



ABSTRACT BOOK

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maintenance of a healthy microbiota. Identifying these social-microbial links could be decisive for the successful adaptation and survival of individuals returning to the wild.

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Microbial Diversity as a Lever for Ecosystem Conservation: Metagenomic Insights from a Rewilded Urban Floodplain

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Wetlands provide critical ecosystem services, including water purification and pathogen suppression. As we face rapid climate change and the emergence of novel zoonotic pathogens, restoring these habitats has become vital for both biodiversity conservation and public health. Despite their importance, the responses of soil, water, and host-associated microbial communities to restoration efforts remain largely unaddressed by standard conservation assessments. This study positions microbial diversity as a primary lever for real-time monitoring as well as assessing the success and resilience of ecosystem restoration.

Moving beyond the constraints of isolated, species-specific diagnostics, we utilized metataxonomy targeting the prokaryotic 16S rRNA and fungal ITS2 gene regions to simultaneously characterize these microbial communities across a rewilded urban floodplain in London (UK). Our sampling encompassed water and soil alongside non-invasively collected fecal samples from resident rodents and carnivores over a two-year longitudinal period. Taxonomic diversity and predicted functional potential of prokaryotic and fungal communities were investigated considering the interplay between host identity, time after restoration, seasonal variation and pathogenic potential. Our findings reveal complex and diverging patterns between investigated microbial communities: while prokaryotes were structured by the joint influence of host identity and seasonal shifts, fungi followed independent trajectories, reflecting distinct dispersal pathways and environmental exposures.

These divergent patterns underscore that prokaryotes and fungi occupy distinct, although potentially overlapping, ecological niches which are structured by differences in dispersal pathways, host associations and environmental exposure. By integrating microbial ecology with pathogen surveillance, this research demonstrates that restoring a wetland is not merely about reintroducing macro-flora and fauna, but about fostering microscopic dynamics promoting fundamental ecosystem services thereby underpinning ecosystem health. Our results provide a framework for using high-resolution microbial data to monitor changes of micro-biodiversity through time and predict the long-term sustainability of restoration projects, ultimately linking environmental integrity to the mitigation of waterborne disease risks.