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The Relationship between the Organic Material Content of Sediments and the Abundance of Macrozoobentos in Saruang Sakin Beach, Sungai Nyalo Village, West Sumatra Province

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ABSTRACT

This research was conducted in June 2022 in the coastal area of Saruang Sakin, Sungai Nyalo Village, West Sumatra Province. This study examines the relationship between sediment organic matter content and the abundance of macrozoobenthos. The method used in this study is the survey method, in which samples will be taken directly at the research location, sediment sampling using a pipe with a size of 10 cm and a length of 70 cm, and macrozoobenthos samples taken directly by hand and a shovel in a plot with a size each plot 1 m x1 m, to see the relationship between the organic matter content of the sediment and its abundance, a simple linear regression test was carried out. Sediment samples were analyzed in the marine chemistry laboratory, and macrozoobenthos samples were analyzed in the marine biology laboratory. This study's results indicate that the sediment's organic matter content ranges from 1.03% - 4.30%. The abundance of macrozoobenthos between study stations obtained an average abundance value of 3.44-5.89 ind/m². The simple linear regression test results obtained a correlation value of 0.092 with a coefficient of determination of 0.1 and a significance value of 0.942.

Keywords: Organic sediments matter, Macrozoobenthos, Abundance, Saruang Sakin beach

1. INTRODUCTION

Saruang Sakin Beach is a beach located in Sungai Nyalo Village, Pesisir Selatan District. This beach is a tourist area that opened in 2020 geographically. This beach is in a bay, with several islands facing the beach and not far from the area hills. This beach has relatively slow waves, which are influenced by the geographical location of the beach. Based on these conditions, the sediment deposits in Saruang Sakin Beach are estimated to be still outstanding. Of course, this will affect the organic matter content and the abundance of macrozoobenthos found in Saruang Sakin Beach.

Organic matter is an indicator of environmental fertility both on land and at sea. Organic matter content in terrestrial ecosystems reflects the soil quality that will flow into the waters. In contrast, organic matter in waters benefits the biota that lives in it, including macrozoobenthos. Organic matter that has undergone decay will settle to the bottom of the sea as sediment (Yasir, 2017). The organic matter content in sediments varies greatly depending on the depositional environment. An essential source of organic matter comes from the mainland via rivers, so there is more organic matter in areas adjacent to river mouths. Fine mud sediments contain more organic matter content (Andri et al., 2012). Organic matter is one of the biotic components that affect the life of benthic organisms.

Macrozoobenthos is a benthic group of macro-sized animals that have an essential role in aquatic ecosystems as key biota in food webs and agents of organic matter degradation (Afrianti et al., 2018). Benthic animals can give an idea of whether water is disturbed or not. The abundance of macrozoobenthos in waters is undoubtedly influenced by several factors that support the life of these macrozoobenthos, both from the substrate, food sources, and physical, chemical, and biological conditions of the waters. The availability of organic matter will affect the abundance of macrozoobenthos in the substrate (Yulandari et al., 2019). This research was conducted to see the relationship of sediment organic matter to the abundance of

macrozoobenthos found in Saruang Sakin Beach.

2. RESEARCH METHODS

Time and Place of Research

This research was conducted in June 2022 in the Saruang Sakin Beach area, Sungai Nyalo Village, Koto Sabaleh Tarusan Subdistrict, Pesisir Selatan District, West Sumatra Province. Analysis of sediment samples to see the fraction and content of sediment organic matter was carried out at the Marine Chemistry Laboratory, and analysis of macrozoobenthos samples was carried out at the Marine Biology Laboratory located in the Department of Marine Science, Faculty of Fisheries and Marine, University of Riau.

Method

Determination of research stations is done based on purpose. Where is the determination of the sampling point based on the criteria of the area around the research site? The research location is divided into three research stations based on criteria; namely, station I is located in an area that is considered unspoiled (far from human activity), station II is located in an area that is considered to have more human activity (tourism and crossings), while station III is in areas not too far from residential areas.

Procedure

Sediment sampling was carried out to determine the sediment's fraction and organic matter content in the Saruang Sakin Beach area. Sediment samples were taken using a paralon pipe with a diameter of 10 cm and a length of 70 cm, ±500 g of sediment. Then, the sediment samples were analyzed in the marine chemistry laboratory, the wet sieving method was used for the sand and gravel fractions, and the silt fraction was analyzed using the pipette method (Rifardi, 2008).

Macrozoobenthos sampling was carried out directly at the study site by hand, and using a small shovel, all sizes of macrozoobenthos were taken. Macrozoobenthos sampling was carried out in each plot measuring 1 m x 1 m. Macrozoobenthos that live in the substrate are taken using a shovel by digging the substrate. Then, the shoveling results are poured into a sieve to separate the macrozoobenthos from the substrate, after which the macrozoobenthos contained in the sieve will be taken. Furthermore, observations were made, including identifying macrozoobento species at the Marine Biology Laboratory (Carpenter *et al*., 1998).

A simple linear regression test was carried out to see the relationship between the content of sediment organic matter and the abundance of macrozoobenthos. Simple linear regression analysis aims to predict the effect of the independent variable on the dependent variable to see whether or not there is a relationship between the two variables. Then, what is the direction of the relationship, and how strong is the relationship (Tanjung, 2016).

3. RESULT AND DISCUSSION

Description of Research Location

Saruang Sakin Beach is a tourist area located in Sungai Nyalo Village, Koto Sabaleh Tarusan Sub District, Pesisir Selatan District, West Sumatra Province. This beach faces Kapo-Kapo Island. Saruang Sakin Beach is also adjacent to Paku Beach and Taluak Marungai Beach. The geographical location of Saruang Sakin Beach is at 1°10'47.5" South Latitude and 100°23'49.5" East Longitude. Water quality parameters found at Saruang Sakin Beach are as follows: Salinity ranged from 29 - 31 ppt, pH ranged from 6.5-6.6, and temperature ranged from 30-32 °C, with a brightness value of 75 cm.

Sedimentary Fraction

Several factors, including waves, ocean currents, and wind, can influence the process of sediment formation in the waters of Saruang Sakin Beach. Human activities on land can also cause it. Human activities around the coast will affect the distribution of sediment fractions because human activities can result in sediment deposits being less good (Mulyadi et al., 2015). The sediment fractions in Sarung Sakin Beach are sandy gravel, muddy gravel, and gravelly mud. At station I, the sediment fraction was sandy gravel and muddy gravel. At station II, the sediment fraction was sandy gravel and muddy gravel, and at station III, the sediment fraction was sandy gravel, muddy gravel, and gravelly mud. The sediment fraction can be seen in Table 1.

Sediment Organic Matter Content

Sediment organic matter content found at

research stations, especially in the upper zone, has relatively the same sediment organic matter content, namely station I of 1.39%, station II of 1.03%, and station III of 1.16%. The organic matter content of the sediments in the middle zone differed between stations where the highest sediment organic matter content was found at station II with a sediment organic matter content value of 2.66%, and the lowest was at station I with a sediment organic matter content value of 1 .48%. In comparison, at station III, the sediment organic matter content was 2.04%. There is little difference in content values between stations I and II in the lower zone. The sediment organic matter at station I was 3.42%. At station II, the sediment organic matter content was 3.37%. In comparison, the sediment organic matter content at station III was the highest organic matter content with a sediment organic matter content value of 4.30%.

Table 1. Sedimentary fraction

Station	Zone	Gravel (%)	Sand (%)	Mud (%)	Sediment Type
I	Upper	70.74	23.68	5.58	Sandy Gravel
	Middle	67.06	27.39	5.55	Sandy Gravel
	Lower	48.09	19.88	31.22	Muddy Gravel
II	Upper	59.89	24.09	16.02	Sandy Gravel
	Middle	60.04	19.32	20.64	Muddy Gravel
	Lower	47.51	18.24	34.26	Muddy Gravel
III	Upper	70.93	22.00	7.07	Sandy Gravel
	Middle	66.01	13.47	20.51	Muddy Gravel
	Lower	35.89	17.16	46.96	Gravel Mud

Natural factors and human activities certainly influence differences in sediment organic matter content at each research station. Sediment organic matter content differences between stations can also be caused by sediment particles present at the stations. Smaller sediment particles can trap organic matter more than larger sediment particles (Arisa et al., 2014). Simanjuntak & Taufani (2018) said sediment textures with small grain sizes will contain more organic matter. The results of the calculation of the Sediment Organic Matter content can be seen in Table 2.

Table 4. **Sediment organic matter content (%)**

Sampling Point	Station		
	I	II	III
Upper	1.39	1.03	1.16
Middle	1.48	2.66	2.04
Lower	3.42	3.37	4.30
Average	2.09	2.35	2.5

Macrozoobenthos Abundance

The abundance of macrozoobenthos found at Saruang Sakin Beach was relatively high, where as many as 37 species of macrozoobenthos were found, consisting of 17 species of bivalves, 17 species of gastropods, and 3 species of Malacostraca. The macrozoobenthos species found at Sarung Sakin Beach can be seen in Table 5.

After calculating the abundance of macrozoobenthos, the average abundance value of macrozoobenthos and its standard deviation are as follows: Station I has an average of 5.89 ± 0.963 ind/m², Station II has an average of 3.44 ± 1.018 ind/m², and Station III has an average of - 3.78 ± 0.384 ind/m², which can be seen if the average abundance between stations is not significantly different. The average abundance of macrozoobenthos and the graph of abundance per station at Salur Sakin Beach can be seen in Table 6.

From the table above it can be seen that the highest average abundance of macrozoobenthos at Saruang Sakin Beach is at station I with an average abundance value of 5.89 ± 0.963 ind/m², and the average abundance of macrozoobenthos at Sauang Sakin Beach is the lowest at different stations II with an average abundance value of 3.44 ± 1.018 ind/m², while the average abundance value of macrozoobenthos found at station III is not much different from station II where the abundance value is found at station III with a value of 3.78 ± 0.384 ind/m².

Table 5. Macrozoobenthos species

Class	Family	Genus	Spesies
Gastropoda	Cerithioidae	*Clypeomorus*	*C. batillariaeformis*
	Conidae	*Conus*	*C. coronatus*
	Cypraeidae	*Cypraea*	*C. laviathan*
	Fasciolariidae	*Latirus*	*L. philberti*
	Haliotidae	*Haliotis*	*H. varia*
	Littorinidae	*Littoraria*	*L. carinifera*
	Littorinidae	*Littoraria*	*L. scabra*
	Mitridae	*Cancilla*	*C. isabella*
	Nassariidae	*Nassarius*	*N. globosus*
	Nassariidae	*Nassarius*	*N. graphiteurs*
	Naticidae	*Polinices*	*P. lacteus*
	Neritidae	*Nerita*	*N. chamaeleon*
	Neritidae	*Nerita*	*N. planospira*
	Potamididae	*Pirenella*	*P. cingulate*
	Potamididae	*Terebralia*	*T. palustris*
	Trochidae	*Monodonta*	*M. labio*
	Turbininae	*Turbo*	*T. cinereus*
Bivalvia	Arcidae	*Anadara*	*A. antiquata*
	Arcidae	*Barbatia*	*B. foliata*
	Arcidae	*Barbatia*	*B. fusca*
	Arcidae	*Scapharca*	*S. inaequivalvis*
	Cardiidae	*Trachycardium*	*T. rugosum*
	Isognomonidae	*Isognomon*	*I. perna*
	Mactrinae	*Mactra*	*M. achatina*
	Mesodesmatidae	*Atactodae*	*A. striata*
	Ostreidae	*Crassostrea*	*C. virginica*
	Psammobiidae	*Asaphis*	*A. violascens*
	Psammobiidae	*Gari*	*G. elongata*
	Tellinidae	*Tellina*	*T. staurella*
	Tellinidae	*Tellina*	*T. timorensis*
	Veneridae	*Katelysia*	*K. hiantina*
	Veneridae	*Lioconcha*	*L. ornata*
	Veneridae	*Periglypta*	*P. puerpera*
	Veneridae	*Marcia*	*M. opima*
Malacostraca	Grapsidae	*Grapsus*	*G. albiolineatus*
	Ocypodidae	*Ocypode*	*O. cordimanus*
	Portunidae	*Potunus*	*P. pelagicus*

Table 6. Average abundance station

Station	Mean ± Standard Deviation	Unit
I	5.89 ± 0,963	ind/m²
II	3.44 ± 1,018	ind/m²
III	3.78 ± 0,384	ind/m²
Average	4.37 ± 0,788	

Relationship between Sediment Organic Macrozoobenthos

After the simple linear regression test was carried out, the results obtained were a constant value of 4.295, while the value of the organic matter content of the sediment was 0.032, so the regression equation can be written as: $Y = 4,295 + 0,032X$

The simple linear regression test also found that the correlation value/relationship r is

0.029, which means that the magnitude of the relationship between the independent and dependent variables is called the coefficient of determination of 0.029. And obtained a coefficient of determination (R square) of 0.001, which implies that, the relationship between the sediment organic matter variable and the macrozoobenthos abundance variable is 0.1%; the variable relationship is said to be weak.

4. CONCLUSIONS

The highest sediment organic matter content was at station III, with a value of 3.40%. The highest mean abundance of macrozoobenthos was at station I, with 5.89 ind/m^2. The relationship between the organic matter content of the sediment and the abundance of macrozoobenthos at Saruang Sakin Beach obtained a coefficient of determination of 0.1%, which means that the relationship is weak, and a significant value of 0.942 was obtained.

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