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On the track of anthropogenic activity in carnivore dens: Altered combustion structures in Cova del Gegant (NE Iberian Peninsula)

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ABSTRACT

Cova del Gegant (Barcelona, NE Iberian Peninsula) is a Middle Palaeolithic site presenting evidence of carnivore occupations with some sporadic Neanderthal activity. The rapid, fine sedimentation in layer IIIa permitted the preservation of the remains of carnivore activity and an ephemeral combustion area, although lithics are absent. We used a detailed excavation procedure in combination with Fourier transformed infrared spectroscopy, soil micromorphological, zooarchaeological and taphonomical analyses, and coprogenic analysis to evaluate the interactions of humans and carnivores in the same area of the cave.

1. Introduction

The occurrence of carnivore and low-intensity human activity remains is a common feature of the Upper Pleistocene karst deposits of Europe (Brugal and Jaubert, 1991; Diedrich and Žák, 2006; Marchal et al., 2009; Villa et al., 2010; Fourvel et al., 2015). Indeed, the presence of the two accumulative agents in discrete archaeological layers has generated a lively debate concerning human and carnivore cave interactions (Stiner, 1994; Villa et al., 2004), with carnivores using caves as dens or as places for hibernation, whereas hominins might have used the same spaces as temporary (seasonal) habitats. Such co-occurrences are determined by a number of factors, including accessibility, availability of water, location, topography, animals inhabiting the immediate area, and seasonality, which can result in direct hominid–carnivore competition or the simple avoidance of confrontation (Stiner, 1994; Rabinovich et al., 2004; Daujeard and Moncel, 2010). The presence of humans and carnivores in the same site can produce an amalgam of ecofacts and artefacts, forming mixed occupation layers where carnivore and human activities occur alternately and successively. Differentiating human from carnivore activities is a matter that has generated much research (Stiner, 1994; Brugal and Fosse, 2004; Costamagno et al., 2005a; Brugal et al., 2006). Among such studies, Villa et al. (2004) proposed four main types of human–carnivore relations in caves: a) diachronic occupations of humans and carnivores separated by stratigraphic succession; b) primary carnivore activities with high occurrence of human activities, including features such as hearths; c) intensive human occupation with frequentation of non-denning carnivores; and d) denning carnivores with sporadic human visits. Occasionally, the association of human and carnivore remains is the result of post-depositional processes, as in Bois Roche where lithics were washed-in (Villa and Soressi, 2000). Additionally, other accidental events might contribute to the biological record, such as carcasses trapped within shafts or fissures (Moncel et al., 2008).

Identifying human behaviour in these contexts is a key factor in our understanding of subsistence strategies and, so, it is necessary to differentiate the remains resulting from human activities from those resulting from carnivore behaviour. Low sedimentation rates, coarser sediment and the superposition of events complicate the assessment of single events, which means macroscopic stratigraphic studies provide unsatisfactory results when the two agents are each, in part, responsible for the accumulation of the archaeological record (Villa et al., 2010; Moncel and Rivals, 2011). Moreover, different types of occupation can co-occur in a discrete archaeological layer that might be considered a single occupation layer,

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thus giving rise to biased interpretations of subsistence strategies, settlement patterns and occupation duration (Machado et al., 2013). In order to differentiate human from carnivore activities in a single archaeological layer a detailed excavation methodology needs to be adopted including three-dimensional plotting and sampling procedures that employ fine mesh screening. Additionally, the excavation should be conducted using high-resolution analyses based on multi-scale methods in bone taphonomy and microarchaeological techniques (Villa et al., 2010).

Recognizing temporary episodes, such as the use of hearths, is critical for distinguishing the agents responsible for the accumulation of the archaeological record and for identifying unique events (Vaquero, 2008; Rosell et al., 2012; Machado et al., 2013). However, identifying combustion features can be problematic: for instance, only small amounts of burnt bones have been recovered from carnivore dens in the absence of in situ hearths (Stiner, 1994; Valente, 2004; Beauval et al., 2005; Davis et al., 2007; Sanz, 2013) and charcoal fragments are often recovered in analogous circumstances (Théry-Parisot et al., 2008). The absence of hearth remains in some contexts may suggest that the presence of charcoal and burnt bones in these deposits is related to the accidental input of wildfires or of anthropogenic burning by-products from outside the cave (Théry-Parisot et al., 2008). Therefore, the only reliable evidence of the use of fire in an archaeological site is the in situ preservation of burning by-products such as ashes and charcoal, and the presence of in situ heat-altered sediments produced by combustion activities (Shahack-Gross et al., 1997; Weiner et al., 1998; Berna et al., 2012; Mentzer, 2014).

The preservation of combustion remains in caves can be affected by severe post-depositional and diagenetic processes, ranging from chemical alteration to bioturbation produced by humans or carnivores, that can complicate the identification of in situ combustion structures (Shahack-Gross et al., 2004; Stiner, 2005; Dibble et al., 2009; Karkanas, 2010; Mallol et al., 2010; Weiner, 2010; Camarós et al., 2013). To date, the best way to identify these structures is to adopt a geoarchaeological approach combining taphonomical analysis with the identification of authigenic minerals derived from ash material (Karkanas et al., 2000; Mallol et al., 2007, 2010; Mentzer, 2014).

The Cova del Gegant site (Barcelona, NE Iberian Peninsula) is an Upper Pleistocene site that presents clear diagnostic features that can be used to examine human and carnivore cave interactions. The first evidence of hearths at this site was recently recorded during the fieldwork seasons conducted between 2010 and 2013, in layers IIIa, XXIV and IV, where several combustion areas were observed. The fine sedimentation in the inner part of the main gallery (GP2) in combination with rapid burial and the existence of remains from both human and carnivore activity allowed occupation and settlement patterns to be evaluated. Here, we used detailed excavation procedures together with soil micromorphology and Fourier transform infrared spectroscopy (FTIR) techniques, in combination with zooarchaeological and taphonomic analyses to study these human and carnivore activities. This study was conducted on layer IIIa, where carnivore activity has been identified in conjunction with anthropogenic fire remnants and burned bones, though no human associated materials (e.g., lithics or anthropogenic marks on bones) have been found.

2. Cova del Gegant

2.1. Site description

The Cova del Gegant (Sitges, Barcelona) is a Middle Palaeolithic site located on the seaward edge of the Garraf massif, some 40 km south of Barcelona (1°46′27.33″E, 41°13′24.75″N). The cave is currently accessible both from the sea and through a natural vertical shaft. It consists of a principal chamber (GP), partially flooded and eroded by coastal erosion, and an inner part (GP2 and GLT), the sedimentation in which was the focus of our current fieldwork. Two galleries, an interior one (GL2) and one nearer the sea (GL1), branch off from the right-hand side of GP (Fig. 1).

At least eight site formation episodes, comprising various stratigraphic layers, from the Upper Pleistocene (Episodes 0–3) to the Holocene (Episodes 4–7), alternating between continental sediment deposition and periods of marine erosion followed by the accumulation of beach deposits, have been recognized in the Cova del Gegant sequence (Daura et al., 2010). This framework allows for a correlation to be made between the Upper Pleistocene deposits of GL1 and GP2 in the cave, spanning from 49.4 ± 1.8 ka to 60.0 ± 3.9 ka. The Upper Pleistocene episodes are composed mainly from the remains of carnivore activity and sporadic human activities.

The publication of two Neanderthal specimens from previous fieldwork (Daura et al., 2005; Rodríguez et al., 2011) has resulted in renewed interest in the cave. Additionally, two Neanderthal fossils have been recovered in stratigraphic context (layer V), at the base of this sequence (GP2) (Quam et al., 2015). Faunal remains, a few stone tools and a large number of coprolites originate from these units, pointing to both Neanderthal and carnivore occupations (Sanz, 2013). The archaeological remains discussed in this study come from layer IIIa of GP2.

2.2. Layer IIIa-EC3

Layer IIIa corresponds to Episode 3a (Fig. 1). It is subjacent to layer II and is located on the inner part of the main gallery (GP2) and is formed by light reddish brown (Munsell colour: 5YR 6/4) sandy silt containing faunal remains and charcoal (Daura et al., 2010). The layer is 10- to 20-cm thick and is located at 100–120 cm below the datum. To the south the layer is eroded by sea action. A combustion structure was identified during fieldwork in squares G25 and H25 and labelled as EC3. The structure lies on top of layer IIIa and is covered by layer II. Towards the south, the marginal edge of the combustion structure lies between layers II and XXIV. EC3 was formed by a ≤1 cm succession from bottom to top of reddened, black, and grey/white coloured sediment. Only the red layer provides some horizontal continuity, while the black, white and grey sediments are distributed in interconnected patches (Fig. 2). The structure was affected by crosscuttings of rodent burrows and two storage pits (Fig. 2). The compactness of the structure, in part caused by the compression of sediments, prevented the determination of the original morphology. The maximum diameter observed is 120 × 80 cm. However, the overall size of the structure is unknown, and is expected to continue into the other, as yet unexcavated, grid squares. No fauna and lithics are directly associated with the structure. In addition to structure EC3, a concentration of charcoal was documented in the same layer in squares G23 and G24 together with a single burnt bone (Fig. 3). No evidence of layering or heat-altered sediments was detected in this case.

The archaeological record in layer IIIa is formed primarily from faunal remains, coprolites and charcoal. No lithics have been recovered from this layer. The palaeoenvironmental reconstruction of the landscape for this layer, based on small-vertebrate assemblage, indicates drier, colder conditions with open dry meadows and a marked reduction in woodland species (López-García et al., 2012).

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