



SOME ASPECTS OF BIOLOGY OF *MYSTUS VITTATUS* (BLOCH 1794) FROM THE MOURI RIVER, KHULNA, BANGLADESH

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Abstract: The study of some biological aspects of *M. vittatus* from the river *Mouri* would provide a basis for further detailed assessment and the conservation of the species. Length-weight relationship, condition factor (K), relative condition factor (K_n), fecundity and egg diameter of *Mystus vittatus* (Bloch, 1794) were estimated from 120 individuals collected from the *Mouri* river of Khulna district, Bangladesh during August 7 to October 25, 2006. The total length (L_T) ranged from 7.2 to 13.4 cm, body weight (W) from 6.9 to 24.2 g for male and 12.1 to 13.6 cm, W from 14.39 to 23.29 g for female. The logarithmic relationship of L_T - W and L_S (standard length)- W were strongly positive ($r = 0.935$ and $r = 0.945$ respectively). The K and K_n varied from 7.24 to 18.49 and 0.44 to 25.81 respectively. The logarithm relationship of L_T - K was not statistically significant ($\text{Log}K_{0.05} = 1.581 - 0.543 \times \text{Log} L_T$, $R^2 = 0.254$) whereas that of L_T - K_n produced negative correlation ($r = -0.841$). The mean bilobed gonad weight (W_G) was 1.41 ± 0.738 g while the left lobe was 0.718 ± 0.375 g and that the right lobe was 0.697 ± 0.367 g. The highest mean egg diameter was 8.75 μm in the left lobe of L_T class 13.5-13.9 cm and the lowest was 8.15 μm of L_T class 13.0-13.4 cm. The fecundity (F) of *M. vittatus* varied from a minimum 1440 to a maximum 5811. The L_T - W_G relationship was positively significant ($\text{Log}W_{G0.05} = 9.85 \times \text{Log}L_T - 10.80$) ($r = 0.831$) and the L_T - F relationship was also significant ($\text{Log}F_{0.05} = 9.179 \times \text{Log}L_T - 6.681$) ($r = 0.778$) while the relation between L_S and F was highly significant ($r = 0.89$).

Key words: *Mouri* river, striped dwarf catfish, *Mystus vittatus*, length-weight relation, condition factor, fecundity

Introduction

The striped dwarf catfish, *Mystus vittatus* (Bloch, 1794), locally known as *Tengra*, *Gholsa* or *Gholsa Tengra*, is abundant in the fresh and brackish waters of South Asia ranging 38° - 0°N (Jhingran, 1991). The Geographical distribution of this small catfish extends throughout Pakistan, India, Srilanka, Nepal, Bangladesh, Burma and Thailand within a temperature range 22-28 °C (Jhingran, 1991). Its color in life varies with age; generally delicate gray-silvery to shining golden, with several (about 5) pale blue or dark brown to deep black longitudinal strips on either side. A narrow dusky spot often present on the shoulder. The fins are glassy with dark tips (Taki, 1974). Adults inhabit standing and flowing waters, usually, among vegetation on the margin in lakes and swamps with a mud substrate (Pethiyagoda, 1991). Natural habitat of this species is mainly canals, *beels*, ponds, ditches, inundated fields throughout Bangladesh (Shafi and Quddus, 1982). It can tolerate adverse water conditions (Rahman, 2005). It feeds on plants, shrimps, insects, mollusks and fish (Pethiyagoda, 1991). *Mystus vittatus* is oviparous, behaves distinct pairing like other members of the family Bagridae. It shows dioecism; breeds and releases egg in summer and rainy season (Breder and Rosen, 1966). It is a nonguarder, makes sound during spawning (Riehl and Baensch, 1991). *M. vittatus* is economically important species due to its nutritive status (19.2 g

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protein, 5.8 g fat, 278 mg calcium, 182 mg phosphorus and 200 mg iron per 100 g flesh), delicacy and market demand (Tk.70-110 per kg) (Rahman, 2005; Siddique and Chowdhury, 1996). The length–weight relationship is used in fishery to investigate environmental adaptability, racial discrimination as well as to estimate growth of a given species (Hile, 1936). Condition factor (K) serves as a useful index of the nutritional and biological cycle *viz.*, gonadal development, spawning etc. Fecundity is one of the most important biological parameters to assess abundance, reproductive potential and to evaluate commercial potential of a fish stock (Das, 1977; Lagler, 1956). The information on the biology of *M. vittatus* from Bangladesh is scanty. However, Rahman (1989) reported its systematics. Azadi *et al.* (1987) reported its fecundity from river. Hossain *et al.* (2006) reported the allometric relationship of *M. vittatus* from the Mathabhanga river, Kustia, Bangladesh.

The derelict *Mouri* river, a link between Rupsha river and a large *beel* through small *khals*, is a habitat of various fish species. *M. vittatus* is one of them which is struggling with the adverse water quality of the river (Kamal *et al.*, 2007). The study of some biological aspects of *M. vittatus* from the river *Mouri* would provide a basis for further detailed assessment and the conservation of the stock. In this perspective, the present study was undertaken to determine the condition and relative condition factor, fecundity, gonad weight and average egg size of *M. vittatus*. The relationships between length and body weight, condition factor and length, condition factor and body weight, fecundity and length, fecundity and body weight, fecundity and gonad weight, gonad weight and length, gonad weight and body weight of the species were also carried out.

Materials and Methods

Physical setting: The *Mouri* river originates from the *Beel Dakatia*, a large water basin on the north of Khulna city. It is fed by water from large number of water channels. From the *Beel Dakatia* a water channel runs south, along the west of the village Teligati. At Aranghata it makes the western boundary of Khulna city corporation and continues southward up to the river Rupsha. At Lata Paharpur the channel takes the name *Khudi Khal*. At the north-west of Rayer Mahal the water channel is joined with another channel. Running between Chak Mathurabad and Choto Boyra the channel enters Sonadunga area at the city inter-district bus terminal from where it takes the name *Mouri* river (Fig. 1).

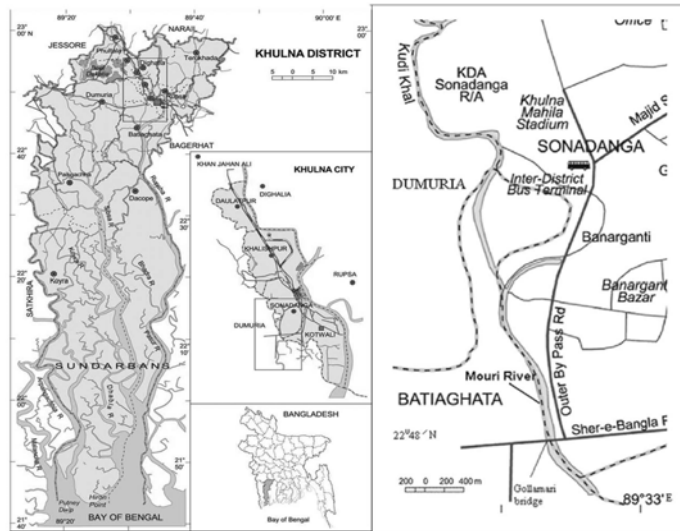


Fig. 1. Sampling location, *Mouri* River. Areas of middle part of the river near the Gollamari Bridge. (Source: Anon., 2004)

Collection of the sample: Using commercial set bag net 120 individuals of *M. vittatus* were captured fortnightly from three different fishing spots of the river *Mouri* between August 7 and October 25, 2006. 20 individuals were selected randomly from the catch in each sampling period. All samples were frozen until processing.

Measurement of total length, standard length and body weight: The washed, clean and blotted dry individual were measured, weighed and examined for various biological parameters. Total length (L_T) (from the tip of the snout to the end of the tail) and standard length (L_S) (from tip of the snout to the base of the caudal fin) were measured in centimeter (cm). Total weight (W) was in g upto three decimal points. Statistical relations were determined using SPSS version 12.0.

Measurement of ovaries: For each sampling period, 10 gravid females were selected based on enlargement and colour (yellowish) of the abdomen female. Abdomen was open with sharp blade and ovaries were taken out, washed with clean water and blotted dry. Individual ovaries were weighed with an electric balance. The two lobes of ovary were measured separately. Diameters of the eggs were measured in microns (μm) by using a micrometer under a compound microscope. Egg samples were taken from both lobes of the ovaries. Randomly selected eggs from anterior, middle and posterior parts of each lobe were measured.

Analysis of length-weight relationship: The length-weight relationship defined by Le Cren (1951) as $W = aL^n$ was used where 'a' is a constant or intercept and 'n' is an exponent or slope. The logarithmic form of this formula was used in this study as follows:

$$\text{Log } W = \text{Log } a + n \text{Log } L$$

The values of 'a' and 'n' in the above equation were calculated by using the following mathematical relationship (Lagler, 1956):

$$\text{Log } a = \frac{\sum \text{Log } W \cdot \sum (\text{Log } L)^2 - \sum \text{Log } L \cdot \sum (\text{Log } L \times \text{Log } W)}{N \cdot \sum (\text{Log } L)^2 - (\sum \text{Log } L)^2}$$

$$\text{and } n = \frac{\sum \text{Log } W - (N \cdot \text{Log } a)}{\sum \text{Log } L}$$

Where, W = Weight in g; L = Length (cm); and, N = Sample size

Statistical software package SPSS 12.0 was used to calculate correlation coefficient 'r'.

Analysis of other relationships: The equation (Le Cren, 1951) used for length-weight relationship was also used to estimate other relationships such as $F-L_T$, $F-L_S$, $F-W$, $F-W_G$, L_T-W_G , L_T-K , L_T-K_n and correlation coefficient 'r'.

Estimation of condition factor (K) and relative condition factor (K_n): The value of 'K' was determined by the following formula:

$K = W \times 10^3 \times L^{-3}$, where W = weight (g), L = length (cm) and 10^3 is the factor used to bring the ponderal index or condition factor (K) near unity (Jennings *et al.*, 2001).

Le Cren (1951) recommended the relative condition factor (K_n) instead of K to estimate the effect of length and other correlated factors. Relative condition factor was calculated by using the following formula:

$K_n = W \times W'^{-1}$, where W = observed weight, W' = calculated weight.

Estimation of fecundity: A precise counting of individual egg gives the accuracy in fecundity estimation (Phillips, 1996). As actual counting of fish eggs is impractical, approximate fecundity may be obtained by Gravimetric method (Lagler, 1956) which was successfully used by Doha and Hye (1970), Dewan and Doha (1979) and Khan *et al.* (1992). Hence fecundity was estimated by using gravimetric equation:

$$F = \frac{N \times \text{Gonad weight (g)}}{\text{Sample weight (g)}}, \text{ where } F = \text{fecundity, } N = \text{number of eggs in the sample.}$$

Results

Size range: L_T of *M. vittatus* in the Mouri river ranged from 7.2 to 13.6 cm. Of the 120 samples 110 were males in which L_T ranged from 7.2 to 13.4 cm and weight range was 6.9-24.2 g and L_T of females (10 nos) ranged 12.1 to 13.6 cm and weight (W) 14.39-23.29 g.

Variation in length and weight of *M. vittatus* in the sampling period: L_T varied over sampling period, the lowest being in August and the highest in October. The mean total length was 8.91, 9.88, 10.63, 11.54, 12.01 and 11.03 cm and mean body weight was 8.2, 10.83, 11.72, 16.13, 18.30 and 15.04 g on the August 7, August 24, September 8, September 23, October 6 and October 25 of year 2006 respectively (Fig. 2).

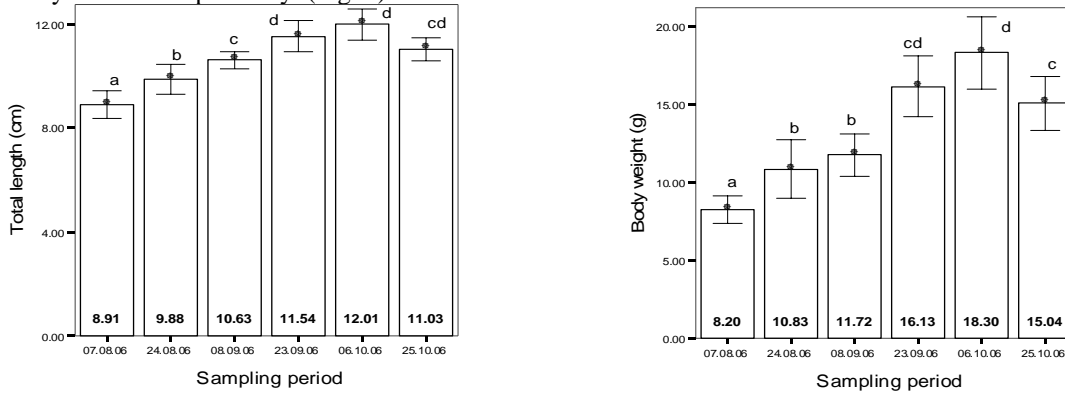


Fig. 2. Mean total length and body weight in different sampling period of *M. vittatus*. Error bars show

Morphometrics: The logarithm relationship between total length (L_T) or standard length (L_S) and body weight (W) gave a strong positive correlation (Fig. 3)

$$(\text{Log } W_{0.05} = -1.419 + 2.457 \times \text{Log } L_T, t = 28.687, r^2 = 0.875, n = 120;$$

$$\text{Log } W_{0.05} = -1.088 + 2.339 \times \text{Log } L_S, t = 31.276, r^2 = 0.892, n = 120).$$

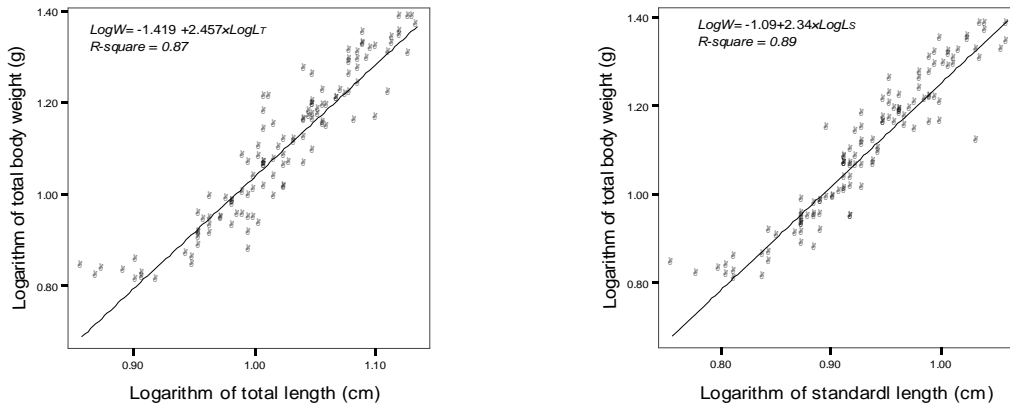


Fig. 3. Relationship of body weight with total length and body weight with standard length in *M. vittatus* from the Mouri river

Condition factor (K): The condition factor (K) of *M. vittatus* was 10.74 ± 1.74 resulting from 7.69 to 18.49 (Mean \pm SD, 10.84 ± 1.74) for male and from 7.24 to 11.29 (9.56 ± 1.19) for female.

Relative condition factor (K_n): The relative condition factor of *M. vittatus* was 1.50 ± 3.25 resulting from 0.44 to 25.81 (1.59 ± 3.39) for male and from 0.44 to 0.58 (0.48 ± 0.05).

Total length-condition factor (K) and relative condition factor (K_n): The condition factor (K) and relative condition factor (K_n) varied with total class length (Table 1) where both K and K_n were found inversely correlated with total class except the length size 13.3-13.9.

Table 1. Condition factor and relative condition factor in terms of total length class

Class limit	Mean Total length (cm)	Observed W (g)	Calculated W (g)	K	K _n
7.0-7.6	7.37	6.76	4.50	16.91	1.50
7.7-8.3	8.05	6.82	6.21	13.07	1.10
8.4-9.0	8.95	7.78	8.46	10.85	0.92
9.1-9.7	9.40	8.24	9.59	9.92	0.86
9.8-10.4	10.10	10.54	11.34	10.23	0.93
10.5-11.1	10.81	12.31	13.11	9.74	0.94
11.2-11.8	11.37	13.39	14.51	9.11	0.92
11.9-12.5	12.16	15.72	16.48	8.74	0.95
12.6-13.2	12.95	17.97	18.46	8.27	0.97
13.3-13.9	13.47	22.92	19.76	9.38	1.16

K=Condition factor, K_n=Relative condition factor.

Logarithmic relationship between total length (L_T) and condition factor was statistically insignificant ($\text{Log}K_{0.05} = 1.581 - 0.543 \times \text{Log} L_T$, $df = 119$, $r^2 = 0.254$, $t = -6.33$), however, significant negative correlation was found between total length and relative condition factor ($\text{Log}K_{n0.05} = 4.729 - 4.685 \times \text{Log} L_T$, $r^2 = 0.707$, $t = -16.88$) (Fig. 4).

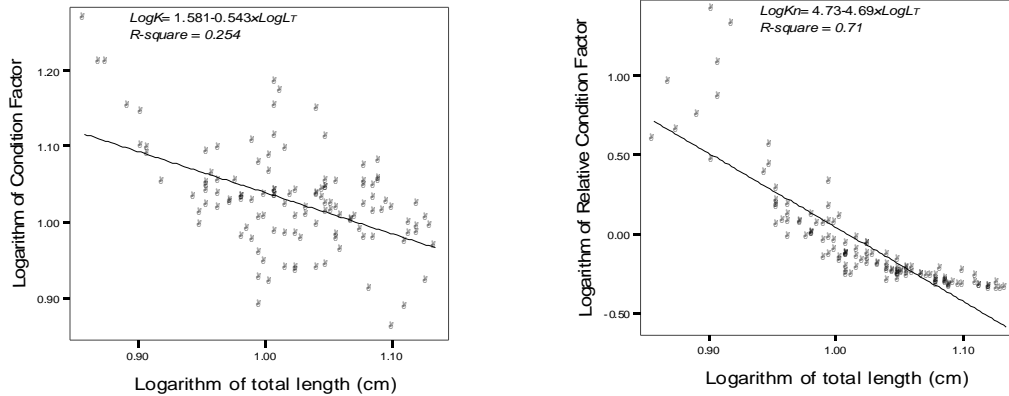


Fig. 4. Relationship of condition factor and relative condition factor with total length in *M. vittatus* from the Mouri river

Ovaries and fecundity: The total weight of the bilobed gonad (Fig. 5) varied from 0.64 g to 3.13 g (1.41 ± 0.738 g) where the left lobe of the ovary varied from 0.34 g to 1.58 g (0.718 ± 0.375 g) and right lobe 0.3 g to 1.55 g. (0.697 ± 0.367 g). The eggs were spherical in shape. The diameter of the eggs of left lobe varied from 7.8 μm to 9.2 μm and that of right lobe 7.1 μm to 9.5 μm . (Table 2). The variation of the left lobe weight with the right lobe of the ovary was insignificant ($t = 0.126$, $df = 18$, $p > 0.05$).

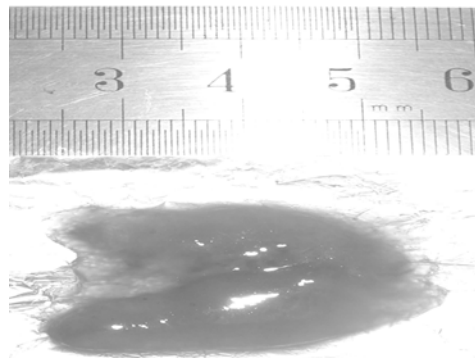


Fig. 5. Ovaries of *M. vittatus* in cm scale

The fecundity of *M. vittatus* varied from minimum 1440 (L_T : 12.2 cm, W : 19.43 g and W_G : 0.78g) to maximum 5811 (L_T : 13.6 cm, W : 23.29 g and W_G : 1.7g). The mean fecundity was recorded as 3333 ± 1584 ($n=10$, $SD=1584$).

Table 2. Egg diameter of two lobes of the gonad of *M. vittatus* from the river *Mouri*

No of fish	Body length (cm)		Body weight (g)		Gonad weight (g)			Fd	AOD (μ m)	
	L_T	L_S	Total	Without egg	Total	LL	RL		LL	RL
1	12.9	10.9	24.1	22.4	1.7	0.81	0.89	4391	9.2	8.4
2	12.01	9.8	14.39	13.75	0.64	0.34	0.30	2155	8.0	7.1
3	12.3	10.4	21.0	19.8	1.2	0.58	0.62	2542	8.4	8.2
4	13.2	10.6	22.5	22.35	1.5	0.76	0.74	3051	7.8	7.3
5	13.6	11.0	23.29	21.59	1.7	0.89	0.84	5811	9.0	9.2
6	12.6	10.2	20.18	19.06	1.12	0.60	0.52	1521	8.0	7.2
7	13.0	11.4	21.09	19.39	1.7	0.92	0.78	5525	8.5	8.5
8	12.2	9.9	19.43	18.65	0.78	0.36	0.42	1440	8.5	9.5
9	13.5	11.0	24.2	20.87	3.13	1.58	1.55	4320	8.5	7.2
10	12.6	10.0	14.49	13.84	0.65	0.34	0.31	2573	8.8	7.9

LL=Left lobe, RL=Right lobe, Fd=Fecundity, AOD=Average ova diameter

The logarithmic values of fecundity was found correlated with both total length ($\text{Log}F_{0.05} = 9.179 \times \text{Log}L_T - 6.681$, $df = 9$, $r^2 = 0.606$, $t = 3.507$) and standard length it was ($\text{Log}F_{0.05} = 8.597 \times \text{Log}L_S - 5.306$, $r^2 = 0.79$, $t = 5.519$) by positive direction.

The logarithmic relationship between body weight and fecundity was found statistically insignificant ($\text{Log}F_{0.05} = 1.707 + 1.356 \times \text{Log}W$, $df = 9$, $r^2 = 0.266$, $t = 1.704$). However, the relationship between gonad weight and fecundity was positive but weak ($\text{Log}F_{0.05} = 3.405 + 0.703 \times \text{Log}W_G$, $r^2 = 0.499$, $t = 2.823$) (Fig. 6).

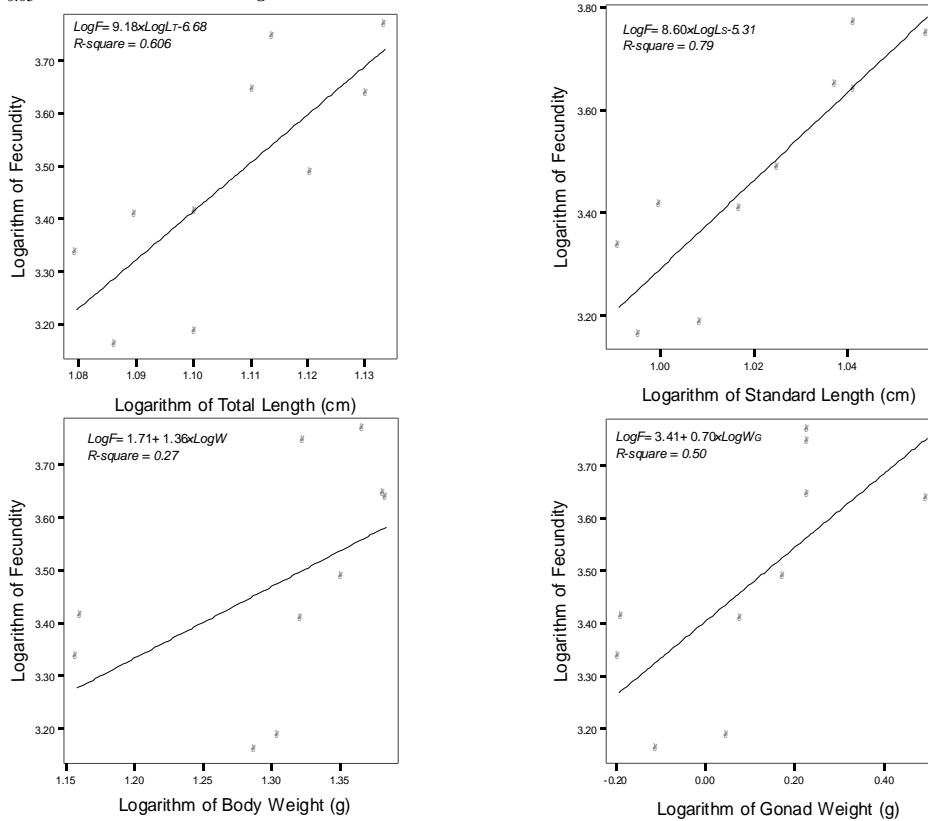


Fig. 6. Relationship of fecundity with total length, standard length, body weight and gonad weight in *M. vittatus* from the *Mouri* river.

The logarithmic relationship between fecundity (F) and both condition factor ($\text{Log}F_{0.05} = 4.10 - 0.64 \times \text{Log}K$, $df = 9$, $r^2 = 0.03$, $t = -0.47$) and relative condition factor ($\text{Log}F_{0.05} = 2.85 - 1.99 \times \text{Log}K_r$, $df = 9$, $r^2 = 0.16$, $t = -1.22$) gave insignificant correlation (Fig. 7).

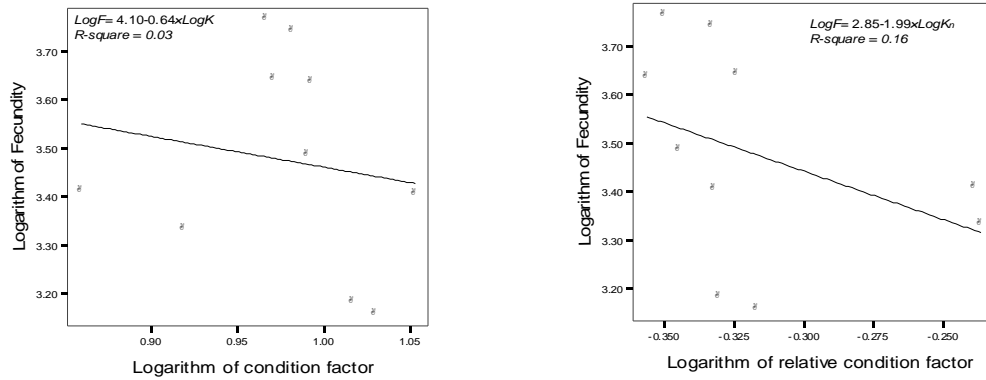


Fig. 7. Relationship between fecundity and condition and relative condition factor

The logarithmic relationship between total length and gonad weight, standard length and gonad, and body weight and gonad weight were positive and significant (Fig. 8) as follows:

$$\text{Log}W_{G0.05} = 9.85 \times \text{Log}L_T - 10.80 \quad (df = 9, r^2 = 0.69, t = 4.23)$$

$$\text{Log}W_{G0.05} = 8.50 \times \text{Log}L_S - 8.58 \quad (df = 9, r^2 = 0.77, t = 5.13)$$

$$\text{Log}W_{G0.05} = 2.33 \times \text{Log}W - 2.93 \quad (df = 9, r^2 = 0.78, t = 5.27)$$

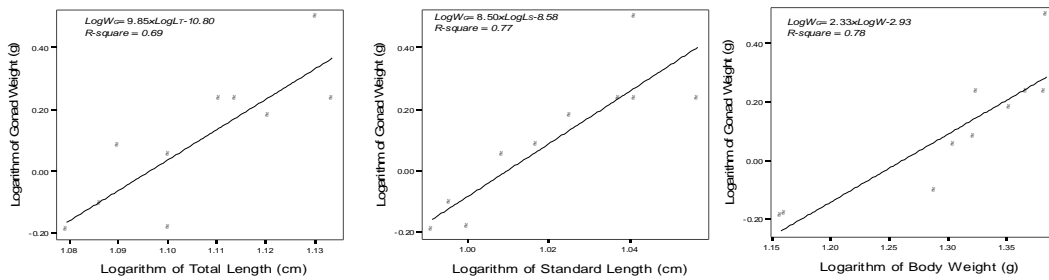


Fig. 8. Relationship of gonad weight with total length, standard length and body weight in *M. vittatus* from the Mouri river

The total length classes of mature females were 12.0-12.4, 12.5-12.9, 13.0-13.4 and 13.5-13.9 cm. The highest mean fecundity was found 4,119 within the L_T class 12.5-12.9 cm and the lowest mean fecundity was 2,344 in the L_T class 12.0-12.4 cm. The standard length classes of mature females were 9.7-10.1, 10.2-10.6, 10.7-11.1 and 11.2-11.6 cm. The highest mean fecundity was estimated at 5,525 within the L_S class 11.2-11.6 cm and the lowest mean fecundity was 2,056 within the L_S class 9.7-10.1 cm. The body weight classes of *M. vittatus* of mature females were 14.3-17.3, 17.4-20.4, 20.5-23.5 and 23.6-26.6 g. The highest mean fecundity was 4,356 within the W class 23.6-26.6 g and the lowest mean fecundity was 1,481 within the W class 17.4-20.4 g (Fig. 9).

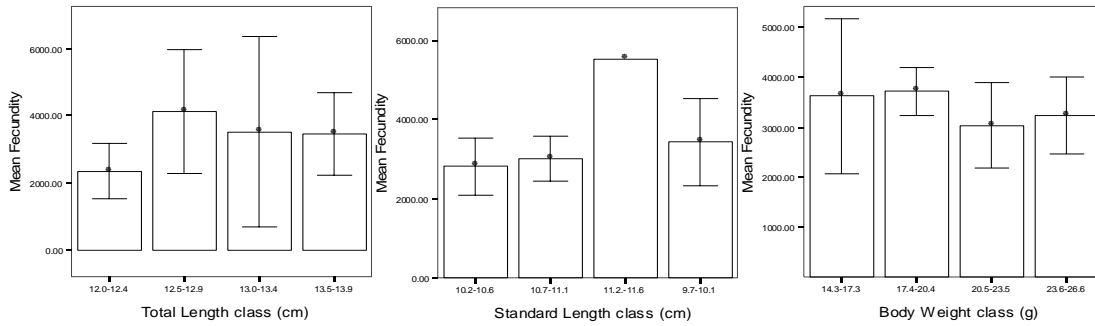


Fig. 9. Mean fecundity in different total length class in *M. vittatus* from the *Mouri* river; error bars show mean±SD

Variation in mean egg diameter between two lobes: During the three months study period the eggs of *M. vittatus* were found only two times (September 23 and October 6, 2006). The mean egg diameter in the left lobe was 8.47 μm that was higher than that of in the right lobe (8.05 μm) (Fig. 10). However, the difference was insignificant ($t = 1.37$, $df = 18$, $p > 0.05$). In both the lobes, egg diameter was higher in larger fish in comparison to smaller fish. For instance, the highest mean egg diameter was 8.75 μm in left lobe of the L_T class 13.5-13.9 cm and the lowest mean egg diameter was 8.15 μm in left lobe of the L_T class 13.0-13.4 cm. The highest mean egg diameter was 8.27 μm in right lobe in the L_T class 12.0-12.4 and the lowest mean egg diameter was 7.83 μm in right lobe in the L_T class 12.5-12.9 (Fig. 11). However, the mean egg diameter between two lobes of different class size was insignificant ($t_{0.05} = 0.47$, $p > 0.05$ for class 12.0-12.4, $t_{0.05} = 1.68$, $p > 0.05$ for 12.5-12.9, $t_{0.05} = 0.360$, $p > 0.05$ for 13.0-13.4, $t_{0.05} = 0.534$, $p > 0.05$ for 13.5-13.9).

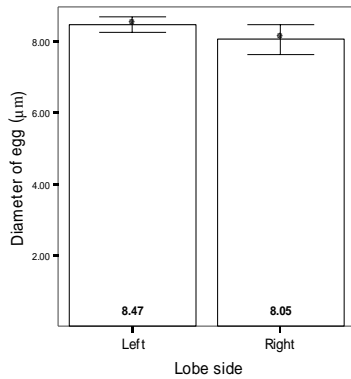


Fig. 10. Mean egg diameter (μm) in two lobes of *M. vittatus*

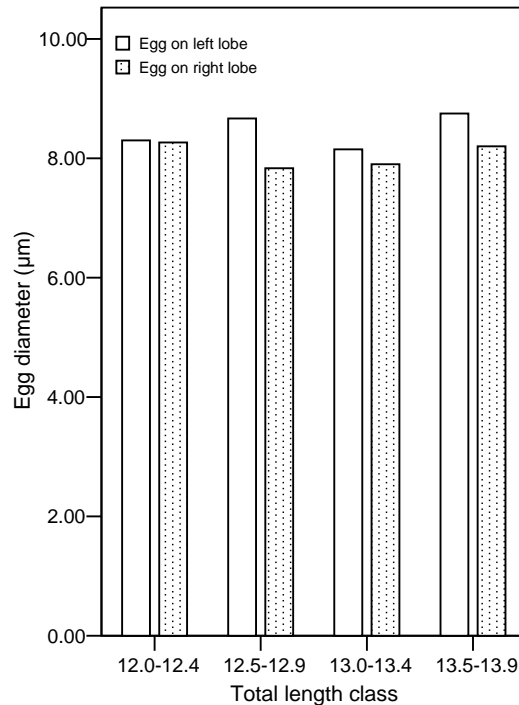


Fig. 11. Mean egg diameter (μm) between two lobes in different size class of *M. vittatus*

Discussion

M. vittatus occurs in a linking river between *beel* and river, the *Mouri* river. During the rainy season (July-August) school of *M. vittatus* generally migrate to *beel* from the river. The broods spend most of the time in the upstream *beel* area. Among the six samples only ten females were found. However, the pollution of the river may expel the brood to the comparatively suitable condition in *beel* area.

The largest specimen found in the *Mouri* river was 13.6 cm. However, Rahman (2005) reported 11.7 cm as the largest one specimen from Bangladesh. The change in length and weight with the sampling period was significant ($F_{0.05} = 23.11, df = 119, p < 0.05$ for L_T and $F_{0.05} = 23.19, df = 119, p < 0.05$ for W) where lower L_T and W were at the beginning of August and higher at the beginning of October (Fig. 2). The logarithm relationship between length (both L_T and L_S) and weight of *M. vittatus* directs towards strong positive correlation that agreed with the report in *M. tengra* (Khan *et al.*, 1992). A highly significant length-weight relationship was found ($R^2 = 0.89$) in respect of standard length of *M. vittatus*. The significant coefficient of correlation between the measurements of standard length and body weight of *M. vittatus* in the present study agreed well Hossain *et al.* (2006).

The K is not constant in the great majority of fishes. In nature, it has been found to vary by individual and at population level. It fluctuates periodically with season of the year which may be due to heavy feeding, spawning and/or rebuilding of reproductive system. The peak K and K_n value were found in L_T class 7.0-7.6 cm in *M. vittatus*. The K and K_n in this species decreased with increase in length (Table 1). The t value, -6.33 for $K-L_T$ and -16.88 for K_n-L_T determines the relative importance of the variable in this model was satisfactory. However, dispersion in K values exists with the total length. This variation might be associated with the smaller sample size or different stages of maturity or spawning, variation in the weight of food contents in the stomach. Variation in the K_n values due to above causes were also reported by many workers (Kader *et al.*, 1988; Das, 1977; Shafi and Mustafa, 1976 and Dewan and Doha, 1967) on different fish species. The K_n for *M. vittatus* ranged from 0.86 (L_T : 9.1-9.7 cm) to 1.5 (L_T : 7.0-7.6 cm). The peak K values for combined sexes in *M. vittatus* reportedly decreased gradually with the increasing size (Akter, 2000).

Fecundity of *M. vittatus* varied from 1,440 (12.2 cm L_T , 19.43 g W and 0.78 g W_G) to 5,811 (13.6 cm L_T , 23.29 g W and 1.70 g W_G) (Table 2). The variation in fecundity is very common in fish (Das *et al.*, 1989; Main and Dewan, 1978; Kader and Talukder, 1978; Das, 1977; Shafi and Mustafa, 1976 and Nikolsky, 1963). Numerous factors including nutritional state (Scott, 1961), racial characteristics (Bagenal, 1966) and the time of sampling and maturity stage (Healy, 1971) have been suggested for the variation in fecundity both within and between fish populations.

Variation in fecundity in *M. vittatus* was observed within same size class in the present investigation (Table 2). It showed that the fecundity of a fish measuring 12.9 cm in L_T (W_G 1.7 g) was 4,391 where as fecundity of another fish of 13.0 cm in L_T (W_G 1.7 g) was 5,525. Azadi *et al.* (1987) reported it as 2,515-9,789 (L_T : 8.9-11.5 cm) for *M. vittatus*. This revealed that the fecundity of a fish is not solely dependent on its length. Similar fluctuations in the fecundity were also reported by Pandian (1967) for *M. gulio* and Hoque and Patra (1987) for *Heteropneustes fossilis*.

The logarithmic relationship between fecundity and total length as well as between fecundity and body weight was positively linear (Fig. 5). A marked increased in fecundity was noticed with the increase in length as well as body weight. Works by Khan *et al.* (1992) for *M. tengra*, Ali *et al.* (1994) for *Clarias batrachus*, Azadi *et al.* (1987) for *M. vittatus* support the positively linear $F-L_T$

relationship ($r=0.778$). F - W relationship observed here was similar to that of Khan *et al.* (1992), Afroze and Hussain (1983), Kader and Talukdar (1978), Main and Dewan (1978), Das (1977), Shafi and Mustafa (1976) and Grant (1972) for different fish species. The correlation of logarithm of F - W_G was significant ($r = 0.706$) but weak ($R^2=0.499$) however, the t value (2.82) made it fit to the model. The relationship between F and W_G should be strongest as suggested by Azadi *et al.* (1987) for *M. vittatus*, Rahman (1989) for *M. gulio*, Das *et al.* (1989) for *Heteropneustes fossilis*, Khan *et al.* (1992) for *M. tengra* and Mustafa *et al.* (1983), Crivelli (1981), for other fishes that support the current result. The cause of weak R^2 may be limited number of female specimen that would produce sampling error. However, according to Bagenal (1967), the number of eggs was related more to weight of the fish than to the length. Conversely, the correlation co-efficient (r) in logarithmic scale between F and W ($r=0.516$) was poor in the current study, and the highest r value was estimated 0.89 between F and L_S means the closer relationship between them. However, insignificant relationship ($r = -0.162$) was found in this study between fecundity and condition factor.

The availability of egg bearing *M. vittatus* was found remarkably low. Only at the end of September and at the beginning of October the brood was captured and the egg size was not significantly different between the two sampling period ($p > 0.05$). The adaptive significance of seasonal variation in egg size of fish had been discussed by Bagenal (1971) who reported that seasonal decrease in egg size was triggered by the availability of food. However, the food availability and seasonal variation were not studied in this investigation. Egg size was studied on only L_T class (12.0-12.4, 12.5-12.9, 13.0-13.4 and 13.5-13.9) and two gonad lobes of *M. vittatus* where the difference of egg diameter in L_T class was insignificant ($F_{0.05} = 0.51, df = 7, p > 0.05$) and the egg diameter between left and right lobes was not significantly different ($t = 1.37, df = 18, p > 0.05$) that indicates that simultaneous release of eggs takes place from both the lobes. This agrees with Shafi and Quddus (1977) and Kader *et al.* (1988) on the simultaneous release of eggs from the lobes in *Parastromateus niger* and *G. rubicundus* respectively.

A comparison of the correlation co-efficient in logarithmic scale between W_G and L_T ($r = 0.831$), W_G and L_S ($r = 0.876$) and W_G and W ($r = 0.881$) indicates a much closer relationship of gonad weight with body weight than the other independent variables.

Conclusion

Some of the fish specimens were not matured. Moreover, the water quality and primary production in the *Mouri* river as described by Kamal *et al.* (2007) was not favorable as a breeding and nursing ground. Therefore, the females *M. vittatus* might be less in abundance. The K_n of *M. vittatus* from the river *Mouri* indicates less condition. The conservation and management regimes should be adopted to sustain the species in the river *Mouri*. This study had limitations like comparatively smaller sample size particularly for female, and the sample was not collected throughout the year. Therefore, more studies are needed to obtain a clearer picture of *M. vittatus* in the river *Mouri*.

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