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ANALYSIS OF CARBON STOCK IN SEAGRASS *Cymodocea rotundata* IN TUAPEJAT WATERS, MENTAWAI ISLAND DISTRICT

Mela Oktari[1]*, Bintal Amin[1], Efriyeldi[1]
[1]Department of Marine Science, Faculty of Fisheries and Marine, Universitas Riau
Kampus Bina Widya KM. 12,5, Simpang Baru, Kec. Bina Widya, Pekanbaru, Riau 28293
*mela.oktari1240@student.unri.ac.id

ABSTRACT

This research was conducted in January 2022. Seagrass density calculations and seagrass sampling were carried out in Dusun Jati, Tuapejat, Sipora Utara District, Mentawai Islands Regency, and seagrass sample analysis was carried out at the Marine Chemistry Laboratory, Faculty of Fisheries and Marine, Universitas Riau. The objective of the study is to analyze the density of seagrass *C. rotundata*, analyze the biomass and carbon stock stored in Agb and Bgb parts, and whether there are differences in density, biomass, and carbon stock between stations in seagrass *C. rotundata* at the research site. The density value of seagrass *C.rotundata* varies for each station. The average density of seagrass *C. rotundata* at the study site was 33.48 stands/m^2. The range of the biomass value in the Agb section is 21.78-39.9 gbk/m^2 while the Bgb section is 31.01-61.4 gbk/m^2. The average value of the carbon stock stored in the Agb section is around 2.08-5.34 gC/m^2 and the Bgb section is 10.81-15.48 gC/m^2. The conclusion from this research is that the density of seagrass at the research location is infrequently and each station has a different density. The highest biomass is found at a greater density as well as the carbon stock. Biomass between stations was not significantly different while the Agb and Bgb parts were significantly different. Density, biomass, and carbon stock have a very strong relationship.

Keywords: Mentawai Islands, Density, Biomass, Carbon Stock, Seagrass.

1. INTRODUCTION

Global warming is a global problem in the form of an increase in atmospheric temperature caused by human activities such as the use of fossil fuels, land conversion, and other activities that contribute to the release of Greenhouse Gases (GHG) into the atmosphere. Rahadiarta et al.[1] explained that the ocean has an important role in the ongoing global carbon cycle, where around 93% of carbon dioxide (CO_2) on earth is stored in the oceans. One of the coastal resources that can absorb carbon is sea grass.

Seagrass is one of the higher plants that has adapted so that it can grow and develop in water. Seagrass usually grows in the form of seagrass meadows which are called seagrass meadow ecosystems. Seagrass has the ability known as blue carbon. Blue carbon is a term for plants that can photosynthesize using carbon dioxide (CO_2) and store it in the form of biomass[2].

One of the islands that have the potential for seagrass ecosystems is Sipora Island, Mentawai Islands Regency, to be precise in Dusun Jati. Dusun jati has several types of seagrass, one of which is *C.rotundata*. However, information regarding the ability of seagrass *C.rotundata* to store carbon is still limited. Referring to the research by Mashoreng et al.[3] stated that the value of carbon storage in seagrass is generally higher as the percentage increases cover. This study aims to analyze the density of *C.rotundata* seagrass, analyze the biomass and stored carbon stock of Agb and Bgb sections, and

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whether there are differences in density, biomass, and carbon stock between stations in *C. rotundata* seagrass at the study site.

2. RESEARCH METHOD

Time and Place

This research was conducted in January 2022. Calculation of seagrass density and seagrass sampling was carried out in Dusun Jati, Tuapejat, Sipora Utara District, Mentawai Islands Regency, and analysis of seagrass samples was carried out at the Marine Chemistry Laboratory, Faculty of Fisheries and Marine, Universitas Riau.

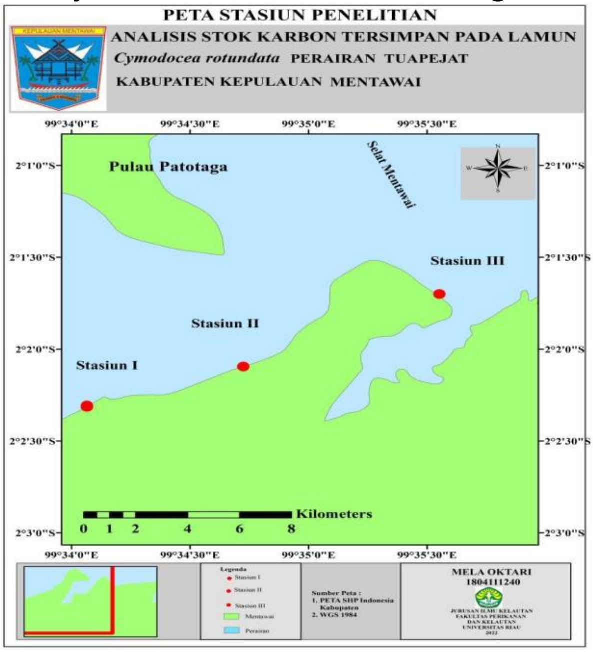

Figure 1. Map of research locations

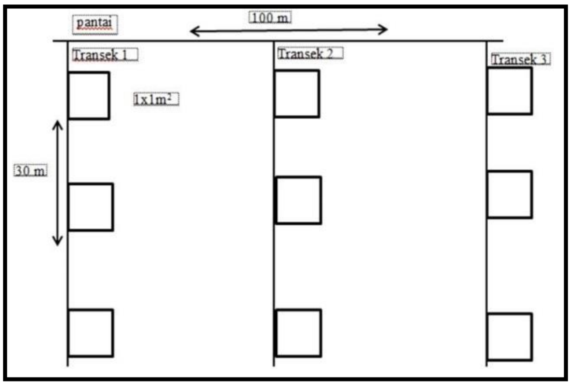

Figure 2. Research transect scheme

Methods

This research was conducted using a survey method where the researcher went directly to observe the location and obtained primary data by sampling. As for determining the location of the sampling in this study, namely purposive sampling in which data collection is based on a specific purpose.

Procedure

Sampling in this study was divided into three stations (Figure 1). Station I is an area that is close to human activity because there is a homestay and a place for fishermen to anchor their boats and is close to the mangrove ecosystem, station II is an area facing mangrove forests and not too much human activity but close to the estuary, while station III is an area away from human activity and port and dealing with mangrove ecosystems. Each station is divided into three transects with a distance of about 100 m between transects and each transect consists of three plots placed perpendicular to the shoreline with a distance of 15 m between the plots (Figure 2).

Data Analysis

Calculation of seagrass density is carried out by placing transects at each station. However, the number of stands in the plot on each transect is calculated using the formula according to Fachrul[4].

$$At = \frac{Ni}{A}$$

Information:

At : The density of species (stands/m^2)
Ni : Number of individuals on the transect
A : Total Sampling Area

C. rotundata seagrass samples were taken randomly as needed from each plot and then the samples were cleaned using water to remove epiphytes and substrate that were still attached to the seagrass. The cleaned sample is put into a sample plastic and then labeled. Then it was put into the coolbox for analysis at the Marine Chemistry Laboratory, Faculty of Fisheries and Marine, Universitas Riau.

Seagrass biomass can be calculated by multiplying the dry weight and seagrass density. Samples of seagrass *C. rotundata* were separated from the part above the Agb substrate (leaves, stems) and the part below the Bgb substrate (rhizome, roots), and then the wet weight was weighed and recorded. Then samples of seagrass *C. rotundata* were dried for 24 hours at 105^0C using an oven. After that, the samples were weighed to determine the dry weight. To find seagrass biomass using Graha et al[5].

$$B = W \times D$$

Information:

A : Seagrass biomass (g/m^2)
W : dry weight standing (g/individual)
D : The density of seagrass (individual/m^2)

The method used for measuring carbon stocks uses the Loss on Ignition method. The dried samples were crushed using a mortar. After that sample was homogenized and put as much as 0.5 g (b) into aluminum foil which has been weighed (a). Then the sample is put into the furnace with a temperature of 550 ^{0}C to become ash, then the sample is weighed (c). The percentage of organic matter content contained in seagrass can be calculated according to Graha[6] with the following formula:

$$\%Tom = \frac{b-a}{b} x100\%$$

Measurement of organic carbon in seagrass is based on Indriani et al.[7] with the formula:

$$C\ org = \frac{TOM}{K}$$

Information

Corg : Organic carbon (%)
TOM : Content of organic matter (%)
K : Organic matter constant (1.724)

Calculation of stored carbon stock is done by multiplying the biomass by the carbon content[8].

$$SK = \frac{B\ x\ C}{100}$$

Information

SK : Carbon Storage (gC/ m^2)
B : Biomass (gbk/m^2)
C-org : C-organic (%).

3. RESULT AND DISCUSSION

The general condition of the research location

Mentawai Islands Regency is one of the districts located in West Sumatra Province. This regency is in a geographical position between 0055'00”-3021'00” South Latitude and 98035'00”-100032'00” East Longitude. The Mentawai Islands have an area of 6,011.35 km^2 and a coastline of 1,402.66 km. Mentawai Islands Regency to the north is bordered by Nias Regency, North Sumatra, to the south, it is bordered by Pesisir Selatan Regency, next door to the east it is bordered by Padang Pariaman Regency, to the west it is bordered by the Indian Ocean.

Dusun Jati is located in Tuapejat Village, Sipora Utara District, Mentawai Islands Regency. Jati Beach has various tourism potentials such as diving, surfing, snorkeling, and others. This beach is 700 m from the Tuapejat pier, Jati Beach is flanked by Awera, Simakakang, and Siburu Islands. The length of Jati Beach is almost 4 km.

Water Quality Parameters

Based on measurements of water quality parameters at the three research stations in Dusun Jati, the following results were obtained: water temperature ranged from 28-30^0C, current velocity ranged from 0.25-5 m/sec, with salinity ranging from 33-35 ppt, and pH ranges from 7-7.5. The brightness value is declared 100% because, at the research location, the penetration of sunlight reaches the bottom of the waters so that the bottom of the waters can be seen very clearly.

Density of Seagrass *C. Rotundata*

Based on the seagrass density value analyzed in the field, it shows that the seagrass density value is *C. Rotundata* ranged from 33.48 ind/m^2 (Figure 3). The highest density value is found in station III while the value density the lowest is at station I.

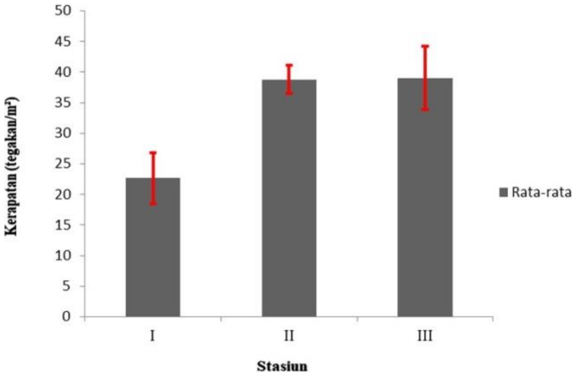

Figure 3. Density of seagrass

The difference in density at each station is thought to be caused by differences in the frequency of human activity at each research station. According to Feryatun et al.[9], that areas affected by human activity will have a smaller density compared to areas that are not disturbed by human activity. The average density of seagrass *C.rotundata* at each station shows a rare scale.

Seagrass Biomass *C. rotundata*

Based on the results of *C.rotundata* seagrass biomass research, the highest value was 31.01-48.50 gbk/m^2 in the Bgb section, while the Agb section was lower, ranging from 21.78 to 39.90 gbk/m^2. (Figure 4).

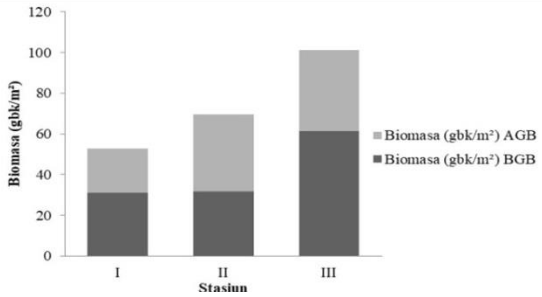

Figure 4. Biomass of seagrass *C.rotundata*

The results of the analysis of the relationship between seagrass density and *C. rotundata* biomass using the Linear Regression Test obtained a correlation coefficient value of 0.962. This shows that the relationship between density and biomass is very close. The difference in biomass at each station was carried out using a one-way ANOVA test. Based on these tests, it showed that the biomass between stations of seagrass *C. rotundata* at the study sites was not significantly different. Based on the results of the analysis that has been carried out, it is found that the lowest biomass is at station I, this is related to the seagrass density at station I because it has a low value. This is following the opinion of Harimbi et al.[10], the biomass value will be directly proportional to the density value so that the density affects the biomass. This is confirmed by the opinion of Heriyanto et al.[11], which states that the high value of seagrass biomass is in line with the high value of seagrass vegetation density.

C-Organic and Stored Carbon Stock in seagrass *C. Rotundata*

The lowest C-organic value was found in the Agb section at station I with an average of 13.65%, while the highest organic C content was found in the Bgb section at station III with an average of 34.25% (Figure 5). Carbon stocks stored in seagrass C. rotundata sections Agb and Bgb have an average total stored carbon stock ranging from 2.08 to 15.48 gC/m^2. The highest stored carbon stock is found in station III, Bgb section (Figure 6).

The results of the Paired Sample T-test conducted on seagrass biomass *C.rotundata* sections Agb and Bgb showed significant results ($p<0.05$). This shows that carbon stocks are stored in the Agb and Bgb sections, however, the research locations are significantly different. Supriadi et al.[12], state that the average biomass under the substrate is three times greater than the biomass above the substrate because the rhizome contains more starch and pest elements where these substances are distributed from the results of photosynthesis stored at the bottom of the substrate. In this study, the biomass is below. The substrate is one-fold larger than the biomass above the substrate.

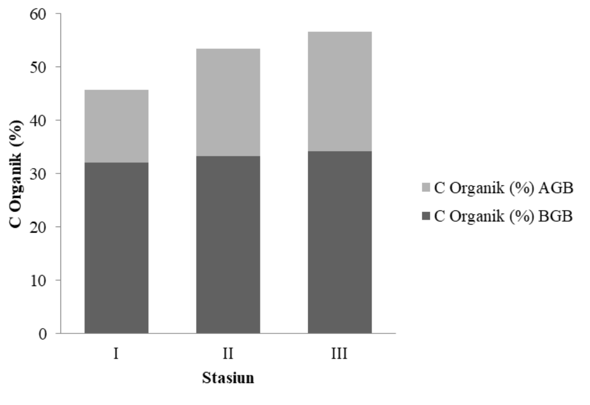

Figure 5. C-organic seagrass *C. rotundata*

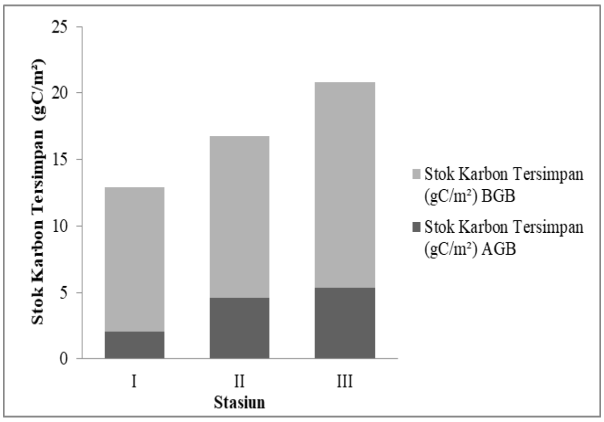

Figure 6. Carbon stocks stored in seagrass *C.rotundata*

4. CONCLUSION

The density of seagrass at the research location is included in the rare category and each station has a different density. The highest biomass is found at a greater density as well as the stored carbon stock. Biomass was not significantly different between stations while Agb and Bgb were significantly different. Density and biomass, biomass and carbon stock are very closely related. In this study the type of seagrass The one user has a small morphology, it is better if you want to use the same seagrass, you should take more than three stands.

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