Vol. 7 No. 1 September 2023
ISSN : 2597-8713 (ONLINE)
ISSN : 2598-5167 (PRINT)
Agricultural Science
AGRICULTURAL SCIENCE
Journal Of Agricultural Science And Agriculture Engineering
Faculty of Agriculture, Merdeka University Surabaya,Indonesia
Available on :
https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

The Role of Mangroves In Mitigation of Ecosystem Degradation Threats In Gunung Anyar city of Surabaya

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Article History: Received: June 30, 2023; Accepted: September 22, 2023

ABSTRACT

The coast of Surabaya City is dominated by mangrove forest ecosystems. The mangrove forest experiences a lot of shrinkage every year. The shrinkage that occurs in mangrove forests is not only caused by natural factors (abrasion and wind) but also due to logging activities by local communities. The degradation that occurs in mangrove forests is largely influenced by waves and tides. The existence of mangrove forests is thought to be very important for reducing the threat of degradation and can play a role in mitigating damage to existing ecosystems. The function of mangrove forests in mitigating the threat of degradation has encouraged a deeper study of mangrove forests which are thought to have a physical function as a barrier to ecosystem damage. The method used is a survey method with sampling using a transect line technique. The data collection technique in the field uses a transect line technique whose placement has been designed. The research results showed that three types were found, namely Avicennia marina, Rhizophora Apiculata, Ceriops candra. The tree level is calculated by the cover and density values (trees/ha) to determine the standard criteria for determining mangrove forest damage. The cover level is very high with a final value of 99.61%. The results of the calculation of the density value (trees/ha) are above>150. amounting to 14,866.67, this shows that the density of trees in the Gunung Anyar mangrove forest is very high. Based on data from analysis of the Gunung Anyar mangrove forest, in general it has the ability to minimize degradation.

Keywords: Degradation, mitigation, mangroves, density, closure.

1. INTRODUCTION

Surabaya City has coastal areas which are dominated by forest ecosystems mangroves. According to (Khairuddin & Syukur, 2018) the condition of the mangrove forest experiences a lot of shrinkage every year. The shrinkage that occurs in mangrove forests is not only caused by natural factors (abrasion and wind) but also due to logging activities by humans who are in the area. Of around mangroves. Area Utilization According to Roslindaet al. (2020) deforestation that occurred on Mount Anyar Tambak was caused by coastal erosion, sea water intrusion, and tidal waves. According to Wahyuningsihetal. (2018) The area of the Gunung Anyar mangrove forest is currently estimated at 10 hectares. According to Strauchetal. (2012) andFatoyinbo etal. (2008) mangroves are vegetation composed of shrubs and trees that are salt tolerant and live in tidal zones in coastal areas, both tropical and subtropical. According to (Konom 2019), mangrove forests are able to minimize degradation caused by nature. Damage to mangrove forests will reduce their physical function as a buffer for sea water and tidal waves in

DOI : https://doi.org/10.55173/agriscience.v7i1.127

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coastal areas and residential areas (Hartati anDhrudu 2016). Mangroves play a very important role in life and are able to maintain environmental quality, protect erosion, protect beaches, reduce wind and wave speed and protect against coastal degradation.

According to Schaduw (2012), mitigation is an effort or action to reduce threats that is carried out before a disaster occurs. Mitigation is an effort made to reduce the risk or threat of damage through various efforts. Mitigation on the coast is an action to prevent coastal degradation so that the condition of the ecosystem on land is protected from erosion factors.

Mardikaningsihet al. (2016) mitigation is defined as a series of efforts to reduce the risk of disasters. Mitigation management can be done through a physical development system or through a system of community awareness and improvement in overcoming degradation. Mitigation on coasts is carried out because coasts have a high chance of degradation, so efforts are needed to ensure that the ecosystem is maintained. Mitigation on coasts is mostly carried out using mangrove forest ecosystems.

Degradation is an event of decreasing environmental quality both now and in the future (Insaniet al. 2020). The occurrence of degradation results in various environmental problems which must be addressed properly in the field. Degradation can also occur due to water erosion (erosive). According to Rusdiet al(2013) Erosive is defined as a degradation process that is directly related to the transfer of various substances or materials caused by water.

The factors that cause degradation are influenced by the quality of the environment, which includes ecological factors. According to Insaniet al. (2020) said that much degradation occurs due to community activities such as clearing land for settlements, for firewood, and for construction materials. Waves and tides are very frequent and dominant factors in reducing environmental quality, especially coastal areas (Herison 2014).

The aim of this research is to explain the function of mangrove forest cover and density as an obstacle to degradation. It is hoped that the benefits of the research results will be able to provide information about mangrove forests to the general public so that they can become a reference in managing mangrove forests to avoid the threat of degradation. The Gunung Anyar mangrove is located on Mount Anyar Tambak. The method used is a survey with sampling using a line transect technique. Methods for laying lines and transectspurposive by setting a path with specific characteristics that are suitable so that it is able to answer the existing purpose.

The new mountain is included in the mangrove forest bordering the coast. Draw a transect line from the sea towards the land for a length of 100 m. The 100 m withdrawal is due to the fact that the mangrove has a stretch of mud, so in reference to Minister of Environment Decree No.

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201 2004 it is stipulated that the withdrawal is 100 m towards land. The following is an example of research plot placement. Description:

2. RESEARCH METHODS

The research was carried out in the mangrove forest on Mount Anyar, Surabaya. The research was carried out from 19 August to 3 September 2023. The research object was forest vegetation.

Inventory

Each route has three research plot placements which generally measure 10 × 10 m at tree level. The size is 10 × 10 m, there are smaller plots for the sapling and seedling levels, each measuring 5 × 5 m and 1 × 1 m (Kusmanaet al. 2008). A 10 x 10 m plot was used for tree data collection (tree) with a stem diameter ≥4 cm. A 5x5 m plot is used for collecting seedling data (sapling) with a diameter of between 1-4cm (1cm≤ tree trunk diameter < 4 cm) and a height of > 1 m. In a plot measuring 1x1 m, it is used to collect seedling data with (seedling) with a height < 1 m (Rentaet al. 2016).

Diameter measurement as high as 1.3 m from the ground surface. Trees on sloping land, place a measuring tool or stick 1.3 m on the upper slope. On[8] trees with branches before the height is 1.3m, measure the two existing branches. For stems that have lumps or roots at a height of 1.3, measurements are taken after the lumps and roots are 0.5 m (Kurniawanet al)

a. closure

Rci =(Ci/∑C)×100 Ci = ∑BA/A

Note: BA= where, BA = $\pi DBH^2/4$ (in cm 2), π (3.1416) is a constant and DBH is the diameter of the tree trunk of type I, A is the total area of the sampling area (total area of the sample plot/plot). DBH=CBH/π (in cm), CBH is the tree ring at breast height.

4. Domination

a. Dominance of a type (D) (m2/Ha). D is only used for the tree category

$$D = \frac{\text{the basic area of a type}}{luaspetakcontoh}$$

b. Dominance relative (DR) (%). DR is only calculated for the tree category

al. 2014).

Data analysis

$$DR = \frac{\text{A Kind}}{D seluruh\ jenis} \times 100\%$$

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1. Density

a. specific density(K) (In/ha)

K=Σindividuasuatugenis

luaspetakconntoh

b. relative density of species(KR)(%)

5. Important Value Index (INP) INP=KR+FR DR(Tree)

INP=KR+FR (seedlings and stakes)

3. RESULTS AND DISCUSSION

KR=A Kind

*Kseluruh jenis*x100%

2. Frequency

Village Mendalok own an area as large as that which includes mangrove forests

a. Type Frequency(F)

F= Σ sub plot of plot is found to be a typeΣ *seluruh sub petak jenis*

b. Relative Frequency(FR)(%)

Tanjung Pagar. The mangrove forest has been designated as a conservation forest. Mangrove forest vegetation in coastal areas

FR=A Kind

*F seluruh jenis*x

3. Local Types and Names(Type and local name)

The number of individuals found was only three types. The small number of individuals found is due to The pilot placement is 100 m parallel to the coast. This decision refers to Minister of Environment Decree No. 201 of 2004

Figure 1. stem of marina,image, root of breath marinaand picturesand leaves and seeds of.marina.

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Decandra grows upright with many branches and has a reddish brown stem color and has nodules on the stem. The root system is in the form of buttresses which are able to support the stand strongly. The single leaf is shiny green, the leaf shape is elliptical and has a rounded leaf tip.

Data calculation results

The following are the results of calculating the level of seedlings, saplings and trees based on data collection in the field.

Table 1. Calculation of sapling and tree data

	IN	KJ	HRK(%)	FJ	FR%	INP
	(1)	(2)	(3)	(4)	(5)	(6)
Avicennia Marina	27	30000,00	62,7907	3	62,7907	125,5814
Rhizophora Apiculata	16	17777,78	37,2093	1,7778	37,2093	74,4186
Total	**43**	**47777,78**	**100**	**4,7778**	**100**	**200**

Based on the data obtained, two types of individuals were found. The most individuals found in this type A. marinawith a total of 27 individuals and typesR. apiculatatotaling 16 individuals. The highest specific density at.marina with a value of 30000.00 higher than the valueR. apiculatawith the amount 17777.78. Relative density is also dominated by typeA. marinawith a value of 62.7907 higher thanR. apiculatawith a value of 37.2093. Type frequency and relative frequency are dominated by type. marinawith value 3 and 62.7907, while atR. apiculata is as big as 1.7778 and 37.2093. In the INP calculation the highest seeding rate of the typeA. marinawith a total INP of 125.5814 while atR. apiculatahas an INP of 74.4186 which is smaller than the first type. At the seedling level it is dominated by typeA. marinabecause it has a greater number of typesR. apiculata.

The existence of seedlings in coastal areas is very important for the sustainability of mangrove vegetation. The seedlings will grow large so that they will become a good mangrove stand. A good mangrove stand will play a role in its physical function, namely being able to prevent or reduce degradation in coastal areas. Because the number of seedlings found was due to their low ability to regenerate. The low regeneration capacity at the seedling level is caused by various factors such as the presence of rubbish cover which results in death and reducing the number of stands at the seedling level.

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Table 2.Pile Level Calculation Results(Stake Level Calculation Results) Type

	NI	KJ	KR(%)	FJ	FR%	INP
	(1)	(2)	(3)	(4)	(5)	(6)
Avicennia marina	81	3600,00	83,5052	9	83,5052	167,0103
Rhizopora apiculata	16	711,11	16,4948	1,7778	16,4948	32,9897
Total	**97**	**4311,11**	**100**	**10,7778**	**100**	**200**

Information: (NI) number, (KJ) type density, (KR%) relative density, (FJ) type frequency, (FR%) relative frequency and important value index (INP).

The results of data analysis in the field at sapling level found 97 individuals consisting ofA. marinatotaling 81 andR. apiculata16 individuals. Calculation of the specific density of the type of pile levelA. marinahas a value of 3600.00 higher than the typeR. apiculatawhich has a value of 711.11. Relative density atA. marinawith a value of 83.5052 higher thanR. apiculatawhich has a value of 16.4948. Type frequency and relative frequencyA. marinanamely 9 and 83.5052 meaning higher thanR. apiculatawith values of 1.7778 and 16.4948. INP on typeA. marinaamounted to 167.0103, while atR. apiculataas much as 32.9897.

At the level of saplings found there were also a small number overall. In total, only 97 individuals were found so their physical function was also very low. The function of the stake is very small in the process of reducing the rate of degradation, but it is able to associate with the tree level to reduce degradation. The physical function of the stake level is very low to reduce degradation, but it functions a lot as a shelter for small animals such as ceramics (Uca sp), and mangrove snails (Cerithidea djadjariensis) as a place of refuge. The low physical function of the stake level to reduce degradation is caused by the small number found in the observation area.

Table 3. Tree Level Calculation Results(Tree Level Calculation Results)

Type	IN	KJ	HR %	FJ	FR %	DIAMETER	LBD	DJ	DR %	INP
	1	2	3	4	5	6	7	8	9	10
A. marina	1.155	12.833,33	86,32	128,33	86,32	12.105,6	11.502.685,63	1.278.076.162,50	94,21	164,1418
R. apiculata	181	2.011,11	13,52	20,11	13,52	3.000,6	7.067.826,28	78.531.403,14	5,79	40,5346
C.decandra	2	22,22	0,14	0,22	0,14	48,4	1.838,91	20.432,33	0,00	95,3236
Total	1.338	14.866,67	100	148,66	100	15.154	122.096.519,82	1.356.627.997,97	100	300

Based on type data analysisA. marinahave a greater number of individuals of both types. TypeA. marinahas a number of individuals of 1,155 individuals while in speciesR. apiculatahas

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181 individuals. The smallest number of individuals in the speciesC. decandra with 2 individuals. Species density and relative density are dominated by species. marina with 12.833,33 and 86,32, atR. apiculatahas values of 2,011.11 and 13.52 higher thanC. decandra with values of 22.22 and 0.14. Calculation of type frequencies and relative frequencies inA. marinaof 128.33 and 86.32, onR. apiculatahas values of 20.11 and 86.32, while atC. decandra with values of 0.22 and 0.14. In the calculation of the largest basal area (LBD) of the typeA. marinawith a total of 115,026,854.63 from 1155 individuals found at tree level. On typeR. apiculatahas an LBD of 7,067,826.28 from 181 individuals. The smallest LBD is found inC. decandra namely 1,838.91 from the 2 individuals found.

Type dominance (DJ) and relative dominance (DR) typeA. marinawith values of 1,278,076,162.50 and 94.21.R. apiculatahas lower DJ and DR% values, namely 78531403.14 and 5.79 compared to the first type. DJ and DR% on typeC.decandra with values of 20,432.33 and 0.00. The highest INP calculation of the typeA. marinawith a total of 164.1418, while in type. apiculateThe INP value is 40.5346. The lowest INP value in this typeC. decandra amounting to 95.3236. The INP calculation results are lower than the INP value for the typeA. marina(265.95) from research results (Junaedi 2016). These differences are influenced by physical condition and growth factors.

Cover and Density (trees/ha)

Based on the calculation results for type closureA. marinahas a closing value of 52.27%. The closing value calculation is then added together with the closing value of other types. On type. apiculatethe closing value is 33.08% smaller than the valueA. marina.TypeC. decandra the closing value is 14.26% smaller than the other two types. Overall the cover value in the research plot in the Gunung Anyar mangrove has a value of 99.61%. The results of density data analysis (trees/ha) show a very high level of density at the tree level. The density value is 14,866.67 which consists of three types. Type A. marinahas a density level of 12,833.33 greater than typeR. apiculata2011.11, while in type C. decandra has a density value of 22.22. Based on the data obtained and referring to Minister of Environment Decree No. 201 of 2004, the Gunung Anyar mangrove forest has a very good function, this is in accordance with the results of calculations of mangrove density and cover. Coverage and high density are able to reduce the occurrence of degradation, especially in coastal areas of mangroves which directly border the coast. This ability is also driven by the conditions where the mangroves grow and the strength of the roots and their footprints. Based on the results of data analysis at tree level, it shows that the typeA. marinadominates the entire species. In kind likeR. apiculata dan C. decandra has a lower value

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than typeA. marina.The overall closure calculation results were 99.61%, consisting of three types. On type A. marinaamounting to 52.27%, the highest compared to other types. OnR. apiculataandC. decandra closing values amounted to 33.08% and 14.26%. Meanwhile, the calculation results for the overall density level amounted to 14,866.67. Based on Minister of Environment Decree No. 201 of 2004, this value is considered very solid because it exceeds the set standards. Standard cover level above >75 and density level (trees/ha) >1500. According to Salimetal. (2016) dense vegetation and major types can reduce the strength of tsunamis and reduce environmental quality degradation. Meanwhile, the calculation results for the overall density level amounted to 14,866.67. Based on Minister of Environment Decree No. 201 of 2004, this value is considered very solid because it exceeds the set standards. Standard cover level above >75 and density level (trees/ha) >1500. According to Salimetal. (2016) dense vegetation and major types can reduce the strength of tsunamis and reduce environmental quality degradation.

Based on the research results of Petra Et al (2012) shows that the density level above 1500 plays a significant role in reducing the current speed with a value of 0.142 m/at station 2, and the highest current speed at station 1 with a value of 0.240 which is caused by a density level below 1500. According to Purbani (2012), density and Tree diameter can reduce the rate of degradation caused by natural factors in the form of waves and tidal waters. Mangrove forests play a role in protecting land from abrasion, sea waves, sea breezes and preventing sedimentation (Turisno Ketat.2018). Touristican that.(2018) also stated that the density of vegetation types on coastal borders can control the movement of sand material due to current movements each season.

4. CONCLUSIONS

Based on the results of data analysis It was obtained regarding the function of closure and density of the Tanjung Pagar mangrove forest that the forest has a very good physical function to reduce degradation. This function originates from a very high level of density and closure based on Minister of Environment Decree No. 201 of 2004.

At the tree level, the cover and density values (trees/ha) are calculated to determine the level of cover and density (trees/ha). The cover level is very high with a value of >75%, amounting to 99.61%. Results of calculating the density value (trees/ha) above. >1500 is 14,866. This shows that the density of Gunung Anyar mangrove trees is very high so that it is able to minimize environmental degradation or decrease in environmental quality.

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Based on data and analysis, the Tanjung Pagar mangrove forest has a good function in minimizing degradation. It is hoped that this research will increase the knowledge of the community and have a high level of concern for the existence of mangrove forests. Good planting and management is highly expected so that the existing physical functions continue to function. properly and protect existing forests.

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