JURNAL PERIKANAN DAN KELAUTAN
Volume 30 No. 3, October 2025: 358-365

e-issn : 2721-8902
p-issn : 0853-7607

Types and Abundance of Microplastics in Lokan (*Geloina erosa*) in the Mangrove Ecosystem of Kedabu Rapat Village, Meranti Islands

Jenis dan Kelimpahan Mikroplastik pada Lokan (Geloina erosa) di Ekosistem Mangrove Desa Kedabu Rapat, Kabupaten Kepulauan Meranti

Dinda Maharani Putri[1*], Irvina Nurrachmi[1], Efriyeldi[1]
[1]Department of Marine Science, Faculty of Fisheries and Marine,
Universitas Riau, Pekanbaru 28293 Indonesia
*email: dindamahputri@gmail.com

Received
4 September 2025

Accepted
27 September 2025

Abstract

One of the current problems for coastal areas is the high level of plastic waste. This waste degrades into microplastic particles, which can threaten the life of marine biota, including the lokan (*G. erosa*). Lokan (*G. erosa*) is used as a bioindicator to study the type and content of microplastics in the mangrove ecosystem. The purpose of this study was to analyze the differences in microplastic abundance between stations and microplastic content between sea turtle sizes, as well as the relationship between shell length and meat weight with microplastic content. This study was conducted from December 2024 to February 2025 in Kedabu Village, Meranti Islands Regency, which directly borders the Malacca Strait. The survey method was used, purposive sampling at three stations: the conservation mangrove area, the mangrove area near the fishing port, and the mangrove area near the settlement. Sea turtles were taken during low tide, each one using a machete. Individual per station. The study results showed that three types of microplastics were found in the lokan (*G. erosa*): fiber, film, and fragments, with an average of 32.73 particles per individual. There was a significant difference in microplastic content between small and large sea turtles, but microplastic abundance between stations did not differ significantly. The highest microplastic abundance was found at Station 1 (11,331 particles/g). Shell length and meat weight showed a moderate positive relationship with microplastic content.

Keywords: Abundance, *Geloina erosa*, Mangrove, Microplastic.

Abstrak

Salah satu masalah saat ini di daerah pesisir adalah tingginya tingkat limbah plastik, yang terurai menjadi partikel mikroplastik. Partikel mikroplastik ini dapat mengancam kehidupan biota laut, salah satunya adalah lokan (*G. erosa*). Lokan (*G. erosa*) digunakan sebagai bioindikator untuk mempelajari jenis dan kandungan mikroplastik dalam ekosistem mangrove. Tujuan penelitian ini adalah menganalisis perbedaan kelimpahan mikroplastik antar stasiun dan kandungan mikroplastik antar ukuran penyu laut, serta hubungan antara panjang cangkang dan berat daging dengan kandungan mikroplastik. Penelitian ini dilakukan dari Desember 2024 s.d Februari 2025 di Desa Kedabu, Kabupaten Kepulauan Meranti, yang berbatasan langsung dengan Selat Malaka. Metode survei digunakan, dengan sampling purposif di tiga stasiun: kawasan mangrove konservasi, kawasan mangrove dekat pelabuhan nelayan, dan kawasan mangrove dekat pemukiman. Penyu laut diambil saat air surut menggunakan parang, masing-masing sembilan individu per stasiun. Hasil penelitian menunjukkan bahwa tiga jenis mikroplastik ditemukan pada lokan (*G. erosa*): serat, film, dan fragmen, dengan rata-rata 32,73 partikel per individu. Terdapat perbedaan signifikan dalam kandungan mikroplastik antara penyu laut kecil dan besar, namun kelimpahan mikroplastik antar stasiun tidak berbeda secara signifikan. Kekayaan mikroplastik tertinggi ditemukan di Stasiun 1 (11.331 partikel/g). Panjang cangkang dan berat daging menunjukkan hubungan positif moderat dengan kandungan mikroplastik.

Kata kunci: Kekayaan, *Geloina erosa*, Mangrove, Mikroplastik

1. Introduction

Marine debris is a significant issue in coastal areas, leading to a decline in water quality and disrupting ecosystem balance. Anthropogenic activities, such as domestic and industrial waste, contribute significantly to this pollution, with plastic being the predominant pollutant (Seftianingrum et al., 2023). Plastic waste, which is difficult to decompose, degrades into microplastics measuring 0.3–5 mm. Currents, tides, and runoff carry these microplastics until they settle in sediments. Microplastics are ingested by filter-feeding organisms such as bivalves. One bivalve species known to accumulate microplastics is the lokan (*G. erosa*) (Sari et al., 2021), with common types of microplastics found including fibers, films, fragments, and pellets (Junaidi et al., 2024).

Lokan (*G. erosa*) inhabits muddy sediments within mangrove ecosystems and obtains its food by filtering organic material from its surrounding environment (Ramli & Rukminasari, 2021). Microplastics ingested by lokan are challenging to digest and can accumulate in their digestive tract or tissues, indicating the level of plastic pollution in an area. One area suspected of experiencing microplastic contamination is the waters of Kedabu Rapat Village, Kepulauan Meranti. The presence of microplastics in lokan has the potential to disrupt food chains and organ systems, posing health risks to humans.

Kedabu Rapat Village is located in Rangsang Pesisir District, Kepulauan Meranti Regency, directly bordering the Malacca Strait, a busy international shipping lane. This geographical position makes the area vulnerable to pollution carried by strong ocean currents and waves, which stir up sediments and contribute to waste accumulation (Febriani et al., 2020). Given that lokan is a vital bioindicator of microplastic pollution in coastal areas (Ramli & Rukminasari, 2021), this study aims to investigate the microplastic content accumulated in lokan from this area.

In line with this background, this study aims to determine the types and concentrations of microplastics, as well as their abundance in lokan across different stations in the mangrove ecosystem of Kedabu Rapat Village. Additionally, it seeks to analyze differences in microplastic abundance among stations and between different lokan sizes, and to examine the relationship between shell length, flesh weight, and microplastic content. The findings of this study are expected to serve as a basis for more sustainable coastal environmental management.

2. Material and Method

2.1. Time and Place

This research was conducted from December 2024 to February 2025 in the mangrove ecosystem of Kedabu Rapat Village, Kepulauan Meranti (Figure 1). Sample analysis to determine the microplastic abundance in lokan (*G. erosa*) was carried out at the Marine Chemistry Laboratory, Department of Marine Science, Faculty of Fisheries and Marine Sciences, Universitas Riau.

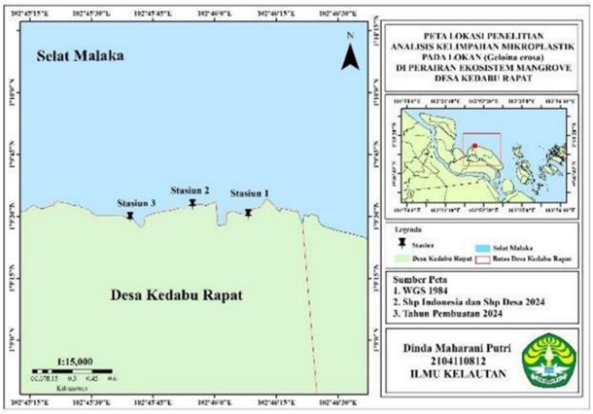


Figure 1. Research location map

2.2. Methods

This study employed a survey method involving direct sampling in the mangrove ecosystem of Kedabu Rapat Village, Kepulauan Meranti, with analysis conducted at the Marine Chemistry Laboratory, Department of Marine Science. Sampling was carried out using purposive sampling techniques based on site characteristics. Data collected consisted of primary data (field and laboratory) and secondary data (literature and supporting articles). Water quality parameters measured included pH, temperature, salinity, and current velocity.

2.3. Procedures

2.3.1. Preparation and Sampling Point Determination

The preparation stage included conducting a literature review relevant to the research topic, determining methods based on references from journals and other sources, and preparing tools and materials for use during the study. Sampling points were determined using purposive sampling in the mangrove ecosystem of Kedabu Rapat Village. The stations are Station 1 in the mangrove area, Station 2 near a fishing port, and Station 3 near residential areas, with an approximate distance of ±300 meters between stations. Station selection was based on environmental characteristics and the presence of lokan in the area.

2.3.2. Sample Collection

Samples were collected randomly along the shoreline at low tide using traditional tools, namely a machete. At each station, nine individual lokan (*G. erosa*) were collected, categorized into three size classes: small (1.1–3.5 cm), medium (3.6–5.5 cm), and large (5.6–8.1 cm), with three individuals per size class. Samples were placed in plastic bags, stored in a cool box, and transported to the laboratory for analysis.

2.3.3. Measurement of Water Quality Parameters

Water quality parameters were measured *in situ* at each sampling point. The parameters measured included temperature, pH, salinity, and current velocity. Measurements were conducted at the lowest tide and repeated three times at each station.

2.3.4. Microplastic Analysis in Lokan (G. erosa) in the Laboratory

Lokan samples (*G. erosa*) were washed to remove mud, and then the shell length was measured using calipers. The flesh was extracted, rinsed, weighed using an analytical balance, and placed in sample bottles. A 10% KOH solution was prepared by heating KOH crystals and distilled water using a hot plate and stirrer. The samples were soaked in the 10% KOH solution for two weeks or until fully digested to dissolve organic material (Sari et al., 2021). The solution was filtered using a vacuum pump with Whatman No. 42 filter paper and observed under an Olympus CX23 microscope (4x4 magnification). Microplastic types were classified into fibers, films, fragments, and pellets (GESAMP, 2015). Identified microplastics were counted to determine their abundance (particles/individual) (Sari et al., 2021) to assess their quantity and potential risk. According to Digka et al. (2018), microplastic abundance can be calculated using the following formula:

$$\text{Microplastic abundance (particles/g)} = \frac{\text{Total number of microplastic particles (particles)}}{\text{Flesh weight of lokan (g)}}$$

To determine the microplastic content in an individual lokan, it can be calculated using the following formula:

$$\text{Microplastic abundance (particles/individual)} = \frac{\text{Total number of microplastic particles (particles)}}{\text{Number of individuals}}$$

Field and laboratory data were calculated to determine the types and abundance of microplastics. The data were tabulated in Microsoft Excel, analyzed descriptively using SPSS, and then presented in tables and histograms. Differences in abundance among stations and microplastic content among size categories were analyzed using a One-Way ANOVA test, while the relationship between shell length and flesh weight with microplastic content was analyzed using simple linear regression, according to Sugiyono (2016), as follows:

$$Y = a + bx$$

Description:

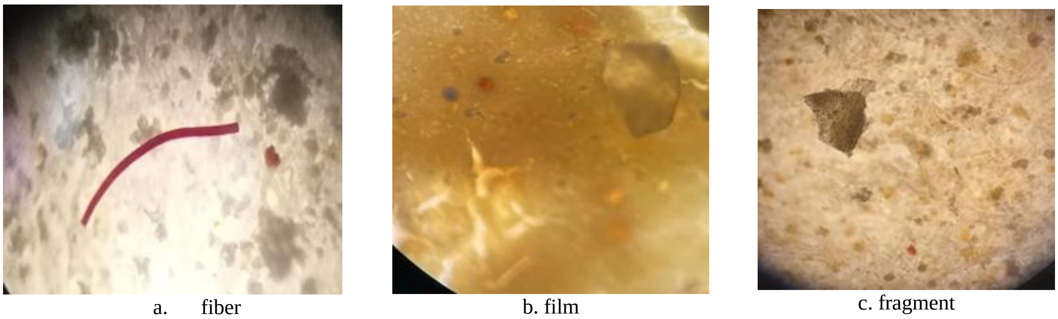
Y : Microplastic abundance
a : Constant (Y value when X = 0)
b : Regression coefficient (value of increase or decrease)
X : Shell length/flesh weight of lokan (*G. erosa*)

To determine the relationship between microplastic abundance and lokan size, the coefficient of determination (R^2) was used, and the strength of the relationship was assessed using the correlation coefficient (r), with r values ranging from 0 to 1. According to Sugiyono (2016), the strength of the correlation coefficient is categorized as follows: 0.00–0.20: very weak; 0.21–0.40: weak; 0.41–0.70: moderate; 0.71–0.90: strong; 0.91–1.00: very strong *2.3.5.*

3. Result and Discussion

3.1. Types and Concentration of Microplastics in Lokan (G. erosa) in the Mangrove Ecosystem of Kedabu Rapat Village

Based on the observations conducted, three types of microplastics were found: fibers, films, and fragments, as shown in Figure 2.



a. fiber b. film c. fragment

Figure 2. Types of microplastics found in lokan (*G. erosa*)

The microplastic content found in lokan (*G. erosa*) based on different size categories was divided into three classifications obtained from the field: small size (1.1–3.5 cm), medium size (3.6–5.5 cm), and large size (5.6–8.1 cm). The highest microplastic content was found in large lokan, with an average of 41 particles/individual. In contrast, the lowest was found in small lokan, with an average of 24.1 particles/individual, as shown in Table 1.

Table 1. Types and content of microplastics in lokan (*G. erosa*) based on size (particles/individual)

Size	Average Shell Length (cm)	Contents Microplastic (particle/ind)			Amount
		Fiber	Film	Fragment	
Small	3.28	13.22±2.10	5.44±4.12	5.44±4.33	24.1±6.07
Currently	4.72	19.77±3.52	5.22±5.60	8.11±2.84	33.1±9.95
Big	7.16	22.55±4.55	12.22±4.47	7.33±6.04	41±10.99
Average	5.05	18.51±3.56	7.62±4.73	6.95±4.40	32.73±2.55

Based on Table 1, the most common type of microplastic found in each size category is fiber, with average values of 13.22 particles/individual for small size, 19.77 particles/individual for medium size, and 22.55 particles/individual for large size. Film-type microplastics were the least common in the medium size category, at 5.22 particles/individual, while fragments were the least common overall, with 5.44 particles/individual in the small size category.

Based on the identification of microplastics in 27 lokan (*G. erosa*) samples from three size groups, three types of microplastics were found: fibers, films, and fragments. These findings are consistent with Yona et al. (2021), who reported similar results in clams from Baanyuurip Gresik. Meanwhile, Seftianingrum et al. (2023) found four types (fibers, films, fragments, and granules) in the Porong River, likely due to differences in methods and microscopes used. Dewi et al. (2015) stated that granules/pellets typically originate from cosmetic and industrial waste; however, no plastic factories are present in this study area. Fibers were the most frequently found microplastic type across all lokan sizes, with averages of 13.22 particles/individual (small), 19.77 particles/individual (medium), and 22.55 particles/individual (large). This aligns with Listiani & Nugraha (2021), who showed that the larger the clam size, the higher the microplastic content. Lokan in Kedabu Rapat had an average of 32.73 particles/individual, which is lower compared to clams in other locations (Rohmah et al., 2022). This difference is likely due to variations in currents, population density, fishing activities, environmental conditions, and pollution factors. Microplastic content in lokan (*G. erosa*) across stations is shown in Table 2.

Table 2. Microplastic content in lokan (*G. erosa*) by station (particles/individual)

Station	Contents Microplastic (particle /ind)			Amount
	Fiber	Film	Fragment	
I	18.22±6.22	5.44±5.19	8.66±5.70	32.32±14.46
II	18.44±4.55	8.22±6.18	6.44±4.09	33.10±9.79
III	17.77±5.04	9.22±5.49	5.77±3.63	32.77±10.51
Average	18.15±5.27	7.62±5.62	6.95±4.47	32.73±2.51

Based on Table 3, the most common type of microplastic found across the three stations is fiber, with average values at Station I (18.22 particles/individual), Station II (18.44 particles/individual), and Station III (17.77 particles/individual). The dominant type of microplastic found at all three observation stations was fiber, with an average of 18.22 particles per lokan individual at Station I, 18.44 particles/individual at Station II, and 17.77 particles/individual at Station III. The dominance of fiber particles indicates considerable anthropogenic pressure in the aquatic environment, most likely originating from human activities such as the disposal of fishing nets, textile waste, and other synthetic materials into the waters. Fiber particles, which are lightweight and easily dispersed in water, are more easily ingested by filter-feeding organisms like lokan. This indicates that microplastic pollution has become a serious threat to aquatic ecosystems and the organisms living within them.

The increase in microplastic content in larger lokan is presumed to be due to their longer lifespan and higher particle consumption (Listiani & Nugraha, 2021). Fibers dominate due to anthropogenic activities such as net disposal (Cahyaningtyas & Chandra, 2024) and because their thin structure allows them to float effortlessly in water (GESAMP, 2015). Meanwhile, fragments are likely derived from larger plastic waste such as food packaging, pipes, and plastic bags, with plastic degradation also influenced by oceanographic factors (Rahimah, 2022). The presence of microplastics in lokan indicates that these organisms have ingested the particles. As filter feeders, lokan filter food from water and sediment, making them highly susceptible to microplastic exposure (Ramli & Rukminasari, 2021). The distribution of microplastics is influenced by their shape, size, polymer type, and ocean currents. High density leads to accumulation on the seabed and contamination of aquatic biota.

Microplastic consumption has negative impacts on biota and humans, such as reduced fecundity, oxidative stress, immune system disorders, and neurotoxicity (Yuan et al., 2022). Microplastics can also act as carriers of hazardous additives that pose risks of cancer and mortality (Lutfi et al., 2023). The identification of microplastics in lokan (*G. erosa*) of various sizes demonstrates the dominance of fiber types. It explains the contributing factors, as well as the ecological and health impacts of microplastic ingestion, supported by relevant studies. The abundance of microplastics in lokan (*G. erosa*) across stations was highest at Station I, with an average abundance of 11.331 particles/g, followed by Station II (10.093 particles/g) and Station III (9.895 particles/g), as shown in Figure 3.

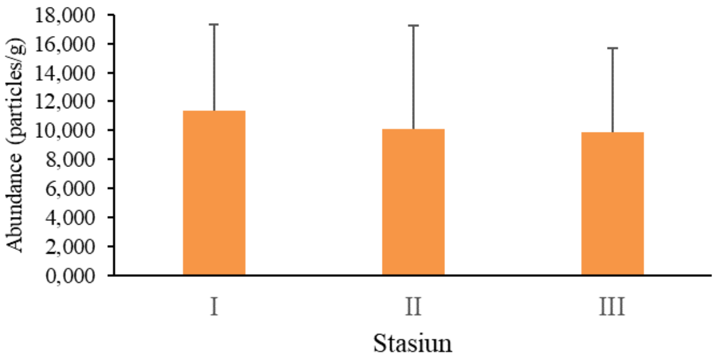


Figure 3. Microplastic abundance in lokan (*G. erosa*) among stations

The highest microplastic abundance in Lokan among stations in Kedabu Rapat Village was found at Station I, with an average abundance of 11.331 particles/g. This finding is attributed to several factors, including the sampling location being in a mangrove area and a tourist site, both of which contribute to plastic waste generation. Additionally, other environmental factors also influence the microplastic abundance at this station, such as low current velocity (0.01 m/s), which can lead to the entrapment of microplastic particles in the sediment, subsequently ingested by lokan and accumulated in their bodies. Various forms of microplastics have distinct characteristics that can negatively impact human health if consumed with shellfish contaminated by microplastics. Microplastics act as carriers of additives. The multiple additives carried by microplastics can have specific adverse effects, potentially leading to cancer and mortality (Lutfi et al., 2023).

Based on the results of the One-Way Analysis of Variance (ANOVA) test, a p-value of $0.874 > 0.05$ was obtained. This indicates that the abundance of microplastics among stations does not differ significantly across the three stations. The microplastic content in lokan (*G. erosa*) based on size yielded a p-value of $0.004 < 0.05$, indicating that the microplastic content in small, medium, and large lokan differs significantly. Subsequently, the Least Significant Difference (LSD) test was conducted to determine which size groups differed the most, revealing the most significant difference between small and large sizes.

The ANOVA test results showed a significance value of 0.874 ($p > 0.05$), meaning there was no significant difference in microplastic abundance in lokan (*G. erosa*) among stations in the Kedabu Rapat mangrove ecosystem. The average microplastic abundance was 11.331 particles/g (Station I), 10.093 particles/g (Station II), and 9.895 particles/g (Station III), indicating an even distribution. Compared to Ghazali et al. (2023), who studied rock oysters (*Saccostrea cucullata*) on the southwest coast of Peninsular Malaysia, these values are much higher than their findings (0.1053–0.6000 particles/g). However, both studies indicate an even distribution of microplastics. Similarly, Tan et al. (2020) in the Malacca Strait linked this even distribution to the influence of ocean currents and anthropogenic activities.

The highest abundance was found at Station I, with an average of 11.331 particles/g. This location, in a natural and conservation mangrove area with slow current flow (0.01 m/s), allows microplastics to become trapped in sediments. Additionally, this area serves as a tourist destination, increasing the potential for plastic waste accumulation. The presence of plastic debris near the sampling site supports this, showing a clear link between human activities and microplastic abundance in the area.

The port area, represented by Station II, where fishing activities occur, had a microplastic abundance of 10.093 particles/g. The use of fishing nets is presumed to be a significant factor contributing to the high abundance of fiber-type microplastics at this station. This aligns with Dalimunthe et al. (2021), who reported high microplastic abundance in areas influenced by fishing activities, particularly fibers from nets. The lowest microplastic abundance was found at Station III, near residential areas, with a value of 9.895 particles/g. Contributing factors include lower settlement density and substrate conditions that are less favorable for lokan (*G. erosa*).

Additionally, environmental factors such as household waste contamination also influence the microplastic abundance at this station. These findings demonstrate that residential factors and other human activities can influence microplastic abundance, albeit to a lesser extent compared to the different stations. This results in a significant difference between microplastic abundance at Station I and Station III. The ANOVA test for microplastic content based on size showed a significant difference ($p = 0.004$), with the highest content in large-sized lokan (41 particles) and an important difference between small and large sizes ($p = 0.001$). These findings are consistent with Yeo et al. (2019), who stated that the dominance of larger particles is influenced by deposition and aggregation mechanisms. Ghazali et al. (2022) reported microplastic abundance in rock oysters (*S. cucullata*) in the Malacca Strait, ranging from 0.105 to 0.600 particles/individual. These particles are dominated by black, blue, red, grey, and yellow fibers (500–1000 µm) composed of PVDF, PP, and PET polymers. Although lower than in Kedabu Rapat, the types and colors are similar. Ghazali also noted that the hazard quotient (HQ) at several locations exceeded safe limits, indicating potential risks.

Differences in abundance among studies are due to site characteristics, such as Kedabu Rapat, which directly faces the Malacca Strait and is influenced by fishing activities. Alpiansyah et al. (2021) stated that coastal areas are closely associated with anthropogenic activities, including settlements, tourism, and other influencing factors. Additionally, the sample size (27 lokan) and species differences contribute, as the morphology and feeding habits of lokan differ, affecting microplastic accumulation. Pollution levels and environmental conditions also play a role. This study demonstrates the relationship between lokan shell size and microplastic presence in the mangrove ecosystem of Kedabu Rapat Village. Meanwhile, studies in the Malacca Strait highlight human activities, pollution, substrate, geographical features, and content as influencing factors for microplastic accumulation. Bivalve consumption increases with age and size, thus increasing the likelihood of microplastic ingestion.

3.2. Relationship Between Shell Length and Flesh Weight with Microplastic Content in Lokan (G. erosa)

The results of the simple linear regression analysis showed that the relationship between shell length and microplastic content in lokan (*G. erosa*) is positive, with the linear regression equation Y = 13.108 + 3.8833x, a correlation coefficient (r) of 0.578, and a coefficient of determination (R^2) of 0.3346, as shown in Figure 4.

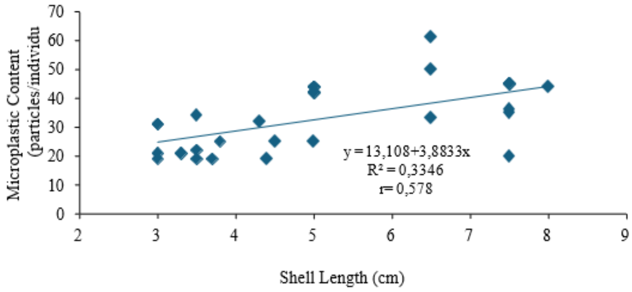


Figure 4. The relationship between shell length and microplastic content in lokan (*G. erosa*)

The results of the simple linear regression analysis showed that the relationship between microplastic abundance and flesh weight of lokan (*G. erosa*) is positive, with the linear regression equation Y = 21.613 + 2.6838x, a correlation coefficient (r) of 0.607, and a coefficient of determination (R^2) of 0.3679, as shown in Figure 5.

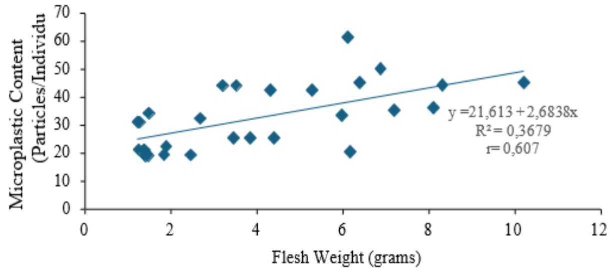


Figure 5. The relationship between microplastic abundance and flesh weight of lokan (*G. erosa*)\

The results of the simple linear regression analysis indicate a significant relationship between shell length and microplastic content, with R = 0.578 (moderate category) and $R^2 = 0.335$, meaning that 33.5% of the variation in microplastic content is explained by shell length. At the same time, the remainder is influenced by other factors such as environmental conditions, pollution sources, and individual characteristics. The regression equation y = 13.108 + 3.883x shows a positive relationship, indicating that the longer the shell length of lokan (*G. erosa*), the higher the potential for microplastic accumulation. This is likely related to the greater filtration capacity of larger lokan, allowing them to filter more microplastics from sediment and water (Rist et al., 2019).

For flesh weight, the regression analysis also showed a significant relationship with microplastic content (R = 0.607; $R^2 = 0.368$). The regression equation y = 21.613 + 2.6838x indicates a positive relationship, where greater flesh weight corresponds to higher microplastic content. This is consistent with Listiani & Nugraha (2021), who stated that larger bivalves have higher microplastic accumulation than smaller ones.

In this study, a moderate correlation was obtained, which may be due to several factors such as age, gape size, and feeding habits. Environmental factors, including microplastic concentrations in water and sediment, current velocity, and turbidity, also influence accumulation. Differences in environmental conditions, such as the concentration of microplastics in sediment and water, the presence of the same pollution sources within an area, water currents, and turbidity, may contribute to variation in microplastic content despite the relatively large body size of the lokan. This is further evidenced by the imbalance between shell size and flesh size, as the study observed that the flesh size was only half of the shell size. The positive relationship between lokan (*G. erosa*) size and microplastic content indicates that lokan from Kedabu Rapat waters have been contaminated by microplastic pollutants, highlighting the need for careful consideration when selecting lokan sizes suitable for consumption.

4. Conclusions

Based on the results of the study conducted in the mangrove ecosystem of Kedabu Rapat Village, three types of microplastics were found in lokan (*G. erosa*): fibers, films, and fragments, with an average content of 32.73 particles per individual. The abundance of microplastics among stations did not show a significant difference; however, there was a substantial difference in microplastic content among the three size categories, particularly between small and large lokan. In addition, there was a positive moderate correlation between microplastic content and both shell length and flesh weight of lokan.

5. References

Alpiansyah, B., Amin, B., & Galib, M. (2021). Identification of Microplastic Type and Abundance in the East Coast of Karimun Besar Island, Riau Islands. *Journal of Coastal and Ocean Sciences, 2*(2): 104–110.

Cahyaningtyas, D.I., & Chandra, A.B. (2024). Identifikasi Mikroplastik pada Air Kolom dan Sedimen di Kanal Mangetan Sidoarjo. *Environmental Pollution Journal*, 4(1): 906-917.

Dalimunthe, A.M., Amin, B., & Nasution, S. (2021). Microplastics in the Digestive Tract of Kurau (*Polydactylus octonemus*) in the Coastal Waters of Karimun Besar Island, Riau Islands Province. *Journal of Coastal and Ocean Sciences*, *2*(2): 80–86.

Dalimunthe, R., Sitorus, E.M., & Pardede, S.S. (2021). Analisis Kelimpahan Mikroplastik pada Bivalvia di Perairan Sumatera Utara. *Jurnal Ilmiah Lingkungan*, 12(2): 112-121

Dewi, S.I., Aditya Budiarsa, A., & Ritonga, R.I. (2015). Distribusi Mikroplastik pada Sedimen di Muara Badak, Kabupaten Kutai Kartanegara. *Depik*, *Jurnal Ilmu-Ilmu Perairan,Pesisir dan Perikanan, 4*(3): 121–131

Digka, N., Tsangaris, C., Torre, M., Anastasopoulou, A., & Zeri, C. (2018). Microplastics in Mussels and Fish from the Northern Ionian Sea. *Marine Pollution Bulletin*, *135*(June): 30–40.

Febriani, I.S., Amin, B., & Fauzi, M. (2020). Distribusi Mikroplastik di Perairan Pulau Bengkalis Kabupaten Bengkalis Provinsi Riau. *Depik Jurnal ilmu-ilmu Perairan, Pesisir dan Perikanan*, *9*(3): 386–392

Ghazali, N. A., Mustaffa, A., & Aziz, H. (2023). Microplastic Contamination in *Saccostrea cucullata:* A Baseline Study Along the Rocky Shore in the Southwestern Area of Peninsular Malaysia off the Strait of Malacca. *International Journal and Environmental Pollution*, 73(1-4): 154-174

GESAMP (Group of Experts on the Scientific Aspects of Marine Environmental Protection). (2015). Sources, Fate and Effects of Microplastics in the Marine Environment: A Global Assessment. *Reports and Studies GESAMP*, *90*, 96

Junaidi, M., Mawardi, A.L., & Sarjani, T.M. (2024). Analisis Mikroplastik yang Terakumulasi pada Bivalvia di Ekosistem Mangrove Kuala Langsa. *Journal Biosense*, *7*(01): 8–22.

Listiani, N.W., & Nugraha, W.A. (2021). Mikroplastik dalam Kerang Darah (*Anadara granosa*) pada Ukuran yang Berbeda di Perairan Kwanyar Kabupaten Bangkalan Madura. *Jurnal Sumberdaya Akuatik Indopasifik*, *5*(2): 169–180

Lutfi, M., Yekti, P.A.A., Wijaya, S., & Ibad, M. (2023). Literature Review: Mikroplastik pada Berbagai Jenis Kerang serta Dampak terhadap Kesehatan. *Journal of Comprehensive Science (JCS)*, *2*(5):1325–1334.

Rahimah, R.A. (2022). Jenis dan Kelimpahan Mikroplastik pada Perairan di Kepulauan Bangka Belitung, Indonesia. *Environmental Pollution Journal*, *2*(3): 527–537.

Ramli, Y.K., & Rukminasari, N. (2021). Kontaminasi Mikroplastik pada Kerang Hijau *Perna viridis* di perairan Pangkajene Kepulauan, Sulawesi Selatan, Indonesia. *Akuatikisle: Jurnal Akuakultur, Pesisir, dan Pulau-Pulau Kecil*, *5*(1):1–5.

Rist, S., Baun, A., & Hartmann, N.B. (2019). Ingestion of Micro- and Nanoplastics in Filter-Feeding Bivalves – A Review. *Environmental Pollution*, 245: 972–988.

Rohmah, S.M., Karsa, A.P., Chandra, A.B., Abida, I.W., & Madura, U.T. (2022). Identifikasi Mikroplastik pada Air, Sedimen dan Bivalvia di Hilir Sungai Brantas. *Environmental Pollution Journal*, *2*: 379–389.

Sari, N., Amin, B., & Yoswaty, D. (2021). Analysis of Microplastic Content in Lokan (*Geloina erosa*) in North Beach Waters of Bengkalis Island, Riau Province. *Asian Journal of Aquatic Sciences*, *4*(1): 13–20.

Seftianingrum, B., Hidayati, I., & Zummah, A. (2023). Identifikasi Mikroplastik pada Air, Sedimen, dan Ikan Nila (*Oreochromis niloticus*) di Sungai Porong, Kabupaten Sidoarjo, Jawa Timur. *Jurnal Jeumpa*, *10*(1): 68–82.

Sugiyono, S. (2016). *Metode Penelitian kuantitatif, kualitatif R&D*. PT Alfabet. Bandung.

Tan, S.G., Lee, S.Y., & Chong, M.F. (2020). Distribution and Abundance of Microplastics in the Coastal Waters of the Strait of Malacca. *Marine Pollution Bulletin*, 155.

Yeo, M., Lee, S., & Tan, S.G. (2019). Size-Dependent Accumulation of Microplastics in Sediment and Water Samples from the Strait of Malacca. *Environmental Science and Pollution Research*, 26(21): 21745–21754

Yona, D., Samantha, C.D., & Kasitowati, R.D. (2021). Perbandingan Kandungan Mikroplastik pada Kerang Darah dan Kerang Tahu dari Perairan Desa Banyuurip, Gresik. *Saintek Perikanan: Indonesian Journal of Fisheries Science and Technology*, *17*(2): 108–114.

Yuan, Z., Nag, R., & Cummins, E. (2022). Science of the Total Environment: Human Health Concerns Regarding Microplastics in the Aquatic Environment - from Marine to Food Systems. *Science of the Total Environment*, *823*, 153730