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Analysis Of Chemical And Physical Parameters In Lemukutan Island Bengkayang Regency West Kalimantan Waters

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Abstract: Indonesia is an archipelagic and maritime country that has 16,766 islands with a water area reaching 3.26 million km^2. Many water areas are utilized for human activities which can cause seawater pollution and affect seawater quality. Seawater quality monitoring must comply with scientific principles so that the results obtained can represent actual sea conditions. This research was conducted to determine the water quality of Lemukutan Island, Bengkayang Regency, West Kalimantan with the parameters of acidity (pH), turbidity, and salinity, provide basic information about the environment of Lemukutan Island and carry out scientific monitoring of seawater quality with reliable data. The method used in this study uses a multiparameter instrument, a refractometer, and a turbidimeter. The research was conducted by taking samples at ten points, namely on Tanjung Batu Putih beach, 50 meters from Tanjung Putih beach, at the inn, at Penata Besar, at the Lemukutan Island pier, in the middle of the sea, on Kabung Island, before Teluk Sauk pier, air menuju dermaga, and at Teluk Sauk Pier. The sample that has been obtained is then tested for the phytochemical properties of seawater on Lemukuta Island. The results obtained by the pH value ranged from 7.99-8.40 which is quite good and meets seawater quality standards. The salinity value on Lemukutan Island is 24-31‰ which is by following quality standards, which range from 18-34‰. As for the turbidity level, various results were obtained with the highest turbidity level in the wharf area and exceeding the maximum quality standard of 5 NTU (Nephelometric Turbidity Unit).

Keywords: Acidity (pH), Lemukutan Island, salinity, sea water, and turbidity.

Introduction

Indonesia is known as an archipelagic country consisting of 16,766 islands stretching for 5,120 km from east to west along the equator and 1,760 km from north to south or between 6^0 LU-11^0 LS and 95^0 BT and 141^{0}BT (Databoks, 2021). The area of marine waters is recorded to reach 3.26 million km^2 with a coastline length of about 81,000 km. Indonesia's marine waters function as local and international shipping lanes and have many important resources, including fish resources, coral reefs, seagrass beds, mangrove forests and coastal areas that are used as tourist attractions. The sea is also important for the life of living things such as humans, fish, plants and other marine life (Waluyo, 2016). One of the islands located at the end of Indonesian waters is the island of Lemukutan.

Currently, Lemukutan island is administratively located in Sungai Raya Kepulauan District, Bengkayang, West Kalimantan. The area of Lemukutan Island is about 12,520 ha (Sudiono, 2008). The people of Lemukutan Island work as fishermen, some others become tourism actors, such as renting lodging, using diving equipment, and providing services as Tour Guides. One of the most popular areas on the island of Lemukutan is the Teluk Cina Village (Muliadi, et al., 2022). In addition, Lemukutan Island is also used in the field of seaweed cultivation and fisheries. The existence of human activities in utilizing these waters will

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certainly be able to affect the value of primary productivity of waters (Rofi'ah, et al., 2022).

Judging from its geographical position, Lemukutan Island is located directly in front of the South China Sea, so it is easily influenced by the density of seawater and land activities. The structure of the ecosystem (complex) that is based on, the pattern of ocean currents, changes in tides, river flows into the sea, and varioustypes of activities as communities and marine activities that are not monitored will cause changes in the quality of water. Likewise, fuel pollution from marine transport vessels and fishing boats, residue from coastal activities and types of organic and non-organic matter entering the sea through seawater can pollute the aquatic environment (Hamuna, et al., 2018).

Changes in physical and chemical components not only have an influence on reducing the quality of seawater waters but can cause the bottom of the waters to decrease so that they affect the life of marine life (Hamuna, et al., 2018). Physical and chemical properties are part of biotic and abiotic factors that can affect the quality of water and organisms present in seawater. Marine quality monitoring needs to be carried out so that the sea quality condition of Lemukutan Island can be known. Monitoring seawater quality must meet scientific rules, so that the results obtained can represent the true sea conditions of Lemukutan Island. Determination of seawater quality can be carried out by several physical and chemical parameters. The physical parameters to be tested are turbidity, while the chemical parameters to be tested are pH and salinity. The purpose of the study was to determine the quality of seawater on Lemukutan Island from the parameters of turbidity, salinity, and acidity level (pH) and provide basic information to find out the environment of the Lemukutan Island water.

Materials and Methods

Field of Study

This research is a chemical-based statistical research with time and place the research was carried out for three days, on November 26, 27, and 29, 2022. The research was conducted on Lemukutan Island and the Chemistry Laboratory of FMIPA Untan starting from taking test samples to the process of testing physicochemical properties with test parameters such as turbidity, salinity, and acidity (pH). The map of Lemukutan island can be seen in figure 1.

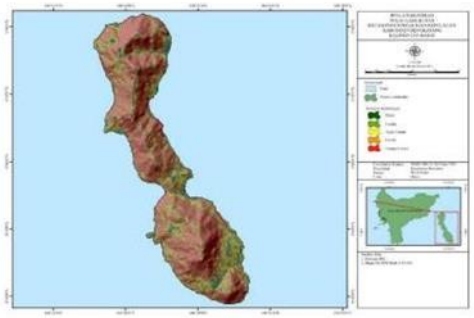

Figure 1. Map of Lemukutan Island (Muliadi, et al., 2022)

Tools and Materials The tools used in this study are polyethylene tereptarate bottles, spray bottles, beaker glasses, multiparameter instruments, plastic samples, refactometers, and turbidimeters. The materials used in this study were aquaades (H_2O) and seawater samples.

Procedure

1. Seawater test sampling

Seawater test sampling for testing physicochemical properties starting from the location of the Suak Bay pier to the location of Lemukutan Island. Test sampling is carried out by preparing a test sample container that is free of contaminants. The test sample is taken at a predetermined location, then put into the container provided and given a mop on the test sample container. The condition of the sample place is recorded to determine the situation around the sampling.

2. Salinity measurement

Salinity parameters are measured using the ATC refactometer tool. Salinity measurement using a refactometer is by opening the prism glass cover on the refactorimeter, then cleaning the prism glass surface and wiped with clean wipes. The sample to be tested is dripped on the prism glass and point the refactometer towards the direct light. On the shoot screen, you will see blue and white fields. The lens on the refactometer is set until a clear boundary between the two shows a scale of seawater salinity levels.

3. Turbidity measurement

Turbidity measurement using a turbidimeter is by measuring the standard solution first by pressing the "Cal" button then "Enter" and waiting 15 seconds until the value listed on the display matches the standard solution value. Sample measurements are carried out by inserting the test sample into a cuvette bottle and closing it. The cuvette bottle is cleaned using a tissue and then put into a phototube detector and closed. The number indicated on the display is read as a result of turbidity measurement.

4. Measurement of acidity (pH)

Measurement of acidity (pH) can use multiparameter instruments. Measurement of physicochemical properties using multiparameters by calibrating tools in the form of sensors that are in multiparameters. After calibration, set the parameters to pH level. The sample to be tested is put into the sample container, then the sensor in the multiparameter is dipped in the container. Wait a few seconds for the number indicated on the display to stabilize. The number on the display is read as a result of measuring the level of acidity (pH).

Data Analysis

The data obtained from each measurement is then recorded and compared with the reference to the standard water parameters that apply in Indonesia, namely the standard value of seawater quality according to the Government Regulation of the Republic of Indonesia Number 22 of 2021 to find out in general the condition of the waters on the island of Lemukutan and its surroundings.

Results and Discussion

Seawater Test Sampling Results

Water test sampling was carried out in ten different locations ranging from the Suak Bay pier to the vicinity of Lemukutan Island. The sampling location can be seen in table 1.

Table 1. Test Sample Sampling Location on Lemukutan Island

Location	Sample Code	Information
Tanjung Batu Putih Beach	A2	The coastline has rocks around
50 meters from Tanjung Batu beach	A5	It has a depth of ±80 cm from sea level and there is a visitor jetski
Lodging	A6	Front of the inn with a water level of ±30 cm
Penata Besar	A9	Seawater around the Great Arranger's location
Lemukutan island pier	A10	There are various transport ships
Mid-Sea	A11	Greenish-colored water
Kabung Island	A12	Sea water around the island children
Before Suak Bay Pier	A13	Turbid brown water
Water to the Pier	A14	Brown water like peat water
Suak Bay Pier	A15	There are many transport ships

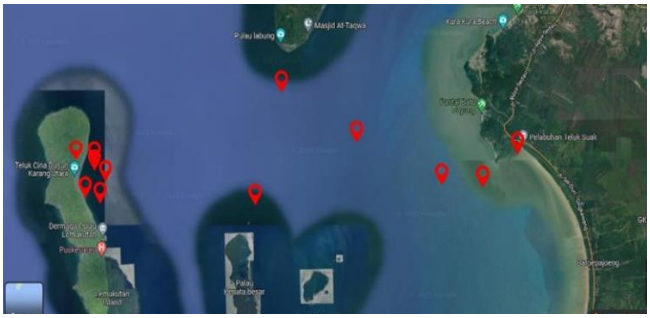

Figure 2. Sampling Location Point

Measurement Results of Physicochemical Properties of Lemukutan Island Seawater Samples

The results obtained from the measurement of salinity, acidity level (pH) and turbidity of each water sample can be seen in table 2. following:

Table 2. Results of Measurement of the Physicochemical Properties of Lemukutan Island Seawater

No.	Sample code	pH	Salinity ($^0/_{00}$)	Turbidity (NTU)
1.	A2	8,18	26,97	1,16
2.	A5	8,32	30,52	1,2
3.	A6	8,18	24,40	1,82
4.	A9	8,03	30,92	1,34
5.	A10	7,99	30,79	0,61
6.	A11	8,21	30,71	0,05
7.	A12	8,18	30,78	0,98
8.	A13	8,13	30,08	26,01
9.	A14	7,25	20,16	20,89
10.	A15	4,88	15,87	53,03

Measurement Results of Acidity Level (pH)

The level of acidity (pH) is a negative logarithm of the concentration of hydrogen ions released in a liquid and is an indicator of the good and bad of a water (Hamuna, et al., 2018). The degree of acidity (pH) in a body of water is one of the important chemical parameters in monitoring the stability of waters. Changes in the pH value of a water to aquatic organisms have certain limitations with

varying pH values (Silalahi, et al., 2017). The results of pH measurements at the location of the Lemukutan sea waters have been obtained values for each location. But the values are not too much different and it can be said that the values obtained are heterogeneous.

Table 2 shows the pH values obtained from the water samples. The value of the degree of acidity (pH) at each measurement location is relatively rising. This value indicates that the pH of the waters tends to be alkaline and still includes the normal range of Indonesian marine pH which generally varies between 6.0-8.5. The degree of acidity (pH) of the waters is strongly influenced by the decomposition of the soil and the bottom of the waters as well as the state of the surrounding environment. The measurement results show that the highest pH value is located in code A5, which is located near the ship with a pH of 8.32 and the lowest pH is located in code A15 located at the Teluk Suak pier with a pH of 4.88. The highest pH value is still said to be stable because it is in the range of 7.5 and 8.4, except near the coast.

The ideal pH value for waters is 7 – 8.5. The lowest pH value is caused by water located at the Suak bay pier where this is due to the influence of humic compounds in the range of the Suak Bay pier. In addition, the pH of the sample code A14 is worth 7.25 because it has mixed with water that has a lower pH. The pH value in the waters of Lemukutan Island (7.99-8.40) is classified as good because it meets the criteria for the Quality Standards of Seawater according to the Government Regulation of the Republic of Indonesia Number 22 of 2021, which is 7-8.5.

Measurement Results of Salinity

Salinity measurements can use a refractometer or a refraction tool. Salinity is the concentration of all saline solutions contained in seawater, where the salinity of water affects the osmotic pressure of the water, the higher the salinity will cause an increase in its osmotic pressure. Variations in water salinity can occur due to variations in evaporation and precipitation (Hamuna, et al., 2018).

The results of salinity measurements in Lemukutan sea waters can be said that the values obtained are heterogeneous with variations in values that are not too large except for salinity in the A15 sample. The low salinity in the A15 sample is due to its origin from the flowing freshwater mountains and the presence of freshwater supply through river flows that emptied into sea waters. The A15 sample is located at the Suak Bay pier which belongs to the estuarial area. Estuarial is an area where salinity levels are reduced due to the influence of incoming fresh water and is also caused by the occurrence of tides in that area (Hamuna, et al., 2018). The highest salinity value was found in the A12 sample around Kabung Island. Salinity in the oceans is influenced by various factors, such as water circulation patterns, evaporation, rainfall and river flow. Variations in saltwater salinity values can be the result of mixing caused by ocean waves or the movement of water masses caused by wind (Banjarnahor, 2000).

The salinity value in the waters of Lemukutan island is worth 24-31$^{o}/_{oo}$. This salinity value is in accordance with the range of salinity values in the water quality standards for marine life, which is 18-34$^{o}/_{oo}$. The salinity value obtained in these waters informs that the magnitude of salinity fluctuations is thought to be influenced by several factors, such as water circulation patterns, evaporation (evaporation), rainfall (precipitation) and the presence of river flow (*run off*).

Measurement of Results Turbidity

Turbidity is the degree of water filthiness caused by suspended materials. Turbidity or turbidity is caused by the presence of collided and suspended materials such as sludge, organic matter, and inorganic, as well as aquatic microorganisms (Patty, et al., 2019). The results of turbidity measurements at the study site varied greatly. The A13-A15 sample has a very large turbidity value of 26-53.03 NTU, where this value is very much different from the seawater quality standard. Based on PP RI Number 22 of 2021, it is stated that the maximum turbidity is 5 NTU. The high turbidity of water located in the mountains is caused by the presence of organic compounds from gambut and polluted soils derived from household waste living on the slopes of the mountains. Meanwhile, the high turbidity of water in locations near the pier until it is observed is due to factors of high rainfall

and *run-off* from land passing into rivers as well as turbulence from strong waves and currents in sea waters.

The turbidity of seawater with high values dominates the coastal waters close to the mouth of the river and vice versa towards the sea the turbidity will be lower. This shows that the highest level of turbidity is in the pier area which tends to get from land so that it exceeds the sea water muku stone, which is a maximum of 5 NTU (Patty, et al., 2019).

Discussion

This research was conducted as a basis for reference and an overview of the water area around Lemukutan island so that in the future there is expected to be further research on the impacts and conditions of the waters in around Lemukutan Island which includes more aspects and parameters so that Indonesia's natural wealth and natural conditions are well mapped. The results and discussion on salinity, turbidity and acidity (pH) of the aquatic environment around lemukutan island are not just figures but these should be a reference to government decisions in responding to the problems of existing water conditions.

Conclusions

The conclusions of this research that has been carried out is the quality of seawater on Lemukutan Island from the turbidity, salinity, and pH parameters of the results obtained by several samples in accordance with standard which has been determined by the Government Regulation of the Republic of Indonesia Number 22 of 2021 , the pH in the A14 sample is acidic with a pH value of 4.88 and the turbidity value of the A13, A14 and A15 samples which are too far from the quality standard, which is above 24 NTU. The water environment of Lemukutan island has relatively normal salinity, pH, and turbidity at some points of location and can still be said to have excellent carrying capacity.

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