

LAKE 2012: National Conference on Conservation and Management of Wetland Ecosystems



LAKE 2012

06th - 09th November 2012 School of Environmental Sciences Mahatma Gandhi University, Kottayam, Kerala In association with

Energy and Wetlands Research Group, Centre for Ecological Sciences, Indian Institute of Science, Bangalore



Advanced Centre of Environmental Studies and Sustainable Development, Mahatma Gandhi University, Kottayam, Kerala

Coastal Wetlands 07

Mangrove Associated Molluscs of India

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Abstract

Phylum Mollusca, the second largest of invertebrates, comprises of soft bodied animals. They inhabit very diverse habitats like marine, estuarine, freshwater, terrestrial and arboreal. They play important role in the function and productivity of coastal mangrove swamps. The attempt here has been to provide comprehensive check list of molluscs found in the Indian mangrove areas, compiled from various sources and from our field studies in Uttara Kannada district of Karnataka State. In India, about 215 species of molluscs were reported from mangrove areas of east and west coasts. In Uttara Kannada, our molluscan sample studies during 2010-12 period, using random collection of leaf litter and opportunistic observation methods, about 12 genera of gastropods and four genera of bivalves were found by us. The investigations mainly covered the mangrove areas in the estuaries of the west flowing rivers from the Western Ghats namely Aghanashini, Gangavali, Kali, and Sharavathi. Although estuarine molluscs as such were inventorised from the district in some earlier studies, this is the first time that we gain glimpses of mangrove associated molluscs.

Key words: Mangrove molluscs, India, Karnataka, Western Ghats.

1.0 INTRODUCTION

Mangroves are salt-tolerant plants inhabiting the tropical and subtropical estuarine regions. They are ranked among the most productive ecosystem of the earth. Few to mention of their ecosystem services are provision forestry products, protection from coast erosion, preservation of water quality, reduction of pollution, recycling of nutrients, and high amount of carbon sequestration especially in the soils (Kathiresan, 2009; Sathirathai, 1998; Bandaranayake, 2002). Of the many kinds of biodiversity elements associated with mangroves, from microbes to mammals, molluscs have important ecosystem functions associated with degradation of organic detritus to playing key role in the trophic structure of estuaries.

Molluscs make the second largest Phylum of invertebrates, next only to the Arthropods. In mangroves, molluscs occupy all the levels in the food web such as predators, herbivores, detritus and filter feeders. Thereby they play an important role in maintaining the function and productivity of mangroves. Gastropods and bivalves are the two major classes of molluscans occupying mangrove areas. These macrobenthic molluses can be broadly grouped under three categories epifauna (living on mud or surface area of the land), infauna (burying themselves in the substratum), and arboreal (living on the vegetation); some molluscs have habitat overlap as well (Dey, 2006; Kesavan et al., 2009; Shanmugam and Vairamani, 2009). Molluscs are used for various purposes like food, ornamental, poultry feed, and source of lime (Boominathan et al., 2008). In India, studies on mangrove associated molluscs were done by Das and Dev Roy (1989), Dehadrai (1994), Dev (2006), Ganapati and Rao (1959), Ingole et al. (2002), Kesavan et al. (2009), Kurian (1984), Mandal and Nandi (1989), Ramamorty and Rao (1993), Oswin (1998), Pereira et al. (2002), Radhakrishna and Janakiram (1975), Radhakrishnan et al. (2006), Santhakumaran Shanmugam (1983),Vairamani (2009), Subba Rao (2003), Suresh et al.

(2012), and Venkatesan et al. (2010). Dey (2006) mentioned that the Indian subcontinent has about 100 molluses associated with mangroves. However, there is no comprehensive list of molluses found in Indian mangrove areas. Hence, the objective of this paper is to provide a comprehensive list of molluses found in the Indian mangrove areas.

2.0 MATERIALS AND METHODS

The molluscs found in the mangrove areas were compiled from various studies conducted in Indian mangrove areas. Molluscs were sampled in the mangrove areas through random collection of leaf litter and by opportunistic observations at low tide during 2010 and 2012. The molluscs from leaf litter samples were segregated by thorough examination of leaf litter under the enamel tray in the laboratory. Opportunistic observations were performed in Aghanashini, Gangavali, Kali, and Sharavathi estuaries (Figure 1), leaf litter sampling was carried out only in the Aghanashini and Sharavathi. In opportunistic observation logs, pools, stones, rocks, surface, mangrove tree trunks, branches, leaves, and roots were examined for molluses.

3.0 RESULTS AND DISCUSSION

Dey, (2006) mentions about 100 species of molluses from mangrove areas of Indian subcontinent. The literature survey reveal of 215 species of molluscs from India. Of these are 133 Gastropoda, 77 Bivalvia, four Cephalopoda, and only one from Polyplacophora (Table 1). During our investigations in the mangrove areas of the estuaries of the west flowing rivers from the Western Ghats namely Aghanashini, Gangavali, Kali, and Sharavathi about 16 genera of molluscs were found. Of these 12 genera are assigned to class Gastropoda. Of these eight were assigned to generic level viz. Assiminea, Cerithidea, Littoraria, Neritina, Onchidium, Stenothyra, Telescopium, Thiara, one was assigned to the family Ellobiidae and three remain to be identified. Four taxa of class Bivalvia are identified to generic level viz. Crassostrea, Modiolus, Polymesoda, and Saccostrea. The edible bivalve species such as Anadara granosa, Meretrix meretrix, M. casta, Paphia malabarica, Villorita cyprinoides, and Perna viridis, although abundant in the local estuaries (Boominathan et al., 2008) were not found in the mangrove areas, although such a conclusion needs to be strengthened by further observations.

4.0 CONCLUSION

As ecology and biodiversity studies on mangrove ecosystems, rated among the most productive ecosystems of the world, are gaining momentum, there has been not yet any comprehensive inventory of mangrove molluscs, which are vital components of estuarine and other littoral functioning. ecosystem From the entire subcontinent of India, hitherto, not more than 100 species of mangrove associated molluscs were reported (Dey, 2006). Our compilation elevates this list substantially to over 200 species. It is as such difficult to isolate exclusive mangrove molluscs at our present level of efforts. As mangroves worldwide, and particularly along the densely populated Indian coast, are threatened with various anthropogenic pressures, from particularly developmental processes, nothing much is known about the fate of the high diversity of molluscs associated with these swamps. Being vital links in estuarine and coastal nutrient cycles themselves constituting food for scores of faunal species in higher trophic levels, including of the humans, the mangrove molluscs require much more attention from conservation biologists. This is all the more important since their silent local extinctions from increasingly human impacted estuaries might set off cascading effects with far reaching consequences affecting the food security of both humans and various other species in water and land, particularly of fishes and birds.

ACKNOWLEDGMENTS

We are grateful to Shrikant, Balachandran, Mahima, Mahabaleswar, Prakash, Vishnu, and EWRG group members for their help in this study. We thank the Ministry of Environment and Forests, Government of India and Indian Institute of Science for the financial and infrastructure support.

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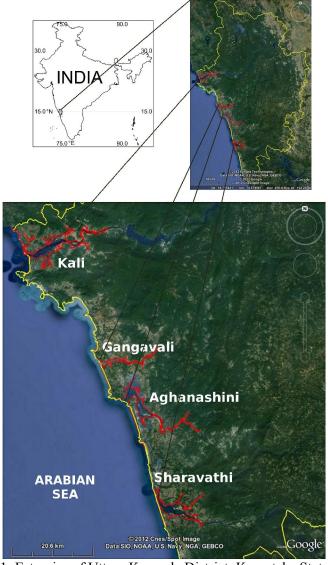


Figure 1: Estuaries of Uttara Kannada District, Karnataka State, India.

Table 1: The comprehensive list of molluscs found in the Indian mangrove areas.

Species	Authority	
Class: Gastropoda		
Amaea acuminata	Sowerby, 1844	
Assiminea beddomeana	Nevill, 1880	
Assiminea brevicula	Pfeiffer, 1854	
Assiminea francesiae	Wood, 1828	
Assiminea hungerfordiana	Nevill, 1880	
Assiminea microsculpta	Nevill, 1880	

Assissing a suitide	Dagge 1965
Assiminea nitida	Pease, 1865
Assiminea theobaldiana	Nevill, 1880
Assiminea woodmasoniana	Nevill, 1880
Auricula translucens	Annandale, 1919
Batillaria sordida	Gmelin, 1791
Bulla ampulla	Linnaeus, 1758
Canarium erythrinum	Dillwyn, 1817
Cassidula aurisfelis	Bruguiere, 1789
Cassidula bensoni	Pfeiffer
Cassidula mustelina	Deshayes, 1830
Cassidula nucleus	Gmelin, 1791
Cerithidea alata	Philippi, 1847
Cerithidea cingulata	Gmelin, 1791
Cerithidea decollata	Linnaeus, 1767
Cerithidea djadjariensis	Martin, 1899
Cerithidea fluviatilis	Potiez and Michaud
Cerithidea obtusa	Lamarck, 1822
Cerithidea quadrata	Sowerby, 1866
Cerithidea weversi	
Cerithium citrinum	Sowerby, 1885
Cerithium columna	Sowerby, 1834
Cerithium coralium	Kiener, 1841
Cerithium scabridum	Philippi, 1848
Cerithium trailli	Sowerby, 1855
Cerithium zonatum	Wood, 1828
Chicoreus brunneus	Link, 1807
Cithon oualaniensis	Lesson, 1831
Clathrella clathrata	Philippi, 1844
Clithon bicolor	Recluz, 1842
Clithon corona	Linnaeus, 1758
Cuthona annandalei	Eliot, 1910
Cyclostrema (Tubiola) innocens	Preston, 1915
Dolomena variabilis	Swainson, 1820
Dostia crepidularia	Lamarck, 1822
Drupella margariticola	Broderip
Ellobium aurisjudae	Linnaeus, 1758
Ellobium gangeticum	Pfeiffer, 1855
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Elysia bangtawaensis	Swennen, 1998
Engina alveolata	Kiener, 1836
Ergalatax contracta	Reeve, 1846
Ergalatax heptagonalis	Reeve, 1846
Gangetica milicea	Nevill
Haminoea crocata	Pease, 1860
Hemifusus pugilinus	Born, 1778
Indoplanorbis exustus	Deshayes, 1834
Lambis (Lambis) lambis	Linnaeus, 1758
Littoraria carinifera	Menke, 1830
Littoraria melanostoma	Gray, 1839
Littoraria scabra	Linnaeus, 1758
Littoraria undulata	Gray, 1839
Littorina intermedia	Philippi, 1846
Lunella cinerea	Born, 1778
Mainwaringia paludomoidea	Nevill, 1884
Mauritia arabica	Linnaeus, 1758
Melampus caffer	Kuster, 1844
Melampus castaneus	Muhlfeldt, 1818
Melampus ceylonicus	Petit
Melampus coffea	Linnaeus, 1758
Melampus pulchella	Petit, 1842
Melampus singaporensis	Pfeiffer, 1855
Melampus striatus	Pease, 1861
Melanoides tuberculata	Muller, 1774
Mitra (Strigatella) paupercula	Linnaeus, 1758
Mitra (Strigatella) scutulata	Gmelin, 1791
Monodonta (Monodonta) labio	Linnaeus, 1758
Morula (Morula) anaxeres	Kiener, 1836
Muricopsis bombayanus	Melvill, 1893
Naquetia capucina	Roeding, 1798
Nassarius foveolatus	Reeve, 1853
Nassarius globosus	Quoy and Gaimard, 1833
Nassarius immersa	Mousson
Nassarius olivaceus	Bruguiere, 1789
Nassarius orissaensis	Preston, 1914
Nassarius stolatus	Gmelin, 1791

Nassarius subconstrictus	Sowerby, 1899
Nerita albicilla	Linnaeus, 1758
Nerita articulata	Gould, 1847
Nerita chamaeleon	Linnaeus, 1758
Nerita chameleon	Linnaeus, 1758
Nerita crepidularia	Lamarck, 1822
Nerita insculpta	Recluz, 1841
Nerita planospira	Anton, 1838
Nerita polita	Linnaeus, 1758
Nerita semirugosa	Recluz, 1841
Nerita squamulata	Le Guillou, 1841
Nerita undulata	Gmelin, 1791
Neritina depressa	Benson, 1836
Neritina smithi	Wood, 1828
Neritina violacea	Gmelin, 1791
Nodilittorina	Martens, 1897
Notocochlis qualteriana	Recluz, 1844
Notocochlis tigerina	Roding, 1798
Onchidium tenerum	Stoliczka, 1869
Onchidium tigrinum	Stoliczka, 1869
Onchidium typhae	Buchannan, 1800
Pascula ochrostoma	Blainville, 1832
Peronia verruculata	Cuvier, 1830
Pila virens	Lamarck, 1822
Pila globosa	Swainson
Planaxis sulcatus	Born, 1778
Polinices tumidus	Swainson, 1840
Potamacmaea fluviatilis	Blanford, 1868
Potamides cingulatus	Gmelin, 1791
Pseudanachis duclosiana	Sowerby, 1847
Pseudonerita obtusa	Benson, 1836
Pseudonerita sulculosa	von Martens, 1879
Pugilina cochlidium	Linnaeus, 1758
Purpura bufo	Lamarck, 1822
Purpura persica	Linnaeus, 1758
Pythia plicata	Gray, 1825
Rhinoclavis (Rhinoclavis) sinensis	Gmelin, 1791

Rhinoclavis aspera	Linnaeus, 1758
Rhinoclavis vertagus	Linnaeus, 1767
Salinator burmana	Blanford, 1867
Septaria caerulescens	Sowerby
Stenothyra blanfordiana	Nevill, 1880
Stenothyra deltae	Benson, 1836
Syncera brevicula	Pfeiffer
Telescopium telescopium	Linnaeus, 1758
Terebralia palustris	Linnaeus, 1767
Thais (Thalessa) virgata	Dillwyn, 1817
Thaisella blanfordi	Melvill, 1893
Thaisella lacera	Born, 1778
Thaisella tissoti	Petit, 1852
Thiara scabra	Muller, 1774
Umbonium vestiarium	Linnaeus, 1758
Vanikoro cancellata	Lamarck, 1822
Class: Bivaly	ria
Anadara granosa	Linnaeus, 1758
Anadara rhombea	Born, 1780
Bactronophorus thoracites	Gould, 1856
Bankia bipennata	Turton, 1819
Bankia campanellata	Moll and Roch, 1931
Bankia carinata	Gray, 1827
Bankia nordi	Moll, 1935
Bankia rochi	Moll, 1931
Barbatia candida	Helbling, 1779
Barnea candida	Linnaeus, 1758
Cardites bicolor	Lamarck, 1819
Codakia tigerina	Linnaeus, 1758
Crassostrea cuttackensis	Newton and Smith, 1912
Crassostrea gryphoides	Schlothem, 1813
Crassostrea madrassensis	Preston
Crassostrea palmipes	Sowerby, 1871
Dicyathifer manni	Wright, 1866
Donax cuneatus	Linnaeus, 1758
Donax incarnatus	Gmelin, 1791
Donax lubricus	Hanley, 1845

Dosinia (Asa) tumida	Gray, 1838
Enigmonia aenigmatica	Holten
Gafrarium pectinatum	Linnaeus, 1758
Geloina galatheae	Morch, 1850
Geloina siamica	Prime, 1861
Glauconome cerea	Reeve, 1844
Glauconome chinensis	Gray, 1828
Isognomon ephippium	Linnaeus, 1758
Katelysia opima	Gmelin, 1791
Laternula truncata	Lamarck, 1818
Lyrodus massa	Lamy, 1923
Lyrodus pedicellatus	Quatrefages, 1849
Macoma birmanica	Philippi, 1833
Macoma qubernaculum	
Mactra cuneata	Chemnitz
Marcia opima	Gmelin, 1791
Martesia striata	Linnaeus, 1758
Meretrix attenuata	Dunker, 1863
Meretrix casta	Chemnitz
Meretrix meretrix	Linnaeus, 1758
Modiolus americanus	Leach, 1815
Modiolus modulaides	Roding, 1798
Modiolus striatulus	Hanley, 1844
Modiolus traillii	Reeve, 1857
Modiolus undulatus	Dunker, 1856
Nausitora dunlopei	Wright, 1884
Nausitora hedleyi	Schepman, 1919
Nausitora hedleyi	Schepman, 1919
Neotrapezium sublaevigatum	Lamarck, 1819
Nototeredo edax	Hedley, 1895
Nuculana mauritiana	Sowerby, 1833
Paphia malabarica	Chemnitz, 1782
Paphia undulata	Born, 1778
Pelecyora trigona	Reeve, 1850
Perna perna	Linnaeus, 1758
Perna viridis	Linnaeus, 1758
Pharella javanicus	Lamarck, 1818

Placenta placenta	Linnaeus	
Placuna placenta	Linnaeus, 1758	
Polymesoda bengalensis	Lamarck, 1818	
Potamocorbula abbreviata	Preston, 1907	
Saccostrea cucullata	Born, 1778	
Siliqua albida	Adams and Reeve, 1850	
Solen annandalei	Preston, 1915	
Solen brevis	Gray, 1842	
Solen kempi	Preston, 1915	
Sphenia pedata		
Strigilla splendida	Anton, 1833	
Tanysiphon rivalis	Benson, 1858	
Tegillarca granosa	Linnaeus, 1758	
Tellina ala	Hanley, 1844	
Tellina bruguieri	Hanley	
Tellina iridescens	Benson, 1842	
Teredo furcifera	von Martens, 1894	
Theora opalina	Hinds, 1843	
Uperotus rehderi	Nair, 1954	
Villorita cyprinoides	Gray	
Class: Cephalopoda		
Loligo indica	Pfeiffer, 1884	
Octopus rugosus	Bosc, 1792	
Sepia aculeata	Van Hasselt, 1835	
Sepia inermis	Van Hasselt, 1835	
Class: Polyplacophora		
Ischnochiton winckworthi	Leloup, 1936	

Source: Das and Dev Roy (1989), Dehadrai (1994), Dey (2006), Ganapati and Rao (1959), Ingole et al. (2002), Kesavan et al. (2009), Kurian (1984), Mandal and Nandi (1989), Ramamorty and Rao (1993), Oswin (1998), Pereira et al. (2002), Radhakrishna and Janakiram (1975), Radhakrishnan et al. (2006), Santhakumaran (1983), Shanmugam and Vairamani (2009), Subba Rao (2003), Suresh et al. (2012), Venkatesan et al. (2010).