

INVESTIGASI PENCEMARAN MIKROPLASTIK DAN KARAKTERISTIK JENIS POLIMERNYA TERHADAP KUALITAS AIR BERDASARKAN PARAMETER FISIKA DAN KONDISI HIDROLIS DI SUNGAI PROGO

ABSTRAK

Oleh:

BRILLIAN RAVI ALVRIANO

19/444088/TP/12465

Sungai Progo di Yogyakarta adalah salah satu sungai di Indonesia yang tercemar oleh sampah plastik. Sampah plastik adalah komponen yang sangat sulit terurai dan semakin sulit dikendalikan saat menjadi mikroplastik (MP). Penelitian ini dilakukan di Sungai Progo dan berfokus terhadap: 1) distribusi kelimpahan MP pada aliran air permukaan dan kaitannya terhadap faktor kondisi hidrolis kecepatan aliran air, 2) distribusi karakteristik jenis polimer mikroplastik pada aliran permukaan air sungai, 3) kualitas air di Sungai Progo berdasarkan parameter fisika (suhu, pH, dan TSS), dan 4) korelasi parameter kualitas air sungai terhadap kelimpahan MP di Sungai Progo.

Pengambilan data dilakukan selama musim penghujan, dari November 2022 hingga Januari 2023, dengan 8 titik lokasi sampling dari hulu hingga hilir Sungai Progo. Sampel plastik dikumpulkan dengan menggunakan *manta trawl net*, diikuti oleh ekstraksi sampel menggunakan metode *wet sieving*, *wet peroxide oxidation*, dan *density separation*, lalu analisis data. Identifikasi jenis polimer MP dilakukan menggunakan *Thermo Scientific Nicolet iS10 FTIR Spectrometer*. Analisis korelasi antara kelimpahan MP dengan parameter kualitas air dilakukan dengan menggunakan analisis uji korelasi Pearson.

Hasil penelitian menunjukkan bahwa kelimpahan MP berkisar antara 75,02 hingga 435,53 partikel/m³. Jenis polimer yang paling dominan adalah *Low-density poly(ethylene)*, mencapai sekitar 56,33% dari sampel, diikuti oleh *Poly(ethylene terephthalate)* sebesar 27,61%, dan *Polypropylene* sebesar 13,97%. Analisis juga menunjukkan bahwa kelimpahan MP berkorelasi positif dengan TSS ($r = 0,144$) dan kecepatan aliran air ($r = 0,614$), sementara berkorelasi negatif dengan pH ($r = -0,549$) dan suhu ($r = -0,564$). Meskipun terdapat tingkat pencemaran MP yang signifikan, nilai parameter fisika kualitas air seperti TSS, pH, dan suhu masih memenuhi standar baku mutu yang ditetapkan oleh PP No. 22 Tahun 2021. Hasil ini menekankan pentingnya upaya pengendalian pencemaran MP untuk menjaga kualitas air Sungai Progo dan ekosistem sekitarnya melalui langkah-langkah mitigasi yang lebih efektif.

Kata kunci: Mikroplastik, Distribusi Kelimpahan, Sungai Progo, Kualitas Air, Kondisi Hidrolis

**INVESTIGATION OF MICROPLASTIC POLLUTION AND ITS POLYMER
TYPE CHARACTERISTICS ON WATER QUALITY IN
PHYSICAL PARAMETERS AND HYDRAULIC CONDITIONS
IN THE PROGO RIVER**

ABSTRACT

By:

BRILLIAN RAVI ALVRIANO

19/444088/TP/12465

The Progo River in Yogyakarta is one of the rivers in Indonesia contaminated by plastic waste. Plastic waste is a component that is highly resistant to decomposition and becomes increasingly challenging to control when it transforms into microplastics (MP). This research was conducted in the Progo River and focused on: 1) the distribution of MP abundance in surface water flow and its relation to the hydraulic conditions of water flow velocity, 2) the distribution of the characteristics of microplastic polymer types in surface river water, 3) water quality in the Progo River based on physical parameters (temperature, pH, and TSS), and 4) the correlation of river water quality parameters with MP abundance in the Progo River.

The sampling was conducted during the rainy season, from November 2022 to January 2023, at 8 sampling locations from the upstream to downstream of the Progo River. Data were collected using a manta trawl net, followed by sample extraction using wet sieving, wet peroxide oxidation, and density separation methods, and then data analysis. Identification of MP polymer types was done using the Thermo Scientific Nicolet iS10 FTIR Spectrometer. Correlation analysis between MP abundance and water quality parameters was conducted using Pearson correlation analysis.

The research results indicated that MP abundance ranged from 75.02 to 435.53 particles/m³. The most dominant polymer type was Low-density poly(ethylene), accounting for approximately 56.33% of the samples, followed by Poly(ethylene terephthalate) at 27.61%, and Polypropylene at 13.97%. The analysis also revealed that MP abundance positively correlated with TSS ($r = 0,144$) and water flow velocity ($r = 0,614$), while negatively correlated with pH ($r = -0,549$) and temperature ($r = -0,564$). Despite the significant level of MP pollution, the values of physical water parameters such as TSS, pH, and temperature still met the water quality standards set by PP No. 22 in 2021. These findings emphasize the importance of controlling MP pollution to preserve the water quality of the Progo River and its surrounding ecosystem through more effective mitigation measures.

Keywords: Microplastics, Abundance Distribution, Progo River, Water Quality, Hydraulic Conditions