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Observation on the Fecundity and Gonadosomatic Index (GSI) of Grey Mullet *Liza parsia* (Ham.)

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Abstract: A total of 50 mature female specimens were examined for fecundity and gonadosomatic index study. The fecundity of the fish ranged from 19343.33 to 301700 with an average value of 126812.6. The relationship between fecundity and gonad weight was most significant (r = 0.9729) than that of fecundity with other factors. The relationship between fecundity and total length, body weight and gonad weight is linear and the regression equation are i) $Log_{10}F = 0.0024 + 4.0761\ Log_{10}TL$, ii) $Log_{10}F = 3.3177 + 1.0778\ Log_{10}TW$ and iii) $Log_{10}F = 3.7550 + 1.5161\ Log_{10}GW$. The fish was found to spawn for several months with two spawning peaks. One in December and other in February as indicated by the peaks of gonadosomatic index.

Key words: *Liza parsia*, fecundity, gonadosomatic index

Introduction

The fish *Liza parsia* (Ham.), under the family Mugillidae commonly known as grey mullet is a catadromous fish and widely distributed in the coastal water of tropical and sub-tropical regions extending from 42°N to 42°S (Nash and Shehadeh, 1980). The fish *Liza parsia* cultured in many developing countries, is a brackishwater fish commonly available in shallow coastal waters, estuary and mangrove swamps of Bangladesh. The adults and juveniles are hardy, euryhaline, eurythermal and not competitor of food. School occurs in shallow coastal water, enters lagoons and estuaries to feed. Juveniles often occur in shrimp culture farms and mangrove swamps. It is one of the most favourite, testy and commercially important fish in Bangladesh as well as southeast Asia, India and many parts of central and south America etc. The popularity of this species in aquaculture is due to high quality of its flesh, its extreme tolerance for a wide range of temperature and salinity, which is important for culture in inter tidal ponds (Nlewadim and Deekae, 1997)

A throughout knowledge of the fecundity of fish is essential for evaluating the commercial potentialities, stock study, life history study, practical culture and actual management of the fishery (Lagler, 1956; Doha and Hye, 1970; Das, 1977). The number of eggs contained in the ovary of a fish is termed the fecundity (Nikolasky, 1963). Considering the economic importance, an investigation on the fecundity of *Liza parsia* was under taken in this study.

Materials and Methods

The study was conducted for a period of 5 months from November 2001 to March 2002. The collected samples were brought to the Soil and Water Quality Laboratory at Brackishwater Station, Bangladesh Fisheries Research Institute, Paikgacha, Khulna, Bangladesh. For this study berried female of *L. parsia* was collected fortnightly from the local market to determine fecundity and GSI. Five mature females were collected randomly during each sampling and a total of 50 mature fish were examined during the study period. In the laboratory the length (cm) and weight (g) of each sample was measured accurately to the nearest millimeter and milligram respectively. Then the ovaries of the female fish were taken out very carefully and preserved in labeled vials containing 5% formalin for subsequent study. Gravimetric method (Lagler, 1949) was used to determine the fecundity.

The external connective tissues were removed from the surface of the ovaries. Moisture of the ovaries was removed with the help of a blotting paper. Weight of the ovaries was recorded in grams. Then 0.100 g of each ovary was taken separately from anterior, posterior and middle region of each lobe. The mean number of eggs in 0.100 g was conducted and then multiplied by total ovary weight, which gave the total number of eggs i.e., the fecundity of respective fish.

Gonadosomatic index (GSI) of the female fishes of the collected samples was determined separately following the equation cited by Parameswarn (1974).

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

Results and Discussion

Fifty gravid females were collected randomly for the study of fecundity of *L. parsia*. Data shows that a fish with a mean total length of 16.99 cm and mean total weight of 44.45 g produces 126812.6 eggs in an average (Table 1). The highest fecundity (301700) was observed in a fish having a total length of 21.2 cm with total body weight 125.10 g and a minimum fecundity 19343.33 was found in a fish with total length 12.36 cm having total body weight of 13.6 g. This study revealed that older fish were more fecund than the younger fish. Dan (1977) also observed same finding for catfish *Tachysurus thalassinus*.

The correlation coefficient, regression equation and significance of correlation of fecundity with total length, body weight and ovary weight of *L. parsia* is given in Table 2. Comparison of correlation coefficient reveals that the variation of fecundity with ovary weight is highly correlated (r = 0.9729) than that of total length (r = 0.8753) and body weight (r = 0.9325). Similar finding was also observed for carp *Lepidocephalus guntea* by Banu *et al.* (1992), for catfish *Mystus tengra* by Khan *et al.* (1992) and *Plotosus canius* by Khan *et al.* (2002).

The fecundity in relation to different parameter

Fecundity (F) and total length (TL) relationship: Fig. 1 a, b show the total length and fecundity relationship in antilog and in log form respectively. The study revealed the following equations:

$F = -333331.5771 + 27043.4428\ TL$ r = 0.8766
$Log_{10}F = 0.0024 + 4.0761\ Log_{10}\ TL$ r = 0.9376
Or, $F = 1.005\ TL^{4.0369}$

Where, F = Fecundity, TL = Total length

Fecundity and total body weight relationship: The relationship between the fecundity and body weight of *L. parsia* are of linear type (Fig. 2 a, b). The relationship of fecundity against

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Table 1: Mean fecundity counts at various length ranges of *L. parsia*

Class interval	Total length (cm)	Body weight (g)	Gonad weight (g)	Fecundity
12.0-13.0	12.36	13.60	2.5720	19343.33
13.0-14.0	13.53	15.09	3.8522	55953.01
14.0-15.0	14.53	20.99	4.9617	75752.14
15.0-16.0	15.31	29.10	5.2806	80194.50
16.0-17.0	16.86	35.20	6.2033	85938.33
17.0-18.0	17.76	40.46	7.0210	95187.51
18.0-19.0	18.60	45.25	8.7910	135545.00
19.0-20.0	19.80	50.20	9.0510	141478.20
20.0-21.0	20.20	69.60	12.2430	277034.00
21.0-22.0	21.20	125.10	13.2990	301700.00
Average	16.99	44.459	7.3274	126812.60

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

Relationships	Correlation coefficient 'r'	Values of regression coefficient (b)	Values of intercept (a)	Significance at 5 % level
Fecundity (F) and total length (TL)	0.8753	26851.65	-329584.90	S
Fecundity (F) and total weight (TW)	0.9325	2612.24	10674.83	S
Fecundity (F) and gonad weight (GW)	0.9729	25728.97	-61715.95	S

S = Significant

Table 3: Month-wise gonadosomatic index of female *L. parsia*

			Ovary		
Months	Total length (cm)	Total weight (g)	Gonad length	Gonad weight	Mean *GSI
November	12.5-17.1	22.7-34.6	4.4-7.5	2.712-6.209	11.842-19.5035
			5.50	4.074	14.5969
December	13.4-18.3	24.9-68.1	5.4-7.1	3.727-12.168	12.3215-23.9202
			6.55	7.536	16.7007
January	12.6-21.5	20.5-115.1	4.2-8.4	1.841-10.299	7.1812-11.3489
			5.03	4.743	9.3479
February	12.6-17.9	21.5-30.2	4.3-7.6	2.23-8.461	9.4344-28.0165
			6.3	6.917	15.9409
March	12.9-18.5	23.4-69.3	4.5-8.1	2.21-9.137	8.0934-15.7157
			5.6	4.804	12.7922

* GSI = Gonadosomatic index

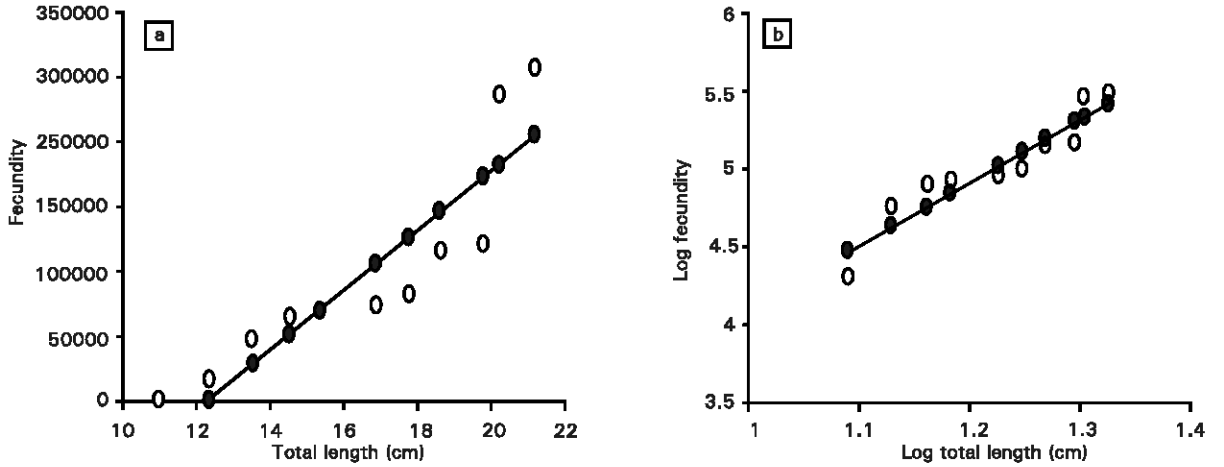

Fig. 1: Relationship between total length and fecundity of *L. parsia* in a) antilog and b) log (● = Calculated value, o = Observed value)

body weight produced a regression, which can be stated as follows:

$F = 10675.0425 + 2612.2396\ TW \quad r = 0.9325$

$\text{Log}_{10} F = 3.3177 + 1.0778\ \text{Log}_{10} TW \quad r = 0.9291$

Or, $F = 2048.260\ TW^{1.0778}$

Where, F = Fecundity, TW = Body weight

Fecundity and gonad weight relationship: The scatter diagram of fecundity and ovary weight suggested a linear relationship between the variables (Fig. 3a). It could be seen from Fig. 3b that a straight line through the origin would fit the point well, showing the direct proportion between the number of eggs and gonad weight of the fish. The similar findings was also observed by Banu *et al.* (1984), Kabir *et al.* (1998) and Islam and Hossain, (1990) in case of *Colisa fasciata*, *Gudusia chapra* and *Puntius stigma* respectively.

$F = -61715.7 + 25728.95\ GW \quad r = 0.9729$

$\text{Log}_{10} F = 3.7550 + 1.5161\ \text{Log}_{10} GW \quad r = 0.9816$

Or, $F = 5688.529\ GW^{1.5161}$

Where, F = Fecundity, GW = Gonad weight

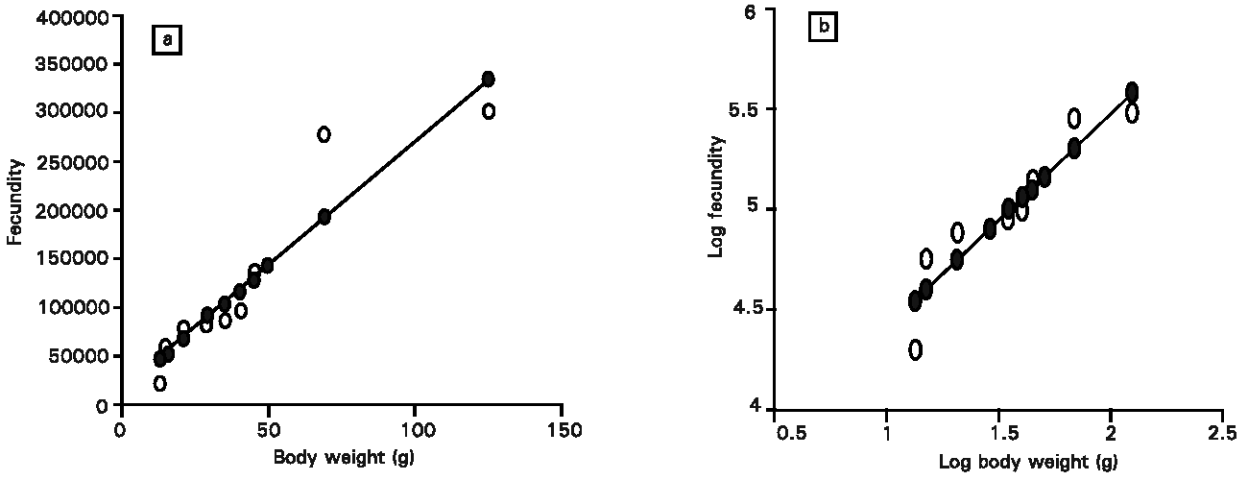

Fig. 2: Relationship between body weight and fecundity of *L. parsia* in a) antilog and b) log (● = Calculated value, o = Observed value)

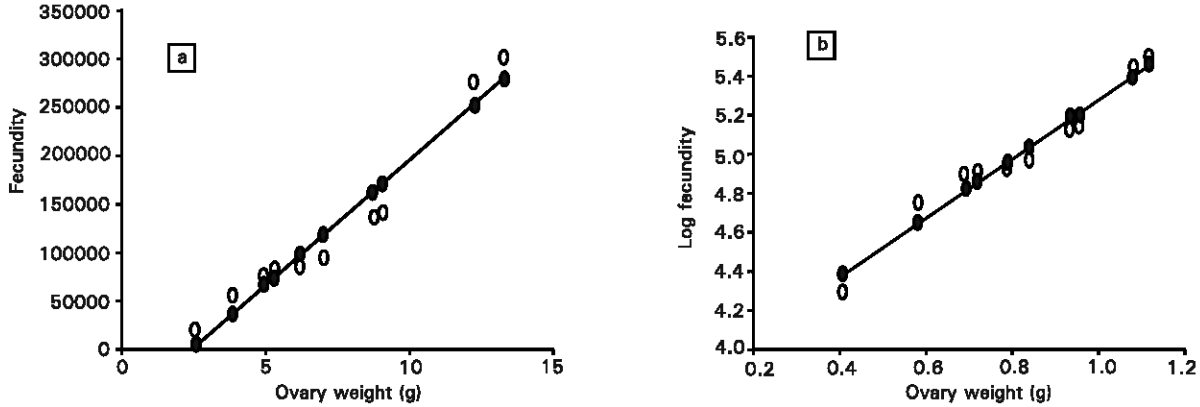

Fig. 3: Relation between ovary weight and fecundity in a) antilog and b) log of *L. parsia* (● = Calculated value, o = Observed value)

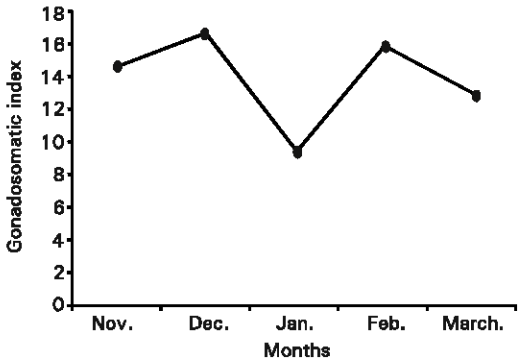

Fig. 4: Monthly fluctuation in the gonadosomatic index of the berried females *L. parsia*

Gonadosomatic index: Gonadosomatic index indicates gonadal development and maturity of fish. It increases with the maturation of fish declining abruptly thereafter (Parameswarn *et al.*, 1974). Length of the gonads of the matured females were ranged from 4.2 to 8.4 cm the weight of the same from 1.841 to 12.168 g, showed two spawning peaks (Table 3). The highest peak of gonad length (6.55) was observed in December and lowest in February (6.3). This finding coincides with the observation of Doha and Hye (1970) and Miah and Dewan (1984).

The gonadosomatic index varied between 7.1812 to 28.0165, it also produced two peaks highest in December (16.701) and lowest (15.941) in February (Fig. 4). Therefore the fish spawned for several months with two spawning peaks. Miah and Dewan (1984) stated three spawning peaks in case of *Sarotherodon nilotica*.

It is clear from the results that the *Liza parsia* is a highly fecund fish and fecundity is linear type with total length, body weight and gonad weight. The fish spawned for several months with highest spawning peak highest in December. These information might be helpful for the proper management of *Liza parsia* stock.

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