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Diversity of Macroalgae in Kasiak Gadang Island Nirwana Beach, Padang - West Sumatra, Indonesia

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ABSTRACT

This study had been conducted in October – November 2014. This study aims to know about the diversity of macroalgae in Kasiak Gadang Island, Nirwana Beach, Padang, West Sumatra Indonesia. The method used in this research is line and belt transect. The result of this study is five species of macroalgae founded on this island. There are *Padine minor*, *Sargassum crassifolium*, *Sargassum cristaefolium*, *Turbinaria decurrens*, and *Halimeda* sp. Based on relative density, *P. minor* had 67.15% at Station I and 51.72% at Station II. *S. crassifolium* had 83.52% at Station III. *T. decurrens* had 50.86% at Station IV. The index of diversity of macroalgae in Kasiak Gadang Island is about 0.48 – 1.27. According to the diversity index criteria, macroalgae diversity in this island is considered being in low.

Keywords: *Diversity, index of diversity, Kasiak Gadang Island, macroalgae, Nirwana Beach*

INTRODUCTION

One of the biology resources that has an important role in marine life is macroalgae. Macroalgae is one of the low-level organism from the division of Thallophyta. All of them is a multicellular plant. Based on the pigment of photosynthesis, macroalgae can be divided into 3 division: Chlorophyta (green algae), Phaeophyta Brown algae) and Rhodophyta (red algae) [1]. The diffferences between the groups are big enough that they were considered as not being related [2]. There are 555 spesies of macroalgae that had been recorded in Indonesian beaches. But not all of them had been used by human because there had not been knowledge yet [3].

Macroalgae or usually we called seaweed is similar in form to the higher vascular plants but the structure and the function of the parts are significantly different from the higher plants. Macroalgae do not have true roots, stem or leaves. But the whole body of the macroalgae is called thallus that consists of the holdfast, stipe and blade. The holdfast resembled the root of higher plants, but its function is for attachment and not for nutrients absorption. The stipe resembled the stem of the higher plants but its function is for support the blade. The blade resembles leaves of the higher plant has function for photosynthesis and absorption nutrients [4].

Nowadays, some of the culinary industry in Japan, Korea, and China, had been increasing and developing the value of the food intake of macroalgae. With this, using macroalgae as material for healthy food keep increasing, and product development from macroalgae keep growing. All of this can happen because mineral wealth and essential element content in macroalgae are more useful than terrestrial food plants [5].

Frequency and density of macroalgae are very useful, as primary producer, food resources, habit and place for an organism that looking for food and shelter in the marine ecosystems such as Crustacea, Mollusca, Echinodermata, and fish. The type of life for macroalgae is called "*rumpun*". It gives protection for small marine organisms from the high wave [6]. In the marine environment, macroalgae can act as decontaminants, by absorbing a range of marine environment toxins, for instance, heavy metals [5].

Distribution of maroalgae had been limited by litt-

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ttoral zone and the sub-littoral zone where the sunlight still penetrated. This zone was important because had sunlight that can be used by macroalge for photosynthesis. Littoral zone is a zone that matched for macroalgae life because there are stone and rocks. The macroalgae will be decreasing at zone with muld and sand [7]. Distribution for macroalgae also had been found in some islands in Padang City. Padang is a capital city of West Sumatra that located at West Coast Sumatra. Padang city had 19 small islands and shoreline. One of this small island is Kasiak Gadang Island. Based on administration, this island coordinates at 1°1' 8.30" South Latitude and 100°21' 45.71" East Longitude. The island has an area of approximately around 1 ha [8]. This island sprawls with different species of macroalgae. When the low tide comes, we can see macroalgae in this coastal waters. However, there is no record on the diversity of macroalgae in this island. This paper tells about how the diversity of macroalgae in this island is.

MATERIALS AND METHODS

This study was conducted from May to November 2014 in Kasiak Gadang Island, Nirwana Beach, Padang, West Sumatra Indonesia. Then this study was continued to Laboratory of Research for Plants and Animals Ecology at Biology Department, Faculty of Mathematics and Natural Sciences, Andalas University, Padang.

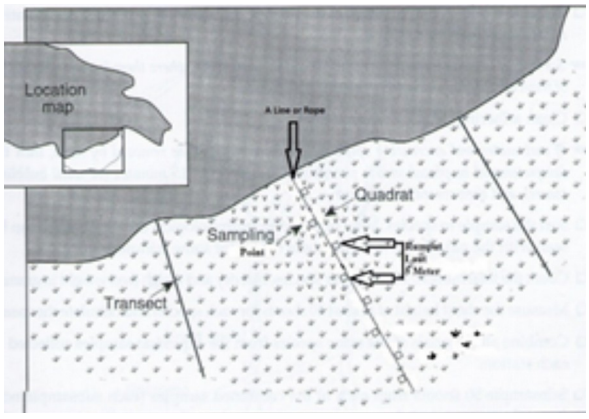

Figure 1. Schematic representation of sampling for baseline macroalgae surveys

The methods used in this study were line transect and belt transect. A long rope was laid perpendicular to the coast from high tide to the low tide. Sampling point using belt transect 0.25 m^2 placed systematically along the rope. The sampling point marked at 5 m interval along the rope. The island was divide into four station sampling area. In each stations was taken 3 line transect (Figure 1) [9]. All of the Stations are Station I at North-East of the Island, Station II at South-East of the Island, Station III at North-West of the Island and Station IV at South-West of the Island. Samples of macroalgae collected from this island were identified using identification books at species level morphologically based on Carpenter and Niem (1998) [10].

To know about Index Diversity of Macroalgae, we were using formula of Index Diversity Shannon-Wiener in Estradivari *et al.* (2007) [11]:

$$H' = -\sum pi \ln pi$$
$$pi = \frac{ni}{N} \quad (1)$$

H' : Index of diversity
pi : ni/N
ni : Quantity of species individual of the – it species
N : Quantity of total individual

RESULTS AND DISCUSSION

Based on Figure 3, at the station I there is *Padina minor* had the highest relative density 67.03 %. It is not only had the high relative density at station I but also at Station II 52.28%. At station III, species that had the highest relative density is *Sargassum crassifolium*. It had relative density is 84.12%. At station IV, species that had the highest density is *Turbinaria decurrens*. It had relative density 50.77%.

Many species of macroalgae can tolerate being dried out completely and being subjected to fluctuation of temperature. A large number of macroalgae had adapted to live in the intertidal zone with different type of substrates [5].

There are some factor affected all of this differences. There are temperature and type of substrate. *P. minor*, *S. crassifolium* and *T. decurrens* had able to survive in high-temperature condition. The temperature in this island had ranged around 31 – 35°C. The average temperature for Tropical Ocean around 20 – 30°C [12]. This three species also found in Nirwana Beach [13] when the temperature in this beach was 30 – 31°C. Not only temperature, but also substrate affffected density and diversity of macroalgae. Generally, macroalgae need rocks or hard substrate to live. But, some macroalgae can survive in sand substrate.

In the Station I, II and III dominated with sand substrate. *P. minor* and *S. crassifolium* can survive in

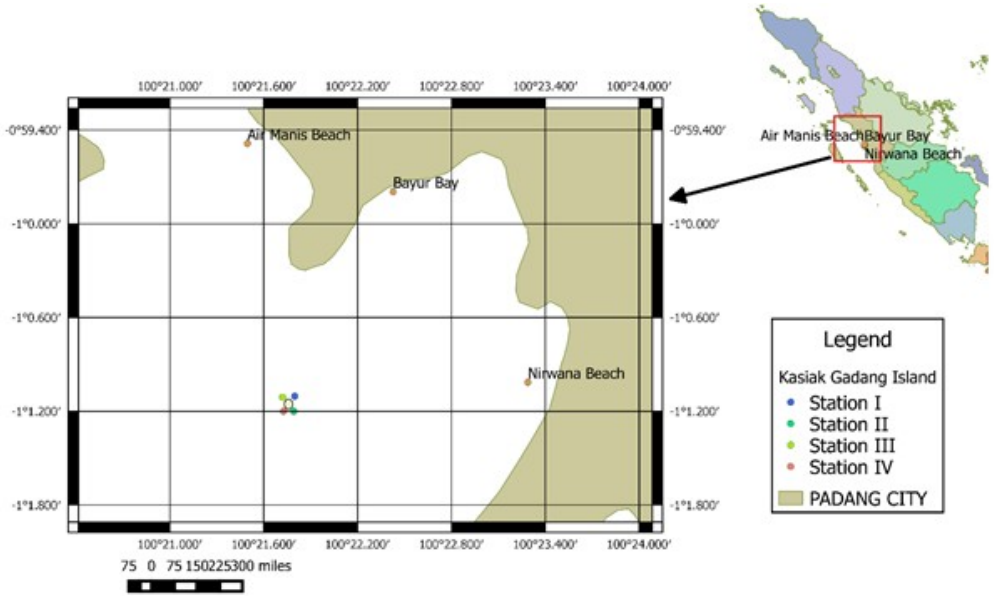

Figure 2. Location of sampling stations in Kasiak Gadang Island, Nirwana Beach, Padang

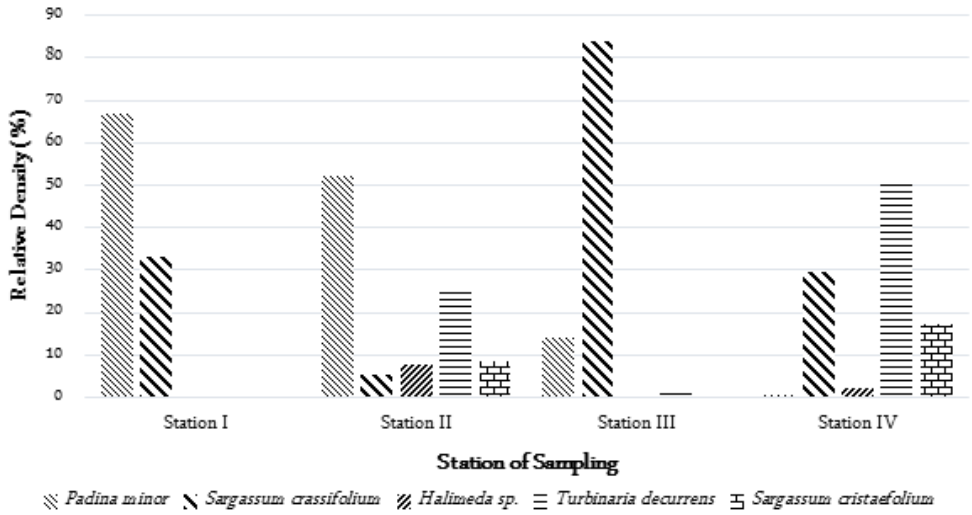

Figure 3. Relative density of macroalgae in Kasiak Gadang Island, Nirwana Beach, Padang

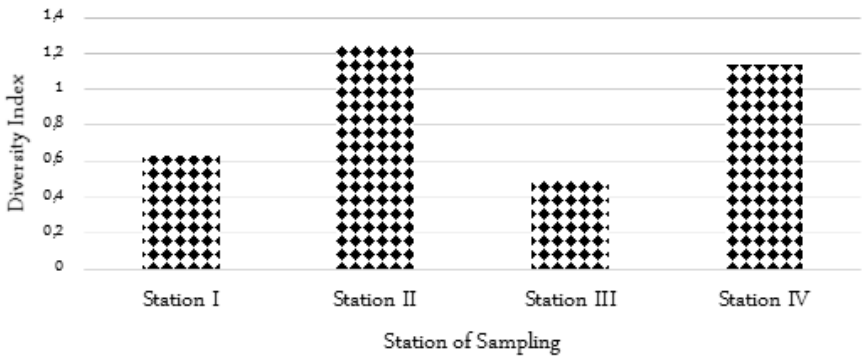

Figure 4. Diversity index of macroalgae in Kasiak Gadang Island, Nirwana Beach, Padang

sand substrate [14]. In the station IV dominated with rocks substrates. This is why *T. decurrens* had the highest density in this station. It can't live in the sand substrate. This species need hard substrate to attach their holdfast. and substrate it seems having less macroalgae, but some species of macroalgae can survive at sand substrate. For instance *Padina* spp., *Sargassum* spp. (Phaeophyta), *Codium* spp., *Caulerpa* spp., and *Enteroporpa* spp. (Chlorophyta) and *Acanthophora* spp. (Rhodophyta) [15].

Based on figure 4 there are differences diversity index of each station. Station one got index diversity 0.63. Station two was 1.24. Station three had 0.49 and Station four had 1.14. High and low of the value of index diversity was influenced by a number of species, the quantity of species and the balance of macroalgae distribution [16]. According to Diversity Index criteria by Ludwig and Reynolds (1988) in Estradivari *et al.*, (2007), if H'$\leq$ 2.0, it means low diversity. If 2.0 < H' $\leq$ 3.0, it means medium diversity and if H' > 3.0, it means high diversity [10]. Based on that criteria, diversity of macroalgae in this island considered being in low diversity. Its means macroalgae in this island has total low species and individuals of species. This is happen because the temperature in this island is high. The other research was found when temperature in 27 - 28.4°C founded 33 species of macroalgae in Masawoy Beach, Ambalau Island [17].

CONCLUSION

There are five species of Macroalgae found on this Island. Diversity Index of Macroalgae in this island around 0,49 – 1,24. Even though the relative density of macroalgae in each station different but according to the criteria of Diversity Index, the Diversity of Macroalgae in this island considered being in Low Diversity.

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