Struktur Komunitas Mangrove Kabupaten Morowali Provinsi Sulawesi Tengah (Kasus Pada Desa Maratape, Desa Lafeu, Dan Desa Labota)

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Struktur Komunitas Mangrove Kabupaten Morowali Provinsi Sulawesi Tengah (Kasus Pada Desa Maratape, Desa Lafeu, Dan Desa Labota)

(Mangrove Community Structure Morowali District, Central Sulawesi Province Case In Maratape Village, Lafeu Village, And Labota Village)

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Abstract

The research purpose aims at analyzing the structure of the existing mangrove communities along the coastal area of Morowali District, Central Sulawesi Province. The sampling was taken from three villages, i.e. Maratape Village, Lafeu Village, and Labota Village. This research used the quadrant line transect method. The analysis and description were made after the method had been conducted. The composition of mangrove species found in this research was 3 (three) types, i.e. Rhizophora apiculata, Sonneratia alba, and Rhizophora stylosa. Of the three species the research finds, the dominant ones are Rhizophora apiculata and Sonneartia alba. The highest species density values were found at Station 1 (M01), i.e. R. apiculata. The frequency value had the highest value found at Station 2 (M02), i.e. R. apiculata type, and the highest relative frequency was R. apiculata. The highest closing value, i.e. S. albater type could be found at Station 2 (M02). The importance value index of Rhizophora apiculata type at the Station 1 (M01) had the highest value and followed in Station 3 (M03), i.e. Sonneratiaalba type, the lowest INP analysis in all stations was Rhizophora type stylosa. The dominant mangrove in 3 (three) Morowali District Stations were Rhizophora apiculata and Silneratia alba types. Based on the research results conducted on the structure of mangrove ecosystem communities in Morowali District, Central Sulawesi Province (Maratape Village Menui Kepulauan Sub-District (station 1), Lafeu Village Bungku Pesisir Sub-District (station 2) and Labota Village Bungku Tengah Sub-District (station 3) are definitely classified as natural and have not experienced significant degradation
Keywords: Community Structure, Mangrove, Morowali, Central Sulawesi

Abstrak

Kajian ini bertujuan untuk menganalisis struktur komunitas mangrove yang ada disepanjang pesisir Kabupaten Morowali Provinsi Sulawesi Tengah. Sampling dilakukan pada tiga desa yaitu Desa Maratape, Desa Lafeu, dan Desa Labota. Kajian ini menggunakan metode line transek kuadaran dilanjutkan dengan analisissnya, kemudian dideskripsikan. Komposisi jenis mangrove yang ditemukan sebanyak 3 (tiga) jenis yaitu Rhizophora apiculata, Sonneratia alba, dan Rhizophora stylosa. Dari ketiga jenis yang ditemukan yang dominan yaitu Rhizophora apiculata dan Sonneartia alba. Nilai kerapatan jenis tertinggi terdapat di Stasiun 1 (M01) yaitu R. apiculata yaitu. Nilai frekuensi memiliki nilai tertinggi terdapat di Stasiun 2 (M02) yaitu jenis R. apiculata, dan frekuensi relatif tertinggi R. apiculata. Nilai penutupan tertinggi yaitu jenis S. alba terdapat di Stasiun 2 (M02) Indeks nilai penting jenis Rhizophora apiculata di stasiun 1 (M01) memiliki nilai tertinggi dan di ikuti Stasiun 3 (M03) jenis Sonneratia alba, analisis INP yang terendah dari semua stasiun yaitu jenis Rhizophora stylosa. Mangrove dominan di 3 (tiga) stasiun kabupaten Morowali adalah dari jenis Rhizophora apiculata dan Sonneratia alba. Berdasarkan hasil penelitian yang telah dilakukan terhadap struktur komunitas ekosistem mangrove di Kabupaten Morowali Provinsi Sulawesi Tengah (Desa Maratape Kecamatan Menui Kepulauan (stasiun 1), Desa Lafeu Kecamatan Bungku Pesisir (stasiun 2) dan Desa Labota Kecamatan Bungku Tengah (stasiun 3) masih tergolong alami dan belum mengalami degradasi yang berarti.
Kata kunci : Struktur komunitas; Mangrove; Morowali; Sulawesi Tengah

INTRODUCTION

Morowali District Central Sulawesi Province has diverse coastal resources and has very high economic and ecological value. Coral reefs, seagrasses and mangroves are coastal biological resources found frequently in this district. Mangrove ecosystems are a system in nature where life takes place that reflects the mutual relationship between living things and their environment. The living species (mangrove) itself dominantly have species of trees or shrubs which grow and develop in coastal areas. Mangrove forest with its raw bed can filter and neutralize some toxic chemical compounds before exposed to free waters. On the other hand, mangrove forests can be natural buildings that reduce waves that erode the beach. Mangrove forests also serve as a place to live for various species of living things and an upbringing area for certain types of fishes from habitat associations in its surroundings such as seagrass beds and coral reefs.

Indonesia's potential forest resources are very abundant, and one of them is mangrove forests. The potential mangrove forests in Indonesia are the largest in the world. Mangrove forests are a typical type of forest located along the coast or river estuary that get effect from tides. Mangroves grow on the protected beaches or flat beaches. The forests are usually shown along the side of the island protected from the wind or behind the coral reef ecosystems in the protected offshore. The characteristics of mangrove forests generally grows on intertidal areas. In the areas, the soil types are muddy, clay and sandy. The areas is periodically always inundated with sea water every day and during high tide (Schaduw, 2008).

Mangrove forest with its raw bed can filter and neutralize certain toxic chemical compounds before exposed to free waters. On the other hand, mangrove forests can be natural buildings that reduce waves that erode the beach. Mangrove forests also serve as a place to live fo various types of living things and the upbringing areas for certain types of fish from habitat associations in its surroundings such as seagrass beds and coral reefs. However, the mangrove forest ecosystems are generally destructed due to human activities in natural resources utilization and coastal areas without considering their sustainability, such as logging for excessive fuelwood demands, ponds, settlements, industry and mining. Considering the importance of the ecosystems on the coast, this research aims at determining the structure of mangrove vegetation communities. It analyzes the Value of Di (species density), Fi (frequency Species), Ci (coverage species), RDi (species relative density), RFi (relative frequency species), RCi (species relative coverage), and INP (Importance Value Index).

MATERILAS AND METHODS

Research Place and Time

The research was carried out in Morowali District, Central Sulawesi Province, July 2019. The research location were in three villages, i.e. Maratape Village Menui Kepulauan Sub-District (the Station 1), Lafeu Village Bungku Pesisir Sub-District (the Station 2) and Labota Village Bungku Tengah Sub-District (the Station 3).

Data Collecting Methods

The research method here is the quadrat line transect method (English et al, 1994). This research analyzes the structure of mangrove communities, species density values (Di), Frequency species (Fi), Species Coverage (Ci), Species Relative Density (RDI), Species Relative Frequency (RFI) and Importance Value Index (INP). This method is very efficient to use and it has been applied in several previous studies (Schaduw, 2015a; Schaduw, 2016b; and Schaduw, 2018b).

RESULTS AND DISCUSSION

Structure of Mangrove Communities

Based on the research results conducted at three stations (Maratape Village, Lafeu Village and Labota Village) there are 3 mangrove species found, i.e.

Rhizophoraapiculata, Rhizophorastylosa and *Sonneratia alba*. It also finds two types outside the transect, i.e. *Bruguera gymnorrhiza* and *Rhizophora mucronatayang* included in three families of *Rhizophoraceaea, Sonneratia alba*. and found 2 types outside the transect, i.e. *Bruguera gymnorrhiza* and *Rhizophora mucronata* which are included in 3 families of *Rhizophoraceaea, Sonneratiaceae* and *Bruguieraceae*. The most common type of mangroves found at each research station is *Rhizophoraapiculata*. According to Sofian et al. (2012), this genus has the advantage of adjusting to the environmental conditions for its stilt roots. The basic component of the food chain in the mangrove ecosystems is litter from mangrove plants (leaves, twigs, fruit, stems and so on). Microorganisms will decompose mangrove litter that falls into the waters into detritus particles as a food source for aquatic biota by filtering seawater. Leaf litter is estimated to make an important contribution to the mangrove ecosystem. The high productivity of leaf litter amounts to 78 tons per year per hectares. (Alongi, et al 2002; Holmer and Olsen, 2002).

The number of trees and their average diameter obtained in the research (Table 1) and (Figure 1) at the M01 (Matarape Village) are Rhizophora apiculata with total of 18 trees and average diameter of 16.45cm, and Sonneratia alba with total of 12 trees and total diameter of 15.87 cm. Moreover, Rhizophora apiculata at M02 (Lafeu village) has 12 trees with average diameter of 9.93 cm, and Silneratia alba has 8 trees with total diameter of 35.55 cm. Finally, *Rhizophora apiculat* at M03 (Labota Village) has 10 trees with average diameter of 9.87cm, and *Silneratia alba* 12 trees with total diameter of 24.12 cm, and *Rhizophora stylosa* 4 trees with average diameter of 8.92cm.

Table 1. Number of trees and average diameter of mangrove forest trees

Species	Total Trees			Average Tree Diameter (cm)		
	M01	M02	M03	M01	M02	M03
Sonneratia alba	12	8	12	15,87	35,55	24,12
Rhizophora apiculata	18	12	10	16,45	9,93	9,87
Rhizophora stylosa	-	-	4	-	-	8,92
Total	30	20	26	32,32	45,48	42,91

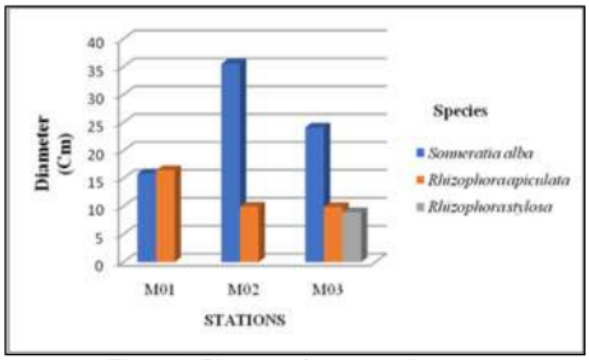

Figure 1. Diagram of average diameter

Species Density and Species Relative Density

The analysis results of the species density and species relative density (Figures 2 and 3) show that the species density at M01 (Matarape Village) is *Rhizophora apiculata* with the total density of 0.06, *Sonneartia alba* 0.04. The species relative density of *R.apiculata* amounts to 60.00%, and *S. alba* 40.00%. *R. apiculata* has the highest species density and relative species density for the higher

number of trees. The species density value of *R.apiculata* at M02 (Lafeu Village) is 0.04 and *S. alba* is 0.03. The species relative density of *R. apiculata species* is 60.00% and *S. alba* is 40.00%. Moreover, the species density value of *R. apiculates*, *S. alba* and *R. stylosa* at M03 (Labota Village) are 0.03, 0.04 and 0.01 consecutively. The species relative density values of *R. apiculatai* is 38.46%, *S, alba* is 46.15% a[14] *R. stylosa* is 15.38%. Furthermore, the highest species density and species relative density values are found at the Station 1 (M01), i.e. *R.apiculata* type with the density value of 0.06 and the species relative density of 60.00%. Otherwise, the lowest species density of 0.01 and species relative density values of 15.38% is *R. stylosa* type. Mangroves are the formation of typical coastal plant along the protected tropical and sub-tropical coasts. Mangrove formation is a combination of land and sea. Mangroves depend on sea water and fresh water as their food source and silt from upstream erosion as a supporting material for the substrate. While tides provide food for forests, river water rich in minerals enriching the sediment and swamps where the mangroves grow. Therefore, the shape of the mangrove forest and its existence are protected from land and sea influences (FAO, 1994). Water quality in the mangrove ecosystems also influences the mangrove growth and breeding, salinity is one of the important parameters for the ecosystems to be maintained (Schaduw, 2018a). Different from the mangrove ecosystem in the mainland, a small island mangrove ecosystem has a higher level of vulnerability and lower diversity if compared to that in the mainland, therefore the management approach differs in the dimensions of ecology, economics, social, and institution (Schaduw, 2013; Schaduw 2015b).

The number of a tree species will describe the percentage of the species density and the species relative density. The species density will be high for its suitable substrates and its adaptation to environmental conditions so the species can grow well. Factors that cause small mangrove growth are due to tree roots classified as large so the growth becomes less optimal (Agustini et al.2016).

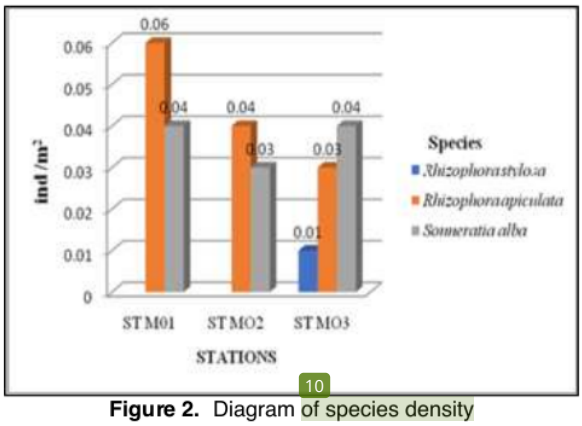

Figure 2. Diagram of species density

Species Frequency and Species Relative Frequency

The species frequency value and species relative frequency (Figures 4 and 5) show that the species frequency of *Rhizophora apiculata* at M01 (Matarape Village) is 1,00, and *Sonneratia alba* 0,67. Moreover, the species relative frequency of *R.apiculata species* is 60.00%, and *S. alba* is 40.00%. The species frequency value of *R.apiculata* at M02 (Lafeu Village) has 1.00 and *S. alba* is 0.33. The species

relative frequency of *R. apiculata* is 75.00% and *S. alba* is 25.00%. The species frequency value of *R. apiculata, S. alba* and *R. stylosa* at M03 (Labota Village) is 0.66, 1,00 and 0,67 consecutively. On the other hand, the species relative density value of *R.apiculata, S. alba* and R. stylosa reaches 28.57%, 27.86% and 28,57% consecutively. The highest value is found at the station 2 (M02) with the species frequency value of 1.00 and the species relative frequency value of 75.00%.

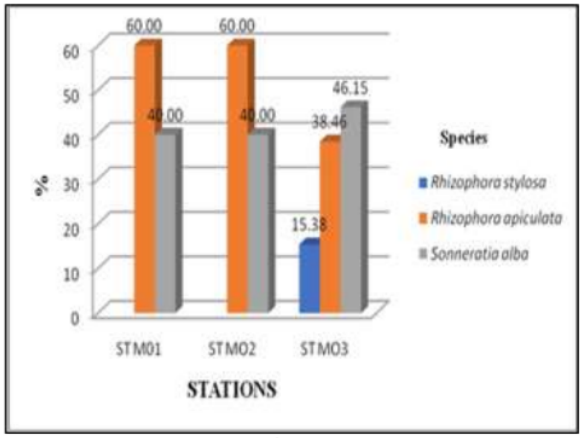

Figure 3. Diagram of species relative density

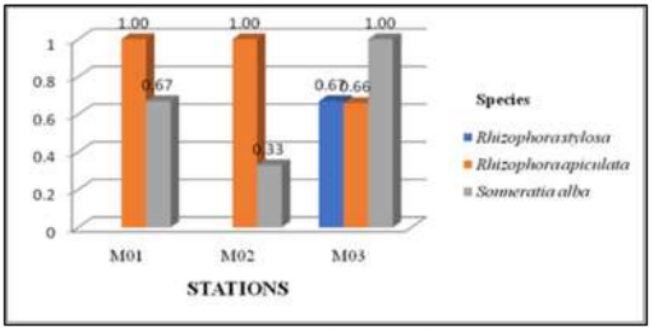

Figure 4. Diagram of species frequency

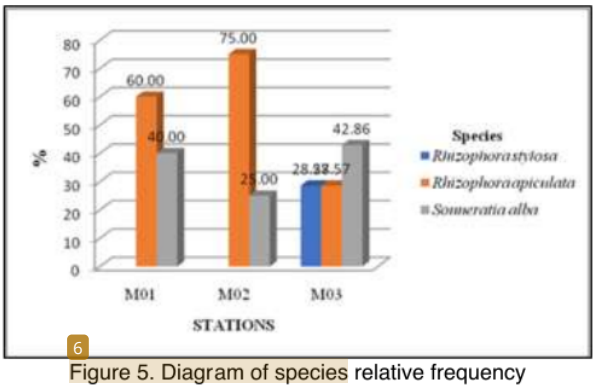

Figure 5. Diagram of species relative frequency

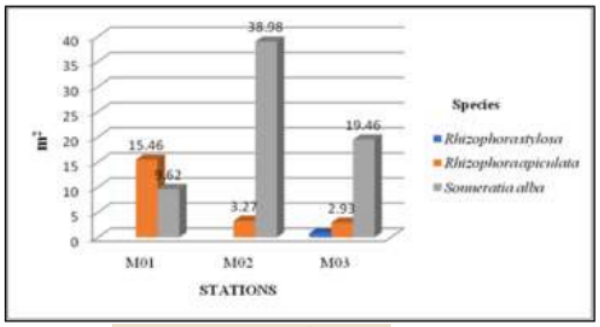

Figure 6. Diagram of species coverage

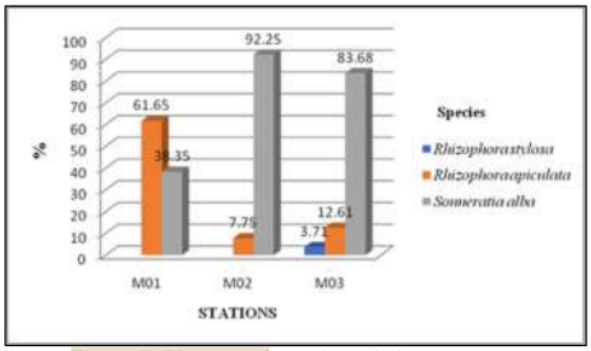

Figure 7. Diagram of species relative coverage

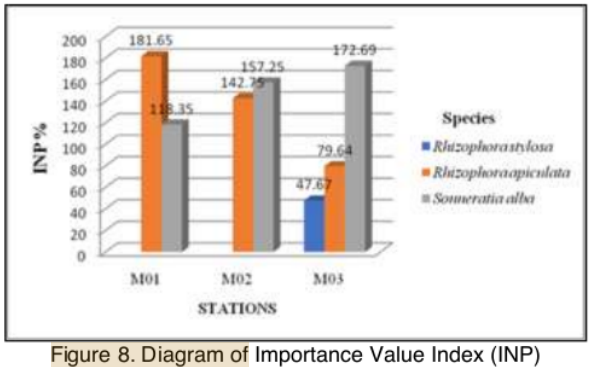

Figure 8. Diagram of Importance Value Index (INP)

Species Coverage and Species Relative Coverage

From the analysis of species coverage and species relative coverage (Figures 6 and 7), the species coverage of *Rhizophora apiculata* at M01 (Matarape Village) has 15.46 species coverage, and *Sonneratia alba* 9.62. Moreover, the species relative coverage of *R.apiculata* amounts to 61.65%, and *S. alba* 38,35%. The species coverage value of *R. apiculata* at M02 (Lafeu Village) has 3.27 dan *S. alba* 38,98. Furthermore, the species relative closure of *R. apiculata* is 7.75% and *S. alba* 92.25%. The species coverage of *R. apiculata* at M03 (Labota Village) is 2.93 and *S. alba* is 19.46 and *R. stylosa* 0.86. Finally, the species relative coverage of *R. apiculata* reaches 12.61%, *S. alba* 83.68% and *R. stylosa* 3.71%.

From the research results at above, the highest percentage of the species coverage at M02 is *S. alba* (92.25%). It has an average large diameter of the dense canopy. Moreover, the highest coverage percentage at M01 and M03 is *R. apiculata* (61.65%) and *S. alba* (83.68%). Factors that influence the low species coverage value relate to heterogeneous mangrove conditions. According to Raymond et al. (2010), the more heterogeneous species of the mangroves in a community, the more various the role and the magnitude of the index will be.

From the research results it is shown that *Sonneratia alba* and *Rhizophora apiculata* has the largest tree trunk circles, therefore the coverage value is high. The important factors affecting the species coverage value are the trunk circles and basal areas in a sampling location.

Importance Value Index

The analysis results show that the Importance Value Index of *Rhizophora apiculat* and *Sonneratia alba* (Figure 8) at the M01 (Matarape Village) amounts to 181.65%, and 118.35% consecutively. The Importance Value Index of *R.apiculata* and *S. alba* at M02 (Lafeu Village) reahces 142.75% and 157,25 consecutively. Finally, the Importance Value Index of *R. apiculata, S.apiculata* and *R. stylosa* at M03 (Labota Village) amounts to 79.64% , 172.69% and 47.67% consescutively.

From the research results at above it is shown that the highest important value index at M01 (Matarape Village) is *R.apiculata* type with total value of 181.65% and the highest species at M03 (Labota Village) is *S.albadengan* with total value of 172.69%. The species is dominant in two stations. Moreover, the highest important value index at M02 (Lafeu Village) is *S.alba* type with total value of 157.25%. This species is dominant at this station. Indriyanto (2006) Agustini et al. (2016), argues that the dominant species (in power) in a plant community will have the high importance value index, so the most dominant species will have the greatest importance value index. On the other hand, Raymond et al. (2010) states that species with the high importance value index means having greater cumulative control value to their habitat. This species will be superior in utilizing resources or more able to adapt to the local environment. According to Aksornkoae (1993), mangrove zoning is one of the first steps for sustainable monitoring and management of the mangrove ecosystems. According to the international agreement on the mangrove zoning there are three main zones, i.e.: maintenance zones, protection zones, and development zones.

The Importance Value Index indicates that the ecosystem in the area is balanced and it provides resistance to disturbance, pollution and changes in environmental factors. Therefore, some mangroves can adapt and grow well in the area. In this data collection, *Sonneratiaa Sp.* and *Rhizophora sp.* have the relatively high Importance Value Index if compared to the other mangroves species in the area (Dedy 2009). A high Fauna that live in mangrove ecosystems coves various groups, i.e.: birds, mammals, molluscs, crustaceans, and fishes. The researches of Gopal and Chauchan (2006) have prove it. In the mangrove area in Sundarbans India there are 8 species of mammals, 10 species of reptiles and 3 species of birds that live and associate with mangroves.

Based on the research results at above it is known that each different area dominantly has different species, so the ability of a species to live in a place is highly dependent on its ability to adapt to environmental conditions in the area. According to Bengen (2003) the importance of each mangrove species highly depends on the condition of mangrove growth. For mangrove plants to grow well, these require a number of supporting factors such as the availability of nutrients or organic matters, suitable substrate, stable water conditions and no mangrove exploitation from the local community. From the functions of the aquatic ecosystem, the mangrove ecosystem provides a place for spawning

and raising various fish species, crustaceans, and other aquatic species (Nagelkerken and Van Der Velde, 2004).

The mangrove ecosystem management is an effort to maintain, protect and rehabilitate the ecosystem, so the utilization can be sustainable. According to Kenneth (1979), the goal of the mangrove ecosystem management is to achieve the maximum benefits of the forest in a versatile and sustainable way. The mangrove forest management is definitely the application of methods of the forest management and exploitation as well as forestry techniques in order to utilize the forest's natural resources.

Mangrove forest management must pay attention to the relationship between the mangrove ecosystem and its surroundings so it has a wide orientation (Barkey, 1990). If there is an over-exploitation to mangrove resources, it will make the ecosystem imbalance. For example, the exploitation of the mangrove ecosystem increases in the eleven areas of Pangpang Bay in Muncar Sub-District, Banyuwangi. The mangrove ecosystems in this area support the local economic development, so the uncontrolled logging activities have occurred for the last few years (Nazili, 2004). Otherwise, the sustainable management of mangrove ecosystems is expected to maintain the productivity and its surrounding area, so the mangrove ecosystems can be preserved. Finally, mangroves in conservation areas are not immune from degradation. It is indicated in the marine protection area of Blongko Village; the mangrove conditions are degraded for the anthropogenic activities (Schaduw, 2016a).

CONCLUSION AND SUGGESTIONS

Conclusion

The composition of the mangrove species found in 3 (three) types is, i.e. *Rhizophora apiculata, Sonneratia alba*, and *Rhizophora stylosa*, Of the three species, the dominant ones are Rhizophora apiculata and Sonneartia alba. The highest density value is found at the Station 1 (M01), i.e. *R. apiculata*. The frequency value has the highest value found at Station 2 (M02), i.e. *R. apiculata*, and the highest relative frequency is *R. apiculata*. The highest coverage value, i.e. *S. alba* can be found at the Station 2 (M02). The importance value index of *R. apiculata* at the Station 1 (M01) has the highest value and followed by the Station 3 (M03) i.e. *Sonneratia alba*, the lowest Importance Value Index analysis in all stations is *Rhizophora stylosa*. The dominant mangrove species in 3 (three) stations, Morowali District are *Rhizophora apiculata* and *Silneratia alba* types.

Suggestions

The conservation programs and field surveys such this one can be carried out in the level of local governments, communities or local agencies to recognizing the importance of mangrove ecosystems. Re-greening and rehabilitation of the mangrove ecosystems should be continuously carried out for the preservation of coastal ecosystems. Other researches need to be carried out such as carbon potentials, biota associated with mangroves, and others that aim at conserving the mangrove ecosystems.

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