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Estimation of the Fecundity of Jat Puti, *Puntius sophore* (Hamilton)

K. Bithy[1], M. I. Miah[1], M. S. Haque[1], K. R. Hasan[2] and M. F. Islam[1]

[1]Department of Fisheries Management, Bangladesh Agricultural University, Mymensingh-2202
[2]Ph.D. Fellow, Dept. of Fisheries Management, Bangladesh Agricultural University, Mymensingh-2202

Abstract
The fecundity of 100 gravid female fishes of Jat puti, *Puntius sophore*, was collected from the experimental ponds of the Field Laboratory Complex, Faculty of Fisheries, Bangladesh Agricultural University (BAU), Mymensingh was estimated during the period from June to August 2011. Collected samples were clustered month-wise: group A (collected in June), group B (collected in July) and group C (collected in August). The estimated fecundity ranged of 7951 to 17670; 8135 to 23053 and 12461 to 15105 eggs and the mean gonadosomatic index (GSI) of 23.44 ± 2.50; 30.47 ± 4.52 and 28.43 ± 2.99 was estimated for the fish group of A, B, and C, respectively. The relationship between fecundity and total length was linear and it was expressed as: Ln F= 1634 ln TL-1972; Ln F= 119405 ln TL-273.53 and Ln F= 1831.6 ln TL+ 825.31 in group A, B, and C, respectively. The regression equation between body weight and total length was linear and it was expressed as: Ln W= 2.2128 ln TL- 0.7048; Ln W= 2.0207 ln TL+ 0.3493 and Ln W= 1.4438 ln TL+ 5.5694, in group A, B, and C, respectively. The regression equation between body weight and fecundity was linear and it was expressed as: F= 656.84 W+199.96, F= 438.16 W+2470, F= 1116.1 W-3433.5, in group A, B, and C, respectively. The fecundity was highly correlated with the total length, and body weight and *P. sophore* may be a medium fecund fish.

Keywords: Fecundity, Jat puti, *Puntius sophore*

Introduction

Fecundity of the fish is the most important aspects of the reproductive biology of the fish which must be understood to explain the variation in the level of production as well as to make efforts to increase the amount of harvest. Alternatively fecundity may be expressed per unit body weight of post stripes fish when it is known as relative fecundity because the number of eggs produced for each unit increase in weight shows significant linear variation. Fecundity may be expressed in terms of the number of eggs produced per brood fish in a breeding season (Lagler, 1956). It is sometime referred to as total or absolute fecundity or more usually just as fecundity (Heese, 1990). The number of ripe eggs or mature eggs produced by a brood fish having every short single spawning season is readily ascertained at full maturity by artificially stripping the eggs from the fish, this number is known as fecundity. It is important to know the number of eggs, fry and young that could be produced from individual brood fish for purpose of fisheries management and aquaculture industry. In Bangladesh 54 freshwater fish species are in threats of different levels of extinction including 32 small indigenous fish species (IUCN, 2003) and among them *P. sophore* is recognized as threaten condition. For sustainable aquaculture, we should give special emphasis on our indigenous fish species that deserve to be brought under culture and management that will meet our annual fish intake as well as protect our indigenous fish species from extinction. To evaluate the commercial potentialities of a fish stock, information on the fecundity of the fish composing the stock is essential. Knowledge of a reproductive biology of fish is essential for evaluating the life history culture practices and the management of the fishery (Doha and Hye, 1970).

Materials and Methods

Collection of brood fish

A total of 100 gravid females of *P. sophore* were collected from the ponds of the Fisheries Field Laboratory Complex, Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh, during the months of June, July, and August, 2011. At least 31 fishes were collected in each month. The breeder's body structure was easily identified on the basis of external feature of their abdomen, vent and pectoral fins. After selection of the fishes, the specimens were preserved in 10% buffered formalin. The fishes were kept into three labeled vials according to the month.

Measure of length and weight

The standard length and total length were recorded separately to the nearest centimeter scale respectively. A steel scale was used to measure the length of the body. The weight of the specimens was taken by an electric balance and the weights were recorded to the nearest gram. The ovary of the individual fish was taken out carefully and preserved in 10% buffered formalin.

Calculation of gonadosomatic index (GSI)

The GSI is the percentage of gonad weight to the total weight of the fish. The GSI of the collected fish was calculated for each of the female separately and using by the following formula:

$$GSI = \frac{\text{Weight of ovary}}{\text{Weight of fish}} \times 100$$

Fecundity estimation

Fecundity has been considered as the number of ripening eggs in the female prior to spawning (Bagenal and Braum, 1978). Gravimetric method or weight method (Lagler, 1956) was used for estimation of the fecundity of *P. Sophore*. Gravimetric method seemed to offer the best possibility of minimizing error due to its simple and easy sampling techniques. The Gravimetric method has used for its greater efficacy over the other methods. The Gravimetric or weight method has been successfully used by Doha and Hye (1970), Shafi *et al*. (1978), Dewan and Doha (1979), Mustafa *et al*. (1983).The gravimetric method was done by the following way, before estimation of the fecundity of the fish species under study, ovaries were cut into some sections or pieces from where pieces removed from the front, mid and rear-section of each ovary and weighed (0.22 gm).

This value was proportional to the total ovary weight; the number of eggs (F_1) for the sub-sample was estimated by using the following equation:

$$\text{Fecundity } (F_1) = \frac{\text{No. of eggs in sub sample} \times \text{Gonad weight}}{\text{Weight of sub sample}}$$

(Yelden and Avsar, 2000).

Later, by taking the mean number of three sub-sample fecundities (F_1, F_2 and F_3), the individual fecundity for each female fish was calculated by the following equation:

$$\text{Fecundity } (F_e) = \frac{F_1 + F_2 + F_3}{3}$$

In this way fecundity of 100 fish were obtained.

Data analysis

From the above data, the relationship of different parameters such as total length and body weight, total length and fecundity, body weight and fecundity were determined as simple linear relationship with the help of MS Excel Programme. Coefficient of correlation (r), regression equation, standard deviation, was also determined.

Results and Discussion

Gonadosomatic index

The values of GSI of *P. sophore* were varied from 17.53-52.14 (Table 1). The average GSI values were recorded 23.44±2.50, 30.47±4.52 and 28.43±2.99 in June, July and August respectively. The highest GSI of *P. sophore* was 52.14 obtained in the month of July (group B). The variation in *gonadosomatic* index of *P. sophore* might be associated with the degree of maturity of ova and spawning. This finding agrees with the finding of Das (1998) for *N. notopterus* (pallas). Afroze and Hossain (1990) for *A. mola* and Ramanondo sarker (2005) for *Pseudeutropius atherinoides*.

Fecundity of P. sophore

Fecundity was estimated with a range of 7951 to 23053 eggs for a corresponding standard length and body weight of the fish 5.5 cm, 10.12 gm and 10 cm, 26.5 gm respectively, which was comparatively lower than *Puntius sarana*, its fecundity ranged from 18925 to 78929 eggs and length between 155 mm and 250 mm (Mustafa *et al.*, 1983). Bhuiyan, *et al.* (1987) estimated the fecundity of *Puntius gonionotus* and mean fecundity was obtained as 14321 eggs with a range of 2254.67 to 6964.73 from fishes having a mean total length and mean body weight of 200.13±20.58 mm and 196±34.379 g respectively. Variation of fecundity among the population may result largely from selectivity different environmental factors (Temperature, Sunlight, weather etc.), of which temperature is considered the most probable selective factor (Jonsson and Jonsson, 1999). This could be due to the availability of food in the natural and captive condition. The variation in fish fecundity is due not only fish length and weight but also due to fish nutritional diet, running water and influence of vitamins.

Relation between total length and body weight, total length and fecundity, body weight and fecundity

In this experiment the fecundity bears a linear relationship between total length and body weight, total length and fecundity, body weight and fecundity. For test of this hypothesis in *P. sophore*, the regression equation and coefficient of correlation of these variables were determined. To determine the above parameters the total length (TL), body weight (W), were taken as independent variables (X), while fecundity (F) as depends on them was taken as dependent variable (Y).

Table. 1. Mean (±SD) of total length, standard length, body weight, ovary length, ovary weight, GSI and fecundity of *P sophore* of group A, B and C

Group name	Total Length (cm)	Standard Length (cm)	Body Weight (g)	Ovary length (cm)	Ovary weight (g)	GSI	Fecundity
A	9.43±1.72 7.00-12.00	7.93±1.47 5.5-10.5	20.15±4.57 10.12-30.41	4.08±0.53 3.00-4.90	4.72±1.16 2.79-6.20	23.44±2.50 17.53-27.97	13438±3299 7951-17670
B	9.37±1.30 7.30-12.00	7.97±1.25 6.00-10.00	19.29±3.47 14.29-26.50	4.45±0.60 3.50-5.50	5.44±0.88 4.05-7.52	30.47±4.52 21.86-52.14	17114±1759 8135-23053
C	8.89±1.29 6.50-11.00	7.11±0.99 5.00-9.00	18.41±2.06 14.9-24.05	4.42±0.48 3.50-5.40	5.46±0.84 3.50-5.40	28.43±2.99 25.00-35.68	10921±2535 12461-15105

Relation between total length and body weight

The scatter plot obtained from the body weight and total length obtain the regression lines of each relationship. The total lengths (TL) of the fishes were plotted against their body weight (W) in logarithmic scale and show the regression to be positive as in the correlation for group A, B and C (Figs. 1, 2 and 3).

Ln W= 2.2128 ln TL- 0.7048…….(a)

Ln W= 2.0207 ln TL+ 0.3493…..…...(b)

R^2= 0.696 (group A)

R^2= 0.5753 (group B)

Ln W= 1.4438 ln TL+ 5.5694……. (c)

R^2= 0.7652 (group C)

The correlation and co-efficient between total length and body weight were found 0.696, 0.5753, and 0.7652 for the group A, B and C respectively, the total length of fish are significant at 95% level of significance. The total length increased significantly with the increase of the body weight. This type of relationship was reported by Parween *et al*. (2000) in *Chanda nama* (Hamilton) and *Corica soborna*. Ramanondo sarker (2005) in *Pseudeutropius atherinoides.* Environmental factors and food supply might affect the fecundity of fish (Bagenal, 1957). It is possible that the variation in fecundity of the *P. sophore* may be due to environmental conditions of the ponds.

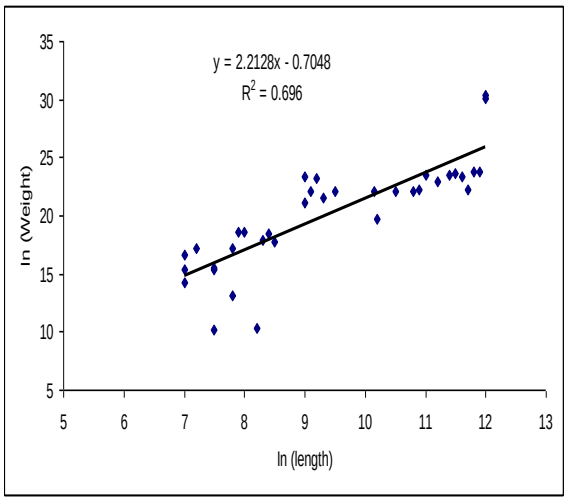

Fig. 1. Relationship between total length and body weight for group A

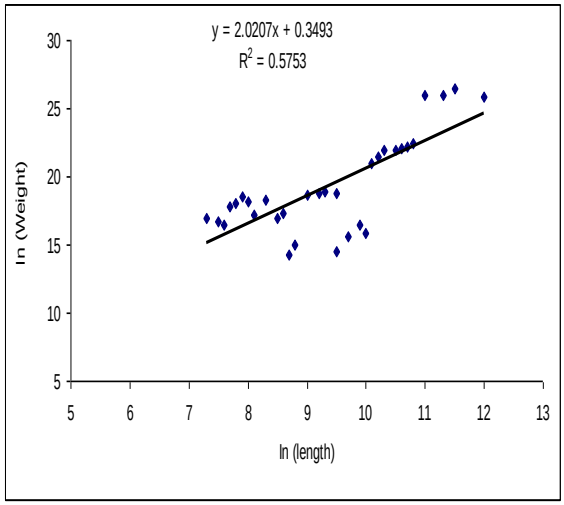

Fig. 2. Relationship between total length and body weight for group B

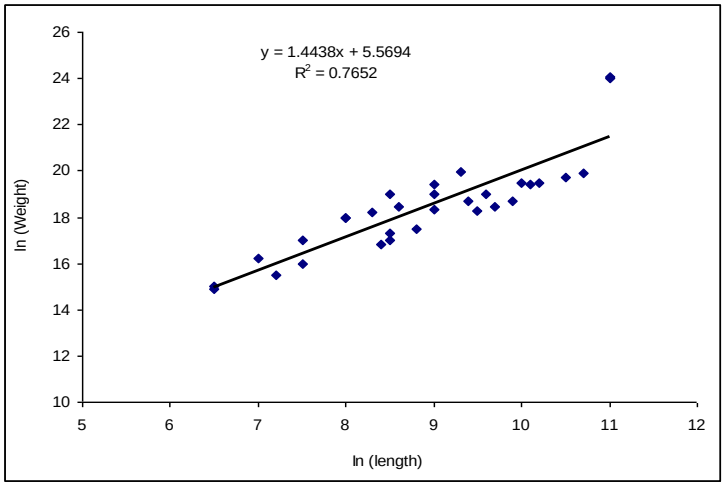

Fig. 3. Relationship between total length & body weight for group C

Relation between total length and fecundity

In the determination of this relation, length was taken as independent variant, while fecundity as dependent variant (Figs. 4, 5 and 6). The relationship between the fecundity and total length was expressed as,

Ln F= 1634 ln TL- 1972…… (a)

Ln F= 119405 ln TL-273.53…..... (b)

R^2=0.727(groupA)

R^2= 0.7825 (group B)

Ln F= 1831.6 ln TL+ 825.31……. (c)

R^2= 0.8118 (group C)

The correlation and co-efficient between total length and fecundity were found 0.727 for the group A, 0.7825 group B, 0.8118 group C, the total length of fish are significant at 95% level of significance. The r values are significant at 95% level of significance. The regression equations obtained by total length and fecundity of *Puntius sophore* of different and dependent on their total length. The fecundity increased significantly with increase of the total length. The similar results showed, Azadi et al. (1987) in *Mystus vittatus* (Bloch); Das (1998) in *N. notopterus* (pallas); Azadi and Mamun, (2004) in *Amblypharyngodon mola* (Hamilton).

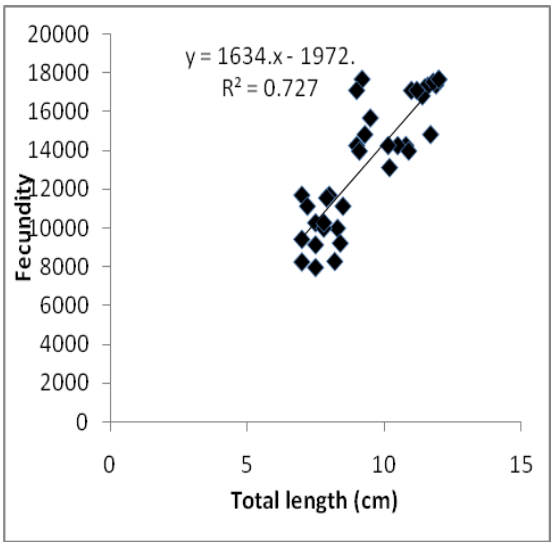

Fig. 4. Relationship between total length and fecundity for group A

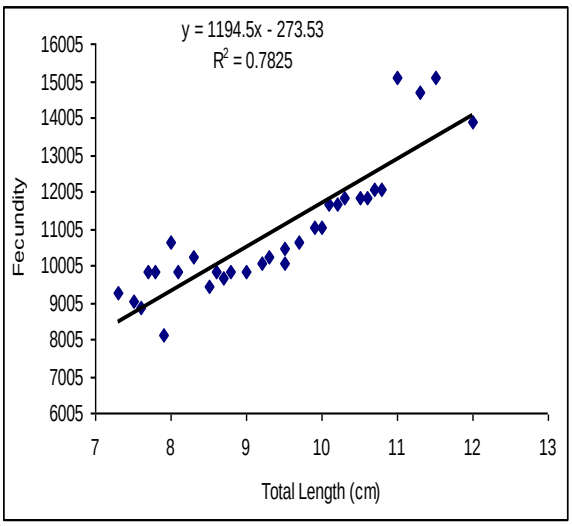

Fig. 5. Relationship between total length and fecundity for group B

Relation between body weight and fecundity

The scatter diagram obtained from the fecundity and body weight showed a linear relationship (Figs.7, 8 and 9). In the determination of this relation, body weight was taken as independent variant while fecundity as dependent variant. The relationship between the fecundity and body weight was expressed as,

F=656.84 W+199.96……. (a)

F= 438.16 W+2470….. ……..... (b)

R^2=0.8262(groupA)

R^2= 0.7472 (group B)

F= 1116.1 W-3433.5……. (c)

R^2= 0.8212 (group C)

The correlation and co-efficient between body weight and fecundity were found 0.8262 for the group A, 0.7472 group B, 0.8212 group C. The r values are significant at 95% level of significance.

The regression equation and scattered diagram showed a positive relation. Increase in fecundity with the increase in body weight is reported by, Bhuiyan, *et al.* (1987) in *P. gonionotus*. Azadi *et al.* (1987) in *Mystus vittatus* (Bloch). Parween (1984) in *A. mola*

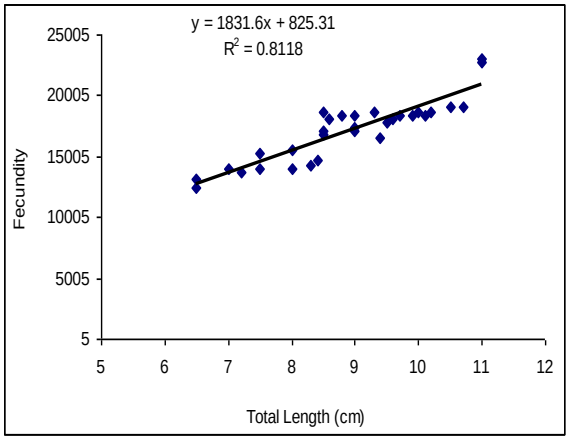

Fig. 6. Relationship between total length and fecundity for group C

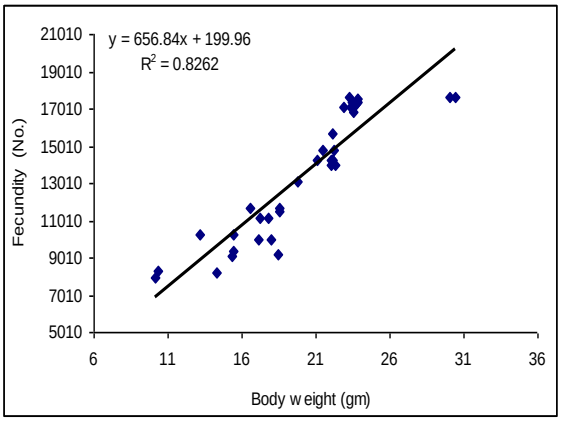

Fig. 7. Relationship between body & fecundity for group A

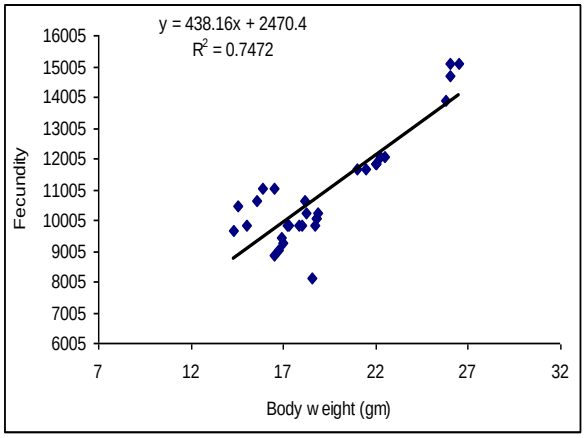

Fig. 8. Relationship between body weight and fecundity for group B weight

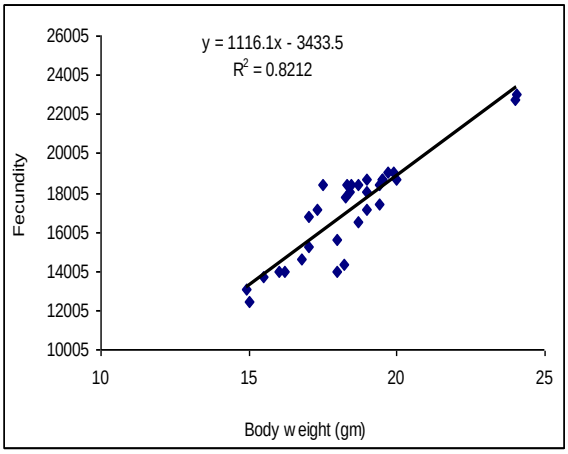

Fig.9. Relationship between body weight and fecundity for group C

Conclusion

The present observations on fecundity reveal that *P. sophore* (7951 to 23053 eggs) is a fecund fish compared to other fishes like, *Esomus danrica* (392 to 2412 eggs), *Amblypharyngodon mola* (l02l to 13815 eggs), *Ambassis nama* (110 to 2448 eggs), *Glossogobius giuris* (376 to24668 eggs) *and Colisa lalius* (127 to 2309 eggs). Lower number of eggs might also be correlated with shorter development time rate of fingerling, which means higher survival rate. The higher number of eggs does not prove to be a disadvantage in reproductive potential. It is an indicator of population behavior and fecundity according to Panthulu (1961).

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