Komposisi dan Kelimpahan Mikroplastik pada Air, Sedimen, dan Ikan Kiper Scatophagus argus (Linnaeus, 1766) di Muara Sungai Blanakan, Subang, Jawa Barat = Composition and Abundance of Microplastics in Water, Sediment, and Spotted Scat Scatophagus argus (Linnaeus, 1766) in the Blanakan Estuary, Subang, West Java

Akbar Naufal Burhanuddin Ramadhan, author

Abstrak

Plastik merupakan salah satu barang yang memiliki tingkat penggunaan yang tinggi hingga mencapai skala produksi sebesar 300 juta ton pertahun. Limbah plastik di perairan membutuhkan waktu hingga ratusan tahun untuk terdegradasi karena karakteristiknya yang kuat, tahan lama, dan tahan terhadap suhu tinggi. Proses degradasi limbah plastik di perairan disebabkan oleh sinar UV yang menyebabkan terjadinya perubahan bentuk dan ukuran menjadi lebih kecil (mikroplastik) atau tercampur di dalam air (< 5mm). Ukuran yang kecil menyebabkan mikroplastik dapat dengan mudah termakan oleh biota perairan, seperti ikan atau melalui mangsanya yang lebih kecil. Penelitian ini bertujuan untuk menganalisis komposisi dan kelimpahan mikroplastik berdasarkan bentuk, ukuran, dan polimer pada air, sedimen, serta organ dan jaringan ikan kiper Scatophagus argus (Linnaeus, 1766) di muara Sungai Blanakan, Subang, Jawa Barat. Metode penelitian dilakukan dengan pengambilan sampel air sebanyak 50 L lalu disaring menggunakan plankton net hingga mendapatkan 1 L sampel air, pengambilan sedimen dilakukan menggunakan Van Veen grab lalu dimasukkan ke dalam jar HDPE 500 ml, dan pengambilan sampel ikan sebanyak 10 individu dilakukan menggunakan alat tangkap bubu. Sampel air ditambahkan larutan H2O2 30% dan FeSO4 0,05 M masing-masing sebanyak 25 ml. Sampel sedimen dicampurkan larutan NaCl dengan perbandingan sebesar 1 : 2 dan didiamkan. H2O2 30% dan FeSO4 0,05 M ditambahkan hingga sampel terendam. Sampel ikan dibedah untuk diambil bagian insang, saluran pencernaan, dan daging. Setiap bagian dihancurkan menggunakan larutan KOH 10% dengan perbandingan 1 : 10 dan didiamkan. Sampel air, sedimen, dan ikan dipipet sebanyak 40 ml dan disaring menggunakan kertas saring cellulose nitrate dengan bantuan vacuum pump lalu kertas saring ditempatkan di cawan petri. Sampel air, sedimen, dan ikan kiper diamati pada kertas saring menggunakan mikroskop Olympus CX22 dan analisis polimer mikroplastik dilakukan dengan metode Raman Spectroscopy. Analisis statistik dilakukan menggunakan uji one way ANOVA, Kruskal wallis, dan Pearson. Hasil penelitian menunjukkan rerata kelimpahan mikroplastik pada sampel air sebesar 710 partikel/m3, sedimen sebesar 879,63 partikel/kg, dan ikan sebesar 74,77 partikel/individu. Kelimpahan mikroplastik dari yang tertinggi hingga terkecil pada ikan kiper terdapat di daging, saluran pencernaan, dan insang. Komposisi mikroplastik paling dominan berupa bentuk fiber dan ukuran < 300 µm. Polimer yang ditemukan bertipe PET, PP, dan PVC. Uji Kruskal wallis menunjukkan terdapat perbedaan secara nyata kelimpahan mikroplastik antar organ dan jaringan ikan. Uji Pearson menunjukkan adanya korelasi kelimpahan mikroplastik pada air dan sedimen terhadap kelimpahan mikroplastik di ikan.
.....Plastic is one of the commodities with a high level of usage, reaching a production scale of 300 million tons per year. Plastic waste in water takes hundreds of years to degrade due to its strong, durable, and heat-resistant characteristics. The degradation process of plastic waste in water is caused by UV radiation, which leads to changes in shape and size, resulting in smaller particles (microplastics) or mixing with water (<

5mm). The small size of microplastics makes them easily ingestible by aquatic organisms, such as fish, or through their prey, which are smaller in size. This research aims to analyze the composition and abundance of microplastics based on their form, size, and polymer in water, sediments, as well as the organs and tissues of the Scatophagus argus(Linnaeus, 1766) fish in the estuary of the Blanakan River, Subang, West Java. The research method involved collecting 50 liters of water samples, which were then filtered using a plankton net to obtain a 1-liter water sample. Sediment samples were collected using a Van Veen grab and placed in a 500 ml HDPE jar, while fish samples were collected using a fish trap, with a total of 10 individuals. The water sample was treated with 25 ml of 30% H_2O_2 and 0.05 M $FeSO_4$ solutions. The sample was mixed with a NaCl solution in a ratio of 1:2 and left to settle. H_2O_2 (30%) and $FeSO_4$ (0.05 M) were added until the sample was fully submerged. The samples were dissected to obtain gill, digestive tract, and muscle tissue. Each part was crushed using a 10% KOH solution in a 1:10 ratio and left to settle. Water, sediment, and fish samples were pipetted (40 ml) and filtered using cellulose nitrate filter paper with the assistance of a vacuum pump, and the filter papers were placed in Petri dishes. The water, sediment, and fish samples were observed on the filter paper using an Olympus CX22 microscope, and the analysis of microplastic polymers was conducted using Raman Spectroscopy. Statistical analysis was performed using one-way ANOVA, Kruskal-Wallis, and Pearson tests. The results of the study showed that the average abundance of microplastics in water samples was 710 particles/m3, in sediments it was 879.63 particles/kg, and in fish it was 74.77 particles/individual. The highest abundance of microplastics in the kiper fish was found in the muscle tissue, followed by the digestive tract and gills. The dominant composition of microplastics was in the form of fibers and with a size of < 300 µm. The polymers found were PET, PP, and PVC. The Kruskal-Wallis test indicated a significant difference in microplastic abundance among the organs and tissues of fish. The Pearson test showed a correlation between the abundance of microplastics in water and sediments with the abundance of microplastics in fish.