OnLine Journal of Biological Sciences 2(4): 232-234, 2002
ISSN 1608-4127

# Study on the Fecundity and GSI of Brackishwater Catfish *Plotosus canius* (Hamilton-Buchanan)

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**Abstract**: The fecundity and gonado somatic index (GSI) of *Plotosus canius* during its peak breeding seasons were studied. Fecundity of *P. canius* during its peak breeding season April to August of size range 36.5 to 69.2 cm varied from minimum 1180 in April and maximum 2250 in July. Fecundity showed a linear relationship to total length, body weight and ovary weight. The linear relationship between weight and fecundity was more valid than that of length and fecundity. The results of correlation regression equation of total length-fecundity, body weight-fecundity and gonad weight-fecundity were (r=0.832619), (r=0.933599) and (r=0.96118). On average 2.3718 ova are produced in pre gram-weight of body. Study on gonado somatic index indicated that mature fish become available from April to August, the peak being July.

**Key words**: *Plotosus canius*, fecundity, gonadosomatic index

## Introduction

*Plotosus canius*, the canine catfish from the tropical estuaries waters belonging to the family Plotosidae forms a considerable part of the catfish from the brackishwater region (mangrove areas, different rivers/canals and estuaries adjacent to the Sundarbans area) of Bangladesh. In Bangladesh, *P. canius* a catfish is commonly known as Kain magur, Gang magur or Sagar magur etc. It was observed that generally the female species of this fish usually attain maturity and breed when their size become around 33.7 cm. The spawning period of *P. canius* is very long extended from February to August (Sinha, 1981). It spawns once in a year with peak discharge in May to June. Fecundity and spawning habits are among the important aspects of the biology of fishes which must be understood to explain the variation of the level of population as well as to make efforts to increase the amount of fish harvest. To evaluate the commercial potentialities of fish stocks information on the fecundity of the fish (*P. canius*) composing the stock is essential. In bio-ecological studies, in practical fish culture it is very desirable to know the number of eggs fry and young produced. The knowledge of fecundity estimation may also be used to assess the abundance and reproduction potential of the spawning stock. In this study, fecundity studies have been used in tracing the stocks or population of the catfish, *P. canius* in brackishwater environment of Khulna. No publication on the biology and fecundity of this species is available and the available information on the biology of *P. canius* literature is scarcity. But only few works have studied the fecundity of some species of fishes in Bangladesh (Doha and Hai, 1970; Shafi and Mustafa, 1976; Das *et al.*, 1989; Karim and Hossain, 1992; Khan *et al.*, 1992; Kabir *et al.*, 1998). Knowledge of biological properties of any species is of paramount importance, both for judicious management of its population as well as to assess its availability for culture purpose. Though the study of the biology of the fish comprises many aspects like a comprehensive account of its size growth and fecundity so it is hopeful that the present work will contribute some knowledge to the aquaculturist in future for more intensive research in the culture and management of this fish.

## Materials and Methods

For this study berried females of *P. canius* were collected twice a month to determine the fecundity and GSI during the period of April to August, 2001 from different collectors in the coastal region of Khulna on the basis of new moon and full moon (gon) with a minimum of 5 fishes in each collection and a total of 52 fishes in 5 months period. The collected samples were brought to the processing laboratory at Brackishwater Station, Bangladesh Fisheries Research Institute (BFRI), Paikgacha, Khulna for detailed studies. The ovaries of each specimen were removed very carefully (n=52) from the females and were preserved in 5% formalin with proper labeling to permit hardening of the ova to facilitate for subsequent studies. The ovary was cleaned properly and each pair of ovary was weighed separately to the nearest milligram. The ovary were teared a pair with the help of a needle and magnifying glass. In this study, gravemetric method (Lagler, 1949) was used to determine the fecundity of fishes. For determining the fecundity, the preserved ovaries were weighed and then samples from anterior, middle and posterior regions of each lobe of the pair was weighed accurately. The number of matured and maturing eggs was then found out by actual counting. The total ova per fish i.e., the fecundity was then computed on a proportional basis. The diameter of eggs at different stages of maturity was measured with the help of an objective micrometer. The measurement was taken in microns along the longest axis of the eggs. Gonado somatic index (GSI) was calculated according to the following equation cited by Parameswarn *et al.* (1974).

$$GSI = \frac{W_1}{W_2} \times 100$$

Where, $W_1$ = wet weight of gonad
$W_2$ = total wet weight of fish

Which is more suitable to explain the maturity of fishes. The relative ovary weight or the gonado somatic index was calculated for the berried females of *P. canius*.

## Results and Discussion

**Fecundity:** The mean numbers of eggs were 1868.92 for a fish with a mean total length 53.11cm and a mean weight of 853.56 (Table 1). The maximum fecundity was 2250 from a fish measuring 68.5 cm in total length (weight 1272.67 g) and minimum fecundity 1180 was observed in fish having a total length of 37.5cm (weight 352.51). The study revealed that although the older fish were more fecund, it is the younger fish that produces more ova per gram weight of body, which was also true for number of ova per gram weight of ovary. The correlation coefficient, regression equation and significance of correlation of fecundity with total length, body weight and gonad weight of *P. canius* was measured (Table 2). There was an increase in fecundity with increase in size of the fish but the relationship with fecundity was stronger (r=0.875185) in case of body weight than total length (r=0.800925) where as strongest correlation was found between fecundity and ovary weight (r=0.937602). This finding agrees with the conclusion reached for catfish *Tachysurus thalassinus* (Dan, 1977), for *Mystus tengra* (Khan *et al.*, 1992). The logarithmic relationship of fecundity on length (Fig. 1a) gave a regression coefficient 0.91164, intercept 1.69719 and correlation coefficient of 0.832619. Therefore, the regression of fecundity of fish length could be expressed as:

Table 1: Average of fecundity counts at various length ranges of *P. canius*

| Frequency | Length range (cm) | Average length of the fish (cm) | Average weight of the fish (g) | Average weight of the ovary ( g) | Fecundity | No. of ova per wt. of body | No. of ova per wt. of ovary |
|---|---|---|---|---|---|---|---|
| 4 | 36.5-40.5 | 38.775 | 370.66 | 21.287 | 1227.50 | 3.3116 | 57.664 |
| 12 | 40.6-44.6 | 42.630 | 463.59 | 45.508 | 1406.58 | 3.0341 | 30.908 |
| 18 | 44.7-48.7 | 46.966 | 796.61 | 73.820 | 1909.50 | 2.3970 | 25.866 |
| 10 | 48.8-52.8 | 50.470 | 887.26 | 133.760 | 2057.90 | 2.3193 | 15.385 |
| 4 | 52.9-56.9 | 54.925 | 875.50 | 143.202 | 2066.50 | 2.3600 | 14.428 |
| 2 | 57.0-61.0 | 58.360 | 982.41 | 154.370 | 2150.33 | 2.1888 | 13.929 |
| 1 | 61.1-65.1 | 64.300 | 1179.78 | 137.230 | 1883.00 | 1.5960 | 13.721 |
| 1 | 65.2-69.2 | 68.500 | 1272.67 | 160.460 | 2250.00 | 1.7679 | 14.022 |
| Mean | | 53.110 | 853.66 | 108.706 | 1868.92 | 2.3718 | 23.240 |

Table 2: Correlation coefficient, regression equation and significance of correlation of fecundity with total length, body weight and gonad weight

| Relationship | Correlationship | Regression equation | Significance at 5% level |
|---|---|---|---|
| Fecundity (Y) and total length (X) | 0.800925 | Y = 376.933 + 28.0886X | S |
| Fecundity (Y) and body weight (X) | 0.875185 | Y = 1002.6930 + 1.0147X | S |
| Fecundity (Y) and ovary weight (X) | 0.937602 | Y = 1179.5935 + 6.3409X | S |

S = Significance

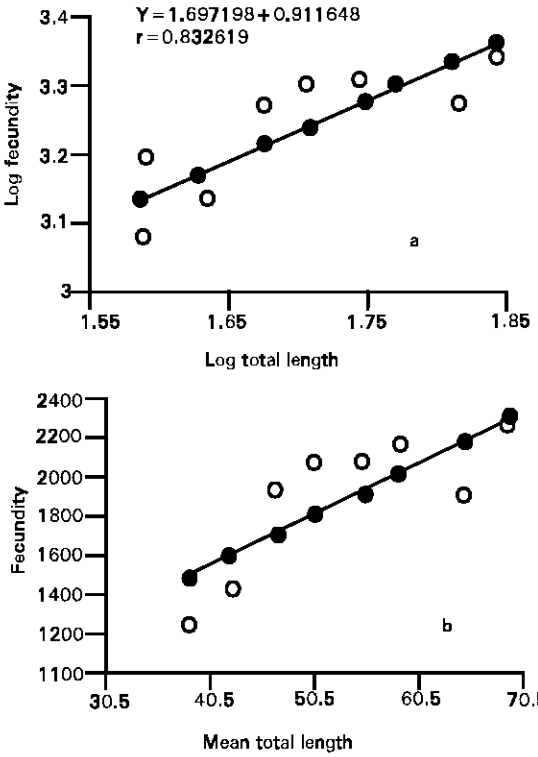


Fig.1(a,b): The relationship between fecundity and total length. a) in log and b) in antilog (○ = Observed value, ● = Calculated value)

$Log_{10}Y = 1.99719 + 0.91164\ Log_{10}X$

r = 0.8326196

Where, Y = Fecundity
X = Total length

The variation of fecundity with fish total length (Fig. 1b) can be expressed by the following relationship:

Y = 376.933 + 28.0886X

The logarithmic relationship of fecundity against body weight (Fig. 2a) produced a regression coefficient of 0.46638, intercept 1.911023 and correlation coefficient of 0.933599. The equation

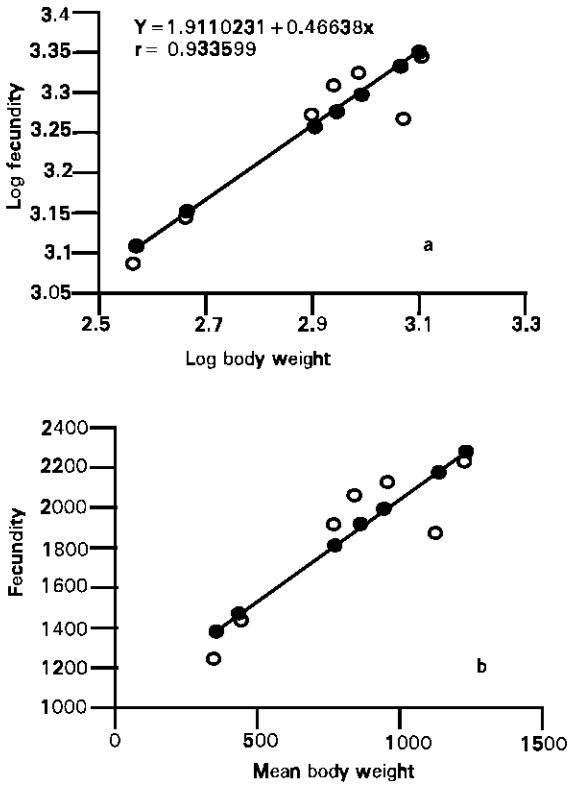


Fig. 2 (a,b): The relationship between fecundity and body weight. a) in log and b) in antilog. (○ = Observes value, ● = Calculated value)

can be stated as:

$Log_{10}Y = 1.911023 + 0.46638\ Log_{10}X$

r = 0.933599496

Where, Y = Fecundity
X = Body weight

The fecundity body weight relationship (Fig. 2b) can be illustrated by the following formula:

Y = 1002.6930 + 1.0147X

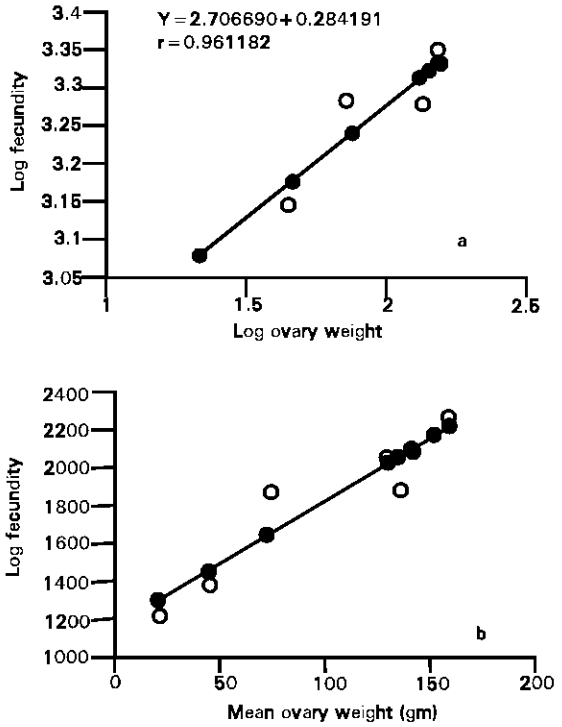


Fig. 3 (a,b): The relationship between fecundity and ovary weight. a) in log and b) in antilog. (○= observed value, ● = Calculated value)

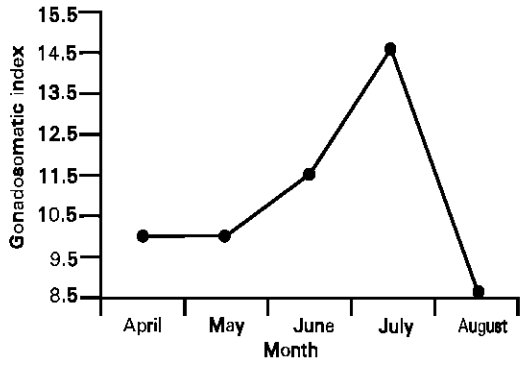


Fig.4: Monthly fluctuation in the gonadosomatic index of the berried female *P. canius*.

It could be seen form the figure that a straight line through the origin would fit the points well, showing that number of egg were directly proportional to the weight of the fish.

The fecundity increased progressively with ovary weight. For the regression of log fecundity on log ovary weight the following equation was obtained:

$\text{Log}_{10}Y = 2.706690 + 0.284191\ \text{Log}_{10}X$
$r = 0.961182$

Where, Y = Fecundity
X = Ovary weight

The above equation and the estimated regression line (Fig. 3a) showed that the relationship between fecundity and gonadal weight was linear. The similar findings was also observed by Banu *et al.* (1984); Islam *et al.* (1990) and Kabir *et al.* (1998) incase of *Colisa fasciata*, *Puntius stigma* and *Gudusia chapra* respectively. The scatter diagram (Fig. 3b) of fecundity and ovary weight suggested a linear relationship between the two variables. The arithmetic equation of fecundity against gonad weight gave the following results:

$Y = 1179.5935 + 6.3409X$

**Gonado somatic index (GSI)**: The gonadosomatic index is an indicator of the state of gonadal development and maturity of *P. canius*, calculated for berried female and depicted in Fig. 4, shows that it increases steadily from April, reaching peak in July and becomes least in August. It is familiar that the gonado somatic index increases with the maturation of fish, being maximum during the period of peak maturity and declining abruptly thereafter (Parameswarn *et al.*, 1974). In *P. canius* the gonado somatic index was maximum during July when majority of fishes were found mature and after then its value felt rapidly, that might be for their spawning.

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