JOJAPS

KEMENTERIAN PENDIDIKAN TINGGI

eISSN 2504-8457

POLITEKNIK MALAYSIA PORT DICKSON

Journal Online Jaringan COT POLIPD (JOJAPS)

Study of Vegetation Structure of Seagrass and Its Management Effort in the Island of Ranoh Islands of Riau

Dwikina Rosa Agusta[1] , Effi A. Thaib[1] and Basuki Rachmad[1]

[1] *Jakarta Fisheries University*

Abstract

This research conducted in the waters of the Ranoh Island, Batam City, Riau Island's. From 15th February until 15th Mei 2016. The observation made about Frequency (Fi), Density (Ki), coverage (Pi), Importan Value Index (INP) . The observation of vegetation structure seagrass using *Survey Methode.* and transplant using methode Frame (TERFS). The species composition of seagrass beds found on the Ranoh Island are *Enhalus acoroides, Thalassia hemprichii, Cymodocea serrulata, Halophila ovalis, Halodule uninervis, Syringodium isoetifolium* and *Thalassodendron ciliatum.* The research result show the value of Seagrass coverage at 4 stations is 66,06% which this condition is categorized as good/health by KEPMEN LH No. 200 tahun 2004. The waters condition paramaters in Ranoh Island from 4 stations are temperatur 28 - 31,5^{0}C, salinity 32 - 33$^0/_{00}$, depth 59 - 113 cm, brightness 59 - 113 cm, current velocity 0,08 - 0,18$^m/_s$. These result are still within the limits of the sea water quality standards by KEPMEN LH No. 51 tahun 2004. Seagrass transplant produce the highest survival rate is species *Thalassia hemprichii* (80%).

Key Word : Seagrass, Vegetation Structure, Ranoh Island, Riau

1. INTRODUCTION

Seagrass is a marine plant that lives on seagrass beds (Seagrass Bed) ecosystems especially in tropical and subtropical regions. The seagrass community plays an important role both ecologically, and biologically in the coastal and estuary areas. Seagrasses that grow in different habitats will form zoning according to the characteristics of the existing species. This situation will form a pure clear zoning or association of some kind (Kiswara, 1997).

Ecological seagrass function is the primary source of primary productivity, food sources for organisms in the form of detritus, basal stabilizer of waters with its root system that can catch sediment (trapping sediment), shelter for marine biota, spawning ground, Nursery ground), as well as feeding ground for marine biota. Coastal protection from erosion, wave absorbers, oxygen producers and CO2 reductions at the bottom of the water. While the function of the economy, among others, as a source of active ingredients for drugs and tourist destinations (Nybakken, 1992), and as a source of food (Nontji, 2005)

Seagrass growth is influenced by light, temperature, turbidity, availability of nutrients, flows, currents, wave action and salinity (Atienza-Mauricio, et al. 1993 in Badria, 2007). Human activity can cause seagrass destruction and to return to its original state is not as easy as land plants. (Fonseca, 1987 in Ritniasih, 2013). The loss of seagrass beds is expected to continue to increase due to pressure on population growth in coastal areas (Kiswara, 2009 in Wulandari, 2013). The results of species identification, density and seagrass cover, important value index, observation of the associated biota type (mollusca, echinodermata, finned fish) and also examining the parameters of waters affecting the growth and development of seagrass, Depth (cm), brightness (cm), tides and base substrate, is expected to make reference in the management of the waters of Ranoh Island Batam Island Riau Islands.

2. METHODOLOGY

The research was conducted in Ranoh Island Waters, Riau Islands on 15 February to 15 May 2016. Sampling to know the condition of seagrass by Line Transect method (transect line) combined with Quadrat Transect or Fixed Transect Method known as Survey Method (Dawson, 1982 in Ditjen KP3K 2008). Observation of biota associated with seagrass is by collecting biota by using gill net (Gill net) which has meshsize 1 inch. The net is operated at the observation station, in the morning, afternoon and evening. As supporting data, water quality parameters such as temperature, salinity, brightness, depth, velocity and current direction, coastal topography and substrate type are observed.

The study was conducted on 4 (four) Observation Stations, station 1 (shipping lanes and fishing venues), station 2 (no human activities), station 3 (no human activities) and station 4 (ex-sand mining and fishing activities) (Figure 1).

.

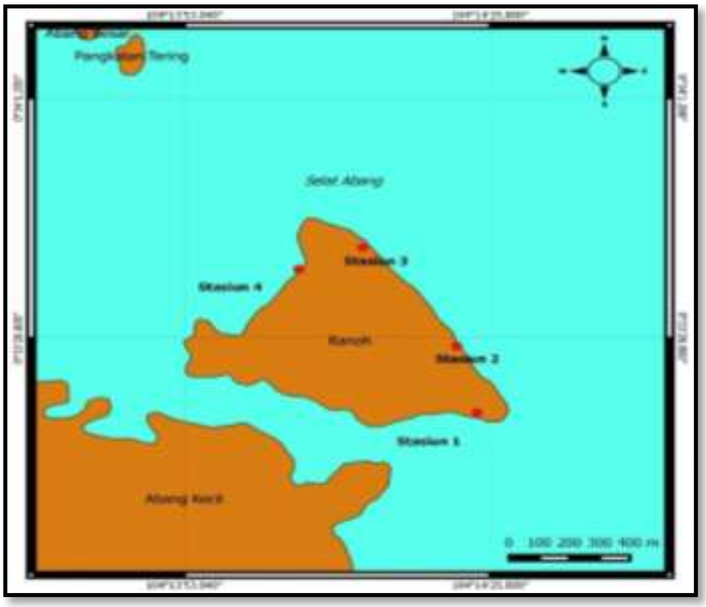


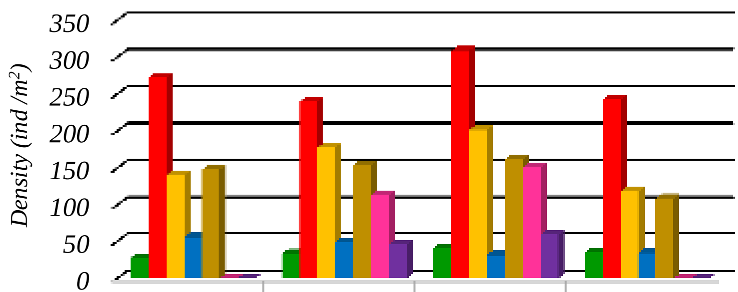
Figure 1 : Maps of Ranoh Island and Observation Station.

3. RESULT AND DISCUSSION

There were 7 seagrass species: *Enhalus acoroides*, *Thalassia hemprichii*, *Cymodocea serrulata*, *Halodule uninervis*, *Halophila ovalis*, *Syringodium isoetifolium*, *Thalassodendron ciliatum* and included in mixed vegetation category because in each station there were more than one type of seagrass. *Enhalus acoroides* has the most widespread spread followed by *Thalassia hemprichii* and its limited spreading is *Thalassodendron ciliatum* type. This also means the highest adaptability to environmental factors owned by *Enhalus acoroides* and *Thalassia hemprichii*, indicating that this species can adapt to the characteristics of the waters of Ranoh Island

According to Nybakken (1992) *Enhalus acoroides* has a higher growth rate and growing ability than other types of seagrasses. Density of seagrass species at each observation station (Figure 2). At station 1 found five types of seagrass, with the highest density of *Thalassia hemprichii* 273 ind/m^2 and lowest density of *Enhalus acoroides* 28 ind/m^2. The lowest density of the species is *Enhalus acoroides* at all observation stations. This situation is thought to be caused by muddy waters, there are many periphitons attached to the leaves so that many seagrasses are damaged. The lowest density is at station 1 which is the cruise line of community vessel, so it can be expected damages of sea grass due to this cruise line. This location is also a fishing area.

The highest density of seagrass species is *Thalassia hemprichii* 273 ind/m^2 (station 1), 240 ind/m^2 (station 2), 309 ind/m^2 (station 3) and 243 ind/m^2 at station 4. lowest density ie seagrass species Enhalus acoroides 28 ind/m^2 at station 1. Differences in species number and density are suspected due to water type That is open there is no obstacle island in front of it. Nutrient supply which is widely indicated to cause high level of density and seagrass growth can work well. The absence of human activity at this station so that seagrass growth is not disturbed, (station 2 and 3), seagrass density of more than 700 ind/m^2. It is suspected substrate type of water base which is very supportive of development. Thalassia hemprichii density is much different when compared with the type of *Halophila ovalis*, indicated by the type of seaweed *Halophila ovalis* that has leaves that grow wide and very susceptible to the influence of the distribution of sediments, especially in shallow areas as well as the waters of Ranoh Island



	Stasiun 1	Stasiun 2	Stasiun 3	Stasiun 4
Enhalus acoroides	28	33	41	36
Thalassia hemphrichii	273	240	309	243
Cymodocea serrulata	141	178	201	118
Halophila ovalis	55	49	31	34
Halodule uninervis	148	154	162	109
Syringodium isoetifolium	0	113	151	0
Thalassodendron ciliatum	0	46	59	0

Figure 2. Density value

This affects the ability to live and grow the leaves of seaweed Halophila ovalis lower than Thalassia hemprichii seagrass premises. Sand mining activities (station 4) makes the lowest density value. The waters are shallow and even visible when sea water falls, so the Thalassia hemprichii seagrass species is easier to grow and grow compared to other species.

The percentage of seagrass coverage from observations ranged from 46.06 to 97.25%. The highest seagrass cover was encountered at station 3 with Thalassia hemprichii dominant type of 20.7%. (Table 1). This is allegedly due to the lack of human acvity, so the seagrasses can grow and develop properly. Based on the Kep Men LH No. 200. Year 2004 but on station 3 is categorized rich / healthy, as well as for station 2 because these waters are rich in nutrients. The type of substrate at station 1 is muddy sand, open waters so high stirring level, resulting in obstruction of sunlight so as to interfere with the process of photosynthesis so that the seagrass is categorized less rich / less healthy

Table 1. Seagrass coverage (Pi) and Relative of Seagrass coverage (Rpi)

No.	Spesies	Stasiun 1		Stasiun 2		Stasiun 3		Stasiun 4	
		Pi (%)	PRi	Pi (%)	PRi	Pi (%)	PRi	Pi (%)	PRi
1	*Enhalus acoroides*	8,77	15,99	8,11	12,27	8,13	8,36	6,75	14,65
2	*Thalassia hemprichii*	17,40	31,74	18,89	28,56	20,70	21,29	19,55	42,46
3	*Cymodocea serrulata*	12,88	23,50	10,62	16,06	12,41	12,76	8,69	18,86
4	*Halophila ovalis*	4,44	8,09	2,18	3,30	3,01	3,09	1,65	3,59
5	*Halodule uninervis*	11,33	20,67	12,86	19,45	19,59	20,15	9,41	20,44
6	*Syringodium isoetifolium*	0	0	8,63	13,05	15,74	16,19	0	0
7	*Thalassodendron ciliatum*	0	0	4,84	7,32	17,67	18,17	0	0
Total		**54.83**	**100**	**66.13**	**100**	**97.25**	**100**	**46.06**	**100**

INP at observation stations 1,2, 3 and 4 describe the most important *Thalassia hemprichii* seagrass plays an important role, can adapt to various water conditions in different habitats (Table 2). The type of seagrass that has the smallest role in the community is *Halophila ovalis*. The three elements that play a role in determining the magnitude of INP are the relative frequency value, relative density, and relative coverage, *Halophila ovalis* has a low value against the three elements that are allegedly caused by environmental changes that occur in Ranoh Island and less adaptability in seagrass..

Table 2. Relative Density (KR), Relative Coverage (PR), Relative Frequency (FR), And Importance Value Index (INP)

Spesies	Tutupan Relatif	Kerapatan Relatif	Frekuensi Relatif	INP
Stasiun 1				
Enhalus acoroides	16.00	4.32	23.00	**43.32**
Thalassia hemphrichii	31.74	42.32	23.00	**97.06**
Cymodocea serrulata	23.50	21.81	18.71	**63.02**
Halophila ovalis	8.10	8.61	15.57	**32.28**
Halodule uninervis	20.67	22.94	19.71	**63.32**
Syringodium isoetifolium	0.00	0.00	0.00	**0.00**
Thalassodendron ciliatum	0.00	0.00	0.00	**0.00**
Stasiun 2				
Enhalus acoroides	12.27	4.11	19.72	**36.10**
Thalassia hemphrichii	28.56	29.49	19.01	**77.07**
Cymodocea serrulata	16.06	21.87	14.08	**52.01**
Halophila ovalis	3.29	6.03	12.68	**22.00**
Halodule uninervis	19.45	18.95	16.20	**54.60**
Syringodium isoetifolium	13.05	13.93	10.56	**37.55**
Thalassodendron ciliatum	7.32	5.61	7.75	**20.67**
Stasiun 3				
Enhalus acoroides	8.36	4.31	21.48	**34.15**
Thalassia hemphrichii	21.29	32.36	17.78	**71.43**
Cymodocea serrulata	12.76	21.12	12.59	**46.48**
Halophila ovalis	3.09	3.30	10.37	**16.76**
Halodule uninervis	20.15	16.94	16.30	**53.39**
Syringodium isoetifolium	16.19	15.80	12.59	**44.58**
Thalassodendron ciliatum	18.17	6.17	8.89	**33.22**
Stasiun 4				
Enhalus acoroides	14.65	6.58	25.23	**46.47**
Thalassia hemphrichii	42.46	44.96	24.30	**111.72**
Cymodocea serrulata	18.86	21.93	19.16	**59.95**
Halophila ovalis	3.59	6.34	13.20	**23.14**
Halodule uninervis	20.44	20.18	18.11	**58.73**
Syringodium isoetifolium	0.00	0.00	0.00	**0.00**

Observations of associated biota in seagrass beds, there are different types of fish from different life cycle stages and at different tropical levels. In general, the composition of fish in seagrass beds is seedling and immature that inhabit the habitat until they migrate to other habitats such as coral reefs. Therefore, seagrass beds are often described as areas of maintenance of various types of organisms, including commercial fish. From observations using visual methods ie Molusca, Echinodermata. While using the net Gill net found the finned fish biota (Table 3).

Tabel 3. Spesies associated in all observation stations.

No.	Nama Biota	stations			
		1	2	3	4
1.	***Molusca***				
	Acmae apatina	+	+	+	+
	Anadara antiquata	+	-	+	+
	Conus miliaris	+	+	+	-
	Fasciolaria trapezium	+	+	+	+
	Strombus lentiginosus	+	+	+	+
2.	***Echinodermata***				
	Diadema setosum	+	+	+	+
	Synapta maculate	+	+	+	-
	Holothuria leucospilota	+	+	+	+
	Linckia laevigata	-	+	+	-
	Protoreaster nodosus	+	+	+	+
3.	**Ikan Bersirip**				
	Amphiprion ocellaris	+	-	+	+
	Dischistodus fasciatus	-	+	+	+
	Dischistodus prosopotaenia	-	+	+	+
	Halichoeres chloropterus	+	-	+	+
	Halichoeres leucurus	-	-	+	+
	Nemipterus marginatus	-	+	-	-
	Paramonacanthus japonicus	+	+	+	-
	Siganus punctatus	+	+	+	+
	Upeneus subvittatus	-	-	-	+
	Valamugil seheli	+	+	-	+

Notes : (+) Yes (-) No

Species *Siganus punctatus* is more herbivorous fish found in each observation station. This is indicated because the leaves of seagrass that exist in Ranoh Island there are many epiphytic organisms (plants that live to ride on other plants) attached to the seagrass and it is a source of food for the fish. The mangrove habitat serves as a feeding ground for fish and seagrass fish communities by providing organic ingredients to the food web. Seagrass and mangrove fields are an important habitat for juvenile fish, and sustainably with coral reefs serve as spawning ground for adult fish. The condition of seagrass ecosystem in Ranoh Island with mangrove ecosystem on the beach and coral reefs in the sea that is maintained because it is located far with the settlement allows the ecosystem of seagrass beds in the location as the flow of inter-habitat fish migration thus affecting the fish community structure. Migratory fish can be caught in the nets when sampling, so its presence is only temporary. This fact is supported by the revelation of Unsworth (2007) in Latuconsina et al. (2012), that The seagrass fish community structure in the Indo-Pacific region is influenced by mangrove and coral reef ecosystems.

Water quality parameters observation (Table 4). Water temperature exceeds the quality standard limits where in the afternoon it reaches 31.5 ºC while the quality standard is 30 ºC. According to Nontji (2005) the temperature difference in waters is influenced by meteorological conditions of precipitation, evaporation, air humidity, air temperature, wind speed and solar intensity) with water conditions in Indonesia ranging from 28 - 31 ºC. This value is still classified in accordance with the standard temperature quality standards to support the growth of seagrass. According to Sudiarsa (2012) in general seagrasses require a water temperature of 20-36 ºC with optimum temperature for photosynthesis in the range 25-35 ºC and photosynthesis ability will decrease when water temperature is outside the optimal range.

Salinity during the study was within limits that could support the growth of seagrass (Table 4). According to Dahuri (2003) the optimum value of tolerance to salinity in seawater is 35 ‰. One of the factors causing seagrass destruction is the increase of salinity caused by the decrease of freshwater supply from the river. According to Nybakken (1992) the distribution of salinity in the sea is influenced by various factors such as water circulation, evaporation, rainfall, and river flow patterns. Waters with high rainfall and influenced by river flow have low salinity while those with high evaporation, high water salinity.

Table 4. Observation Result of Water Quality Parameters.

No.	Parameters	Stations				Standart Quality (Kepmen LH No.51 tahun 2004)
		1	2	3	4	
1.	Temperature (^{0}C)	28,5 - 31,5	28,5 - 31	28 - 31,5	28 - 31,5	28 - 30
2.	Salinity($^0/_{00}$)	32 - 33	32 - 33	32 - 33	32 - 33	33 - 34
3	Current velocity (m/s)	0,09 – 0,18	0,09 – 0,15	0.08 – 0.15	0,09 – 0,12	-
4	Depht (cm)	62 - 98	59 - 98	59 - 113	66 - 102	-
5	Water Brightness (cm)	62 – 98 (100%)	59 – 98 (100%)	59 – 113 (100%)	66 – 102 (100%)	>3
6	Substrats	Muddy Sand	Sandy	Sandy	Sandy	-

The occurrence of current velocity fluctuations is thought to be caused by the state of wind velocity. Water depth at all observation stations can be penetrated sunlight to the bottom of the waters, this condition is enough to provide opportunities for seagrass muntuk photosynthesis process. Ranoh Island Beach is a coastal region with a sloping slope and almost. There is no height spike so it can be called a continental shelf area. In order to save coastal waters in Ranoh Island, the local government has created a spatial plan for zonal and sub zone development for the Regional Water Conservation Area of Batam City and refers to the direction of Batam City Spatial Plan 2004-2014 and the Regional Medium Term Development Plan 2011-2016 (Perda Batam No. 6 Year 2011) which is based on the conformity indicator and the carrying capacity of space for various zone and sub-zone activities within a region.

Batam City Government has implemented policies and strategies of coastal area development on protection and conservation activities focused on two main components namely (1) impact impact from the mainland and (2) physical protection of coastal and marine ecosystem habitat. From this concept several important things can be done: (a) raising public awareness in utilizing coastal natural resources such as seagrass ecosystems, (b) involving communities in the protection of coastal ecosystem conservation and (c) incorporating external values in the planning of economic value calculation of a resource.

4. CONCLUSION

Based on the study of community structure and seagrass management efforts in Ranoh Island waters, it is concluded that there are 7 species found during observation and there are 5 types found in all stations; *Enhalus acoroides, Thalassia hemphrichii, Cymodocea serrulata, Halophila ovalis, Halodule uninervis*, while *Syringodium isoetifolium* and *Thalassodendron ciliatum* can be found in Stations 2 and 3. Seagrass density varies from 28 to 273 ind/m2, the highest of the lowest *Thalassia hemprichii* Enhalus acoroides. Overall 66.06% are rich/healthy, this gives a picture of seagrass resources potential at the research location in Ranoh Island waters quite well. This is reinforced by the presence of spesies associated in seagrass beds that is molluscs, echinoderms and finned fish. The local government of Batam City has established policies and strategies to protect from damage both due to activities on land and coastal and marine activities through the issuance of Batam City Local Regulation No. 6 of 2011.

References

Badria, S. (2007). Laju Pertumbuhan Daun Lamun (Enhalus acoroides) Pada Dua Substrat Yang Berbeda Di Teluk Banten. Bogor : Fakultas Perikanan Dan Ilmu Kelautan Institut Pertanian Bogor.
Dahuri, R. (2003). Keanekaragaman Hayati Laut. Jakarta : PT Gramedia Pustaka Utama.
Direktorat Jenderal Kelautan, Pesisir dan Pulau – Pulau Kecil (2008). Pedoman Umum Identifikasi Dan Monitoring Lamun. Jakarta : Departemen Kelautan dan Perikanan.
Kementerian Negara Lingkungan Hidup (2004). Keputusan Menteri Lingkungan Hidup No.200 Tahun 2004. Kriteria Baku Kerusakan dan Pedoman Penentuan Status Padang Lamun. Jakarta.
Kementerian Negara Lingkungan Hidup (2004). Keputusan Menteri Lingkungan Hidup No.51 Tahun 2004. Baku Mutu Air Laut Untuk Biota Laut. Jakarta
Kiswara, W. (1997). Struktur Komunitas Padang Lamun Perairan Indonesia . Inventarisasi dan Evaluasi Potensi Laut – Pesisir II, Jakarta : P3O LIPI. Hal 54-61.
Kordi, M. G. (2011). Ekosistem Lamun (Seagrass). Jakarta : Rineka Cipta.
Latuconsina, Husain., M. N. Nessa dan R. A. Rappe (2012). Komposisi Spesies Dan Struktur Komunitas Ikan Padang Lamun Di Perairan Tanjung Tiram – Teluk Ambon Dalam. Jurnal Ilmu dan Teknologi Kelautan Tropis.

Nontji, A. (2002). Laut Nusantara. Jakarta . Djambatan.

Nontji, A. (2005). Laut Nusantara. Jakarta . Djambatan.

Nybakken, J. W., (1992). Biologi Laut Suatu Pendekatan Ekologis (Terjemahan). Jakarta . PT. Gramedia.

Pemerintah Daerah Kota Batam (2011. Peraturan Daerah Kota Batam Nomor 6 Tahun 2011. Rencana Pembangunan Jangka Menengah Daerah (RPJM) Kota Batam Tahun 2011-2016.

Ritniasih, I. dan H. Endrawati (2013). Pertumbuhan Lamun Hasil Transplantasi Jenis Cymodocea rotundata Di Padang Lamun Teluk Awur Jepara. Semarang : Oseanografi Marina.

Sudiarsa, I. N. (2012). Analisis Struktur Komunitas Dan Produktivitas Lamun Di Perairan Pulau Lima Kelapa, Teluk Banten. Jakarta : Universitas Terbuka.

Wulandari, D., I. Riniasih dan E. Yudiati (2013). Transplantasi Lamun Thalassia hemprichii Dengan Metode Jangkar Di Perairan Teluk Awur Dan Bandengan, Jepara. Semarang : Jurnal Fakultas Perikanan dan Ilmu Kelautan, Universitas Diponegoro.