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ANALYSIS OF MICROPLASTIC CONTENT IN SEAWATER AT PADANG AND PARIAMAN TOURISM BEACHES, WEST SUMATRA PROVINCE

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ABSTRACT

Coastal and marine areas have the potential for anthropogenic pollution. Solid waste, especially plastic, is a pollutant that contributes greatly to polluting coastal areas. Plastic will degrade into small sizes known as microplastics. The purpose of this study was to determine the content of microplastics in the Padang and Pariaman Coastal Waters, West Sumatra. This research was conducted in November 2021 in the seawaters of Padang Wisata Beach (Air Manis Beach and Muaro Lasak Beach) and Pariaman Beach (Kata Beach and Gandoriah Beach) of West Sumatra Province. Based on the results of the study, four types of microplastics were found, namely fiber, film, fragments, and granules. The type of fragment is the dominant type found, followed by the type of film, fiber and granules. Microplastic abundance at Air Manis Beach ranged from 616.67-2196.97 particles/m^3, Muaro Lasak Beach 916.67-2396.67 particles/m^3, Kata Beach 320.00-1190.00 particles/m^3, and Gandoriah Beach 550, 00-1363.33 particles/m^3. In general, at Padang Beach and Pariaman Beach by type, microplastic fragments were the most common type found with a percentage of 53%. The type of film is the second most common type (32%), followed by the type of fiber (11%) and the type of grain (4%). Microplastics were distributed in seawater at Padang Beach and Pariaman Beach with different abundances.

Keywords: Tourist beaches, Seawater, Microplastics.

I. INTRODUCTION

Coastal and marine areas are potential areas because they have economic and aesthetic values that can be developed as tourist areas. Coastal waters are the border areas between land and sea which are influenced by the highest tides and lowest ebb and are influenced by the physics of the sea, while landward is limited by natural processes and human activities in the terrestrial environment, which is a real illustration of the dynamic interaction between water, wind and land [1]. Several coastal areas in West Sumatra Province have been developed as tourist areas because of their exotic beauty, especially Padang and Pariaman Beaches. The two regions have different statuses, where Padang is the Capital of the Province while Pariaman is the Capital of the Regency. The large number of community activities around the coastal area and the influence of oceanographic factors means that the beach is not free from solid waste pollutants. Marine debris is the waste of living things in solid form that enter the marine environment either intentionally or unintentionally. The dominant waste in marine waters is plastic type waste. Plastic will experience degradation into small sizes

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known as microplastics. According to [2], microplastics will consistently increase on beaches and sediments over time if there is no control. Based on this, researchers are interested in conducting microplastic research on tourist beaches in Padang City and Pariaman City, West Sumatra Province.

2. RESEARCH METHOD

Time and Place

This research was conducted in November 2021 at Padang Tourism Beach (Air Manis Beach and Muaro Lasak Beach) and Pariaman Beach (Kata Beach and Gandoriah Beach) in West Sumatra Province (Figure 1).

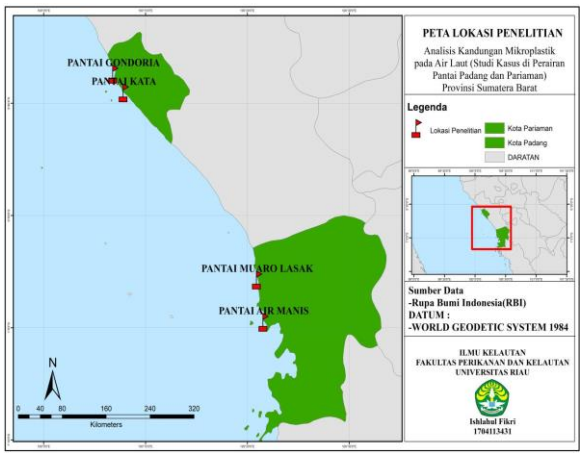

Figure 1. Map of Research Locations

Method

The method used in this study is a survey method. The data taken are primary data and secondary data.

Research Procedure

Sampling locations were determined using a purposive sampling method. The parameters of the waters measured include pH, temperature, salinity, and speed as supporting data to describe the condition of the waters on the tourist beaches of Padang and Pariaman.

Sampling of seawater was carried out in two areas, namely Padang City (Air Manis Beach and Muaro Lasak Beach) and Pariaman Beach (Kata Beach and Gandoriah Beach) and at each location, there were three stations. Sea surface water samples were taken with a volume of 100 liters of water using plankton net no. 25 and filtered to 100 mL.

Sampling of seawater at each station was carried out randomly using a boat at high tide as far as ±100 m towards the sea (appendix 1). Seawater samples are stored in a cool box for analysis in the laboratory.

Data Analysis

Analysis of the type and abundance of microplastics using the method of [3] at the Marine Chemistry Laboratory, Department of Marine Science, Faculty of Fisheries and Maritime Affairs, University of Riau. Microplastic abundance data was processed using Microsoft Excel and statistically analyzed using SPSS.

3. RESULT AND DISCUSSION

There are four types of microplastic found in all research locations, namely fiber, film, fragments and granules (Figure 2).

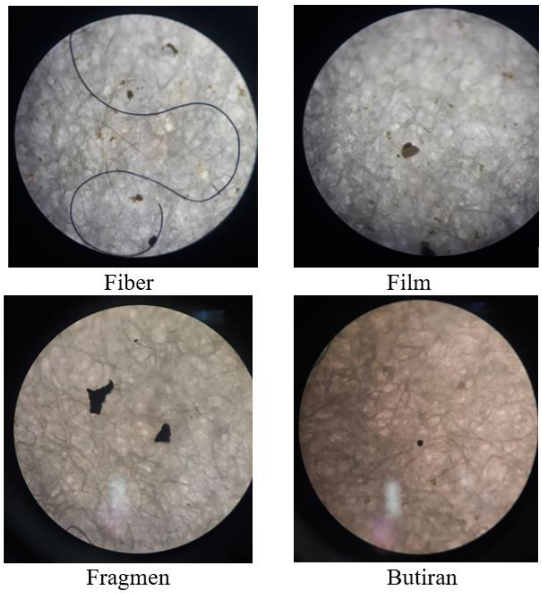

Figure 2. Types of Microplastics Found

The abundance of microplastics in seawater at Air Manis Beach ranges from

616.67 to 2196.67 particles/m^3. The highest abundance was found at station 1, because it is in a densely populated residential area. Furthermore, station 2 is located on Pulau Pisang Kecil, which is a panoramic area that is busy visiting. The lowest abundance of microplastics was found at station 3, namely 616.67 particles/m^3, which is a station with low activity (Figure 3).

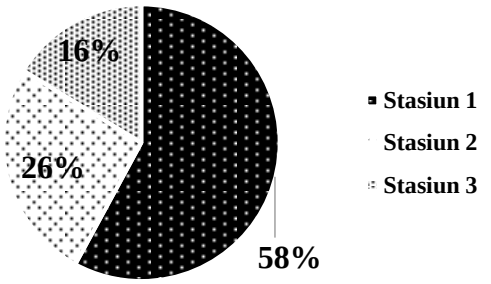

Figure 3. Diagram of the percentage of microplastic abundance in Air Manis Beach

The abundance of microplastics in seawater at Muaro Lasak Beach ranges from 916.67 to 2396.67 particles/m^3, the highest abundance was found at station 3 because it is close to an industrial area, then station 2 which is a tourist beach and the lowest is at station 2 because it has low activity (Figure 4).

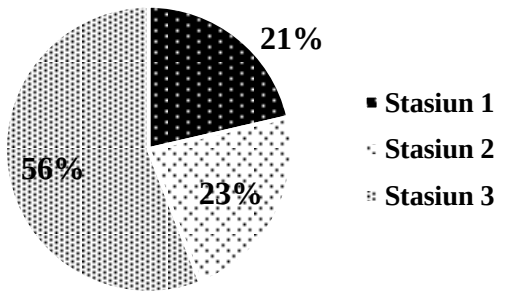

Figure 4. Percentage of microplastic abundance on Muaro Lasak Beach

The abundance of microplastics in seawater at Kata Beach ranges from 320-1190 particles/m^3, the highest abundance was found at station 2, which is in a tourist area that is busy with visitors, followed by station 1 that is adjacent to a residential area. The lowest abundance of microplastics in seawater at Kata Beach was found at station 3 that has low activity (Figure 5).

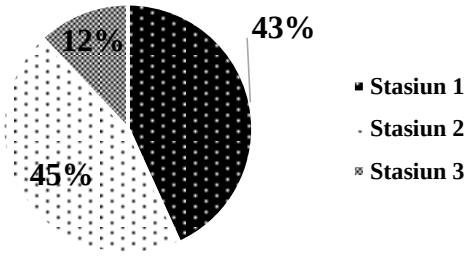

Figure 5. Percentage of microplastic abundance in Kata Beach

The abundance of microplastics in seawater at Gandoriah Beach ranges from 550.00 to 1363.33 particles/m^3, the highest abundance of microplastics was found at station 1 because it is an area of dense activity and close to residential areas. The abundance of microplastics at station 2 was 1221.67 particles/m^3 that is a tourist area that is busy with visitors and the lowest was found at station 3, which was an area with low activity (Figure 6).

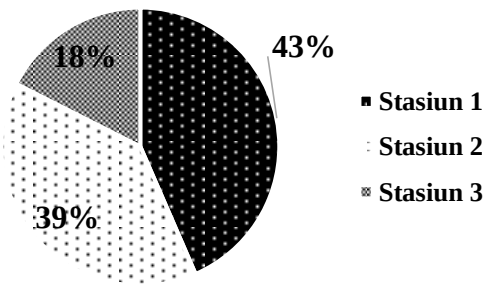

Figure 6. Percentage of microplastic abundance in Gandoriah Beach

In general, in Padang Beach and Pariaman Beach, West Sumatra, based on type, microplastic fragment types were the

most common type with a percentage of 53%. Film type was the second most abundant type, namely 32%, followed by fiber type with 11% and granular type with a percentage of 4% (Figure 7).

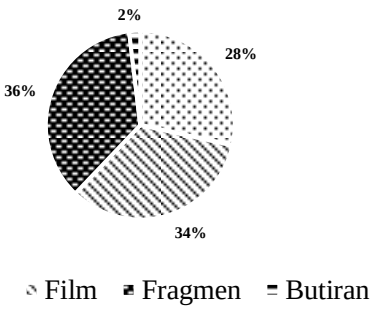

Figure 7. Diagram of the percentage of microplastic abundance found in all study locations

The results of the test of the split plot design at Air Manis Beach, the results of the analysis of variance obtained the Sig (p-value) of the treatment variable (Station) = 0.007 which is smaller than 0.05 (<0.05) so that the hypothesis H_0 is rejected and it is concluded that there is a difference There is a very significant difference between the station treatment and the results of microplastic content in seawater. The results of the analysis of variance obtained the Sig value (p-value) of the Group variable (Content) = 0.000 which is less than 0.05 (<0.05) so that the H_0 hypothesis was rejected and it was concluded that there was a very significant difference between the Station treatment and the microplastic content results on seawater. The treatment interaction with the group has a Sig value (p-value) = 0.000 (<0.05) so that the H_0 hypothesis is rejected and it is concluded that there is a very significant difference between the station and group treatments on the results of microplastic content in seawater.

The results of the split plot design test at Muaro Lasak Beach, the results of the analysis of variance obtained the Sig (p-value) of the Treatment variable (Station) = 0.073 which is greater than 0.05 (<0.05) so that the hypothesis H_0 is accepted and it is concluded that there is no a very significant difference between the Station treatment and the results of microplastic content in seawater. The results of the analysis of variance obtained the Sig value (p-value) of the Group variable (Content) = 0.000 which is less than 0.05 (<0.05) so that the H_0 hypothesis was rejected and it was concluded that there was a very significant difference between the Station treatment and the microplastic content results on seawater. The treatment interaction with the group has a Sig value (p-value) = 0.020 (<0.05) so that the H_0 hypothesis is rejected and it is concluded that there is a very significant difference between the station and group treatments on the results of microplastic content in seawater.

The test results of the split plot design at Kata Beach, the results of the analysis of variance obtained the Sig (p-value) of the Treatment variable (Station) = 0.012 which is smaller than 0.05 (<0.05) so that the hypothesis H_0 is rejected and it is concluded that there is a significant difference very significant difference between the Station treatment and the results of microplastic content in seawater. The results of the analysis of variance obtained the Sig value (p-value) of the Group variable (Content) = 0.000 which is less than 0.05 (<0.05) so that the H_0 hypothesis was rejected and it was concluded that there was a very significant difference between the Station treatment and the microplastic content results on seawater. The treatment interaction with the group has a Sig value (p-value) = 0.000 (<0.05) so that the H_0 hypothesis is rejected and it is concluded that there is a very significant difference between the station and group treatments on the results of microplastic content in seawater.

The results of the test of the split plot design at Gandoriah Beach, the results of the analysis of variance obtained the Sig (p-

value) of the Treatment variable (Station) = 0.035 which is smaller than 0.05 (<0.05) so that the hypothesis H_0 is rejected and it is concluded that there is a significant difference very significant difference between the Station treatment and the results of microplastic content in seawater. The results of the analysis of variance obtained the Sig value (p-value) of the Group variable (Content) = 0.000 which is less than 0.05 (<0.05) so that the H_0 hypothesis was rejected and it was concluded that there was a very significant difference between the Station treatment and the microplastic content results on seawater. The treatment interaction with the group had a Sig value (p-value) = 0.000 (<0.05) so that the H_0 hypothesis was rejected and it was concluded that there was a very significant difference between fertilizer treatment and genotype on the results of microplastic content in seawater.

4. CONCLUSION

Overall, the type of fragment is the dominant type of microplastic found on the tourist beaches of Padang and Pariaman. The abundance of microplastics in Air Manis Beach ranges from 616.67-2196.97 particles/m^3, Muaro Lasak Beach 916.67-2396.67 particles/m^3, Kata Beach 320.00-1190.00 particles/m^3, and Gandoriah Beach 550.00-1363.33 particles/m^3. Microplastics are distributed in seawater at Padang Beach and Pariaman Beach with different abundances.

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