International Archive of Applied Sciences and Technology
Int. Arch. App. Sci. Technol; Vol 9 [4] December 2018 : 82-86

[ISO9001: 2008 Certified Organization]
www.soeagra.com/iaast.html

IAAST
ONLINE ISSN 2277- 1565
PRINT ISSN 0976 - 4828

CODEN: IAASCA ORIGINAL ARTICLE

DOI: .10.15515/iaast.0976-4828.9.4.8286

Diversity and Distribution of Gastropods on Rocky Shores Off Visakhapatnam, Andhra Pradesh, India

Prasanna Lakshmi. G, and Ramesh Babu. K
Department of Marine Living Resources, College of Science and Technology,
Andhra University, Visakhapatnam
Andhra Pradesh, India
Corresponding author E-mail: gnana.gorle@gmail.com

ABSTRACT
Diversity and distribution of gastropod species have been studied during pre-monsoon season in the intertidal zones of two sampling sites i.e., Rushikonda beach and Tenneti park from Visakhapatnam coast. Each site was surveyed during low tide levels of pre-monsoon season. Total of 38 species, 20 genera and 12 families were identified during the survey. Diversity indices were utilized to quantify the species richness and evenness. The highest number of individuals were observed in Tenneti park than Rushikonda. A significant change is observed in the total number of individuals collected from month wise in the pre-monsoon season. The highest number of individuals belonged to 3 families, Neritidae, Littorinidae, Cerithidae. The result of this study indicates that the coast of Visakhapatnam has huge gastropod fauna and needs to be protected.
Keywords:*Intertidal, pre-monsoon, indices, Neritidae, Littorinidae, Cerithidae.*

Received 28/07/2018 Revised 25/08/2018 Accepted 24/10/2018

Citation of this article
Prasanna Lakshmi. G, and Ramesh Babu. K. Diversity and Distribution of Gastropods on Rocky Shores Off Visakhapatnam, Andhra Pradesh, India. Int. Arch. App. Sci. Technol; Vol 9 [4] December 2018. 82-86.

INTRODUCTION

India is one of among 12 super biodiverse nations and 25 hotspots of the most extravagant and exceptionally jeopardized eco-locales of the world. Among the Asian nations, India is maybe the special case that has a long record of inventories of seaside and marine biodiversity going back to no less than two centuries. Gathering information on species composition is the basis for the understanding the course affecting the stability of communities or ecosystems. Biodiversity of an area plays a significant role in the conservation of the species and habitat [1-3].

Gastropoda is the biggest ordered class in the phylum Mollusca, it incorporates snails and slugs from minuscule to large. The fossil history goes back to late Cambrian period. Gastropods have extraordinary diversification of habitats. The anatomy, habitat and reproductive adaptations of gastropods change essentially from one group to another. The molluscs are soft-bodied organisms with a long evolutionary history and diversity [7, 8, 9, 12]. Gastropods are abundantly found in intertidal regions of rocky shores with relatively slow going and they are clearly visible to naked eye and collectable by hand picking. The marine gastropods include edible species such as abalones, conches, periwinkles, whelks, etc.

The organisms in the intertidal zone are influenced by several abiotic factors. Organisms living in the rocky intertidal zone has exposed to several stressful factors like limited space, exposure to severe wave action, fluctuations in salinity and temperature, radiation, oxygen availability and the threat of desiccation and predators. The diversity indices provide the

total data of community structure, the α-diversity in a community is explained by Shannon-Weiner diversity index and species richness can be described by Margalef's index.

MATERIAL AND METHODS

Study area

The proposed ponder region Visakhapatnam is situated at (17°41'47.63" N 83°20'39.08" E), geologically the present work taken in two sampling sites which occupy majorly with rocky intertidal belts.

Twodifferent sampling sites i.e., Rushikonda beach (17°46'39.95" N, 83°23'9.35" E) Tenneti Park (17°44'49.15" N, 83°21'2.45" E). The samples, were collected during low tide based on the tide table given by the National Institute of Oceanography, Visakhapatnam. The gastropod molluscs were collected by hand picking and by scrapping as described by [1]. After collection of the samples they are kept in plastic bags and are transported to the laboratory of Department of Marine Living Resources, Andhra University for analysis. The shells are cleaned and photographs are taken for further identification. The shell measurements and other external characters are recorded. Taxonomic identification is followed by using FAO sheets, identification modules-CMFRI, WoRMS websites etc.

Fig. 1. Map showing Study area

Data Analysis

Biodiversity can be quantified by different ways, the main factors involved for measuring diversity are species richness and evenness. The diversity indices that employed for data analysis are

i) Shannon-weiner index (H') a measurement that accounts for species richness and proportion of each species within their community and expressed as $H' = \sum[(pi) \times |n(pi)]$ where pi= proportion of total samples represented by species I, S= total number of species collected, H_{max}= |n(S) = maximum diversity possible.

ii) Margalef richness index (d) is to measure the species richness which is given by S-1/In(N) where S= total number of species and N= number of individuals.

iii) Pielou's evenness index (j) is to determine species evenness and is represented as H'/In(S) where H'= Shannon wiener index and S= total number of species.

RESULTS

Distribution and diversity of Gastropods

A total of 38 species, 20 genera and 12 families were gathered over the examination territory comprising of two inspecting localesduring pre-monsoon season. The rocky intertidal zone of Rushikonda recorded 14 species and Tenneti Park with 20 species during the study period.

Table 1. Taxonomic list of Gastropod species from intertidal rocky shores

Family	Species
Turbinidae	*Turbo intercostalis Menke, 1846*
	Turbo bruneus T.b.Roding, 1791
Muricidae	*Morula marginalba Blainville, 1832*
	Semiricinula fusca Kuster, 1862
	Purpura persica Linnaeus, 1758
	Purpura bufo Lamarck, 1822
	Tylothais virgate Dillwyn, 1817
	Drupella rugose Born, 1778
Neritidae	*Nerita alveolus Hombron & Jacquinot, 1848*
	Nerita litterata Gmelin, 1791
	Nerita chamaeleon Linnaeus, 1758
	Nerita articulate Gould, 1847
	Nerita atramentosa Reeve, 1855
	Nerita albicilla Linnaeus, 1758
Cerithidae	*Cerithium vulgatum Bruguiere, 1792*
	Rhinoclavis sinensis Gmelin, 1791
	Rhinoclavis articulate A. Adam & Reeve, 1850
Lottidae	*Lottia antillarum G. B. Sowerby I, 1834*
	Lottia digitalis Rathke, 1833
	Lottia dalliana Pilsbry, 1891
	Lottia gigantean Gray in G. B. Sowerby I, 1834
	Lottia pelta Rathke, 1833
	Lottia strigatella Carpenter, 1864
Littorinidae	*Littorina littorea Linnaeus, 1758*
	Nodilittorina trochoids Gray, 1839
	Echinolittorina placida Reid, 2009
	Echinolittorina peruviana Lamarck, 1822
	Echinolittorina marquesensis Reid, 2007
	Littoraria intermedia Phillipi, 1846
	Echinolittorina lineolata d'Orbigny, 1840
	Littoraria scabra Linnaeus, 1758
Conidae	*Conus flavascens G. B. Sowerby I, 1834*
	Conus figulinus Linnaeus, 1758
Nacellidae	*Cellana exarata Reeve, 1854*
Patellidae	*Patella caerulea Linnaeus, 1758*
Ranellidae	*Gyrineum natator Roding, 1798*
Collumbellidae	*Mazatlania fulgurata Philippi, 1846*
Planaxidae	*Planaxis sulcatus*

The data of diversity indices for the sampling sites during the pre-monsoon period, the Shannon-wiener index (H') values ranged from 2.1468 to 2.4097. The Margalef's richness index (d) found to be high in Tenneti Park and low in rushikonda beach. Pielou's evenness index (j) is high in rushikonda and low in Tenneti Park.

Table 2. Diversity indices of pre-monsoon months

Month	Sampling site	S	N	H'	J	D
March	T.P	23	996	2.3852	0.7607	22.8551
	R.K	17	457	2.3453	0.8278	16.8367
April	T.P	21	905	2.2319	0.7331	20.8531
	R.K	14	387	2.1468	0.8134	13.8321
May	T.P	25	953	2.4097	0.7486	24.8542
	R.K	17	410	2.1920	0.7736	16.8337

T.P= Tenneti park; R.K= Rushikonda; S=total number of species, N=total number of individuals, H'= Shannon-wiener index, j= pielou's evenness index, d= margalef's richness index.

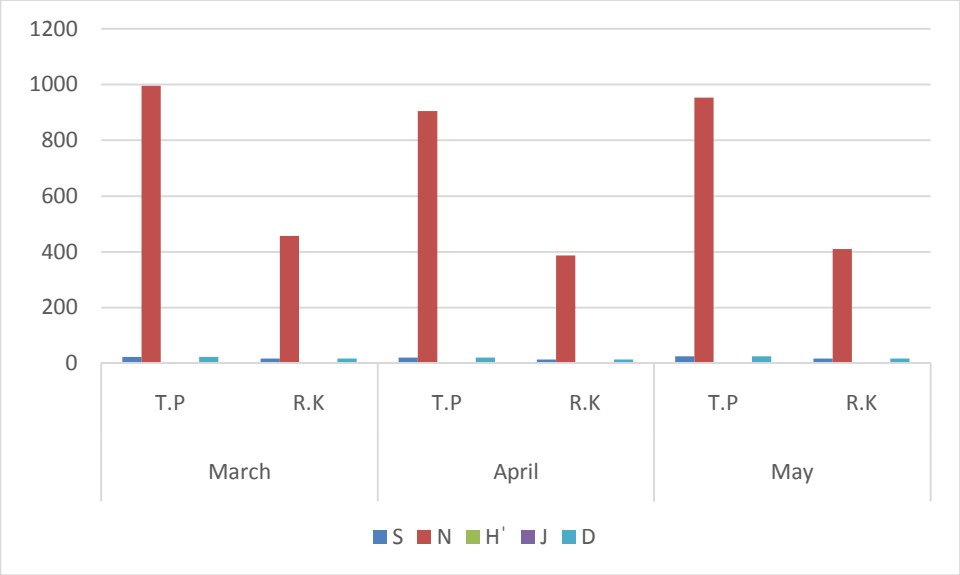

Fig. 2. Diversity indices of gastropods from three different landing stations

DISCUSSION

A number of studies have been conducted on various aspects of molluscs along with diversity and distribution patterns [10, 21, 25, 17, 19, 18, 16, 28, 20, 5, 6] seasonal variation [14], speciation, molecular phylogeny, ecology and biogeography [26, 27, 28, 15].
This survey was undertaken to study the diversity and distribution of gastropods from Visakhapatnam coastline during pre-monsoon season. The survey was conducted on 2 selected sampling sites with rocky shores having 38 species of gastropods that inhabit the 2 sampling sites of Visakhapatnam. Tenneti park recorded high species richness during the pre-monsoon seasons. The consequence of this investigation shows a noteworthy change in the total number of species and individuals, the cause ofthis variation is due to the change in temperature or other environmental factors.The diversity of gastropod fauna has been drastically affected by polluting the shores by dumping sewage, rapid urbanization, human activities, runoffs and shell collectors. The intertidal zones are known to support a wide variety of fauna [4] which has to be protected and preserved.

REFERENCES

1. Anandaraj, U. Balasubramanian, P. Murugesan and S. Muthuvelu, (2011). Biodiversity of marine molluscks in east coastal area of thanjavur district, Tamilnadu, India.
2. Anuradha David, (2011). Biodiversity and distribution of marine gastropods during pre and post monsoon seasons along the Goa coastline, India.
3. Belen Lumeran, (2015). Gastropods in the intertidal zone of Asray beach, kingdom of Bahrain.
4. Benkendorff and A. R. Davis, (2002). Identifying hotspots for species richness of molluscans on rocky intertidal reefs. Biodiversity conserve., 11; 1959-1973.
5. Benkendorff and A. S. Gomes, (2009). Biogeography and biodiversity of gastropod molluscs from the eastern Brazilian continental shelf and slope.
6. Benkendorff and R. Przeslawski, (2008). Multiple measures are necessary to access rarity in molluscs; a case study from southeastern Australia.
7. Bogan, (2008). Global diversity of mussels (Mollusca, Bivalvia) in freshwater.

8. Cassie Bednar, (2015). Human impacts on rocky intertidal gastropods: Are marine protected areas effective.
9. Chiba, (2007).Patterns on species richness along environmental gradients on Molluscan fauna.
10. Lowry, Mc Elroy and J. S Pearse, (1974). The distribution of six gastropod species in California kelp forest.
11. Manolisha and J. K. Patterson Edward, (2012). Biodiversity of marine molluscs from selected locations of Andhra Pradesh coast, southeastern India.
12. Pedro Flores-Rodriguez, Rafael Flores-Garza, Sergio Garcia-Ibanez, (2014). Molluscks of the rocky intertidal zone at three sites in Oaxaca, Mexico.
13. Rawling, T. A., K. A. Hayes, R. H. Cowie and T. M. Collins, (2007). Distribution, identification and impacts of non-native apple snails in the continental United States.
14. Rueda, Urra and C. Salas, 2008. Diel and seasonal variations of Molluscan taxocoenosis associated with a zostera marine bed in southern spain.
15. Rundell, (2008). Cryptic diversity, molecular phylogeny and biogeography of rock and leaf litter dwelling land snails of Balau.
16. Schrodl, Linse and Schwabe, (2006). Review on the distribution and biology of Antarctic monoplacophora with first abyssal record of Laevipilina Antarctica.
17. Selin and Latypoy, (2006). Distribution patterns and population structure of Septifer bilocularis on reefs of southern Vietnam.
18. Sitnikova, (2006). Endemic gastropod distribution in Baikal.
19. Smith, 2005. Rapid assessment of invertebrate biodiversity on rocky shores.
20. Strong, Gargominy, Ponder and P. Bouchet, (2008). Global diversity of gastropods in freshwater.
21. Suzuki, M. Nishira and N. Paphavasit, 2002. Size structure and distribution of Ovassiminea brevicula in thai mangrove swamp.
22. Venkataraman and M. V. M. Wafar, 2005. Coastal and marine diversity of India.
23. Venkataraman, 2003. Natural aquatic ecosystems of India. National Biodiversity Strategy Action Plan, India.
24. Venkataraman, C. and K. Venkataraman, 2012. Diversity of molluscan fauna along the Chennai coast.
25. Watson and S. J. Ormerod, 2004. The distribution of three uncommon freshwater gastropods in the drainage ditches of British grazing marshes.
26. Williams and D. G. Reid, 2004. Speciation and diversity on tropical rocky shores: a global phylogeny of snails of the genus Echinolittorina.
27. Yu, D. H. and K. H. Chu, 2006. Species identity and phylogenetic relationship of the pearl oyster in Pinctada Roding, 1798 based on ITS sequence analysis.
28. Zamorano, M. E. Hendrickx and A. Toledano-Granados, 2007. Distribution and ecology of deep-water molluscs from the continental slope, southern Gulf of California.