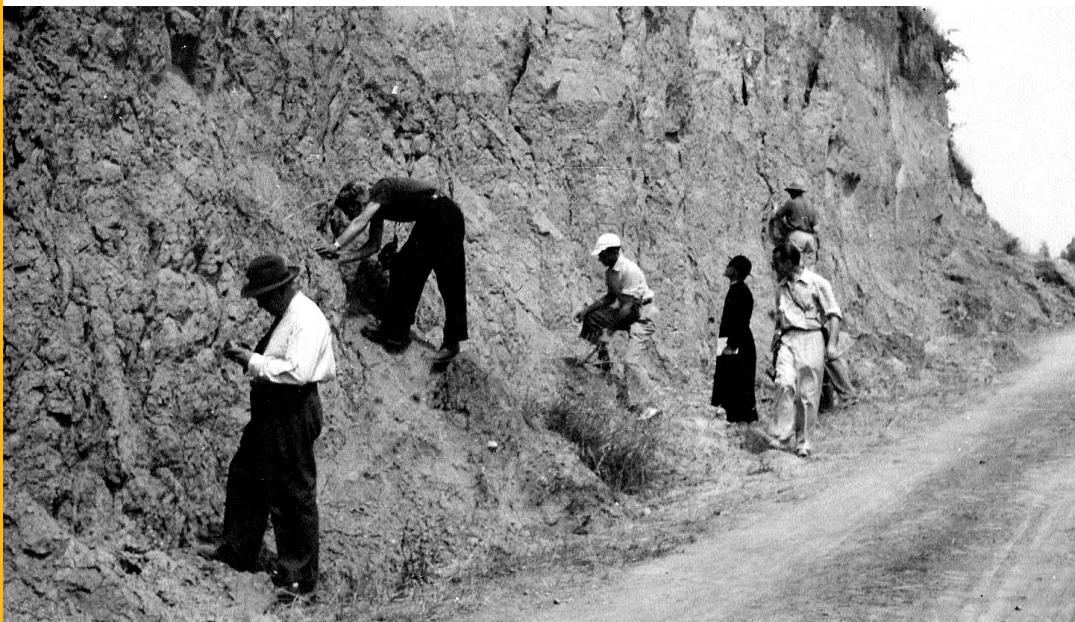


# Paleontologia i evolució

## XXVII Jornadas de la Sociedad Española de Paleontología

Simposios de los proyectos PICG 587 y 596

Sabadell, 5 - 8 de Octubre de 2011



Institut Català de Paleontologia  
Miquel Crusafont

## **PALEONTOLOGIA I EVOLUCIÓ, MEMÒRIA ESPECIAL 5**

### **XXVII JORNADAS DE LA SOCIEDAD ESPAÑOLA DE PALEONTOLOGÍA Y SIMPOSIOS DE LOS PROYECTOS PICG 587 Y 596**

**Sabadell, 5-8 de Octubre de 2011**



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# **XXVII JORNADAS DE LA SOCIEDAD ESPAÑOLA DE PALEONTOLOGÍA Y SIMPOSIOS DE LOS PROYECTOS PICG 587 Y 596**

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## THE ACTION OF CARNIVORES IN THE EARLY PLEISTOCENE VERTEBRATE SITE OF CUEVA VICTORIA (CARTAGENA, MURCIA, SPAIN)

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### Resumen

Cueva Victoria es un yacimiento cárstico muy rico en restos de vertebrados fósiles. Los datos bioestratigráficos y magnetoestratigráficos sitúan su edad en el Pleistoceno Inferior. La presencia de *Homo* y *Theropithecus* en este yacimiento aporta datos para interpretar las vías de migración de los macromamíferos durante el Pleistoceno Inferior. Distintos tipos de evidencias indican que la cueva funcionó como un cubil de hienas, que contribuyeron en gran medida a la acumulación de restos óseos en el yacimiento.

**Palabras clave:** Cueva Victoria, Pleistocene, mamíferos, hienas, tafonomía

### Abstract

Cueva Victoria is a karstic site rich in vertebrate remains. The magnetostratigraphic and biostratigraphic data indicate an Early Pleistocene age. The presence of *Homo* and *Theropithecus* makes Cueva Victoria a key site to understand the migrations routes of macromammals during the Early Pleistocene. As shown by several types of evidence, the cave was used as a den by hyaenas, which contributed to a great extent to the accumulation of bone remains in the site.

**Keywords:** Cueva Victoria, Pleistocene, mammals, hyaenas, taphonomy

## Geological setting

Cueva Victoria is a karstic site with Early Pleistocene vertebrate remains. It is located in the Triassic limestones of the San Ginés de la Jara Hill, near La Unión (Cartagena, Murcia). The cave has more than 3 km of galleries and rooms, some of them more than 100 m long and 20 m high. The upper part of the cavern complex was originally filled up with a breccia rich in fossil content, which was discovered and partially removed during manganese mining exploitation in the first half of the XXth century.

The formation and development of the cave is related to late Neogene hydrothermal processes linked to volcanic activity during the Miocene and Pliocene that produced sulphide mineralizations. In the Pleistocene, the SE part of the cave, including the two large rooms (Sala Unión and Victoria II) and related smaller cavities, became opened to the outside and allochthonous sediment started to enter the cave until it was filled up with the breccia where abundant fossil vertebrate remains are found.

The stratigraphy of the cave infill (Ferrández et al., 1989) shows a lower part of autochthonous red clays (*terra rossa*) that resulted from the dissolution of the Triassic limestones, and a coarsening upward allochthonous infilling of silt, sand and breccia with fossil remains. The breccia is covered by a calcite crust that seals the sedimentary infilling. This upper calcite unit represents a period in which the cave was already filled up with sediment and the percolation of saturated  $\text{CaCO}_3$  waters cemented the upper breccia and generated a capping flowstone of up to 25 cm thick.

The magnetostratigraphic study (Gibert et al., 2006) showed reverse polarity in the upper red clays and throughout the breccia, whereas normal polarity was identified in the upper calcite crust. A possible normal polarity in the lower red clays needs confirmation. The lower half of the upper laminated calcite crust is still reverse but the upper half is normal, indicating that this polarity change occurred during a period of continuous sedimentation. This boundary (R-N) is interpreted using biostratigraphic data (see Gibert et al., 2006) as Early Pleistocene magnetochrons: late Matuyama (R) and Jaramillo (N). Petrographic evidence shows numerous stages of post-infilling manganese-oxide growth, apparently reflecting hydrologic pulses within the cavern

system. These provide an age range of 1.2 to 0.8 Ma for the Mn mineralization in the red clay, breccia, fossils and flowstone. Thus, the breccia and the fossils it contains were deposited and at least partially cemented during the late Matuyama, then covered with calcite flowstone during the early Jaramillo at 1.07 Ma.

## Paleontology

After some initial studies of some fossil remains (Pons-Moyà, 1981a,b, 1985; Pons-Moyà & Moyà-Solà, 1978), the paleontological excavation of the cave was initiated by Josep Gibert in the last eighties. In the last four years (2008-2010) the installation of a scaffold by the Consorcio Sierra Minera and the Ayuntamiento de Cartagena facilitated the systematic excavation of the breccia *in situ*. Due to the mining operations, which included the use of explosives, previous excavations only allowed the study of reworked material and limited *in situ* excavations in available locations or in large fallen down blocks (e.g. the 15 m long ‘Bloque 1’, easy to restore to the original position and equivalent to a *in situ* excavation).

The macrofauna includes diverse canids, felids, ursids, hyaenids, bovids, cervids, equids, rhinocerontids, proboscideans and primates. The paleontological inventory, study and revision of the excavated material are being developed by several specialists. Such studies have yielded some new results: The revision of the squamate reptiles and amphibians has revealed the presence of 6 anurans, 5 lizards and 3 snakes, together with the first occurrences of the toad *Bufo viridis* and the turtle *Testudo hermanni* in the Early Pleistocene of Spain (Blain et al., 2008, 2010; García-Porta, 2001).

Up to 39 species of birds have been recognized (Sánchez Marco, 2004), which contrasts with a very low diversity of insectivores (Furió, in press). A number of new species have been defined with material from Cueva Victoria: a canid, *Cuon rosii* (Pons-Moyà & Moyà-Solà, 1978); a vole, *Allophaiomys chalinei* (Alcalde et al., 1981); a lagomorph, *Oryctolagus giberti* (de Marfà, 2008).

Cueva Victoria has supplied evidences for the presence in Europe during the Early Pleistocene of the African cercopithecid *Theropithecus oswaldi* (Gibert et al., 1995). The last excavations

(2008, 2010) yielded new remains of *Theropithecus* which are under study. Finally, a human phalanx was found in the breccia (Gibert & Pons-Moyà, 1985; Gibert & Pérez-Pérez, 1989; Palmqvist et al., 1995; Gibert et al., 2002). Despite the claims by Martínez-Navarro et al. (2005) on its assignation to *Theropithecus*, its human nature has been confirmed (Gibert et al., 2008). Other possible human remains, such a femur diaphysis (Gibert, 2004), remain questionable. The presence of *Theropithecus* and human remains makes Cueva Victoria a key site to discuss migrations routes out of Africa during the Early Pleistocene (Gibert, 1999, 2004).

### Taphonomy

The skeletal remains from Cueva Victoria are characterized by manganese coatings. All the bones show manganese mineralizations to some degree, from a few spots on the surface to completely stained bones, and with bones with manganese oxide crusts. Manganese oxides are abundant in the cave (they were the object of the mining activity), both as stratabound polimetallic deposits of hydrothermal origin in the Triassic limestones and as nodules and clasts in the sediments. Petrographic evidence shows numerous stages of manganese oxide growth, apparently reflecting hydrologic pulses within the cavern system. Within the fossiliferous breccia manganese oxides were dissolved and precipitated as cement and coatings in the bone surface and cavities and the porosity of the breccia. The different degree in manganese staining of the bones depends on their relative position within the cave rather than on their stratigraphic position.

Most of the skeletal macromammal remains in the breccia were produced by carnivorous activity, as shown by the large amount of bones with carnivorous-type of fracture and teeth marks, and also by the relative abundance of the skeletal parts of the macromammal taxa. Although there are remains of several carnivore taxa, including, *Ursus* and different felid and canid species (Pons-Moyà & Moyà-Solà, 1978; Pons-Moyà, 1981a,b; 1985; Gibert et al. 2006; Madurell-Malapeira et al., 2010), the main carnivorous activity can be related to hyaenas. The presence of *Hyaena* sp. among the fossil remains may account for

some of the accumulation, as porcupines show a well-known bone collecting behavior, although the scarce remains of this genus (two specimens) rules it out as the main agent.

There are different kinds of evidence for the cave being used as a den by the large Pleistocene hyaena *Pachycrocuta brevirostris*. These include:

1) Evidences for the action of carnivores in general and of hyenas in particular, such as the type of fracture of bones, tooth marks, digested bones, and the relative proportion of skeletal parts (Gibert et al., 1993).

2) Evidences for the cave acting as a den, such as the presence of deciduous teeth of *Pachycrocuta*, abundant hyaenid coprolite levels throughout the sedimentary infilling, and the presence of digested bones.

Further evidence of the action of hyaenas using the cave as a den is the occurrence of marine mammal remains in the breccia: an hemimandible and a maxilar of a seal (cf. *Monachus monachus*) and of several small cetacean vertebrae. Recent spotted hyaenas bring large pieces of their preys to the den. The site of Cueva Victoria is nowadays some 3 km away from the coast (Mar Menor). Although the paleogeography of the zone during the Early Pleistocene is not yet clear, the seaside could not be much far away, and recent spotted hyaenas (*Crocuta crocuta*) have territories usually larger than 200 km<sup>2</sup>.

### Conclusions

Cueva Victoria is an important site for understanding the continental Early Pleistocene vertebrate biostratigraphy and paleoecology, as well as the paleobiogeography and migration routes of several taxa. The site was used as a den by the hyaena *Pachycrocuta brevirostris*, which represents the main source for the bone accumulation in the site.

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