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ANALYSIS OF MESOPLASTIC WASTE COMPOSITION IN TOURISM AREA, MUARA BADAK DISTRICT, KUTAI KARTANEGARA REGENCY, EAST KALIMANTAN

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ABSTRACT

Waste is one of the problems for people all over the world, marine debris can come from community activities from the mainland or from the coast. Most of the activities of coastal communities may produce waste including fishing and tourism activities. Research on plastic waste in the Tourism Beach area of Muara Badak District was conducted to identify the type of mesoplastic, analyze the total weight, density and proportion of mesoplastic and determine differences in mesoplastic. This research was conducted at two tourist beach locations, namely Panrita Lopi Beach and Jingga Beach. The research method used was Purpusive Sampling method with recycling and making transect lines with a size of 100 m × 20 m, followed by dividing the transect into 5 lanes measuring 5 m x 5 m. Four types of mesoplastic were found, namely film, fiber, fragment and styrofoam. The amount of trash found on both beaches was 53 particles with the number of particles on Panrita Lopi Beach as many as 32 particles and Jingga Beach was 21 particles. The results of the composition of the percentage of waste obtained at Panrita Lopi Beach were 50% for fragment types and at Jingga Beach for 71% for filament types. The most common amount of trash found was at Panrita Lopi Beach, this was due to the fact that the number of visitors was greater than that of Pantau Jingga. The relationship between length and weight of waste at Panrita Lopi Beach was 94% while at Jingga Beach it was 58%.

Keywords: Marine Debris, Panrita Lopi Beach, Jingga Beach

INTRODUCTION

Garbage is a problem for people all over the world, both waste that comes from land and sea. One type of waste that is most abundant in land and sea areas is plastic waste. Indonesia is the second largest plastic user country in the world after China and contributes plastic waste to the oceans (Ayuningtyas, 2019).

Plastic waste is the most widely used material because it is durable, lightweight and easy to produce. The advantages of products made from plastic are a challenge for ecosystem sustainability due to the nature of plastic which takes a long time to decompose. Plastic waste is not only found on land, but plastic waste is also found in the oceans where this plastic waste includes marine debris.

Marine debris, commonly called marine debris, is the result of production or processed products that are disposed of, either intentionally or unintentionally. Marine debris is carried by rivers, drainages or other waste disposal systems that are carried by water currents and wind from the mainland and then end up in the sea (UNEP, 2005). Marine debris has a big impact on the sea and beaches, various kinds of problems arise due to the presence of marine debris. These impacts include reducing the beauty of coastal and marine areas, causing various kinds of diseases for marine biota, and impacting on damage to coastal and marine ecosystems. One of the coastal locations that is threatened by the impact of marine debris is in Muara Badak District, this is in accordance with research by Nurdiana et al., (2022) who found the number of marine debris on Sambera Beach, Muara Badak District, was 321.77 g.

Muara Badak District is a sub-district located in the coastal area of Kutai Kartanegara Regency, East Kalimantan. Muara Badak has several beaches where the beach is a tourist attraction for local visitors, one of which is Panrita Lopi Beach. The large number of tourists who come, causes a large contribution of garbage at the Panrita Lopi Beach location, both garbage from the beach or the sea. The presence of plastic waste in the beach area reduces the aesthetic value of the beach. Plastic waste scattered around these waters can disturb the surrounding marine biota, for example it can be eaten, snagged and entangled, so it often causes the death of these biota. Based on this, this research needs to identify and analyze the plastic waste found at Panrita Lopi Beach, Muara Badak District, which is assumed to be one of the potential locations for plastic waste to accumulate due to

tourism activities. The availability of actual data related to the distribution and composition of plastic waste is currently not available. The purpose of this study was to determine the amount and weight of plastic waste at Panrita Lopi Beach, Muara Badak District.

MATERIALS AND METHODS

This research was carried out for 3 months from June to August 2022 which included preliminary studies, research location surveys, data collection and waste, field data processing and discussion. Field data collection was carried out at Panrita Lopi Beach and Jingga Beach (Figure 1). Processing of mesoplastic samples was carried out at the Water Quality Laboratory, Faculty of Fisheries and Marine Sciences, Mulawarman University.

Figure 1. Location of Mesoplastic Sampling Locations

Location Determination and Sampling Method

The location of this research was determined by conducting field observations to see the condition of the tourist beach in Muara Badak District. Sampling was carried out using the purposive sampling method by looking at the amount of macroplastic waste in the beach area. The samples taken are in accordance with the research objectives, namely taking mesoplastic waste found on the tourist beach of Muara Badak District. According to Prajanti et al., (2020), the mesoplastic sampling process follows the following steps.

Determination of Research Locations

Determine the transect area of 100 m by spreading the transect parallel to the shoreline, while the transect width is at least 5 meters according to beach/field conditions.

Making Transect Lines

The division of the transect line was carried out by making a transect of 5 lanes with a distance of 20 meters each from a total length of the 100-meter transect area, marking each transect as a sign of the research location. After that, determine the sub transect box with size (5x5) m in each 20 m lane (Figure 2).

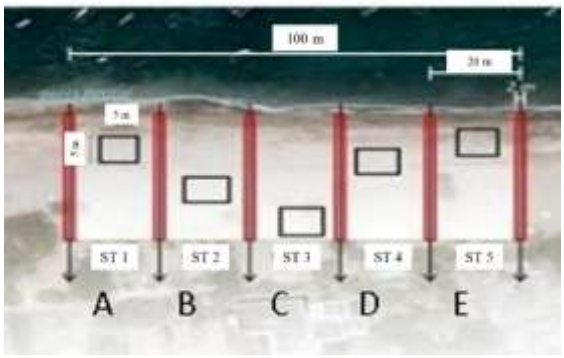

Figure 2. Illustration of a transect being carried out (Prajanti et al., 2020).

Garbage on each sub-transect is taken as a representative of each existing transect in the lane, then make sections of the sub-transect with size (1x1) within the 5x5 transect so that 25 boxes are obtained in each 20 m lane. Each box is assigned a code 1 to 25 (Figure 3).

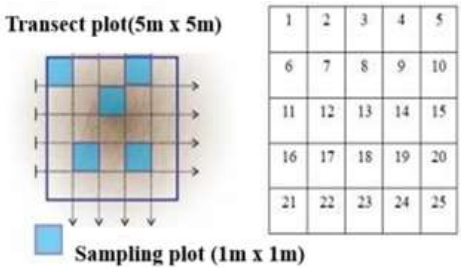

Figure 3. Sub Transe Plot Numbering 1×1m^2 (Prajanti et al., 2020)

Then choose 5 boxes out of 25 sub-transect boxes (1x1) m using a random system. The determination of the box is done using the website

: www.randomizer.org (Urbaniak and Plous, 2013).

Collection and Classification of Types of Waste

After determining five boxes out of 25 sub-transects, then determining the coordinates of the sampling locations at each sampling location using GPS. Each coordinate is recorded in decimal degrees, then documenting the waste collection area before carrying out the collection, then collecting mesoplastic waste in 5 sub-transect areas (1x1) m at a depth of 3 cm is collected using a shovel, then sifting the waste using a sieve with a size of 0 .5 cm x 0.5 cm for mesoplastic waste, then collecting and cleaning all waste samples from sand and drying these samples from the water by drying them, then documentation of each waste sample obtained is counted and weighed per classification – per sub-transect.

Waste Management Interview

Information regarding the form of waste management was carried out by means of open interviews with managers of tourist sites, by seeking information regarding forms of management, cleaning methods and cleaning time.

Data Analysis

Identification of mesoplastic waste samples was carried out directly at the Water Quality Laboratory, Faculty of Fisheries and Marine Sciences, Mulawarman University. The mesoplastic samples that have been collected are then grouped into categories of types of plastic waste. After categorizing according to type, the amount, weight, density and percentage of mesoplastic waste in each transect will be calculated.

Garbage weight

Waste weight (M) is taken based on the area of the sampling area m2. The total waste weight is obtained based on the total value of the total waste found (g/m2). Calculation of waste weight will follow a formula

(Prajanti et al., 2020).

$$M : \frac{Total\ Waste\ Weight\ (g)}{Long\ (m) x\ Wide\ (m)}$$

Waste Density

Waste density (K) is calculated from the amount of waste per type per transect box area. Waste density data is reported in units of amount of waste per type/m2. Waste density will be calculated using a formula

(Prajanti et al., 2020).

$$K : \frac{Amoount\ of\ waste\ type}{Long\ (m) x\ Wide\ (m)}$$

RESULTS AND DISCUSSION

Description of Research Locations

Muara Badak District is located at e 117˚07' - 117˚ 32' and s 0˚11' -0˚31' with an outer area of ±939.09 km2 (BPS, 2022). Muara badak district has many beaches that are used as tourist attractions, including Panrita Lopi Beach and Jingga Beach, both locations have a large number of visitors every weekend and holiday.

Composition of Mesocplastic Waste Based on Location

There were four types of mesoplastic found in this study including films, fragments, fiber and Styrofoam. The most common type of mosplastic waste found at both locations was film with 26 particles with an average of 13 particles (Table 1).

Tabel 1. Type of Mesoplatic

Type	Mesoplastic amount (Particle)		Total Mesolastic from 2 location (Particle)	Mesoplastic Mean (Particle)
	Panrita Lopi	Jingga		
Film	11	15	26	13
Fragment	16	3	19	9,5
Fiber	-	1	1	0,5
Styrofoam	5	2	7	3,5
Total	32	21	53	26,5

The amount of mesoplastic on the two beaches is different, Panrita Lopi Beach has 32 particles while jingga beach has 21 particles with total waste at both locations of 53 particles. With an average of 26.5 per particle. The types of particles that are often found on Panrita Lopi Beach are 16 fragments, while on Jingga beach, the most abundant type of mesoplastic is film, 15 particles.

Based on table 1. The amount of rubbish on panrita lopi beach is greater than on jingga beach. This is because panrita lopi beach has a greater number of visitors compared to Jingga Beach. Visitors at tourist attractions are one of the factors that produce waste at tourist locations. According to Apriyanthi et al., (2022), the large number of visitors greatly influences the amount of waste at a location. The large number of tourist visitors must have awareness and care in paying attention to the cleanliness and arrangement of coastal areas by disposing of rubbish in its proper place (Ical & Mane, 2022). Apart from the large number of visitors, Panrita Lopi Beach also has a rubbish dump, but the rubbish disposal capacity is still small so tourist rubbish disposal is not yet sufficient. According to Wahyudi et al., (2023), waste collection sites also influence the amount of rubbish strewn on the coast due to the absence of waste collection sites.

Even though the rubbish dump is still at a small capacity, waste management at Panrita Lopi Beach

has been carried out by collecting large rubbish and then burning the rubbish, but small rubbish still cannot be managed. Small-sized waste cannot be managed because small-sized waste is very difficult to collect so it is just left alone by tourism managers, so small-sized waste is often found at tourist sites.

Waste management can be done directly or indirectly, direct management involves managing waste directly, while indirectly it can take the form of reducing waste through the zero-waste principle. According to research by Wahyudi et al., (2023) at the monkey forest tourist attraction, waste is divided into organic and non-organic waste so that waste management can be easier, while indirect waste management uses the zero-waste principle, namely management that produces no waste as far as possible. Using this method, it can be disseminated directly to the public as well as on social media and webinars (Herdiansah, 2021).

Composition Percentage of Mesoplastic Waste

The amount of mesoplastic waste that dominates on both beaches is the filament and fragment type. The medominant filament type was found at Jingga Beach while the Fragment type dominated at Panrita Lopi Beach (Figure 4).

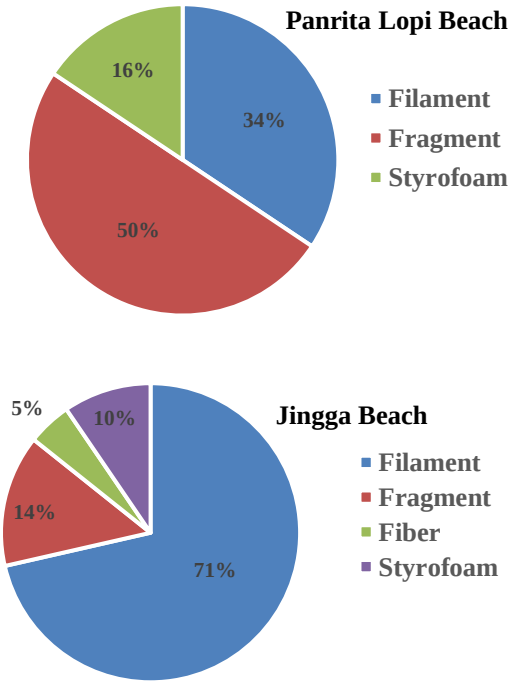

Figure 4. Percentage of Total Mesoplastic Waste.

At Panrita Lopi beach, the percentage of filament waste is 34% and at Jingga beach is 71%, while the percentage of fragment type waste at Panrita Lopi beach is 50% and 14% at Jingga beach, followed by strofoam type waste at 16% at Panrita Lopi beach and 10% at Panti Jingga and a 5% type of fiber that is only found on Jingga Beach. Yona et al., (2020) found something different at Pasuruan Beach, finding that the percentage of film was greater than other types of waste, namely 50%, fiber 31%, fragments 16%, and styrofoam 2%. The differences in the composition of mesoplastic waste types at the two locations are greatly influenced by the level of waste management and the use of tourist waste types. According to September strong (Septian, 2014) and styrofoam comes from small plastic pieces that are soft (Ambarsari & Anggiani, 2022).

Based on the type of mesoplastic waste, it shows that the use of waste on Panrita Lopi beach comes from plastic fragments such as children's toys and pieces of plastic food containers, while on Jingga beach the percentage of waste found mostly comes from plastic bags or plastic packaging (Figure 5). The difference in the composition of the percentage of waste types at the two locations is influenced by the fact that the plastic waste at Panrita Lopi beach is cleaned by the tourism manager, whereas at Jingga Beach the tourism manager does not clean up the plastic waste and just leaves it there. Based on the results of interviews with waste management at Orange Beach, many types of plastic were found because tourism managers were not active in cleaning up tourist areas so that the amount of plastic waste dominated at that location. Even though waste management has been carried out at Panrita Lopi beach, due to the larger number of visitors compared to Jingga beach, there is still rubbish. According to Ratnawati et al., (2022) the identified waste is generally waste produced from people's consumption activities, the dominant type of plastic waste is in the form of fragments.

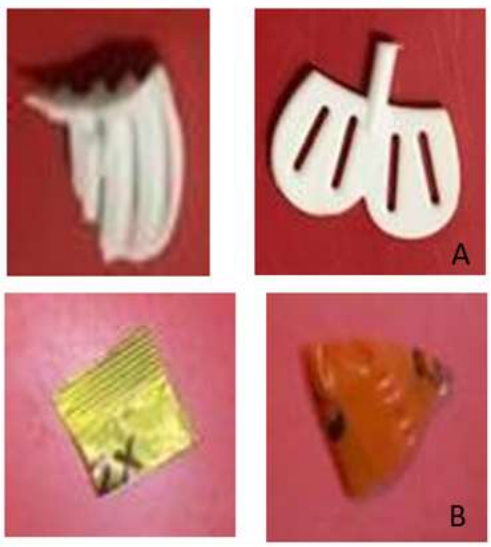

Figure 5. Plastic Packaging Waste: A) Panrita Lopi; B) Pantai Jingga

Total Mesoplastic Weight by location

Based on the total weight of mesoplastic waste at the two locations, it can be seen in Figure 6. The weight is very different, where the weight of the waste on Jingga beach is lower than the weight of waste on Panrita Lopi beach.

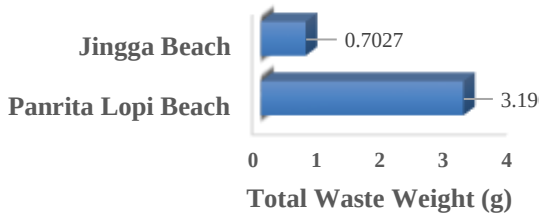

Figure 6. Weight of Mesoplastic Waste at Both Research Locations

Based on Figure 4, the weight of rubbish on Panrita Lopi beach is 3.192 grams, while on Jingga beach it is 0.702 grams. There is a difference in the total weight of rubbish at the two tourist locations because the amount of rubbish at the two locations is different, where the amount of rubbish at Panrita Lopi beach is greater than at Jingga beach (Table 1). A different thing was found by Yona et al., (2020) where the total weight of mesoplastic waste at Kualo Beach was 2.76 gr, the weight of the waste was also found by Rahma et al., (2022) at Bumiayu at 47 gr.

Apart from that, the type of waste also greatly influences the weight of the waste, according to Wardiha et al., (2013), the composition of the waste was found to influence the weight of the waste produced because the weight of organic waste is much heavier than inorganic waste such as plastic. The type of rubbish that is most often found on Panrita Lopi Beach is fragments at 50% (figure 4). According to Nugroho et al., (2018), fragment waste tends to have a greater weight than the filament type because fragment plastic is denser and made from strong synthetic polymer plastic compared to food wrap plastic, plastic fragments which are larger and thicker (Annisa, 2021). The results of the weight of rubbish on panrita lopi beach show that the amount of rubbish on Panrita Lopi Beach is greater than that of Jingga Beach, so there is a need for greater waste management because it can be negative, both from the beauty of tourist locations and can have an impact on marine biota such as crabs and shellfish.

Analysis of the relationship between the number of particles and weight

The results of the analysis of the relationship between the number of particles and the weight are based on Figure 5. On both beaches the amount of waste per type shows a difference in the results of linearity. The results of the relationship between the number of particles and the weight at Panrita Lopi beach was 94% while at the Jingga orphanage it was 59%.

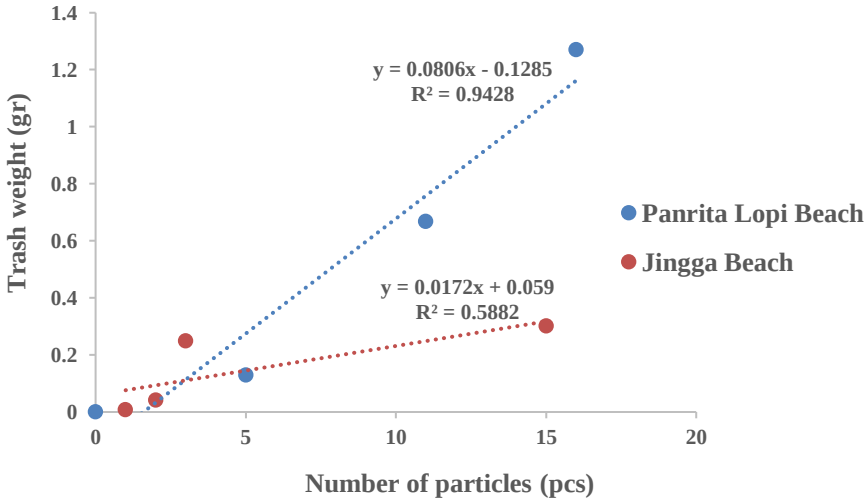

Figure 4. Weight of Mesoplastic Waste at Both Research Locations

The results of the relationship between the number of particles and their weight at the two locations show that there are differences, on Panrita Lopi beach the types of particles that are mostly found are fragments. This type of fragment is plastic waste which has a larger weight because the arrangement of the particles is denser. According to Harpah et al., (2020) this type of fragment comes from the weathering of solid plastic packaging so it has a greater weight compared to other particles. This is also in line with research by Sari and Meliana, (2011), the form of fragments is thought to come

from the fragmentation of plastic packaging such as drink bottles, plastic bags and pieces of paralon pipe. Meanwhile, in orange pantia, the linearity value is only 58% because the number of particles found is mostly filemen, however this type has a lower weight compared to the fragment type so the results of the relationship between the number of particles and the weight are not so high. Film is a secondary plastic polymer that comes from the fragmentation of plastic bags or plastic packaging and has a low density (Kingfisher, 2011).

CONCLUSION

Based on the research results, it can be concluded that, The highest amount of waste found on Panrita Lopi and Jingga Beach was 53 particles, with 32 particles on Panrita Lopi Beach and 21 particles on Jingga Beach. The percentage composition of the waste obtained was 50% for fragment types found at Panrita Lopi Beach and 71% for filament types found at Jingga Beach. The most common amount of trash found was at Panrita Lopi Beach, this was due to the fact that the number of visitors was greater than that of Pantau Jingga. The relationship between length and weight of waste at Panrita Lopi Beach was 94% while at Jingga Beach it was 58%. The difference in the linearity relationship between the two beaches was much different due to the abundance of different types of waste at the two locations.

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