

Microplastics in running waters: Assessment of surface water and macroinvertebrates along longitudinal river gradients

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Microplastics (MPs; 1 µm–5 mm) are widespread contaminants of freshwater ecosystems, yet their distribution in running waters remains poorly understood. Rivers act as both transport pathways and potential accumulation zones, making longitudinal MPs contamination assessments essential for identifying sources, sinks, and exposure routes. However, sampling, extraction, purification, and analytical approaches vary widely among studies, limiting the comparability of results. We therefore aim to develop and validate a standardised methodology for quantifying and characterising microplastics across freshwater matrices. Here, we compare MPs in surface water and in macroinvertebrate samples collected along longitudinal river profiles. At each river, samples were taken at (i) a minimally impacted headwater reference site, (ii) sites upstream and (iii) downstream of a major wastewater treatment plant (WWTP), and (iv) sites upstream and (v) downstream of a reservoir, allowing assessment of point sources and depositional effects. Strict contamination control was applied throughout sampling and laboratory processing. Microplastics were extracted by oxidative purification using optimised reagents, and particle identification and polymer characterisation were performed by µFT-IR transmission spectroscopy. Initial results indicate spatial variability in MP abundance and polymer composition. Some of the highest particle counts occurred in upper river sections, suggesting atmospheric deposition as a potentially important source. Spatial patterns of MPs in macroinvertebrate and surface water samples were broadly comparable. However, these findings remain preliminary and highlight the value of multi-matrix monitoring and further methodological harmonisation to better understand microplastic sources and pathways in freshwater systems.

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