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Water Physical Quality in the Mangrove Area of the Air Telang Protected Forest During the West Season

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ABSTRACT

This study investigates the water quality in the mangrove area of the Air Telang Protected Forest, Banyuasin Regency, during the western monsoon season. The research was conducted from February to October 2025 using a survey method. Sampling was carried out through purposive sampling at five observation stations: Station 1 (Pasir Timbul), Station 2 (Sonneratia zone), Station 3 (Avicennia zone), Station 4 (Nipah zone), and Station 5 (Rhizophora zone). The observed parameters included physical parameters (clarity, color, odor, and temperature). The results showed that among the physical parameters, only odor and temperature met the standards, whereas color and clarity did not. These findings indicate that the water quality in the Air Telang Protected Forest during the western monsoon season is potentially polluted.

Keywords: water quality, Air Telang Protected Forest, mangrove

INTRODUCTION

Mangrove ecosystems are among the most important pessimistic ecosystems. Mangroves play a crucial role in coastal areas, both ecologically and economically. Mangroves function as carbon sinks, coastal protection against erosion, and natural filters that clean water of sediment and pollutants before it enters the ocean (Setiawan *et al*., 2020; Alongi, 2020). The Air Telang Protection Forest (HLAT) in Banyuasin, South Sumatra, is one such area, covering over 12,660 hectares and crucial for protecting water systems and mitigating the impact of seawater intrusion (Eddy *et al.*, 2018; Fadlurrahman *et al.*, 2022).

However, pressures from human activities such as land conversion have threatened water quality in this area. Changes in the physical, chemical, and biological parameters of water in mangrove ecosystems can affect the life of marine biota and the welfare of communities that depend on coastal natural resources (Fadli *et al*., 2021; Fadlurrahman *et al*., 2022). Therefore, research on water quality in mangrove ecosystems such as in HLAT is important to understand how this area can continue to support its functions optimally.

Besides being crucial for water quality, mangroves also play a role in climate change mitigation due to their ability to absorb significant amounts of carbon. Previous studies have shown that mangrove forests in the HLAT (Indonesian Watershed), both natural and rehabilitated, possess substantial carbon stocks, averaging approximately 191 to 194 tons per hectare (Fadlurrahman *et al*., 2022). Good water quality is crucial for the continued functioning of these functions.

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Water quality can be measured based on its physical, chemical, and biological properties. River basins typically serve as dumping grounds for domestic and industrial waste. River areas with these characteristics include the Musi River, which serves as a fishing ground, a factory, a tourist park, and housing, all of which serve as waste disposal sites. Land use changes characterized by increased domestic, agricultural, fisheries, and industrial activities will influence and impact river water quality, contributing to the greatest input of pollutants into the river (Rosarina and Kusumawati, 2018).

Air Telang Protected Forest is one of the areas with quite high mangrove potential which has the main function as a protection of life support systems to regulate water management, prevent flooding, control erosion, prevent sea water intrusion and maintain soil fertility. The area of HLAT is recorded at around 12,660.87 hectares located in the Muara Telang District and Banyuasin II District, Banyuasin Regency, South Sumatra Province, whose status is determined through the Decree of the Minister of Forestry No. 76 / Kpts-II / 2001 concerning the Designation of Forest and Water Areas in the South Sumatra Province (Eddy *et al.*, 2017).

The Air Telang Protected Forest (HLAT) is a protected coastal forest area on the east coast of Sumatra Island that has experienced significant anthropogenic disturbances, with some parts converted to coconut plantations, oil palm plantations, fish ponds, and settlements. Conversion of this forest into settlements and coconut plantations began in the 1970s. In disturbed mangrove forests, such as the HLAT, plant formations in various mangrove forest zones no longer follow the natural pattern of typical mangrove forests. Plants that can reproduce and have high adaptability will dominate an area in the mangrove vegetation succession process. Human intervention, changes in hydrographic conditions, interactions between species, geomorphological and environmental changes are known to influence mangrove forest succession (Eddy *et al*., 2017). Therefore, research on water quality in the mangrove area of the Air Telang Protected Forest is essential. The research results are expected to provide a basis for more effective environmental management, support climate change mitigation efforts, and improve the welfare of local communities.

MATERIAL AND METHOD

Research Design

The research was conducted from February to October 2025. The study location was in the mangrove area of the Air Telang Protected Forest, Banyuasin District. The study used a descriptive survey method. Sampling was conducted using purposive sampling, adapted to the research objectives. This was based on research by Rosarina and Kusumawati (2018), Rosanti et al. (2021), and Jumingin et al. (2025). Physical parameters, including brightness, temperature, color, and odor, were measured.

The sampling locations were divided into five stations. The first station was in the sandbank area, the second station in the Avicennia zone, the third station in the Sonneratia zone, the fourth station in the Nypa zone, and the fifth station in the Rhizophora zone. Water sample testing was conducted at the Laboratory Technical Implementation Unit (UPTD) of the South Sumatra Environmental and Land Agency, Jalan Aerobic Number 4, POM IX Campus, Palembang City 30137.

Location Determination

The research was conducted at five stations :

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Station 1: The sandbank area of Sungsang Village 4, geographically located at 2.27447°S, 104.91678°E.
Station 2: The natural area of the Sonneratia zone, Tanjung Carat, geographically located at 2.31605°S, 104.84202°E.
Station 3: The natural area of the Avicennia zone, geographically located at 2.442265°S, 104.757357°E.
Station 4: The degraded area of the Nipah zone, geographically located at 3.542856°S, 104.741999°E.
Station 5: The Rhizopora area, geographically located at 2.58727°S, 104.73309°E.

Data Analysis

The data obtained is presented in graphs or tables and analyzed descriptively. Physical parameters observed include color, odor, temperature, and clarity. The following are the results of a water quality survey in the HLAT mangrove area of Banyuasin Regency during the west monsoon season, conducted in February.

RESULTS AND DISCUSSION

Water used for daily needs must be clear and colorless. The results of observations of water samples in the HLAT mangrove area of Banyuasin Regency yielded the following data in Table 1.

1) Color and Odor

Table 1. Results of color and odor observations at 5 stations.

Parametre	Station				
	1	2	3	4	5
Color	Cloudy brown	Cloudy brown	Cloudy brown	Cloudy brown	Cloudy brown
Odor	Odorless	Odorless	Odorless	Odorless	Odorless

Table 1 shows the water quality from the five stations, which averaged a murky brown and odorless. The turbidity is caused by the rise of silt deposits from rainwater and high tides to the surface, so even though the water is cloudy, it is odorless. According to Minister of Health Regulation Number 492 of 2010, turbidity is a mandatory parameter in determining drinking water quality. Turbidity is caused by water containing suspended solid particles, which can be hazardous to health.

High turbidity can complicate filtration efforts and reduce the effectiveness of disinfection in the water purification process. Furthermore, turbid water is difficult to disinfect, allowing pathogenic microbes, both inorganic and organic, to be protected by these particles. This is very dangerous to human health if consumed directly.

2) Temperature

Water temperature is a controlling factor for aquatic life, controlling metabolic activity, reproductive activity, and life cycles. If stream temperature increases, decreases, or fluctuates too much, metabolic activity can increase, slow down, or even stop. Many factors can influence stream temperature. Water temperature can fluctuate seasonally, daily, and even hourly, especially in smaller streams.

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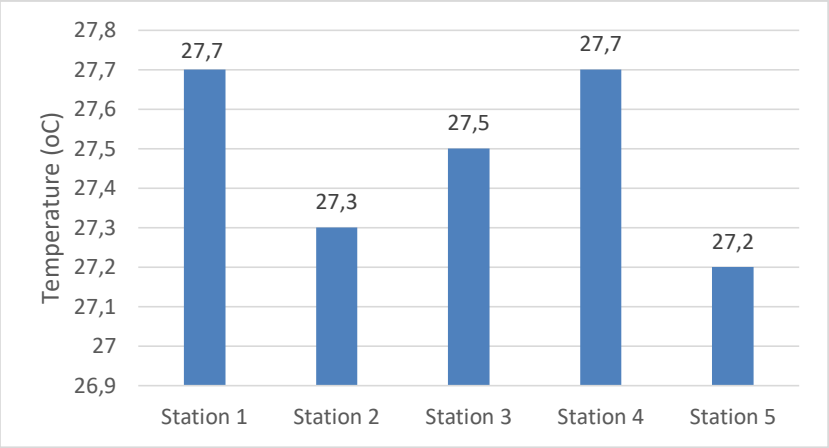

Figure 1. Measurements of Temperature

Water temperature measurements at five observation stations showed a range of 27°C to 28°C. Based on Government Regulation No. 22 of 2021 concerning Class II water quality standards, changes in water temperature are not permitted to exceed ±3°C from the natural water temperature. Water temperatures that do not meet water quality standards indicate the presence of significant amounts of dissolved chemicals or the ongoing decomposition of organic matter by microorganisms (Mairizki, 2017).

Temperature correlates with other water quality parameters. This indicates that temperature is a key physicochemical water quality parameter important in evaluating water quality. According to Rosarina and Laksanawati (2018), temperature changes can significantly impact other seawater characteristics and also affect the survival of marine biota. The rate of photosynthesis increases with decreasing temperature because the solubility of CO_2 and O_2, two gases essential for the process, is greater in cooler temperatures than in warmer temperatures.

3) Clarity

Clarity is the amount of light that can penetrate water at a certain depth. Rosanti *et al.* (2021) stated that clarity values are greatly influenced by measurement time, suspended solids, weather conditions, turbidity, and the accuracy of the person conducting the measurement.

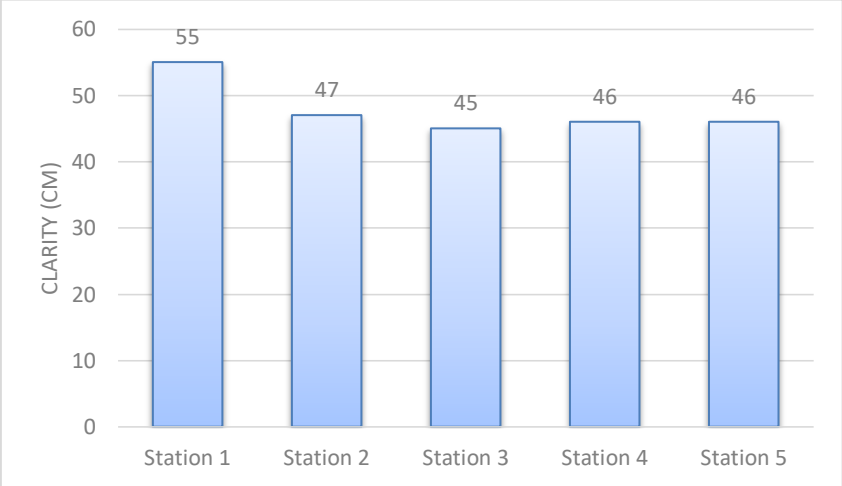

Figure 2. Measurement of Clarity

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Water clarity during the observation period ranged from 3-8.5 m, in line with research (Rosarina and Laksanawati, 2018), where clarity is greatly influenced by weather conditions, the time of turbidity measurement, and suspended solids. Optimal marine life occurs at a minimum clarity of 40 cm. If it is less than 25 cm, oxygen depletion occurs quite rapidly. Hamuna et al. (2018) argue that a sufficiently high clarity number causes light penetration to deepen. If the clarity is insufficient, it indicates a high level of turbidity in the water. This is certainly a factor that disrupts the life of living creatures there. The low clarity value is due to the damage of several objects such as organic waste, microorganisms, clay mud, and other floating particles. Turbidity causes light to deflect and prevents light from entering the water.

CONCLUSION

Based on the results and discussion, it can be concluded that in terms of physical parameters, only odor and temperature meet Class II water quality requirements in the HLAT mangrove area during the west monsoon. Color and clarity, however, do not meet Class II water quality requirements.

REFERENCES

Alongi, D., & Mukhopadhyay, S. (2015). Contribution of Mangroves to Coastal Carbon Cycling in Low Latitude Seas. *Agricultural and Forest Meteorology*. 213 page 266–272.

Eddy, S., D. Rosanti, & M. Falansyah. 2018. "Keragaman Spesies dan Etnobotani Tumbuhan Mangrove di Kawasan Hutan Lindung Air Telang Kabupaten Banyuasin." *Seminar Nasional Sains Dan Teknologi Terapan* (May):4–12.

Eddy, S., Mulyana, A., Ridho, M.R. & Iskandar, I. 2015.Dampak Aktivitas Antropogenik terhadap Degradasi Hutan Mangrove di Indonesia. *Jurnal Lingkungan dan Pembangunan*, 1(3): 240-254.

Fadli, N.2021. Water Quality and Mangrove Ecosystems: Relationships and Management Implications. *Journal of Coastal Research*, 35(3), 542-553.

Fadlurrahman, M. H., Ridho, M. R., & Patriono, E. 2022. "Perbandingan Simpanan Karbon pada Kawasan Mangrove Rehabilitasi dan Alami di Hutan Lindung Air Telang Banyuasin Sumatera Selatan." Undergraduate thesis, Sriwijaya University.

Hamuna, B. , R.H.R. Tanjung., H.K.Maury dan Alianto. 2018. Kajian Kualitas Air Laut dan Indeks Pencemaran Berdasarkan Parameter Fisika-Kimia Di Perairan Distrik Depapre, Jayapura. *Jurnal Ilmu Lingkungan*. Program Studi Ilmu Lingkungan Sekolah Pascasarjana Universitas Diponegoro. Semarang.

Jumingin, D., Rosanti, Giyanto, Kamisah, & Rahmawati. (2025). "Studi Kualitas Kimia Air Pada Kawasan Mangrove Hutan Lindung Air Telang Kabupaten Banyuasin." *Jurnal Redoks*, 10(1), 1-10.

Mairizki, F. 2017. "Analisis Kualitas Air Minum Isi Ulang Di Sekitar Kampus Universitas Islam Riau." *Katalisator* 2(1): 9–19.

Peraturan Pemerintah Nomor 22 Tahun 2021 tentang pelaksanaan perlindungan dan pengelolaan lingkungan hidup.

Rosanti, D., D. Novianti dan Y.P. Putri. (2021). "Perbandingan Kualitas Air Sungai Musi pada Tiga Tata Guna Lahan." *Jurnal Ilmu Matematika dan Ilmu Pengetahuan Alam*

Rosarina, D., & Laksanawati, E. K. (2018). StudiKualitas Air Sungai Cisadane KotaTangerang Ditinjau Dari Parameter Fisika.*Jurnal Redoks*, 3(2), 38.

Setiawan, A., Nurhasanah, & Andini, P. (2020). "Pengelolaan kawasan mangrove berkelanjutan di Kabupaten Banyuasin. " *Jurnal Pengelolaan Lingkungan*, 15(1), 45-54.