SEAGRASS MEADOWS CONDITIONS IN PANTAR STRAIT AND SURROUNDING AREA, ALOR REGENCY, EAST NUSA TENGGARA

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Abstract - Monitoring seagrass beds play an important role in the management of the coastal environment because of two things, that this activity is a method for improved management practices and can provide information about the status and condition of seagrass meadows, so it can be used as one consideration of adaptive management of marine protected areas. Data were collected in December 2016 in the northern part of Alor Island, namely Alila Beach, Mali Beach, Deere Beach, and Lapang Beach. Percentage of seagrass cover, pH, salinity, and temperature were measured in situ, while sediment organic content was analyzed in the laboratory using LOI method. The results showed a range of seagrass cover between 25,1-72,8% (x = 47,6 ± 17,5), pH 8,29-8,58 (x = 8,48 ± 0,10), salinity 31- 33 ppt (x = 31,7 ± 1,1), temperature 28,6-33,5^{0}C (x = 32,2 ± 1,9), and organic sediment content from 2,73 to 4,46% (x = 3,57 ± 0,76). There were six seagrasses composed of T. *hemprichii*, E. *acoroides,* C. *rotundata*, H. *pinifolia*, S. *isoetifolium*, and H. *ovalis*. Based on the condition of seagrass cover, the seagrass ecosystem in Pantar Strait and its surroundings were in a rare to the dense category, with criteria for the status of seagrass beds were poor (25,1%) to rich/healthy (72,8%) conditions.
Keyword: Pantar, Seagrass, Mangrove, Sea Urchin, Sea Cucumber

***Abstrak** - Kegiatan monitoring padang lamun berperan penting dalam pengelolaan lingkungan pesisir karena dua hal, yaitu kegiatan ini merupakan suatu metode untuk peningkatan praktik pengelolaan dan dapat menyediakan informasi mengenai status dan kondisi padang lamun sehingga dapat digunakan sebagai salah satu pertimbangan adaptif pengelolaan kawasan perlindungan laut. Pengambilan data dilakukan pada Bulan Desember 2016 di bagian utara Pulau Alor, yaitu di Pantai Alila, Pantai Mali, Pantai Deere, dan Pantai Lapang. Data yang diukur secara insitu adalah persentase tutupan lamun, pH, salinitas, suhu, sementara kandungan organik sedimen dianalisis menggunakan metode pembakaran di laboratorium. Hasil kajian menunjukkan kisaran tutupan lamun antara 25,1-72,8% (x = 47,6±17,5), pH 8,29-8,58 (x = 8,48±0,10), salinitas 31-33 ppt (x = 31,7±1,1), suhu 28,6-33,5^{0}C (x = 32,2±1,9), dan kandungan organik sedimen 2,73-4,46 % (x = 3,57±0,76). Terdapat enam jenis lamun, yaitu T. hemprichii, E. acoroides, C. rotundata, H. pinifolia, S. isoetifolium, dan H. ovalis. Berdasarkan kondisi tutupan lamun, maka ekosistem lamun di Selat Pantar dan sekitarnya berada pada kategori jarang sampai padat, dengan kriteria status padang lamun berada pada kondisi miskin (25,1%) sampai kaya/sehat (72,8%).*
***Kata Kunci**: Pantar, Lamun, Mangrove, Bulu Babi, Teripang*

I. INTRODUCTION

Alor Regency is an archipelagic district consisting of several large and small islands. This district has 15 islands with eight inhabited islands, they are Alor, Pura, Ternate, Pantar, Kepa, Kura, Buaya, and Marica/Kangge Island, and six uninhabited islands namely Kambing, Rusa, Lapang, Batang, Sika, dan Kapas Island.

The islands in Alor Regency are very prospective for the development of marine tourism and marine fisheries, i.e seaweed aquaculture that can bring beneficial effect

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for prosperity (Fakhraini et al., 2020). In general, the islands are coral islands with beautiful white-sand beaches. The attractiveness of the beach is also decorated with amazing underwater habitats, including views of coral reefs on the slopes and cliffs that form a reef wall. Wabang (2018) showed that life coral reef status around Pantar Strait in moderate to very good condition (27,7-79,2% cover with average 58,4%) and mortality rate index from 0,01-0,47. Besides, the coastal areas and marine waters of these islands have coastal ecosystems with high biodiversity.

The area of waters in Alor Regency which is known as a potential area for fisheries and marine development due to its high biodiversity is the Pantar Strait. This area is also a migration route for whales during certain seasons. Therefore, the area of the Pantar Strait and its surroundings was designated as a Marine Park through Regent Decree No. 5/2002.

The Pantar Strait Marine Park has the main function of protecting life support systems, preserving the diversity of flora and fauna, as well as utilization for cultivation, research, education, and, tourism, especially marine tourism. Apart from these functions, the waters of the Pantar Strait Marine Park and its surroundings can still be utilized by the community for productive economic development while still observing the principles of environmentally friendly and sustainable use.

The Regent of Alor has designated the Pantar Strait as a Regional Marine Conservation Area through the Alor Regent Regulation No. 12 of 2006 on 17 July 2006. In connection with the expansion of the conservation area, on 6 March 2009 the Regent of Alor Regulation No. 6/2009 which amends the Regent of Alor Regulation No. 12/2006. The objectives of expanding the Pantar Strait as an MPA, are: (a) support the management of stocks that protect certain life stages (larva nursery ground), critical functions of exploited populations (feeding ground, spawning ground), dispersion centre for recruitment the larvae of exploited species; (b) support fisheries stability; (c) ecological substitutes that are lost due to the impact of ecosystem damage; and (d) increasing the socio-economic results of the community. Administratively, the Pantar Strait Marine Park is located between Alor Island and Pantar Island. The coastal ecosystem of the Pantar Strait Marine Park has an important role. Its healthy condition will support marine life in the surrounding waters in Alor Regency. Information about its condition needs to be reviewed and monitored as well as updated to maintain its sustainability. Therefore, a survey on the condition of the coastal ecosystem, such as seagrass, needs to be carried out sustainably.

Seagrass is a flowering plant (Angiosperms) that lives and grows in shallow seas, has roots, rhizomes (rhizome), leaves, flowers and fruit and reproduces sexually (flower pollination) and vegetatively (shoot growth) (Kepmen LH No. 200/2004). Seagrass meadows are formed by one type of seagrass (single vegetation) and or more than 1 type of seagrass (mixed vegetation). Seagrass thrives especially in tidal open areas and coastal waters where the substrate is mud, sand, gravel and broken coral. As a chlorophyll plant, the need for sunlight causes seagrass to only grow in shallow waters where the penetration of the sun can still affect the photosynthesis process in seagrass. The coastal area of Indonesia has 13 species of seagrass, but generally, there are 12 species of seagrass. East Nusa Tenggara have 11 species of seagrass (Yefra et al., 2014). There are many facts that *Dugong dugon* frequently occur in seagrass beds (Sjafrie, 2018 and Nugraha et al. 2019). Mali Beach and Pante Deere Village are one of the areas in Alor Regency where Dugong is often reported around the seagrass habitat (Juraij et al., 2017).

Natural factors and the result of human activities, especially in the coastal environment can cause the decrease in the area of seagrass beds (Short and Wyllie-Echeverria, 1996) in Indonesia. These natural factors include strong waves and

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currents (Koch et al., 2006), storms (Granata et al., 2001), earthquakes (Moseby et al., 2020), and tsunamis (Komatsu et al., 2015). Meanwhile, human activities that contribute to the decline of the seagrass area are beach reclamation (Unsworth et al., 2018), anchoring and mooring (Collins, 2010), sand mining, dredging (Erftemeijer and Lewis, 2006), and pollution (El Zrelli et al., 2017).

Seagrass beds monitoring is repeated observations of seagrass beds in a certain area to determine the status and condition of the seagrass beds, whether they are stable, increasing or decreasing. The monitoring activity of seagrass beds plays an important role in coastal environmental management for two reasons; a) this activity is a method for improving management practices and b) can provide information on the status and condition of seagrass beds so that it can be used as an adaptive consideration for the management of marine protected areas. Also, data and information regarding changes in seagrass beds in Indonesia are still limited, so observing changes in the extent of seagrass beds is very important. Changes in seagrass cover on subsequent monitoring can realistically make it easier for coastal managers to make better decisions.

II. METHODS

2.1 Time and location

Seagrass ecosystem surveys were conducted from 10-14 December 2016 in the northern part of Alor Island, namely Alila Beach, Mali Beach, Deere Beach, and Lapang Beach (Figure 1). The locations (Table 1) were recorded using Garmin eTrek 20 GPS.

Tabel 1. Research Locations

	Locations	Date	Time (local time)	Coordinate (DMS)	
1	Alila	10-Des-16	13.40	S8 08 54.2	E124 27 14.8
2	Mali	11-Des-16	12.07	S8 08 40.4	E124 35 34.2
3	Deere A	12-Des-16	15.20	S8 07 31.1	E124 33 58.1
4	Deere B	14-Des-16	10.10	S8 07 34.7	E124 34 17.6
5	Lapang A	13-Des-16	11.50	S8 12 41.1	E124 02 34.8
6	Lapang B	13-Des-16	13.30	S8 12 49.5	E124 02 02.7
7	Lapang C	13-Des-16	15.30	S8 12 46.6	E124 01 53.1

2.2 Data Collection

The method of collecting seagrass data using quadrants and line transects refers to Rahmawati et al. (2014). pH and temperature measurements using a Hanna combo pH meter. Salinity was measured by Attago refractometer. Organic content in the sediment was measured using the Loss Of Ignition (LOI) method (Heiri et al., 2001).

2.3 Data Analysis

Water environment parameter was analyzed descriptively. Decree of Minister for the Environment Number: 51/2004 is used as a reference for the quality standard of seawater quality for seagrass (Kementerian Negara Lingkungan Hidup, 2004a) (Table 2). Seagrass cover was calculated by estimating the percentage of seagrass covers the substrate in the entire plot of 1 m^2 quadrant in each line transect (Rahmawati et al., 2014).

The results of the analysis of seagrass cover were compared with the criteria based on Rahmawati et al. (2014) (Table 3) and Decree of The Minister of Environment Number 200/2004 On The Standard Criteria of Damage and Guidelines for Determining The Status of Seagrass (Kementerian Negara Lingkungan Hidup, 2004b) (Table 4).

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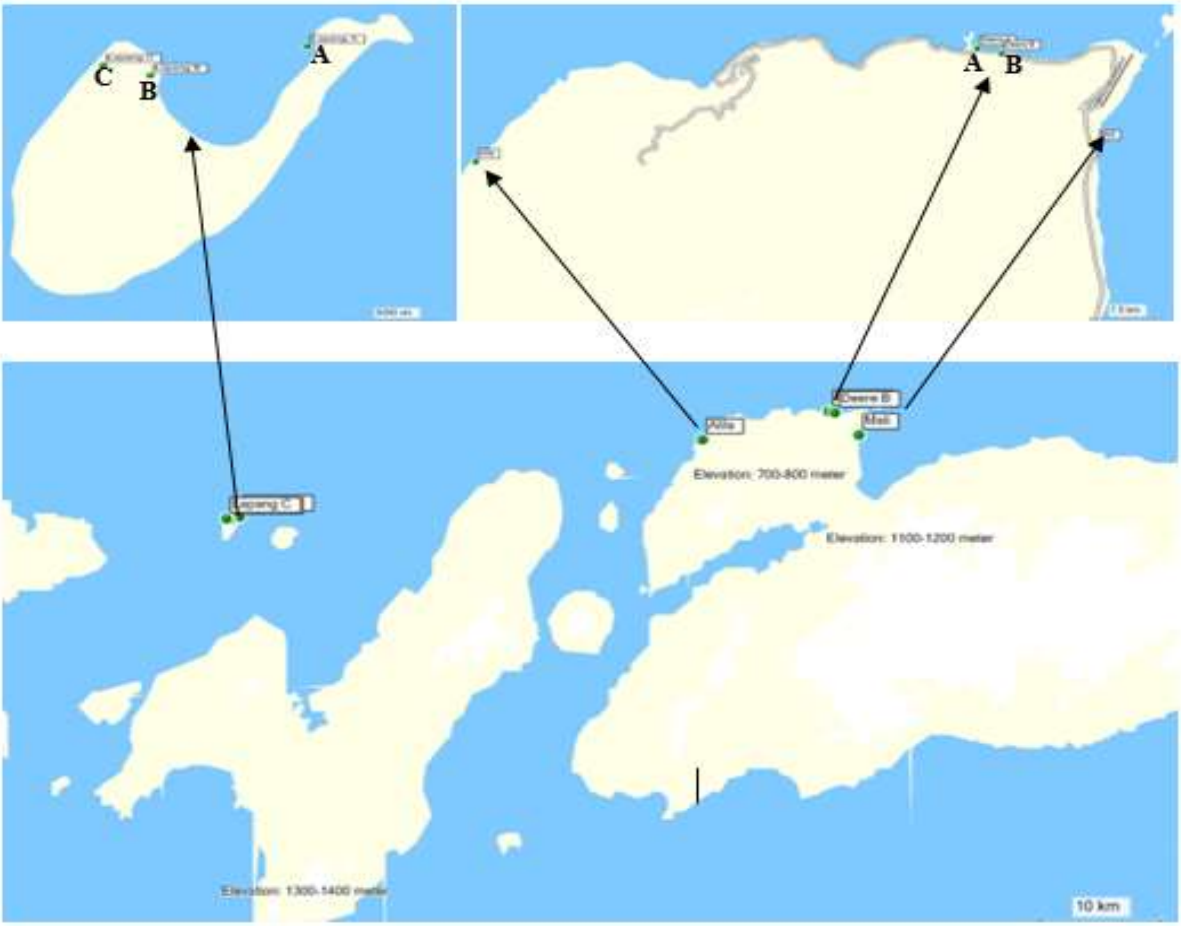

Figure 1. Survey locations for seagrass ecosystems

Table 2. Sea Water Quality Standard For Marine Biota

Parameter	**Quality standard**
Temperature (^{0}C)	28,0-30,0 ± < 2 from natural temperature (i.e 26,1-31,9 ^{0}C)
pH	7,0-8,5 ± < 0,2 from pH criteria (i.e 6,81 – 8,69)
Salinity ($^0/_{00}$)	33-34 ± < 5% from seasonal average salinity (i.e 31,36 – 35,69 $^0/_{00}$)

Table 3. Percent Covered Category

Covered (%)	**Category**
0-25	Rare
26-50	Moderate
51-75	Dense
76-100	Very dense

Table 4. Status of Seagrass

Condition		**Covered (%)**
Good	Rich/Healthy	≥ 60
Damaged	Less rich/Less healthy	30 – 59,9
	Poor	≤ 29,9

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III. RESULT AND DISCUSSION

3.1 Water Quality

Water quality variables are presented in Table 5.

Table 5. Water Quality in Each Location and Weather Condition

No	Location	H-L	pH	Salinity ($^0/_{00}$)	Temperature (^{0}C)	Sediment organic content (%)	Depth (m)	Weather condition
1	Alila	H→L	8,48	32	33,5**	4,46	1,0-1,5	Sunny
2	Mali	H→L	8,58	31*	32,3**	2,86	1,0-1,5	Sunny
3	Deere A	L→H	8,55	32	34,5**	4,42	0,3-1,5	Sunny
4	Deere B	L→H	8,29	30*	28,6	2,93	0,3-1,0	Heavy rain
5	Lapang A	H→L	8,42	31*	32,6**	4,11	1,0-1,5	Sunny
6	Lapang B	H→L	8,55	33	32,1**	2,73	0,5-1,0	Drizzle
7	Lapang C	H→L	8,51	33	31,6	3,45	0,5-1,0	Sunny
	Average		8,48	31,7	32,2**	3,57		
	Std.Dev		0,10	1,1	1,9	0,76		

Note: H→L: High tide heading to low; L→H: Low tide heading to high
* lower than the seawater quality standard
** higher than the seawater quality standard

The range of pH waters on seagrass in Alor indicate the natural seawater. The same thing happens in the salinity of the waters around the seagrass meadow that corresponds to the conditions of the sea waters although the value for Mali, Deere B and Lapang A were lower than the standard. Water temperatures are generally quite high, and can even reach 34,5^{0}C. High temperatures are a threat to the lives of aquatic organisms like seagrass (Pedersen et al., 2016).

The low temperature on Deere B (28,6 ^{0}C) allegedly due from the date of 13 when the weather conditions in the northern part somewhat cloudy and in some areas rainy occured. Besides, on the 14th, there was heavy rain in Deere with cloudy conditions, resulting in a decrease in temperature.

The content of sediment organic matter in the seagrass ecosystems in each site following the conditions of the content of organic matter in seagrass ecosystems generally, i.e. between 0,5 to 16,5% where the value is usually lower than 5% (Erftemeijer and Koch, 2001). The organic content of more than 4% at the study location indicates waters with a fairly high organic content.

The high organic content occurs because the site is in the presence of a mangrove ecosystem (Alila and Deere) where a lot of mangrove litter were degraded and eventually deposited on the substrate. High organic content also occurs in fairly calm and deeper waters which were dominated by *Enhalus acoroides* (Lapang A), so that the process of resuspending organic material is minimized. In all three locations, substrates were dominated by mud and sandy mud.

3.2 Seagrass

3.2.1 Seagrass Composition

Of the 12 seagrass species that can be found in Indonesia, nine species are found in NTT: *Cymodocea rotundata*, *Cymodocea serrulata*, *Enhalus acoroides*, *Halophila ovalis*, *Halodule pinifolia*, *Halodule uninervis*, *Syringodium isoetifolium*,

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Thalassia hemprichi, and *Thalasodendron ciliatum* (Hernawan, 2017 and Supriyadi et al., 2019). There were six species of seagrasses in all locations while this research conducted (Figure 2). It means 50% species of Indonesian seagrass exist in the study site during the research. Supriyadi et al. (2019) reviewed nine species occur in Alor including C. *serrulata*. There is a difference in the number of seagrass species between Tim Peneliti Undana (2009) and this study in each island (Table 6). Differences in sites within each island or differences in sampling times may cause differences in the number of species found.

Tabel 6. Seagrass Species Comparison in Two Studies

Species	Alila[1]	Alila[2]	Mali[1]	Mali[2]	Deere[1]	Deere[2]	Lapang [1]	Lapang[2]
C. rotundata	+	+	+	+	+	+	+	+
E. acoroides	+	+	V	+	+	+	+	+
H. ovalis	+	+	V	-	-	+	-	+
H. pinifolia	+	+	+	-	-	-	-	-
S. isoetifolium	+	+	-		V	-	-	-
T.hemprichii	+	+	+	+	+	+	+	-
H. uninervis	-	-	-	-	-	-	-	+
T. ciliatum	-	-	-	-	-	-	-	+

[1]: This research
[2]: Tim Peneliti Undana (2009)
V: found outside the quadrant

Three predominant species were *C. rotundata* (27,0%), *E. acoroides* (32,9%), and *T. hemprichii* (35,3%). *C. rotundata* was found in all survey locations, while *E. Acoroides* and *T. hemprichii* were found at five locations inside the quadrant.

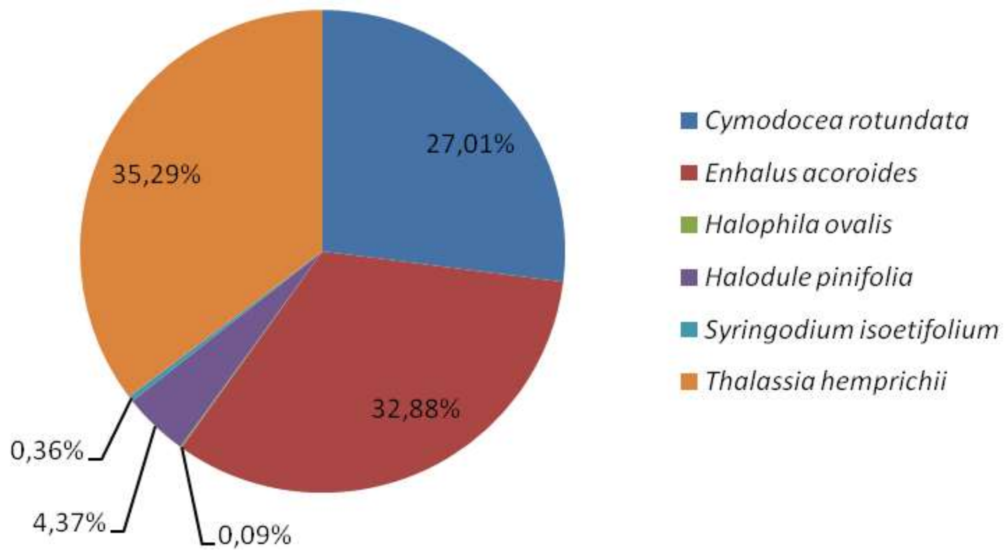

Figure 2. Composition of seagrass species in all study locations

3.2.2 Seagrass Condition

Of all seagrass species, Alila Beach had the highest number of species (six species), while Lapang A only had two species of seagrass. However, the densest seagrass cover was in Lapang C, while Lapang A was the location with the lowest seagrass cover (Figure 3). Seagrass covered ranging from 25,1% to 72,8%. Eventhough in one island, seagrass covered vary depend

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on the geomorfology condition and current movement, such as Deere and Lapang.

Generally, the deeper waters will be dominated by *E. acoroides*. In shallower waters, it will be dominated by *C. rotundata* and *T. hemprichii*. *C. rotundata* was generally located at the initial boundary of the sub-tidal area where seagrass was found. After that, there was a transition of the seagrass zone into a *T. hemprichii* zone that was longer than the area where *C. rotundata* exist.

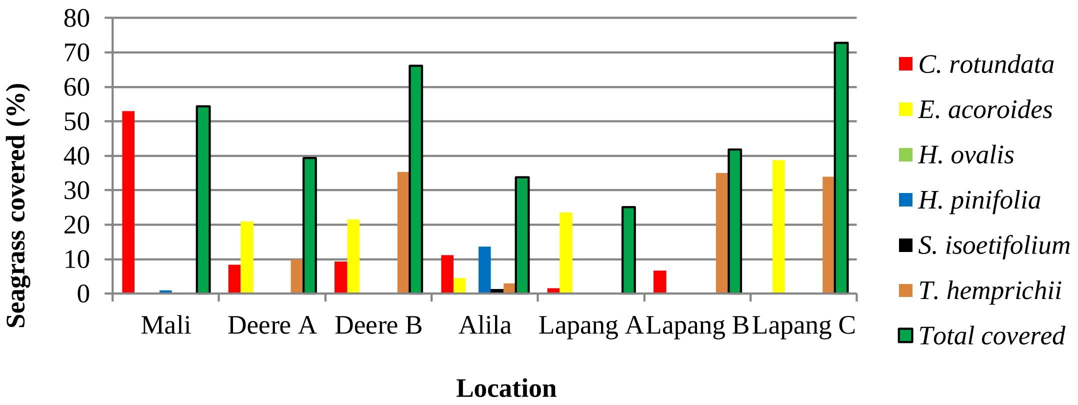

Figure 3. Seagrass Distribution at the Study Location

If Deere and Lapang are summed, the seagrass percent cover of Deere was 52,8% and Lapang was 46,6%. Then the conditions of the seagrass at each location are as follows: Mali and Deere were dense, Alila and Lapang were Moderate. Based on the status of seagrass, generally all location showed less rich/less healthy condition, but when viewed in detail, then Deere B and Lapang C conditions were rich/healthy while Lapang A condition was poor and categorized as rare.

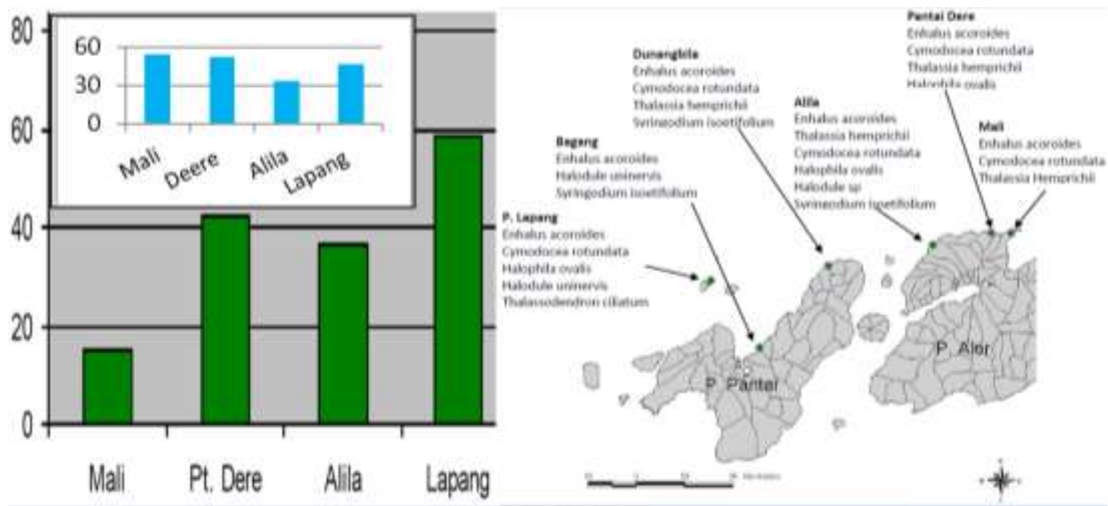

Figure 4. Comparison of Seagrass Covered (%) Beetween Tim Peneliti Undana (2009) (Green Column) and This Research (Blue Column) and The Location Where Tim Peneliti Undana Collected the Data

Alila

Alila Beach (Figure 5) was a tourist location but a bit far from the settlement which is north of western Alor and facing the open sea. Alila faces a mangrove ecosystem which was dominated by the genus *Rhizopora* . When the study was carried out, the tide was heading low.

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Figure 5. Location of Seagrass Survey in Alila

Seagrass beds found at a depth of about 1 m. Seagrass cover was 33,7%. From all study areas, Alila waters had the highest species richness because there were six species of seagrass, namely *C. rotundata*, *E. acoroides*, *H. pinifolia*, *H. ovalis*, *S. isoetifolium*, and *T. hemprichii*. Two species of seagrasses that dominate this location were *C. rotundata* (11,1%) and *H. pinifolia* (13,6%). At the study site, there were sea urchin (*Diadema setosum*). *D. setosum* is common found in intertidal area in Alor such as Mola Beach (Duan et al., 2020) .

Mali

Mali Beach (Figure 6) was a tourist location, close to Mali Airport, and facing the open seas. However, because the location was behind the seawall, the waters behind it were quite calm. Therefore, this location is often used as a place to swim and moor boats. There were no mangroves behind the location, thin mangroves were in the northern part of the study site and were not blocked by the seawall. When the study was carried out, the tide was heading low. At this location, sea urchins (*D. setosum*) were found.

Figure 6. Survey Locations For Seagrass in Mali

The percent cover of seagrass on Mali Beach was 54,3%. Five species of seagrasses were found, composed of *C. rotundata*, *E. acoroides*, *H. pinifolia*, *H. ovalis*, and *T. hemprichii*, but *E. acoroides* and *H. ovalis* were found outside the quadrant. Furthermore, these two species were found in a small amount, consequently very rarely found behind the seawall. The most dominant seagrass was *C. rotundata* (53,0 %). On Mali Beach, there were several seawalls. Generally, seagrass grows well behind the seawall, whereas in the gaps between the seawalls as a passage in and out of boats, the seagrass coverage was drastically reduced. The fast current

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movement between the gaps was suspected to be the reason for the reduced density of the seagrass. The stability of the sediment was disturbed, eventually damaging the root structure of the seagrass so that it was difficult for the seagrass to grow.

Deere A.

The location of Deere A (Figure 7) is in front of the white sandy Deere Beach. This location was near a settlement. The study location was flanked by a mangrove ecosystem that was not too thick. Behind the site, there were mangroves planted with a height of about 1 m. Its location was somewhat sheltered in the western part, causing the sediment conditions in this sub-tidal area to became muddy. The current at this location was quite calm during the study. In front of the seagrass bed, there was seaweed cultivation. At the last boundary of the seagrass beds were found foliose coral, submassive corals, and a number of corals from Family Fungidae. Some *D. setosum* were found at this location.

Seagrass began to be found at a depth of about 30 cm to 1,5 m with 39,3% seagrass cover. There were three species of seagrasses: *C. rotundata*, *E. acoroides*, and *T. Hemprichii*, where *E. acoroides* (21%) and *T. hemprichii* (10%) dominate the seagrass beds, but the first seagrass found on the first two transects was *C. rotundata* .

Figure 7. Seagrass Survey Locations in Deere A.

Deere B

Deere B (Figure 8) is in front of Deere Beach which has white sand. Behind the beach at this location, a wall about 1 m high was built - which extends - which divides the beach and the field as well as settlements. The site was in front of the Maternal & Child Health Centre (no longer used) and the field. There were no mangroves in front of this location, mangroves were found in the western part of the site (around Deere A). At the time of the study, there was heavy rain with a fairly strong current as the waters headed for high tide. Sea cucumbers were found at this location. Based on information from the local community, there are many sea cucumbers on Deere Beach.

Seagrass began to be found at a depth of about 30 cm to 1 m with 66,2% seagrass cover. The seagrasses composed of *C. rotundata*, *E. acoroides*, *Syringodium isoetifolium*, and *T. Hemprichii*, where *E. acoroides* (21,6%) and *T. hemprichii* (35,3%) dominated the seagrass beds. As at the Deere A Beach, the first seagrass found on the initial transect was *C. rotundata*. *Syringodium isoetifolium was* found outside the quadrant in very small amounts.

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Figure 8. Location of Seagrass Survey in Deere B

Lapang A

Lapang A (Figure 9) which is in the eastern part of the bay is a rocky beach location and there are no mangroves. This location is close to the fishing settlement. The water conditions at this location were quite turbid even though the water flow was calm. When the study was carried out, the tide was heading low.

Seagrass was found at depths from 1 – 1,5 meters at low tide with a coverage 25,1%, composed of *C. rotundata* and *E. acoroides* . At Lapang A, the seagrass beds were dominated by *E. acoroides* (23,6%), which were found immediately at the beginning of the transect. The high percentage of *E. acoroides* is probably because the waters were quite calm, deep, quite turbid, and also influenced by high levels of nutrients that come from western areas where there are settlements of fishermen. This was indicated by the abundance of *Chaetomorpha* macroalgae in the northwest of Lapang A, thus forming a macroalgae beds. The genus *Chaetomorpha* is a bright green, hair-like algal filament which indicates the high nutrient levels in the waters (Community Environment Network, 2005).

Figure 9. Location of Seagrass Surveys in Lapang A

Lapang B

Lapang B (Figure 10) is inside the western bay. There are no settlements at this location. There is a white sandy beach with a thin mangrove ecosystem behind it. The water condition in Lapang B was clearer than Lapang A. When the study was conducted, the tide was heading low.

Seagrass was found at a depth of about 0,5 to 1 meter just before low tide. At the time of the study, the water flow was quite fast and it rained, even though it was only for a few minutes. In Lapang B, there are three

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species of seagrasses: *C. rotundata*, *E. acoroides*, and *T. hemprichii* with a total seagrass cover of 41,8%. In contrast to the location of Lapang A, Lapang B was dominated by *T. hemprichii* (35%) who was met immediately from the start of placing the transect.

Figure 10. Seagrass Survey Locations in Lapang B

Lapang C

Lapang C (Figure 11) is outside the bay on the western side of Lapang Island, facing a white sandy beach without mangroves. The waters at this location face the open seas and far from settlements. At the time of the study, the current conditions were quite calm and the tide was heading low.

Seagrass beds were found at a depth of 0,5 - 1 m with 72,8% coverage. In Lapang C, there are three species of seagrasses: *C. rotundata*, *E. acoroides*, and *T. hemprichii* where *E. acoroides* (38,8%) and *T. hemprichii* (34,0%) dominate the seagrass beds.

Figure 11. Seagrass survey locations in Lapang C

IV. RECOMMENDATION

Scientifically, in addition to their physical ability to maintain coastal stability, seagrass has shown various ecological roles such as being a place to spawn, breed, shelter, and forage for various aquatic organisms (Hemminga and Duarte, 2000). This ecological role is generated directly by seagrass or indirectly due to the high organic content of detritus from all organisms in the seagrass ecosystem. Therefore, the seagrass ecosystem should not only be used as an indicator of change and health in the coastal ecosystem but can also be used as a place of protection and cultivation for economically important animals such as sea cucumbers and sea urchins, which are their habitat in the seagrass beds. The existence of seagrass is also expected to sustain the life of exotic organisms such as turtles and *Dugong dugon* so that it can play a role in conservation activities as well as the development of tourism (eco-tourism). To maintain the ecological and physical functions of the seagrass, it is important to maintain the

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condition of the seagrass in order not to experience ecosystem degradation mainly due to anthropogenic impacts, both due to physical activity directly adjacent to the coast and the sea, such as development on the beach or due to the entry of waste from human activities from upstream to downstream.

V. CONCLUSION

At the locations of Alila, Mali, Deere, and Pulau Lapang, there were six seagrasses composed of T. *hemprichii*, E. *acoroides*, C. *rotundata*, H. *pinifolia*, S. *isoetifolium*, and H. *ovalis*, where C. *rotundata* was found in all locations. The total percentage of seagrass coverage at the Alila location was 33,7%, Mali was 54,3%, Deere A was 39,3%, Deere B was 66,9%, Lapang A was 25,1%, Lapang B was 41,8 %, and Lapang C was 72,8%. Seagrass ecosystems with high organic sediment content are generally found in areas directly facing mangrove ecosystems (Alila and Deere A) except in Lapang B because the thickness of the mangroves in Lapang B was thinner than the two previous locations. Sediment in calm waters such as the seagrass ecosystem in Lapang A has a high organic content. In both locations, E. *acoroides* species generally dominate. The conditions of the seagrass at each location are as follows:Mali and Deere were dense, Alila and Lapang were Moderate. Based on the status of seagrass, generally all location showed less rich/less healthy condition, but when viewed in detail, then Deere B and Lapang C conditions were rich/healthy while Lapang A condition was poor and categorized as rare.

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APPENDIX

Percentage of Seagrass Cover at Each Location

Species	Alila	Mali	Deere A.	Deere B	Lapang A	Lapang B	Lapang C
C. rotundata	11,11	52,96	8,31	9,34	1,56	6,63	0,09
E. acoroides	4,53	-	21,00	21,56	23,56	0,13	38,78
H. ovalis	0,30	-	-	-	-	-	-
H. pinifolia	13,61	0,96	-	-	-	-	-
I. syringodium	1,19	-	-	-	-	-	-
T. hemprichii	2,97	0,38	10,00	35,28	-	35,00	33,97
Total covered (%)	**33,71**	**54,29**	**39,31**	**66,19**	**25,13**	**41,75**	**72,84**
Number of Species	**6**	**5**	**3**	**4**	**2**	**3**	**3**
Category	**Moderate**	**Dense**	**Moderate**	**Dense**	**Rare**	**Dense**	**Dense**
Status/Condition	**LR/LH**	**LR/LH**	**LR/LH**	**R**	**P**	**LR/LH**	**R**

Note:
LR: Less Rich/Less Healty
R: Rich/Healthy
P: Poor

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