

Explorations & History

Proceeding of the 18th UIS Congress - Volume II

- S.02 - Caving and explorations
- S.10 - History of Speleology
- S.13 - Artificial cavities
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KARSTOLOGIA 22
Mémoires

Savoie Mont-Blanc 2022



18th INTERNATIONAL CONGRESS
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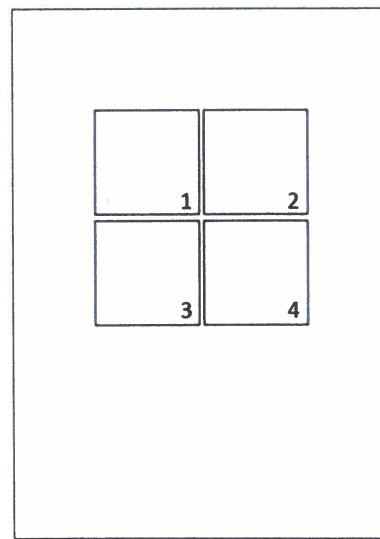
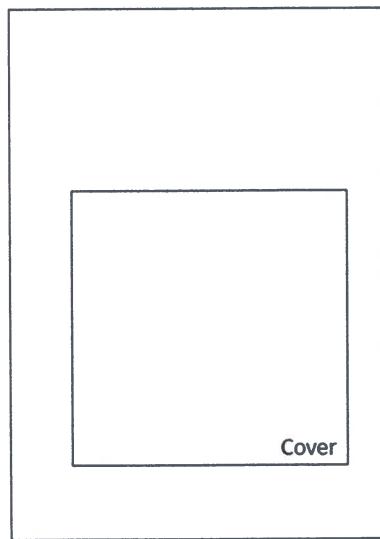
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SYMPOSIUM 10

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The caves of Gorongosa National Park, Mozambique

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Abstract

We present an overview of the results of four speleological expeditions to Gorongosa National Park (GNP) conducted between 2016 and 2019 under the umbrella of the Paleo-Primate Project Gorongosa, with each annual field season lasting for about two weeks. The main objective consisted of the inventory, exploration and characterization of the karstic caves located in the limestone formations of GNP, with the aim of ascertaining their archaeological and paleontological potential and their implications for the study of human evolution. Following previous bibliographic and documentary research, six karstic areas were surveyed via airborne and on-foot visual scanning, and also with the help of local guides. A considerable number of previously undocumented caves and rockshelters have been inventoried, ranging from small cavities to complex anastomosed galleries with hundreds of metres and large chambers. Most of these caves were thoroughly explored and described in their general and specific features, including non-invasive appraisal of the deposits' archaeological or palaeontological potential. The speleological resources of GNP are now being revealed and prove to be much more impressive than previously thought. The produced cave inventory is becoming a powerful reference database, with potential for future research in geology, paleoclimate, archaeology, ethnography, palaeontology, biodiversity and other fields of knowledge.

1. Introduction and framework

GNP is located in the province of Sofala, central Mozambique. It is found in the Pungue River drainage basin, where the southernmost continental section of the East African Rift System (EARS) ends, with Mount Gorongosa to the northwest and the Cheringoma plateau east of the Urema Graben. The plateau is prominent, with Eocene nummulitic limestone formations, a remnant of the former coastal plain (TINLEY, 1977) and a speleological hotspot. Several caves are known in this area, including the largest recognized cave system in Mozambique, the Codzo River Cave, with 942 m surveyed in 1998 by Laumanns and collaborators, in the NE Buffer Zone of the Park (LAUMANNS 2001; LAUMANNS *et al.*, 2016). Unpublished reports from guano prospectors referenced the existence of caves within the GNP (cf. VACHAMUTECO 1982) and later the archaeologists MERCADER & SILLÉN (2013) described a few caves and rockshelters, some with archaeological remains ranging from the Middle to Late Stone Age and Iron Age. Nevertheless, available knowledge about caves to the south of Codzo remained scarce, most probably due to lack of

further speleological research and the fact that caves in this area generally present discrete entrances.



Figure 1: Surveyed sectors (GNP main boundaries in green outline). Adapted Google Earth Image.

Considering the geographic location, the geological framework, and the gap between EARS and South Africa, two core areas for the study human evolution (cf. BOBE et al. 2020), the potential scientific interest of these karst formations is compelling.

2. Materials and methods

Prior to field work, bibliographical and documentary research was carried out on karst cavities in the GNP region. Six different sectors were selected for surveying, based on previous references to the existence of caves, geological and geomorphological characteristics of the terrain and observations using satellite imagery. These sectors are, from north to south: Codzo – Mazamba (GNP buffer zone), Nhagutua, Condué, Goronga – Nhacquideze, Muanza and Muredeze (Fig. 1).

Field surveying was based on visual tracking performed during systematic on-foot coverage inside the fluvio-karstic canyons, in adjacent plateau areas and in other karst terrains. When possible, field search was conducted with the participants walking side by side to cover the largest surface area. When geologic faults and fractures were detected, their alignments were inspected, considering the potential of these discontinuities for the development of karst cavities. Some of the areas were previously searched

Therefore, speleological research was included in the Paleo-Primate Project Gorongosa (PPPG), a long-term paleontological, archaeological, and primatological project, held by GNP, under the coordination of Susana Carvalho.

through low altitude aerial observation (helicopter). On several occasions the involvement of local people was very useful.

The expeditions required specialized equipment for cave rigging and progression. Whenever necessary, passages were unblocked using manual methods. The cavities' geographical coordinates and prospection tracks were recorded with GPS devices: *Garmin GPSMAP 64st*, *OREGON 750t* and *RINO 650*. The topographic and topometric surveys were carried out using the *DistoX/X2* laser distance measurement device specifically created for subterranean topography by Beat HEEB (2009), and the *TopoDroid* program, with a *Samsung Galaxy Note 10.1* tablet. The *DistoX/X2* calibration procedure was performed with the *AESDA Calib* (REGALA, 2015). The cave topographic drawings were carried out *in loco*, following primarily the conventions for underground topography established by the International Union of Speleology (UIS).

3. Results

Among the six different prospected areas, as expected, the one that revealed larger caves was Codzo-Mazamba, partly included in the Buffer Zone of the GNP, related with the rivers that drain from the Cheringoma Plateau to the Rift Valley. Reconnaissance visits were conducted to the previously known caves in these areas, broadly explored and surveyed by Laumanns and collaborators in 1998 (cf. LAUMANNS, 2001). Also, the two caves where MERCADER & SILLÉN (2013) conducted archaeological tests (Nhamissimbiti and Nhamababwa) were visited and mapped. During field surveying, three new caves were found and mapped, the larger one (Ninga ya Jeremias) with 56 m of development and a depth of 11.5 m. In these caves large mammal bones are common. The probability for the existence of other caves in this area is very high, given the extraordinary density of endokarst formations. Most caves have large sediment deposits that may contain archaeological and/or paleontological remains; however these are largely covered with thick guano layers hiding any ancient vestiges. So far, only the caves tested by MERCADER & SILLÉN proved to be archaeological, but more testing in some of the dry galleries in other Codzo caves is likely to give similar results.

The Nhagutua area is partly covered by the GNP in its northeastern boundary. About 40 m to the east of the cave described by LAUMANNS (2001), the 170 m karst-gorge-cave Ninga Nhagutua, another similar and parallel cave was discovered, with 200 m linear development in a tectonic fault (SE-NW). Elephant bones were found inside this cave. The Goronga-Nhacquideze area turned out to be rich in modest size caves. A total of 13 caves were explored, the larger one with a length of 56 m (Goronga 10). Relevant sediment deposits, suitable for preserving archaeological/paleontological remains, are often present.

In the Goronga Shaft several modern bones of large herbivores and other animals were collected for the GNP comparative vertebrate anatomy laboratory. Some other caves have abundant sediment deposits with the possibility of containing ancient vestiges. Of these, Goronga 2 may have ethnographic and archaeological interest given the presence of a large pottery vessel, probably of recent age, and a quartzite laminar flake in the sediments near the entrance.

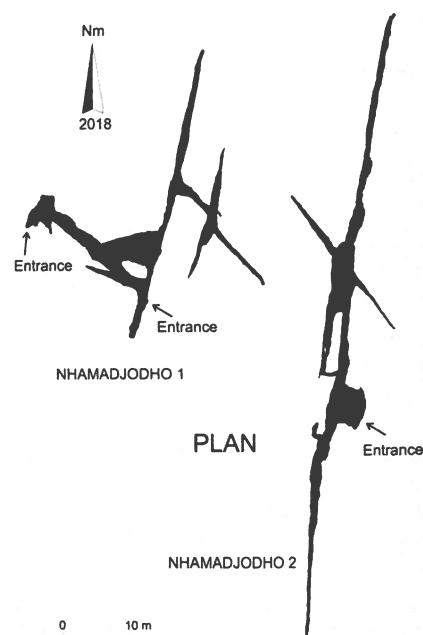


Figure 2: Plan view of the Nhamadjodho caves

Condué/Kundwe showed an abundance of karst cavities, mostly of very small size. In the field surveys many shelters were referenced. The limestone outcrops exhibit horizontal bedding, with numerous joint controlled cavities, which are very low but sometimes penetrable, creating shelters, occasionally leading to wide but very shallow chambers. This is the case of the *Bat Shelter*, or "Shallow Cave", whose progression is only possible by crawling, although it opens into a shallow wide chamber of about 7 x 11 m. This cavity is inhabited by a large colony of *Nycteris thebaica* bats (identification by P. Naskrecki). There are sediment deposits and abundant bat guano, rich in guanobiont fauna. Besides the archaeological *Kondué* cave and *Machibombo* shelter previously tested by Julio MERCADER and Peter SILLÉN (2013), in the *Snake Shelter*, discovered in 2017, archaeological lithics were also found.

In Muanza, the existence of caves was previously pointed out by LAUMANS (*op cit.*) and MERCADER & SILLÉN (*op. cit.*), some with lithics surfacing the deposits, showing archaeological potential. Excavations conducted by William ARCHER and Vera ALDEIAS in 2018 under the PPPG revealed possible Iron Age and Stone Age contexts in the *Conga Cave*. During the surveys held in the Muanza River influence area, other 25 karstic caves were recorded, and are, to our knowledge, new unpublished sites, although at least two of them (*Engenho* and *Pedro & Abel*), suffered intensive bat guano harvesting.

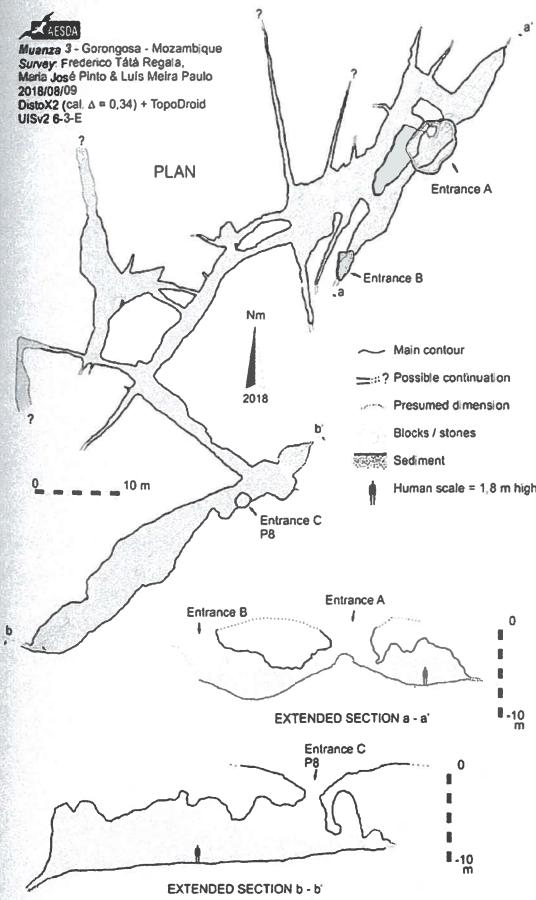


Figure 3: Survey of the Muanza 3 cave

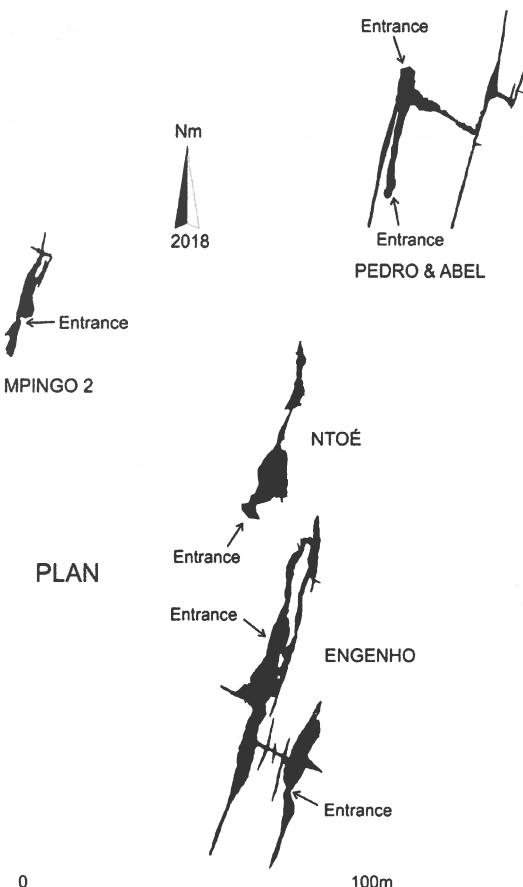


Figure 4: Plan view of selected caves in the Muanza river region.

From the speleological point of view, some of the caves surveyed in this region are, so far, the most expressive endokarst formations known within GNP's main boundaries, especially *Engenho Cave* (290 m) (see Fig. 4) and *Muanza 3* (>230 m) (Fig. 3). We must also note the biodiversity relevance of *Nhamadjodho 1*, *Nhamadjodho 2* (both in Fig. 2), *Muanza 3*, *Muanza 4* and *Mpingo 3*, all with massive bat colonies comprising different species. Also, the *Ntoé* cave may be considered as an ethnographical curiosity, with the preserved remains of old animal traps, representative of traditional hunting practices and techniques. This cave seems to be also one of the most promising for containing preserved archaeological and/or palaeontological remains in the sediment deposit, considering the location, not far from the river, and its suitable sheltering conditions. The *Amarula Cave*, with more than 130 m and not thoroughly explored yet, presents good conditions for paleoclimate studies based on speleothems, with several uncommonly well-preserved stalagmites.

Muredeze/Muaredzi - Prospections in this area were practically restricted to the karst gorge. Five caves plus one possible cave high in the gorge wall (*Muredeze 6*) were recorded. The surveyed caves are mainly small river tributaries which are probably active during the rainy season. The *Muredeze 2* Cave is the largest and houses an important bat colony.

4. Conclusions and future work

The speleological research included aerial and field prospection, underground exploration, photographic documentation, technical description, topographic survey and preliminary archaeological or paleontological potential assessment. The speleological inventory was enhanced with reports on 42 previously undocumented caves, several rockshelters and obstructed cave entrances. Topographic surveying was conducted in 25 caves and one shelter, summing up around 1,750 m of mapped galleries. Several of these caves contain extensive and apparently deep sediment deposits, often with large mammal bones from several different species of extant animals, but also species that no longer roam in the immediate area, although still present in parts of the Cheringoma plateau. They are, therefore, relevant sources for the collection of useful specimens, especially important in terms of comparative anatomy and molecular data for phylogenetic studies. The occurrence of a few pottery fragments and lithics reveals the human activity in or near the caves and the infilling deposits

may also contain other preserved archaeological vestiges. The pottery samples found inside the caves so far are undecorated vessels, probably from Late Iron Age assigned to the Late Farming Communities, according to the classification used in Mozambique and in Eastern and Southern Africa, in general.

The collected data is a fertile contribution for mapping GNP's natural and cultural heritage. It improves the Park's appealing traits for scientific research as well as environmental and heritage education, particularly useful for the local communities but also considering a broader cultural tourism. This will, therefore, be considered within the general heritage management efforts, through existing legislation, fostering the deeply desired sustainable development for this region.

The success so far achieved in finding new caves in the GNP fully justifies investing further research effort. The involvement of local communities has been fundamental and must be nurtured.

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