

# KONTAMINASI MIKROPLASTIK DAN AKUMULASI Pb DAN Cd PADA *Penaeus vannamei* (Boone, 1931) DI TAMBAK UDANG, BANTUL, DAERAH ISTIMEWA YOGYAKARTA SERTA PENILAIAN RISIKO KESEHATAN

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## INTISARI

Pencemaran limbah plastik sangat mengkhawatirkan di era modern ini. Sampah plastik dapat terdegradasi membentuk mikroplastik. Mikroplastik memiliki kemampuan untuk menyerap senyawa hidrofobik beracun dari lingkungan sekitarnya. Salah satu organisme yang sangat rentan terhadap paparan mikroplastik adalah *Penaeus vannamei*. Melalui rantai makanan, kontaminasi mikroplastik ini dapat berdampak pada manusia yang mengonsumsi *Penaeus vannamei* yang terkontaminasi oleh polutan tersebut. Penelitian ini difokuskan pada tingkat kontaminasi mikroplastik pada *Penaeus vannamei* di Tambak Udang Bantul, Daerah Istimewa Yogyakarta, serta interaksinya dengan logam berat seperti Pb dan Cd. Selain itu, untuk mengevaluasi potensi risiko kesehatan yang terkait. Sampel dikumpulkan dari PT. Indokor Bangun Desa, Yogyakarta dengan tiga kelompok umur yaitu 1, 2, dan 3 bulan. Mikroplastik diekstraksi lalu dikarakterisasi berdasarkan jumlah, ukuran, bentuk, warna, dan jenis polimer yang ada. Analisis menggunakan teknik seperti Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscope Energy-Dispersive X-Ray Spectroscopy (SEM-EDS), dan Flame Atomic Absorption Spectroscopy (FAAS). Potensi risiko kesehatan dinilai berdasarkan beberapa parameter, termasuk Indeks Bahaya Polimer (PHI), Indeks Beban Polusi (PLI), Estimasi Asupan Harian (EDI), Target Bahaya (THQ), Total Hasil bagi Target Bahaya (TTHQ), dan Target Risiko Kanker (TR). Hasil penelitian menunjukkan bahwa mikroplastik telah mengontaminasi air permukaan tambak dan udang (*Penaeus vannamei*). Pada karakterisasi mikroplastik didominasi oleh bentuk fiber, berwarna hitam, berukuran sedang dan kecil, serta berjenis polimer *polypropylene* (PP) dan *ethyl vinyl acetate* (EVA). Terdapat asosiasi logam berat (Pb dan Cd) akibat adsorpsi oleh permukaan mikroplastik. Selain itu, umur organisme yang lebih tua atau dewasa pada udang mempengaruhi kelimpahan mikroplastik dan kontaminasi logam berat (Pb dan Cd). Berdasarkan perhitungan PHI, PLI, dan PERI menunjukkan risiko kontaminasi mikroplastik pada Tambak Udang Bantul tergolong rendah. Berdasarkan nilai EDI, THQ, TTHQ, dan TR, udang (*Penaeus vannamei*) tergolong aman dikonsumsi.

**Kata kunci :** *Penaeus vannamei*, mikroplastik, Tambak Udang Bantul, Logam Berat, Potensi Risiko Kesehatan

## MICROPLASTIC CONTAMINATION AND ACCUMULATION OF Pb AND Cd IN *Penaeus vannamei* (Boone, 1931) IN SHRIMP FARMS, BANTUL, YOGYAKARTA SPECIAL REGION AND HEALTH RISK ASSESSMENT

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### ABSTRACT

Plastic waste pollution is a significant concern in the modern era. Plastic waste can degrade into microplastics, which have the ability to absorb toxic hydrophobic compounds from their surrounding environment. One of the organisms highly susceptible to microplastic exposure is *Penaeus vannamei*. Through the food chain, this microplastic contamination can impact humans who consume *Penaeus vannamei* contaminated with these pollutants. This study focuses on the level of microplastic contamination in *Penaeus vannamei* from the Bantul Shrimp Pond, Special Region of Yogyakarta, and its interactions with heavy metals such as Pb and Cd. Additionally, it aims to evaluate the associated health risk potential. Samples were collected from PT. Indokor Bangun Desa, Yogyakarta, encompassing three age groups: 1, 2, and 3 months. Microplastics were extracted and characterized based on quantity, size, shape, color, and polymer type. Analytical techniques such as Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscope Energy-Dispersive X-Ray Spectroscopy (SEM-EDS), and Flame Atomic Absorption Spectroscopy (FAAS) were employed. Health risk potential was assessed using several parameters, including the Polymer Hazard Index (PHI), Pollution Load Index (PLI), Estimated Daily Intake (EDI), Target Hazard Quotient (THQ), Total Target Hazard Quotient (TTHQ), and Target Cancer Risk (TR). The results indicated that microplastics have contaminated the surface water of the pond and the shrimp (*Penaeus vannamei*). The characterization of microplastics revealed a dominance of fibrous shapes, black color, small and medium size, and polymer types including *polypropylene* (PP) and *ethyl vinyl acetate* (EVA). There was an association of heavy metals (Pb and Cd) due to adsorption by the microplastic surface. Additionally, the older or mature age of the shrimp influences the abundance of microplastics and heavy metal contamination (Pb and Cd). Calculations of PHI, PLI, and PERI indicated that the microplastic contamination risk in the Bantul Shrimp Pond was minor. Based on the values of EDI, THQ, TTHQ, and TR, the shrimp (*Penaeus vannamei*) were considered safe for consumption.

**Keywords:** *Penaeus vannamei*, microplastics, Bantul Shrimp Pond, Heavy Metals, Health Risk Potential.