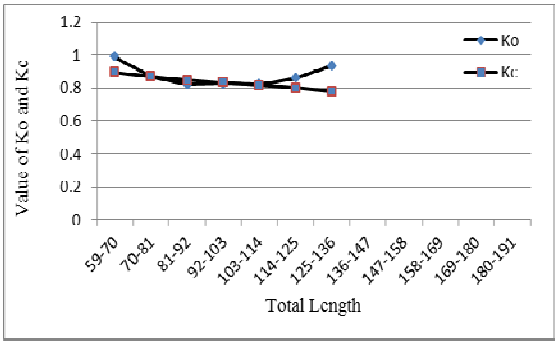

Fig. 10. Relationship between total length (TL) and coefficient of condition for observed weight (*Ko*) and calculated weight (*Kc*) in male *G. giuris.*

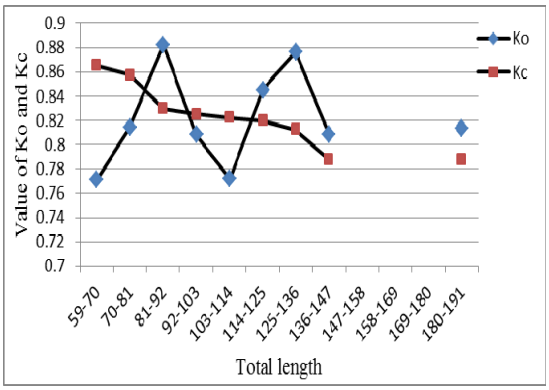

Fig.11. Relationship between total length (TL) and coefficient of condition for observed weight (*Ko*) and calculated weight (*Kc*) in female *G. giuris.*

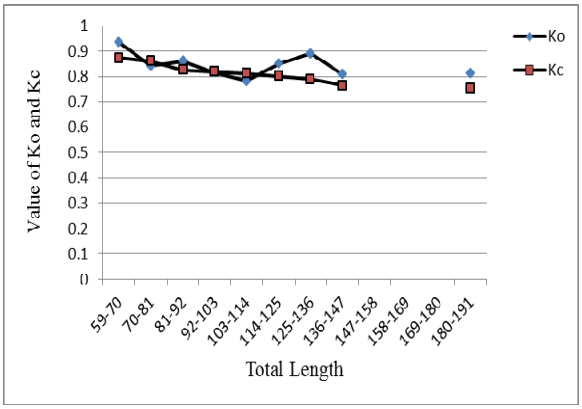

Fig.12. Relationship between total length (TL) and coefficient of condition for observed weight (*Ko*) and calculated weight (*Kc*) in combined sex of *G. giuris.*

Relative coefficient of condition (Kn): The relative coefficient of condition (*Kn*) of *Glossogobius giuris* of male was found to be 0.9402-1.1071 with the mean of 1.0006; in case of female, it ranged from 0.919-1.125 with the mean of 1.0035; in combined sex, the range was 0.960-1.057 with an average of 1.0002 (Fig. 13). Doha (1974) determined the mean of *Kn* of *G. giuris* as 0.9993 with a range of 0.903-1.117 which shows similarity with the present work. However, the *Kn* values shows dispersion in all the sex groups of freshwater fishes (Rahman 1990 and Saha & Saha 2010, 2011) which is in agreement with the present study.

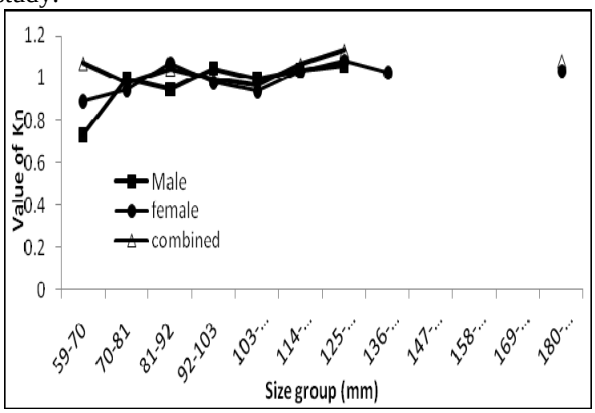

Fig.13. Relationship between total length and relative coefficient condition *(Kn*) for male, female and combined sex of *G. giuris.*

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