

GOBHOLO CAVE: A LONG GRANITE CAVE IN SWAZILAND (SOUTHERN AFRICA)

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The results from the 2012 year's reconnaissance expedition to the first major cave reported from Swaziland, southern Africa, will be presented and discussed. The cave is formed by deep weathering and fluvial transport of weathering products in the 2.7 Ga old granites of the Mbabane Pluton, Kaapvaal Craton. So far only a small fraction of the cave has been explored, but with Gobholo River running underground for 1.8 km there is potential for a cave measuring thousands of meters in length. In the higher levels pottery has been found. The biology of the cave is surprisingly rich, with three species of bats, at least five species of spiders and harvestmen, one species of weta, crab, and mollusc, respectively, in addition to observations of springtails and millipeds. There are numerous and diverse non-calcium carbonate speleothems throughout the cave. The exploration of this surprisingly complex cave will continue.

1. Background

Early 2011, during the preparation of the Conference on Granite Caves, one of us (RS) was contacted by Darron Raw who runs Swazi Trails, an adventure agency in Swaziland. He wanted to know more about granite caves, and the reason was that one of the activities Swazi Trail offered is an Adventure Caving trip to Gobholo Cave, a large granite cave near Mbabane, the capital of Swaziland. The trip runs for more than two hours, so the cave had to be of considerable dimensions, and Swazi Trails had run trips there for more than a decade. Still, nothing was known about the cave, its origin or significance. Available sources (Middleton and Waltham 1986; Laumanns 2008) indicated that there are no known caves in Swaziland, at all. Meanwhile, RS wrote a presentation of the cave and its plausible origin (Sjöberg 2011); this paper was the working hypothesis for the geomorphological part of the expedition here presented. All this prompted the idea of a small reconnaissance expedition to Swaziland and Gobholo Cave, and for three weeks in late July-early August 2012 two of us (MS and JL) visited Swazi Trails and Gobholo Cave to initiate the exploration of this remarkable cave.

2. Geological and geographic setting

Swaziland is a small landlocked country in subtropical Africa, entirely on the Kaapvaal Craton. Gobholo Cave is in the western part of the country, in the Highveld on the border to the Middleveld (Figure 1). Topographically the Highveld is characterized by higher altitudes, with summits reaching 1,800 m a.s.l., and a large amount of rain (up to 2,000 mm per year). The Highveld is also influenced by jointing and faulting, with many deeply dissecting valleys. The Lowveld has more moderate altitudes (800 m a.s.l. down to 400 m a.s.l.) with less rain.

There are no carbonate rocks known from Swaziland (Laumanns 2008). Most of western Swaziland is instead dominated by Archean intrusive and metamorphic rocks. Gobholo Cave is formed in the c. 2.7 Ga old coarse grained granites of the Mbabane Pluton (Layer et al. 1989), that

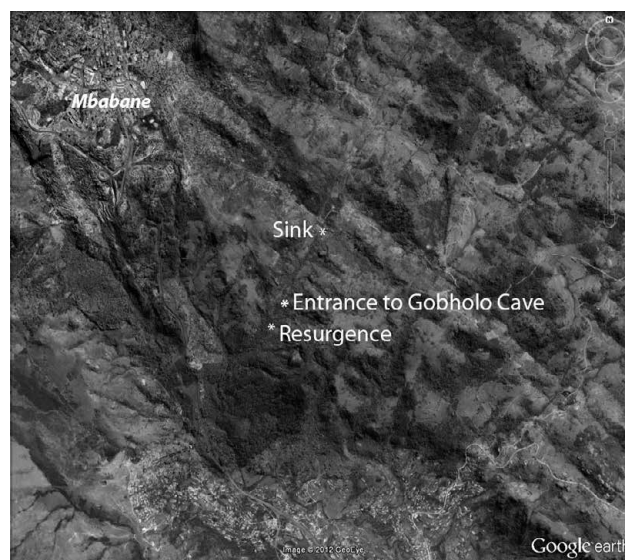


Figure 1. Gobholo valley, Swaziland. Gobholo River sinks underground near the middle of the image. The distance between the sink and the resurgence is 1.8 km. Source – Google Earth (image date 2009-07-28).

intruded the up to 3.66 Ga old gneisses of the Ancient Gneiss Complex.

3. Methods

We surveyed most of the tourist cave using ordinary analogue survey techniques (Suunto Compass and Clinometer, together with a Disto DXT for length measurements). The survey data was daily processed in an Excel spreadsheet.

The morphology of the cave was inspected on site, both in the cave and outside at several surface trips.

Speleothems were carefully sampled outside the main tourist part of the cave. The samples have been equally distributed between Prof. Juan Ramón Vidal Romaní, A Coruña, Spain, and the Swedish Museum of Natural History, for later investigation.

Cave life was collected by hand and stored in 70% Et-OH and has been distributed to experts (spiders to Prof. Anise Dippenaar, Pretoria, South Africa, and crickets to Prof. Gianmaria Carchini and Dr. Mauro Rampini, Rome, Italy).

4. Results and Discussion

4.1. Gobholo Cave

Gobholo River sinks underground in the upper part of Gobholo Valley. From there it flows nearly 1.8 km underground until it exits in resurgence in the lower part of the valley. Most of the valley floor is covered by saprolite of unknown thickness. The main entrance to the cave is a few hundred meters upstream the resurgence, between residual boulders forming a small boulder heap. From the large entrance chamber several passages lead steeply down to the middle levels where corestones are still intact. The lowermost part of the cave, with the stream, can be reached in the innermost tourist chamber, at a depth of more than 40 meters under the entrance. The stream passage has not been explored, but there are multiple parallel passages in the middle and higher levels of the cave, forming a 3D-labyrinth. A second source of water in Gobholo Cave has been found in a small middle level passage, where a trickle of moderately warm water can be found, indicating the possibility for at least local scale influences from thermal water.

We surveyed only about 400 meters of the cave, but the surface distance from the extreme points in the survey is slightly more than 100 meters. This gives a factor of at least 3.5 for the length; this number is probably much higher since many parallel side passages were left unsurveyed. Even if the stream only can be followed underground for say 1 km, this indicates that Gobholo Cave eventually will attain a considerable length, possibly measured in kilometers.

Prior to our visit, there have been two competing hypotheses (or rather guesses) for the origin of the cave (D. Raw, pers. info.): that the cave is simply a huge talus cave, formed by boulders that have gravitationally been transported from the sides of the valley; or that it is formed by deep weathering of the granite, and that the boulders are in situ. The presence of free boulders in the upper level of the cave, and well preserved more or less intact corestones in the middle and lower parts (Figure 2), indicates that at least part of the cave is formed by granite deep weathering (Sjöberg 2011). It is likely that the stream primarily has acted as a transport agent for the weathering products, but especially during flooding events it seem to reach high energies and can act as an erosion agent.

4.2. Speleothems

There are numerous speleothems in the cave, forming different morphologies. Most common are coralloids and flowstones (Figure 3), but also draperies are common. Most of the speleothems in the lower parts show signs of erosion from streaming water. No stalactites or stalagmites have been found. It is likely that the speleothems consist of the common granite cave speleothem forming minerals opal-A and pigotite (Vidal Romaní et al. 2010).

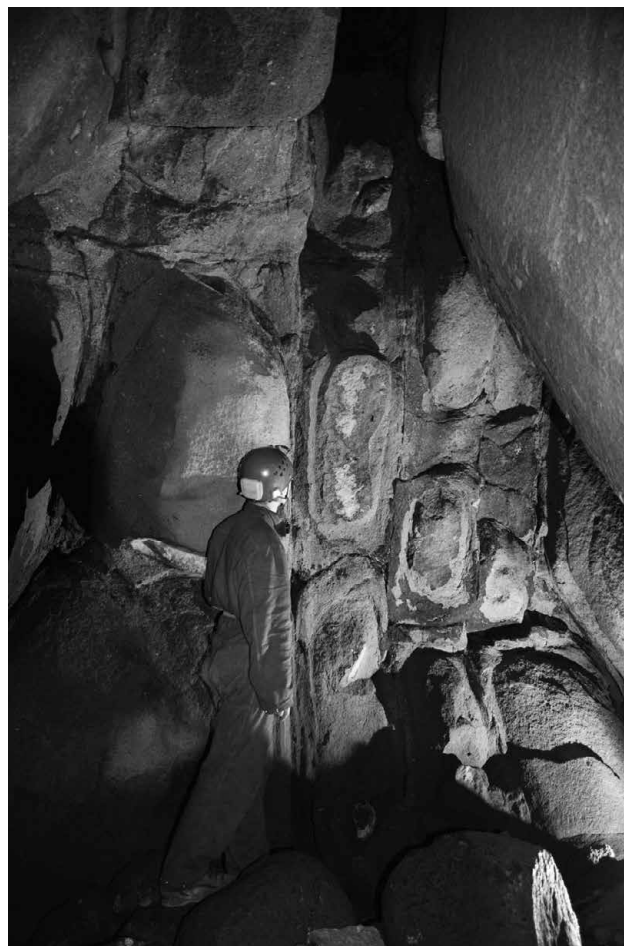


Figure 2. Corestones in the middle level of Gobholo Cave, about 150 m from the entrance. Photo by Johannes Lundberg.

4.3. Biology

The cave ecosystem is surprisingly rich with three species of bats (schreibers' long-fingered bat *Miniopterus schreibersii*, cape hairy bat *Myotis tricolor* (Figure 4), and geoffroy's horseshoe bat *Rhinolophus clivosus*), several species of spiders and harvestman (some with a tendency towards less pigmentation), and numerous individuals of a cave living king cricket (Insecta: Orthoptera: Anostostomatidae). There are also observations of a stationary mollusc, a pigmented crab, and unpigmented springtails as well as millipeds, resting lepidopterans, and small dipterans. Differently coloured colonies of Actinobacteria can be found on the walls, and the guides from Swazi Trail reported the histoplasmosis inducing fungi *Histoplasma* from bat guano (but there are no reported cases of histoplasmosis infection after visits in the cave).

4.4. Archeological potentials

In the upper levels of the cave, near the entrance and in some of the passages leading to the middle levels, scattered pottery has been found. Until fairly recently, western Swaziland was mainly inhabited by Khoisan, hunter-gatherer people now extinct from Swaziland. They were replaced by bantu-speaking people during the Bantu migration reaching the area less than 1,000 years ago. The age and attribution of the pottery is not known. Secret caves in nearby valleys are used as royal burial sites, but no

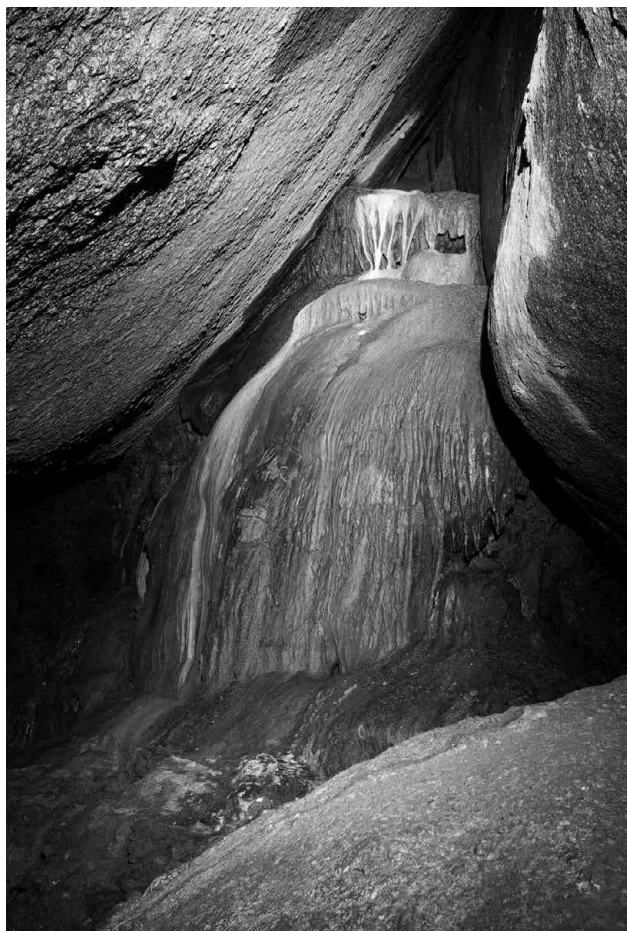


Figure 3. The large flowstone in the lower part of Gobholo Cave, about 200 m from the entrance. The height of the flowstone is about 2.5 m. Note the graffiti in the left hand of the flowstone. Photo by Manuela Scheuerer.

human remains have been found in any cave in Gobholo Valley.

5. Future research

We are planning to return to Gobholo Cave late this year (2013) or early next year with a larger expedition, together with cavers and researchers from Spain, South Africa and possibly other countries. The goal will be to survey the main passages of the cave, using digital surveying equipment and a digital pipeline for processing the survey data. We will also more thoroughly survey the occurrence of speleothems, their distribution and diversity. A more detailed inventory of the cave life will be undertaken, with special emphasis on the smaller fauna, and we hope to be able to start exploring nearby areas of Swaziland for caves.



Figure 4. Hibernating cape hairy bat (*Myotis tricolor*) in Gobholo Cave. This is one of three species of bats found in the cave. Photo by Manuela Scheuerer.

Acknowledgment

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