



Mangrove Health Condition Status Based on Canopy Cover in Coastal Ecotourism Areas in Kersik Village, Kutai Kartanegara Regency and Mangrove Ecotourism in Kampung Baru, Penajam Paser Utara Regency

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Abstract. Mangroves are plants that can live in areas that have salinity and are influenced by tides. Kersik Village and Kampung Baru are areas that have mangrove ecosystems in them. One of the parameters is knowing the health condition of the mangrove ecosystem by analyzing the mangrove canopy cover. This research was conducted using the Hemispherical Photography method and analyzed using ImageJ Software. From the results of the study found 10 types of mangroves at the research station in Kersik Village including *Rhizophora mucronata*, *Rhizophora apiculata*, *Avicennia alba*, *Avicennia marina*, *Sonneratia alba*, *Ceriop tagal*, *Acrostichum speciosum*, *Lumnitzera littorea*, *Lumnitzera racemose*, and *Aegiceras floridum*. Then in the Kampung Baru, 9 of the same species were found except for the mangrove species. While the percentage value obtained in Kersik Village is 71.04% with good criteria (medium) and in Kampung Baru 74.28% with good criteria (medium).

Keywords: Kersik Village · Kampung Baru · Mangrove Canopy

1 Introduction

Kersik Village and Kampung Baru are one of the areas that have ecotourism in East Kalimantan. Where Kersik Village has coastal ecotourism and Kampung Baru has mangrove ecotourism. In addition, at both locations there is also a mangrove ecosystem in it. Mangrove itself is a plant that is grouped into tree and shrub species consisting of 8 families of 12 genera of flowering plants such as *Avicennia*, *Sonneratia*, *Rhizophora*, *Bruguiera*, *Ceriops*, *Xylocarpus*, *Lumnitzera*, *Laguncularia*, *Aegiceras*, *Aegiatilis*, *Snaeda*, and *Conocarpus* [1]. According to Irwanto (2006) concluded that of the many types of mangroves in Indonesia, the types of mangroves that are often encountered are the api-api (*Avicennia* sp.), mangrove (*Rhizophora* sp.), tancang (*Bruguiera* sp.), and bogem or pedada (*Sonneratia* sp.) [2].

Noor et al. (2006) said that the current condition of mangrove forests in Indonesia is continuously experiencing very high damage so that it affects the area of mangrove

land [3]. One of the parameters to determine the health condition of mangroves is to analyze the cover in the mangrove canopy. Analysis of mangrove canopy cover can be done using the Hemispherical Photography method. The Hemispherical Photography method has the advantage that it can see the condition of the mangroves directly at the research location and does not take much time.

2 Methods

2.1 Research Location

The study was conducted in August-September 2021 in Kersik Village, Marangkayu District, Kutai Kartanegara Regency (Fig. 1) and Kampung Baru, Penajam District, North Penajam Paser Regency (Fig. 2).

2.2 Research Procedures

1. Field observations to determine the conditions around the research location.
2. Determination of the research station is done by Random Sampling method. The distance between stations is approximately 300 m with plot repetition 3 times at each research station.
3. The size of the plot at each research station is 10×10 m and identification is carried out in it.
4. The data retrieval stage is carried out using the Hemispherical Photography method and the pictures are taken using a mobile front camera with a resolution above 3 megapixels. Image analysis was performed using ImageJ Software and the data was processed using Microsoft Excel.

2.3 Data Analysis

Mangrove canopy cover data were analyzed using the following formula:



Fig. 1. KersikVillage Research Map

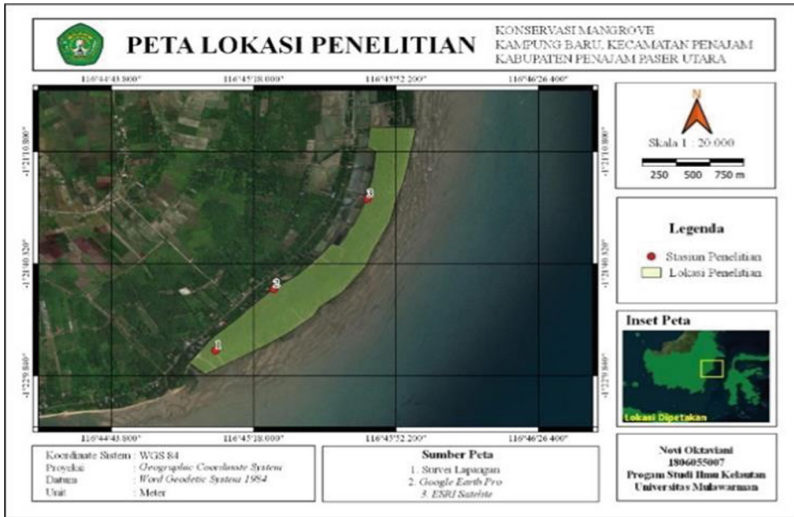


Fig. 2. Kampung Baru Village Research Map

Table 1. Criteria for Mangrove Cover

Kriteria		Penutupan (%)
Baik	Padat	>75%
	Sedang	50–75%
Rusak	Jarang	<50%

$\% \text{ cover} = P255 / \sum P \times 100\%$ Where:

$\% \text{ cover}$ = Percentage of mangrove cover.

P225 = Number of pixels of mangrove canopy cover. P = Total number of pixels.

Calculation of the percentage of mangrove canopy cover using Microsoft Excel. The results obtained, an assessment of the criteria based on the Decree of the Minister of the Environment No. 201 of 2004 which are categorized into 3, namely (Table 1):

3 Result and Discussion

3.1 Results and Discussion-1 Mangrove Composition Structure

Kersik village and Kampung Baru are ecotourism areas that are quite well known among the surrounding community. Kersik village itself has coastal ecotourism and Kampung Baru has mangrove ecotourism. In addition to ecotourism, there is also a mangrove ecosystem in it. The expansion of ecotourism, aquaculture and settlements can damage and affect the composition and health of mangroves in each of these areas. It is known that at the research station in Kersik Village, there are 10 types of mangroves including *Rhizophora mucronata*, *Rhizophora apiculata*, *Avicennia alba*, *Avicennia marina*,

Sonneratia alba, *Ceriop tagal*, *Acrostichum speciosum*, *Lumnitzera littorea*, *Lumnitzera racemosa*, and *Aegiceras floridum*. Meanwhile, in Kampung Baru, 9 species of mangrove were found in the same research station except for *Aegiceras floridum*. To find out what types of mangroves are found at each research station, see Table 2.

In Table 2, it is known that the mangrove species *Rhizophora mucronata*, *Rhizophora apiculata* and *Avicennia alba* are mangrove species that are often found at the two research stations. According to Halidah (2004) these mangroves are classified as major mangrove species. Then the type of mangrove *Rhizophora sp.* is a type of mangrove that is very easy to adapt to its environment [4]. Meanwhile, *Avicennia sp.* According to Susanto et al. (2013) is a type of mangrove that has the ability to tolerate salinity compared to other types of mangroves [5]. To find out the most common adult stands found at the study site, it can be seen in Fig. 3.

In the picture above, it can be seen in Kersik Village that the most mature mangrove stands were *Rhizophora apiculata* with 39 stands, *Rhizophora mucronata* 27 stands and *Acrostichum speciosum* 25 stands. Then in Kampung Baru, the most mature stands were *Rhizophora apiculata* 71 stands, *Rhizophora mucronata* 60 stands and *Sonneratia alba* 18 stands. Mangrove area which is usually dominated by *Avicennia sp.* and *Rhizophora sp.* usually has a muddy substrate type and if dominated by *Sonneratia sp.*, usually has a sandy substrate [3].

Substrate is one of the factors that support the growth of mangrove species because it contains nutrients in it. In addition, there are also other factors that can affect the growth of mangroves in Kersik and Kampung Baru villages, namely anthropogenic factors. It is known that in the villages of Kersik and Kampung Baru, there is a fairly large aquaculture area. The use of mangrove land for settlements, ponds and ecotourism can affect the composition of the mangroves in it. Excessive use of mangrove land is caused by the absence of laws that protect mangrove ecosystems. Ritohardoyo and Galuh (2011)

Table 2. Types of Mangroves Found at Research Stations

NO	Species	Kersik (Marangkayu)			Kampung Baru (Penajam)		
		1	2	3	1	2	3
1	<i>Rhizophora mucronata</i>	+	+	+	+	+	+
2	<i>Rhizophora apiculata</i>	+	+	+	+	+	+
3	<i>Avicennia alba</i>	+	+	+	+	+	+
4	<i>Avicennia marina</i>	+	+	+	—	+	+
5	<i>Sonneratia alba</i>	—	+	+	+	+	+
6	<i>Ceriop tagal</i>	—	+	+	+	+	+
7	<i>Acrostichum speciosum</i>	+	+	+	—	+	+
8	<i>Lumnitzera littorea</i>	+	+	+	—	+	+
9	<i>Lumnitzera racemosa</i>	—	—	+	—	+	—
10	<i>Aegiceras floridum</i>	—	—	+	—	—	—

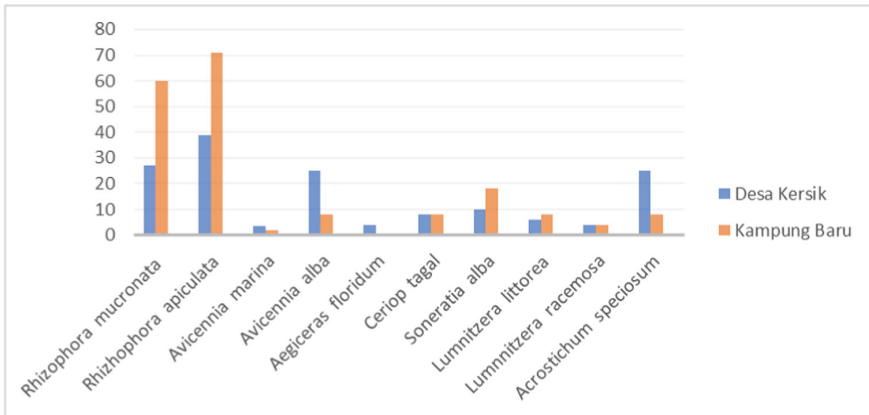


Fig. 3. Grafik Jumlah Tegakan Mangrove

suggest that ownership of small agricultural land is one of the driving factors for people to convert mangrove areas into residential, cultivation and agricultural areas [6].

3.2 Results and Discussion -2 Mangrove Canopy Cover

At the location of the research conducted in the villages of Kersik and Kampung Baru, the percentage value of mangrove cover was found as follows (Table 3).

It is known that Kersik Village has a mangrove canopy cover percentage value of 71.04% with good (medium) criteria. Then in Kampung Baru, the percentage value of mangrove canopy cover is 74.28% with good (medium) criteria. In both research locations, the highest percentage of canopy values was found in Kampung Baru. This is caused by the presence of the *Rhizophora* mangrove species, which are more abundant in every research station in Kampung Baru. *Rhizophora* itself is a type of mangrove that has a canopy with a Conical Crown shape (cone) so that its growth is very tight. In addition, the leaves on the *Rhizophora* species have a wide shape so that the mature mangrove species have a perfect canopy cover.

Tomlinson (1994), said that the formation of the mangrove canopy is usually influenced by environmental factors such as damage to mangroves due to ocean waves and

Table 3. Percentage Value of Mangrove Cover

No	Lokasi	Stasiun	%Tutupan	Kriteria	Rata-rata
1	Kersik Village	1	68,23%	Good(medium) Good (medium) Good (medium)	71,04%
		2	71,00%		
		3	73,45%		
2	Kampung Baru	1	75,85%	Good (solid) Good (solid) Good (medium)	74,28%
		2	76,24%		
		3	70,74%		

sunlight. In addition, the type of mangrove is also one of the factors that affect the percentage of canopy cover. This can be seen at the research station in Kersik Village. It is known, at the research station in Kersik Village, there are quite a lot of *Acrostichum speciosum* mangrove species. *Acrostichum speciosum* or often called the mangrove fern is a type of mangrove that has a height of 1.5 m and is usually often found in mangrove swamps. According to Setyawan et al. (2005), the species *Acrostichum speciosum* belongs to the minor mangrove group with a very wide distribution [7]. This type of mangrove is not classified as a stand type, so it is very difficult to take the canopy cover. In addition, in Kersik Village there is also a type of *Avicennia* which is quite a lot found at the research station. In the *Avicenniaceae* species itself has a spread canopy cover, so that in adult stands there is a distance between trees which causes the canopy cover to be smaller. According to Supriharyono (2009), the mangrove canopy itself has a function as a place to live for land animals [8]. The mangrove canopy also has a function to regulate the intensity of sunlight entering the waters.

4 Conclusions

1. 10 species of mangroves were found at the research station in Kersik Village, including *Rhizophora mucronata*, *Rhizophora apiculata*, *Avicennia alba*, *Avicennia marina*, *Sonneratia alba*, *Ceriop tagal*, *Acrostichum speciosum*, *Lumnitzera littorea*, *Lumnitzera racemose*, and *Aegiceras floridum*. Meanwhile, in Kampung Baru, there are 9 similar types of mangroves except *Aegiceras floridum*.
2. In both research locations, it was known that the mangrove species *Rhizophora mucronata*, *Rhizophora apiculata*, and *Acrostichum speciosum* were mangrove species that were often found at the research station.
3. It is known that the health condition of the mangroves in Kersik Village based on its canopy cover has good criteria (medium) with a percentage value of 71.04% and in Kampung Baru it has a percentage value of 74.28% with moderate good criteria.

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