Biodiversity of limestone caves: aggregations of aerophytic algae and cyanobacteria in relation to site factors

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INTRODUCTION

Cave ecosystems represent life in extreme environments, and there are many geological and biological definitions of caves. White and Culver (2005), and Gradziński (2012) pointed out that natural caves are characterized by two features i.e. natural origin and human availability. Caves are colonized by a variety of plants such as: mosses, moss protonema, lichens and ferns (Culver and Pipan 2009), and the photosynthetic microorganisms and mainly composed by aerophytic algae and cyanobacteria, which were the main objectives of taxonomic and ecological investigations. Caves are considered to be a difficult environment for autotrophic organisms to inhabit, since they need light for photosynthesis (Ivarsson et al. 2013). According to Hernández-Mariné and Canals (1994), Ducarme et al. (2004), Pouličková and Hašler (2007), Lamprinou et al. (2009, 2012), a special microclimate and ecological conditions inside the caves are determined by three factors: light, humidity and temperature. The erosion-weathering factors in such an environment do not work (or work much less), however they play an important role in the soil surface denudation (Urban 2006). Hence, in the cave habitats, rare, cosmopolitan and also new algal species can be found (Hernández-Mariné and Canals 1994, Pipan 2005). Lamprinou et al. (2012) reported that a typical cave is divided into...