POLITECNICO DI TORINO
Repository ISTITUZIONALE

Biocorrosion of speleothems in show caves: analysis of young speleothems exposed to two years of new LED lights

Original
Biocorrosion of speleothems in show caves: analysis of young speleothems exposed to two years of new LED lights / Balestra, Valentina; Peruzzi, Aurora; Marini, Paola; Bellopede, Rossana. - STAMPA. - (2023). (Intervento presentato al convegno International Congress of Karst, Speleology and Valorization of Natural Heritage tenutosi a Rabat (MA) nel 2-5 November 2023).

Availability:
This version is available at: 11583/2983683 since: 2023-11-09T10:24:05Z

Publisher:
Faculté des Sciences, Rabat

Published
DOI:

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

29 April 2024

Biocorrosion of speleothems in show caves: analysis of young speleothems exposed to two years of new LED lights

Valentina Balestra*†[1,2,3], Aurora Peruzzi[4], Paola Marini[1], and Rossana Bellopede[1]

[1]Department of Environment, Land and Infrastructure Engineering, Politecnico di Torino – Italy
[2]Biologia Sotterranea Piemonte - Gruppo di Ricerca – Italy
[3]Underground Karst Laboratory of Bossea Cave - S.O. Bossea C.A.I. – Italy
[4]Politecnico di Torino – Italy

Abstract

Speleothems in show caves are the most important attractions, however, they are often subjected to tourism-driven alterations, including corrosion due to CO2 increase, undersaturated water and photosynthetic biofilms. The so-called "lampenflora" is a community of photosynthetic microorganisms, mainly cyanobacteria, diatoms and green algae, but may also include mosses, ferns and higher plants. It develops on speleothems in show caves, following the installation of artificial lights, which allow the photosynthetic activity in an otherwise dark environment. The growth of the lampenflora causes physical, chemical and aesthetic damage to speleothems and changes the underground ecosystem, as it modifies the food chain and can therefore damage the organisms that naturally inhabit the cave itself. Moreover, the biochemical reactions given by the metabolic activity of microorganisms can release substances that lead to the deterioration of the rock, resulting in erosion and damage to speleological formations.
Bossea cave, Piedmont, Italy, was opened to the public in 1874, and receives about 12,000 tourists/year. The cavity develops for about 2800 m in a tectonic contact between dolostone, carbonate rocks and metavolcanics and it is crossed by a subterranean river. Different underground karst laboratories to study hydrogeology, climatology, radon activity and subterranean biology are located in the cave, managed by S.O. Bossea CAI, the DIATI of the Politecnico di Torino, and Biologia Sotterranea Piemonte – Gruppo di Ricerca. In the Bossea cave, the presence of lampenflora and biocorrosion on speleothems along the tourist path was previously documented. A new LED lights system was installed in 2021, which should allow a slowdown of the phenomenon of lampenflora.
This study aims at observing the growth of lampenflora with the new LED lamps, evaluating changes in calcite crystal habits over time. A homogenous slab of speleothem recently formed as a patina on a cover of the central underground laboratory instrumentation was collected, divided into several parts and observed with a Scanning Electron Microscopy (SEM). After, 17 small slab parts were placed along the tourist path in six different areas, from one to seven parts per point, positioned with different inclinations, where they remained for two years. These areas were chosen taking into account the presence of lampenflora due to the previous halogenic lamps. Then, the samples were collected to verify the degree of biocorrosion. For each sample, different points were analysed with SEM and classified according to a predetermined index.

*Speaker
†Corresponding author: valentina.balestra@polito.it

Keywords: show caves, lampenflora, LED lights, biocorrosion, speleothems