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ABSTRACT BOOK

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Microplastic pollution in show cave sediments

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Microplastic (MP) (plastics < 5 mm) are a global issue, which has been widely found in marine and terrestrial environments, contaminating also remote areas, being them extremely mobile. However, MP pollution in underground environment, such as caves and karst aquifers, is still largely unknown. MPs can be ingested by hypogean animals and endanger the fragile ecosystems of the caves. Geologic features are the primary attraction of the show caves, and MPs can irreversibly damage speleothems deposited on them: they can directly damage speleothems, being incorporated into the cave formation growth, sometimes coloring them, or indirectly, by providing nutrients for acid-producing organisms that can dissolve limestone. Moreover, MPs can pollute karst aquifers which are open systems, even susceptible to contamination by surface pollutants. Therefore, the areas above the caves must also be monitored.

To improve the current knowledge of MP pollution, the sediments of three different show caves in Italy (Bossea, Borgio Verezzi and Toirano caves) were sampled and investigated. A new detection technique, based on the optimization of investigation tests used on different kind of sediments was used (Balestra & Bellopede, 2022). MPs were extracted from sediments via density separation and subjected to organic matter removal. Filters were observed with and without UV light under a microscope, exploiting the MPs fluorescence given by the fluorescent whitening agents additives, before and after organic matter removal. MPs were characterized with visual identification and described using the standardized size and colour sorting system (SCS) (Crawford & Quinn, 2016). In Bossea cave, an average of 4390 items/kg dry weight was calculated for the touristic zone and 1600 items/kg dry weight for the speleological/research section of the cave. Fibre (84.9%) was the most abundant shape, suggesting that synthetic clothes of visitors are the main source of MPs pollution in cave. Most MPs were smaller than 1 mm, accounting for 85.4%, of which 58.4% were shorter than 0.5 mm. The highest MP abundance was fluorescent under UV light (87.7%); however, 12.3% of the MPs observed on filters were not fluorescent. Most fluorescent fibres were transparent (84%), whereas blue (46.1%) and black (22.4%) fibres were more common for the non-fluorescent ones. Borgio Verezzi and Toirano caves sediment samples will be used to test an automated counting software designed by a team work of Politecnico di Torino.

Our results highlight the presence of MPs in show caves, and we provide a valid non-invasive and non-expensive analytical technique for the preparation and isolation of MPs from cave sediments, giving useful information for evaluating the environmental risks posed by MPs in caves.

Balestra V. & Bellopede R. (2022) - Microplastic pollution in show cave sediments: first evidence and detection technique. Environ. Pollut., 292, 118261.

Crawford C.B. & Quinn B. (2016) - Microplastic Pollutants. Elsevier, Amsterdam.