The Status of Seagrass Health: Supporting Sustainable Small-Scale Fisheries in Misool Marine Protected Area, Raja Ampat, Indonesia

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Abstract

Seagrass plays an important role in aquatic resources, such as to support the sustainable management of small-scale fisheries, ensuring the availability of seagrass stocks for generations of local communities to cultivate in a sustainable manner. The purpose of this study is to provide information on the seagrass health status to support sustainable small-scale fisheries in the South Misool Regional Waters Conservation Areas which is located within the Raja Ampat Marine Protected Area of West Papua. The research was conducted in January 2019 in the Yefgag, Yellu and Harapan Jaya island. A total of ten quadratic transects measuring 1x1 m were laid perpendicularly to the coastline adapted from the seagrass watch method to collect the seagrass data, i.e. the species and the frequency of seagrass found, the dominance and the percentage of seagrass cover. Additional data on fish species were collected by interviewing the local fishermen directly. The relationship between seagrass cover and the number of fish species was analyzed. Th results showed that there were eight species of seagrass found in three observation stations, i.e. Halophila ovalis, Halodule uninervis, Halodule pinifolia, Halophila minor, Syringodium isoetifolium, Cymodocea serrulata, Cymodocea rotundata and Enhalus acoroides. According to the standard criteria for the health status of seagrass beds, the three locations are classified as less rich/less healthy. It because the seagrass coverage was in the range of 30-59%. The relationship between the percentage of seagrass cover and the number of fish species resulted equation of Y= 15,923x + 0,3174 with R2= 0,763. It means that the percentage of seagrass cover affects the abundance of fish species by 76,3% with the remaining being influenced by other variables, such as water quality.

Keywords: *seagrass health, small-scale fisheries, South Misool, Raja Ampat MPA*

Introduction

Papua is a strategic island with diverse terrestrial and marine flora and fauna (Kartikasari *et al.*, 2012). Its natural resources and biodiversity, which have the most unique features and endemicity in Indonesia, must be carefully maintained. Seagrass is one of the resources with significant promise in Papua's marine environment. It has the potential to be a very productive fishery resource which provide local people with a sustainable fisheries stock.

Seagrass ecosystem is found in coastal environments primarily in very shallow waters to a depth of 60m. Seagrass beds are widely distributed across the globe and are highly productive across all continents (Unsworth *et al.*, 2018). Seagrass beds serve an essential function as a fish habitat, where they form a community (Sedberry and Carter, 1993) such as in the Indian Ocean (Pinto and Punchihewa, 1996), Pacific Ocean (Tzeng and Wang, 1992) and Mozambique (Gullström and Mattis, 2004). The higher abundance of fish is found in the ecosystem with seagrass beds than without seagrass (Horinouchi, 2006). Besides, seagrass has a socio-economic benefit for local communities in Papua (Tebaiy, 2012 and 2013).

The physical role of seagrass ecosystems in shallow waters is to help reduce the force of waves and currents, filter dissolved sediment in water and stabilize the bottom sediment (Kiswara, 1999).

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Seagrass ecosystems play an important role in survival of fish as a shelter to hide from predators as well as a feeding ground for prey species, particularly small juvenile fish (Shervette *et al.*, 2006; Irawan *et al.,* 2018). It also acts as a habitat for other biota including sea cucumbers, mollusc and crabs. In addition, seagrass-related fish species contribute to the small-scale fisheries industry (SSF) (Unsworth *et al.*, 2018; Irawan *et al.*, 2019).

Balancing human well-being and ecosystem health are essential to achieve sustainable fisheries. Commercial fish populations and the ecosystems in which they live must be maintained in such a way so that all stakeholders who rely on fish for food and livelihood are involved. The socio-ecological system developed between humans and the potential of seagrass in a given location has an impact on fishermen and coastal communities' major reliance on seagrass habitats (Wawo, 2017).

Examining the features of seagrass, such as the species, its density, and coverage can help to understand the state of seagrass resources in Papua. This information is critical to understand the condition of the ecosystem as a whole, and to what extend the seagrass community is able to take advantage of the existing area (Erina, 2006). Understanding the condition of seagrass could also be used to understand their status in ecosystem. The status of seagrass condition were range from good, less rich or unhealthy, to poor. Seagrass with 60% coverage means rich condition, and unhealthy seagrass has 30-59% coverage and while poor or damaged seagrass has $\leq$ 29,9% coverage (Decree of Stated Minister of Environment No. 200/2004).

The condition of seagrass coverage represent a status of its ecosystem has been studied in Papuan marine ecosystems. The status of less rich or less healthy was found in Jayapura Bay which was 0.04-49.27% (Tebaiy, 2014), in Aisandami, Wondama Bay (30-59,9% cover) (Tebay *et al.*, 2020), and in Yosudarso Bay, Jayapura seagrass (25-78.3% cover) (Sari *et al.*, 2015). Seagrass status classified as moderate or unhealthy was found in Manokwari waters (14,19-45,33% cover) (Lefaan *et al.*, 2013) and 40-60% cover (Kopalit, 2010). Seagrass conditions in healthy status were found in Salawati Utara Raja Ampat (60% cover) (Hoek *et al.*, 2016) and in Waisai waters, Raja Ampat (77,78-100% cover) (Ansal *et al.*, 2017).

Seagrass provides a variety of ecosystem services that directly or indirectly benefit to human needs. Research on community interactions with seagrass resources are limited locally and globally (Nordlund, 2018). In Indonesian, including Papua, there is also a little documentation on how local communities interact with the environmental services provided by seagrass ecosystems. Most studies describe the comprehensive management of seagrass (Tebaiy and Denny 2017). This suggests that there are still gaps in understanding on how seagrass ecosystem services could be accessed by local communities. Additionally, public knowledge is lacking on seagrass in general, as well as the benefits it provides.

The potential of seagrass resources in eastern Indonesia has a much richer status than the western Indonesia region. Marine protected areas (MPAs) are established in Indonesian waters to maintain the health of seagrass in Indonesian marine ecosystems according to its function. Regional Waters Conservation Areas (KPPD) protect seagrass and coral reef ecosystems as habitats for fish and other biota that support small-scale fisheries. One good example is the South Misool KKPD, which has a 366.000 ha marine protected area in the Misool Islands, Raja Ampat (Suraji *et al.*, 2015). In this MPAs, a 22% area is set as a no-take zone to protect the stock of fish. This area could produce fish stocks for small-scale fishing activities.

The purpose of this study was to provide information on the status of seagrass health in the South Misool *Regional Waters Conservation Areas* located within the Raja Ampat MPA in West Papua in order to support the sustainable small scale fisheries

Materials and Methods

This research was conducted in January 2019 in South Misool. The data were collected from Yellu, Yefgag, and Harapan Jaya Island (Figure 1.). The stations were selected based on their characteristic, in which Yefgag Island represent tourist resort zone, while Yellu and Harapan Jaya Island are residential zone. Each station was consisted of three sub-stations.

A total of ten quadratic transects measuring 1m x 1m were laid perpendicularly to the coastline, adapted from the Seagrass Watch method (Hutomo and Nontji, 2014) (Figure 2.). Sampling was carried out during low tide. Prior to data collection, preliminary field observations were made to observe the distribution of seagrass species and to determine the transect line points. The vertical distance of the line transect was 20m x 20m parallel to the coastline on Yefgag Island, 30m x 60m parallel to coastline in Yellu Island and 20m x 50m parallel to the coastline in Harapan Jaya island. These results are used to determine the distance of the sample plots to the sea and to determine the distance of the transect lines parallel to the coastline.

The data collected included the species of seagrass, the frequency of seagrass found, prevalence of seagrass species and the percentage of seagrass cover. The identification of seagrass species was carried out *in situ* referred to Azkap (1999), Seagrass Watch Northern Fisheries Center-Australia (McKenzie, 2003), the Field Guide to the Identification of East Asian WESTPAC (2010), and Hutomo and Nontji (2014). The distribution of seagrass species and its frequency and dominance were determined based on Fachrul (2007) and Hutomo and Nontji (2014).

The number of seagrass cover per station was obtained by summing the seagrass cover per square observed on all transects in one station. The sum was then divided by the number of squares at that station (English *et al.,* 1997) and the correlation between number of fish species and the percentage of seagrass coverage was analysed using linear regression using Microsoft Excel 2010. The status of seagrass coverage was done based on the Stated Minister of Environment Decree No. 200/2004. Data on fish species were collected by direct interviews the local fishermen and fish collectors (totally 26 respondents) and then analyzed descriptively and presented in the form of a perceptual relationship between seagrass cover and the abundance of fish species in observation stations.

Result and Discussion

Distribution of seagrass

The South Misool Regional Water Conservation Areas (KKPD) is a part of the Raja Ampat Marine Protected Area network, an area renowned for its rich marine biodiversity where the protection of coral and mangrove ecosystems is prioritized (Sala *et al.*, 2018). While seagrass ecosystems play the same role and function as coral reefs and mangrove ecosystems. It is not yet been well understood how

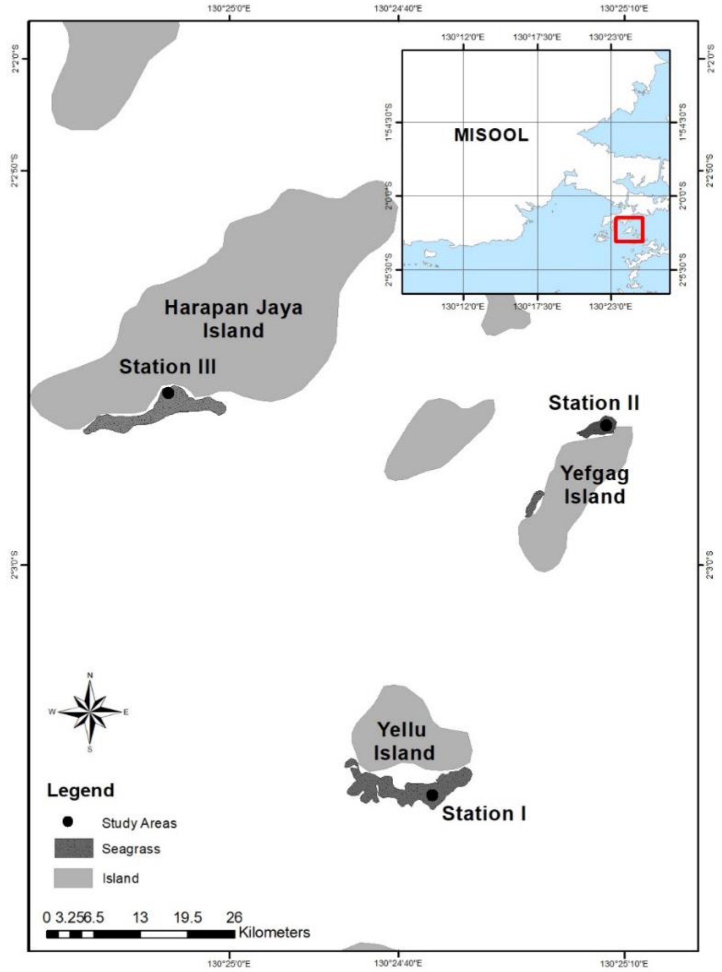

Figure 1. Research location part of South Misool Regional Marine Protected Area

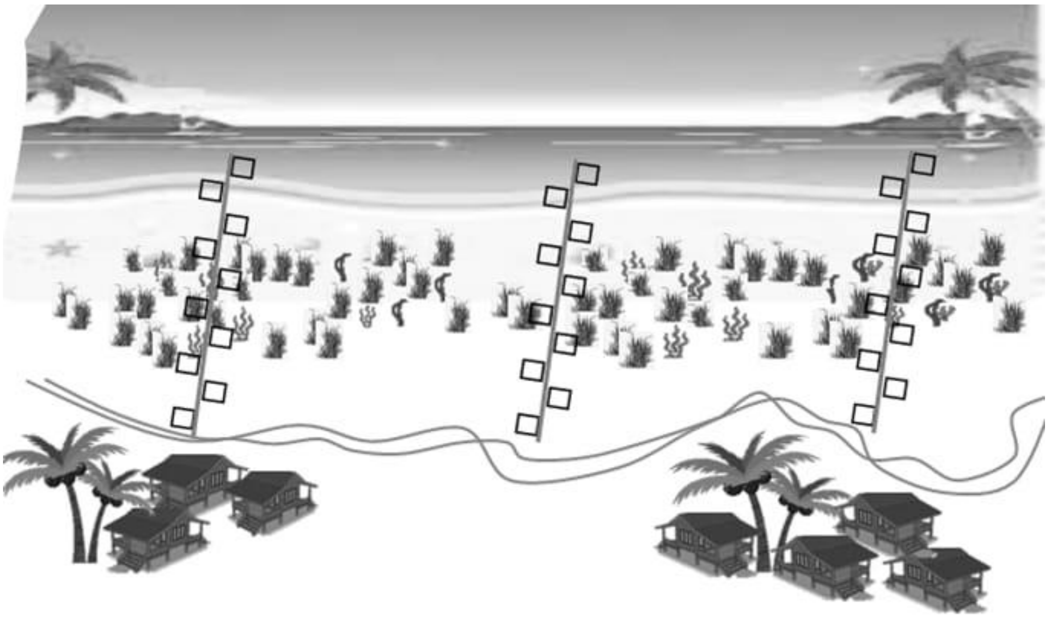

Figure 2. Placement of quadratic transects at each data collection station

seagrass ecosystems benefit to small-scale fisheries. According to Arkham *et al.* (2015), seagrass bed is a part of ecosystem that provides services to give benefits to organisms that live with it and the humans around it. Seagrasses need to receive the same consideration and protections as coral reefs and mangroves for their important role in coastal ecosystems.

The results of this study revealed that there were varies substrate among three stations. At Yellu Island, seagrass grew on the substrate of coral rubbles and sand along the slope, from the seagrass toward coral reefs. The substrate at Station 2 (Yefgag Island) was dominated by sand, while substrate at Station 3 (Harapan Jaya Island) was dominated by sand towards the sea and muddy sand substate toward the land. On the land and coastline, mangroves were found, therefore the seagrass ecosystem at Station 3 was associated with coral reef and mangrove ecosystems.

There were eight species of seagrass found in the three observation stations. Those seagrass species were belong to two families *i.e.* Cymodeoceacea and Hidrocharitacea and constisted of eight species including *Halophila ovalis*, *H. minor*, *Halodule uninervis*, *H. pinifolia*, *Syringodium isoetifolium*, *Cymodocea serrulata*, *C. rotundata* and *Enhalus acoroides* (Table 1.). This demonstrates that South Misool has higher diversity of seagrass species compared to several areas in Indonesia, such as six species at Mara'Bombang, Makassar (Hardiyanti, 2012) and at Kumbang island of Karimunjawa Islands (Hartati *et al.,* 2012; Prasetya *et al*., 2017), five species at Panjang Island, East Kalimantan (Nurzahraeni, 2014), and four species in Otiola Village, North Gorontalo (Bratakusuma, 2013).

Frequency of seagrass species

The most frequent seagrass species found at Station 1, 2, and 3 were *C. serrulata* (97%), *E. acoroides* (60%), *and E. acoroides* (97%) respectively. While *C. rotundata* (3%). *H. pinifolia,* and *H. minor* (3%) were the less frequent found in Station 1, 2, and 3 (Figure 3.). The presence of each seagrass species in each station is influenced by the substrate where the seagrass lives. At Stations 2 and 3, the presence of *E. acoroides* is higher because this species was able to live in sand, muddy and coarse substrates in shallow estuary waters (Tomascik *et al.*, 1997). The *C. serrulate and H. ovalis* species have a higher presence at Yefgag Island because these species prefer growing in areas with coral, rubble or sand substrates (Rawung *et al.*, 2018). The frequency at which species of seagrass occur indicates how each species of seagrass is distributed in an ecosystem. A species of seagrass that has a high-density value is not certain to have a high frequency value. The high frequency value of seagrass shows the distribution of species across all sampling stations (Hardiyanti, 2012). Based on the data presented in Table 1, it can be seen that there is not much variation in the frequency of seagrass species. This indicates the ability or adaptability of each seagrass species to grow and spread over the substrate and occupies with favorable environmental.

Dominance of seagrass species

By observing seagrass species in the three observation stations, an overview of seagrass species that are more dominant can be provided (Figure 4.). *C. serrulata* was found to be dominant at Yefgag and Yellu Island, while *E. acoroides* was the most dominant at Harapan Jaya Island. *C. serrulata* is a species that is sensitive to disturbance and turbidity. However, those species are also could be found in high turbidity locations and demonstrate adaptability in disturbed conditions (Lefaan, 2008). It also showed to thrive in poor aquatic conditions, such as in the estuary of the river that received domestic and industrial waste (Nainggolan, 2011).

The foliage of *C. serrulata* is thought to have physiologically tolerant to drought, it also has a longer vertical rhizome that helps to stay away from wet substrate. Its fronds are narrower and thinner which are not able to prevent water loss. These morphological characteristics are unfavorable in an intertidal area as shown by Tanaka and Nakaoka (2004) in which it has a very low survival rates in the intertidal zone. The long vertical rhizomes characteristic of *C. serrulata* are considered favorable for obtaining light and to avoid being buried deeper in subtidal locations (Duarte *et al.*, 1997). Therefore, under unfavorable conditions *C. serrulata* dominates over other species at both Yefgag and Yellu Islands.

The environmental conditions present in these locations- substrate sand mixed with mud- make this species more dominant as it shows its ability to adapt and compete in stagnant aquatic environments.

The seagrass *E. acoroides* was found to be more dominant than other species at Harapan Jaya Island. This is due to shallow and relatively calm waters at low tide which is favorable for muddy substrate habitats that support the growth and presence of the seagrass. *E. acoroides* is easier to grow than other species and is the most common species found in fine to mud sediments. It is still able to grow in medium to coarse sediments since it has long and strong roots that can stand firmly and absorb food well (Tomascik *et al.*, 1997). *E. acoroides* are generally found growing on muddy substrates in turbid waters and can easily dominate seagrass communities (Susetiono, 1993; Hemminga and Duarte, 2000; Yusmiati, 2015). This species of seagrass has also been found in the Tasilaha Lagoon where it has sandy and sandy mud substrate (Yusniati, 2015).

Table 1. The species of seagrass found at three observation stations

Species of Seagrass	Family	Location Yefgag Island	 Yellu Island	 Harapan Jaya Island
Halophila ovalis	Hidrocharitaceae	+	+	+
Halodule uninervis	Cymodoceaceae	+	+	+
Halodule pinifolia	Cymodoceaceae	-	+	-
Halophila minor	Hidrocharitaceae	-	-	+
Syringodium isoetifolium	Cymodoceaceae	+	+	+
Cymodocea serrulata	Cymodoceaceae	+	+	+
Cymodosea rotundata	Cymodoceaceae	+	-	+
Enhalus acoroides	Hidrocharitaceae	+	+	+

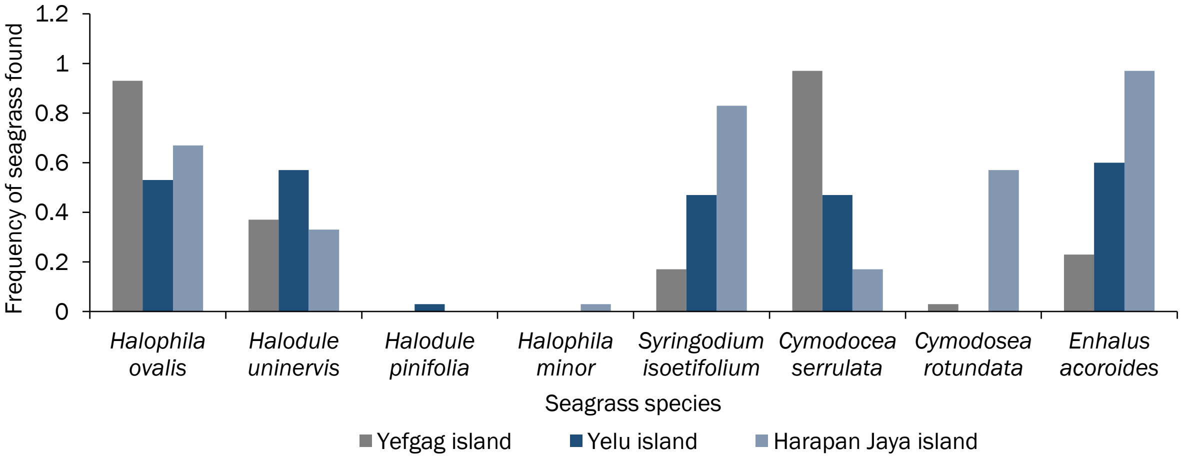

Figure 3 Frequency of seagrass species across three observation stations

Seagrass coverage

The percentage of seagrass cover is an estimate of how much seagrass grew in one quadrant transect and how it is influenced by morphometric conditions (Sari, 2015). High density and tidal conditions can also affect the estimated value of seagrass cover. *E. acoroides,* a physically large seagrass species, has a higher coverage rate than the *H. ovalis* species because of the size of its foliage. Meanwhile, smaller seagrass species such as *H. minor* have a smaller percentage of cover (Patty, 2013). Present work showed that the highest percentage of seagrass cover in the research area was found at Yellu Island (42%) followed by Station Harapan Jaya Island (41%), with the lowest coverage of seagrass found at Yefgag Island (17%) (Figure 5.).

The level of damage in seagrass beds was the impacts of the ecosystem condition. According to Environmental Ministerial Decree No. 200/2004 concerning to standard criteria for determining the health status of seagrass beds and damage to seagrass, seagrass cover of ≥60% can be classified as rich or heavy, 30-59,9% can be classified as less rich or healthy and ≤29,9% can be classified as poor. In present work, the seagrass in the three locations can be classified as less rich or healthy as seagrass coverage was in the range of 30-59%. This condition is related to the number of species found and their densities. This pertains to species with wide leaf morphology such as *E. acoroides* and *C. serrulata* as they are able to cover the area and/or substrate beneath.

With regard to the percentage of seagrass coverage at each station, Yefgag Island had a lower value than the other two stations. This low coverage is due to narrow distribution of seagrass in the area and the species are small size. The other two stations

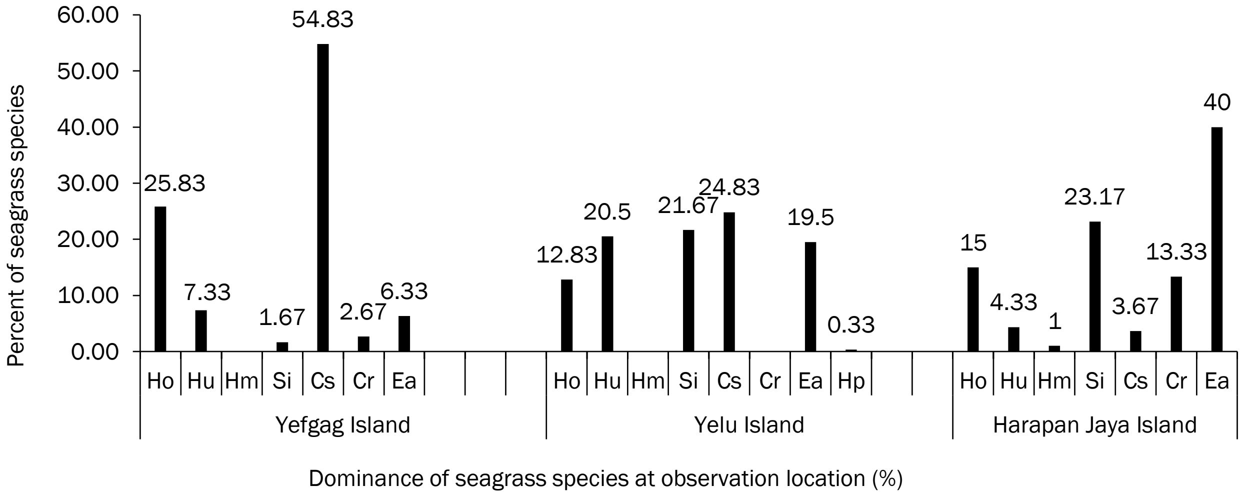

Figure 4. Dominance of Seagrass Species at South Misool

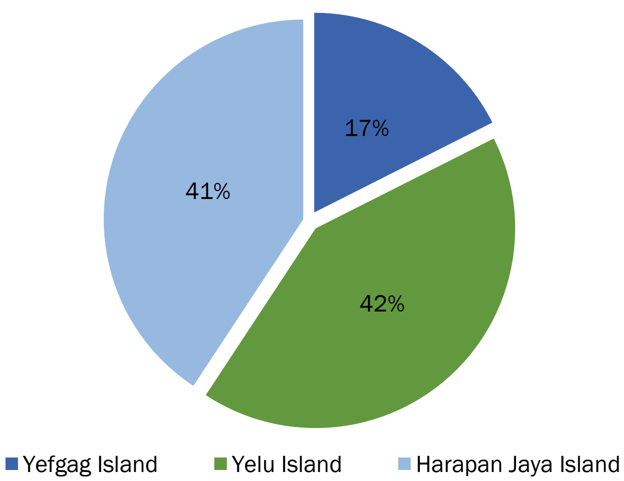

Figure 5. Percent of seagrass cover at the three study sites

have a higher seagrass cover, since the stations are located on slopes some distance from the sea and bordered by a large coral reefs which enable seagrass to have the sufficient opportunity to grow, dominate and occupy the habitat. In Harapan Jaya island, *E. acoroides* is more dominant and grows along the substrate. It is also an area that is broad and open to the sea, as well as adjacent to a coral reef.

Several variables observed on seagrass in the three sampling locations explained how many environmental elements are interrelated within seagrass habitats in their ecological systems. These ecological systems connect individual environmental elements in a functioning habitat in which a comprehensive arrangement enables all environmental elements to influence each other. The existence of seagrass in its habitat is supported by other elements including substrates, properties contained in salt water, as well as other supporting factors that influence how seagrass survives, grows and adapts. Therefore, the ability of seagrass to survive, grow and adapt contributes to the survival, growth and adaptation of associated biota in the same habitat.

The supporting environmental elements in the seagrass habitat encourage seagrass species to grow with various characteristics that occupy a particular area and cover various types of substrate. The presence of various species of seagrass with varying morphological sizes was found in three observation sites. Eight species of seagrass were found illustrating its diversity of species. This species diversity plays a very important role in its ecosystem, especially for associated biota, including various fish species. Research conducted by Rappe (2010) looked at the structure of fish communities in different seagrass beds to evaluate its ecological functions based on the difference in type of seagrass species and density, found that the stations with denser seagrass had a higher number of fish species. Stations where seagrass was sparse but contained many species still found several types of economically viable fish species. However, stations with less vegetation did not contain many species of fish. This demonstrates that fish prefer to congregate in areas with rich seagrass. Even artificial seagrass with complex structures attract a diversity of fish (Rani *et al.*, 2010).

Relationship between seagrass beds and the number of fish species

According to Kikuchi and Peres (1977), seagrass plays an important role as a habitat of many marine organisms where it provides shelter as well as a place for various animals and plants to attach. Besides, seagrass beds also play as a nursery or pasture, as well as act as food, for various herbivorous fishes. The abundance of fish in a waters is not only influenced by ecological aspects, but is also depended on socio-economic aspects utilization of fish resources by fishermen.

The socio-economic aspects of fisherman in the area research based on the interaction of fishermen with their environment are characterized by ethnic distribution, number of family members per household, average respondent age, average education level and economic variables such as fixed costs, production costs, types of production, and income distribution from fishermen. Based on Tebaiy *et al.* (2019), several tribes caught fishes in South Misool such as Ternata, Tidore, Flores, Lembata and Raja Ampat. For Raja Ampat consists of fisherman from Yellu, Fafanlap and Harapan Jaya villages.

Number of family members of the respondents was 6-7 people per household, the average education level is junior high school and most of fishermen respondents is 34-45 years old. Prior to fishing, the fishermen have to purchase supplies, such as nylon, fishing rods, drinking water, cigarettes, fuel, ice cubes, areca nuts and transportation expenses (Tebaiy *et al.*, 2019).

The relationship between fish species abundance (Y) and the percentage of seagrass cover (X) was described using simple linear regression analysis. The results showed that Y= 15,923x + 0,3174. The value R2 was 0,762 indicated that the percentage of seagrass cover affects the abundance of fish species by 76,3% and the rest is influenced by other variables such as environmental conditions. The number of fish species found at each observation station varied. This difference is caused by different environmental conditions and factors. The diversity of fish species in the seagrass ecosystem also depends on the presence of other ecosystems around the seagrass habitat such as coral reefs, mangroves, river estuaries and estuaries (Adrim, 2006).

The percentage of seagrass cover or individual density of seagrass in an area can explain the significant relationship between seagrass health status with the number of fish species and/or the abundance of individual fish. This is shown by studies of Nafidza (2018) whose found that at Pramuka Island, Kepulauan Seribu, Jakarta, seagrass density affects fish abundance by 69,32. The correlation value between seagrass density and the abundance of Baronang fish is 0,971 with a coefficient value of 94,2% demonstrating a very strong relationship between seagrass density and the abundance of fish (Fakhri *et al.*, 2016). Linear regression analysis between fish abundance and seagrass density at Hoga Island, Kaledupa District, Wakatobi showed that seagrass density has a significant effect on fish abundance and diversity, in which its ecological index analysis indicated that the seagrass and fish communities are in stable condition (Sarisma and Ramli, 2017).

The health status of the seagrass in the study area can be explained by the percentage of seagrass cover. Yefgag Island has 19,5% seagrass health status and 22 fish species were caught by fishermen, Yellu Island has 46,3% seagrass health status and 30 species of fish were caught by fishermen, and Harapan Jaya village has 45,2% seagrass health status and 35 fish species were caught by fishermen (Table 2.). Primary data processing results indicate that seagrass habitat with good health will provide habitat for various species of fish caught by fishermen. At Harapan Jaya station, there were more species of fish caught by fishermen than the other two observation locations. This is due to the fact that the waters surrounding the village contain three complete coastal ecosystems- mangroves, seagrass and coral reefs. The level of diversity of biota within the three types of coastal habitat is higher compared to the two other observation stations which only contain two types of coastal habitat, seagrass and coral reefs.

Maintaining the health status of seagrass is very important because coral reefs in the tropics are threatened, available fish stocks have decreased, and their management requires significant energy and resources (Unsworth *et al.*, 2018). The areas within the South Misool MPA tend to have a high abundance of target fish but are dominated by certain species and fish communities are less diverse (Figure 6.). The ecological status of the target fish inside and outside of the MPA is likely to be influenced by the condition of coral reefs in the surrounding areas (Sala *et al.*, 2019).

With increasing threats of climate change and increases in global temperatures, fishermen who depend on coral reefs have had to rely on resources from other habitats. Seagrass beds, in particular, are becoming increasingly important to humans and to the planet. Seagrass conservation efforts are needed to achieve sustainable ecological systems (Unsworth *et al.*, 2018). Seagrass conservation needs to be improved not only to increase seagrass viability, but also to support the increasing dependence of fishermen on the fish that inhabit in seagrass habitats. MPA management plans must include seagrass management as a strategic and primary activity to support small-scale fisheries development (Unsworth *et al.*, 2018).

Table 2. The species of fish caught by fishermen

No	Local Name	Scientific name
1	Sikuda, Gutila	*Lethrinus erythropterus*
2	Sikuda, Gutila	*Lethrinus microdon*
3	Geropa	*Epinephelus fasciatus*
4	Geropa	*Cephalopholis cyanostigma*
5	Geropa	*Epinephelus fuscoguttatus*
6	Geropa	*Plectropomus areolatus*
7	Geropa	*Variola albimarginata*
8	Geropa	*Aethaloperca rogaa*
9	Gorara	*Lutjanus ehrenbergii*
10	Tatapeh	*Parachaetodon ocellatus*
11	Bobara	*Caranx ignobilis*
12	Gorara	*Lutjanus fulvilamma*
13	Geropa	*Cephalopholis argus*
14	Sunu	*Plectropomus maculatus*
15	Singaro	*Lutjanus bohar*
16	Oci	*Selar boops*
17	Bobara	*Caranx tille*
18	Tibok	*Pomacentrus opisthostigma*
19	Selender	*Cheilinus sp*
20	Gurisi	*Nemipterus peronii*
21	Tambak Pasir	*Gymnocranius griseus*
22	Bitak Balande	*Saurida gracilis*
23	Tibok	*Stegastes nigricans*
24	Beloso	*Synodus dermatogeny*
25	Dakocan	*Dacyllus melanurus*
26	Kapas-kapas	*Gerres Oyena*
27	Biji nangka	*Parupeneus Multifasciatus*
28	Bangarau	*Lutjanus decussates*
29	Gofo	*Monotaxis granduculis*
30	Samandar	*Siganus chrysospilos*
31	Sako	*Tylosurus strongylurus*
32	Paparok	*Sphyraena jello*
33	Mula	*Hermigymnus melapterus*
34	Suo	*Sillago sihama*
35	Mamahe	*Myripristis burndti*

Understanding the role that seagrass health plays in supporting sustainable small-scale fisheries in the South Misool KKPD needs to be addressed in the management of Raja Ampat MPA. One practice in the conservation area management found within the South Misool is *sasi* (an unwritten customary law of Indigenous peoples in Raja Ampat which prohibits the harvest of marine animals within a certain peiord of time) (Tebay *et al.*, 2019) which is still being implemented to support small-scale fisheries (Tebaiy *et al.*, 2019). The benefits obtained from *sasi* production activities include the increase in fish targets, reduced levels of exploitation, and restoration of fish stocks, as well as increasing the income of the people who inhabit in this conservation

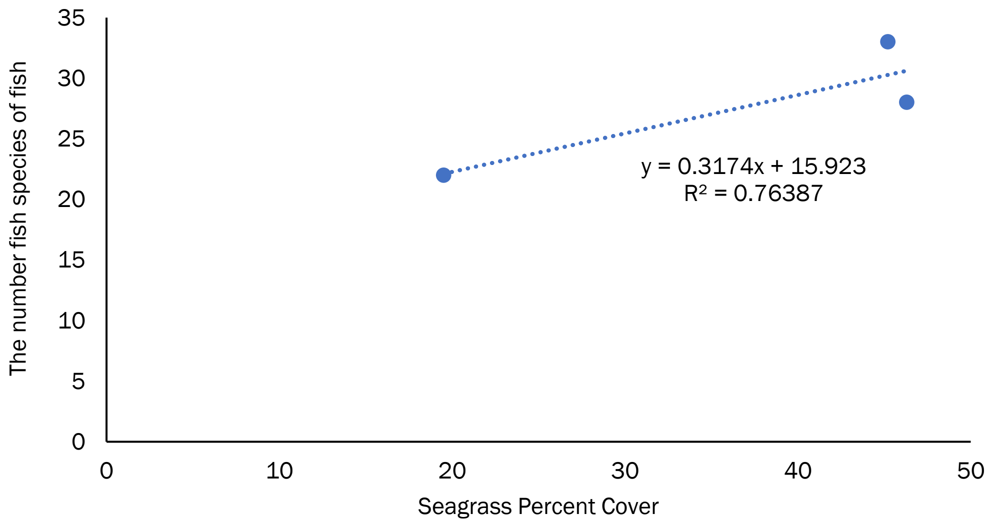

Figure 6. Relationship between seagrass status and fish abundance in the study site

area. Management of conservation areas directly help protect and conserve marine biological resources (Boli *et al*., 2014).

Conclusion

In the three observation stations, eight species of seagrass, whereas seagrass cover at Yefgag Island was 19,5% with 22 fish species), Yellu Island had 46,3% cover with 30 fish species caught by fishermen) and Harapan Jaya village (45,2% cover with 35 fish species caught by fishermen). The coverage in the range of 30-59% in which its health status is less rich or healthy. However, despite this status, the percentage of seagrass cover has a positive effect on the on the abundance of fish species, where every one percent increase in seagrass cover increases fish species by 0,3174

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