Analysis Condition of Coral Reef Covering in Pramuka Island Waters, Seribu Islands using Line Intercept Transect (LIT) Method

The coral reef ecosystem is one of the typical tropical ecosystems with high biodiversity which has an important role both biologically, ecologically, physically as well as socially and economically. Several coral reef areas in Indonesia were reported to have suffered damage, not only due to climate change which has an impact on rising sea surface temperatures and ocean acidification but also due to anthropogenic factors and irresponsible management of marine tourism. This study aimed to analyze the condition of coral reefs based on covering in Pramuka Island, which is one of the famous tourist destinations in the Seribu Islands. The study was conducted using Line Intercept Transect (LIT) method at predetermined coordinate points. The results showed that the dominant coral reef life form was Acropora Submassive (ACS), namely 18.9%, and Acropora Branching (ACB) as much as 12.48%. Besides, the types of life forms found were coral foliase (9.42%), Miliepora Coral (9.2%), Coral Massive (4.8%), Acropora Encurstring (4.24%), and so on. Based on the results of this study, it can be concluded that the condition of coral reefs in Pramuka Island is still relatively good with a total coral cover percentage of 72.38%. Efforts to protect the coral reef ecosystem in this area need to be considered so that its condition can be maintained.

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INTRODUCTION

Coral reef ecosystem is one of the ecosystems with the highest biodiversity among other ecosystems (Adey, 2000). In addition, this ecosystem also plays an important ecological role, both biologically and physically as a barrier protective for coastal areas (Moberg & Forke, 1999; Dahuri, 2000). Currently, coral reef ecosystems, especially in tropical waters, face various threats, such as the impact of climate change, namely an increase in sea water temperature and ocean acidification which causes coral bleaching (Baker et al., 2008). In addition, anthropogenic impacts resulting from human activities are also a threat factor for coral reef ecosystems, including chemical pollution, use of non-environmentally friendly fishing gear and irresponsible tourism activities (Edinger et al., 1998; Jones, 2007; Biggs, 2011).

Indonesia is one of the countries with the most extensive coral reef cover in the world, especially in the eastern part of Indonesia where there is the center of the coral triangle (Coral Triangle Center) together with five other countries, namely Malaysia, the Philippines, Papua New Guinea, Timor Leste and the Solomon Islands (Clifton, 2009). Based on geographic information obtained from satellites, the total area of coral reefs in Indonesia is around 2.5 million hectares (Hadi et al., 2009). Of the total area, only about 6.56% were in the very good category while the rest were in the good category (22.96%), moderate (34.5%) and bad (36.18%). Although there are still many local coral reef communities showing very rapid recovery, various surveys show that average live coral cover is decreasing periodically. This is because disturbance or threats to coral reefs are almost always faster than their recovery rate.

The Seribu Islands Cluster which is located in DKI Jakarta Province, especially Pramuka Island, which is the center of administrative activities in the Seribu Islands, has been reported to experience high environmental pressure, especially from waste pollution and tourism. According to research conducted by Suhery et al. (2017), the coral reef ecosystem on Pramuka Island was in the medium category in the context of vulnerability to oil spills. This was based on the location of the island, which was in the route of Tanjung Priok Port and the Indonesian Archipelago Sea Channel I (ALKI I). Therefore, this study aimed to determine the condition of coral reefs in Pramuka Island as seen from their cover through the method Line Intercept Transect (LIT). Apart from being relatively easy, this method has also been widely used in the analysis of the condition of coral reef ecosystems (Sarbini et al., 2016; Wahib, 2019).

MATERIALS AND METHODS

The research was conducted using the method Line Intercept Transect (LIT) along 50 meters at a depth of 3-6 meters consisting of one transect. Determining the location of the observation station based on purposive sampling technique. The research used Manta tow method, which was conducted by snorkeling around the observation location to determine the data collection point (Sukmara et al., 2001). Observations were then carried out along the 50-meter transect by recording the types of life forms found.

The types of life form observed include: Coral Foliose (CF), Acropora Submassive (ACS), Acropora Branching (ACB), Coral Milepora (CM), Acropora Encrusting (ACE), Coral Encrusting (CE), Coral Submassive (CS), Acropora Digitate (ACD), Coral Tubipora (CTU), Coral Mushroom (CMF) and also life forms other than coral, namely Sponge (SP), Rubble (RB), Dead Coral (DC), and Dead Coral with Algae (DCA) (UNEP, 1993).

Calculation of coral reef cover is then continued by calculating the area of cover using a simple mathematical equation, namely:

\[
\text{% Cover} = \frac{\text{Total Life Form cover (Life)}}{\text{Total Transect Length}} \times 100
\]

Furthermore, the percentage of live coral cover is categorized according to the coral reef condition category according to Yuliani et al. (2016) which are divided into five categories, namely:

1. Very Bad Category: 0 - 10%
2. Bad Category: 11 - 30%
3. Medium Category: 31 - 50%
4. Good Category: 51 - 75%
5. Very Good Category: 76 - 100%

RESULTS AND DISCUSSION

The condition live coral on the coast of Pulau Pramuka, Seribu Island with the LIT method, found the Percent Life Coral Life Form value of 72.38% which is in the good category for the distribution of corals along the transect line, which is about 50 m. From the data obtained, the percentage value of coral cover from the most consecutive was Acropora submassive (ACS) with a value of 18.9% and Acropora Branching (ACB) with a value of 12.48%, after that Coral Foliose (CF) which looks...
like a sheet leaves with a value of 9.42%, then Coral Milepora (CML) or fire coral which can be recognized by the presence of a yellow color at the end of the colony, amounting to 9.2%, Coral Mushroom (CMF) 4.88%, Coral Massive (CM) 4.8%, Acropora Encrusting (ACE) 4.2%, Coral Milepora (CME) 3.86%, Dead coral still covered with algae (DCA) by 3.44%, other types of organisms (OT) such as sea urchins as much as 2.34%, as for dead corals (DC) as much as 1.9%, then there is Coral Encrusting (CE) 1.8%, Coral Submassive (CS) 1.72%, Acropora Digitate (ACD) 1%, Sponge (SP) 0.9%, Coral Tubipora (CTU) 0.08%, and Rubble (RB) 0.04%. The cover of all life forms observed, both living and not visible in Table 1.

Table 1. Observation results of Life form at Pramuka Island Beach, Seribu Islands.

| Life Form | Total Length (m) | Percentage (%) |
|-----------|------------------|----------------|
| CF        | 4.71             | 9.42           |
| CML       | 4.6              | 9.2            |
| CMF       | 2.44             | 4.88           |
| CM        | 2.4              | 4.8            |
| CS        | 0.86             | 1.72           |
| CME       | 1.93             | 3.86           |
| CE        | 0.9              | 1.8            |
| CTU       | 0.04             | 0.08           |
| ACE       | 2.12             | 4.24           |
| ACD       | 0.5              | 1              |
| ACB       | 6.24             | 12.48          |
| ACS       | 9.45             | 18.9           |
| RB        | 0.02             | 0.04           |
| DC        | 0.95             | 1.9            |
| DCA       | 1.72             | 3.44           |
| OT        | 1.17             | 2.34           |
| SP        | 0.45             | 0.9            |

The dominant coral type in a habitat depends on environmental conditions or the habitat where the coral lives (Daniel & Santosa, 2014). In habitat, the type of coral that is alive can be dominated by a certain type of coral. It can be seen that the live corals that dominate the Pramuka island waters are Acropora Sub massive (ACS) and Acropora Branching (ACB). This was influenced by environmental conditions that are not far from the coastline, where this area usually gets higher environmental pressure such as currents and strong waves and pollution from the land. Besides, at this location, the condition of the ecosystem is still good and the type of hard substrate is still supportive and there is no cover sand (S) which can cause poor sedimentation because the sand when exposed to high currents will carry a substrate that can bury coral reefs (Adriman et al., 2013). because the type of Acropora grows in clear waters and there are wave breaks (Sembiring & Trianto, 2018). The results of the average percentage of live coral cover in Pramuka Island, Kepulauan Seribu can be seen in Figure 1.

The Current parameter at the research location is quite high because it is influenced by the conditions of its open waters and strong winds. The existence of currents and waves in the waters is very important for the survival of coral reefs. The current is needed to bring food in the form of plankton; besides that, it also cleans itself from sediments and to supply oxygen from the free sea. Therefore, growth in a place where the water is constantly being stirred up by currents and waves is preferable to calm, sheltered waters.

The appearance of Dead Coral with Algae (DCA) can be predicted that the dead coral is a type of coral that cannot adapt to strong currents. The emergence of sponges (SP) can also be a serious threat, although only 0.9% were identified, because they live on corals and become coral “drillers” (Tioho & Roeroe, 2002). Several species are dangerous endolites that can damage coral reefs. In addition to their ability to "drill" sponge coral, they also produce siphonodictine compounds, which can inhibit the growth of coral polyps (Sullivan et al., 1983).

In addition, there are also coral fractures around the transect, the existence of coral fractures at this dive station is thought to be caused by high
boat traffic along the area, the release and towing of anchors who do not pay attention to the presence of corals and the behavior of divers who easily break the coral. All of these activities fall into the anthropogenic category, namely damage caused by humans.

Human threats to coral reefs can be detected by looking at visible indications and possible treatments. Threats to the coral reef ecosystem can also be caused by natural factors. Threats by nature can include hurricanes, tsunami storms, earthquakes and global warming that causes coral bleaching. In addition, predation by COT (crown-of-thorns starfish) can also be a threat to coral reefs (Vogler et al., 2008). To support the sustainable use of corals, artificial coral breeding can be carried out by endeavoring for conservation, including by performing coral transplants.

CONCLUSION

It can be concluded that the condition of coral reefs in Pramuka Island was classified as good with a percentage of coral cover of 72.38%. The type of coral reef that dominates was Acropora Submassive (ACS), which was 18.9% and Acropora Branching (ACB) at 12.48%. In addition, other types of coral were also found such as Coral Foliose (CF), Coral Milepora (CML) or fire coral, CMF, Massive Coral (CM), Acropora Encrusting (ACE), CME or the same as CML, namely Milepora Coral. Dead Coral which are still covered with algae (DCA), other types of organisms (OT) such as sea urchins, as for dead corals (DC), Coral Encrusting (CE), Coral Submassive (CS), Acropora Digitate (ACD), Sponge (SP), Coral Tubipora (CTU), and Rubble (RB).

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