Identification Of The Diversity Of Marine Algae The Coast of The Cumpleng Hamlet In Brengkok Village, Lamongan District

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Abstract:

Algae are marine biological resources that are found in many coastal areas and Indonesian waters, one of which is the coast of Dusun Cumpleng. On the coast of Dusun Cumpleng, there are various kinds of marine algae scattered in it. However, until now the species of algae on the coast of Dusun Cumpleng have not been identified. So based on this, a study was conducted with the aim of identifying the diversity of marine algae species on the coast of Dusun Cumpleng. This type of research is quantitative descriptive research with on-site surveys for data collection. Observation and collection of algae is carried out directly at the location with the criteria of a rocky place. Next, identify the type of algae. Algae samples obtained were identified using an algae identification book. Based on research conducted in the waters of the Dusun Cumpleng Coastal Sea, there are 5 species from 4 families. For that is, *Eucheuma spinosum* from the Solierisceace family, *Caulerpa racemosa* from the Caulerpaceae family, *Halimeda discoides* from the Halimedaceae family, *Turbinaria ornata*, and S*argassum polycystum* from the Sargassaceae family. These species are *Eucheuma spinosum*, *Caulerpa racemosa*, *Halimeda discoides*, *Turbinaria ornata*, and *Sargassum polycystum.* Based on the results of data analysis obtained. The algae species diversity index on the Dusun Cumpleng coast is 1.51. The index value of the dominance of Algae species on the Dusun Cumpleng coast is 0.2202. Based on the diversity index and dominance index values, the algae species on the coast of Dusun Cumpleng are classified as low.

***Keywords**:* algae diversity, cumpleng hamlet coast, and rocky coast

1. Introduction

Indonesia is an archipelago that stretches from 6LU to 10℃ latitude and from 95℃ east longitude to 142℃ east longitude, has 17,508 large and small islands with a coastline of 80,791 km, Indonesia has about 17,500 islands, with 81,000 km of coastline. About 62% of Indonesia's territory is sea and water (Maiti & Bidinger 1981). Two-thirds of Indonesia's territory is a sea that has the potential for natural resources that are very important for the life of the nation. One of the northern beaches of its waters is the coast of Dusun Cumpleng which is located in the northeast of Brengkok Village (Diansyah et al. 2018)(Silaban 2019)(Jenis et al. 2019). The coastal waters of Dusun Cumpleng are thought to have the potential of marine biological resources which are quite abundant and rich in abundance of marine biota. (Herlinawati et al. 2017).

Dusun Cumpleng is one of the hamlets of Brengkok Village, Brondong District, Lamongan Regency, which is close to coastal waters, where the beach has the potential of marine resources scattered therein. (Tuiyo 2016). On the beach you can find many

marine life, one of which is marine algae (Sataloff et al. 2017). The marine algae on the coast of Dusun Cumpleng have several characteristics that are also shared by other marine plants, such as chlorophyll pigments. (Rahmat & Kasim, Ma'ruf. 2020). Morphologically, algae can be divided into two groups, namely microalgae and macroalgae (Pengusul 2016). Microalgae are a natural source of various important compounds, including pigments, and Macroalgae are benthic marine algae that are photosynthetic and occupy the first trophic in the food chain (Fauzan & Widiarti 2018)(de Fretes et al. 2012).

Algae is seaweed which is a low-level plant whose habitus is difficult to distinguish between roots, stems and leaves. The whole body is called the thallus (Thallophyta), in terms of the morphology of the algal organs such as: the roots, stems and leaves are undifferentiated (Bama et al.)(MPOC 2020)(Sundari et al. 2017)(Zedadra et al. 2019)(Ardiyanto et al. 2020). Algae or seaweed in nature live attached to a stable substrate to maintain its position so that it is not carried away by currents, waves and tides (Meiyasa et al. 2020)(Tarigan et al. 2020). In general, algae are chlorophyll organisms. The reproductive organs of algae are generally single cells, but algae can also have one cell or many cells by forming colonies (Oryza et al. 2016) (Bintan). Marine algae are one of the many marine biological resources that are found in waters and have great potential for growth and have many benefits for both humans and the surrounding environment (Purwo et al.). In addition, the chemical content in algae can also support human needs as food and industry which makes a significant contribution to regional income. Marine algae can meet human needs from energy independently by carrying out photosynthesis (Suwandi et al. 2017). Algae have 2 habitats to live in water, both living in fresh water and in sea water (Lukitasari & Purwati 2015). Most of the diversity of algae in Indonesia has a high economic value and can be used as food, traditionally marine algae is used as medicine by people especially in coastal areas (Nurgayah 2019). The greater the number of types of algae, the higher the diversity value (Melsasail & Namakule 2020) (Harmoko & Sepriyaningsih 2017).

The diversity and abundance of marine algae on the coast of Dusun Cumpleng has now decreased due to environmental factors that affect the growth and survival of algae (Khotija et al. 2016)(Meiyasa et al. 2020). The survival of algae depends on the conditions of their habitat, either from physical conditions, chemical conditions or biological conditions of the water (Srimariana et al. 2020) (Tuiyo 2013) (Nurhasanah 2014). The more algae that can be taken by the community in a place, it can show how much the level of productivity and quality of the area. The quality of the area can be said to be good if the environmental condition parameters still meet the existing quality requirements. However, there is a problem regarding the condition of the coastal environment in Dusun Cumpleng due to lack of maintenance of marine cleanliness which can result in a decrease in algae on the quality of the coastal environment (Shobir et al. 2019).

Based on these conditions, there is a need for a study of marine algae in the coastal waters of Dusun Cumpleng, Brondong District, Lamongan Regency with the aim of identifying the Diversity of Marine Algae on the Coastal Coast of Cumpleng Hamlet, Brengkok Village, Brondong District, Lamongan Regency.

2. Research Methods

2.1 Types and Research Methods

This type of research is a quantitative descriptive study, which is a form of data collection that aims to describe or describe the diversity of marine algae on the coast of Dusun Cumpleng. The method used in this study is a survey method, namely direct observation to obtain data or facts regarding the diversity of marine algae species to the research location located in the coastal waters of Dusun Cumleng on rocky site criteria, this research was conducted during January 2021. The data collected in the form of primary data includes types of algae, diversity index and dominance index. The tools and materials used in this study are cameras, plastic bags, pH meters, and algae identification books.

2.2 Research Steps

The steps in this research include the first stage, namely the field observation stage which aims to determine the initial state of the conditions of the research location. Observations are made by observing directly to determine the location to be used by the research. The second stage is the stage of determining the research location. The location determination is based on the results of the survey that has been carried out, namely at the Dusun Cumpleng Beach as shown in Fig 1. The third stage is the stage of preparing tools and materials. The subjects to be studied were marine algae and tools and materials to be used in the study, namely: cameras, plastic bags, pH meters, and identification books. The fourth stage was sampling. Sampling of marine algae was carried out using documentation techniques and roaming techniques at the research location and the sampling location as shown in Fig 2.

Figure 1. Research Location in the Coastal Areas of Dusun Cumpleng
Source: Personal Documents

Figure 2. Sampling Location in the Coastal Areas of Dusun Cumpleng

Source: Personal Documents

2.3 Data Collection Technique

The data collection technique used in this study is a direct survey technique. The direct survey technique is to take or directly observe the type of algae at the research location which is located on the Dusun Cumleng Beach, Brondong District, Lamongan Regency. The data obtained after making observations (direct observation) are various types of marine algae diversity in Cumpleng Beach, namely in the form of primary data. which includes observations of the object of research in the form of types and numbers of individual marine algae on the Cumpleng Coastal Coast.

2.4 Data Analysis

Analysis of Species Diversity Index Data

To determine the diversity of algae species in the waters using a diversity index which shows the relationship between the number of species and the number of individuals that make up a community. with the formula according to Shannon-Wienner:

$$H' = -\sum_{i=1}^{S} \left(\frac{Ni}{N}\right) \ln \left(\frac{Ni}{N}\right) \qquad (1)$$

Information :
H '= Shannon-Wienner diversity index
Ni = Number of individuals of one kind
N = total number

Based on the species diversity index according to Shannon-Wienner is defined as follows:
a. The value of H '> 3 indicates that diversity is high
b. The value of H '1 ≤ H' ≥ 3 indicates that diversity is moderate
c. The value of H '<1 indicates that the diversity is little or low

Dominance Index Data Analysis

To determine the value of the dominance index and the status of the community condition, it can be determined using the dominance index. with the formula:

$$D = \sum_{i=1}^{S} \left[\frac{Ni}{N}\right]^2 \qquad (2)$$

Information :
D: Simpson-dominance index
Ni: Number of individuals of type i
N: The total number of individuals
S: Number of types

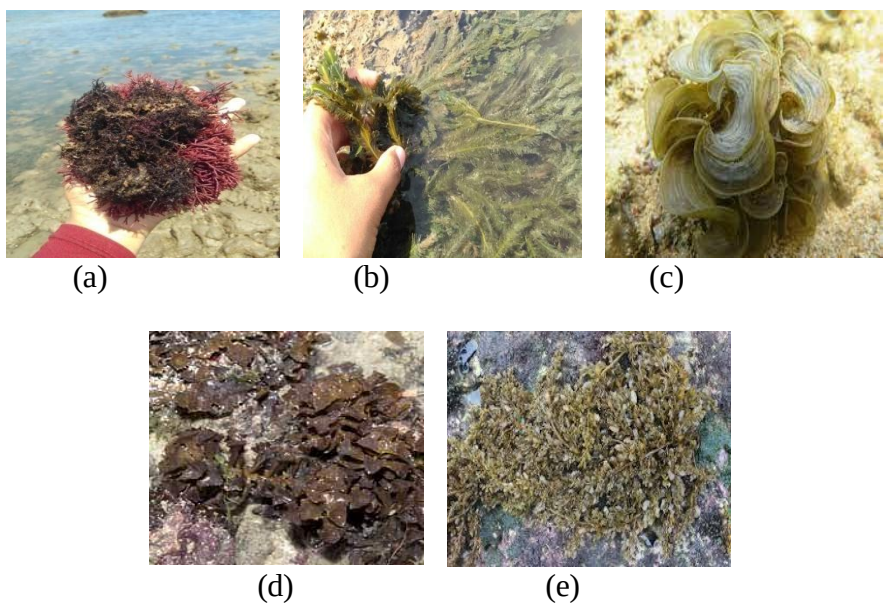
The range of Domninace indices is as follow:
$0 < C \leq 0,5$: Low dominance (no species that extensively dominate other species), stable environmental conditions, and no ecological stress to the biota in

		the location
$0,5 < C \leq 0,75$	:	Moderate dominance and fairly stable environmental conditions
$0,75 < C \leq 1,0$	:	High dominance (there are species that dominate other species), environmental conditions are unstable, and there is an ecological pressure

3. Results and Discussion

3.1 Results

The types of algae that were found in the coastal area of Dusun Cumpleng are presented in Fig. 2. Of the 5 species and 4 families, namely: *a) Eucheuma spinosum, b). Caulerpa racemosa, c). Halimeda discoides, d). Turbinaria ornata, e). Sargassum polycystum.* Meanwhile, the marine algae found on the Coastal Coast of Dusun Cumpleng amounted to 114 individuals from 5 species and 4 families which are presented in Table 1. The results of data analysis on the Diversity Index on the coast of Dusun Cumpleng are presented in Table 2. and the results of the dominance index analysis are presented in Table 3.



(a) (b) (c)

(d) (e)

Fig. 2. Types of Algae found in the Coastal Areas of Dusun Cumpleng
a). *Eucheuma spinosum,* b). *Caulerpa racemosa,* c). *Halimeda discoides,* d). *Turbinaria ornata,* e). *Sargassum polycystum.*
Source: Personal Documents

Table 1. Identification results of marine algae diversity in Cumpleng Hamlet Coast

No.	Family	Species	Number of Species
1.	Solierisceace	*Eucheuma spinosum*	38
2.	Caulerpaceae	*Caulerpa racemosa*	26
3.	Halimedaceae	*Halimeda discoides*	20
4.	Sargassaceae	*Turbinaria ornata,*	16
5.		*Sargassum polycystum*	14
Total Number			114

Table 2. Data on the Diversity Index of marine algae on the coast of Dusun Cumpleng

No.	Family	Species	Number of Species	H'
1.	Solierisceace	*Eucheuma spinosum*	38	0,36
2.	Caulerpaceae	*Caulerpa racemosa*	26	0,33
3.	Halimedaceae	*Halimeda discoides*	20	0,30
4.	Sargassaceae	*Turbinaria ornata,*	16	0,27
5.		*Sargassum polycystum*	14	0,25
Total Number			114	1,51

Table 3.Data on the Dominance Index of marine algae on the coast of Dusun Cumpleng

No.	Family	Species	Species of Number	D
1.	Solierisceace	*Eucheuma spinosum*	38	0,1089
2.	Caulerpaceae	*Caulerpa racemosa*	26	0,0484
3.	Halimedaceae	*Halimeda discoides*	20	0,0289
4.	Sargassaceae	*Turbinaria ornata,*	16	0,0196
5.		*Sargassum polycystum*	14	0,0144
Total Number			114	0,2202

3.2 Discussion

Based on the results of the study (Table 1.), it was found that the types of algae in the coastal waters of Dusun Cumpleng Lamongan Regency with a total number of 114 consisting of 5 species, namely *Eucheuma spinosum, Caulerpa racemosa, Halimeda discoides, Turbinaria ornata*, and *Sargassum polycystum*. The five species come from 4 families, namely Solierisceace, Caulerpaceae, Halimedaceae, Sargassaceae.

Eucheuma spinosum (Figure 2a) is one of the most important types of algae and is widely distributed. *Eucheuma Spinosum* itself is a type of seaweed from the Rhodophyceae (red algae) class and from the Solierisceace family. The characteristics of this type of seaweed are the cylindrical thallus, the thallus branching with a pointed or blunt tip and growing nodules, in the form of soft spines arranged regularly around

the branches, more than in *E. cottonii*. The central tissue consists of filaments that are colorless and surrounded by large cells, a layer of cortex, and a layer of epidermis (Inventarisasi keanekaragaman makro alga di teluk meru taman nasional meru betiri banyuwangi 2008). Several types of *Eucheuma spinosum* have carrageenan levels that range from 3% to 547% depending on the type and location where it grows. Recent studies have found that the extracts of *K. alvarezii* and *E. spinosum* have demonstrated antibacterial properties (Ii & Pustaka 1998).

Caulerpa racemosa (Figure 2b) is a type of sea grape from a group of green algae that lives spreading in several Indonesian waters, of course on the north coast, one of which is Dusun Cumpleng Coast. *Caulerpa racemosa* has special characteristics, namely the plant can grow to a height of 8.5 cm, the standing branches have the shape of leaves like grapes, the color of the thallus is green, the shape is tubular, and there are small nodules, living attached to rocks in shallow waters. *Halimeda discoides* (Figure 2c). is a type of green algae with a thallus height of 8 cm, which is very rigid and shaped like a branched, overlapping and irregular kidney, with a width of 0.7 cm and a height of 0.5 cm.

Turbinaria ornata (Figure 2d) is one of the brown algae that is used by the community as medicine. The general characteristics of this brown algae are that generally the color of the thallus is brown, the body is like a tree or bush, the shape of the main thallus is generally cylindrical, the shape of the leaves is like a trumpet. , amethyst or funnel with serrated edges, having an air bubble bladder located on the phyloid. *Sargassum polycystum* (Figure 2e) is a brown algae that grows in coral reef areas. The body of *Sargassum polycystum* is dominated by brown color with a cylindrical thallus shape [33]. The main body is diploid or a sporophyte, in which the talus has branches that resemble angiosperms. This type of seaweed has the appearance of a slightly flattened, slippery shape and the main stem is rather rough.

Based on the type of algae found, the most common is *Eucheuma spinosum*, and the least is *Sargassum polycystum*. where *Eucheuma spinosum* is found living in the sea which is most often found. While *Sargassum polycystum* (brown algae) is found the least because brown algae is one of the algae that grows in coral reef areas and often appears in shallow water. The body of Sargassum polycystum is dominated by brown color with a cylindrical tallus (Manteu et al. 2018). Based on the images of marine algae found, it can be seen that what is useful or edible are the families of Caulerpaceae and Halimedaceae, because Caulerpaceae itself is green algae or in Javanese language (Latoh) and Halimedaceae is also a green alga similar to latoh. Meanwhile, the algae used as medicine are the Solierisceace and Sargassaceae families. The growth and abundance of marine algae is strongly influenced by weather factors and coastal environmental conditions.

Based on Table 2 shows that the value of the Algae diversity index found is 1.51 which indicates that the diversity of Algae on the coast of Dusun Cumpleng is moderate. This is because diversity is also used to determine the effect of abiotic environmental factors on the community (Karmana, Wayan 2010). High species / species diversity indicates that a community / ecosystem has high complexity due to very high species interactions in the community. a community is said to have high species diversity if the community is composed of many species, on the other hand, a community is said to have low species diversity if the community is composed of a few striking species (Nuraina et al. 2018). This research is in line with the statement of

Dharmawan et al (Zedadra et al. 2019). that the species diversity index is an important community character to be discussed in depth both in concept and in its application in the field. where diversity is a combination of the number of species that make up a species community (richness) and the number of individuals in each species (evenness).

Based on Table 3, it shows that the Algae dominance index value found is 0.2202, which indicates that the dominance of Algae on the coast of Dusun Cumpleng is low. which can be interpreted that in the community there is a tendency for the dominance of certain species, this indicates that the condition of the community is in a stable environment. According to odum (Murti 2020) (2013). The dominance index ranges from 0 to 1, where the smaller the dominance index value, it shows that there is no dominant species, on the contrary, the greater the dominance it indicates the presence of certain species. (Sirait et al. 2018). As stated by Indriyanto (Nurmianti et al. 2015). The dominance of species in a community can be concentrated on one species, several species, or on many species which can be estimated from the high and low of the dominance index. This is in line with research conducted by Barange and Campos (Sirait et al. 2018). explained that the dominance shows that there is competition / competition in the utilization of environmental conditions and marine natural resources that are not balanced or less stable (depressed).

In this research, the type of marine algae carried out in the waters of Dusun Cumpleng Beach is the species with the most individuals at low tide and can be less due to unpredictable weather and poorly maintained sea conditions. This is because marine algae generally grows and attaches to rocks and often appears at low tide, while the substrate that dominates the Cumpleng coast itself is a rocky substrate. (Zainuddin 2009).

4. Conclusion

There are 114 types of marine algae found in the coastal waters of Cumpleng Hamlet, Lamongan Regency, consisting of 4 families, namely Solierisceace, Caulerpaceae, Halimedaceae, and Sargassaceae. The four families come from 5 species, namely: *Eucheuma spinosum, Caulerpa racemosa, Halimeda discoides, Turbinaria ornata* and *Sargassum polycystum.* Based on the data analysis, the value of Algae diversity is 1.51 which means moderate, and the dominance value is 0.2202 which means low. Based on this, it can be concluded that the environmental conditions of Dusun Cumpleng Beach are quite stable, which means that there is no striking dominance of certain species and is good enough for the growth of marine algae.

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