STUDI BIOINDIKATOR PENCEMARAN LINGKUNGAN DI SUNGAI SENAPELAN, KOTA PEKANBARU, PROVINSI RIAU

INTISARI

Sungai Senapelan merupakan salah satu sub daerah aliran Sungai Siak yang berada di Kota Pekanbaru, Provinsi Riau, dan berperan penting sebagai badan air penerima limbah domestik, aktivitas pasar, dan permukiman padat penduduk. Tekanan antropogenik yang terus meningkat berpotensi menurunkan kualitas air serta mengganggu keseimbangan ekosistem perairan. Penelitian ini bertujuan untuk mengevaluasi kualitas air Sungai Senapelan berdasarkan parameter fisika, kimia, dan mikrobiologi, serta menganalisis komunitas makrozoobentos sebagai bioindikator pencemaran lingkungan. Pengambilan sampel dilakukan pada empat stasiun pengamatan yang mewakili wilayah hulu, tengah, dan hilir sungai. Parameter fisika yang dianalisis meliputi suhu, kekeruhan, dan *Total Dissolved Solids* (TDS); parameter kimia meliputi pH, *Dissolved Oxygen* (DO), *Biochemical Oxygen Demand* (BOD), *Chemical Oxygen Demand* (COD), nitrat, dan nitrit; serta parameter mikrobiologi meliputi *Escherichia coli* dan Total Coliform. Penilaian mutu air mengacu pada baku mutu air sungai kelas II berdasarkan Peraturan Pemerintah Nomor 22 Tahun 2021 tentang Penyelanggaran Perlindungan dan Pengelolaan Lingkungan Hidup . Hasil menunjukkan bahwa suhu air berkisar antara 29,0–30,4°C dan pH antara 6,76–7,42, masih dalam batas baku mutu. Namun, parameter lain menunjukkan pencemaran berat. Nilai DO berada pada kisaran 3,10–3,41 mg/L (di bawah baku mutu ≥4 mg/L). Nilai BOD sangat tinggi, berkisar 4–17 mg/L, sementara COD mencapai 27–54 mg/L, keduanya melampaui baku mutu yang ditetapkan. Nilai TDS berkisar 220–460 mg/L dan menunjukkan tren peningkatan ke arah hilir. Konsentrasi nitrat dan nitrit relatif rendah (NO_3^-: 0,035–0,88 mg/L; NO_2^-: 0,46–0,54 mg/L), namun mengindikasikan adanya masukan nutrien. Parameter mikrobiologi menunjukkan pencemaran paling serius. Konsentrasi *E. coli* mencapai 160.000–240.000 MPN/100 mL, dan Total Coliform sebesar 240.000 MPN/100 mL di seluruh stasiun, jauh melebihi baku mutu. Struktur komunitas makrozoobentos memperlihatkan keanekaragaman rendah dan dominasi organisme toleran pencemaran, yang menegaskan tekanan ekologis berat. Berdasarkan seluruh parameter, Sungai Senapelan dikategorikan sebagai perairan tercemar berat. Diperlukan pengelolaan terpadu melalui perbaikan sanitasi, pengolahan limbah domestik, dan rehabilitasi bantaran berbasis bioindikator untuk memulihkan fungsi ekosistem sungai.

Kata Kunci: Sungai Senapelan, Kualitas Air, Makrozoobentos, Bioindikator, Pencemaran Lingkungan, Strategi Pengend.

STUDY OF ENVIRONMENTAL POLLUTION BIOINDICATORS IN SENAPELAN RIVER, PEKANBARU CITY, RIAU PROVINCE

ABSTRACT

The Senapelan River is a sub–watershed of the Siak River located in Pekanbaru City, Riau Province, and plays an important role as a receiving water body for domestic wastewater, market activities, and densely populated settlements. Increasing anthropogenic pressure has the potential to degrade water quality and disrupt the balance of aquatic ecosystems. This study aimed to evaluate the water quality of the Senapelan River based on physical, chemical, and microbiological parameters and to analyze the macrozoobenthos community as a bioindicator of environmental pollution.Sampling was conducted at four stations representing the upstream, middle, and downstream segments of the river. Physical parameters included temperature, turbidity, and Total Dissolved Solids (TDS); chemical parameters included pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), nitrate, and nitrite; while microbiological parameters consisted of Escherichia coli and Total Coliform. Water quality assessment was based on Class II water quality standards according to Government Regulation Number 22 of 2021 concerning Environmental Protection and Management. The results showed that water temperature ranged from 29.0–30.4°C and pH ranged from 6.76–7.42, indicating conditions within acceptable limits. However, other parameters reflected severe pollution. DO concentration ranged from 3.10–3.41 mg/L, which was below the standard threshold (≥4 mg/L). BOD values were considerably high (4–17 mg/L), while COD concentrations reached 27–54 mg/L, both exceeding permissible limits. TDS values ranged from 220–460 mg/L and showed an increasing trend toward the downstream section. Nitrate and nitrite concentrations were relatively low (NO_3^-: 0.035–0.88 mg/L; NO_2^-: 0.46–0.54 mg/L), but indicated continuous nutrient input. Microbiological parameters showed the most critical condition, with E. coli concentrations reaching 160,000–240,000 MPN/100 mL and Total Coliform of 240,000 MPN/100 mL at all stations, far exceeding quality standards. The macrozoobenthos community structure exhibited low diversity and dominance of pollution-tolerant taxa, confirming severe ecological stress. Based on all observed parameters, the Senapelan River is classified as a heavily polluted water body. Integrated management through sanitation improvement, domestic wastewater treatment, and bioindicator-based riparian rehabilitation is essential to restore the river's ecological function.
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Keywords: *Senapelan River; Water Quality; Macrozoobenthos; Bioindicator; Environmental Pollution; Pollution Control Strategy.*