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Fecundity of guchibaim, *Mastacembelus pancalus*

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Abstract

Fecundity of guchibaim, *Mastacembelus pancalus* was described based on 100 samples collected from the experimental ponds of the Field Laboratory Complex, Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh during the period from May to July 2007. The surveyed sample ranged from 115 to165mm in total length and 6.97±0.44 to 10.52±0.22g in average body weight. The ovary weight of the specimens varied from 0.77±2.61 to 5.19±0.29g. The fecundity was found to vary from 881.50±44.03 to 1182.30±27.33 eggs. The relationship between fecundity and total length was linear and it was expressed as: Y= 4.3927x+398.02 (R^2=0.5336). The relationship between fecundity and body weight was linear and it was expressed as: Y= 67.319x+449.62 (R^2=0.7446). The relationship between fecundity and ovary weight was also linear and it was expressed as: Y=72.36x+799.77 (R^2=0.9189). The fecundity was highly correlated with the total length, body weight and ovary weight of fish and the *Mastacembelus pancalus* is a low fecund fish.

Keywords: Fecundity, Guchibaim, *Mastacembelus pancalus*

Introduction

The fecundity of a fish is defined as the number of eggs that are likely to be laid during a spawning season (Chondar, 1977). Knowledge about fecundity of a fish is essential for evaluating the potentialities of its stocks, life histories, practical culture and actual management of the fishery (Lagler, 1956; Das, 1977). Assessment of fecundity is having paramount importance in fisheries management as it provides knowledge about the number of offspring produced in a season and the reproductive capacity of the species (Qasim and Qayyum, 1963). The fecundity and its relation to the size of a fish make it possible to estimate the number of eggs likely to be liberated (Chondar, 1977). Though plenty of information is available on the fecundity of *Macrognathaus aculeatus* (Farid, 2008) and *Puntius sarana*(Chakraborty *et al*.,2005). But no precise information is available about the fecundity of *Mastacembelus pancalus.* To the best of the knowledge, there is no previous information on the fecundity of *Mastacembelus pancalus,* although few studies have been conducted on sexual maturity and fecundity of this species from the Indian sub-continent (Jhingran and Verma, 1967; Chondar, 1977; Rao and Sharma, 1984; Quddus *et al*., 1990). Considering the availability and importance to the common people, the present work was undertaken with a view to determine the fecundity of this species.

Materials and Methods

Sample collection

The experiment was conducted for a period of three months from May to July 2007. Samples of *Mastacembelus pancalus* were collected from the experimental ponds of the Field *Laboratory* Complex, Faculty of Fisheries, Bangladesh Agricultural University (BAU), Mymensingh. These fish were caught by means of traditional fishing gear jhaki jal (cast net), dughair (conical trap) (Kibria and Ahmed, 2005) and pond drying. During the above period, 100 specimens was collected on different date and brought to the laboratory to measure the total length and body weight of individual fish. Then the ovary of each fish was taken out very carefully and preserved in 10% buffered formalin with labeled vials for further study. All specimens were sexed by gonad observation under a binocular microscope and only female specimens were used for this study. For each individual, total length (TL) was measured, and total body weight (BW) was taken on a digital balance with 0.01g accuracy.

Measurement of total length, body weight, ovarian weight and ova diameter

The total length and the weight of each fish were recorded separately to the nearest millimeter and gram respectively. A wooden measuring board was employed for measuring the total length and body weight was taken by an electric balance. The two parts of ovary from each fish were removed intact and placed in 10% buffered formalin. The preserved ovary of each fish was taken from the buffered formalin and washed with water and dried the surface of the ovaries with blotting paper. Then the ovary was weighed to the nearest gram by an electric balance. Diameter of the eggs taken from each of the anterior, central and posterior end of ovaries of 100 fish were recorded in microns under a microscope with the help of an objective micrometer.

Fecundity estimation

Gravimetric method was applied in the present study. For the estimation of fecundity, the ovaries were weighed; three sub-samples were taken from the front, mid and rear-section of each ovary and weighed. The total number of eggs in each sub-sample of ovary was calculated. 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:

$$F_1 = \frac{(\text{Gonad weight} \times \text{number of eggs in the sub - sample})}{\text{sub-sample weight}}$$ (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:

$$F_e = \frac{F_1 + F_2 + F_3}{3}$$

The relationship between fecundity and some morphometric measurements were determined by relating total fecundity (F_e) data to total length (TL) and total weight (BW) using the following formulae:

$\ln F_e = \ln m + n \times \ln TL$; $F_e = m \times TL^n$
$\ln F_e = \ln m + n \times \ln BW$; $F_e = m \times BW^n$

Here, m and n are constant parameter in the linear regression analysis and ln is the natural logarithm.

Statistical analysis

Statistical package MICROSTAT and EXCEL were used to determine correlation coefficient (R^2) between total length and fecundity, body weight and fecundity, and gonadal weight and fecundity following the methods of Zar(1996).

Results and Discussion

Fecundity

The fecundity was estimated from 100 randomly collected fish samples ranging in total length from 117.70±2.16 to 163.50±1.26 mm in length, 6.97±0.44 to 10.52±0.22 g in weight and ovary weight from 0.77±2.61 to 5.19±0.29 g. The fecundity was found to vary from 881.50±44.03 to 1182.30±27.33 eggs (Table 1). The following relationships between fecundity and total length, fecundity and body weight, and fecundity and ovary weight were established:

Table 1. Min. Max. and average ± SD of the number of eggs in relation to mean total length, mean body weight and mean gonad weight of *Mastacembelus pancalus*

Group size in length (mm)	No. of fish examined	Mean total length (mm)	Mean body weight (g)	Mean ovary weight (g)	Mean fecundity
115-120	10	117.70±2.16	6.97±0.44	0.77±2.61	881.50±44.03
121-125	10	121.00±1.69	6.53±0.30	0.69±0.20	811.50±285.91
126-130	15	128.00±1.49	7.38±0.11	1.27±0.19	948.30±10.19
131-135	11	133.10±1.37	7.71±0.16	1.74±0.15	965.00±3.05
136-140	07	107.37±60.21	6.38±3.00	2.78±2.46	974.14±428.82
141-145	08	143.12±1.64	8.27±0.21	2.66±0.14	993.50±7.11
146-150	10	148.20±1.61	8.79±0.16	3.30±0.22	1017.50±9.73
151-155	09	153.22±1.39	9.33±0.21	3.88±0.20	1052.44±14.62
156-160	08	140.32±52.29	8.96±2.51	4.50±0.32	1099.13±366.59
161-165	12	163.50±1.26	10.52±0.22	5.19±0.29	1182.30±27.33

Relationship between fecundity and total length of fish

A scattered diagram of fecundity with total length (mm) is presented in Fig. 1. The relationship between them was found to be polynomial of second order of body weight and is expressed as: Y= 4.3927x+398.02. The equation yielded R^2 = 0.5336 indicated that fecundity was highly ($P < 0.01$) correlated with the total length of fish.

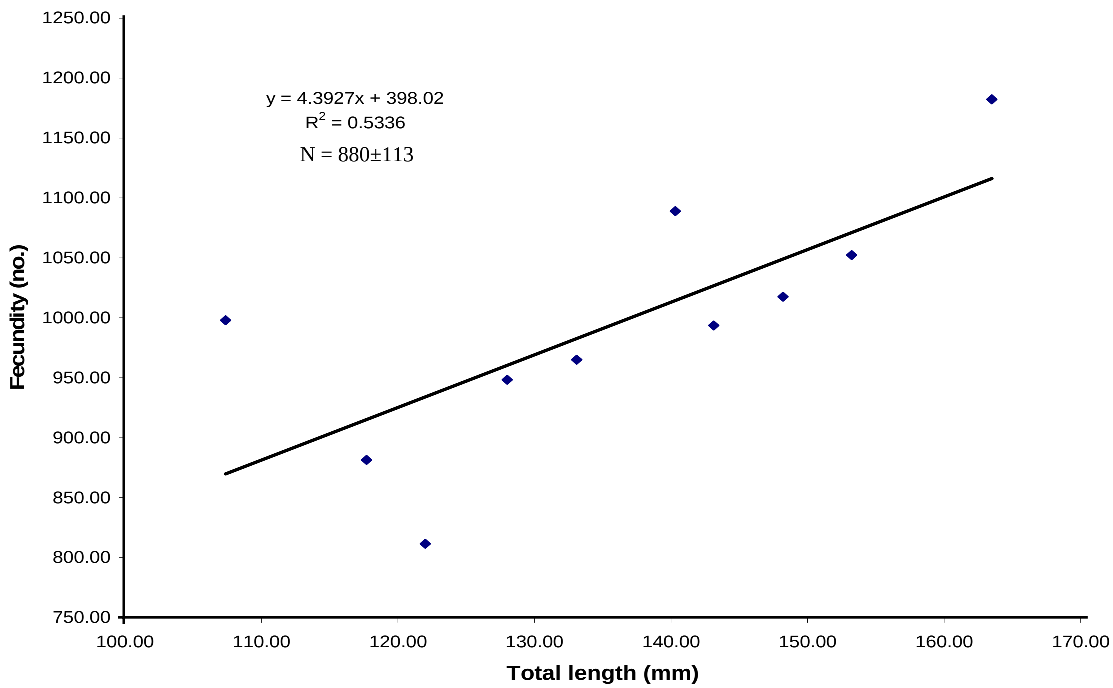

Fig. 1. Relationship between fecundity and total length of *Mastacembelus pancalus*

Relationship between fecundity and body weight of fish

Scatter diagram of fecundity and total body weight of *Mastacembelus pancalus* has been shown in Fig. 2. The regression equation of fecundity on total body weight was found to be represented by: Y= 67.319x+449.62.

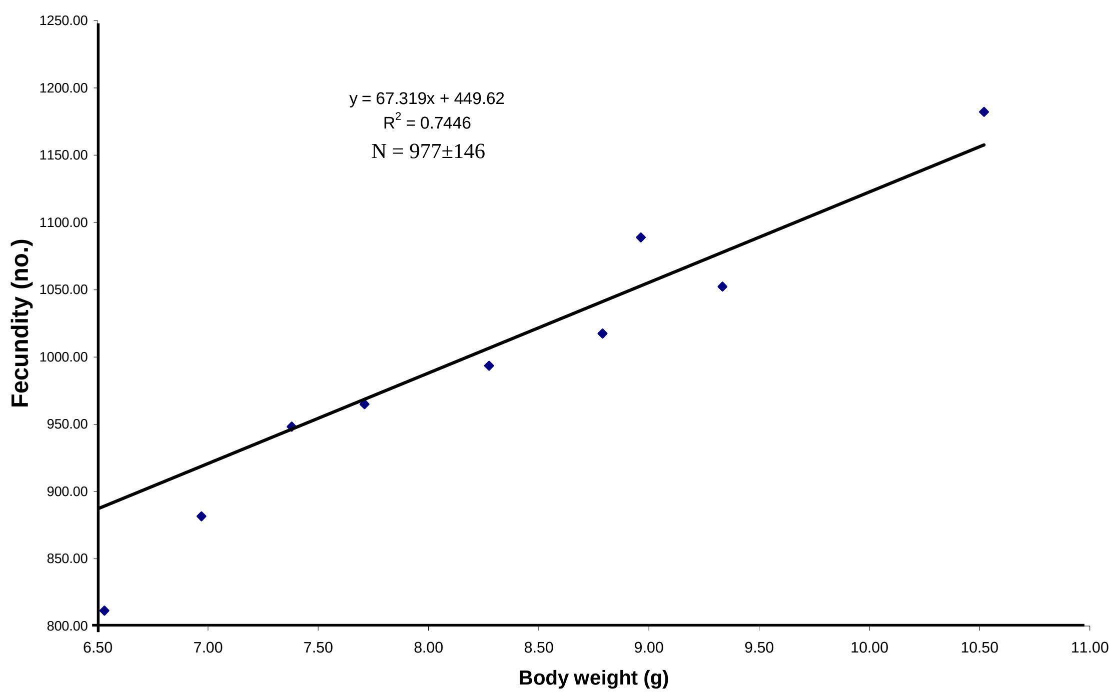

Fig. 2. Relationship between fecundity and body weight of *Mastacembelus pancalus*

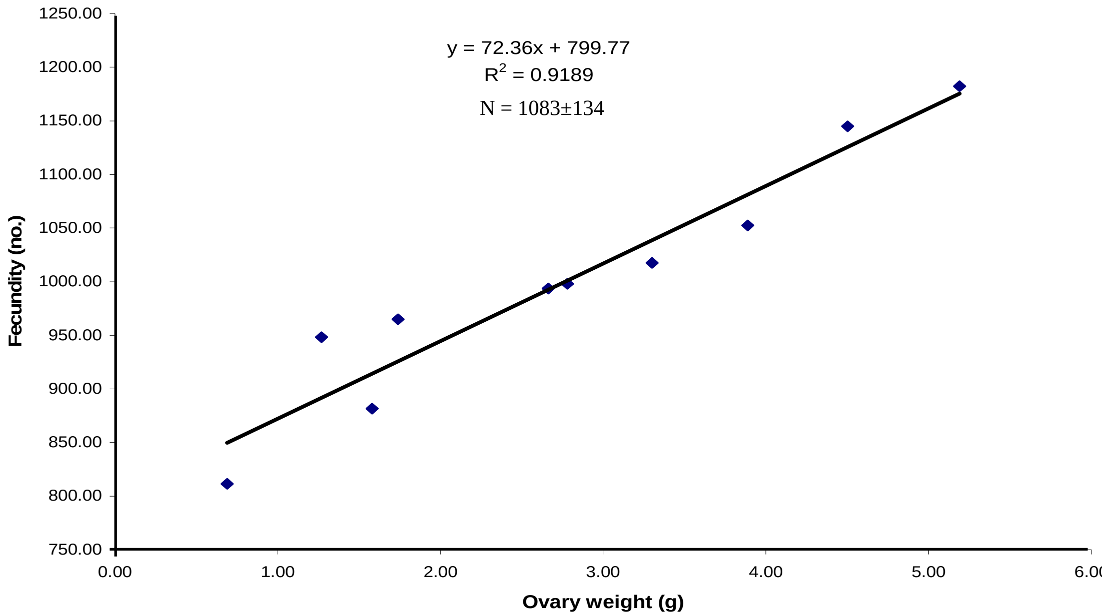

Fig. 3. Relationship between fecundity and ovary weight of *Mastacembelus pancalus*

The above equation shows that the relationship between fecundity and total weight was linear in nature. From the linear correlation value (R^2 = 0.7446), it was concluded that fecundity had high ($P < 0.01$) correlation with the body weight of fish.

Relationship between fecundity and ovary weight of fish

Figure 3 shows the scatter diagram of fecundity and gonadal weight relationship of *Mastacembelus pancalus*. A highly ($P < 0.01$) significant linear relationship was found to exist between fecundity and ovary weight, where R^2 = 0.9189 and the equation was Y = 72.36x+799.77. Similarly fecundity had high ($P < 0.01$) correlation with the ovary weight of fish.

In this study, the fecundity of the *M. Pancalus* increased in proportion to TL and BW. Positive relationships between fecundity and body weight have been reported in a number of fishes and this support to the present findings (Khan and Jhingran, 1975; Raina and Bail, 1982). The total estimated fecundity of this species is comparable with the similar species from the Indian sub-continent (Rao and Sharma, 1984). In general, the total fecundity increased with increasing size and weight of fish and also with the gonad weight. The estimated relationship between fecundity and total length and fecundity and body weight in sample from Aligarh, India was given by ln F_e= 5.451 ln TL+1.6556 and ln F_e= 1.681 ln BW+2.0477 (Qasim and Qayyum, 1963). In Jammu division, India, these relationships were ln F_e = 3.0225 ln TL+0.7469 and ln F_e= 1.3594 ln BW+2.2935 (Malhotra *et al.,* 1979). The result of the present study revealed that the fecundity of *M. Pancalus* is comparatively lower than the other species. The ovary from the smallest mature female weighted 0.77 g and its total fecundity was 881. The highest total fecundity was 1182 eggs with a body length and totals weight of 163.50 mm and 10.52 g respectively. Variation of fecundity among the population may result largely from selectivity different environmental factors (Temp, Sunlight, weather etc.), of which temperature is considered the most probable selective factor (Jonsson and Jonsson, 1999). However, fecundity of fishes varies from species to species, also within the same species due to different factors such as age, size, body and gonad weight, ecological conditions of the water body, etc (Lagler, 1956).

Conclusion

In conclusion, this study has provided some basic information on the size at sexual maturity and fecundity for *M. Pancalus* that will be helpful to evaluate reproductive potential of individual fish species in similar studies. Further, it would be useful for fishery biologist/manager to impose adequate regulation for sustainable fishery management for the control of exploiting fishing of young individuals and when associated with other information aids in evaluation and prediction of fish stock in the different water bodies of Bangladesh.

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