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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 to12 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 studies by transect method(Misra, 1968).Quadrates of 1 m^2 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 Ratnagiricoastline 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

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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.

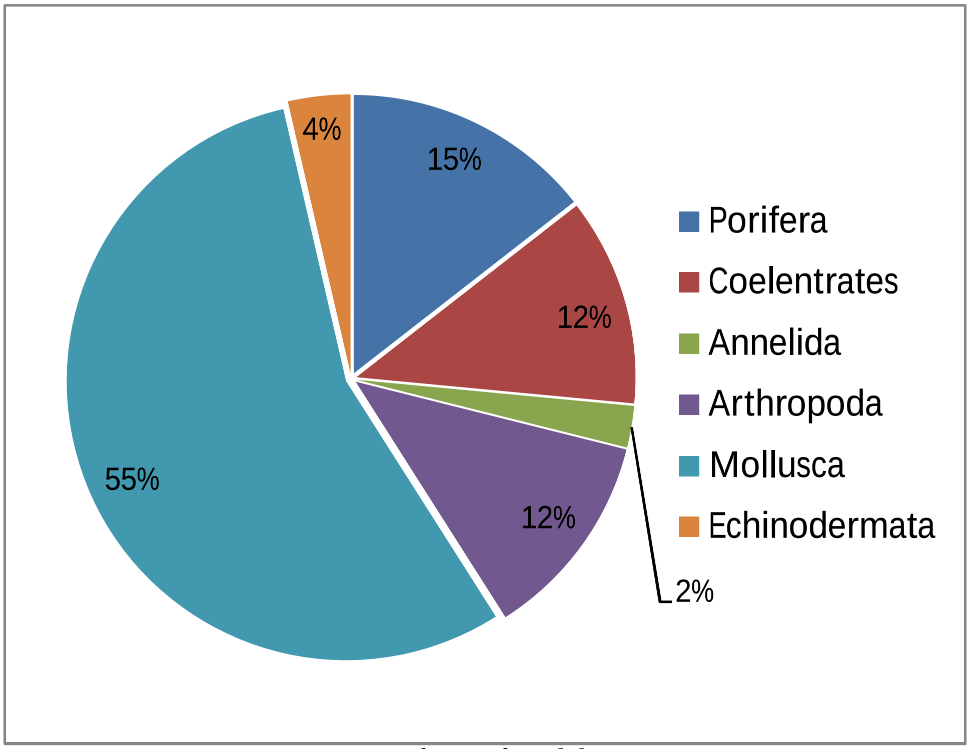

Fig. 1: Percentage representation of macrofaunal diversity in Ratnagiri Coast.

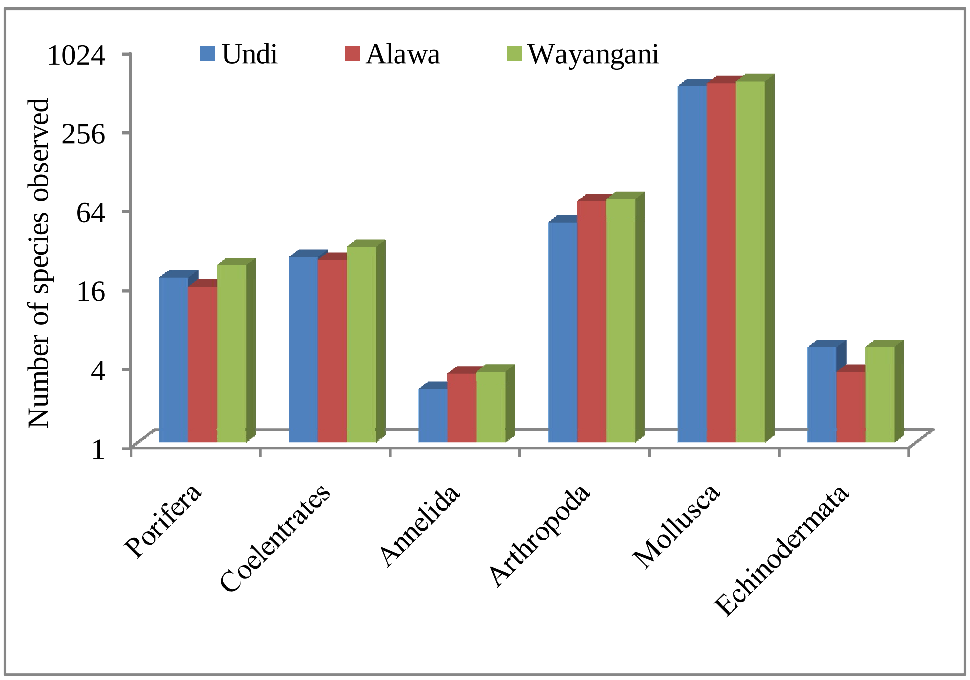

Fig. 2: Site wise distribution of macrofaunal species.

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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	Halichondriasitiens (Schmidt,1870)
				Halichondria panacea (Pallas, 1766)
		Poecilosclerida	Mycalidae	Mycale laevis (Carter, 1882)
				Mycale (Zygomycale) parishii (Bowerbank, 1875)
		Tetractinellida	Tetillidae	Paratetillabacca (Selenka,1867)
		Haplosclerida	Chalinidae	Haliclona (Reniera) tubifera (George and Wilson, 1919)
				Haliclonapermollis (Bowerbank, 1866)
			Niphatidae	Amphimedonviridis (Duchassaing and Michelotti, 1864)
		Verongiida	Aplysinidae	Aiolochroiacrassa (Hyatt, 1875)
		Clionaida	Clionaidae	Clionavarians (Duchassaing and Michelotti, 1864)
		Scopalinida	Scopalinidae	Stylissamassa (Carter, 1887)
		Dictyoceratida	Irciniidae	Irciniafusca (Carter, 1880)
Coelenterates	Anthozoa	Actiniaria	Actiniidae	Boloceratuediae (Johnston, 1832)
				Actinia equina (Linnaeus, 1758)
				Anthopleuraelegantissima (Brandt, 1835)
		Scleractinia	Euphylliidae	Galaxeaastreata (Lamarck, 1816)
			Montastraeidae	Montastraeacavernosa (Linnaeus, 1767)
		Zoantharia	Sphenopidae	Palythoatuberculosa (Esper, 1791)
				Palythoacaribaeorum (Duchassaing and Michelotti, 1860)
			Zoanthidae	Zoanthusgigantus (Reimer et al., 2006)
		Alcyonacea	Melithaeidae	Melithaeaochracea (Linnaeus, 1758)
	Scyphozoa	Semaeostomeae	Pelagiidae	Chrysaoraquinquecirrha (Desor, 1848)
Annelida	Polychaeta	Amphinomida	Amphinomidae	Eurythoecomplanata (Pallas, 1766)
			Cossuridae	Cossuralongocirrata (Webster and Benedict, 1887)
Arthropoda	Hexanauplia	Sessilia	Balanidae	Balanuscrenatus (Bruguiere, 1789)
				Balanusglandula (Darwin, 1854)
			Archaeobalanidae	Semibalanusbalanoides (Linnaeus, 1767)
	Malacostraca	Decapoda	Portunidae	Charybdis acutifrons(De Man, 1879)
				Charybdis callianassa(Herbst, 1789)
				Charybdis orientalis(Dana, 1852)
				Portunuspelagicus(Linnaeus, 1758)
				Neptunuspelagicus(Linnaeus, 1758)
			Xanthidae	Atergatisintegerrimus(Lamarck, 1801)
			Sergestidae	Acetesjohni(Nataraj, 1947)
Mollusca	Bivalvia	Arcida	Arcidae	Barbatianovaezealandiae (Smitt, 1915)
		Venerida	Veneridae	Gafrariumdivaricatum (Roding, 1798)
				Venerupisphilippinarum (Adams & Reeve 1850)
				Marcia japonica (Gmelin, 1791)
				Circe tumefacta (Sowerby, 1851)
				Gafrariumaequivocum (Holten, 1802)

			Cyrenidae	Geloinaerosa (Lightfoot, 1786)
		Cardiida	Cardiidae	Laevicardiumcrassum (Gmelin, 1791)
			Semelidae	Semelecordiformis (Holten, 1802)
		Imparidentia	Mactridae	Mactramaculata(Gmelin,1791)
		Mytilida	Mytilidae	Mytilustrossulus(Gould, 1850)
		Ostreida	Ostreidae	Ostreaconchaphila(Carpenter, 1857)
	Gastropoda	Caenogastropoda	Cerithiidae	Cerithiumcoralium (Kiener, 1841)
				Clypeomorusmonilifercus (Kiener, 1841)
				Cerithiumtenellum (Sowerby II, 1855)
				Cerithiumtrailli (Sowerby,1855)
				Cerithiumcaeruleum(Sowerby II, 1855)
			Planaxidae	Planaxissulcatus (Born, 1778)
				Supplanaxisniger (Quoy&Gaimard, 1833)
			Epitoniidae	Acrilla acuminate (Sowerby II, 1844)
		Seguenziida	Chilodontidae	Euchelusasper (Gmelin, 1791)
		Littorinimorpha	Ranellidae	Gyrineumnatator (Röding, 1798)
		Neogastropoda	Muricidae	Tenguellagranulata (Duclos, 1832)
		Trochida	Turbinidae	Turbo bruneus (Röding, 1798)
				Turbo intercostalis (Menke, 1846)
				Trochusradiatus (Gmelin, 1791)
				Astraliumsemicostatum(Kiener, 1850)
			Tegulidae	Tectusniloticus (Linnaeus, 1767)
		Littorinimorpha	Littorinidae	Littorariaundulata (Gray, 1839)
		Neogastropoda	Babyloniidae	Babylonia spirata (Linnaeus, 1758)
			Buccinidae	Gemophosauritulus (Link, 1807)
				Gemophosgemmatus (Reeve, 1846)
				Cantharusdorbignyi (Payraudeau, 1826)
			Muricidae	Perpurapunama (Roding, 1798)
				Semiricinulakonkanensis (Melvill, 1893)
				Muricopsiszeteki (Hertlein and Strong, 1951)
				Purpurabufo (Lamarck, 1822)
			Conidae	Conusebraeus (Linnaeus, 1758)
				Neritaoryzarum (Récluz, 1841)
				Neritachamaeleon (Linnaeus, 1958)
		Cycloneritimorpha	Neritidae	Neritaalbicilla (Linnaeus, 1758)
				Neritahistrio (Linnaeus, 1758)
				Neritafragum (Reeve, 1855)
			Lottiidae	Lottiapelta (Rathke, 1833)
			Nacellidae	Cellanaradiata (Born, 1778)
	Cephalopoda	Ammonoidea	Stephanoceratidae	Stephanoceras (Stephanoceras) mutabile(Quenstedt, 1886)
Echinodermata	Ophiuroidea	Ophiurida	Ophiuridae	Ophiocomaimbricatus(Muller and Troschel, 1842)
	Asteroidea	Spinulosida	Echinasteridae	Echinastercallosus(Marenzellar, 1895)
	Holothuroidea	Holothuriida	Holothuriidae	Holothurialeucospilota (Brandt, 1835)

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(Vinod*et 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(Pati*et 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, werea 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 andgeographical 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

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