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*by Ahmad Jupri*

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## Identification and Abundance of Macroalgae at Batu Layar Coast, West Lombok, Indonesia

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**Identification and Abundance of Macroalgae at Batu Layar Coast, West Lombok, Indonesia**

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**Abstract** Batu Layar coastal area provides an optimum environment for the diversity of coastal biota in the form of corals, crustaceans, molluscs, echinoderms and macroalgae. Macroalgae are plant-like marine biota that are large in size. Based on taxonomy, macroalgae are included in the Thallophyta group because their bodies are thallus. The purpose of this study is to evaluate the abundance of macroalgae in Batu Layar Coastal areas to be used as primary data for further research. This research is located at Batu Layar Coast using the Transect method. The number of transects used is 4 transects with the length of each transect is 50 m. On each transect, 5 stations were taken. Samples of each different macroalgae species at each station were taken for the purpose of morphological identification. Macroalgae identification is presented in the form of descriptive analysis and graphs in the presentation of diversity, evenness, and abundance. The results of the identification of macroalgae in research at Batu Layar Coast as a whole found that there were 24 species of macroalgae consisting of 11 species of Chlorophyta, 8 species of Rhodophyta and 5 species of Phaeophyta. Dominant species on the shoreline are Chlorophyta, in the middle of the transect most of algae are the Phaeophyta and dominant species farthest from the shore are Rhodophyta. The conclusion is the most abundant macroalgae species is *Gelidium latifolium* from Rhodophyta division with number of abundance is 4.58 individuals/m<sup>2</sup>.

### 1. Introduction

Macroalgae or often called seaweed is a group of macro-sized algae that belongs to the protist kingdom because it has chlorophyll. Macroalgae could not be distinguished between the roots, leaves and stems. The leaf-like part of the algae is called the thallus. Based on the macroalgae pigments, they are divided into three divisions, namely Chlorophyta (green algae), Phaeophyta (brown algae) and Rhodophyta (red algae). Macroalgae have a variety of habitats to live in, ranging from sticking to rocky substrates, sticking to corals, and living on sandy to muddy substrates. [1]

Batu Layar Beach is located in Batu Layar District, West Lombok Regency, which is one of the beaches with a diversity of resources and abundant biota. Batu Layar Beach is unique because unlike the



surrounding coastal areas, Batu Layar Beach has a dominant substrate of petrified coral and live coral along its coast which can be used as a habitat for biota such as gastrophoda and crustaceans. In addition, the estuary water which directly empties into the coast of Batu Layar Beach adds nutrients to the marine biota on the beach. In addition to biota such as gastrophoda and crustaceans, macroalgae thrive in this area with abundant diversity.

However, even though the diversity at Batu Layar Beach is abundant, data related to the abundance of macroalgae species remains limited.

## 10 2. Material and Methods

### 2.1 Determination of Sampling Point

Macroalgae sampling was carried out in the intertidal area of Batu Layar Beach in September 2021 at Batu Layar Coast, Batu Layar District, West Lombok Regency, West Nusa Tenggara (8°31'01.9"S 116°03'39.6"E) (Figure 1).

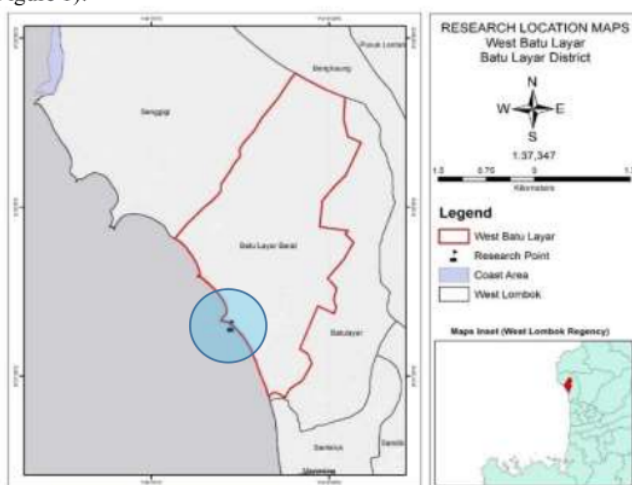


Figure 1. Research Location Maps, Batu Layar Coast, Batu Layar District.

### 17 2.2 Materials and tools

The tools used in this research are roll meter, quadrant plot 1 x 1 m<sup>2</sup>, whiteboard, hand refractometer, pH meter, thermometer, and camera. While the materials used are macroalgae which are sampled on Batu Layar coast, herbarium labels, plastic sampel, and identification books, Field Guide of Marine Macroalgae of Kuwait [2] and The Identification Of Macroalgae And The Assessment Of Intertidal Rocky Shores'ecological Statuses In The Central Western Coast Of Continental Portugal [3]

### 2.3 Sampling Method

Samples were taken using the transect method and quadrant plot (Figure 2). Transect was measured using a 200 m Roll meter and then marked using a peg. Then a 50 m line is drawn perpendicular to the shoreline towards the sea. Five square plots were placed along the right and left of the transect with a distance between the plots of 10 m. In each plot, the number of macroalgae per individual of each type was recorded, then samples were taken and put into labeled zip lock plastic to be identified in the lab.

### 2.4 Indentification

After the samples were washed and cleaned from remaining marine debris or sand. The samples were documented with a camera (Fuji X-100 mirrorless camera). Identification was firstly conducted by morphological observation of the macroalgae with guidance from the book Field Guide of Marine

2 Macroalgae of Kuwait [2] and The Identification Of Macroalgae And The Assessment Of Intertidal Rocky Shores'ecological Statuses In The Central Western Coast Of Continental Portugal [3]. In addition, online database was also used to confirm this [4].

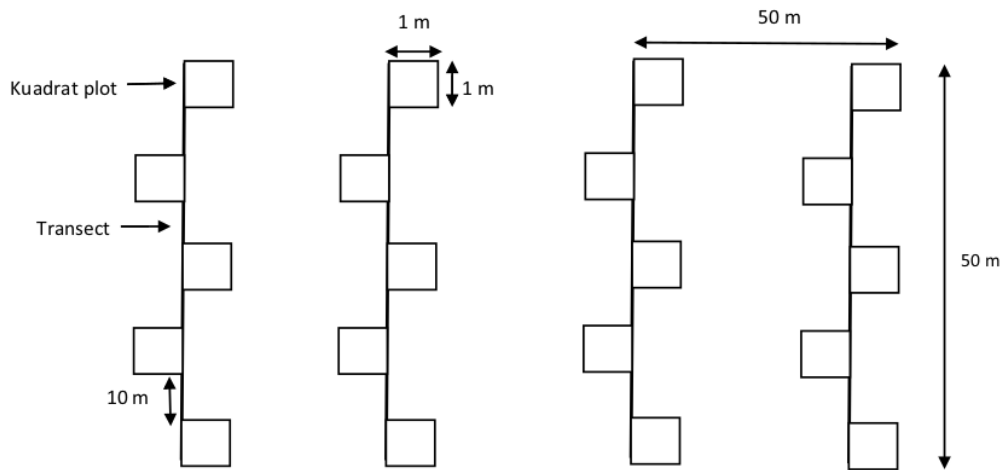


Figure 2. Line Transect Quadrant.

5 2.5. Data analysis

Quantitative data analysis was used to obtain data in the form of abundance of macroalgae species, diversity index, evenness index and species dominance index. Here are the following formulas used to analyze the data :

a. Species abundance (K)

Macroalgae abundance can be calculated using the following formula [5,6,7] :

$$K = \frac{ni}{A}$$

K = Species Abundance (individual/m<sup>2</sup>)  
 A = Observation Area  
 ni = Number of individuals of the i-th species

b. Diversity index (H') (Shannon-Wiener)

The diversity index is calculated using the formula (Shannon-Wiener) [7] :

13 
$$H' = \sum \left\{ \left( \frac{ni}{n} \right) \ln \left( \frac{ni}{n} \right) \right\}$$

H' = Diversity index Shannon-Wiener  
 ni = Number of individuals of the i-th species  
 n = Number of individuals of all species

Table 1. Classification of Diversity Index (H') Values of ShannonWiener.

No	Index Value	Description
1.	<1	5 Low diversity, low stability of community
2.	1-3	Moderate diversity, moderate spread number of individual 5 each species, moderate stability of community
3.	>3	High diversity, high spread number of individual of each species, high stability of community

**c. Evenness Index (E)**

The evenness index is calculated using the following formula [6,7,8] :

$$E = \frac{H'}{H_{max}}$$

2  
E = Evenness Index

H' = Diversity Index

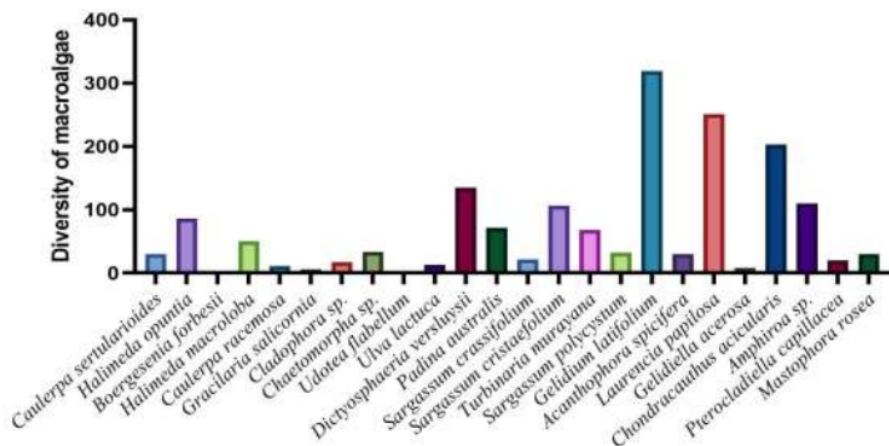
H max = ln S

S = Number of community-forming genera

If the value of E is close to 1 (one), it means that it is evenly distributed, whereas if the value of E is close to 0 (zero), it is said to be uneven.

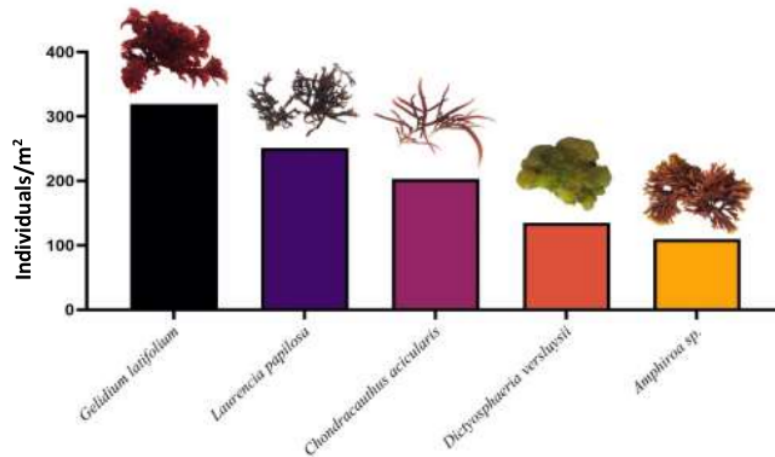
**3. Results and Discussion**

The results from this research and observation shown that 24 species of macroalgae from 3 different divisions (Chlorophyta, phaeophyta and Rodophyta) were present in Batu Layar coastal area (Figure 3). According to previous data [5,9] diversity is due to variations in the existing substrate, light intensity and aquatic environment. Generally, macroalgae lives in the intertidal areas that have a fairly high variation of environmental factors compared to other parts of the marine ecosystem [10].



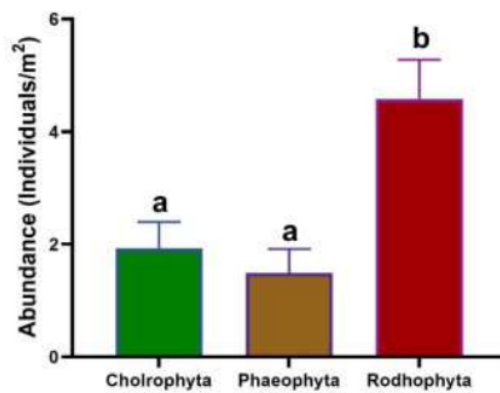
**Figure 3.** Macroalgae species found in Batu layar coastal area

Among the 24 types of macroalgae, 5 species were found to be the most abundant (Figure 4). 8 The most abundant species is *Gelidium latifolium* from the division Rhodophyta. Rhodophyta are found because Rhodophyta mostly live in the vertical zone between the surface and the seabed [11,12]. With the holdfast structure of Rhodophyta, the substrate which is dominated by dead coral is very suitable for the growth of Rhodophyta [1,5,12]. In accordance with the existing substrate on Batu Layar beach, which is dominated by a stretch of dead coral and slightly sandy.



**Figure 4.** Top 5 of most common species

The abundance of macroalgae based on their class in Batu layar coast can be seen in Figure 5. It can be seen that Rhodophyta is the most abundant division in the region. Rhodophyta abundance on Batu Layar Beach is 4.58 individuals/m<sup>2</sup>. While for chlorophyta 1.92 individuals/m<sup>2</sup> and phaeophyta 1.49 individuals/m<sup>2</sup>. Rhodophyta is abundant in this area possibly caused by the influence of the substrate and the influence of light [5,13] The substrate in the Batu Layar Beach area is dominated by a stretch of dead coral and slightly sandy substrate. This is in accordance with the results of research from previous study which states that Rhodophyta has a rocky habitat because the substrate is used for attachment [12,14]. For Chlorophyta and Pheophyta probably have lower abundance because the substrate is not suitable for them to grow. Chlorophyta's habitat is usually dominated by sandy substrates accompanied by coral debris [7]. While in phaeophyta some do not live attached to the substrate but float on the water surface like macroalgae in the genus *Sargassum* [1]. In addition, the species abundance could differ based on the sampling time. Because macroalgae abundance also depends on seasonal changes [15].



**Figure 5.** Abundance of Macroalgae. Different letters indicate significant difference between groups ( $p < 0.05$ ).



Another analysis was carried out on the diversity index and evenness index. The diversity index was analyzed using the Shannon-Wiener ( $H'$ ) equation. The diversity index was carried out to see the diversity of macroalgae and the stability of the community in this area. While the evenness index (E) was carried out to determine the degree of evenness of species at the location of data collection. From the analysis, it is known that the diversity index value at Batu Layar Beach is 2.60, which indicates that the diversity of macroalgae in this area according to the Shannon-Wiener index is moderate [8]. This means that the diversity of macroalgae is moderate, the distribution of the number of individuals of each species is moderate and the stability of the community is moderate. For the evenness index (E) obtained a value of 0.84. According to the previous research [8] the evenness of macroalgae can be said to be even because the index value is close to 1.

#### 10 Conclusion

Based on the results of this research it can be concluded that we found 24 Species of Macroalga 3 Division, 11 Chlorophyta, 5 Phaeophyta, 8 Rhodophyta. Top 5 most common types of species is *Gelidium latifolium*, *Laurencia papilosa*, *Chondracanthus acicularis*, *Dyctiosphaeria versluysii* and *Amphiroa* sp. The Abundance of Macroalgae is 2 individuals/m<sup>2</sup> for Chlorophyta, 1 individuals/m<sup>2</sup> for Phaeophyta, and 5 individuals/m<sup>2</sup> for Rhodophyta. Diversity index ( $H'$ ) is 2.60 it's indicate that the diversity of macroalga in Batu Layar coast is moderate. And the number of evenness index (E) is 0.84 where it can be said that the type of distribution is even. The limitation of this study is that it was conducted in one time period which is September, the dry season. The abundance and diversity may be different if the sampling was conducted in a different time period. Nevertheless, current study shows that Batu layar coastal area provides rich diversity of macroalgae samples which are potential natural resources for various utilizations.

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