



FECUNDITY OF *LIZA PARSIA* (HAMILTON) AND RELATIONSHIP BETWEEN LENGTH-WEIGHT AND FECUNDITY

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Abstract: The fecundity of *Liza parsia* (Hamilton) was estimated studying 80 gravid females collected from the local markets in Khulna during November 2007 to January 2008. The fecundity ranged from 37,675 (total length 15.5 cm, body weight 39.791 g and ovary weight 3.532 g) to 1,87,442 (total length 21.8 cm, body weight 118.8 g and ovary weight 18.421 g). The mean fecundity was calculated to be 91269.29±35501.09. The mean weight of the ovary was 8.657±3.458 g while that of left and right lobes were 4.467±1.823 g and 4.192±1.667 g respectively. The diameter of the eggs of left lobe ranged from 0.42-0.72 mm while that of the egg from right lobe was 0.42-0.75 mm. The regression equation for total length and fecundity, standard length and fecundity, body weight and fecundity, ovary weight and fecundity was estimated to be $F = -237097.61 + 18214.78 \times TL$ ($R^2=0.69$), $F = -238969.73 + 22049.01 \times SL$ ($R^2=0.69$), $F = -12797.2 + 1538.98 \times BW$ ($R^2=0.76$) and $F = 6932.86 + 9742.08 \times OW$ ($R^2=0.90$), respectively while that for total length and ovary weight, standard length and ovary weight, body weight and ovary weight was $OW = -24.65 + 1.85 \times TL$ ($R^2=0.74$), $OW = -25.03 + 2.25 \times SL$ ($R^2=0.75$) and $OW = -1.93 + 0.16 \times BW$ ($R^2=0.83$), respectively. The linear relationship was highly significant in all the above cases.

Key words: Fecundity, length-weight, *Liza parsia*, *Parse*

Introduction

Liza parsia (Hamilton) of the family Mugillidae, commonly known as gold spot mullet or *Parse*, is one of the most popular and commercially important fish in Bangladesh. It is a catadromous fish widely distributed in the coastal waters of tropical and sub-tropical regions extending from 42°N to 42°S (Nash and Shehadeh, 1980). It grows from 15 to 19 cm in one year and may attain a maximum length of 40 cm in natural waters and 25 cm in ponds (Talwar and Jhingran, 1991). Rheman *et al.* (2002) reported the fecundity and gonado-somatic index of *L. parsia*.

Fecundity and spawning habits are the important aspects of fish biology of which must be understood to explain the variation at population level as well as to increase the amount of fish harvest. To evaluate the commercial potentiality of a fish stock, information on the fecundity of the species composing the stock is essential. Fecundity may be defined as a season's crop or the number of eggs released by an individual fish during a spawning season (Saifullah *et al.*, 2004). In bio-ecological studies and in fish culture it is desirable to know the number of eggs, fry and young produced. Fecundity estimates may also be used to assess the abundance and reproduction potential of the spawning stock (Khan *et al.*, 2002). Fecundity of fishes varies from species to

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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. (Saifullah *et al.*, 2004). Variation in fecundity is primarily a reflection of variation in the size of the fish at maturity. Considering the economic importance, an investigation on the fecundity of *L. parsia* was undertaken.

Materials and Methods

Sample collection: Eighty berried females of *L. parsia* were collected fortnightly over a period of three months from November 2007 to January 2008 from different local markets in Khulna district. The species was identified following Talwar and Jhingran (1991). On each sampling occasion 10 to 15 mature females were collected randomly. Ocular observation and common experience were used in identifying matured fish. The collected samples were then brought to the Biological Laboratory of Fisheries and Marine Resource Technology Discipline, Khulna University for detail studies.

Laboratory measurements: Total length (TL) from anterior tip of the snout to the posterior end of the tail and standard length (SL) from anterior tip of the snout to the base of the caudal fin were measured to the nearest 0.1 cm. Body weight (BW) was taken by an electric balance of 0.001 g accuracy. Before taking the body weight the fish was washed thoroughly with tap water and wiped dry with a piece of cloth. Ovaries from each of the fishes were removed by opening the abdomen. Ovaries were washed and cleaned with distilled water. Excess moisture from surface of the ovaries was removed with blotting paper before weighing. Ovaries were weighed with an electric balance of 0.001 g accuracy. The two lobes were also weighed separately. Diameter of the eggs was measured in mm under a compound electric microscope. Eggs taken from anterior, middle and posterior parts of each of the lobes were selected randomly and measured. The diameter of the eggs was measured along the longer axis by moving the eggs with a fine needle when necessary.

Fecundity estimation: Gravimetric method was applied in the present study. From each of the ovary six cross-sectional samples from the anterior, central and posterior regions of the two lobes were weighed individually and the total eggs in each of the six samples were counted with a colony counter and a needle. The total number of eggs for each fish was calculated from the sample mean and the total weight of the ovary. Fecundity values presented here are the total number of eggs from both the lobes. The number of eggs of each sample was multiplied by the total weight of the lobes of ovaries as follows:

$$F = \frac{N \times \text{Ovary weight}}{\text{Sample weight}} \text{ (Dewan and Doha, 1979 and Shafi *et al.*, 1979)}$$

Where F is the fecundity and N is the number of eggs in the sample.

Condition factor estimation: The condition factor (K) was calculated by using the following formula:

$$K = \frac{W \times 10^3}{L^3} \text{ (King, 1997)}$$

Where, W = weight of the fish in g; L = length of fish in cm; K = condition factor and 10^3 = the factor bringing the ponderal index or condition factor near unity.

Results

The female reproductive organ of *L. parsia* consisted of bilobed ovaries, lobes being more or less same in size and slightly tapering posteriorly and broader anteriorly (Fig. 1). Ovaries in ripe adults were golden yellow in color. The mean weight of the ovary was 8.657 ± 3.458 g and that of the left and right lobes were 4.467 ± 1.823 g and 4.192 ± 1.667 g respectively. The weight of the two lobes were significantly different ($p < 0.05$)-the left lobe was heavier than the right lobe.

The fecundity of *L. parsia* varied from 37,675 to 1,87,442 with the mean fecundity of 91269.29 ± 35501.09 . The minimum fecundity was found in a fish of total length 15.5 cm, body weight 39.791 g and ovary weight 3.532 g while the maximum was in a fish of total length 21.8 cm, body weight 118.8 g and ovary weight 18.421 g. Fecundity of *L. parsia* according to different length classes is presented in Fig. 3.

The eggs were spherical in shape (Fig. 2). The diameter of the eggs of left lobe was 0.42-0.72 mm while that of the eggs from right lobe was 0.42-0.75 mm. The mean diameter of the eggs of the left lobe was 0.542 ± 0.041 mm while that of the right lobe was 0.543 ± 0.044 mm. The mean diameters of the eggs of the left and right lobe were not significantly different ($p > 0.05$). The mean diameter of eggs belonging to left and right lobe of *L. parsia* according to different length classes is presented in Fig. 4. Ovary weight, egg diameter and fecundity of *L. parsia* are summarized in Table 1.

Table 1. Ovary weight, egg diameter and fecundity of *L. parsia*.

Aspects	Parts	Minimum	Maximum	Mean±SD
Ovary weight	Left lobe	1.927 g	9.236 g	4.467 ± 1.823 g
	Right lobe	1.452 g	9.139 g	4.192 ± 1.667 g
	Total	3.532 g	18.421 g	8.657 ± 3.458 g
Egg diameter	Left lobe	0.42 mm	0.72 mm	0.542 ± 0.041 mm
	Right lobe	0.42 mm	0.75 mm	0.543 ± 0.044 mm
Fecundity	-	37675	187442	91269.29 ± 35501.09



Fig. 1. The ovary of the *L. parsia*.



Fig. 2. Microscopic view of an egg of *L. parsia*.

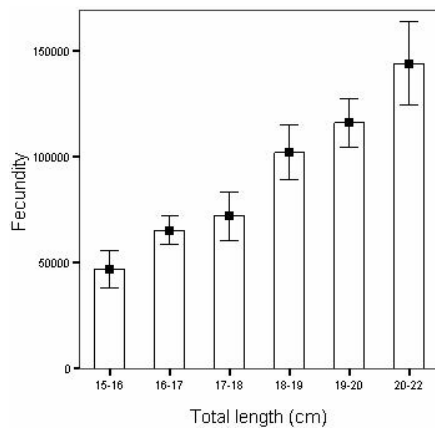


Fig. 3. Fecundity of *L. parsia* by length classes.

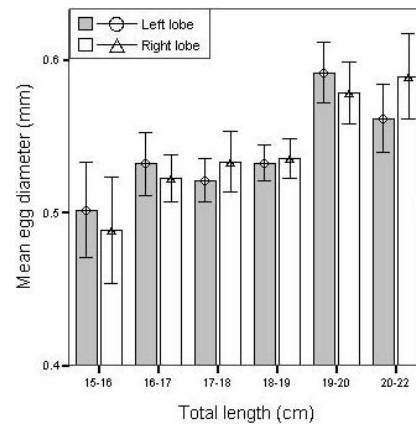


Fig. 4. Mean egg diameters of the left and right lobe of *L. parsia* by length classes.

The relationship between fecundity and other body parameters, the values of regression coefficient (b), intercepts (a) and correlation coefficient (r) were estimated by using the statistical formula $y = a+bx$. Linear relationships were found to exist between total length and fecundity, standard length and fecundity, body weight and fecundity, ovary weight and fecundity, total length and ovary weight, standard length and ovary weight, body weight and ovary weight, and condition factor and fecundity and the coefficient of correlations were highly significant except that of fecundity and condition factor (Fig. 5).

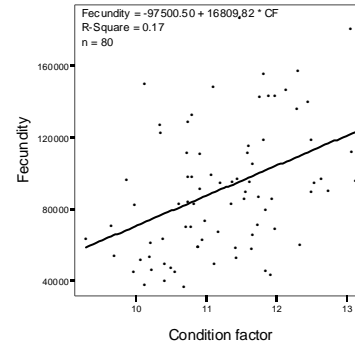


Fig. 5. Relationship between fecundity and condition factor of *L. parsia*.

Table 2. Relationship between fecundity and ovary weight with other parameters of *L. parsia* (n=80).

Relationship	Regression coefficient (b)	Intercepts (a)	Regression Co-efficient (R ²)	t-test at 5% sig.
Fecundity – Total length	18214.78	-237097.61	0.69	13.067*
Log fecundity – Log total length	3.65	0.35	0.68	12.947*
Fecundity – Standard length	22049.01	-238969.73	0.69	13.079*
Log fecundity – Log standard length	3.65	0.64	0.68	12.752*
Fecundity – Body weight	1538.98	-12797.2	0.76	15.62*
Log fecundity – Log body weight	1.18	2.78	0.76	15.792*
Fecundity – Ovary weight	9742.08	6932.86	0.90	26.526*
Log fecundity – Log ovary weight	0.91	4.11	0.91	28.702*
Ovary weight – Total length	1.85	-24.65	0.74	15.075*
Log ovary weight – Log total length	3.99	-4.1	0.74	14.991*
Ovary weight – Standard length	2.25	-25.03	0.75	15.442*
Log ovary weight – Log standard length	4.01	-3.81	0.74	14.897*
Ovary weight – Body weight	0.16	-1.93	0.83	19.323*
Log ovary weight – Log body weight	1.30	-1.45	0.84	19.934*
Fecundity – Condition factor	16809.82	-97500.50	0.17	3.973

*Significant relationship

Discussion

The fecundity of *L. parsia* observed in the present study was more or less similar to that of Rheman *et al.* (2002). Numerous factors like nutritional status (Scott, 1961), racial characteristics (Bagenal, 1966), time of sampling and maturity stage (Healy, 1971), environmental factors (McFadden *et al.*, 1965), etc. have so far been reported to affect the fecundity both within and between fish populations. Obtaining the highest number of eggs in the largest specimen, as well as, the observed variation in the fecundity of fish in the same length class were probably due to racial characteristics and/or maturity stages of the samples. Such variation was also reported by Islam *et al.* (1987), Shafi *et al.* (1977), Doha and Hye (1970) and Jones and Menon (1951).

The variation in the average diameter of eggs and increase in egg diameter with the increase in total length, body weight and ovary weight, observed in the present study, were probably due to environmental factors and maturity stages of the fish samples. This agrees with the findings of McFadden *et al.* (1965) and Healy (1971).

Linear relationships between fecundity-total length, fecundity-standard length, fecundity-body weight and fecundity-ovary weight observed in this study agree with the findings of Rheman *et al.* (2002) in case of *L. parsia*. Similar results were also obtained by Bhuiyan *et al.* (2006), Roy and Hossain (2006), Azadi and Mamun (2004), Saifullah *et al.* (2004), Khan *et al.* (2002), Narejo *et al.* (2002) and Kabir *et al.* (1998) in case of *Puntius gonionotus*, *Mystus cavasius*, *Hilsa ilisha*,

Amblypharyngodon mola, *Mastacembalus armatus*, *Plotosus canius* and *Gudusia chapra*, respectively.

A comparison of the correlation of coefficient of ovary weight-total length, ovary weight-standard length and ovary weight-body weight indicates a much closer relationship of ovary weight with body weight than with the other factors like total length and standard length.

The condition factor was found to vary (9.29 to 13.10) in the present study. The scatter plot of fecundity and condition factor indicates that no relationship existed between condition factor and fecundity. The present findings agree with the findings of Doha and Dewan (1967) who reported that the condition factor is not constant and found to vary in an individual, species or a population having relationship between seasonal changes in the environment and with the changes of physiological conditions of the fishes.

Conclusion

The major limitation of the present study was small sample size and data were collected for only three months so, variation in the value of gonadosomatic index during different months could not be observed. Moreover, some of the fish samples used in the present investigation were not fully mature and related environmental parameters were not studied. Therefore, round the year systematic study for at least three consecutive years is recommended in different aqua-ecological regions to arrive to a conclusion.

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