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Fecundity and Gonadal Maturity of Gongota Loach *Somileptes Gongota* (Hamilton) (Cobitidae) in the Habitat of the Someswari River

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Abstract

Fecundity and gonadal maturity of gongota loach, *Somileptes gongota (=Cobitis gongota)* (Ham.) were studied from October 2005 to September 2006. The fecundity of *S. gongota* varied from 1540 to 91500. The average fecundity was calculated as 34916.85 ± 25967.51. The maximum and minimum fecundities were determined as 72520± 13423.59 and 2891.44 ± 1084.19 in June and March, respectively. The relationships between fecundity and other variables were calculated and found to be straight, linear and positively significant. The gonadal maturity of *S.gongota* was determined by using five methods viz. Percentage of gravid females against time, Gonado- Somatic Index (GSI), Gonadal-length Index (GLI), Ova Diameter (OD) and Colour of Ovary (CO). The highest percentages of gravid females were recorded as 100 in June and July. The overall percentage of gravid females was determined as 58.15±30.11. The Gonado-Somatic Index level was recorded as 7.76 8.66 with maximum (26.17±3.13) in May. The Gonadal-Length Index level was determined as 35.34 ±10.40 having the highest (50.31± 3.04) in May. The Ova Diameter ranged from 0.1-1.5 mm with a mean value of 0.53± 0.3 mm. The highest ova diameter was found to be 1.40±0.23 mm in June. The colour of ovary was recorded as reddish orange and orange in the months of May to June and July, respectively.

Key words: Fecundity, Gonadal maturity Ova diameter

Introduction

An important member in the freshwater fish fauna is the loaches (Family Cobitidae) and they are poorly explored in Bangladesh. Loaches in Bangladesh are represented by 6 genera (Rahman 1989). Most of them are of small size inhabiting the hillstreams, a few are also found in the rivers and swamps. The loaches being small in size do not form an important fishery anywhere in Bangladesh. Of these, *Somileptes gongota* (Hamilton), locally known as Pahari gutum, is distributed in the streams and rivers of Mymensingh, Sylhet Division and Rangpur district (Rahman 1989) has failed to draw the attention of the fishery biologists and only brief aspects of its biology are available (Shafi and Quddus 2004, Rahman 1989). The Dahaki river and the Rangapani canal near Jaintiapur in Sylhet, the Someswari river near Shusang Durgapur in Netrakona and the Mahananda river near Tetulia in Panchagarh are largely inhabited by the loaches. Besides Bangladesh, this species is also distributed all over India (Srivastava 1968, and Talwar and Jhingran 1991).

An understanding of the reproductive biology of fish is the basic requirements for the successful management and exploitation of fisheries resources (Lagler *et al.* 1962). The determination of breeding season is an essential part of biological investigations of fishes (Reddy 1979), which is done through the observation of gonadal maturity. No work has been done on the biology of this rare species, *S. gongota* from Bangladesh water bodies.

The present investigation has been carried out to determine fecundity and gonadal maturity of *S. gongota* inhabiting the Someswari river of Netrakona district. It may help to induce artificial breeding, culture practices and fishing of *S. gongota.*

Materials and Methods

The present study describes the data on fecundity, total length, standard length, total weight, gonadal length, gonadal weight, ova diameter and gonadal colour of the cobitid fish of Bangladesh. The fish samples were collected once a month during October 2005 to September 2006 at Shusang Durgapur of the Someswari river of Netrakona. A total number of 220 samples were collected by cast nets and drag nets, and only mature female fishes were selected for the study of gonadal maturity along with measurements of

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total length, total weight, gonadal length and gonadal weight, and estimation of fecundity. After collection, the fishes were preserved in 10% formalin. Measurements of fishes were taken by means of a measuring board fitted with a centimeter scale and their weights were also recorded by means of a sensitive Pan Balance. The fishes were sexed after dissecting out the gonads. After dissecting out the ovaries, the same procedure was applied for length and weight measurements after dehydration with blotting paper. Fifteen to twenty ova were collected at random sampling from anterior, central and posterior parts of each ovary of each fish. Diameters of the collected ova was measured with the help of ocular and stage micrometers and calculated by calibration (Each micrometer division having equivalent to 0.01 mm). Colour of the ovaries was observed throughout the year. Gravimetric method (Lagler 1956) was used to determine fecundity. The values of the regression (b) and correlation (r) coefficients, 95% confidence limits of the regression coefficient, the intercept and the standard deviation were calculated using statistical formulae according to Snedecor (1956) and Simpson *et al.* (1960) to establish mathematical relationship between fecundity and other variables.

Gonadal maturation of *S. gongota* was determined by using the following five methods: Percentage of gravid females against time, Gonado - somatic index (GSl), Gonadal - length index (GLI), Ova diameter (OD) and Colour of ovary (CO). Gonado-somatic and Gonadal-length indices were calculated after Jhingran (1961) and Kader *et al.* (1988).

Results and Discussion

Fecundity

Estimation of fecundity

S. gongota is highly fertile and the number of eggs varied from 1540 (for a female of total length of 113 mm and total weight of 10.07g) to 91500 (for a female of total length of 122 mm and total weight of 15.85g). The average fecundity was calculated as 34916.85 ± 25967.51. (for the females of average total length of 115.74 mm and average total weight of 11.63 ± 3.198g). The highest fecundity was 72520 ± 13423.59 in June while the lowest fecundity was recorded as 2891.44 ± 1084.19 in March. The gonadal weight ranged from 0.11-4.40g showing the fecundity range of 1540-61600 eggs having total length and total weight from 9.8-11.8 mm and 3.57-14.20g, respectively. The gonadal length was found to be varied from 2.6 to 6.6 mm showing the fecundity range of 1625-66220 eggs in a total length and total weight of 10.6-12.4 mm and 6.0-15.95 g, respectively. Usually bigger fishes exhibited higher fecundity. The same sized fishes had different number of eggs in their ovaries. For example, 2 females of total length of 119.0 mm contained 3014 and 4788 eggs each inside their ovaries. Another 2 females of total length of 124.0 mm contained 4494 and 66220 eggs each. This type of variation is also common in other fishes (Islam and Hossain 1984, Saha *et al.* (2006) and Saha *et al.* 2007). According to Rahman (1990), the number of eggs of *L. guntea* varied from 4020 (total length of 62 mm and body weight of 2.2 g) to 15250 (total length of 96 mm and body weight of 8.0g) with a mean value of 9664.92 $\pm$13833.07 eggs (mean total length of 80.01$\pm$11.86 mm and mean body weight of 4.57$\pm$2.02g) from Rajshahi.

The same weighed female fishes were found to have different fecundities, e.g., 2 females of total weight of 11.53g contained 3014 and 4494 eggs. The females having same weighed ovaries were recorded to bear different fecundities, e.g., 2 females of ovary weight of 2.20g contained 31460 and 36300 eggs.

Fecundity and total length

The variations in the fecundity have been shown in scattered diagram (Fig.1) of fecundity and total length expressing a

Table I: Regression coefficients with 95% confidence limits, intercepts, standard deviation and correlation coefficients in the fecundity related different parameters of *S.gongota*

Relationship	Values of regression coefficients (b) with 95% confidence limits	Values of intercepts (a_y)	Values of standard deviation of (S_x)	Values of correlation coefficients (r)	Significance of r value at 5% level
Fecundity-Total length	11099.85±12239.97	-99555.87	0.8342	0.3498	Significant
Fecundity-Total weight	5859.84±2372.696	-42346.26	3.2243	0.7131	Highly Significant
Fecundity-Ovary length	20814.86±6880.48	-75787.35	0.9915	0.7799	Highly Significant
Fecundity-Ovary weight	16960.07±2629.09	-71.15	1.4602	0.9358	Most highly Significant

linear, positive and significant relationship between them. The results have been presented in Table. I.

The regression analysis of fecundity (Y) on total length (X) was evaluated as follows:

Y= -99556+11100 x

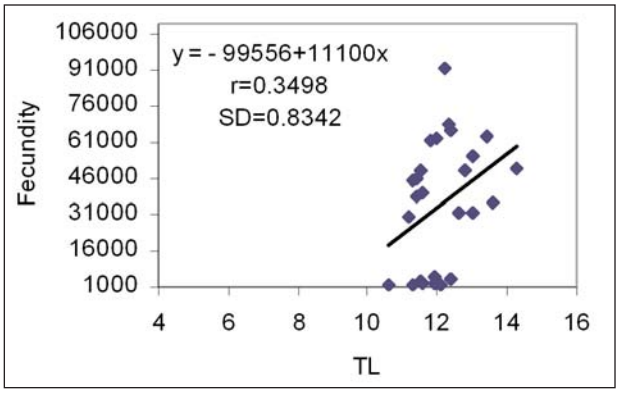

Fig. 1: Relationship between Fecundity (F) and Total Length (TL) of *S. gongota*

Fecundity and total weight

Scattered diagram of fecundity and total weight depicts a linear, positive and significant relationship between them. The values of the regression (b) and correlation (r) coefficients, 95% confidence limits of `b', the intercept and the standard deviation have been shown in Table I.

The following equation was used to calculate regression values:

Y= - 42346+5859.8X

Shafi and Quddus (1974) obtained the similar result working on *Puntius stigm*a from the Buriganga river of Dhaka.

Fecundity and ovary length

Scattered diagram (Fig. 2) of fecundity and ovary length clearly shows a linear relationship between them. Regression analysis of logarithm having fecundity (Y) on the logarithm of ovary length (X) shows that their relationship is exactly linear, positive and highly significant. The values of the regression and correlation coefficients, the intercept and standard deviation have been shown in Table I. The equation used for determining the regression analysis was as follows:

Y= - 75787+20815X

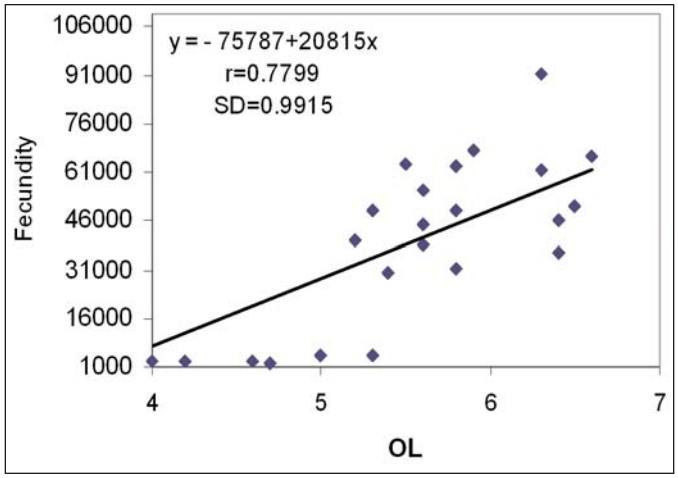

Fig. 2: Relationship between Fecundity (F) and ovary Length (OL) of *S. gongota*

The present finding is in conformity with the view of Shafi and Quddus (1974) who worked on *Puntius stigma* from the Buriganga river of Dhaka.

Fecundity and ovary weight

Scattered diagram (Fig. 3) of fecundity and ovary weight clearly shows a linear positive and highly significant relationship between them. The values of the regression and correlation coefficients, the intercept and standard deviation have been given in Table I.

The equation derived from the regression analysis was as follows :

Y= - 71.152+16960X

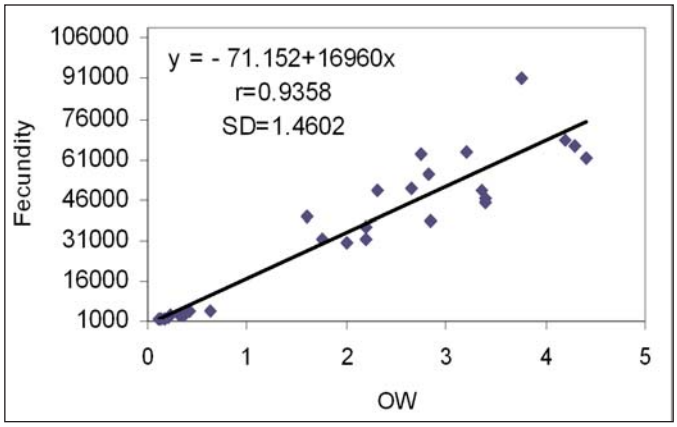

Fig. 3: Relationship between Fecundity (F) and ovary Weight (OW) of *S. gongota*

This finding is similar as reported by Shafi and Quddus (1974) in *Puntius stigma* from the Buriganga river of Dhaka.

Monthwise fecundity

The maximum and minimum fecundities of pahari gutum were recorded as 72520 ± 13423.59 in June and 2891.44 ± 1084.19 in March, respectively. Fecundity of this species was not recorded in January, February, August, October, November and December, during the study period.

Gonadal Maturity

Percentage of gravid females against time

The overall percentage of gravid females was 58.15 ± 30.10 (Table II) Out of 140 females, 52 were gravid ones occurring in the months of March to July and September while no such fish was caught during the months of January, February, August and October-December. The maximum gravid females were found to occur in June (100%) and July (100%) and minimum in March (7.6%) (Table II). From the observation of Rahman (1990), the percentage of gravid females of *L. guntea* is higher in the months of April to July with a peak in June.

GSI level

The weight of the ovaries increased gradually during the months of April to July attaining a peak in the month of May. The highest GSI level (26.16 ± 3.13) was recorded in the month of May. The overall GSI level was calculated as 7.76 ± 8.66 (Fig. 4). The mean GSI level of *L. guntea* ranged from 2.27 in February to 24.13 in July (Rahman 1990).

GLI level

The length of the ovaries increased gradually from April to July showing a peak in May. The highest GLI level (50.31 ± 3.03) was recorded in the month of May (Fig. 5). The overall GLI level was calculated as 35.34 ± 10.40. Rahman (1990) calculated the GLI level of *L. guntea* ranging from 18.98 in March to 44.94 in July from Rajshahi.

Ova diameter (OD)

The overall ova diameter was calculated as 0.53 ± 0.30 mm (Table II). The minimum and maximum ova diameter were recorded as 0.1mm in November and 1.5 mm in June respectively. The range of ova diameter of *L. guntea* was 0.20 mm in February to 0.47 mm in May according to the record of Rahman (1990). Shafi and Quddus (1974) observed the mean diameter of the eggs of *Puntius stigma* as 0.545 mm which is similar to this finding.

Colour of ovary (CO)

The colour of ovaries differed greatly in different months during the study period. Orange colour of ovaries was observed in the months of May - July while cream colour was in January, February, November and December, (Table II.

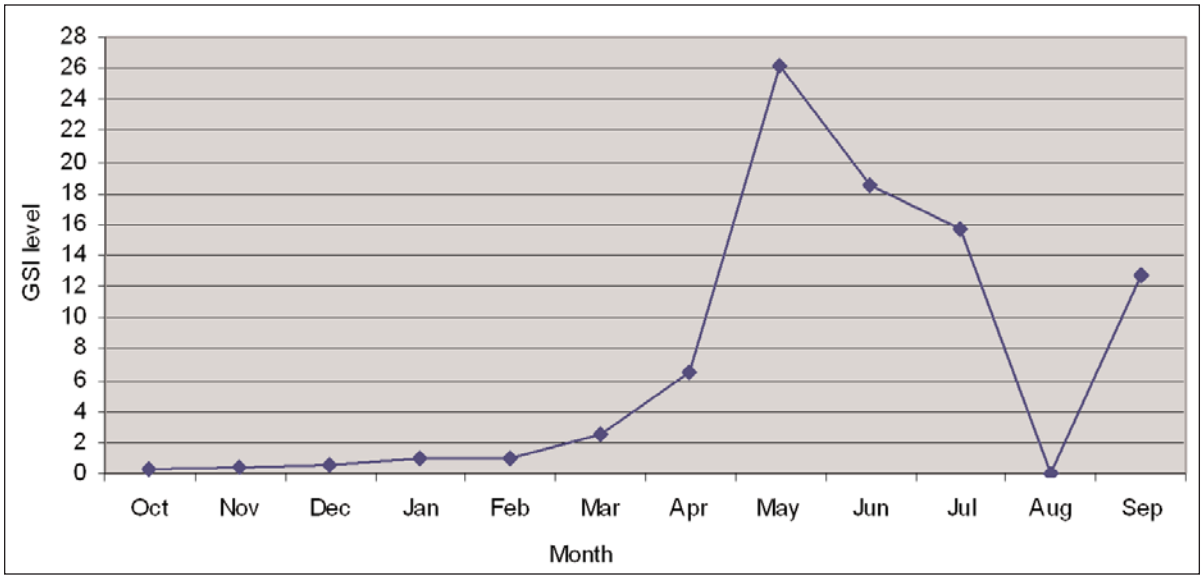

Fig. 4: Gonado-somatic index (GSI) level of different months of Pahari gutum (*Somileptes gongota*)

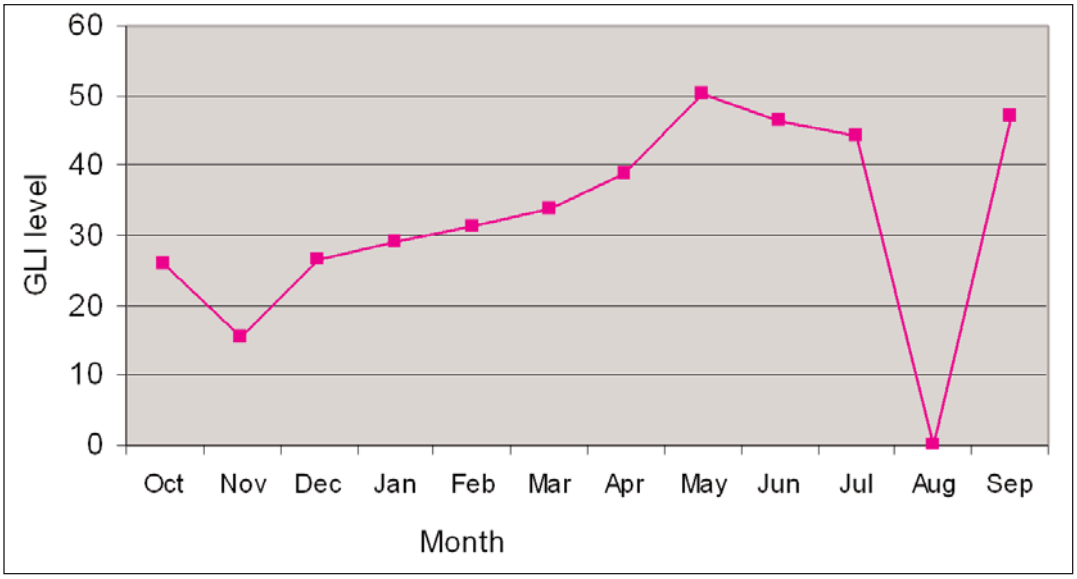

Fig. 5: Gonadal-length index (GLI) level of different months of Pahari gutum (*Somileptes gongota*)

Table II: Occurrence of gravid females, OD and colour of ovary of Pahari gutum (*Somileptes gongota*) caught from the Someswari river of Netrakona

Months and year	Percentage of gravid females	OD(mm) Mean±SD	Colour of ovary
Oct 2005	0	0.226 ± 0.064	Brown
Nov 2005	0	0.338 ± 0.196	Cream
Dec 2005	0	0.392 ± 0.174	Cream
Jan 2006	0	0.43 ± 0.11	Cream
Feb 2006	0	0.495 ± 0.164	Cream
Mar 2006	61.54	0.476 ± 0.103	Pink
Apr 2006	71.43	0.487 ± 0.105	Yellow
May 2006	83.33	0.771 ± 0.360	Reddish orange
Jun 2006	100	1.40 ± 0.229	Reddish orange
Jul 2006	100	0.403 ± 0.066	Orange
Aug 2006	0	0	0
Sep 2006	66.67	0.422 ± 0.071	Brown
Overall	58.154 ± 30.107	0.53 ± 0.303	-

This finding resembles the record of Saha *et al.* (2006) from Netrakona.

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