



Health Status of Seagrass Beds in Intertidal Zone of West Sekotong West Lombok

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Abstract: The coastal waters of West Sekotong possess significant potential in fisheries and marine resources. Seagrass is one of the key biotas contributing nutrients to support the fertility of surrounding waters. This study, conducted from May to July 2021 aimed to identify seagrass species and assess the health status of seagrass bed based on percentage cover and ecological indices. The research method used was purposive sampling with three research stations and systematic random sampling with transects. Based on the research that has been conducted, the following results were obtained seven seagrass species from two families. Hydrocharitaceae families (*Enhalus acoroides*, *Thalassia hemprichii*, *Halophila ovalis*, *Halophila minor*) and Cymodoceaceae families (*Cymodocea rotundata*, *Cymodocea serrulata*, *Halodule pinifolia*). The highest species density was *H. pinifolia* (119.47 ind/m²), with the highest important value index at station 1 (*H. pinifolia* 89%), station 2 (*T. hemprichii* 205%), and station 3 (*E. acoroides* 300%). Station 1 had the highest diversity and uniformity index, while station 3 was dominated by single species. Seagrass cover ranged from 31–48.33%, indicating unhealthy conditions, although environmental parameters remained within suitable ranges for seagrass growth.

Keywords: Health status; Seagrass beds; Sekotong

Introduction

The waters in the West Nusa Tenggara region are partly national conservation areas, one of which is the coastal waters in West Lombok Regency, especially Sekotong subdistrict (Dermawan et al., 2014). Sekotong subdistrict consists of several villages, one of which is West Sekotong village. The West Sekotong coastal area has potential resources for fisheries and marine activities, which are utilized by the local community for fishing, aquaculture (fish farming), fisheries management, and other fisheries-related services (Armiani et al., 2012).

West Sekotong coastal have diverse ecosystems such as mangrove forest ecosystems, seagrass beds and coral reefs (Safari Ilham et al., 2018). Seagrass ecosystems are coastal ecosystems that have high biodiversity and act as contributors of nutrients to the fertility of the surrounding waters (Kawaroe et al., 2016).

Seagrass is a higher plant with single-seeded (liliopsida) and a closed inflorescence system (magnoliophyta) that is fully adapted to grow and develop while its entire body is submerged in seawater (Feryatun, 2012). Seagrass have a life pattern that often takes the form of a stretch, like grasslands on land, so they are known as seagrass beds. Seagrass beds provide great benefits, both ecologically and economically. This ecosystem really supports the sustainability of fisheries resources in Indonesia (Wahyudin et al., 2016).

Globally, seagrass meadows have experienced a decline in areas ranging from meters to hundreds of square kilometers (Dunic et al., 2021). Seagrass ecosystems do not receive much attention, even though they provide important goods and services (de la Torre-Castro et al., 2014). According to the research result of Dewi et al. (2019) the ecological role of seagrass is as a primary producer, habitat for other organisms, sediment trap, current and wave barrier, nutrient recycler, and

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carbon sink.. Apart from that, seagrass is used by the community as a source of green fertilizer, food ingredients, raw materials for housing, materials for making ropes, and raw materials for making paper. One type of seagrass, namely *H. ovalis* leaves can be used as a basic ingredient to cure various skin diseases. Therefore, seagrass also has high economic value (Robert et al., 2006; Zurba, 2018).

According to data from P2O-LIPI, Indonesia's seagrass cover in 2018 was 293,464 hectares, obtained through remote sensing using satellite imagery. This figure represents only 16%-35% of the potential seagrass cover in Indonesia (Trisnadi & Putranto, 2022). This figure will undoubtedly continue to fluctuate as surveys continue to be conducted across Indonesia's coast.

The research location was chosen in West Sekotong coastal because in this area there has been no research regarding the health status of seagrass. On the other hand, the utilization of natural resources in this coastal area is the highest compared to other coastal areas in Sekotong District, which has the potential to affect the existing ecosystems, including seagrass ecosystems. Based on this, research needs to be conducted to determine the health status of seagrass beds in terms of seagrass coverage percentage, ecological index, and water conditions in West Sekotong.

Method

This research was carried out from April to June 2021. Samples were taken in the waters of West Sekotong, West Lombok Regency (Figure 1.) and sample analysis at the Advanced Biology Laboratory, Faculty of Mathematics and Natural Sciences, Mataram University.

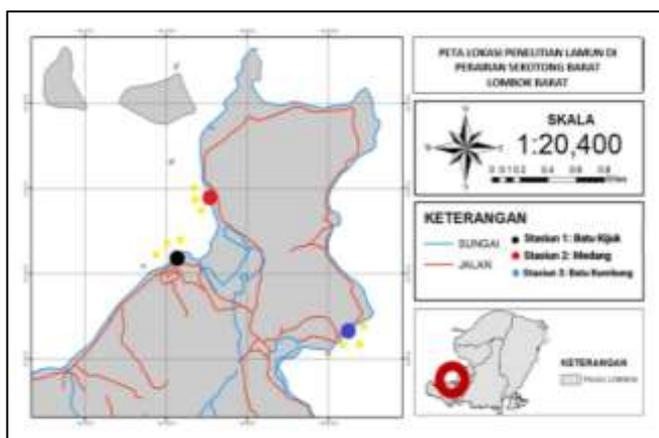


Figure 1. Map of research locations in West Sekotong coastal waters

Experimental Design

The first stage is the preparation stage. This stage is the initial stage of research which consists of literature study, field observation/survey activities by collecting

information and references from previous research as well as preparing equipment and teams (Figure 2).

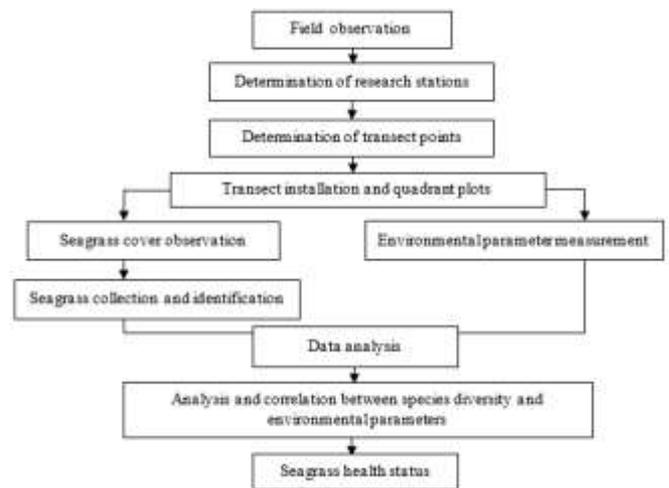


Figure 2. Research flowchart

The second stage is determining the research stations. This determination uses purposive sampling, which is a technique for determining stations based on specific considerations (Asari et al., 2023). The considerations used are based on factors that cause sedimentation, the position of the current direction and the substrate. This research was conducted at three stations. The first station, Batu Kijuk coastal area (Station 1) is a coastal area directly facing the Indonesian sea, so it has relatively large waves compared to the other station and a predominantly sandy substrate. Next, the Medang coastal area (Station 2) is an area that faces the mangrove area of former ponds so the dominant substrate is muddy sand. The third and final station is the Batu Kumbang coastal area (Station 3) which is located behind a hill where there is a mangrove ecosystem facing the river mouth, so the dominant substrate is muddy.

The next stage is determining transect points using systematic random sampling technique. This technique is used by drawing a transect line perpendicular to the coastline for 100 m, then plot quadrants measuring 50x50 cm² are placed systematically with a distance between quadrants of 20 m and a distance between transects of 100 m. Each station consists of 3 transects with each transect consisting of 5 plot quadrants (Figure 3).

The next stage is observing seagrass in the field including identifying seagrass, calculating seagrass density and percentage cover. All types of seagrass found in the quadrants were identified using the Seagrass-Watch Monitoring Guide Line (McKenzie et al., 2003). Identification is carried out by paying attention to the morphology of the seagrass leaves, stems and rhizomes. Calculating seagrass density by counting

the number of individuals seagrass stands in each quadrant, where one seagrass stand is a collection of several leaves whose bases are fused (Hartati et al., 2012). Calculation of the percentage of seagrass cover was carried out using the Seagrass Percent Cover Standards method. This method is carried out by estimating the percentage of seagrass cover area in each quadrant transect and the results will then be compared with standard damage criteria and guidelines for determining the status of seagrass meadows (McKenzie, 2003).

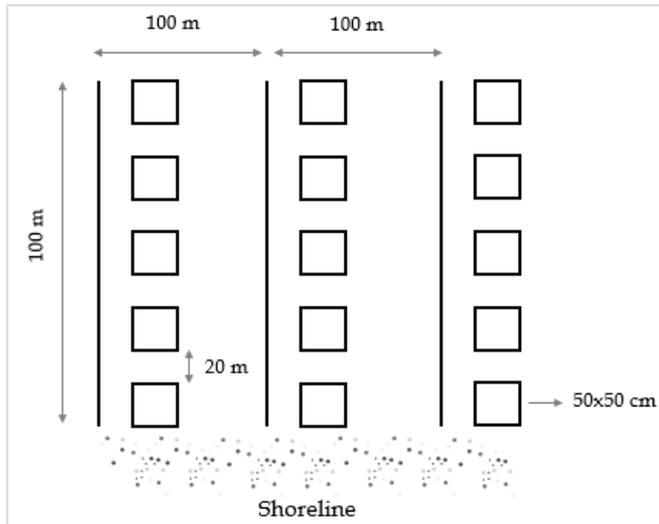


Figure 3. Illustration of transects and quadrant plots installation at each station

The next stage is measuring environmental variables include physical and chemical factors at the sampling location, namely measuring pH, temperature, salinity, nitrate and substrate.

Data Analysis

The data analysis conducted includes the following:

Species Identification

Species identification was carried out with the help of the Seagrass-Watch Monitoring Guide Line in the Seagrass Watch-Methods sub-chapter (McKenzie et al., 2003).

Seagrass Cover Percentage

Estimates of seagrass cover percentage in 50x50 cm² plot quadrants were made based on standard seagrass cover percentage guidelines from Seagrass-watch Methods. The percentage of seagrass cover is the proportion of the substrate area covered by seagrass vegetation in one unit area observed perpendicularly from above (Brower & Zar, 1990). The estimated data obtained for each plot was then averaged per observation station.

Table 1. Condition of Seagrass Beds Based on Coverage Percentage of Minister of Environment Decree Number 200 of 2004

Condition	Coverage (%)
Healthy	≥ 60
Unhealthy	30-59.90
Poor	≤ 29.90

Species Density

Seagrass species density is the number of individuals/stands of a seagrass species in a certain area. Species density (Di) is the number of individuals of type i divided by the total area measured (Bengen & Geoffrey, 2009) which is generally expressed in individual units per square meter (Ind/m²):

$$D_i = \frac{n_i}{A} \tag{1}$$

Where:

- D_i : Density of seagrass, species i (Ind/m²)
- N_i : Number of seagrass with species i (Ind)
- A : Total observation area (m²)

Table 2. Seagrass Conditions Based on Density (Gosari & Haris, 2012)

Density (ind/m ²)	Condition
<25	Very rarely
25-75	Rarely
75-125	A bit tight
125-175	Tight
>175	Very tight

Species Frequency

Frequency is the probability that a type is found in an observed sample point. The type frequency is calculated using the formula (Odum, 1993):

$$F_i = \frac{P_i}{\sum P} \tag{2}$$

Where:

- F_i : Frequency type (ind)
- P_i : Number of sample plots where species i was found (unit)
- ∑P : Total number of sample plots observed (units)

Diversity Index

The calculation of the seagrass diversity index refers to the Shannon-Wiener diversity index (H') with the following formula (Odum, 1996):

$$H' = -\sum p_i \ln p_i; \quad p_i = \frac{n_i}{N} \tag{3}$$

Where:

- H' : Diversity Index

N_i : Number of individuals of each species
 N : Number of individuals of all species
 p_i : Abundance of every species

Table 3. Classification of Shannon-Wiener Diversity Index Values

Diversity index value	Categories
$H' > 3$	High level of diversity
$3 \geq H' \geq 1$	Moderate level of diversity
$H' \leq 1$	Low level of diversity

Uniniformity Index

The uniformity index calculation refers to the Simpson Index with the following formula (Odum, 1993):

$$E = \frac{H'}{H_{max}} ; H_{max} = \ln S \tag{4}$$

Where:

E : Uniniformity Index
 H' : Diversity Index
 S : Number of seagrass species found

Table 4. Uniniformity Value Index Criteria

Uniniformity value	Categories
$1.00 \geq E > 0.60$	High uniformity
$0.60 \geq E > 0.40$	Moderate uniformity
$0.40 \geq E \geq 0$	Low uniformity

Dominance Index

The dominance index value is a description of whether or not a species dominates in a water area. The calculation of the dominance index value refers to the Simpson dominance index with the following formula (Brower & Zar, 1990):

$$C_i = \Sigma (P_i); P_i = \frac{n_i}{N} \tag{5}$$

Where:

C_i : Simpson Dominance Index
 N_i : Number of individuals of type i
 N : The total number of individuals of all species

Table 5. Dominance Index Level Criteria

Dominance value (C)	Categories
$0.60 < C \leq 1.00$	High dominance
$0.40 < C \leq 0.60$	Moderate dominance
$0 \leq C \leq 0.40$	Low dominance

Important Value Index (IVI)

The important value index is a value that provides an overview of the influence or role of a plant type in a location. The important value index is obtained by the formula (Brower & Zar, 1990):

$$INP = RD_i + RFi + Rci \tag{6}$$

Where:

INP : Important Value Index (%)
 RD_i : Relative Density (%)
 RFi : Relative Frequency (%)
 Rci : Relative Dominance (%)

Result and Discussion

Identification of Seagrass Species in West Sekotong Coastal Waters

The waters of West Sekotong have potential resources for fisheries and marine life. Seagrass is one of the biotas that contributes nutrients to the fertility of the surrounding waters. The presence of seagrass species in West Sekotong coastal area apart from being influenced by natural factors, is also influenced by anthropogenic factors such as crossing tourist areas and daily activities of local residents (fishing, netting and *madak*). *Madak* is an activity of collecting biota in tidal areas at low tide (Tania et al., 2014).

Table 6. Presence of Seagrass Species Per Station

Family	Species	Station
Hydrocharitaceae	<i>Enhalus acoroides</i> (Ea)	Ki, M, Ku
	<i>Thalassia hemprichii</i> (Th)	Ki, M
	<i>Halophila ovalis</i> (Ho)	Ki
	<i>Halophila minor</i> (Hm)	Ki, M
Cymodoceaceae	<i>Cymodocea rotundata</i> (Cr)	Ki
	<i>Cymodocea serrulata</i> (Cs)	Ki
	<i>Halodule pinifolia</i> (Hp)	Ki
Total		7

Description: Station 1 Batu Kijuk (Ki), Station 2 Medang (M), Station 3 Batu Kumbang (Ku).

Table 7. Environmental Parameter

Parameter	Station 1	Station 2	Station 3
Temperature (°C)	28	28	29
Salinity (ppt)	31	31	34
pH	7	7	6.50
Nitrate (mg/L)	0.001	0.001	0.001
Substrate	Sandy, muddy sand	Muddy sand, muddy	Muddy

Based on the results of research conducted at three research stations, seven types of seagrass were found which belong to two families, namely the Hydrocharitaceae family (*E. acoroides*, *T. hemprichii*, *H. ovalis*, *H. minor*) and Cymodoceaceae (*C. rotundata*, *C. serrulata*, and *H. pinifolia*) with the presence of different types at each station (Table 6). In station 1 all species of seagrass were found, in station 2 three species of seagrass were found and in station 3 only one species of seagrass was found. The bottom substrate of the waters is dominated by sand, muddy sand, sandy and muddy

mud because some areas face directly towards the river mouth and are right in front of the mangrove ecosystem, which causing turbidity.

The highest number of seagrass species was found at station 1, with seven species. This is likely due to the substrate type being suitable for seagrass growth, namely sandy to muddy sand substrate. This is supported by research by Feryatun (2012), which states that if the coastal seabed consists of sand and muddy sand, seagrass can grow abundantly in that location. The dominant sandy substrate at station 1 is due to the station being directly facing the Indonesian sea, resulting in larger waves compared to other stations. Seagrass at station 2 grows into a seagrass bed that appears denser than at Station 1. This is because *E. acoroides* and *T. hemprichii* dominate the area. Both of these seagrass species have relatively tall stems and broad leaves.

Seagrass growth at station 1 and station 2 forms a multispecies seagrass community (mixed vegetation) consisting of three to seven seagrass species. However, at station 3 only one seagrass species, *E. acoroides* was found forming a monospecific seagrass bed with a predominantly muddy substrate. The *E. acoroides* species is known to form a single species or dominate seagrass bed communities (Zurba, 2018). This is also confirmed by Kordi & Ghufuran (2011), who noted that single species seagrass meadows with high association are commonly found on muddy substrates in mangrove areas near the sea.

E. acoroides species was found at all research stations because this species is adaptable and able to grow on various types of substrates (Zurba, 2018). *E. acoroides* is one of the dominant seagrass species found in Indonesian waters. *E. acoroides* can form single-species seagrass beds (monospecies vegetation) and mixed vegetation (Terrados et al., 1999). At the time of the research, *E. acoroides* was found to grow on various types of substrates ranging from sandy, muddy sand to muddy substrates. *E. acoroides* wins the competition in terms of nutrient absorption in water and sediment. This species has a strong and large root system, making it easier to absorb more nutrients from the sediment. Additionally, *E. acoroides* has a large body structure with a wide leaf canopy, enabling it to win spatial competition and obtain light for photosynthesis compared to other seagrass species that are smaller in size (Terrados et al., 1999). *E. acoroides* at station 3 is larger than the other two stations with leaf lengths reaching one meter or more and a dark green color. This condition may be due to the absence of intraspecific competition among *E. acoroides* seagrasses in a monospecific environment (Rattanachot, 2008).

Furthermore, the type of seagrass found was *T. hemprichii* at stations 1 and 2, growing on sandy and

muddy sand substrates, but more commonly found on sandy substrates. This is in accordance with research by Hartog 1970 cited in Dewi et al. (2018), which indicates that *T. hemprichii* has a tendency to live and reproduce well on sandy substrates with coral rubble. The most distinctive feature of this species is its curved, sickle-shaped leaves with black spots (tannin cells), erect stems, and thick, rough rhizomes.

Other types of seagrass belonging to the Hydrocharitaceae family that have been found are *H. ovalis* and *H. minor*. These two types have quite similar morphology. *H. ovalis* has oval-shaped leaves like paddles with 10-25 pairs of veins, while *H. minor* has oval-shaped leaves like eggs with no more than eight pairs of veins. Both types have white rhizomes that break easily.

The seagrasses from the Cymodoceaceae family that were found were *C. rotundata*, *C. serrulata*, and *H. pinifolia*. The species of *C. rotundata* and *C. serrulata* can be differentiated from the shape of the leaf tips. *C. rotundata* has rounded leaf tips and a curve in the middle so that it looks like a heart and closed leaf scars. Meanwhile, *C. serrulata* has rounded leaf tips with serrated edges and open leaf scars. *H. pinifolia* species has elongated leaves like small ribbons with rounded leaf tips and a vein in the middle that is blackish brown. Rhizomes are pale in color.

Differences in seagrass distribution at each research site may be due to differences in environmental conditions such as physical and chemical factors and water topography. Seagrass species distribution at station 1 grows on a dominant sandy and muddy sand substrate. This is because station 1 is directly exposed to the Indonesian sea, resulting in stronger currents and waves compared to other stations, leading to a dominant sandy substrate. The seagrass at station 2 grows on muddy and muddy sand substrate. This is because the waters at station 2 have a sloping beach type and there is a mangrove ecosystem from former ponds which causes the dominant substrate to be muddy sand. Similar to the previous station, seagrass at station 3 grows on a muddy substrate because it faces the river mouth. Berwick (1992) explains that the thinner the substrate, the more unstable the seagrass conditions, whereas the thicker the substrate, the more stable the seagrass conditions because the seagrass roots can attach, bind, and capture sediment optimally. Additionally, according to Kiswara & Winardi (1994), substrate depth plays a role in sediment stability, encompassing two aspects, protecting plants from ocean currents and serving as a processing site and nutrient supplier.

Seagrass Health Status Based on Percentage Cover

The standard criteria for seagrass bed damage are the limit of physical and/or biological changes in seagrass beds that can be tolerated, determined based on the percentage of the damaged area or the area covered by living seagrass (Rustam et al., 2015). Based on Figure 4.3, the total seagrass coverage area of the three stations was 48.33% for station 1, 45.67% for station 2, and 31% for station 3. Although station 1 has the highest coverage value, according to Ministry of Environment Decree No 200 of 2004, this value falls into the “unhealthy” category as it is below 59.9%. The damage to seagrass beds at the three research site locations was most likely caused by anthropogenic factors. Dropping of anchors and propellers from shipping traffic activities can erode seagrass plants. Apart from that, several local community activities such as fishing, fishing nets and *madak* (harvesting biota with tools and materials that are not environmentally friendly such as soil scrapers or sickles) can uproot and sever the seagrass root system (Tania et al., 2014). The increase in inorganic waste in seagrass areas originating from residential areas and tourist activities also affects seagrass growth. Environmental parameters other than substrate, which is temperature, pH and salinity, were measured in situ and the measurement data can be seen in (Table 7). The measurement results for water temperature ranged from 28-29 °C, pH ranged from 6.50 - 7, nitrate at 0.001 and salinity ranged from 31-34 ppt. These values did not show significant differences across stations and remained within safe (suitable) ranges for seagrass growth base on Ministry of Environment Decree No 51 of 2004.

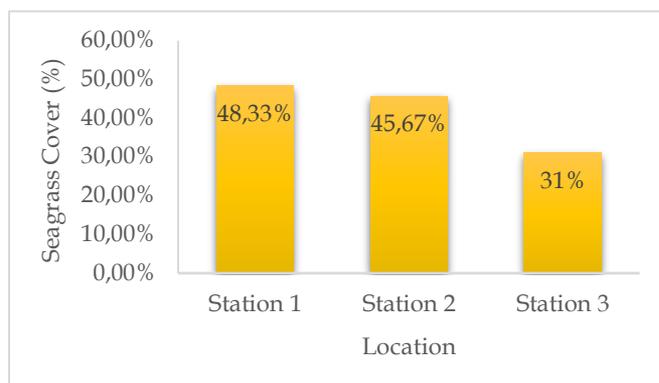


Figure 4. Graphic of total seagrass cover percentage in West Sekotong coastal waters

The seagrass ecological index includes species density, species frequency, diversity index, uniformity index, dominance index, and importance value index.

Table 8. Ecological Index of Seagrass

Station	Di	Fi	Ci	H'	E
Station 1	389.33	4	0.20	1.76	0.90
Station 2	115.20	1.60	0.54	0.79	0.72
Station 3	28.80	0.87	1	0	0

Description: Species Density (Di), Species Frequency (Fi), Dominance Index (Ci), Diversity Index (H'), Uniniformity Index (E).

Species Density

Seagrass species density is the number of individuals/stands of a seagrass species in a certain area. Seagrass density is influenced by the location where seagrass grows (Kiswara, 2004). The environmental characteristics of each station are similar.

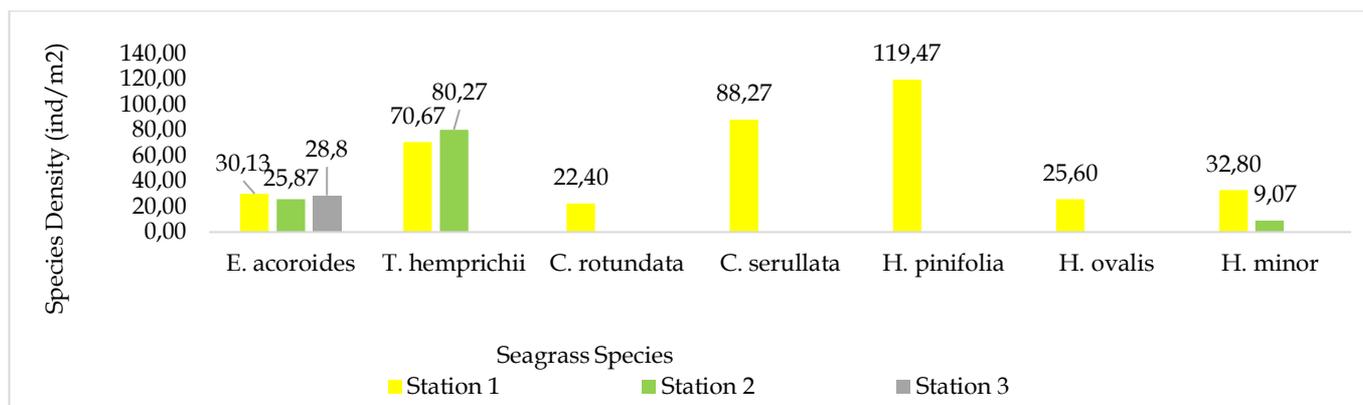


Figure 5. Graphic of seagrass species density in West Sekotong coastal waters

Based on table 8, station 1 has the highest total seagrass density value compared to the other two stations, which is 396 Ind/m². *H. pinifolia* species has the highest density with a value of 119.47 Ind/m² (Figure 5.) At the time of the research, this species was most abundant in tidal areas with predominantly sandy substrates. Alhaddad & Abubakar (2016) explained that

H. pinifolia can be found on substrate types such as sand, muddy sand, and sandy mud. This is also in line with research by Irawan et al. (2016), which explains that *H. pinifolia* is abundant in substrates dominated by fine sand that is often stirred by waves and exposed during low tide. Additionally, at station 1, there are many activities such as snorkeling and swimming by both

local residents and tourists, as well as the docking of fishing boats and tourist transport boats heading to the Gita Nada area. These various activities cause disruption to seagrass growth. Therefore, it is in accordance with den Hartog, (1967), who states that the *H. pinifolia* species is an opener or pioneer type that can grow well to various types of substrate in disturbed habitats.

The highest species density at station 2 was *T. hemprichii* species with density value of 80.27 Ind/m² (Figure 5). This species was found in almost all observation plots at station 2 and was found growing monospecies vegetation in several observation plots. Unlike *E. acoroides*, although it appears quite frequently in observation plots at station 2, there are only two to three stands in a single plot, so its density is lower than *T. hemprichii*. The low density of *E. acoroides* seagrass is primarily due to the fact that *E. acoroides* is the largest seagrass species among the 16 seagrass species found in Indonesia, resulting in different densities in the same space compared to other seagrass species. In addition, the suitable substrate type also supports the growth of *T. hemprichii*. It is known that this species is highly tolerant and can grow and survive in various types of substrates, ranging from sand to mud (Kawaroe et al., 2016). This is in line with research by Satriani et al. (2024), which states that seagrass density is closely related to the type of substrate and its ability to support seagrass growth. The high density of *T. hemprichii* indicates that this species is widespread and well adapted.

In Figure 5, it can be seen that station 3 is only grown by *E. acoroides* species thus forming a monospecies seagrass bed. Even though it consists of a single vegetation, the species density at station 3 based on (Table 8.) is the lowest compared to other stations with a value of 28.8 Ind/m². The growth of *E. acoroides* at this station is rare, seen from several empty plots (there are no such species) and the frequency of appearance in each plot is also relatively low. The results of research by Duarte et al. (2000) indicate that *E. acoroides* will thrive when mixed with other types of seagrass (multispecies), because it wins the competition in terms of nutrient absorption in water and sediment. Density is also influenced by the size of the seagrass leaves. The smaller the leaf size, the higher the density. As is known, *E. acoroides* is the largest type of seagrass, has broad leaves and can grow up to one meter long. The density and growth of seagrass is also influenced by the depth of a body of water (Zurba, 2018). This is related to the photosynthesis process which requires light. The deeper the water, the more hampered the ability of seagrass to carry out photosynthesis due to the reduced intensity of incoming light.

Species Frequency

Species frequency is the probability of a species being found at a given observation point, thereby describing the distribution of seagrasses encountered. *E. acoroides* and *T. hemprichii* were the dominant species found in a number of observation plots. Out of the total 45 observation plots, 37 plots were found to be *E. acoroides* and 24 plots were found to be *T. hemprichii*. This may be due to the fact that these two species have a wide distribution and are the most commonly found in Indonesia (Zurba, 2018). Species with high frequencies generally have greater adaptability to different environmental factors (Menajang et al., 2017). The high occurrence of *E. acoroides* is due to its wide distribution and higher tolerance range for substrate conditions compared to other seagrass species. Similarly, *T. hemprichii*, which is found throughout Indonesian waters, often dominates mixed vegetation with a vertical distribution reaching up to 25 m and can grow on various types of substrates, ranging from mud, sand, medium-sized and coarse sand to coral fragments (Patty & Rifai, 2014).

Diversity, Uniformity and Dominance Index

The diversity, uniformity, and dominance indices can describe the level of stability of a community in an ecosystem (Wijana et al., 2019). These three indices can also describe environmental conditions because environmental conditions greatly influence the level of species as the smallest component of the population that forms a community.

Seagrass diversity index value can be seen in (Table 8). Station 1 obtained a diversity index value of 1.76. Based on this value, the diversity index for station 1 is included in the medium category. A moderate diversity index means that individual distribution of each species is moderate and community stability is moderate. According to Fitriana (2006), a moderate diversity index value can mean that the location has sufficient productivity, the ecosystem condition is quite balanced and the ecological pressure is moderate. Meanwhile, the diversity index for station 2 was 0.79 and station 3 was 0. Both stations were categorized as having low diversity index values. A low diversity index value indicates that diversity is low, individual distribution of each species is low and community stability is low. The low diversity value, apart from the low distribution of individuals, is also caused by the presence of one type of seagrass whose numbers are much different compared to other types.

The uniformity index value indicates the stability of a community (Pratiwi & Ernawati, 2018). The seagrass uniformity index value in West Sekotong coastal area can be seen in Table 8. Station 1 has a uniformity index value of 0.90, station 2 has a value of 0.72, and station 3

has a value of 0. Station 1 falls into the high uniformity index category, meaning that the number of individuals of one species is not significantly different from the other species, and the environmental conditions are considered stable. Station 2 falls into the moderate category, indicating that the environmental conditions are not very stable. However, one species, *T. hemprichii*, had the highest abundance among all observation plots, significantly different from the abundance of other species, resulting in a moderate uniformity index value. Station 3 falls into the low category because it is dominated only by *E. acoroides* species, which grows to form a monospecific seagrass bed. If the uniformity index value decreases, the difference in abundance between species increases (indicating dominance), and conversely, if the uniformity index value increases, the difference in abundance between species decreases, so there is no tendency for dominance by a particular species (Wijana et al., 2019).

The dominance index value shows whether or not a species dominates in a water area. Based on Table 8, the highest total dominance was at station 3, followed by station 2, and the lowest at station 1. Station 1 had a dominance value of 0.20, which falls into the low dominance category. Low dominance means that the number of individuals of each species is not significantly

different, so no single species dominates. This is also consistent with the high diversity index value in that area. Station 2 with a dominance index value of 0.54, falls into the moderate dominance category, indicating that the environmental conditions are fairly stable. Meanwhile, station 3 with a dominance index value of 1,0 falls into the high dominance category. High dominance indicates that there is one species with a very large number of individuals, significantly different from the others, and the environmental conditions are unstable due to ecological pressure (Rappe, 2010). Station 3 itself is a monospecies seagrass ecosystem with the *E. acoroides* species dominating the coastal area.

The Importance Value Index

The Importance Value Index (IVI) provides an overview of the dominant species and the influence or role of a species in a seagrass community (Menajang et al., 2017). The IVI shows that this species has an important role in the seagrass community in West Sekotong coastal area. The higher the IVI, the greater the role of the seagrass species. If this species disappears or is low, it can be used as a sign that there has been a major change in the seagrass environment in West Sekotong coastal waters.

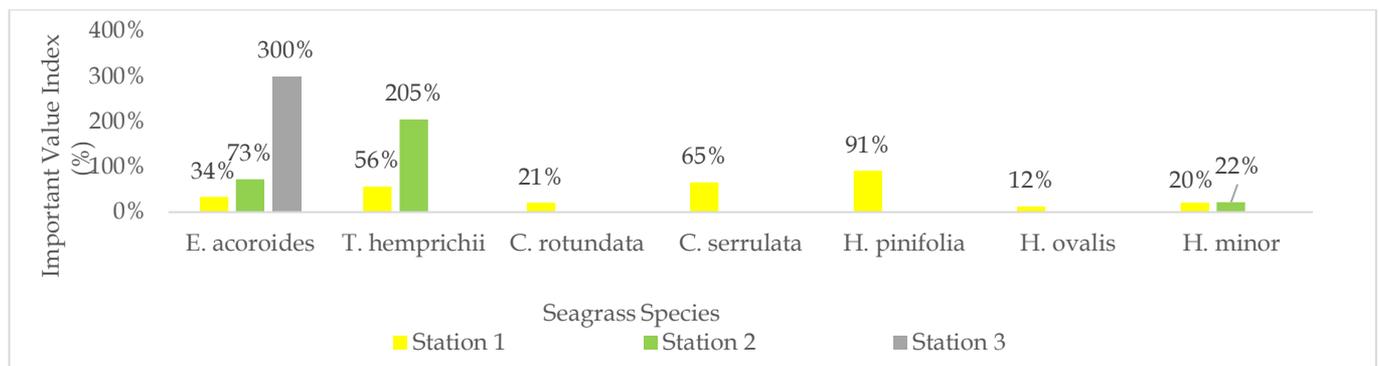


Figure 6. Important value index (IVI)

Based on Figure 6, at station 1 the highest IVI is the *H. pinifolia* species at 89%. The high IVI of *H. pinifolia* is caused by its rapid growth because it is a pioneer species acting as the vanguard of seagrass restoration due to its ability to grow faster. *T. hemprichii* species has the highest IVI of 205% at station 2. This species dominates at station 2 so it has a high density and frequency. The fairly high density and frequency of appearance indicates that it is a fairly abundant food source. According to Dewi et al. (2018), it is known that this species of seagrass is easy to digest. Station 3 has an IVI value of 300% for the species *E. acoroides*. The high IVI value of this species is due to the large size and long lifespan of *E. acoroides* leaves, which provide shelter for several other marine biota, as well as the greater number

and variety of epiphytic macroalgae found on *E. acoroides* seagrass.

Conclusion

Based on research that has been carried out regarding the health status of seagrass beds in the coastal waters of West Sekotong, it can be concluded that, there are seven types of seagrass species were found from two families, namely the Hydrocaritaceae family consisting of the species *E. acoroides*, *T. hemprichii*, *H. ovalis*, *H. minor* and the Cymodoceaceae family consisting of the species *C. rotundata*, *C. serrulata*, and *H. pinifolia*. The percentage of total seagrass cover ranges from 31-48.33%, indicates the condition of seagrass beds

in the coastal waters of West Sekotong is unhealthy. The highest species density was *H. pinifolia* with a value of 119.47 ind/m². The diversity and uniformity index were highest at station 1 which caused low species dominance, in contrast to station 3 because it was dominated by one species. The highest important value index for station 1 is *H. pinifolia* species at 89%, station 2 *T. hemrichii* species at 205% and station 3 *E. acoroides* species at 300%. The environmental parameter values for each station do not show significant differences and are still good for seagrass growth according to sea water quality standards for marine biota.

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Author Contributions

All authors discuss the results of the research and contribute to the final manuscript. The contributions of each author are as follows, A.N. contributed to research ideas, research funding, data collection, manuscript collection and revision and related to journal publishing. D.A.C., S.P.A., H.A., and S. contributed as supervisor and writing review. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflicts of interest in preparing this article.

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