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Marine gastropods molluscan diversity from west coast of India

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Abstract
The study have been made in assessing the diversity and taxonomy of marine gastropods from five study sites Harihareshwar, Lada, Jivanabander, Shrivardhan and Kondvil, from Indian coast, including mangroves which is provide nourishment and shelter for the gastropoda, rocky substrata, and muddy habitat, during October, 2014 to September, 2015, there is rich diversity of marine gastropoda molluscs, marine ecosystem in the whole sea might respond to global change, therefor there is need to research to maintain ecosystem, this approach to coastal diversity is not only helpful, but is in fact indispensable.

Keywords: marine gastropoda, diversity, west coast of India

1. Introduction
The gastropoda molluscs are studied in India from the diverse habitats. They occur in different habitats such as mangroves, rocky coasts, coral reef, sandy beaches, sea grass beds and also at greater vertically deeper in the sea, they are more diverse in the rocky intertidal zone along the coast. Sandy stones, inter tidal flats, mangrove habitats [1]. Mangrove forest one is the most biologically diverse ecosystems in the world, rich in organic matters as well as nutrients too and it has support to large biomass of biota [2]. The gastropods and bivalves use to collect extensively for local consumption as a food for people. 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 clams, *Anadara granosa* and other cockles can be found in huge numbers on mudflats in 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 which is easily digestible compared to other animal food (flesh) [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]. Pirawadi and Karanja of Raigad district has greater diversity and commercial value [19]. The research papers investigate the diversity of gastropoda molluscs of mangrove habitat, rocky coasts, sandy beach from selected study sites of Raigad district coast which is 240 kms across the Coast of India.

2. Materials and Methods
a. Harihareshwar "A": (Lat. 17°59.568" North and Long. 073°01.187" East). The rocky shore, about 05m area exposed during the low tide, along hill there is one rocks flat platform, in the rocks pits gastropods diversity were high, village about ½ kms on the north-eastern side from the high tide mark, by one small canal domestic discharge occurrence from the village which is meets to the sea just beside study site.

b. Lada: (Lat. 18°01.686" North and Long. 073°01.752" East). The backwater muddy region, there is exposed inter-tidal mudflat about 20 m during low tide, sea water flows is circular shape (3 side land and 1 side influx of sea water), in scatter large mangrove trees of *Sonneatia alba* J. Smith, *Ceriops tagal* (Perr.) (Robinson). Aprox - 2km area occupies by oysters beds spread over on the boulders.

c. Shrivardhan: (Lat. 18°02.556" North and Long. 073°00. 598" East). The open fine sandy beach, north and south side rocks were present; tide influx result in deposit of sand in rock crevices, intertidal shore was about 15m.The gastropods *Umbonium vestarium* (Linnaeus) was recorded at the study site during high tide mark during low tide, there is direct domestic discharge occurrence into the Sea.

d. Jivanabander: (Lat. 18°03.062" North and Long. 072°59. 944" East). The rocky shore (surf beaten), about 05-10 m intertidal area exposed during low tide, village is about 60-70m far away from high tide mark on the eastern side, fishing activity has been going on by boat, there one cement constructed jetty for the purpose of landing the fish catch for local people, on the study site domestic discharge has been occurrence from village.

e. Kondvil: (Lat. 18°06.158" North and Long. 072°59.080" East). The open rocky shore, towards the North and south side black rocks with pebbles and crumbly rocky area was present.

Live animals collected by handpicking with the help of forceps including mangrove associated gastropods 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 2014 to September 2015, soon after collecting, 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 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, those species are not able to identify in the laboratory that 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" At the study site Harihareshwar had recorded eighteen species, at the Lada site ten species had recorded, at the Shrivardhan site two species had recorded, at the Jinvanabander site twenty three species had recorded and at the Kondvil site twenty five species had recorded. According to fig "2" Across five study sites total sixteen families recorded, Trochidae belongs to three species, Turbinidae belongs to two species, Neritidae belongs to eleven species, Lottiidae belongs to one species, Patellidae belongs to one species, Littorinidae belongs to three species, Planaxidae belongs to one species, Cerithidae belongs to five species, Potamididae belongs to two species, Turritellidae belongs to one species, Strombidae belongs to one species, Ranellidae belongs to one speices, Muricidae belongs to five species, Nassariidae belongs to two species, Ellobiidae belongs to one species, and Onchidiidae belongs to two species had recorded. According to fig "3" five Orders, sixteen families as well as forty genus while forty one live gastropoda species recorded meanwhile study duration.

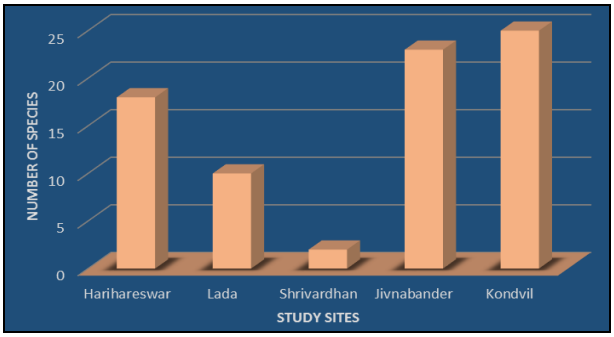

Fig 1: Gastropods recorded in number of individual/m² during 2014-15.

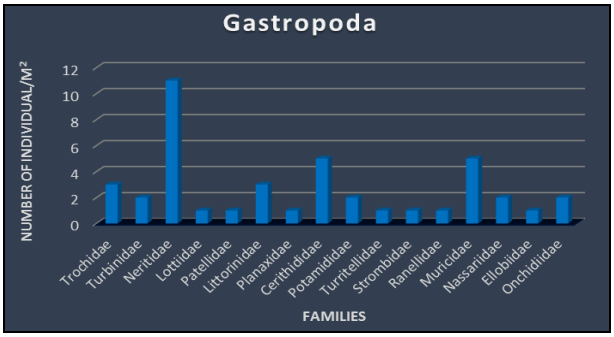

Fig 2: Gastropods recorded from families during 2014-15.

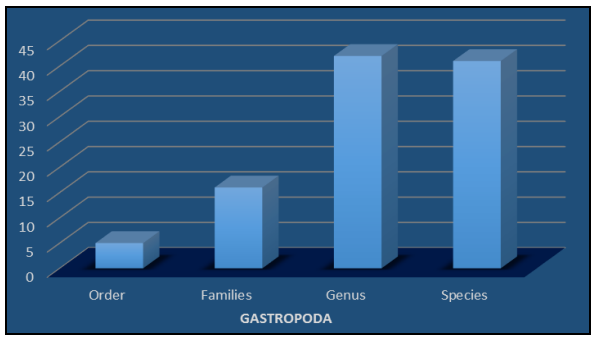

Fig 3: Taxonomical identification of class gastropoda during 2014-15.

4. Discussion

The gastropods diversity at five localities of Raigad district coast varies significantly. 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]. The importance of ecology the relatively high temperature, high oxygen content, low wave energy [18]. 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 [13]. 44 sp., of Sematan mangrove forest of Malaysia recorded [14]. A total account at Sundarban fifty six species of molluscs thirty one gastropods and twenty five bivalves [15]. Twelve bivalves and Thirteen gastropods from mangrove associate molluscs at Ratnagiri [16] Thirty nine gastropods belongs fifteen families recorded along the Raigad district coast [17]. Nagaon and Kegaon of Raigad district have probably have suitable habitat to support large number of edible molluscs diversity [20]. The order Neogastropoda is dominantly with eight species recorded during 2010-2011 [21]. Eight species of bivalves and twenty species from gastropods from selected study localities of Raigad Coast [22]. Twelve bivalves from seven families and thirteen gastropods from eight families recorded from Ratnagiri Coast [23]. The maximum number of molluscan species was observed from mud flats along the mangroves [24]. The order Archaeogastropoda has more diversity with five families and eleven species recorded [25] The Class gastropoda is typically one of the dominant and most conspicuous macrofauna on the Indian coast, it occupy huge range of ecological niches in the marine ecosystem.

5. Conclusion

At the study site Kondvil has greater diversity from rocky habitat, so rocky shore have been more dominant regarding diversity of marine gastropoda due to intertidal zone which is significance in the point of view of marine ecosystem.

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