

**KAJIAN DISTRIBUSI MIKROPLASTIK DAN KARAKTERISTIK  
BENTUKNYA SERTA HUBUNGANNYA TERHADAP KUALITAS AIR  
BERDASARKAN PARAMETER LOGAM BERAT  
DAN TOTAL *COLIFORM* DI SUNGAI PROGO**

**ABSTRAK**

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Sungai Progo ( $\pm 140$  km) diestimasikan termasuk dalam 20 sungai paling tercemar sampah plastik di dunia dan berpotensi terkontaminasi mikroplastik. Kondisi ini dapat menyebabkan penurunan kualitas air sekaligus ancaman bagi makhluk hidup. Sedangkan, Sungai Progo berperan penting sebagai sumber air baku untuk kegiatan perikanan, irigasi, hingga air minum. Penelitian ini bertujuan untuk 1) mengkaji kelimpahan dan distribusi mikroplastik pada permukaan air, 2) mengkaji karakteristik bentuk mikroplastik, 3) mengkaji kualitas air, dan 4) mengkaji potensi korelasi kelimpahan mikroplastik terhadap kualitas air di Sungai Progo berdasarkan parameter logam berat dan total *coliform*. Pengambilan sampel mikroplastik dan air dilakukan di delapan titik lokasi Sungai Progo dari hulu hingga hilir. Selanjutnya, mikroplastik diekstraksi dan disortasi berdasarkan karakteristik bentuk. Kualitas air diuji berdasarkan parameter logam berat Kadmium (Cd), Krom (Cr), Timbal (Pb), Seng (Zn), dan total *coliform*. Hasil kelimpahan mikroplastik diuji korelasi terhadap kualitas air dengan statistika deskriptif dan uji korelasi Pearson. Hasil pengujian digunakan untuk mengkaji potensi hubungan antara kelimpahan mikroplastik terhadap kadar logam berat (Cd, Cr, Pb, Zn) dan total *coliform*. Aliran permukaan Sungai Progo telah ditemukan mikroplastik dengan kelimpahan berkisar 75,02-435,53 partikel/m<sup>3</sup>. Karakteristik bentuk didominasi oleh partikel film (26,2-83,4%) diikuti oleh fiber (14,7-70,0%), fragmen (1,05-14,3%), *pellet* (0,0-1,4%), dan *foam* (0,1-3,0%). Kualitas air Sungai Progo berdasarkan parameter logam berat Cd, Cr, Pb, Zn masing-masing diperoleh sebesar 0,0047-0,0066; 0,0048; 0,0058-0,0061; 0,0159 mg/L dan masih memenuhi baku mutu air, namun konsentrasi total *coliform* ( $540-92 \times 10^6$  MPN/100mL) tidak memenuhi baku mutu. Hasil uji korelasi Pearson menunjukkan korelasi positif kelimpahan mikroplastik terhadap logam Cd ( $r = 0,1538$ ), berkorelasi negatif terhadap logam Pb ( $r = -0,1538$ ) dan total *coliform* ( $r = -0,0191$ ). Tidak terdapat korelasi antara kelimpahan mikroplastik terhadap logam Cr dan Zn.

**Kata kunci:** kualitas air, logam berat, mikroplastik, total *coliform*

## **ASSESSMENT OF MICROPLASTIC DISTRIBUTION AND SHAPE CHARACTERISTICS AND ITS RELATION TO WATER QUALITY BASED ON HEAVY METAL AND TOTAL COLIFORM PARAMETERS IN PROGO RIVER**

### **ABSTRACT**

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Progo River ( $\pm 140$  km) is estimated as one of the top 20 most plastic-polluted rivers globally and is potentially contaminated by microplastic. This condition can lead to water quality degradation and threaten living things. The Progo River plays a vital role as a source of raw water for fisheries, irrigation, and clean water supply for Central Java and Yogyakarta Provinces. This study aimed to 1) investigate the abundance and distribution of microplastics in surface water, 2) identify shape characteristics of microplastics, 3) assess the water quality, and 4) the potential correlation of microplastic abundance to water quality in the Progo River based on heavy metal and total coliform parameters. Microplastics and water samples were collected from eight points of the Progo River from upstream to downstream. The microplastic samples were extracted and sorted based on shape characteristics. The water samples were tested based on heavy metal Cadmium (Cd), Chrom (Cr), Lead (Pb), Zinc (Zn) parameters, and total coliform. Results of microplastic abundance were tested for its correlation with water quality using descriptive statistics and Pearson correlation test. The results determined the potential relationship between microplastic abundance with heavy metals (Cd, Cr, Pb, Zn) and total coliform. Total microplastic abundance in the surface water of the Progo River ranged from 75.02 to 435.53 particles/m<sup>3</sup>. The shape of microplastics in the water were dominated by film (26.2-83.4%), followed by fiber (14.7-70.0%), fragment (1.05-14.3%), pellet (0.0-1.4%), and foam (0.1-3.0%). The water quality of the Progo River based on heavy metal parameters Cd, Cr, Pb, Zn were obtained around 0.0047-0.0066, 0.0048, 0.0058-0.0061, 0.0159 mg/L which have met the water quality standards, however the total coliform concentration ( $540\text{--}92 \times 10^6$  MPN/100mL) has not met the quality standards. The results of the Pearson correlation test showed a positive correlation of microplastic abundance with Cd ( $r = 0.1538$ ), negatively correlated with Pb ( $r = -0.1538$ ) and total coliform ( $r = -0.0191$ ). There was no correlation observed between microplastic abundance with Cr and Zn.

**Keywords:** heavy metal, microplastic, total coliform water quality