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Reproductive Biology of Spiny eel, Mastacembelus *armatus*

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Abstract—*The spiny eel, Mastacembelus armatus is a commercially important inland water teleostean fish, Monthly samples of fish were collected from NCR region from January to December, 2016. Fecundity estimation was carried out by using gravimetric method. Timing of spawning was determined by using the gonadosomatic index. (GSI) Male showed a slight numerical superiority over female. Paired Gonads elongated with ripening and extended towards the posterior half of the abdomen of the fish. Gonads developed in March and entered the ripening stage and subsequently got predominant thereafter. Size of ova ranged between 0.4 to 1.45 mm in the ripening stage. Ova sampled from different parts of the ovary were of the same size indicated one spawning in a year. Fecundity increased with size and weight of fish. Absolute fecundity varied between 927-7409 egg cm-1 in the specimens of M. armatus ranged from 12.0-48.2 cm in size. Length-wise the fecundity varied between 53-146 egg cm-1.with an average of 63 egg cm-1 and weight wise it varied between 13-88egg g-1with an average of 29 egg g-1 of the body weight of the fish. Regression analysis indicated that the total length and weight could be used to predict fecundity of this spiny eel, but weight proved to be the best predictor of fecundity (r=0.9151). Although in both cases significant correlation was noted (p<0.001).Ova per gm of ovary weight varied between 177-1108, with an average of 64egg g-1. The condition of all the ova in an ovary being at the same stage of development is indicative of the fact that spawning in this fish take place only once in a year.*

Keywords*: Reproductive, biology, spiny eel*

INTRODUCTION

The freshwater spiny eel *Mastacembelus armatus* locally known as baam ,belongs to the family mastacembelidae of order symbranchiformes. The fish, *M.armatus* is very popular and widely accepted in Indian subcontinent due to its good taste ,high market value, lucrative size and high protein contents. The caloric value of eel flesh is as high as 303 cal/100 g compared to 110 cal/100 g in other average fishes (Nasar,1997). In northern and eastern India, the fish is very popular when sold alive. It occurs in a variety of freshwater habitats in the plains as well as in hills of India (Talwar & Jhingran, 1991). Despite its abundance, palatability and consumer appeal,no published information is available on the biology and culture of *M.armatus* hence no scientific culture method is being used. This fish received an urgent attention, due to the declining wild population .The decline in population is attributed to the loss of habitat, introduction of alien species, disease, pollution siltation, poisoning, dynamite and other destructive fishing. Reproductive biology of a fish is of much importance in connection with its rational management. Studies of reproductive potential of fish are used in formulating the degree of rearing facilities needed and to assess the aquacultural success.

Very little work has been carried out on reproductive biology of spiny eels, though this group of fish is commercially important. Karim and Hossain (1972), worked on sexual maturity and fecundity of *Mastacembelus pancalus,* Saxena *et al*. (1979) observed the cytological details of oocytes of this fish. Qaayum and Qasim (1961) studied the spawning frequencies and breeding season of *Rhynchobdella aculeata (Macrognathus aculeatus)* and Serajuddin *et al.* (2002) studied the reproductive cycle and fecundity of spiny eel. *M. armatus.* Serajuddin (2004) reported the intraspecific diversity of *M. armatus*. The karyotype of *M.armatus* was studied by Das & Khuda Bukhsh (2007). Narejo *et al* (2002) studied the reproductive biology of *M.armatus* fromBangladesh. Pathak *et al* (2012) reported a comparative analysis of reproductive traits in a closely related species, *Macrognathus pancalus* from lentic and lotic ecosystems of Gangetic basin. Serajuddin and Pathak (2012) studied reproductive traits *of M.armatus.* Keeping in mind the paucity of information on this aspect of *M.armatus* present study is undertaken to gather the data on various aspects of breeding of *M.armatus* such as sex ratio, gonad maturation, fecundity and spawning season of this fish.

MATERIALS AND METHODS

Monthly samples of fish were collected from NCR region from January to December with each sample of about 20-30 .The fish were caught using cast and drag nets and brought to

laboratory packed in ice..Total length of each fish was measured from the tip of the snout to the longest caudal fin ray to the nearest 0.1 mm.Their weight (g) was recorded on an electric balance sensitive up to 0.001 g. The fish (size range 5-50 cm) were sexed and divided into five length groups on the basis of their sizes. Except for group one ,where it was 5 cm.,length range of each group was 10 cm.Gonadal condition was examined and the stage of maturation of the samples was determined following the scheme of classification used by Qayyum and Qasim (1964a) for *Ophiocephalus punctatus.*

Fecundity estimation was carried out by using gravimetric method (Lagler 1956) **F=N x Gonad weight/Sample weight**

Where F= Fecundity of fish;and N=Number of eggs in sample

To determine the stages of maturity, the gonads were extracted from the fish, the intra ovarian eggs were taken out and their diameter was measured with the help of an ocular micrometer using 8x12.5 magnification of binocular dissecting microscope. Timing of spawning will be determined by using the gonadosomatic index.(GSI)

GSI=GWx100/BW

Where GW is the Gonad Weight to the nearest 0.01g and BW is the Body Weight of fish (g) nearest to 1.0 g.

RESULT AND DISCUSSION

Feeding Intensity in accordance with Maturity Stages

Both male and female feeds hungrily in the gonad ripening stage, which is the third stage of sexual cycle. This suggests that, at this stage the fish feed more avidly because of a higher energy demand for gonad development. Fish with medium gut fullness in almost all the months suggest that feeding was never discontinued and even during the breeding season, there was no cessation of feeding. Khan *et al* I(1988)also reported the same type of feeding intensity in relation to the stages of maturity in freshwater catfish, *Mystus nemurus*

Maturity Stages

Five maturity stages have been recognized in both males and females *M. armatus* Details about these stages are mentioned below :

Male

Stage I (Immature Virgin): Testes are small, paired, slender, thread like, distinguished microscopically from the ovaries. Vasadeffrentia not very distinct and difficult to locate.

Stage II (Maturing Virgin or Recovering Spent): Testes slightly elongated, opaque and white in colour. Vasa diferentia distinct and easy to locate.

Stage III (Ripening): Testes ivory in colour, more prominent than Stage II. Viscous fluid oozes out if slight pressure iss brought to bear on the abdomen.

Stage IV (Ripe or Full Mature): Testes flabby, massive, creamy white in colour, grown to maximum in size, occupying substantial part of the body cavity and discharge white milt on gentle pressure.

Stage V (Spent): Testes shrunken, their weight drastically reduced in this stage. No milting while pressure on abdomen.

Female

Stage I (Immature Virgin): Ovaries short, translucent, paired, silver in colour thread like structures extending one third of the body cavity. Eggs of circular shape, semitransparent.

Stage II (Maturing Virgin or Recovering Spent): Ovaries thin, slightly elongated. Ova spherical opaque.

Stage III (Ripening): Ovaries yellowish, elongated, slightly lobulated, ovarian blood vessels visible extending almost the entire length of the body cavity. Eggs visible to naked eye.

Stage IV (Ripe or Full Mature): Ovaries yellow white in colour ovarian membrane are very thin. Eggs opaque and very distinct, almost round and easily ejected if slight pressure is applied on the abdomen.

Stage V (Spent): Ovaries flabby, shrunken and left with only a few residual ova in recently spawned fish . Majority of ova were small, transparent, invisible to naked eye, resembles stage II, but differs from it in the relatively smaller sizes and loosely packed mature ova. Weight considerably reduced.

In both of the sexes gonads show a regular seasonal development with little overlap in different phases of maturation.

Sex ratio, Gonad Development, Ova Diameter and Fecundity

Male

Population is slightly higher than female. Pointed gonads elongate with ripening and extend towards the posterior half of the abdomen. Gonads developed in March and entered the ripening stage and subsequently remains large afterward.

Size of ova ranged between 0.4 to 1.45 mm in the ripening stage. Ova sampled from different parts of the ovary were of the same size. The reproductive potential of the fish was measured in terms of fecundity .Fecundity increased with size and weight of fish. Absolute fecundity varied between 927-7409 egg cm-1 in the specimens of *M.armatus* ranging from 12.0-48.2 cm in size. Length-wise the fecundity varied between 53-146 egg cm-1.with an average of 63 egg cm-1 and weight wise it varied between 13-88egg g-1with an average of 29 egg g-1 of the body weight of the fish.

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Table: Regression analyses of fecundity relations in *M.armatus*

Parameters	Regression equation		Correlation Coefficient	significance
	Logarithmic	Parabolic		
Body Length 'L' Vs Fecundity 'F'	Log F= 1.83 + 0.99 Log L	F= 6.7 X 101 L 0.99	0.86	0.001
Body Weight 'W' Vs Fecundity 'F'	Log F= 2.50 + 0.41 Log W	F= 3.1 X 10^2 W0.41	0.91	0.001
Ovary Length 'OL' Vs Fecundity 'F'	Log F= 1.74 +1.88Log OL	F= 5.4 X 101 L 1.88	0.93	0.001
Ovary Weight 'OW' Vs Fecundity 'F'	Log F= 3.21 + 0.14Log OW	F= 1.6 X 10^3OW0.14	0.87	0.001

Regression analysis indicated that the total length and weight could be used to predict fecundity of this spiny eel, but weight proved to be the best predictor of fecundity (r=0.9151). Although in both cases significant correlation was noted ($p<0.001$).Ova per gm of ovary weight varied between 177-1108, with an average of 64egg g-1. Results of the relationship of fecundity with both ovary length and ovary weight are presented in Table 1.The condition of all the ova in an ovary being at the same stage of development is indicative of the fact that spawning in this fish take place only once in a year. Breeding season synchronous with onset of monsoon i.e. from late June to early September. The male female ratio remains near constant throughout the year.

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