Microplastic Distribution in Seawater and Sediment on Kampung Atas Air, Balikpapan

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Abstract. Kampung Atas Air at Margasari Village, West Balikpapan Sub-District on Balikpapan City is a densely populated settlement where most of the houses are located on the tidal land of the sea. That location is an area that has a high potential for microplastic pollution due to existing settlement activities. Microplastic is plastic particles that smaller than 5 mm in size sourced from large or macro-sized industrial, household, and plastic weathering activities. Microplastic samples were taken from two media, water and sediment. Microplastic identification was carried out under a microscope with 10 times magnification. The result of this observation shown 4 types of microplastic, which are films, fragments, fibers, and granules. Fiber is the most common type found in this observation. It came from community activities such as fishing and washing clothes.

Keywords: Microplastics, Seawater, Sediment

1. Introduction
Kampung Atas Air at Margasari Village, West Balikpapan Sub-District on Balikpapan City is a densely populated settlement where most of the houses are located on the tidal land of the sea. The government of Balikpapan City carries out the regional arrangement as an effort to repair the city area. Currently, Kampung Atas Air Margasari is designated as a tourism area. However, Yuniastri’s (2020) research found the people's behavior in maintaining cleanliness and waste management is still lacking. A huge part of society does not throw their waste into landfills or garbage collectors. Waste that was thrown into water is one of the sources of microplastic.

Microplastic is plastic particles smaller than 5 mm in size. Microplastic comes from 2 primary and secondary sources. The primary source is the production of microplastic for household and industrial purposes, for example, personal care products (skincare) and detergent products. Meanwhile, the secondary source is weathering process of macro plastic becoming microplastic (Cook, Sarah dkk,
Microplastic has some criteria which are larger than 1 µm, no cells or organic structure, have fine fibers with the same thickness, clear particles with homogenous color, can be observed using a microscope if it is transparent (HildagoRuz et al. 2012).

Microplastic existence is a source of marine pollution that can threaten marine life because through ingestion because of its micro size. Kampung Atas Air is one of the areas that can highly be contaminated by microplastic because of the residential and fishing activities (HildagoRuz et al. 2012).

Microplastic observation using a microscope with a magnification of 10 times on the water and sediment samples microplastic is measuring 1 µm - 5 mm. The microplastic is divided into 6 types (Kovač Viršek et al., 2016), there are fragments, films, pellets, granules, filaments, and foams. From water and sediment samples, 4 types of microplastic were found they are fragments, films, granules, and filaments.

| Types of Microplastic | Explanation |
|-----------------------|-------------|
| Films                 | The thin sheet of plastic with dimensions from less than 5 mm to 1 mm |
| Fragments             | Plastics of an irregular shape with dimensions from less than 5 mm to 1 mm |
| Filaments             | Plastic strands or filaments with dimensions less than 5 mm to 1 mm |
| Granules              | Round plastic with a diameter less than 1 mm to 1 µm |
| Pellets               | Round plastic with a diameter less than 5 mm to 1 mm |
| Foam                  | Sponge, foam, or plastic material such as foam with dimensions less than 5 mm to 1 mm |

2. Methods

2.1. Microplastic in The Water
The identification of microplastic in the water was conducted by taking a water sample of 1,000 ml at a depth of ± 10 cm, then filtering it using 1µm filter paper. The samples were separated from organic material such as shell fragments of animal parts, algae, seagrass, etc. The types and amount of microplastic were analyzed using a microscope with a total magnification of 100 times.

2.2. Microplastic in The Sediment
A sampling of microplastic sediment was carried out in three sampling points with a 100 m distance from one point to another with a sampling scheme on the wrack line. Analysis of the microplastic content in the sediment consists of sample preparation (drying), separation/flotation of plastic based on specific gravity, filtering, and identification using a microscope with a magnification of 100 times.

2.3. Microplastic visual inspection on microscope
The sample observation using a 10x lens magnification light microscope (100x total magnification) on Whatman GF/C filter paper/ Particles suspected as microplastic is to find out a shape or color that were different from the dominant environment of brown color. This method of identification was based on the microplastic characteristics conducted by Horton et al. (2017), the colors contrast with the environment, homogeny colors, and different unique shapes such as fiber.

3. Result and Discussion
Settlement activities such as trading and fishery are the largest source of microplastic pollution in the water. The community is still discharging garbage to the water body. The garbage is then carried by the tides and part of it is retained in sediment. There are garbage disposal facilities in this area but some people still throw out the garbage into the water. The microplastic observation found 4 types of microplastic that are films, fragments, fibers, and granules. The result of microplastic observation in the water is shown in table 2 and figure 1.
Table 2. The number of microplastic in the water.

| Types of microplastic | Microplastic particles/ liter |
|-----------------------|------------------------------|
| Films                 | 13                           |
| Fragments             | 6                            |
| Fibers                | 138                          |
| Granules              | 33                           |

Figure 1. Distribution of microplastic on the seawater at Kampung Atas Air, Balikpapan.

The result of microplastic observation in the sediment is shown in Table 3 and Figure 2, meanwhile, the morphological form of microplastic particles can be seen in Figure 3 and Figure 4.

Table 3. The number of microplastic in the sediment.

| Types of microplastic | Microplastic particles/ 100 gram |
|-----------------------|----------------------------------|
| Films                 | 13                               |
| Fragments             | 12                               |
| Fibers                | 126                              |
| Granules              | 50                               |

Figure 2. Distribution of microplastic on the sediment at Kampung Atas Air, Balikpapan.

The proportion of the number of microplastic in the water and sediment samples is showing the same distribution of fibers, granules, films, and fragments. Fiber is the most common type of microplastic found in this observation. The fibers came from community activities such as fishing and...
washing clothes. Synthetic clothes such as polyester, when washed, decompose into microplastic because of the friction in the washing machines, water, and detergents. Another factor that affects is the presence of fishnets in the water that can be broken down by natural causes into smaller particles or microplastic (Lolondo and Wahyu, 2019). The settlement activities in Kampung Atas Air is high since it is densely populated. Films are derived from the degradation of plastic bags or plastic packaging from waste disposed into the water. Fragments are the results of pieces of plastic products with strong synthetic polymers such as beverage bottles, waste jars, mica folders, gallon pieces, and small pieces of pipe.

![Microplastic image on microscope](image1.png)

**Figure 3.** Microplastic image on microscope (a) Films (b) Fragments.

![Microplastic image on microscope](image2.png)

**Figure 4.** Microplastic image on microscope (a) Fiber (b) Granule.

4. **Conclusion**
This study discovered the presence of microplastic on the coastal settlement area, Kampung Atas Air Balikpapan. It can be concluded that fiber is the most common type of microplastic was found in this observation both on the seawater and sediment.

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