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ABUNDANCE OF MARINE DEBRIS ON PADANG AND PARIAMAN BEACHES WEST SUMATRA PROVINCE

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ABSTRACT

Padang and Pariaman Beaches are regional strategic locations for tourism and have been growing rapidly. However, waste has become a significant concern because of its anthropogenic impact. This study aims to identify and analyze the types of waste abundance on both beaches of these tourist destinations. This research was conducted in August 2022 using a survey method. This study found eight types of waste in the two locations. They comprise plastic, metal, glass, wood, paper, rubber, and cloth fragments. The total fragment on Padang Beach reached 3,392 items/m^2, higher during the weekend than before the weekend (1,212 and 1,072 items/m^2). Meanwhile, the total fragment on Pariaman Beach reached 2,484 items/m^2 and was higher during the weekends than after the weekends (0.956 and 0.74 items/m^2). Moreover, there was no significant difference between the two locations ($p>0.05$). It might relate to the characteristics of the same water quality parameters: the current velocity ranges from 0.3-0.4 m/s (medium current), so it does not have a different effect.

Keywords: Pollution, Anthropogenic impact, Waste abundance

1. INTRODUCTION

The cities of Padang and Pariaman City have strategic regional locations and abundant natural resources. Apart from that, regional management in this city can be said to have developed rapidly, especially in fisheries and maritime affairs. The cities of Padang and Pariaman City have potential as marine tourism areas. The rapid development of marine tourism shows that there is potential in the area that is quite promising to be managed so that it can increase regional income and create jobs for the surrounding community. However, this increase can impact the environment because anthropogenic activities are recorded as one of the sources causing waste generation in coastal areas[1].

Coastal waste is solid organic or inorganic material waste that does not decompose quickly, originating from anthropogenic activities that are produced or processed by humans and have the potential to enter the aquatic environment, either intentionally or unintentionally[2]. This is because regional development with inappropriate management will give rise to environmental problems, such as environmental degradation, environmental pollution, and waste problems, which cause the loss of the beauty of tourist areas and the comfort of visitors when traveling in the area. The issue of waste continues to be a public conversation topic. Therefore, this research is interesting because the waste problem in the cities of Padang and Pariaman City is still unresolved.

2. RESEARCH METHOD

Time and Place

This research was conducted in August 2022 at Padang Beach (Air Manis Beach and Muaro Lasak Beach) and Pariaman Beach (Gandoriah Beach and

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Kata Beach) in West Sumatra province (Figure 1).

Figure 1. Map of Research Location

Methods

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

Procedures

Sampling was carried out in three periods: before the weekend (Thursday and Friday), the weekend (Saturday and Sunday), and after the weekend (Monday and Tuesday) when conditions receded. The sampling location has a beach length of 100 m measured from the water's edge with a distance of 20 m for each transect for 5 transects. At each research station, a transect was placed with a plot size of 5x5 m^2 (Figure 2).

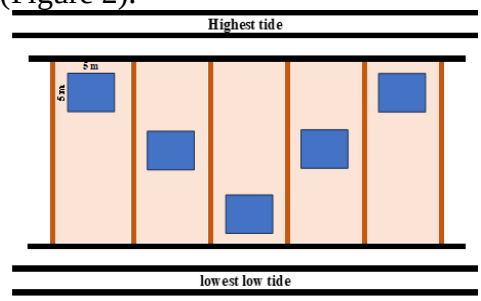

Figure 2. Transect Sample Collection

Next, all the waste found is put into rubbish bags to be identified according to categories: plastic, metal, glass, wood, paper, rubber, cloth, and other materials. Identified waste will be counted and weighed. Calculation of the weight and abundance of waste between research stations used the following formula:

$$\text{Weight} = \frac{\text{Total weight of waste (g)}}{\text{Area (m}^2\text{)}}$$

$$\text{Abundance} = \frac{\text{Total Waste per Type (unit)}}{\text{Area (m}^2\text{)}}$$

Data Analysis

Analysis of the type and abundance of waste between research stations is tabulated in tables and figures. A T-test was carried out using Microsoft Excel and SPSS 25 to compare types and abundance of waste.

3. RESULT AND DISCUSSION

Type, Total, and Weight of Waste

There are various types of waste. Therefore, to facilitate identification and analysis, waste type grouping is carried out, which groups waste into several types: plastic, metal, glass, wood, paper, rubber, cloth, and others. The type and total of waste found on Padang and Pariaman Beaches can be seen in Table 1, while the weight of waste found on Padang and Pariaman Beaches can be seen in Table 2.

Table 2. Types and Total of Waste at Padang and Pariaman Beaches

Type	Total Waste (Unit)											
	Before Weekend				*Weekend*				*After Weekend*			
	1	2	3	4	1	2	3	4	1	2	3	4
Plastic	15	192	29	116	32	206	32	146	17	189	21	107
Metal	-	1	-	-	-	4	-	-	-	3	-	-
Glass	-	3	-	-	-	-	-	-	-	1	-	-
Wood	5	9	5	17	4	8	5	10	5	19	4	13
Paper	1	7	2	5	2	10	1	7	1	5	2	4
Rubber	-	2	-	-	-	3	-	-	-	4	-	-
Cloth	-	2	-	-	-	-	-	-	-	1	-	-
Other	9	22	9	17	8	24	13	24	9	23	13	20
Total	**30**	**238**	**45**	**155**	**46**	**255**	**51**	**187**	**32**	**245**	**40**	**144**

Note :1. Air Manis Beach; 2. Muaro Lasak Beach; 3. Gandoriah Beach; 4. Kata Beach

Based on the results of research conducted in 3 periods (before, on the weekend, and after the weekend) at Padang

and Pariaman Beaches, it is known that during the research, 1,468 units of waste were found, which were dominated by plastic waste. The highest waste generation in Padang City is at Muaro Lasak Beach, where 255 units of waste were found at the weekend, and the lowest waste generation was at Air Manis Beach, where only 30 units of waste were found before the weekend. Meanwhile, for Pariaman City, the highest waste generation was found at Kata Beach, with 187 units of waste at the weekend, and the lowest waste generation was at Gandoriah Beach, where only 40 units of waste were found at the weekend.

Table 2. Weight of Trash at Padang and Pariaman Beaches

Type	Weight of Trash (g)											
	Before Weekend				*Weekend*				*After Weekend*			
	1	2	3	4	1	2	3	4	1	2	3	4
Plastic	51	557,5	51	515.5	107,5	777,5	99	255	44	485	40	238,5
Metal	-	7	-	-	-	32	-	-	-	61	-	-
Glass	-	367	-	-	-	-	-	-	-	125	-	-
Wood	309	1.502	113	1.923	262	1.932	229	810	534	2.866	344	649
Paper	8	116	37	85	37	113	14	86	8	83	28	65
Rubber	-	279	-	-	-	342	-	-	-	339	-	-
Cloth	-	426	-	-	-	-	-	-	-	643	-	-
Others	461	1.151	1.487	2.980	127	2.596	1.105	3.703	409	2.062	1.110	2.766
Total	**829**	**4.405,5**	**1.688**	**5.5035**	**533.5**	**5.792.5**	**1.447**	**4854**	**995**	**6.664**	**1.522**	**3.718,5**

Note :1. Air Manis Beach; 2. Muaro Lasak Beach; 3. Gandoriah Beach; 4. Kata Beach

Based on the results of research conducted in 3 periods (before weekend, weekend, and after weekend) at Padang and Pariaman Beaches, it is known that during the research, the waste collected weighed 37,952.5 kg, which was dominated by wood and other waste. The highest waste weight for Padang City was at Muaro Lasak Beach, producing 6,664 kg of waste after the weekend. The lowest waste weight was at Air Manis Beach, producing 533.5 kg of waste at the weekend. In contrast, for Pariaman City, the highest waste weight was Kata Beach, which produced waste weighing 5,503.5 kg before the weekend, and the lowest weight was at Gandoriah Beach, producing waste weighing 1,447 kg at the weekend.

The data presented in Table 1 shows that plastic waste is the type of waste most often found on Padang and Pariaman Beaches. The percentage of waste found on Padang Beach is plastic (651 units or 77%), other (95 units or 11%), wood (50 units or 6%), paper (26 units or 3%), rubber (9 units or 1%), metal (8 units or 1%), glass (4 units or 1%) and fabric (3 units). Meanwhile, the percentage of waste found at Pariaman Beach was plastic (451 units or 73%), other (96 units or 15%), wood (54 units or 9%), and paper (21 units or 3%). The percentage of total waste on Padang and Pariaman Beaches can be seen in Figure 3.

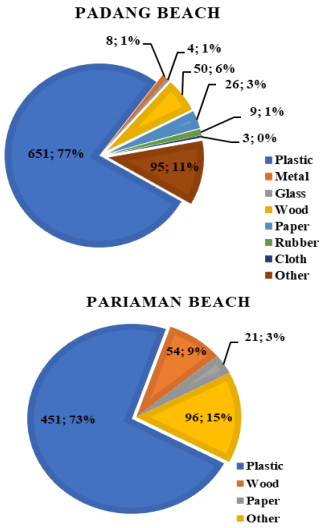

Figure 3. Percentage of the Total Waste on Padang and Pariaman Beaches

Abundance of Waste

The abundance of waste based on 3 periods of waste sampling at Padang and Pariaman Beaches can be seen in Figure 4.

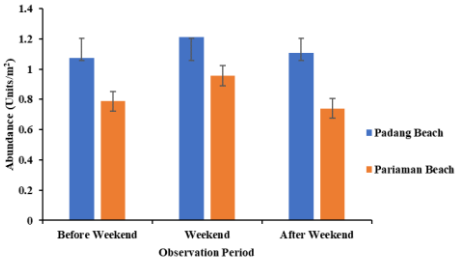

Figure 4. The Abundance of Waste at Padang and Pariaman Beaches

Based on the results of research conducted in August 2022 with the research

location being on the tourist coast, namely Padang Beach (Air Manis Beach and Muaro Lasak Beach), the results showed that the total abundance of waste was 3,392 units/m^2 with the highest total abundance of waste occurring at the weekend at 1,212 units/m^2 and the lowest total abundance of waste occurred before the weekend at 1,072 units/m^2. Meanwhile, the abundance of waste at Pariaman Beach (Gandoriah Beach and Kata Beach) resulted in a total waste abundance of 2,484 units/$m^{2,}$ with the highest total waste abundance occurring at the weekend at 0.956 units/m^2 and the lowest total waste abundance occurring after weekends of 0.74 units/m^2. This is because the research location is a tourist attraction in the cities of Padang and Pariaman City, which is visited by many local and foreign tourists close to the coastline, residential areas, trade centers, urban areas, and so on.

This is supported by research by Hardesty et al.[3], who explained that currents and anthropogenic activities close to the coast influence high and low waste generation. Apart from that, the presence of waste is also influenced by tourist and industrial activities around the coastal area. The research of Husri et al.[4] explained that there is more waste at stations close to the coastline compared to stations further from the coast. Therefore, the high and low abundance of waste is influenced by anthropogenic activities and current speed, which play a role in the process of placing waste because the faster the current is, the faster the accumulation of waste occurs in coastal areas[5].

The results of this research have been proven by the t-test, which shows no significant difference ($p>0.05$) in the abundance of waste on Padang and Pariaman Beaches, West Sumatra Province, between research stations. This is because the sampling locations have the same water quality parameter characteristics, namely current speeds ranging from 0.3-0.4 m/sec (medium current), so they do not have a different influence.

4. CONCLUSION

Based on the research results, 1,468 waste units were found on Padang and Pariaman Beaches weighing 37,953 kg. It is known that there are 8 types of waste, namely plastic, metal, glass, rubber, wood, and others. The dominant waste found was plastic waste, with an accumulation of 77% in Padang Beach and 73% in Pariaman Beach. The highest abundance of waste on Padang and Pariaman beaches occurs at weekends. Strong currents and anthropogenic activities on land and in water cause the high amount of waste produced.

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