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Identification of Inorganic Waste in the Mangrove Ecosystem in Wara Timur and Bara District Palopo City

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ABSTRACT

One of the problems caused by human activities that many cities in the world face is marine debris. The emergence of some problems caused by an increase in the amount of waste is closely related to the increasing needs and human activities as the population increases. The purpose of this study was to determine the type of inorganic waste in the mangrove ecosystem in the Wara Timur and Bara Districts. This research was conducted in April - November 2023 in Wara Timur and Bara Districts. Meanwhile, the analysis of marine debris was carried out at the Marine Laboratory of the Muhammadiyah University of Palopo. Data collection techniques use the observation method by making a 100 long transect. In each District, 3 observation stations are made. The results of this study indicate that the types of inorganic waste found at the research location are plastic, glass, and cloth waste. Of the various types of waste obtained, plastic is the most common type of waste found in research locations.

Keywords: Inorganic Waste; Mangrove Ecosystem; Palopo City

1. INTRODUCTION

One of the problems caused by human activities that many cities in the world face is marine debris. The emergence of some problems caused by an increase in the amount of waste is closely related to the increasing needs and human activities as the population increases (Manik et al., 2016). Currently, marine debris is a very important and interesting topic to study. This is because marine debris that is disposed of directly threatens the survival and sustainability of organisms.

Marine debris can be transported and distributed over long distances from one place to another with the help of ocean currents and wind. The impacts caused by marine debris can threaten the survival and sustainability of aquatic biota (Bangun et al., 2019). If marine debris continues to increase, it will affect the food chain, the economy, and the health of people in coastal areas (Johan et al., 2020).

The mangrove ecosystem is one of the habitats where trash that enters the sea can be trapped. Because mangrove trees tend to grow very tightly and this trapped waste can hurt the mangrove ecosystem (Yona et al., 2019). This is consistent with Nadir (2020), that mangrove ecosystems play a role in protecting coastal areas from wind, currents, and waves, as well as protecting floods from the mainland. Mangrove damage is caused by inorganic waste pollution due to pressure and population growth, especially in coastal areas, causing excessive changes in the cultivation of natural resources so that mangrove ecosystems are quickly eroded and damaged (Yuliani & Herminasari, 2017).

Palopo City is one of the cities in Indonesia which is located in the coastal area. Based on data from the BPS (2020) there has been an increase in population from 2017 – 2020. The population of Palopo City in 2020 is ±184.068 thousand residents. The population in Wara Timur District is 38,344 people. Meanwhile, the population in Bara District is 30,660 people and these two areas are research locations which are coastal areas. Based on the same data, it shows that two sub-districts have experienced an increase in population, namely Bara District and Wara Timur District. Based on the description above, a study was carried out on the Identification of Inorganic Waste in Mangrove Ecosystems in Wara Timur and Bara Districts, Palopo City. The purpose of this

study was to determine the type of inorganic waste in the mangrove ecosystem in the Wara Timur and Bara Districts. The difference between this research and previous research is that this reseaech only took data on the type of inorganic waste and measured the condition of the mangrove ecosystem.

2. RESEARCH METHODS

Time and Place

This research was conducted in April - November 2023 in Wara Timur and Bara Districts. Meanwhile, the analysis of marine debris was carried out at the Marine Laboratory of the Muhammadiyah University of Palopo. For more details regarding the research location, it can be seen in the following Figure 1.

Procedure

Data collection techniques use the observation method by making a 100 long transect. In each District, 3 observation stations are made. At each observation station, 12 plots were made measuring 5 x 5 m in length. In each of these plots, the number of mega (> 1 m) and macro (> 2.5 cm – 1 m) waste types were identified. In addition, in the same plot identification of waste weight and size was carried out. Garbage that has been collected is then put into sacks and sorted and then analyzed based on type, amount, weight, and size.

Figure 1. The location of, observation stations are located in the East Bara and Wara Districts of Palopo City

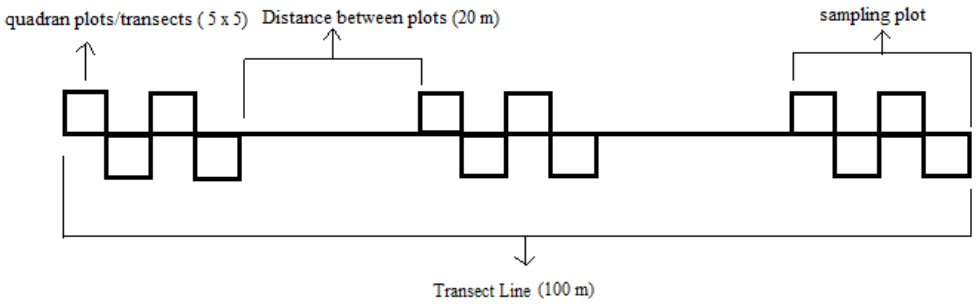

Figure 2. Transit sketch of data collection

Data Analysis

Calculation of the total amount, weight, and size of waste at each station is calculated using the formula (NOAA, 2013):

The total value and an average value for the amount of waste of each type.

JnTot = Jn st. 1 + Jn st.2 + Jn St.3

$$Jnx = \frac{Jn\ st\ 1 + Jn\ st\ 2 + Jn\ st\ 3}{X\ st}$$

The total value and an average value for the weight of each type of waste

Bn Tot = Bn st. 1 + Bn st. 2 + Bn St. 3

$$Bnx = \frac{Bn\ st\ 1 + Bn\ st.\ 2 + Bn\ st.\ 3}{X\ st}$$

The total value and the average value for the size of each type of waste.

Un Tot = Un st. 1 + Un st. 2+ Un st. 3

$$Unx = \frac{Un\ st\ 1 + Un\ st\ 2 + Un\ st\ 3}{X\ st}$$

Information:

Jn Tot = Total amount of type n waste (cut)
Jn X = Average amount of type n waste (cut)
BnTot = Total weight of type n waste (g)
Bn X = Average weight of type n waste (g)
UnTot = Total size of type n waste (cm)
Un X = Average size of type n waste (cm)

3. RESULT AND DISCUSSION

Types of Garbage

The types of inorganic waste found at the research location were plastic, glass and cloth waste. The types of plastic waste obtained were in the form of drink bottles, plastic cups, plastic wrap, nylon, basket scraps, Styrofoam, raffia rope and cosmetic wrappers. Meanwhile, the type of glass waste found included broken glass. While the type of fabric waste is in the form of pieces of used clothing, gloves and masks. When compared to the three types of waste, plastic waste is the most common type of waste found in the research location. This is presumably because community activities have a greater influence on the existence of plastic waste compared to glass and cloth. Because this type of plastic is light, it easily floats and is carried away by currents. This is by the research of Moningka et al. (2021). Marine debris that is stranded in waters is waste that is carried away periodically and comes from community activities around coastal areas.

Figure 3. Marine debris found in the research location

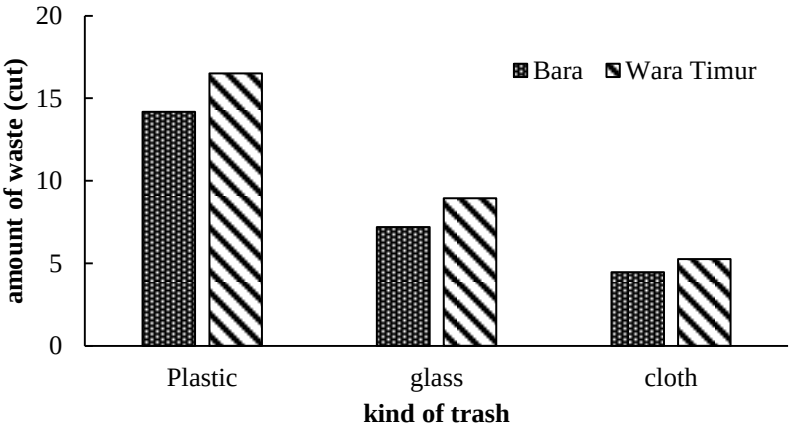

Figure 4. The average amount of waste

The Average Amount of Waste

Based on the results of an analysis of the amount of waste in the two sub-districts, the highest amount of plastic waste was found in the Wara Timur sub-district, with 17 pieces. Menwhile, the lowest amount of cloth type waste in the Bara District was 4 pieces (Figure 4).

From the two research locations, it can be seen that Wara Timur District and Bara District are research locations with the highest average amount of marine debris dominated by

plastic. Based on the results of observations at the two locations, it is possible that because the area is an area close to settlements, there has been no effort to handle marine debris in the area and also marine debris flows into the waters so that waste can accumulate in the waters. This is by the research of Mboro et al. (2022) that the plastic waste that dominates at this location is thought to have come from community activities that are not far from the mangrove ecosystem. Distribution of waste in the mangrove ecosystem is due to the encouragement of waves, currents and tides that carry the waste from one place to another (Sundah et al., 2021).

Average Waste Weight

The weight of waste in the two sub-districts obtained the highest weight of plastic waste in the Wara Timur sub-district at 17.19 grams. Meanwhile, the lowest weight of cloth waste in Bara District was 5.17 g (Figure 5).

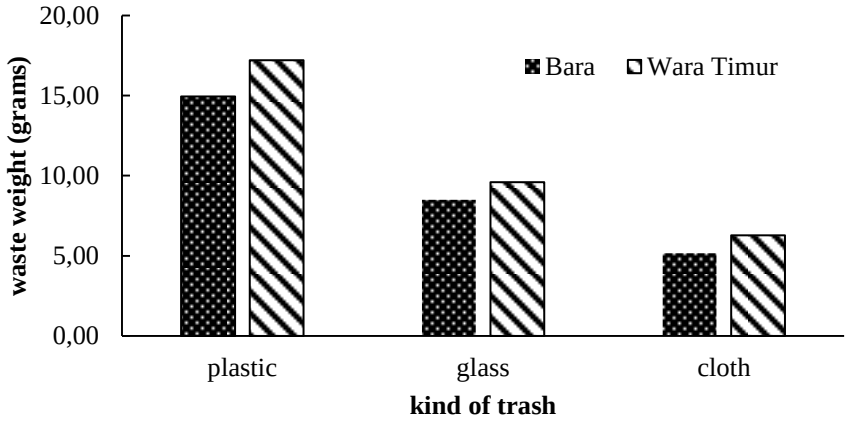

Figure 5. Average waste weight

When compared to the weight of the three wastes, plastic waste has the highest average weight of all inorganic waste. This is by research Loliwu et al. (2021) that this type of plastic waste has a higher distribution and presence compared to other types of waste. This is presumably because plastic waste is the most marine waste that is distributed in all waters and is lasting. The weight value of inorganic waste depends on the amount of waste per type, and vice versa, if the amount of waste per type is less, the weight will also be lower. Sundah et al. (2021) the high value of the weight of inorganic waste is determined by the large amount of waste per type.

Average Litter Size

Based on the analysis results obtained in the two sub-districts, the highest size of plastic waste was obtained in the Wara Timur sub-district at 13.65 cm. Meanwhile, the lowest size of cloth waste in the Bara District was 4.88 cm.

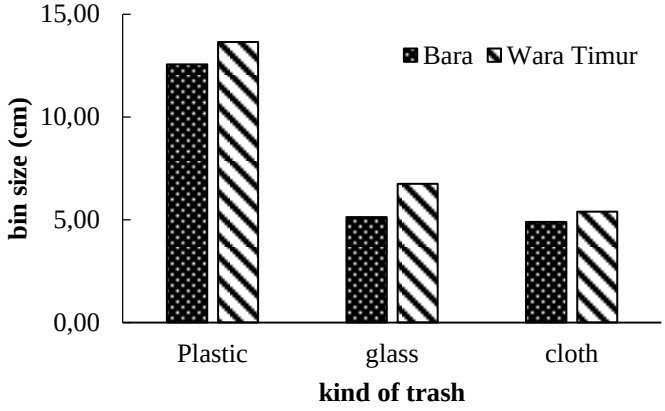

Figure 6. Average waste size

When compared to the three sizes of waste, this type of plastic waste has the largest average size of all the average sizes of waste. This is presumably because plastic is the most

dominant waste used by the community. Plastic waste is dominant because its density is lower than that of glass and cloth, which makes it easy to transport (Ryan et al., 2009).

4. CONCLUSIONS

Based on the results of the research when weighing, the types of marine debris found in the two research locations were types of plastic, glass and cloth. The most dominant type of waste is plastic waste. Plastic waste is the heaviest type of waste, while the lightest is cloth. Plastic waste is also the largest type of waste, then glass and finally cloth.

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