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Diversity and density of mangrove in Nusa Laut island beach

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Abstract. Mangrove forests are typical forest types along the coast or river estuaries that are influenced by tides. Mangrove often referred to as coastal forests, tidal forests, brackish forests, or mangrove forests. All the plants in this forest interact with each other both the biotic and abiotic environment. All these interdependent systems make up what is known as the mangrove ecosystem. A glimpse of mangrove forest in Nusa Laut is still good and looks green because it has good characteristics and has not been contaminated or suffered long-term damage caused by human civility. This is of course very inversely with the existing mangrove forest conditions in other islands like Ambon Island whose status has been categorized in the state of damage to the mangrove forest that is located around the bay Ambon. The island of Nusa Laut is one of a series of small islands in the Province of Central Maluku, which has a wealth of mangrove forest spread over seven (7) villages. This study aims to determine the value of diversity, as well as the density of mangroves in the coastal island of Nusa Laut. The data obtained were analyzed to determine and obtain the value of diversity H '> 1 (height) and the value of K where K = area/distance of the average tree is more than 1,500 stands/ha then the value is high. The results showed that it's found six types of mangrove with the value of diversity H '= 0.86 is low while the density value is 4054.65 trees/ha classified as good, so it can be said that the value of the diversity of mangroves at Nusa Laut island was low because H' <1, while for density is density > 1,500 stands/ha categorized as good.

Keywords: Diversity, Density and Nusa Laut Island

1. Introduction

Mangrove forest is a typical forest type found in along the beach or estuary in influence by tides. Mangrove often referred to as coastal forests, tidal forests, brackish forests, or mangrove forests. All the plants in this forest interact with each other both biotic and abiotic environment. All these interdependent systems form what is known as the mangrove ecosystem.

Another uniqueness is the all-around function mangrove forest as a source of income for rural communities in coastal areas, where the development of certain marine biota and coastal flora-fauna, and can be developed as a tourist attraction for education and research. Ecologically, mangrove forests serve as spawning areas and areas exemptions some types of fish, shrimp, shellfish and other species.

In addition mangrove litter that fell in the waters become a source of biota waters and elements that determine the productivity of fisheries in the coastal and marine waters. Mangrove forests with solid

and canopy root systems and canopy serve as terrestrial explosions from the waves, tsunamis, hurricanes, seepage of seawater, and other malignant marine forces (Supardjo, 2008: 10).

According to Pattimahu et al (2010: 240) mangrove forest area throughout the territory of Indonesia is expected to 3.73525 million hectares, the spread of mangrove forests are found in almost all the Indonesian archipelago, which is largely concentrated in Papua with an area of 1.3 million ha and the rest in other parts of Indonesia. Pulumahuny (1992: 34) adds that the total area of Maluku Province (North, Central, and South East Maluku) is 77,870.56 km2 and is estimated to have 100,000 ha of mangrove forest spread across the island, including Nusa Laut in Maluku Island, located in Maluku Central District.

Overview of the mangrove forest in Nusa Laut Island, the sea is still good and looks green because it has good characteristics and has not been contaminated or damaged in the long term caused by human civility. This is, of course, san gat inversely proportional to the state of mangrove forests that there are other islands such as Ambon Island whose status has been categorized in the state of damage to the mangrove forest surrounding the Ambon bay.

The change of mangrove forest area in Ambon bay is generally caused by human activity which can cause damage. The damage is sourced from the amount of sedimentation caused by the diversion of highland forest function and high rainfall which causes a lot of erosion. Luqman, et al (2013: 3), states that when the rate of population growth and development increased, the coastal environment functions in some areas have decreased or damaged. This is indicated by the process of erosion or coastal abrasion, seawater intrusion, and the degradation of aquatic results. By the strategic location, many interests that cause forest area mangrove experience treatment that exceeds its ability to hold natural regeneration, for example, conversion status of its allotment.

Nontji (2007: 106) states that the term mangrove should only be used for certain types of plants such as Rhizophora genera, while the term mangrove is used for all plants that live in this unique environment. Because in the forest is not just the type of mangroves that exist then the term mangrove forest is more popularly used to refer to this forest. All the plants in these forests interact with their environment both abiotically and all these interdependent systems form what we call mangrove ecosystems.

The mangrove ecosystem is defined as tidal and supra-pasut mintakat from muddy beaches and bays, estuaries and estuaries dominated by halophytes (halophyte), ie plants that live in salty, high-adapted and adaptable areas associated with tributaries, swamps, and floods, together with plant and animal populations. Juwana (2007: 333) states that the mangrove ecosystem consists of two parts, the land part and part of the water. The water part also consists of two parts namely the bargaining and the sea. The famous mangrove ecosystem is highly productive, fragile and resourceful.

As the main habitat of mangroves lies coastal areas and is a rich ecosystem of various animals and interact among the components of the habitat. Coastal areas are also the most vulnerable ecosystems affected by human activities. Generally, human activities in development either directly or indirectly impact on the deterioration of environmental quality, especially mangrove ecosystem (Susiana, 2011: 6-7).

The flora composition contained in the mangrove ecosystem is determined by several important factors such as soil type conditions and tidal inundation. On the open beach, the dominant tree and the pioneer tree are generally fires (*Avicennia* and pedada/*Sonneratia*).The flames tend to live on the rather hard sandy soil while pedada on soft muddy soil.

In a place that is protected from waves of mangrove communities is primarily outperformed by mangroves. More towards the mainland on a rather solid clay soil can be found in the long community. A kind of sea nail (*Acrostichum aureum*) and jeruju (*Acanthus ilicifolius*) can often be found in the margins of the mangroves as undergrowth. Nipa (*Nypa fruticans*) is a type of palma which is also a component of mangroves that is often found on the banks of the river upstream (Nontji, 2007: 107).

The diversity of species is a characteristic of the community level based on its biological organization. The diversity of species can be used to express community structure. The diversity of species can also be used to measure community stability, that is the ability of a community to keep itself stable despite the disruption to its components. High species diversity suggests that a community has a high complexity

because species interaction occurs in communities said to have high diversity if the community is composed by few species and if only a few species are dominant (Indriyanto, 2006: 145-146). Nontji (2007: 107) states that the mangrove image in Indonesia is known to have a high diversity of species all of which are recorded as 89 species of plants, 35 species of which are trees and the rest are terna, shrubs, lianas, epiphytes, and parasites.

The diversity of mangrove forest species is generally relatively low compared to other types of natural forests, due to mangrove forest conditions that are constantly or periodically inundated by sea water, thus having a high salinity and affecting their species. Janis that can grow on the mangrove ecosystem is the halofit that is types stands that can survive on salt-containing soils from sea water puddles.

Mangrove forests have several main functions: physical, ecological and economical. According to Setiawan (2013: 105), the function of mangrove forests physically, among others, to maintain the stability of the coastline and river banks from erosion and abrasion, accelerate the expansion of land with the sludge deposits carried by the current to the mangrove forest area, controlling the rate of seawater intrusion so that water the surrounding wells become more fresh, protecting the area behind the mangroves from waves, strong winds and tsunami hazards.

The ecological function of the mangrove forest area is as an area of care, the area where to find a place to feed, and spawning areas for some aquatic biota (fish, shrimp, crabs and shellfish) both living in coastal waters and offshore, so the ecosystem mangrove is a habitat of some epiphytic type of plant.

While the economic function of mangrove as a source of fuel (wood charcoal), building materials (beams and boards), as well as textile, food, and medicinal materials. Mangroves carry nutrient nutrients and detriment ran around enough high and important for water fertility. The leaves, twigs, flowers, and fruits of dead mangroves are exploited by macrofauna that will form the food chain. Detritus is then utilized by higher level aquatic animals such as bivalves, gastropods, various fish and shrimp species and crabs, because the presence of mangrove is very important then the utilization of mangrove for aquaculture should be rational.

2. Research Methods

Type of this research used descriptive research type with survey technique using ecological approach. This study was conducted on villages located on Nusa Laut Island. Overall the mangrove population located on the coastal of Nusa Laut Island, while the samples mengrove located only at the point of observation. With some research procedures as follows: a) Make a preliminary survey on the area to be in the location of research, b) Determine the location of sampling that can be representative of the existence of mangrove at Nusa Laut island in the village that forms the island of Nusa Laut, c) In each sample villages, mangrove sampling is done using quadrant center point method by making a pioneer line perpendicular to the beach, d) Then made observation point as much as 10 observation point randomly with purposive sampling method, e) In each quadrant specify 1 tree which includes the compiler of the analysis vegetarian, f) Identification of mangrove species found in each quadrant based on guidance book of mangrove introduction in Indonesia, g) Measure the diameter of the tree trunk near the chest height (130 cm). Then it is analyzed by using diversity index, density index, and dispersion pattern.

3. Result and Discussion

Nusa Laut Island is a small island among 6 clusters of populated islands and a sub-district administratively located in Nusa Laut sub-district, Central Maluku district, Maluku Province. The type of substrate in 7 sample villages at Nusa Laut Island is a sandy substrate mixed with dead coral and muddy substrate with a mixture of sand.

Climatic conditions on the island of Nusa Laut is dominated by relatively high rainfall which is indicated by dense and dense forest vegetation conditions, tropical rain forest climate type and seasonal climate with high annual average rainfall. Like other parts of Indonesia on the island of Nusa Laut only has 2

seasons a year, the rainy season that begins in October and the dry season that starts in April with wet months longer in comparison with the dry month. This research was conducted in September where the sea tide condition occurred at 09.00 WIT and receded 5 hours later at around 14.00 WIT.

From the results of observations on the existence of mangrove ecosystems Nusa Laut island indicated by the sample villages were found to be 6 species of mangrove covering *Sonneratia alba* , *Sonneratia caseolaris* , *Rhizophora mucronata* , *Bruguiera gymnorrhiza* , *Aegiceras corniculatum*, and *Hibiscus tiliaceus* . Of the 6 species of mangrove species *Sonneratia alba* has the most spread in all observation sites followed by *Rhizophora mucronata*, *Bruguiera gymnorrhiza*, *Aegiceras corniculatum*, and *Hibiscus tiliaceus*.

Diversity shows the diversity of species and is the hallmark of community structure. The calculation results obtained value Index Diversity (H') total on the island of Nusa is 0.86. Based on the Shannon-Wiener index, the diversity value (H') indicates a low diversity due to H' <1. With this value, it is known that the diversity of mangroves on the island of Nusa Laut is low.

Density is the number of individual plants expressed per unit area. From the observation, it was found that the community of mangrove forest located in Nusa Laut Island found 6 types of mangroves that make up the mangrove forest ecosystem this island. From the 7 villages used as sampling sites, the data analysis shows the amount of total mangrove density in Nusa Laut island is 4,054 trees/ha.

Said to be unstable means that mangrove ecosystem is experiencing ecological pressure due to human activities or human activities that impact on changes in mangrove communities on the island such as mangrove logging as firewood by local residents as well as excavation of coastal sand that will impact on damage to existing ecosystems in coastal areas in particular mangrove ecosystem.

This is in accordance with the opinions raised by Indryanto (2006: 145) that diversity can be used to express the community structure and can be used to measure the stability of the community, that is the ability of a community to keep himself steady although no disruption to its components. A community is said to have a high variety of janis if the community is structured by many species.

Instead, a community is said to have low species diversity if the community is composed only by a few specific types. In addition, high species diversity demonstrates that a community has a high complexity because of the high interaction between the species within the community. Type diversity tends to be low in physically and biologically controlled communities and in disturbed ecosystems. Also stated by Odum (1993) that the diversity of species is not only the nonimus with many species, but the nature of the community determined by the number of species and the evenness of individual abundance of each species. As affirmed by Michael (1995) diversity is essential in determining the extent of damage done to natural systems and human intervention, the number of species in the community is ecologically important because the diversity of species seems to increase if the community becomes stable. Disturbance to the mangrove ecosystem causes a noticeable decrease in diversity directly.

The suitability of individual species to habitat affect the species diversity of a particular species likes a suitable substrate type, so the number will increase so that there will be a process of competition between different species to occupy the space so that similar organisms tend to occupy the same habitat over the environment.

The pattern of group distribution is commonly encountered in the presence of the need for the same environmental factors. There are many reasons why plants show a clustered spread. This species is one of the most important and widespread mangroves with inflorescences occurring throughout the year because it will embed the ground when the flowers are ripe.

4. Conclusion

Based on the results of this research on the diversity and density of mangroves on the beaches of Nusa Laut island, it can be mentioned some conclusions as follows: a) the composition of mangrove species found on the coast of Nusa Laut island consisting of 6 species of mangrove, b) mangrove diversity on the coast of Nusa Laut island has a value of H '= 0.86 which means low diversity based on Shannon-Winner diversity criteria because H' < 1, c) for the total mangrove density value on Nusa Laut island

has a total density value of 4,045 trees/ha which means good density due to density > 1,500 stands/ha in accordance with LH Ministerial Decree No. 201 on standard criteria of mangrove density with a good category.

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