

## Types and Abundance of Microplastics in the Digestive Tract of Cucumbers in Banyak Island, Aceh Singkil

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Received: 1 April 2024; Accepted: 3 May 2024

### ABSTRACT

Banyak Island is an island located in Aceh province, precisely in Aceh Singkil district. The people of Banyak Island often consume food whose packaging is made of plastic, and then it ends up in the sea. Island community waste thrown into the sea will enter and potentially pollute the marine ecosystem and the biota within it. This research aims to identify the type of composition and abundance of microplastics found in the digestive tract of sea cucumbers on Banyak Island, Aceh Singkil, in terms of the shape and abundance of microplastics. The method used in this research is a descriptive analysis method, which is based on photos taken with a microscope. Based on the research results, the species composition ranged from 50-114 particles/g, and the abundance of microplastics obtained was 0.2-11.4 particles/g. It was dominated by microplastic pellets, fibers, and films, with the pellet type being the first. Judging from the large amount of microplastic content found in the digestive tract of sea cucumbers on Banyak Island, Aceh Singkil, they can be categorized into types of sea cucumbers that are still suitable for consumption and sale, but if done continuously, can trigger the growth of if done frequently and over a long period, it will cause adverse effects for humans who consume it.

**Keywords:** Microplastics, Banyak Island, Sea cucumbers

### 1. INTRODUCTION

Banyak Island is an island located in Aceh province, precisely in the Aceh Singkil district. Based on the results of a direct survey of the research location area, the fisheries sector is first in terms of the livelihood and economic status of the local community. People on Banyak Island carry out fishing activities such as catching fish, shrimp, lobsters, octopus, sea cucumbers, and so on. Now, many islands are visited by tourists, both local and international. This is because of its natural beauty and stunning marine tourism panorama. However, unfortunately, the marine ecosystem of Banyak Island is now starting to be polluted by rubbish, especially plastic waste. The people of Banyak Island often consume food whose packaging is made of plastic, and then it ends up in the sea. A direct survey of the research location area proved this.

Island community waste thrown into the sea will enter and potentially pollute the marine

ecosystem and the biota within it. Plastic that has long been degraded in the sea will turn into smaller particles, commonly known as microplastics. One biota that is easily contaminated by microplastics is sea cucumbers. Sea cucumbers move slowly and live in sandy substrates, mud, and coral reef areas. Sea cucumbers are widely used animals because they have many benefits in the health and pharmaceutical fields (Riani et al., 2016).

Sea cucumbers are also Deposit feeder animals that have a non-selective system in filtering food so that it can cause microplastics to enter the sea cucumber's body quickly and of course, can damage the tissues of the sea cucumber itself (Cozar et al., 2015) Previous research conducted by (Melindo et al., 2022) in cultivating sand sea cucumbers in Bandar Lampung proved that microplastics can be degraded in cultivation ponds. Almost all types of microplastics are found in them. This is, of

course, a pleasure for researchers to see the differences in microplastic content found in the Banyak Island area due to the process.

The catch is carried out in the open sea, which contains more plastic particles than aquaculture ponds. Based on the explanation that has been explained previously, it is very necessary to research microplastics found in the digestive tract of sea cucumbers in Pulau Banyak, Aceh Singkil. Sea cucumbers, deposit feeder animals, digest large amounts of sediment in the top layer. The upper sediment will likely contain microplastic particles that settle and become trapped in coral reef areas. Due to the eating status of sea cucumbers, sea cucumbers are said to be strongly contaminated with microplastics. This research hopes to provide information regarding the type, shape, color, and abundance of microplastics found in sea cucumbers' digestive tracts on the Aceh Singkil.

## 2. RESEARCH METHOD

### Time and Place

This research was conducted from September 2023-January 2024 on Banyak Island, Aceh Singkil, and at the Fisheries Laboratory of Teuku Umar University. The sea cucumber samples in this study were taken randomly, and the number of samples taken was 6, consisting of 3 types, so each type contained two. Microplastic identification was conducted at the fisheries laboratory, Faculty of Fisheries and Marine Sciences, Teuku Umar University.

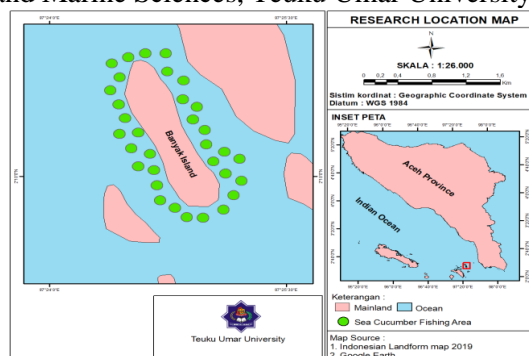


Figure 1. Map of Research Location

### Method

The method used in this research approach is conducting a direct survey at the data collection location and carrying out microplastic analysis in the laboratory.

### Procedures

#### Sample Collection and Preparation

The sea cucumber samples taken are then

identified, and the results are documented. Next, the sea cucumber intestine samples were identified, documented, and entered into a sample bottle to which 96% alcohol was added. Then, the sample was put into a cool box containing ice cubes to ensure that it remained durable until further analysis was performed in the laboratory. The final step is to identify microplastics using an optical microscope. Then, the types of microplastics that have been found are documented, and the type is identified.

### Microplastic Analysis

The sample analysis used the method from (Lusher et al., 2016). This method is adapted from Rahman (2021). Microplastic analysis was conducted in the Fisheries Laboratory, Faculty of Fisheries and Marine Sciences, Teuku Umar University. Samples of preserved sea cucumber intestines were then dissected using surgical tools to extract only the contents of the intestines. The wet weight of the sediment taken was then weighed first, and then 10 g of the sample was transferred into a petri dish lined with aluminum foil. The next stage is for the sample to be dried using an oven for 1x24 hours at a temperature of 60°C. After being oven-treated, the sample was put into an Erlenmeyer flask, and H<sub>2</sub>O<sub>2</sub> was added, then stirred using a wh260-h hotplate stirrer for 20 minutes at a temperature of 40°C with a speed of 500 rpm. Next, the sample was left to cool.

After that, 30 mL of NaCl solution was added, and the hot plate was returned in 2 minutes. After being hot plated for 2 minutes, the sample was filtered using 5 mm filter paper. The next stage is that the sample that has been filtered is then put into a petri dish and placed in the oven for 20 minutes at a temperature of 60°C. The final step is to identify the microplastics using an optical microscope. Then, the types of microplastics that have been found are documented, and the type is identified.

### Data Analysis

Analysis of microplastic data in sea cucumbers used descriptive analysis based on the documentation results shown on the microscope. The abundance of microplastics is calculated based on the formula from (Laila et al., 2020), namely:

$$K = \frac{n}{V}$$

Information:

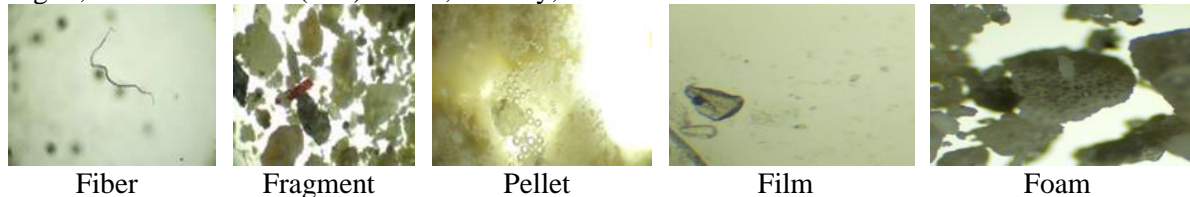
K = Abundance of microplastics

(particles/g)  
 $N$  = Number of microplastic particles  
 (particles/ g)  
 $V$  = Sample weight (g).

### 3. RESULT AND DISCUSSION

#### Characteristics of Microplastics based on shape

Based on the results of the identification of microplastics in the digestive tract of sea cucumbers found on Banyak Island, Aceh Singkil, it consists of 5 (five) forms, namely,



**Figure 2. Form of Microplastics found in the Digestive Tract of Sea Cucumbers on Banyak Island, Aceh Singkil**

**Table 1. Overall Types of Microplastics based on Shape on Banyak Island, Aceh Singkil**

Sea cucumber species	Fiber	Fragmen	Film	Pellet	Foam
<i>Holothuria Fusco1</i>	36	15	26	114	2
<i>Holothuria Fusco 2</i>	5	-	2	-	-
<i>Stichopus Pseudohorens 1</i>	7	3	15	-	-
<i>Stichopus Pseudohorens 2</i>	12	3	13	-	-
<i>Holothuria Atra 1</i>	12	3	4	-	-
<i>Holothuria Atra 2</i>	18	2	3	-	-

Fragment-type microplastics come from larger plastic fragments (Ayuningtyas et al., 2019), have a lower density, and are found more frequently on the water's surface. Examples of this type of microplastic come from bottles to ready-to-eat food packaging.

Fim-type microplastics are a type of microplastic that comes from secondary plastic polymers, where plastic packaging has a lower density or density and has the physical characteristics of being flexible and thin (Ebere et al., 2019). The type of waste that can be degraded into this type of microplastic is plastic bags, where the density of plastic bags is lower than that of seawater.

Pellet-type microplastics are the main type of microplastics in the plastic manufacturing process. This type of microplastic is often found on surface waters due to its low density. Pellets were the first microplastics found in the ocean and have been found almost everywhere on all beaches and surface waters of the world. Generally, this type of microplastic comes from polyethylene or polypropylene plastic (Kenny, 2019). Foam-

fiber, fragment, pellet, film, and foam (Figure 2).

Fiber is a type of microplastic that generally comes from the activities of coastal communities such as fishermen, where many fishermen use net-type fishing gear made from fiber. These degraded nets then become small particles to form fiber-type microplastics. Fiber-type microplastics can also come from household waste, such as laundry products that drain the waste into the sea (Wagner & Lamberts, 2018).

type microplastics have the characteristics of a round shape and are elastic, so they change quickly (Gesamp, 2019).

#### Microplastic Abundance

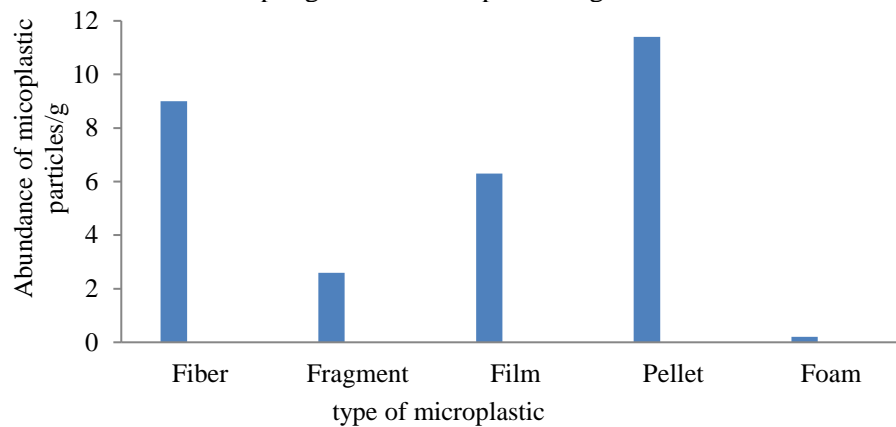
Based on the results of the microplastic analysis in the digestive tract of black sea cucumbers, sand sea cucumbers, and spiny sea cucumbers on Banyak Island, Aceh Singkil, which researchers carried out, the abundance of microplastics was 0.2-11.4 particles/g (Figure 3).

This is different from Melindo et al. (2022) research conducted by Sayogo et al. (2019), where the type of fiber was in the first position in their research. This is, of course, influenced by environmental factors and the particular habits of the Banyak Islands community, where people often consume food, whose packaging is made of plastic so that pellets are the most dominant form, seen from the characteristics of the pellets themselves, which are the Primary raw material in the plastic manufacturing process (Kenny, 2019).

Based on research that has been carried

out, the abundance of microplastics obtained is 0.2-11.4 particles/g. This is very different from previous research, such as research conducted by Melindo et al. (2021) on sand sea cucumber cultivation ponds in Bandar Lampung which

obtained higher yields, namely approximately 45 - 51 particles/ g, and research conducted by Mohsen et al. (2018) which obtained a higher abundance of microplastics, namely 0-30 particles/g.



**Figure 3. The abundance of microplastics on Banyak Island, Aceh Singkil**

Like plastic, microplastics are dangerous for other ecosystems, such as marine biota. There are direct and indirect impacts if microplastics have contaminated a biota. The direct impact of microplastics on biota is internal bleeding and blockage of the digestive tract. Apart from that, microplastics also have the potential to contaminate soil or substrates, and microplastics can also cause the death of coral reefs, which are ecosystems that have high biodiversity for marine life (Asia, 2017). The indirect impact is caused by another biota that has been previously contaminated. Besides impacting biota, microplastics can also hurt humans who consume them (Miller et al., 2020).

#### 4. CONCLUSION

Based on research that has been carried out, the characteristic form of microplastic that is most often found in the digestive tract of sea cucumbers on Banyak Island, Aceh Singkil, is pellets. The abundance of microplastics found in the digestive tract of sea cucumbers was 0.2-11.4 particles/g. After reviewing the accumulated microplastics, we see that the sea cucumbers in this area are still suitable for sale and consumption because the microplastic content obtained is still in the small category compared to previous studies. However, if done frequently and over a long period, it will cause adverse effects for humans who consume it.

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