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Molluscan Diversity in Mangrove Ecosystem of Uran (Raigad), Navi Mumbai, Maharashtra, West coast of India

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ABSTRACT

Aim of the present study is to assess the species diversity of molluscs from mangroves of Uran because many mangroves associated species of molluscs acts as an indicator species for mangrove. During present study, a total of 55 species of molluscs representing 13 orders, 30 families and 39 genera were recorded from the mangroves of Uran. Of the recorded species, 69.09 % belonged to gastropods, 23.64 % to pelecypods and 7.27 % to cephalopods. 38 species of gastropods representing 6 orders, 18 families and 25 genera, 13 species of pelecypods representing 4 orders, 8 families and 10 genera and 4 species of cephalopods representing 3 orders, 4 families and 4 genera were recorded. Species like Telescopium telescopium, Thais carinifera, Bursa tuberculata, Arca granosa, Placenta placenta, Merettrix meretrix, Katelysia opima, Octopus herdmani and Sepia officinalis were common where as Chlamys singaporina, Loligo vulgaris and Amphitretus pelagicus were rare. At present, ecological conditions in mangroves of Uran supports high density of molluscs but due to intense industrialization and urbanization, pollution of Uran coast cannot be ignored. Therefore, data presented in this paper can be taken as a base line data.

Key Words: Mangroves, Molluscs, Navi Mumbai, Species diversity, Urbanization, Uran.

INTRODUCTION

Mangrove forests are among the world's most productive ecosystems and cover an area of about 18 X 10^6 hectares [1]. Mangrove habitats harbour much of the world's tropical biodiversity and 50% of the world's mangrove forests have been lost as a result of clearing and alteration of coastlines [2]. Mangroves are one of the biologically diverse ecosystems in the world, rich in organic matter and nutrients and support very large biomass of flora and fauna [3]. Knowledge on species diversity of an ecosystem would help maximizing resource utilization in a sustainable manner besides preserving biodiversity [4]. With continuing degradation and destruction of mangroves, there is a critical need to understand the biodiversity of the mangrove ecosystems [5].

The Indian mangroves cover about 4827 Km^2, with about 57% of them along the east coast, 23% along the west coast and 20% in Andaman and Nicobar Islands [6]. The total number of mangrove-inhabiting faunal species in Indian mangroves is 3,111, which includes prawns, crabs and molluscs, fish, fish parasites, insets, reptiles, amphibian and mammals [7]. Anthropogenic activities involving development projects have resulted in depletion of coastal resources, destruction of mangrove habitats, disruption of ecosystem processes and loss of biodiversity [8].

Mumbai, a major metropolis and one of the world's most populous cities called as the Urbs Prima of India, generates 0.85 millions m^3/d of liquid effluent and 14,600 t/d of solid waste, which without any treatment, are discharged in the coastal region in and around Mumbai [9]. Estimates of area of mangroves in Mumbai varied from 248.7 Km^2 [10] to 200 Km^2 [11] to 92.94 Km^2 [12] to 26.97 Km^2 [13]. Zingde [14] reported that Mumbai has lost 40 % of all its mangroves in the past decade because of overexploitation and unsustainable demand for housing, slums, sewage treatment and garbage dumps.

Molluscs forms an important link in food chain from primary to tertiary level leading to fish production and also an edible source for coastal population. Besides, they are utilized for ornamental trade, pharmacological products and in the manufacture of lime and cement [15]. In India, till today, 5070 species of molluscs have been recorded of which, 3370 species are from marine habitats [16]. 8 species of oysters, 2 species of mussels, 17 species of clams, 6 species of pearl oysters, 4 species of giant clams, 1 species of window pane oyster and other gastropods such as Sacred chank, Trochus, Turbo as well as 15 species of cephalopods are exploited from the Indian marine region [6].

Till now extensive scientific research on ecological aspects of molluscan fauna in mangroves has been carried out in India however data on species diversity of molluscs in mangroves of Uran, Navi Mumbai is not available, hence, the present study is undertaken.

MATERIALS AND METHODS

***The study area*:**

Geographically, Uran with the population of 23,251 is located along the eastern shore of Mumbai harbour opposite to Coloba. A creek called 'Uran creek / Sheva creek' (Lat. 18^0 50' 20" N and Long. 72^0 57' 5" E) encircles Uran city towards the north side and is continuous with the Panvel creek and Thane creek. Creek namely Dharamtar creek (Lat.18^0 50' 5" N and Long. 72^0 57' 10" E) encircles Uran city towards the south side and is continuous with the Karanja creek and Pen – Khopoli creek. On the west side, Uran is encircled by Arabian Sea (Fig. 1). Both creeks have rocky shore towards the seaward side where as remaining part of the creeks is marshy and of mud flats. Both Uran creek and Dharamtar creek are uniformly deep with 10 meters range and have moderate cover of mangroves with mud flats and low lying marshy areas on their sides. The coastal environment of Uran has been under considerable stress since the onset of industries like Oil and Natural Gas Commission LPG Distillation Plant, Grindwell Norton Ltd., MSEB Gas Turbine Power Station, Bharat Petroleum Corporation Ltd., Jawaharlal Nehru Port Trust (JNPT), Nhava-Seva International Container Terminal (NSICT), Container Freight Stations (CFS) etc. An international port called 'Jawaharlal Nehru Port Trust (JNPT)' was established in 1989 near the Uran creek and supports a variety of maritime activities; as a result, the area of Uran creek became the ground for hectic activities of Container Freight Stations (CFS). These activities affect the ecology of fauna and flora of mangroves. Hence this area has been identified for the ecological assessment.

***Species diversity of molluscs in mangroves*:**

For present investigation, 2 study sites separated approximately by 10 km were selected along the coastal line of Uran i. e. Sheva Creek and Dharamtar Creek. Along the selected sites where the mangroves vegetation is present, were visited monthly from April 2009 to March 2011 for assessment of species diversity of molluscs.

Molluscs were hand-picked from the intertidal, sub tidal as well as from the seaward fringes of the mangroves and carried to the laboratory in icebox. Specimens were narcotized with powdered menthol to extend fully and killed by using 1% chloral hydrate. Animals were preserved in 5% seawater buffered formalin. For correct identification, standard keys of Menon et al [17], Subrahmanyam et al [18], Apte [19] were followed.

RESULTS AND DISCUSSION

A total of 55 species of molluscs representing 13 orders, 30 families and 39 genera were recorded from the mangroves of Uran coast. Of the recorded species, 69.09 % belonged to gastropods, 23.64 % to pelecypods and 7.27 % to cephalopods. The recorded species in alphabetical order of families is given in Table 1 and 2.

38 species of gastropods representing 6 orders, 18 families and 25 genera were recorded during present study. Among gastropods species of *Telescopium telescopium*, *Thais carinifera* and *Bursa tuberculata* were recorded abundantly at both sites. Remaining species were common at both sites throughout the period of investigation.

13 species of pelecypods representing 4 orders, 8 families and 10 genera were recorded. Species like *Arca granosa, Placenta placenta*, *Merettrix meretrix* and *Katelysia opima* were common whereas *Chlamys singaporina* shows rare distribution at both study sites.

4 species of cephalopods representing 3 orders, 4 families and 4 genera were recorded during present investigation. *Octopus herdmani* and *Sepia officinalis* were common whereas *Loligo vulgaris and Amphitretus pelagicus* were rare at both sites.

The coastal environment of Uran has been under considerable stress since the onset of other industries and JNPT since 1989. Hectic activities of Container Freight Stations (CFS), urbanization, industrialization and reclamation in the stretch of creek around Uran, result in the loss of mangrove biodiversity. Several incidences of coastal pollution occur because of leakage/discharge of transporting materials along with industrial effluents.

Fig. 1: General map of study area.

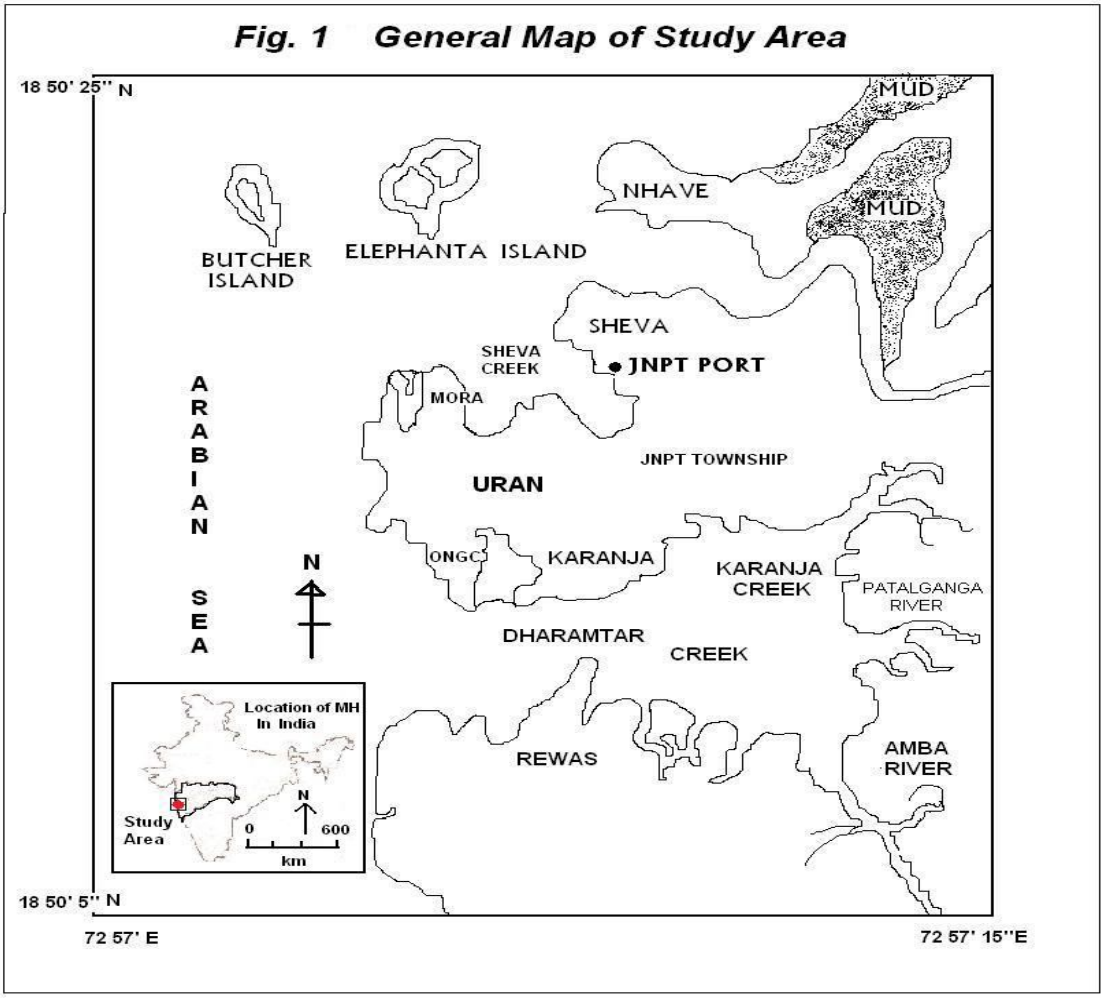

Table 1: List of gastropods recorded in mangroves of Uran (Raigad), Navi Mumbai.

No.	Order	Family	Binomial Name
1	Archaeogastropoda	Trochidae	*Trochus stellatus* (Gmelin, 1791)
2	Archaeogastropoda	Trochidae	*Trochus radiatus* (Gmelin, 1791)
3	Archaeogastropoda	Trochidae	*Trochus tentorium* Gmelin, 1791)
4	Archaeogastropoda	Trochidae	*Euchelus asper* (Gmelin, 1791)
5	Archaeogastropoda	Trochidae	*Clancules ceylonicus* (Nevill, 1869)
6	Archaeogastropoda	Turbinideae	*Astrea stellata* (Gmelin, 1791)
7	Neritimorpha	Neritidae	*Nerita oryzarum* (Recluz, 1841)
8	Neritimorpha	Neritidae	*Nerita crepidularia* (Lamarck, 1816)
9	Neritimorpha	Neritidae	*Nerita albicilla* (Linnaeus, 1758)
10	Caenogastropoda	Ficidae	*Ficus gracilis* (Sowerby, 1825)
11	Caenogastropoda	Strombidae	*Tibia curta* (Sowerby, 1842)
12	Hypsogastropoda	Bursidae	*Bursa lissostroma* (Smith, 1914)
13	Hypsogastropoda	Bursidae	*Bursa spinosa* (Lamarck, 1816)
14	Hypsogastropoda	Bursidae	*Bursa elegans (*Sowerby, 1835)
15	Hypsogastropoda	Bursidae	*Bursa tuberculata* (Brodrip, 1833)
16	Hypsogastropoda	Naticidae	*Natica picta* (Recluz, 1844)
17	Hypsogastropoda	Naticidae	*Natica maculosa* (Lam., 1799)
18	Hypsogastropoda	Planaxidae	*Planaxis sulcatus* (Born, 1778)
19	Hypsogastropoda	Potamididae	*Telescopium telescopium* (Linn., 1758)

20	Hypsogastropoda	Potamididae	*Potamides cingulatus* (Gmelin, 1791)
21	Neogastropoda	Buccinidae	*Babylonia spirata* (Linnaeus, 1758)
22	Neogastropoda	Buccinidae	*Cantharus spiralis* (Gray, 1846)
23	Neogastropoda	Cancellaridae	*Cancellaria costifera* (Sowerby, 1835)
24	Neogastropoda	Conidae	*Conus mutabilis* (Reeve, 1844)
25	Neogastropoda	Cypraeidae	*Erosaria lamarcki* (Gray, 1825)
26	Neogastropoda	Muricidae	*Murex adustus* (Lamarck, 1799)
27	Neogastropoda	Muricidae	*Murex tribulus* (Linnaeus, 1758)
28	Neogastropoda	Muricidae	*Murex brunneus* (LinK. 1807)
29	Neogastropoda	Muricidae	*Ocinebra bombayana* (Melvill, 1893)
30	Neogastropoda	Muricidae	*Thais carinifera* (Lamarck, 1822)
31	Neogastropoda	Muricidae	*Thais sacellum* (Gmelin, 1791)
32	Neogastropoda	Onchidiidae	*Onchidium damelii* (Samper, 1882)
33	Neogastropoda	Turridae	*Surcula javana* (Linnaeus, 1758)
34	Neogastropoda	Turridae	*Surcula amicta* (Smith, 1877)
35	Neogastropoda	Turridae	*Clavus crassa* (Smith, 1888)
36	Neogastropoda	Volemidae	*Hemifuus pugilinus* (Born, 1778)
37	Neogastropoda	Volemidae	*Hemifuus cochlidium* (Linnaeus, 1758)
38	Pulmonata	Siphonariidae	*Siphonaria laciniosa* (Linn., 1758)

Table 2: List of pelecypods and cephalopods recorded in mangroves of Uran (Raigad), Navi Mumbai.

No.	Order	Family	Binomial Name
	Pelecypods		
1	Eulamellibranchiata	Pectinidae	*Chlamys singaporina* (Sowerby, 1842)
2	Ostreoida	Ostreidae	*Placenta placenta* (Linnaeus, 1758)
3	Pteriomorpha	Arcidae	*Arca granosa* (Linnaeus, 1758)
4	Veneroida	Cardiidae	*Cardium flavum* (Linnaeus, 1758)
5	Veneroida	Dosiniiae	*Vellorita cyprinoids* (Gray, 1825)
6	Veneroida	Mactridae	*Mactre cornea* (Poli, 1791)
7	Veneroida	Meretricinae	*Merettrix meretrix* (Linnaeus, 1758)
8	Veneroida	Meretricinae	*Merettrix casta* (Chemnitz, 1782)
9	Veneroida	Meretricinae	*Merettrix lyrata* (Sowerby, 1851)
10	Veneroida	Veneridae	*Callista erycina* (Linnaeus, 1758)
11	Veneroida	Veneridae	*Dosinia cretacea* (Reeve, 1850)
12	Veneroida	Veneridae	*Dosinia gibba* (H. & A. Adams, 1856)
13	Veneroida	Veneridae	*Katelysia opima* (Gmelin, 1791)
	Cephalopods		
1	Octopoda	Amphitretidae	*Amphitretus pelagicus*
2	Octopoda	Octopodidae	*Octopus herdmani* (Hoyle, 1904)
3	Sepiida	Sepiidae	*Sepia officinalis* (Linnaeus, 1758)
4	Teuthida	Loligunidae	*Loligo vulgaris* (Lamarck, 1798)

Disposal of domestic wastes and untreated or partially treated industrial effluents in coastal region of Uran, Navi Mumbai have depleted coastal resources, public health risk and loss of coastal and marine biodiversity. Sighting of dead fish surfacing in creeks of Mumbai and Navi Mumbai (Panvel creek, Vashi creek, Belapur creek etc.) is common from last few years affecting the livelihood of fishermen. Dumping of industrial effluents, untreated sewage and unchecked encroachment along the coastal line have resulted in deterioration of water quality and incidences of industrial pollution are common in creeks of Mumbai and Navi Mumbai. Slaughtering of mangroves from Navi Mumbai region due to over exploration, unsustainable demand and reclamation have resulted in destruction of marine life [20].

In conclusion, it is stated that, number of molluscs recorded in mangroves of Uran indicates fairly good health of the sediments in mangroves. Because of regular tidal flushing, the molluscan fauna appear to be rich and healthy. In coming few years, area around Uran coast will be dominated by intense industrialization and urbanization. In such circumstances, pollution of Uran coast cannot be ignored. Therefore, data presented in this paper can be taken as a base line data for management of the mangrove ecosystem of Uran in near future.

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REFERENCES

1. Spalding, M. D., F. Blasco and C. D. Field, (1997). World mangrove atlas, (The International Society for Mangrove Ecosystems, Okinawa, Japan), pp. 178.
2. Duke, N. C., (1992). Mangrove floristic and biogeography. In Robertson, A. I. & D. M. Alongi (Eds.), Tropical mangrove ecosystems, (American Geophysical Union, Washington DC): 63–100.
3. Robin, L. E. and N. I. Bazelevic, 1966. The biological production of main vegetation types in the Northern Hemisphere of the Old World. For abs., 27: 369–372.
4. Biju, A and G. R. Deepthi, (2009). Mean trophic index of fish fauna associated with trawl bycatch of Kerala, southwest coast of India. *J. Mar. Biol. Ass. India*, 51(2): 145–157.
5. Vannucci, M., 2002. Indo-west Pacific mangroves, In Lacerda L. D. (Eds.) Mangrove ecosystems, (Springer, Berlin), : 122 – 215.
6. Venkataraman, K. and M. Wafar, (2005). Coastal and marine biodiversity of India. Ind. J. Mar. Sci., 34(1): 57-75.
7. Kathiresan, K. and S. Z. Qasim, (2005). Biodiversity in mangrove ecosystems. Hindustan Publishers, New Delhi.
8. Vijay, V., R. S. Birader, A. B. Inamdar, G. Deshmukhe, S. Baji and M. Pikle, (2005). Mangrove mapping and change detection around Mumbai (Bombay) using remotely sensed data. *Indian Journal of Marine Sciences*, 34(**3**): 310–315.
9. Zingde, M. D., (1999). Marine environmental status and coastal zone management issues in India. In: South Asia Regional Workshop on Estuarine modeling and Coastal Zone Management. A Joint START / LOICZ / IGBP-SL Workshop, Apr. 28–30, Colombo, Sri Lanka. pp. 153–164.
10. Queshi, I. M., (1957). Botanical silviculture features of mangrove forest of Bombay State. Proceeding of Mangrove Symposium (Government of India Press, Calcutta), pp. 20–26.
11. Blasco, F., C. Caratini, S. Chanda and G. Thanikaimoni, (1975). Main characteristics of Indian mangroves. Proceeding of the International Symposium on Biology and Management of Mangroves, (Walsh, G. E., S. G. Snedkar and H. J. Reas ed.) IFAS University of Florida:71–87.
12. Inamdar, A. B., R. K. Surendrakumar, M. C. Behera, H. B. Chauhan and S. Nayak, (2000). Land use mapping of Maharashtra Coastal Regulatory Zone, SAC/RESA/MWRD/CRZ/SN/02/00 (Indian Space Research Organization, Ahmadabad, India): pp 42.
13. Mukherji, M., (2002). Degradation of creeks and mangroves and its impact on urban environment – A case study of Mumbai. Proceeding of National Seminar on Creeks, Estuaries and Mangroves – Pollution and Conservation. B. N. B. College of Science, Thane, Mumbai, Nov.28–30, pp 331–333.
14. Zingde, M. D., (2002). Degradation of Marine habitats and Coastal management framework. Proceeding of National Seminar on Creeks, Estuaries and Mangroves – Pollution and Conservation. B. N. B. College of Science, Thane, Mumbai, Nov.28–30, pp 3–7.
15. Jaiswar, A. K. and B. G. Kulkarni, (2005). Conservation of Molluscan biodiversity from intertidal area of Mumbai coast. *J. Natcon*, 17(**1**): 93–105.
16. Subba Rao, N. V., (1991). Mollusca in Animal Resources of India (Zoological Survey of India, Calcutta): 125–147.
17. Menon, P. K. B., A. K. Datta and D. Das Gupta, (1951). On the marine fauna of Gulf of Kutch Part II – Gastropoda. *J. Bombay Nat. Hist. Soc*. 8(**2**): 475–494.
18. Subrahmanyam, T. V., K. R. Karandikar and N. N. Murti, 1949. The marine Pelecypoda of Bombay. J. Univ. of Bombay, 17: 50–81.
19. Apte, D. A., (1988). The book of Indian shells. Bombay Natural History Society, Oxford University Press, India pp 115.
20. Pawar, P. R., (2011). Floral diversity of mangrove ecosystem from coastal environment of Uran (Raigad), Maharashtra. *Electr. J. Envir.Sci.,* 4:113-117.