



Two new records of bivalve (Mollusca) from Sonadia Island, Bangladesh

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Abstract

The Sonadia Island, located at the south-east coast of Bangladesh, comprises a wide variety of wetland habitats including mudflats, sand dunes and mangroves which made this island a favoured habitat for diversified molluscan fauna. This paper deals with the new distributional record of two species of marine Bivalvia in Bangladesh- *Tellinides timorensis* Lamarck, 1818 and *Vepricardium coronatum* (Schröter, 1786) belonging to the family Tellinidae and Cardiidae respectively. Analysis of taxonomy, diagnosis of shell, geographic distribution and habitat, illustrations of each species and identification characteristics were presented in this paper.

Keywords: Bivalvia; first record; morphological identification; *Tellinides timorensis*; *Vepricardium coronatum*

1 | INTRODUCTION

Bangladesh is situated on the apex of the Bay of Bengal which is one of the prominent malacological provinces of the world (Shahabuddin *et al.* 2010) that contains an extremely functional coastal ecosystem (Iftekhar 2006). Tributaries and distributaries of various rivers, dynamic estuarine system and drainage basin not only made the coastal ecosystem of Bangladesh unique from the rest of the country but also a potential source of natural resources that support diversified fauna and flora (Shamsuddoha and Chowdhury 2007). Sonadia Island is situated in the far south-eastern corner of Bangladesh and the area is bounded by the Bay of Bengal on the west and east that make the island a unique and complex geological system (Majilis *et al.* 2013). The marine biodiversity of south-eastern part of the country is extremely high

and around five hundred molluscan species have been reported (Siddiqui *et al.* 2007; Hossain *et al.* 2014). This region also supports abundant marine bivalves including clams, edible oysters, windowpane oysters and mussels (Faruk 2012). Bivalvia (Mollusca) is the second largest taxonomic class comprising above 10000 known living species throughout the world (Asadi *et al.* 2018).

Bivalves have ecological, economic and food value, and play a crucial role in coastal ecosystems (Asadi *et al.* 2018). There have been only few studies on the biodiversity of marine bivalves in Bangladesh. Siddiqui *et al.* (2007) described 142 marine and 6 freshwater bivalve species from Bangladesh whereas Hossain *et al.* (2014) reported 125 bivalve species under 19 families from Kutubdia, Maheshkhali and Sonadia Island. Sarker *et al.* (2014) illustrated 16 bivalve species from the Saint Mar-

tin's Island. In a survey on the marine bivalve diversity in the south-east coast of Bangladesh, we identified two bivalve species *Tellinides timorensis* Lamarck, 1818 and *Vepricardium coronatum* (Schröter, 1786) for the first time in the country. These two newly recorded species were collected from the western part of Sonadia Island. In this paper, we have reported and illustrated these two species and highlighted their taxonomy and identification characteristics.

2 | METHODOLOGY

Specimen of each species (*T. timorensis*, 1; *V. coronatum*, 1) were collected by direct hand-picking method from the intertidal and deep intertidal zones of the western part of the Sonadia Island (21°29'0"N, 91°54'0"E), Bangladesh.

Both specimens were photographed, tagged, preserved in the storage box and were deposited (deposition IDs: MB1904SD-64 and MB1904SD-103) at the Aquatic Bio-resource Research Lab (ABR Lab), Department of Fisheries Biology and Genetics, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh. Existing inventories (Ahmed 1990; Siddiqui *et al.* 2007; Hossain *et al.* 2014; Sarker *et al.* 2014) were searched in order to verify the two identified species as the new records in Bangladesh. Morphological analysis was performed following Afshar (1969), Carpenter and Niem (1998) and Vidal (2000). In the present study, classification of each species was done by following World Register of Marine Species: WoRMS (2020). Geographical distribution of *T. timorensis* and *V. coronatum* is shown in Figure 1.

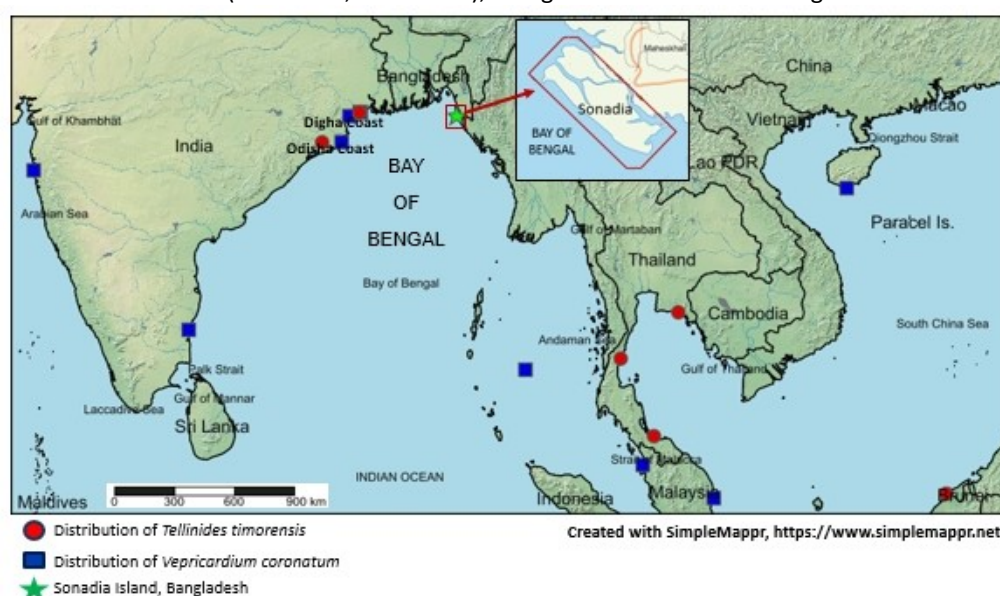


FIGURE 1 Geographical distribution of *Tellinides timorensis* and *Vepricardium coronatum* (Source: SimpleMappr, www.simplemappr.net)

3 | RESULTS

3.1 Taxonomy

Tellinides timorensis Lamarck, 1818 (Figure 2)

Order Cardiida Ferussac, 1822

Family Tellinidae Blainville, 1814

Genus *Tellinides* Lamarck, 1818

Tellinides timorensis Lamarck, 1818

3.1.1 Materials examined

BANGLADESH • 1 valve (left), shell length = 54 mm, shell height = 36 mm; Southeast Coast, Sonadia Island; 21°29'0" N, 91°54'0" E; 5 April 2019; Md. Jayedul Islam leg; deep intertidal zone; MB1904SD-64.

3.1.2 Identification

Shell elongate-ovate in outline, laterally flattened, rather thin and semi-transparent, compressed, nearly equilateral, transversely striated, striae concentric, glossy white often tinged with yellow at the ventral margin. Dorsal outline of shell is roughly straight and have moderate slope. Periostracum is thicker at the shell border. Ventral

edge widely rounded. Anterior and posterior edges rounded. Umbone is situated a short distance anterior of mid-length. Ligament is situated in a shallow ligamental groove (Figure 2D). Shell surface have relatively strong growth lines. Hinge plate of left valve has an anterior tall, trigonal and bifid cardinal tooth and a posterior small, thin, lamellar cardinal tooth (Figure 2C). Laterals of left valve are obsolete. Two adductor muscle scars, the anterior adductor muscle scar is slightly higher, rounded, dorsoventrally elongated and the posterior adductor muscle scar is oval (Figure 2B). One cruciform scar, formed by marks of two muscles, adjacent to the pallial line is located at vertical level of posterior adductor muscle scar (Figure 2B). Pallial sinus deep, confluent with pallial line forming an arch run close to anterior adductor muscle scar, which is well above the ventral margin.

3.1.3 Distribution and habitat

Philippines, Indian Ocean, Indonesia, Japan to Red sea, Taiwan, China, Singapore, Thailand, Malayasia, Myanmar (Yangon River) and India (West Bengal coast, Lakshad-

weep) (Carpenter and Niem 1998; Tudu *et al.* 2018a, 2018b; GBIF 2019a; Palomares and Pauly 2020). Benthic, muddy bottoms, littoral and sublittoral zone to 25 m deep, tropical environment (Carpenter and Niem 1998; Simone and Wilkinson 2008; Palomares and Pauly 2020).

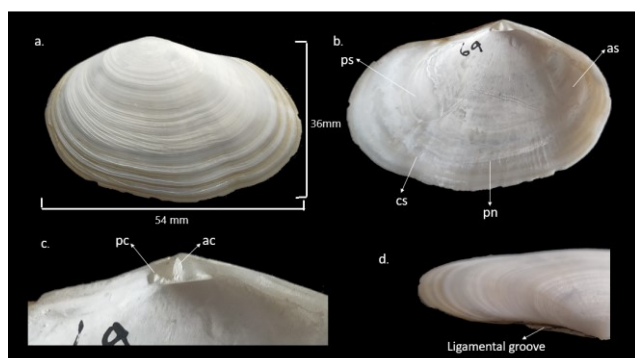


FIGURE 2 *Tellinides timorensis*. A, external view; B, muscle scars and pallial line, internal view; C, detail of hinge plate; D, ligamental area, external view. ac, anterior cardinal; as, anterior adductor muscle scar; cs, cruciform scar; pc, posterior cardinal; pn, pallial line; ps, posterior adductor muscle scar.

3.1.4 Remarks

In our specimen of *T. timorensis*, three identical characteristics of left valve: shape of left cardinals, obsolete laterals and dorsoventrally long, rounded anterior adductor muscle scar lead us to confirm the identification of this species. In 1818, Lamarck proposed subgenus *Tellinides* as a full genus of the family *Tellinidae* and referred *T. timorensis* as the first species of this genus (Afshar 1969). *Tellinid* clams are rapid diggers which make them flattened in shape and they lie vertically in relation to the bottom (Simone and Wilkinson 2008). Seventeen species of *tellinid* clams were reported from Sonadia Island until now but there is no species in this list belongs to the genus *Tellinides* (Siddiqui *et al.* 2007; Hossain *et al.* 2014). Present study first reports the genus *Tellinides* from this island as well as Bangladesh. However, the checklist of malacofauna of India's West Bengal coast of the Bay of Bengal compiled by Tudu *et al.* (2018a) revealed 15 species of *Tellinidae*, of which 2 species belong to the genus *Tellinides*; *Tellinides timorensis*, Lamarck, 1818 and *Tellinides sinuatus* Spengler, 1798. *Tellinides timorensis* is distinguished from *T. sinuatus* by having slightly higher and rounded anterior adductor muscle scar, and oval posterior adductor muscle; on the contrary, *T. sinuatus* contain oval anterior adductor muscle scar and rounded posterior adductor muscle scar (Dey 2006). Another *tellinid* clam *Tellinides conspicuus* Hanley, 1846 is similar in appearance to *T. timorensis*. However, *T. conspicuus*, occurs in Indonesia, is not so elongated in shape having far more slanting dorsal edges but *T. timorensis* has roughly straight and moderate sloped dorsal outline (Sowerby 1847; Coan and Kabat 2012).

3.2 Taxonomy

Vepricardium coronatum (Schröter, 1786) (Figure 3)

Order *Cardiida* Ferussac, 1822

Family *Cardiidae* Lamarck, 1809

Genus *Vepricardium* Iredale, 1929

Vepricardium coronatum (Schröter, 1786)

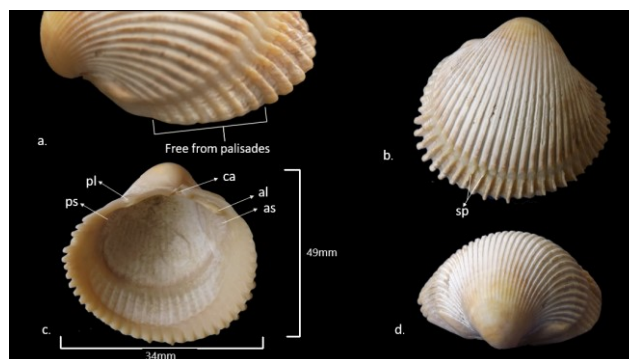


FIGURE 3 *Vepricardium coronatum*. A, first 7 radial ribs, detail of the anterior part; B, spine and 29 palisades on posterior margin of ribs, external view; C, hinge teeth and muscle scars, internal view; D, dorsal view. al, anterior lateral; as, anterior adductor muscle scar; ca, cardinals; pl, posterior lateral; ps, posterior adductor muscle scar; sp, spine.

3.2.1 Materials examined

BANGLADESH • 1 valve (left), shell length = 34 mm, shell height = 49 mm; Southeast Coast, Sonadia Island; 21°29'0"N, 91°54'0"E; 5 April 2019; Md. Jayedul Islam leg; intertidal zone; MB1904SD-103.

3.2.2 Identification

Medium sized, thick and tumid shell. Shell surface sculptured with 36 strong radial ribs. First 7 short ribs at the anterior part of the shell are free from spine or notch (Figure 3A). The remaining 29 ribs located at the middle and posterior portion of shell are crenulated with calcareous spine (Figure 3B). Spines are imbricated and merged to form strong palisades on posterior margin of ribs (Figure 3B). Ribs are thin towards the umbone. Ribs are slightly rounded to trapezoidal separated from each other with deep interval. Hinge has small cardinals and two distinguishable pointed laterals (Figure 3C). Adductor muscle scars conspicuous (Figure 3C). Pallial line entire. Externally shell beige color with white median zone. Interior of the shell beige color with faint white median zone. Interior of the shell sculpt with impressions of external ribs. Internal margin crenulated.

3.2.3 Distribution and habitat

Persian Gulf to Indonesia, the Red sea, northern Indian Ocean to the north of the Pacific, Gulf of Thailand, Vietnam, Philippines, Southern China, South east Java, Equatorial Guinea, Iran Western Central Pacific, Malaya-

sia, Hong Kong, Myanmar and India (West Bengal coast) (Gravelly 1942; Knudsen and Hylleberg 1999; van der Meij *et al.* 2009; Rao 2017; Tudu *et al.* 2018a, 2018b; GBIF 2019b). Benthic, muddy bottom, tropical environment (van der Meij *et al.* 2009; Kazmi 2018).

3.2.4 Remarks

In our specimen of *V. coronatum*, presence of spine and palisades on posterior margin of ribs, and absence of spine and palisade on first 7 anterior ribs lead us to confirm its proper identification. *Vepricardium coronatum* is often misidentified as *V. asiaticum* found in West Bengal coast of the Bay of Bengal (Voskuil and Onverwagt 1988; Tudu *et al.* 2018a). *Vepricardium asiaticum* lacks rib ornamentation but present in *V. coronatum* (Vidal 2000). Only 12 palisades on posterior margin of ribs are present in *V. asiaticum* (Figure 4A), however, this number is 29 for *V. coronatum* (Vidal 2000; Figure 3B). The condition of our collected specimen of *V. coronatum* from Sonadia

Island, Bangladesh was somewhat worn and shabby which made the umbone of the specimen a bit shiny.

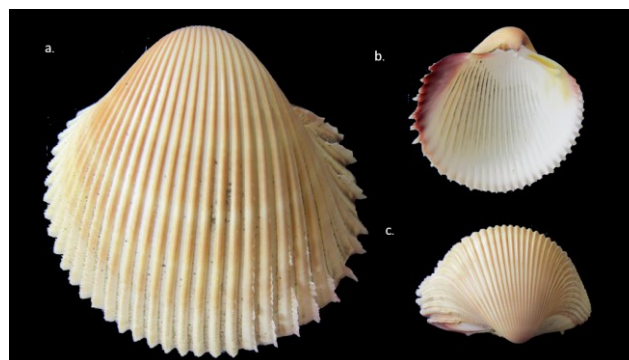


FIGURE 4 *Vepricardium asiaticum*. A, 12 palisades on posterior margin of ribs, external view; B, internal view; C, Dorsal view.

TABLE 1 Species of the family Tellinidae and Cardiidae in the coastal areas and islands of Bangladesh.

Species Name	Locations of occurrence	References
Family: Tellinidae		
<i>Psammotreta papyracea</i> (Gmelin, 1791)	Kutubdia, Moheshkhali and Sonadia Island	1
<i>Tellina chariessa</i> Salisbury, 1934	Kutubdia, Moheshkhali and Sonadia Island	1
<i>Tellina albinella</i> (Lamarck, 1818)	Teknaf, Nuniarchar and Sonadia Island	1, 2, 3
<i>Tellina spengleri</i> Gmelin, 1791	Sonadia Island and Teknaf Sea Beach	1, 2, 3
<i>Arcopagia margaritina</i> (Lamarck, 1818)	Kutubdia, Moheshkhali and Sonadia Island	1
<i>Tellina capsoides</i> Lamarck, 1818	Teknaf and Sonadia Island	2, 3
<i>Tellina palatam</i> (Iredale, 1929)	Sonadia Island	2, 3
<i>Tellina planissima</i> Anton, 1839	Sonadia Island	2, 3
<i>Tellina strigosa</i> Gmelin, 1791	Sonadia Island	3
<i>Tellinides timorensis</i> Lamarck, 1818	Sonadia Island	Present study
<i>Tellina tenuis</i> da Costa, 1778	Kutubdia, Moheshkhali and Sonadia Island	2, 3
<i>Moerella philippinarum</i> (Hanley, 1844)	Saint Martin's Island	2, 3
<i>Gastrana abildgaardiana</i> (Spengler, 1798)	Saint Martin's Island	2, 3,
<i>Gastrana polygona</i> (Gmelin, 1791)	Sonadia Island	2, 3
<i>Apolymeltis edentula</i> (Spengler, 1794)	Sonadia Island	2, 3
<i>Arcopagia margaritina</i> (Lamarck, 1818)	Sonadia Island	2, 3
<i>Macoma birmanica</i> (Philippi, 1849)	Sonadia Island, Saint Martin's Island	2, 3
<i>Psammotreta obesa</i> (Deshayes, 1855)	Sonadia Island	3
<i>Macoma truncata</i> (Jonas, 1844)	Sonadia Island	3
<i>Gastrana pectinatum</i> (Author unknown)	Saint Martin's Island	4
Family: Cardiidae		
<i>Trachycardium enode</i> Sowerby, 1841	Saint Martin's Island and Sonadia Island	2, 3
<i>Trachycardium muricatum</i> (Linnaeus, 1758)	Saint Martin's Island	4
<i>Trachycardium elongatum</i> (Bruguiere, 1789)	Kutubdia, Moheshkhali and Sonadia Island	1
<i>Vepricardium coronatum</i> (Schröter, 1786)	Sonadia Island	Present study
<i>Trachycardium asiaticum</i> (Bruguiere, 1792)	Saint Martin's Island and Sonadia Island	2, 3
<i>Trachycardium procerum</i> (Sowerby, 1833)	Kutubdia, Moheshkhali and Sonadia Island	1, 5
<i>Fulvia mutica</i> (Reeve, 1844)	Kutubdia, Moheshkhali and Sonadia Island	1
<i>Parvicardium exiguum</i> (Gmelin, 1791)	Kutubdia, Moheshkhali and Sonadia Island	1, 5
<i>Trachycardium flavum</i> (Linnaeus, 1758)	Saint Martin's and Sonadia Island	2, 3

1, Hossain *et al.* 2014; 2, Ahmed 1990; 3, Siddiqui *et al.* 2007; 4, Sarker *et al.* 2014; 5, Islam *et al.* 2019

4 | DISCUSSION

Diversity of molluscan fauna in different islands of the south-east coast of Bangladesh including Sonadia Island is relatively higher than other coastal areas of the country and most of the clams and cockles of Bangladesh were reported from south-east parts (Siddiqui *et al.* 2007). Seventeen valid species of tellin clam (Tellinidae) were reported from Bangladesh and all occurs in Sonadia Island (Ahmed 1990; Siddiqui *et al.* 2007; Hossain *et al.* 2014). On the other hand, only eight valid species of cockles (Cardiidae) were reported from Bangladesh and they are also reported in Sonadia Island along with Kutubdia and Moheshkhali islands of the country (Ahmed 1990; Siddiqui *et al.* 2007; Hossain *et al.* 2014). Available species of the family Tellinidae and Cardiidae, and their occurrence locations in different coastal areas and islands of Bangladesh are shown in Table 1. There is no valid record of *T. timorensis* and *V. coronatum* species from Bangladeshi waters before this study (Siddiqui *et al.* 2007; Hossain *et al.* 2014). However, these two species have been reported from the coast of Digha and Odisha located at the West Bengal coast of India (Tudu and Ray 2017; Tudu *et al.* 2018b). Therefore, the known distributional range of *T. timorensis* and *V. coronatum* extends from the west coast to the east coast of the northern Bay of Bengal (Figure 1). *Tellinides timorensis* occurs in the coastal muddy bottom and muddy bed of mangrove hammocks (Simone and Wilkinson 2008) and *V. coronatum* is found in muddy bottom along the low tide mark (Kazmi 2018). The Sonadia Island constitutes of sandy, sandy-muddy to muddy beaches, mangroves, seagrass beds and dunes (Arefin *et al.* 2017; Islam *et al.* 2019) which made the island a suitable habitat for these two species and many other molluscs as well. Reporting of two new records of bivalve species has helped to expand the inventory of molluscan fauna in Bangladesh. More new distributional records of molluscs could be found in Bangladesh if extensive investigation carried out along the south-east coast of the country. Besides, conservation initiatives are also urgent for molluscan fauna in Bangladesh. Bivalves and gastropods are being enormously collected from coastal areas and used in many different purposes, like, making poultry and fish feed, lime production, shell crafts manufacturing, paint making etc. Such indiscriminate extractions along with habitat loss are causing negative impact on the mollusc diversity in the county.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

MJI collected specimens; **KAH** acquired funding; **PSB** & **KAH** led the taxonomic study, morphological analysis and revised the manuscript, **MBB** assisted in the planning of the study and critically reviewed the manuscript; **MJI, SS** & **KSS** drafted the manuscript; **MJI** & **PSB** edited photographs.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available within the article [and/or] its supplementary materials.

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