http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 5 (7): 809-811, 2002

Studies on the Reproductive Biology of Freshwater Spiny Eel, *Mastacembalus armatus* (Lacepede) Reared in the Cemented Cisterns of BAU, Mymensingh, Bangladesh

N. T. Narejo, S. M. Rahmatullah and M. Mamnur Rashid
Department of Aquaculture, Faculty of Fisheries,
Bangladesh Agricultural University, Mymensingh, Bangladesh

Abstract: Some aspects of the reproductive biology of freshwater spiny eel, *Mastacembalus armatus* (Lacepede) has been studied in terms of sex dimorphism, gonadosomatic index, ova diameter and fecundity. The peaks of GSI during May to July for female (10.58± 1.51) and male (8.40± 1.80) indicate that the fish have only one breeding season during summer. The range of ova diameter was found to vary from 0.100 to 1.00 mm. The estimation of fecundity ranged from 580 to 10980 eggs, the maximum fecundity was observed from a fish measuring 605 mm in length and 355.8 g in weight, and minimum from a fish, 245 mm in length and 34.7 g in weight. The number of ova per gram body weight was 29.38 and the number of ova present per gram of ovary weight was 407.57. The fecundity increased with the increase in length and weight of the fish. The fecundity data was plotted against total length, body weight and gonad weight of the fish. Fecundity- total length and fecundity- body weight gave a better relationship as compared to fecundity- gonad weight relationship.

Key words: Reproductive biology, *Mastacembalus armatus*, ova diameter, gonadosomatic index, fecundity, freshwater spiny eel

Introduction

The freshwater spiny eel, *Mastacembalus armatus*, locally known as Bam or Baim belongs to a family Mastacembalidae of order Perciformes. It commonly occurs in ponds, lakes, streams and rivers of Bangladesh, India, Pakistan and Sri Lanka (Rahman, 1989). *Mastacembalus armatus* (Baim) is a delicious and widely accepted fish in this sub-continent but unfortunately no progress has been made to culture it economically in Bangladesh although it can survive in any type of freshwater habitat. Ever increasing demand for fish has made quite a few entrepreneurs think deeply to utilize the tremendous potential of this species for culture in freshwater but a serious shortage of some basic scientific information on the biology of this species jeoparadise all their attempts. In view of the above, present investigation is aimed to study the reproductive biology based on gonadosomatic index, ova diameter and fecundity of *Mastacembalus armatus* from the cemented cisterns of the Bangladesh Agricultural University Mymensingh.

Few isolated studies related to secretory cells in the gills of an Indian fresh water spiny eel (Kapoor, 1957 and Maheshwari, 1966 and 1971) cephalic sensory canals and a case of abnormality in the testes are available.

At present no published information is available on any aspect of the reproductive biology of these important fresh water eel from this sub-continent. So that the present study was designed to supply such information and to serve as a basis for subsequent studies on the reproductive biology of this important freshwater eel from Bangladesh.

Materials and Methods

The above study was conducted for a period of twelve months from February 2001 to January 2002. From the examination 120 specimens of *M. armatus* were collected from cultural stock maintained in the cemented cisterns of Bangladesh Agricultural University (BAU) Mymensingh. Ten mature fish (five males five females) were collected randomly during each month to determine the total length and body weight. The male and female fish were differentiated and data was recorded after dissecting out the gonads of the individual fish. The condition of the gonads was noted and weighed on electronic balance before being preserved in a labeled vial containing 5% buffered formalin for subsequent studies. From each ovary, diameter of about 100 ova was measured by using a graticule under the dissecting microscope. Gonadosomatic index (GSI) of the male and female was determined separately by using the following method.

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

For fecundity estimation gravimetric method was applied in the present studies. The gravimetric method has been successfully used as described by Blay (1981), Dewan and Doha (1979). For fecundity estimation 15 matured fish ranged from 245-605 mm (in TL) were used. Samples taken from the anterior, middle and posterior region of both ovaries were weighed separately and the number of ova present within each sample was counted, fecundity was estimated on the basis of total weight of the ovaries. The fecundity of the fish was obtained by using the following formula:

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

Where, F is the fecundity and N is the number of eggs in the sample. The relationship between various parameters *viz.*, fecundity-total length, fecundity –body weight and fecundity-gonad weight were determined by the method of least square.

Results

Sex dimorphism: The fish *Mastacembalus armatus* is diecious but there are no secondary sex characters. The sex of *M. armatus* could not be recognize easily outside the spawning season except by dissection. During the breeding season the male became active and brighter in colour while female became more pot- bailed and dull in colour. A light press on the belly of ripe fish had brought the whitish milk from males and the eggs from females. Females grew faster than the males and so attained a larger size.

Gonadosomatic index (GSI): Gonadosomatic index was ranged from 0.76-8.40 in males and 0.82-10.58 in females and also showed one peak in July (Table 1). During the present study the higher values of GSI were observed from May to July it ranges from 4.80-8.40 and 6.89 to 10.58 with mean 6.60 ± 1.80 and 8.61± 1.51 for males and females respectively (Fig. 1). After extrusion or evacuation of ripe ova, the gonads were suddenly reduced in size and weight. There were no ova from August to November (Table 1) because the percentage of GSI declined rapidly

Table 1: Month-wise changes in ova diameter and gonadosomatic index (GSI) of males and females of *M. armatus*

Sr. No.	Months		No. of females	Mean % of GSI	Maximum ova diameter (mm)	No. of males	Mean % of GSI
1	February	2001	5	2.90	0.300	5	1.99
2	March	"	5	4.05	0.400	5	2.30
3	April	"	5	5.51	0.500	5	3.46
4	May	"	5	6.89	0.750	5	4.80
5	June	"	5	8.36	0.90	5	6.60
6	July	"	5	10.58	1.00	5	8.40
7	August	"	5	0.82	0.00	5	0.76
8	September	"	5	0.89	0.00	5	0.80
9	October	"	5	0.93	0.00	5	0.85
10	November	"	5	1.39	0.00	5	1.00
11	December	"	5	1.90	0.100	5	1.25
12	January	2002	5	2.20	0.200	5	1.60

Table 2: Data on fecundity to total length (TL), body weight (BW) and gonad weight (GW) of *M. armatus*

Sr. No.	Length of fish (mm)	Weight of fish (g)	Gonad weight (g)	Fecundity
1	245	34.7	2.2	580
2	283	68.1	3.8	1191
3	475	139.4	8.5	2890
4	493	191.2	12.3	4640
5	555	280.5	16.6	7870
6	366	150.2	10.4	3622
7	395	160.0	11.2	4085
8	507	220.8	13.0	5217
9	301	90.5	4.5	1389
10	434	140.5	10.8	3442
11	589	310.7	21.9	9540
12	404	180.0	15.5	7372
13	605	355.8	25.2	10980
14	317	105.3	6.5	2020
15	385	180.7	17.9	8770

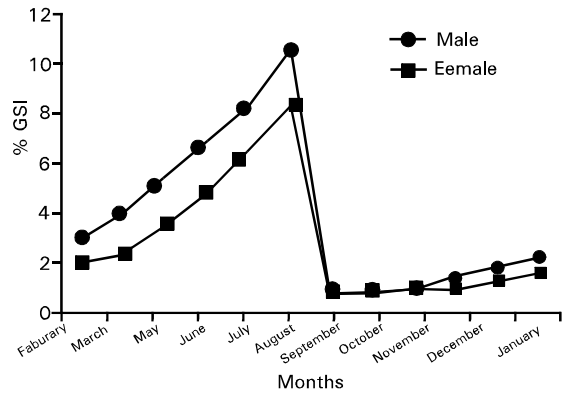

Fig. 1: Changes of gonadosomatic index (GSI) in males and females of *Mastacembalus armatus*.

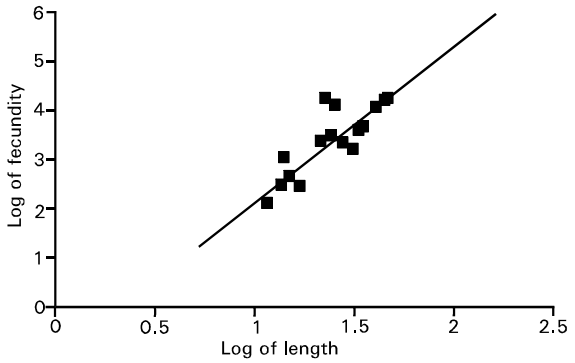

Fig.. 2: Logarithmic relationship between fecundity and body length of female *M. armatus*.

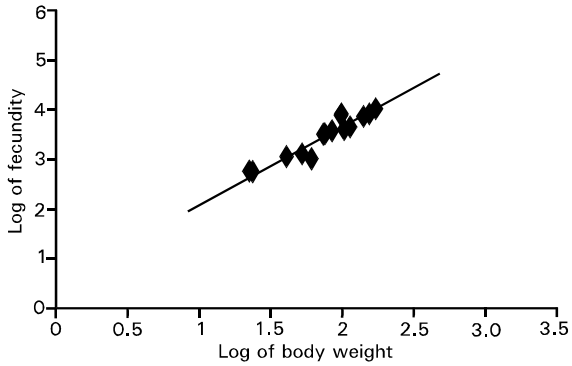

Fig. 3: Logarithmic relationship between fecundity and body weight of female *M. armatus*.

after spawning to minimum indices during August, 0.76 ± 0.20 and 0.82 ± 0.10, respectively. Therefore it was observed that the fish spawned once in a year with one spawning peak highest in the month of July as indicated by the values of both ova diameter (1.00 mm In July) and gonadosomatic index (6.60 and 8.61) respectively.

Maturation of ova: The data on ova diameter and changes in GSI in males and females of *M. armatus* from the cemented cisterns of BAU, Mymensingh is presented in Table 1. During the period of twelve months (February, 2001- January, 2002) diameter of ova found in the ovaries of *M. armatus* was recorded. The diameter of ova ranged from 0.100 to 1.00 mm during December to July. All the ova (100) were measured and found to be spherical and uniform in diameter, it indicates that the eggs were shed in a single batch during the peak period of spawning May to July. Thus the eggs shed in a season developed simultaneously. No evidence was found to show that the resting oocytes in mature females would reach maturity during the current spawning season.

Fecundity: The estimate of fecundity in present study was based on 15 specimens of mature females of *M. armatus* sampled during April to July 2001. These individuals ranged in size from 245- 605 mm in length (TL) and 34.7– 355.8 g in weight. The estimation of ova, in the present study ranged from 580-10980 eggs. The maximum fecundity was observed from a fish measuring 605 mm (TL) in length and 355.8 g in weight and the minimum from a fish measuring 245 mm (TL) in length and 34.7 g in weight. The number of ova present per gram of body weight was 29.38

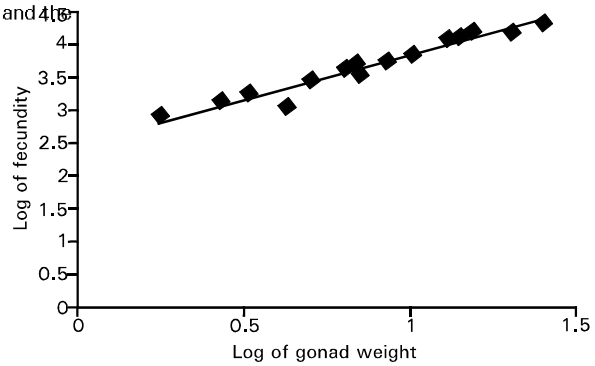

Fig. 4: Logarithmic relationship between fecundity and gonad weight of female *M. armatus*

number of ova present per gram of ovary was 407.57. The fecundity increases with the increase in length and weight of the fish. The equations of regression coefficient between total length (TL), body weight (BW) and gonad weight (GW) versus fecundity (F) (Fig. 2,3 and 4) are given below.

Log F= -1.74+ 3.30 x Log L (Fecundity- Total length relationship)
Log F= - 0.53+ 1.39x LogW (Fecundity- Body weight relationship)
Log F= 1.87+ 1.69x Log Gw (Fecundity- Gonad weight relationship)

As may be noted from the above regression equations it would appear that the fecundity has a linear relationship with total length and body weight. It is clear that the fecundity of this fish was mainly dependent on their total length and body weight. The fecundity- total length and fecundity body weight relationship was found to be more dependable than the fecundity- gonad weight relationship.

Discussion

The reproductive biology of freshwater spiny eel, *Mastacembalus armatus* were described for twelve months from February 2001 to January 2002. There were no secondary sex characters in *M. armatus* and female became more pot-bailed during the spawning season. Narejo *et al.* (1998) reported similar observations, no secondary sex characters in *Tenualosa ilisha.* Berra (1984) observed milk and egg on applying slight pressure on the belly of *Prototractes maraena* male and female respectively. It was observed during the present studies that the fish have only one breeding season in summer and spawn during May to July with peak in July, similar observations have been reported by Nabi and Hossain (1996) in freshwater spiny eel, *Macrognathus aculeatus.* The maximum size of the mature egg found during the present investigations was 1.00 mm. The eggs were spherical and uniform in diameter. Similar findings were also reported by Nabi and Hussain (1996) in the spiny eel, *Macrognathus cualeatus.* The gonadosomatic index (GSI) during the present investigations shows one peak in summer and the mean GSI 8.61 ± 1.51 and 6.60 ± 1.80 in females and males, respectively during the months from May to July, it indicates that all the mature ova were released at once during the spawning season. Nabi and Hossian, (1996) also reported the single spawning season from May to July and all the mature ova were released during the breeding season in spiny eel *Macrognathus aculeatus.* The fecundity estimation during present study ranged from 580 to 10980 eggs and the size ranged from 245 to 605 mm (TL). The fecundity increased with the increase in length and weight of the fish. The results of the present study are very similar to those obtained by Kabir *et al.* (1998) in *Gudusia chapra.* During the present investigations the fecundity was plotted against the body length, body weight and gonad weight. It was observed that the fecundity body length and fecundity body weight relationship gives a better relationship as compared to fecundity-gonad weight relationship. Similar observations were reported by many authors like Kabir *et al.*(1998) in *Gudusia chapra.* Faruq *et al.* (1996) in *Clarias batrachus.* Azadi and Siddique, (1986) and Das *et al.* (1989) in *Heteropneustes fossilis,* Danwattana and Nakorn (1985) in *Channa striatus* and Azadi *et al.* (1987) in *Mystus vittatus.* The same linear relationship was also observed between the two variables i.e. fecundity- total length and fecundity- body weight relationship.

References

Azadi, M. A. and M. S. Siddique, 1986. Fecundity of catfish, *Heteropneustes fossilis* (Bloch). Bangladesh. J. Zool., 14: 33-39.

Azadi, M. A., M. A. Islam and S. R. Dev, 1987. Some aspects of the biology of *Mystus vittatus* (Bloch) food and feeding habits and fecundity. Abstracts, BAAS Conference., pp: 36.

Berra, T. M. 1984. Reproductive anatomy of the Australian grayling, *Prototractes maraena* (Cunther). J. Fish. Biol., 25: 241-251.

Blay-Jr, J., 1981. Fecundity and spawning frequency of *Sarotherodon galiaeus* in a concrete pond. Aquaculture, 25: 95-99.

Danwattana, W., and Ulhairat-Na-Nakorn, 1985. Study on fecundity and relationships between fecundity, length and weight in snake head (*Channa striatus* Fowler). Kan prachum tang wichakan khrang thi 23 sakha pramong., pp: 271-279.

Das, M., S. Dewan and S. C. Debnath, 1989. Studies on fecundity of *Heteropneutes fossilis* (Bloch) in a minipond of Bangladesh Agricultural University, Mymensingh. Bangla. J. Agric. Sci., 16: 1-6.

Dewan, S. and S. Doha, 1979 Spawning and fecundity of certain pond fishes. Bangla. J. Agric., 4: 1-8.

Faruq, M. A., M. R. Amin, S. M. Rahmatullah and M. I. Miah, 1996. The fecundity of *Clarias batrachus* (Linnaeus) and the relationship of fecundity with length and weight. Bangla. J. Fish. 19: 67-70.

Kabir, A. K. M. A., M. A. Hossain, S. M. Rahmatullah, S. Dewan and M. S. Islam, 1998. Studies on the gonadosomatic index and fecundity of chapila (*Gudusia chapra* Ham.). Bangla. J. Fish, Res., 2: 195-200.

Kapoor, B.G., 1957. Secretory cells in the gills of an Indian fresh water spiny eel, *Mastacembalus armatus* (Lacep.). Japan. J. Ichtyhology, 123- 126.

Maheshwari, S.C., 1966. A case of abnormality in the testes of *Mastacembalus armatus* (Lacep). Japanese J. Icthyology, 14: 101-102.

Maheshwari, S.C., 1971. The cephalic sensory canals of *Mastacembalus armatus* L.,J. Zool. Soc. India. 23: 163- 166.

Nabi, M. R. and M. Altaf Hossain, 1996 Reproductive biology of the fresh-water spiny eel *Macrognathus aculeatus* (Bloch). Bangla. J. Zool., 24: 115-120.

Narejo, N. T., S. S. Ali, S.I.H. Jafri and S. M. Hussain, 1998. Studies on the reproductive biology of Palla, *Tenualosa ilisha* from the river Indus. Pak. J. Zool., 30: 223-227.

Rahman, A. K. A., 1989. Freshwater fishes of Bangladesh. Zool. Soc. Bangladesh. Univ. Dhaka. pp: 364.