

## Diversity of Mangrove Plants in the Coastal of Palopo City

Akhmad Syakur<sup>1</sup>

Affiliation: Department of Biology Education, Cokroaminoto Palopo University<sup>1</sup>

([ahmadherlang@gmail.com](mailto:ahmadherlang@gmail.com))

### Abstract

The aim of the research was to know diversity of mangrove plants in the coastal of Palopo City. Method used in this research was line transect in 4 stations. There were 32 plots used in this research, with 8 plots in each station. The results showed that there were 5 true mangrove and 3 associated mangrove in the coastal of Palopo City. *Bruguiera parviflora* and *Sonneratia alba* were the dominant species mangrove plants in the coastal of Palopo city. Diversity index of mangrove plants in the coastal of Palopo City showed low to intermediate level with the value 0,636 – 1,569.

**Keywords:** mangrove, diversity, Coastal of Palopo

### 1. Background

Mangrove is one of important coastal ecosystems besides coral reefs and sea grasses. Mangrove forest have many roles in ecosystem, such as ecosystem stabilizer, sources of nutrients, spawning sites, places to obtain food, and coastal protectors. In economy sector, mangrove ecosystem also can be used as a place of cultivation, tourist attraction, research and timber resources for the community.

Mangrove plants in Indonesia consist of 47 species of trees, 5 species of shrubs, 9 species of herbs and grasses, 29 species of epiphytes, 2 species of parasites, and several species of algae and bryophytes (MoE, 1997). The formation of mangrove forests consists of four main genera, namely *Avicennia*, *Sonneratia*, *Rhizophora*, and *Bruguiera* (Nybakken, 1993; Chapman, 1992), there are also *Aegiceras*, *Lumnitzera*, *Acanthus illicifolius*, *Acrosticum aureum*, and *Pluchea indica* (Backer and Bakhuizen van den Brink, 1965). *Nypa fruticans* and several types of Cyperaceae grow on the border of mangrove forests with freshwater swamps (Sukardjo, 1985; Odum, 1971).

Natural mangrove forests form certain zonation. The outer zone is dominated by *Avicennia*, *Sonneratia*, and *Rhizophora*, the middlezone is dominated by *Bruguiera gymnorhiza*, the third zone is dominated by *Xylocarpus* and *Heritiera*, the interior zone is dominated by *Bruguiera cylindrica*, *Scyphiphora hydrophyllacea*, and *Lumnitzera*, while the transition part is dominated by *Cerbera manghas* (de Haan in Steenis, 1958). It can be used as a reference of mangrove zonation pattern although the pattern is hard to define nowadays (Sasaki and Sunarto, 1994). It was because some habitat changes in the form of pond development, deforestation, sedimentation/reclamation, and environmental pollution (Lewis, 1990; Primavera, 1993; Nybakken, 1993).

Coastal of Palopo City is located in South Sulawesi Province, Indonesia. There are natural and artificial mangrove forests in this coastal. But, the condition of the mangrove forest in the coastal of Palopo City has not received attention from the local government. Complete data of mangrove area and its species are not available yet. Besides, community exploits the mangrove forest by cutting down the mangrove trees illegally. These cases showed that the mangrove habitats in the coastal of Palopo City need to be maintaining to keep the

sustainability of mangrove ecosystem. This study aims to determine the diversity of mangrove plants in the coastal of Palopo City. The result of the research can be used for basic information in mangrove maintenance in Palopo City.

**2. Methods**

The research was conducted in the coastal area of Palopo City, South Sulawesi Province from February to June 2019. The tools used in this study were meters and rope to laid transect line and plots; camera and plant identification books as guidelines in identification of mangrove species; pH meters and thermometers for collecting environmental parameter; and instruments to write and collect data. The materials used in this study were alcohol and sample of plant species of mangroves in the coastal of Palopo City.

The method used in the research is transect line method with quadrant plots, located in 4 station with 8 plots in each station. Transect line were set horizontal with coastal line. multi-size plots were placed along the line transect, consist of 10m x10 m for trees, 5 m x5 m for stakes, and 1 x 1 m for seedlings. Data of species and its number were processed further to obtain species density, frequence, importance and diversity of mangroves. The results of the data analysis were described descriptively.

**3. Results and Discussion**

***Species Composition***

The identification result of mangrove plants in the coastal of Palopo City showed that there were 5 true mangrove species and 3 species of associated mangrove species (Table 1 and Table 2). True mangrove species consist of *Avicennia alba*, *Aegiceras floridum*, *Rhizophora apiculata*, *Bruguiera parviflora*, *Sonneratia alba*, while associated mangrove species consist of *Terminalia catappa*, *Ipomea pes-caprae*, *Hibiscus tiliaceus*. There are 43 species of mangrove plants in Indonesia, 32 species among them found in Sulawesi (Noor, et al, 2006). The total number of species mangrove plants found in coastal of Palopo city was relatively low compared with whole number species mangrove plants found both of in Sulawesi and Indonesia.

Table 1. Species Composition of True Mangrove Plants In The Coastal of Palopo City

No	Family	Species	Local Name	Stations			
				I	II	III	IV
1	Avicenniaceae	<i>Avicennia alba</i>	Api-api	√	-	-	-
2	Myrsinaceae	<i>Aegiceras floridum</i>	Pisang-pisang	√	-	-	-
3	Rhizophoraceae	<i>Rhizophora apiculata</i>	Bakau/Bangko	√	-	-	-
		<i>Bruguiera parviflora</i>	Langgade	√	√	√	√
4	Sonneratiaceae	<i>Sonneratia alba</i>	Parappa/Pedada	√	√	√	√

Species composition and the number of mangrove plants found in research area were scattered on each research stations, although the differences were not significant. Environmental conditions data showed that the averages of salinity, pH, water temperature, and humidity in research area respectively 28,9<sup>0</sup>/<sub>00</sub>; 7,25; 27,5°C; 78,75%. There are no significant differences on environmental parameters and type of substrates in each station.

Table 2. Species Composition of Associated Mangrove Plants in the Coastal of Palopo City

No	Family	Species	Local Name	Stations			
				I	II	III	IV
1	Combretaceae	<i>Terminalia catappa</i>	Ketapang	√	√	-	-
2	Convolvulaceae	<i>Ipomea pes-caprae</i>	Batata pantai	√	√	-	-
3	Malvaceae	<i>Hibiscus tiliaceus</i>	Waru	√	√	-	-

### **Species densities**

Species densities of mangrove plants in research area can be seen in Table 3. *Bruguiera parviflora* is the most dominant species among the other mangrove species and is found in all stations. This is due to abiotic factors; such as muddy substrate, high salinity and tidal sea water were optimal for the growth of this mangrove species. Another type of mangrove found is *Sonneratia alba*. The ability to tolerate in environmental changes makes this type of mangrove are able to survive and distributed in all stations.

Table 3. Species Densities of Mangrove Plants in the Coastal of Palopo City

Species	Species density (individu/100m <sup>2</sup> )		
	Seedlings	Stakes	Trees
<i>Avicennia alba</i>	22	18	15
<i>Aegiceras floridum</i>	18	24	14
<i>Rhizophora apiculata</i>	15	20	18
<i>Bruguiera parviflora</i>	24	39	46
<i>Sonneratia alba</i>	22	28	22
<b>Jumlah</b>	<b>101</b>	<b>129</b>	<b>115</b>

### **Important Value Index of mangrove**

Important Value Index shows the importance of a type of plant and its role in the community. Its values in tree and sapling category are obtained from the sum of relative density, relative frequency and relative dominance, while in seedling category were obtained from the sum of the value of density relative and frequency relative. The result of Important Value Index of mangrove plants in research area showed in Table 4.

Table 4. Important Value Index of Mangrove Plants in the Coastal of Palopo City

Species	Important Value Index (%)		
	Seedlings	Saplings	Trees
<i>Avicennia alba</i>	40,53	30,62	28,43
<i>Aegiceras floridum</i>	36,57	35,27	27,56
<i>Rhizophora apiculata</i>	27,36	32,17	31,04
<i>Bruguiera parviflora</i>	48,76	55,23	70,76
<i>Sonneratia alba</i>	46,78	46,71	42,21

The variations of these Important Value Index indicates the influence of the environmental conditions such as humidity, temperature, salinity, competitiveness, such as the struggle for nutrients, sunlight and growing space. Species with the highest Important Value Index is *Bruguiera parviflora*, followed by *Sonneratia alba*. These results indicate that these species have important role in form mangrove ecosystem in the coastal of Palopo City. According to Odum (1993), the dominant type has large productivity, and in determining a dominant type of vegetation that needs to be known is the stem diameter. The existence of the dominant species in the research location is an indicator that the community is in suitable habitat and supports its growth.

### **Diversity Index**

The diversity index of mangrove species in this research area based on the Shannon-Wiener diversity index (H') categorized in the medium and low level.

Table 5. Diversity index of mangrove plants (tress) in each station.

Stations	H'	Category
Station I	1,495	Medium
Station II	1,569	Medium
Station III	0,636	Low
Station IV	0,692	Low

Distribution of mangrove plants in the research area is influenced by natural and human factors. The low level of species diversity in the research area is due to the mangrove plants in the coastal of Palopo City being an artificial ecosystem, with the type and amount of mangrove planted consist of *Bruguiera parviflora* and *Sonneratia alba*.

Medium diversity index of ecosystem is influenced by the presence of a type of component found in ecosystem and also changes in plant vegetation at the location of research due to community activities. According to Soerianegara (1972) this type of diversity is caused by changes in vegetation that occur continuously and are supported by the presence of nutrients, light and water obtained by vegetation so the condition are optimal to support plants growth.

Diversity of mangrove forests is indeed lower than tropical forests. Nevertheless this forest has a structure and function that is able to maintain its life in extreme environments in the tidal zone (Duke et al., 1998). Walters et al., (2008) stated that mangrove ecosystems have high primary productivity but can easily change if there are disturbances especially from anthropogenic activity.

#### **4. Conclusion**

Based on results of the research on the diversity of mangrove species in the coastal of Palopo City, it can be concluded that there are 5 types of true mangroves and 3 types of mangrove associations. The species diversity index value ranges from 0.636 to 1.569 (low and medium species diversity). It is most likely because the mangrove ecosystem in the coastal of Palopo City was an artificial ecosystem, with the type and amount of mangrove planted were of *Bruguiera parviflora* and *Sonneratia alba*.

#### **5. Citation and References**

- Backer, C.A. and R.C. Bakhuizen van den Brink, Jr. (1965). *Flora of Java*. Vol. II. Groningen: P.Noordhoff
- Chapman, V.J. (1992). *Wet coastal formations of Indo Malesia and PapuaNew Guinea*. In Chapman, V.J. (ed.). *Ecosystems of the World 1: Wet Coastal Ecosystems*. Amsterdam: Elsevier.
- Duke, N.C., Ball, M.C. & Ellison, J.C.(1998). *Factors influencing biodiversity and distributional gradients in mangroves*. *Global Ecology and Biogeography Letters* 7(1):27-47.
- Lewis, R.R. (1990). *Creation and restoration of coastal wetlands in Puerto Rico and the US Virgin Islands*. In: Kusler J.A. and M.E. Kentula (eds.) *Wetland Creation and Restoration: The Status of Science, Vol. I: Regional Reviews*. Washington: Island Press.
- MoE (Minister of Environment). (1997). *National Strategy for Mangrove Management in Indonesia*. Volume 2 (mangrove in Indonesia current status). Jakarta: Office of the Minister of Environment, Departement of Forestry, Indonesian Institute of Science, Department of Home Affairs and The Mangrove Foundation.
- Noor, Y.R., Khazali, M., Suryadiputra, I.N.N. (2006). *Panduan Pengenalan Mangrove di Indonesia*. Wetlands International, Indonesia Programme, Jakarta.
- Nybakken, J.W. (1993). *Marine Biology, An Ecological Approach*. 3rd edition. New York: Harper Collins College Publishers.
- Odum, E.P., (1971). *Fundamental of Ecology*. 3rd ed. Philadelphia: W.B. Saunders Co.
- Odum, E.P. (1993). *Dasar-Dasar Ekologi*. Edisi 3. Penerjemah T. Samingan. Gadjah Mada Press. Yogyakarta.
- Primavera, J.H. (1993). *A critical review of shrimp pond culture in the Philippines*. reviews in fisheries. *Science* 1(2): 151-201

- Sasaki, Y. and H. Sunarto. (1994). *Mangrove forest of Segara Anakan lagoon*. In Takashima, F. and Soewardi, K. (eds.) Ecological Assessment for Management Planning of Segara Anakan Lagoon, Cilacap, Central Java. Tokyo: NODAI Center for International Program, Tokyo University of Agriculture and JSPS-DGHE Program.
- Soerianegara, I. (1972). *Ekologi Hutan Indonesia*. Bogor: Departemen Management Hutan Fakultas Kehutanan IPB.
- Steenis, C.G.G.J. van. (1958). *Ecology of mangroves*. In: Flora Malesiana. Djakarta: Noordhoff-Kollf.
- Sukardjo, S., (1985). *Laguna dan vegetasi mangrove*. Oseana 10 (4): 128-137.
- Walsh, G.E. (1974). Mangroves: A review. In Reinhold, R. J. and W.H. Quee (ed.). Ecology of Halophytes. New York:Academic Press.
- Walters, B.B. (2008). Ethnobiology, socioeconomics and management of mangrove forests: A review. Aquatic Botany, 89, 220–236.