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MALACOLOGICAL NOTES ON SAGAR ISLAND

By

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Introduction

Earlier reports on molluscs of Gangetic delta, lower Bengal, are from Stoliczka (1869), Nevill (1880), Annandale (1907), Preston (1915), Annandale & Prashad (1919), Roonwal (1954a, 1954b, 1967), Rajagopalaiengar (1961, 1966), Rajagopal (1964, 1970) and Subba Rao *et al* (1983). The studies covered the vast areas of Sunderbans in general. No particular attention was paid to the molluscs of Sagar, an important island in the Sunderbans. Keeping this in view, a project was undertaken and regular surveys were conducted in different seasons, to study the malacofuana of Sagar island, with special reference to their bioecology. Results of these studies covering a period of two years (1979-81), are summarised here.

Physiography of Sagar Island

Sagar island (Lat. 21°39'N., Long. 63°03'E.) is situated about 105 kms. south of Calcutta, in the mouth of river Hooghly. The island is approximately 300 Sq. kms. bounded by the branches of the river Hooghly on all sides, except on the south, where is there Bay of Bengal. The branch flowing west is known as Hooghly and the other flowing north and east is Muriganga or Burtola. On the southern side is a sandy beach interspersed with mudflats. Three creeks criscross the island. The major one is Chemaguri creek, running from east end to west, and is stagnant at present. A few mangrove patches are present in the south. The island is surrounded by mud bunds all around to prevent inflow of saline waters. Erosion is rather common, particularly in monsoon and bamboo poles are erected as supports to prevent this. Two jetties, one at Kachuberia, the northern tip and the other at Chemaguri, the southern tip of the island, 11 kms. north-east of Ganga Sagar, are present.

Based on the ecology, a total of five sations were established in the island. These are I. Kachuberia, II. Costala, III. Sagar Thana, IV. Chemaguri and V. Ganga Sagar. In addition, nearby islands i.e. Ghoramara, Lohachora, Kakdamari were also surveyed. The details of the stations are given below.

KACHUBERIA (Station. I)

Kachuberia is situated on the northern part of the island. The piles of the jetty, damaged by the shipworms were replaced by iron pillars recently. A 50 metre brick wall along the bank is on the east.

The terrain on either side of the jetty is hard, interspersed with brick pieces, stones etc. and devoid of vegetation. In the eastern side the bank is steep to very steep and in the west it is shallow with grass vegetation beyond 200 metres of the jetty. No fauna was recorded on either side of the jetty except mud skippers and hermit crabs at high water mark as the area is constantly disturbed by human activity. The wooden jetty piles were found covered with sea anemones (*Metridium* sp.), barnacles, oysters and gastropods, *Littorina scabra scabra* (Pl. V, fig. 5). *Nerita articulata* (Pl. V, figs. 1 & 2) and *Cymia lacera* (Pl. VI, fig. 6). The first mentioned species was dominent and occupies the highest position on the piles. Occasionally empty shells of *Littorina melanostoma* (Pl. V, fig. 6), *Natica tigrina* (Pl. VI, figs. 2 & 3) and *Nerita articulata* inhabited by hermit crabs were also seen. Though the piles were damaged by the shipworms, no live animals were found during the visits. The empty tunnels were occupied by crabs, isopods, polychaetes etc. A list of molluscs occuring in this station are given in Table I.

COSTALA (Station II)

The place is situated about 3 kms. north west of Kachuberia. Here the river bifurcates and the bank is protected by mud bund. During low tide about 0.5 km. of the bed is exposed. There is a small patch of mangrove vegetation of plants locally called as, 'Ban (*Avicenia* sp.) and Harcoza (*Acanthus illicifolius*). Rest of the bed is covered with grass extending upto mid water mark and gradually decreases towards low water mark.

The terrain is hard to semi-hard between high to mid water mark and semi-hard to loose between mid to low water mark, traversed by a few small creeklets. At high water mark large number of ditches are present. The malacofauna is dominated by assiminid, *Assiminea brevicula* (Pl. V, fig. 11) and the tower shells, *Telescopium telescopium* (Pl. V, fig. 15) which are found crawling on mud banks. The former extends from mid to low water mark with a gradual increase in their numbers. The latter is mostly found along the creeklets and ditches near the bund. In addition, the ditches are inhabited by stenothyrids, *Stenothyra deltae* (Pl. V, fig. 8), slugs. *Onchidium tenerum* (Pl. VII, fig. 1). The latter burrows below the surface and comes out only at night. However, the number of faecal pellets of these animals is greater in rainy season.

The mangrove plants offer shelter to *Littorina melanostoma*, which cling to their branches. In addition, *Assiminea francesiae* (Pl. V, figs. 9 & 10) and *Pila globosa* (Pl. V, fig. 7) are noticed crawling on the substratum in September. The occurrence of latter, a common freshwater species is interesting. It indicates either a fall in the salinity or the tolerance of the species to salinity. Bivalves were collected from exposed bed during low tide.

SAGAR THANA (Station III)

It is about 6kms. south east of Kachuberia. A creek known as Bomankhali opens into the main river at this point. The river bank is similar to that at Costala with no mangrove vegetation. The banks of the creek are steep and slippery, semi hard in the upper and slushy in lower region. Grass vegetation extends from mid to high water mark and upto the bund.

The malacofauna is similar to that of Costala except for the absence of littorinids.

Assiminids are dominant and concentrated on the banks of the creek rather than in the main river. Assiminids are represented by two species, *Assiminea brevicula* and *A. beddomeana*, but the latter is not abundant. In the slushy ditches at high water mark and creeklets stenothyrids, *Stenothyra deltae*, atyids, *Haminea crocata* (Pl. VI, figs. 13 & 14), and tower shells *Telescopium telescopium* are found. Occurrence of slugs was also indicated by their faecal pellets. Table I presents the list of molluscs.

CHEMAGURI (Station IV)

Chemaguri, situated slightly interior, is about 11 kms. north east of Ganga Sagar. A creek flowing through this place opens into the main river at a distance of about 2 kms. from Chemaguri village. The banks of the creek are steep with thick mangrove vegetation all along upto the mouth, with patches of grass locally called 'Dhani' gach' (*Oxyza* sp.) from mid to lower water mark. The terrain is hard to semi-hard with loose slushy patches at low water mark. The malacofauna is similar to that of other stations, but *Cerithidea obtusa* (Pl. V, figs. 12 & 13) and *Littorina melanostoma* clinging to the branches of mangrove trees were recorded. During low tide they become active and seen crawling on the exposed slushy mud.

The jetty piles are thickly coated with sea anemones (*Metridium* sp.) in addition to the usual barnacles and oysters, *Crassostrea cuttackensis*, *Littorina scabra scabra* and *Cymia lacera*. Some of these piles are damaged by the shipworms, but no live ones could be collected.

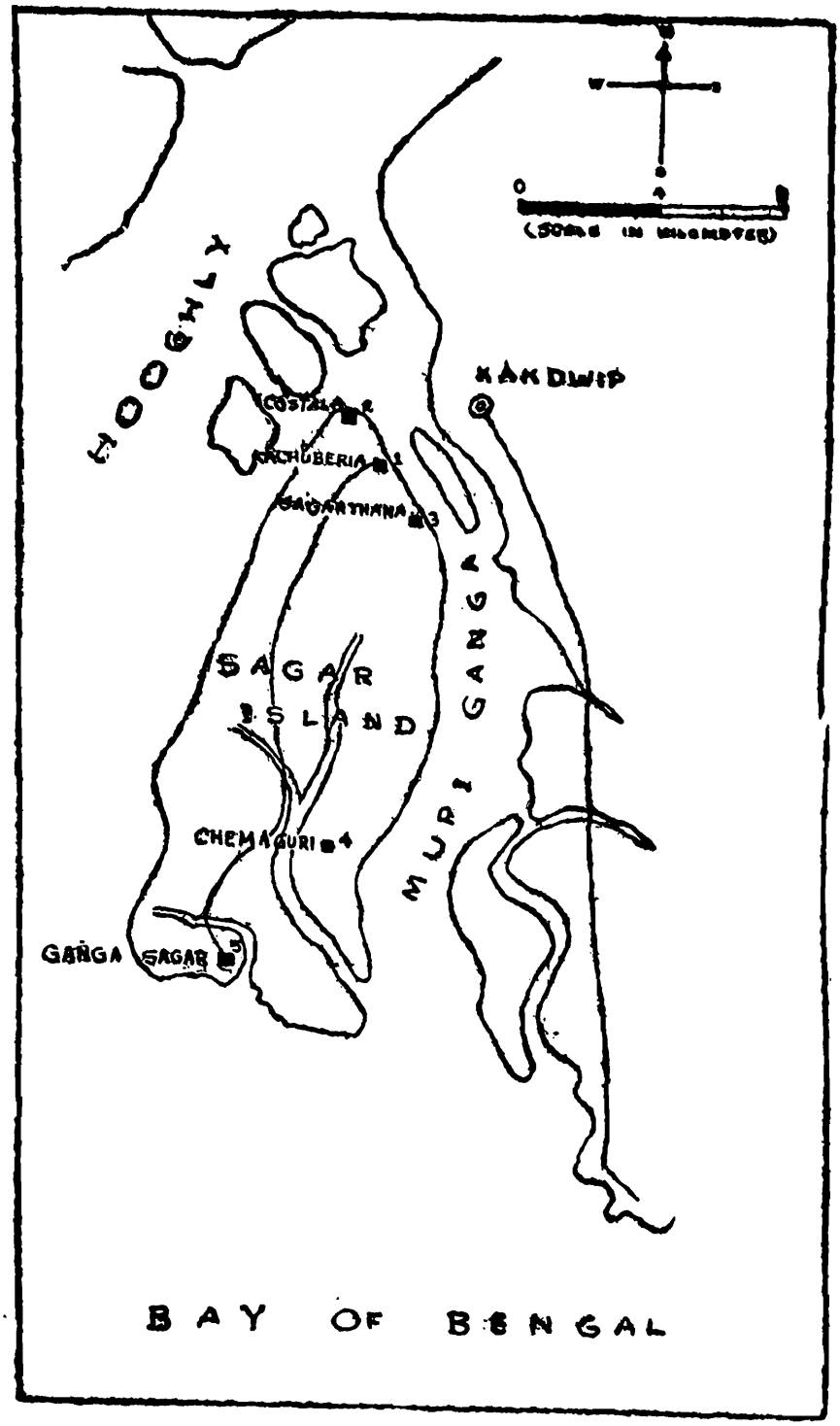
A mud flat is exposed near the mouth of the creek during spring tides. The substratum consists of very loose mud with slushy pockets, cris-crossed by small creeklets. The slushy pockets are kneedeep to waist-deep. Only tall grass is present in the middle of the flat. The malacofauna in this mud flat in order of dominence consists of *Cerithidea cingulata* (Pl. V, fig. 14), *Telescopium telescopium*, *Nassarius foveolatus* (Pl. VIII, fig. 8) and *Macoma birmanica* (Pl. VIII, figs. 6 & 7). The former two species were concentrated in the centre of the flat and latter two near the bank, the last mentioned occurring at a depth between 15 to 30 cms. in the slushy pockets. Presence of these animals inside the burrows were indicated by their protruding siphons spread out on the slushy mud surface.

GANGA SAGAR (Station V)

It is on the southern tip of the island facing sea. The beach is confined to in between the two river mouths. A creek which opens into the sea about 0.5 kms. east of the Irrigation bunglow, runs north-west after separating in two tributaries. One of the branches, the course of which is obstructed by the irrigation bunglow, runs behind the Kapil Muni temple ending in a marshy mangrove forest, which spreads over most part of the region, particularly on the west. For covenience of survey three sub-stations were established *viz.* Ganga Sagar beach, the creek and its branches, and mangrove forest.

Ganga Sagar beach :

The beach is mostly sandy admixed with fine mud and interspersed with mud flats. Vertically three zones have been recognised on the beach i.e. supra littoral, littoral and eulittoral zones. At supra littoral zone the beach is mainly sandy with sand dunes



Map showing the Physiography of Sagar Island

extending upto the Kapil Muni temple. Beyond the temple there are hard mud flats. The vegetation on sand dunes is that of *Ipomea* creepers (*Ipomea bilabiata*) and on west the mangrove forest consists mainly of 'Henthal' (*Phoenix peludosa*) trees. The region between high to mid-water mark is sandy towards east and interspersed by more mud flats in the west. The terrain is semi hard on sandy patches due to admixture of silt. The mud flats are very hard, corrugated, slippery, criss-crossed with small canals and with mangrove stumps and their roots. Several dead and empty shells washed ashore were noted (Table. I). However, the mud flats near mid water mark support a small population of *Glauconome sculpta* (Pl. VIII, figs. 12 & 13). Further down towards low water mark, the beach is hard to semi hard with patches of mud flats in between. During spring tides a vast area of the beach is exposed, often extending for about a kilometre from the supra littoral zone. Apparently the beach appears barren. A careful observation, soon after the receding tide, however reveals a large number of tiny nudibranchs (*Limapontia* sp.) tunnelling through the subsurface level of the sandy beach leaving clear tracks behind. The number of these animals are comparatively higher when the sun is not too hot. In addition to these, *Nassarius stolatus* (Pl. VI, fig. 10), *Natica gualteriana* (Pl. VI, fig. 4) are common. Occasionally species like *Acrilla acuminata* (Pl. VI, fig. 1), *Donax incarnatus* (Pl. VIII, figs. 10 & 11) are also found. The mud flats support a rich population of *Glauconome sculpta* and thinly populated pholads, *Barnea candida* (Pl. VIII, figs. 16 & 17) and *Solen kempi* (Pl. VIII, fig. 18). The mangrove stumps on the mud flats are inhabited by *Littorina scabra scabra*, *Larina burmana* (Pl. VII, fig. 4) and also oysters, *Crassostrea cuttackensis*. Some of these stumps are damaged by shipworms, *Banka rochii*.

Creek at Ganga Sagar :

Unlike that of other creeks at Chemaguri and Sagar thana the present creek has a wider mouth opening into the sea. The mouth is shallow and sandy. Up-stream the banks are more steep and muddy with mangrove plants.

The malacofauna near the mouth include *Cerithidea cingulata*, *Nassarius stolatus* and *Meretrix meretrix* (Pl. VII, figs. 10 & 11). The last mentioned species is a burrowing form. The banks of the creek are inhabited by *Assiminea brevicula*, *Telescopium telescopium*, *Stenothyra deltae and Haminea crocata* in order of dominance. A small population of *Littorina melanostoma* is found clinging to the plants on the bank.

Mangrove forest :

The mangrove forest extends from the irrigation bunglow to west almost upto the mouth of Hooghly. The major constituents of the forest is henthal, which grows upto a height of 2.5 to 3 metres, with thorny branches. Other plants include Ban, Ganwa (*Excoecaria agallocha*) and Harcoza. The terrain is muddy with puddles and ditches. During spring tides water enters this region, but at other times it is semi dry. Molluscs inhabiting this region include *Telescopium telescopium*, *Cerithidea obtusa*, *Auricula transluscens* (Pl. VII, fig. 2) and *Pythia plicata* (Pl. VII, fig. 3).

Discussion

A total of 55 species belonging to 43 genera included in 34 families were collected

TABLE—I. List of species occurring in Sagar Island

Name of the species	Stations					Remarks
	I	II	III	IV	V	
Class : GASTROPODA						
Family : NERITIDAE						
Nerita articulata (Gould)	+	—	—	+	+	
Pseudonerita sulculosa (Martens)	+	—	—	—	—	
Neritina (*Dostia*) *violacea* (Gmelin)	+	+	+	—	—	empty shells
Family : PILIDAE						
Pila globosa (Swinson)	—	+	+	—	—	
Family : LITTORINIDAE						
Littorina (*Littorinopsis*) *scabra scabra* (Linnaeus)	+	—	—	+	+	
L. (*Littorinopsis*) *melanostoma* Gray	—	+	—	+	+	
Family : STENOTHYRIDAE						
Stenothyra deltae (Benson)	—	+	+	—	+	
Family : ASSIMINEIDAE						
Assiminea brevicula Pfeiffer	+	+	+	+	+	
A. beddomeana Nevill	—	—	+	+	—	
A. francesiae (Wood)	—	+	—	—	—	
Family : POTAMIDIDAE						
Cerithidea (*Cerithidiopsis*) *cingulata* (Gmelin)	—	—	—	+	+	
C. obtusa Lamarck	—	—	—	+	+	
Telescopium (*Telescopium*) *telescopium* (Linnaeus)	—	+	+	+	+	
Family : EPITONIDAE						
Acrilla acuminata (Sowerby)	—	—	—	—	+	
Family : NATICIDAE						
Natica tigrina (Roding)	—	—	—	—	+	
N. gualteriana Recluz	—	—	—	—	+	
Family : CYMATIDAE						
Gyrineum natator (Roding)	—	—	—	—	+	empty shell
Family : MURICIDAE						
Cymia lacera (Boin)	+	—	—	+	—	
Family : VOLEMIDAE						
Pugilina cochlidium (Linnaeus)	—	—	—	—	+	
Family : NASSARIIDAE						
Nassarius stolatus (Gmelin)	—	—	—	—	+	
N. foveolatus Dunker	—	—	—	+	+	
N. nodifera (Powis)	—	—	—	—	+	
Family : OLIVIDAE						
Amalda ampla (Gmelin)	—	—	—	—	+	
Family : TEREBRIDAE						
Terebra duplicata Linnaeus	—	—	—	—	+	
Family : ATYIDAE						
Haminea crocata Pease	—	—	+	—	+	
Family : LIMAPONTIIDAE						
Limapontia sp.	—	—	—	—	+	
Family : ONCHIDIIDAE						
Onchidium tenerum Stoliczka	—	+	—	—	—	
O. tigrinum Stoliczka	—	—	+	—	—	

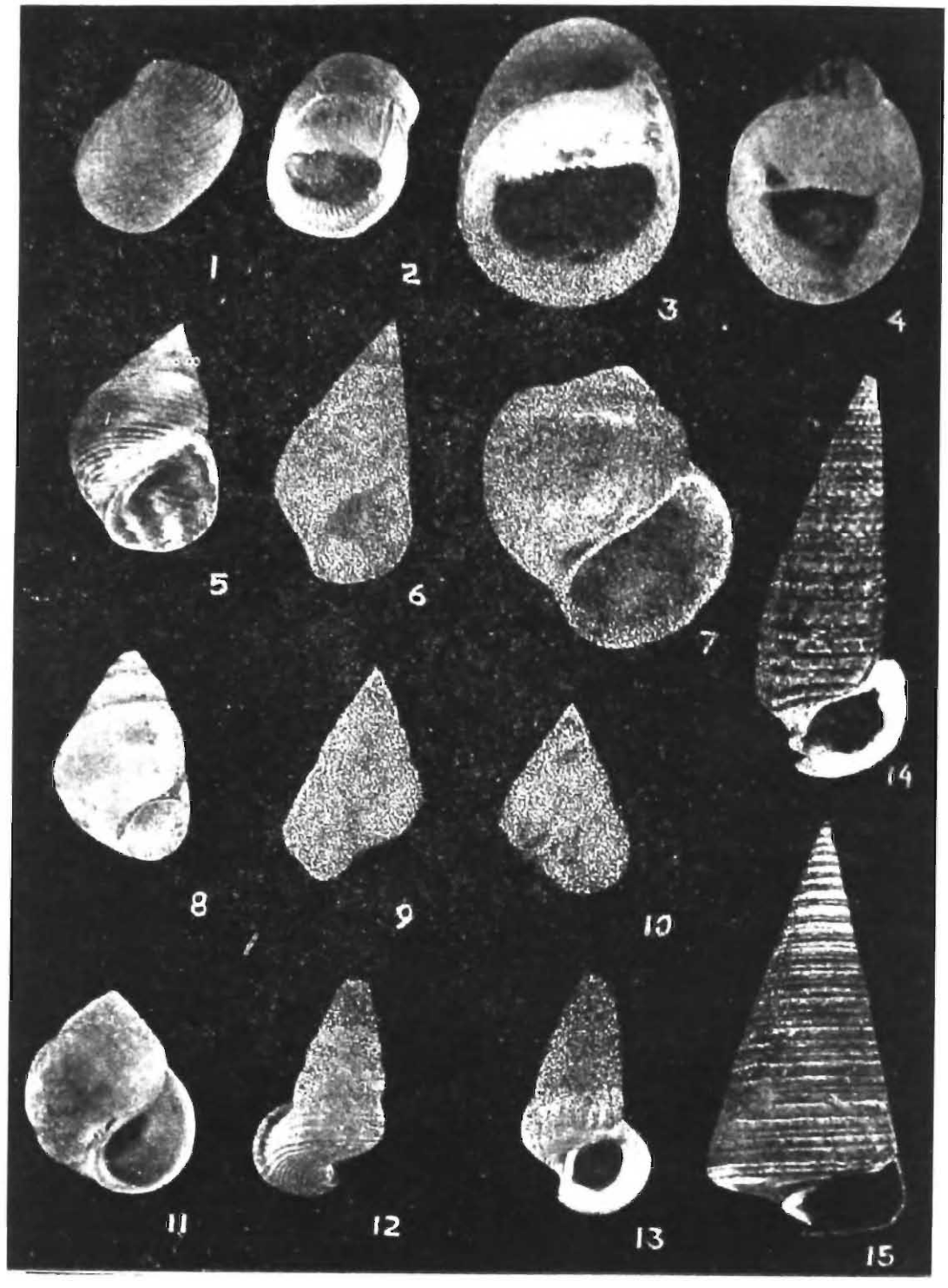
Name of the species	Stations I	II	III	IV	V	Remarks
Family : ELLOBIIDAE						
Auricula transluscens Annandale & Prashad	+	+	+	+	+	empty shells
Pythia plicata (Gray)	+	+	+	+	+	empty shells
Family : THIARIDAE						
Larina burmana Blanford	—	—	—	—	+	
Class : SCAPHOPODA						
Family : DENTALIIDAE						
Dentalium octangulatum Donovan	—	—	—	—	+	empty shells
Class : BIVALVIA						
Family : ARCIDAE						
Anadara granosa (Linnaeus)	—	—	—	—	+	empty valves
Family : MYTILIDAE						
Modiolus undulatus (Hanley) (Pl. VII, figs. 8 & 9)	—	—	—	—	+	
Family : OSTREIDAE						
Crassostrea cuttackensis (Newton and Smith)	—	—	—	—	+	valves
Family : VENERIDAE						
Meretrix meretrix (Linnaeus)	—	—	—	—	+	
Dosinia eudeli Fischer Piette & Delmas	—	—	—	—	+	empty valves
D. trigona Reeve (Pl. VII, figs. 13 & 14)	—	—	—	—	+	empty valves
Paphia malabarica (Schroeter) (Pl. VII, fig. 12)	—	—	—	—	+	do
Family : MACTRIDAE						
Mactra luzonica Deshayes (Pl. VII, figs. 15 & 16)	—	—	—	—	+	do
M. mera Deshayes (Pl. VIII, fig. 1)	—	—	—	—	+	do
M. turgida (Gmelin) (Pl. VIII, fig. 3)	—	—	—	—	+	do
M. violacea Gmelin (Pl. VIII, fig. 2)	—	—	—	—	+	do
Family : PSAMMOBIIDAE						
Sanguinolaria (*Soletellina*) *acuminata* (Philippi) (Pl. VIII, figs. 4 & 5)	—	—	—	—	+	do
Family : TELLINIDAE						
Macoma birmanica (Philippi)	—	—	—	+	+	
Strigilla splendida Anton	—	—	—	—	+	
Tellina iridiscens (Benson)	—	—	—	—	+	
Family : SEMELIDAE						
Theora opalina (Hinds) (Pl. VIII, figs. 8 & 9)	—	—	—	—	+	
Family : GLAUCONOMIDAE						
Glauconome sculpta (Sowerby)	—	—	—	—	+	
Family : DONACIDAE						
Donax incarnatus Gmelin	—	—	—	—	+	
Family : SOLENIDAE						
Solen kempi Preston	—	—	—	—	+	
Family : CULTELLIDAE						
Siliqua albida Dunker	—	—	—	—	+	
Tanysiphon rivalis Benson	—	+	—	—	—	
Family : PHOLADIDAE						
Barnea candida (Linnaeus)	—	—	—	—	+	
Family : TEREDINIDAE						
Bankia rochi Moll	—	—	—	—	+	

from the island (Table. I). Out of these, gastropods are represented by 30 species, bivalves by 24 species and scaphopoda by a single species. Ganga Sagar (Station V) supports a large number of species (46 spp.) followed by Chemaguri (Station IV) 13 spp., Costala (Station II) 12 spp., Sagar Thana (Station III) 11 spp. and Kachuberia (Station I) 8 spp. Ganga Sagar is in the immediate vicinity of the sea thus having maximum marine influence. Chemaguri is nearer to Ganga Sagar and has more species than other stations which are not primarily marine in nature.

Of all the species, *Assiminea brevicula*, *Auricularia transluscens* and *Pythia plicata* are common to all stations. *Telescopium telescopium* and *Stenothyra deltae* are common to all except for station I (Kachuberia) where the ecology is disturbed more due to human interference and also due to wide salinity fluctuations. The species like *Littorina scabra scabra* and *Cymia lacera* are common at both Kachuberia and Chemaguri, the latter species is only found attached to jetty piles whereas the former species, along with *Larina burmana* is found on jetty piles as well as mangrove stumps at Ganga Sagar beach. Total absence of *Neritina violacea* (Pl. V, fig. 4), even their shells from last two stations i.e. IV & V, perhaps indicates their inability to tolerate high salinity. Occurrence of *Pila globosa*, a freshwater form and *Assiminea francesiae*, which is near freshwater in habit, at Costala and Sagar Thana, during September obviously points to the either fall in salinity or the tolerance of the species to salinity after the monsoon. The species *Pseudonerita sulculosa* (Pl. V, fig. 3), *Acrilla acuminata*, *Pugilinus cochlidium* (Pl. VI, fig. 7), *Nassarius nodifera* (Pl. VI, fig. 9), *Amalda ampla* (Pl. VI, fig. 11), *Terebra duplicata* (Pl. VI, fig. 12) and *Haminea crocata* among gastropods and *Strigilla splendida*, *Siliqua albida* (Pl. VIII, fig. 14 & 15) and *Tanysiphon rivalis* among bivalves are found rarely. Most of the bivalves listed are found as empty shells except for the species *Glauconome sculpta*, *Barnea candida*, *Solen kempii* and *Bankia rochii*.

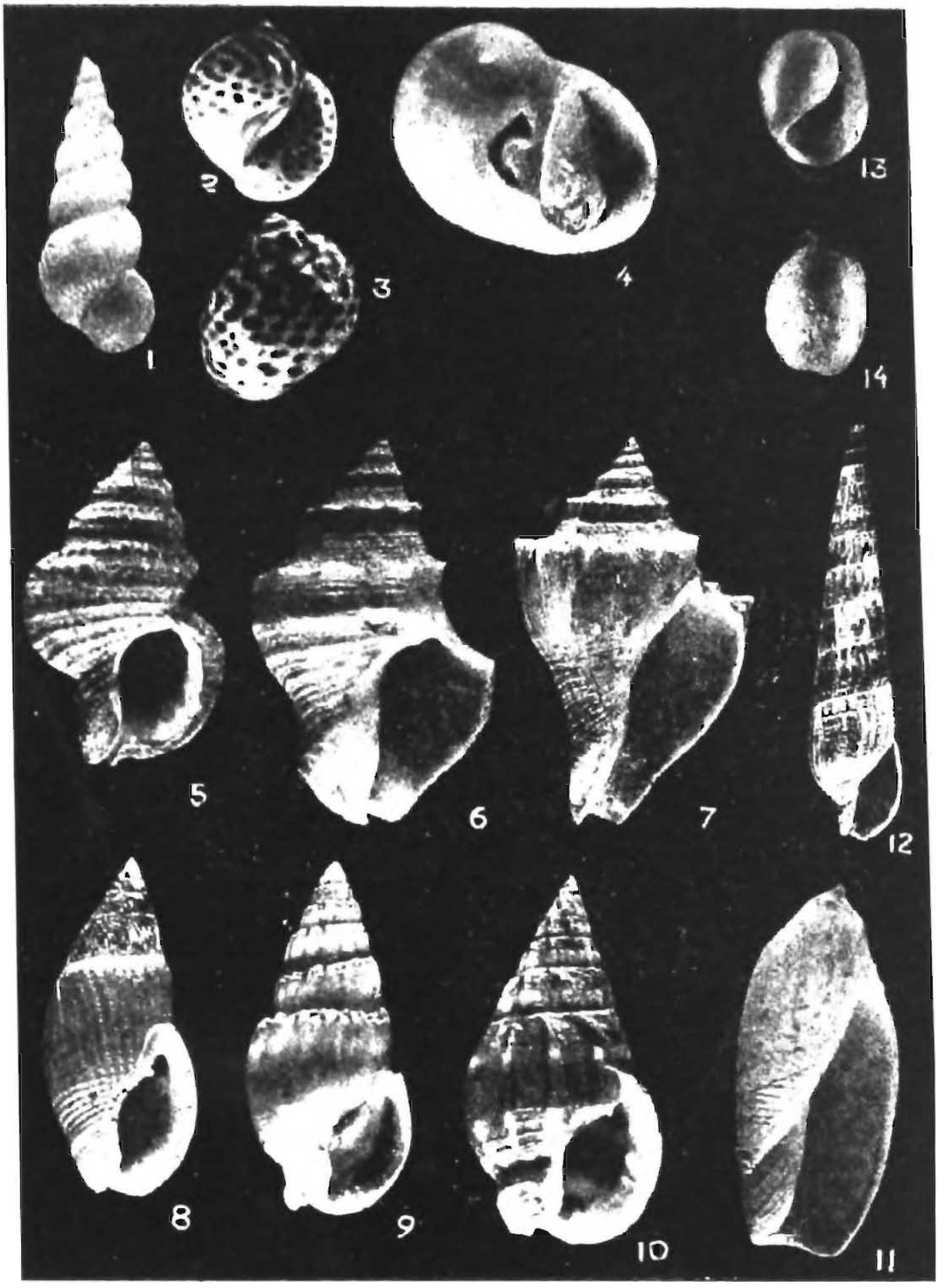
The species occurring throughout the year in order of dominance are *Assiminea brevicula*, *Telescopium telescopium*, *Littorina scabra scabra*, *L. melanostoma*, *Natica tigrina*, *Cerithidea cingulata*, *C. obtusa*, *Nassarius stolatus*, *Glauconome sculpta* and *Barnea candida*. Population counts were taken for the most common species i.e. *Assiminea brevicula* of gastropods and *Glauconome sculpta*, a bivalve. The assiminids are found on the mud banks extending from high water mark to low water mark, the maximum number (833 to 100/ sq.m.) being in November-December period. During this period young ones are abundant along the low water mark grandually becoming scarce towards high water mark, which is occupied by adults. Size range varies between 0.5 to 6 mm. Pairing was noticed from August to October. Glaucomomids found at depths of 7-15 cms. in the mud flats at Sagar island beach, are dominant between mid water mark to low watermark. The young shells are at a depth between 10-15 cms, whereas the adults are in superficial layer, a part of the body remaining exposed. The size range varies from 0.3 to 33 cms. Maximum number (450-503/sq.m.) which includes mostly young ones are found in the month of November.

Table II shows dominance of the fauna in a particular ecological niche. A perusal



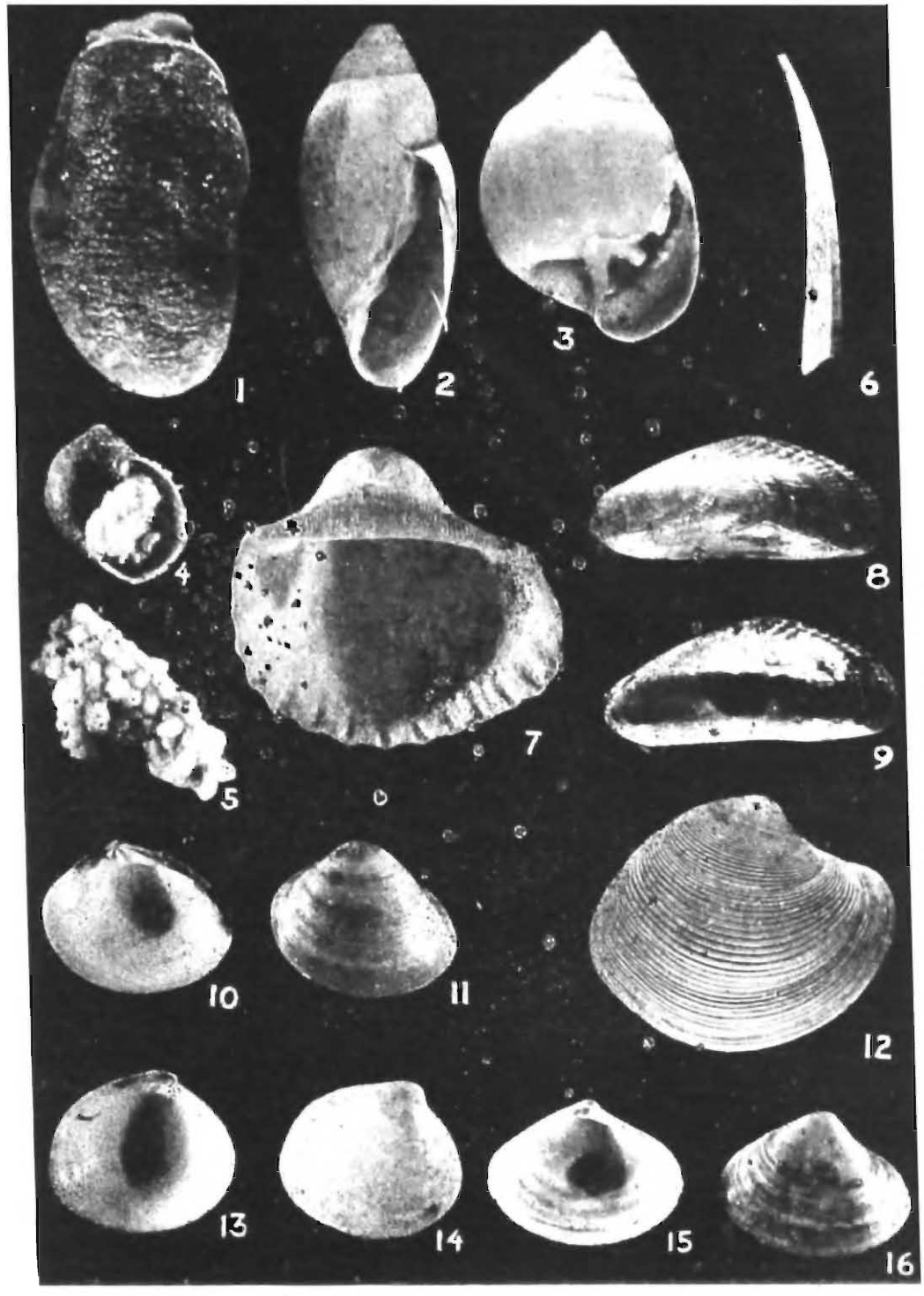
Measurements in MM

Figs. 1-15. 1. & 2. *Nerita articulata* (Gould) 31.75×29.34 (Dorsal) & 32.10×29.15 (Ventral) 3. *Pseudonerita sulculosa* (Martens) 6.40×6.10 4. *Neritina* (*Dostia*) *violacea* (Gmelin) 19×10.85 5. *Littorina* (*Littorinopsis*) *scabra scabra* (Linnaeus) 9.40×6.43 6. *Littorina* (*Littorinopsis*) *melanostoma* Gray 21.40×11.95 7. *Pila globosa* (Swainson) 49×42.10 8. *Stenothyra deltae* (Benson) 5.30×3.55 9. & 10. *Assiminea francesiae* (Wood) 9.30×5.45 (Dorsal); 8×5.35 (Ventral) 11. *Assiminea brevicula* Pfeiffer 6×4.6 12. & 13. *Cerithidea obtusa* Lamarck 42.20×22.65 (Dorsal); 42.88×23.55 (Ventral) 14. *Cerithidea* (*Cerithidiopsis*) *cingulata* (Gmelin) 25×9.20 15. *Telescopium telescopium* (*Linnaeus*) 73.45×33.85



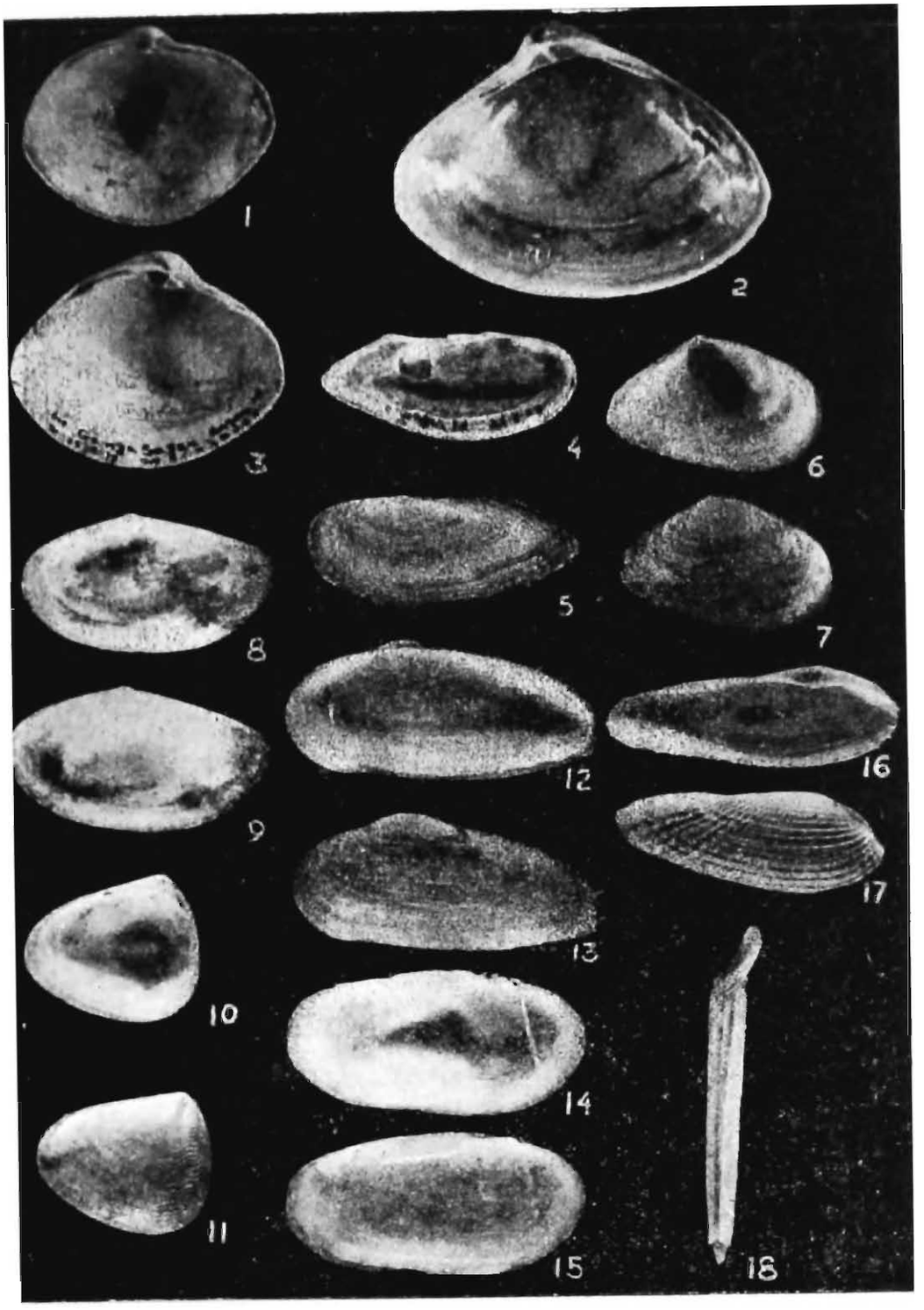
Measurements in MM

Figs. 1-14. 1, *Acrilla acuminata* (Sowerby) 4.96×1.90 2. *Natica tigrina* (Roeding) (Dorsal) 12.45×10.8 3. *Natica tigrina* (Ventral) 13.45×10.95 4. *Natica gualteriana* Recluz 9.25×8.10 5. *Gyrineum natator* (Roeding) 40.9×25 6. *Cymia lacera* (Born) 26.66×17.05 7. *Pugilinus cochlidium* (Linnaeus) 86.40×48.40 8. *Nassarius foveolatus* (Dunker) 18.85×8.50 9. *Nassarius nodifera* (Powis) 10.80×5 10. *Nassarius stolatus* (Gmelin) 23.15×12.40 11. *Amalda ampla* (Gmelin) 21.55×9.85 12. *Terebra duplicata* Linnaeus 22.45×5.90 13. *Haminea crocata* Pease (Dorsal) 8×5.95 14. *Haminea crocata* Pease (Ventral) 8.35×6.25



Measurements in MM

Figs. 1-16. 1. *Onchidium tenerum* Stoliczka 37.75×18.80 2. *Auricularia tranluscens* Annandale & Prashad 24.15×10.30 3. *Pythia plicata* (Gray) 19.45×13.10 4. *Larina burmana* Blanford 9.60×7.80 5. *Larina burmana* Blanford (egg mass) 6. *Dentalium octangulatum* Donovan 18.65×2.62 7. *Anadara granosa* (Linnaeus) 64.84×63.18 8. *Modiolus undulatus* (Hanley) (Outer view) 16.46×6.84 9. *Modiolus undulatus* (Hanley) (Inner view) 16.46×6.84 10. *Meretrix meretrix* (Linnaeus) (Outer view) 50.26×41.82 11. *Meretrix meretrix* (Linnaeus) (Inner view) 50.26×41.82 12. *Paphia malabarica* Schroter 51.20×41.85 13. *Pelecyora trigona* (Reeve) (Outer view) 12.85×12.02 14. *Pelecyora trigona* (Reeve) (Inner view) 12.85×12.02 15. *Mactra luzonica* Deshyaes (Outer view) 20.95×15.38 16. *Mactra luzonica* Deshayes (Inner view) 20.95×15.38.



Measurements in MM

Figs. 1-18. 1. *Mactra mera* Deshayes 40×32.62 2. *Mactra violacea* Gmelin 55.90×43.78 3. *Mactra turgida* (Gmelin) 46.60×56.50 4. *Sanguinolaria* (*Soletellina*) *acuminata* (Philippi) (Outer view) 31.64×72.75 5. *Sanguinolaria* (*Soletellina*) *acuminata* (Philippi) (Inner view) 29.26×67.20 6. *Macoma birmanica* (Philippi) (Outer view) 50.35×30.70 7. *Macoma birmanica* (Philippi) (Inner view) 50.35×30.70 8. *Theora opalina* (Hinds) (Outer view) 11.65×9.94 9. *Theora opalina* (Hinds) (Inner view) 11.29×8.84 10. *Donax incarnatus* Gmelin (Outer view) 10.05×11.10 11. *Donax incarnatus* Gmelin (Inner view) 10.05×11.10 12. *Glauconome sculpta* (Sowerby) (Outer view) 25.70×11.54 13. *Glauco ome sculpta* (Sowerby) (Inner view) 25.70×11.54 14. *Siliqua albida* Dunker (Outer view) 19.48×9.30 15. *Siliqua albida* Dunker (Inner view) 19.48×9.30 16. *Barnea candida* (Linnaeus) (Outer view) 69.94×26.02 17. *Barnea candida* (Linnaeus) (Inner view) 74.48×26.32 18. *Solen kempi* Preston (Lateral view) 13.05×2.65.

TABLE—II Table showing the different ecological niches with dominant malacofauna (In order of dominance)

Mud banks and mud flats exposed in riverine system	Mangrove forest	Ganga sagar beach	Mud flats on sea beach	Jetty piles & Mangrove stumps on sea beach
Assiminea brevicula Pfeiffer	*Cerithidea obtusa* Lamarck	*Limapontia* sp.	*Glauconome sculpta* (Sowerby)	*Littorina scabra scabra* Linnaeus
Telescopium telescopium (Linnaeus)	*Littorina melanostoma* Gray	*Nassarius stolatus* (Gmelin)	*Barnea candida* (Linnaeus)	*Cymia lacera* (Born)
Cerithidea cingulata (Gmelin)	*Nerita articulata* (Gould)	*Natica tigrina* (Roding)	*Solen kempi* Preston	*Bankia rochi* Moll
Stenothyra deltae (Benson)	*Auricula transluscens* Annandale & Prashad	*Natica gualteriana* Recluz	*Cochlidium pugilinus* (Linnaeus)	*Larina burmana* Blanford
Onchidium tenerum Stoliczka	*Pythia plicata* Gray	*Cerithidea cingulata* (Gmelin)		
Onchidium tigrinum Stoliczka		*Donax incarnatus* Gmelin		
Macoma birmanica (Philippi)		*Nassarius nodifera* (Powis)		
Nassarius foveolatus Dunker		*Amulda ampla* Gmelin		
Haminea crocata Pease		*Terebra duplicata* Linnaeus		
Assiminea beddomeana Nevill		*Acrilla acuminata* (Sowerby)		
A. francesiae (Wood)		*Meretrix meretrix* (Linnaeus)		
Pila globosa (Swainson)				

of the table reveals that the sea beach including mud flats and mud banks in the riverine system has almost equal number of species (14 and 12 respectively). The commonest and most dominant species in the riverine system is *Assiminea brevicula*. The other two species of the genus *A. beddomiana* and *A. francesiae* are rare to very rare. *Telescopium* occupies the next position and lastly *Nassarius foveolatus*. The commonest species on the sea beach is the small gray coloured nudibranch (to be identified). Next in order of dominance are *Nassarius stolatus* and *Natica tigrina*, which occur throughout the year. Though, *Cerithidea cingulata* are common on beach, they occur more near the mouth of the creek and on the exposed mud flat near Chemaguri and in other back water in the beach. *Natica gualteriana* and *Donax incarnatus* are found occasionally. The mud flat on the sea beach is inhabited by four species. *Glauconome sculpta* being the dominant among them and rarest is the *Pugilinus cochlidium*.

The molluscs of the mangrove zone include *Cerithidea obtusa* and *Littorina melanostoma*. The other species, *Nerita articulata*, *Auricula transluscens* and *Pythia plicata* occur near the base of the plants or in the crevices. The first mentioned species is also found at a height of 2 to 2.5 metres above the ground level on the 'Ban' trees elsewhere. The other two species are represented by empty shells along the mud bund, where they might have been carried along with the mud from the mangrove swamp. However, a few live specimens are found in the crevices of the plants in the month of September.

The last zone i.e. mangrove stumps on the beach at Ganga Sagar and jetty piles at Kachuberia and Chemaguri harbour have entirely different type of fauna. The commonest and dominant among them are *Littorina scabra scabra*. The species is gregarious and found in groups occupying the highest position on the piles and in the crevices of the dead stumps. Interestingly a rare species, *Larina burmana* Blanford is also found on these stumps along with sea anemones (*Metridium* sp.). One of us (N.V.S.) has studied the ecology and breeding habits of this species. These animals and their egg mass (Pl. VII, fig. 5) are found in September-March period. Most of the tunnels of damaged jetty piles and dead trees are empty while a few are with worms within all round the year.

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