Sea Water Quality Analysis at Muncar Fishing Port, Banyuwangi Regency, Indonesia

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Abstract. The condition of sea water quality is very important to study to determine whether a sea water is polluted or not. Muncar Fishing Port, located in Banyuwangi Regency, is the largest fish port on the island of Java. Economic activities around the port are dominated by fish canning factories which cause a very high amount of waste. Factory waste that is not managed by the factory is dumped directly into the ocean so that the waters at the Muncar Fishery Port become polluted. This study aims to determine the quality of sea water at the Muncar Fishery Port using a TDS meter. The parameters used in this study consisted of water temperature, pH, and PPM. Research samples were taken in five locations that have different characteristics. Based on the results of the research, the first and second locations have high levels of pollution which are characterized by low pH values (7) and high PPM (8.3). The third, fourth, and fifth locations have safe values so that they can be classified as unpolluted waters.

1. Introduction

The increasing activity of the manufacturing industry in Indonesia makes this country also increase the amount of waste produced. One of the impacts of waste disposal by factories is sea water pollution. Liquid waste produced by factories contains chemicals that will kill every living thing in the sea. Chemicals produced by factories are classified as B3 (hazardous and toxic materials). Polluted sea water will cause damage to marine ecosystems, namely fish and coral reefs [5]. In addition, pollution carried out by factories will also cause changes to the food web structure, water community structure, physiological effects, genetics, behavior, and resistance [12]. The impact of factory waste being discharged into the water will lead to a decrease in water quality and a decrease in fish species that inhabit these waters [19]. In addition, factory waste will change or pollute the pH of the waters [24].

Shallow sea area is an area of marine waters that can still be reached by sunlight which reaches the continental shelf (approximately 200 meters from the coast). In this area, there are many living things because they get enough sunlight and sufficient oxygen content. The life of these living things is dominated by small to medium size fish and coral reefs as a place to live for some fish. This makes the shallow sea an area rich in potential marine resources because it is a habitat for small to medium fish [16]. The potential for marine resources found in shallow sea areas can be in the form of fisheries, coral reefs, mangrove forests, mining materials, to become tourist areas.

Muncar District is one of the sub-districts in Banyuwangi whose economic life is based on the marine sector. This is due to the position of the Muncar sub-district around the coast so that the community's economic activities depend on the sea. These economic activities include salt farmers, fishermen, and even industrial activities such as fish canning. The economic activities of coastal communities are dominated by fishermen, cultivators, fish processors and traders which are the strength factors of the coastal community's economy [23]. This makes in the coastal areas many activities and buildings that support the community's economy such as factories and ponds.

Muncar Beach in Banyuwangi Regency is one of the beaches that has problems in sea water pollution. The pollution is carried out by fish canning factories around the coast, causing factory
waste to be disposed of in sea water. People who live and carry out economic activities on Muncar Beach have complained about the actions of these factories. Some of the impacts felt by the community are itchy skin and fishing boats that get dirty quickly. The sea water pollution that occurred at Muncar Beach also caused a fish crisis to occur in this beach in 2011. In addition, the liquid waste produced by the fish canning factory in Muncar District has not yet operated a Wastewater Treatment Plant (IPAL) [4]. This shows that water pollution by waste has an impact on the community's economy as evidenced by decreased productivity and decreased income [23]. Another impact that is also felt by the community is the pungent odor from the disposal of waste, which disrupts people's daily activities. Disposal of factory waste that is not handled will interfere with public health such as stomach disease (diarrhea) and itching of the skin due to water and air pollution [8].

The impact felt by the community is based on the quality of sea water on Muncar Beach. Son, et al. (2020) said that if fish canning factory waste can be managed, it can become an economic source for the surrounding community. In addition, the coastal community of Muncar has also adapted by managing factory waste into fish oil, petis, and fertilizer [2]. However, the fact that the coastal communities of Muncar Beach are still complaining about the impact of disposing of factory waste into seawater should be taken into consideration for this problem. Disposal of factory waste directly into the sea changes the quality of Muncar Beach. Conducting research on sea water quality at Muncar Beach will be useful in determining community and government policies regarding activities around the research location. The purpose of this study was to determine the area of marine waters in the Muncar Fishery Harbor that was heavily polluted and not polluted. This is intended so that the use of community socio-economic activities can be carried out in the right area so that it does not have an impact on the losses felt due to polluted sea waters.

2. Methods

2.1 Types of Research

The case study research “Analysis of Water Quality at Muncar Beach, Banyuwangi Regency” is a qualitative research. Qualitative research is research that produces descriptive data in the form of written or spoken words from people and observable behavior (Trisliatanto, 2020). In addition, the data used for this study were taken from interviews with research samples and laboratory results of water quality tests. The data that has been obtained will be adjusted to the existing theories. After adjusting to the theory, a conclusion will be drawn which will be the final result of this research.

2.2 Research Sites

Muncar Beach is one of the beaches in Banyuwangi which has been used as a fishing port and is the largest port on the island of Java. Location Muncar Beach is located in Muncar District, Banyuwangi Regency, East Java at the coordinates of 8.44°45' South Latitude (LS) and 114.33°112' East Longitude (BT). The distance between Muncar District and Banyuwangi City is 52 kilometers so it takes about one hour at an average speed. As the largest fish port on the island of Java, the most common economic activities are fish auctions and fishing activities. In addition, around the research location there is a canned fish factory which is the main economic source of the people who live in the area.

2.3 Research Subjects and Samples

The population used in this study is the people who live in the area around Muncar Beach, Banyuwangi Regency. To collect data, the researcher will choose several research samples from a predetermined population using purposive sampling method. Purposive sampling method is a research
sample collection technique by selecting samples that meet the criteria set by the researcher. The terms and conditions to become a research sample are as follows.

a. Domiciled around the Muncar Beach area, Banyuwangi Regency.
b. Productive age (15-64 years).

Based on these criteria, three research subjects have been obtained. The interview was conducted on November 20, 2021 at the Muncar Beach Fish Port, Banyuwangi Regency. The identity of the research subject is as follows.

| Name               | Age            | Note                          |
|--------------------|----------------|-------------------------------|
| Dimas Adi Laksana  | 24 years old   | Citizen of Muncar             |
| Muhammad Nur Ajis  | 30 years old   | Employees at Muncar Beach Fish Harbor |
| Tia Amelia         | 19 years old   | Citizen of Muncar             |

The research sample in the form of sea water taken at five different points. The selection of research sample points was carried out by considering the locations that received the most plastic and textile waste as well as factory waste. The location of the research sample was carried out at the Muncar Beach Fish Harbor where the majority of activities were fish canning and a place for ships to rest. The second location is carried out in an area that has piles of plastic and textile waste and is in a residential area. The third location is carried out in residential areas where there are no ship-related activities. The fourth location is carried out in areas that focus on additional activities. The last location is carried out in an area that has been designated as a tourism area by the local government.

2.4 Data Collection Technique

The data collected for the research is in the form of primary data. Primary data were obtained for two types of data, namely: (1) seawater sample points at Muncar Beach, Banyuwangi Regency, and (2) interviews with research samples based on predetermined criteria. The list of questions for data collection interviews is as follows.

a. What causes Muncar Beach, Banyuwangi Regency to be dirty with waste?
b. Who produces the waste?
c. Since when is Muncar Beach, Banyuwangi Regency polluted by waste?
d. What is the impact of the disposal of the waste on the community?
e. What types of waste have the most impact on society?
f. Has there been any effort from the community or local government to overcome this problem?
g. (If the answer is 'yes') What are the efforts of the community and local government to overcome the problem of sea water pollution at Muncar Beach, Banyuwangi Regency?
h. (If the answer is 'no') What are the factors that cause no effort from the community or local government to overcome this problem?
i. In your opinion, what is the most appropriate effort to overcome the problem of sea water pollution at Muncar Beach, Banyuwangi Regency?

2.5 Data Analysis Technique

Data analysis will be carried out qualitatively using the Spradley model. According to Spradley, qualitative data analysis is carried out by collecting as much data as possible to obtain satisfactory data results within a certain period of time. The data analysis of the Spradley model consists of three stages, namely domain analysis, taxonomic analysis, and compensatory analysis. Therefore, the stages of data analysis are described as follows.
3. Results and Discussion

3.1 General Description of Research Location

Research samples were taken from five different location points. The research locations were carried out at five different points as follows.

a. First point : 8°26'28.82” and 114°20'30.82”E
b. Second point : 8°26'26.21” and 114°20'34.98”E
c. Third point : 8°26'16.27” and 114°20'30.32”E
d. Fourth point : 8°25'39.16” and 114°20'21.12”E
e. Fifth point : 8°25'24.36” and 114°20'22.97”E

Figure 1. Data Analysis Technique

- **Domain Analysis**: Conducting observations and document studies to find out the general description of the research location.
- **Taxonomic Analysis**: Taking water samples at five different locations and conducting interviews.
- **Componental Analysis**: Conducting laboratory tests of seawater quality using a TDS meter at the Geography Education Laboratory of the University of Jember.
3.2 Quantitative Analysis

Human activities both in economic and social terms are able to have an impact on the quality of sea water in an area. These impacts will affect the physical and chemical conditions of seawater. The results of the sea water quality test will determine the value of sea water quality to be classified as polluted sea waters. The results of laboratory tests of sea water quality at the Muncar Beach Fish Port, Banyuwangi Regency are as follows.
Table 2. Seawater Quality Laboratory Test Results

| Parameter | Unit | Measurement Results |
|-----------|------|---------------------|
|           |      | 1   | 2   | 3   | 4   | 5   |
| Physical Parameters |
| Tempeature | °C   | 27.8 | 28.3 | 27.9 | 28.3 | 27.8 |
| Chemical Parameters |
| pH         |      | 5   | 6.1  | 7   | 7.5  | 7.3  |
| PPM        |      | 540 | 375  | 240 | 220  | 175  |

3.3 Qualitative Analysis

Water temperature is an important indicator of the life of organisms or living creatures in the sea. Water temperature is an indicator of metabolic activity and the spread of organisms that live in the water [13]. In addition, sea surface temperature will also affect the catches obtained by fishermen [25]. Factors that cause the water temperature at each location to be different are caused by external factors such as weather, wind, and currents. In addition, variations in water temperature can also be caused by the level of solar radiation and the rate of evaporation that occurs [21]. The temperature of the water will affect the level of stress on the fish body and affect the increase in the metabolism of organisms in the water [11]. Water temperature that is not in accordance with the body temperature of the fish will cause the death of the organism, the speed of respiration and photosynthesis, an increase in the accumulation power, and an increase in the toxicity of chemicals [10]. Therefore, the water temperature suitable for the living environment of fish is between 20-30°C [7].

The results of the measurement of the temperature of the sea waters at the Muncar Beach Fish Port showed relatively the same results, namely between 27°C to 28°C. This can be influenced by temperature measurements that are not carried out directly in the field so that there is a change in temperature in the water itself. Measurement of sea water temperature will be more precise and appropriate if it is carried out directly in the field. This is caused by the difference in room temperature will affect the temperature of the seawater under study. Based on the temperature measurement results obtained, the surface temperature of the water at the Muncar Beach Fish Port can be said to be normal because it is in the temperature range of 20-30°C.

Researching the pH in a condition of marine waters is very important so that researchers can determine the stability of marine waters (Simanjuntak, 2009). Hamuna, et al. (2018) said that pH or acidity is an important indicator in determining the good and bad conditions of a waters. In addition, the pH conditions in marine waters will determine the type of marine biota that can live in the area. Differences in pH in an area of marine waters can be different because of the source of oxygen and pollution. Waters that have an acidic or alkaline pH will directly endanger the life of organisms because there will be disturbances in metabolism and respiration [11].

pH research can also be done by looking at the solubility of dissolved compounds in these waters. Please, et al. (2017) said that an increase in the degree of acidity in waters will generally be followed by a smaller solution of metal compounds. The degree of ocean acidity is relatively stable if it is at 7.5 to 8.4 [6]. The pH of the factory drainage channel in Muncar District has a pH of 7.33 [1]. The quality of sea water can increase as a result of drainage sources flowing into the sea with different river water quality conditions [3]. Based on the laboratory tests that have been carried out, the results of measuring the degree of acidity at the Muncar Fishery Port have heterogeneous results. The first and second points have a low degree of acidity indicated by the numbers 5 and 6. A pH value below 7 indicates that the water is acidic due to its strong acidity. The low pH value can be caused by the mass of water coming from various river mouths, the amount of rainfall, and the oxidation process [15]. In addition, the low pH value can also be caused by sampling in the factory waste disposal channel [14].

The results of the sample test research at the third to fifth locations show a neutral pH value, namely the pH value at number 7. The quality of water with a neutral pH indicates that the water is not polluted with evidence of fish and microorganism living in the area. Lemuru fishery products are
still abundant around the Muncar Fishing Port, Banyuwangi [17]. The total fishing catch at Muncar Fishery Port in 2020 was able to reach more than 200 tons for laying fish and tuna and more than 70 tons for lemuru [9]. In addition, this statement is proven to be true because around the sampling location there are many fish ponds managed by the community. In addition to fish ponds, the community also carries out fish pond activities which prove that the water around three to five locations is not polluted.

4. Conclusion
The average temperature at the Muncar Fishing Port is relatively the same, showing the numbers 27°C to 28°C. The difference in the degree of acidity in each research location is caused by the waste that pollutes the water quality. Human activities both in economic and social terms are able to have an impact on the quality of sea water in an area. Measurement of sea water temperature will be more precise and appropriate if it is carried out directly in the field. It would be better if the research was carried out at the same location and at the same time so that there were no changes in the physical or chemical components of the water. It would be better if the local government made a firm policy to overcome sea water pollution at the Muncar Fishery Port. This is caused by the influence of chemicals from the waste which causes the number of fish in coastal areas to decrease. For further research, it would be better to examine the components of water quality more completely so that conclusions can be drawn more precisely.

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