



## Pearl producing mussel diversity and distribution in Meghna river of Bangladesh

Mohosena Begum Tanu, Md. Saiful Islam\*, Arun Chandra Barman, Sonia Sku, Md. Nazmul Hossen, Shishir Kumar Dey

Bangladesh Fisheries Research Institute (BFRI), Mymensingh-2201, Bangladesh

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#### \*Corresponding Author

MS Islam  
✉ msi.89p@gmail.com

### ABSTRACT

A study was conducted from June 2016 to July 2017 to determine the current status of pearl producing mussels in Meghna river of Bangladesh. To complete this study thirteen sampling site along the Meghna river region (Meghna Ferry Ghat, Kuliarchar, Char Monoharpur, Kumilla-Lanch Ghal, Rasulpur Ferry Ghat, Gazaria-Launch Ghat, BFRI Fishing Ghat, Haimchar, Char Alexander, Ramgati Meghna Ghat, Char Maksumul Ferry Ghat, Kajir bazar, Hatiya bazar) were visited. The study was conducted to identify pearl producing mussels and factors driving the changes of mussel's diversity and distribution in Meghna river. A total of five species of musels were identified belonging two families where as four species were pearl producing mussel. Unionidae was found the most dominant order of the total mussel's population. Among five species of mussels two species were recorded as threatened in Meghna river while *Parreysia corrugata* found as vulnerable and another species *Lamellidens phenchooganjensis* found as endangered. To collect the mussels different gears and crafts were usually used in the study area. Highest numbers of mussels were collected by moiyaal. Available species of mussels *L. marginalis*, *L. corrianus*, *Parreysia corrugata*, *L. phenchooganjensis* and *Meretrix meretrix* were collected by the fishers in Meghna river. Most of them were found all the year round but winter is the best season (October to December) to collect the mussel easily. The highest and lowest weight was recorded 200g and 80g of the mussel name *Lamellidens marginalis* and *Meretrix meretrix* respectively.

### INTRODUCTION

Bangladesh is full of fisheries resources including fish, crustacean and mollusks. Freshwater mussels are important for both man and the aquatic environment. The most important thing of freshwater mussels is pearl production. Mussels are filter feeders and act as a natural water cleaners and indicators of water quality (Dan et al., 2001). Mussels process large volumes of water and therefore exposed to dissolved toxic substances such as heavy metals (Imlay, 1982; Metcalfe and Green, 1992). Freshwater mussel communities are important components of food webs and they link to multiple trophic levels.

Bangladesh is country of hundreds river and well enriched with fisheries biodiversity. The most

important river in Bangladesh is Meghna. Bangladesh has an area of 35,000 square kilometer in Meghna basin, the upper and lower Meghna are two distinct parts of the river in which the former one is comparatively small from Kuliarchar to Shatnol. It is the largest river in the world due to its wide estuary mouth. This river is important for fish and mussels and also serves as nursery ground for them. Due to the environmental and anthropological causes, abundance and diversity of freshwater mussels are decreasing day by day (Paul, 2000). Indiscriminate killing and overexploitation, use of destructive fishing gear, pollution and lack of proper management the fish and mussels diversity of Meghna river to be in great danger. Many of mussels become vulnerable, endangered and critically endangered, little research have been conducted for mussels

diversity in Meghna river. But there is no complete list of existing mussels species. For this reason it's very difficult to understand the present status of mussels in Meghna river. Deep research is need to updated list of pearl producing mussels list.

Natural enemies of mussels fall into four categories- predators, competitors, parasites and shell borers (Bayne, 1976). Utilization of these water bodies for aquaculture and fisheries development can help in salvaging these water bodies from total environmental degradation and ecological catastrophe (Korakandy, 2000). Our knowledge on freshwater mussels of Bangladesh is very scanty. Ali and Begum, 1990 described only four species of bivalves from Dhaka city. Begum et al., 1989 reported 10 species of freshwater mussels from Bangladesh. Begum et al., 1990 studied on pearl culture in freshwater mussel *L. marginalis* in Bangladesh Fisheries Research Institute Pond, Mymensingh. The present study was to identify, morphometric characteristics,

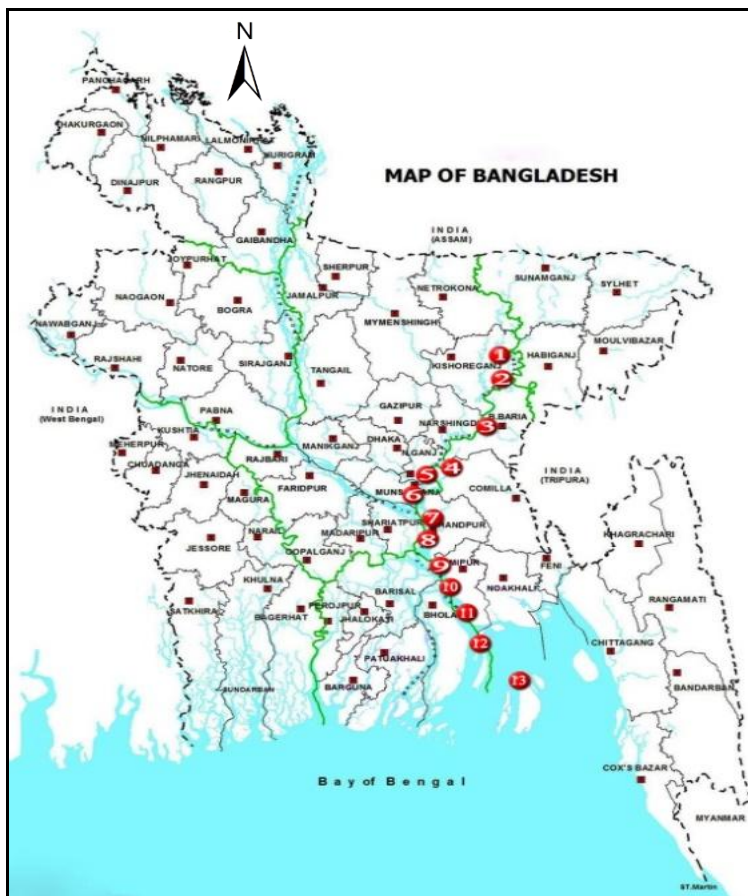
population density and economic importance of freshwater mussel collected from Brahmanbaria, Kumilla, Habiganj, Moulvibazar, Sylhet and Sunamganj districts of North-East Bangladesh.

## MATERIALS AND METHODS

The survey was conducted in Meghna river of Bangladesh to identify freshwater pearl producing mussel species and its distribution. Water quality parameters of the collection sites were also recorded. The collected specimens were identified by its diagnostic features. The biometric parameters of the collected specimens were measured using standardized techniques.

### Selected sites

For this study 13 sampling site from 9 upazillas of 7 districts were selected along the bank of Meghna river region. The selected sites given below (Figure 1).



1. Megna Fery Ghat
2. Kuliarchar
3. Char Monoharpur
4. Kumilla, Lanch Ghal
5. Rasulpur Ferry Ghat
6. Gazaria, Launch Ghat
7. BFRI Fishing Ghat
8. Haimchar
9. Char Alexander
10. Ramgati Meghna Ghat
11. Char Maksumul Ferry Ghat
12. Kajir bazar
13. Hatiya bazar

Figure 1: Different sites of the study areas

## Mussels collection

The specimens were collected randomly from the above mentioned study area, with the help of local fishermen, farmer and upazilla fisheries officer of that region. At shallow exposed regions mussels were collected by hand picking, dredging by hand and rack hook from the muddy soft areas. Where ever the mussels were under the water, still at the reach of hand was collected using moyajal by which the mussels attaches to the substrate. Below water, while the mussels were submerged at a depth of 1-1.5m water, it was collected using a slightly curved, sharply pointed and serrated knife. Thirty specimens were collected randomly from each site.

## Identification of collected mussel specimens

The collected specimens were identified by its morphological features. According to literature, it was well known that *L. marginalis*, *L. corrianus*, *Parreysia corrugata*, *L. phenchooganjensis* and *Meretrix meretrix* only reported along the Meghna River. So the specimens were first looked on to, whether it belongs to either of the above mentioned species by analyzing their diagnostic features, according to Sidall, 1980 and Rajagopal et al, 1997. If they showed any deviation in their characters other than the above mentioned two species, then only it was further analyzed or compared with the meristic features of other species of the genera. The conchological features help in the identification and differentiation of the *L. marginali*, *L. corrianus*, *Parreysia corrugata*, *L. phenchooganjensis* and *Meretrix meretrix* individuals.

## Biometric parameters

From each site 30 specimens were selected randomly for sampling. Length, width, weight, soft muscle weight, shell weight and total body weight data were recorded. Slide calipers, electric balance, dissecting tools were used to measure the biometric parameters. Length, width and height measured in (cm) and weight measured in (g) unit (Okumus and Stirling, 1998).

## Water quality parameters

Different water quality parameter including temperature, pH, dissolved oxygen and salinity were measured by Celsius thermometer, pH meter, digital DO meter and saline testing kit respectively.

## Statistical analysis

All the statistical analysis was performed using SPSS 13.0 for windows. Graphs were also plotted using this program. The means of measured variables of *L. marginalis*, *L. corrianus*, *Parreysia corrugata*, *Lamellidens phenchooganjensis* and *Meretrix meretrix* were compared to test the significance of difference between them using independent-one sample t-test, at 95% confidence interval.

## RESULTS AND DISCUSSION

### Mussels collection and identification

During the study period 390 of mussels were collected from the 13 sampling site of 9 upazilla beside Meghna river. Each sampling site shows more or less same species only variation in estuary of Meghna. Collected bivalves *L. marginalis* (Lamarck, 1819), *L. corrianus* (Lea, 1834), *L. phenchooganjensis* (Preston, 1912), *Parreysia corrugata* (Muellar, 1774) and *Meretrix meretrix* (Linnaeus, 1758) were identified on the basis of their morphological characteristics. Identified mussels are shown below (Figure 2).

From the species presented in Table 1 *L. marginalis*, *L. corrianus*, and *L. phenchooganjensis* are pearl producing mussel (Hua Dan et al., 2001). Some study revealed that are the most suitable mussels for pearl culture in Bangladesh (Pagcatipunam 1986, Mian et al. 2000, Hossain et al. 2004).

### Existing freshwater mussels distribution

After survey in the different sampling site it found that, most abundant of mussels was *L. marginalis* 44% and the lowest was *Meretrix meretrix* 7% (Table 2, Figure 3). Most of mussel *L. marginalis*, *L. corrianus*, *Lamellidens phenchooganjensis*, *Parreysia corrugata* and *Meretrix meretrix* distributed at Kuliarchar, Ramgati Meghna Ghat,

Haimchar, Char Alexander, and Hatiya bazar respectively. All of species are common through

Bangladesh, India, Myanmar and Srilanka (M.A. Hossain et al., 2007).

Table 1: Identified mussel in the study area.











Identified Species	Identified characters	Inner part shell	Outer part shell
Kingdom : Mollusca Phylum : Animalia Class : Bivalvia Order : Unionoida Family : Unionidae Genus: <i>Lamellidens</i> Species: <i>L. marginalis</i>	Large size with thin valves, outline very smooth and oblong-ovated, Periostracum is blackish-brown and shining, wing. The anterior side is narrow, dorsal margin is little curved. (Mazid M.A, 2007)		
Kingdom : Mollusca Phylum : Animalia Class : Bivalvia Order : Unionoida Family : Unionidae Genus: <i>Lamellidens</i> Species: <i>L. corrianus</i>	Shape is narrow, elongated and elliptical, umbo is slightly inflated, umbo more turned up and absences of light border on the ventral margin. (Mazid M.A, 2007)		
Kingdom : Mollusca Phylum : Animalia Class : Bivalvia Order : Unionoida Family : Unionidae Genus: <i>Lamellidens</i> Species: <i>L. phenchooganjensis</i>	Umbo is flat, anterior side is angled above and gently rounded below, posterior margin is obtusely rounded. (Mazid M.A, 2007)		
Kingdom : Mollusca Phylum : Animalia Class : Bivalvia Order : Unionoida Family : Unionidae Genus: <i>Parreysia</i> Species: <i>L. corrugata</i>	Shells are smooth, elliptic to oval, with scarcely an aequilateral and green colour. (Mazid M.A, 2007)		
Kingdom : Mollusca Phylum : Animalia Class : Bivalvia Order : Venerida Family : Veneridae Genus: <i>Meretrix</i> Species: <i>L. meretrix</i>	Thick shell covered by thin, delicate, white-coloured or grey periostracum. (Linnaeus, 1758)		

Table 2: Mussel availability in different study region in Bangladesh

Sampling site→ Species name↓	Meghna Ferry Ghat	Kuliarchar	Char Monoharpur	Kumilla-Lanch Ghat	Rasulpur Ferry Ghat	Gazaria-Launch Ghat	BFRI Fishing Ghat	Haimchar	Char Alexander	Ramgati Meghna Ghat	Char Maksumul Ferry Ghat	Kajir bazar	Hatiya bazar	Total mussel number
<i>L. marginalis</i>	16	18	13	16	18	11	15	12	11	10	13	8	9	170
<i>L. corrianus</i>	8	6	9	5	6	11	9	8	5	12	11	8	5	103
<i>L. phenchooganjensis</i>	3	4	3	4	3	4	3	5	4	3	3	3	2	44
<i>P. corrugata</i>	3	2	5	5	3	3	3	4	7	3	3	3	2	46
<i>Meretrix meretrix</i>	-	-	-	-	-	1	-	1	3	2	-	8	12	27

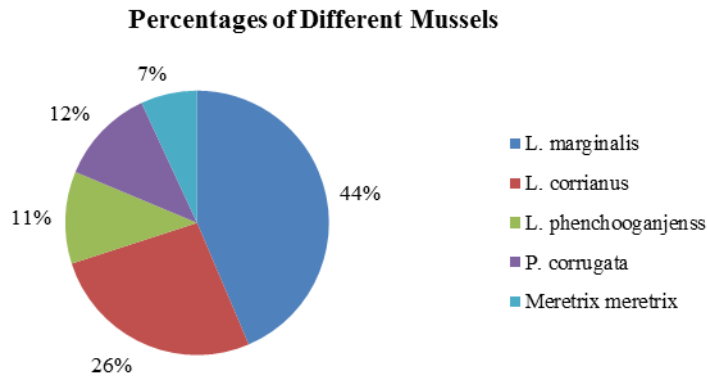


Figure.3: Status of freshwater mussels in Meghna river during study period

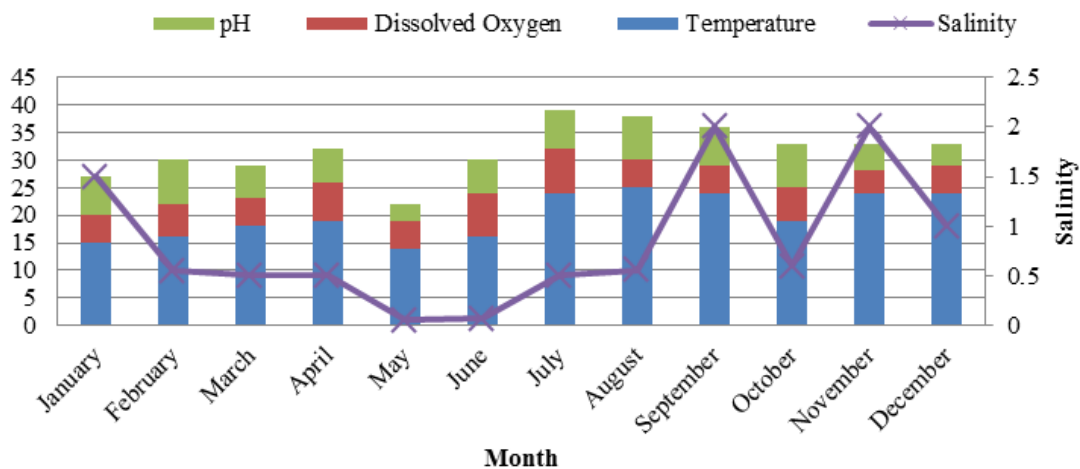


Figure 4: The water quality parameters from the study sites

**Water quality parameters**

Quality of water is very important factor for mussel living which directly effect on mussels growth. During study period hydrographical parameter were measured and all factors were in suitable ranges for mussels living (Figure 4). The optimum range of water quality parameters for pearl culture and mussel living are Temperature 15°C-30°C, pH 6.5-8.5, Dissolve oxygen 5-8 mg/l (Dan et al., 2001).

**Biometric parameters**

The biometric analysis showed that *Lamellidens sp* is comparatively larger species tha other collected species. The average highest weight and length of *Lamellidens spp* was found 200g and 12 cm respectively, while *Meretrix meretrix* was only 80g weight and 8cm length. Pagacatipunam, 1986 cited the result of a survey for pearl mussel in Bangladesh.



Figure 5: Pictorial view during mussel measurement

Table 3: The average biometric parameters of collected specimens from the study sites

Species	Length (cm)	Width (mm)	Soft muscle weight (g)	Shell weight (g)	Total body weight (g)
<i>L. marginal</i>	6.12±3	2.93±3	7.65±29	11.55±2	18.61±1
<i>L. corrianus</i>	5.05±2	2.39±2	6.33±75	8.47±1	14.76±2
<i>L. phenchooganjensis</i>	5.36±2	2.59±2	7.43±65	9.84±1	16.20±3
<i>P. corrugata</i>	4.74±3	2.13±1	5.71±32	6.90±1	11.54±2
<i>M. meretrix</i>	2.83±2	1.95±2	1.44±69	7.43±2	08.65±1

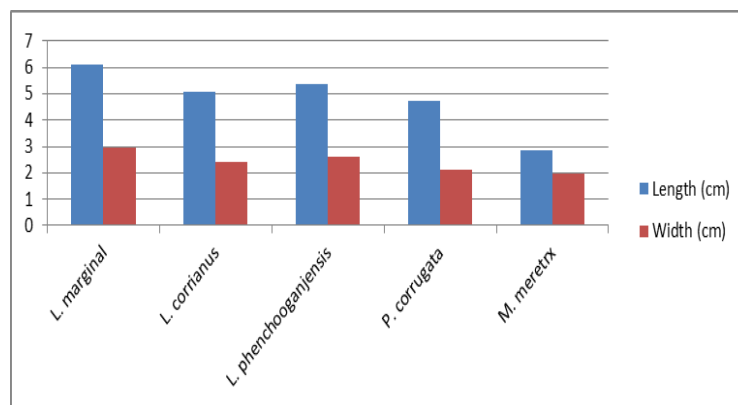


Figure 6: Length and width of sampled mussels

## CONCLUSION

The Meghna river is one of the largest rivers in Bangladesh. A total of five species of mussels were identified belonging two families whereas four species are pearl producer. Unionidae was found to be the most dominant order of the total mussel's population. Among five species of mussels two species were recorded as threatened in Meghna river where one species *Parreysia corrugata* found as vulnerable and another species *Lamellidens phenchooganjensis* found as endangered. The highest numbers of mussels were recorded in the catches by moiyajal. Available species of mussels were caught by the fishers in Meghna River including *L. marginalis*, *L. corrianus*, *Parreysia corrugata*, *L.*

*phenchooganjensis* and *Meretrix meretrix*. Most of them are found all the year round but winter season is the best. Maximum catches are obtained during the month of October to December. Further study on the present status of freshwater mussel available all over Bangladesh need to be carried out for better understanding, conservation of biodiversity and economic use of mussels.

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