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Fecundity and Gonadosomatic Index (GSI) of Corsula, *Rhinomugil corsula* Hamilton, 1822 (Family: Mugilidae) from the Lower Meghna River Estuary, Bangladesh

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Abstract: Gravid females of *Rhinomugil corsula* were collected from the lower Meghna River Estuary adjacent to Noakhali District, Bangladesh to study the fecundity and Gonadosomatic Index (GSI) of the species. The fecundity was in the range of 9506 to 16113 with a mean value of 11902.133±543.377 for a corresponding length and weight 17-20.9cm and 68.71-82g. The correlation co-efficient for fecundity and total length (TL), fecundity and body weight (BW), fecundity and gonad weight (GW) and gonad weight (GW) and body weight (BW) were 0.907, 0.978, 0.984 and 0.995 respectively. The mean GSI (%) was 4.54±0.16 with a range of 3.72-5.54. The regression line for the TL, BW, GW and GSI of the sample fishes were found to be linear when they were plotted against their fecundity. All the variables observed were significant at $P<0.01$.

Key words: Fecundity · Gonadosomatic Index · *Rhinomugil corsula*

INTRODUCTION

Rhinomugil corsula belongs to the family Mugilidae is uncommon species of mullets in the Indo-Bangladesh region. It is a surface-dwelling fish and an omnivore in its feeding when adult. This fish is able to form schools and spawn in brackish water and inhabit rivers and estuaries throughout Bangladesh. They feed on small fish, insects, leaves of plants and play an important role in our ecology [1]. Fecundity among egg-laying animals is the number of eggs being readied for the next spawning by a female [2]. Fecundity appears to bear some broad relationship to the care or nurture accorded to the eggs [3]. Knowledge about fecundity of a fish is essential for evaluating the commercial potentialities of its stock, life history, practical culture and actual management of the fishery [3-5]. Hora [6] made a few observations on the spawning habit of *R. corsula*. Qasim and Qayyum [7] attempted to understand its maturity and spawning habit and to delimit the spawning season. Although Fatima and Khan [8] estimated the GSI of *Rhinomugil corsula* of the River Yamuna, India but no published work have been found yet on the fecundity and GSI of this fish in Meghna River estuary. Hence, considering the economic importance of this species, an investigation on the fecundity and GSI of *Rhinomugil corsula* was undertaken in the present study.

MATERIALS AND METHODS

A total number of 15 female Corsula were collected from the lower Meghna River Estuary, Bangladesh from June to August 2011 for the determination of fecundity and GSI. External morphological features were used to distinguish the matured females. Bulged abdomen of the female fish was easily distinguished as matured conditions. In the laboratory, the selected fishes were clearly washed with tap water. For each fish, total length (TL) was measured with a measuring scale to the nearest millimeter and body weight (BW) were measured by an electronic balance. Excess water from fishes was removed with blotting paper before weighing the fishes. The gonads were dissected out and weighed to the nearest 0.01 g. Gonadosomatic index (GSI %) was calculated as gonad weight divided by total weight multiplied by hundred. After ranging weight, the ovary was fixed in 5% formalin for enumeration of fecundity. To estimate the fecundity, gravimetric method was followed [9].

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Three cross sectional samples were taken from anterior, middle and posterior portion of the two lobes of each ovary. The eggs in each of the three sections were counted and then the mean number of eggs was calculated [4, 10]. The total number of eggs for each individual was calculated from the sample mean and the total weight of the ovaries. To establish the relationship between fecundity (F) and total length (TL), body weight (BW) and ovary weight (OW) correlation coefficients were calculated. Relationship between gonad weight (GW) and body weight (BW) was also established.

RESULTS AND DISCUSSION

Ovary of *Rhinomugil corsula* was bi-lobbed with a short oviduct, situated in the body cavity dorsal to the digestive tract and central to the kidney. The shape and size of the ovary were found to depend on the stages of sexual maturity of the female. The ripe ovaries were found to extend up to the end of the urinogenital pore. The eggs were spherical in shape. The mean fecundity of *R. corsula* was 11902.133±534.377. The mean total length of *R. corsula* were 18.47±0.28cm, mean total body weight of 73.14±1.35g and mean gonad weight of 3.35±0.187g. The minimum fecundity, total length, body weight and gonad weight were 9506, 17cm, 68.71g and 2.49g respectively; while the maximum fecundity, total length, body weight and gonad weight were 16113, 20.9cm, 82g, 4.54g respectively (Table 1). To establish the mathematical relationship between fecundity and other parameters, the values of correlation coefficient (r) were established (Table, 2) by using the statistical formula:

$$y = bx + a$$

Linear and positive co-relationships were obtained between fecundity and total length fecundity and body weight and fecundity and gonad weight. The mean value of fecundity was obtained to be 11902.133±543.377 and the mean value of total length was 18.47±0.28 and correlation coefficient, r=0.906873 in the relationship between fecundity and total length (Figure 1). In this study, weight of fishes was recorded before removing the ovaries. Fecundity plotted against weight showed a linear trend. The regression equation was found to be linear and the coefficient of correlation (r=0.978343) and the relationship showed a highly positive relationship (Figure 2). The relationship between fecundity and gonad weight showed a significant positive relationship. Relationship between total length (TL) and gonad weight

Table 1: Mean (± SEM) of fecundity and other parameters of *R. corsula* from the lower Meghna River Estuary Noakhali District, Bangladesh

Parameters	Mean ± SEM	Range
Total length (cm)	18.47±0.28	17-20.9
Body weight (g)	73.14±1.35	68.71-82
Gonad weight (g)	3.35±0.18	2.49-4.54
Weight of right gonad (g)	1.63±0.089	1.26-2.28
Weight of left gonad (g)	1.65±0.09	1.22-2.25
Fecundity of right gonad (g)	6152.867±250.17	5058-8101
Fecundity of left gonad (g)	5749.27±287.72	9506-16113
Fecundity	11902.133±543.377	9506-16113
GSI	4.54±0.16	3.72-5.54

Table 2: Correlation coefficient (r), regression equation and significance of correlation of fecundity with total length, body weight and gonad weight and body weight with gonad weight

Relationship	r	Regression equation	Significance at 1% level
Fecundity (Y) and total length (X)	0.906873	Y=1700.x - 19514	Significant
Fecundity (Y) and body weight (X)	0.978343	Y = 387.2x - 16424	Significant
Fecundity (Y) and Gonad weight (X)	0.983547	Y = 2813.x + 2481.	Significant
Gonad weight (Y) and body weight (X)	0.995369	Y= 0.137x - 6.726	significant

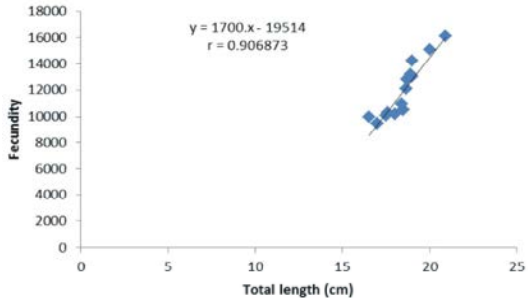

Fig. 1: Relationship between fecundity and total length of *R. corsula* from the lower Meghna River Estuary, Noakhali District, Bangladesh

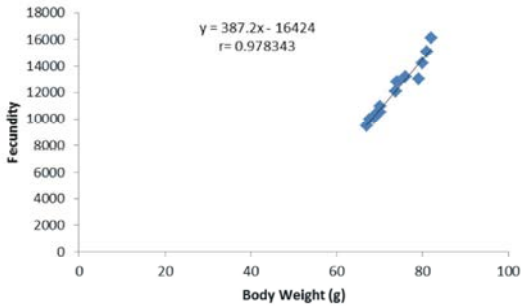

Fig. 2: Relationship between fecundity and body weight of *R. corsula* from the lower Meghna River Estuary, Noakhali District, Bangladesh

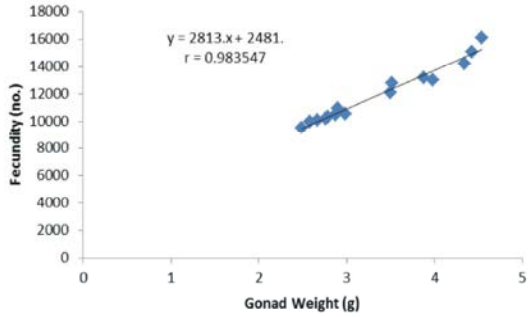

Fig. 3: Relationship between fecundity and gonad weight of *R. corsula* from the lower Meghna River Estuary, Noakhali District, Bangladesh

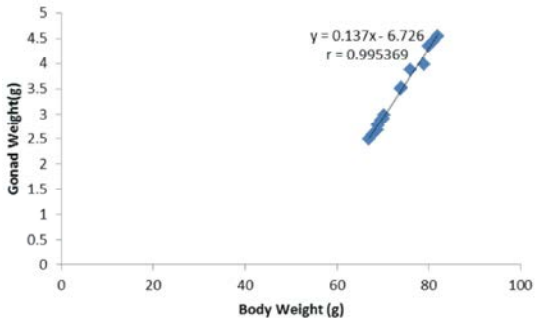

Fig. 4: Relationship between gonad weight and body weight of *R. corsula* from the lower Meghna River Estuary, Noakhali District, Bangladesh

(GW) was linear and r= 0.983547 (Figure 3). The relationship between gonad weight and body weight showed a positive, linear and significant relationship and r= 0.995 (Figure 4).

In the present study the range of fecundity of *R corsula* varied from 9506-16113 for a corresponding length and weight 17-20.9cm and 68.71-82g. The average number of eggs of *R. corsula* indicates that the fish is low fecund. During the study, it was observed that the ovaries of same the size of fishes contained different numbers of eggs. This may be due to the variations in environmental conditions and food intake by the individual. The variation in fecundity is very common in fish and has been reported by many researchers [10, 11]. Numerous factors like different stock of fish, nutritional status [12], racial characteristics [10], time of sampling and maturation stage and changes in environmental parameters [11] have so far been reported to affect the fecundity both within the species and between fish populations. So, variation in fecundities during the study was not an exception. It is familiar that the gonadosomatic index (GSI) increases with the maturation of fish, being maximum during the period of peak maturity and declining abruptly thereafter [13]. In *Rhinomugil corsula*, the gonadosomatic index was maximum during July when majority of fishes were found mature. It was found that the bigger sized fishes have higher fecundity and smaller sized fishes have smaller fecundity. The regression equation (Y=1700.x - 19514) representing the relationship between fecundity and total length was found as linear and the value of r = 0.906873, which is highly significant. Variation in the fecundity of the fish in the same length class was found in the study which indicates that the fecundity of a fish is not solely dependent on its length. This comment agrees with the findings of [14] in *H. ilisha*. The relationship between fecundity and body weight was significant (r = 0.978343) and found to be linear (Y = 387.2x - 16424). Positive relationships between fecundity and body weight have been reported in a number of fishes which support the present findings [12]. The relationship between fecundity and gonad weight was found to be linear, significant (r = 0.983547) and the equation was Y = 2813.x + 2481. Fecundity increased with increasing gonad weight. This result is also agreed with Sultana [15]. The relationship between body weight and gonad weight was found to be linear (r = 0.995369) and the equation was Y= 0.137x - 6.726 (Figure 4). Body and gonad weight relationship was highly positive. Gonad weight was increased with the increasing body weight and this was happened till maturity of the gonad.

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