

STRUKTUR KOMUNITAS MAKROINVERTEBRATA BENTIK SEBAGAI BIOINDIKATOR KUALITAS EKOSISTEM KALI KUNING, DAERAH ISTIMEWA YOGYAKARTA

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INTISARI

Ekosistem sungai rentan terhadap tekanan antropogenik seperti urbanisasi, pertanian intensif, perubahan penggunaan lahan, serta pembuangan limbah domestik dan industri yang dapat menurunkan kualitas dan fungsi ekologisnya. Biomonitoring berbasis makroinvertebrata bentik digunakan sebagai pendekatan representatif karena organisme ini memiliki mobilitas terbatas, siklus hidup relatif panjang, dan sensitivitas terhadap perubahan lingkungan. Selain dianalisis secara taksonomi, makroinvertebrata bentik dapat diklasifikasikan ke dalam *Functional Feeding Groups* (FFG) untuk merefleksikan fungsi ekologis perairan. Penelitian ini dilakukan di Kali Kuning, Daerah Istimewa Yogyakarta, pada September 2025 di empat stasiun berdasarkan Indeks Kualitas Lingkungan Hidup (IKLH) 2019. Parameter fisika-kimia perairan diukur bersamaan dengan pengambilan sampel makroinvertebrata menggunakan metode systematic random sampling dengan tiga ulangan per stasiun. Organisme diidentifikasi hingga tingkat genus, kemudian dianalisis struktur komunitas, indeks biotik (EPT dan indeks biotik famili), serta komposisi FFG. Analisis statistik (ANOVA, Kruskal-Wallis, PERMANOVA) dan multivariat (*Canonical Correlation Analysis/CCA* dan *Non-metric Multidimensional Scaling/NMDS*) digunakan untuk mengevaluasi hubungan antara komunitas dan parameter lingkungan. Hasil menunjukkan variasi komposisi taksa dan FFG antar stasiun yang berkorelasi dengan kondisi fisika-kimia. Kelompok sensitif seperti EPT dan shredders lebih dominan di hulu dengan kualitas perairan lebih baik, sedangkan collectors lebih melimpah di hilir yang terpapar tekanan antropogenik. Analisis multivariat mengonfirmasi keterkaitan antara struktur komunitas, FFG, dan gradien kualitas sungai. Makroinvertebrata bentik efektif sebagai bioindikator kesehatan ekosistem sungai tropis.

Kata Kunci: Ekosistem sungai; Tekanan antropogenik; Makroinvertebrata bentik; *Functional Feeding Groups*; Biomonitoring

**COMMUNITY STRUCTURE OF BENTHIC MACROINVERTEBRATES
AS BIOINDICATORS FOR RIVER ECOSYSTEM QUALITY IN KALI
KUNING, SPECIAL REGION OF YOGYAKARTA**

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ABSTRACT

River ecosystems are highly vulnerable to anthropogenic pressures such as urbanization, agricultural intensification, land-use change, and waste discharge, which may reduce ecological quality and function. Benthic macroinvertebrate-based biomonitoring is widely applied due to the organisms' limited mobility, relatively long life cycles, and varying sensitivities to environmental changes. Beyond taxonomic analysis, benthic macroinvertebrates can be classified into Functional Feeding Groups (FFGs), providing insight into ecosystem functioning. This study was conducted in the Kali Kuning, Special Region of Yogyakarta, in September 2025 at four stations determined by the 2019 Environmental Quality Index (IKLH). Physicochemical parameters were measured concurrently with benthic macroinvertebrate sampling using systematic random sampling with three replicates per station. Specimens were identified to the genus level, followed by analyses of community structure, biotic indices (EPT and Family Biotic Index), and FFG composition. Statistical tests (ANOVA, Kruskal–Wallis, PERMANOVA) and multivariate analyses (Canonical Correspondence Analysis/CCA and Non-metric Multidimensional Scaling/NMDS) were applied to evaluate relationships between biological communities and environmental variables. Results revealed spatial variations in taxa composition and FFG distribution correlated with physicochemical conditions. Sensitive groups such as EPT taxa and shredders dominated upstream segments with better water quality, whereas collectors were more abundant downstream under anthropogenic pressure. Multivariate analyses confirmed the linkage between community structure, FFG composition, and the longitudinal water quality gradient. These findings highlight the effectiveness of benthic macroinvertebrates as bioindicators of tropical river ecosystem health.

Keywords: River ecosystem; Anthropogenic pressure; Benthic macroinvertebrates; Functional Feeding Groups; Biomonitoring