

Occurrence and distribution of microplastics in freshwater benthic invertebrates

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Abstract

The ubiquity and circulation of microplastics in all environmental components is a highly discussed phenomenon globally. Thus, the research on microplastic pollution in surface waters has been one of the fastest-growing science topics in the last decade. In freshwater ecosystems, microplastics can easily enter the food webs and possibly accumulate in biota. In lotic freshwaters, the distribution of microplastics may vary in river longitudinal gradient according to anthropogenic pollution sources, such as inputs from agriculture, industry or insufficiently treated municipal wastewater. Although many experimental studies have been conducted yet to observe the potential of aquatic biota to consume and digest microplastics, our knowledge of microplastic distribution and dynamics in trophic chains in natural habitats is still limited. We conducted several pilot field studies to access preliminary insight into the presence and distribution of various types, forms and sizes of microplastics in different freshwater macroinvertebrate taxa depending on their feeding habit, along ten streams with a focus on artificial pollution sources. All specimens were collected in the field with minimal use of plastic equipment and stored in pre-filtered plastic-free media. Samples were laboratory purified using oxidative and digesting protocols (i.e., 30% H₂O₂, proteinase) followed by density separation (ZnCl₂) if needed. Obtained microplastic samples were filtered to Anodisc filters (Whatman), analysed using μ FT-IR transmission spectroscopy (LUMOS II, Bruker), and evaluated in Microplastic Finder software (Purency GmbH). For all studied invertebrate taxa (Baetis sp., Calopteryx sp., Gammarus sp., Hydropsyche sp., Simulium sp.), we found the most microplastics particles in active filtrators and collectors/scrapers, predominantly smaller-sized taxa. Although in lower numbers – 558 specimens with 234 microplastic particles in total –, we observed microplastics in all the taxa, even predators, presuming microplastics transfer in trophic chains. We have not observed a significant increase in microplastic particles amount along the longitudinal gradient or below pollution influx in corresponding invertebrates. Contrarily, we observed the highest numbers of microplastics in upper river parts and even

