

SCIENCE IN BURNSVILLE COVE – 2018

BCCS Science Committee

Katarina Ficco
John Haynes
Bill Jones
Phil Lucas
Jenn Macalady
Ben Schwartz
Chris Swezey
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INTRODUCTION

The 2017 Science Report was mainly a wish-list, describing a variety of possible interesting investigations in the Cove. All required time, personnel, and money, all of which seem to be in short supply. This year's report summarizes investigations that are actually underway in the Cove and surrounding areas.

Two new members joined the committee this year, Phil Lucas and Kararina Kosič Ficco, thus broadening the base of expertise and sources of advice for others who may wish to do research in the Cove.

GEOLOGY

Emily Brent, Michael Knez, and Brian Stone, JMU students, are working with John Haynes and Chris Swezey to produce a geology map of Owl Cave

David Jeffery, Geology Professor at Marietta College (OH), has done some research on the stromatoropoid reefs at Mustoe and at Water Sinks. He thinks that the reef at Water Sinks and the reef at Mustoe grew during approximately the same time interval, but the reef at Water Sinks grew in water that was shallower and was thus exposed to more episodes of exposure caused by fluctuations of sea level. He will present his results at the forthcoming Geological Society of America meeting. His abstract follows.

PALEO GHOST-ROCK KARSTIFICATION AT WATER SINKS CAVE REEF, LATEST SILURIAN KEYSER FORMATION, VIRGINIA

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Latest Silurian reef exposures of the Keyser Formation at Water Sinks, Highland County, Virginia show evidence of early to intermediate stage ghost-rock karstification. Reef strata are characterized by horizontal beds several meters thick, composed of cobble-sized heads of stromatoporoid and coral. The large heads are separated by degraded, fossiliferous grainstone rich in disseminated limonite, clay minerals, and chert, as well as void filling, limonite-rich travertine that contains abundant fossil residue. Large, impermeable stromatoporoid heads are the only fossil components left that may have originally been composed of aragonite. Smaller fossil particles within the residue between stromatoporoids were all originally calcite. This differs from exposures of a reef at a similar stratigraphic position at Mustoe, located 7 miles northwest of Water Sinks which is interpreted to be farther basinward. Mustoe reef displays aggradational growth and cavities are filled with normal marine skeletal grainstones. Calcareous algae are present, and although no longer composed of original aragonite, were likely preserved because of recrystallization and cementation within a buffered system rather than an open system with abundant flushing of meteoric waters. Karsting of the Water Sinks reef indicates that its shallower position resulted in exposure during periods of sea level fall. If both reef systems were deposited during the same sea level cycle, one would interpret that the Mustoe reef nucleated at sea level earlier and seaward and was not exposed by subsequent sea level fall. Water Sinks reef nucleated later and higher on the platform, but was exposed during sea level fall and was planed off, resulting in the residual tabular geometry. The characteristics consistent with ghost rock karstification are that undissolved materials were not physically removed to form open voids. The residual material containing insoluble minerals as well as more stable and larger carbonate grains remains in the areas between the more robust, impermeable stromatoporoid and coral heads. Small spaces created by the loss of rock volume by dissolution were filled with travertine and then all pore spaces were filled by later burial cementation.

SURFACE KARST AND CAVE GEOMORPHOLOGY

The sinkhole inventory underway by Phil Lucas and Maret Maxwell has been on hold for the summer because heavy foliage makes precise GPS locations difficult. Discovery of a bed of Licking Creek Limestone above the Shriver Chert explains why there are so many sinkholes in the Oriskany Sandstone in the hill above Helictite Cave and in the mostly flat property behind the Fossil Dig site.

HYDROLOGY

Bill Jones and Phil Lucas did a hydrological investigation of Boiling Spring in the Jackson River valley and presented their results at the Sinkhole Conference held in Shepherdstown in April. Their title and abstract follows:

AN UNUSUAL SPRING IN THE JACKSON RIVER, BATH COUNTY, VIRGINIA

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Abstract

Boiling Spring rises in the bed of the Jackson River about 0.5 km (0.3 mi) downstream of the USGS gaging station on the Jackson River near Bacova, Virginia. Five tracer tests to the spring have been conducted on sinking upstream tributaries to the Jackson River. The longest trace was 12.5 km (7.75 mi) from Muddy Run with the dye injected on the east side of the Cobbler Mountain Anticline. Additional traces to Boiling Spring are from Muddy Run on the west side of the anticline, Chimney Run, Creek Bed Cave, and Warm Springs Run. Travel times were greater than one mile per day. The gaging station is missing about one third of the total flow under low flow conditions. Discharge measured in October 2005 was 0.36 m³/s (12.8 cfs) from the spring, and 0.77 m³/s (27.0 cfs) at the Bacova gaging station. The ungaged discharge is probably not a significant part of the total flow at higher river levels. However, the annual runoff for the Jackson River station at Bacova—with a drainage area of 409 km² (158 mi²)—is 371 mm (14.6 in) per year, well below the 480 mm (18.9 in) per year for the nearby Bullpasture River at Williamsville that has a smaller drainage area of 285 km² (110 mi²).

MINERALOGY AND SPELEOTHEMS

There is an on-going investigation of stalagmite paleoclimate records and microclimate monitoring in Helictite Cave under the guidance of Yongli Gao, Dept. Of Geological Sciences, University of Texas at San Antonio.

BIOLOGY

The Virginia Department of Conservation and Recreation continues its biological inventory in the Cove. In 2018, Benjamin Schwartz, Matija Perneand, and Katarina Kosič Ficco inventoried and collected in the following caves.

Butler Cave

2 cave beetles (*Pseudanophthalmus*)

7 aquatic cave snails

Barberry Cave

3 aquatic isopods

3 amphipods

2 cave millipedes

Subway Cave

1 cave beetle (*Pseudanophthalmus*)

2 spiders

1 rove beetle

There was also a short trip into Helictite but no specimens were collected. The collected specimens have not yet been identified so the species remain unknown.