



## Not so deserted...paleoecology and human subsistence in Central Iberia (Guadalajara, Spain) around the Last Glacial Maximum



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### ABSTRACT

In contrast to the coastal areas of the Iberian Peninsula, the Upper Palaeolithic settlement of central Iberia, dominated by the Spanish plateau, is poorly known. Traditional models assume a total or virtual depopulation of the interior of the Iberian Peninsula during the Last Glacial. In this paper we present a detailed investigation of human–environment interactions through the first zooarchaeological, taphonomic and isotopic study of the key site of Peña Capón, a rock shelter located in the south-eastern foothills of the Central System range that contains a multi-layered deposit dated to marine isotope stage 2 (MIS 2). Analyses of the faunal assemblages of the Proto-Solutrean (3) and Middle Solutrean (2) layers show that human preferentially hunted horse, deer and Iberian ibex living in the vicinity of the rock shelter. Isotope geochemistry of the animal remains of Peña Capón provides us with the first detailed intra-tooth multi-proxy analysis for this time period in south-western Europe, providing estimates of climatic conditions, seasonal fluctuation of diet, as well as patterns of seasonal mobility. Our results indicate that human presence at Peña Capón was apparently restricted to relatively warm intervals around the LGM or reflects the presence of an ecological refuge, and provide us with evidence of recurrent human presence in the Iberian interior during the Upper Paleolithic prior to the Magdalenian.

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### 1. Introduction

The Iberian Peninsula, located at the southwestern edge of Europe, is generally considered to have been a glacial refugium during the Pleistocene. Together with the Italian and Balkan peninsulas, Iberia is thought to have hosted animals, plants and humans moving from the northern latitudes during periods of peak

glaciation (Straus et al., 2000; Finlayson et al., 2006; Stewart and Stringer, 2012). This would explain the relatively large number of archaeological and paleontological sites throughout the Iberian Peninsula, from the Lower Pleistocene (Carbonell et al., 2008a, 2008b; Toro et al., 2009), the Middle Pleistocene (Santonja and Villa, 1990; Arsuaga et al., 1997; Carbonell et al., 1999; Fernández-Peris, 2007) to the Late Pleistocene (Vega et al., 1999; Straus et al., 2000). A significant number of Upper Palaeolithic sites in the Iberian Peninsula are located along the Cantabrian (Straus, 1992, 2015a; Fano, 2007; Fortea et al., 2010) and Mediterranean coastlines (Davidson, 1989; Cortés-Sánchez, 1996; Bicho et al., 2007, 2010; Fullola et al., 2010; Mangado et al., 2010; Villaverde et al.,

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2010) and Atlantic regions (Bicho et al., 2007, 2010). In the interior of Iberia, which is dominated by a large upland plateau (the *Meseta*) bisected by the Central System range, Lower and Middle Palaeolithic sites are fairly common (Santonja and Pérez-González, 2000–2001; Vega et al., 1999; Panera and Rubio, 2000; Yravedra and Cobo, 2015) but the Upper Paleolithic record is poorly documented.

The paucity of sites in the center of the Peninsula could be due to a real absence of human occupation, to a lack of research effort (Cacho et al., 2010; Alcaraz-Castaño et al., 2013) or to the difficulties of locating open-air sites (Alcaraz-Castaño, 2015). In any case, this paucity has been the traditional basis for proposing a total or partial depopulation of the Spanish plateau during most of the Upper Palaeolithic until the Tardiglacial (Breuil and Obermaier, 1913; Sauvet and Sauvet, 1983; Davidson, 1986; Straus, 1991; Corchón, 1997; Straus et al., 2000; Vaquero, 2006). Causes for this purported gap in the record of human occupation that have been proposed include harsh environmental and climatic conditions of the Iberian interior, in contrast to the coastal areas of the peninsula (Finlayson, 2004; Schmidt et al., 2012; Bradtmöller et al., 2012). Although palaeoecological archives and data for MIS 2 in the Iberian interior are scarce (Ruiz-Zapata et al., 2010; Vegas et al., 2010; Martínez-Pillado et al., 2014; Alcaraz-Castaño et al., in press), recent geomorphological studies of the Central System have emphasized the harsh climatic conditions that would have prevailed during the late Pleniglacial (Palacios et al., 2012; Carrasco et al., 2013; Pedraza et al., 2013; Dominguez-Villar et al., 2015). Paleoclimate simulations also suggest that climate variability in central Iberia was relatively high, creating a high risk environment for human populations during the Last Glacial Maximum (LGM) (Burke et al., 2014).

Magdalenian occupations in the Iberian interior suggest that at least some inner territories were occupied by humans, even during cold and dry episodes of MIS 2, including the LGM, suggesting that the Upper Palaeolithic settlement of interior Iberia was not limited to the warmer phases of the Tardiglacial, as proposed by the classic models, (Davidson, 1986; Straus, 1991; Corchón, 1997; Straus et al., 2000; Vaquero, 2006). However, despite recent developments, data on the settlement of interior Iberia during MIS 2 are still scarce and too problematic to allow us to build models of human–environment interactions in the region. While technological and even symbolic information have increased significantly in recent years, chronometric, economic and ecological data are virtually absent from the record (see Alcaraz-Castaño et al., in press). This is not only because most of the sites in areas such as the Madrid basin were excavated in the first half of the 20th century (see Santonja et al., 2011), and hence lack data suitable for modern paleoecological analyses, but also because faunal remains and other biomarkers are very scarce in their assemblages.

In a recent article studying the settlement of Central Iberia around the LGM, Alcaraz-Castaño (2015) highlights recent work in this region, while pointing out the necessity of obtaining more evidence before proposing solid interpretations of human–environment interactions and population dynamics during the Late Pleniglacial in inland Iberia. Alcaraz-Castaño (2015) proposed a number of hypothetical questions that can be addressed using existing data, namely: 1) were the Solutrean occupations of Central Iberia related to relatively favorable episodes within the otherwise harsh conditions of the LGM 2) Were they favored by the existence of ecological refugia? Or 3) do they just reflect the adaptability of Upper Palaeolithic hunter-gatherers to harsh environments?

In this paper we discuss the above questions by means of zooarchaeological, taphonomic and stable isotope analyses of the faunal assemblages of the Peña Capón rock shelter (Upper Tagus basin, Spain). Peña Capón is currently the only location in Central

Iberia which has yielded faunal remains associated to lithic products during several episodes of MIS 2, and therefore is of paramount importance for studying human subsistence strategies, ecological conditions and human–environment interactions more generally for this period. This study represents the first exhaustive analysis of this faunal material, and the first detailed intra-tooth multi-proxy isotopic analysis of faunal remains for this period in southwestern Europe.

## 2. Peña Capón rock shelter

Peña Capón is a northwest-oriented rock shelter located in the northern part of the Spanish Southern Meseta. The rockshelter is part of a limestone formation close to the southeastern foothills of the Central System range. Situated at an altitude of 861 m above sea level, the site lies within the Upper Tagus basin (Sorbe valley, Guadalajara province) (Fig. 1). The site was discovered and excavated in 1970 by a team directed by J. Martínez Santa-Olalla, but the results were never published. It was only in the late 1990's that the archaeological assemblages, diaries and photos from the excavation were gathered and analyzed in a preliminary paper on the site by Alcolea et al. (1997a). Recently, a more detailed study of the lithic and faunal remains, including the radiocarbon dates for several bone samples, was conducted (Fig. 2); so far only data from the Proto-Solutrean layer (3) have been thoroughly published (Alcaraz-Castaño et al., 2012a, 2013).

According to existing data, the archaeological deposit of Peña Capón comprises, from top to bottom (Fig. 2), a surface level (1) containing mixed Magdalenian and Upper Solutrean materials, which includes shouldered points, a Middle Solutrean level (2) characterised by laurel leaf points, a Proto-Solutrean level (3) with Vale Comprido points, and a level containing non-diagnostic lithic products produced mostly in quartz, from which a date in the range of known dates for the Gravettian (i.e.  $25.4 \pm 0.3$  ka cal BP) was obtained (4). Radiocarbon dates and diagnostic lithic artifacts from each layer are shown in Fig. 2 (see also Alcolea et al., 1997a; Alcaraz-Castaño et al., 2013; Alcaraz-Castaño, 2015).

The material analyzed here comes from the assemblages collected during the 1970 excavation. This excavation was stratigraphically controlled and thus the provenance of lithic and bone materials is considered secure. However, work conducted in 1970 did not include geomorphological, sedimentological or palaeoecological analyses, and hence these data are currently lacking. Furthermore, current methods of recording and screening were not used and it is very likely that small lithic and bone remains were lost in the course of excavation (Alcolea et al., 1997b; Alcaraz-Castaño et al., 2013). The rock shelter still preserves archaeological deposits, however it is currently under water (a reservoir was constructed in 1982) and is only accessible in very dry years. Thus, new archaeological excavations at the site have not been possible until very recently.

Nevertheless, Peña Capón is relevant for both the understanding of the human settlement of Central Iberia and the reconstruction of ecological and climatic conditions during MIS 2.

## 3. Material and methods

All available faunal remains from level 2 (Middle Solutrean) and level 3 (Proto-Solutrean) from Peña Capón have been analyzed from a zooarchaeological and taphonomic perspective, corresponding to  $N = 306$  and  $N = 564$  bones, respectively (Table 1). Isotopic analyses have been conducted on a total of six ungulate dental remains from layer 2 and 3, corresponding to three teeth in each layer.

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