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COMPOSITION AND DIVERSITY OF THE MACROBENTHIC COMMUNITY IN UNAWATUNA, AHANGAMA AND MADIHA, SOUTHERN COAST OF SRI LANKA.

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ABSTRACT

Macro benthic fauna inhabit the bottom sediment layers. They play a very important role in benthic ecosystem functions including nutrient recycling, decomposing particulate organic material by exposing them to microorganisms and also serve as a food source for other consumers in marine food webs. Macro benthos are sometimes considered as indicator species that provide evidences of the health condition of a ecosystem since the distribution of macro benthos significantly depend on the characters of the physical condition of the substrates, nutrient content and physico chemical water quality parameters. The study of macrobenthic fauna in a coastal ecosystem would serve as a useful index for evaluating its ecology and the pollution levels. The present study on macro benthic fauna was carried out in the southern coastal belt of Sri Lanka from May 2013 to July 2013. Three sampling stations were selected for this study, namely, Unawatuna, Ahangama and Madiha. Sediment samples were collected to analyze macrobenthos in order to evaluate species diversity and density. Water samples were collected to determine selected physico chemical parameters. Fourteen macrobenthic faunal species were identified, which comprised of 12 gastropods, 1 polychaete, 1 amphipod and 1 decapod species. The maximum macrobenthic faunal species diversity was recorded in Unawatuna (2.1001) while the lowest species diversity recorded in Madiha (1.4953).

Key words: *Macrobenthos, Species diversity, Species density, Gastropods, Polychaetes*

INTRODUCTION

Macro benthos are the 'creepy critters' that inhabit in bottom sediments. They play a vital role in the marine sediments in ecosystem functions including nutrient recycling, pollutant metabolism, and dispersion and in secondary production (Snelgrove, 1998). They possess different types of body shapes, feeding habits and reproductive modes. These fauna are very important organisms in marine food webs since they form vital linkages and also they serve as a food source for many coastal fishes, sea birds and other marine invertebrates. Distribution of macro benthos is greatly dependent on the nature of the physical condition of the substrates, nutrient content, dissolved oxygen content and Hydrogen Sulphide content. Therefore, even a slight change in the ecosystem results in a substantial change in the benthic community. This phenomenon allows determination of pollution conditions in coastal marine ecosystem (Fernando, 1981). Therefore, macro benthos are considered as indicator organisms that provide clues about the condition and characteristics of the ecosystem. The current status of a particular ecosystem can be only determined by standard analysis of its benthic fauna. Since there was no evidence on a single detailed study on macro benthos in the Southern coastal region of Sri Lanka, this study was planned to investigate the diversity and density of macrobenthos in selected sites of the Southern coast of Sri Lanka.

MATERIALS AND METHODS

The present study was carried out for three months from May 2013 to July 2013 from Unwatuna to Madiha of the Southern coast of Sri Lanka. Three stations were selected for this study, namely, Unawatuna (Station 1) (6° 00′ 19.30" N, 80° 15′ 17.81" E), Ahangama (Station 2), (5° 57′ 59.43" N, 80° 22′ 29.77" E) and Madiha (Station 3) (5° 56′ 11.07" N, 80° 30′ 53.00" E). Water and sediment samples were collected monthly from each station during the study period. A hand corer of inner diameter of 4.2cm was used to

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collect sediment samples. All samples were filtered through a sieve of 0.5mm mesh size and the organisms collected were preserved in 5% formalin. Organisms were identified up to species level using standard references and identification guides (Fernando, 2009). The number of individuals of each species was counted. The species density was expressed as Number of organisms/m^2 (individuals/m^2). Species diversity and Evenness at sampling stations were estimated by using Shannon-Wieners diversity index. The water quality parameters, temperature, salinity, pH and Dissolved Oxygen (DO) were estimated by using standard methods.

RESULTS AND DISCUSSION

The water quality parameters recorded at the stations are given in Table 1. The surface water temperature ranged from the lowest value of 26 °C at station 3 to the highest value of 28 °C at station 1 and 2. The salinity of the surface water varied between 30 ppt (July) at station 3 and 36 ppt (May) at station 1. The minimum value of water pH was recorded as 7.73 at station 2 and the maximum was recorded as 7.93 at station 1. DO content in the surface water ranged from the minimum value of 6.5 mgl^{-1} (June) at station 2 to 8.4 mgl^{-1} (July) at station 3. (Table1).

Macrobenthic organisms belonging to the Gastropoda, Polychaeta, Amphipoda and Decapoda were recorded during the study period at the three study sites. The highest number of species (14) was recorded from Unawatuna while 12 and 10 species were recorded from Ahangama and Madiha respectively (Table 2). A total of 15 species were recorded from all three sampling sites.

Table 1. Selected physio - chemical water quality parameters recorded at the three sampling sites during the study period

Parameters	Unawatuna (Station 1)			Ahangama (Station 2)			Madiha (Station 3)		
	May	June	July	May	June	July	May	June	July
Temperature (°C)	28	27.5	27	28	27	27	27.5	27	26
Salinity (ppt)	36	34	34	35	34	34	34	32	30
pH	7.93	7.82	7.81	7.80	7.81	7.73	7.81	7.84	7.76
Dissolved oxygen (mgl^{-1})	7.4	7.6	6.8	7.3	6.5	7.0	6.8	7.6	8.4

Table 2. Benthic macrofaunal species recorded during this study

Macrobenthos	No: of species		
	Unawatuna (Station 1)	Ahangama (Station 2)	Madiha (Station 3)
Gastropods	11	9	7
Polychaetes	1	1	1
Amphipods	1	1	1
Decapods	1	1	1
Total	**14**	**12**	**10**

Only one species of gastropod (*Cypraea moneta*) was found restricted to the Unawatuna sampling station while another gastropod (*Conus coronatus*) was found only in Ahangama station. Eight species (5 gastropods - *Cypraea arabica, Oliva oliva, Cellana radiata, Cellana rota, Patelloida striata,* 1 polychaete – *Nereis* sp., 1 amphipod- *Gammarus* sp. and 1 decapod – *Portunus pelagicus*) were recorded at all three stations (Table 3). Although some of these organisms (gastropods and decapods in particular) prefer rocky

hard substrates, they were found in samples of sediment cores mainly due to characteristics of the specific sampling sites selected in this study. All these sampling sites are coastal reef lagoons comprised with a mix of hard and sandy bottom substrates allowing these organisms to be present in both rocky and sandy substrates. The macrobenthic species density ranging from the lowest value of 148 individuals/m^2 was observed at Madiha station to the highest value of 198 individuals/m^2 at Unawatuna sampling station. Ahangama recorded a density 156 individuals /m^2 (Table 3).

The macrobenthic faunal species diversity varied from 1.4953 to 2.1001. The highest macrobenthic faunal species diversity was observed in Unawatuna (2.1001) while the lowest was reported in Madiha (1.4953). The recorded values of macrobenthic faunal species diversity confirmed that there is no significant difference of macrobenthos distribution among the sampling stations. The macrobenthic faunal species evenness was ranged from 0.6490 to 0.7958 and these values revealed that there is no clear variation of macrobenthos between the sampling stations and all individuals contributing near similar proportions for the macrobenthos population structure (Figure 1).

Table 3. Distribution and mean species density (individuals/m^2) of benthic macrofaunal species recorded at the three stations during the sampling period.

No	Macrobenthos	Mean density (individuals/m^2)		
		Unawatuna (Station 1)	Ahangama (Station 2)	Madiha (Station 3)
	Gastropods			
1	*Cypraea arabica*	8	6	4
2	*C. moneta*	6		
3	*C. staphylaea*	7	4	
4	*Morula sp.*	5		6
5	*Oliva oliva*	9	6	5
6	*Conus ceylanensis*	4	3	
7	*C. coronatus*		7	
8	*Trochus radiatus*	8		7
9	*Cellana radiata*	17	15	11
10	*C. rota*	9	7	4
11	*Patelloida striata*	10	6	5
12	*Patella sp.*	3	4	
	Polychaetes			
1	*Nereis sp.*	82	76	90
	Amphipods			
1	*Gammarus sp.*	22	17	12
	Decapods			
1	*Portunus pelagicus*	8	5	4
	Total species density (individuals/m^2)	**198**	**156**	**148**

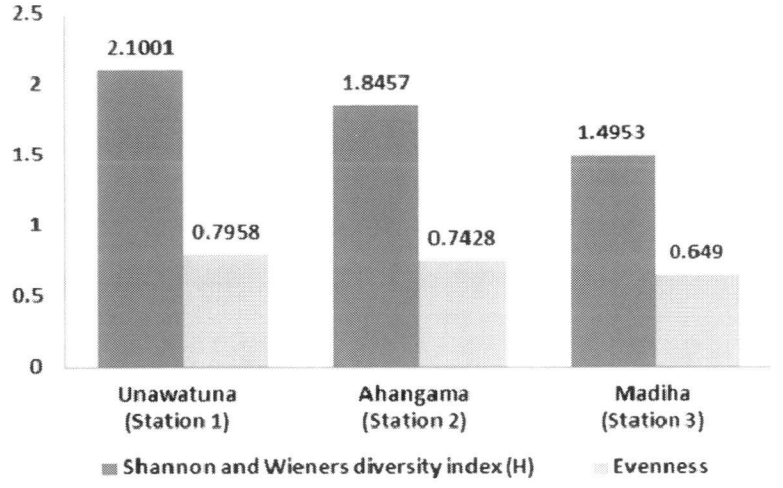


Figure 1. Species diversity and Species Evenness of macrobenthic fauna

This study found that Gastropods were the dominant group of macrobenthos. The phenomenon was also observed in a similar study carried out in the coastal belt of Thondi, Southeast coast of India (Anbuchezhian *et al.,* 2009). Dominance of Gastropods was followed by Polychaetes, Amphipods and Decapods.

Although only a single species of ploychaetes (*Nereis* sp.) was reported in this study the same species was found to be the dominant macrobenthic fauna that showed the highest average species density at all sampling stations. The high polychaete species density might be a result of the dense cover provided by seaweed depositions that is used to protect themselves in adverse condition in coastal estuarine habitats (Sadhana, 1993).

In the current study, the station 3 (Madiha) showed lowest macrobenthic abundance as well as the species density and diversity (Table 2, Table 3 and Figure 1). This might be due to the presence of coconut husks pits that may contribute to make the shore environment anaerobic. Compared to other sampling stations, station 1 (Unawatuna) had higher macrobenthic species abundance as well as high species density and diversity. This can be attributed to abundance of sea weeds and sea grass patches in the area which provides favorable environment for macrobenthos.

The physico chemical parameter such as water temperature is an important ecological factor that influences the distribution of macrobenthic organisms (Varadharajan *et al.,* 2010). This study was carried out only for three months and the results of the physico chemical water quality parameters was not sufficient to show any significant influence on diversity and density of macrobenthic fauna. Therefore, a long term study of at least one year is needed to understand the density, diversity and the temporal changes of macrobenthic fauna.

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REFERENCES

Anbuchezhian, R.M, Rameshkumar, G. and Ravichandran S., 2009. Macrobenthic Composition and Diversity in the Coastal Belt of Thondi, Southeast Coast of India. *Global Journal of Environmental Research 3* (2): 68-75.

Fernando, O.J., 1981. Ecological studies in the intertidal region of the Vellar estuary (Porto novo. S. India). Ph.D. Thesis, Annamalai University, India. pp: 140.

Malik Fernando, 2009. Shells of Sri Lanka seashore. Biodiversity Secretariat, Ministry of Environment.

Sadhana, 1993. Ecology of macrobenthos in lower region of river reaches of kaveri, south east coast of India. Ph.D.Thesis, Annamalai Univ. India.

Snelgrove, P.V.R., 1998. The biodiversity of macrofaunal organisms in marine sediments. Biodiv. Conserv., 7: 1123-1132.

Varadharajan, D., Soundarapandian, P., Gunalan, B., and Babu R., 2010. Seasonal Abundance of Macro Benthic Composition and Diversity along the South East Coat of India. *European Journal of Applied Sciences 2* (1): 1-5.