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Diversity and statistical analysis of marine gastropod, Raigad District, Maharashtra

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Abstract

Diversity and taxonomy of gastropod molluscs from, rocky substrata, sandy beach, and muddy habitat was studied during October 2010 to September 2011. The productive molluscan fauna in prevalence of different habitats so a wide chance of research to further explore on the possibility of ecological value and there conservation.

Keywords: diversity, gastropod, Raigad district coast

1. Introduction

In India the marine molluscs are recorded from the diverse habitats. They occur in different habitats such as mangroves, coral reef, rocky coasts, sandy beaches, sea grass beds and also at greater depth in the sea, they are more diverse and abundant in the rocky intertidal zone along the coast. Sandy stones, inter tidal flats, mangrove areas ^[1]. 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 ^[2]. The gastropods are collected extensively for local consumption. Mangrove roots & lower parts of trunks provide substrate for oysters and mussels. Because these animals are filter feeders, they are confined to microhabitats below mean high water and are usually only abundant in areas adjacent to open water. The blood clam, *Anadara granosa* and other cockles can be found in large numbers in mudflats on mangrove strands, where it lies partially buried in the sediment ^[3]. An oysters, mussels and clams serve the nutritional needs of the coastal population they are good source of minerals, protein, and glycogen and easily digestible compared to other animal food ^[4]. In India, till today, 5,070 species of molluscs have been recorded of which, 3,370 are from marine habitats ^[5]. The gastropods such as sacred chank, *Trochus*, *Turbo* are exploited from the Indian marine region ^[6]. The present papers investigate the diversity of gastropod molluscs of mangrove, rocky coasts, sandy beach from selected study localities of Raigad district coast.

2. Materials and Methods

The study area divided in four localities of Raigad district viz.

2.1. Nagaon: Lat. 18°51.994"N and Long. 072°56.355"E. The rocky open shore, about 10m rocky area open during low tide, black pebbles were present at the above high water mark, in scattered small mangroves trees of *Bruguiera sexangula* (Lour.) Poir. were recorded, on the eastern side away from the high water mark town is about 20-30m, due to nearest village there is domestic water discharged. Mangrove: *Bruguiera sexangula*.

2.2. Kegaon: Lat. 18°52.995"N & Long. 072°54.704"E. The rocky open shore, about 10-20m rocky area open during low tide, pebbles were present at the above high water mark on the western side, on the rocky pits and crevices two scattered mangroves trees of *Bruguiera sexangula* (Lour.) Poir. *Sonneratia alba* J. Smith. were recorded from mid tide to till high tide mark, on the northern side away from the high tide mark town is about 30-40m, due to nearest village domestic water discharged, no fishing activities. Mangrove: *Bruguiera sexangula*, *Sonneratia alba*.

2.3. Mora: Lat. 18°54.676"N and Long. 072°55.445"E. The rocky open shore, about 10-20m on the rocky shore slightly mud mixed, small pebbles were present at the above of high water mark, in dense large mangroves trees of *Sonneratia alba* J. Smith, *Avicennia marina* (Forsk.)

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Vierh. were recorded, on the southern side away from the high tide mark town is about 10-20m, due to nearest village there is domestic discharged, due to fishing activities oil discharged. Mangrove: *Sonneratia alba*, *Avicennia marina*.

2.4. Panaje: Lat. 18°54.615”N and Long. 072°56.812”E. The rocky open shore, below high tide mark about 60-70m marshy area open during low tide, rocky and pebbles were present at the above of high tide mark, above mid tide mark in scattered mangroves trees *Bruguiera sexangula* (Lour.) Poir. were recorded, there is no domestic water discharged, no fishing activities oil discharged. Mangrove: *Bruguiera sexangula*.

2.5. Sheva: Lat. 18°55.739”N and Long. 072°57.214”E. The rocky open shore, about 10-20m rocky and muddy area opens during low tide, big black stones and pebbles were present at the above of high tide mark, in scattered large mangrove trees of *Avicennia marina* (Forsk.) Vierh. were present, JNPT about 40-50m away on the northern side from the high tide mark, no domestic water discharged, no fishing activities. Mangrove: *Avicennia marina*.

Live animals collected by handpicking including mangrove associated gastropod species during low tide. Five quadrates of nylon rope each 1-m² was prepared, randomly at each locality just over the bed. Twice in each season post-monsoon, winter and summer October 2010 to September 2011. Soon after fishing, they were brought to the laboratory and the shells were brushed to clean the fouling biomass and mud. They were then stocked in filtered seawater pumped in the laboratory from the localities for observation then animal preserved in 70% alcohol for taxonomical identification of morphological characters of typical animal, especially, lunal, umbo, and operculum. Internal parts teeth. The shells were identified from Zoological Survey of India, Kolkata. Also using the following references: Annotated checklist of Indian Marine Molluscs (Cephalopoda, Bivalve and Scaphopoda) Part-1 Ramakrishna and A. Dey. Occasional Paper no. 320, ZSI - 2010.

3. Results

According to "fig. 1". The 03 Orders, 10 families, 30 genus and 29 species recorded from these five localities, Order Archaeogastropoda belongs to three families like- Trochidae belongs to one species, Neritidae belongs to six species,

Patellidae belongs to one species. Order Mesogastropoda belongs to five families like- Littorinidae belongs to three species, Planaxidae belongs to one species, Cerithiidae belongs to five species, Potamididae belongs to one species, and Ranellidae belongs to two species. While Order Neogastropoda belongs to two families like-Muricidae belongs to nine species and Buccinidae belongs to one species. It is an indicates much more diversity on rocky habitats. The muricidae family with 09 species recorded in rocky habitats, while Neritidae were noticed. The gastropods are playing a vital role in the homeostasis, during study period October 2010 to September 2011.

According to Shannon Wiener Diversity Index

No. of sample	pi=sample/sum	ln (pi)	pi*ln (pi)
27	0.281	-1.269	-0.356
26	0.270	-1.309	-0.353
23	0.239	-1.431	-0.342
14	0.145	-1.931	-0.279
06	0.062	-2.780	-0.172
sum=96			Sum = -1.502

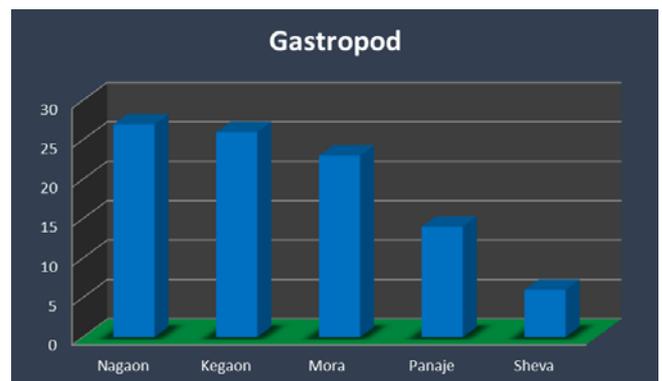
$H = 1.502$

$H_{max} = \ln(N) = \ln(4) = 1.609$

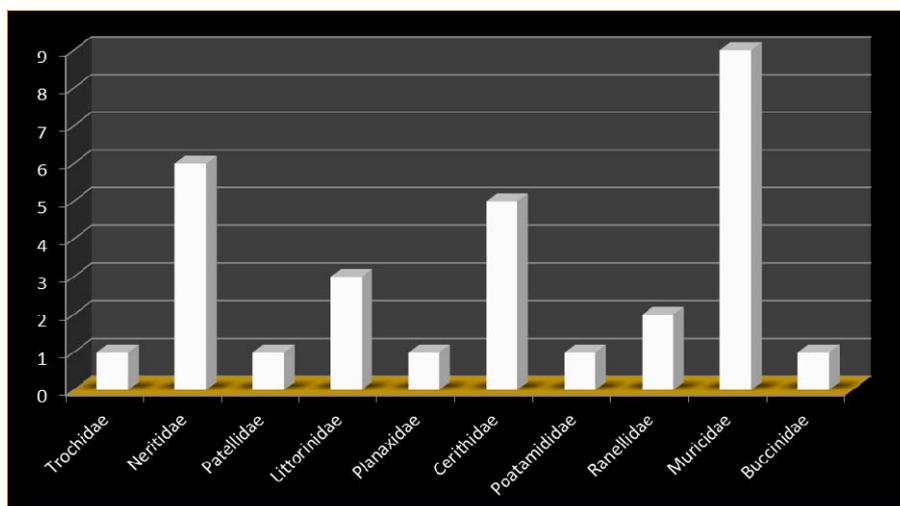
$Evenness = H/H_{max} = 1.502/1.609 = 0.933$

Result: Shannon diversity index (H) = 1.502

Evenness = 0.933



Graph I: According to localities occurrence of gastropods on Raigad coast.



Graph II: According to family occurrence of gastropods on Raigad coast.

Also other gastropods recorded in the Akshi creek, Raigad district by [7]. The pulmonate snail *Cassidula nucleus* has been studied from Pichavaram mangroves [8]. The *Nerita (Dostia) crepidularia* in vellar estuary mangroves, its having a variety of habitats mangroves plant on the stems, intertidal mudflat during the high tide time animals moving to plant stem after that during low tide time animals moving to mud flats [10]. At Locality Panaje and sheva has less diversity as compare to Nagaon, Kegaon and Mora due to the pollution.

4. Discussion

The diversity of gastropods molluscs at five localities of Raigad district coast varies significantly. The importance of ecology the relatively high temperature, high oxygen content, low wave energy and the semi-enclosed nature of the habitat. Decomposed minerals of the plant litter from August onwards is an important component of nutrient cycling in wetlands & it harbours a large number of diverse species [7]. The lowest density was in the month of July because of monsoon season. In monsoon, due to self-dilution of the body fluid, the sensitive molluscs were unable to adjust the fluctuating osmotic balance quickly hence their mortality was high. After the month July because of adjustment, the mortality rate of molluscs decreased gradually. As a result, density of molluscs increased. It also understood that in the month of July, the salinity and temperature dropped down which made the condition adverse for the molluscs [10]. The population density was at its peak in the month of November during post monsoon period. It is clearly noticed by many research workers that the post monsoon period is the most favorable time for the new inflow of molluscan species. The mangroves support high density of every type of molluscan species especially, *Telescopium*, *Potamides*, *Natica*, *Nerita*, and *Littorina* and oysters. The *Littorina sp.* was densely found on the trunks, pneumatophores as well as on stilt roots of mangrove plants. It is good harvesting place for variety of molluscan species [7].

The gastropods are generally benthos organism and they are regularly used as bio-indicators of aquatic healthy. These species can produce a billion of larvae in the form of planktons that sustains the biotic population & they have an essential role in food chain, & energy flow. The observation of these species populations in mangrove ecosystem is important to evaluate their condition [11]. In the region of *Nerita (Dostia) crepidularia*, *Littorina sp.*, *Cerithidea sp.* were observed to the mud banks, mudflats, mangrove forest, sandy muddy area swamps, prop-roots and pneumatophores. *Telescopium telescopium* were found in the mud flats of mangroves plants. Mangroves are providing rich faunal resources from macro faunal communities to microbial diversity. Molluscs can reach high biomass in mangroves ecosystem because of high primary production within the food web, as predators, herbivores, detritivores & filter feeders. The numerical abundance & biomass of molluscs can be equally impressive. The numerous investigation of mangroves associated molluscs in the world wide, 39 species recorded of gastropods in as Australian mangroves, [12], 23 molluscs species from the mangrove forest in Hong Kong [14], 44 sp. of Sematan mangrove forest of Malaysia recorded [15]. A total account of Sundarban 56 sp. of molluscs 31 gastropods & 25 bivalves [16]. 12 bivalve & 13 gastropods mangrove associated molluscs at Ratnagiri recorded [17] 39 gastropods belongs 15 families from Raigad district coast recorded [18]. Gastropods are typically one of the dominant and most conspicuous macrofauna in

mangrove systems, and occupy wide range of ecological niches [19].

5. Conclusion

At the Nagaon & Kegaon has greater diversity & commercial value importance. The total number & type of molluscs probably is influenced by their habitat & geographical condition. Nagaon, Kegaon, Mora & Panaje probably have suitable habitat to support rich diversity, also commercial & ecological molluscan importance. At Kegaon *Cornia konkanensis* & *Morula nodicostata* are recorded while at the Sheva *Cerithidea cingulata* found dominantly.

The gastropods have a significant ecological role to play in the mangrove ecosystems, also rocky habitats is suitable especially for gastropods. However very little information is available on the gastropod diversity of mangroves. Hence, it is necessary to document the diversity of the group of threatened ecosystems. There is an urgent need conservation & sustainable utilization of gastropod molluscan species.

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