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Multitemporal Analysis of Coral Reef area using Sentinel 2a Image Data in Sabanjar Waters, Indonesia

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ABSTRACT

The study aims to determine coral reef cover using multi-temporal analysis from 2017 to 2020 using Sentinel-2A data. The results of the analysis of Sentinel-2A satellite images found that coral cover during 2017-2020 coral cover in Sabanjar waters in ranged from 0.05 Ha -12.0 Ha. With the lowest range for damage status in 2020, reaching 0.05 ha and the highest damage occurring in 2020, reaching 0.1 Ha. Meanwhile, the highest area of coral reefs was seen in 2020 with a very good area reaching 12.0.

Key words : *Multitemporal analysis, Sentinel 2A, Coral reef*

Introduction

Sabanjar waters are included in the Watershed Conservation Area of the Pantar Strait and the Surrounding Seas in Alor-Indonesia Regency and precisely in the utilization zone which is used as a snorkeling and diving tourism object so that the coral reefs in this tourist area are vulnerable to damage. According to research conducted (Spalding *et al*., 2017); (Prideaux and Pabel, 2018); (Huang and Coelho, 2017); (Diedrich, 2007); (Cowburn *et al*., 2018) found that snorkeling and diving activities in coral reef areas can cause damage to coral reefs. According to research (Wabang, 2018) regarding the suitability of beach tourism, it is found that tourist activities are still doing damage to coral reefs in the Pantar Strait Nature Reserve and the surrounding sea with snorkeling and diving activities.

Analysis of the use of remote sensing data as a solution to monitor coral reef damage as seen from the distribution of coral reefs each year using the temporal spatial method. according to research (Bajjouk*et al*., 2019; Xu and Zhao, 2014; Ackleson, Moses and Montes, 2018; Knudby *et al*., 2007; Hedley *et al*., 2012; Reichstetter *et al*., 2015) said that remote sensing data is a method that is very effective and efficient in monitoring a large body of water, especially the distribution of coral reefs in time series.

Recruiting research (Sari *et al*., 2020; Purwanto *et al*., 2020; Wicaksono *et al*., 2020; Kunarso *et al*., 2019; Rahman *et al*., 2020) found that the use of sentinel

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2A satellite data to map benthic corals, the extent of coral reefs by time series in several waters in parts of the world.

Materials and Methods

Analysis of this satellite image data was carried out by referring to Hartoko *et al*., (2015); Maro *et al*., (2016); Nurdin *et al*., (2019); Hedley *et al*., (2018); Bell *et al*., (2020) and Afifa *et al*., (2020), namely processing and calculating digital satellite data through a computerized process, including cutting, geometric correction, image sharpening, image classification (Unsupervised), coral reef cover analysis, making coral reef density algorithm modeling and overlay (Image Data Merging) using the Er Mapper 7.0 application.

Analysis of coral reef area data using the Lyzenga Algorithm Lyzenga Algorithm or also known as the Depth Invariant Index is an algorithm that is applied to images for water column correction. The principle of this method uses a combination of satellite imagery visible light channels. This technique was previously described to determine the condition of the bottom of the water using sentinel 2A imagery based on the reflection value of the bottom waters which is estimated from the linear function of bottom water reflectance and the exponential function of water depth (Thalib, 2017). After the analysis is carried out, the class is carried out, namely Very High, High, Neutral, Low and Very Low for each coral reef cover and mapping is carried out using the ArcGis 10.8 application.

Results

Analysis of the area of coral reef land was carried out in the coastal waters of Sebanjar (Fig. 1) using sentinel data 2A. The results of the analysis using the temporal spacing method with the Lyzenga algorithm approach showed that the area of coral reefs in 2017 - 2020 had an average area of coral

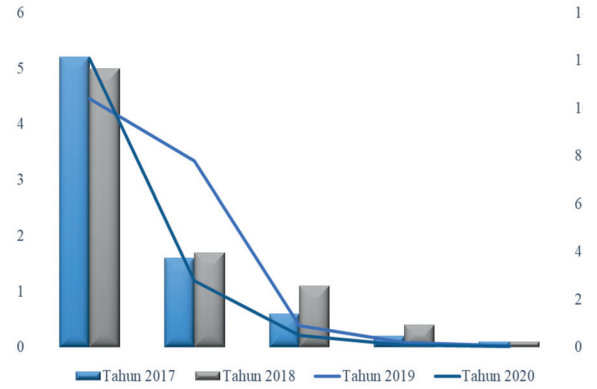

Fig. 2. Graph of Average Coral Reef Area at Sebanjar Beach

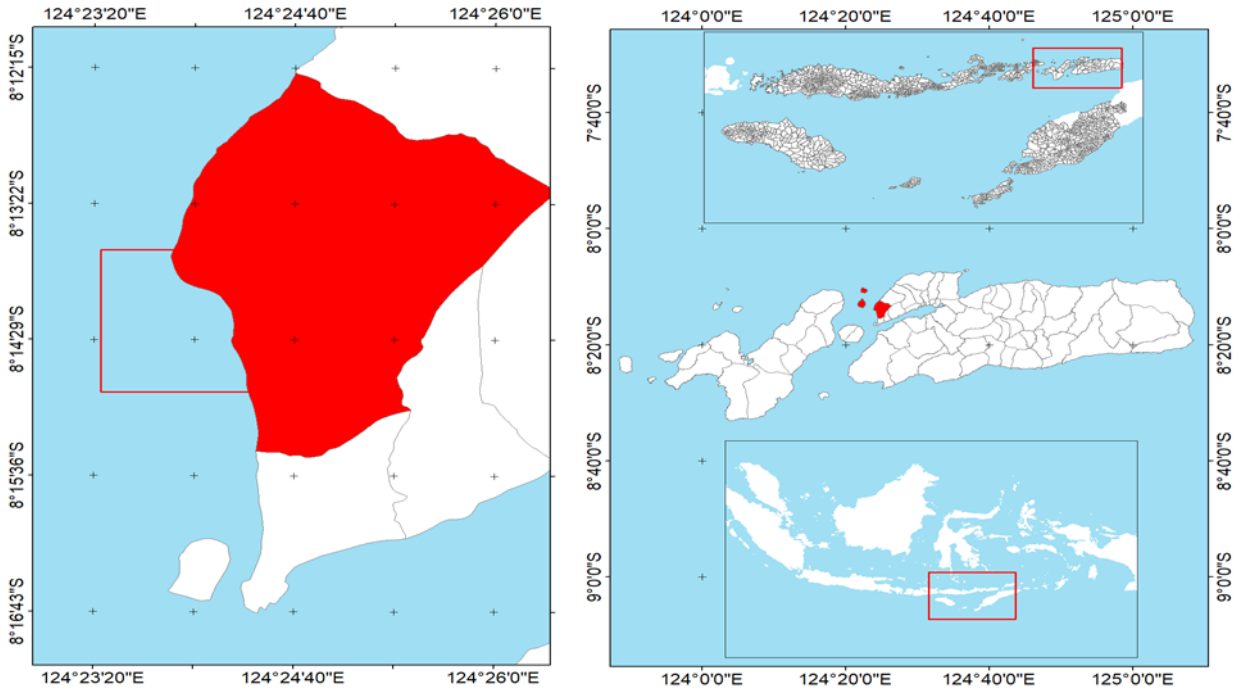

Fig. 1. Map of Sebanjar Beach Research Location

reefs ranging from 0.05 ha - 12.1 ha (Fig. 2). Looking at the average coral reefs, it can be explained that the area of coral reefs will increase in 2020, seen from the class of coral reefs in the very low category with a range of 0.05 Ha (0%) (Figs. 3-4). It is suspected that in early 2020 the spread of the corona virus (COVID) 19 outbreak where tourism activities did not run optimally because all tourism access in Indonesia, especially in Alor Regency was closed, resulting in a recovery process on coral reefs and an impact on increasing the area of coral reef reached a good category, namely 12.1 ha (78%) (Figs. 3-4). According to research Mazaya *et al*., (2019); Saputra, (2020); Cowburn *et al*., (2018), the tourism activity is one of the activities that has a significant impact on the damage to coastal ecosystems, one of which is is a coral reef ecosystem. The decline in the area of coral reefs in coastal waters along the coast is clearly

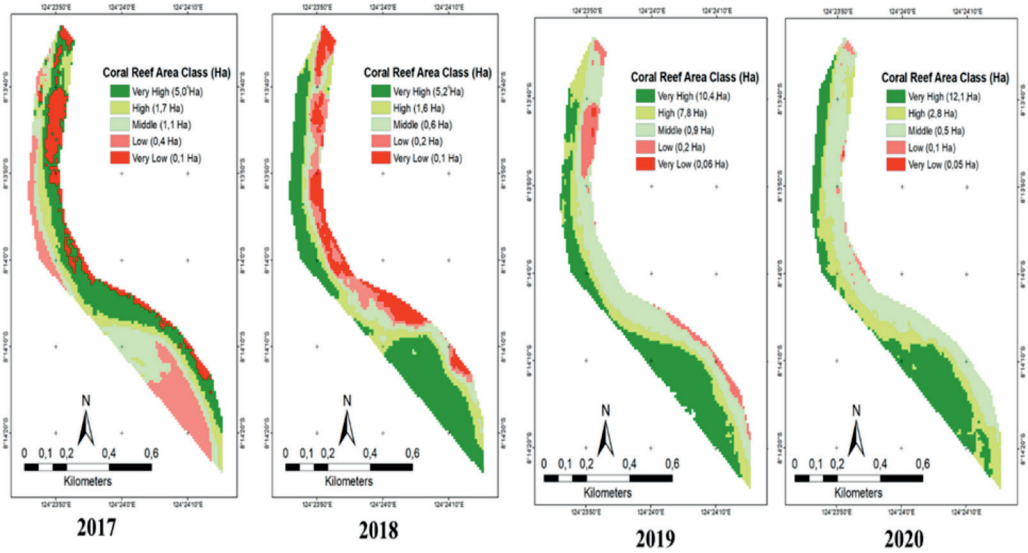

Fig. 3. Temporal ratio of the distribution of coral reefs on the coast between 2017-2020

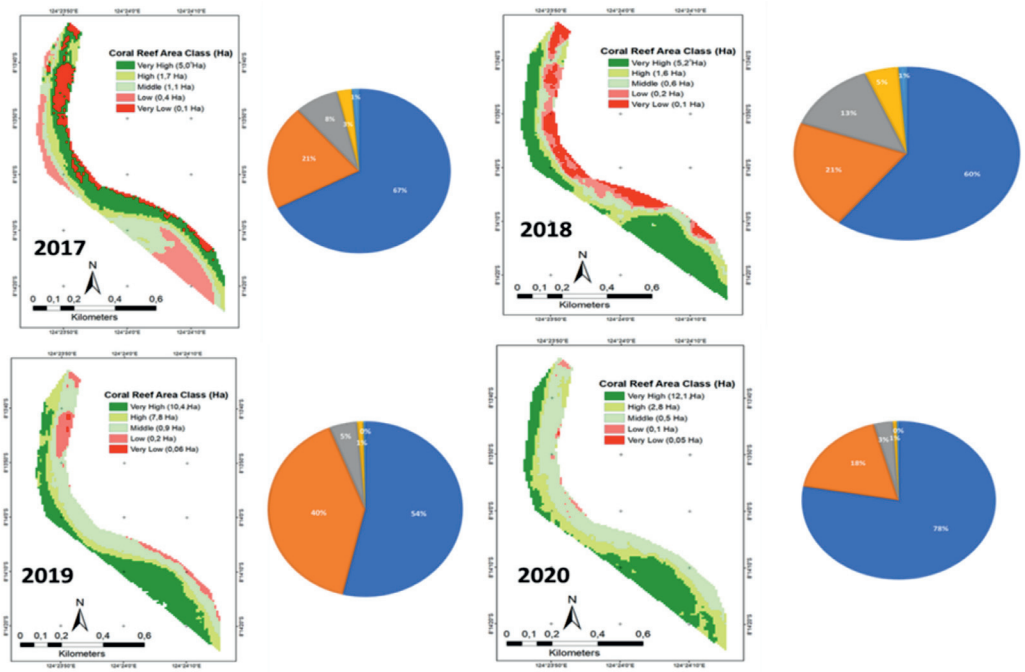

Fig. 4. Extent and Percentage of coral reefs on the coast as of 2017-2020

visible in 2017 - 2018, reaching 0.1 ha (1%) (Fig. 3-4) with Very Bad status while very high status only reaches 5.1 ha (60%) (Figs. 3-4). The loss of coral reef area is due to the fact that in 2017- 2018 the coast was very crowded with visitors for beach tours, namely snorkeling and diving. Recreational fishing, usustainable fishing, and diving that do not follow the diving protocol will result in aquatic ecosystems, both abiotic and biotic (Hasan and Islam, 2020; De *et al*., 2020; Gani *et al*., 2021; Hasan *et al*., 2021a; Hasan *et al*., 2021b). Not only tourism activities, but it is suspected that there are capture fisheries activities that are destructive. Research conducted by Dan *et al*., 2018; Wabang, 2018; Nauli *et al*., 2020, found several coastal ecosystems such as mangroves, seagrass beds and coral reefs that were damaged due to unfriendly tourism and fishing activities. environment such as tracing coral reefs, dumping anchors and using explosives and potassium to catch fish in the waters of the Pantar Strait Nature Reserve and the Surrounding Sea. This is also supported by research conducted by (Reichstetter *et al*., 2015; Kunarso *et al*., 2019, found tourism and fishing activities as one of the main causes of damage to coral reefs in several tropical waters in Indonesia.

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