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Status of Seagrass Community in Coastal Area in the Kei Besar District of North-East, South-East Maluku Regency

Agmy Beruat[1*], Bambang AN[2] and Ambaryanto[3]

[1]*Polytechnic State Fisheries, Tual, Indonesia*

[2]*Fishery and Marine Science, Diponegoro University, Semarang, Indonesia*

[3]*Central Laboratory of Research and Services Diponegoro, University Semarang, Indonesia*

[*]**Corresponding author:** Agmy Beruat, Polytechnic State Fisheries, Tual, Indonesia, Tel: +62 24 7460011; E-mail: ab.agmy@yahoo.com

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Abstract

This study was conducted to determine the condition of seagrass existing in the coastal waters of the District of Kei Besar Utara Timur. The purpose of the study is to examine some of the important aspects of the condition of seagrass. The research found four species of seagrass, namely *Cymodocea rotundata, Enhalus acoroides, Halodule pinifolia, H. uninervis, and Thalassia hempricii*. Seagrass was found in coastal waters in station I, station II and station IV with the highest number of seagrass species of four (4) species, whereas at the coastal waters of station III only one (1) species was found. *Cymodocea rotundata* species spread throughout the research stations. *Halodule pirifolia* was a species that came with the highest density (1019 teg./m^2). The highest percent cover was represented by *Enhalus acoroides*, *Halodule pinifolia dan Cymodocea rotundata* species (90%). Based on the approach of percent cover as stipulated in the Decree of the Ministry of Environment No. 200 of 2004, the condition of seagrass in the coastal waters of the District of Kei Besar Utara Timur was categorized into good condition (rich / healthy).

Keywords: Seagrass conditions; Number of stands; Density; Frequency of presence; Percent cover

Introduction

Seagrass is a coastal ecosystem that is covered by seagrass as the dominant vegetation. Seagrass is a group of closed seed plants (Angiospermae) and Monocots capable of living permanently below sea level [1]. The presence of seagrass communities in a body of water contributes to the value of marine productivity. Seagrass beds found in nature are often associated with other aquatic fauna and flora, such as algae, meiofauna, mollusks, echinoderms, crustaceans and various types of fish. These associations form a complex ecosystem in seagrass beds [2]. Thus the loss of seagrass communities in the waters, of course, will affect the food chain existing in this community.

The number of seagrass species found in Southeast Asian waters is about 20 species, 12 of which are found in the waters of Indonesia, which are *Cymodocea serrulata, C. rotundata, Enhalus acoroides, Halodule uninervis, H. pirifolia, Halophilia minor, H. ovalis, H. decipiens, H. spinulosa, Thalassia hemprichii, Syringodium isoetifolium and Thalassodendron ciliatum*. The 12 species spread in the waters of Java, Sumatra, Bali, Kalimantan, Sulawesi, Maluku, East Nusa Tenggara and Irian Jaya. Furthermore, Den Hartog [3] found that there are 13 species of seagrass in the waters of Indonesia, with the addition of a species that is *Halophilia beccari* and 7 species in the waters of Maluku [4].

Based on the earlier description, this research on the condition of seagrass communities in the coastal waters of the District of Kei Besar Utara Timur was conducted with the aim to examine some important aspects of the status of seagrass community, including (1) the species composition and spatial distribution of seagrass species, as well as its contributing factor, (2) the density and percent cover, and (3) the condition of seagrass in the community. The results of this study are expected to be useful for the government, and educational institutions and researchers, and "stakeholders" in managing seagrass in coastal waters of the District of Kei Besar Utara Timur.

Research Methodology

Time and location of the research

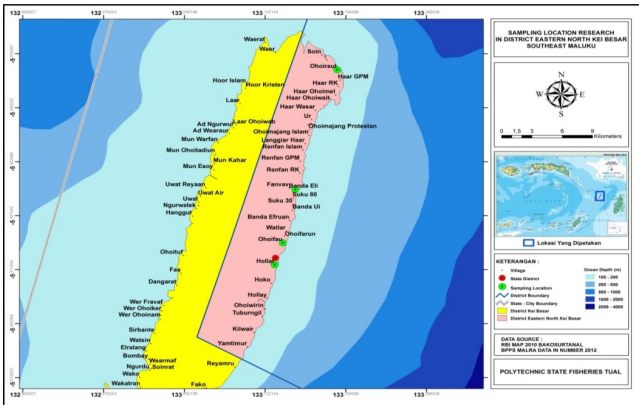

Figure 1: Map of research site.

This research was conducted in November 2011 in the waters of Southeast Maluku regency, District of Kei Besar Utara Timur (Figure 1). The research location was situated in Hollat village (Station I),

Ohoifau village (Station II), Banda Eli village (Station III), and Ohoiraut village (Station IV).

Sampling

The sampling of seagrass was done using a transect method with a sample plot, i.e., transect was drawn perpendicular to the shoreline. Seagrass species encountered were sampled to be analysed and recorded for their habitat characteristics. Data density and biomass of seagrass species were obtained by using a method of squared size of 1 x 1 meter on each transect between one plot and another plot. The condition of seagrass was observed using a transect method and a transect plot. The sampling method of population sample of the community was conducted using a sample plot approach, on the line that is drawn through the seagrass ecosystem (Figure 2). The measurement was based on the guidelines of Ministry of Environment, Decree 200 of 2004 as follows:

- The stations specified for observations of seagrass vegetation should be representative of the study area or each zone of seagrass beds.
- For each observation station, set transect lines from land to seaward direction (perpendicular to the coastline along the seagrass zoning that occurs) in the intertidal area,
- For each transect line, place the sample plots in a square with a size of 1x1 m at intervals of 5 m to a diverse region,
- For each sample plot that has been determined, examine each species of seagrass and count the number of individuals of each species.

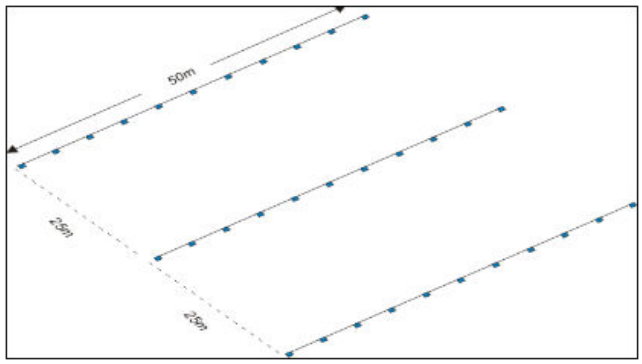

Figure 2: Sampling method of seagrass.

Data analysis

The estimation of the extent of seagrass beds damage was classified into three categories: high, medium and low. As for the determination of the status of the seagrass, it is based on the transect method and transect plot.

The calculation of the percent cover of certain seagrass species in each plot was done by using the following approach:

$$\text{Density}(ind/m^2) = \frac{\text{Number of stands of one species}}{\text{Number of plots number of individual}}$$

$$C = \frac{\sum(Mixfi)}{\sum f}$$

	C: Coverage prosentase of seagrass speies i,
Where	Mi: Median of prosentase of seagrass spesies i,
	F: Number of sub-plot where frequent of seagrass i is same

Results and Discussion

The number of species and the number of stands of seagrass

Seagrass is not only a vital habitat, but also a component of the ecosystem which is more complex in the coastal zone and the sea, contributing to the health of coral reefs and mangroves as well as swamp ecosystem [5]. Seagrass has an important role in the ecology of coastal areas, as a habitat for a variety of marine life including being the feeding ground for green turtles, dugong, fish, echinoderms and gastropods [6]. Another role is to be a barrier for the ecosystem of coral reefs from sedimentation threats coming from the mainland. Seagrass habitat is one of the richest and most important beaches in the sea, and it supports a variety of important marine species ecologically in all trophic levels [7].

Community of seagrasses in coastal waters of the District of Kei Besar Utara Timur had an uneven distribution; From the waters of Hollat village to the ones of Ohoiraut village, there were four (4) species of seagrass found in those coastal waters including: *Cymodocea rotundata, Enhalus acoroides, Halodule pinifolia, H. uninervis, and Thalassia hempricii.* The species spread evenly in each coastal waters of District of Kei Besar Utara Timur because in every sampling location a number of species was found per sampling site. It was observed that the coastal areas of Hollat village, Ohoifau village and Ohoiraut village had the highest number of species of seagrass, each of which had 4 (four) species, whereas in the village of Banda Eli coastal waters only one (1) species was found. *Cymodocea rotundata* species spread throughout the research stations with the number of stands in each station varied from 112 - 1019 teg./m^2 (Table 1).

No	Name of the Species	Number of Stands (teg./m^2)			
		Hollat	Ohoifau	Banda Eli	Ohoiraut
1	*Cymodocea rotundata*	391	112	298	281
2	*Enhalus acoroides*	164	-	-	59
3	*Halodule pinifolia*	557	433	-	1019
4	*H. uninervis*	-	138	-	-
5	*Thalassia hempricii*	516	98	-	119
Number of Species		4	4	1	4

Table 1: Number of stands and the number of species of seagrass in coastal waters of the district of Kei Besar Utara Timur.

Density, presence frequency, percent and seagrass cover

Seagrass species with the highest density was *Cymodocea rotundata* species having the high density value at station IV. Besides, *Cymodocea rotundata* species spread on to four (4) observation stations, with a range between 9.3 to 75 ind./m^2, followed by *Halodule* species *pinifolia* with 36.08 to 63.69 ind./m^2, spreading on three (3) observation stations. Although the species *Cymodocea rotundata* had

the highest density value, *Halodule pinifolia* species were species that contributed to the density value ranging between 1019 teg./m^2, which was found in coastal waters station IV (Table 2). This is possibly related to the physical condition of the plants which was relatively small, so they were more resistant to physical changes of waters. Analysed from the ecological role of seagrass to fishery activities, *Halodule pinifolia* species with small leaves played a very important role for some economically important marine resources, such as shrimps, crabs and fish, as nursery ground, feeding ground and spawning ground.

Station	Species	Density	Presence Frequency	Percent cover
		(ind./m^2)	(ind./m^2)	(%)
I Hollat	*Cymodocea rotundata*	27,93	0,86	85
	Enhalus acoroides	11,71	0,79	90
	Halodule pinifolia	39,79	0,86	90
	Thalassia hemprichii	36,86	1	85
II Ohoifau	*Cymodocea rotundata*	9,3	0,25	75
	Halodule pinifolia	36,08	0,5	90
	H. uninervis	11,5	0,42	85
	Thalassia hemprichii	8,17	0,25	80
III Banda Eli	*Cymodocea rotundata*	75	1	90
IV Ohoiraut	*Cymodocea rotundata*	17,56	0,44	75
	Enhalus acoroides	3,7	0,25	60
	Halodule pinifolia	63,69	1	90
	Thalassia hemprichii	7,44	0,19	65

Table 2: Density, presence frequency and the percent cover of seagrass.

Setyono [8] explained that species *T. hemprichii, H. pinifolia and H. ovalis* are food for some marine species, such as mollusks *(Strombus gigas),* crab *(Uca sp.),* Sea urchin *(Diadema antilarum),* fish *(Siganus sp., Scarus sp., and Acanthurus sp.),* turtle *(Chelonia midas)* and dolphins (Dugong dugong).

The highest frequency of presence had a value of 1 ind./m^2 presence, represented by *Thalassia hemprichii* species (station I), *Cymodocea rotundata* (station III), *Halodule pinifolia* (station IV) while the species with the lowest value of presence frequency of 0.25 ind./m^2 was represented by *Cymodocea rotundata, Thalassia hemprichii and Enhalus acoroides species (station II and IV). Cymodocea rotundata* species was present on the entire observation stations. This indicates that the species could adapt to the substrate condition at these stations, and were able to take advantage of available food resources (Table 2). *Cymodocea rotundata* species was one of the dominant species in the intertidal zone [9]. Hutomo et al. also reported that the *Thalassia hemprichii* species was the most dominant species and had the highest extent for its distribution. This species is found in almost all waters of Indonesia, and often dominates the mixed vegetation with a vertical spread which can reach 25 m and can grow on a variety of substrates ranging from mud sand, coarse to medium-sized sand, to the fragments of corals. This species generally forms fields or monospecific vegetation [10].

Based on the results obtained in the coastal waters of the District of Kei Besar Utara Timur, it was found that the percent cover of seagrass ranged between 65-90%, which was dominated by a few species, among others: *Enhalus acoroides, Halodule pinifolia and Cymodocea rotundata,* with the percent cover of 90% Meanwhile, the lowest percent cover was represented by *Enhalus acoroides* species of 60%.

Conditions of Seagrass

This study tried to give a picture of the seagrass communities in the coastal waters of the District of Kei Besar Utara Timur, using an approach of percent cover as stipulated in the Decree of the Ministry of Environment No. 200 of 2004 [11]; the status of seagrass ecosystems can be categorized as rich / healthy (Table 3) [12].

	Condition	Cover (%)
Good	Rich / Healthy	≥ 60
Damaged	Less rich / less healthy	30-59.9
	Poor	≤ 29.9

Table 3: Conditions and seagrass cover based on the Ministry of Environment No. 200 of 2004.

The value of percent cover of four (4) species of seagrass was above ≥ 60% indicating that the water was still natural, and was in good condition (rich / healthy). Despite having a few number of species, the condition of seagrass in the District of Kei Besar Utara Timur was still good; this condition certainly needs to be maintained so that this community can function with a high level of productivity. However, by looking at pressure through various forms of exploitation of fisheries resources in the area, it is likely that there will be a downward trend in the quality of seagrass resources and environment in the future.

Conclusion

Based on the research results obtained, it can be concluded that in terms of variety of species with four species observed, the highest number of strands was represented by *Halodule pinifolia* species teg./m^2 1019, the highest density was represented by *Cymodocea rotundata* and spread to the four research stations, and the frequency of the highest presence with the value of the presence of one ind./m^2 was represented by *Thalassia hemprichii* species and *Enhalus acoroides*, *Halodule pinifolia* and *Cymodocea rotundata* species, covering coastal zone dominantly. Coastal areas of the District of Kei Besar Utara Timur had adequate resources of seagrass. In addition, the conditions of seagrass species found in this area of research grew in good condition (rich / healthy). These results reveal a fact that the beach areas in the the District of Kei Besar Utara Timur had potential ecosystems that could give contribution in improving the productivity of coastal resources. Therefore, the government together with the community and stakeholders must take strategic steps to manage, maintain and preserve existing seagrass well.

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