

# “STAY TUNED!”

## Arizona State Parks – A Science & Research Brief

**Partnership/project:** UA & ASP

Guano Mycology Project

Report: Sampling Trip #1

**Researchers:** M. Joe Vaughan, Dr. Barry Pryor,

University of Arizona

**Facilitator:** Dr. Bob Casavant

ASP Science and Research Mgr.

**On-site Ranger Liaison:** “K.C.” Curtis

Discovery Center Ranger

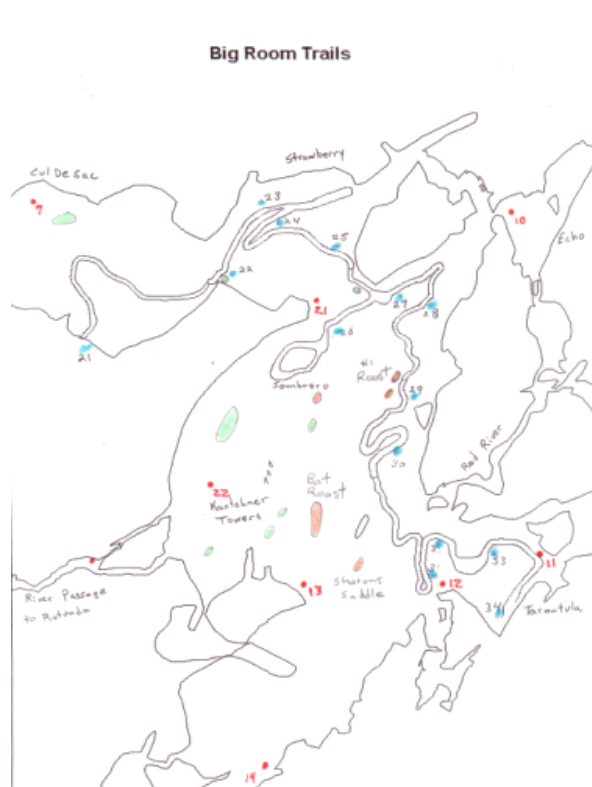
**Location:** Kartchner Caverns SP

OK. Some of you may know that *mycology* is the study of fungi. However, did you also know that even though all molds are fungi, not all fungi are molds! So, we invite you to *stay tuned* on this project and others taking place at Kartchner Caverns State Park that support the park’s mission for continuing discovery, promoting science-informed and adaptive cave management, building advocacy for conservation and education, and showcasing only a portion of a more extensive and beautiful cavern system that SO worth protecting.

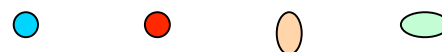
This recent mycology program is led by graduate student, Joseph Vaughan under the direction of Dr Barry Pryor at the Department of Plant Sciences, University of Arizona. Although micro-fungi make up an essential portion of the microbial population in many ecosystems, not enough is known about the different types, in-cave distributions, and life cycles of fungi in caves and their supporting surface environments. Kartchner Caverns State Park is home to a wide variety of biological communities, and serves as a natural laboratory to examine microscopic cave-inhabiting microbes and fungi in a nearly pristine environment. This project, funded by the National Science Foundation, will investigate fungal communities growing on bat guano deposits, an essential nutrient source for many cave ecosystems. The project will explore fungal community diversity and changes in life cycles throughout the cavern complex from a temporal and spatial perspective. Questions about the source of different fungi in Kartchner Caverns and why they vary in their distribution within and on the piles will be interesting to contemplate and solve.

The first sampling trip was conducted on Tuesday, Feb. 2, 2010. Only four piles were sampled. The sampling team consisted of Joe Vaughan (graduate student researcher from the Mycology Laboratory in the UA School of Plant Sciences), “K.C.” Curtis (KCSP

Discovery Center Ranger), “Dr. Bob” (ASP Research and Science Manager/ KCSP Resource Manager) and Ginger Nolan (Cave Unit Supervisor). Researchers received cave safety and preliminary navigation of off-trail pathways to access fresh and old guano piles. These same pathways are routinely used by Cave Unit staff for monitoring cave environmental conditions and maintaining cave lighting systems.



IS stations    EM stations    Fresh Guano    Old Guano



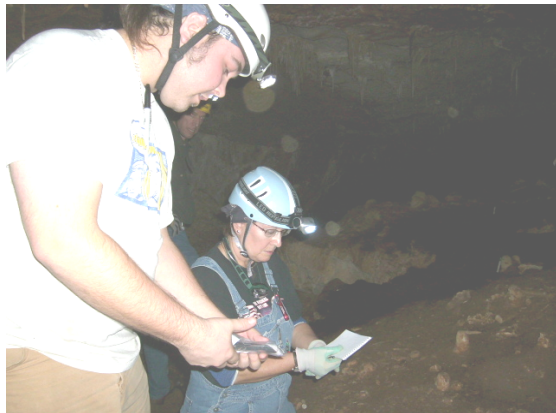
*Preliminary “field map” showing approximate locations of bat droppings or guano deposits within the Big Room complex. IS = interpretative station, EM = environmental monitoring station*

The purpose of this and future visits is to obtain various samples of guano from the Big Room area at different times of the year in order to develop a baseline record of the fungal communities that thrive within and on top of the guano piles. To sample the piles, Mr. Vaughan presses a metal coring device into the tops or sides of various guano piles to a depth of about 4 inches. Because both old and new guano piles tend to be relative soft, the sample compacts within the corer

producing a physical sample of guano of about only 1 inch thick. Joe then uses another tool to push out or “express” the core into a sterile, zip-lock plastic bag for off-site analysis at the university lab. After each sample, the corer and expressing tools with disinfectant wipes.

Large, fresh guano piles are ideal because their relatively moist, naturally compacted, and often host a layer of heavy, grey fungal growth. Future trips will sample other piles as well as previous sampling sites at different times of the year to access the growth cycles of fungal communities, which have adapted to different environmental and nutrient conditions. Once back at the lab, the DNA of the fungi will be sequenced to tease out the presence and linkage between different fungal communities or types. Other attributes accounting for fungal survival and diversity that Joe is interested in exploring include water content, mineral content, and other organic and inorganic nutrients.

In addition to advancing understanding of linkages between biological and geosystems within and outside the caverns, mycological research at KCSP may someday play a key role in advancing our knowledge and application of new fungal types and behavior in pharmaceutical and medical research. State parks like Kartchner remain dynamic, four-dimensional natural laboratories for conducting cutting-edge science and research, and educating generations of business leaders, educators, scientists and policy makers.



*Researcher, Joe Vaughan and park ranger KC Curtis record data from a dark guano pile shown in the background. The pile is covered with a fungal-rich layer deposited last summer by cave *Myotis* (*Myotis velifer*)*

Kartchner Caverns State Park supports a great variety of other short- and long-term inventory and monitoring projects that give our rangers, volunteers and park visitors, unique opportunities to expand their experience and knowledge as they work or interact with managers and scientists on science projects. Research and science programs focus on enhancing park operations and stewardship strategies, advance interdisciplinary scientific literacy, and build advocacy for cave conservation and Arizona State Park’s mission.

Casavant along with other members of the park management team, Assistant Park Manager, Chris DeMille, and Superintendent, Dave Pawlik, adapt projects like the mycology study to advance employee development and cross-training in support of SPOT initiatives. SPOT (Strategic Planning on Talent) is a long-term internal agency program whose focus is to advance recruitment, employee retention, knowledge transfer, professional development and open communication across the agency and with our partners, as reasonable budgetary climates permit.

For additional information on this and other microbiology projects at KCSP, go to the following website:

[http://ag.arizona.edu/swes/maier\\_lab/kartchner/index.html](http://ag.arizona.edu/swes/maier_lab/kartchner/index.html)

*R. Casavant*

*(This article was supported from field notes submitted by DC Ranger K.C. Curtis and Joe Vaughan. Administrative support was graciously provided by Sherry Groothousen, ASP Sr. Administrative RIM Volunteer.)*