

## Fungal Diversity of Limestone Caves in Sabah, Malaysia

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**Purpose:** Despite Borneo being a biodiversity hotspot, there have been no studies conducted on the mycobiota of its limestone caves. The aims of this study were to isolate and characterize the microfungi in different substrates in caves and compare the diversity between caves. Four limestone caves in Sabah had been selected as ideal study sites.

**Methods:** Gomantong and Madai caves represented anthropogenically active caves, and Balambangan and Keruak caves represented anthropogenically non-active caves. Opportunistic sampling was undertaken to collect 20 speleothem samples, 14 water samples, 11 bat guano samples, and 9 dead arthropod samples. Only Gomantong caves yielded arthropod cadavers. Morphological and molecular methods were utilized to identify all isolates to at least the genus level.

**Results and conclusions:** A total of 76 distinct taxa from 35 genera were identified from 180 pure isolates. Identification of 58 taxa (54 species) received molecular confirmation after DNA extraction, amplification, and sequencing. An average of 4.10 species per speleothem site, 3.71 species per water sample, 3.18 species per guano site, and 1.11 species per dead arthropod were recorded. The highest average CFU count for speleothem was 254.0 CFUcm<sup>2-1</sup> per isolate, cavern water was 335.0 CFUml<sup>-1</sup>, guano had 6266.7 CFUg<sup>-1</sup>, and dead arthropods had 1.11 isolates per cadaver. In order of decreasing frequency, some the genera of fungi identified include *Penicillium*, *Aspergillus*, *Trichoderma*, *Fusarium*, *Purpureocillium*, *Nodulisporium*, *Annulohyphoxylon*, *Clonostachys*, *Talaromyces*, *Cladosporium*, *Curvularia*, and *Paecilomyces*. We suggest that fungal abundance is higher in caves with more anthropogenic activity, and distance from the cave entrance may play a role in fungal abundance.