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# Analysis of Microplastic Containment in Coral Grouper (*Cephalopholis miniata*) and Brown-Marbled Grouper (*Epinephelus fuscogattatus*) Grown on the Station of Baguk Island, Singkil Aceh

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## ABSTRACT

Baguk Island is one of several islands in the Aceh Singkil Regency. This water area is included in a coastal ecosystem widely used for various human activities, such as sea transportation routes; these activities can increase domestic and anthropogenic waste, including microplastics. The study aimed to determine the type and amount of microplastic content in coral groupers (*Cephalopholis miniata*) and Brown-marbled grouper (*Epinephelus fuscogattatus*), fish often consumed by the community. This research was conducted in August-November 2023 in the tangkahan of Baguk Island village using quantitative methods where data collection was carried out through field surveys and laboratory experiments based on the NOAA (National Oceanic and Atmospheric Administration) method but with several differences, namely the number of samples and the addition of hydrogen peroxide ($H_2O_2$) solution. The results of the identification of this study found as many as three types of microplastics in coral grouper fish, namely fragment, film and fiber types and four types of microplastics in Brown-marbled grouper fish with fragment, film, fiber and granule types.

**Keywords:** Baguk Island, Brown-marbled grouper, Coral Grouper, Microplastics, Tangkahan

## 1. INTRODUCTION

Baguk Island is one of the islands in Aceh Singkil Regency and is located on the west side of Pulau Banyak District. Many island water areas include coastal ecosystems widely used for various human activities, namely tourism activities, settlements, aquaculture, sea transportation routes, and anchorage of fishing boats. According to Sulastri et al. (2008), all these human activities can increase the input load in the form of domestic waste and other anthropogenic waste. Marine debris has many types, including plastic, styrofoam, cloth, paper, wood, foam and many more. In addition to the types of waste that can be seen, it turns out that the sea has also been contaminated with plastic substances that are very small in size, <5 mm (microplastics). Microplastics have a very minimal or small size, and this substance has spread to all corners of the sea in the world. With a small size, it is not uncommon for this microplastic substance to be consumed by marine fish because its size is almost the same as plankton. This substance has a destructive impact on biota in the sea because it will be challenging to decompose when consumed. Besides fish, humans can also get the consequences of speeding this substance by intentionally or unintentionally consuming fish contaminated by microplastic substances (Putri, 2021).

The alarming phenomenon of microplastics will have an unfavourable impact on the community around Baguk Island. In addition, data on microplastic pollution in the sea is still scarce, and no information on microplastics in the region has been found. Based on this, it is necessary to conduct a study to identify the types of microplastics in coral grouper *(Cephalopholis miniata*) and Brown-marbled grouper *(Epinephelus fuscogattatus*), which dominate and are one of the types of fish

that are often consumed in the waters of Baguk Island. This research aims to determine and identify the content of microplastics in coral grouper and Brown-marbled grouper in the waters of Baguk Island. In addition, it is hoped that the results of this study will be helpful to see the level of microplastic pollution in the region.

## 2. RESEARCH METHOD

### Time and Place

This research was conducted in the catchment of Pulau Baguk Village, Aceh Singkil Regency and then identified using a microscope at the Teuku Umar University Fisheries Product Technology Laboratory, Meulaboh, in August - November 2023.

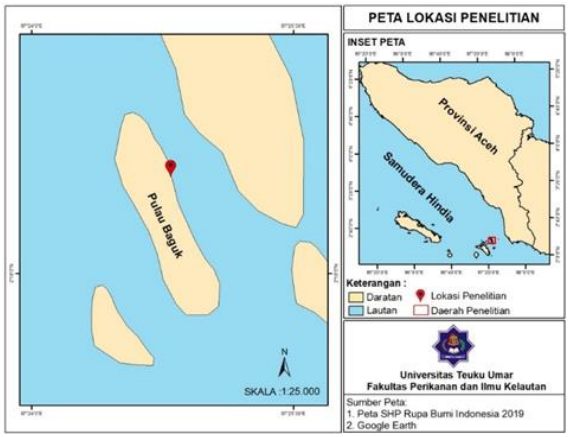


**Figure 1. Map of Fish Sampling Locations**

### Method

This research uses a research approach in which data collection is carried out through field surveys, sampling and laboratory experiments.

### Procedures

Samples were taken by buying fish caught by fishermen directly landed in the catchment of Pulau Baguk Village. The fish samples used in this study were coral grouper and brown-marbled groupers, each with as many as three ind / fish. These two fish come from the same family and are often consumed and traded by the local community.

The sample testing method carried out follows the NOAA (National Oceanic and Atmospheric Administration) method but with several differences, namely the number of samples and the addition of hydrogen peroxide ($H_2O_2$) solution (Gunawan et al., 2021). Fish digestive tract samples, as many as six samples with three samples per fish species, were then transferred to a glass baker to be given the addition of 20 mL of 30% $H_2O_2$ solution and five drops of Fe (II) 0.05M after that stirred and closed for the incubation process at room temperature for 24 hours. The sample that has been incubated is then heated for approximately 20 minutes using a Hotplate Stirrer tool, which is a tool used to mix or homogenize and heat a chemical solution with the help of a magnetic stir bar, after which the sample is allowed to cool before it is filtered with filter paper into a Petri dish. Microplastic particles left on the filter paper are then rinsed using NaCl solution until clean and stored for identification using a microscope.

### Data Analysis

The filtered samples were then identified by placing them in a petri dish and then transferring them to a glass plate to be observed using a stereo microscope. The results of microplastic identification are grouped into five types: fragments, fiber, film, granule and foam (Crawford & Quinn, 2017).

The results of identifying microplastic content in fish are attached as photos of microscopy results. The amount of data and type (shape) of microplastics are presented quantitatively descriptively in the form of tables and graphs.

## 3. RESULT AND DISCUSSION

The results of the research that have been carried out are that there are a total of 3 types of microplastics in coral grouper, namely fragments, film and fiber (Figure 2). While in brown-marbled grouper, four types of microplastics were found in the fish digestive tract samples, fragments, films, fibers and granules (Figure 3).

The amount of microplastics found in reef grouper and brown-marbled grouper is different. This is due to the habitat of reef grouper, which is in an average depth of 20-150 m, which is different from the habitat of brown-marbled grouper, which lives in a coral area at a depth of 30 m (Sudirman & Aidah, 2015).


**Figure 2. Types of Microplastics in Coral Grouper, (a) fragment, (b) film and (c) fiber**

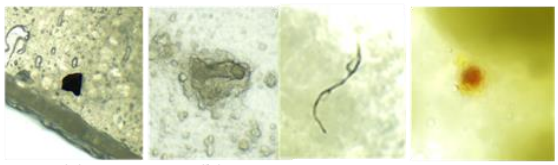


**Figure 3. Type of Microplastics in Brown-Marbled Grouper, (a) fragment, (b) film, (c) fiber and (d) granule**

The difference in habitat depth results in differences in exposure or microplastic contamination received by the two fish, whereas brown-marbled grouper certainly gets more contamination because it is in a relatively shallow area with much microplastic-producing waste around it. This study showed two fragments, four film-type particles and 14 fibres in coral grouper fish. In brown-marbled grouper fish, eight fragments, one film-type particle, 36 fibre-type particles and four granule-type microplastic particles were found.

**Table 1. Number of Microplastics in Each Fish**

| Type Fish | Number of Microplastics | | | |
|---|---|---|---|---|
| | Fragments | Film | Fiber | Granule |
| Coral Grouper (*C. miniata*) | 2 | 4 | 14 | - |
| Brown-marbled grouper (*E. fuscogattatus*) | 8 | 1 | 36 | 4 |

**Table 2. Total Number of Microplastics**

| Type of Microplastic | Amount |
|---|---|
| Fragment | 10 |
| Film | 5 |
| Fiber | 50 |
| Granule | 4 |

It can be seen in the table that there are more fiber microplastics than other types of microplastics. This happens because, in the fishing area, there is a lot of textile waste, fishing nets (polypropylene fiber), raffia, carpets and plastic sacks, which are the source of the formation of fibre-type microplastics.

Microplastics are one of the wastes that can only be seen using a microscope, and they contain chemical compounds that can become toxic. Furthermore, this makes microplastics worth being aware of because microplastics are found in various types of seafood, such as shellfish, fish, shrimp, and so on. Microplastics are found in many marine ecosystems and come from the weathering process of plastic waste floating in seawater (Jenna et al., 2015).

The results showed that coral grouper and brown-marbled grouper landed in the catchment of Pulau Baguk Village were indicated to be contaminated with microplastics caused by various human activities such as community waste disposal, fishing nets and marine transportation fuel spills (Caruso, 2015). This statement is corroborated by discovering three types of microplastics in reef grouper fish and four types in brown-marbled grouper fish, where fiber is the most commonly found type among all microplastics. Fiber itself is formed due to the contamination of fishing net waste (polypropylene fiber), which can pollute the habitat of the two fish in the waters of Baguk Island village.

Waste management strategies at sampling sites likely reflect the source and variation in microplastic type, polymer and size. Different consumption rates of different species also influence microplastic abundance. Plastic debris found in the digestive tract of organisms can be caused by a trophic transfer of smaller species being targeted by larger trophic organisms (Karbalaei et al., 2019). Microplastics are ingested by fish that mistake plastic particles for food due to their size and appearance, similar to plankton. Filter feeders can also inadvertently ingest microplastics by filtering water that contains suspended food material and plastic particles (Pizzurro et al., 2022).

## 4. CONCLUSION

The conclusions obtained from this study are three types of microplastics in reef grouper fish, while in brown-marbled grouper fish, there are four types of microplastics consisting of fragments, films, fibers and granules. There are two microplastic fragments in reef grouper fish, four films and 14 fibre particles. In brown-marbled grouper fish, microplastic particles of the fragment type amounted to 8, and there was only one particle of the film type. Fiber became the most common particle present in brown-marbled grouper fish, namely 36 and 4 microplastic particles of the granule type.

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