



# Dominance and Zoning Pattern of Mangrove in West Pentadu Tomini Bay Gorontalo

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**Abstract:** The purpose of this study is to discover the composition, dominance index value, and zoning pattern of mangrove plant in Pentadu Barat Village, Tilamuta Subdistrict, Boalemo Regency. This study was conducted from January to March 2023. The sampling method is purposive sampling using 10 × 10 cm linear transect for tree, 5 × 5 cm linear transect for saplings, and 2.5 × 2.5 cm linear transect for seedlings. The mangrove sample is descriptively and quantitatively analysed by identifying the species to calculate the type compositions and dominance index using Microsoft Excel. The result of the study reveals 12 species of 4 families from 3 study location (*Avicennia alba*, *Avicennia officinalis*, *Bruguiera cylindrical*, *Bruguiera gymnorrhiza*, *Bruguiera parviflora*, *Ceriops decandra*, *Ceriops tagal*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Rhizophora stylosa*, *Sonneratia alba* and *Xylocarpus granatum*). The type composition value was 35% from *Rhizophora mucronata*. The average dominance index value was 0.0174. The zoning pattern was mixed because it grows mixed with each other among several species.

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## 1. Introduction

Mangrove comes from the word “mangue” (Portuguese) which means plant, with “grove” (English) which means thicket. The life of the mangrove ecosystem is greatly influenced by tidal conditions. Mangroves have many benefits in human life, both direct and indirect. As a regulator of environmental balance and climate balance (Saputra et al., 2019). Ecologically, mangroves play a very important role in maintaining the sustainability and balance of coastal and coastal ecosystems (Baderan, 2019). The socio-economic aspects of the

mangrove ecosystem can be developed into a tourist attraction that has a direct impact on the lives of people in coastal areas (Wakano et al., 2022).

Mangrove ecosystems can be studied from various variables such as area, density, thickness, dominance and others. In particular, the dominance aspect describes the visual appearance of tree size. Of course, this correlates with species diversity and the production (body weight) of aquatic biota that live at the bottom of the mangrove tree (Wahyu et al., 2021). Apart from that, mangrove ecosystem is an ecosystem species that can form zones along the coast. Zoning influenced by tides is an ecological phenomenon in coastal waters. In tropical and subtropical coastal areas, this influence causes the development of distinctive communities that thrive along coastlines, such as lagoons, swamps, deltas and river estuaries. Mangrove species differ from each other based on zoning in natural mangrove ecosystems due to the different physiological characteristics of mangroves. This is what allows them to adapt to their environment (Bachri & Abdullah, 2020).

Gorontalo Province has a large mangrove area, namely 9,294.00 Ha (Moha et al., 2022), including Pentadu Barat Village which is a coastal area in Tilamuta District, Boalemo Regency. This makes the mangrove ecosystem in Pentadu Barat Village, Tilamuta District, Boalemo Regency, have unique ecosystem characteristics because it is located in the waters of Tomini Bay. However, currently there is only a few information regarding the mangrove ecosystem in this area. Therefore, research was carried out on dominance and zoning patterns in Pentadu Barat Village, Tomini Bay, Gorontalo in order to see zoning patterns and identify dominant species based on the direction of mangrove growth. It is hoped that the benefits of this research will be more accurate database information regarding the existence of mangroves so that it can be used as a basis for making policies on the sustainable use of mangrove ecosystems.

## 2. Materials and Methods

This research was conducted for 3 months (January–March 2023). The location in this research was in Hamlet 2, Pentadu Barat Village, Tilamuta District, Boalemo Regency, Gorontalo Province. Calculation of the quantitative value of vegetation parameters, especially in determining the important value index by referring to Bengen (Gazali & Marlian, 2021).

$$K_i = p_i \times 100\% \quad (1)$$

In this case,  $K_i$  is the species composition,  $p_i$  is  $n_i/N$ ,  $n_i$  represents the individual numbers of the species- $i$ ,  $N$  represents the total number of individuals of all species.

Index of dominance is a parameter that states the category of centralized dominance (control) of a species in a community. The Simpson index is used to calculate dominance between mangrove species (Sipahelut et al., 2019).

$$D = \sum_{i=1}^s (p_i)^2 \quad (2)$$

This equation describes that  $D$  is index of dominance,  $p_i$  is  $n_i/N$ ,  $n_i$  represents the individual numbers of the species- $i$ , dan  $N$  represents the total number of individuals of all species. The

dominance value is classified as low dominance when  $0 < D \leq 0.5$ , is classified as fair dominance when  $0,5 < D \leq 0,75$ , and is classified as high dominance when  $0,75 < D \leq 1$ .

To determine the zoning pattern at the research location, each route was analyzed because the location of each route was placed from furthest from the sea to closest to the sea so that there were differences in salinity (Irpan et al., 2017), then implemented descriptively. Observation transect lines are installed perpendicular to the shoreline towards land or vice versa to observe mangrove growth (Bachri & Abdullah, 2020).

### 3. Results

Based on the identification of mangrove species in Pentadu Barat Village, 4 families of 12 species were found that grow naturally at all research stations (Figure 1). The results of research in Pentadu Barat Village show that the highest percentage of mangrove species at stations 1, 2 and 3 are the Rhizophoraceae family. If analyzed as a whole, the highest species composition is *Rhizophora mucronata* at 35.1%.

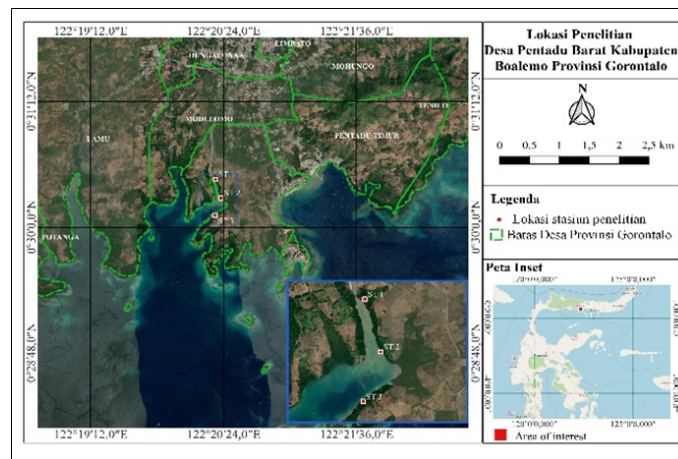


Figure 1. Map of Observation Locations

Analysis of the dominance index values for each mangrove species at stations 1, 2 and 3 has varying values. The average dominance index value is 0.0174 with the most common species found being *Rhizophora mucronate* (Figure 2).

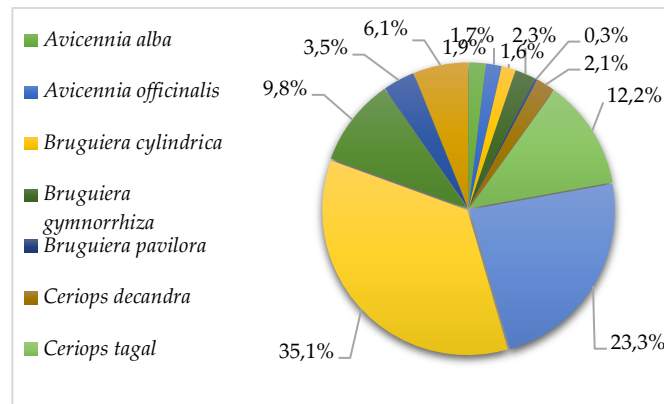
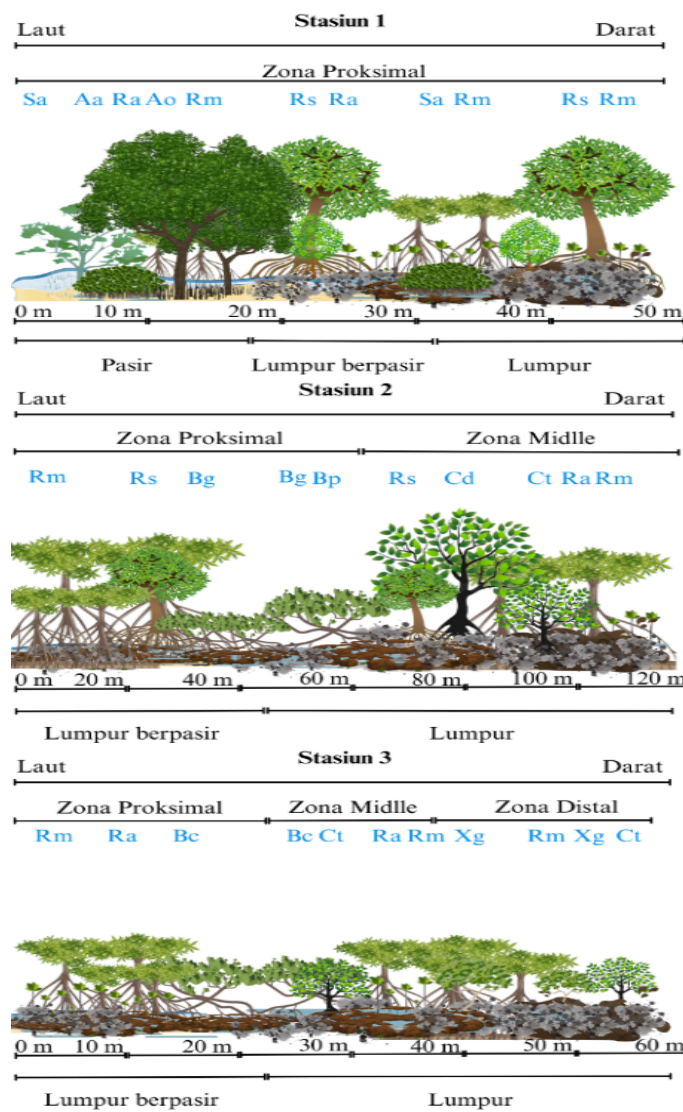


Figure 2. Mangrove Species Composition Diagram.

The research results show that the mangrove zoning in Pentadu Barat Village is classified as mixed at each research station (Figure 3). This is influenced by sea tides; this influence causes the development of certain species in a coastal area. On the shoreline of Station 1, the species *Avicennia alba* was found compared to Station 2 and Station 3. This is because *Avicennia alba*, *Sonneratia alba* and *Rhizophora* sp. are major mangroves that are on the front line of the coast and form a zone (Ashari et al., 2019).

Based on research conducted in Pentadu Barat Village, in the proximal zone, 8 mangrove species were found, namely *Rhizophora mucronata*, *Rhizophora apiculata*, *Rhizophora stylosa*, *Avicennia alba*, *Avicennia officinalis*, *Sonneratia alba*, *Bruguiera gymnorrhiza*, *Bruguiera cylindrical*. Then in the middle zone, 10 mangrove species were found, namely *Bruguiera cylindrica*, *Bruguiera gymnorrhiza*, *Bruguiera parviflora*, *Ceriops decandra*, *Ceriops tagal*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Rhizophora stylosa*, *Sonneratia alba* dan *Xylocarpus granatum*.



**Figure 3.** Mangrove Species Composition Diagram

#### 4. Discussion

There are more mangrove species found in Pentadu Barat Village comparing to the research of Faqih et al. (2020) in the Langala Coast, Dulupi District, Boalemo Regency, where only 5 species were found. Meanwhile, the lowest species composition value was found in the *Bruguiera parviflora* mangrove species, namely 0.3% and was only found at station 2 (Figure 2). This research is similar to Pratama and Sari (2022) who found that the highest species composition was the *Rhizophora mucronata* species.

*Rhizophora mucronata* was found at all stations because this species has the ability to adapt to salinity and tides (Noor et al., 2012). This is in line with the opinion of Asman et al. (2020) which states that in general *Rhizophora* sp. can grow well in muddy soil to muddy sand. This refers to the dominance index criteria where, if the dominance index value for mangrove species in an area is  $0 < D \leq 0.5$ , it is classified as low dominance (Sipahelut et al., 2019).

This research is almost similar to Nasution et al. (2017) who also found 12 species in Bengkalis, Riau Province. However, this is different from research by Rahmandika (2017) which stated that there are 2 species of mangrove species found in the proximal zone, in Tambakrejo Village, Sumbermanjing Wetan District, Malang Regency, East Java, namely *Rhizophora apiculata* and *Sonneratia alba*. Similarly, Mughofar et al. (2018) who only found the species *Rhizophora apiculata*, *Rhizophora mucronata* and *Sonneratia alba*.

The results of this this research are also almost similar to research by Lewerissa and Latumahina (2018), in Ihamahu State Waters on Saparua Island, which only found 8 mangrove species in the middle zone. Likewise, in Mughofar et al. (2018), who only found 9 species in their research at Cengkong Karangandu Beach, Trenggalek Regency, East Java.

#### 5. Conclusions

Based on research conducted in Pentadu Barat Village, Tilamuta District, Boalemo Regency, 12 species from 4 mangrove families were found at 3 station locations with varying species composition at each station. *Rhizophora mucronata* is a mangrove species that dominates at all stations. The mangrove zoning pattern in Pentadu Barat Village is classified as mixed.

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