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MACROZOOBENTHOS COMMUNITY STRUCTURE IN SETAN ISLAND, MANDEH TOURISM AREA, PESISIR SELATAN, WEST SUMATRA

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ABSTRACT

Macrozoobenthos are aquatic organisms that live on the bottom of the water. Macrozoobenthos can be tolerant or sensitive to environmental changes. Organisms that live relatively sedentary and have varying adaptability to environmental conditions. However, there is no information about macrozoobenthos on Setan Island in Mandeh Tourism Area. To know/understand information about the density and distribution patterns of macrozoobenthos on Setan Island, this study was conducted in January 2022. The sampling area is in the intertidal zone of Setan Island. Sampling was conducted at three stations, each station was divided into three transects. Macrozoobenthos sampling was done using a sieve measuring 1mm x 1mm. The movement of macrozoobenthos to the gravel substrate was relatively slow to avoid the waves. Macrozoobenthos samples were then identified. The density of macrozoobenthos on Setan Island ranged from 2.89-3.89 ind/m^2. Station 2 has a higher macrozoobenthos density of 3.89 Ind/m^2, the calculation of macrozoobenthos on Setan Island obtained data on the distribution pattern of macrozoobenthos in clusters.

Keywords: Macrozoobenthos, Density, Setan Island, Mandeh Tourism Area.

1. INTRODUCTION

Macrozoobenthos is an organism that lives relatively sedentary and has varying adaptability to environmental conditions. Macrozoobenthos can be tolerant or sensitive to environmental changes. Organisms that have a wide range of tolerance will have a wide distribution as well. Conversely, for organisms whose tolerance range is narrow (sensitive) then the spread is also narrow. Macrozoobenthos that have a higher tolerance then the survival rate will be higher. According to Ashton *in* Ayunda[1], it is stated that environmental factors in an ecosystem will affect the abundance, diversity, and distribution of fauna living in it related to community structure.

The community structure of macrozoobenthos can often be used as environmental bioindicators that represent local conditions, because many of these animals are sedentary, with relatively long life cycles, high abundance and diversity, and have the ability to respond to water quality conditions continuously. The use of macrozoobenthos as an indicator of water quality is expressed in the form of biological indices. Later by aquatic biologists, this knowledge was developed, so that changes in the structure and composition of aquatic organisms due to changing habitat conditions can be used as indicators of water quality, especially coastal waters.

The purpose of this study was to determine the structure of the macrozoobenthos community to determine the type of macrozoobenthos on Setan Island, Mandeh Tourism Area, South Coast of West Sumatra Province.

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2. RESEARCH METHOD

Time and Place

The research was conducted in January 2022. The research location is on Setan Island, Mandeh Tourism Area, Pesisir Selatan, West Sumatra Province.

Method

The method used in this study was the survey method. Samples were identified and analyzed at the Marine Biology and Marine Chemistry Laboratory, Department of Marine Science, Faculty of Fisheries and Marine Sciences, Universitas Riau

Procedure

Location Determination

The research location is divided into 3 (three) stations based on purposive sampling, namely station I is at the anchorage of fishing boats and tourist boats on Setan Island station II is in the tourist area of Setan Island, and Station III is located in the eastern part of Setan Island. Each station uses 3 transects whose distance is adjusted to the area after arriving in the field. The research sampling stations already represent the characteristics of the existing environment on Setan Island Mandeh Tourism Area Pesisir Selatan West Sumatra (Figure 1).

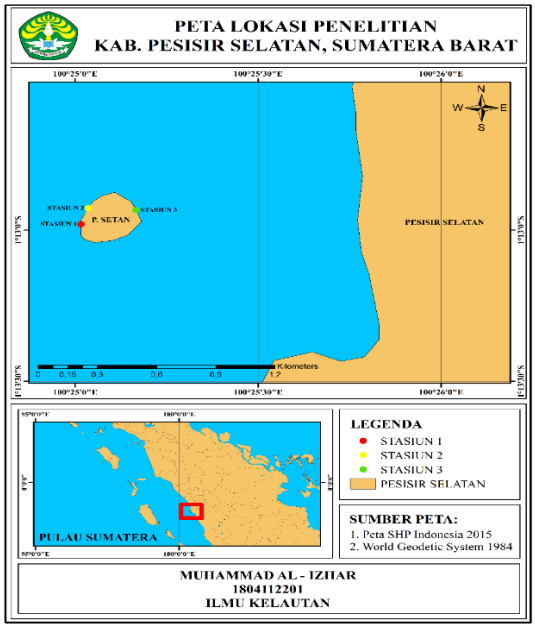

Figure 1. Research location

Sediment Organic Matter Content Analysis

The procedure for analyzing the content of organic matter in sediments was carried out using the loss on ignition method[2] and the macrozoobenthos community structure analysis procedure using the formula[3].

Measurement of Aquatic Environmental Parameters

Measurements of aquatic environmental parameters consisted of acidity (pH), temperature, brightness, and salinity.

3. RESULT AND DISCUSSION

The Setan Island Mandeh Tourism Area is one of the attractive tourist destinations in West Sumatra Province. This area is located in Koto XI Tarusan District which is directly adjacent to Padang City. This area is only 56 km from Padang with an area of ±18,000 ha and a travelling time of about 56 minutes. Setan Island Mandeh Tourism Area covers 7 villages in 3 villages inhabited by 9,931 people with farming, cattle, and fishing livelihoods, with a cluster of small islands rich in underwater biota and coral reefs.

The SetanIsland area is a silent witness to the history of the arrival of the Dutch to West Sumatra (archaeological site of the sunken ship MV Boelongan Nederland, a Dutch ship that was sunk by Japanese soldiers in 1942), enchanting mangrove parks, tourist resorts, and high cliff jumping locations or free fall from high cliffs making Mandeh Tourism Area has been known both at national and international levels. Several national and international tourism events that are ready to attract tourists to visit the Mandeh Tourism Area have been held by the Pesisir Selatan Regency Government. Among them: Paragliding in Bukit Langkisau, Beach Volleyball in Sago, BMX in Carocok and fishing in the high seas, the "Mandeh Underwater Expedition" photography

contest, and the Tour de Singkarak International event.

The condition of water quality parameters such as pH, temperature, salinity, and brightness is still in good condition as a place to live biota, but the existence of social activities such as people who are traveling and taking some types of macrozoobenthos for personal collections also affects the distribution of biota in Setan Island Mandeh Tourism Area

Aquatic Environment Parameters

The results of measurements of the aquatic environment of the physical and chemical parameters of the waters at the research site have salinity values ranging from 30-31 ppt, pH 6. Brightness values range from 50-80 cm and temperatures between 32-34^{o} C. The results of measurements of the aquatic environment can be seen in Table 1.

Table 1. Aquatic environment parameters

Station	pH	Temperature (^{o}C)	Salinity (ppt)	Brightness (cm)
I	6	34	30	80
II	6	33	31	50
III	6	32	30	60

Table 2. Types of macrozoobenthos at the research site

Class	Genus	Species
Gastropods	Turbo	*Turbo crassus*
	Pythia	*Phythia scarabaeus*
	Nerita	*Nerita polita*
	Clypeomorus	*Claypeomorus batillariaeformis*
	Cypraea	*Cypraea caurica*
	Strigatella	*Strigatella paupercula*
	Nassarius	*Nassarius mutabilis*
		Nassarius globosus
Bivalves	Atactodea	*Atactodea striata*
	Codakia	*Codakia tigerina*
	Donax	*Donax variabilis*
	Anadara	*Anadara nodifera*
	Vastikardium	*Vastikardium flavum*
		Vastikardium vertebratum
	Tridacna	*Tridacna squamosa*

Type and Density of Macrozoobenthos

Macrozoobenthos species obtained based on the zone, in the upper zone, obtained 15 different macrozoobenthos species from each station, including *T.crassus, A.striata, C.tigerina, P.scarabaeus, D.variabilis, N.polita, C.batillariaeformis, C.caurica, A.nodifera, S.paupercula, V.flavum, T.squamosa, N.mutabilis, V.vertebratum, N.globosus* (Table 2).

The density of macrozoobenthos between stations on Setan Island is low, ranging from 2.89-3.89 ind/m^2. The highest average is found at station II which is 3.89 ind/m^2, while the lowest density is found at station III which is 2.89 ind/m^2. Macrozoobenthos density at station II is 3.89 ind/m^2, higher than station I and station III. This station is located in the area of Setan Island Tourism. The organic matter at this station is 5.44% the highest average among station I is 5.40% and station III is 2.22% (Table 3). The organic matter at this station is influenced by the presence of community activities that cause

ecological pressure and is thought to affect the density of macrozoobenthos. Following the statement Ritniasih and Widianingsih[4], high and low-density values are supported by the average content of organic matter contained in the sediment. This is thought to be due to organic matter playing an important role in providing a food source for organisms macrozoobenthos

Table 3. Mean (±) standard deviation of macrozoobenthos density in Setan Island

Station	Zone	Transect			Total	Average per zone (ind/m^2)	Average per station (ind/m^2)	St.dev
		1	2	3				
	Upper	1	5	3	9	3,00		
I	Middle	2	4	3	9	3,00	2,89	0,19
	Lower	3	4	1	8	2,67		
	Upper	1	3	3	7	2,33		
II	Middle	3	4	9	16	5,33	3,89	1,50
	Lower	3	7	2	12	4,00		
	Upper	3	4	3	10	3,33		
III	Middle	2	6	5	13	4,33	3,67	0,58
	Lower	2	5	3	10	3,33		

Macrozoobenthos density at station I is 2.89 ind/m^2. This area is located between the anchorage of fishing boats and tourist boats. The organic matter at this station is 5.40% lower than station II which is 5.44% and higher than station III which is 2.22%. Following the statement of Nurdin et al.[5] which states that the density of macrozoobenthos is strongly influenced by habitat conditions and high human activity in the habitat.

Macrozoobenthos density at station III was 3.67 ind/m^2 which is a high density value compared to station I of 2.89 ind/m^2. The area is located in the eastern part of Setan Island which is dominated by coconut and mangrove vegetation. This is following the view of Silaen et al.[6] the density and distribution of macrozoobenthos are influenced by habitat, food availability, predation, and competition

Based on the analysis of the organic matter content of the sediments carried out in Pongkar Village, Tebing District, Karimun Regency, Kepulauan Riau Province, the highest organic matter content was obtained at station III with an average value of 6.95%, while the lowest organic matter content was at station I with a value an average of 4.40% and station II with an average value of 5.69%.

Macrozoobenthos Diversity, Dominance, and Uniformity Indices

The diversity index of macrozoobenthos on Setan Island in this observation ranged from 1.41 to 1.55 (Table 4). Station I with a diversity index value of 1.49, station II with a diversity index value of 1.41, and Station III with a diversity index value of 1.55.

Table 4. Diversity, dominance, and uniformity of macrozoobenthos

Station	H'	C	E
I	1,49	0,37	0,06
II	1,41	0,41	0,04
III	1,55	0,35	0,05

Based on the diversity criteria at Station I, Station II, and Station III, it can be concluded that the diversity index category at all stations is in the moderate category, where the index value ranges from 1.0≤H'<3.0: moderate diversity, sufficient productivity, balanced ecosystem conditions, moderate ecological pressure. An ecosystem can be said to be normal if it is characterized by a high level of community diversity without any dominant species, and the distribution of the number

of individuals of each species is relatively uniform.

Macrozoobenthos Distribution Pattern

The distribution pattern of macrozoobenthos on Setan Island in this observation ranged from 3.07-3.16 (Table 5). Station I with Morisita index value of 3.16, Station II with Morisita index value of 3.07, and Station III with Morisita index value of 3.09.

Table 5. Distribution pattern of macrozoobenthos

Station	Id	Distribution Pattern
I	3,16	Clustering
II	3,07	Clustering
III	3,09	Clustering

Based on the Morisita index criteria of Station I, Station II, and Station III with Id>1, it can be concluded that the distribution of macrozoobenthos on Setan Island with clustered distribution is a pattern of organisms or biota in a habitat that live in groups in certain numbers. This is following the statement according to Werdiningsih[7], the pattern with clustered distribution is a pattern of organisms or biota in a habitat that live in groups in certain numbers. The distribution pattern of each species and habitat type is very distinctive. The cause of the distribution pattern is due to differences in response to habitat. Distribution patterns with various levels of grouping are the most common form of distribution because individuals in a population tend to form groups of varying sizes

Sediment Type and Organic Matter

Based on the analysis results, it can be seen that the sediment type of all stations on Setan Island is gravelly sand. The highest percentage of sand sediment fraction is 96.53% in the lower zone of station II and the lowest is 81.07% in the middle zone of station II. The calculation of each sediment type can be seen in Table 6.

Table 6. Sediment type analysis

Station	Sampling Point	% Sediment Fraction			Sediment Type
		Gravel	Sand	Mud	
I	*Upper*	2,02	93,85	4,14	Gravelly sand
	Middle	0,05	86,26	13,69	Gravelly sand
	Lower	0,02	87,78	12,20	Sand
II	*Upper*	0,14	87,02	12,85	Sandy gravel
	Middle	0,09	81,07	18,85	Gravelly sand
	Lower	0,27	96,53	3,20	Gravelly sand
III	*Upper*	0,03	94,18	5,79	Gravelly sand
	Middle	0,04	87,15	12,81	Gravelly sand
	Lower	0,10	92,78	7,11	Sandy gravel

Table 7. Mean (±) standard deviation of sediment organic matter content on Setan Island

Station	Mean ± Standard Deviation
I	5,40 ± 2,26
II	5,44 ± 2,56
III	2,22 ± 0,18

It is seen that the sediment organic matter content at each research station has a diverse percentage. The highest organic matter content is found in Station II middle zone with a total percentage of 5.44%. While the lowest organic matter content is at Station III's lower zone with a total percentage of 2.22% (Table 7).

4. CONCLUSION

Based on the results of this study, it is concluded that the structure of the macrozoobenthos community on Setan Island consists of 2 classes (Bivalves and Gastropods) and 15 species (*T.crassus, A.striata, C.tigerina, P.scarabaeus, D.variabilis, N.polita, C.batillariaeformis, C.caurica, A.nodifera, S.paupercula, V.flavum, T.squamosa, N.mutabilis, V.vertebratum, N.globosus).* Polychaeta and crustacean classes were not found during the study. The density of macrozoobenthos on Setan Island is low. Diversity index (H') macrozoobenthos at each station was categorized as moderate. Dominance index (C) at all stations categorized as no dominating species. The index of uniformity (E) at each station is categorized in a state of balance. Overall macrozoobenthos distribution pattern at each station is clustered. Macrozoobenthos density between stations is not significantly different.

Based on the research that has been done, it is recommended that further research be carried out on environmental parameters that are thought to affect the structure of the macrozoobenthos community which includes dissolved oxygen, and total suspended solids so that a more complete explanation of water quality conditions is obtained. As well as research sampling should be done during good weather and using tools that support getting more accurate and efficient research samples.

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