

## ARCHAEOLOGY VERSUS PALEONTOLOGY: THE QUESTION OF THE SOUTH AMERICAN PALAEOVERTEBRATE TUNNELS

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*Keywords: Palaeovertebrate tunnels, Indian galleries, Archaeology, Paleontology*

### 1. INTRODUCTION

Ichnofossils exclusive to South America, to our knowledge, are tunnels excavated by giant armadillos and ground sloths of the Pleistocene Megafauna (e.g., Buchmann *et al.*, 2003, 2009; Frank *et al.*, 2010; Lima *et al.*, 2010). The origin of the very conspicuous tunnels, however, has been attributed over the times to several different entities, like natural processes (e.g., underground waters), historical characters (e.g., Jesuits) and even mythical beings like the “curupira”, a male supernatural that guards the forest and whose feet are turned to face backwards. This contribution presents and discusses the interpretation given to the tunnels by Brazilian archaeologists over time.

### 2. CHARACTERISTICS OF THE PALAEOVERTEBRATE TUNNELS

Palaeovertebrate tunnels, as found in Brazil, present original tunnel widths that range from 0.8 to 4.2 meters; original tunnel heights range between 0.6 and 2.0 meters (Fig. 1). A definition about the maximum length of a single tunnel is hampered by the fact that usually only tunnel remnants are found. Many remnants are only a few meters long (5, 10, 20 m, etc); sometimes tunnels with a length of 40 meters can be found. Individual tunnels may reach lengths of more than 100 meters (Stevaux *et al.*, 2010). Systems of interlinked tunnels are much longer: a preserved tunnel complex in the state of Minas Gerais sum 340 meters of tunnels.

Destruction of the tunnels by geologic processes may clog or erode the tunnels. Tunnels entirely clogged with sediments (called “crotovines”) constitute 60-70% of the occurrences; most open tunnels are filled with sediments to some degree. If meteoric waters run inside the tunnels, they erode the floors and collapse the roofs. In such situations, the originally narrow tunnel may surpass 2.0 meters in height; tunnel widths attain similar values.

Research over the last decade identified more than 150 sites in the five Southern Brazilian states (Rio Grande do Sul, Santa Catarina, Paraná, São Paulo and Minas Gerais); the number of individual tunnels is reaching almost 500 (~300 of them are crotovines).



Fig. 1: A palaeovertebrate tunnel with its typical shape and size. The width of the tunnel at floor level range between 1.4 and 1.8 meters. Sediments cover the floor of the original tunnel, diminishing its original height by about 20-30%. Claw marks can be found on several spots.

### **3. ARCHAEOLOGICAL VIEWS**

Systematic archaeological workings in Southern Brazil started in the late sixties, identifying a plethora of different archaeological sites related to human occupation in South America during a period of more than 10,000 years: superficial dwellings, pit houses, earth mounds, enclosures sites, rock shelters with or without mortuary deposits, camping sites, burial mounds, monumental burials, rock art sites, workshop sites, shellmounds and others.

The tunnels found during the archaeological prospectings were seen as a new type of site. (e.g., Chmyz & Sauner, 1971). The detailed report of João Alfredo Rohr, S.J. about the archaeological sites in the state of Santa Catarina includes 19 “underground galleries” (Rohr, 1971). Usually the galleries do not show any sign of pre-historic human presence. Only very rarely, it was possible to detect rock art at their walls or to collect some lithic or ceramic material inside. After these first pioneering archaeological publications, the underground galleries became an integral part of the archaeological sites of specific Indian Traditions in Brazil (e.g., Prous, 1991, p. 318). In the same way, the National Register of Archaeological Sites of Brazil (<http://portal.iphan.gov.br/portal/montaPaginaSGPA.do>) lists many tens of places with “underground Indian galleries”.

### **4. METHODS**

Our research of palaeovertebrate tunnels starts with fieldwork, systematically inspecting huge

anthropogenic cuts in the terrain that may exhibit tunnels. However, as most of the open tunnels are located in hidden places, only a continuous media program to raise public understanding of science and the use of several different databases allow us to find them. One of these databases is the archaeological literature about the “underground Indian galleries”. We identified and visited, using appropriate speleological equipment, the galleries SC-Urubici-10 and SC-Urubici-15 described by Rohr (1971). They are characteristic palaeovertebrate tunnels, with the typical concave roofs and the sinuous outline. Both are connected to several other tunnels and show abundant claw marks at their walls. In the tunnel SC-Urubici-10 (Fig. 1), we even found the excavation pit made by Father Rohr. His finding of ceramics inside this tunnel is easy to understand, due to the presence of a huge pit house some 50 meters NW of the tunnel, whose excavation rendered more than 2,000 pottery sherds (Rohr, 1971, p. 17). Claw marks are especially abundant in the tunnel SC-Urubici-15 (Fig. 2), a complex system of 7 individual tunnels that converge to a single 3-meter-wide open space.



Fig. 2: Claw marks on the walls of one of the tunnels that compose the remains of SC-Urubici-15 of Rohr (1971). Scale is of 10 cm.

## **5. DISCUSSION AND CONCLUSIONS**

The “underground galleries” always aroused doubts about their origin. Padberg-Drenkpol (1933), the first written record of underground galleries in Brazil, suggested that they were mines, having being excavated rather recently by gold and silver hunters. Padberg-Drenkpol (1933) stressed the fact that the walls of the tunnels show marks that resembled pickax marks and that the Indians never have had pickaxes. There is no evidence that Brazilian Indians

made any use of metallic tools, despite the regular presence of nodules of native copper in some regions covered by the basaltic lava flows of the Paraná-Etendeka Continental Flood Basalt Province (Leonardos, 1948).

The interpretation of the palaeovertebrate tunnels as “underground Indian galleries” is related to two main factors. At first, it has to be remembered that the concept of the existence of preserved tunnels of prehistoric big-sized vertebrates is a very recent one. Disregarding some short observations about huge crotonines in the coastal region of Mar del Plata (Argentina), the first article that describes a tunnel and attributed it to giant armadillos was that of Quintana (1992), followed by only a few others like Zárate *et al.* (1998) and Vizcaíno *et al.* (2001). The archaeological investigations are much older than this new concept. Secondly: The occasional presence of rock art, lithics and pottery sherds inside the tunnels easily induce scientists to think that Indians excavated the tunnels. The fact is that the Indians only occupied some of the pre-existing tunnels, probably the ones closer to their pit houses, with easier access and lower degree of clogging. The tunnels SC-Urubici-10 and SC-Urubici-15 are located in the municipality of Urubici, at altitudes of around 1,000 meters. In the winter, regular subzero temperatures and frost are commonplace; sometimes it snows. It is easily understandable that the Indians sometimes seek for shelter in the warm and more or less dry tunnels. However, such signs of human presence never have been found inside the palaeovertebrate tunnels in lower and therefore warmer regions. Archaeological discussions about the motifs for the excavation of the tunnels by the Indians list habitation, shelter from the cold, hideout from beasts or from enemies like other Indian groups or even from white Indian killers, a character of the relationship between Indians and European settlers.

The archaeological literature, in conclusion, is a very important database to identify more palaeovertebrate tunnels. The tunnels with lithic material, pottery and rock art have to be considered true archaeological sites. Without any sign of early human presence, however, they should be regarded only as paleontological objects, as ichnofossils.

## 6. ACKNOWLEDGMENTS

We are deeply indebted to the many people that helped us during the investigation of the palaeovertebrate tunnels, especially the landowners Raimundo Wiggers (SC-Urubici-10) and Donizete Willemann (SC-Urubici-15). We also thank the archaeologist Rafael Corteletti for his constructive comments. Research partially funded by Project CNPq 401772/2010-1.

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