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Reproductive characteristics of *Liza parsia* (Ham.) inhabiting south-west coast of Bangladesh

M. Begum, M. A. Islam, H. K. Pal and M. J. Alam
Bangladesh Fisheries Research Institute, Brackishwater Station, Paikgacha, Khulna-9280, Bangladesh

Abstract

In order to determine the reproductive characteristics of *Liza parsia*, a fish of commercial importance, the GSI, egg diameter, sex ratio and fecundity were examined in 331 specimens caught monthly for a period of ten months from September 2006 to June 2007. According to the GSI and egg diameter, the reproduction period of *Liza parsia* was determined to be in November to March with two peaks in the months of December and February. The maximum GSI values obtained for male and female were 1.49 and 14.71 respectively in the month of February. In December, the gonadosomatic index decreased in female (13.5) and in male (1.4). The average egg diameter of *Liza parsia* ranged from 0.35 to 0.50 mm. The sex ratio (Male:Female) of the investigated fish was1:1.21. Fecundity of the fish ranged from 18,950 to 1,71,210 during the period of study. Linear relationships between fecundity and total-length, body-weight, gonad-length and gonad-weight were found and fecundity was more related to the ovary length (r=0.8172) and ovary weight (r=0.8552) than the fish length (r=0.7538) and fish weight (r=0.7592).

Keywords: Reproductive characteristics, *Liza parsia,* GSI, Fecundity

Introduction

Fish have great nutritious value and are an important alternative to other protein sources. Therefore, in order to protect and better appreciate these available living resources, fish reproduction time and condition should be determined. The fish *Liza parsia* (Ham.), belongs to the family Mugillidae commonly known as goldspot mullet is a catadromous fish and widely distributed in the coastal waters of tropical and sub-tropical regions extending from 42^0N to 42^0S (Talwar and Jhingran, 2001; Nash and Shehadeh, 1980). This is a brackishwater fish species commonly available in shallow coastal waters, estuary and mangrove swamps of Bangladesh (Rheman *et al,* 2002). The adults and juveniles are hardy, euryhaline, eurythermal and not competitor of food. It is one of the most favorite, tasty and commercially important fish in Bangladesh as well as in Southeast Asia, India and many parts of central and South America. The popularity of this species in aquaculture is due to high quality of its flesh, its extreme tolerance of a wide range of temperature and salinity, which is important for culture in intertidal ponds (Nlewadim and Deekae, 1997).

Fecundity, one of the most important biological aspects of fish, plays a significant role to evaluate the commercial potentialities of fish stock. This must be known to assess the abundance and reproductive potential of a fish stock (Das *et al*., 1989). It is prime important to know the fecundity of a fish species for efficient fish culture and effective management practices (Miah and Dewan, 1984). Several studies have been carried out on mullet biology with brief accounts on fecundity, GSI, reproductive characteristics and spawning (Rheman *et al*., 2002; Ergene, 2000 and Cherif *et al*., 2007). But so far, very few works have been done on the fecundity and GSI of *L. parsia* (Rheman *et al*., 2002), which is not sufficient to assess reproductive potential and induced breeding of *L. parsia*. In view of this fact the present study was conducted to determine the egg productivity, gonadosomatic index, the reproduction period and age at maturity of *L. parsia* and also to establish a relationship between the fecundity and body-length, body-weight, gonad-length and gonad-weight of the fish.

Materials and Methods

The experiment was conducted in Brackishwater Station, Paikgacha, Khulna for a period of ten months from September 2006 to June 2007. Thirty one mature fish were collected randomly during monthly sampling to determine the total length and weight. A total of 310 male and female *Liza parsia* were examined to determine the gonadosomatic index, fecundity and ova diameter. The collected specimens

were brought to the laboratory and they were firstly cleaned, measured and weighed. In order to determine the sexual maturity and reproduction time, the male and female fish were separated and data were recorded after dissecting out the gonad of the individual fish. Then the gonads of fish were taken out very carefully and preserved in well labeled vials containing 5% buffered formalin for subsequent studies. Gravimetric method was followed to determine the fecundity of fish. In using this method, the external connective tissues were removed from the surface of the ovaries. Moisture of the ovaries was removed with the help of blotting paper. Weight of ovaries was recorded in gram with the help of a fine electric weighing balance. Then 0.01 g of each ovary was taken separately from anterior, middle and posterior regions of each lobe. The number of mature and immature eggs for each portion was sorted out and counted with the help of a needle and magnifying glass. The mean number of eggs in 0.01 g was determined and then multiplied by the total weight of the ovary, which gave the total number of eggs *i.e*., the fecundity of the respective fish.

Gonadosomatic index (GSI) of the male and female fish of the collected samples was determined separately following the equation cited by Parameswarn *et al.* (1974).

GSI = (Weight of gonad / Weight of fish) × 100

Ova diameter at different stages of maturity was measured with the help of ocular micrometer. In this study, 12 ova were taken randomly from the mixed sample of eggs of three portions of each ovary. Measurements of ova diameter were taken along the longest axis of the ova. Sex ratio of the collected fishes was estimated. The relationship between the fecundity and total-length, body-weight, gonad-length and gonad-weight were determined with the help of a computer following MS Excel program.

Results and Discussion

Sex ratio and reproduction period: The sex ratio (Male:Female) of the examined fish were recorded 1:1.21. Ergene (2000) recorded the male and female ratio as 1:1.24 for *Liza ramada* in Akgol-Paradeniz Laggon. Ergene's results are similar to those of this study. To determine the reproduction period of *L. Parsia*, the gonadosomatic index values of 100 males and 100 females were evaluated according to month. The maximum GSI values obtained for male and female were 1.49 and 14.71 respectively in the month of February. In January, the gonadosomatic index decreased (11.5) in female and (1.14) in male possibly due to a reason that the sampled fish presumably dispensed a certain portion of their eggs and milt. After January, the gonads began to develop and the values of GSI again increased in the month of February. GSI values of both males and females were found to be lower in the months of September, October, April, May and June. On the basis of GSI values, the reproduction period of *L. parsia* was found to extend from November to March with two peaks in the months of December and February (Fig. 1 & 2).

Rheman *et al. (2002)* reported that females *L. parsia* has maximum GSI values (16.7) in December and this species spawned for several months with two spawning peaks in the months of December and February. Ergene (2000) stated that the reproduction period of *Liza ramada* in Akgol_paradeniz Lagoons was November through December.

In addition, to determine the reproduction period of *L. parsia,* egg diameter changes in 100 females were evaluated month-wise (Fig. 3).The egg diameter of *L. parsia* reached 0.49 mm in December and 0.5 mm in February. The egg diameter measurements showed a harmony with the GSI values.

The egg diameter in *L. parsia* varied between 0.35 mm and 0.50 mm. The peak reproduction period was in February and the egg diameter was 0.59 mm, but in December it was 0.49 mm. GSI values and egg diameter changes were harmonious with each other, these results showed that the reproduction period had two peaks, one in February and another in December. These results are similar to the results obtained by Das (1992) in *L. subviridis,* Ergene (2000) in *L. ramada* and Rheman *et al.* (2002) in *L. parsia*. Das (1992) stated that egg diameter of *L. subviridis* varied between 0.5 mm and 0.75 mm during spawning period. Ergene (2000) reported that egg diameter of *L. ramada* varied between 0.20 mm and 0.59 mm, and GSI values and egg diameter changes were harmonious with each other.

Fecundity: For fecundity studies 100 specimens in the total length range of 11.2- 23.4 cm were examined. Fecundity of *L. parsia* was found to range from 18,950 to 1,71,210 during the period of study (Table 1). The highest fecundity (1,71,210) was observed in the month of February in the fish having a total length of 22.6 cm with total body weight of 128 g and minimum fecundity (18,950) was found in a fish having a total length 12.6 cm with 38.9 g total body weight in the month of October. These results revealed that older fish were more fecund than the younger one. Rheman *et al.* (2002) and Dan (1977) also observed same findings for *L. parsia* and *Tachysurus thalassinus*. The study of fecundity indicated a linear relationship with total-length, body-weight, gonad-length and gonad- weight of the fish (Figs. 4, 5, 6 and 7). The similar findings were also observed by Rheman *et al*. (2002), Khan *et al*. (2002), Banu *et al*. (1984), Kabir *et al*. (1998), Islam and Hossain (1990) and Kaliyamurthy (1981) in case of *Liza parsia***,** *Plotosus canius***,** *Colisa fasciata***,** *Gadusia chapra***,** *Puntius stigma* and *Mystus gulio* respectively. The relationship between fecundity and total length, body weight, gonad length and gonad weight have been established and it has been noted that the fecundity is more related to the ovary length (r=0.8172) and ovary weight (r=0.8552) than the fish length (r=0.7538) and fish weight (r=0.7592). Rheman *et al*. (2002) found that fecundity of *L. parsia* was more related to the ovary weight than total length and body weight of fish.

Table 1. Month-wise mean fecundity of *Liza parsia*

Months	No. of fish examined	Total length (cm)	Body weight (g)	Ovary weight (g)	Egg number (Fecundity)
September	10	14.50±4.30 (12.5~16.5)	45.60±6.25 (38.6~48.2)	3.42±1.25 (2.1~4.2)	32900±11320 (20100~40320)
October	10	14.90±3.20 (12.6~15.2)	45.80±4.50 (38.9~47.8)	4.10±1.20 (2.3~5.4)	33580±12520 (18950~45120)
November	12	15.75±1.05 (14.7~16.8)	48.65±9.36 (41~54)	6.1±1.96 (5.9~6.3)	42210±13751 (39825~43785)
December	14	20.06±1.75 (16.5~23.4)	96.36±21.01 (55~124)	13.21±3.14 (7.78~14.7)	91498±22130 (54304~99960)
January	11	20.66±2.39 (16.7~23.1)	111.6±15.67 (90~146)	12.83±5.25 (7.25~18.5)	88655±23661 (50025~126344)
February	13	20.88±1.32 (18.6~22.6)	112.3±16.64 (90~128)	16.51±5.0 (9.4~20.0)	134226±40216 (69560~1,71,210)
March	8	17.21±2.0 (13.4~19.6)	65.3±19.67 (31~89)	7.42±4.0 (3.4~14.0)	87036±41941 (37060~134400)
April	8	12.88±1.48 (11.2~16.6)	26.4±8.77 (20~52)	2.24±0.47 (1.3~2.3)	43276±10109 (25831~54270)
May	7	12.21±0.38 (11.5~12.7)	22.8±2.0 (19~25)	1.73±0.31 (1.5~2.3)	38527±14568 (29880~55292)
June	7	13.50±2.32 (10.2~14.2)	23.30±3.5 (17.4~25.6)	1.16±0.50 (1.0~1.7)	25830±9550 (22230~46750)

Figures in parentheses indicate ranges.

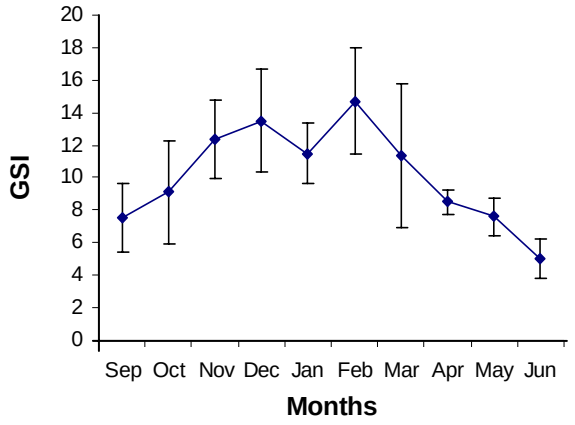

Fig. 1. GSI values (±SD) of female *Liza parsia*

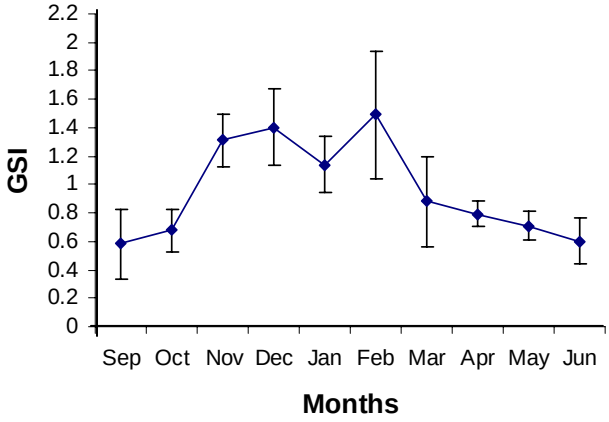

Fig. 2. GSI values (±SD) of male *Liza parsia*

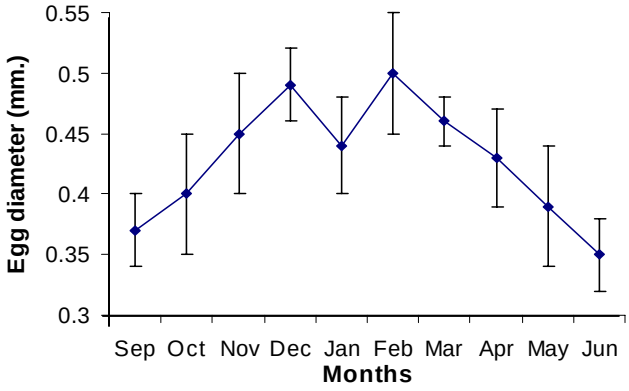

Fig. 3. Monthly changes in egg diameter (±SD) of *Liza parsia*

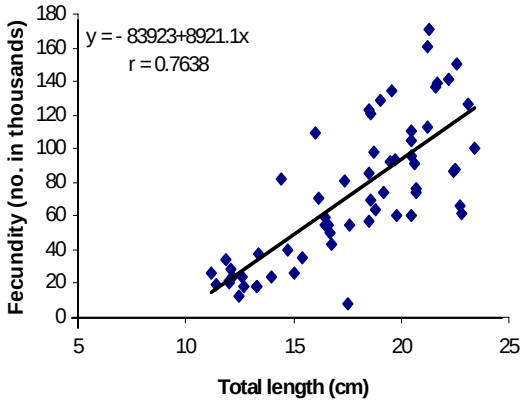

Fig. 4. Showing the relationship between fecundity and total length of *Liza parsia*

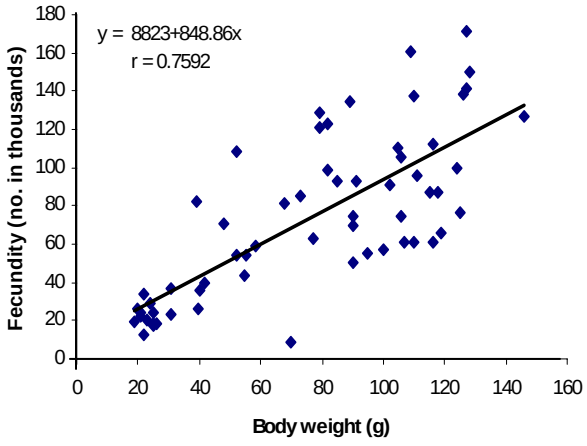

Fig. 5. Showing the relationship between fecundity and body weight of *Liza parsia*

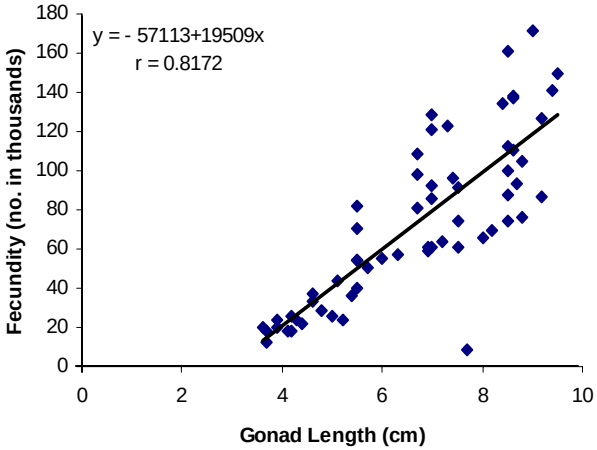

Fig. 6. Showing the relationship between fecundity and gonad length of *Liza parsia*

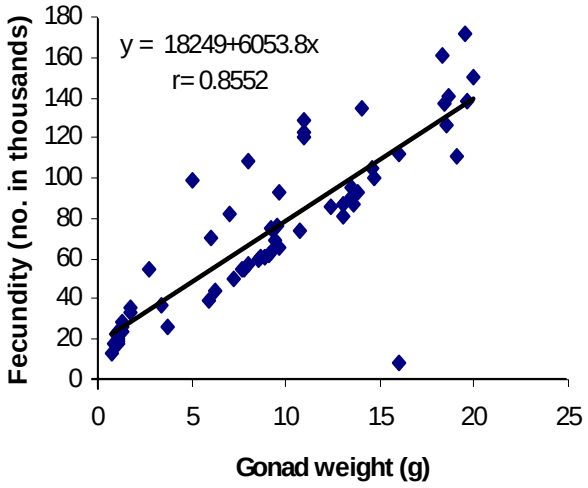

Fig. 7. Showing the relationship between fecundity and gonad weight of *Liza parsia*

In accordance with the findings obtained, it was determined that the induced breeding of *L. parsia* should be done during November to March as it is the breeding period of this species. It was furthermore established that a prohibition on fishing should be put into effect during December and February since these months were observed to constitute the peak reproduction periods of *L. parsia*

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