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ponor Kovai – izvor Riina karst system (BiH)

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BIOLOGIA SOTTERRANEA PIEMONTE GRUPPO DI RICERCA



Microplastic and microfibre pollution in ponor Kovači – izvor Ričina karst system (BiH)

Balestra Valentina^{1 2*}, Bellopede Rossana¹

¹ Department of Environment, Land and Infrastructure Engineering, Politecnico di Torino, Italy

² Biologia Sotterranea Piemonte – Gruppo di Ricerca, Italy

* valentina.balestra@polito.it

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Keywords: microplastics; microfibers; karst areas; caves; pollution

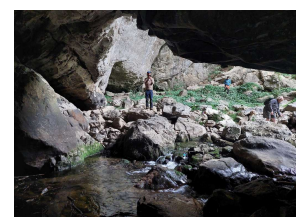
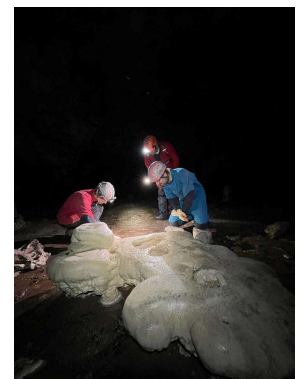
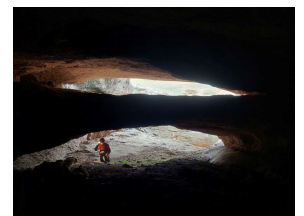
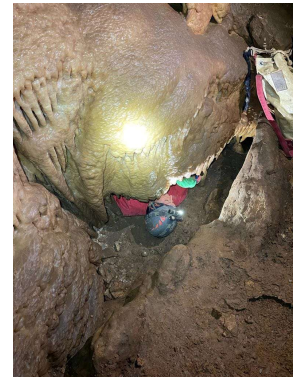


Microplastics pollution

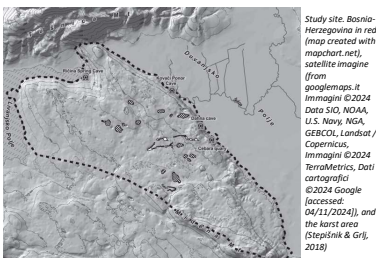
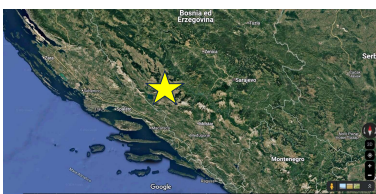
Microplastics (MPs) are plastic particles with a dimension between 5mm and 1 µm (<1mm ISO TR 29960). They can be produced with dimension less than 5 mm (primary production), such as care products, or from degradation of plastic materials in the environment (secondary production). MPs are a global issue, which has been widely found in marine and terrestrial environments, contaminating also remote areas, being them extremely mobile. Karst areas and subterranean environments are poorly studied therefore, investigations are essentials. MPs in karst systems pollute waters, are assimilated and/or ingested by organisms and are an ecosystems threat.

Anthropogenic microfibers in natural environments

Anthropogenic microfibres (MFs), fibres <5 mm in length of any composition (natural, regenerated, and synthetic) derived from larger primary textiles manufactured for different human use, impact natural environments. Adverse effects on ecosystems and animal health have been studied. Non-synthetic MFs have been often considered microplastics because of their colour, and because are processed industrially. However, natural and regenerated fibres are a source of carbon for organisms, and are not plastic polymers. Despite the general consensus on the biodegradability and reduced dangerousness of the non-synthetic fibres in the environment, little is known about their degradation in ecosystems. Their potential faster degradation could release toxic compounds into the environment. In addition, natural and regenerated textiles release more MFs than synthetic ones during laundering. All these factors may explain a long-term accumulation of MFs in the environment over time.



Sampling in caves of Bosnia-Herzegovina. Photos by Speleološko Društvo Mijatovi Dvori



Study site, Bosnia-Herzegovina in red (map created with mapchart.net), satellite imagine (from goooglemaps.it, Imagini ©2024 Data SIO, NOAA, U.S. Navy, NGA, GEBCO, Landsat/Copernicus, Imagini ©2024 TerraMetrics, Dati cartografici ©2024 Google (accessed: 04/11/2024)), and the karst area (Stepanić & Grif, 2018)

Study area

The Grabovica Plateau is a well-confined levelled karst area between Duvanjsko polje and Livanjsko polje. Lithological setting of the Grabovica Plateau is rather uniform. Majority of the plateau is built of a well-bedded Upper Cretaceous limestone underlying the Lower Cretaceous beds. The latter that are built of dolostone and dolomitized limestone are located in a narrow strip close to the southeastern margin of the area. The most dominant ponor in the area is Kovači, located at the edge of Duvanjsko Polje, where Šuica River is submerging. The river is discharging majority of waters from Duvanjsko Polje towards spring at the western edge of the plateau. The majority of the Grabovica Plateau is poorly vegetated, therefore, great variety of small-scale karst morphologies are exposed to the surface with a number of dolines, collapse dolines and other depressions of various origins. The presence of caves characterize this area.

Materials and method

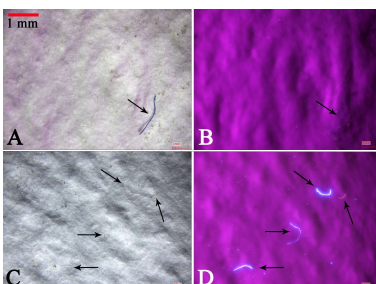
Sampling: for the first time, ten sediment samples were collected in five different non-touristic caves of the karst area during the Scientific and Speleological Expedition “PONOR KOVAČI – IZVOR RIČINE” held in 2022, to verify MP and MF pollution in underground environments.

Analysis: sediment samples were pre-treated with 1:1 30% H₂O₂. MPs and MFs from 0.1 to 5.0 mm will be counted and characterized by size, color and shape via visual identification under a microscope, with and without UV light. Spectroscopic analyses with µFTIR-ATR will be carried out to determine material composition.

Aims and Investigations

- MPs and MFs content in cave sediments
- MPs and MFs characterization by size, shape, colour, fluorescence and typology
- Increase in MP and MF amount with the decrease in the size considered
- Abundance of synthetic MFs respect to natural and regenerated

This preliminary investigation provides useful information regarding micropollutants in natural environments, paying a baseline for future works. Anthropogenic MF and MP pollution studies and monitoring in karst environments are under-represented in literature, therefore, this work can be useful for mitigation and management plans for species protection, habitat conservation, and waters management.



MP and MF analysis under microscope, with and without UV light. Balestra, V., & Bellopede, R. (2022). Microplastic pollution in show cave sediments: First evidence and detection technique. *Environmental pollution*, 292, 118261.

