



## **Coral Reef Cover and Diversity on Tinabo Besar Island, Taka Bonerate National Park, South Sulawesi**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/AJFAR/2021/v12i130225

#### Editor(s):

(1) Dr. Pinar Oguzhan Yildiz, Ataturk University, Turkey.

#### Reviewers:

(1) Puji Prihatinningsih, Indonesia.

(2) Okeoghene A. Emuedo, Rubber Research Institute of Nigeria, Nigeria.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/66970>

**Original Research Article**

**Received 25 January 2021**

**Accepted 29 March 2021**

**Published 13 April 2021**

### **ABSTRACT**

Research related to coral reef cover and diversity on Tinabo Besar Island was carried out in 2018, so it is necessary to conduct further research to determine the cover and diversity of coral reefs on Tinabo Besar Island in a sustainable manner (Time series) in order to improve the quality of coral reef ecosystems in the waters and management of national park area. This research was conducted from 9 July 2019 to 7 August 2019 at Taka Bonerate National Park, Selayar Islands, South Sulawesi, Indonesia. Location of data collection on Tinabo Besar Island. The data taken includes coral reef cover with 4 stations representing the wind directions, namely north, south, east, and west. Coral reef data were collected using the LIT (Line Intercept Transact) method. Based on the research results, it was concluded that the percentage of coral reef cover on the island of Tinabo Besar, Taka Bonerate National Park, South Sulawesi ranged from 25.80% to 45.80%. The diversity is in the medium category with the index value (H') ranging from 1 - 3 based on the Shannon - Wiener Index. The average percentage of life corals from the four stations is moderately damaged.

*Keywords: Coral reef; diversity; tinabo besar; LIT.*

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## 1. INTRODUCTION

Takabonerate National Park located in Selayar Islands Regency, South Sulawesi Province, Indonesia, is one of the Marine Protected Areas (MPAs) protected by the state. TNT has the characteristics of the third largest atoll type coral reef in the world after Kwajifein in the Marshall Islands and Suvadiva in the Moldiva Islands, covering an area of 220,000 hectares. Geographically it is located in the Flores Sea, which is between 120°55'- 121°9' East Longitude and 6°41'- 7°70' LS. 8 As a nature conservation area, TNT has a function for the protection of life support systems, preservation of biodiversity sustainable use of living natural resources and their ecosystems [1].

Coral reefs are dynamic ecosystems with rich biodiversity and high productivity, therefore coral reefs have a significant role [2]. Coral reefs are a habitat for more than 300 types of corals, 200 species of fish, and various other invertebrates such as mollusks, crustaceans, sponges, algae, and other biota (Dahuri, et al., 2009). Currently, the global factor that causes damage to coral reef ecosystems is global climate change. Climate change causes an increase in sea water temperature which causes death and bleaching of corals and reduces coral calcification due to changes in seawater chemistry with increasing sea water CO<sup>2</sup> concentrations [3].

Although coral reefs appear large and are a very stable system, they are damaged on a large scale by various forces, such as mechanical damage by very strong tropical storms (typhoons and cyclones), human activities that cause siltation of land from land due to deforestation, waste disposal through rivers and beaches such as industrial waste (heavy metals), fishing with explosives and toxic chemicals and coral mining for building materials [4].

Research related to coral reef cover and diversity on Tinabo Besar Island was carried out in 2018 by Fazar Dwi Gustiar, so it is necessary to conduct research in an effort to determine the coverage and diversity of coral reefs on Tinabo Besar Island in a sustainable manner (Time series) in order to improve the quality of the coral reef ecosystem in these waters and the management of the national park area for the Taka Bonerate National Park Office.

The purpose of this study was to determine the cover and diversity of coral reefs in Tinabo Besar

Island in a sustainable manner (Time series) in order to improve the quality of coral reef ecosystems in the waters and to manage the national park area.

## 2. MATERIALS AND METHODS

The research was carried out by 4 divers who were tasked with rolling out a roll meter, observing and recording objects of research, documenting activities and observing reef fish. The object observed was the category of coral reef in the LIT lifeform which the transect line passed per centimeter. These objects are Hard Coral (ACB, ACD, ACE, ACS, ACT, BC, CE, FC, MC, ME, CMR, CS, CHL, CTU), Dead Coral (DC, DCA), Algae (AA, CA, HA, MA, TA), Others (SC, SP, ZO, OT (ASC, CRI, GO)), and Abiotic (CO, RCK, RB, SD, SI, WA).

The depth of observations is made at 5 - 10 meters below sea level. The average salinity of the four stations is 37%. Coral reefs cannot thrive in waters deeper than 50 - 70 m, most coral reefs grow well at depths of up to about 25 m [5]. The salinity range of corals is between 27 - 48% [6] and According to Santoso and Kardono [7], the salinity of coral reefs is 27-40%. It is best to live in sea water with a normal salinity of 36%.

Coral reef cover data collection was carried out on July 23, 2019. The data collection location was on Tinabo Besar Island, Taka Bonerate National Park, Selayar Islands, South Sulawesi. The data taken includes coral reef cover. The coral reef cover survey was conducted on Tinabo Besar Island, with 4 stations representing the cardinal directions, namely north (station 3), south (station 1), east (station 2), and west (station 4). The research used a survey method. Collecting coral reef data using the LIT (Line Intercept Transect) method. According to Fachrul [8], line transects are used to describe the structure of coral communities by looking at live coral cover, dead coral, substrate shape, algae and the presence of other biota. Coral specifications that are expected to be recorded are in the form of coral growth (life form) and are allowed for researchers who already have the expertise to record corals to the genus or species level. Observations using the LIT method were then processed using Microsoft Excel which was modified by the Indonesian Coral Reef Foundation (TERANGI) to determine the percentage of coral cover.

The formula for the percentage of coral cover based on the Cox [9] formulation is as follows:

The data analysis includes:

a. Diversity Index

To determine diversity, the following formula is used (Shannon-Wiener):

$$H' = - \sum P_i \ln P_i$$

Information:

H' : Diversity Index

Pi : ni / N

Ni : The number of individuals of a species of a species

N : The total number of individuals

From the data above, to classify the level of diversity the following criteria are used:

H' ≤ 1 = low diversity

1 < H' < 3 = moderate diversity

H' ≥ 1 = high diversity

### 3. RESULTS

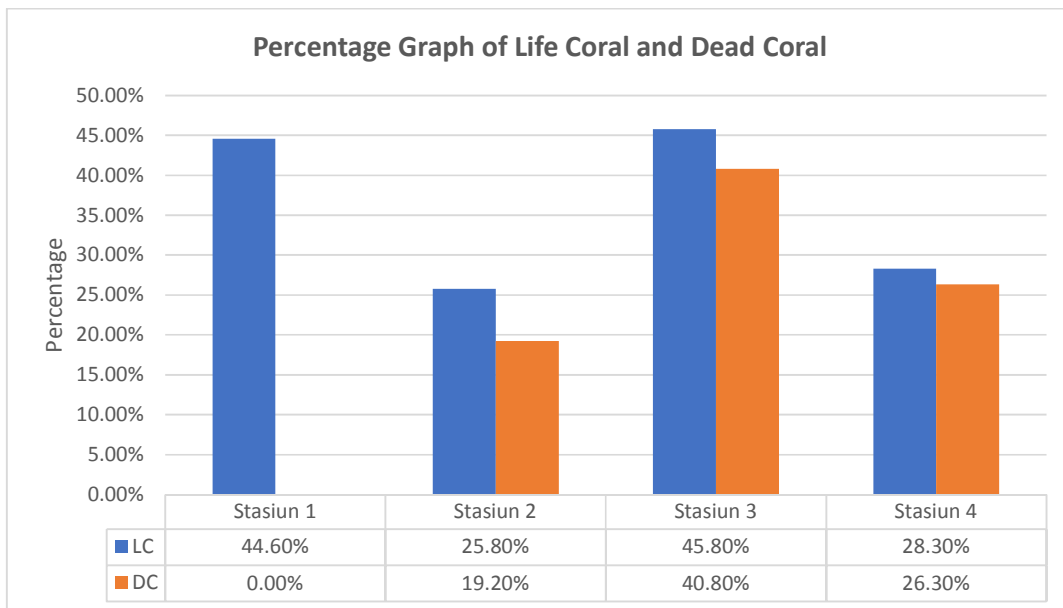
#### 3.1 Value Added Analysis of Fish Drumstick

The results of observations of Live Coral (LC) and Dead Coral (DC) in Tinabo Besar at four stations, as a whole, have a percentage of Live Corals more than 20% and the percentage of Dead Corals does not exceed 40.8%.

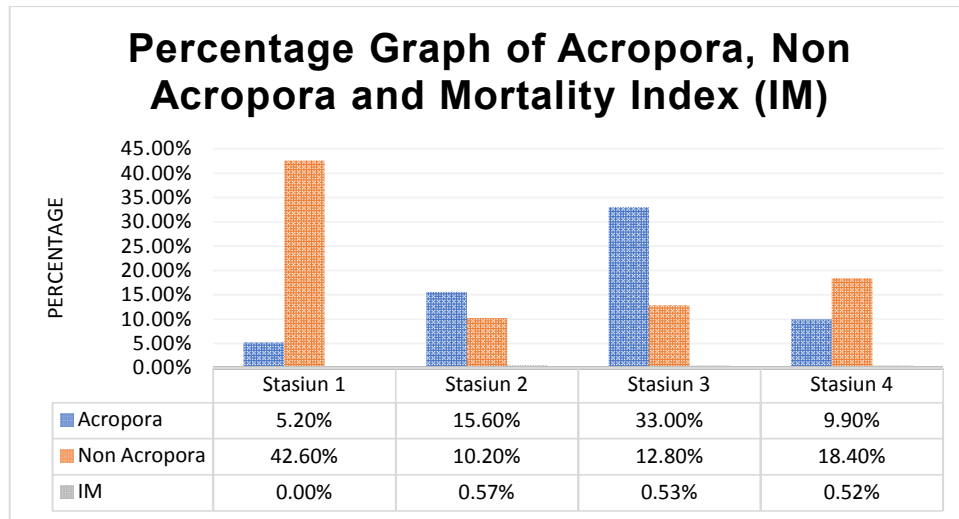
The highest live coral cover is at Station I and the lowest is at Station 2. With each type of growth form, it is Acropora Branching (ACB), Acropora Digitate (ACD), Acropora Tubulate (ACT), Acropora Submassive (ACS), Coral Branching (CB ), Coral Foliose (CF), Coral Mushroom (CMR), and Coral Submassive (CS).

Then the results of observing the shape of coral reef growth in Tinabo Besar at four stations, overall the condition of Tinabo Besar's coral reefs can be said to be quite good. The highest percentage of acropora species is at station 3, for non-acropora species the highest is at station 1, while the highest Mortality Index (IM) is at Station 2 Tinabo Besar (Graph 2).

The results of the research carried out in 2019 above according to the Decree of the Minister of the Environment No. 4 of 2001 concerning the Standard Criteria for Damage to Coral Reefs that the average percentage of live corals from four stations is experiencing moderate damage. Based on Graph 1 , the highest mortality index is obtained at Station 2 (East Tinabo Besar), this is thought to be due to port activity which is quite busy by fishing boats and tourists and according to local hall officials at the time of the study along with the monsoon. east where the waves on Tinabo Island tend to be strong on the eastern coast and this affects the high mortality of corals in the area.



Graph 1. Comparison Graph of Life Coral and Dead Coral Reef Data from Four Stations



**Graph 2. Graph of Comparison of Percentage of Coral Reef Cover at Four Stations in 2018 and 2019**

Source: Research Data Fazar Dwi Gustiar [10] and Ivan Aditama (2019)

Comparison of coral reef cover data in 2018 and 2019 (Graph 2) shows an increase and decrease in percentage. An analysis was obtained in 2018, namely the decline in the quality of coral reefs due to exploitation that is not environmentally friendly, one of which is the use of bombs that are often found to catch fish, as evidenced by the sound of bombs during the data collection process. Bahar root exploitation activities also still occur on Rajuni Island. This activity was carried out by the community secretly because officials from the Taka Bonerate National Park had strictly prohibited this activity. However, because the selling price is quite profitable, this exploitation activity often takes place. Another thing that can cause the condition of damaged coral reefs is also due to the fact that household waste sent from Rajuni Island is still often found dumped into the sea due to the absence of a landfill [10].

Based on the Shannon-Wiener diversity index, stations 1, 2, 3 and 4 have H 'values (1.6), (1.1), (1.3) and (1,2), respectively. According to the index, the four stations have a range of 1 to 3 indicating moderate diversity category. The higher of coral diversity index can show good environmental conditions as a habitat for corals and other organisms [11].

It can be seen that the percentage of coral reef cover (Graph 2) at stations 1, 2 and 3 has increased, but at station 4 there has been a decrease in the percentage of coral reef cover. This shows that the management of the national

park area is better so that the increase in coral reef cover is proof of the preservation of nature that is maintained. From the statement of one of the center officers who are in the Tinabo Besar area, it strengthens the fact that crime and environmental destruction are decreasing and increased supervision from the Taka Bonerate National Park Officer has yielded positive results for the coral reef ecosystem. However, the decline that occurred at station 4 could be caused by several factors, including the influence of the impact of the waves that damaged coral reefs and the position of taking the research sample points that were different from the coral reef sample points in the previous year, namely 2018 conducted by Fazar [10].

#### 4. CONCLUSION

Based on the research results, it was concluded that the percentage of coral reef cover on the island of Tinabo Besar, Taka Bonerate National Park, South Sulawesi, Indonesia ranged from 25.80% to 45.80%. The diversity is in the medium category with the index value (H ') between 1 - 3 based on the Shannon - Wiener Index. The average percentage of life corals from the four stations is moderately damaged.

#### ACKNOWLEDGEMENT

We would like to thank The Faculty of Fisheries and Marine Science, Padjadjaran University, Indonesia for making this research possible.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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*Peer-review history:*  
*The peer review history for this paper can be accessed here:*  
<http://www.sdiarticle4.com/review-history/66970>