

Studies on the gonadosomatic index and fecundity of chapila (*Gudusia chapra* Ham.)

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Abstract

The study was conducted in pond to determine the fecundity and gonadosomatic index of chapila, *Gudusia chapra*. The male fish was found to attain sexual maturity at 7.7 cm and 7.41 g and that of the female at 9.3 cm and 14.65 g by standard-length and body-weight respectively. The investigated fishes were found to be male and female at the ratio of 1:3 and generally female was found to be larger than male. The fish was found to spawn for several months with two spawning peaks, one in April and another in August as indicated by the peaks of gonadosomatic index and ova diameter. Fecundity of the fish ranged from 25,220 to 154,528 with an average value of 72,383 and was found to increase with the increase in length and weight of the fish. The relationships between fecundity and standard-length, body-weight, gonad-length and gonad-weight of the fish were found to be linear and significant.

Key words : *Gudusia chapra*, Fecundity, Gonadosomatic index

Introduction

Gudusia chapra, belongs to the family Clupeidae is a prolific breeder and one of the most favorite, tasty and commercially important fish in Bangladesh. Fecundity is one of the most important biological aspects of fish. This must be known to assess the productive potential and to evaluate the commercial potentialities of a fish stock (Das *et al.* 1989). For efficient fish culture and effective management practices it is prime important to know the fecundity of fish (Miah and Dewan 1984). Moreover, study is also essential to determine the index of density dependent factor affecting population size (Simpson 1951).

Notable works have been done on the fecundity of some species of fishes in Bangladesh (Doha and Hye 1970, Karim and Hossain 1972, Shafi *et al.* 1979, Dewan and Doha 1979, Miah and Dewan 1984 and Das *et al.* 1989). But so far, no work has been done on the fecundity of *G. chapra*. In view of that the present study was undertaken to determine the fecundity and gonadosomatic index of chapila and also to establish a relationship between the fecundity and standard length, body weight, gonadal length and gonadal weight of the fish.

Materials and methods

The experiment was conducted for a period of seven months from March to September'95 in three earthen ponds each covering an area of 800 m² and with an average depth of 1.5 m. Twenty matured fishes were collected randomly during each sampling from the ponds to determine the standard length and body weight. The male and female fishes were differentiated and data were recorded after dissecting out the gonad of the individual fish. Then the ovary and testis of each fish was taken out very carefully and preserved in a well labeled vial containing 5% buffered formalin for subsequent studies. Gravimetric method was used to determine the fecundity of fish.

In using this method, the external connective tissues were removed from the surface of ovaries. Moisture of the ovaries was removed with the help of a blotting paper. Weight of the ovaries of each fish so treated was recorded in gram with the help of a fine electric weighing balance. Then 0.01 g of each ovary were taken separately from anterior, middle and posterior portions of each lobe. The number of matured and immature eggs for each portion were sorted out separately and counted. 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 respective fish.

Gonadosomatic index (GSI) of the male and female fishes of the collected samples were determined separately by using the following method.

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

Diameter of the eggs at different stages of maturity was measured with the help of an objective 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 fishes was estimated. The relationship between fecundity and standard length, body-weight, gonad-length and gonad-weight were determined with the help of a computer following SPSS programme.

Results and discussion

In the present study, 280 male and female *Gudusia chapra* were examined to determine the gonadosomatic index and fecundity. Sex ratio of the examined fishes were recorded 1:3. De-Silva and Chandrasoma (1980) and Islam and Hossain (1990) was recorded the male and female sex ratio 1:2 in *Sarotherodon mossambicus* and *Puntius stigma* respectively. The standard-length and weight of the male and female fishes were found to range from 7.7 cm - 11.5 cm and 7.41 g - 24.60 g, and 9.3 cm - 17.0 cm and 14.65 g - 64.90 g respectively. Here the female was found to be larger than the male. Month-wise average highest

length and weight of testis were 3.65 cm and 0.85 g respectively in the month of April and next to the same were 3.11 cm and 0.34 g respectively in the month of August which indicated that there were two peak periods of sperm production of male *G. chapila* (Table 1).

Table 1. Month-wise gonadosomatic index of male *G. chapila*

Month	No. of fish examined	Standard length(cm)	Body weight (g)	Testis		Mean GSI
				Mean length (cm)	Mean weight (g)	
March	12	8.0 - 9.5	9.01 - 15.00	2.50 \pm 0.09 (2.4-2.6)	0.22 \pm 0.16 (0.09-0.50)	1.92 \pm 0.08 (0.66-3.33)
April	04	9.8 - 10.5	17.45-21.95	3.65 \pm 0.07 (3.6-3.7)	0.85 \pm 0.11 (0.77-0.92)	4.30 \pm 0.16 (4.19-4.41)
May	12	7.9 - 10.8	10.11-20.51	2.87 \pm 0.37 (2.5-3.4)	0.25 \pm 0.08 (0.15-0.33)	1.69 \pm 0.28 (1.48-2.19)
June	16	7.7 - 11.5	7.41 - 24.60	2.87 \pm 0.48 (2.2-3.5)	0.25 \pm 0.13 (0.13-0.44)	1.72 \pm 0.56 (1.08-2.90)
July	14	9.2 - 10.3	10.95-20.10	3.10 \pm 0.57 (2.7-3.5)	0.31 \pm 0.31 (0.04-0.79)	1.84 \pm 0.64 (0.30-3.93)
August	04	9.5 - 10.1	13.52-16.14	3.11 \pm 0.36 (2.7-3.8)	0.34 \pm 0.08 (0.25-0.46)	2.17 \pm 0.75 (0.93-3.40)
September	04	9.7 - 10.0	15.69-15.78	2.85 \pm 0.07 (2.8-2.9)	0.31 \pm 0.14 (0.16-0.52)	2.13 \pm 0.06 (2.09-2.17)

Figures in parentheses indicate ranges of different parameters

Table 2. Month-wise gonadosomatic index of female *G. chapila*

Month	No. of fish examined	Standard length(cm)	Body weight (g)	Ovary		Mean GSI
				Mean length (cm)	Mean weight (g)	
March	28	9.8 - 12.7	19.50-35.12	3.38 \pm 0.57 (2.5-4.1)	0.93 \pm 0.51 (0.45-1.60)	4.20 \pm 2.75 (2.04- 8.21)
April	36	9.3 - 12.8	16.21-46.72	4.15 \pm 0.63 (3.2-5.8)	1.56 \pm 0.68 (0.52-2.96)	5.58 \pm 2.00 (2.84-11.20)
May	28	9.9 - 15.0	16.82-64.15	3.96 \pm 0.39 (3.2-4.8)	1.43 \pm 0.67 (0.74-3.35)	5.20 \pm 2.01 (2.35- 8.30)
June	24	9.3 - 15.0	14.88-63.04	4.20 \pm 0.22 (3.8-4.4)	1.51 \pm 0.92 (0.47-3.90)	5.08 \pm 2.47 (2.11-10.51)
July	26	10.6-12.5	19.73-30.85	4.33 \pm 0.65 (3.2-5.7)	1.95 \pm 0.95 (0.72-3.52)	7.38 \pm 3.27 (3.55-13.01)
August	36	9.8 - 17.0	16.97-64.90	4.56 \pm 0.49 (3.9-5.8)	2.48 \pm 1.02 (0.83-4.98)	8.07 \pm 2.59 (3.76-12.61)
September	36	9.3 - 13.7	14.65-44.14	4.33 \pm 0.53 (3.6- 5.3)	2.24 \pm 1.01 (1.07-4.03)	7.34 \pm 3.21 (2.93-13.32)

Figures in parentheses indicate ranges of different parameters

Length of ovaries of the mature females were ranged from 2.5cm to 5.8cm and the weight of the same from 0.45g to 4.98g, showed two spawning peaks, the lowest peak was recorded in April and the highest in August (Table 2). The mature ova were randomly distributed throughout the ovary. Similar findings

were also reported by Otsu and Uchida (1959), Doha and Hye (1970) and Miah and Dewan (1984).

Gonadosomatic index were ranged from 0.37 - 4.41 in male and 2.04 - 13.32 in female and also showed two peaks, one in April and another in August (Tables 1 & 2). Ova diameter were found to range from 350 -1250 μm and also showed two peaks, one in April and another in August (Table 3). Therefore, the fish spawned for several months with two spawning peaks, highest in August and lowest in April as indicated by the values of both ova diameter and gonadosomatic index. Miah and Dewan (1984) recorded three spawning peaks in *Sarotherodon nilotica*.

Table 3. Month-wise fecundity and ova diameter of *G. chapra*

Month	No. of fish examined	Mean standard length(cm)	Mean body weight (g)	Mean fecundity (no.)	Mean ova diameter (μm)
March	28	10.97 \pm 0.95 (9.8-12.7)	23.79 \pm 5.66 (19.50-35.12)	45494 \pm 15141.48 (25650-70400)	565.97 \pm 63.81 (450-700)
April	36	10.96 \pm 0.95 (9.3-12.8)	26.16 \pm 8.54 (16.21-46.72)	62434 \pm 16177.19 (39104-99280)	648.40 \pm 118.51 (400-900)
May	28	11.68 \pm 1.18 (9.9-15.0)	30.58 \pm 11.66 (16.82-64.15)	56930 \pm 20006.34 (25220-99960)	618.43 \pm 87.12 (450-850)
June	24	11.75 \pm 1.46 (9.3-15.0)	30.37 \pm 12.71 (14.88-63.04)	56350 \pm 22793.42 (25380-94809)	656.06 \pm 145.42 (350-1000)
July	26	11.30 \pm 0.61 (10.6-12.5)	25.91 \pm 3.87 (19.73-30.85)	91702 \pm 42606.64 (33984-154528)	693.75 \pm 155.24 (350-1000)
August	36	12.07 \pm 1.50 (9.8-17.0)	31.19 \pm 10.33 (16.97-64.90)	96907 \pm 28643.36 (38595-149898)	768.75 \pm 171.00 (400-1250)
September	36	11.98 \pm 1.27 (9.3-13.7)	32.01 \pm 8.88 (14.65-44.14)	76447 \pm 20883.44 (38695-103635)	716.44 \pm 147.05 (350-1000)

Figures in parentheses indicate ranges of different parameters.

Fecundity and standard length, body weight, and gonad length and gonad weight relationships

Fecundity of the *G. chapra* was found to range from 25,220-154,528 with an average of 72,383 during the period of study (Table 3) and indicated a linear relationship with its standard-length, body-weight, gonad-length and gonad-weight (Figures 1, 2, 3 and 4). The relationship between fecundity and standard length, body weight, gonad length and gonad weight were found statistically significant ($P < 0.01$). Das et al. (1989) recorded highly significant relationship between fecundity and gonad weight in *H. fossilis*.

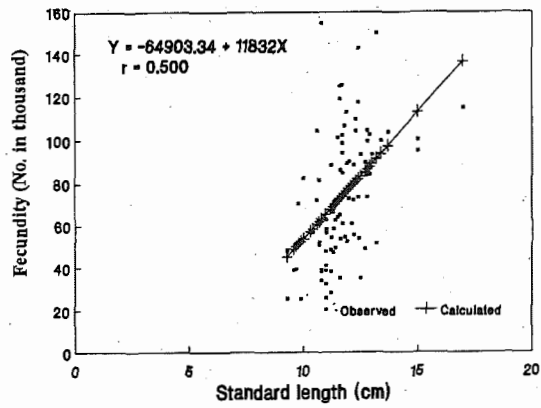


Fig. 1. Showing the relationship between fecundity and standard-length of *G. chapra*.

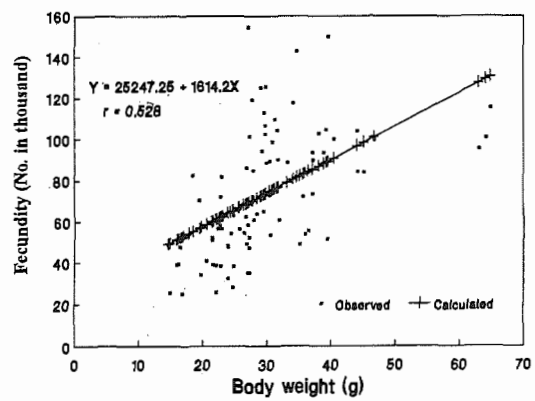


Fig. 2. Showing the relationship between fecundity and body weight of *G. chapra*.

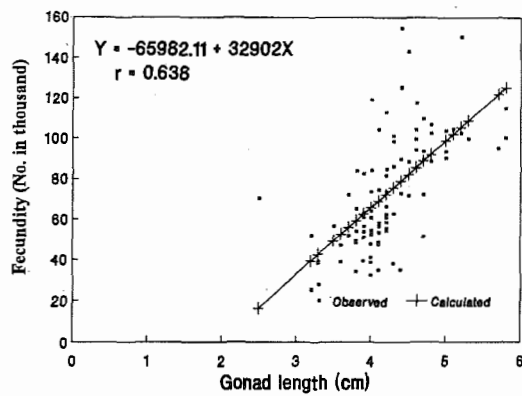


Fig. 3. Showing the relationship between fecundity and gonad-length of *G. chapra*.

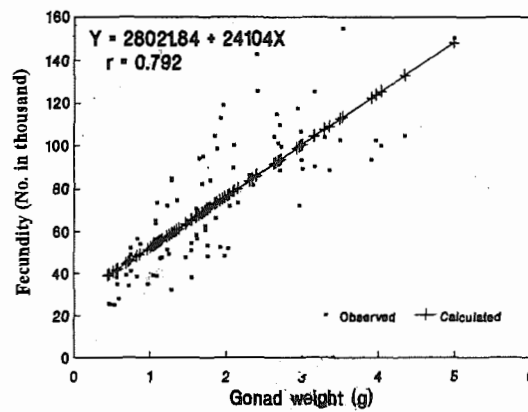


Fig. 4. Showing the relationship between fecundity and gonad weight of *G. chapra*.

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