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MANGROVE VEGETATION ANALYSIS BASED ON SUBSTRATE TYPE AND NUTRIENT CONTENT IN SUBSTRATES IN SANGIANG ISLAND AREA, SERANG DISTRICT, BANTEN PROVINCE

Indah Riyantini**, Sandra MoertiOktavian*, M UntungKurnia**, Sunarto**

*) Students of the Faculty of Fisheries and Marine Sciences, Padjadjaran University
*) College teacher at the Faculty of Fisheries and Marine Sciences, Padjadjaran University

Study Program of Marine Science, Faculty of Fisheries and Marine Sciences, Padjadjaran University, Bandung-Sumedang street km 21 Jatinangor, Sumedang district, West Java.
Email: sandramoertioktavian@gmail.com

Abstract

Mangrove ecosystems make important contributions in coastal and marine areas. The type of substrate and nutrient content in the substrate affect mangrove vegetation. In this study, we want to know the condition of the structure of the mangrove vegetation community, the type of substrate and the condition of nutrients on the substrate, and analyze the correlation of mangrove vegetation with the substrate and nutrients on the substrate. The field data collected on May 10, 2018 on Sangiang Island, Serangdistrict, Banten province. Data was collected at three stations, using the line plot transect method for mangroves, substrate samples were entered into the laboratory to obtain substrate and nutrient data on the substrate. Based on field observations in the Sangiang Island area, 8 mangrove species were found, the total density ranged from 1500 ind / ha - 3133.33 ind / ha, frequencies ranged from 3 - 7.33, dominance ranged from 0.6073 m ^ 2 / ha - 17,8413 m ^ 2 / ha. The substrate obtained is gravel sand and gravel mud sand. Nitrogen content ranges from 0.03% - 0.1%, phosphorus ranges from 7.67 mg / 100g - 18.08 mg / 100g, and potassium ranges from 35.84 mg / 100g - 66.76 mg / 100g. Correlation value of the substrate and nutrients in the substrate to mangrove vegetation has a diverse relationship.

Keywords: *Mangrove*, *Nutrient*, *Substrate*, Correlation

INTRODUCTION

Background

Indonesia is an archipelagic state. Most of the islands are small islands that have a wealth of natural resources and environmental services that are potential. The area of small islands has considerable development potential because it is supported by ecosystems with high biological productivity such as sea grass, sea weeds, mangrove forests and coral reefs (Decree of the Minister of Maritime Affairs and Fisheries Number 41 of 2000). Sangiang Island is part of Indonesia's coastal and oceanic region, which is famous for its richness, and diversity of natural resources, both recoverable resources and non-recoverable resources. Sangiang Island has several natural potentials, one of which is mangrove ecosystems (BBKSDA 2016). Mangrove forests have high productivity, making important contributions in coastal and marine areas. The role of mangrove forests is divide into two main functions, namely ecological functions and economic functions (Wetlands 2006). Because of the importance of mangrove ecosystems, this ecosystem needs to be maintain, the development of mangrove vegetation is influence by several factors including water quality, type of substrate and nutrient content, it will affect the mangrove ecosystem itself. Mangroves will be able to grow optimally if they obtain suitable substrates and nutrients, in this study we want to know whether the substrates and nutrients in the mangrove ecosystem in Sangiang Island are in good condition and test whether the conditions of the substrate and nutrients in the mangrove ecosystem have a correlation.

Problem Identifications

1. What is the condition of the structure of the mangrove vegetation community on SangiangIsland
2. What is the condition of the substrate and nutrients in the substrate in the Sangiang Island mangrove ecosystem
3. Does mangrove vegetation have a correlation with the substrate and nutrients on the substrate

Purpose

1. Knowing the condition of the structure of the mangrove vegetation community in the Sangiang Island area,
2. Analyzing the type of substrate and nutrient conditions on the substrate in the Sangiang Island mangrove ecosystem.
3. Analyzing the correlation of mangrove vegetation with the substrate and nutrients on the substrate

Usability

1. Factual information and data regarding the conditions of mangrove vegetation, substrate and nutrients on the substrate on Sangiang Island,
2. Scientific information about the relationship between mangrove vegetation with substrates and nutrients on the substrate
3. Give assisting consideration of managing the conservation of mangrove ecosystems on Sangiang Island.

METHODS

Time and Place of Research

Field data collection was carried out on May 10, 2018 on Sangiang Island, Serang Regency, Banten (Figure 1). Data is collected at 3 stations. Analysis of organic matter in the compound was carried out at the Soil Fertility and Plant Nutrition Laboratory, Faculty of Agriculture, Padjadjaran University. Substrate type analysis was carried out at the Marine Science and Technology Laboratory, Faculty of Fisheries and Marine Sciences, Padjadjaran University.

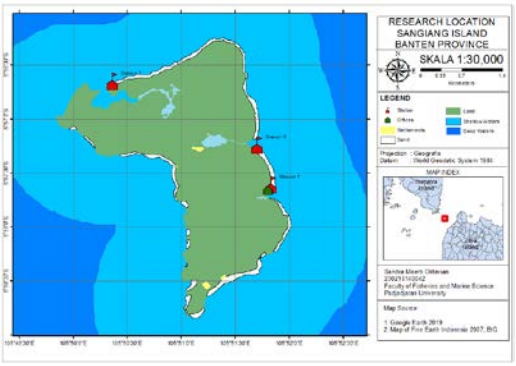

Figure 1. Research Location Map

The following are the tools used during the research is GPS, roll meters, ropes, slate paper, stationery, mangrove identification books (kitamura 2003), sewing meter, shovel, plastic zipper, cool box, refractometer, thermometer, pH meter, DO meter, camera. the tools used in laboratory testing are, sieve shakers, analytical balance, trays, spoons, digestion tubes, 250 ml boiling flask, 100 ml Erlenmeyer, 10 ml burette, magnetic stirrer, test tube, tube shaker, distillation apparatus, shake bottle, machine shake it back and forth, centrifuge, 10 ml dispenser, 0.5 ml volume pipette, 2 ml volume pipette, 10 ml measuring pipette, uv-vis spectrophotometer, atomic absorption spectrophotometer. The software used to process data is Ms. world, Ms. excel, ArcGIS and kummod cells.

This research uses several materials, including concentrated sulfuric acid, mixed mixture, boric acid, sodium hydroxide 40%, boiling stone, Conway pointer, H_2SO_4 4 N, standard solution of 1 N sulfuric acid (Titrisol), standard solution sulfuric acid 0.05 N Na-phenic solution, Tartrate buffer solution, Sodium hypochlorite (NaOCl) 5%, aquades, HCl 25%, Concentrated P reagent, P dye reagent, Mother standard 1,000 ppm PO_4 (Titrisol), Standard parent 200 ppmPO_4, parent standard 1,000 ppm K (Titrisol), standard 200 ppm K, standard series PO_4 and standard series K

Retrieval of Research Data
Mangrove Data

The retrieval of mangrove vegetation data includes species identification, measurement of stem circumference and number of stands. Installation of transects using the Checked Path Method or Transect Line Plot (BSN 2011). Transect installation is done by pulling the main line or main line perpendicular to the coastline along 30 meters, with the number of three plots The plot size is adjusted to the growth rate of mangrove stands, seedlings (plot 1 mx 1 m), saplings (5 mx 5 m plots), trees (plot of 10 m x 10 m).

Substrate Data

Sampling of the substrate is done by taking samples at five different points at each station substrate sample is taken as much as ± 1 kg, using a tool and then put into a plastic bag. Substrate samples taken are the top soil substrate because the top substrate contains a lot of humus or organic material (Hardjowigeno 1987). Substrate samples that must be dried, take a sample of 100 gr and put into a sieve shaker for sifting, the sediment left in each filter size is weighed again, after the data is obtained, enter the data into the kummod-cell software, then we will get the results of the type of substrate tested. Calculation of sediment weight be known from each of the sediment fractions using the weight percent equation (Purnawan et al 2012)

Nutrient Data

Samples were processed at the Laboratory of Plant Chemistry and Soil Nutrition, Faculty of Agriculture, Padjadjaran University. The N, P and K test treatments are in accordance with the guidebook published by the Indonesia Soil Research Institute (2009).

a. Determination of N in soil (Nitrogen Kjeldahl)

1. Destruction

Weighed 0.5 g of soil sample size <0.5 mm, inserted into the digest tube. Add 1 g of selen mixture and 3 ml of concentrated sulfuric acid, then were reduced to 350°C (3-4 hours). Destruction is complete when white

steam comes out and a clear extract (about 4 hours) is obtain. Remov the tube, cooled and then the extract is dilut with ion free water to exactly 50 ml. Beat until homogeneous, leave overnight so that the particles settle. The extracts used for N measurements by distillation or colorimetry.

2. Distillation

Transfer the entire sample extract into the boiling flask (use ion-free water and spray flask). Add a little boiling stone powder and distilled water to half the volume of the pumpkin. Prepared containers for NH3 released are erlenmeyers containing 10 ml of 1% boric acid plus three drops of the Conway indicator (colored red) and connected with a distillation apparatus. With a measuring cup, add 40 ml of NaOH as much as 10 ml kc in a boiling flask containing the sample and immediately closed. Distilled until the volume of the container reaches 50-75 ml (green colored). The distillate is titrated with 0.050 N H2S04 to pink. Record the volume of sample tilt (Vc) and block (Vb)

b. Determination of P in soil

1. Determination of P with 25% HCl extract (Potential)

Weigh 2 g of soil sample with size <2 mm, put in a shake bottle and add 10 ml of 25% HCl then shake with meşin shake for 5 hours. Put into the test tube left overnight or centrifuged. Transfer 0.5 ml clear sample extract into a test tube. Add 9.5 ml of aquades (20 x dilution) and shake it. Add 2 ml of aqueous sample extract and a standard row each put into a test tube, then add 10 ml of the P dye reagent solution and shaken. Leave for 30 minutes, then measure the absorbancep with a spectrophotometer at 889 nm wavelength.

c. Determination of K in soil

1. Derermination of K with 25%HCl extract (Potensial)

Weigh 2 g of soil sample with size <2 mm, put in a shake bottle and add 10 ml of 25% HCl then shake with machine for 5 hours. Put into the test tube left overnight or centrifuged. Take 0.5 ml clear sample extract into a test tube. Add 9.5 ml of ion free water (20 x dilution) and shake it. Take 2 ml of aqueous sample extract and standard K series are measured directly by means of an SSA Emission.

Data processing

In the observation parameters sub-section explained about what are the observational parameters taken in the study, specifically the parameters of density, frequency, dominance, relative density, relative frequency, relative dominance, and the importance value index of all formulas sourced from the National Standardization Agency (2011), about Survey and mangrove mapping.

Density

$$\text{Density (individual / ha)} = \frac{\text{Number of Individuals of a species}}{\text{Area of total plot}}$$

Frequency

Frequency

$$= \frac{\text{Number of plots filled with a species}}{\text{Sum of all plots}}$$

Dominance

$$\text{Dominance } (m^2/\text{ha}) = \frac{\text{The area of a species}}{\text{Area of total plot}}$$

Relative Density

Relative Density=

$$\frac{\text{Density of a species}}{\text{Density of all species}} \text{ X } 100\%$$

Relative Frequency

Relative Frequency=

$$\frac{\text{Frequency of a species}}{\text{Frequency of all species}} \text{ X } 100\%$$

Relative Dominance

Relative Dominance =

$$\frac{\text{Dominance of a species}}{\text{Dominance of all species}} \text{ X } 100\%$$

Important Value Index

IVI (Seedlings and Stakes) = Relative density + Relative frequency

IVI (Tree) = Relative density + Relative frequency + Relative dominance

AnalisisData

1. Spearman Rank correlation analysis in Sudjana(1996) :

$$\rho = 1 - \frac{6.\sum di^2}{n\,(n^2-1)}$$

Information :

ρ(rho) : Correlation Coefficient

di : Difference in scores between the 2 variables

n : Number of subjects in the variable

RESULTS

Analysis of Mangrove Vegetation

Based on field observations in SangiangIsland, 8 mangrove species found, including *Lumitzeralittorea, Xylocarpusgranatum, Aegicerascorniculatum, Pemphisacidula, Bruguieragymnorrhiza, Rhizophoraapiculata, Rhizophoramucronata, Rhizophorastylosa.*

The results of the density calculation showed that at station I the mangrove species *Rhizophoramucronata* had the highest density value for the sapling category (1166,67 ind/ha) and trees (533,33 ind/ha). At station II the highest density seedling category was *Rhizophorastylosa* (66,67ind/ha),

sapling category was *Rhizophoraapiculata* (233,33 ind/ha), there was only one tree category, namely *Aegicerascorniculatum*, because of that the type of *Aegicerascorniculatum* became mangrove with the highest density, amounting to 66,667 ind/ha. Whereas at station III the density calculation results show that at station III the species of mangrove *Rhizophoramucronata* has the highest density values for the seedlings (33,33 ind/ha), saplings (700 ind/ha) and trees (466,67 ind/ha). The total mangrove density at Station I was 3133,33ind/ha, while at Station II it was 666,67 ind/ha, and at Station III it was 1500 ind/ha. If categorized based on the Decree of the Indonesia Minister of Environment No. 201 of 2005 concerning the standard criteria and guidelines for determining mangrove damage, the total density of mangroves at Station I is categorized as good and density is very dense, whereas for Station II it is damaged as well as rare density, and at Station III it is categorized as good and very dense density. The highest total density is at station I and lowest at station II.

The total frequency value of each station is varies, station I has a total frequency value of 7,33, station II has a total frequency value of 3, and station III has a total frequency value of 3,33. Frequency shows the distribution pattern or distribution of species of a plant, the frequency value is influenced by the value of the plot where the mangrove species are found, the more plots of mangrove species are found, the frequency value of the presence of mangrove species will be higher (Fachrul 2007).

At station I the type that has the highest dominance value is *Lumitzeralittorea* with a dominance value of 8,18m^2/ha, while the one with the lowest dominance value is *Rhizophorastylosa* with a dominance value of m^2/ha. At Station II there is only one type of mangrove tree category, namely the type of *Aegicerascorniculatum* with a dominance value of 0,60 m^2/ha. At station III the type that has the highest dominance value is *Rhizophoramucronata* with a dominance value of 5,80m^2/ha, while the one with the lowest dominance value is *Pemphisacidula* with a dominance value of 0,27 m^2/ha.

Based on the calculation of the important value index data from each observation station is quite varied, from all the highest IVI observation stations in the seedling category *is Rhizophoramucronata* at station III with an IVI value of 200% but the perfect value was obtained because no other types were found in the same category, Next is the type of *Rhizophorastylosa* at Station II with an IVI value of 133.33%. In the category of stakes the highest value of all stations is *Rhizophoramucronata* type

at station III with an IVI value of 147,5%, while in the category of trees the highest value is the type of *Aegicerascorniculatum* at station II being a mangrove with a perfect IVI of 300% but the perfect value is obtained because no other species were found in the same category, the next was *Rhizophoramucronata* type at station III with an IVI value of 160,81%. From all observation stations, it is clear that the *Rhizoporasp* mangrove species dominates very much because the *Rhizoporasp* mangrove species has a high level of tolerance and adaptation, *Rizhophorasp* in general can grow well in muddy soils to muddy sand (Bengen 2009; Darmadi et al 2012). *Rhizophora sp.* has a large area to live so that it can develop well into the interior while still getting a good supply of salt water (Kusmana 2010).

Substrate

The results is at station I the percentage of pebbles is 15%, sand 82,5% and silt 2,5%, at station II the percentage of pebbles is 10,6%, sand 87,5% and silt 1,9%, while at station III the percentage is obtained gravel 10,2%, sand 74,5% and silt 15,3%. Substrate that dominates at each station is sand with a little added gravel and silt. After processing the data using kummod cell station I and station II with gravel sand substrate, while station III has gravel mud sand substrate.

Nutrient

Nitrogen content ranges from 0,03% - 0,1% with very low to low categories, phosphorus content ranges from 7,67 mg/100g – 18,08 mg/100g with very low to low categories, while potassium content ranges from 35,84 mg/100g – 66,76 mg/100g with moderate to very high categories.

Correlation

The results of the calculation of the correlation value between the substrate to mangrove vegetation has various values, the correlation value of the substrate to the density of mangrove is 0,5 it shows a sufficient relationship between the substrate to the density, which means the higher the value of the substrate grain size means the higher the mangrove density value . For the substrate correlation value to frequency and dominance are rated the same that is equal to -0.5, it shows a sufficient relationship but negatively correlated which means that the higher the value of the substrate grain size, the smaller the frequency and dominance value.

The results of correlation calculation is phosphorus has a correlation value of 1 to the density of mangroves, it explains that phosphorus has a perfect positive relationship to the density of mangroves, while the correlation value of nitrogen, and potassium to mangrove density is 0,5 which means that nitrogen and potassium have an adequate positive

relationship against mangrove density. Nitrogen and potassium have a correlation value of 1 to the frequency of mangroves, it explains that nitrogen and potassium have a perfect positive relationship to mangrove frequency, while the correlation value of phosphorus to mangrove frequency is 0,5 which means that phosphorus has a sufficient positive relationship to mangrove frequency. While the dominance, nitrogen and potassium also have a correlation value of 1 to the dominance of mangroves, it explains that nitrogen and potassium have a perfect positive relationship to the dominance of mangroves, while the correlation value of phosphorus to mangrove dominance is 0,5 which means that phosphorus has a sufficient positive relationship against mangrove dominance.

CONCLUSION AND SUGGESTION

Conclusion

1. Based on field observations in Sangiang Island, 8 mangrove species were found, *Lumitzeralittorea, Xylocarpusgranatum, Aegicerascorniculatum, Pemphisacidula, Bruguieragymnorrhiza, Rhizophoraapiculata, Rhizophoramucronata, Rhizophorastylosa*. The total density values range from 1500 ind/ha – 3133,33ind/ha, having a range of categories from damaged to sparse to good density with. The total frequency values range from 3 to 7,33, the total value of dominance ranges from 0.621 m^2/ha- 17.84 m^2/ha, mangrove *Rhizophoramucronata*species are the most dominating mangroves with the highest IVI values in several categories and stations
2. Station I and Station II have gravel sand substrate, while Station III has gravel mud sand substrate. Nitrogen content ranges from very low to lowcategories, phosphorus content ranges from very low to low categories, while potassium content ranges from moderate to very high categories.
3. The correlation value of the substrate to mangrove vegetation has a fairly positive and negative relationship, while the value of the correlation of nutrients to the mangrove vegetation has a diverse positive relationship,

Suggestion

1. Examined again in detail about the correlation between mangrove vegetation with nutrients on the substrate and water in the substrate
2. If conducting a correlation study of a kind is recommended at least 5 stations of the research station so that the resulting correlation data is more diverse

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