Fungal communities in bat guano, speleothem surfaces, and cavern water in Madai cave, Northern Borneo (Malaysia)

ABSTRACT

The island of Borneo is a global biodiversity hotspot. However, its limestone caves are one of its least-studied ecosystems. We report for the first time the fungal species richness, diversity and abundance from Madai cave, situated in north-eastern Borneo. Environmental samples from inside the cave environment were collected (guano, speleothem, and cavern water) via opportunistic sampling. The dilution method was performed for isolation of fungi. Morphological characterisation and molecular analysis of the ITS region were utilised for the identification of isolates. Fifty-five pure cultures of fungi were attained, comprising 32 species from 15 genera, eight orders, and two divisions, Ascomycota and Basidiomycota. Ascomycetes dominated the fungal composition, accounting for 53 (96%) out of 55 total isolates. Penicillium spp. accounted for more than 47.1% of fungal abundance in all sample types. However, Aspergillus spp. had the highest occurrence rate, being isolated from all environmental samples except one. Purpureocillium lilacinum was isolated most frequently, appearing in five separate samples across all three substrates. Annulohypoxylon nitens, Ganoderma australe, Pyrrhoderma noxium, and Xylaria feejeensis were discovered and reported for the first time from the cave environment. This study provides additional data for further research on the mycoflora of Sabah's various ecosystems, especially limestone caves.