

STUDY OF MANGROVE VEGETATION COMMUNITY AT BUNAKEN NATIONAL PARK AREA, TELING VILLAGE

Febiola Gabriela Tular¹, Helen J. Lawalata², Marthy L. S. Taulu³

¹Biology Departement, Faculty of Matehematics and Natural Science, Universitas Negeri Manado, Indonesia.

*Corresponding author: febiola.tr@gmail.com

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Abstract

Mangrove vegetation generally grows to form a zoning starting from a beach to a view of meters inland. Mangrove zoning consists of *Avicennia* plant species that face directly toward the sea and behind or on the edge of the *Avicennia* plant. There is the *Riophora* plant. Towards the mainland, there are *Bruguiera* plants and, finally, the *Ceriops* plant which grows and interacts with small bushes. Each type of Mangrove plant has a level; the first is the seedling level, the second is the sapling level, the third is the pole level, and the fourth is the tree level. This study aims to analyze the Mangrove Vegetation Community in Bunaken Nation Park, Teling Village, using a descriptive survey method and constructing three transects, which are transected measuring 10×10 m², 5×5 m², and 2×2 m². The result on each transect shows that in Bunaken National Park, Teling Village, there were types of Mangrove Vegetation Communities, namely *Avicennia* plant species with a total of 129, *Rhizophora* plant species with a capacity of 122 and *Bruguiera* plant species with a total of 91, where each plant type it has levels with different numbers.

Keywords: *Community, Mangrove, Vegetation*

INTRODUCTION

Mangroves are a group of plants consisting of various plant tribes that have morphology and psychology of the habitat and are found along the coast or around river mouths that are affected by tides. They are inundated at high tide and free without water during high tide. Mangrove vegetation includes trees and shrubs consisting of approximately twelve genera of flowering plants in 8 different families. The most important or dominant are *Bruguiera*, *Rhizophora*, and *Avicennia*. Mangroves have several unique forms that allow mangroves that live in shallow marine waters, namely short roots, spreading widely with supporting roots or root caps that grow from stems or branches (Nybakken, 1988). Mangroves interaction are scattered throughout the tropical and subtropical coasts. Mangroves can grow only on beaches protected from wave movement if the coast is different. Otherwise, the seeds cannot grow properly and drop their roots. These beaches are located immediately along the windward side of the island, on a series of islands, or an island or land mass behind a sheltered offshore reef. Mangroves develop well in tropical estuaries and are scattered in various regions.

Areas facing directly are inhabited mainly by *Avicennia* species, which interact with *Sonneratia*. *Avicennia* can live in muddy areas with low oxygen levels. This is because *Avicennia* has a breath root that can adapt by taking oxygen from the air. Behind the periphery of *Avicennia* is the *Rhizophora* zone, which one inhabits more. Next to the mainland is the *Bruguiera* zone.

According to Bagen (2001), the distribution and zoning of mangrove vegetation depend on various environmental factors. In general, the mangrove forest area is divided into four main zones, namely: Zone *Avicennia-Sonneratia*, which is the zone that is the outermost and closest to the sea, on the thickest expanse of land, and in the mud. Form by the plant species *Avicennia spp.* and *Sonneratia spp.* Zone *Rhizophora*, namely the zone that is in the middle arexa. Form by the plant species *Rhizophora spp.*, and occasionally *Bruguiera spp.*, and *Xylocarpus spp.* Zone *Bruguiera* is a zone that is slightly inundated at high tide. Formed by the plant species *Bruguiera spp.*, and sometimes also found by *Xylocarpus spp.*, *Kandelia spp.*, and *Aegiceras spp.* Zone *Ceriops*, which is the zone closer to dry land or terrestrial. *Ceriops spp.* and *Nypa Frutican*.

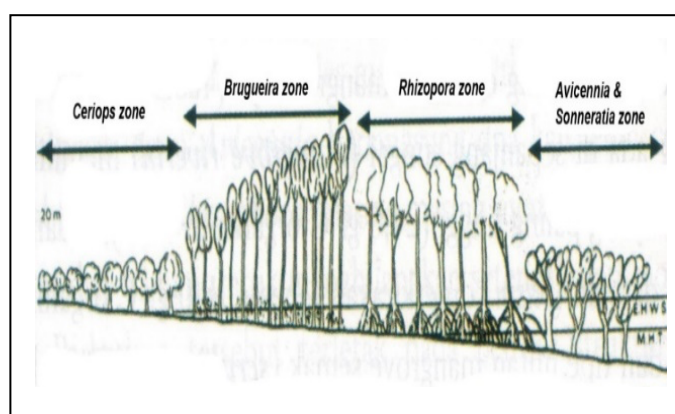


Figure 1. Mangrove zoning pattern (Meadows & Campbell, 2003)

This research aimed to analyze the mangrove vegetation community in Bunaken National Park, Teling Village.

RESEARCH METHODS

Time and Place of Research

The research was conducted on August 2021 at Bunaken National Park, Teling Village.

Materials and Tools of Research

Materials and research materials used in this study are maps, secondary data, and primary data from field survey results. The maps used are Peta Rupa Bumi Indonesia (RBI) Lembar Tanawangko with a scale of 1: 50.000 in 1991 dan Peta Taman Nasional Bunaken Bagian Selatan with a scale of 1: 100.000 in 2004. Secondary data were obtained from related agencies, namely Bunaken National Park Agency, The Provincial and District/ City Forestry Services, and The Meteorology and Geophysics Agency of North Sulawesi Province.

The other materials are an MPIX brand photo camera with 8 Mega Pixel resolution and 3× optical

zoom; a measuring device (hour meters to determine when sampling in the field; an identification reference book, used Guide of Introduction to Mangrove in Indonesia, Noor et al., 1991). Writing tools and label paper to write all the data in the field, stakes, and ropes for making transect line and observation plots (blocks), GPS (Global Positioning System) type Garmin III+ to determine the location of station coordinate points and sampling points, cutting tool (cutter) to cut the rope (P. B. Tomlinson 1994).

2.3 Research Procedure

There are several stages in taking transect data, namely, pulling the tape measure seaward with the initial position marked (stakes or tree painting) and determining blocks (sample plots/measure plots) to the left and right of the transect line in the form of a square (Figure 2); 10 × 10m for observation of tree phases; 5 × 5m for observation of the sapling phase; 2 × 2m for observation of seedling phase.

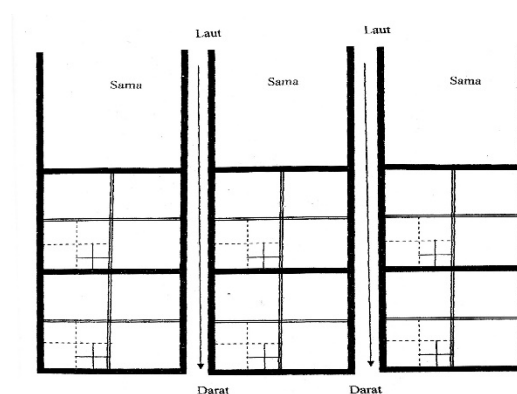


Figure 2. Transect Sample Plots

Descriptions:

- = Transects size 20 × 20 m to measure tree level
- ===== = Transects size 10 × 10 m to measure pole level
- = Transects size 5 × 5 m to measure stake level
- = Transects size 2 × 2 m to measure seedling level

The data that has been collected and identified is immediately recorded in the observation table or tabulation.

Data Analysis

The data that has been tabulated is then analyzed using the vegetation analysis method to obtain the structure and composition of the mangrove vegetation. The analytical method uses the formula Indriyanto (2006); *Density* is the number of individuals of a species in a particular area. Relative density is the percentage of the number of individuals of a species to the number of individuals in the same area.

RESULTS AND DISCUSSION

The observation was carried out on several transects. The transects are the front, middle, and back transect with dimensions of 10×10 m², 5×5 m², and 2×2 m².

Total type of mangrove species

Observation shows that there were one hundred and twenty-nine (129) *Avicennia*, one hundred and twenty-two (122) *Rhizophora* plant species, and ninety-one (91) *Bruguiera* plant species in Bunaken National Park, Teling Village.

Observation of each type of plant showed that there were four types of mangrove levels in each transect. The type of mangrove stages is seedling level, sapling level, pole level, and tree level. Moreover, the most plant species were found at the seedling level with hundred and thirty-seven (137) species, followed by eighty-nine (89) species at the sapling stage, eighty-one (81) species at the pool level, and forty-two species at the pole level. (Figure 3.)

Number of Mangrove Levels found

Number of mangrove levels on the front transect. Number of mangroves at the tree level; observation research showed that the number of mangroves at the tree level found on the front transect with a size of 10×10 m² was nine trees, a size of 5×5 m² was three trees, and a size of 2×2 m² was zero trees. Number of mangroves at the pole level; observation level results showed that the number of mangroves on tree level found on the front transect with a size of 10×10 m² was fourteen trees, a size of 5×5 m² was nine trees, and a size of 2×2 m² was four trees. Number of mangroves at sapling level; observation result shows that the number of mangroves found on a front transect with 10×10 m² was nineteen trees, 5×5 m² was eleven trees, and a size of 2×2 m² was fourteen trees. Number of mangroves at the seedling level; observation level results showed that the number of mangroves on tree level found on the front transect with a size of 10×10 m² was forty trees, 5×5 m² was fourteen trees and a size of 2×2 m² was five trees. (Figure 4.)

Number of mangrove levels on the middle transect. Number of mangroves at the tree level; observation research showed that the number of mangroves at the tree level found on the middle transect with a size of 10×10 m² was ten trees, a size of 5×5 m² was three trees, and a size of 2×2 m² was one tree. Number of mangroves at the pole level; observation level results showed that the number of mangroves on tree level found on the middle transect with a size of 10×10 m² was ten trees, a size of 5×5 m² was three trees, and a size of 2×2 m² was one tree. Number of mangroves at sapling level; observation result shows that the number of mangroves found on a middle transect with 10×10 m² was twenty-two trees, 5×5 m² was twelve trees, and a size of 2×2 m² was one tree. Number of mangroves at the seedling level; observation level results showed that the number of mangroves on tree level found on the middle transect with a size of 10×10 m² was thirty-one trees, 5×5 m² was eighteen trees, and a size of 2×2 m² was three trees. (Figure 5.)

Number of mangrove levels on the back transect. Number of mangroves at the tree level; observation research showed that the number of mangroves at the tree level found on the back transect with a size of 10×10 m² was eight trees, a size of 5×5 m² was five trees, and a size of 2×2 m² was three trees. Number of mangroves at the pole level; observation level results showed that the number of

mangroves on tree level found on the back transect with a size of 10×10 m² twelve ten trees, a size of 5×5 m² was five trees and a size of 2×2 m² was one tree. Number of mangroves at sapling level; observation result shows that the number of mangroves found on a back transect with 10×10 m² was nine trees, 5×5 m² was ten trees, and a size of 2×2 m² was zero trees. Number of mangroves at the seedling level; observation level results showed that the number of mangroves on tree level found on the back transect with a size of 10×10 m² was thirty fifteen trees, 5×5 m² was eleven trees and a size of 2×2 m² was five trees. (Figure 6.)

Vegetation types mangrove plants on the front. The observation showed that the number of mangrove species on the front transect with a size of 10×10 m² with the most plant species was *Avecannia* with thirty species, followed by *Rhizophora* with twenty species and *Bruguiera* with twenty-four species (Figure 7.). The observation showed that the number of mangrove species on the front transect with a size of 5×5 m² with the most plant species was *Avecannia* with eighteen species, followed by *Rhizophora* with twelve species and *Bruguiera* with twenty-seven species. (Figure 8.) The observation showed that the number of mangrove species on the front transect with a size of 2×2 m² with the most plant species was *Avecannia* with seven species, followed by *Rhizophora* with two species, and *Bruguiera* with zero species. (Figure 9.)

Vegetation types mangrove plants on the middle transect. The observation showed that the number of mangrove species on the middle transect with a size of 10×10 m² with the most plant species was *Avecannia* with forty species, followed by *Rhizophora* with thirty-four species and *Bruguiera* with seven four species. The observation showed that the number of mangrove species on the front transect with a size of 2×2 m² with the most plant species was *Avecannia* with six species, followed by *Rhizophora* with two species, and *Bruguiera* with zero species. (Figure 10.)

Vegetation types mangrove plants on the back transect. The observation showed that the number of mangrove species on the back transect with a size of 10×10 m² with the most plant species was *Avecannia* with thirty species, followed by *Rhizophora* with nine species and *Bruguiera* with five four species. (Figure 11.) The observation showed that the number of mangrove species on the back transect with a size of 5×5 m² with the most plant species was *Avecannia* with twenty species, followed by *Rhizophora* with six species and *Bruguiera* with five species. (Figure 12.) The observation showed that the number of mangrove species on the back transect with a size of 2×2 m² with the most plant species was *Avecannia* with six species, followed by *Rhizophora* with three species, and *Bruguiera* with zero species. (Figure 13.)

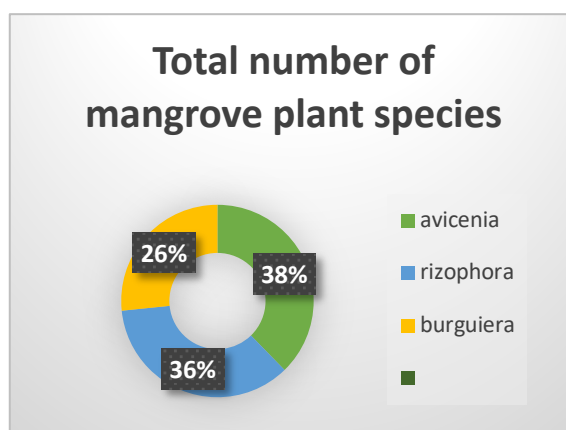


Figure 3. Percentage diagram for the total number of mangrove plant species in each transect based on research.

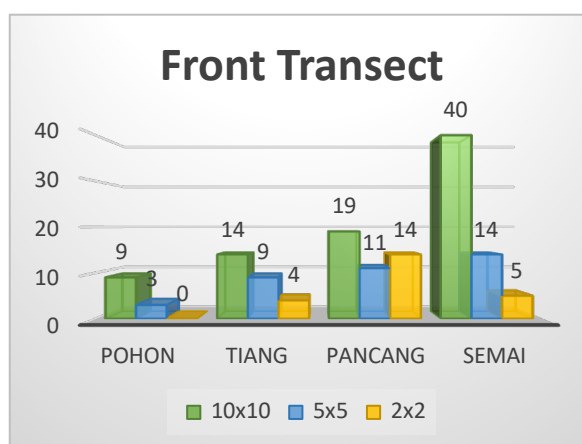


Figure 4. Diagram of the number of mangrove levels on the front transect based on research.

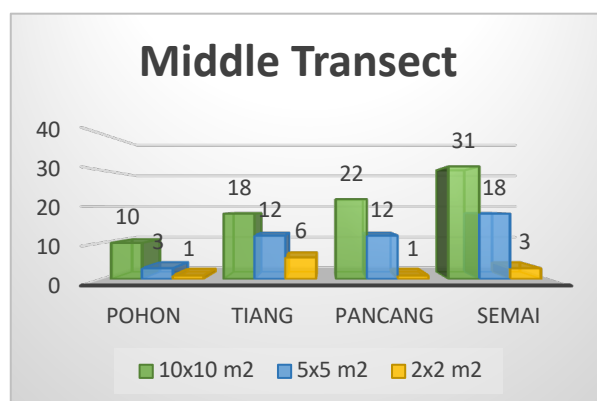


Figure 5. Diagram of the number of mangrove levels on the middle transect based on research.

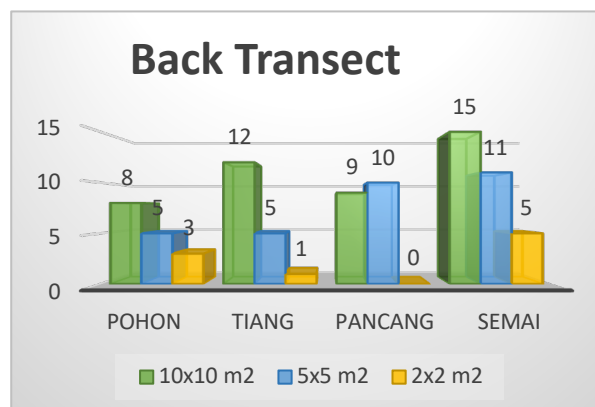


Figure 6. Diagram of the number of mangrove levels on the back transect based on research.

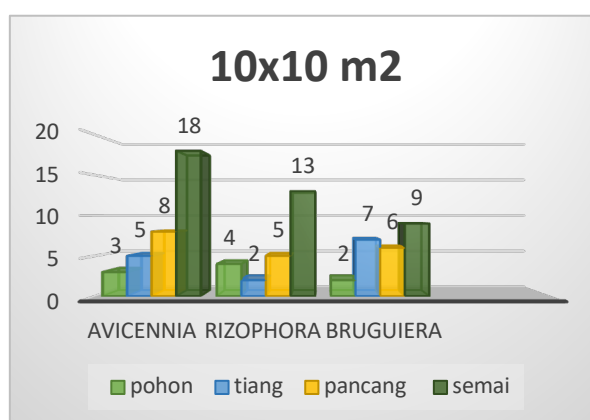


Figure 7. Diagram of the amount of mangrove vegetation with size 10×10 m2 on the front transect.

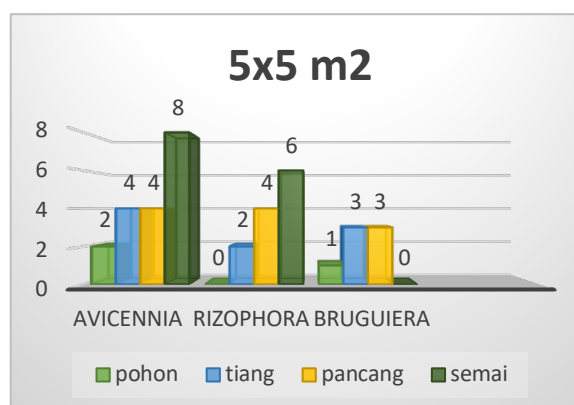


Figure 8. Diagram of the amount of mangrove vegetation with size 5×5 m2 on the front transect.

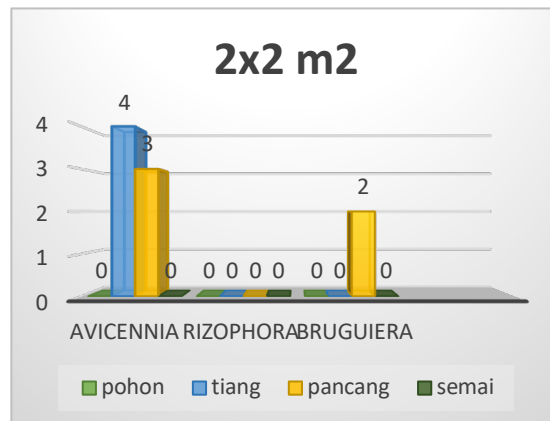


Figure 9. Diagram of the amount of mangrove vegetation with size 2×2 m2 on the front transect.

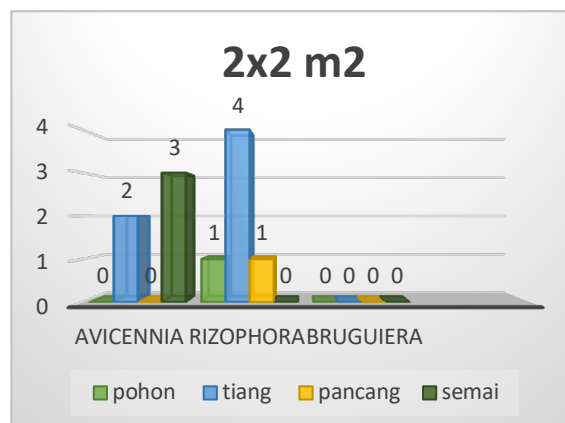


Figure 10. Diagram of the amount of mangrove vegetation with size 2×2 m2 on the middle transect.

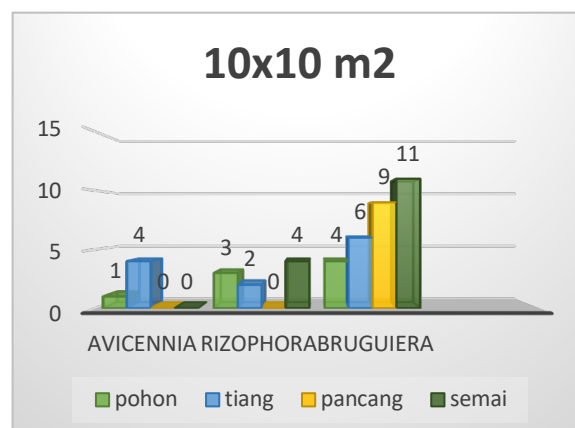


Figure 11. Diagram of the amount of mangrove vegetation with size 10×10 m2 on the back transect.

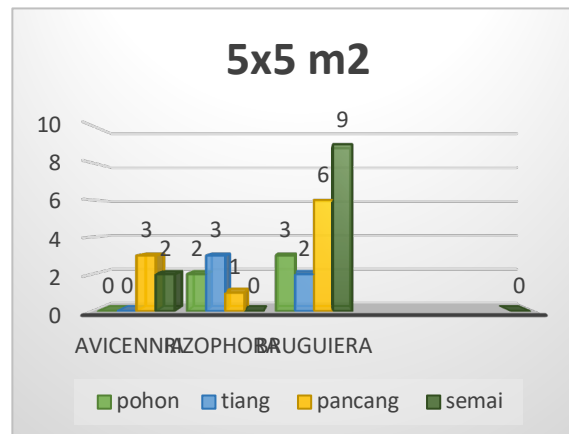


Figure 12. Diagram of the amount of mangrove vegetation with size 5×5 m2 on the back transect.

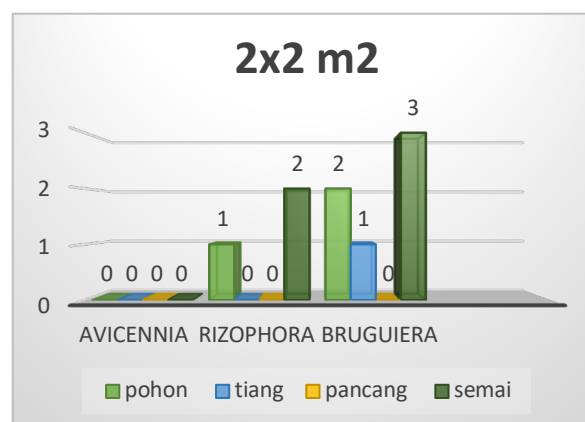


Figure 13. Diagram of the amount of mangrove vegetation with size 2×2 m2 on the back transect.

CONCLUSION

In Bunaken National Park, Teling Village, there are three types of mangrove vegetation consisting of *Avicennia*, with a total of fifty-nine species on the front transect, fifty-seven on the middle transect, and ten species on the back transect. *Rhizophora* with a total of thirty-six on the front transect, sixty-eight on the middle transect, eighteen species on the back transect, and *Bruguiera* with a total of thirty-three species on the front transect, nine species on the middle transect and thirty-one species on the back transect. Each type of mangrove plant has a level consisting of seedling, sapling, pole, and tree levels. Each level on each transect was found, totaling; There were forty-nine seedlings on the front transect, forty-nine trees on the middle transect, and thirty-one trees on the back transect. Forty-four saplings were on the front transect; nineteen trees were on the middle transect. With thirty-three trees for *Avicennia*, twenty-six for *Rhizophora*, and thirty for *Bruguiera*. There are twenty-seven pole levels on the front transects and eighteen trees on the back transect, with thirty-two trees for *Avicennia*, twenty-six for *Rhizophora*, and twenty-three for *Bruguiera*. The tree level on the front transect is twelve trees, on the middle transect is fourteen trees and on the back transect is sixteen transects with twelve trees for *Avicennia*, seventeen for *Rhizophora*, and thirteen for *Bruguiera*.

REFERENCE

- Bengen, D. G. 2001. Pedoman Teknis Pengenalan dan Pengelolaan Ekosistem Mangrove. Pusat Kajian Sumberdaya Pesisir dan Lautan. IPB. Bogor.
- Ginantara, I. K., A. A. K. Darmadi., I. B. M. Suaskara., & I. K. Muksin. 2018. Keanekaragaman jenis mangrove pesisir Lembongan dalam menunjang kegiatan wisata mangrove tour. Jurnal Prosiding Seminar Nasional Pendidikan Biologi.
- Indriyanto. 2006. Ekologi Hutan. PT Bumi Aksara Jakarta.
- Meadows and Campbell. 2008. *dalam Dahuri*. Pola Zonasi Mangrove.
- Noor, Y. R., Kazali. M., Suryadiputra, INN. 1999. Panduan Pengenalan Mangrove di Indonesia. Wetland International Indonesia Programme.
- Suprayogo, H., D. K. Hairiah, N. Wijayanto, Sunaryo., & Noordwijk, M. 2003. Peran Agroforestri pada Skala Plot: *Analisis Komponen Agroforestri Sebagai Kunci Keberhasilan atau Kegagalan Pemanfaatan Lahan*. Bogor: Word Agroforetri Center (ICRAF).
- Noor, Rursila Yus dkk. 2006. Panduan Pengenalan Mangrove di Indonesia. Bogor.
- Nybakken, J. W. 1998. Biologi Laut: Suatu Pendekatan Ekologis. Alih bahasa oleh H. Mohammad Eidman *et al.* Penerbit PT Gramedia. Jakarta.