



Report
**PRELIMINARY FIELD SURVEY
ON DUGONG
AND SEAGRASS HABITAT**
Kotawaringin Barat,
10 – 16 October 2016

Organized by:
Ministry of Marine Affairs and Fisheries
Research Center for Oceanography -LIPI
Bogor Agricultural University
WWF-Indonesia

Didukung oleh:

**LPKSDMO, PPO, LIPI
University of Sultan Ageng Tirtayasa
Center of Research, Recovery, and Fish Resources Conservation, MMAF
Department of Marine and Fisheries, West Kotawaringin District,
Central Kalimantan Province**



Editorial Team

Sekar M.C. Herandarudewi, M.App.Sc.

Juraij, M.Si

Muta Khalifa, M.Si

Riswanto, M.Ba

Acmad Arifin

Fitriyah Anggraeni, M.Si

Suhardi

Cassandra Tania, M.Sc

Syarif Yulius Hadinata, S.Sos.

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INTRODUCTION

Background

Dugong are endangered and currently listed as vulnerable to extinction species based on IUCN (1996) red list- species and included in Appendix 1 CITES (the Convention of International Trade in Endangered Species of Wild Flora and Fauna). Dugong population in Indonesia scattered almost everywhere on shallow water ocean around Indonesia. Marsh (2002) predicted on 1970 the population of dugong was around 10.000 individuals, but in 1994 the population diminished to 1000 dugong.

Through the collaboration between Indonesia Ministry of Marine Affairs and Fisheries (KKP), Indonesian Institute of Science (LIPI), Bogor Agricultural University (IPB), World Wildlife Fund (WWF-Indonesia), which funded by Global Environment University (GEF) are initiating Dugong and seagrass ecosystem conservation program: *Dugong and Seagrass Conservation Projects* (DSCP). This program has been starting in 2016 and is scheduled to complete in 2019. Some locations in Indonesia have been selected as program implementation sites. The locations are Bintan, Kotawaringin Barat, Toli-toli and Alor.

The existence of dugong and seagrass ecosystem in these four areas have been well known in the national symposium of Dugong and seagrass ecosystem in 2016. To acknowledge the current status of Dugong and seagrass ecosystem in these locations, a preliminary survey in these areas has been established with several methods.

The information about dugong occurrence in West Kotawaringin is signified by dugong hunting by local community. This issues also emerged at the Dugong National Symposium and seagrass habitat, held in Bogor in April 2016. The study of Dugong in West Kotawaringin District is still very limited. There is only one study by Prasetyo et.al. (2015) on the structure of the seagrass community in West Kotawaringin.

Purpose

The purpose of the preliminary field survey is to:

1. Acknowledge the presence and common location of dugong sightings,
2. Acknowledge the seagrass ecosystem condition,
3. Review the awareness level in the community about dugong and Seagrass ecosystems, and
4. Recognize the threats to dugong and seagrass ecosystem

I. STUDY ON DUGONG EXISTENCE AND DISTRIBUTION IN WEST KOTAWARINGIN

1. Method

1.1. Visual survey

Visual survey method is conducted with three different methods, including Visual survey by boat, aerial survey, and from under water with feeding trail identification.

1.1.1. Visual survey by boat

Visual surveying by ship was conducted by three observers. Two observers were on the bow of the ship and one person was at the stern of the ship (Figure 1). Two ways were applied in this observation, by using binoculars and without binoculars (observer's eyesight only). Observers who observed dugong were in the bow by using binoculars while the observer who was at the stern observed it without the tools, or with their vision only. One observer in the bow also acts as a data recorder. Observations were made for 15 minutes continuously. After 15 minutes, observers rotated to do other roles. During observation, travel data was stored directly in the GPS.

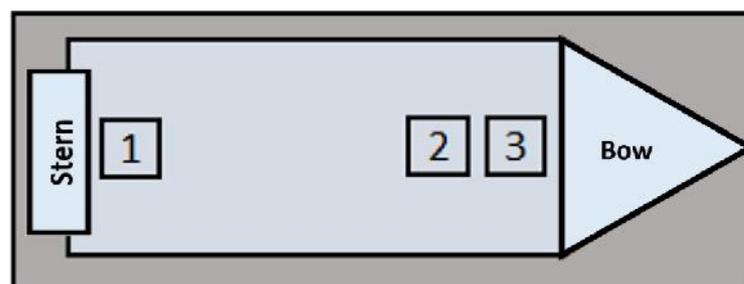


Figure 1. Observer position in boat survey

1.1.2. Aerial visual Survey

Aerial surveys were conducted to record the abundance and distribution of dugongs. Aerial surveys used a small plane/drone. Drones were operated at an altitude of +/- 30 meters above the sea level at a speed of 6 m/s. At that height, the drone captured images at 6 meters on the right and left of the line transect. The line transects used was 400 meters long and the distance between line transects was 100 meters. The description of the aerial survey plan was shown in Figure 2.

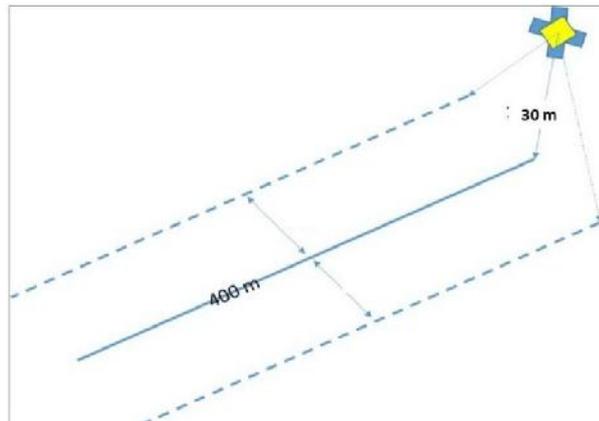


Figure 2. Dugong aerial survey design with drone

1.1.3. Underwater visual survey with feeding trail identification

Feeding trail is a path formed by dugong feeding activity. The initial stage of observation is done by manta tow by boat to detect the presence of dugong feeding traces. The feeding traces found are analyzed, whether they are included as old or new traces.

The new feeding traces are directly documented using the camera, marked with GPS, recorded in length x width by meter and marked using color clips. This is conducted to determine the condition of the feeding trace and to avoid double

data. As for the old eating trails, performed the same steps, but with including additional data on the existing high seagrass measurements. This is done to find out how long has the feeding trail been in the location. Observations were made using basic dive tools (masks, snorkels, fins), GPS, and underwater cameras.

1.2. Bioacoustics survey method

In this method, an omnidirectional hydrophone is connected to a recorder onboard. This hydrophone device is attached to a stick and inserted into the water to 1-meter depth or more from the water surface. The Floating Stationary Survey scheme is shown in Figure 3.

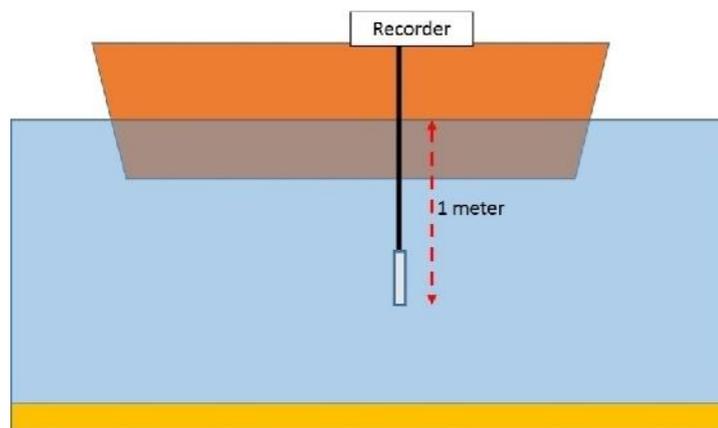


Figure 3. Recording scheme with floating stationary survey method

This method requires an omnidirectional hydrophone device, voice recorder, battery (power source), headphones, wood, data sheets, and binoculars. One person operates omnidirectional hydrophone and two people conduct visual observation using binocular. Voice data recording is performed at potential dugong habitat locations. Potential habitat information is obtained based on interviews and results of underwater visual methods or the identification of feeding traces. Data recording is conducted at the time of dugong potential occurrence.

This bioacoustics observation was conducted for 4 days (11 and 13-15 October 2016), the tool used in this research was hydrophone model SQ26-H1. This tool

was submerged in water column which indicated the occurrence of Dugong activity. The sound was then recorded by using recorder (Figures 4 and 5). The soundwave saved in the device will be analyzed further using a specified program.



Figure 4. Operating the hydrophone



Figure 5. Hydrophone is submerged into the depth.

In general, data collection site is shown in figure 6 as the following illustration.

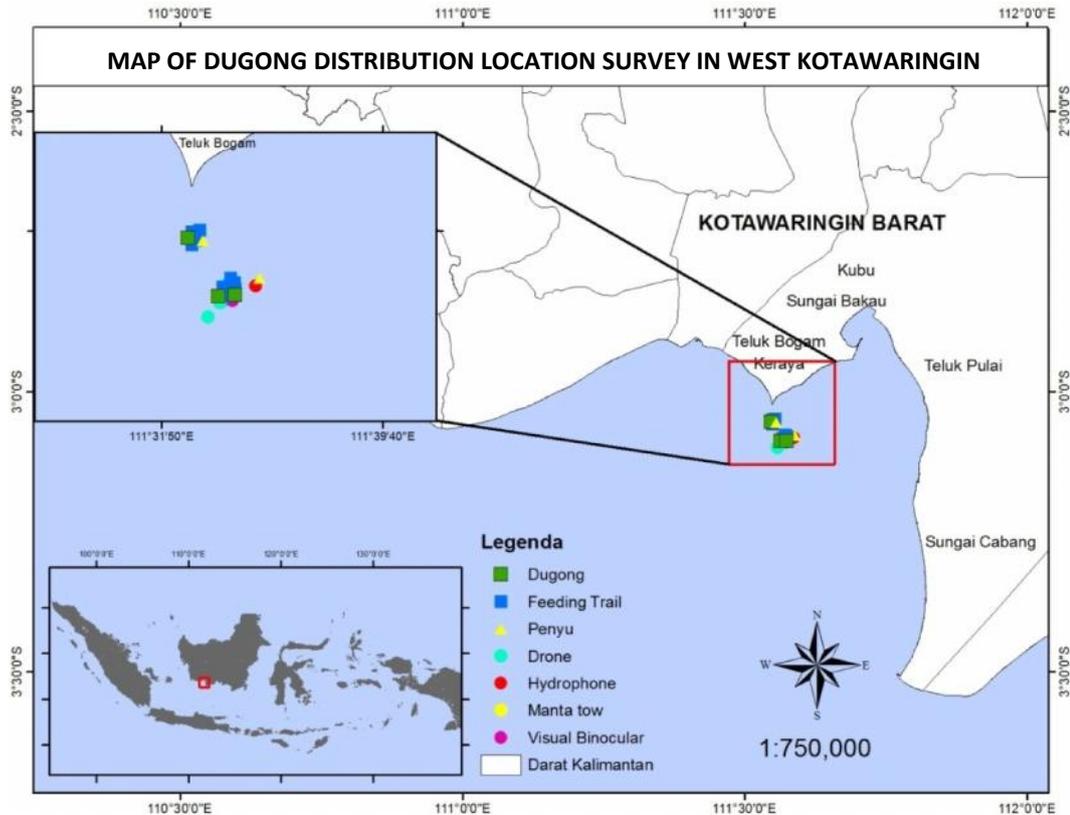


Figure 6. Data collections sites for Dugong occurrence and distribution in West Kotawaringin

2. Result and Discussion

2.1. Visual survey result

Visual observation was conducted by using drone, binoculars and diving gear. Activity of the visual survey was focused on South coastal area of Bogam Bay Village, which is Gosong Beras Basah. Observation was being held for 5 days (11-15 of October 2016), dugong had sighted on the first day, Tuesday, October 11th 2016 evening at 23.17 GMT+7 (03^o05.361 S, 111^o34.000 E) and Wednesday, October 13th 2016 morning at 09.47 GMT+7 (03^o05.476 S, 111^o34.351 E), Dugong also sighted swam around with sea turtle (figure 7). Dugong in the area is really sensitive, during observation it was very difficult to take documentation of dugong went to the surface area to take a breath, because the timing only needs about 2 seconds and the cloudy water made it more difficult to be documented.



Figure 7. Sea turtle in the seagrass ecosystems, dugong's feeding ground

Feeding Trail Survey

Observation on Dugong's feeding trail had been conducted for 5 days (October 11th-15th 2016). Feeding trails being sighted on the East and West of Gosong Beras Basah (03^o04.955 S, 111^o34.272 E) and Gosong Senggora, the condition when observed was new and just got left by the dugong, based upon how clean the feeding trail and there was not any pioneer vegetation grown on site. The location is really close with the previous location where a dugong had been sighted. This confirmed that the feeding trail was new and just recently visited by the dugong for feeding activity.

Based on feeding trail analysis, the average length measurement is 1,5 – 7,6 m, with width of 9 - 22 cm and depth of 2 - 6 cm (Figure8). Founded feeding trail formed a long and intricate trail, this indicated that the dugong feeds with grazing method, Jejak makan yang ditemukan ini membentuk jejak memanjang dan berliku, kondisi ini menginformasikan bahwa dugong yang ada di Desa Jelaje makan dengan cara *grazing*, a crawling position and using both of pectoral fins to prop the bodyweight and plucking on the seagrass to the roots, the activity resulting a huge bare spot on the seabed known as *feeding trail*.

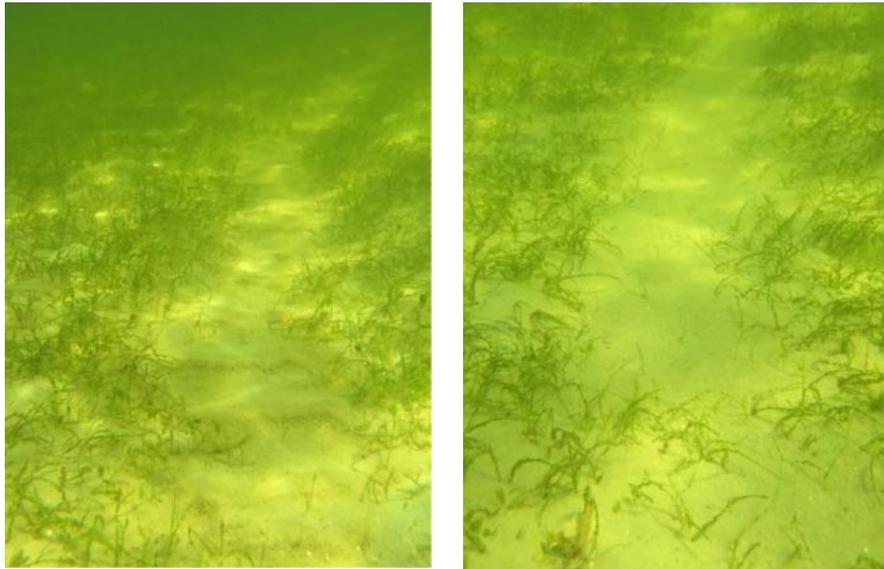


Figure 8. Some feeding trails founded in Gosong Beras Basah, Bogam Bay

The feeding trail which has been passed by dugong in this area, could be identified with seagrass species as *Halodule uninervis*, *Cymodocea serrulata*, *Halophila ovalis* dan *Thalassia hemprichii* (Figure 9).

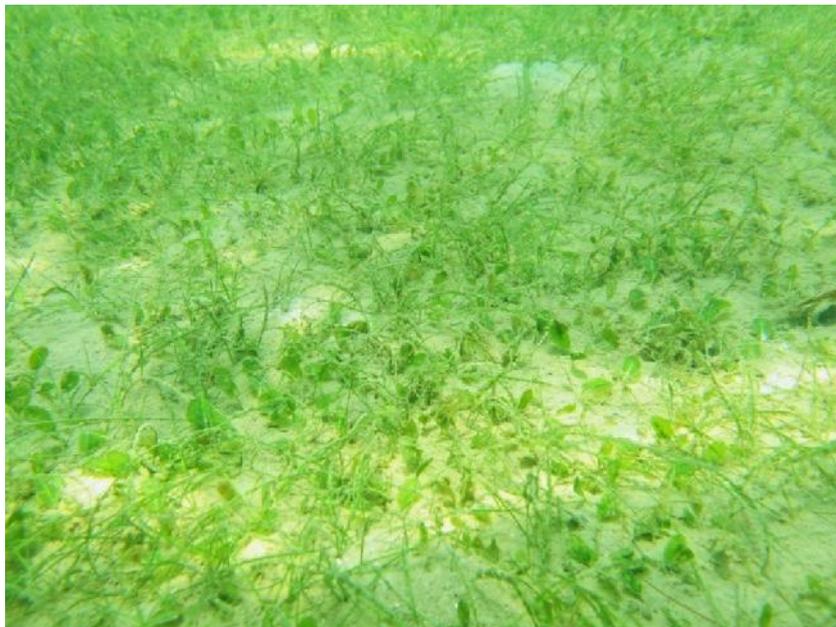


Figure 9. Seagrass Condition in Gosong Beras Basah, Bogam Bay

Figure 10 shows the feeding trail and seagrass species which grow around the feeding trail. Dugong in Gosong Beras Basah has preferences to feed on smaller, fibrous or cellulosed seagrass. Dugong preferred smooth and easier to digest type of seagrass but has high nutrient density as like *Halodule uninervis* and *Cymodocea serrulata*, this is suitable with Preen (1995) statement as mentioned one of dugong's favorite type of seagrass are *Halophila* sp, *Cymodocea* sp. and *Halodule* sp.



Figure 10. Photograph of Dugong's feeding area in Gosong Beras Basah, Bogam Bay

Based on identified feeding trail in Gosong Beras Basah, indicated that seagrass ecosystems there is a feeding ground area for *Dugong dugon* (Figure 10).

2.2. Bioacoustics Survey Result

Marine mammal, especially dugong, communicate in the water by using soundwave. Dugong communicate by making chirping sound which is similar to birds. The sound has a frequency range from 3-18 kHz for 6 seconds. Dugong also communicate by making trembling sound in a frequency of 740 Hz, within 3-18

kHz for 4 minutes (Khalifa 2010). According to Anderson and Barclay (1995), there are three types of sound that are used by Dugong to communicate, i.e.: *chirp*, *trill*, and *bark*. *Chirp* has a range of frequency of 3-18 kHz, while *trill* has a range of frequency which is higher than 740 Hz dalam batas 3-18 kHz and lastly, *bark* is ranging from 500-2.200Hz.

The result of bioacoustics survey conducted in West Kotawaringin produces 7 sound recordings. Voice identification is based on Hishimoto et al. (2004) and Ichikawa et al. (2006). However, all the 7 recordings did not indicate a single record that detected the sound of dugong. It shows different result from the visual survey findings which found many feeding trails and the presence of dugong in that location.

References

- Anderson, P. K. and R. M. R. Barclay. 1995. Acoustic signals of solitary Dugongs: Physical characteristics and behavioral correlates. *Journal of Mammalogy*, 76 (4): 1226 – 1237.
- Heinshon, G.E., Wake, J., Marsh, H. and Spain, A.V., 1977. The Dugong (*Dugong dugon*) in the seagrass system. *Aquaculture*, 12: 235-248.
- Hishimoto Y, Ichikawa K, Akamatsu T, Arai N. 2005. The acoustical characteristics of dugong calls and the behavioral correlates observed in Toba aquarium. Kyoto University repository.
- Ichikawa K, Tsutsumi C, Arai N, Akamatsu T, Shinke T, Hara T, Adulyanukosol K. 2006. Dugong (*Dugong dugon*) vocalization patterns recorded by automatic underwater sound monitoring systems. *J. Acoust. Soc. Am* (119): 3726-3733.
- Khalifa, M. A. 2011. Tingkah laku dan karakteristik suara *Dugong dugon* di SeaWorld Indonesia, Taman Impian Jaya Ancol, Jakarta. Skripsi, Institut Pertanian Bogor, Departemen Ilmu dan Teknik Kelautan, Fakultas Perikanan dan Kelautan.
- Preen A. 1995. Diet of Dugongs: Are they omnivores?. *Journal of Mammals*. 76(1),163-171.

II. STUDY ON SEAGRASSECOSYSTEM IN WEST KOTAWARINGIN

1. Method

The data were collected on three transects with 100 m lengths each and the distance between transects was 50 m so that the total area was 100 x 100 m² (Figure 12). Several square frames were placed on the right side of the transect with the distance between each square is 10 m so that the total of squares on each transect is 11. The starting point of the transect is placed at a distance of 5-10 m from the first seagrass encountered (from the coast).

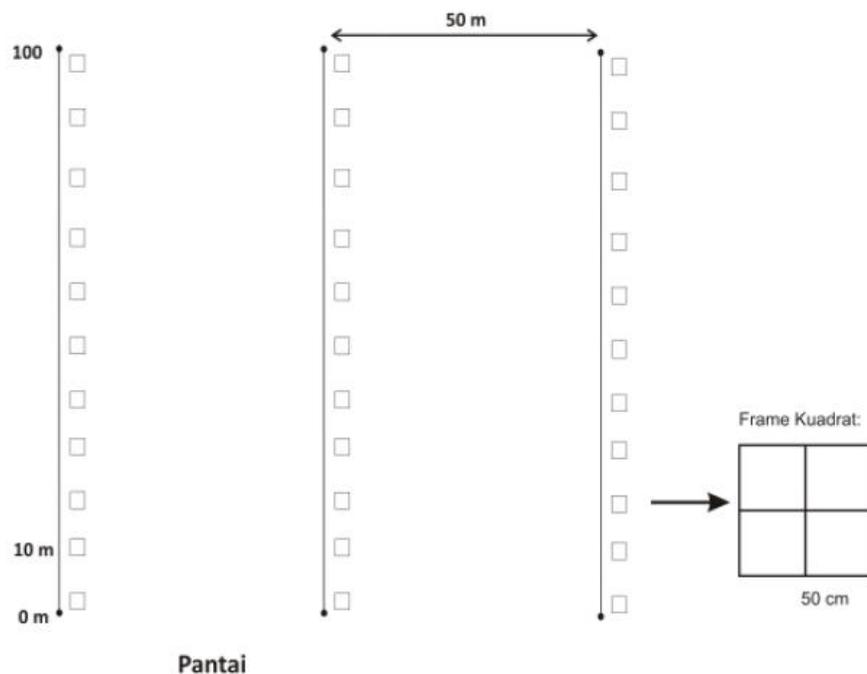


Figure 11. Seagrass data collection scheme

Seagrass and water quality survey sites are shown as the following figure 12.

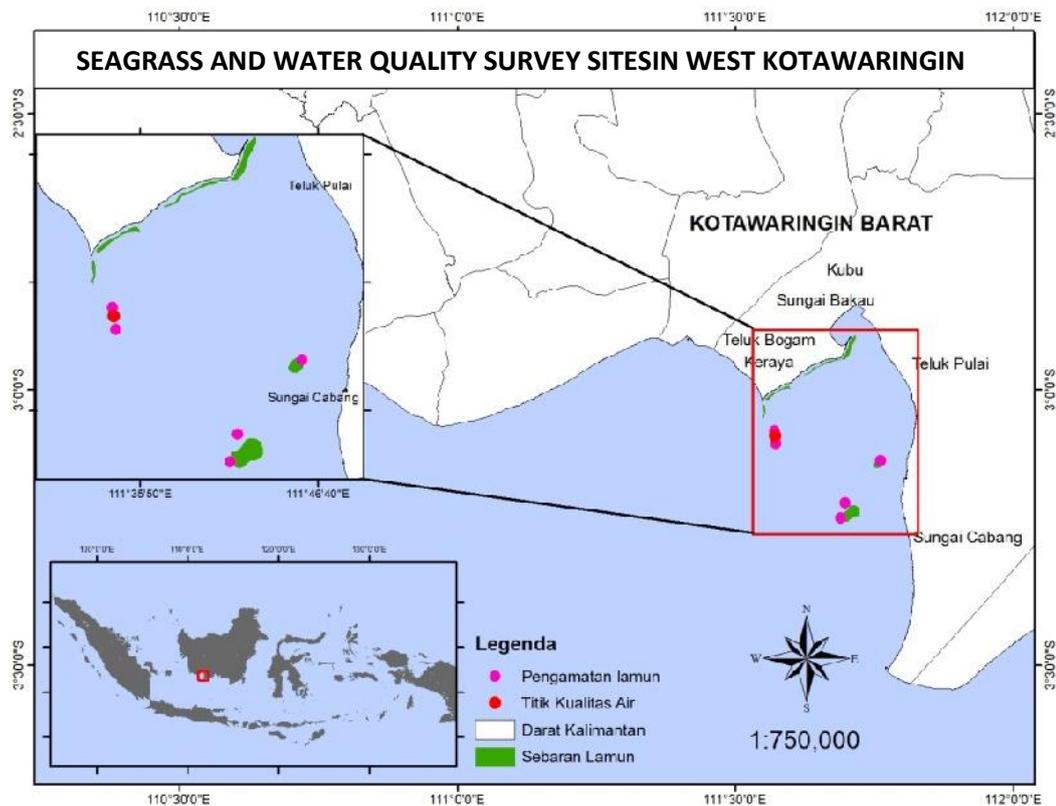


Figure 12. Seagrass and water quality survey sites in West Kotawaringin

2. Result and Discussion

The water condition in West Kotawaringin influenced by the water flow from the mainland because there are a lot of river creeks along the coastline. However, even the water was cloudy, common residents oftentimes saw dugong. Therefore, observation on seagrass structure community has been conducting by BPSPL Pontianak with Research Center for Oceanography-LIPI. Second observation had been done by DSCP team on Oktober 2016. Monitoring conducted in four locations of Gosong (Gs) Pasir, which are Gosong Beras Basah, Gosong Senggora Besar, Gosong Senggora Terendam and Gosong Sepagar.

Gosong Beras Basah, which is a part of Bogam Bay's territory formed a length landscaping area from North to the South. Seagrass monitoring being done on The West side of Gosong. On the other hand at Gosong Senggora clusters, seagrass

structure monitoring had done in Gosong Senggora Besar which located in the middle of the cluster and in Gosong Sengggora Terendam on the north side of the cluster. Location for monitoring in Gosong Senggora Besar was on the South side. This method applied to avoid repetition data collection from the previous observation which had been done (2015) on the North side. In Gosong Sepagar observation has been conducted in South side. Hereby the coordinate for every observation sites presented in Table 1.

Table 1. Geographical position of seagrass observation area in West Kotawaringin

Location	Geographical Position	
	Latitude (Lat)	Longitude (Long)
Gs. Beras Basah	03° 03' 11.82"	111° 33' 7.20"
Gs. Senggora Besar	03° 14' 01.21"	111° 41' 19.64"
Gs. Senggora Terendam	03° 12' 20.34"	111° 41' 48.67"
Gs. Sepagar	03° 07' 45.59"	111° 45' 41.61"

Environmental condition in monitoring site considered to be good and in sea water quality standard released based on KEPMEN-LH No.51 in 2004, except for salinity (Table 2). Salinity score in the aquatic region of West Kotawaringin tend to be low influenced by the stream of fresh water from the rivers. Yet, the seagrass still be able to grow. On every site, the dominant substrate formed from fine sand (Table 3). By this, it is strongly indicated the seagrass ecosystem is a feeding ground for dugong because it is easier to feed on seagrass with fine substrate.

Table 2. Water Quality Result around Observation Site in West Kotawaringin

Location	Temperature (°C)	Salinity (psu)	pH	DO (mg/L)	TDS (g/L)	Depth (cm)
Gs. Beras Basah	30,20 - 31,89	18,2 - 28,2	8,41 - 8,66	42,35 - 46,19	25,40 - 45,40	64 - 153
Gs. Senggora Besar	31,82 - 33,09	28,5 - 29,0	8,53 - 8,76	40,92 - 42,50	43,00 - 46,40	87 - 190
Gs. Senggora Terendam	31,30 - 31,80	26,7 - 28,7	8,51 - 8,57	41,81 - 43,62	45,90 - 46,60	76 - 223

Table 3. Percentage size of substrate particle on seagrass ecosystem

Location	Gravel (%)	Coarse Sand (%)	Fine Sand (%)	Mud (%)
	(4 -8 mm)	(0,5 - 2 mm)	(0,125 - 0,25 mm)	(residu - 0,65 mm)
Gs. Beras Basah	1.02	15.81	79.88	3.29
Gs. Senggora Besar	1.28	24.72	34.97	6.26
Gs. Senggora Terendam	9.09	7.71	81.83	1.37
Gs. Sepagar	0.96	15.18	79.01	4.86

There are ten species of seagrass which had been found in the monitoring location, there are *Cymodocea rotundata*, *Cymodocea serrulata*, *Enhalus acoroides*, *Halodule pinifolia*, *Halodule uninervis*, *Halophila decipiens*, *Halophila minor*, *Halophila ovalis*, *Syringodium isoetifolium*, serta *Thalassia hemprichii* (Table 4). Gosong Beras Basah has the most seagrass species up to 7 types.

Table 4. Species composition and seagrass distribution in West Kotawaringin*

Species	Gs. Beras Basah	Gs. Senggora Besar	Gs. Senggora Terendam	Gs. Sepagar
<i>Cymodocea rotundata</i>	+	-	+	-
<i>Cymodocea serrulata</i>	-	+	+	+
<i>Enhalus acoroides</i>	+	-	-	-
<i>Halodule pinifolia</i>	-	-	+	+
<i>Halodule uninervis</i>	+	+	+	+
<i>Halophila decipiens</i>	+	-	-	-
<i>Halophila minor</i>	+	-	-	-
<i>Halophila ovalis</i>	+	+	+	-
<i>Syringodium isoetifolium</i>	-	+	+	+
<i>Thalassia hemprichii</i>	+	-	-	-

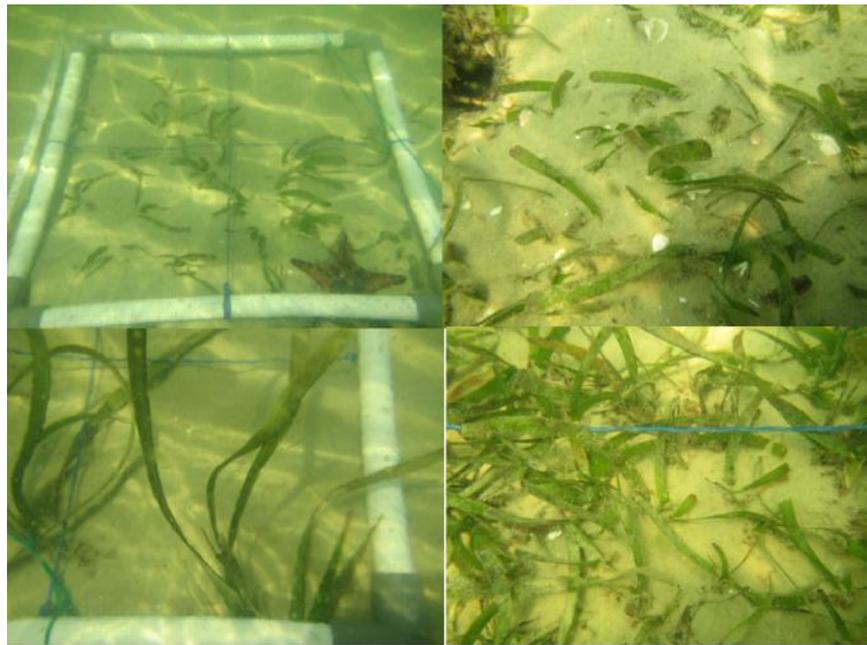
*Noted: (+) = found, (-) = not found

Seven species were found in every monitoring sites. For structure community monitoring, it started from the side which the site where the first seagrass being found (the closest part which is not submerged during low tide). Five seagrass species are found during the monitoring (Table 5). Percentage cover in the area is $35,58 \pm 16,30$ % and dominated by *Thalassia hemprichii* (Table 3). In general, seagrass which being found in this area tend to have smaller size. The ecosystem form seagrass commune with structure in approximate to ± 1 km distance from the side of Gosong (Waypoint 72). On that site, we could find a varies growth

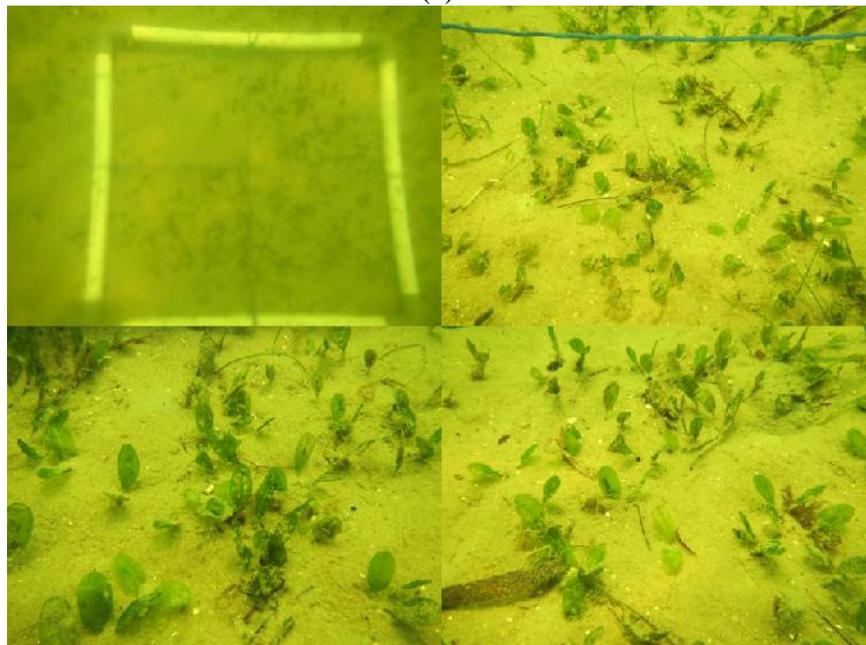
area of *Halodule uninervis*, *Halophila decipiens* and *Halophila ovalis* with percentage cover of 25 %. The condition is presented in Figure 13.

Table 5. Percentage cover of seagrass at monitoring locations in Kotawaringin

Location	Seagrass Species	Percentage Cover (%)	
		Species	Average Point
Gs. Beras Basah	<i>Cymodocea rotundata</i>	11,25 ± 0,00	35,58 ± 16,30
	<i>Enhalus acoroides</i>	10,69 ± 13,34	
	<i>Halophila decipiens</i>	1,25 ± 0,00	
	<i>Halophila minor</i>	5,00 ± 0,00	
	<i>Thalassia hemprichii</i>	32,06 ± 16,67	
Gs. Senggora Besar	<i>Cymodocea serrulata</i>	8,70 ± 8,29	26,42 ± 16,05
	<i>Halodule uninervis</i>	9,25 ± 6,51	
	<i>Halophila ovalis</i>	8,44 ± 10,35	
	<i>Syringodium isoetifolium</i>	5,15 ± 3,04	
Gs. Senggora Terendam	<i>Cymodocea rotundata</i>	6,06 ± 2,75	18,83 ± 9,62
	<i>Cymodocea serrulata</i>	5,35 ± 2,55	
	<i>Halodule pinifolia</i>	8,50 ± 2,12	
	<i>Halodule uninervis</i>	5,81 ± 2,84	
	<i>Halophila ovalis</i>	6,88 ± 0,88	
	<i>Syringodium isoetifolium</i>	8,08 ± 2,24	
Gs. Sepagar	<i>Cymodocea serrulata</i>	6,56 ± 2,58	18,86 ± 14,57
	<i>Halodule pinifolia</i>	28,75 ± 8,84	
	<i>Halodule uninervis</i>	13,44 ± 14,20	
	<i>Syringodium isoetifolium</i>	16,25 ± 0,0	



(a)



(b)

Figure 13. Ecosystem Condition of Seagrass in Gosong Beras Basah; side part of gosong (a) and Waypoint 72 (b)

Based on Table 4, Gosong Senggora Besar has four species of seagrass, which are *Cymodocea serrulata*, *Halodule uninervis*, *Halophila ovalis*, and *Syringodium isoetifolium*. Percentage vegetation cover score is $26,42 \pm 16,05$ % and dominated by *Halodule uninervis* (Table 5). Previous monitoring result on the North part of Gosong Senggora Besar recorded seven species of seagrass. As for other species

being found in Gosong Senggora Besar were *Enhalus acoroides*, *Cymodocea rotundata*, and *Thalassia hemprichii*. The landscape is not too long and the all area length is about 70 m. The condition is shown by Figure 14.

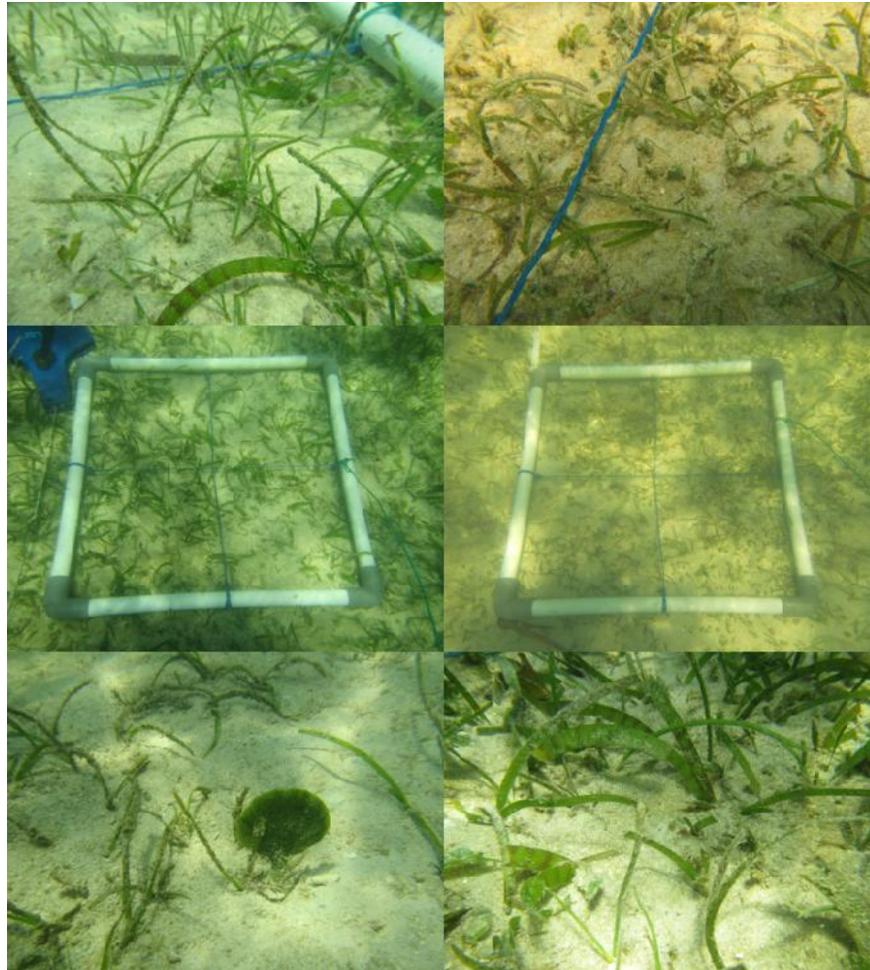


Figure 14. Seagrass Ecosystem Condition in Gosong Senggora Besar

Located on The North part of Gosong Senggora Cluster, Gosong Senggora Terendam often impassable by fishing ships which are going to be in the jetty or just to take a break in Gosong Senggora Besar. Named as Gosong Senggora Terendam because oftentimes being submerged during high tides or even low tides. The seagrass in this location growth in structure and group of seagrasses called *aspatch*. There are six species found in the area (Table 4). *Halodule pinifolia* is dominating the percentage vegetation cover in Gosong Senggora Terendam with average score of $18,83 \pm 9,62$ % (Table 7). Figure 15 below shows the ecosystem condition of the area.

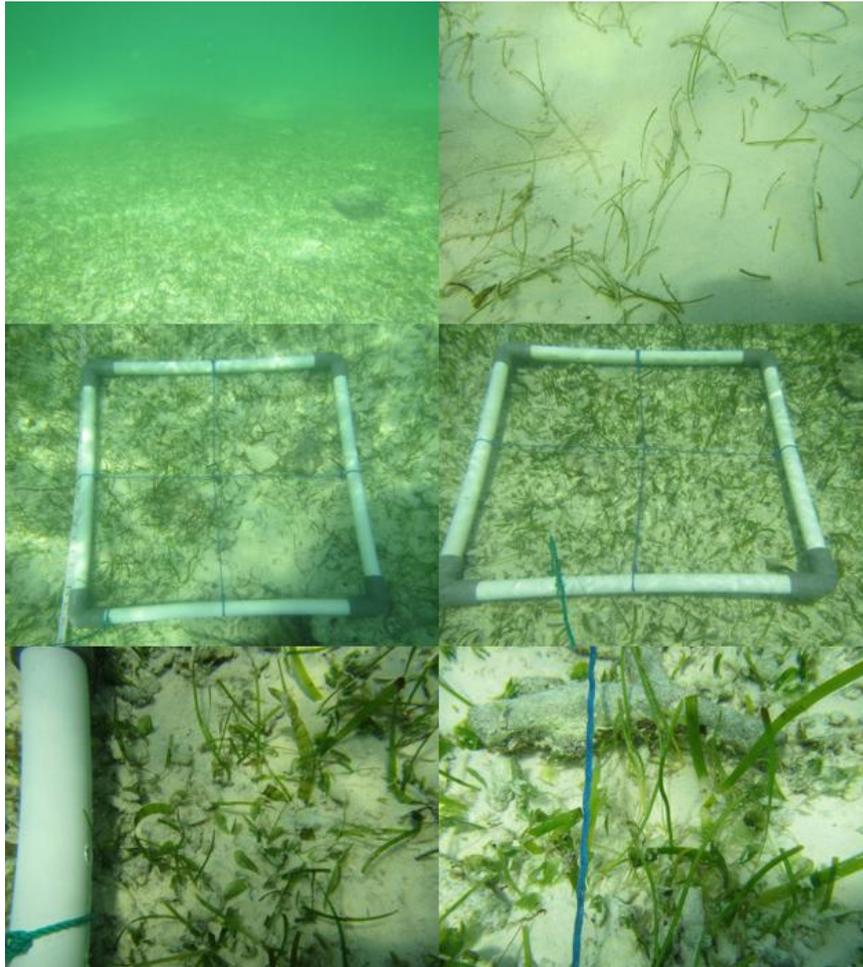


Figure 15. Seagrass ecosystem condition in Gosong Senggora Terendam

The last location being monitored in West Kotawaringin is Gosong Sepagar. Seagrass ecosystem in the area has four species of seagrass (Table 4). From the four species, *Halodule pinifolia* dominated the population in Gosong Sepagar with percentage cover average score is $18,86 \pm 14,57$ % (Table 5). The length of the area only about 100 m. On the point of 100 meter, some species of corals are dominating the base substrate on the seabed. A unique thing was visible is there are bivalvia attached to *Halodule sp.* The condition of seagrass ecosystems presence in Figure16. In general, on every observation areas in West Kotawaringin is really potential as dugong's feeding ground areas according to seagrass species (Table 5) and type of substrate (Table 3) as the result from monitoring which had been conducted.

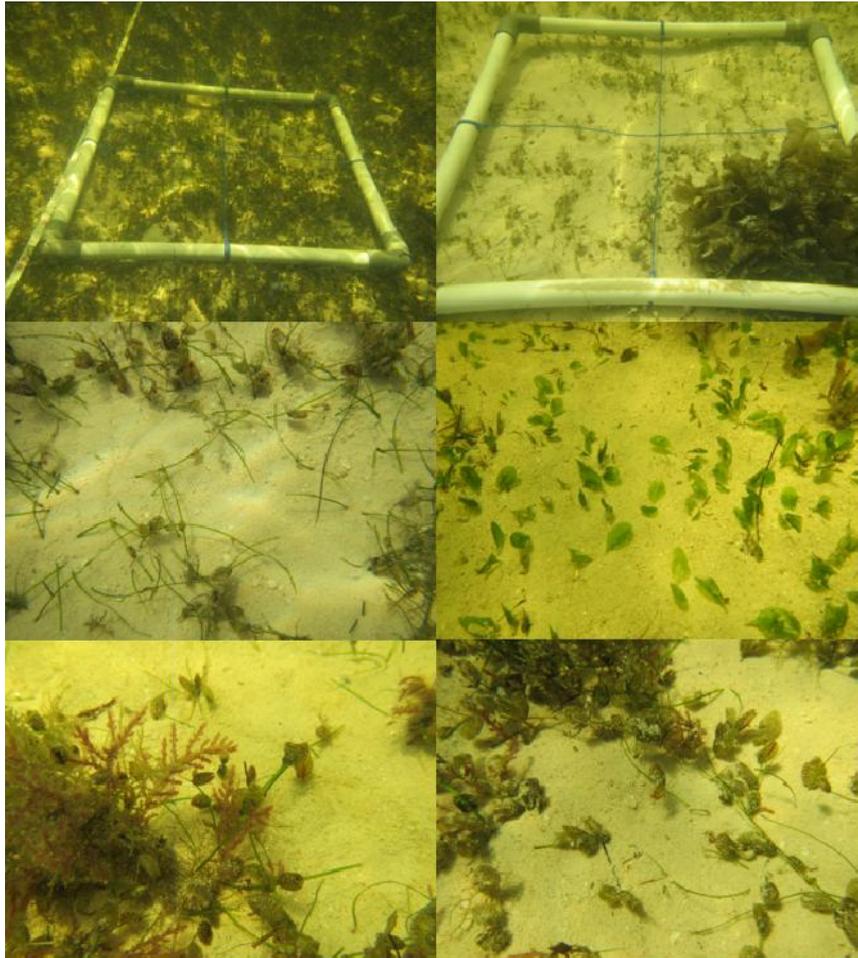


Figure 16. Seagrass Ecosystem Condition in Gosong Sepagar

Build upon the vegetation density score, *Thalassia hemprichii* in Gosong Beras Basah has the highest score of 12988 individu/m² (Figure 5). Seagrass species as *Halodule uninervis*, *Halophila ovalis*, and *Thalassia hemprichii* at Gosong Senggora Terendam showed sizable percentage cover scores. On the other hand, *Enhalus acoroides*, *Halophila decipiens* and *Halophila minor* in the area of Gosong Beras Basah has a low density score.

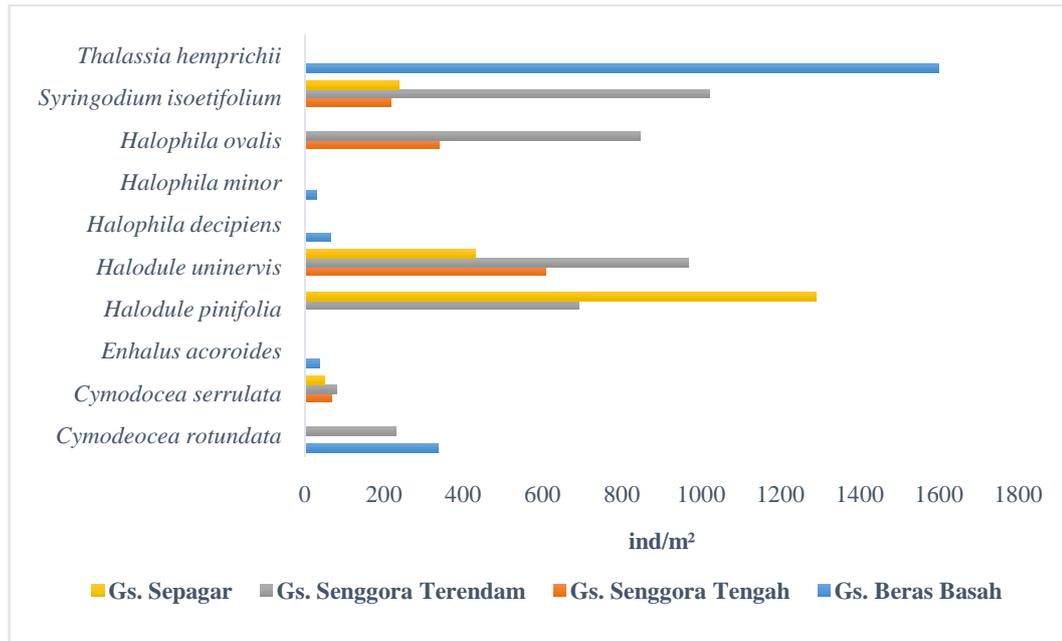


Figure 17. Density score of seagrass ecosystem in West Kotawaringin

Grazing activity has closely related to the amount of seagrass biomass. In consequence of that, dried seagrass biomass becomes one of the indicator in structure monitoring of seagrass community areas. The weight of dried seagrass total biomass is about $5,52 \pm 7,06$ to $956,32 \pm 562,37$ gBK/m² (Table 6). Seagrass species which has the highest total dried biomass in Gosong Beras Basah as well as the highest score measurement compared to all other monitoring sites is *Thalassia hemprichii* with total biomass up to $956,32 \pm 562,37$ gBK/m². In Gosong Beras Basah, seagrass species as *Halophila decipiens* has the lowest dried total biomass which was about the score of $194,71 \pm 0,00$ gBK/m².

Table 6. Average Biomass Weight of Dried Seagrass

Location	Species	Lower Biomass (gBK/m ²)	Upper Biomass (gBK/m ²)	Total Biomass (gBK/m ²)
Gs. Beras Basah	<i>Enhalus acoroides</i>	170,04 ± 70,20	72,66 ± 64,66	242,69 ± 114,58
	<i>Halophila decipiens</i>	-	-	194,71 ± 0,00
	<i>Thalassia hemprichii</i>	839,79 ± 485,35	116,54 ± 97,11	956,32 ± 562,37
Gs. Senggora Besar	<i>Cymodocea serrulata</i>	22,27 ± 19,60	4,98 ± 5,75	27,27 ± 24,89
	<i>Halodule uninervis</i>	21,46 ± 14,26	7,81 ± 4,77	29,27 ± 16,45
	<i>Halophila ovalis</i>	-	-	5,52 ± 7,06
	<i>Syringodium isoetifolium</i>	25,80 ± 6,30	6,44 ± 3,15	32,24 ± 9,45
Gs. Senggora Terendam	<i>Cymodocea rotundata</i>	8,65 ± 7,69	4,79 ± 2,09	13,44 ± 9,71
	<i>Cymodocea serrulata</i>	16,09 ± 0,00	10,51 ± 0,00	26,60 ± 0,00
	<i>Halodule pinifolia</i>	9,85 ± 0,00	2,46 ± 0,00	12,31 ± 0,00
	<i>Halodule uninervis</i>	32,27 ± 8,27	4,85 ± 2,81	37,12 ± 5,48
	<i>Halophila ovalis</i>	-	-	12,36 ± 13,03
	<i>Syringodium isoetifolium</i>	42,74 ± 9,31	18,95 ± 0,07	61,69 ± 9,38
	<i>Thalassia hemprichii</i>	4,52 ± 0,00	14,15 ± 0,00	18,67 ± 0,00
Gs. Sepagar	<i>Halodule uninervis</i>	19,90 ± 13,79	6,67 ± 4,04	26,58 ± 12,51
	<i>Syringodium isoetifolium</i>	24,27 ± 0,00	9,55 ± 0,00	33,82 ± 0,00

Total dried biomass from *Halophila ovalis* seagrass in Gosong Senggora Besar is the lowest biomass seagrass biomass from the entire monitoring area in West Kotawaringin, which is only $5,52 \pm 7,06$ gBK/m². While the highest dried biomass measurement shown by *Syringodium isoetifolium* with weight score up to $32,24 \pm 9,45$ gBK/m². As well as the highest biomass measurement in Gosong Senggora Terendam is from the same seagrass species with score up to $61,69 \pm 9,38$ gBK/m². Seagrass species with the lowest biomass score in Gosong Senggora Terendam is *Halodule pinifolia* with measurement of $12,31 \pm 0,00$ gBK/m². During observation in Gosong Sepagar, only two species of seagrass available which are *Halodule uninervis* and *Syringodium isoetifolium*. Both species has total dried biomass measurement in the amount of $26,58 \pm 12,51$ and $33,82 \pm 0,00$ gBK/m².

Dried biomass measurement also performed on the feeding trail in Gosong Beras Basah as the most often sites where dugong has been sighted. Three types of seagrass recoded along the feeding trail and presented in Table 7. The top part of biomass (from seagrass leaves and sheath) were found in and outside the feeding trails. The total biomass measurement from *Halophila ovalis* species has the highest amount of scored compared to other *Halodule* species founded in the feeding trail, whilst *Halodule pinifolia* has the highest dried biomass measurement in the feeding trail with the amount of $18,22 \pm 11,50$ gBK/m². Based on Table 6 and 7, the part of seagrass which potentially being eaten by the dugong is the lower part of the seagrass (rhizome and roots part).

Table 7. Average measurement of dried biomass found in feeding trail all along in seagrass ecosystem in Gosong Beras Basah

Location	Species	Position	Lower part Biomass (gBK/m ²)	Upper part Biomass (gBK/m ²)	Total Biomass (gBK/m ²)
Gs. Beras Basah	<i>Halodule pinifolia</i>	Inside	-	$18,22 \pm 11,50$	$18,22 \pm 11,50$
		Outside	$10,60 \pm 18,42$	$22,79 \pm 14,50$	$33,39 \pm 9,34$
	<i>Halodule uninervis</i>	Inside	-	$13,47 \pm 0,00$	$13,47 \pm 0,00$
		Outside	$2,83 \pm 2,52$	$13,82 \pm 16,46$	$16,65 \pm 18,08$
	<i>Halophila ovalis</i>	Inside	-	-	-
		Outside	-	-	$45,30 \pm 16,16$

The ecosystem condition of the seagrass field is analyzed based on the number of species found, density and percentage cover of seagrass vegetation and from biomass measurement compiled by Wouthuyzen (2009). Based on those criteria's, Gosong Beras Basah is in good

condition, while Gosong Senggora Besar and Senggora Terendam's seagrass ecosystems have moderate condition (Table 8). However, the ecosystem in Gosong Sepagar is really poor.

Table 8. Seagrass ecosystem condition in West Kotawaringin District

Location	Score				Seagrass Condition
	Numbers of Species	Coverage	Biomass	Total	
Gs. Beras Basah	3	2	4	9	Good
Gs. Senggora Besar	2	2	1	5	Moderate
Gs. Senggora Terendam	3	1	1	5	Moderate
Gs. Sepagar	2	1	1	4	Poor

References

- Prasetyo, D.E., S.I.T. Alkadri, N. Sulistyowati, A. Saputra, S. Wardono, W.Kiswara. 2015. Struktur Komunitas Padang Lamun Habitat Duyung (Dugong dugon Muller) di Kabupaten Kotawaringin Barat, Kalimantan Tengah. Prosiding Forum Nasional Pemuliharaan dan Konservasi Sumberdaya Ikan Ke-5 Pemuliharaan dan Konservasi Sumberdaya Ikan Mendukung Ketahanan, Keberlanjutan, dan Kedaulatan Pangan Nasional, 20 Oktober 2015, Universitas Padjadjaran, Jatinangor, Bandung.
- Wouthuyzen, S. 2009. Riset untuk Penyusunan Rencana Pengelolaan Sumberdaya Lamun dan Ekosistem terkait di Wilayah Pesisir Bintan Timur, Riau Kepulauan. Program Riset Kompetitif LIPI Sub-Program Eksplorasi dan Pemanfaatan Sumberdaya Hayati (Darat dan Laut) Indonesia - Lembaga Ilmu Pengetahuan Indonesia (LIPI). Jakarta.

III. STUDY ON COMMUNITY PERCEPTION AND KNOWLEDGE ON DUGONG AND SEAGRASS CONSERVATION PROGRAM IN WEST KOTAWARINGIN

1. Method

1.1. Interview

Field survey has been conducted at West Kotawaringin, Central Borneo Province on October 10th – 15th 2016. Data had been collected through key informant interview on 5 locations which are Bogam Bay, Sungai Bakau, Kubu, Keraya, Pulau Bay, dan Sungai Cabang (Figure 18 and Table 9). Target respondents were government staffs, local residents, and fisherman around research site.

Key informants interviews had done based on questionnaire on dugong sightings and residents perceptions of Dugong conservation program and Seagrass ecosystem using Bahasa Indonesia which has been developed and adapted based on CMS questionnaire (<http://www.cms.int/en/project/cms-unep-dugong-questionnaire-survey>). Questionnaire list then uploaded to Akvo Flow software and data collection can be accessed through Android based smartphones or tablets. Data which has been collected is available to be downloaded on: <https://wwfid.akvoflow.org/>.

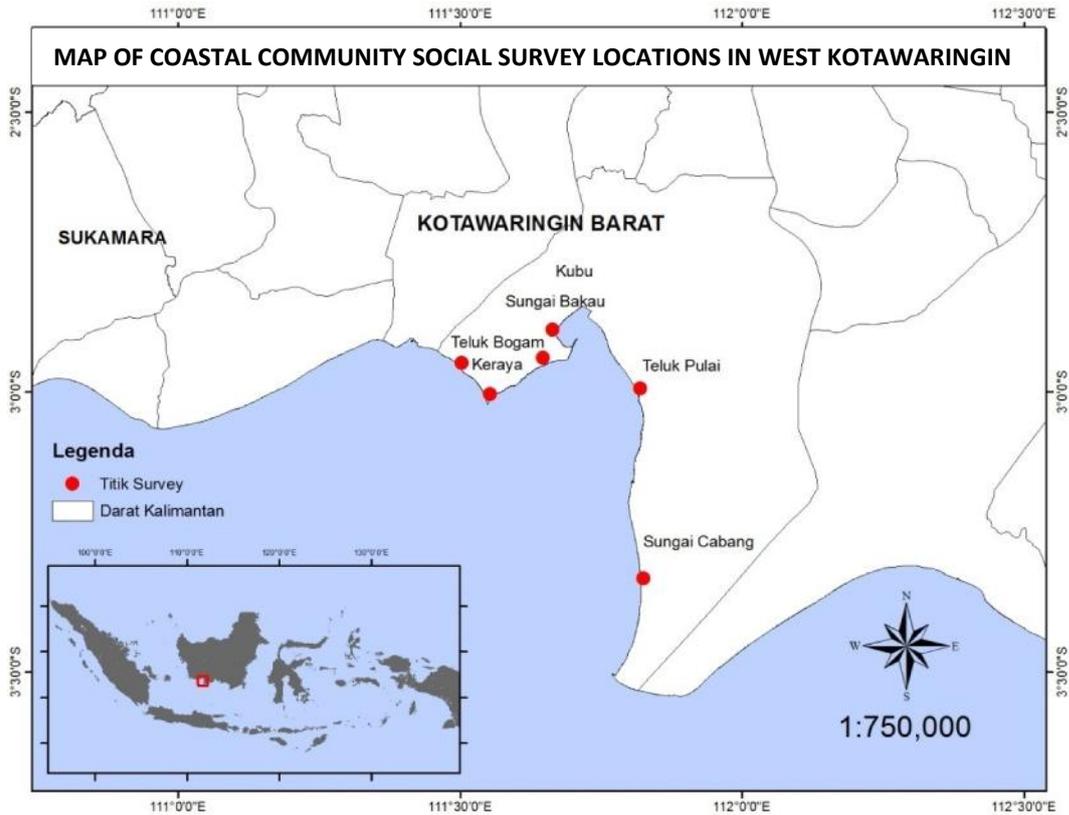


Figure 18. Target Locations and station for dugong and seagrass monitoring

Table 9. Date and Location of Data Collection

Date	District	Village/Island
11 October 2016	Kumai	Bogam Bay
12 October 2016		Pulai Bay
13 October 2016		Sungai Cabang
		Sungai Bakau
		Kubu
14 October 2016	West Kotawaringin Regional District Administration Office	
15 October 2016		Bogam Bay

1.2. Focus Group Discussion (FGD)

To form a mapping data besides from key informant interviews, forum Group Discussion (FGD) was facilitated by the team on 11 October 2016 in Bogam Bay Village and Fisheries and marine agency (DKP) was involved in hearings session on October 14th 2016. FGD involved local residents to discuss some statements as:

- 1) Threats to Dugong and Seagrass ecosystems.
- 2) Societal expectations for developing areas related to dugong existence and seagrass ecosystems.
- 3) Tourism development form based on societal expectations.
- 4) Local producing development program.
- 5) Hearings conducted by the team with DKP have been done to consign Dugong and Seagrass Conservation Project and to convey the result from the first field preliminary survey.

2. Result and Discussion

2.1. Key Informant Interview

2.1.1. Respondents Background

Survey team managed to interview 16 key informants (Table 2) based on residential distribution in Bogam Bay Village (7 orang), Keraya (5 orang), Kubu (2 orang), Pulau Bay (1 orang), and Sungai Bakau (1 orang). The majority of the key informants are male (81.25%).

Table 2. Name, Age, Gender, and Residency of The Informants

No.	Name	Age	Gender	Residency
1	Arsyad	60	Male	Bogam Bay
2	Syahrian	44	Male	Bogam Bay
3	Anang Suparman	42	Male	Bogam Bay
4	Misnah	50	Female	Bogam Bay
5	Misrah	50	Female	Bogam Bay
6	Idum	40	Male	Bogam Bay
7	Muhammad Yusran	41	Male	Bogam Bay
8	Muhammad Tarli	41	Male	Keraya
9	Abdul syukur	73	Male	Keraya
10	Ahmadi	48	Male	Keraya
11	Syafrudin	44	Male	Keraya
12	Mastora	62	Female	Keraya
13	Satlar	54	Male	Kubu
14	Ali Hanafiah	45	Male	Kubu
15	Gusti Arsip	55	Male	Pulai Bay
16	Dahrian	43	Male	Sungai Bakau

Sixteen key informants stated they had interviewed in regards with village competitions, marine conservation areas and village planning development. The interview about marine and seagrass ecosystem has never been conducted, however there was a public counseling regarding to DSCP by the Ministry of Marine Affairs and Fisheries. The majority of informant (81.25%) confirmed they have never been in any kind of interview before.

More than half of the key informants (68.75%) have never been educated/trained in association with skill enhancement activities. The rest of the informant (31.25%) claimed they have been trained/education vocationally associated to hawksbill sea turtle hatchery, family planning, mangrove, restriction in using trawl nets for fishing, agriculture and fisheries. The last workshop or training program which had been participated was in 1992 until in the beginning of 2016. 1992 sampai dengan awal 2016. Conducted by DKP Pangkalan Bun, BPSPL Pontianak, WWF Indonesia, Pemda, BKKBN, Forestry Regional Office, and Department of Agriculture.

According to most of the informant (75%) claimed they frequently gathering information from the mass media. Mass media type that accessible by the informant are television, verbal information from residents/relatives, information board, and newspaper. This information shows the key informant relatively being opened to information and interaction from other areas and adequate access to get information.

The majority of informant (69%) said there have never been any dugong and seagrass conservation activity (or other type of conservation in environment and natural resources program) (Figure 19). On the other hand, quarter (25%) of the informant claimed there were some activities as socialization about endangered wildlife, seagrass cultivation and conservation in mangrove and seagrass.

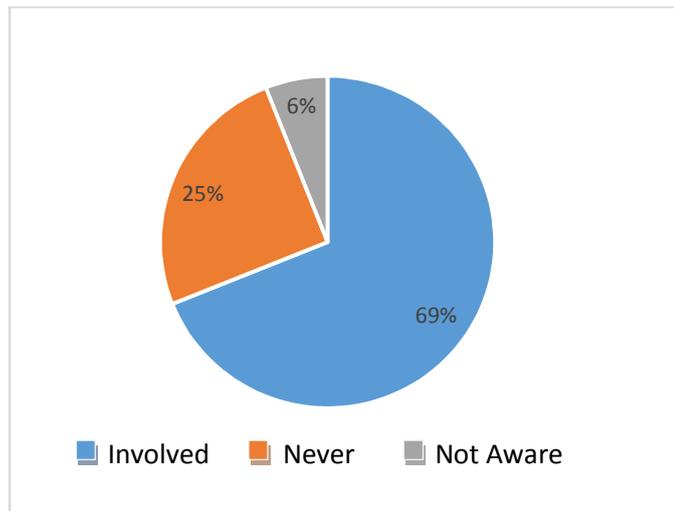


Figure 19. Respond related to dugong and seagrass conservation programs (or other conservation program related to environment and natural resources) before

The majority of informant (68.75%) has main occupation as fisherman, as the rest of the informant works as the head village, farmer, and housewife. Furthermore, the rest of the key informant (81.25%) had experienced fishing with their parents who were fisherman, and 62.5% of them have grandparents as fisherman. This result shows most of the key informant has profile and strong background attached to marine and coastal resources because they have experienced it when they were kids.

More than half of the key informant who works as fisherman (68.75%) usually go fishing all year long, in Januari through Desember. There is no seasonal time because there is no main catch in their fishing activities. Every day in a month they are going for fishing. Nevertheless, the most secure time for them to go fishing is on East-Wind Season (April-October). On West Season with the strong wind coming usually on November-January they would go for fishing nearby the coast using fishing rod. Apart from what the men do, the women would help to collect some type of crabs, *belayung*, *simping*, *lokan*, dan *kopang* during low tides area and some snails and *ketuyung* on the seagrass field.

2.1.2. Knowledge on Dugong

Most of the key informant (93.75%) stated they have ever seen dugong at their territorial waters and they (87.5%) could differentiate between dugong and dolphin. More than half of the informant (60%) do not know how long is the lifespan of a dugong and less than half (40%) asserted that dugong has the same lifespan as human with maximal lifespan up to 65-80 years old. Local residence called dugongs as mermaids.

Based on the survey results, there are information available concerning to dugong sightings and seagrass ecosystems (Figure 20). Seagrass ecosystems spreads along the coast of Bogam Bay until Kubu Bay and all around Gosong Beras Basah, Gosong Senggora, and Gosong Sepagar. While dugong has been sighted often on the cape of Bogam Bay and Gosong Sepagar.

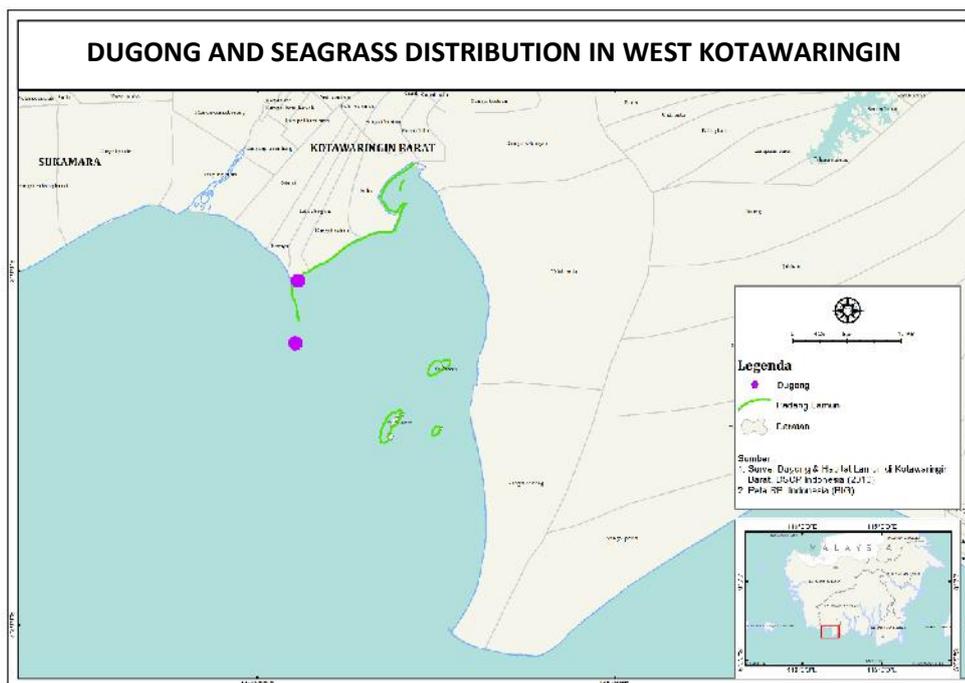


Figure 20. Map of Dugong Distribution and Seagrass Habitat

Based on Figure 21 and 22, the majority of key informants saw dugong while fishing (40%). The rest saw dugong while sailing to the fishing ground, accidentally trapped in fishing nets or other fishing tools, and while hunted them down each percentage represents to 15% of

the key informant. Dugong has been sighted as stranded on the beach, eventually dead, or sighted while took shelter by the beach (5%).

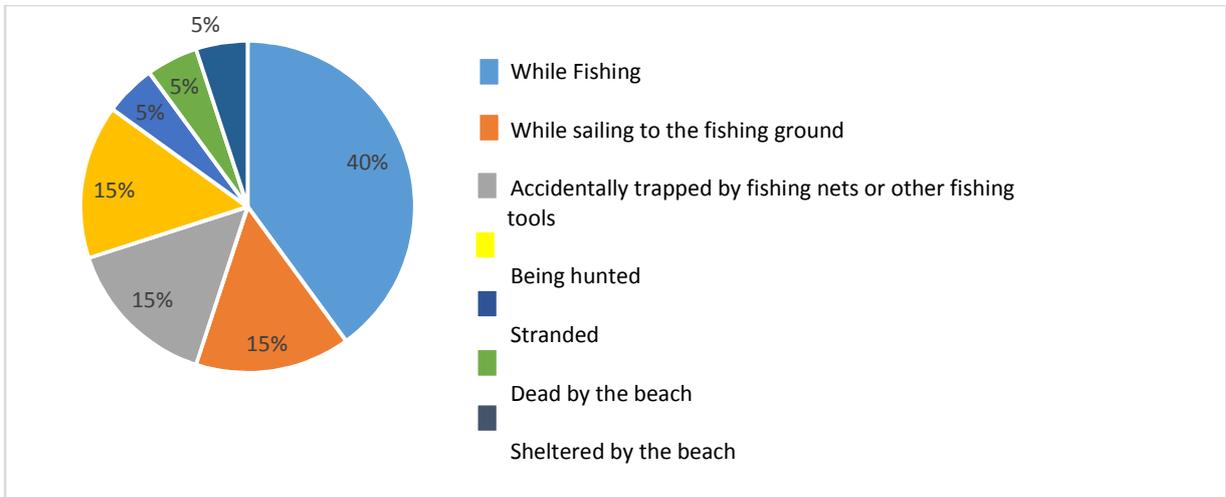


Figure 21. Respond related to intensity of dugong sightings

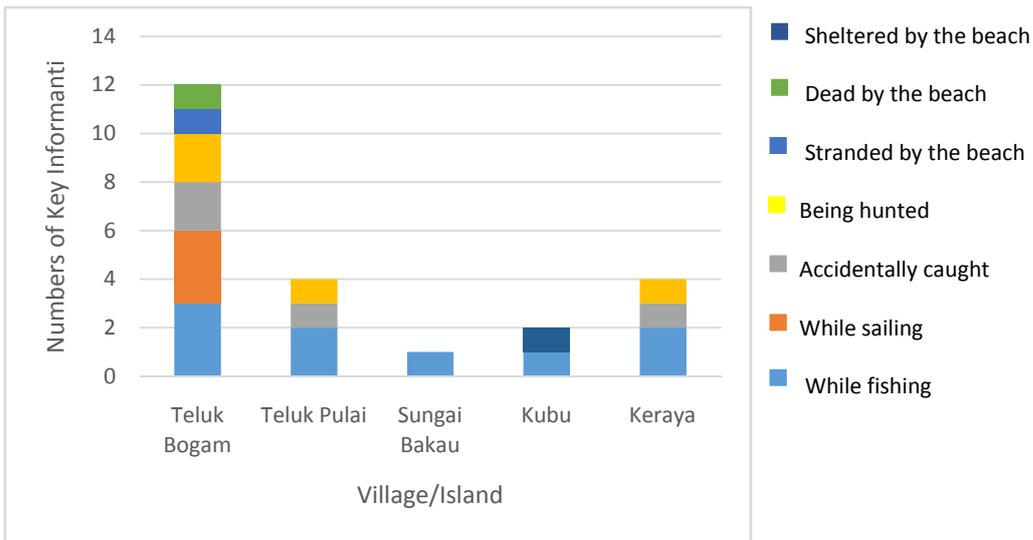


Figure 22. Respond according to timeline based on informant's residency

Less than half (38%) of the key informant claimed they have seen dugong often or for once in their lifetime. Two informants said they have seen dugong for couple of times (12,50%), each person said they saw it in the last 5 years (6,25%) and the other said never seen dugong ever. The timing when the dugong being sighted were varies from whole night long, every month, and around September to November, once said every beginning of the year from January until March and other said there is no exact time that they could remember of (Figure23).

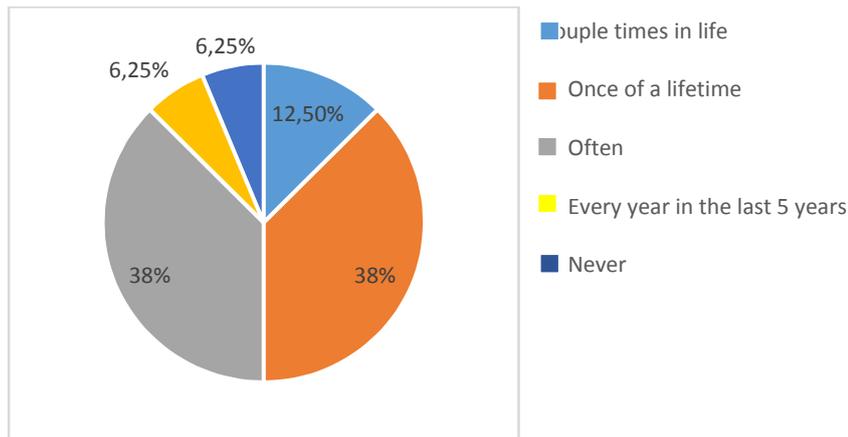


Figure 23. Respond related to intensity of dugong sightings

Key informant at Bogam Bay Village asserted they usually see dugong around Gosong Beras Basah, Gosong Sepagar, dan Gosong Senggora. Another informant from Pulau Bay, Sungai Bakau, Kubu, and Keraya explained that local residents in Bogam Bay, more intense for sighting and knows better about dugongs sighting locations. Because Gosong is an area where Bogam Bay people are going for fishing. The majority of key informant(60%)do not know whether the sightings based on time. A few informant claimed that the sighting location has been changed based on time (20%) and the rest (20%) claimed it does not change based on the timing. More than eighty percent (86,67%) said they do not have any idea how many dugongs are living in their region, the rest asserted about 1 and less than 10 dugongs are living in the region. (Figure7).

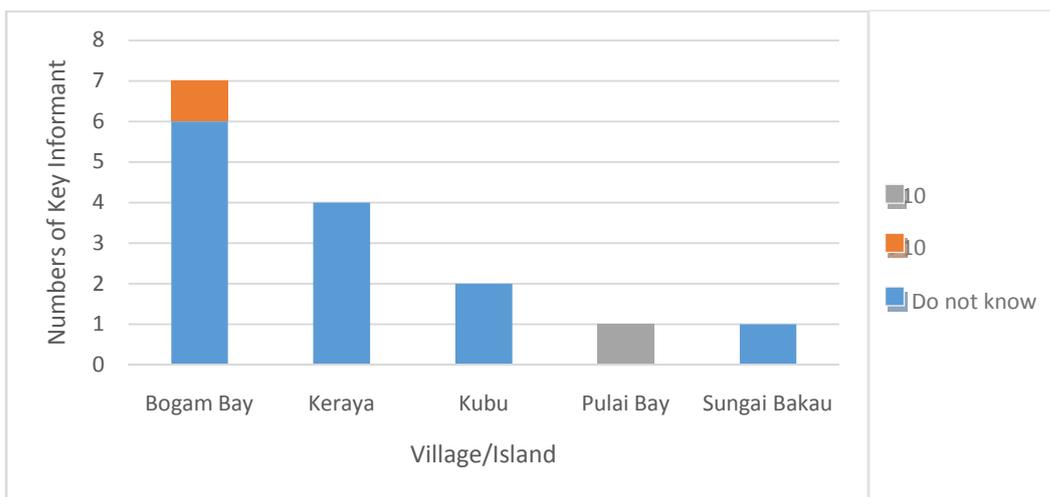


Figure 24. Respond according to numbers of dugong estimation

Almost half of informants (46.67%) stated they have seen baby dugong. Informant from Bogam Bay saw baby dugong in 2014 and in the end of 2015 at Gosong Beras Basah. Based on information from key informant from Keraya baby dugong had sighted in the 60's and in

the beginning of October 2016 also at Gosong Beras Basah and also at Batu Babi. In difference with other informant from previous locations, informant from Kubu claimed in 2006-2007, he saw baby dugong at Tanjung Kluang and another informant from Pulau Bay stated saw a baby dugong on early January in 1970 at Pulau Bay Beach.

Based on informant from Bogam Bay's explanations there were one until three man who are expert in hunting dugong in the region, one man from Keraya, and for the rest of observation sites key informants stated there are no dugong hunter. Dugong deliberately being captured in 1971-1980, while in Keraya it happened in 1988. Hunting tools in mean time was spear and captured 3-4 dugongs in every hunt. However, it is no longer happened, the rest cases are incidental caught or trapped around Bogam Bay, Keraya and Kubu. At Bogam Bay and Sungai Bakau, no one ever caught dugong even deliberately or accidentally.

Couple years back, there were two informants from Bogam Bay who were a dugong hunter. One of them captured dugong in purpose of consuming and selling the meat and the skeletons and fangs were made for pendants and eye rings. In Keraya one of the informant said he purposely captured dugong in the 60's for being consumed and sold.

In the recent years there were some cases of dugong found already dead on the water or stranded on the beach. The events happened at Bogam Bay in 2008, at the end of Pantai wisata in 2010 and at Gosong Beras Basah in 2014. If founded dead already some people tend to take the skeletons remains from causality. The critical threat that usually be the cause of death is being trapped in fishing nets. Dugong who got accidentally trapped in fishing nets occasionally being consumed if the meat still edible and not rotten.

Beside dugong, additional information about other charismatic species which frequently being spotted are dolphins, around Gosong Beras Basah (Figure25). Dolphins often swimming by the fisherman's boat.

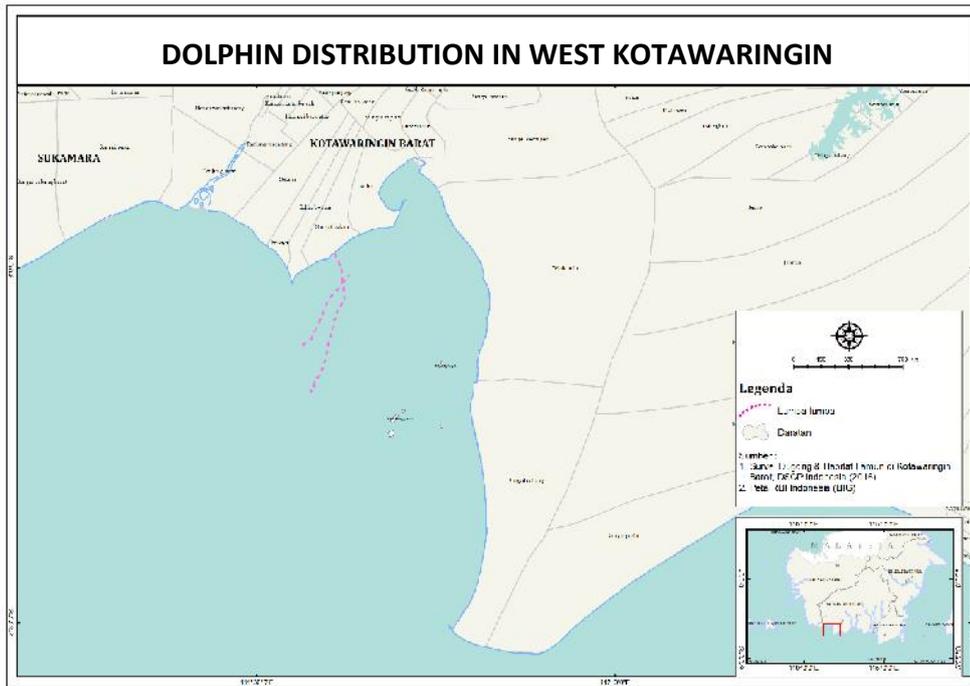


Figure 25. Distribution of The Dolphins Emergence Areas

Besides dolphins, sea turtles are often being seen along the coast of Sungai Cabang until Pulau Bay Village, right on the border of Tanjung Putting National Park (TPNP) either for laying eggs or just being sighted from the boat(Figure26).

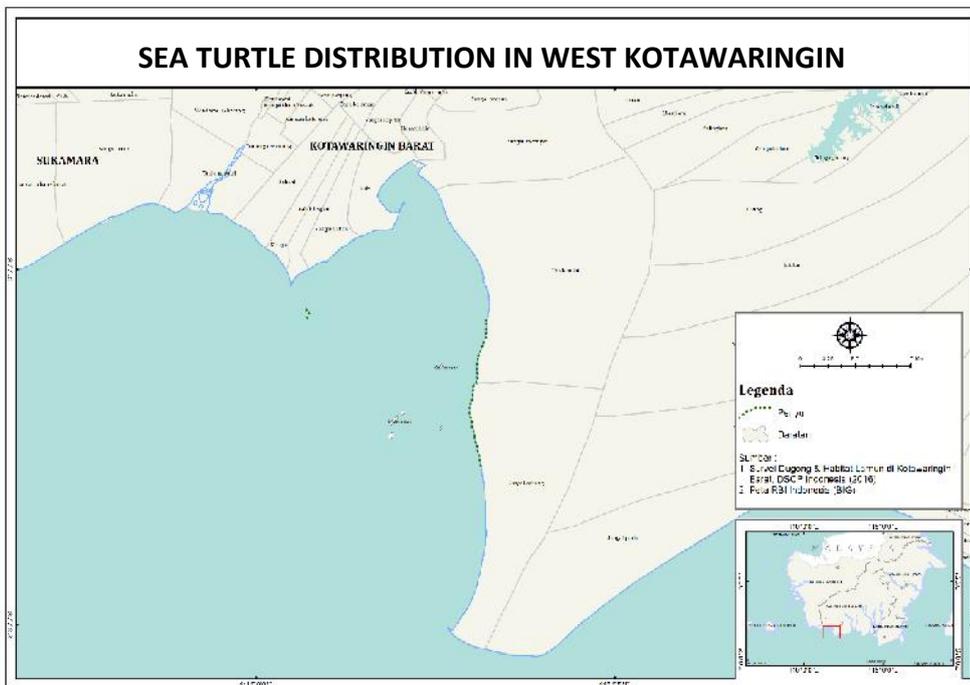


Figure 26. Distribution of Sea Turtles Sightings

2.1.3. Knowledge on seagrass ecosystem

Almost all of the key informant stated that they have never seen any of seagrass field in the region and only one informant who claimed that he had never seen it before. Seagrass that have ever been seen consisted of 1-4 species (Figure 27) and could be found in 0-5 m depth (Figure 28).

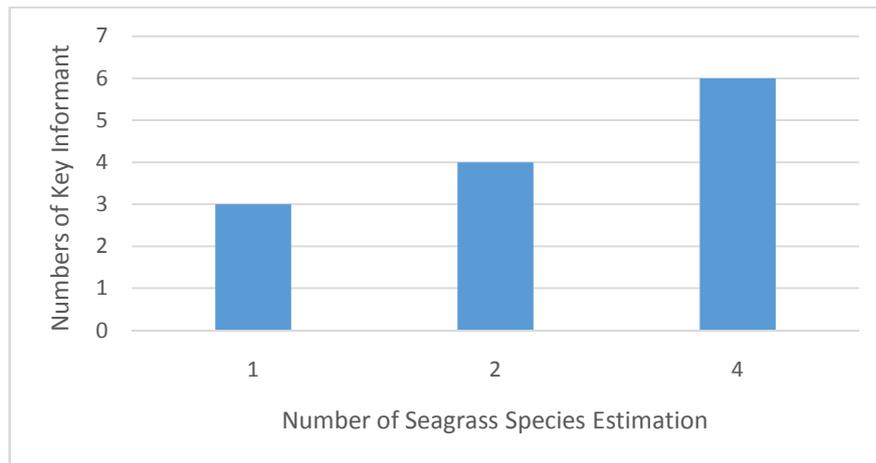


Figure 27. Respond according to knowledge of seagrass species

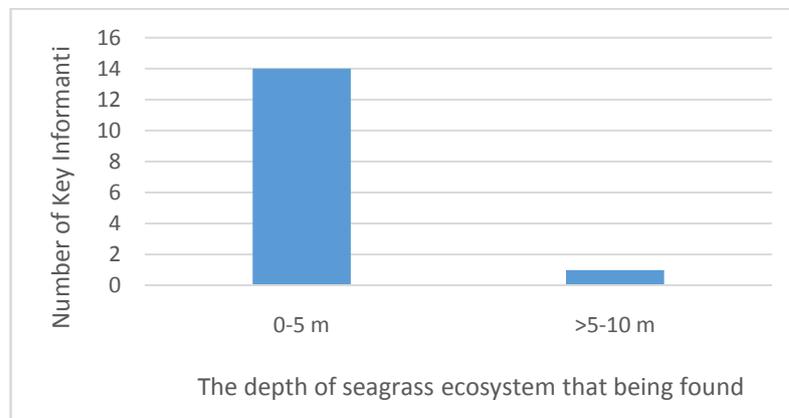


Figure 28. Respond according to the depth where seagrass ecosystem can be found

All of the informants said seagrass ecosystem is really important because the habitat of seagrass is a feeding ground. Majority of informants claimed that seagrass ecosystem is really important for their daily life too because seagrass ecosystem provides them resources as fish, prawns, and types of crabs and also it withstands the surge and huge waves during South-east season. In the other hand, 5 informants said the seagrass ecosystem is not important for their life.

2.1.4. Community Perception

In major 56% informant asserted the existence of dugong is important (Figure 29). Some of the reasons why people think dugong is important for them are because of dugong has a role to maintain the balance of nature and that is why dugong is protected, so that people who have never seen them has the chance to see them and just to know about the name only, the existence of dugong in the region also be considered as a tourism attraction, likewise as being socialized by DKP that dugong are being protected under the country law. In the past, before there is a prohibition law, dugong meat used to be sold for Rp 15.000/kg, now people sells the meat for Rp 40.000/kg if only the fisherman accidentally catch dugong and the dugong died in the case. This represents the community comprehension about dugong is slightly high and they expected their region could be a tourist destination in regard with dugong existence. However, there are some community in the resident who is still utilizing dugong for consumption if captured accidentally in dead condition.

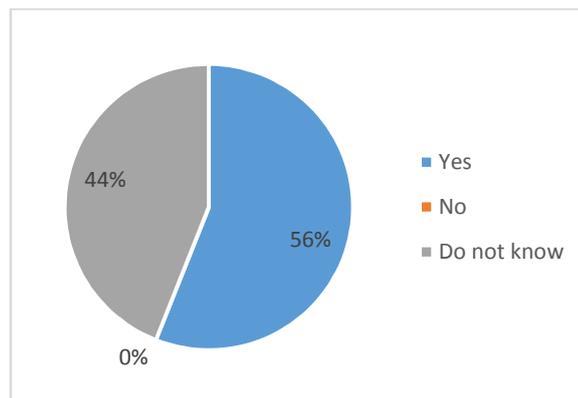


Figure 29. Community Perception about the Importance of Dugong Existence

As many as 33% key informant said the seagrass ecosystem condition becomes denser with more varieties of species, and it is in the same percentage of key informants who stated the condition becomes less or in the same state as before (Figure 30). Concerning about the utilizing of seagrass ecosystems, majority of informant (86%) gained earnings from collecting shells, snails and other type of edible small marine creature (Figure 31). Several marine biotas which being consumed from the seagrass ecosystem are sea cucumbers, sea slugs, prawns, squids, prawns, *gamat*, crabs, mullet, *lokan*, *ketuyung lamun*, *ketuyung siput*, *simping*, *kapiting balayung*, clams, and *kipat*. To catch those type of marine biota, people used bare hands, nets, *raga* (a type of clothes basket), pans, unused rice bags, diving goggles, and

arrows. Almost all (66%) key informant stated the importance of seagrass ecosystems towards availability of other marine creatures which being utilized for their daily life. There are also informants who stated that not all of those sea creatures only can be found in the seagrass ecosystem, some may be founded in sand with no seagrass at all.

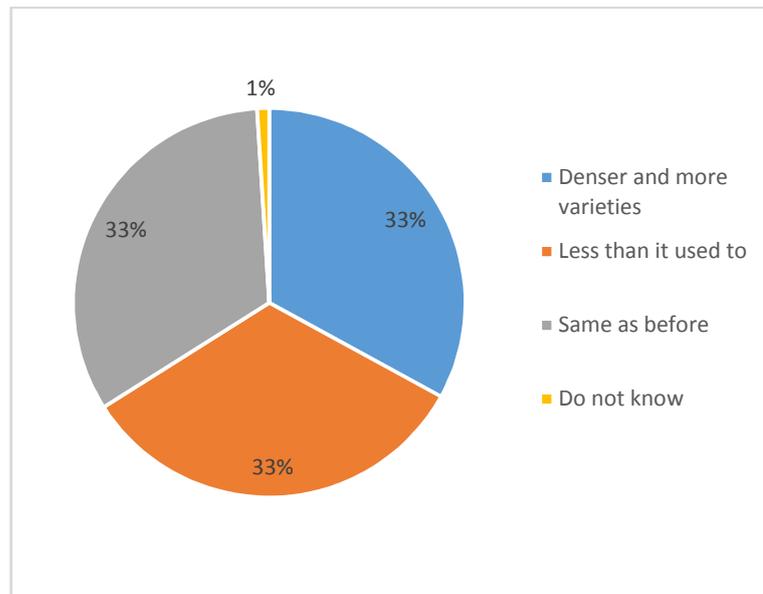


Figure 30. Community Perception about the changes on seagrass ecosystems

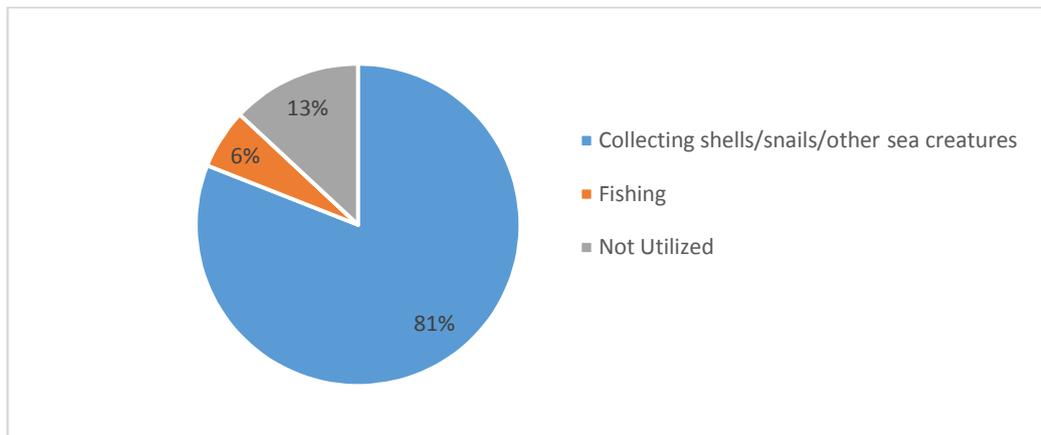


Figure 31. Respond based on utilizing seagrass ecosystems

Only 12.5% of key informant expressed the natural resources collecting activities has the impact to the damage of seagrass habitat and the statement is in proportion as some key

informant explanations about seagrass ecosystem which been damaged could be restored if fisherman activities around the seagrass field is subsided and/or coming with ban regulation for fishing in the seagrass ecosystem in a period of fishing season. This survey result shows the community perception, their activities has no negative impact on the health condition of seagrass ecosystem.

The majority of informants (68.75%) are aware to capture dugong deliberately is against the law (Figure 32). Only 2 informants from Bogam Bay, 2 from Keraya, and 1 from Kubu who did not know it was against the law. Nonetheless, how about dugong which got captured/trapped in fishing nets accidentally, less than half (43.75%) stated against the law, some expressed the nescience (31.25%), and the rest about a quarter stated it is not against the law (Figure 33). Therefore, it is necessary to conduct socialization or training for releasing trapped dugong to minimized threats of accidental captured by fishing nets.

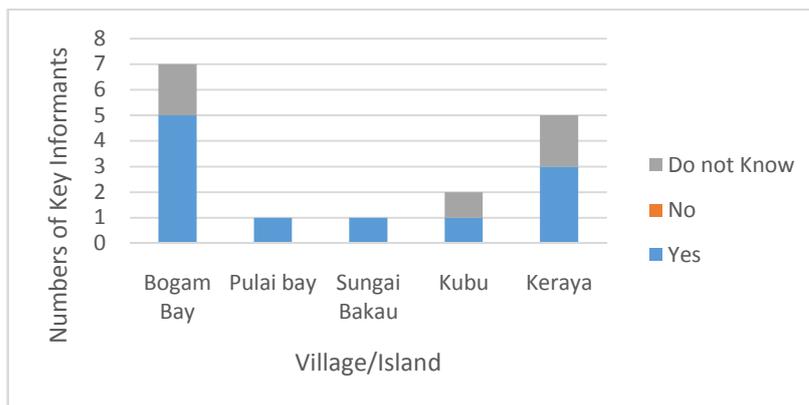


Figure 32. Respond concerning the awareness of state law for capturing dugong

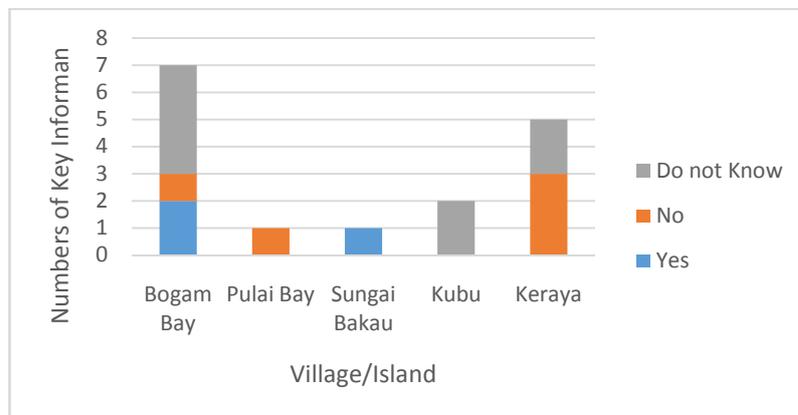


Figure 33. Respond in regard to accidental case of dugong which being captured

The majority of informant(62.5%) on every survey sites would report the capturing event of dugong in their region to the higher administration officer, except in Sungai Bakau and Pulau Bay(Figure34). According to the informant they would notified the officer such as the head village or staffs and will be forwarded to DKP. Related to the case, officer should be equipped with adequate knowledge.

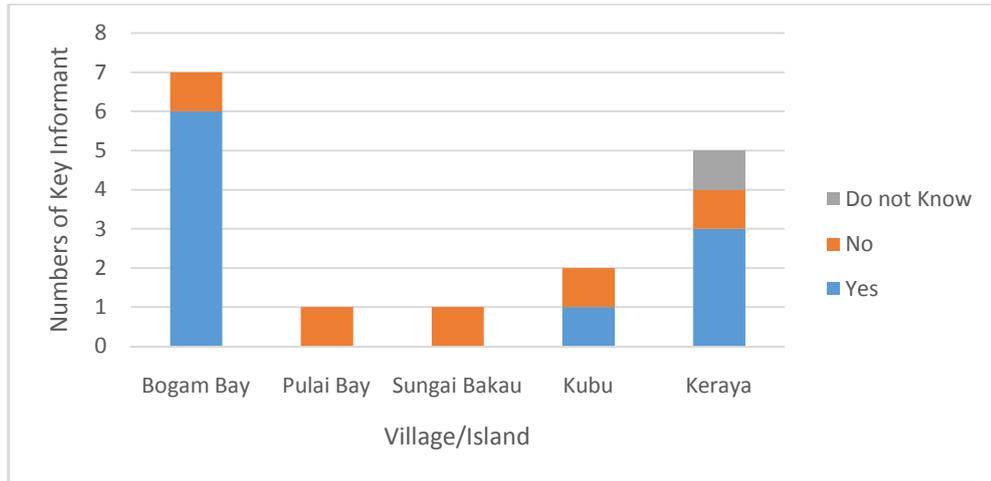


Figure 34. Community perception according to report unintentionally captured events of dugong to the local officials

Half of the informants (50%) stated they have never seen any marine patrol activities in their regions (Figure35). But some of them (37.5%) had experienced to frequently see marine patrol conducted by DKP, marine police, and the navy.

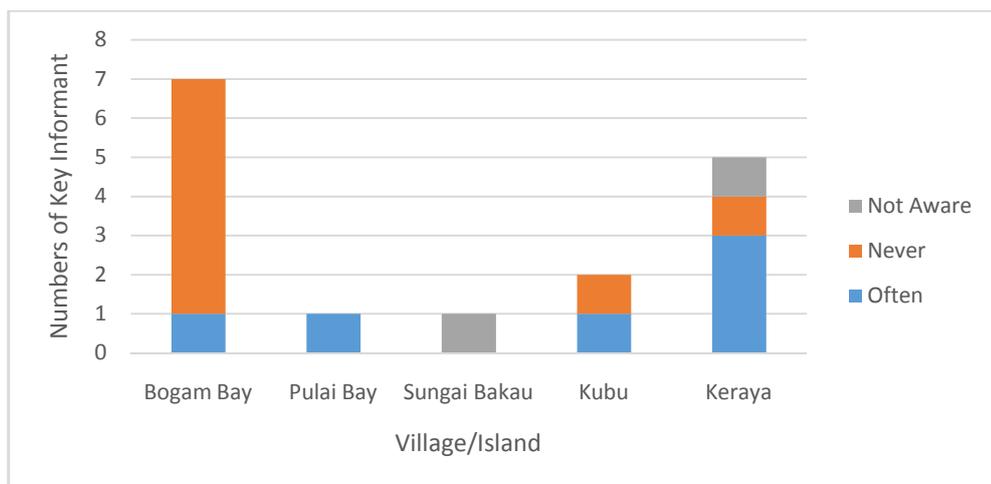


Figure 35. Respond according to routine activity of supervising and patrolling on the region

For the Kotawaringin coastal residents especially in Kumai, there are some stories/folklore about dugong and seagrass habitat. In Bogam Bay, the people believes that there were dugong sacrifices in boat with size of 2-2.5 meter which would sent to sail and given with spells. While the remain skeletons, which are not being consumed is kept in the home lawn to prevent pest animals such as boars, rats, etc. As for the fangs and teeth usually be arranged as necklace and told could treated asthma. In Keraya, the tears oftentimes is collected and mixed with coconut oil and people believe it would bring fortune and the bones used for smoking pipes. Another villages do not have any special folklore about dugong. While seagrass has a different story, once said if a person ate the seagrass fruit it could change the person into a dugong. There was a pregnant lady who was craving on the seagrass fruits and because she ate too much of the fruit she changed into a dugong.

More than half of key informant (62.5%) stated the government, public figures, community organization and/or private corporations tend to support the effort of marine and coastal conservation activities especially about dugong and seagrass ecosystems (Figure36). The majority of informant (75%) has claimed they want to be involved and have a role and support in the attempt of dugong and seagrass conservations. Actions and events that had been submitted are stop capturing and consuming dugong, if there were a case of accidentally captured dugong they would release it. The community also expressed they would obey the law and involved with dugong and seagrass ecosystem conservations programs. The community is expecting there would built a monitoring post in Gosong Beras Basah to make sure dugong will be indwell in their regions and with public patrol the post could be a place for taking recess during patrolling in the region.

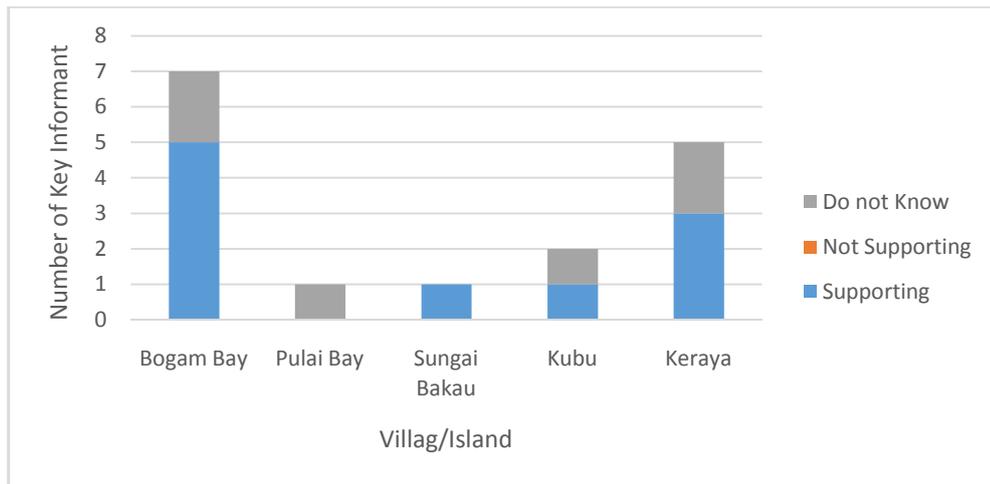


Figure 36. Community Perception in regards with the role of governments, public figures, community organization, and/or private corporations (e.g.: tourism resorts) about the effort for coastal resource conservation projects (especially for dugong and seagrass ecosystems)

Concerning to the question in the questionnaire about is there any impact on dugong and seagrass conservation activities from point a to j, two of informants did not answer them (12.5%) they are key informants from Pulai Bay who does not understand the questions and from Keraya Villagewho got a sudden family matters and could not manage to continue the interview. In association with population increase in the region (Figure37a) the majority of informants (56.25%) stated it is not giving any impact to the conservation activities. This is because in their opinion people tend to stop exploiting dugong. As the result even though the human population is increasing it gives no effect to the dugongs in the region.

More than sixty percent of the key informants (62.5%) expressed there is no impact either from the increasing tourism facilities/activities (Figure37b). The result of this opinion showed that the residents does not understand enough about tourisms. They assumed tourism activities only happened on the beach, just as an example which happens on the tourism beach in Kubu. Beside that opinion, most of the tourist attraction and activities concentrated in TPNP. Key informants from Bogam Bay also complained about their village land which got owned by foreigners and developed to tourist attraction but has not yet well managed.

The majority of key informants even though less than fifty percent (37.5%) stated the industrial/mining activities would give an impact to dugong and seagrass ecosystems, and more than ten percent (12.5%) expressed the strong agreement of influenced which will be given from industrial/mining activities (Figure37c). The impact can be seen as an environmental damage, and would be possible for dugong to relocate to another region.

In the topic about garbage/waste disposal or the absence of managing garbage program/facility in the region, less than half of informant (43.75%) stated it would be

influential to the dugong and seagrass ecosystem (Figure 37d). So far, there are no manufactory which operating in all of the villages as the survey location sites so that there has not yet been any awareness of the direct impact of garbage/waste from industrial activities. Although the picture of what would happened if the garbage/waste really occurred they expressed that their residential would be terribly polluted.

More than half of the key informant (56.25%) asserted the climate change/weather patterns changing does not give any impact to dugong and seagrass ecosystems (Figure 37e). They explained it with an experience when there was strong wind and huge wave, they will not see any dugong around. Mereka menjelaskan hanya ketika angin kencang dan ombak besar dugong jarang terlihat, hal ini juga dikarenakan nelayan tidak melaut saat kondisi cuaca buruk. Whereas the intensity of activities from fisherman using motorized boat claimed to be not giving any impact by the majority of key informant (Figure 37f). Especially in Bogam Bay, Sungai Bakau, and Kubu which has the distribution of seagrass area along the coastline, some of the informant (37.5%) stated the seagrass field is being damaged because the motorized boat passing over and lean on around the area.

Exactly half of the informant (50%) expressed the fishing activities using harm way tools or chemicals which damaging the environment would give a huge impact to the seagrass habitat and to the dugong (Figure 37g). From five of the villages as the survey locations, all of the informant claimed in Kubu Village there are many fishermen who use bomb besides the fishing tools. The influence has been perceived by another fisherman from different region who stated their haul is decreasing nowadays. Key informants from Kubu Village themselves also expressed the discrepancy of using eco-friendly fishing tools to the use of bomb in fishing. Sometimes other fisherman suggested them to stop and reproach the negative side to them but those did not work. In this case, the community tend to use bomb to gain bigger haul in fishing because the haul inclined to come down nowadays

More than half informants (56.25%) expressed the unawareness from the community would affecting to dugong and seagrass ecosystem (Figure 37h). Even the key informants already have the cognition and awareness about dugong and seagrass, it is necessary to perform community assistance to increase the awareness.

The majority of the key informants (62.5%) stated the existence of conservation areas or even protected areas would give an impact to dugong and seagrass ecosystems (Figure 37i). This represented the socialization conducted by West Kotawaringin DKP regarding to the function and impact of conservation areas has a tangible result. The role of regional office especially for the community in Bogam Bay has been conducting very well in socializing about protected and endangered animals.

One third of the informants (37.5%) restated the ineffectual activities of marine patrol/law enforcement to dugong and seagrass ecosystem (Figure 37j). This represents the management authority has never been in there for the community. Marine patrol only has been conducted by public and when reports being made because of there were violation, the follow-ups from the official always tend to be late.

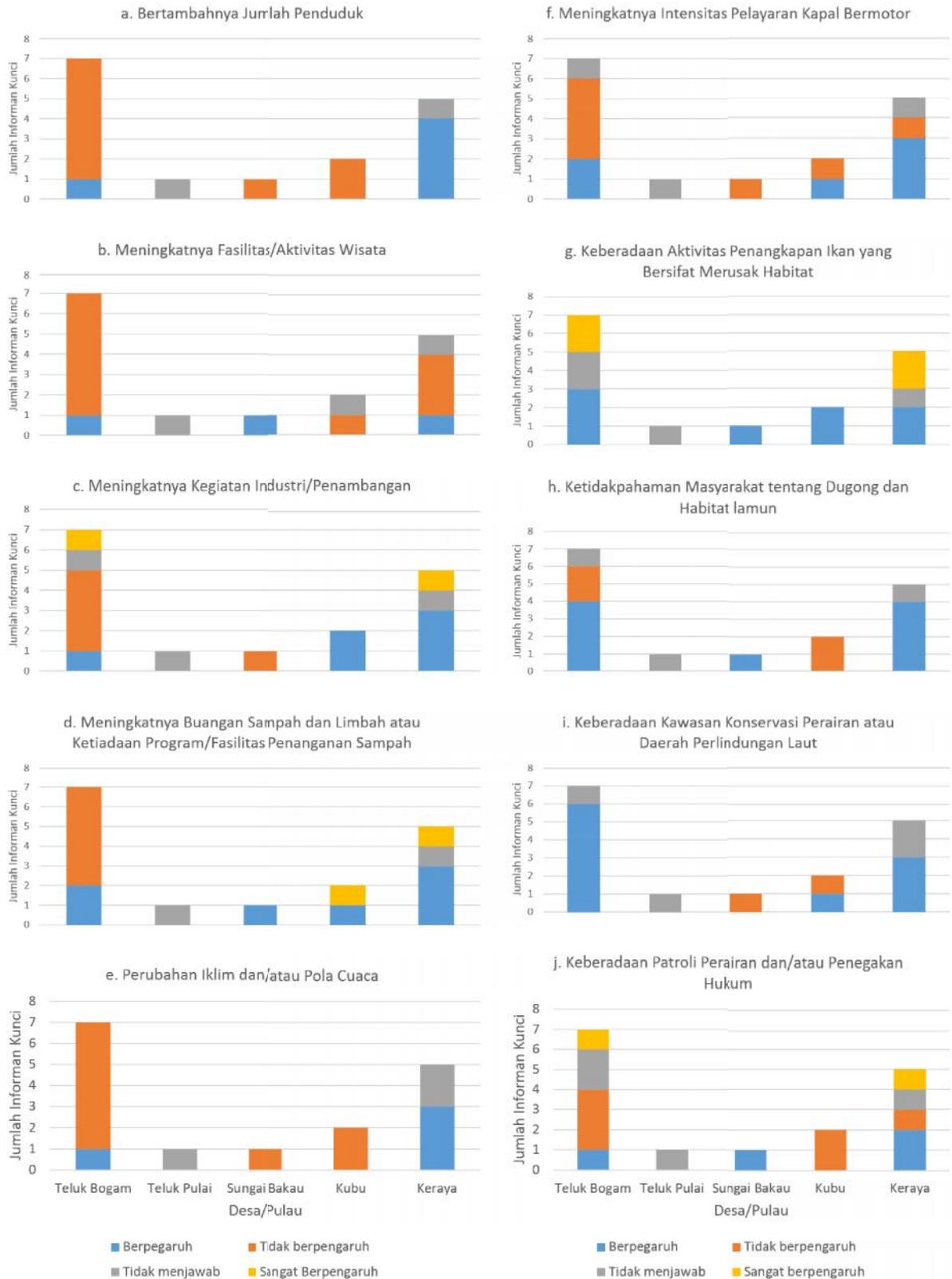


Figure 37. Social Perception in the local residents according to the factors affected to Dugong and Seagrass ecosystems

Figure 38 represented the community perception to the expectation of developing in their region in the form of infrastructure or even business venture. In the interview processed, two of informants from Keraya and Pulau Bay did not answer the questions since there was a family matters occurred and the other just simply did not understand the questions. The majority of key informant (81.25%) agreed and strongly agreed in the improvement of road access (Figure 38a). Even though the condition of road and access has already sufficed, the expectation is there would be a broadening construction for improvement and two-way vehicles can passing by more adequately.

As well as motorization of fisherman's boat (Figure 38b) and residential development (Figure 38e) most of the informants stated an agreement and strongly agree of the planning (87.5%). The statement reckoned by most of fisherman in the survey locations still operating traditional fishing tools. Regarding to the development plan for hotel/resort (Figure 38c), malls/shopping avenues (Figure 38d), a little more than half of the informant (68.75%) declared to be agreed and strongly agreed. Despite of the opinions from informants there should be another consideration and further studies about the impact in conformity with local characteristic for community/territory.

Most of the informant (87.5%) disagree in the establishment of bar/nigh clubs (Figure 38f) because that is against the norms which espoused/applied by the residents. And it is proportionate to informant perception to preserve the local wisdom for the values or even folklore in the community (Figure 38g).

In regards of the closure regions to restore the seagrass ecosystems and coastal areas (local protected and conservation areas), half and almost of the informant (50%) expressed the agreement (Figure 38h). However, all of the informants from Kubu Village stated the disagreement to the statement because it would have rendered difficulties for them to go fishing. In Pulau Bay, informants tend to agree on the statement because there are only 10 people left who works as fisherman. In general, the resident works in swallow's nest cultivation and as labor/farmer of palm oil plantations. Along with the agreed statement, informants also suggested to discuss about this with everyone in the regions, if there were a disagreement then people should come up with solution in regard to closure region.

Development in marine tourism activities in support to dugong and seagrass conservation (Figure38i) and improvement in home industry sectors which promoted the activities of marine tourisms (Figure38j) were welcomed by the majority of key informant (87.5%) who stated agree and strongly agree on the statement. This perception is conformable by the previous statement about developing hotel/resort in the regions as some supported facilities, with expectations to start improving the tourism activities first before developing the hotel/resort. This stated so that the development would utilized thoroughly.

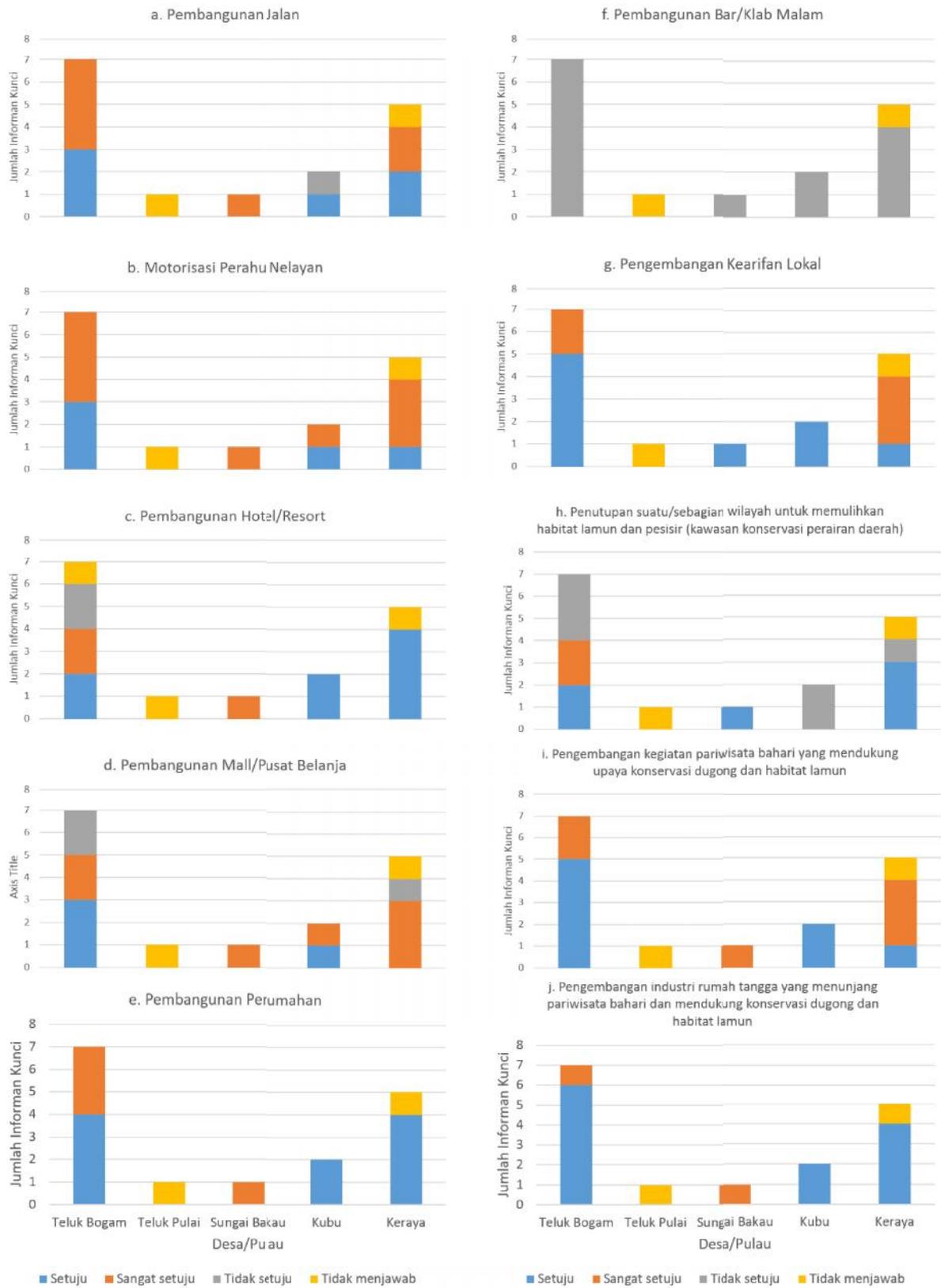


Figure 38. Community Perception throughout the Plan to Develop the Region

2.2. Focus Group Discussion and Hearings with DKP West Kotawaringin

Some of the main points as the result from FGD in Bogam Bay Village:

- Dugong distribution sighting locations in Gosong Beras Basah, Gosong Senggora, dan Gosong Sepagar. And seagrass ecosystem distributions along the coastline from Bogam Bay until Kumai Bay.
- Threats to Dugong and Seagrass Ecosystems:
 - a. Bycatch cases because being trapped in fishing nets
 - b. Ships/boats trajectory on seagrass field during low tides.
- Social expectations for developing the area related to dugong and seagrass: People expected that their residency can be developed as tourism destination.
- Developing form which been expected by the community in tourism sectors:
 - a. Currently, there are 135-hectare areas which targeted to be aquatic conservation areas in Bogam Bay and Sungai Bakau Village which already in agreement by DKP and the community.
 - b. Bogam Bay residents expects for a monitoring post to be built in Gosong Beras Basah for a dugong monitoring station by the community.
 - c. Tourism development needs to be done by other parties who comprehended about the areas and knows exactly what to do for eco-tourism improvement and development programs.
- Local manufactured products which can be developed:
 - a. Purun Webbing souvenir from pandan leaves.
 - b. Garbage/waste recycled products to be souvenir
 - c. Beads embroidery
 - d. Rice basket
 - e. Entrepreneurship training

References

Marsh, H. 2002. Dugong: Status Report and Action Plans for Countries and Territories. UNEP/Earthprint.

Marsh, H. & S. Sobotzick. 2015. *Dugong dugon*. The IUCN Red List of Threatened Species 2015:e.T6909A43792211. <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T6909A43792211.en>. Diunduh pada 9 September 2016.

CONCLUSION

The majority of the key informant has already seen dugong and can differentiate dugong to dolphin. Nowadays dugong has not been hunted anymore. Some dugong hunter from Bogam Bay who were really active in hunting finally stopped after getting awareness and informed that it is against the law by administration officer from DKP West Kotawaringin. Even though if there was an accidental case of trapped dugong in death condition, the causality would be utilized as food in some survey locations. Bogam Bay Village has the community who are frequently encountered with dugong and even captured a dugong accidentally. This happened because the community fishing ground is in the same place as dugong and seagrass ecosystems. A week before the survey being conducted, a dugong accidentally caught in fishing nets and released back to the sea because it was still alive. In 2015, an accidental case happened and the dugong was dead, so the community consumed it with other community from Bogam Bay.

Dugong and seagrass conservation and tourism being one of tourist attraction and tourism sector which the community really wants to improve as a highly potential income resource and support for conservation program. In Bogam Bay besides it has been declared about 135 hectares area would be stated as protected and conservation areas as cooperation results between West Kotawaringin DKP and the community of Bogam Bay and Sungai Bakau, also being planned to be built a Monitoring Station in Gosong Beras Basah. To be a monitoring post by the community and also West Kotawaringin DKP.

MANAGEMENT ADVICES

- Interventions need to be developed to reduce the number of bycatch case, either through fishing tools modifications (e.g: Ping tools installation which producing sounds which would make dugong stay away from the tools) and also there should be time and location arrangement while using a net. If on a location has been identified as an important habitat for dugong, it is necessary to arrange the type of tools, the location and the time to settle a fishing tools.
- It is important to do a refinement on the regulation for an environmentally friendly (dugong friendly) fishing tools utilization as fish trap and fishing rod. Perlu perbaikan regulasi terkait penggunaan alat tangkap yang ramah lingkungan (ramah Dugong) seperti bubu dan pancing. The catch can be lifted using '*Eco-labeling*' mechanism.
- Necessity to declare a district/national aquatic preservation and conservation area to support public aspirations in regards of dugong and seagrass ecosystems protection.
- Necessity to develop tourism destination based on conservation involving every element as the first step in public attendance in the improvement program.
- A better communication and coordination in every governmental office from central, province, district, and village should be constructed as a synergy for DSCP.

Appendix 1. Interview, FGD, and visitation activities



FGD in Bogam Bay Village FGD with community patriarch in Bogam Bay



FGD with housewives community Interview in Bogam Bay Village



Interview process in Pulai Bay Interview process in Sungai Bakau Villages



Interview process in Kubu Village Interview conducted in Keraya Village

Appendix 2. Dugong Monitoring Result in West Kotawaringin

Date	No	Methode	Time	WP	Latitude	Longitude	Velocity	Finding	Environmental Condition	Information
			(a-b)	(c-d)					#Individual, Behavior	
11-Okt-16	1	Drone	9:10-9:30	Beras Basah	3° 5' 6.310" S	111° 34' 17.047" E	v= 3m/s; h= 30 m	-	Gosong Pasir	
	2	Manta taw	11:00-11:30	72	3° 3' 16.664" S	111° 33' 0.428" E		Feeding Area	Seagrass field, fine sanded, cloudy water	
				73	3° 3' 20.351" S	111° 32' 57.242" E		Feeding Trail		
	3	Hydrophone	23:17-23:32	75	3° 5' 6.310" S	111° 34' 17.047" E	h=-3m	None	Strong current	Heard the sound of Dugong's breath
	1	Drone	8:58-9:15	76	3° 3' 20.531" S	111° 32' 57.059" E	v= 3m/s; h= 30 m	None	Seagrass field, clear sight	Manta tow 11/10/16, WP 72-73
	2	Hydrophone	8:53-9:05				h=-3m			
	3	Visual	8:50-9:15							
	4	Visual		77	3° 6' 4.713" S	111° 33' 29.610" E		Feeding Trail	Seagrass field, clear sight	
	5	Visual	9:47	78	3° 5' 28.903" S	111° 33' 58.586" E		Dugong and Seaturtle	Seagrass field, clear sight	Head Village Officer's recommendation to do night monitoring, WP
	6	Drone	09:50-09:55	78	3° 5' 28.903" S	111° 33' 58.586" E	v= 3m/s; h= 30 m	Feeding Trail		

										75
	7	Visual	10:00-10:20	80	3° 5' 1.864" S	111° 34' 8.407" E		Dugong	Seagrass field, clear sight	
	9	Drone	10:07-10:20				v= 3m/s; h= 30 m			
	10	Hydrophone	10:10-10:20				h=-3m	None		
	11	Manta taw	10:51	81	3° 4' 50.117" S	111° 34' 14.344" E	2 km/jam	Feeding Area	Seagrass field, clear sight	
	12	Manta taw	10:52	82	3° 4' 50.217" S	111° 34' 15.316" E	2 km/jam	Feeding Area	Seagrass field, clear sight	
	13	Manta taw	10:55	85	3° 4' 53.083" S	111° 34' 14.999" E	3,8 km/jam	Feeding Area	Seagrass field, clear sight	
	14	Manta taw	10:56	86	3° 4' 54.494" S	111° 34' 14.613" E	3,8 km/jam	Feeding Area	Seagrass field, clear sight	
	15	Manta taw	10:58	87	3° 4' 57.320" S	111° 34' 13.660" E	3,8 km/jam	Feeding Area	Seagrass field, clear sight	

	16	Visual	11:21	88	3° 4' 53.303" S	111° 34' 10.582" E		Feeding Trail	Seagrass field, clear sight	
	17	Visual	11:27	89	3° 5' 7.206" S	111° 34' 14.210" E		Feeding trail	Seagrass field, clear sight	
	18	Visual	11:30 - 12:00	90	3° 5' 28.561" S	111° 34' 21.025" E		Dugong andSeaturtle	Cloudy water	
	19	Drone	11:40- 12:00				v= 3m/s; h= 30 m	Seaturtle		
	20	Hydrophone	11:45- 12:00				h=-3m	Suspect		
13/10/2016	1	Hydrophone	8:10- 8:27	88	3° 4' 53.303" S	111° 34' 10.582" E		None	Cloudy, low exposure	
	2	Visual						Seaturtle		
	3	Drone	10:55- 11:15	91	3° 5' 19.442" S	111° 34' 6.831" E	v= 3m/s; h= 30 m	Seaturtle	Clear	
	4	Visual	10:55- 11:17							
	5	Visual	11:31	91	3° 5' 19.442" S	111° 34' 6.831" E		Seaturtle	Clear	
	6			92	3° 5' 32.039" S	111° 33' 58.288" E		Seaturtle	Clear	
	7			93 (batu babi)	3° 4' 58.123" S	111° 35' 10.212" E		Seaturtle	Clear	
	8			94	3° 5' 19.795" S	111° 34' 9.412" E		Seaturtle	Clear	
	9	Visual	14:30- 15:00	88	3° 4' 53.303" S	111° 34' 10.582" E			Couldy, streams	

14/10/2016	1	Visual	7:30-8:21	93 (batu babi)	3° 4' 58.123" S	111° 35' 10.212" E	v= 3m/s; h= 30 m		Wave, a lot of noise	
	2	Hydrophone	8:08-8:18				h=-3m	Suspect		
	3	Drone	8:01-8:21					Seaturtle		
	4	Drone	8:43-8:53	88	3° 4' 53.303" S	111° 34' 10.582" E	v= 3m/s; h= 30 m	Seaturtle	Cloudy,toward low tide	
	5		9:06-9:27					Barracuda		
	6	Hydrophone	9:30-9:35				h=-3m	none		
	7	Visual	8:43-9:35							
15/10/2016	1	Drone		98	3° 5' 33.968" S	111° 33' 54.522" E	v= 3m/s; h= 30 m		Cloudy,toward low tide	
	2	Visual	11:24	98	3° 5' 33.968" S	111° 33' 54.522" E	v= 3m/s; h= 30 m	Seaturtle		
	3	Hydrophone	11:32-11:48	99	3° 5' 6.122" S	111° 34' 16.989" E	h=-3m	Suspect (07:20, 07:28, 10:08)		