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LENTIC MODULATORS BETWEEN LOTIC ECOSYSTEMS

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Introduction

Urban aquatic ecosystems are strongly influenced by anthropogenic pressures, and the interaction between lotic sectors and reservoir lakes generates complex processes of pollutant transport and transformation. Lakes can act both as reservoirs of contaminants and as ecological filters that modulate the microbial load transmitted downstream. Physico-chemical parameters such as pH, dissolved oxygen, and organic carbon directly influence the structure and resilience of bacterial communities, including the persistence of fecal bacteria and antibiotic-resistant strains. In urban environments, where pollution input is high, the buffering role of lakes becomes essential for maintaining ecological balance. The study objective was to evaluate Lake Morii role within the lotic–lentic–lotic continuum (Dâmbovița River–Lake Morii–Ciurel basin), by analysing its influence on physico-chemical parameters and bacterial dynamics, in comparison with the Dâmbovița River, the Argeș Canal, and the Ciurel basin. In addition, considering the growing concern about antibiotic resistance in urban waters, *Escherichia coli* isolates were tested for resistance patterns, providing complementary insights into microbial risks beyond standard fecal indicators.

Materials and methods

The study was conducted between April and May 2025, through four sampling campaigns in the Dâmbovița River, Lake Morii, the Argeș River, and the Ciurel basin (Figure 1). Physico-chemical parameters measured included pH, water temperature (WT), dissolved oxygen (DO), chemical oxygen demand (CODCr), dissolved organic carbon (DOC), and surfactant concentration, using volumetric, electrochemical, and spectrophotometric methods.

Figure 1. Schematic map of water flow and connections between lotic–lentic ecosystems.

Microbiological analyses targeted coliforms, *Escherichia coli*, enterococci, and *Salmonella* spp., while antibiotic resistance of *E. coli* isolates was assessed using the Kirby–Bauer disk diffusion method. Physico-chemical parameters were subsequently correlated with microbial abundance and distribution to evaluate their influence on bacterial dynamics within the lotic–lentic continuum.

Results and conclusions

Variations in physico-chemical parameters, particularly DO and CODCr, shaped microbial abundance and distribution across the continuum. Moderate CODCr levels in the Dâmbovița and Argeș rivers (31.1–58.8 mgO_2/L) reflected significant organic inputs that supported bacterial growth, while the more stable profile of Lake Morii (<18 mgO_2/L) favoured the persistence of native microbial communities and acted as an ecological filter, reducing the downstream microbial load. In contrast, extreme CODCr peaks in the Ciurel basin (>360 mgO_2/L) suggested resuspension or untreated discharges, with potential impacts on dissolved oxygen and bacterial proliferation. Overall, these results indicate that water quality parameters directly influence bacterial dynamics, with the Dâmbovița River as the main source of contamination and Lake Morii buffering microbial transfer (Figure 2 a, b, c, d).

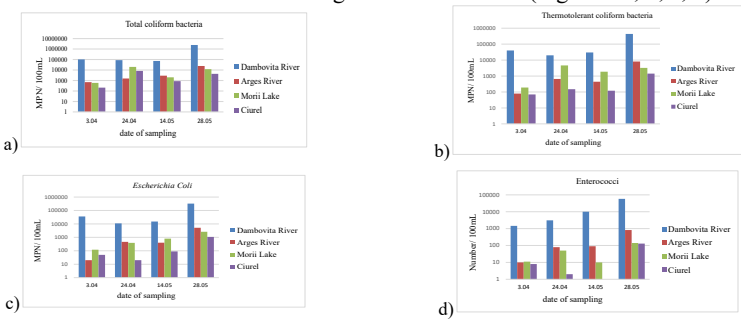

Figure 2. Temporal variation of microbial load in 100 ml water samples a) most probable number of total coliform bacteria; b) most probable number of thermotolerant coliform bacteria; c) most probable number of *E.coli*; d) number of enterococci.

Consistently undetectable levels of surfactants in Lake Morii (<0.1–0.15 mg/L) indicate minimal domestic wastewater impact and efficient natural degradation, creating conditions favourable to microbial diversity. The absence of surfactants further reflects efficient self-purification, while WT, DO and CODCr, strongly shaped bacterial dynamics and antibiotic resistance (ampicillin, cefepime, ciprofloxacin, imipenem) with pronounced effects in lentic systems (Figure 3).

Differences in bacterial contamination highlight one of the roles of ecosystems type, pollution sources, and natural self-purification. Lotic systems disperse contaminants rapidly, whereas lentic systems accumulate and modulate them, favouring the persistence of fecal bacteria. An integrated assessment of water quality is essential for effective management of urban aquatic resources.

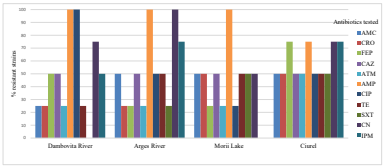

Figure 3. Percentage of antibiotic resistant strains identified in surface water.