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Types and Abundance of Beach Waste in the Coastal Area of Kampung Beran Tanjung Harapan, Meranti Islands District

Jenis dan Kelimpahan Sampah Pantai di Pesisir Kampung Beran Tanjung Harapan, Kecamatan Kepulauan Meranti

Bonita Tiolona Exaudi[*1], Bintal Amin[1], Syahril Nedi[1]
[1]Department of Marine Science, Faculty of Fisheries and Marine, Universitas Riau, Pekanbaru 28293 Indonesia
*Correspondent Author: bonita.tiolina0771@student.unri.ac.id

ABSTRACT

This research was carried out in June 2023; the research location was on the coast of Kampung Beran, Tanjung Harapan, Meranti Islands Regency. This research aims to determine the type and abundance of beach litter, analyze the differences in the type and abundance of beach waste between stations, and analyze the type and abundance of beach litter between sampling times. Beach litter data collection was taken at three stations, with each station 25m in distance. Each station has three transect lines with nine plots or quadrants measuring 5×5 m^2 with a distance between plots of 5m. Sampling was conducted during low tide and on weekdays (Tuesday, Wednesday) and weekends (Saturday, Sunday). Based on the research results, five types of beach litter were found, namely plastic (40%), iron/metal materials (5%), broken glass/ceramic (31%), rubber (3%), wood (11%), and others (10%). The highest abundance of waste occurred on weekdays (10,59 units/m^2), and the lowest waste occurred on weekends (7,97 units/m^2). ANOVA analysis and independent sample test show that the abundance of beach litter waste between stations and between sampling times did not have significant differences (P > 0.05).

Keywords: Beach Waste, Plastic, Pollution, Meranti Islands

ABSTRAK

Penelitian ini dilakukan pada bulan Juni 2023; lokasi penelitian berada di pesisir Kampung Beran, Tanjung Harapan, Kabupaten Kepulauan Meranti. Penelitian ini bertujuan untuk mengetahui jenis dan kelimpahan sampah pantai, menganalisis perbedaan jenis dan kelimpahan sampah pantai antar stasiun, serta menganalisis jenis dan kelimpahan sampah pantai antar waktu pengambilan sampel. Pengumpulan data sampah pantai diambil di tiga stasiun, dengan masing-masing stasiun berjarak 25 m. Setiap stasiun memiliki tiga jalur transek dengan sembilan plot atau kuadran berukuran 5×5 m^2 dengan jarak antar plot 5m. Pengambilan sampel dilakukan saat air surut dan pada hari kerja (Selasa, Rabu) dan akhir pekan (Sabtu, Minggu). Berdasarkan hasil penelitian, ditemukan lima jenis sampah pantai, yaitu plastik (40%), bahan besi/logam (5%), pecahan kaca/keramik (31%), karet (3%), kayu (11%), dan lain-lain (10%). Kelimpahan sampah tertinggi terjadi pada hari kerja (10,59 unit/m^2), dan limbah terendah terjadi pada akhir pekan (7,97 unit/m^2). Analisis ANOVA dan uji sampel independen menunjukkan bahwa kelimpahan limbah sampah pantai antar stasiun dan antar waktu pengambilan sampel tidak memiliki perbedaan yang signifikan (P>0,05).

Kata Kunci: Limbah Pantai, Plastik, Polusi, Kepulauan Meranti

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INTRODUCTION

Garbage is one of the biggest pollution threats, not only in Indonesia but throughout the world. Barboza et al. (2019) estimate that an increase in marine debris will occur by 2025 globally if it is not addressed seriously. Waste is unwanted or leftover material no longer useful for humans after an activity or domestic process ends. Coastal areas are transition areas between land and sea with enormous potential resources. Besides the ample potential resources, some threats can affect the coastal and marine environment. This threat can be caused by dense population and anthropogenic activity around coastal areas. The Selatpanjang coast has potential fisheries and marine areas fishermen use to catch fish. The catch is then sold and distributed to the public at the Pasar Baru Selatpanjang, near the research location. With the existence of a market, being close to the coast will hurt the surrounding waters because people tend to throw rubbish on the coast.

Various problems arise due to the presence of rubbish on the coast, such as affecting water quality, reducing the productivity of marine biological resources in surrounding areas, and affecting the balance of ecosystems in coastal areas. If this happens and continues, it will impact the food chain, the economy and public health in the area and cannot be avoided (Citasari et al., 2012). This research was conducted to provide information regarding the type and abundance of beach waste found in the coastal area of the Village Beran Meranti Islands District as public education material to help reduce the amount of rubbish in coastal regions. This research determines the type and abundance of beach litter, analyzes differences in the type and abundance of beach waste between stations, and analyzes differences between sampling times.

MATERIALS AND METHOD

This research was conducted in June 2023 in Beran Tanjung Harapan Village, Meranti Islands Regency, as seen in Figure 1.

Figure 1. Map of locations and research stations

Determination of research stations

Determining the research location begins with checking the tide schedule of receding waters; this is the opinion of Opfer et al. (2012), which states that the high and low water levels (tides) that occur will influence the volume/quantity of waste found in a coastal area. Pick-up location: The sample consists of 3 (three) stations. Station I is on the coast of Fisherman's Village, Station II is in Pasar Baru, and Station III is on the shore of Tanjung Harapan Harbor.

Data collection on beach litter

Data collection on marine waste is first carried out by checking the scheduled tides to make data collection easier. Data retrieval is carried out at the lowest tide. Beach waste data was taken at three point stations, with each station 25 m. Each station has three transect lines with nine plots or quadrants measuring 5×5 m2, with a distance between plots of 5 m. Sampling was carried out on Weekdays (Tuesday and Wednesday) and weekends (Saturday and Sunday), as seen in Figure 2.

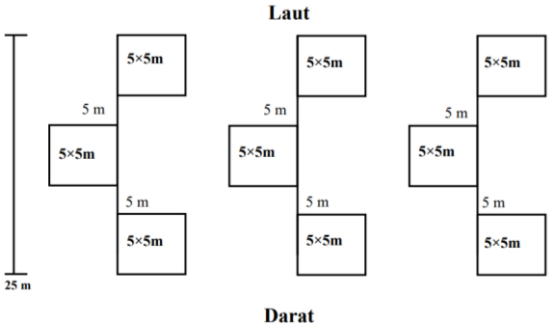

Figure 2. Station points

The rubbish in the plot is then taken and put inside sacks/trash bags to characterize the type of waste based on NOAA (2013). Next, the mass was weighed, and the abundance of beach waste was calculated using the NOAA (2013) equation:

$$\text{Abundance (K)} = \frac{\text{Amount of Waste per Type}}{\text{plot length(m)x plot width(m)}}$$

$$\text{Mass (M)} = \frac{\text{Total Waste Weight (Kg)}}{\text{plot length(m)x plot width(m)}}$$

RESULT AND DISCUSSION

General location conditions

Geographically, Meranti Islands Regency is at coordinates between 0° 42' 30" - 1° 28' 0" N and 102° 12' 0" - 103° 10' 0" E and is located on the coast east of the island of Sumatra with coastlines bordering several countries neighbours and is included in the Economic Growth Triangle area Indonesia - Malaysia - Singapore (IMS-GT). The location of Meranti Islands Regency is 3,707.84 km^2, while the area of Selatpanjang City is 45,44 km^2.

Based on the results of the interpretation of a topographic map with a scale of 1: 250,000, it was obtained the general picture is that the Meranti Islands Regency area is mostly flat topography with a slope of 0-8%, with an average height of around 1-6.4 m above the sea level. This area has a tropical climate with air temperatures between 25- 32°C, with relatively high humidity and rainfall. In the group of island areas, there are several large islands such as Tebing Tinggi Island (1.438,83 km²), Rangsang (922.10 km²), Padang and Merbau (1.348,91 km²).

Categories of Type and Amount of Waste

The types of beach waste found at the research location are presented in Table 1.

Table 1. Categories of types of beach waste

Category	Type
Plastic	Food packaging, plastic bags, plastic bottles, Straws, sacks, bottle caps, and rope.
Metal	Iron materials, spoons, cans, batteries.
Glass	Broken glass, Ceramic pieces.
Rubber	Tire pieces, Shoe soles, Sandals, Leather cables, and Hoses.
Wood	Pieces for bridges/buildings, plywood, and tree branches.
Others	Clothing/fabric, Nets, Diapers/diapers, Cigarette butts, Bags.

The amount of beach waste (units) at each station is presented in Table 2.

Table 2. Amount of beach waste (units)

Type	Weekday			Amount	Weekend			Amount
	I	II	III		I	II	III	
Plastic	272	536	105	913	214	448	124	786
Metal	40	43	21	104	48	23	15	86
Glass	187	500	24	711	125	471	9	605
Rubber	19	56	0	75	10	48	0	58
Wood	279	56	42	377	12	55	28	95
Others	52	164	5	221	55	126	14	195
Total	849	1.355	197	2.401	464	1.171	190	1.825

Based on the research results conducted at three-weekday stations, The highest waste producer is Pasar

Baru, with 1,355 waste-producing units. The second highest is Fisherman's Village, with a total of 849 units, while producers have the lowest waste at the Port, with a total of 197 units, and the total amount of waste at three stations on weekdays is 2,401. Meanwhile, during the producing weekend. The highest waste is Pasar Baru, with a total of 1,171 units; the highest waste producer second is Fisherman's Village, with a total of 464 units, while waste producers the lowest is the Port, with a total of 190 units and the total amount of waste at three stations on weekends is 1,825 units.

Plastic waste is the most dominant type of waste found in research sites. Total plastic waste was 1,699 units, or 40% of all types of waste found. Then followed by glass (1,316 units or 31%), wood (472 units or 11%), types of waste that cannot be classified (416 units or 10%), metal/metal (190 units or 5%), and rubber (133 units or 3%). Percentage of total waste The beach can be seen in Figure 2.

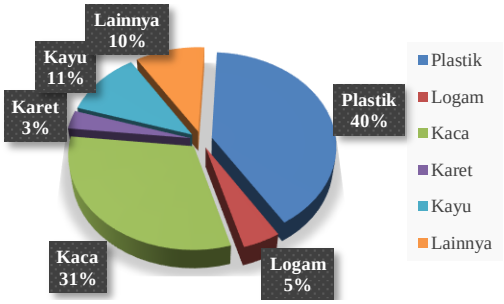

Figure 2. Percentage of total beach waste

Waste mass

The mass of waste that has been collected can be seen in Table 3.

Table 3. Mass of waste at each station

type	waste mass (Kg/m^2)							
	Weekday			amount	Weekend			amount
	I	II	III		I	II	III	
Plastik	0,06	0,09	0,008	0,158	0,06	0,11	0,01	0,18
Logam	0,01	0,01	0,006	0,026	0,01	0,009	0,005	0,024
Kaca	0,02	0,06	0,009	0,089	0,02	0,05	0,004	0,074
Karet	0,01	0,03	0	0,04	0,008	0,01	0	0,018
Kayu	0,04	0,07	0,01	0,12	0,01	0,05	0,01	0,07
Lainnya	0,04	0,03	0,004	0,074	0,01	0,02	0,01	0,04
Total	0,18	0,29	0,037	0,507	0,118	0,249	0,039	0,406

Note: Station 1: Fisherman's Village, Station II: Pasar Baru, Station III: Harbor

The total mass of beach litter collected on weekdays (Tuesday and Wednesday) and weekends (Saturday and Sunday) is 0,913 kg/m^2. The highest mass of waste came from Pasar Baru was 0,539 kg/m^2; the second highest mass of garbage came from Kampung Fishermen, which amounted to 0,298 kg/m^2, and the lowest mass of waste came from the port area, namely 0,076 kg/m^2. On weekdays, the total mass of waste is 0,076 kg/m^2; at the weekend, the total mass of waste is 0,406 kg/m^2.

Abundance of waste

The abundance of waste based on collection time can be seen in Table 4.

Table 4. Abundance of waste

type	Ability (Unit/m²)							
	Weekday			amount	Weekend			amount
	1	2	3		1	2	3	
Plastik	1,2	2,38	0,46	4,04 ± 0,9	0,95	1,99	0,55	3,49 ± 0,7
Logam	0,17	0,19	0,09	0,45 ± 0,05	0,21	0,1	0,06	0,37 ± 0,07
Kaca	0,83	2,22	0,1	3,15 ± 1,07	0,55	2	0,04	2,59 ± 1
Karet	0,08	0,24	0	0,32 ± 0,1	0,04	0,21	0	0,25 ± 0,1
Kayu	1,24	0,24	0,18	1,66 ± 0,5	0,05	0,24	0,12	0,41 ± 0,09
Lainnya	0,23	0,72	0,02	0,97 ± 0,3	0,24	0,56	0,06	0,86 ± 0,2
Total	3,75	5,99	0,85	10,59	2,04	5,1	0,83	7,97

Note: Station 1: Fisherman's Village, Station II: Pasar Baru, Station III: Harbor

Based on Table 4, research conducted in June 2023 was obtained; the results of beach waste disclosure

during weekdays and weekends were 18,56 units/m^2. The highest abundance of waste occurred on weekdays at 10,59 units/m^2, whereas the lowest waste reporting occurred at weekends at 7,97 units/m^2.

The abundance of waste on weekdays is higher than at weekends; this is inversely proportional to research (Aditya et al., 2019), which states that garbage on weekends is higher than on weekdays. This could be caused by differences in activity in the study area. Tanjung Harapan is not a tourist area with tourist visiting hours, so the distribution of the abundance of waste that occurs at that location does not depend on the number of visitors but instead on environmental parameters that happen naturally. Additionally, increasing community activity will impact the quantity and quality of the waste/garbage produced. Ultimately, it can negatively impact environmental quality (Tampuyak et al., 2016).

CONCLUSION

Based on the results of the research conducted, the types of beach waste found in the form of plastic, metal, glass, rubber, wood, etc. Plastic waste is the most common type found (40%), and the last type found was rubber (3%). The abundance of waste on weekdays is higher than on weekends. The abundance of waste between stations and between sampling times is not different.

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