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Microalgae on dimension stone of a medieval castle in Thuringia

C. Hallmann (2), L. Stannek (1), D. Fritzlar (1), M. Hoppert (1,3)

(1) Institut fuer Mikrobiologie und Genetik, Univ. Goettingen, Germany, (2) Experimentelle Phykologie und Sammlung fuer Algenkulturen, Univ. Goettingen, Germany, (3) Courant Research Centre Geobiology, Univ. Goettingen, Germany

Phototrophic microorganisms are important primary producers on hard rock substrata as well as on building facades. These eukaryotic microalgae and cyanobacteria, along with lichens, have also been recognized as important factors for rock weathering and stone decay. The rock substratum itself mostly provides extreme environmental conditions. Composition and diversity of sub-aeric phototrophic microbial communities is up to now poorly understood. Here we present a comparative study addressing the composition of algal biofilms on sandstone substrata based on the analysis of rDNA clone libraries from environmental samples and enrichment cultures. From a W-exposed, shaded wall area of a medieval castle ruin (Burg Gleichen, Thuringia, Germany cf. Hallmann et al., 2011), green algae like Prasiococcus, Prasiola and Elliptochloris could be retrieved. A ESE, sun-exposed wall section was colonized mainly by Apatococcus, Phyllosiphon and the lichen alga Trebouxia and Myrmecia. Accordingly, cyanobacterial communities show clear differences between both wall areas: the sun exposed area was dominated by Synechococcus-like organisms while on the W-exposed area cyanobacteria were almost absent. Just a few species, in particular Stichococcus-related strains, are ubiquitous in both areas. It is obvious that, apart from few generalists, different species colonize the wall areas that are situated in close vicinity, but provide different microclimatic conditions. These differences are discussed in view of biogenic weathering phenomena: certain microalgal species colonize crusts and scales along fracture planes and may contribute to rapid detachment and turnover of dimension stone surfaces.

Hallmann, C., Fritzlar, D., Stannek, L., Hoppert, M. (2011) Ascomycete fungi on dimension stone of the "Burg Gleichen", Thuringia. Env. Earth Sci. 63, 1713-1722.