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International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 Issue: I Month of publication: January 2018

DOI: <http://doi.org/10.22214/ijraset.2018.1252>

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Intertidal Macrofaunal Invertebrates Diversity from Ratnagiri Coast, (MS) India of Arabian Sea

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Abstract: The diversity of intertidal macrofaunal invertebrates from rocky substrata of Ratnagiri coast was studied during March 2015 to February 2017. A total 83 species were identified representing 6 phyla, belonging to 12 classes, 34 orders and 50 families were recorded from Ratnagiri coast. Results showed that mollusca exhibited highest contribution with 46 species with 55% of the total diversity. Phylum porifera appeared as the second most dominant group contributed 12 species with 15% diversity, Coelenterates comprised 10 species with 12% and Arthropods contributed 10 species with 12% diversity, Echinodermata 3 species with 4% and last Annelids 2 species with 2% of the total diversity. The diversity of macrofaunal group in prevalence of different habitats a wide chance of research to further explore on the possibility of ecological value and there conservation.

Keywords: Diversity, Intertidal zone, Macrofaunal assemblage, Ratnagiri Coast.

I. INTRODUCTION

The intertidal zone of any ecological area is considered as the most productive with the greatest diversity of plant and animal life. Because of its accessibility, the intertidal zone remain highly explored than any other area (Vaghela *et al.*, 2010). Rocky shores are the most extensive littoral habitats exposed to eroding waves and thus are ecologically very important (Crowe, *et al.*, 2000). Ratnagiri district is one of the most important maritime districts of the state with the coastal belt extending to about 200 Km. Ratnagiri is an important coastal area of Maharashtra with average rainfall about 2500 mm. The Arabian Sea is considered as one of the most productive zones in the world oceans (Qasim, 1997, De Sousa, 1996). This coastline is known for its rich marine life especially intertidal biota in its extended intertidal and subtidal areas (Shukla and Misra, 1977). Coastal marine environments are reported to have greater biodiversity than open ocean regions and majority of world's most productive marine ecosystems are found within coastal environments (Bierman *et al.*, 2009). Among that invertebrate communities of rocky shores function as integrators of ecological processes over time scale (Kroncke, *et al.*, 1998 and Beuchel, *et al.*, 2006). Intertidal invertebrates and macroalgae occupy low trophic levels and are responding quicker to alterations in climate than species at higher trophic levels (Jenouvrier, *et al.*, 2003). They often show the first response in a cascade of effects up the food chain and are therefore important sentinels of climate change impacts (Johnson, *et al.*, 2011). Molluscan shells have been found to be important raw material for various commercial products as poultry feeds, fertilizers, tooth powder, tooth pest etc. India exports seashells and cuttle fish bones to various countries (Sarvaiya, 1988). The planet has always been changing: current patterns of biodiversity are the result of past environmental conditions and ecological and evolutionary constraints (Benton, 2010; Clarke and Crame 2010; Lyons *et al.*, 2010). The present study evaluates the ecological status of various macrofaunal invertebrate group of the rocky intertidal areas at Ratnagiri coastline of the Arabian Sea.

II. MATERIALS AND METHODS

The entire intertidal belt of the selected sites on the Ratnagiri coastline of the Arabian Sea was thoroughly surveyed for macrofaunal diversity and intertidal assemblages. The study was conducted on three different stations of Ratnagiri coast, at Undi (17° 13'38.29 N, 73° 14'16.93 E), Alawa (17° 01'29.32 N, 73° 16'08.89 E), Wayangani (16° 55'42.12 N, 73° 16'57.01 E). The intertidal zones of the sites were visited regularly during the lowest tide and the macrofauna were recorded. The study was conducted during March 2015 to February 2017. During present study intertidal zones of three different coasts like Undi, Alawa and Wayangani were intensively surveyed to check the present status of intertidal macrofaunal diversity. The structural attributes of the intertidal fauna were studied by transect method (Misra, 1968). Quadrates of 1 m² were laid on transect. The identification of macrofauna from MBRC Chennai, the identification keys, literature available in the form of books, journals reports and checklist of macrofauna was prepared.

III. RESULTS AND DISCUSSION

Intertidal zone of Ratnagiri coastline shows a great deal of macrofaunal diversity in marine ecosystem. There are total 83 invertebrate species were recorded during present study. All species belonging to 6 phyla, 12 classes, 34 orders and 50 families were

recorded from Ratnagiri coast (Table no.1).Phylum molluscs exhibited highest contribution with 46 species belonging to three classes i.e. bivalve 12 species, gastropods 33 species and cephalopoda 1 species with 55% of the total diversity. Phylum porifera appeared as the second most dominant group contributed 12 species with 15% diversity, Coelenterates comprised 10 species with 12%, Arthropods contributed 10 species with 12% diversity, Class malacostraca was major having 7 species, whereas class hexanauplia having 3 species recorded in arthropods. Echinodermata 3 species with 4% and last Annelids 2 species with 2% of the total diversity showed in table 1 and fig. 1.

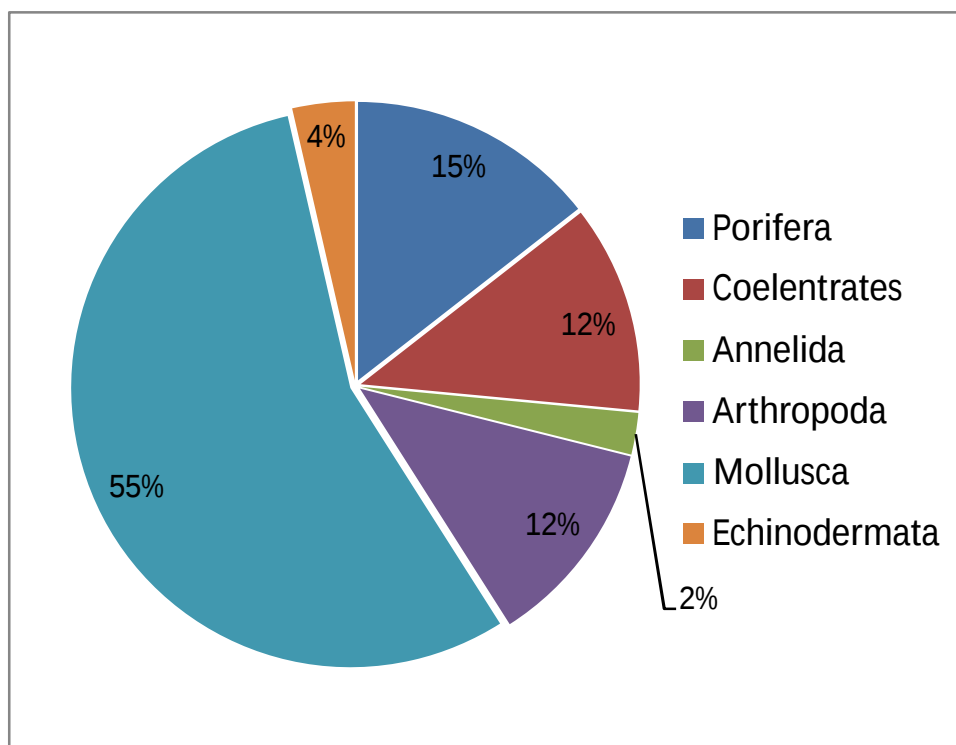


Fig. 1: Percentage representation of macrofaunal diversity in Ratnagiri Coast.

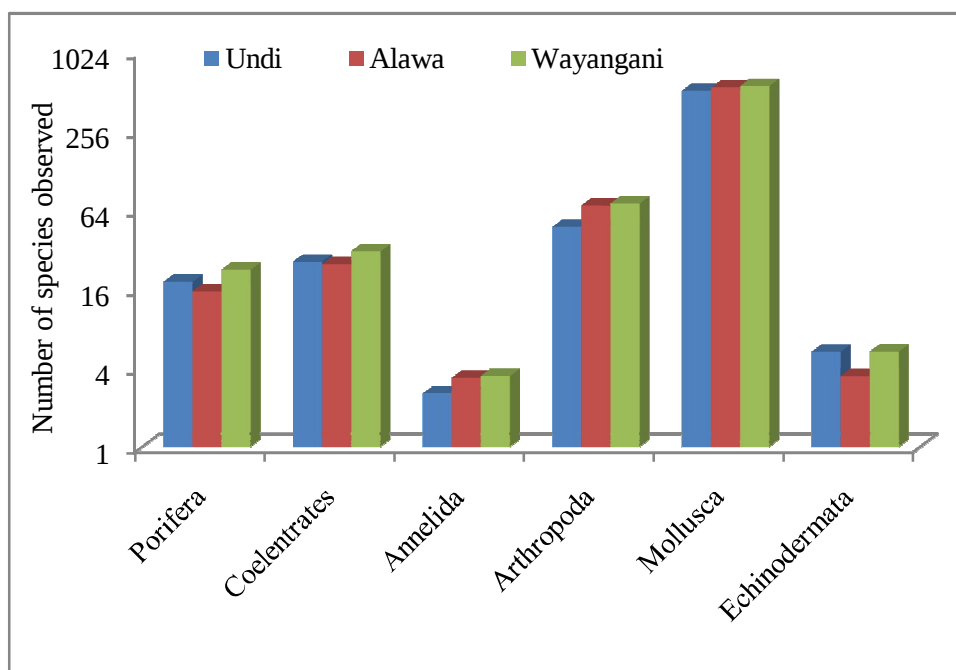


Fig. 2: Site wise distribution of macrofaunal species.

Table No. 1: The Checklist of the Intertidal Macro-faunal Invertebrates collected from Ratnagiri Coastlines of Maharashtra, India.

Phylum	Class	Order	Family	Genus/species
Porifera	Demospongiae	Suberitida	Halichondriidae	Halichondriasitens (Schmidt, 1870)
				Halichondria panacea (Pallas, 1766)
				Mycale laevis (Carter, 1882)
		Poecilosclerida	Mycalidae	Mycale (Zygomycale) parishii (Bowerbank, 1875)
				Paratetillabacca (Selenka, 1867)
				Haliclona (Reniera) tubifera (George and Wilson, 1919)
		Tetractinellida	Tetillidae	Haliclona permollis (Bowerbank, 1866)
				Amphimedon viridis (Duchassaing and Michelotti, 1864)
				Aiolochroia crassa (Hyatt, 1875)
		Haplosclerida	Chalinidae	Clionavarians (Duchassaing and Michelotti, 1864)
				Stylissamassa (Carter, 1887)
				Ircinia fusca (Carter, 1880)
		Verongiida	Aplysinidae	Bolocera tuediae (Johnston, 1832)
				Actinia equina (Linnaeus, 1758)
				Anthopleura elegantissima (Brandt, 1835)
Coelenterates	Anthozoa	Clionaida	Clionaidae	Galaxea astrea (Lamarck, 1816)
				Montastraea cavernosa (Linnaeus, 1767)
				Palythoa tuberculosa (Esper, 1791)
		Scopalina	Scopalinae	Palythoa caribaeorum (Duchassaing and Michelotti, 1860)
				Zoanthus gigas (Reimer et al., 2006)
				Melithaea ochracea (Linnaeus, 1758)
		Dictyoceratida	Irciniidae	Chrysaora quinquecirrha (Desor, 1848)
				Eurythoe complanata (Pallas, 1766)
				Cossuralongocirrata (Webster and Benedict, 1887)
		Actiniaria	Actiniidae	Balanus crenatus (Bruguere, 1789)
				Balanus glandula (Darwin, 1854)
				Semibalanus balanoides (Linnaeus, 1767)
		Scleractinia	Euphylliidae	Charybdis acutifrons (De Man, 1879)
				Charybdis callianassa (Herbst, 1789)
				Charybdis orientalis (Dana, 1852)
Annelida	Polychaeta	Amphinomida	Amphinomidae	Portunus pelagicus (Linnaeus, 1758)
				Neptunus pelagicus (Linnaeus, 1758)
				Atergatis integerrimus (Lamarck, 1801)
		Alcyonacea	Melithaeidae	Acetes johni (Nataraj, 1947)
				Barbatianovaezealandiae (Smitt, 1915)
				Gafrarium divaricatum (Roding, 1798)
		Semaestomeae	Pelagiidae	Venerupis philippinarum (Adams & Reeve 1850)
				Marcia japonica (Gmelin, 1791)
				Circe tumefacta (Sowerby, 1851)
		Amphipnomida	Cossuridae	Gafrariumaequivocum (Holten, 1802)
		Hexanauplia	Balanidae	
Arthropoda	Malacostraca	Decapoda	Portunidae	
		Sessilia	Archaeobalanidae	
		Hexanauplia	Balanidae	
		Hexanauplia	Balanidae	
		Hexanauplia	Balanidae	
Mollusca	Bivalvia	Arcida	Arcidae	
		Venerida	Veneridae	
		Venerida	Veneridae	
		Venerida	Veneridae	
		Venerida	Veneridae	

Gastropoda	Cardiida	Cyrenidae	Geloinaerosa (Lightfoot, 1786)
	Imparidentia	Cardiidae	Laevicardiumcrassum (Gmelin, 1791)
	Mytilida	Semelidae	Semelecordiformis (Holten, 1802)
	Ostreida	Mactridae	Mactramaculata(Gmelin,1791)
	Caenogastropoda	Mytilidae	Mytilustrossulus(Gould, 1850)
	Trochida	Ostreidae	Ostreaconchaphila(Carpenter, 1857)
Echinodermata	Seguenziida	Cerithiidae	Cerithiumcoralium (Kiener, 1841)
	Littorinimorpha	Planaxidae	Clypeomorusmoniliferus (Kiener, 1841)
	Neogastropoda	Epitoniidae	Cerithiumtenellum (Sowerby II, 1855)
	Trochida	Chilodontidae	Cerithiumtrailli (Sowerby,1855)
	Littorinimorpha	Ranellidae	Cerithiumcaeruleum(Sowerby II, 1855)
	Neogastropoda	Muricidae	Planaxissulcatus (Born, 1778)
	Trochida	Turbiniidae	Supplanaxisniger (Quoy&Gaimard, 1833)
	Littorinimorpha	Tegulidae	Acrilla acuminate (Sowerby II, 1844)
	Neogastropoda	Littorinidae	Euchelusasper (Gmelin, 1791)
	Trochida	Babyloniidae	Gyrineumnator (Röding, 1798)
Echinodermata	Ammonoidea	Buccinidae	Tenguellagranulata (Duclos, 1832)
	Ophiuroidea	Muricidae	Turbo bruneus (Röding, 1798)
	Asteroidea	Conidae	Turbo intercostalis (Menke, 1846)
	Holothuroidea	Cycloneritimorpha	Trochusradiatus (Gmelin, 1791)
Echinodermata	Ammonoidea	Neritidae	Astrariumsemicostatum(Kiener, 1850)
	Ophiuroidea	Lottiidae	Tectusniloticus (Linnaeus, 1767)
	Asteroidea	Nacellidae	Littorariaundulata (Gray, 1839)
	Holothuroidea	Stephanoceratidae	Babylonia spirata (Linnaeus, 1758)
Echinodermata	Ammonoidea	Ophiuridae	Gemophosauritulus (Link, 1807)
	Ophiuroidea	Echinasteridae	Gemophosgemmatus (Reeve, 1846)
	Asteroidea	Holothuriidae	Cantharusdorbignyi (Payraudeau, 1826)
	Holothuroidea		Perpurapunama (Roding, 1798)

This study agreement with previous similar data was carried out at west coast of India, total of 24 species of sponges were identified which belonged to 20 genera, 14 families and 6 orders (Vinodet *al.*, 2014) and also the Gulf of Mannar and Palk Bay region (319 species), Andaman and Nicobar islands (95 species) and Lakshadweep islands (91 species) as shown in the works of Venkataraman and Wafar (2005) and Thomas (1989). There are 20 species of coelenterate were recorded from Gujrat (Poriya and Kundu, 2014). Similar kind of results from Maharashtra coast, a total of 180 species of polychaetes belongs to 113 genera, 41 families and six orders have been recorded (Patiet *al.*, 2014). A total of 24 species of decapod crustacean under three infraorders, seven families and 13 genera were recorded from coastal waters of Ratnagiri in Maharashtra (Kolhe and Mogalekar, 2017).

Gastropods and bivalves are generally benthos organisms and they are regularly used as bioindicators of aquatic health. This study agreement with previous similar data was carried out at intertidal zone of Ratnagiri coast, Maharashtra, were a great species diversity and distribution of 127 gastropods species observed and identified (Kurhe, 2014). It was also suggested that the specific seaweed association of molluscs play considerable role in their abundance and distribution in the intertidal zone (Newell, 1976; Purchon, 1968; Underwood, 1992; Misra & Kundu, 2005; Vaghela *et al.*, 2010). A total account of Sundarban 56 species of molluscs including 31 gastropods and 25 bivalves (Anirudha, 2006). 12 species of bivalve and 13 species of gastropod mangrove associated molluscs at Ratnagiri, Maharashtra, India (Khade and Mane, 2012) and the total 19 bivalves belongs 9 families while 39 gastropods belongs 15 families from selected sites of Raigad district coast (Khade and Mane, 2012). Similar study was carried out at some of the localities from Raigad district, Maharashtra West Coast of India (Khade and Mane, 2012). The diversity of the echinoderms from two landing centers was 8 families, 11 genera and 14 species (Kollimalai and Antony, 2014). Echinoids are one of the more diverse and successful echinoderm groups today. Fourteen species and 11 families were recorded in Taiwan water by Chao (2000).

The marine animals from the intertidal area protect themselves against high salinity, desiccation and against the predators. Thus they achieve through taking shelter under the bushy canopy of the seaweeds which grow better on the lower littoral zone (Misra & Kundu, 2005). Similar kind of study carried out at Gujrat, a total of 60 species of intertidal macro-invertebrate recorded on the rocky intertidal belt, Molluscs group comprised 35 species followed by coelenterate, arthropods, annelids, porifera and echinodermata (Bhadja, 2010). There are 82 invertebrate species were recorded from Gujrat, 4 species of porifera, 20 species of coelenterate, 5 species of annelid, 11 species of arthropoda, 40 species of mollusca and 3 species of echinodermata (Poriya and Kundu, 2014). The diversity of the macrofauna at the selected shore occupy different levels of the intertidal zone, each species were dominated at the particular zone where the conditions are most favourable for them. However, the nature of substratum type such as pools, cups and channels and availability of food also play significant role for the distribution of different species.

IV. CONCLUSION

Present studies report the diversity of intertidal macrofaunal invertebrates from rocky substrata of Ratnagiri coastlines. The Alawa and Wayangani have greater diversity than the Undi. Phylum molluscs exhibited highest contribution probably is influenced by their habitat and geographical condition suitable to support rich diversity of molluscs. The diversity of macrofaunal group in prevalence of different habitats a wide chance of research to further explore on the possibility of ecological value and there conservation.

V. ACKNOWLEDGEMENT

The authors are grateful to the Head, Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad for providing necessary laboratory facility.

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