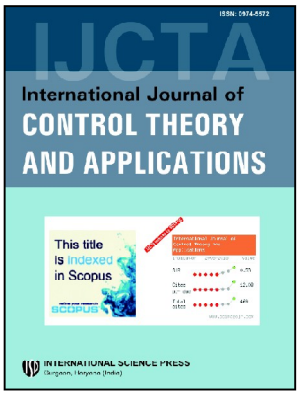

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The Effect of Environment from The Marine Ecotourism Development in Seagrass Trikora Conservation Area, Bintan Regency, Riau Islands

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***Abstract*:** In recent years, the development of Trikora Seagrass Conservation Area, Bintan, Riau Islands in the ecotourism sector has begun to develop. On the other hand, the various aspects of the development of marine ecotourism is bound to have a positive impact or a negative impact and threat for the environment. This study aims fatherly provide an overview of socioeconomic conditions and ecological status, especially the condition of the coastal ecosystem structure seagrass and mangrove structure, as well as the threat of coastal ecosystems and the threat of solid waste around the area of marine ecotourism in Trikora Seagrass Conservation Area, Bintan, Riau Islands. The survey was conducted in August and September 2016 in the area around the village of Teluk Bakau, Malang Rapat Village and Village Berakit. Socioeconomic conditions of society and ecological status in Trikora Seagrass Conservation Area, Bintan, Riau Islands support for the development of marine ecotourism. Density value type and percentage of seagrass cover each area ranged between 86.00- 301.56 shoots / m2 and 45.90% - 101.43%. Mangrove vegetation density class tree Ind 583.59 / ha with the dominant vegetation types *Rhizophora apiculata* and *Bruguiera gymnorrhiza* with IVI each *Rhizophora apiculata* is 46.11 155-157.47% - 106.23%. The threat of coastal ecosystems in the region, especially in the form of pollution, damaged and degradation of coastal ecosystems, and biota degradation. The threat comes from marine ecotourism development such as construction of hotels, inns and resort and facilities, as a result of tourist activities, the activities of fishermen and locals. Waste on the dominant in the region in the form of a plastic type material, wood, paper and Styrofoam; then other materials such as glass, cans rubber and fabric.

Keywords: Bintan, Conservation Area, Ecotourism, Environmental Impact

1. INTRODUCTION

On the east coast of Bintan Island, seagrass grows along Trikora Beach Trikora (Arifa *et al*, 2014; Larasanati *et al*, 2015). Trikora Beach is one of water conservation areas in Bintan regency which has been determined based Regent Decree 36 / VIII / 2007 of August 23, 2007 (Regional development agencies Bintan regency, 2007) as conservation areas of seagrass or better known as TRISMADES "Trikora Seagrass Management Demonstration Site" and exact location on the eastern coast of Bintan Island, Riau Islands, which is focused in three villages namely Teluk Bakau, Malang Rapat Village, and Berakit Village.

This Trikora Seagrass Conservation Area, in addition to having a good seagrass ecosystems, also has other coastal mangrove ecosystems and coral reef ecosystems. Moreover, the region has a clear waters and accompanied by a beautiful white sand to form a sloping beach.

Marine ecotourism development in the conservation area of seagrass Trikora should be done wisely and appropriately, and adheres to the principles of friendly and sustainable environment. With community involvement, it can increase revenue and encourage more people to maintain natural resources and the environment. The development of marine ecotourism is expected to make two (2) types of impacts, both positive and negative impacts. The positive impact can be nature conservation, conservation of historical and archaeological site and distinctive formations, environmental quality improvement, improved infrastructure, and increased environmental awareness. While the negative effects may include water pollution, air pollution, noise pollution, pollution of view, the problem of waste treatment, reduction in ecology, environmental disaster, damage to historical sites and archeology, as well as land use issues. Erdmann (1997) had analyzed the influence of tourism development in the coastal areas from 3 (three) points, which were (1) the development of tourism on the ocean side (seaside), including socio-economic changes and settlements, (2) influence on the culture of local communities, and (3) influence on environmental aspects. Correspondingly, Akpabio et al (2008) had found that the development of coastal tourism to the socioeconomic had impact on society and the environment.

To predict the impact of nautical tourism development of this area, it takes the basic data regarding the environmental conditions. This study aims to provide an overview of the socioeconomic conditions of society and the status of ecological condition of coastal ecosystems particularly the structure of seagrass and structure of the mangrove, as well as the threat of coastal ecosystems and the threat of solid waste around the area of marine ecotourism in Trikora Seagrass Conservation Areas, Bintan regency, Riau Islands.

2. THEORETICAL REVIEW

The study was conducted in August and September 2016 in Trikora Seagrass Conservation Areas, Bintan, Riau Islands. Sampling was done in three (3) villages, namely Teluk Bakau, Malang Rapat Village and Berakit Village (Figure 1).

Data of socioeconomic and ecological status were obtained from government agencies either provincial, district or village administration, as well as from reports of earlier study conducted in the study area. The measurements of data condition of coastal ecosystems (seagrass and mangrove ecosystems) and the threat of coastal ecosystems and the threat of solid waste were carried out in the field.

Table 1
Coordinates of sampling points seagrass observations in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands

No	*Village Location*	*Observation Coordinate*
1	Teluk Bakau	01^{0}04’22,5’’N - 104^{0}38’40,4’’E
2	Malang Rapat	01^{0}06’36,44’’N - 104^{0}37’54,31’’E
3	Berakit	01^{0}10’50.1"N - 104^{0}34’33,4’’E

Observations of seagrass structure were conducted with block transect method on three (3) sampling points as in Table 1. Identification and seagrass density calculation refer to methods from Mulyadi (2010), English et al (1994), Azkab (1999), and Ghufran (2011).

Observations of mangrove ecosystem were conducted with transect method at observation points as shown in Table 2. The condition of mangrove ecosystems which was observed includes mangrove vegetation, the

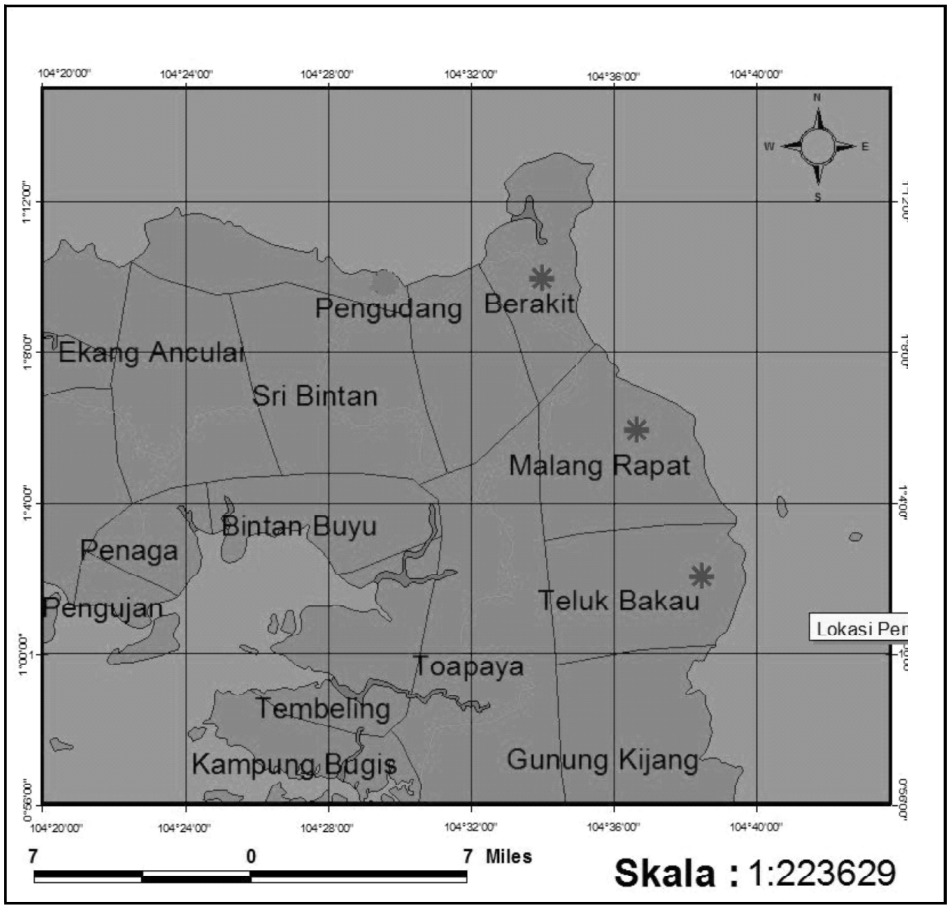

Figure 1: Research Sampling locations of the Potential of Environmental Impact on Seagrass Conservation Area, Bintan regency, Riau Islands

density and importance value index (IP) and the percentage of cover. Identification of mangrove refers to the book "Free Introduction to Indonesian's Mangrove" (Noor and Khazali, 2006), and the book "Mangrove on the campus of the University of Riau Dumai" (Mulyadi, 2010). The calculation of the density, IP calculation, and the percentage of cover refer to the method of English et al (1994).

Table 2
Coordinate points of mangrove ecosystem observations sampling in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands

No	*Village Location*	*Observation Coordinate*
1	Teluk Bakau	$01^0$03'21,7''N - $104^0$38'58,9''E
2	Malang Rapat	$01^0$10'35,7''N - $104^0$34'40,4''E
3	Berakit	$01^0$10'48,7"N - $104^0$34'38,4''E

Identification of the threats of coastal ecosystems in the area of marine ecotourism in Trikora Seagrass Conservation Areas Bintan, Riau Islands was conducted by a survey in the field. Particularly for measurements of solid waste, a survey was conducted through observation and calculation of solid waste in Teluk Bakau Village and Malang Rapat Village. Four (4) of sampling points had been established for the measurement of the

density of solid waste (Table 3). Identification and quantification of solid waste were carried out by the method of blocks, where each point sampling has done counting of solid waste at three (3) blocks measuring 5 m x 5 m.

Table 3
Observation station of solid waste in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands.

Observation Station	*Village*	*Observation Coordinate*
Station 1 (ST.1)	Teluk Bakau	1°3'33,5"N - 104°39'0,70"E
Station 2 (ST.2)	Teluk Bakau	1°3'36,32"N - 104°39'7,74"E
Station 3 (ST.3)	Malang Rapat	1°6'2,8"N - 104°37'56,90"E
Station 4 (ST.4)	Malang Rapat	1°6'2,1"N - 104°37'56,70" E

Data analysis on a picture of the socioeconomic and ecological status, conditions of coastal ecosystems, as well as the threat of coastal ecosystems and solid waste around the area of marine ecotourism in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands was conducted descriptively.

FINDING AND DISCUSSION

Social Economic Community

Social Culture Population

Residents who live in the research area have a socio-cultural structure of heterogeneous livers and live in harmony with among ethnic and religious condition. In general, the residents are of Islamic religion, then followed by the Christian Catholic, Protestant, Buddhist and Confucian (Table 4).

Table 4
Population Based on Religion around Trikora Seagrass Conservation Area, Bintan regency, Riau Islands in 2014

No.	*Village Name*	*religion*					*District*
		Islam	*Protestan*	*Khatolik*	*Budha*	*Konghucu*	
1	Teluk Bakau	1774	7	214	34	-	Gunung Kijang
2	Malang Rapat	173	22	44	51	6	
3	Berakit	1354	9	245	20	119	Teluk Sebong

Source: Processed from BPS data Bintan Regency, 2015

While tribes for the majority of people who are around Trikora beach are eight parts which are ethnic of Malays, Javanese, Bugis, Buton, flores, Minang, Batak and China (Table 5).

Economic Activity

The economic development of a region is largely determined by the supporting facilities such as and trade finance facilities. The market is where financial transactions, in addition to market transactions also occurs in the shops/ banking-store. The banking industry which serves as a collector and distributor of funds holds a central role in some economies. Disruption of the process of collection and distribution of the fund will affect economic activity. The numbers of commercial banks operating until the end of December 2011 in the Gunung Kijang District are two, which consist of 1 private commercial bank and 1 rural bank.

Table 5
Total Population by Ethnicity in Trikora Beach in 2014

No.	*Clan*	*Village's Name*		
		Teluk Bakau	*Malang Rapat*	*Berakit*
1	Melayu	366	984	
2	Jawa	348	235	
3	Bugis	148	101	No Data Available
4	Buton	97	36	
5	Flores	169	183	
6	Minang	62	88	
7	Batak	46	31	
8	China	71	51	

Source: Processed from BPS data Bintan Regency, 2015

In developing its efforts, the cooperative facesinternal major constraints, namely the weakness in capital. As mostly known, capital of autonomy is as "blood" that would encourage other economic resources in business activities. Therefore, the development of capital for the cooperative should be a priority, both from within and from outside the cooperative. The number of cooperatives registered in 2011 in the Gunung Kijang district was as many as 19 units, and those which were activewere only 13 cooperatives with a membership of 3,006 people and 21 number of businesses. Despite an increase in terms of number of cooperatives and members, they also faced the decrease in terms of capital, assets and SHU. It had been identified that there was capital decrease by 35 percent, a decrease of 46 percent of assets and impairment SHU by 69 percent.

While in Berakit village, in 2014, there were only 2 non cooperative financial facilities of non-Village Unit Cooperatives (KUD - Koperasi Unit Desa). In addition there was also a panel of 20 fruit stores / Grocery shop, and one stall spot, and one mini market.

Ecological Status

Topography

Gunung Kijang district (Teluk Bakau and Malang Rapat) has a topography that varies from flat to undulating with a slope of 0-40% to 98.03%. As for the slope of > 40%, it only reached 1.97% (Central Bureau of Statistics of Bintan, 2015b). While Berakit Village (North Bintan District) has a hilly topography (Central Bureau of Statistics of Bintan, 2015a).

Types of Soil

The type of soil around Trikora Seagrass Conservation Areas, Bintan, Riau Islands is classified by USDA in groups of podzolic, alluvial, litosol and andosol soil (Board of Capital and Investment, Bintan District, 2006).

Temperature and Precipitation

Trikora Seagrass Conservation Areas of Bintan, Riau Islands, is a tropical area with a temperature of 21-37°C and rainfall per year for 86 days.

Humidity

In 2014, it was noted thatthe average humidity of the air around the study area was ranged from 76-87%, with the highest average was found in May, August, November and December, while the lowest average humidity was seen in February (Table 6).

Land Use

The land area of potential for horticultural crops in the Gunung Kijang District is 446.25 hectares and only 331.1 hectares have been cultivated with details of 226.1 hectares of land potential for crop vegetables and the whole potential has been cultivated, whereas for fruit crops, it covers 220.15 hectares and 150 hectares of new try. The area that has been harvested and vegetable planting area has almost decreased, but in 2014 there is chilli commodity that has acreage and harvested area in the amount of 9 ha and 1 ha, of which two years earlier this commodity is not in production.

Table 6
Humidity in Tanjung Pinang in 2014

Month		*Humidity*		
		Mean	*Maximum*	*Miinimum*
1.	January	79	98	52
2.	February	76	97	44
3.	March	79	98	46
4.	April	85	100	51
5.	May	87	98	57
6.	June	85	100	56
7.	July	84	98	57
8.	August	87	98	56
9.	September	80	100	41
10.	October	83	98	41
11.	November	87	100	51
12.	December	87	100	58

Source: Meteorology and Geophysics Station Tanjung pinang (2014)

As with the production of vegetable crops which has increased significantly compared to the previous year, the increase is in the range of more than 100 percent, or three times the previous year's production.However, the bean crop production decreased by 85 tons. The total to plant fruit production increased only by 72 percent, while there were some commodities that experienced a decline in production. They were guava plant (not producing), jicama (63 percent) and citrus (41 percent) compared to their production in 2013.

Coastal Biota

Non-coastal-fish fauna encountered can be grouped to Gastropods, Bivalve and Crustaceans (Table 7). There were three types were encountered as the type of fauna from gastropods group, five types of bivalves group and 4 types of crustaceans groups of Fishery resources.

Gear works operated by the community are in the form of nets bloating/cob, webs rays, reef nets, fish traps, crab traps, Kelong/ floating chart, fishing rod, longline,spears and fishing rifles.

Moreover, in the study area have also been found fisheries infrastructure such as mooring boats, fishing ports, ice plants, SPDN / APMS, drying facilities of bilis/ anchovies.

The most dominant fish caught by fishermen are tuna fish, barred fish, long jawed mackerel fish, mackerel fish, *selikur,* stingray, *julur*, *kasai*, pomret fish, *tampur*, groper fish, *sunu*, and *jahar*.

Table 7
Non coastal fish species of animals observed around Trikora Seagrass Conservation Areas of Bintan, Bintan regency, Riau Islands

No.	*Class and Biota Name*	*Latin Name*
Gastropoda		
1	Gonggong Snail	*Strombus sp*
2	*Cucup Snail*	*Cerithidea quadrata*
3	Lumpur Snail	*Turritella terebra*
Bivalvia		
1	Bulu Shell	*Anadara inflate*
2	Darah Shell	*Anadara sp*
3	Simping Shell	*Amusium pleuronectes*
4	Remis Shell	*Pilsbryoconcha sp*
5	Kampak Shell	*Pina bicolor*
Krustase		
1	Lobster	*Panulirus sp*
2	White Shrimp	*Panaeus margueinsis*
3	Kipas Shrimp	*Slipper lobster*
4	Galah Shrimp	*Palaemon serratus*

While the production of local fishery of Gunung Kijang District in 2015 amounted to 1,179 tonnes with a value of Rp. 17.685.000.000, Teluk Sebong District with fishery production amounted to 1083.6 tonnes worth Rp 16.254.000.000 (UPTD Fishery Business Services of Gunung Kijang and Teluk Sebong District, 2015)

Management of the fishery result conducted by community groups produce domestic industrial production, such as, grilled fish cake, fish crackers and fish balls.

Marketing is done at the local level and export, to the local market, it is marketed to Tanjungpinang, Batam, Medan and even to other areas. While exports are marketed through the port of Bintan Eastern District to Singapore and Malaysia.

Condition of Coaster Ecosystems

Seagrass Ecosystem

Seagrass ecosystem is one unit of coastal ecosystem which becomes the important element in sea preservation. Despite the function of seagrass ecosystem either ecologically, economically and in other ways, the seagrass vegetation also has its own attractiveness for tourists both for entertainment or coastal ecotourism education.

Based on the observation in the location of Trikora Seagrass Conservation Area, Bintang Regency, Riau Islands, there are 9 (nine) types of seagrass found. Every observation point has different species distribution in which there are 7 types of seagrass found in Malang Rapat village, 6 types in Teluk Bakau Village and 3 types found in Berakit Village (Table 8).

The density of seagrass species in observation locations have different values. A density value of seagrass species in every observation site ranged between 86.00- 301.56 shoots/m^2, where the level of the highest density found in the village of Malang Rapat is 301.56 shoots/m^2, in the village of Teluk Bakau is 92.00 shoots/ m^2. While the lowest density level in Berakit village is 86.00 shoots/ lowest (Table 9).

Table 8
The types of Seagrass in Trikora Seagrass Conservation Areas, Bintan Regency, Riau Islands

No	*Type*	*Teluk Bakau*	*Malang Rapat*	*Berakit*
1	Enhalus acoroides	+	+	+
2	Cymodocea serrulata	+	+	+
3	Thalassia hemprichii	+	+	-
4	Halodule pinifolia	-	+	-
5	Halodule uninervis	-	+	-
6	Syringodium isotifolium	-	+	-
7	Thalassodendron ciliatum	+	+	+
8	Halophila ovalis	+	-	-
9	Halophila desciepiens	+	-	-

Note: + Found, - Not Found

Table 9
Seagrass density in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands

Station	*Type*	*Toral Shoots (ΣDi)*	*Total Quadrant (Σni)*	*Spacious Quadrant (m²)*	*Density (Shoots/m²)*
Teluk Bakau	*Enhalus acoroides*	129	9	0.50	28.67
	Cymodocea serrulata	145	9	0.50	32.22
	Thalassodendron ciliatum	109	9	0.50	24.22
	Halophila ovalis	21	9	0.50	4.67
	Halophila decipiens	10	9	0.50	2.22
	Total				*92.00*
Malang Rapat	*Enhalus acoroides*	360	9	0.50	80.00
	Cymodocea serrulata	340	9	0.50	75.56
	Thalassia hemprichii	178	9	0.50	39.56
	Halodule pinifolia	60	9	0.50	13.33
	Halodule uninervis	75	9	0.50	16.67
	Syringodium isotifolium	310	9	0.50	68.89
	Thalassodendron ciliatum	34	9	0.50	7.56
	Total				*301.56*
Berakit	*Enhalus acoroides*	197	9	0.50	43.78
	Cymodocea serrulata	160	9	0.50	35.56
	Thalassodendron ciliatum	30	9	0.50	6.67
	Total				*86.00*

Based on analysis of the percentage (%) of cover of seagrass, the highest average level of cover percentage of seagrass in Malang Rapat Village is 101.43%, then in Berakit Village, it is 45.90%, while the lowest cover percentage level in Teluk Bakau Village is 45.90% (Table 10).

Table 10
Seagrass cover percentage in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands.

Station	*Type*	*Total Shoots*	*Total Quadrant*	*Average Percentage of Cover Seagrass (%)*
Teluk Bakau	*Enhalus acoroides*	129	9	69.00
	Cymodocea serrulata	145	9	77.00
	Thalassodendron ciliatum	109	9	59.00
	Halophila ovalis	21	9	15.00
	Halophila decipiens	10	9	9.50
	Total			*45.90*
Malang Rapat	*Enhalus acoroides*	360	9	184.50
	Cymodocea serrulata	340	9	174.50
	Thalassia hemprichii	178	9	93.50
	Halodule pinifolia	60	9	34.50
	Halodule uninervis	75	9	42.00
	Syringodium isotifolium	310	9	159.50
	Thalassodendron ciliatum	34	9	21.50
	Total	101.43		
Berakit	*Enhalus acoroides*	197	9	103.00
	Cymodocea serrulata	160	9	84.50
	Thalassodendron ciliatum	30	9	19.50
	Total			*69.00*

Mangrove ecosystems

The mangrove ecosystem plays an important role in the coastal area of physical, chemical, and biological ways which strongly support the fulfillment of human needs and serve as a buffer balance of the ecosystem in coastal areas. The potential of mangrove forests is in addition to the physical, chemical, and biological. Mangrove has now become its own attraction for tourists to visit besides the plants and unique rooting and diverse biota. Supriharyono (2007) stated that the utilization of mangrove forests for nature aims to increase and disseminate conservation efforts of mangrove biodiversity resources and its ecosystem, and improve the welfare of forest communities and state income.

The composition of mangrove species identified in Trikora Seagrass Conservation Area, Bintan Regency, Riau Islands is 6 true mangrove species and 1 species of mangrove associates. The highest distribution of mangrove species was found in Malang Rapat Village with 5 types, and in Teluk Bakau Village and Berakit Village with 4 types (Table 11).

Table 11
Composition Type of Mangrove in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands

No	*Type*	*Teluk Bakau*	*Malang Rapat*	*Berakit*
1	*Avicennia alba*	-	+	+
2	*Bruguiera gymnorrhiza*	+	+	+
3	*Bruguiera parviflora*	-	+	-
3	*Rhizophora apiculata*	+	+	+
4	*Rhizophora mucronata*	+	-	+
5	*Rhizopora stylosa*	+	+	-
6	*Pandanus tectorius Parkinson*	+	-	-

Keterangan:

+ Found –Not Found

The density of class types of mangrove trees in Trikora Seagrass Conservation Area has an average value of density type with 583,59 Ind/Ha. It is known that *Rhizophora mucronata* has high specific density level with a value of 322.22 ind/ha, while the density of the lowest kind is on *Avicennia alba* kind with a value of 25.10 Ind/Ha. Based on the research observation points, the highest density in Malang Rapat village(800.00 Ind/Ha) and the lowest is in Berakit village (428.54 Ind/Ha). While the types of mangrove that dominate are *Rhizophora mucronata* and *Bruguiera gymnorrhiza* (Table 12).

Table 12
The density of Class Type of Mangrove Trees in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands

No	*Type*	*Density Type (Ind/Ha)*			*The average density*
		Teluk Bakau	*Malang Rapat*	*Berakit*	
1	*Avicennia alba*	0	66.67	8.62	25.10
2	*Bruguiera gymnorrhiza*	155.56	77.78	31.03	88.12
3	*Bruguiera parviflora*	0	100.00	0	33.33
4	*Rhizophora apiculata*	211.11	444.44	311.1	322.22
5	*Rhizophora mucronata*	66.67	0	77.78	48.15
6	*Rhizopora stylosa*	88.89	111.11	0	66.67
	Total	522.23	800.00	428.54	583.59

Based on the results of the calculation of important values for the mangrove for classes of trees have different values. *Rhizophora apiculata* and *Bruguiera gymnorrhiza* are kind of important classes of trees, whose values of INP of each each Rhizophora apiculata is 155 - 157.47% and Bruguiera gymnorrhiza is 46.11 - 106.23% (Table 13).

Table 13
Important Value Class of Mangrove Trees in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands

No	*Type*	*Important score (%)*		
		Teluk Bakau	*Malang Rapat*	*Berakit*
1	*Avicennia alba*	0	23.53	22.73
2	*Bruguiera gymnorrhiza*	106.23	46.11	92.49
3	*Bruguiera parviflora*	0	23.57	0
4	*Rhizophora apiculata*	118.47	157.47	155
5	*Rhizophora mucronata*	30.11	0	29.79
6	*Rhizopora stylosa*	45.19	49.32	0
	Total	300.00	300.00	300.00

Based on the tiller class, the density of the mangrove species in the research site has an average value of 362.97 Ind/Ha. It is known that the highest density is in the type of Teluk Bakau (388.89 Ind/Ha), then the village of Malang Rapat (366.68 Ind/Ha), and Berakit Village (333,34 Ind/Ha). The mangrove species of *Rhizophora apiculata* have the highest density value in each region of the observations with a value which is equal to 255.56 Ind/ha (Table 14).

Table 14
The density of TillersTtype Class of Mangrove in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands

No	*Type*	*Density Type (Ind/Ha)*			*The average density*
		Teluk Bakau	*Malang Rapat*	*Berakit*	
1	*Avicennia alba*	0	55.56	0	18.52
2	*Bruguiera gymnorrhiza*	122.22	55.56	77.78	85.19
4	*Rhizophora apiculata*	211.11	255.56	188.89	218.52
5	*Rhizophora mucronata*	0	0	66.67	22.22
6	*Rhizopora stylosa*	55.56	0	0	18.52
	Total	388.89	366.68	333.34	362.97

Based on the importance, mangrove tillers class is dominated by *Rhizophora apiculata* with a value of 207.13%, and *Bruguiera gymnorrhiza* with a value of 82.94%. Both types play an important role in the formation of the mangrove ecosystem in Trikora Seagrass Conservation Area (Table 15).

Table 15
Important Value of Tillers Class of Mangrove in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands

No	*Type*	*Important Score (%)*		
		Teluk Bakau	*Malang Rapat*	*Berakit*
1	*Avicennia alba*	0	47.31	0
2	*Bruguiera gymnorrhiza*	82.94	45.56	80.54
3	*Rhizophora apiculata*	149.23	207.13	151.81
4	*Rhizophora mucronata*	0	0	67.65
5	*Rhizopora stylosa*	67.83	0	0
	Total	300.00	300.00	300.00

Based on the seedling class, the mangrove at Trikora Seagrass Conservation Area has the average value of the density of 444.83 Ind/Ha. Malang Rapat Village has the highest density value of seedling class type which is577,78 Ind/Ha, then Berakit village with a density of 412.25 Ind/ha, and the lowest Teluk Bakau village with a density value of 344,45 Ind/Ha (Table 16).

Table 16
Mangrove seedling density type classes in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands

No	*Type*	*Density Type*			
		Teluk Bakau	*Malang Rapat*	*Berakit*	*The average density*
1	*Bruguiera gymnorrhiza*	66.67	144.44	200.00	137.04
2	*Rhizophora apiculata*	277.78	377.78	166.67	274.08
3	*Rhizophora mucronata*	0	0	45.58	15.19
4	*Rhizopora stylosa*	0	55.56	0	18.52
	Total	344.45	577.78	412.25	444.83

Threats in Coastal Ecosystems

The dominant source of the threat to coastal ecosystems from marine ecotourism activities in Trikora seagrass conservation area, Bintan regency, Riau Islands comes from community activities and tourism activity. It has been identified that the source of the main threat comes from resort construction, hotel and lodging, as well as the activity of visitors/tourists, fishing activities and residential areas.

The threat posed by the activities of resorts, hotels and residential areas include disposal of solid waste and liquid waste into the marine environment, degradation of coastal ecosystems resulting from the expansion and construction of the facility. While the threat that may be posed by the activities of visitors/tourists are solid waste generation, collection and biota degradation due to tourism attractions such as snorkeling, diving, swimming and fishing. Fishing activities and residential areas have caused the destruction of coastal ecosystems due to mooring the ship and fishing charts, disposal of solid waste and liquid waste, and the search for marine biota (wooden mangrove, seagrass, corals, gastropods, shellfish and fish) for the necessities of living and life and manufacture of souvenirs. A very significant impact of fishing activities around the coastal ecosystem is doing fishing using bombs and cyanide.

Threats of Solid Waste

Potential marine ecotourism and its implementation is expected to have implications for the environment, in the form of physical and biological impacts and social and economic development, both positive and also negative impacts. The possible negative impact is derived from different sources and for different threats. Part of this research is more focused on the threat of solid waste to study the source of the threat and the potential environmental impacts in the area of Marine Ecotourism of Trikora Seagrass Conservation Area, Bintan, Riau Islands.

Surveys had discovered that the average amount of solid waste was 23.38 pieces/ m^2, or with the range at any observation station between 12.0 to 37.0 pieces/ m^2 (Table 17). The dominant type of solid waste in the form of plastic materials was 48.56%, followed by the type of wood waste which was 18.47%, paper with 8.99%, styrofoam by 7.79%, glass and cans with 5.40% for each. While this type of waste rubber and fabric got a small percentage of 4% of its existence.

Waste plastic materials found were in the form of bottles, package or boxes packaging, plastic bags, jute and plastic rope and fishing gear including former plastic used by fishermen from netting and fishing line.

Table 17
Density of solid waste at ecotourism in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands

Type of waste	*Densitas (pieces/m^2)*					*Precentage (%)*
	ST1	*ST2*	*ST3*	*ST4*	*Average*	
Plastic	4	4,5	10	22	10,13	48,56
wood	3,4	1	7	4	3,85	18,47
Paper	2	2	2	1,5	1,88	8,99
Styrofoam	1	1,5	2	2	1,63	7,79
Glass	1	0,5	2	1	1,13	5,40
Tin	0,5	2	1	1	1,13	5,40
Rubber	0,5	0,5	0,5	1,5	0,75	3,60
Fabric	0,5	0	0,5	0,5	0,38	1,8
Total	12,9	12,0	25,0	37,0	23,38	100,00

It is estimated that the source of solid waste is derived from the activity of the population around like household waste, the inn/hotel and fishermen, as well as the rest of the materials brought by visitors/tourists.

Various impacts might arise from the presence of this solid waste. The dominant impactsare those will interfere with the beauty or aesthetics, impair the growth and microbial life in coastal seagrass, mangrove and marine animals around.

To manage the impact and source of solid waste in the Trikora Seagrass Conservation Area, some of the actions taken have been identified including: 1) the inns, hotels and resorts have been managing solid waste through waste disposal in trash cans, making the warning signs that it is prohibited to take out the trash and providing guidance to guests staying; 2) some areas of ecotourism have provided landfills, giving a warning sign of not to litter, and have even provided beach janitor; 3) society has also given counseling on the importance of managing household waste.

CONCLUSIONS AND RECOMMENDATIONS

Socio-economic conditions of communities and ecological status in Trikora Seagrass Conservation Area, Bintan regency, Riau Islands support the development of marine ecotourism. Coastal ecosystem which is reflected from vegetation structure of seagrass and mangrove vegetation structure has the type, density and the good cover of the supporting aspects of the environment. The threat of coastal ecosystems in the region is especially in the form of pollution, damaged and degradation of coastal ecosystems, as well as biota degradation. The threat comes from marine ecotourism development such as construction of hotels, inns and resorts and facilities; as a result of tourist activities, the activities of fishermen and local people. Solid waste that is dominant in the region is in the form of a plastic type material, wood, paper and styrofoam; then other materials such as glass, cans rubber and fabric.

Research for the wide impact on the development of marine ecotourism in this Trikora Seagrass Konserevasi Region needs to be comprehensive, in order to support the development of this region towards more sustainable way.

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