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RELATIONSHIP BETWEEN CORAL REEF COVER CONDITION AND MEGABENTHOS ABUNDANCE IN PASUMPAHAN ISLAND, WEST SUMATRA

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ABSTRACT

This study analyzes live coral cover, megabenthos abundance, and the relationship between coral reef condition and megabenthos abundance in Pasumpahan Island waters. The survey method was used to collect primary and secondary data. The results showed that the average percentage of live coral reef cover in Pasumpahan Island, West Sumatra, was 33.31%. The abundance of megabenthos obtained was 10,000 ind/ha. Regression results showed a strong positive correlation between coral reef cover and megabenthos abundance, with an R2 value of 0.5396, meaning that the percentage of live coral affects megabenthos by 53.96%.

Keywords: Coral Cover, Megabenthos, Pasumpahan Island

1. INTRODUCTION

Pasumpahan Island is an area of coral reef ecosystem with 14,097 ha from the coast to the shore. The distribution of coral reefs is only 5-10 meters deep. The average condition of Palau Pasumpahan coral reefs is included in the category of damaged coral conditions, where 17.14% of live corals were found, with the level of damage to coral reefs around Pasumpahan Island reaching 82.86%[1]. In general, non-acroporous corals are more commonly found in the waters of Pasumpahan Island, and one type of coral mushroom (CMR) is called mushroom coral[2].

Research related to coral reefs and megabenthos has been done, such as[3] on the relationship between coral reef cover conditions and megabenthos density in the waters of Talam Island, Central Tapanuli Regency, North Sumatra Province[4] on monitoring the health of coral reefs and related ecosystems in North Nias Regency[5] on the relationship between coral cover conditions and megabenthos density on Pandan Island, West Sumatra Province. However, in the location that the author researched, there has been no research on the relationship between coral reef cover conditions and megabenthos abundance, so it is necessary to conduct such research[2].

2. RESEARCH METHOD

Time and Place

This research was conducted in August 2024 on Pasumpahan Island, West Sumatra Province.

Method

The method to be used is a survey method that collects primary data from direct observations in the field and secondary data from literature studies in the form of books, journals, papers, articles, and related parties.

Procedures

Determination of station points is determined in the field based on purposive sampling, which considers existing environmental characteristics such as the condition of the research location. Observations of coral reef cover will be carried out using the Underwater Photo Transect (UPT) method[4]. The UPT (underwater photo transfer) method utilizes

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technological developments in both digital camera technology and computer software technology. Data collection in the field is only in the form of underwater photographs taken using an underwater digital camera. Data collection for megabenthos monitoring was carried out using the Benthos Belt Transect (BBT) method. This method is a modification of the Belt Transect method combined with the Reef Check Bentos method. Transect lengths on coral reefs were synchronized using the Benthos Belt Transect method to see the relationship between megabenthos abundance and coral reef cover.

Figure 1. Research location

Data Analysis

Photographs from underwater shooting at every 1 m interval from the transect line were then analyzed to obtain quantitative data such as the percentage of coral cover and biota. To obtain quantitative data based on underwater photos generated from the UPT (Underwater Photo Transect) method, data analysis was carried out on each frame by randomly selecting point samples. This technique is done by determining a random number of 30 pieces for each frame, which is representative enough to estimate the percentage of categories and substrate cover[4]. Megabenthos abundance was calculated using the following formula:

$$K = ni/L$$

Description:

K = Species abundance (ind/m^2)
ni = Number of individuals of each species
L = Total area of observation (100 m^2)

3. RESULT AND DISCUSSION

The relationship between coral reef cover conditions and megabenthos abundance on Pasumpahan Island, West Sumatra, is strongly positive. This conclusion can be made based on the calculation and testing of data obtained and has been tested. The data that will be obtained and analyzed are water quality, coral reef cover conditions, megabenthos abundance, and the relationship between coral reef cover and megabenthos abundance.

Table 1 shows the results of measuring water quality parameters at stations 1, 2, and 3. The salinity obtained ranges from 29.33 - 30 ppt, the current velocity ranges from 0.4 - 0.16 m/s, and the brightness of the three stations is 100%[5]. PP number 22 of 2021 shows good salinity for coral growth between 33 and 34 ppt. Although coral reefs can survive in salinities outside this range, their growth is less good than normal salinity.

Table 1. Pasumpahan Island water quality

No	Location	pH	Salinity (ppt)	Temperature (^{0}C)	Current Speed (m/s)	Brightness (%)
1	Station I	8,65	30	30	0,04	100
2	Station II	8,67	29,33	30,33	0,16	100
3	Station III	8,63	29,67	30,67	0,04	100

Table 1. Percentage of coral cover in Pasumpahan Island waters

Station	Depth (m)	Percentage cover of live corals (%)	Category[7]
I	5	18.67	Bad
	7	16.80	Bad
II	5	35.67	Medium
	7	46.36	Medium
III	5	47.33	Medium
	7	35.07	Medium

Table 3. Abundance of megabenthos in Pasumpahan Island waters

Stasiun	Meter	Trocus	Planulirus	Holothuria	Tridacna	Druppella	Achantaster	Diadema	Jumlah (ind/ha)
S I	K5	0	0	0	0	0	0	142,86	142,86
	K7	0	0	71,43	0	0	0	0	71.43
S II	K5	71,43	0	142,86	142,86	0	0	571,43	928,58
	K7	0	71,43	0	285,71	0	71,43	857,14	1.285,71
S III	K5	0	0	0	357,14	0	0	4500	4.857,14
	K7	0	0	0	285,71	0	0	2428,57	2.714,28
Total (ind/ha)		71,43	71,43	214,29	1.071,42	0	71,43	8.500	10,000,87

Based on Table 2, the condition of coral reef cover in the waters of Pasumpahan Island is classified as moderate and poor. The highest percentage is found at station III at a depth of 5 m, which is 47.33%, while the lowest is found at station I at a depth of 7 at 16.80%. Based on this percentage, the average rate of live coral cover is 33.31%, which, according to the criteria for assessing the condition of coral reefs[6], the condition of coral reef cover is included in the moderate category.

Based on the bare substrate cover condition, coral reef ecosystems from the three stations on Pasumpahan Island consist of live coral, algae, macroalgae, turf algae, dead coral, sand, and silt. The percentage of coral cover at each station and depth varies. The percentage of live coral cover at station 1, 5 m depth, is 18.67%. Station II 5 m depth is 35.67%, and station III 5 m depth is 47.33%. The percentage of coral cover at Station I Depth 7 is 16.80%, station II depth 7 is 46.36%, and station III depth 7 is 35.07%.

Factors that cause differences in percentages at each station are pressure on the environment; the higher the pressure on the environment, the worse the coral reef cover condition. This is due to the environment's inability to meet the needs of the coral. Therefore, it is important to maintain the environment on coral reefs. By retaining the environment on coral reefs, the biota is also maintained, and the ecosystem is well created.

Table 3 describes the abundance of megabenthos, which can be 10,000 ind/ha. The highest abundance is found at station 3, 7 m depth of 4500 ind/ha, and the lowest at station I, 7 m depth of 71, 43 ind/ha. In the table it can be seen that megabenthos Lola conch (*Trocus sp*) is 71.43 ind/ha, Lobster (*Planularius* sp) is 71.43 ind/ha, Snail *(Drupella sp*) is not found, Clams (*Tridacna sp*) 1,072.42 ind/ha, Sea Cucumber (*Holothuria sp*) 214.29 ind/ha, Sea urchin

(*Diadema sp*) 8500 ind/ha, Spiny sea star (*Acanthaster sp*) 71.43 ind /ha.

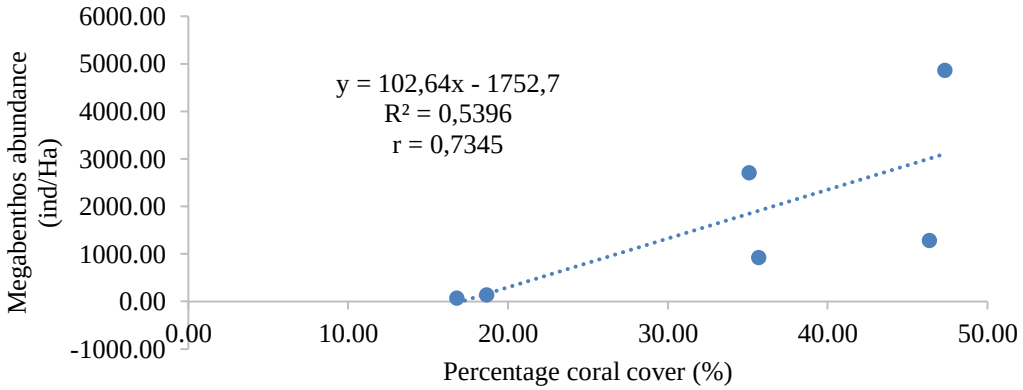

Figure 2. Megabenthos abundance in Pasumpahan Island, West Sumatra.

The abundance of megabenthos depends on the coral reef cover. The better the coral reef cover, the more abundant the megabenthos are. The most abundant megabenthos found at the study site were sea urchins (*Diadema* sp). Sea urchins indicate coral health, whereas large numbers indicate unhealthy corals[7]. Sea urchins are not a threat to coral reefs, unlike algae, which are competitors for coral reefs that maintain living space and sunlight. With the presence of megabenthos sea urchins, algae can be driven by sea urchins because the megabenthos acts as a grazer (algae eater) in the coral reef ecosystem. Clams are found at almost every station because the station has many massive corals, which provide a suitable substrate for the growth of clams. *Druppella* sp snails were not found during the study because these snails are a group of megabenthos that habitually eat coral polyps, especially on branching corals. The small number of megabenthos is because massive and submassive corals dominate the research station.

According to Gomes et al.[8], the density of Druppella is negatively correlated with live coral cover, so it is rarely found in live coral tissue and tends to stay away from uneaten areas to avoid stinging cells (nematocyst) of coral animals. Spiny starfish (*Acanthaster* sp) is only found at station II depth[7], and this megabenthos is rarely found. It poses a serious threat because it eats coral polyps. Megabenthos conch (*Trochus* sp), lobster, and sea cucumber are seldom found because, at the research location, it is suspected that there are fishermen activities that are conducting megabenthos capture activities such as lobsters and sea cucumbers. In general, megabytes are nocturnal, which causes megabytes to be rarely found during the study. Each difference in megabenthos found has its reasons from various factors - one of which is ecological factors and also the factor of large-scale capture. Therefore, protecting the environment and preserving megabenthos is essential so that the balance of the coral reef ecosystem is not disturbed.

The coefficient value (r) is 0.7345 in the regression results above. The regression analysis results obtained an R2 value of 0.5396, meaning that the percentage of live coral reef cover affects megabenthos by 53.96%. At the same time, error factors and other factors influence the rest. Based on Figure 2, a positive y value is obtained, indicating that the relationship between coral reef cover and megabenthos is strong and positive.

According to Rahmita et al.[5], the regression results explain that the correlation coefficient (r) value is 0.7345, where these results indicate that the relationship is strongly positive. The table graph above demonstrates that the variable (x) affects the variable (y), where the higher the value of the variable (x), the higher the variable (y), which means that the better the coral cover,

the more abundant the Number of megabenthos. In the straight line equation Y = 102.64x- 1752.7 where 102.64 is the regression coefficient and 1752, 7 is a constant when x = 0. In the regression coefficient, 102.64 x means that y will change by 102.64 when x is added to 1.

4. CONCLUSION

Based on the study's results, the condition of coral reefs on Pasumpahan Island can be categorized as moderate. This can be seen from the average value of live coral reef cover on Pasumpahan Island of 33.31%. In the waters of Pasumpahan Island, there are six types of mega benthos indicators of coral reef cover, namely spiny starfish, sea urchin, sea cucumber, clam, lobster, Lola and conch, with an abundance of 10,000 ind/ha. The regression analysis shows a relationship between the percentage of coral reef cover and hip and memento abundance in Pasumpahan Island, West Sumatra. Live coral reefs have a strong relationship with mega benthos with a correlation coefficient (r) of 0.7345.

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