



Breeding Biology of Freshwater Spiny eel, *Mastacembelus armatus* from Indus River near Jamshoro, Sindh Pakistan

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Received 14th January 2018 and Revised 8th July 2018

Abstract: Present investigation on breeding biology of freshwater spiny eel, *Mastacembelus armatus* was enumerated in relation to ova diameter, gonadosomatic index and fecundity from 85 specimens ranged between 25.0 to 57.0 cm and 28.0 to 367 g in length and weight respectively during April to August 2017. The diameter of ova was ranged from 0.55- 1.0 mm, all ova were found to be spherical and uniform in diameter; this indicated that the eggs were released in a single batch during the peak period of spawning (July). The values of gonad somatic index were ranged from 3.40-6.5 and from 5.3- 10.28 in male female respectively. The highest GSI values were noticed in the month of July in both cases.

Fecundity was estimated from the twelve mature fishes ranged between 41.8-59.0 cm and 88.0-155.0 g in length and weight respectively. The ranged of fecundity of the present study was from 260-554 eggs, highest fecundity was observed 554 eggs at the length of 59.0cm and lowest 260 eggs at the length of 41.8 cm. The fecundity was plotted with various body parameters like total length, total weight and gonad weight. The significantly better relationship was observed between fecundity verses with gonad weight followed by body weight and linear relationship was found between fecundity with total length. It was concluded that fish *Mastacembelus armatus* spawns once in a year during the month July as indicated by the highest values of both ova diameters and gonad somatic index.

Keywords: Breeding Biology, Fecundity, Ova diameter, Gonadosomatic index, *Mastacembelus armatus*, River Indus

1. INTRODUCTION

The study of reproduction of fishes is an important parameter in fish biology; consequently, it has its applied status in solving some fishery management queries like determination of spawning standard (Narejo *et al* 1998). *Mastacembelus armatus* also known as zigzag eel of the genus *Mastacembelus* and *Mastacembelidae* family these are indigenous species in Pakistan, Thailand Indonesia, India, Bangladesh, Sri Lanka, and Viet Nam (Narejo *et al* 2002). The spiny eel attains length about 65cm and termed as the biggest among other freshwater eel species is commercially valuable and found in inland waters with palatable size nutritious and delicious (Narejo *et al* 2003). The current study aims to assess the spawning period and productive potential which are significant vital biological parameters and show an important part in estimating the marketable abilities of *Mastacembelus armatus* stocks in Indus River. There is no data is available regarding the reproductive periodicity of this important fish from Pakistan. Present study will serve as base line data for future researchers.

2. MATERIALS AND METHODS

Breeding Biology:

Collection of fish samples

For the above study, 10 fish of both the sexes (5 male 5 female) of *Mastacembelus armatus* of different

sizes was collected from the catch of local fishermen of Indus River near Jamshoro once in a month for five months starting from April- August 2017.

Laboratory studies:

The collected specimen was then transported to research Laboratory Department of Freshwater Biology and Fisheries, University of Sindh, Jamshoro in plastic bags preserved in 10% formalin. Sex and the condition of the gonad of each fish was noted; gonads dissected out, weighed on electronic balance and transferred to a vial filled with 10% buffer formalin for the following subsequent studies.

Measurement of ova diameter

100 ova were measured from each ovary, by using binocular microscope fitted with ocular micrometer according to recommended methods as suggested by LeCren, (1951).

Determination of Gonadosomatic Index (%GSI)

Gonadosomatic Index (%GSI) was determined for male and female separately throughout the study by using

$$\text{GSI \%} = \frac{\text{Gonad weight}}{\text{Total body weight}} \times 100$$

Estimation of fecundity

For fecundity enumeration sub sample of one gram from different regions of ovary like anterior, middle and

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posterior were taken weighed on electronic balance the ova present in one gram of sub sample were determined. The fecundity was estimated on the basis of total weight of the ovaries Fecundity was estimated. The fecundity of the fish was determined by using formula:

$$F = N \times \text{Gonad weight/sample weight}$$

Where:

F= fecundity and

N= the number of egg in the sample.

Various parameters like body weight, gonad weight and total length were plotted against fecundity the relationship of the various parameters were calculated by the least square methods as given by LeCren (1951).

The relationship between various parameters like fecundity – total length, fecundity –body weight and fecundity –gonad weight were determined using linear regression (least square estimation).

3. RESULTS

The measurement of egg size of *Mastacembelus armatus* was recorded from April to August 2017. Size of egg as appeared in the gonad of *Mastacembelus armatus* from Indus River near Jamshoro is exhibited in (Table 1). Egg size varied between 0.55 to 1.00 mm. It starts increasing from April-July with peak in July during the study period. Diameters of all the eggs were found to be uniform and spherical in shape that reflects that the ova shed once in the peak period of breeding (July). No gonad was found in the month of August that indicated that ova were shed during the season Table 1. No indication was found to show the resting oocytes in mature females would reach maturity during the current spawning season. As in case of gonadosomatic index the % of GSI during the present course of investigation was found to be varied between 0.71 to 6.5 and 0.82 to 10.28 in male and female respectively. The values increase during April – July and also showed one maxima in the month of July (Table 2). The mature gonads were shed during the breeding season so that there was no gonad or reduced in weight and size to minimum indices. (Table 2) elucidated that there were no gonads in the month of August it may be seen decreasing values of gonadosomatic index after breeding to the minimum indices in the month of August 0.71 and 0.82 respectively. It was therefore noted that the experimental fish breeds during the month of July once in the season as % of GSI (6.5 and 10.28 and egg size (1.0 mm) values attaining highest in the month of July. Results of egg count in the present course of investigation were based upon 12 ripe experimental fish of *Mastacembelus armatus* from Indus River that exhibited as (Table 3). In investigation it was noted that the egg count in *Mastacembelus armatus* was ranged between 260 to 554 ova. Low egg count 260 egg was observed fish of size 41.8cm and at the weight of 88.0g

and highest fecundity at 554 eggs at the length of 59cm and 155g in weight Table 3. The mean ova at one gram weight of the body and ovary gonad was noted as 5.87 and 809 respectively. For enumeration of dependency of fecundity with different parameters such as weight of ovary, length of body and weight of *Mastacembelus armatus*, the fecundity was plotted against their respective variable exhibited ideal correlation with gonad weight ($r=0.99$) followed by body weight ($r = 0.98$). The upward tendency in fecundity increases in relation to body length ($r = 0.96$).

Table 1. Month wise changes in ova diameter of *Mastacembelus armatus* from Indus River near Jamshoro, Sindh Pakistan

S. No.	Months	Number of Female	Ova diameter (mm)
1	April	05	0.55
2	May	05	0.71
3	June	05	0.93
4	July	05	1.0
5	August	05	No eggs

Table 2. Month wise changes in gonadosomatic index of *Mastacembelus armatus* from Indus River near Jamshoro, Sindh Pakistan

S. No	Months	No. Of male	% GSI male	No. of female	% GSI female
1	April	05	3.40	05	5.32
2	May	05	4.80	05	6.43
3	June	05	5.50	05	8.0
4	July	05	6.5	05	10.28
5	August	05	0.71	05	0.82

Table 3 Length, weight gonad weight and fecundity of experimental fish, *Mastacembelus armatus* from Indus River near Jamshoro

S. No.	Length of fish (cm)	Weight of fish (g)	Gonad weight (g)	Fecundity
01	41.8	88.0	6.8	260
02	48.0	98.0	8.9	360
03	52.5	143.0	8.6	489
04	55.0	120.0	9.2	485
05	58.9	145	6.8	260
06	59.0	155	10.2	554
07	46.1	90.0	7.0	280
08	49.3	100	7.3	300
09	51.1	110	7.2	295
10	43.8	95.5	7.4	310
11	47.3	97.0	7.9	350
12	50.0	130.5	8.0	390

The equations of correlation coefficient of fecundity verses body parameters calculated as

$\text{Log } F = 0.32 + 2.54 \text{ Log } Gw$ ($r = 0.99$) (Fecundity – gonad weight)

$\text{Log } F = -1.4 + 0.7 \text{ Log } Bw$ ($r = 0.98$) and (Fecundity – body weight)

$\text{Log } F = -1.8 + 1.7 \text{ Log } Bl$ ($r = 0.96$) (Fecundity with total length)

The values of different body parameters plotted with fecundity that indicated linear relationship of fecundity with the gonad weight ($r = 0.99$), followed by fecundity and body weight ($r = 0.98$) and upward tendency was noted fecundity and body length ($r = 0.96$)

4. DISCUSSIONS

The present investigation on breeding biology of spiny eel *Mastacembelus armatus* from Indus River near Jamshoro have been initiated with a view to contributing basic knowledge towards their profitable commercial production. The investigation was based on reproductive periodicity includes ova diameter, gonadosomatic index and estimation of fecundity. The diameter of ova in the present research was observed as 0.55 to 1.0. Similar observation was also recorded by (Narejo *et al.*, 2002) in *M. armatus* from Bangladesh. Nabi and Hossain (1996) in *Macragnathusaculeatus*, the maximum ova size was noticed 1.00 mm. Egg were uniform in diameter. (Ali *et al* 2013) in *Mastacembelus armatus*, they noticed range of ova between 0.20, 1.90 and 2.20 mm. (Mian *et al.*, 2015) in *Monopterusuchia* ranged 0.3 mm to 4.30 mm. (Narejo *et al.*, 2015) in *Channa striatus*. They recode ova size 0.70-1.30mm. (Jalbani *et al.*, 2015) observed ova diameter of *Heteropneustes fossilis* size of ova diameter was 0.90-1.10. (Jalbani *et al.*, 2016) recorded size of ova 0.24-1.40 in catfish *Rita rita*. Findings of these all researchers are in accordance of the present work. In the present study values of gonadosomatic index was noticed from 0.71-6.5 for male and 0.82- 10.28 for male respectively. Numerous works recorded alike values from the eels. Like (Narejo *et al.*, 2002) recorded values of GSI 8.40 and 10.58 for male and female respectively in *Mastacembelus armatus*. (Mian *et al.*, 2015) calculated GSI values 2.14 in male and 5.1 in female in *Monopterusuchia*. These all values are alike or similar with current research. Many workers also determined GSI value in other fish species also like (Narejo *et al* 2006) in *G. chapra*, (Jalbani *et al.*, 2015) in *Heteropneustes fossilis* and (Chandio *et al.*, 2016) in *Notopterusnotopterus*. Diameter of ova showed inverse relationship with fecundity ova diameter increases and decreases fecundity. The fecundity of *Mastacembelus armatus* in the present study was recorded 260-554 eggs at the length of 41.8-59.0cm

respectively. Numerous researchers reported low ova diameter values with high fecundity in number of fish species as (Phatak and Jhingran, 1977: Khan 1988: Nabi and Hussain 1996: Narejo *et al* 1998 and Afroz *et al* 1999: Narejo *et al* 2002)

5. CONCLUSION

It has been observed that the experimental fish breeds once in the year during month of July. Highest fecundity 554 eggs were observed at the length of 59.0 cm at gonad weight of 10.2 and lowest 260 were recorded at 41.8cm and fecundity posse's strong relationship with gonad weight.

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