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# Assessment of coral reef condition using upt (underwater photo transect) method on gili labak island madura indonesia

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**Abstract.** Coral reefs are unique, complex and high-productivity marine ecosystems that make coral reefs a place to grow and breed most fish and biota in the waters, and physically the function of coral reefs is to withstand coastal abrasion, break waves and so on. To be able to manage coral reefs properly, valid data support is needed as a basis for formulating a policy. Gili Labak Island is one of the islands that is currently a tourist attraction because it has a very wide expanse of coral reefs. The UPT method is a method that utilizes technological developments, because in this method digital camera technology and computer software are used. Data retrieval in the form of underwater photos is done by shooting using an underwater digital camera. The photographs were then analyzed using computer software to obtain quantitative data. This study aims to calculate the biota in the transect. The results obtained Coral 72.92%, Dead coral (DC) 2.03, Dead Coral Algae (DCA) 9.09%, Soft Coral (SC) 0.33%, Rubble (R) 6.15%, Sand (S) 8.98%, Rock (RK) 0.52%.

## 1. Introduction

Coral reefs are ecosystems that have important and complex economic values and have high diversity, but are very vulnerable to natural factors and human activities [1], Coral reef tourism also has economic value that can create new jobs for the community [2]. As tourism activities are carried out by utilizing coral reef areas for tourism activities, will always experience pressure and lead to damage [3]. The development of methods used to assess the condition of coral reefs in the world in recent decades continues to grow. The various methods used are inseparable from weaknesses, both in terms of technical field implementation, human resource capabilities, and the amount of budget required for the implementation of each method. Using the manta tow method English *et al.* [4]. can reach a wider study area in a shorter time, but it will be difficult and dangerous if done in an area full of massive hard corals with large sizes. Using the Line Intercept Transect (LIT) method. It takes longer time than the manta tow method, and requires one's ability to dive and the ability to identify coral to the species



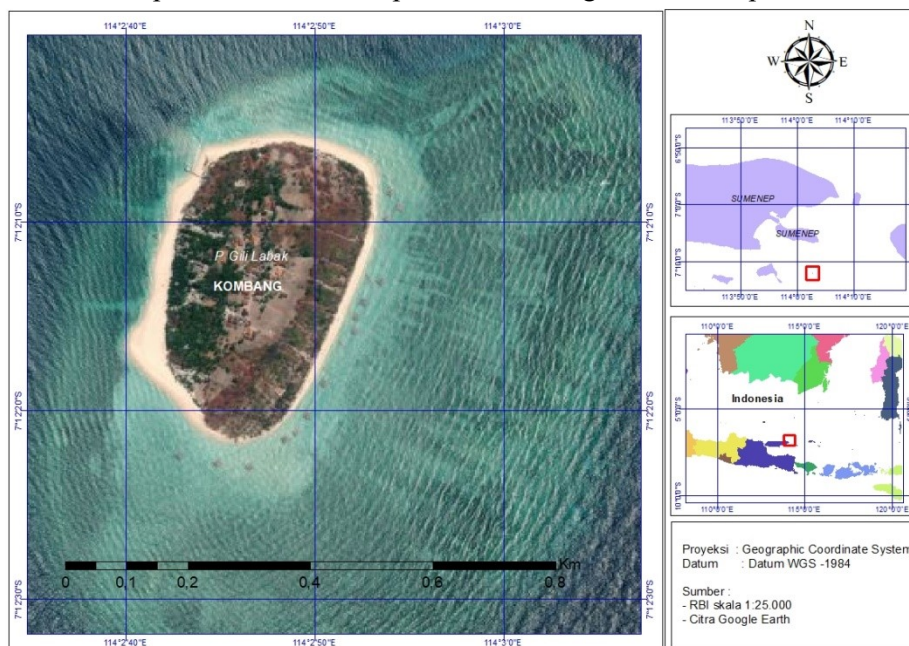
level. The UPT (Underwater Photo Transect) method was developed to speed up and simplify coral reef analysis using software.

Sumenep Regency is one of the regencies in East Java which has the most islands (approximately 115 named islands). This condition makes this area has great potential for coral reefs [5]. These islands have great potential to be developed as tourist areas, including Gili Labak [6,7,8]. Gili Labak Island has great potential for the development of diving ecotourism, snorkeling ecotourism, and beach ecotourism. The results of the 2016 survey, the area of coral reefs on Gili Labak Island reached 66 ha. The condition of live coral reached 48.7% and dead coral reached 51.3%. The dominant type of coral is *Stylophora* (Branching) reaching 29.27% [6].

Gili Labak Island tourism has been developed by the Sumenep Regency government since 2014, causing many visitors to come to see coral reef tourism so that the risk of damage to coral reefs is very high [9]. Gili Labak Island is a favorite tourist destination on the island of Madura and has a coral reef cover of 73% and is in the good category [10]. The percentage of coral lifeform cover on Gili Labak Island, especially in the snorkelling area, is dominated by live coral as much as 74% and abiotic elements by 22%. The coral species that dominate Gili Labak Island are *Acropora* Branching by 19.88% and Coral Foliose by 10.25%. During 6 weeks of observation, there was a decrease in total coral by 0.64% which was categorized as lightly damaged, where most of the damage occurred to corals with branching growth such as *Acropora* Submassive and Coral Submassive. The decline in the percentage of high coral cover occurred after snorkeling activities (after) carried out by tourists. Analysis of the potential impact of marine tourism (DWB) snorkeling on coral reefs in Gili Labak waters for 6 weeks of observation is in the low category, ranging from 0.052% to 0.085% [9].

## 2. Materials and methods

The study was conducted in July 2022 in the waters of Gili Labak Island (Figure 1). The percentage of coral cover data was collected using the UPT (Underwater Photo Transect) method taken at the place where tourists go snorkeling with a 50 meter transect length [11]. The measurement of supporting parameters includes: temperature, sanitation, pH, DO, and brightness at the point of observation.



**Figure 1.** Map of research locations on Gili Labak Island, Madura, Indonesia

Coral reef data analysis was analyzed using CPCe software computer software. Calculation of the condition of coral reefs using the formula:

$$\text{Percentage of coral reef cover} = \frac{\text{Number of Category } i}{\text{Number of random points}} \times 100\% \text{ [11].}$$

**Table 1.** Coral cover categories follow [12].

No.	Percentage (%)	Category
1	0-24,9	Bad
2	25-49,9	Currently
3	50-74,9	Well
4	75-100	Very well

### 3. Results and discussion

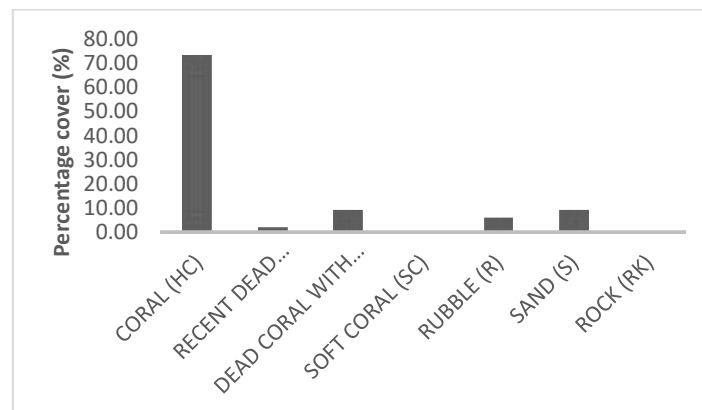
**Table 2.** Physical and chemical parameters of the waters

No.	Time	Temperatur (°C)	pH	Brightness (%)	Sanility (‰)	DO (mg/l)	TSS	Current Speed (m/s)	CD
1	Morning	28,8	8,29	100	31	11,2	0,0422	21	51,4
2	Afternoon	31,9	8,47	100%	30	14,4	0,0504	17,22	52,2
3	Afternoon	31	8,48	100	34	13,9	0,047	11,49	52

Measurement of the physical and chemical parameters of the waters in this study aims to determine the suitability of the physical and chemical parameters of the water with the needs of corals. The results of the measurement of the physical-chemical conditions of the Gili Labak island waters are in good condition. This is in accordance with the Regulation of the Minister of the Environment No. 51 of 2004.

The water parameter of acidity (pH) obtained from the results of the average time measurement is 8.41. This value is said to be good for coral reef growth. According to Madduppa and Zamani. [13] The range of pH values suitable for coral reefs is 7 to 8. Apart from measuring chemical parameters, physical parameters of the waters such as brightness and water temperature are also carried out. According to Nyabakken. [14] The optimal temperature for the growth of coral biota is between 25-30°C. However, the temperature of 30-35°C can be tolerated by coral reefs. Based on observations, the average water temperature is 30°C. High brightness levels can affect the growth of coral reefs, brightness is directly related to the level of light intensity that enters the water column. High brightness has a positive impact on zooxanthellae because it can facilitate photosynthesis and can help growth. The average brightness level of observations has a value of 100% at a depth of 8 meters. The condition of the waters at the study site has currents that are influenced by tides. However, corals still survive to live, because currents are needed by corals to obtain food in the form of zooplankton and oxygen and can clean corals from sediment.

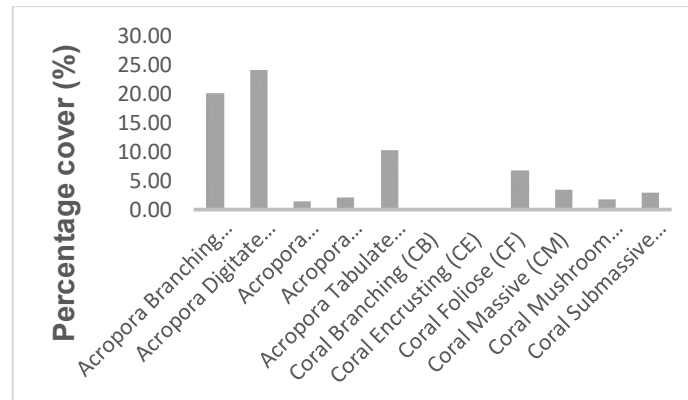
The results showed that the highest coral cover was in the category of hard coral (HC) 72.92%, Dead Coral Algae (DCA) 9.09%, Sand (S) 8.92%, Rubble (R) 6.15%, Dead Coral (DC) 2.03%, Rock (RK) 0.52%, and Soft Coral (SC) 0.33%. The results of the analysis show that the percentage of live coral on Gili Labak Island is in the good category. Benthic cover on Gili Labak Island can be seen in Figure 2.



**Figure 2.** Percent closure on Gili Labak Island

The highest category of coral coral cover (HC) at the study site was due to the observation location being in waters that were directly opposite a closed area with weak waves. The coral was found growing in deeper places. It is natural selection for these animals to protect their colonies from damage.

The results of live coral data on Gili Labak Island reached 72.92% consisting of Acropora Branching (ACB) 19.88 %, Acropora Digitate (ACD) 23.87%, Acropora Encrusting (ACE) 1.44%, Acropora Submassive (ACS) 2.09 % , Acropora Tabulate (ACT) 10.27 % , Coral Branching (CB) 0.07%, Coral Encrusting (CE) 0.20%, Coral Foliose (CF) 6.80%, Coral Massive (CM) 3.40 % , Coral Mushroom (CMR) 1.90%, and Coral Submassive (CS) 3.01%. The results of live coral on the island of Gili Labak can be seen in Figure 3.



**Figure 3.** Results of live coral analysis on Gili Labak Island

Types of coral reefs in the waters around Gili Labak Island are fringing reefs. The basic forms of complete coral colonies are massive, branching, encrusting, and foliaceous corals. The type and number of life forms, especially those with branched and massive colonies, are high enough to support the life of marine organisms. The high percentage of CB is supported by clear water conditions and far from sedimentation so that sunlight penetration can penetrate the waters up to 100% at a depth of 3-10 m. According to , in clear waters or low sedimentation, corals will be found in branched and tabulated forms.

#### 4. Conclusion

Based on the results of monitoring the condition of coral reefs on Gili Labak Island, it can be concluded that: The percentage of live coral cover using the UPT method is 72.92% so it is categorized as good. This shows that Gili Labak Island has quite good coral reefs but is under pressure from destructive human activities or due to pressure from natural factors.

## 5. References

- [1] Nurrahman Y A, Faizal I 2020 *Akuatika Indones.* 5(1) 27–32.
- [2] Akhmad D S, Supriharyono and Purnomo P W 2018 *J Ilmu dan Teknol Kelaut Trop.* 10(2) 419–430.
- [3] Roche R C, Harvey C. V, Harvey J. J, Kavanagh A P, McDonald M, Stein-Rostaing V R, and Turner J R 2016 *Environ Manage.* 58(1) 107–116.
- [4] English, S., Wilkinson, C., & Baker, V. 1998. Survey manual for tropical marine resources. Second edition. *Survey Manual for Tropical Marine Resources. Second Edition.*
- [5] Muhsoni F F, Syarief M, and Effendi M 2011 *J Ilmu Kelaut.* 4(1), 96–101.
- [6] Muhsoni F F 2016 *Semin Nas Perikan dan Kelaut VI, Fak Perikan dan Ilmu Kelautan, Univ Brawijaya Malang.* 1–6.
- [7] Muhsoni, F. F. 2017. *Potential and Management of Gili Gili Labak Island.* UTM PRESS.
- [8] Muhsoni F F, and Nuraini C 2006 *J Protein.*, 13(1) 87–94.
- [9] Insafitri I, Asih E N N, and Nugraha W A 2021 *Bul Oseanografi Mar.* 10(2), 151–161.
- [10] Insafitri I, Asih E N N, and Nugraha W A 2020 *AACL Bioflux*, 13(6), 3789–3797.
- [11] Giyanto. 2013. *Underwater photo transect method for assessing the condition of coral reefs. Oseana, Volume XXX.*
- [12] Gomez Yap, H. T., E. D. 1984. Monitoring reef conditions. In *Coral reef management handbook.*
- [13] Madduppa H, and Zamani N P 2011 *J Indones Coral Reefs.* 1(2). 137-146
- [14] Nyabakken, J. W. 1992. *Marine Biology an Ecological Approach* Translated by H.M. Eidman, Koesbiono *et al. Jakarta : Gramedia.*

## 6. Acknowledgement

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