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Microplastic pollution in the Trieste Karst (Italy) protected habitats: preliminary analysis of cave and spring water sediments

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Abstract

Microplastic (MP) pollution in karst and subterranean areas is still poorly studied and research are generally focused on the water matrix. The Trieste Karst, Italy, is rich in peculiar karst habitats and species, including some endemics. To preserve these ecological heritages, different European, national and local laws are present.

In this preliminary study we collected and investigated several sediment samples from aquatic environments in different protected habitats (three caves and a spring) of the Trieste Karst. Sediment samples were subjected to organic matter removal with 1:1 30% HO solution and for each sample, three subsamples of 15g dried sediment were selected via coning and quartering. MPs were extracted from sediment via density separation and filtered. Particles on filters (5-0.1 mm) were counted and characterized by size, color and shape via visual identification under a microscope, with and without UV light, exploiting fluorescence given by additives added in many plastic materials. Finally, spectroscopic analyses were carried out on random particles on each filter. The concentration of MPs in cave water sediments varied from 911 to 2178 items/kg, instead, in the sediments of the spring it was of 889 items/kg. Fibre represented the most abundant shape (67.5%), followed by fragment (21.6%), bead (10%), and film (0.9%). Most MPs (86.4%) were smaller than 1 mm. The majority of the MPs were fluorescent under UV light (69.1%) and have 77.1% blue fluorescence, 8.1% red fluorescence, 6.1% green fluorescence and 8.7% other colors. Fluorescent particles were mainly transparent (63.8%), instead, in non-fluorescent ones predominated the black (56.2%) and brown (15.1%) MPs.

Our results show the presence of MPs in all examined aquatic habitats, providing essential information for future research. The studied areas are adjacent to highways, roads and railways, therefore, most of the particles found in water sediment samples could come from surface pollution, transported by water and/or air. In addition, the waters of the sampling points are often stationary or poorly moved, therefore, there may be an accumulation of pollutants in the sediments. Vulnerable and troglobitic species hosted in these habitats could consume or assimilate MPs, which can irreversibly damage ecosystems and contaminate water resources too. Analyses on a greater number of aquatic surface and subterranean habitats

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should be done to better understand this kind of problem. Monitoring MPs pollution in karst areas should become a priority for the habitat conservation, the species protection and the water resources management.

Keywords: microplastics, karst, water sediments, protected habitats, aquatic environments