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Original research article

Coral Reefs Health Level in The Local Use Zone of Lentea Island Wakatobi National Park, Indonesia

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ABSTRACT

Coral reefs are marine resources that are most vulnerable to disturbances from both human and natural activities. Fishing activities that are not environmentally friendly such as bombardment and potassium are still found in coastal areas and threaten the resources in the conservation area. This research will look at the health condition of coral reefs in conservation areas, especially in local utilization zones. In this zone the activity of exploiting marine resources is very high, therefore data is needed to find out and prove whether the use of marine resources is damaging. Locations were selected at four stations on Lentea Island which are included in the local use zone in the conservation area. The assessment uses the PIT (Point Intercept Transect) method. The results of the assessment showed that the coral reefs on Lentea Island were in the bad to good category (24.0% -50.3%). This data shows that there are still destructive marine resource utilization activities in the local utilization zone.

Introduction

Coral reefs are ecosystems that have the highest biological value on earth. about 275 million people live close to coral reefs, it has a beneficial value as a source of income and as a place to eat various associated living organisms (Burke et al. 2012). The country that has the widest distribution of coral reefs in the Asian region is Indonesia. However, the current coral reef area is estimated at 51,000 km2 (Burke et al. 2002). The distribution of coral species in Indonesia is more than 590 species, with archipelagic geography dominating with more than 75% of coral species (ADB, 2014). The institution that conducts assessments of coral reefs in Indonesia is the Indonesian Institute of Sciences,

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monitoring conducted in 2017 showed 6.39% were still very good, 23.40 good, 35.06% moderate and 35.15% bad (Giyanto et al , 2017). This indicates that there is pressure both from utilization activities and natural factors that interfere with the sustainability of coral reef life. Therefore there is a need for better management efforts.

Wakatobi as a conservation area was designated as a national park in 1996 with an area of 13,900 km^2 located in Southeast Sulawesi (Clifton 2013). One of the reasons for designating Wakatobi as a conservation area is the high diversity of coral reefs and the presence of coral atolls, spread over the four inhabited islands of Wanci, Kaledupa, Tomia and Binongko (Adimu, et al. 2019; Pet-Soede and Erdman, 2003). More than 390 species of hard corals are found, 68 genera and 15 families (Turak, 2003). The population in 2015 was around 94,985 people/km^2 with a density of 223 people/km2 (BPS, 2016). As a conservation area that has the densest population it has an impact on natural resources because the Wakatobi people live dependent on nature which is the main livelihood of the community, especially the Bajau community who live (Adimu et al. 2018).

Before Wakatobi was designated as a conservation area, destructive fishing activities were often encountered, such as bombing and the use of potassium (Adimu et al. 2017). Another activity that threatens the destruction of natural resources is the illegal extraction of beach sand, this activity is carried out as a basic material for building houses, roads and others. In addition to destructive fishing activities, Wilson et al. (2010) conducted a study of environmental changes that threaten the survival of coral reefs, namely coral bleaching due to global warming, found 10-20% of total coral colonies bleached. Lentea Island as one of the islands affected by coral bleaching is a local utilization area within the Wakatobi National Park zoning. So it is necessary to review the health of coral reefs and examine whether resource utilization activities are damaging by looking at the form of coral damage.

Material and Method

Study site

The study was conducted in July 2017, a research site on the Lentea Island of Wakatobi National Park. The study sites were in local use zones and marine protection zones (Figure 1). The location of the observation consists of 4 stations divided into 2 depths, 3 m and 7 m (Figure 1).

Survey Method

Coral cover was measured using the Point Intercept Transect (PIT) method (Hill and Wilkinson 2004; Obura, 2014). This method is used to see the extent of coral reef health and monitoring of coral disease (Aeby et al. 2011). This method has been widely used to assess the health of coral reefs (Green 1996, 2002, Hughes 2006, Hamilton et al. 2007). Technically the measurement is coral colonies recorded at each transect point at 50 cm intervals, recording is done based on predetermined points or measuring points. Percent coral cover was determined by dividing the number of points recorded. The recording process ended by taking the bottom substrate by calculation using English et al. (1997) and Gomez and Yap (1984). Coral growth form criteria recorded based on English et al. (1997), such as acropora branching, acropora tabulate, acropora digitate, coral branching, coral foliose, and other criteria such as macro algae, sponges and soft corals.

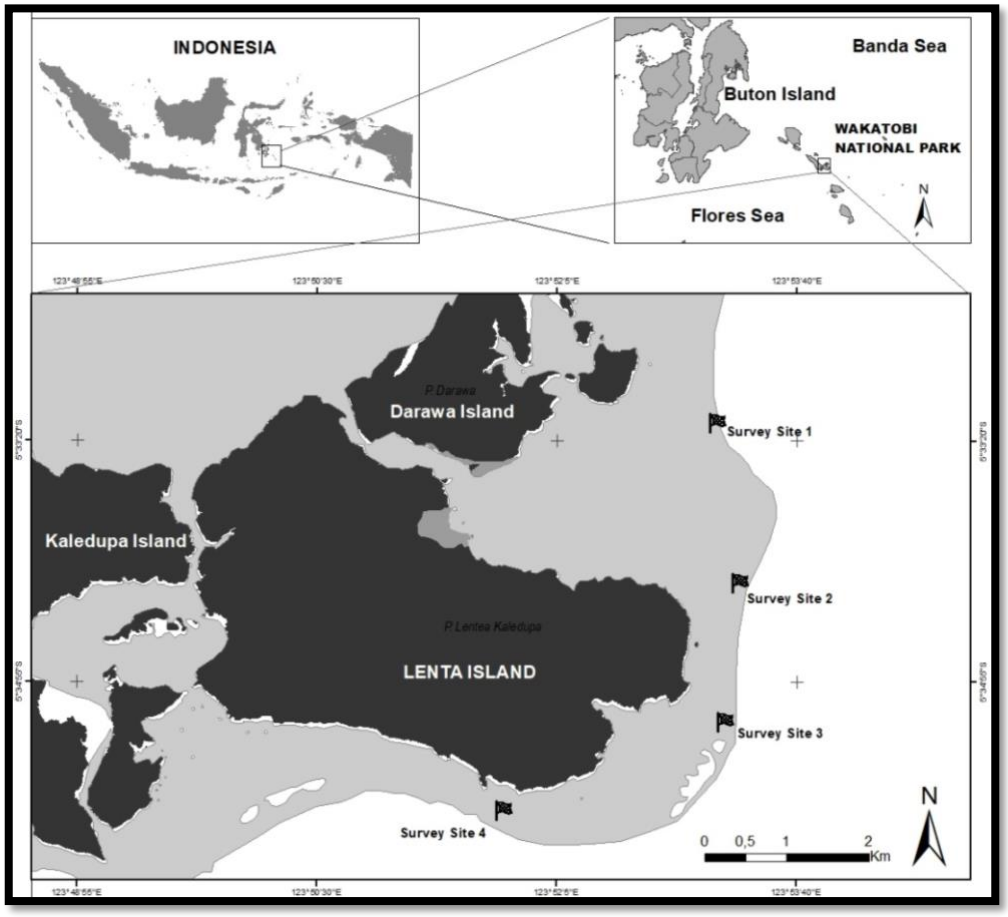

Figure 1. Lentea Island Research Location

Analysis Data

Coral cover was calculated based on the percentage value of each coral colony calculation using the formula English et al. (1997).

$$C_i = \frac{l_i}{L}\ x\ 100\%$$

Information:

C_i = Percentage of coral cover (*coverage*) life form - i
l_i = Total length *lifeform* of species - i
L = Length of the transect line (50 m)

Result and Discussion

The Coral Reef Condition

The result of coral reef condition analysis in local utilization zone of Lentea Island from four stations obtained the percentage value of coral cover from bad to good category (24.0% -50.3%). Percentage of live coral cover was found at station 4 depth of 10m (50.33%) lowest at station 1 depth of 3m (24.0%). In observation of station 1 the value of low coral cover is dominated by dead corals that have been grown algae. Coral reefs with category (damaged) are in station 1 depth of 3m (24.0%). The average coral reefs in Lentea Island waters fall into the category of medium, this can be seen at station 1 depth of 10m (26.33%), station 2 depth of 3m (27.0%) 10m (31.0%), station 3 depth of 3m (28.0 %) 10m (35.3%) and station 4 depth of 3m (41.3%). While the category (Good), there is at the station 4 depth of 10m (50.3%). The percentage of live coral cover recorded at the station is a combination of coral species from Acropora and Non-Acropora (Figure 2).

Other abiotic categories, dead coral with algae and dead coral cover are more dominant, the highest percentage of dead coral with algae cover in station 2 depth

10m and lowest at station 4 depth 3m. The highest percentage of coral fractures (rubber) was found at 10m depth station 2 and lowest at station 4 depth 10m. According to Suharsono (2015), the high percentage of dead coral cover can be caused by natural factors and due to human activities. As a result of natural factors is a large wave or storm while the damage caused by human activities in the form of bomb use in fishing. Based on observations related to physical conditions in the waters of the island Lentea has a large enough sea waves so that from natural factors may affect the presence of coral reefs. The results of substrate observations and other biotic components at each station are presented in Figure 3.

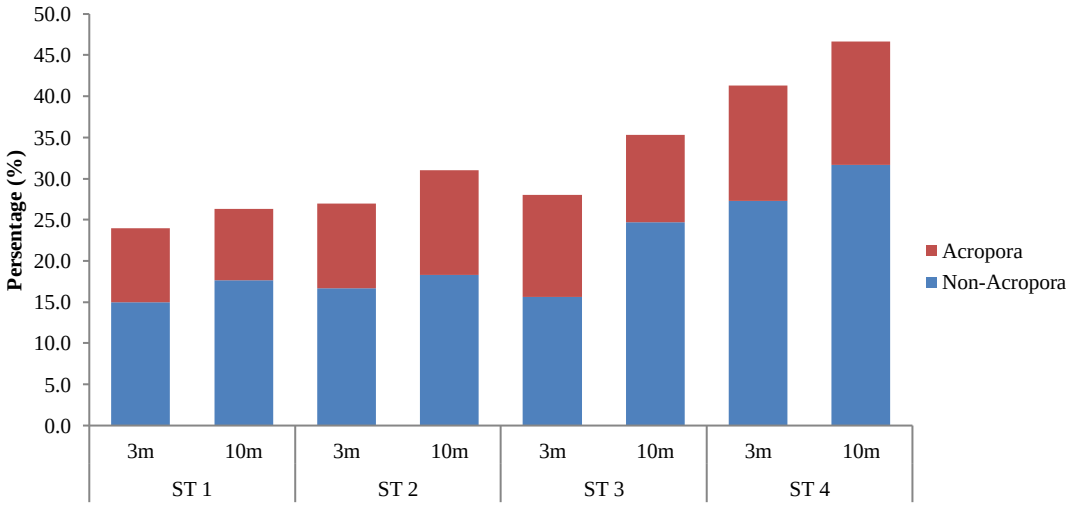

Figure 2. Percentage of live coral cover by category Acropora and Non-Acropora

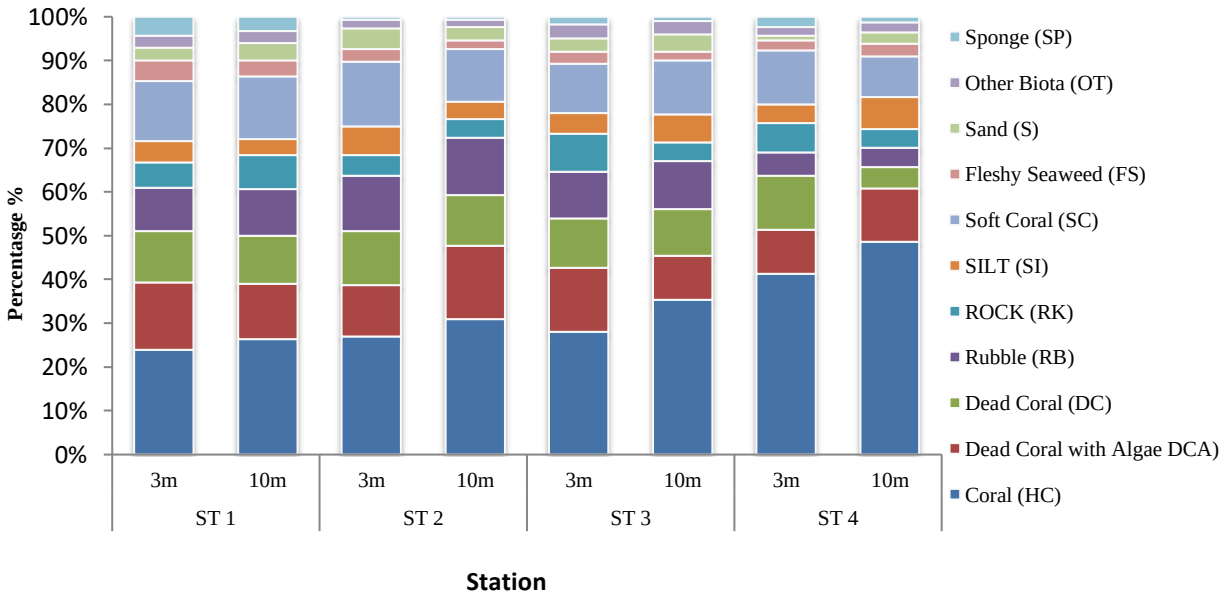

Figure 3. Biotic and abiotic cover at the observation

General Description of Location

The observation station is located in the eastern Lentea waters adjacent to Darawa Island. The base contour of the tube with a slope of about 35^0. The condition of the waters at the time of observation is quite clear with visibility reaches 7m. The average condition of coral reefs is coarse sand and corals dead overgrown with algae. Based on the observations (Figure), NA + AC hard coral cover data was found at 24.0% at depth of 3m and 26.3% at 10m depth. Percentage of coral cover indicates coral reef condition in condition (damaged and moderate). Other biotic categories include soft corals at 13.7% depth of 3m and 14.3% 10m, sponges 4.3% and 3m 3.3% 10m, algae 5.0m 3m and 3.7m 10m and other biota 2.7% 3m and 2.7% 10m. The abiotic category, ie, dead corals overgrown with algae 15.3% 3m 12.7% 10m, 10.0% 3m 10.7% 10m, and 3.0% 3m and 4.0% 10m.

The observation station is located in the mid waters of Lentea and Darawa, in this area fishermen utilize the waters for seaweed cultivation. The base contour is slightly sloping around 20-25º. The condition of the waters at the time of observation is quite clear with visibility reaches 5m. The average condition of coral reefs is coarse sand and corals dead overgrown with algae. Obtained by hard coral cover NA + AC 27.0% depth 3m and 31.0% depth 10m. The percentage of hard coral cover indicates coral reef condition in medium condition. Other biotic categories include soft corals of 14.7% depth of 3m and 12.0% 10m, sponge 0.7% and 3m 0.7% 10m, algae 6.7% 3m and 4.0% 10m and other biota 2.0% 3m and 1.7% 10m. Abiotic category ie, dead coral overgrown algae 11.7% 3m 16.7% 10m, coral fragments 12.7% 3m 13.0% 10m, and sand 4.7% 3m and 3.0% 10m.

Observation station is located in front of Lentea island, in this area fishermen utilize the waters to catch the fish using basic fishing rod. The base contour is tilted around 30-40o. The condition of the waters at the time of observation is very clear with visibility reaches 10m. The average condition of the coral reefs is sandy and the corals of algae die overgrown. Based on observation results obtained hard coral cover data NA + AC 28.0% depth 3m and 35.3% depth 10m. The percentage of hard coral cover indicates coral reef condition in medium condition. Other biotic categories include soft corals of 11.3% depth 3m and 12.3% 10m, sponges 1.7% and 3m 1.0% 10m, algae 4.7% 3m and 6.3% 10m and other biota 3.3% 3m and 3.0% 10m. The abiotic category, ie dead coral overgrown algae 14.7% 3m 10.0% 10m, coral fragments 10.7% 3m 11.0% 10m, and sand 3.0% 3m and 4.0% 10m.

Observation station is located in front of Lentea island, at this location little visible fisherman activity so that resource condition do not experience big pressure. The flat bottom contour of the coastline is about 5-6m towards a tread with a slope of about 35-40º. The condition of the waters at the time of observation is very clear with visibility can reach 10m. The average condition of coral reefs is coarse sand and corals dead. Based on the observation results obtained data of hard coral cover NA + AC 41.3% depth 3m and 50.3% depth 10m. The percentage of hard coral cover indicates the condition of coral reefs in (good) condition. Other biotic categories include soft corals at 12.3% depth of 3m and 9.7% 10m, sponge 2.3% 3m and 1.3% 10m, algae 2.3% 3m and 3.0% 10m and other biota 2.0% 3m and 2.3% 10m. Abiotic category, ie dead coral overgrown algae 10.0% 3m and 12.7% 10m, coral fraction 5.3% 3m 4.7% 10m, and sand 1.0% 3m and 2.7% 10m. In general the condition of coral reefs at station 4 is in good condition (Figure 4).

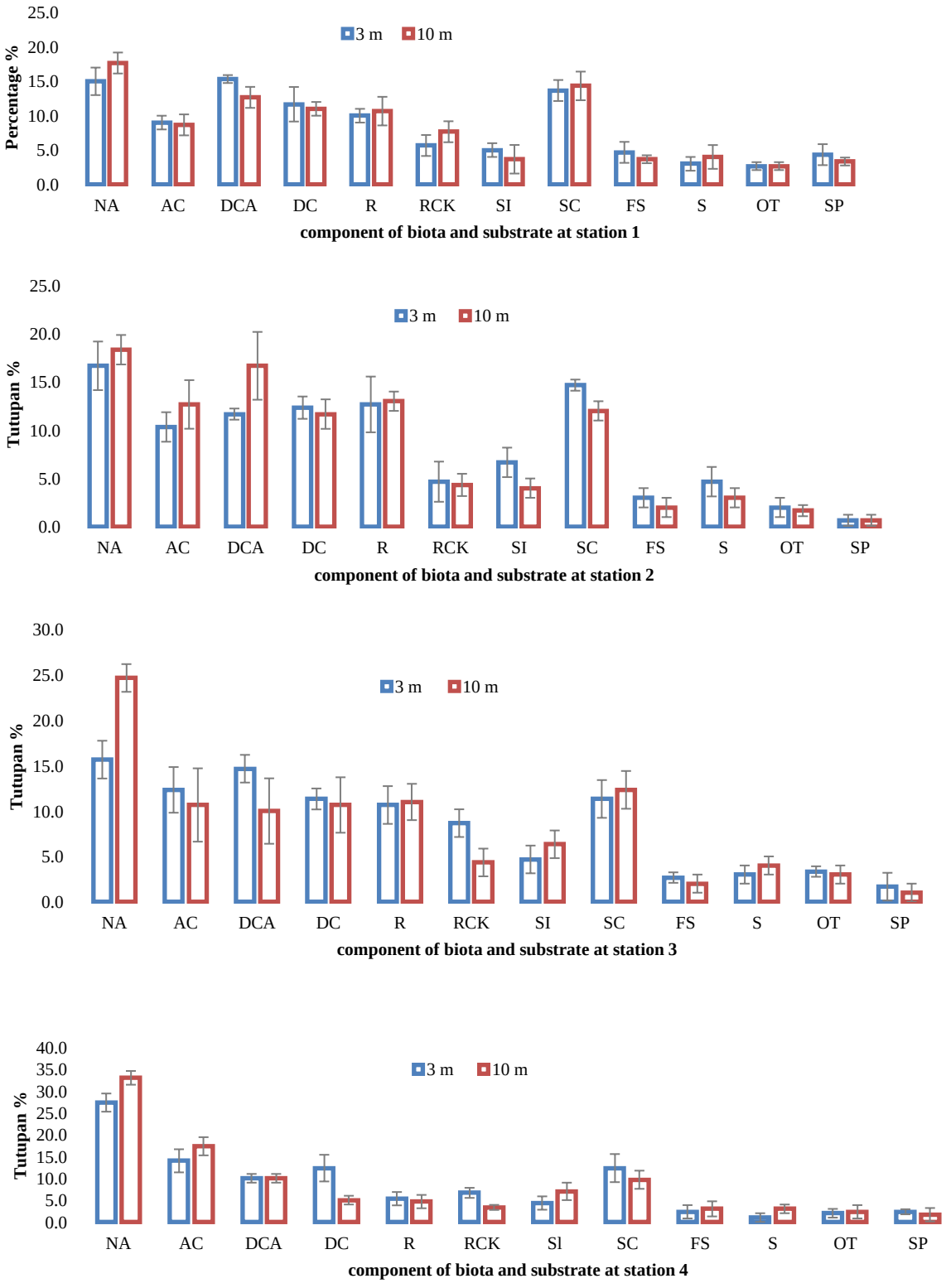

Figure 4. The average percentage of biota and substrate components at each station ($\bar{x} \pm SD$)

Conclusion

Based on the observation of coral reef condition in the local utilization zone of Lentea island from four observation sites, namely 1 hard coral cover station at depth of 3m 24.0% and 10m 26.3%, station 2 hard coral cover at depth of 3m 27.0% and 10m 31,0%, 3 hard coral cover station at depth 3m 28,0% and 10m 35,3%, and station 4 depth 3m 41,3% and 10m 50,3%. In general condition of coral reef of Lentea island in condition (being).

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