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STUDIES ON THE GONADOSOMATIC INDEX AND FECUNDITY OF *Mystus gulio* (Ham.)

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ABSTRACT

The study was conducted for a period of twelve months from January to December 2006 to determine the gonadosomatic index (GSI) and fecundity of *Mystus gulio*. Total 370 of *Mystus gulio* were examined during the study period. The sex ratio (male:female) of the investigated fish was 1:1.22 and generally female was larger than male. The fish was found to have a wide spawning season (March to November) with a single spawning peak in July as indicated by the gonadosomatic index and ova diameter. Fecundity of the fish was ranged from 3,891 to 1,68,358 with an average of 32,909.49 during the period of study and was found to increase with the increase of body length and weight. The relationships between fecundity and total-length, body-weight, gonad-length and gonad-weight were found linear and statistically highly significant ($p<0.05$).

Key words : Gonado-somatic index, Fecundity, *Mystus gulio*

INTRODUCTION

Mystus gulio (Ham.) locally called 'Nona tengra' belongs to the family Bagridae is an important indigenous estuarine catfish found in the coastal waters of Bangladesh (Talwar and Jhingran, 1991). Catfish contribute about 1.46% of the total fish production in Bangladesh (FRSS, 2006). This species contributes a lot to our coastal fishery. It has an increasing demand in both domestic and export markets. In our country the supply of this fish species is fully depends on natural catch. It is found almost throughout the year with peak during rainy season, June to August (Sarkar *et al*., 2002).

Fecundity is one of the most important biological aspects of fish which plays a significant role to evaluate the commercial potentialities of fish stock. This must be known to asses the abundance and reproductive potential of a fish stock (Das *et al*., 1989). It is important to know the fecundity of a fish species for efficient fish culture and effective management practices (Miah and Dewan, 1984).

Some workers have done observation on the some aspects of biology, fecundity and taxonomy of freshwater tengra, *Mystus tengra* (Bhuiyan, 1964 and Khan *et al*., 1992). In the literature, there are several reports of studies on the fecundity, spawning biology, induced spawning, spawning behavior and larvae rearing of *M. gulio* (Sarker *et al*., 2002; Kaliyamurthy, 1981; Alam *et al*., 2006a and 2006b; Islam *et al*., 2007). Sarker *et al*. (2002)

studied only on the GSI of female and fecundity according to length ranges. They did not work on the GSI of male, fecundity and ova diameter changes according to months that are very important information to asses reproductive potential and induced breeding of this species. In view of those facts the present study was conducted to detect the gonadosomatic index and fecundity of *M. gulio* 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, Bangladesh Fisheries Research Institute, Paikgacha, Khulna for a period of twelve months from January to December 2006. Thirty one matured fish were collected randomly during monthly sampling from brackishwater aquaculture farms to determine the total length and weight. The total 370 male and female fish were used to determine the gonadosomatic index and fecundity. The collected specimens were brought to the laboratory and they were firstly cleaned, measured and weighed. The male and female fish were separated and data were recorded after dissecting out the gonad of the individual fish. Then the ovaries and testis of fish were taken out very carefully and preserved in well labeled vials containing 5% buffered formalin for subsequent studies.

Gravimetric (Islam and Talbot, 1968; Evans, 1969; Doha and Hai, 1970) method was followed to determine the fecundity of fish. In this case, 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 matured and immature eggs for each portion were 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 by using the following formula:

$$GSI = (\text{Weight of gonad}/\text{Weight of fish}) \times 100$$

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 fish 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

Maturity and spawning

The sex ratio (male: female) of the examined fish were recorded 1:1.22. Kaliyamurthy (1981) recorded the male and female sex ratio 1:1.27 of same species in Lake Pulicat which result is very close to the findings of the present study. The total length and weight of the male fish ranged from 10.5 to 20.6 cm and 18 to 102g respectively whereas it was 12.3 to 24.5 cm and 20 to 205g respectively in case of female. From the study it was observed that the female was larger than the male that is similar to the findings of Kabir *et al.* (1998) in case of *Gadusia chapra*.

Month-wise average highest length and weight of testis were 4.54 cm and 1.7625g respectively in the month of July which indicated that there was one peak period of sperm production of male *M. gulio*. Length of ovaries of the matured females was ranged from 1.5 to 11.0 cm and the weight of the same from 1.09 to 53.11 g. The highest values of length (7.97 ± 1.22 cm) and weight (26.72 ± 11.26g) of ovaries were observed in the month of July which indicated the peak spawning season.

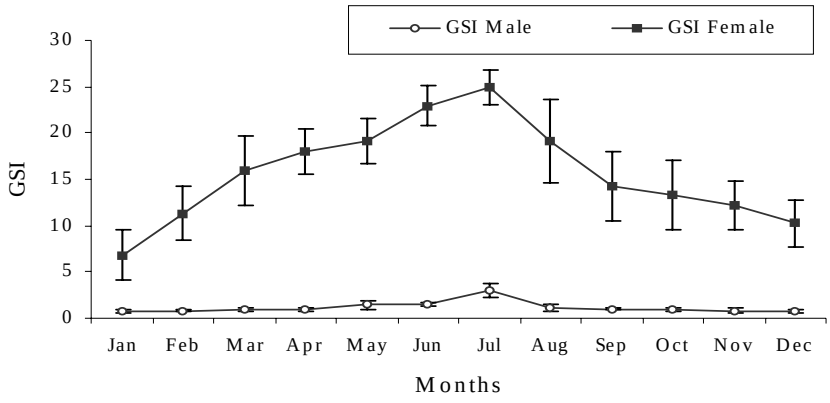

Fig. 1. Monthly variation of GSI for male and female *Mystus gulio*

Monthly average GSI values of male and females are graphically presented in Fig. 1. From the figure it was clearly observed that GSI values of both male and female were found to increase from March onwards reaching a peak in July followed by a gradual decrease up to December. Increase in GSI values indicated development of the gonads during March to July and a drop in December which indicated spent stage of the fish. Similar finding was also observed in the same species by Sarker *et al.* (2002). Ova diameter were found to range from 450 to 1000.2 µm and average highest value (841.8 ± 76.98 µm) (Table 1) was observed in July showed a single peak which is comparable to the observations made by Pantulu (1961); David (1963). From this study it was observed that *M. gulio* has a wide spawning season (March to November) which coincides with the findings of Sarker *et al.* (2002); Jhingran and Natarajan (1969).

Table 1. Month-wise fecundity and ova diameter of *M. gulio*

Month	No. of fish examined	Total length (cm)	Body weight (g)	Mean fecundity (No.)	Mean ova diameter (µm)
January	15	16.12 ± 1.84	43.27 ±17.11	9894 ± 5827	625.09 ± 91.48
		(14.0-20.0)	(20-76)	(3891-20000)	(450.29-745.5)
February	14	15.04 ± 1.10	43.64 ± 9.39	14894 ± 715	631.65 ± 73.76
		(13.0-17.0)	(27-56)	(9985-20428)	(466.76-780.9)
March	20	14.29 ± 0.74	33.60 ± 5.10	18127 ± 4769	645.8 ± 78.06
		(13.0-16.0)	(25-45)	(8260-25996)	(490.6-805.25)
April	20	15.02 ± 1.72	47.8 ± 9.80	26255 ± 8642	698.0 ± 71.07
		(12.30-17.50)	(32-68)	(15810-44252)	(569.39-814.1)
May	20	17.65 ± 1.86	69.90 ±20.37	46594 ± 18540	700.33 ± 77.26
		(12.30-17.50)	(47-106)	(26907-76077)	(490.9-790.34)
June	20	18.03 ± 2.69	85.4 ± 27.09	62979 ± 22273	773.18 ± 93.3
		(13.9-22.8)	(53-133)	(35040-105400)	(525.9-1000.2)
July	20	20.45 ± 2.57	115.0 ± 43.37	81532 ± 36607	841.8 ± 76.98
		(16.5-24.5)	(64-205)	(37800-168358)	(750.1-1000.2)
August	10	19.42 ± 1.68	98.4 ± 14.55	55274 ± 15350	727.41 ± 97.62
		(16.8-22.5)	(82-120)	(33170-88920)	(566.78-900.1)
September	15	16.35 ± 1.63 (13.9-19.9)	48 ± 11.63	19165 ± 8100	710.5 ± 78.5
			(35-80)	(11880-41160)	(583.45-866.8)
October	20	14.83 ± 0.76 (13.9-19.9)	35.15 ± 4.76	15479 ± 3842	678.37 ± 72.68
			(28-47)	(8372-21267)	(569.39-814.1)
November	14	15.47 ± 0.78 (14.5-17.0)	45 ± 7.33	14658 ± 2204	629.06 ± 78.73
			(35-56)	(11520-17999)	(450-805.25)
December	15	16.66 ± 1.38 (15.2-19.3)	44.26 ± 16.29	9343 ± 4174	620.75 ± 73.64
			(21-74)	(4492-17500)	(490.6-833)

Figures in parentheses indicate ranges of different parameters

Fecundity

For fecundity studies 203 specimens in the total length range of 12.3- 24.5 cm were examined. Fecundity of the *M. gulio* was found to range from 3,891 to 1,68,358 with an average of 32,909.49 during the period of study (Table 1). The study of fecundity indicated a linear relationship with total-length, body-weight, gonad-length and gonad-weight of the fish (Figs. 2, 3, 4 and 5). 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 *M. gulio* respectively. The relationship between

fecundity and total length, body weight, gonad length and gonad weight were found statistically highly significant ($p<0.05$) which is seemed to be similar to those reported by Kabir *et al*. (1998); Khan *et al*. (1992); Das *et al* (1989). Among the relationships, relationship between fecundity and gonad weight showed very close (r= 0.987).

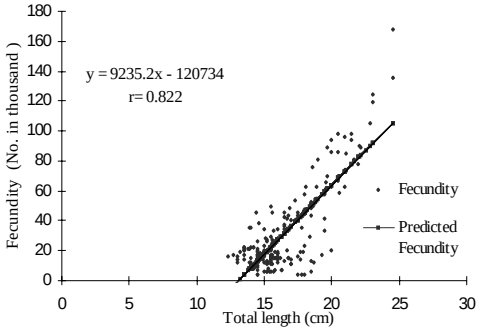

Fig. 2. Showing the relationship between fecundity and total length of *M. gulio*

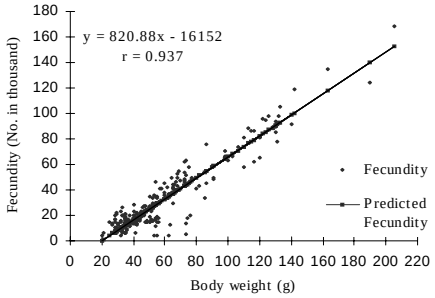

Fig. 3. Showing the relationship between fecundity and body weight of *M. gulio*

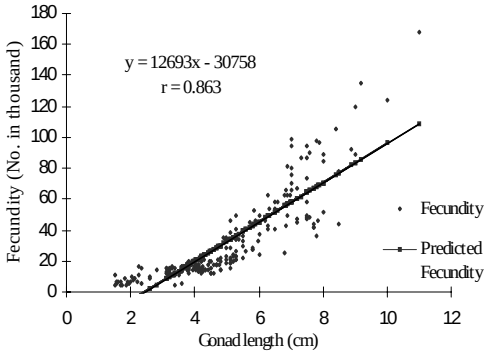

Fig. 4. Showing the relationship between fecundity and gonad length of *M. gulio*

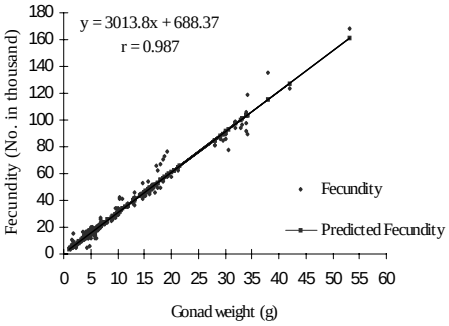

Fig. 5. Showing the relationship between fecundity and gonad weight of *M. gulio*

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