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RELATIONSHIP BETWEEN SEDIMENT TEXTURE AND ABUNDANCE OF *Telescopium telescopium* IN THE MANGROVE ECOSYSTEM OF THE NYALO RIVER, PESISIR SELATAN, WEST SUMATRA

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ABSTRACT

The research was conducted in October-November 2021 in the Nyalo River Mangrove Ecosystem, South Coast of West Sumatra, aiming to determine the characteristics of sediment texture, an abundance of Telescopium snails (*Telescopium telescopium*), and the relationship between sediment particle size. The abundance of mangrove snail populations. Habitat parameters measured include physical and chemical parameters of marine waters. Station determination using purposive sampling method. Sampling locations are divided into 3 collection points or stations that are considered to represent the study area with one transect at each station. Mangrove snails were sampled using a 3m x 3m plot with three subplots placed along the transect. The results showed that the type of substrate varied at each station. The average size ranges from 3.58 – 2.05 with very fine sand classification dominating. The abundance of the mangrove snail population ranged from 1.78–14.89 ind/m^2. The correlation between sediment particle size and the abundance of mangrove snail populations is related but not closely related.

Keywords: Telescopium snail, Sediment Particle Size, Population Abundance.

I. INTRODUCTION

The estuary of the Nagari Sungai Nyalo River, which is one of the areas in Pesisir Selatan Regency, is a river mouth that has a muddy substrate and is overgrown with mangrove forests as a place for various marine organisms to live. Apart from being a place where it ends. Communities around the mouth of this river have been fishing for telescopium snails (*Telescopium telescopium*) for a long time, so they are very influential on the existence of these snails.

Telescopium telescopium is one of the biota that plays an important role in litter decomposition and mineralization of detritivor and herbivore organic matter to improve water quality. According to [1] explained mangrove snails can act as biofilters to reduce suspended levels and bacterial populations, waste water from intensive shrimp farming, and water pollution. If there is a decrease in the Telescopium population, it can be used as a bioindicator of damage to the environmental quality of mangrove forests, either due to reduced mangrove density, input of contaminants into the mangrove ecosystem and overfishing.

Mangroves are one of the most important plants in coastal areas that act as nutrient providers for aquatic biota and various kinds of aquatic organisms [2]. The variety of substrate is very important in the development of the benthic community of organisms. Sand tends to make it easier to

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shift and move to another place. The substrate in the form of mud usually contains little oxygen and therefore the organisms that live in it must be able to adapt to this [3]. The surface of the basic substrate will contain more nutrients and oxygen that are useful for macrozoobenthos animals [4].

Transported sediments can settle easily in river mouths, due to tidal activity and ocean currents in the area. The activity of inserting sediment into water can cause a change in the ecosystem, both changes in the texture of the sediment, and the abundance of gastropod biota. One of the organisms that can be affected by differences in ecosystems is the telescopium snail.

This study aims to determine the characteristics of sedimentary habitat, abundance, and the relationship between sediment particle size and the abundance of the telescopium snail.

2. RESEARCH METHOD

Time and Place

This research was conducted in October - November 2021 in Nagari Sungai Nyalo, Pesisir Selatan, West Sumatra (Figure 1). Then the samples of mangrove snails obtained were analyzed at the Marine Biology Laboratory, Faculty of Fisheries and Marine, Universitas Riau and samples of sediment and water were analyzed at the Marine Chemistry Laboratory, Faculty of Fisheries and Marine, Universitas Riau.

Method

Determination of the sampling point was carried out using a purposive sampling method. The research location is divided into 3 sampling points or observation stations, which are considered representative of the research area that includes far from settlements, close to settlements, and close to tourist attractions. Each station has one transect and three plots measuring 3m x 3m.

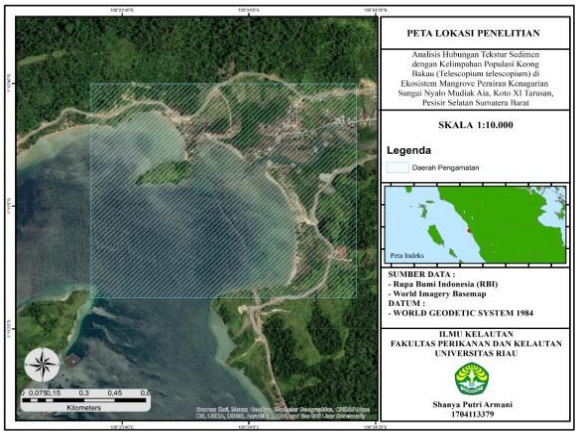

Figure 1. Map of the Nyalo River Nagari on the Pesisir Selatan of West Sumatra

Research Procedure

Sampling

Taking samples of the telescopium snail begins by drawing a line perpendicular to the length ±50m. On each transect, 3 plots measuring 3m x 3m were placed where each plot was divided into 9 sub-plots measuring 1m x 1m, then 3 sub-plots were selected randomly. Intake of telescopium snails carried out at low tide, taken from the largest and smallest sizes by hand, then put into a plastic bag and buffered with formalin.

Sediment sampling was carried out with a pcs pipe inserted at a depth of 20-30 cm, taken as much ±500 g in each plot at each station, then put into a plastic bag. Water sampling at each station was carried out using a sample bottle with three repetitions and then mixed together.

Sample Analysis

Sediment grain size analysis was carried out by sieving or wet screening methods referring to [5]. Analysis of suspended matter follows SNI 06-6989-3-2004.

Data Analysis

Samples of mangrove snails found were then counted for the number found.According to [6] the density of each

species at each observation location is calculated using the following formula:

$$K = \frac{n}{A}$$

Information:
K = Abundance of individuals (ind/m^2)
n = Number of individuals
A = Plot Area (m^2)

The water sample that has been analyzed is then calculated according to SNI 06-6989-3-2004 with the formula:

$$TSS = \frac{(A-B) \times 1000}{V}$$

Information:
TSS = Total suspended solids (mg/L)
A = Weight of filter and residue after heating (g)
B = Weight of empty filter paper (g)
V = Sample volume (L)

From the analysis of the sediment fraction that was carried out, the value of the sediment particle size (*MeanSize*) according to [5] with the formula:

$$\textit{Mean Size}\ (Ps) = \frac{Ø16 + Ø50 + Ø84}{3}$$

Classification:
Ø1: coarse sand (coarse sand)
Ø2: medium sand
Ø3: fine sand
Ø4: very fine sand
Ø5: coarse silt
Ø6: medium silt
Ø7: fine silt
Ø8: very fine silt
> Ø8: clay

From analysis *Mean Size* which was carried out then sought the relationship between particle size and abundance using a simple linear regression test [7] with the formula:

$$\mathbf{Y = a + bX}$$

Information:
Y = Population Abundance
X = Particle size
a = constant
b = Slope Coefficient

3. RESULT AND DISCUSSION

Measurement of water quality parameters aims to describe the condition of the waters at the time the research was carried out. The measurement values of water quality parameters obtained from this study can be seen in Table 1.

Table 1. Parameters of water quality in the Mangrove Ecosystem of the Nyalo River Nagari, Pesisir Selatan, West Sumatra

Station	Parameter		
	pH	Salinity (ppt)	Temperature (°C)
I	6	29	32
II	7	28	28
III	7	30	31
Overall Average	6,67	29	30,33

The pH value at the study site has an average of 6.67. This shows that the pH at the research location has a value that is said to be suitable for the life of gastropods in the mangrove ecosystem. According to Odum (1993) in [8] stated that gastropods require a water pH between 6.5–8.5 for survival and reproduction.

Salinity in these waters has an average value of 29 ppt. According to [9] stated that the mangrove snail is a type of gastropod that lives a lot in brackish water (15-34 ppt) or mangrove forests. This is supported by [1] this research area has an average range of 28–30‰, where this range is the normal range and the ideal salinity range for growth.

Measurement of water quality in the Nyalo Mudia Aia River Mangrove Ecosystem, an average temperature value of 30.33°C. The temperature range obtained can still be said to be the normal range for gastropod life. The temperature value is in accordance with seawater quality standards in Mangrove that ranges from 28 – 32^{o}C [10]

Temperature is a parameter in the growth and development of gastropods. According to Odum (1993) in [8], the ideal temperature range for the growth and reproduction of gastropods in general is 25 - 32^{o}C.

Suspended Solids

The value of suspended solids (TSS) in the Nagari Waters Mangrove Ecosystem of Nyalo Mudia Aia River averages 90 mg/l (Table 2). The further inland the higher the suspension value, this is presumably due to high silt deposition. According to [11], suspended sediments originating from marine activities or caused by human activities can cause turbidity in the waters. Based on the Decree of the Minister of Environment No. 51 of 2004 for marine life, namely <80 mg/L.

Table 2. Suspended Solids in the Mangrove Ecosystem of Nagari Sungai Nyalo Waters, Pesisir Selatan, West Sumatra

Station	Average Suspended Solids (mg/l)
I	90
II	85
III	95
Average	90

Sediment Fraction

The results of the analysis of sediment grains at each sampling point in the Nyalo River Nagari Mangrove Ecosystem consist of four types of sediment, namely sandy mud, gravelly mud, muddy gravel and sand-gravel mud which can be seen in Table 3.

Table 3. Percentage of Weight Fraction and Type of Sediment in the Mangrove Ecosystem of Nagari Sungai Nyalo Waters, Pesisir Selatan, West Sumatra

Station	Plot	Sediment Type Analysis Results			Type
		Gravel (%)	Sand (%)	Sludge (%)	
I	1	17.99	28,72	53,29	Sandy mud
	2	25,28	19.73	54.99	Pebbled mud
	3	43,67	19.02	37,31	Muddy gravel
II	1	67.06	14,24	18,7	Muddy gravel
	2	44,53	9,73	45,74	Pebbled mud
	3	51,34	15.06	33,6	Muddy gravel
III	1	52.02	10.74	37,24	Muddy gravel
	2	26,13	21.67	52,2	Pebbled sand mud
	3	17,66	25,86	56,48	Sandy mud

Analysis of the sediment fraction obtained in Nagari Sungai Nyalo, Pesisir Selatan, showed that the substrates varied between stations. The different types of sediments are influenced by factors, namely currents and waves, seen from the conditions in the field the currents tend to be stable at stations I and 3, because at low tide the stagnant water is still relatively high compared to station II. Therefore, the difference in current velocity causes the size of the sediment grains that settle to also be different. Fine sediment grains will find it difficult to settle in strong currents or vice versa.

According to [5], currents and waves are the main factors that determine the direction and distribution of sediments.

This force causes different sediment characteristics so that at the bottom of the waters various groups of sediment populations compose it. The stronger the water current, the more difficult it is for sediment to settle, but if the current is weak, the chance for sediment to settle is greater and will affect the composition of the sediment itself.

Sediment Average Diameter (Mean Size (Mz))

Calculation of the average diameter value (mean size) of sediment in the Nagari Sungai Nyalo mangrove ecosystem obtained values ranging from 3.58 to 2.05. Sediment particle size is thought to be closely related to the high content of organic matter. Because the larger the particle size of the sediment, the smaller the organic matter contained in the sediment, conversely the smaller the particle size of the sediment, the higher the organic matter content contained in the sediment.

This is in accordance with the opinion of [13] which states that waters with fine sediments tend to have higher organic matter content when compared to coarse particles, because the environmental conditions of fine sediments allow the deposition of silt sediments.

Abundance of Telescopium Snail (*T.telescopium*)

The results of calculating the abundance of telescopium snails found at the study site obtained as many as 175 individuals, the most common species with a total of 134 individuals were at station 1 followed by station 3 which had a total of 25 individuals found, abundance calculation telescopium snail and the standard deviation can be seen in Table 4.

Table 4. Abundance and Standard Deviation of telescopium Snail in the Mangrove Ecosystem of Nagari Sungai Nyalo Waters, Pesisir Selatan, West Sumatra

Station	Amount	Abundance (ind/m^2)	Relative abundance (%)	Std. Deviation
I	134	14.89	76,57	1.69
II	16	1.78	9,14	0.67
III	25	2.78	14,29	0.44

From the table above it can be seen that the results of calculating the abundance of mangrove snails have varying values at each station. Where the highest abundance value was at station I, namely 14.89 ind/m^2, while the lowest abundance value was at station II, namely 1.78 ind/m^2.

The low abundance value at station II was caused by the highest gravel subpopulation at station II compared to stations I and III. Gravel proportions at station II ranges from 44.53 - 67.06%, the high proportion of gravel at station II is thought to cause a lack of the abundance of telescopium snails due to the large size of the sediment particles so they cannot store organic matter. Besides that, it is suspected that there is competition or predators, the physical environment, and the chemistry of the waters that are not good, so that it can cause differences in the abundance results.

The high abundance at station I is thought to be caused by the dominance of the mud substrate found at this station and the mangrove ecosystem that is still maintained at station I, while at station III the low abundance of telescopium snails is due to the lack of preservation of the mangrove ecosystem found at this station, where mangroves are a habitat for telescopium snails. This can be seen in the field conditions, namely the mangrove ecosystem at station III is experiencing degradation or land conversion into a

tourist spot and the mangrove ecosystem at this station has a rare density.

According to [13], mangrove Snails are native mangrove mollusks that can be found in the middle of mangrove forests and overgrown with mangroves. Real mollusks naturally choose mangrove forests as their only place to live. Areas where there are river mouths with muddy substrate overgrown with mangrove vegetation are also ideal habitats for these snails. These snails are rarely found on sandy substrates or other relatively rough substrates. In general, this snail prefers brackish water habitat with high salinity.

According to [9] explained that the high-density value of telescopium snails was due to this type of gastropod living and developing in large numbers in mangrove areas, especially in most types of muddy substrates. These results are in accordance with the explanation of [13-14] who reported that mangrove forests are the most preferred habitat for the Potamididae family, have a wide geographical distribution, and are found in high abundance in mangrove ecosystems

Relationship between Sediment Particle Size and Abundance of Telescopium Snail

The results of a simple linear regression test on particle size and abundance of telescopium snails in the Nagari Sungai Nyalo Mangrove Ecosystem, Pesisir Selatan can be seen in Figure 2.

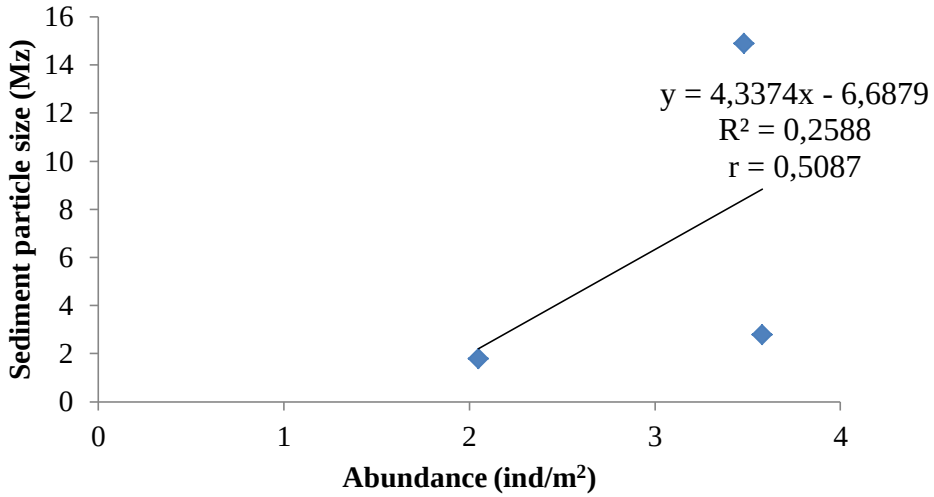

Figure 2. Relationship Between Particle Size and Abundance of Telescopium Snails *(T.telescopium)*

The results of the analysis of the relationship between sediment particle size and the abundance of telescopium snails in the Nagari Waters Ecosystem of Nagari Sungai Nyalo Mudiak Aia obtained the equation value y = 4.3374x – 6.6879 with a determinant coefficient value (R2) of 0.2588 and a coefficient value correlation (r) is 0.5087 which shows a moderate relationship and is thought to be closely related to other factors not analyzed such as organic matter.

This means that the relationship between the size of the sediment particles and the density of telescopium snails is 25.88%, while 74.12% is influenced by other factors. Local community, physical and chemical parameters of the waters such as dissolved oxygen, rainfall, current velocity, water waves, light penetration and organic matter. In accordance with statement Nybakken's (1992) in [8], this states that water quality is an important

factor in regulating life processes and the pattern of distribution of organisms.

This is in accordance with [15], the density and distribution of mollusks in nature, both gastropods and bivalves are influenced by several abiotic and biotic factors such as environmental conditions, food availability, and predation by predators and competition. Pressure and environmental changes can also affect the number of species and structural differences between gastropods and bivalves. Moreover, supported by [16], the number or absence of gastropods in the study site may be related to the conditions of the substrate or the place where each species lives. The existence of food factors such as detritus and the environment are also supportive for the life of the types of gastropods found.

According to [15] physical and chemical parameters of waters are one of the factors that also influence the level of abundance of an organism, so that the presence and abundance of biota in an aquatic environment can describe the quality of these waters. If there is a decrease in the quality of waters, it can have a direct impact on the biotas that live in it.

4. CONCLUSION

Habitat characteristics of the telescopium snail in the Mangrove Ecosystem of Nagari Sungai Nyalo Waters, Pesisir Selatan, West Sumatra which were found to have varied substrate types, namely sandy mud, gravelly mud, muddy gravel, and gravelly sandy mud, with high suspended solids (TSS). Parameters of water quality in Nagari Sungai Nyalo are still in proper condition for the life of marine organisms. The highest abundance of mangrove snails was found at station I with an abundance of 14.89 ind/m^2 and the lowest was at station 2 with an abundance value of 1.78 ind/m^2. There is not a close (moderate) relationship between the size of sediment particles and the abundance of telescopium snails in the Nyalo River Mangrove Ecosystem, Pesisir Selatan, West Sumatra.

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