

Spatial Dynamics of Microbial Communities in Subtropical Urban Water Bodies Driven by Heatwaves

Lin Yueh-Hsien

Master's Student

*Shenzhen MSU-BIT University,
Faculty of Biology, Shenzhen, China*

E-mail: dennis@fx-aviation.com

Urbanization and climate change increasingly interact to reshape aquatic ecosystems. However, their combined effects on microbial communities remain insufficiently understood. This study examines the spatial dynamics of microbial communities in subtropical urban water bodies under heatwave conditions. It focuses on the interactions between urbanization intensity and environmental stressors. Field sampling was conducted across heterogeneous urban landscapes during peak summer. The sites included both forested and highly urbanized areas. Soil, water, and sediment samples were collected. Microbial communities were used as bioindicators due to their environmental sensitivity. Environmental variables, including temperature, dissolved oxygen, and nutrient concentrations, were measured. Spatial statistical analysis was performed using GIS and Local Moran's I to identify clustering patterns. The results show that heatwaves significantly reduce microbial diversity and promote stress-tolerant taxa. This indicates strong environmental filtering. Urbanization further amplifies these effects. Highly urbanized sites exhibited greater biodiversity loss and more pronounced community shifts. Clustering patterns reveal that ecological hotspots are associated with lower urbanization intensity and more stable environmental conditions. Overall, this study demonstrates that urbanization and heatwaves jointly drive microbial community restructuring. These findings provide important insights for urban water management and blue-green infrastructure planning.