



## Relationship of Distribution Seagrass Species with Dugong (*Dugong dugon*) Sighting at Liki Island-Papua

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### ABSTRACT

*Dugong dugon* is a herbivorous marine mammal. One of Dugong's favorite foods is seagrass. This study examines the distribution of seagrass species to dugong sighting in Liki Island. The study was conducted in November 2018. Observation of seagrass conditions was carried out using a line transect method and a quadrat of 50 x 50 cm with a distance interval between 10 m plots. Interviews were also conducted with the community to find out the location of Dugong presence in Liki Island. There are seven species of seagrasses are found in Liki Island: *Enhalus acoroides*, *Cymodocea rotundata*, *Thalassia hemprichii*, *Halophila ovalis*, *Halodule uninervis*, *Halodule pinifolia* and *Syringodium isoetifolium* spread over four observation stations. The results showed that Dugong in Liki Island is often found during the eastern season, they often appear in seagrass ecosystem area to do eating activities. Dugong is often found in the eastern part of Liki Island (Station 4) and sometimes sometimes also is found in the western part of Liki Island (Station 3).

**Keywords:** biodiversity, *Dugong dugon*, Liki, Papua, seagrass

### ABSTRAK

Dugong merupakan mamalia laut yang bersifat herbivor. Salah satu makanan favorit dugong adalah lamun. Penelitian ini mengkaji terkait sebaran spesies lamun terhadap kemunculan Dugong di Pulau Liki. Penelitian dilaksanakan pada bulan November 2018. Observasi kondisi ekosistem lamun menggunakan metode transek garis dan kuadrat berukuran 50 x 50 cm dengan jarak antar kuadrat sebesar 10 m pada setiap transek garis. Dilakukan wawancara terhadap masyarakat untuk mengetahui lokasi kemunculan Dugong di Pulau Liki. Terdapat tujuh spesies lamun yang ditemukan di Pulau Liki yaitu: *Enhalus acoroides*, *Cymodocea rotundata*, *Thalassia hemprichii*, *Halophila ovalis*, *Halodule uninervis*, *Halodule pinifolia* and *Syringodium isoetifolium* yang tersebar pada empat stasiun pengamatan. Hasil wawancara terhadap masyarakat menjelaskan bahwa Dugong sering muncul pada musim timur, dan melakukan aktivitas makan pada ekosistem lamun. Dugong sering ditemukan di bagian timur Pulau Liki dan terkadang ditemukan di bagian barat Pulau Liki.

**Kata Kunci:** biodiversity, *Dugong dugon*, Liki, Papua, seagrass

### 1. Introduction

Seagrass is one of the plants which able to live under the sea. Currently there are sixteen species of seagrasses found in Indonesia.

Seagrass can exist by forming an ecosystem known as seagrass ecosystem. Seagrass ecosystem are part of coastal ecosystem which has important ecological function.

Seagrass ecosystem play a role as a source productivity in marine ecosystem to give the ecological function for marine organism and human, including : nursery area for several marine biota (Christianen et al., 2014), source animal protein for coastal communities and sea substrate stabilizing (Koch et al., 2012; Christianen et al., 2013). In addition, seagrass ecosystem also plays a role in regulating carbon cycle from the atmosphere (Mcleod et al., 2011). Another role from seagrass ecosystem is as a food source for marine biota, it is very important in supporting the sustainability of marine biota (Christianen et al., 2014; Kawaroe et al., 2016a).

One of marine biota which has a high dependence on seagrass ecosystems is *Dugong dugon*. Dugong is a protected marine mammals from the Sirenia order and Dugongidae family. Currently the existence of Dugong population in field continues to decline (Marsh et al., 2015). Some species of seagrass which favored by dugong are generally pioneer seagrass such as *Z. capricorni* and *Halophila* and *Cymodocea* spp. *Halodule* (Juraij, 2014)

Liki Island is one of the small islands in Papua which located in the Pacific Ocean region and still has good condition of the marine ecosystem. Seagrass ecosystem in Liki Island are found almost around the island and have a considerable role in maintaining dugong life at the area. This study examines the relationship of seagrass species distribution as Dugong food source with Dugong sighting in Liki Island.

## 2. Materials and Methods

### 2.1. Time and location

This study was conducted in Liki Island, Sarmi Regency, Papua Province in November 2018. The study location is presented in the map of Figure 1.

### 2.2. Seagrass ecology data collection

At each observation station, data was collected from seagrass ecosystem included: distribution of seagrass species, seagrass percent coverage, seagrass density and biomass of seagrass. Data was taken using line transect method. In each transect line, a perpendicular line was drawn starting from beginning of the shoreline where the seagrass was near perpendicular to the sea and a quadrat of 50 x 50 cm with a distance interval between 10 m plots. The seagrass that has been found will be identified by reference to McKenzie and Yoshida (2009).

### 2.2 Dugong sighting observation in seagrass ecosystem

The method that used to record the dugong sighting in seagrass ecosystems were using two methods. The first method was to identify feeding trail or traces of dugong feeding in seagrass ecosystem (Mukai et al., 1999). The second method was by interviewing people around Liki Island who carried out activities around the seagrass ecosystem area. Interview method adopt from rapid rural appraisal (RRA) method.

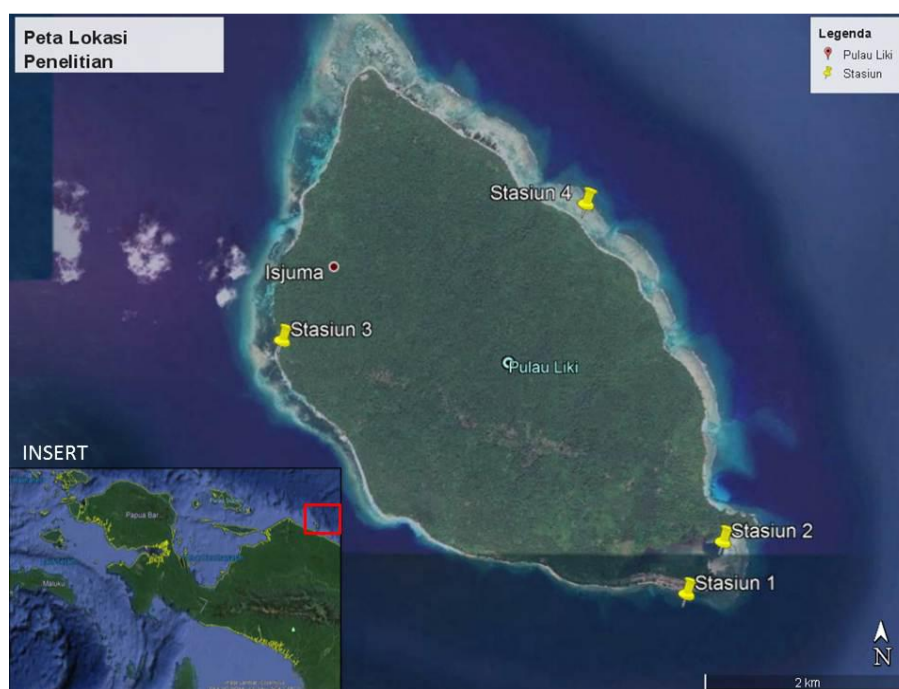


Figure 1. Research Map Area

### 2.3. Data analysis

Correspondence factorial (CA) analysis was used to analyze the relationship of dugong sighting with the distribution of seagrass species. CA analysis was carried out using XL-STAT software.

## 3. Results and Discussion

### 3.1. Seagrass ecosystem structure

Seagrass ecosystems in Liki Island could be found around Liki Island. Result showed that in Liki Island, seven species were found (Table 1). There are *Enhalus acoroides* (Ea), *Thalassia hemprichii* (Th), *Cymodocea rotundata* (Cr), *Halodule uninervis* (Hu), *Halodule pinifolia* (Hp), *Halophila ovalis* (Ho) and *Syringodium isoetifolium* (Si).

There were six species of seagrass which found at the southern station (St 1), western (St 3) and eastern (St 4), while at the southeast station (St 2) only three species of seagrass were found. Condition of environmental parameter is one of factors that influence the distribution of seagrass species in field (Juraij et al., 2014; Kawaroe et al., 2016). There were three species of seagrass found in all observation stations such as Ea, Th and Cr, which has a high level of adaptation to the different conditions of environment (Short et al.,

2007). Hp was only found at one station in Western of Liki Island.

The quality of seagrass ecosystem conditions can be determined based on total seagrass percent cover. Total seagrass percent cover is related to the density and morphology of the seagrass species (Juraij et al., 2014). In general, seagrass ecosystems in Liki Island has a percent cover value of > 60% (Figure 2). Based on the Ministry of Environmental Regulation No. 200 of 2004, the value of seagrass percent coverage is > 60% it indicates that the seagrass ecosystem was healthy. The total highest seagrass percent cover was found at station 3 which located in the western of Liki Island. Anthropogenic is one of the factor which influence the physiological response of seagrass (; Nugraha et al;2017). The condition of seagrass beds in Liki Island that has small population and a location very far from the main land, causes condition of the environment that still maintained and has a little impact on the high seagrass percent cover. The high total seagrass percent cover in Liki Island has an impact on the healthy of marine ecosystems around Liki Island, it could be seen from the high diversity of association marine biota and direct use of seagrass ecosystem by local communities as an area for catching marine biota which has an economical value.

Table 1. Composition of seagrass species in Liki Island

Station	Species of seagrass						
	Ea	Th	Cr	Hu	Hp	Ho	Si
Southern Liki Island (St 1)	+	++	+	+	-	+	+++
South eastern Liki Island (St 2)	++	+++	+	-	-	-	-
Western Liki Island (St3)	+	++	++	+	+	-	++
Eastern Liki Island (St 4)	++	++	++	+	-	+	++

Note: +++ : High density of seagrass, ++: Medium density of seagrass, +: Small density of seagrass

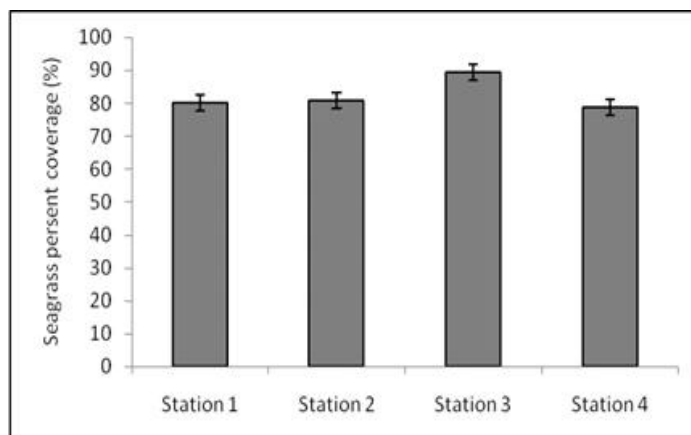


Figure 2. Seagrass total percent cover at Liki Island

### 3.2. Dugong Sighting

Dugong is the only marine mammal that herbivorous. When the study was conducted, the observation of dugong sighting used dugong feeding trails observation in seagrass habitat. Observations in the field did not find any feeding trail of dugong, so interviews were conducted with the community to find out the existence of dugongs around Liki Island. Most communities in Liki Island were fishermen, there were 69 families registered in Liki Island. Interviews were carried out on several communities such as community leaders, fishermen and people who often interacted with Dugong in Liki Island. The summary of the interview results is then presented in Table 2.

Based on the information presented in Table 2, it could be seen that the communities in the Liki Island generally had known the biological characteristics of Dugong that sighting around Liki Island. It suspected because there were still many dugongs live in the sea or there were many people who still interacted with the dugongs. The communities around Liki Island saw the existence of dugongs frequently on seagrass ecosystems and showed that dugong has a high dependence on seagrass ecosystem (Tol *et al.*, 2016). In addition, the high intensity of dugong sighting in Liki Island was also related to seagrass conditions that still good and low in anthropogenic activity around dugong habitat. Dugong will avoid when many human activities are found around the environment and will go away (Sheppard *et al.*, 2006) This was also proven, where the dugong in Liki Island

emerged far from the village where community stay in there.

The dugong sighting in the eastern monsoon when the sea still in quiet condition in according to Jurajj (2016) who claims that Dugong in Bintan Island frequently appears when the waters were quiet. The study result of Tol *et al* (2016) said that season is one of factors that influence Dugong sighting in the waters. The existence of dugong catch activities carried out by the community and indicates that the communities in Liki Island did not know yet that this animal is protected.

### 3.4 Relationship of dugong sighting with seagrass habitat structure.

Data on dugong sighting on seagrass habitats in Liki Island resulted from interviews with communities, to be related to seagrass distribution species using correspondence factor analysis (Figure 3). Referring to the results of the correspondence analysis at station 1, it was characterized by the existence of *Halophila ovalis* and *Thalassia hemprichii*. Station 2 was characterized by the existence of *Enhalus acoroides* and *Thalassia hemprichii*. Station 3 was characterized by the existence of *Halodule pinifolia* and *Syringodium isoetifolium* and station 4 was characterized by the existence of *Halodule uninervis*. Based on factorial analysis (Figure 3) it could be seen that dugong sighting at station 3 was closely related to *Halodule pinifolia* and *Syringodium isoetifolium*. Whereas at station 4 the dugong sighting was closely related to the existence of seagrass *Halodule uninervis*. Seagrass species

Table 3. Result of community interview related to the Dugong sighting in Liki Island

No	Indicator	Result of interview
1	Morphological characteristics of dugong	Majority the communities in Liki Island know the dugong as well. They know dugong as a "Duyung". They also know the morphology of the dugong. They were able to distinguish it from dolphins, turtles and another marine biota.
2	Habitat characteristics	The communities in Liki Island know that dugong habitats were commonly found on seagrass ecosystem. Seagrass ecosystem is a feeding ground for Dugong. In addition to the seagrass ecosystem, dugong was also found relatively in deeper waters near seagrass ecosystem as their playground. Dugong in Liki Island was found in the eastern and western of Liki Island.
3	Season characteristic of dugong sighting	Dugong in Liki Island was found during the eastern monsoon where the seawater conditions still quiet than west monsoon.
4	Interaction human with dugong	The communities saw the dugong frequently when they were eating and took breath to the surface. Another interaction among the communities and dugong was dugong catch activities. Currently the dugong catch activities are not as intensive as before. Now people still make the dugong catch activities as a need for source material food when the part of community in Liki island organize the party. The fishing gear used to catch dugong by using a spear.

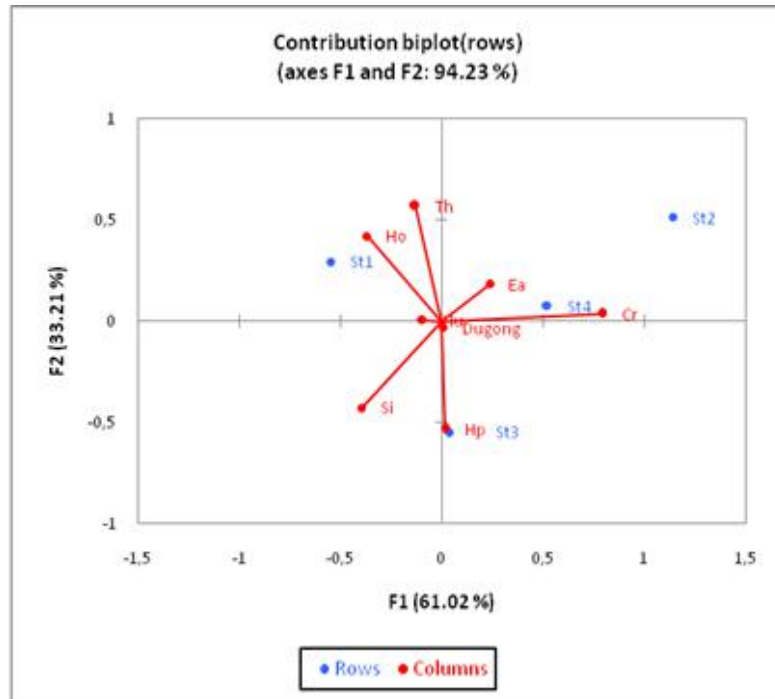


Figure 3. Correspondence factorial analysis of the relationship between dugong sighting with seagrass distribution species

which characteristic of the dugong station were the seagrasses as dugong's food. Preen (1995) explained that the Dugong in Moreton Bay likes to eat seagrass from the species of *Halophila* and *Halodule*. Overall the seagrass species preferred by Dugong at Moreton Bay are: *Halophila ovalis*> *Halodule uninervis*> *Halophila spinulosa*> *Syringodium isoetifolium*> *Cymodocea serrulata*. The results of other research in Lease Islands (Maluku), seagrass preferences as food source for Dugong are *Halophila ovalis*> *Halodule uninervis*> *Cymodocea rotundata*> *Cymodocea serrulata*> *Thalassia hemprichii* (De longh, 1997). Based on the results of factorial analysis, it was further confirmed that station 3 and station 4 were included in the feeding area for the dugong, indicating that seagrasses has an important role in maintaining the dugong survival.

#### 4. Conclusion

Dugong sighting in Liki Island was frequently found in the western (St 3) and eastern part (St 4) of Liki Island. Dugong sighting in the western and eastern of Liki Island was closely related to the existence of seagrass species as dugong's favorite foods such as *Halodule* and *Syringodium*.

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