JURNAL BIOLOGI

El-Hayah

Journal Homepage: http://ejournal.uin-malang.ac.id/index.php/bio/index
e-ISSN: 2460-7207, p-ISSN: 2086-0064

Seagrass Vegetation Analysis on The Coast of Hadirin and Batu Lawang Beach Karimunjawa National Park

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DOI: 10.18860/elha.v7i3.10057

Article Info

Article history:
Received 10 June 2019
Received in revised form
08 July 2019
Accepted 15 August 2019

Keywords:
Batu Lawang Beach,
Hadirin Beach,
karimunjawa National Park,
Seagrass

Abstract

The purpose of this study was to determine the structure and condition of seagrass communities in the waters of hadirin Beach and Batu lawang karimunjawa. national park. This exploratory research used descriptive qualitative methods, each study location is divided into two transects. Data identified at SPTN Office 1 Kemujan Karimunjawa National Park. The results of the study were six species of seagrass, namely: Holodule uninervise, Thalassodendron ciliatum, Halophila minor, Syringodium isoetifolium, Thalassia hemprichii and Cymodocea serrulata. The percentage of seagrass cover namely Holodule uninervise is 38.04 %. Thalassodendron ciliatum of 6.25%, Halophila minor of 29.56%, Syringodium isoetifolium of 31.25%, Thalassia hemprichii at 14.21% and Cymodocea serrulata to 16.9%. The highest density of seagrass species in Hadirin Beach is from the Uninervise holodule species 72.30%, with 858 stands on the first transect and 54.66% on the second transect with 253 stands. Whereas for the highest Batu Lawang Beach is the species of Thalassia hemprichii 51.1% with 162 stands, on the first transect and 44.9% with 114 stands. The substrate has the type of sandy clay and coral fragments. Holodule uninervise is the most dominant species found on the beach of Hadirin meanwhile Thalassia hemprichi is the most dominant species in Batu Lawang.

1. INTRODUCTION

Kemujan Island is one of the islands in Karimunjawa National Park which has areas covered by seagrass beds. Kemujan Island is also one of the island used as a residential area by local people, as well as Karimunjawa

Island. Activities carried out by residents on the rainy island have the potential to cause damages to the seagrass ecosystem. The ability of seagrasses to absorb carbon can be disrupted due to environmental pollution caused by various activities carried out by surrounding residents and tourists who come to travel as well as the use not of environmentally friendly fishing gear, garbage disposal, anchors of fishing boats, land use conversion, and so (Setiawan, 2017).

Seagrass beds are ecosystems with very high organic productivity. Water depth and tidal influences and substrate structure affect the zone of some types of ammunition and its growth form (Azkab, 1999). Seagrass ecosystems also have important roles in supporting the life and development of the living organism in shallow seas, including as primary producers, habitat for many of other biota, sediment catchers and nutrient recyclers. Various types of fish make seagrass areas as feeding areas, nurturing larvae (nursery ground), spawning ground, as stability and retention of sediments, reducing and slowing down the movement of waves, as a place for nutrient cycles (Kikuchi and Perez, 1977) and as dissolved carbon in the ocean or known as blue carbon and used for photosynthesis (Kawaroe, 2009).

In this regard, it is necessary to conduct a study that can be the basis for managing seagrass ecosystems in karimunjawa waters, especially in Hadirin and Batu Lawang beach. The purpose of this study was to find out the types of seagrass, the percentage of seagrass cover, the density and frequency of seagrass in Kemujan Island, especially in Hadirin and Batu Lawang beach.

2. MATERIALS AND METHODS

Study area

The tools used in data collection are roll meters, 1m x 1m frames, diving equipment such skin dives (mask & snorkel), sample bags, underwater cameras, slates used to record data in water, GPS used to plot locations global position (Figure: 1), and identification book offered kepmenlh No. 20 (2004). Figure 1 : Map area hadirin and batulawang beach karimunjawa national park, red dots are stations of data collection.

Procedures

Data retrieval was carried out in two different locations using two lines transects of 50 meters perpendicular to the coastline towards the sea with a distance of 25 meters each. Placement of plots measuring 1 x 1 meter (English et al., 1994) on each transect is done once every 5 meters starting from point 0 meters to 50 meters. Seagrass data collection is acquired by calculating the number of seagrass stands per seagrass species. For the determination of seagrass types refer to the Guide to the identification of segrasses in the great barrier reef (Lanyon, 1986).

Data analysis

The condition of the seagrass ecosystem data can be obtained by calculating the percentage of cover, composition, frequency, relative frequency, density and relative density of seagrass species.

- Closure of Seagrass Types

  The closure of seagrass can be calculated by adding the closing percentage value of each type of seagrass to the plot of the entire transect and divide it by the number of plots at that station. The calculations are performed for each type of seagrass found

at the station by using the following (Tuwo, 2011):

$$\text{Cover seagrass} = (\sum n)/N2$$

Information :

Σn = Total of Seagrass cover, all squares per type

N^2 = Total of squares of all ojects

- Density

Density is the ratio between the total number of individuals and the measured unit area. The density of seagrass species can be determined by equation (Tuwo, 2011)

$$\mathbf{KJi = Ni/A}$$

Information:

KJi = i-type density

Ni = Total number of individuals of type i (stand)

A = Total area of sampling (m2)

- Frequency

The frequency is the ratio between the number of sample plots found in a seagrass type and the total number of sample plots observed. The frequency of seagrass types can be determined by equation (Tuwo, 2011):

$$\mathbf{FJi = Pi/ \Sigma P}$$

Information:

FJi = Frequency of type i

Pi = Number of sample plots where I found type i

ΣP = The total number of plot samples observed

3. RESULTS and DISCUSSION

The result of Seagrass species composition at Hadirin Beach and Batu Lawang showed that four species of seagrass were found at the Hadirin Beach, they are *Uninervis holodule, Thalassodendron ciliatum, Syringodium isoetifolium* and *Halophila minor.* As the results of Monitoring conducted by Wicaksono (2012) show that seagrass found in the waters of karimunjawa islands consists of eight species that lived in the sand, lumpy sand, and sandy sediments, namely *Cymodocea rotundata, Cymodocea serrulata, Thalassia hemprichii, Enhalus acoroides, Halodule pinifolia, Halodule uninervis, Halophila ovalis and Syringodium isoetifolium*. Whereas the species composition of Batu Lawang Beach consist of two species, they are *Thalassia hemprichii and Cymodocea serrulata. T. hemprichii* is a widely distributed tropical seagrass (Tomascik, et al.,1997). According to Kiswara (1994), this type of seagrass is very common. It is often found in flat reef areas, both of which grow independently (monospecific) and that grow together with other types of seagrass or other plants.

Different species are found between the species on Hadirin Beach and the coast of Batu Lawang according to the data obtained. The different compositions can be caused by the difference of substrate type between Hadirin Beach and Batu Lawang Beach. In addition, the lowest species richness found in Batu Lawang beach. This could be due to the location on the coast of Batu Lawang mostly being used as a parking lot for the local fishing boat.

Table 1. Percentage of seagrass cover in karimunjawa national park.

Location	Seagrass Type	Cover Percentage (%)	Total cover Percentage (%)
Hadirin Beach	*Halodule uninervis*	38.04	86.25
	Thalassendron ciliatum	3.125	
	Halopbila minor	29.56	
	Syringodium isoetifolium	15.625	
Batu Lawang Beach	*Thalassia hemprichii*	14.21	31.11
	Cymodocea serrulata	16.9	

The percentage of seagrass cover describes the area covered by seagrass. Measuring the percent closure of seagrass is a method for viewing status and for detecting changes from vegetation (Hemminga and Duarte, 2000). The results of observations carried out at the Hadirin Beach found four types of seagrass including *Holodule uninervis*,

Thalassodendron ciliatum, *Halophila minor*, and *Syringodium isoetifolium* (Table 1). With the percentage of seagrass cover, namely *Holodule uninervis* amounting to 38.04 %. *Thalassodendron ciliatum* 3.12% *Halophila minor* 29.56 %, *Syringodium isoetifolium* 15.62 %. Based on the data obtained above, it can be seen that the total percentage of seagrass cover at Hadirin Beach is 86.35 %. The high percent seagrass cover on both transects is influenced by the high density of seagrass species on the transect. Referring to the Decree of the Minister of Environment No. 200 of 2004 concerning describing damage criteria and guidelines for determining the status of seagrass beds, where seagrass cover ≥ 60% is classified as rich; 30 - 59.9% classified as less; and ≤ 29.9% are classified as poor. So that it can be said that at the Beach of Hadirin the percentage of seagrass cover is said to be Rich. Whereas the results from Batu Lawang Beach have a percentage of *Thalassia hemprichii* seagrass cover at 14.21 % and *Cymodocea serrulata* amounting to 16.9 %, and the total percentage of seagrass cover at Batu Lawang Beach is 31.11 %. Based on these data, it can be said that the percentage of seagrass cover in Batu Lawang Beach is classified as less (Decree of the Minister of Environment No. 200, 2004). Based on the values obtained from the two beaches above, it can be seen that at the Beach of Hadirin, the type of seagrass cover is classified as rich. In contrast in the Beach of Batu Lawang the percentage of seagrass cover is classified as less. This is due to the distance of seagrass beds in Batu Lawang Beach, which is very far from coral reefs, while seagrass beds on Hadirin Beach are very close to the presence of coral reefs. This is in line with Mann (2000), which states in his research that the closer the distance between seagrass ecosystems and coral reef ecosystems and the better health conditions of these seagrass ecosystems, the more abundant consumption of reef fish.

Table 2. Seagrass Density and Frequency in Karimunjawa National Park

Location	Seagrass Type	Stands	Density	Frequency
Hadirin Beach	*Halodule uninervis*	555,5	49	0.9
	halassendron ciliatum	62	5,635	0.23
	Halopbila minor	153	14	0.31
	Syringodium isoetifolium	54	5	0.13
Batu Lawang Beach	*Talassia hemprichii*	138	12.55	0.78
	Cymodocea serrulata	147.5	13.41	0.91

The density of seagrass species is a large number of individuals stands of a seagrass species in a certain area. Density is the number of individuals (stands) of broad unity (Brower et al., 1989). The results of the values from the two locations, namely Hadirin Beach and Batu Lawang Beach, can be seen as in the (Table 2). Based on the results of the data, the highest density of seagrass species from the two locations is from the *Uninervis holodule* type with an average stand of 555.5 and with an average density of 49 individual. And for the least density is *Syringodium isoetifolium* as much as 54 average stands and with a value of Density 5 individual. based on according to Hemminga and Duarte (2000) that *Syringodium isoetifolium*. grows in relatively deep waters even though it is a shallow ebb and has a slight anthropogenous impact so it does not experience too much sedimentation. Waters that have high suspended solids can experience sedimentation and cause *Syringodium isoetifolium* to be difficult to develop. In addition, the substrate is suitable for its habitat, which is mostly muddy sand with a TSS value of 9 mg/L. According to Kiswara (1994), the density of seagrass species is influenced by the seagrass's growth factor.

Several factors that affect seagrass types density include depth, brightness, water flow and substrate type. Frequency is the chance of a type found in the observed sample point (Brower et al., 1989). For the results of observations, that the highest frequency value of the two study sites is from the type of *Cymodocea serrulata* of 0.91 while the lowest frequency value is of the type *Syringodium isoetifolium*. So that it can be seen that the type of seagrass *Cymodocea serrulata* is spread more widely than the other seagrass species at Hadirin Beach and Batu Lawang Beach.

Table 3. Seagrass Important Value Index in Karimunjawa National Park

Location	Seagrass Type	Kr (%)	Fr (%)	INP (%)
Hadirin	*Halodule uninervis*	63,495	57,56	121.06
	Halassendron ciliatum	5,125	13.15	18.28
	Halopbila minor	19,38	19.9	39.28
	Syringodium isoetifolium	12	9.39	21.38
Batu Lawang	*Thalassia hemprichii*	48	45.65	93.65
	Cymodocea serrulata	52	54.35	106.35

As for the importance value index (IVI) (Table. 3), the highest at both sites is *Holodule univervis* (121.06%). *Holodule uninervis* has the greatest influence compared to the others. This is in accordance with Brower et al. (1989) which states that the higher the INP value of a species, the highercommunity's role. The magnitude of the Important Value Index shown allows the dominance of one species on the coast of Bulu Lawang and the Audience beaches. According to Unsworth, et. al. (2009) added that the two beaches were strongly influenced by the aquatic environment's characteristics and adaptation of seagrass types to the environmental conditions in each of the transects.

4. CONCLUSION

The conclusion of this research showed six species found in Hadirin Beach and at Batu Lawang Beach, namely: *Uninervis holodule, Thalassodendron ciliatum, Halophila minor, and Syringodium isoetifolium, Thalassia hemprichii and Cymodocea serrulata*. The cover percentage of *Holodule uninervis* is 38.04 %. *Thalassodendron ciliatum* is 6.25%, *Halophila minor* is 29.56%, *Syringodium isoetifolium* is 31.25%, *Thalassia hemprichii* is 14.21% and *Cymodocea serrulata* amounting is 16.9%. While the highest density of seagrass species in Hadirin Beach is *Uninervis holodule* (72.30%), 858 stands on the first transect and 54.66% on the second transect with 253 stands. The highest density of seagrass in Batu Lawang Beach is *Thalassia hemprichii* (51.1%), with 162 stands, on the first transect and 44.9 % with 114 stands on second transect..

5. ACKNOWLEDGEMENTS

The authors would like to thank Ruri Siti Resmisari, M. Si as the supervisor for the critical advices crucial to the completion of this manuscript and to the Biology Departement of Maulana Malik Ibrahim State Islamic University of Malang for providing laboratory facilities as well as giving permission to the authors to publish the results of this research

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