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## Reproductive biology of the Cyprinid, *Amblypharyngodon mola* (Hamilton) from the Kaptai Reservoir, Bangladesh

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**Abstract:** *Amblypharyngodon mola* was found to breed thrice a year during the spawning months of July, August, October and March in the Kaptai Reservoir. GSI (Gonadosomatic Index), GLI (Gonadal Length Index) and Ova Diameter (OD) frequency showed three peaks in a year during the breeding months, which confirmed the multiple breeding nature of the fish in Kaptai reservoir. Female dominated significantly over male throughout the year and overall sex ratio of male and female was 1.00:2.078 ( $\chi^2=202.48$ ,  $p<0.01$ ,  $N=1650$ , d.f. 1). Fecundity varied from 1,280 (for a fish of total length 47.5 mm, body weight 1200 mg and ovary weight 90 mg) to 13,679 (for a fish of total length 87.5 mm, body weight 10,528.57 mg and ovary weight 1668.71 mg) with an average  $5,182.67 \pm 3, 731.51$  eggs ( $n=120$ ). Fecundity factor (995 eggs  $g^{-1}$  of body weight) indicated that the fish was highly fecund. Fecundity was highly correlated ( $p<0.01$ ) with body length, ovary weight and ovary length.

**Key words:** Cyprinidae, fecundity, reproduction, *Amblypharyngodon mola*, sex-ratio, Kaptai reservoir

### INTRODUCTION

*Amblypharyngodon mola* (Ham.) locally known as 'Mola', 'Moilla' is a commercially important naturally occurring auto-stocked cyprinid fish in Kaptai reservoir. Morphometric description of Kaptai reservoir is given by Mamun *et al.*<sup>[1]</sup>. Earlier the fish was considered as weed fish in the fish cultured ponds but in advent of time the fish is now highly demanded, economically valuable and costly fish in the market. Considering nutrition value, taste, income source, availability, family chosen fish and to alleviate poverty, recently emphasis was given to culture ten small indigenous fish in Bangladesh, out of which 'Mola' is one of them<sup>[2]</sup>. 'Mola' has high protein, vitamin and mineral contents<sup>[3,4]</sup>.

Knowledge on the reproductive strategy of any fish is very important for productive aquaculture and scientific based fishery management of any water bodies. Although some important works on the reproductive biology of some other fishes of Kaptai reservoir have been done<sup>[5-8]</sup> but no works on the reproductive biology of *Amblypharyngodon mola* have been done except of its' food and feeding habits<sup>[1]</sup> from the mentioned reservoir. However, some works on fecundity<sup>[9-11]</sup>, vitamin contents<sup>[3]</sup> and reproductive cycle<sup>[12]</sup> of *A. mola* have been done from other water bodies of Bangladesh and India.

Reproductive biology i.e. fecundity, spawning, sex ratio etc. are among the important aspects of the biology of fishes which must be understood to explain the

variations in the level of populations as well as to make efforts to increase the amount of harvest<sup>[13]</sup>. Considering its importance in the Kaptai reservoir fishery an attempt was made to study the reproductive biology of *Amblypharyngodon mola* in Kaptai reservoir.

### MATERIALS AND METHODS

A total of 1650 *A. mola* were obtained from the fisherman catch landed at the Rangamati Fish landing station of Bangladesh Fisheries Development Corporation of Kaptai Lake from July 1999 to June 2000. The total length (mm) and weight (mg) of fishes were recorded. The gonads were removed, length and weight were measured to the nearest mm and mg, respectively which after gross examination were preserved in 5% formalin and subsequently subjected to detailed studies. The Gonadosomatic Index (GSI) and Gonadal Length Index (GLI) were computed for different months using the following formulae:

$$GSI = \frac{GW}{BW} \times 100$$

$$GLI = \frac{GL}{TL} \times 100$$

Where, GW= gonad weight, BW= body weight of fish, GL= gonad length and TL= total length of fish

Fecundity factor was calculated by dividing fecundity (F) by body weight (BW) (F/BW).

To study the sex ratio a total of 1650 fishes were used and the ratio was analysed by Chi-square ( $\chi^2$ ):

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Where, O= observed value and E = expected value.

For size frequency distribution of the intraovarian oocytes the diameter of the eggs from the anterior, central and posterior regions of the ovaries of 20 females were measured. Fecundity was measured from 120 mature female fishes ranging from 45 to 95 mm in total length. Ova were counted following the direct method<sup>[14]</sup> with the help of a binocular compound microscope.

### RESULTS AND DISCUSSION

Of the 1650 fishes, 536 were males and 1114 were females. The monthly ratio between males and females ranged from 1.00:1:1.15 to 1.00:3.64, the average being 1.00:2.078 ( $\chi^2 = 202.48$ ,  $p < 0.01$ ,  $N = 1650$ , d.f. 1) (Table 1). Females significantly ( $p < 0.01$ ) dominated over males throughout the year. Dominance of females over males was also reported in *E. vacha* from Kaptai reservoir<sup>[6]</sup>. On the basis of microscopic and macroscopic study three stages of maturity of gonads were recognized.

- Stage 1: Immature-ovum with nucleus, yolk not formed, spent and immature ovaries were white in colour.
- Stage 2: Maturing-ovaries were swelling, yolk developed, nucleus degenerating, colour light yellowish to reddish yellow.
- Stage 3: Ripening-ovum with no trace of nucleus membrane, oil globular present. Ovaries of all gravid females were deep yellow or reddish yellow in colour mainly during March, June, July, August and October.

The ova diameter frequency ranged from 0.2056 mm to 0.5588 mm with peaks in July (0.4758 mm), August (0.5588 mm) and March (0.4967 mm) (Fig. 1). Mean Gonado-somatic Index (GSI) for 145 females ranged from 3.911 to 14.432 with peaks in July (12.752), August (14.432), October (13.572) and March (12.571) while mean Gonadal Length Index (GLI) ranged from 24.009 to 35.124 with peaks in July (32.493), August (35.124), October (33.124) and March (32.286) (Fig. 2). Study of ova diameter frequency, GSI and GLI indicated that *A. mola* was a multiple (thrice in a year) breeder in Kaptai reservoir and July, August, October and March were the spawning months. In Kaptai reservoir small indigenous 'Kaski' fish, *Corica soborna* and *Oreochromis niloticus* were

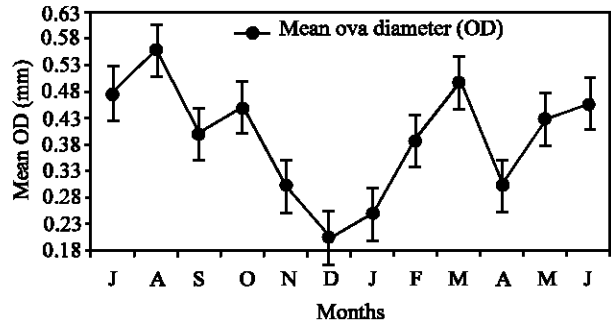


Fig. 1: Monthly variations in the Ova Diameter (OD) (Mean±SD) of *A. mola*

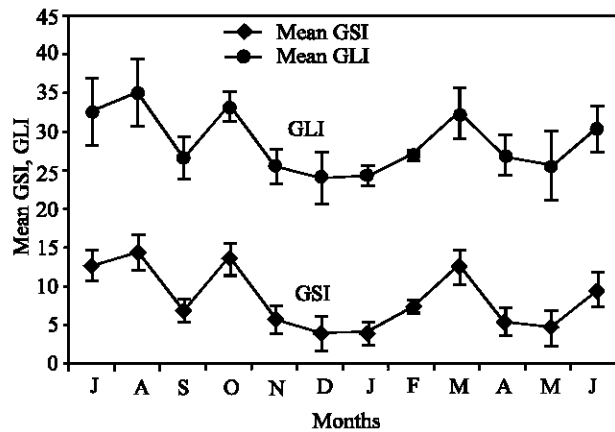


Fig. 2: Monthly fluctuations in Gonadosomatic Index (GSI) and Gonadal Length Index (GLI) (Mean±SD) of *A. mola*

reported to be continuous breeder<sup>[5,15]</sup> while *Eutropichthys vacha* and *Notopterus notopterus* were found to be seasonal breeder (once a year)<sup>[6,8]</sup>.

In the present study fecundity of *A. mola* varied from 1280 (for a fish of total length 47.5 mm, body weight 1200 mg and ovary weight 90 mg) to 13,679 (for a fish of total length 87.5 mm, body weight 10,528.57 mg and ovary weight 1668.71 mg) with an average 5,182.67±3,731.51 eggs (n=120). Fecundity factor (995 eggs/g of body weight) showed that the fish was highly fecund. The fecundity (F) was highly correlated ( $p < 0.01$ ) with total length (TL), body weight (BW), ovary length (OL) and ovary weight (OW) and the relationships (curvilinear and linear) were as follows:

$$F = 0.02004 TL^{2.893} \text{ or } \text{Log } F = -1.698 + 2.893 \text{ Log } TL \quad (r = 0.864, p < 0.01)$$

$$F = 0.02598 BW^{0.837} \text{ or } \text{Log } F = -1.586 + 0.837 \text{ Log } BW \quad (r = 0.843, p < 0.01)$$

$$F = 0.04806 OL^{1.776} \text{ or } \text{Log } F = -1.318 + 1.776 \text{ Log } OL \quad (r = 0.835, p < 0.01)$$

$$F = 0.01524 OW^{0.672} \text{ or } \text{Log } F = -1.816 + 0.672 \text{ Log } OW \quad (r = 0.816, p < 0.01)$$

Dewan and Doha<sup>[10]</sup> observed that the fecundity of *A. mola* ranged from 1,021 to 13,812. Parveen<sup>[11]</sup> stated that

Table 1: Monthly distribution of sex ratio and chi-square ( $\chi^2$ ) values of *A. mola*

Months	No. of fish	Male (Obs.value)		Female (Obs. value)		Ratio of male and female	$\chi^2$ (male+female)	Level of significance
		No.	%	No.	%			
Jul.	201	55	27.36	146	72.63	1:2.65	41.19	p<0.01
Aug.	150	50	33.33	100	66.66	1:2	16.67	P<0.01
Sep.	150	45	30.00	105	70	1:2.33	24.00	p<0.01
Oct.	125	50	40.00	75	60	1:1.5	5.00	p<0.01
Nov.	141	52	36.87	89	63.12	1:1.71	9.70	p<0.01
Dec.	135	45	33.33	90	66.66	1:2	15.00	p<0.01
Jan.	125	40	32.00	85	68	1:2.15	16.20	p<0.01
Feb.	140	50	35.71	90	64.28	1:1.8	11.42	p<0.01
Mar.	144	56	38.88	88	61.11	1:1.57	7.11	p<0.01
Apr.	95	35	36.84	60	63.15	1:1.71	6.58	p<0.01
May	116	25	21.55	91	78.44	1:3.64	37.56	p<0.01
Jun.	128	33	25.78	95	74.2	1:2.878	30.03	p<0.01
G.T.	1650	536	32.48	1114	67.51	1:2.078	202.48	p<0.01

the average fecundity of *A. mola* was 3,601. Mitra and Jain<sup>[9]</sup> showed that the fecundity of *A. mola* ranged from 1,210 to 16,072. Afroze and Hossain<sup>[13]</sup> stated that the fecundity of *A. mola* ranged from 400 to 8,550. Mustafa<sup>[14]</sup> stated that the fecundity of *A. mola* was 738. In the present study the fecundity (1,280-13,679) of *A. mola* in Kaptai reservoir closely agreed with those recorded by Dewan and Doha<sup>[10]</sup>, Mitra and Jain<sup>[9]</sup> but partially with those of Mustafa<sup>[14]</sup>, Parveen<sup>[11]</sup>, Afroze and Hossain from other water bodies of Bangladesh and India.

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