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Analysis of Water Quality Parameters in Lhok Bubon Estuary, West Aceh Regency

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Abstract
Estuary waters have unique characteristics where fresh water and seawater transition. These characteristics affect the environment's quality and aquatic biota's life. In addition, human activities such as fishing and industry can also affect water quality and impact biota's life. This study aims to analyze water quality parameters in Muara Lhok Bubon, West Aceh Regency waters. This study was conducted in September 2024 and used a survey method. The results showed an average water temperature of 29.9 ° C, an average pH of 7.6, and an average current speed of 0.24 m/s. These parameters indicate that the water quality in Muara Lhok Bubon is still in the good category, supporting the survival of aquatic biota.

1. Introduction

Estuary waters are formed by meeting fresh and sea water to create an estuary (Pamuji et al., 2015; Budiman et al., 2021). This estuary has different characteristics from seawater and freshwater; these estuary waters also affect the occurrence of periodic ebb and flow and carry nutrients and sediment particles (Pamuji et al., 2015). These estuary waters not only function as natural resources for the community, but estuaries are also often used by the surrounding community as a ship transportation route to go to sea, as a place of livelihood for the surrounding community and as a habitat for various types of marine biota. However, human activities such as fishing and industry can affect water quality and disrupt the lives of biota in the estuary waters.

Water quality is among the most critical environmental parameters, especially in the Lhok Bubon Estuary area, West Aceh Regency. Water quality parameters generally refer to water conditions related to activities around the estuary itself; this activity shows the good or bad quality of water in a body of water based on physical, chemical and biological parameters (Wailisa et al., 2022). In understanding water conditions, water's physical and chemical parameters are very influential. Physical parameters act as a nutrient distribution tool that carries ocean currents. Ocean currents are water that moves horizontally in a mass of water; the causes or factors that influence this movement include differences in pressure, wind, density and tides (Simatupang et al., 2016).

Other physical parameters include temperature and the degree of heat or cold of water, which are measured using a specific scale. The temperature-measuring instrument is a thermometer. The temperature unit used is degrees Celsius (^oC). The factor that affects temperature is the length of exposure to sunlight (Hidayat & Sari, 2021). Chemical parameters such as pH are the degree of acidity that measures water's acidic and basic properties. The factors that affect pH in waters include chemical, physical and biological characteristics and the biota that live in them. The pH scale ranges from 1-14; pH 1-6 is categorized as acidic pH, while 7 is neutral pH, and alkaline pH ranges from 8-14 (Ningrum & Oktavia, 2018).

Previous research in the Lhok Bubon estuary is still in the good category with an average temperature value ranging from 20 - 31 ^{o}C, pH ranging from 7.0 - 7.9 and current speed ranging from 0.11 - 0.20 m / s (Kusumawati et al., 2018). Based on the description above, it is crucial to research water quality parameters in Lhok Bubon because it is necessary to renew water quality information at the location. This study aims to assess the water quality in the waters of the Lhok Bubon Estuary by analyzing physical and chemical parameters that affect water conditions such as pH, current speed, and temperature.

2. Research Method

Time and Place

This research was conducted in September 2024. Field data was collected in the waters of the Lhok Bubon estuary, Samatiga District, West Aceh Regency, and data analysis was carried out at the Integrated Marine Laboratory of Teuku Umar University.

Metode Penelitian

This study used a survey method. Determination of stations based on purposive sampling by looking at different environmental characteristics, namely: Station 1 calm waters, which represent areas with minimal physical disturbance; Station 2 under the bridge, which reflects conditions with higher water flow and potential turbulence; and Station 3 mixed area of fresh water and seawater, which is a transition zone with varying salinity. Sampling was done by observing and measuring water quality parameters in the field (Kulla et al., 2020).

3. Result and Discussion

Water quality parameter data expresses the estuary water quality condition in Lhok Bubon, West Aceh Regency. The estuary waters in that location have dark watercolour because the area around the location is a place for fishing boats to anchor; in addition, many buffaloes pass through the area. The results of the analysis of water quality data in the Lhok Bubon estuary waters are presented in Table 1.

Table 1. Condition of water quality parameters of the Lhok Bubon estuary in terms of physical and chemical parameters

No	Water quality	Station 1		Station 2		Station 3		Average	Quality standards
		1	2	1	2	1	2		
1	Temperature (^{o}C)	30,1	30,1	29,9	30,1	30,1	30,1	29,9	natural
2	pH	8	7,7	7,6	7,5	7,5	7,5	7,6	7-8.5
3	Current speed (s)	13,39		34,14		23,10		0,24	-

Temperature

The temperature in a body of water can be influenced by the intensity of sunlight entering a body of water that can be penetrated by sunlight. After the light enters a body of water, it is absorbed and turned into heat energy (Warman, 2015). Measurements of the temperature of the Lhok Bubon estuary waters carried out at each point showed that the temperature was classified as warm or a temperature that was classified as normal for the waters. Generally, the water temperature ranges from 27 oC to 30 oC, and the temperature conditions in the Lhok Bubon estuary waters are suitable for the organisms in the waters. The temperature on the sea surface in Indonesia generally ranges from 28-30 ^{o}C, with a normal temperature estimated at 27-30 ^{o}C. This temperature increase is caused by the research location being close to topogenic activities, which causes the temperature to increase (Patty, 2020).

Power of Hydrogen (pH)

According to Warman (2015), the pH value in water is influenced by various factors, such as biological activity, temperature, oxygen content and ions. Biological activity, such as respiration, produces

CO_2 gas. The more CO_2 produced through respiration, the chemical reaction will release H+ ions, which causes a decrease in the pH of the water. Conversely, in the process of photosynthesis, which requires large amounts of CO_2, the pH of the water tends to increase. Power of Hydrogen (pH) measurements at each point show that a pH value of 7.6 indicates slightly alkaline water conditions because a pH above 7 indicates that the water is no longer neutral but tends to be more alkaline. At this pH, the waters tend to support the diversity of aquatic organisms because most species of fish, microorganisms and aquatic plants can live at a slightly alkaline level. Water quality parameters in marine fish farming include ammonia, nitrate, pH, DO (dissolved oxygen) and temperature. The range of water temperatures that are suitable and ideal for the growth and development of organisms in waters is between 26.5°C and 28.5°C. This water quality parameter with aquatic sensitive organisms is very closely related to changes in temperature, DO, and pH in waters, pH and the neutral pH range for waters is 7 to 8.5 and also greatly supports the survival of organisms in certain waters (Affandi et al., 2021).

Current Speed

According to Daruwedho et al. (2016), current is the movement of flowing water mass due to wind blowing, differences in density, or long wave movements. Ocean currents are wind movements that cause friction on the surface of the water and will trigger the movement of water masses in a body of water by the friction that occurs, the current will move at a depth of less than 200 m and will move from one area to another according to the direction of its movement towards the area that has pressure. Current is also the movement of water mass in a body of water that can move vertically or horizontally (Ma'arif & Hidayah 2020). At each point, current speed measurements in Lhok Bubon waters have an average value of 0.24 m/s. The current speed ranging from 0.24 m/s indicates a moderate water flow speed. This value can be influenced by various factors, such as wind strength, differences in temperature or salinity of water that create differences in density, and interaction with long waves. At this speed, the current can transport sediment particles, organic matter, and nutrients in the water, which are very important for aquatic ecosystems, especially in estuary areas.

4. Kesimpulan

Based on the research results, the average temperature value obtained in this study was 29.9°C, which is included in the normal temperature range for pH. The average value obtained in this study was 7.6, where pH 7.6 is included in the neutral range and for the current speed at the time of the study, the average value obtained was 0.24 m/s, which is still included in the moderate current speed, so that it can support the survival of stable and balanced biota

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