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THE CONNECTION BETWEEN CANOPY COVER AND WATER QUALITY IN THE COASTAL OF TABANIO VILLAGE OF TANAH LAUT REGENCY, SOUTH KALIMANTAN

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ABSTRACT
Canopy cover is one approach to measuring canopy density. The area of land is covered by the vertical projection of the plant canopy or tree canopy is known as canopy cover. A photography technique called hemispherical photography is used to photograph the topography of terrestrial forests or mangroves. Another way of taking pictures to measure tree canopy cover is closed photography, which does not use a fisheye lens and concentrates more on examining the characteristics of the canopy such as the area index of leaves. This study aims to determine the percentage of canopy cover using hemispherical photography methods, water quality, and the relationship between canopy cover and water quality in Tabanio Village. Methods in data analysis use Mueller-Dumbois and Ellenberg (1974), ImageJ, STORET, and PCA (Principal Component Analysis). The results of the study can be seen in the type of mangrove canopy cover criteria, which range from medium to very dense.

KEY WORDS
Canopy cover, ImageJ, water quality, mangrove.

Tabanio Village is located in Takisung District, South Kalimantan where factors such as wind, rain, and predation of litter by marine organisms have a significant impact on the condition of mangroves in Takisung District. Temperature with an average of 29.1 °C, salinity with an average of 11 ‰, and pH with an average of 6.1 the waters were measured and the type of substrate in the form of muddy sand, and the status of mangrove canopy cover was 70.75% (Dharmaji and Putri, 2019). A photographic technique called *hemispherical photography* allows users to visualize the extent of the forest canopy through photographs taken with a camera. This is a useful approach because it is easy to use, inexpensive, and accurate in finding. However, this method has several limitations, including not being able to cover large areas of mangroves and collecting them is time consuming. Therefore, a different approach is needed to replace it (Zahra *et al*., 2022) photographing the canopy vertically with a *fisheye lens* (180°) (Dharmawan, 2020).

There is still a paucity of mangrove data, including information on the relationship between canopy cover and water quality, which is also lacking and current. This information is needed to develop strategies for the management and utilization of mangrove forests in order to enjoy their functions and benefits in a sustainable manner. Mangrove ecosystem is one of the potential parameters to determine the presence of blue carbon stocks. The role of mangroves in blue carbon is emphasized as an effort to use CO_2 in the photosynthesis

process and store it in biomass and sediment for climate change mitigation (Tony, et al., 2022).

This causes this research to have objectives, namely, knowing the percentage of canopy cover using the *hemispherical photography method,* water quality, and the relationship between canopy cover with the mangrove *hemispherical photography method* and water quality in the coastal area of Tabanio Village, Tanah Laut Regency, South Kalimantan while for managing the utilization of coastal potential and empowering coastal village communities requires the government's role in supporting the development of business diversification (Hidayat AS, and Agusliani, E., 2020).

MATERIALS AND METHODS OF RESEARCH

Location The research was conducted in the mangrove ecosystem in the Coastal Village of Tabanio, Tanah Laut Regency, South Kalimantan. Based on the Geospatial Information Agency Regulation Number 3 of 2014 is each. transects were plotted with a size of 10 x 10 m (tree category) diameter >10 cm, 5 x 5 m (sapling category) stem diameter 2 ≤ DBH (*Diameter at Breast Height)* < 10 cm, and 1 x 1 m (sapling category) diameter < 2 cm height < 2 m. Taking *hemispherical photography,* or taking photos vertically and perpendicular to the sky, with a height of 1/3 of the community's typical canopy height. Camera locations are set at chest height in adults in stands higher than 4 meters (1.3 m). Shooting is carried out at a third of the height or lower than 1.3 meters in a mangrove ecosystem with a height of less than 4 meters.

Water quality measurements were carried out 3 repetitions at each station where plot 1 was carried out in the morning, plot 2 was carried out during the day and plot 3 was carried out during the day at the three research stations.

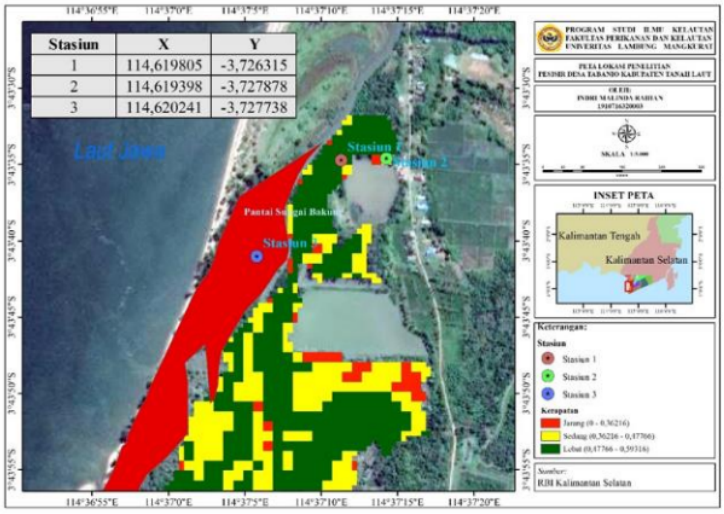

Figure 1 – Research Location Map

Analyzing the percentage of canopy cover in the field for inclusion in rectification data is important for delineating thematic canopy density maps. *ImageJ* is a program that is often used to check hemisphere images (LIPI, 2020). The following procedure was followed for *hemispherical photographic analysis:*

- Upload field finding images to the *ImageJ program*;
- Under the menu *Image – Type* - 8-bit, change the image to 8-bit;
- To differentiate the canopy from the sky, use the menu option *Image – Adjust – Threshold*;

- Adjust the canopy value bar to ensure no canopy cover is missing; doing so will impact the outcome. Select *Apply* once the value is set;
- Select *the value* 255 with the number of canopy calculations and the number of *count calculations,* which are then determined using *Microsoft Excel,* from the *Analyze* – Histogram – *List menu*;
- Next, use the formula to determine the canopy percentage.

ImageJ software will be used to progressively evaluate camera shots (img) in the field (one by one). It aims to obtain the results of binary image analysis from the software pixel value separation procedure (Dharmawan and Pramudji, 2014) using the following formula:

$$\%\ \text{tutupan}\ (cover)\text{mangrove} = \frac{\text{P255}}{\sum P} \times 100\%$$

Where: % mangrove *cover* = mangrove canopy cover (%); P255 = Number of *pixels* with a value of 255 as an interpretation of mangrove canopy cover; ΣP = Number of all *pixels*.

The idea behind this analysis is to distinguish between the pixel colors of the mangrove vegetation and the sky (white and black). Then there are the standard results of damage to mangrove forests based on the Minister of Environment Regulation No. 201 of 2004.

Table 1 – Standard Standard for Damage to Mangrove Forests Based on Minister of Environment Decree No. 201 of 2004

Criteria		Closing	Density (Trees/ha)
Good	Very solid	≥75	>1500
	Currently	≥50 - <75	>1000 - <1500
Damaged	Seldom	<50	<1000

Source: Minister of Environment No. 201 of 2004.

Water quality analysis is carried out to determine the suitability of water for a particular designation by comparing it with water quality standards according to water class. Based on the Government Regulation of the Republic of Indonesia Number 22 of 2021 concerning the implementation of environmental protection and management, namely the temperature parameter (° C) in mangroves is 28 – 32 ° C. The pH parameter in mangroves is 7 – 8.5. the salinity parameter (° / ₀₀) in mangroves is up to 34 / ₀₀. the DO parameter (mg/L) in mangroves is >5 mg/L. The procedure for determining water quality status uses the STORET method according to KEMENLH No. 115 of 2003 are as follows:

- Collect data on water quality and discharge periodically to form data from time to time (*time series data)*;
- Comparing the measurement data for each water parameter with the quality standard values according to the water class;
- Measurements that meet the water quality standard values (measurement results ≤ quality standards) are given a score of 0;
- Measurements that do not meet the water quality standard values (measurement results > quality standards), are given a score;
- The negative number of all parameters is calculated and the quality status is determined from the total score obtained using a scoring system.

According to Lewerissa *et al (*2018) that gravel with a grain size of 4 mm and fine sand with a grain size of 0.25 mm dominate the type of substrate based on the mangrove *Avicennia alba* species. Silt substrate (mud) with a grain size of 0.063 mm, fine sand substrate with a grain size of 0.25 mm, and granule substrate with a grain size of 4 mm are the majority of the substrate for *Rhizophora mucronata.* According to Masruroh and Insafitri (2020) Sand, muddy sand, and sandy silt are different types of substrate found in *Avicennia marina.*

A statistical technique called *Principal Component Analysis (PCA) can be used* to divide a large number of original variables into smaller groups of orthogonal variables while maintaining the overall variation of the original variables. main character:

- The resulting principal components are independent of each other and orthogonal to each other (meaning that the coefficients are orthogonal and the component scores are uncorrelated);
- A fraction of the original variable's variability accumulates in the last principal component, whereas the majority of the variance tends to converge in the first principal component.

The principal component analysis equation is:

$$PC_1 = a_{11}X_1 + a_{21}X_2 + \cdots + a_{p1}X_p + \varepsilon_i$$
$$PC_2 = a_{12}X_1 + a_{22}X_2 + \cdots + a_{p2}X_p + \varepsilon_i$$
$$PC_k = a_{12}X_1 + a_{22}X_2 + \cdots + a_{pk}X_p + \varepsilon_i$$

Correlation matrix and covariance matrix are two types of matrices used in PCA. It's better to use a covariance matrix if all the unit variables are the same. Use a correlation matrix if the variable has multiple units (eliminates the unit effect). The following formula is used in the correlation matrix:

$$\mathrm{M} = \frac{\mathrm{N}}{Ni}$$

Where: M = Average; N = Number of data; ni = Lots of data.

$$\mathrm{s} = \sqrt{\frac{\sum(X - \bar{X})^2}{n - 1}}$$

Where: S = Standard deviation; X = Each population data value; $\bar{X}$ = Average population data; N = Total number of data population.

The correlation between mangrove canopy cover data and water quality measurements will be used to analyze the data which is then presented in the form of tables and graphs. Using PCA to assess mangrove canopy cover data and water quality parameters, it was found that canopy cover depended on the type of mangrove that was still alive and was associated with water quality measures.

RESULTS AND DISCUSSION

A photographic technique called *hemispherical photography* allows users to visualize the extent of the forest canopy through photographs taken with a camera. This is a useful approach because it is easy to use, inexpensive, and accurate in finding. However, this method has several limitations, including not being able to cover large areas of mangroves and collecting them is time consuming. Therefore, a different approach is needed to replace it (Zahra *et al*., 2022) photographing the canopy vertically with a *fisheye lens* (180°) (Dharmawan, 2020).

Table 2 – Percentage of canopy cover using the *hemispherical photography method*

STATION	AVERAGE COVERAGE(%)	CRITERIA
1,1	86,81	Very solid
1,2	88,859	Very solid
1,3	72,837	Currently
2,1	60,747	Currently
2,2	63,128	Currently
2,3	63,512	Currently
3,1	69,588	Currently
3,2	74,832	Currently
3,3	66,17	Currently

Source: Primary Data, 2023.

The percentage of mangrove canopy cover on the coast of Tabanio, Tanah Latu Regency at station 1 has an average closure of 82.835%, station 2 has an average closure of 62.462% and station 3 has an average closure of 70.197%. The mangroves found in this area are *Acanthus ilicifolius, Avicennia alba, Nypa fruticans, Rhizophora mucronata, Sonneratia alba,* and *Sonneratia caseolaris*. Station 1 has an average percentage of closure with very dense criteria with a total of 53 individual species with mangrove species *Avicennia alba, Rhizophora mucronata* and *Nypa fruticans*. Where density conditions and conditions for the distribution of various types of mangrove leaves cause a higher percentage of cover compared to other stations, and based on previous research that the results of observing mangroves at other research locations, namely in Mekarsari Village, Tanah Laut Regency, mangroves were only found three types of mangrove trees, namely: *Avicennia alba, Rhizophora mucronata* and *Sonneratia alba (*Tony, et al., 2022).

Figure 2 – Station 1 Mangrove Cover (Source: Field Documentation, 2023)

Figure 3 – Station 2 Mangrove Cover (Source: Field Documentation, 2023)

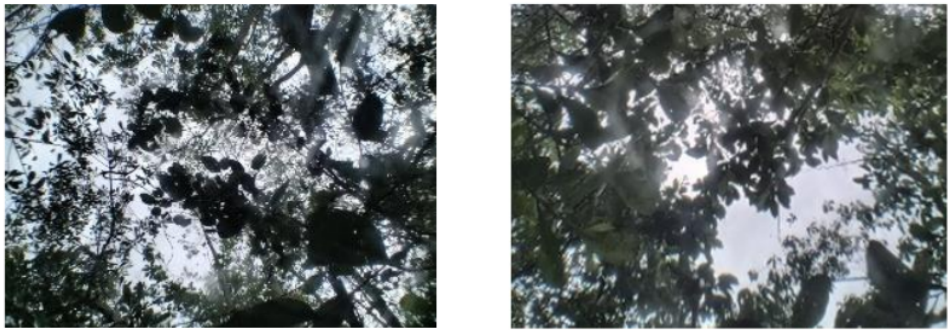

Figure 4 – Station 3 Mangrove Cover (Source: Field Documentation, 2023)

Parameters of water quality as an illustration of the physical and chemical conditions in the mangrove ecosystem in influencing the life of mangrove species that grow in the Tabanio Coastal area.

Table 3 – Parameters of water quality and substrate in the mangrove ecosystem on the Tabanio Coast

Station	Plot	Temperature (^{0}C)	pH	DO(mg/L)	Salinity (^{0}/ $_{00}$)	substrate
1	1	27.7	7.18	7.1	15.38	Sandy Mud
	2	29.3	7.56	6.8	17.11	Sandy Mud
	3	30.2	6.43	6.9	16.7	Sandy Mud
Average		29,067	7,057	6,933	16,397	
2	1	30.8	7.12	6.3	13.44	Sandy Mud
	2	31.7	7.23	7	13.03	Sandy Mud
	3	31.4	6.67	6.7	11.67	Sandy Mud
Average		31.3	7007	6,667	12,713	
3	1	30.8	8.04	5.4	20.91	Mud
	2	29.8	7.58	5.5	20.13	Mud
	3	28.6	7.96	5.8	19.06	Mud
Average		29,733	7.86	5,567	20033	-
Quality Standard		28-32	7-8.5	>5	up to 34	

Source: Primary Data, 2023.

Water quality measurements were carried out 3 repetitions at each station where plot 1 was carried out in the morning, plot 2 was carried out during the day and plot 3 was carried out in the afternoon at the three research stations. Based on the table above, the temperature parameters at stations 1, 2 and 3 still meet the quality standards for mangrove biota according to PP No. 22 of 2021, namely the range between 28 - 32 °C. Where Evaporation and photosynthesis are two physiological processes that are affected by temperature. The pH quality limit for mangrove biota is 7 to 8.5, according to Government Regulation No. 22 of 2021, where stations 1,2 and 3 still meet quality standards.

DO quality criteria for mangrove biota are > 5 mg/L, according to Government Regulation No. 22 of 2021, where stations 1,2 and 3 still meet quality standards. Water temperature and salinity have a negative relationship with oxygen solubility (Maulidia *et al.*, 2022). Oxygen becomes less soluble as temperature and salinity increase. The level of salinity in areas near mangroves also has an effect. The quality limit for salinity for mangrove biota is up to 34 ° / $_{oo}$ based on Government Regulation No. 22 of 2021 stations 1,2 and 3 still meet quality standards.

Table 4 – Water Quality Status

Station	Longitude	Latitudes	Class	Information
1	114 ^{0}37' 12" E	3 ^{0}43' 33,6" S	0	Good (Meet Quality Standard
2	114 ^{0}37' 15,6" E	3 ^{0}43' 33,6" S	0	Good (Meet Quality Standard
3	114 ^{0}37' 4.8" E	3 ^{0}43' 40,8" S	0	Good (Meet Quality Standard

Source: Primary Data, 2023.

Based on STRORET data processing, the table above shows that the status of water quality at stations 1, 2 and 3 is still good (meeting quality standards) in accordance with the biota of the mangrove ecosystem according to Government Regulation No. 22 Year 2021.

The relationship between canopy cover and water quality in the Tabanio Coastal Village can be determined using PCA analysis (Principal Component Analysis). The results of the relationship can be seen in Figure 5.

Based on the table 5, the substrate values are obtained according to Avramidis *et al,* 2009 where there is an operator diagram involving three *operands* in the form of a diagram of *sand, silt and clay* so that the substrate values can be included in PCA analysis.

Correlation between variables is done to find out how a variable influences or is influenced by other variables. Variables will be described as directed lines in biplot analysis. There are three images to be generated.

Table 5 – Value of Relationship between Mangrove Canopy Cover and Water Quality

Station	Closing Canopy	Temperature	pH	DO	Salinity	substrate
1a	86,810	27.7	7.18	7.1	15.38	50
1b	88,859	29.3	7.56	6.8	17.11	50
1c	72,837	30.2	6.43	6.9	16.7	50
2a	60,747	30.8	7.12	6.3	13.44	50
2b	63,128	31.7	7.23	7	13.03	50
2c	63,512	31.4	6.67	6.7	11.67	50
3a	69,588	30.8	8.04	5.4	20.91	10
3b	74,832	29.8	7.58	5.5	20.13	10
3c	66,170	28.6	7.96	5.8	19.06	10
Average	71,831	30,033	7,308	6,389	16,381	36,667
Standard Deviation	9,599	1,245	0.509	0.626	3,081	18,856

Source: Primary Data, 2023.

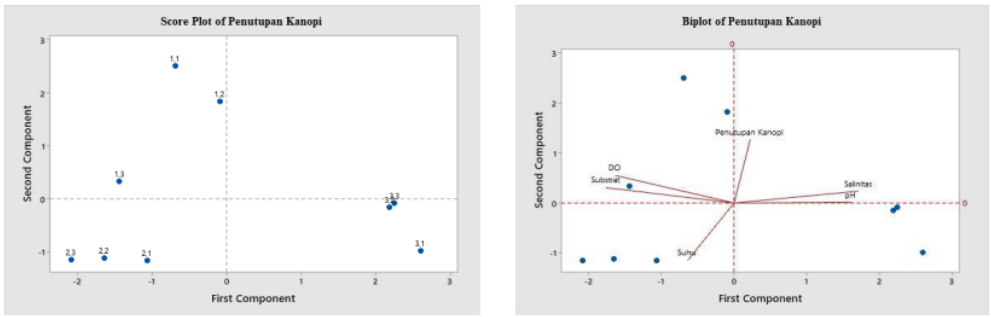

Figure 5 – PCA Analysis Results

First, if two variables have a positive correlation value, they will be depicted as two lines in the same direction or forming a narrow angle. Second, if two variables have a negative correlation value, they will be depicted in the form of two lines in opposite directions or forming a wide angle (obtuse). Third, if the two variables are not correlated, they will be depicted in the form of two lines with angles approaching 90˚ (right-angled) (Katili *et al.*, 2020). Based on Figure 4.13. It can be seen that canopy cover has a positive correlation with DO and substrate water quality parameters, this occurs because an increase in mangrove canopy cover has the potential to correlate with an increase in DO and certain types of substrates in the mangrove ecosystem. One of the roles of the canopy cover is in the process of photosynthesis where the results of photosynthesis produce oxygen and mangrove roots can also provide a suitable substrate for the mangrove ecosystem. Meanwhile, canopy cover has a negative correlation with temperature, pH and salinity where there is an opposite relationship between mangrove canopy cover and these parameters. PCA analysis revealed a negative relationship between the main components of temperature, salinity, and pH and the main components indicating mangrove canopy cover. The process of photosynthesis in plants can be affected by the temperature in the mangrove ecosystem. The intensity of incoming light can have an impact on changes in temperature (Abubakar *et al.*, 2021 *in* Dewi *et al.*, 2021). If the salinity value is excessive, the plant's ability to absorb nutrients will be hampered, which will slow down its growth (Yusniawati *et al.*, 2017 *in* Dewi *et al.*, 2021). Nutrient absorption can also affect the pH conditions of the mangrove ecosystem.

CONCLUSION

The conclusions from this study are as follows:

- The percentage of canopy cover using the hemispherical photography method at the study site is a medium to very dense criterion;

- The water quality in the Tabanio Coastal District of Tanah Laut Regency at all stations still meets the quality standards for mangrove biota according to Government Regulation No. 22 of 2021 concerning the implementation of environmental protection and management;
- The relationship between canopy cover and water quality in Pesisir Desa Tabanio, Tanah District can be determined using PCA (Principal Component Analysis), namely canopy cover has a positive correlation with DO and substrate water quality parameters and negatively correlates with water quality temperature, pH, and salinity.

REFERENCES

1. Achmad S Hidayat, Erma Agusliani., 2020. Beach coastal tourism, whether benefit or disaster for fishermen of Tanah Laut Regency, South Kalimantan Province. AACL Bioflux, 2020, Volume 13, Issue 3. http://www.bioflux.com.ro/aacl.
2. Geospatial Information Agency. Number 3 of 2014. About the Technical Guidelines for Collection and Management of Mangrove Geospatial Data.
3. Dewi, IGAI P, Elok F., Abd. Rahman A., and I Wayan ED 2021. Natural Regeneration of Mangrove Seeds in the Benoa Bay Area, Bali. Journal of Tropical Marine Science and Technology. 13(3): 395 – 410.
4. Dharmaji, Deddy and Putri Mudhlika Lestarina. 2019. Mangrove Ecosystem Status in Takisung District, Tanah Laut District: Hemispherical Photography Approach. Journal of the National Seminar on Wetland Environment. 4 (2): 138 – 142.
5. Dharmawan, I Wayan Eka and Pramudji. 2014. Guidelines for Monitoring the Status of Mangrove Ecosystems. Bogor: LIPI.
6. Dharmawan, I Wayan Eka. 2020. Hemispherical Photography Analysis of Percentage of Mangrove Community Canopy Cover. Makasar: Nas Media Pustaka.
7. Katili, Abubakar Sidik, Hartono D. Mamu, and Ilyas H. Husain. 2020. Potential Structure of Mangrove Vegetation and Biomass Carbon Uptake Value. Gorontalo: Ideas Publishing.
8. Lewerissa, Yona A., M. Sangaji and MB Latumahina. 2018. Mangrove Management Based on Substrate Type in Ihamahu State Waters, Saparua Island. TRITON Journal. 14(1): 1–9.
9. Masruroh, Lulu and Insafitri. 2020. Effect of Substrate Type on Avicennia marina Vegetation Density in Gresik Regency. Juvenile 7 (2): 151 – 159.
10. Maulidia, V., Aji AA, Jumiati, Arifin, and Aini S. 2022. The Value of Mangrove Ecosystems Based on Mangrove Carbon Sequestration in West Kalimantan. Journal of Wetlands Environmental Management. 10(1): 12–26.
11. Minister of State for the Environment. Number 115 of 200 3. Concerning Guidelines for Determining Water Quality Status.
12. Nugroh, Sigit. 2008. Applied Multivariate Statistics. Bengkulu: UNIB Press.
13. Regulation of the Government of the Republic of Indonesia. Number 22 of 2021. Concerning the Implementation of Environmental Protection and Management.
14. Tony. F., Lestarina, PM, Putra. A., Iskandar R. 2022. Amount Stock of Blue Carbon in Mangrove on the Area of Pt Arutmin Indonesia Kintap Mine Mekarsari Village, Tanah Laut Regency, South Kalimantan. International Journal of Environment, Agriculture, and Biotechnology (IJEAB). ISSN: 2456-1878, CrossRef DOI: 10.22161/ijeab.
15. Tony. F., Lestarina, PM, Ilmy NDY, Iskandar R. 2022. The Relationship of Bivalvia Affairs to Mangrove Density in Pt Arutmin Indonesia Kintap Mining Area Mekarsari Village, Tanah Laut Regency South Kalimantan Province., International Journal of Environment, Agriculture and Biotechnology Vol -7, Issue-5; Sep-Oct, 2022 Journal Home Page Available: https://ijeab.com/ Journal DOI: 10.22161/ijeab.
16. Zahra, NF, Y. Setiawan, and LB Prasetyo. 2022. Estimation of Mangrove Canopy Cover Using Unmanned Aerial Vehicle (UAV) in Indramayu Regency, West Java. IOP Conf. Ser.: Earth Environ. sci. 950 012032.

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