

Preliminary Report
Lone Mountain Expedition
Grand Canyon Parashant National Monument
Trip dates: 25-26 May 2005
Reported by
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Lichen Diversity Survey and Biological Crust Study:

We first visited the Parashant National Monument in May of 2003 to survey the lichens present there. We were impressed by the immense lichen biodiversity that we encountered. In total, one hundred seventy-three species in fifty-eight lichen genera collected at the monument were reported in the Journal of the Arizona-Nevada Academy of Science (Sweat et al., 2004, available at www.bioone.org/pdfserv/i1533-6085-037-02-0085.pdf). Naturally, we were excited by the prospect of visiting the Lone Mountain site as this relatively pristine locality promised to reveal additional lichen diversity. Furthermore, this site would offer the unique opportunity to study and document lichens and fungi associated with mature biological soil crusts that had been subjected to only minimal anthropogenic pressures.

To assess lichen biodiversity upwards of 300 specimens were collected from soil, rock and wood substrates. Diversity of bark lichens was limited to 4 species in the genera *Candelariella*, *Hyperphyscia*, *Physcia*, and *Xanthomendoza*. This low diversity is most likely due to the paucity of large and old perennial vegetation on the mesa. Rock lichens also had a limited diversity (est. 15-30 taxa), probably due to the single substrate present (sandstone) and its geologic instability. Although species diversity was not extensive, the number and over-all appearance of the rock growing species was indicative of a healthy and robust community. This diversity study will add to the existing research of lichen diversity present in the region (Sweat et al. 2004, Boykin & Nash 1994), and contributes to a baseline of knowledge that can be used to design future research. One author, K.G. Sweat, hopes to expand his Ph.D. study related to the use of lichens as air pollution monitors to include plots within the monument.

In addition to the lichen diversity found on the wood substrates and the sandstone formations of Lone Mountain, a rich lichen flora was encountered covering the soils of the area. Soil lichens were almost exclusively found growing in association with biological soil crust. Numerous collections were made of lichens in the family Lichinaceae. These lichens with coccoid cyanobacterial photobionts are poorly known and difficult to identify. These specimens will be sent to Germany where an expert in this group, Mattias Schultz (www.biologie.uni-hamburg.de/bzf/fbca002/fbca002.htm), will annotate the collections. The annotated specimens will later be deposited in the ASU Lichen Herbarium and will be a valuable aid for future workers identifying soil lichens in this family.

Other common cyano-lichens, such as *Collema* spp., were also collected, as well as many unique lichens with green algal photobionts. For example, four *Psora* species were collected associated with the biocrusts. *Psora crenata*, which appears to be an excellent indicator of mature undisturbed crusts, was found in abundance, and one collection of *P. icterica* was made, which is a new record for the monument. Collections made at the Lone Mountain site will be a valuable addition to our knowledge of the lichens flora of the greater Sonoran desert region (Nash et al. 2002 & 2004) and can serve as 'pristine' baseline data for future studies related to lichen biodiversity in the area.

After curation and final identifications are made, a set of all of the lichen species collected from the Lone Mountain site will be deposited in the ASU Lichen Herbarium. An additional voucher set will be provided to the Kari Yanskey as a reference for the monument. Subsequently, these specimens will be added to the herbarium database, which is accessible to the public through the Southwest Environmental Information Network (<http://seinet.asu.edu/collections/selection.jsp>). These data are a valuable reference as few lichen collections have been recorded from northwestern Arizona. In addition, we hope to publish a brief account of the trip in a popular journal, as well as, submit a manuscript discussing our findings to a scientific journal.

Lichens associated with biological soil crusts have been covered in a handful of publications; however, there is paucity of published data relating to non-lichenized fungal components of biocrusts (States & Christensen 2001). Our primary survey of the area revealed little evidence of anthropogenic disturbance at the Lone Mountain site. Indeed, we were delighted to find what appear to be mature biological crusts, which have apparently thrived for years, perhaps centuries, without being trampled by grazing cattle. Sites such as these, offer a unique opportunity to discover biological diversity of fungal crust components that might not be present in disturbed crusts. The importance of examining understudied systems, such as 'pristine' biological soil crust, is significant in light of the recent discovery of a novel class level lineage of soil inhabiting fungi (Schadt 2003).

At the Lone Mountain site biocrust samples were gathered along a five hundred meter transect. In addition, a mature crust site was selected and gradient samples were taken along a three-meter stretch, which ran from the crust edge, through dark crust, across a section of moss associated with the crust, and ended beneath an *Ephedra* shrub. It is hoped that these samples will be examined for fungal diversity using a combination of traditional and molecular techniques for community analysis as part of one author's, S.T. Bates (www.public.asu.edu/~stbates), Ph.D. study examining fungal components of biological crusts. In addition to offering baseline of fungal diversity associated with an undisturbed biocrusts, it is hoped that these samples will offer insight into the ecology of fungi associated with the crust and possibly yield fungal organisms that are new to sciences.

In summation, the expedition to Lone Mountain has the potential to generate valuable data that will be beneficial to the fields of fungal (lichenized and non-lichenized) diversity, air pollution bio-indicators, as well as to the emerging discipline of

biological soil crust ecology. We hope that the fruits of this trip will encourage future collaboration between the Arizona State University School of Life Science and the monument and that the present collaboration will serve the monument's mission of the "... protection of the scientific and historic resources....". Any resultant publications would fully acknowledge Kari Yanskey and the Parashant National Monument. Finally, we wish to express our gratitude to Kari for her effort in organizing this expedition and thank the monument administration for affording us the opportunity to participate in this unique scientific experience.

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Fig. 1: A view of Lone Mountain from the air



Fig. 2: An excellent example of an undisturbed biological soil crust from Lone Mountain

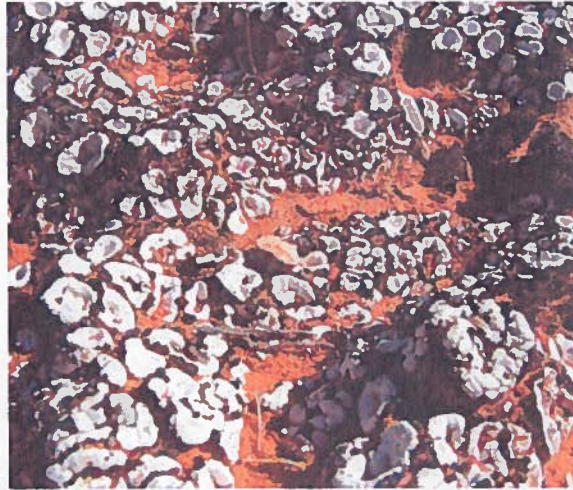


Fig. 3: The lichen *Psora crenata*, a potential indicator species for mature, undisturbed biological soil crust



Fig. 4: A gradient sample across a segment of mature crust