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Diversity species and condition of seagrass ecosystem in Teluk Awur and Prawean Jepara

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Diversity species and condition of seagrass ecosystem in Teluk Awur and Prawean Jepara

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Abstract. Seagrass bed ecosystem is one of the coastal marine ecosystems which supports the health of coral reef ecosystem. The purpose of this study was to determine the diversity of species and seagrass conditions in Teluk Awur and Prawean Jepara. Nowadays, increasing land development and coastal activity highly affect the condition of seagrass bed ecosystem. This research used transects quadrant method with 100 meters length. Water quality (pH, salinity, depth and substrate) were also measured. The research result showed that there were 5 species found in both site i.e. *Enhalus acoroides, Cymodocea rotundata*, *Cymodocea serrulata, Thalassia hemprichii,* and *Syringodium isoetifolium.* The lowest dominance was found in Teluk Awur for the *S. isoetifolium* (0.65%), while the highest dominance in both research areas is *C.serrulata.* The seagrass coverage showed an unhealthy condition at both location (28.55% and 48.71%). Fisherman's traditional boat activities as well as fishing and trampling activities are suspected to be the main cause of the decreasing health index of seagrass bed ecosystem at both stations.

1. Introduction

Seagrass bed ecosystem is one of shallow marine ecosystems in the coastal line which function to support the coral reefs health ecosystem [1]. Seagrass bed ecosystem has an ecologically significant function, as for spawning, nursery and feeding ground for many marine organisms[2]. It also has important role to maintain the sustainability of the marine biotas and to help maintaining another marine ecosystem's balance. One of its physical functions is to be a wave resistant and sediment trap which will soothe and clear the waters, so it will creates a very good condition for its surrounding coral ecosystem [3].

Teluk Awur and Prawean Bandengan waters of Jepara coast have seagrass bed ecosystem. Coastal community activities, fisherman traditional boat and anthropogenic waste are the common influence the seagrass bed ecosystem health, such as high tourism activities in Prawean, Bandengan coast [4].

A healthy seagrass bed condition is important to support various species marine organisms. Regarding the ecological and physical functions of the seagrass bed, it is necessary to conduct a research on seagrass bed health in Teluk Awur and Prawean Waters. This research is expected to give some accurate description on seagrass bed ecosystem status in those study areas.

2. Material and methods

The observation on seagrass bed condition in Jepara was conducted in December 2017 in 2 stations, i.e. Teluk Awur and Prawean Bandengan waters. The observation was done by skin diving[5]. The shoreline transects (50x50 cm) were established and transects extended to 100 meters (or less in certain area) of coral slope. The distance between transects was 10 meters[6]. The conditions of the seagrass bed were determined by their species composition, density, coverage and domination. Height of canopy are measured on three randomly chosen seagrass leaves which is dominant in every quadrant. Seagrasses leaves were measured from the sediments surface to tip of the leaves tip without pulling it out from the plant. Epiphytic abundance and microalgae cover were measured in each transect quadrant.

The seagrass coverage category was assessed into four group [5], i.e. rare (0-25%), dense enough (26-50%), dense (51-75%), and very dense (76-100%). In addition, seagrass conditions were also assessed based on their density, as follows, rich/healthy (>60%), less rich/unhealthy (30-59.9%), and poor (<29,9%) [7].

3. Results and discussion

The observation on seagrass bed at Teluk Awur and Prawean Bandengan waters showed that there were five seagrass species, i.e. *Enhalus acoroides, Thalassia hemprichii, Cymodocea serrulata, Cymodocea rotundata* and *Syringodium isoetifolium. C. serrulata* and *T. hemprichii* are dominating at both area. These species of seagrass are commonly found at almost every coastline because they are strong seagrass and capable to survive at various type of substrate. The species is widespread in the tropics since it has a high tolerance for various types of environment, light intensity, estuaries, lagoons and open water areas[8].

There were four species of seagrasses in Teluk Awur waters, i.e. *T. hemprichii, C. serrulata, E. acoroides* and *S. isoetifolium* and dominated by *C. serrulata*. The range seagrass coverage in this location was 25–50% (total cover of 28.55%) belong to a medium category with poor seagrass condition (29%)(Table 1).There is a small river went down to this area which bring about sediment form upstream so that the substrate was fine sands. There is also mangrove vegetation and its association in the shore line. The water depth was 50–95 cm and the light intensity reached the bottom of the waters.

T. hemprichii, C. rotundata, C. serrulata, and *E. acoroide* were found in seagrass bed ecosystem of Prawean Bandengan waters. Their coverage was 25-75% (total cover of 48.71%) (Table 2) belong to less rich condition (30-59.9%) and is dominated by *C. serrulata*. There is no river and only little cluster of mangrove vegetation along the coastal line in this location. The water depth were 50-98 cm with light intensity reached the rough sands and coral fragments bottom substrate.

Table 1. Seagrass species diversity in Teluk Awur and Prawean Jepara waters

Seagrass species	Station	
	Teluk Awur	Prawean
Family Cymodoceae		
1. *Cymodocea serrulata*	+	+
2. *Cymodocea rutondata*	-	+
3. *Syringodium isoetifolium*	+	-
Family Hydrocharitaceae		
1. *Enhalus acoroides*	+	+
2. *Thalassia hemprichii*	+	+

Table 2.Seagrass species coverage (%) in Teluk Awur and Prawean Jepara waters

Station	Coverage (%)					Total coverage (%)
	E.acoroides	*T.hemprichii*	*C.serrulata*	*C.rotundata*	*S.isoetifolium*	
Teluk Awur	1.95	6.50	19.45	-	0.65	28.55
Prawean	3.70	11.51	31.70	1.80	-	48.71

Table 3. Water quality parameters measured in seagrass ecosystem of Teluk Awur and Prawean, Bandengan, Jepara

Station	Water Quality Parameters			
	pH	Salinity(ppt)	Water Depth(cm)	Substrate
Teluk Awur	9	27-28	50 – 95	Fine Sand
Prawean	9	28-30	50 – 98	Sand – rubble

Table 4. Length of Seagrass leaves (canopy), macroalga and epiphyte density at seagrass ecosystem of Teluk Awur and Prawean Jepara

Station	Supporting Parameter Value (Average)		
	Length leaves (cm) /Species	Macroalgae density (%)	Epiphyte (%)
Teluk Awur	12.4/*C. serrulata*	24.54	61.43
Prawean	20.25/*C.serrulata*	21.20	47.01

Seagrass cover in Teluk Awur and Prawean Bandengan waters of Jepara is 28.55–48.71% (average of 38.63%) which belong to less healthy/less rich (30–59.9%) of seagrass. *T. hempricii* and *C. serrulata* were found in both locations. The difference on seagrass species is mostly affected by current in the seagrass bed. There are only 5 seagrass species found is probably due to substrate and shallow water level.

Seagrass growth is also influenced by seasonal varieties. Size and capacity of seagrass affect their storing and managing resources in the growth phase. Smaller seagrass species with lower storage capacity tends to be more seasonally varied, while large seagrass species with larger internal resources stored underground tends to grow more independently in any environmental conditions[10]. Shallow water depths also affect seagrass condition at some station as it causes excessive exposure of sunlight to seagrass beds. Thus seagrass leaves will turn brownish. Direct sunlight exposure will also directly inhibit seagrass growth as well as increase waters temperature which can also be a resistance factor on seagrass development.

Canopy as one of the seagrass monitoring supporting parameter (Table 4). Canopies average value in each station was obtained from dominated species. It was measurement the length of seagrass leaves starting from sediment surface to the leaf tip. Macroalgae cover on both locations were low i.e. 21.20-24.54%. Macroalgae are vegetation association commonly found in the seagrass ecosystem. The greater the algae cover the good water condition [11]. Periphyton cover indicate high nutrient in the waters due to anthropogenic activity. High abundance of periphyton showed bad waters quality. Epiphyte cover were 47.01-61.43% in both location.

Seagrass bed in research location experienced a rather high disturbance. This is because the observation station were close to community residence and their activity as fisherman and trampling to catch Bivalvia. In addition the location of seagrass bed area under transportation line for both fisherman and tourist boat. Accordingly, a sustainable act and monitoring must be done to maintain the seagrass ecosystem in Jepara coastal area.

4. Conclusion

There are 5 species of seagrass in the Teluk Awur and Prawean, Bandengan waters with domination of *Cymodocea serrulata*. The species diversity and coverage were affected by the substrate and influence of community activity.

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