

ANALYSIS OF MANGROVE DAMAGE AND DIVERSITY IN THE MANGROVE FOREST AREA OF TANJUNG SOLOK VILLAGE, KUALA JAMBI SUB-DISTRICT

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Abstract. Mangrove forests are tropical coastal vegetation communities consisting of several species that are able to grow and develop in muddy tidal areas. Coastal areas have a variety of community activities in utilizing coastal natural resources in the economic sector. Social condition factors and lack of understanding of the functions and benefits of mangroves also affect the damage to mangrove ecosystems. This directly causes ecological impacts that threaten the sustainability of mangrove forests. The purpose of this study was to analyze the damage and diversity of mangroves in the mangrove ecosystem area of Tanjung Solok Village. This research method uses indepth interview techniques, and observation in the field with data collection including documentation and sample identification. The results showed that the damage to mangrove ecosystems in Tanjung Solok Village, Kuala Jambi District was categorized as low or damaged, because the results obtained tree density <1000 trees/ha. This is caused by activity factors and lack of knowledge of the surrounding community. As well as the level of diversity (H') obtained in Tanjung Solok Village, Kuala Jambi District, obtained a value of 2.033. This shows that the level of diversity of mangrove vegetation in Tanjung Solok Village, Kuala Jambi Subdistrict is in the medium category.

Key words: *Mangrove diversity, coastal ecosystems, mangrove malfunction*

INTRODUCTION

Mangrove forests are on muddy coastal tidal areas. Mangrove forests grow adjacent to land at the highest tidal range, so this ecosystem is a transitional area influenced by the existence of land and sea factors [1]. Mangrove ecosystems are dominated by various types of mangrove trees that can grow and develop in muddy tidal areas. Mangrove ecosystems are physical transformations of living and non-living things that will not be damaged again if not disturbed by natural and human factors [2].

Indonesia's mangrove species diversity is the highest in the world, recording at least 40 of the world's 50 major mangrove species in Indonesia. These species include *Avicennia marina*, *A. officinalis*, *Bruguiera cylindrical*, *B. gymnorrhiza*, *B. parviflora*, *Ceriops decandra*, *C. tagal*, *Rhizophara apiculata*, *R. stylosa*, *Sonneratia alba*, *S. caseolaris*. Indonesia's minor mangrove species diversity is also quite high, including *Acrostichum aureum*, *A. speciosum*, *Aegiceras corniculatum*, *A. floridum*, *Excoecaria*

agallocha, *Heritiera littoralis*, *Osbornia octodonta*, *Pemphis acidula*, *Planchonella obovata*, *Scyphiphora hydrophyllacea* [3].

Mangroves have various important functions and roles, such as physical functions to maintain stable coastal conditions, protect the shoreline, prevent abrasion and seawater intrusion, and as a trap for pollutants. The biological function of mangroves is as a food provider, feeding ground, nursery ground, and spawning ground for both organisms living in mangrove ecosystems and surrounding waters, especially fish [1].

In general, damage to mangrove ecosystems is often caused by human activities due to unsustainable utilization of natural resources in coastal areas, such as pollution, conversion of mangrove forests that pay little attention to environmental factors, excessive logging, pollution such as oil and heavy metal pollution, land conversion for aquaculture (ponds), agriculture (rice fields and plantations), industrial salt production and settlement [2].

Social conditions and a lack of understanding of the functions and benefits of mangroves also affect the damage to mangrove ecosystems. This directly causes ecological impacts that threaten the sustainability of various coastal biota that make mangrove forests as habitat [4], therefore, protection of mangrove forest areas needs to be continuously improved so that the existence and sustainability of mangrove forests as protected areas are maintained [5]. This is considered necessary for further research and observation, to determine the damage to mangrove forests and the factors that cause mangrove forest damage and determine the level of mangrove diversity in mangrove forest areas.

MATERIALS AND METHODS

Time and place

This research was conducted in the Mangrove Forest Area of Tanjung Solok Village, Kuala Jambi Subdistrict, East Tanjung Jabung Regency, Jambi Province, which was carried out in December 2023. The research location map is shown in Figure 1.

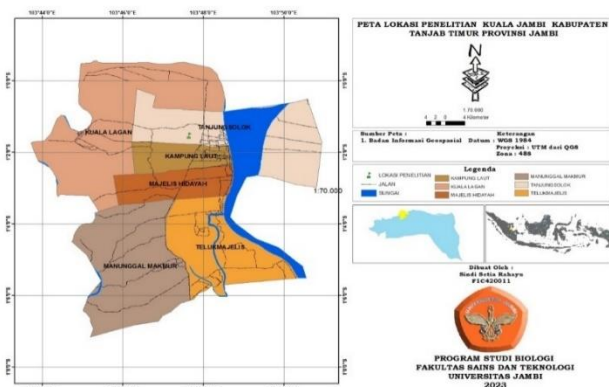


Figure 1: Map of the Research Location

Methods

This research uses descriptive methods with qualitative and quantitative approaches, where this research seeks to explore and get a complete picture of an event or is intended to expose and identify a phenomenon that occurs based on the experience of the informant [6]. Data collection techniques using in-depth interviews, and data collection by observation in the field with data collection including documentation and sample identification. This research uses two types of data, namely primary and secondary data. Primary data was

obtained by conducting field observations either from physical observations or interviews with several resource persons related to the development of management and utilization of coastal areas at this time, while secondary data was obtained by conducting institutional surveys to support this research related to coastal and coastal management.

Data Analysis

Community perception. The data obtained were analyzed descriptively, using interview techniques obtained by asking questions orally by researchers and answered orally by informants. By using the interview technique, a direct impression of the respondent is obtained and the truth said by the respondent is assessed [7]. Selection of informants/respondents in this study is by Snowball sampling technique.

Mangrove vegetation. Data collection of mangrove vegetation by direct survey in the field with the method of plotted lines (Purposive systematic sampling), namely by making a transect line along 100 M with a width of 10 M and then make a plot size of 10 x 10 m (for trees > 10 cm in diameter), 5 x 5 m (for saplings, woody vegetation with a diameter of 2.5 cm to ≤ 10 cm) and 1 x 1 m (for seedlings ≤ 2.5 cm in diameter with a height of ≤ 1.5 m), [4].

According to Boon and Tideman (1950 cited by Trisno et al., 2019) that for forests that have an area of 1,000 ha or more the sampling intensity used should be 2%. The area of Tanjung Solok Village is 3,756 ha so it uses a sampling intensity of 2%. Determination of the number of quadrat plots is based on Odum's formula (1998 cited by Trisno et al., 2019) [8] with the following formula:

$$n = \frac{IS \times N}{Lpc}$$

Description:

n = Number of sample plots

IS = Sampling intensity

N = Total area of the study area (ha)

Lpc = sample plot area (10x10 = 100 m² / 0.01 ha)

The composition of vegetation types and structures is carried out by analyzing parameters that refer to (Akram and Hasnidar, 2022) [4], namely:

- a. The density of a species (K)

$$K = \frac{\text{number of individuals of a species}}{\text{sample plot area}}$$

- b. Relative density (KR)

$$KR = \frac{\text{density of a species}}{\text{density of all species}} \times 100\%$$

- c. Frequency (F)

$$F = \frac{\text{number of plots found of a species}}{\text{number of all plots}}$$

- d. Relative frequency (FR)

$$FR = \frac{\text{frequency of a species}}{\text{frequency of all species}} \times 100\%$$

- e. Dominance (D)

$$D = \frac{\text{basal area of a species}}{\text{area of sample plots}}$$

- f. Dominansi relative (DR)

$$DR = \frac{\text{Dominance of a species}}{\text{Dominance of all species}}$$

- g. Important value index (INP)

$$INP = KR + FR + DR$$

Species diversity (H'). Species diversity can be used to state the community structure of high species diversity indicates that a community has high complexity because the interaction of species that occur in the community is very high. To estimate the diversity of species used Shannon index analysis or Shannon Wiener (1988) [9]:

$$H' = -\sum P_i \ln P_i$$

Description:

H' = diversity index

P_i = Proportion of important value of the i-th species

Ln = Natural logarithm

According to Fachrul (2007) [10], the amount of species diversity index according to Shannon-Wiener is defined as follows:

H' < 1 = Indicates a low level of species diversity

1 ≤ H' ≤ 3 = Indicates a moderate level of species diversity

H' > 3 = Indicates a high level of species diversity

Mangrove Damage Level. The method used to calculate the level of mangrove damage is guided by the decision of the Minister of Environment No. 201 of 2004 concerning standard criteria and guidelines for

determining mangrove damage with criteria (Table 1). The standard criteria, calculated using the following formula:

- a. Closure is the ratio between the area of closure of species I (C_i) and the total area of closure of all species (ΣC)

$$RC_i = \left(\frac{C_i}{\sum C} \right) \times 100$$

$$C_i = \frac{\sum BA}{A}$$

$$BA = \frac{\mu DBH^2}{4}$$

Description:

RC_i = Closure (%)

A = Total area of sampling area (Sample)

BA = Basal area

μ = 3.1416 (constant)

DBH² = CBH/μ (Circumference of tree at breast height)

- b. Tree density is the ratio between the number of stands of type I (n_i) and the total number of all species stands (Σn)

$$R_{di} = (n_i / (\sum n)) \times 100$$

Description:

R_{di} = tree density/ha

N_i = Number of stands of type I

Σn = Total number of all types

RESULTS AND DISCUSSION

Mangrove Damage Level

Based on the results of direct observations in the field and interviews with the surrounding community, mangrove forest damage is mostly due to the conversion of forests into plantations. Some local people also take wood for building materials.

Closure is the ratio between the total area of all species closure area (ΣC), while tree density is the ratio between the number of stands of type I (n_i) and the total number of all species stands (Σn). Based on the research data, the value of mangrove species closure can be seen in table 1, where it is said that the mangrove species that has the highest closure value is *Nypa fruticans* by 25.858% and the lowest closure value is the type of *Hibiscus tiliaceus* by 0.003%. As for the value of tree density, the type of mangrove that has the greatest value is *Sonneratia alba* with a

percentage value of 21.795%, while the lowest type is *Sonneratia ovata* with a density percentage value of 1.282%.

Based on the results of mangrove closure values and mangrove tree density, it can be concluded that the criteria for mangrove forests in Tanjung Solok village are included in the category of rare or damaged. This is based on the 2004 ministerial decision on the standard criteria for the level of damage to mangrove forest ecosystems, namely if the tree density <1000 trees / ha then the level of mangrove damage in the study area is included in a rare or damaged condition. According to Refli et al., (2023) , the results of research research obtained are the percent cover (%) of

mangroves amounting to 14.008% and included in the criteria damaged or rare.

Based on the above data, the occurrence of damage to the research location is caused by changes in ecological conditions in the mangrove forest area caused by several activities of the surrounding community. In the study to analyze the damage was done at 2 stations where both have damage criteria, namely at the location of mangrove forests converted into community plantations and mangrove forest locations adjacent to settlements, the location of the settlement was chosen because the location was found a lot of garbage can be seen in (Figure 2).

Table 1. Result Value of Mangrove Cover and Density in Tanjung Solok Village, Kuala jambi sub-district.

No			RCi%	Rdi %
1	<i>Sonneratia alba</i> J.E. Smith	17	1,043	21,795
2	<i>Nypa fruticans</i> Wurmb.	16	25,858	20,513
3	<i>Acrostichum aureum</i> Linn.	13	-	16,667
4	<i>Acanthus ilicifolius</i> L.	11	-	14,103
5	<i>Avicennia alba</i> BI.	6	3,271	7,692
6	<i>Excoearia agallocha</i> L.	5	0,250	6,410
7	<i>Bruguiera gymnorhiza</i> (L.) Lamk.	4	0,272	5,128
8	<i>Bruguiera cylindrica</i> (L.) BI.	3	0,706	3,846
9	<i>Sonneratia ovata</i> Back.	2	0,029	2,564
10	<i>Hibiscus tiliaceus</i> L.	1	0,003	1,282
		78	100	100

CONCLUSION

Making bioethanol from jackfruit seeds is carried out with the help of microorganism *Saccharomyces cerevisiae* under conditions. The highest bioethanol content was achieved in 4 days with an alcohol content of 13.19%, is because in these conditions microorganisms work perfectly where the growth rate reaches maximum, so the bioethanol produced is higher.

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