

ABSTRACT

ABUNDANCE AND CHARACTERISTICS OF MICROPLASTICS IN WATER AND SEDIMENT IN THE BOGOWONTO RIVER, PURWOREJO DISTRICT

Plastic waste is characterized by its resistance to degradation, posing a significant environmental threat. Plastics smaller than 5 mm are defined as microplastics. These microplastics originate from everyday products such as household waste. The Bogowonto River is an ecosystem providing water for domestic, agricultural, and industrial needs. This study aims to determine and analyze the abundance and characteristics of microplastics in the water and sediment of the Bogowonto River. Sampling was conducted in December 2023, collecting 15 water and sediment samples each. Samples were taken in triplicate at five stations. Water samples were collected using a plankton net (30 cm diameter, 60 μ m mesh size, and 50 mL cod-end). Organic matter was degraded using 10% KOH (Merck Millipore EMSURE®, ACS, ISO, Reag., Ph Eur), followed by vacuum filtration (Rocker-300, Taiwan) using 2.5 μ m cellulose filter paper (Whatman, UK). Sediment samples were collected using a grab sampler (Van Veen, Hydro-Bios, Germany), with organic matter degradation using 10% KOH (Merck Millipore EMSURE®, ACS, ISO, Reag., Ph Eur), density separation using 30% NaCl ($\rho = 2.17 \text{ g/cm}^3$, Merck Millipore EMSURE®, ACS, ISO, Reag., Ph Eur), and vacuum filtration (Rocker-300, Taiwan) using 2.5 μ m cellulose filter paper (Whatman, UK). Microplastics were identified using a binocular microscope (Olympus CX43, Japan) with additional microscope photography (Optilab Advanced version 2, Minocos, Indonesia) and measured using the Image Raster version 3 application. Polymer types were determined using FTIR-ATR with identification based on the Open Specy website. Microplastic pollution in the river was influenced by residential areas, with the highest abundance in urban regions and the lowest in downstream areas. Fiber microplastics were the most dominant form at all stations, blue was the most dominant color, Large Microplastic Particles were the most frequently found size, and polyamide and polypropylene were the most dominant polymers identified in the samples. These findings highlight the significant impact of human activities on the distribution and characteristics of microplastics in the Bogowonto River ecosystem, emphasizing the need for effective waste management strategies to mitigate pollution.

Keywords: Anthropogenic, Bogowonto River, Environmental Pollution, FTIR, Microplastics

INTISARI

KELIMPAHAN DAN KARAKTERISTIK MIKROPLASTIK PADA AIR DAN SEDIMEN DI SUNGAI BOGOWONTO, KABUPATEN PURWOREJO

Sampah plastik memiliki karakteristik yang sulit terurai sehingga berpotensi untuk mencemari lingkungan. Sampah plastik yang lebih kecil dari 5 mm didefinisikan sebagai mikroplastik. Sumber dari mikroplastik ini dapat berasal dari produk yang digunakan sehari – hari seperti limbah rumah tangga. Sungai Bogowonto merupakan ekosistem yang menyediakan air untuk kebutuhan domestik, pertanian, dan industri. Penelitian ini bertujuan untuk mengetahui dan menganalisis kelimpahan dan karakteristik mikroplastik pada air dan sedimen di Sungai Bogowonto. Pengambilan sampel dilakukan pada bulan Desember 2023 masing – masing sebanyak 15 sampel air dan sedimen. Pengambilan sampel dilakukan dengan tiga kali pengulangan pada 5 stasiun. Pengambilan sampel air menggunakan *plankton net* (diameter 30 cm, mesh size 60 μm , dan 50 mL cod-end). Selanjutnya dilakukan penghancuran bahan organik menggunakan KOH 10% (Merck Millipore EMSURE®, ACS, ISO, Reag., Ph Eur), filtrasi menggunakan pompa vakum (Rocker-300, Taiwan), dan kertas saring selulosa berukuran 2,5 μm (Whatman, UK). Pengambilan sampel sedimen menggunakan *grab sampler* (Van Veen, Hydro-Bios, Jerman), penghancuran bahan organik menggunakan KOH 10% (Merck Millipore EMSURE®, ACS, ISO, Reag., Ph Eur), pemisahan densitas menggunakan NaCl 30% ($\rho = 2.17 \text{ g/cm}^3$, Merck Millipore EMSURE®, ACS, ISO, Reag., Ph Eur), filtrasi menggunakan pompa vakum (Rocker-300, Taiwan), dan kertas saring selulosa berukuran 2,5 μm (Whatman, UK). Identifikasi karakteristik mikroplastik menggunakan mikroskop binokuler (Olympus CX43, Jepang) dengan tambahan foto mikroskop (Optilab Advanced versi 2, Minocos, Indonesia) dan pengukuran mikroplastik menggunakan aplikasi image raster versi 3. Pengujian untuk mengetahui jenis polimer menggunakan metode FTIR-ATR dengan basis identifikasi menggunakan website *open specy*. Kontribusi pencemaran mikroplastik ke sungai dipengaruhi oleh pemukiman penduduk dengan kelimpahan tertinggi pada perkotaan dan terendah pada daerah hilir. Mikroplastik fiber adalah bentuk yang paling mendominasi pada semua stasiun, warna biru adalah warna yang paling dominan, *Large Microplastic Particle* adalah ukuran yang paling banyak ditemukan. Polyamide dan polypropylene adalah polimer yang paling dominan teridentifikasi pada sampel.

Kata Kunci: Antropogenik, FTIR-ATR, Mikroplastik, Pencemaran Lingkungan, Sungai Bogowonto