Journal of Archaeological Science 37 (2010) 2947–2957

Contents lists available at ScienceDirect

Journal of Archaeological Science

journal homepage: http://www.elsevier.com/locate/jas

Phytolith evidence for hearths and beds in the late Mousterian occupations of Esquilleu cave (Cantabria, Spain)

Dan Cabanes [a,*], Carolina Mallol [b], Isabel Expósito [c], Javier Baena [d]

[a] Kimmel Center for Archaeological Research, Dpt. of Structural Biology, Weizmann Institute of Science, Rehovot 76100, Israel (GEPEG)
[b] Universidad de La Laguna, Departamento de Prehistoria, Antropología e Historia Antigua, Campus de Guajara, La Laguna 38071, Tenerife, Spain
[c] IPHES (Institut Català de Paleoecologia Humana i Evolució Social), Àrea de Prehistoria, Universitat Rovira i Virgili, 43005 Tarragona, Spain
[d] Universidad Autónoma de Madrid, Departamento de Prehistoria y Arqueología, Campus de Cantoblanco, 28049 Madrid, Spain

ARTICLE INFO

Article history:
Received 30 May 2010
Received in revised form
7 July 2010
Accepted 9 July 2010

Keywords:
Phytoliths
FTIR
Site formation processes
Bedding
Hearths

ABSTRACT

Esquilleu cave site has provided a moderately well preserved archaeological cave deposit from the Late Pleistocene in the Cantabrian area. Phytolith quantification, identification and determination of the refractive index have been carried out, together with FTIR analyses, from sediment samples collected in the profile. The comparison of the data obtained with the previous micromorphological results allows us to make inferences about the site formation processes and the Neanderthals use of the cave. Phytolith results show the presence of grass leaves nearby the hearth suggesting the repetitive existence of a bedding zone on the same area. Neanderthal behavioral patterns should be revised on the light of high resolution analyses, since diagenetic processes can obscure the existence of differentiated activity areas in the site.

1. Introduction

The Middle to Upper Paleolithic transition in Western Europe has been one of the most debated issues in prehistory (Duarte et al., 1999; Green et al., 2010; Mellars, 2004, 2005, 2006; Mellars et al., 2007; Roebroeks, 2008; Shipman, 2008; Straus, 2005; Stringer, 2002; Walker et al., 2008; Zilhao, 1997, 1998; Zilhao et al., 2010, and references therein). Replacement, continuity, interbreeding, acculturation and cultural convergence are terms frequently used to explain a process that took thousands of years. Although there are different hypotheses to explain this transition, implying both, socio-cultural and environmental factors, the fact is that the information we have about the behavior of the last Neanderthals or the earliest Anatomically Modern Humans is insufficient to evaluate the nature and implications of their social interaction.

The study of human behavior in prehistory aims at an understanding of the technological skills, subsistence strategies and organizational patterns of prehistoric populations. Technological skills include not only tool-making but also other skills such as fire management. Subsistence strategies include the acquisition and management of both plants and animals, and organizational patterns comprise the distribution and use of a living space in which different activities were carried out.

Different studies of prehistoric sites from the Middle East and Europe have demonstrated that phytolith analysis is a suitable tool to investigate fuel management, plant exploitation and the spatial organization of Neanderthal (Albert et al., 1999; Albert et al., 2000; Albert et al., 2003; Albert and Weiner, 2001; Cabanes et al., 2007; Henry et al., 2004; Karkanas et al., 2002; Madella et al., 2002)

Recent geoarchaeological investigations at Esquilleu cave site have provided an example of a well preserved Late Pleistocene cave deposit containing a rich phytolith assemblage associated with abundant archaeological remains (Mallol et al., 2010). The chronology of the site corresponds to the Middle Paleolithic to Upper Paleolithic transition in Cantabrian Spain. This chronology, the site's location (Fig. 1), and the rich phytolith assemblage make Esquilleu a key site to explore the use of plants by the last Neanderthals of Northern Spain.

This paper follows up on the previous micromorphology and FTIR results (Mallol et al., 2010) focusing on the analysis of the phytolith assemblage. Our aims are: 1) to identify possible agents responsible for the phytolith accumulation (anthropogenic versus natural agents); 2) to determine the preservation state and integrity of the phytolith record using the mineralogical composition of the samples; 3) and to understand the implications of the information obtained on the phytolith assemblage in terms of hominid behavioral patterns and plant use.

* Corresponding author.
E-mail address: dan.cabanes@weizmann.ac.il (D. Cabanes).

0305-4403/$ – see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.jas.2010.07.010

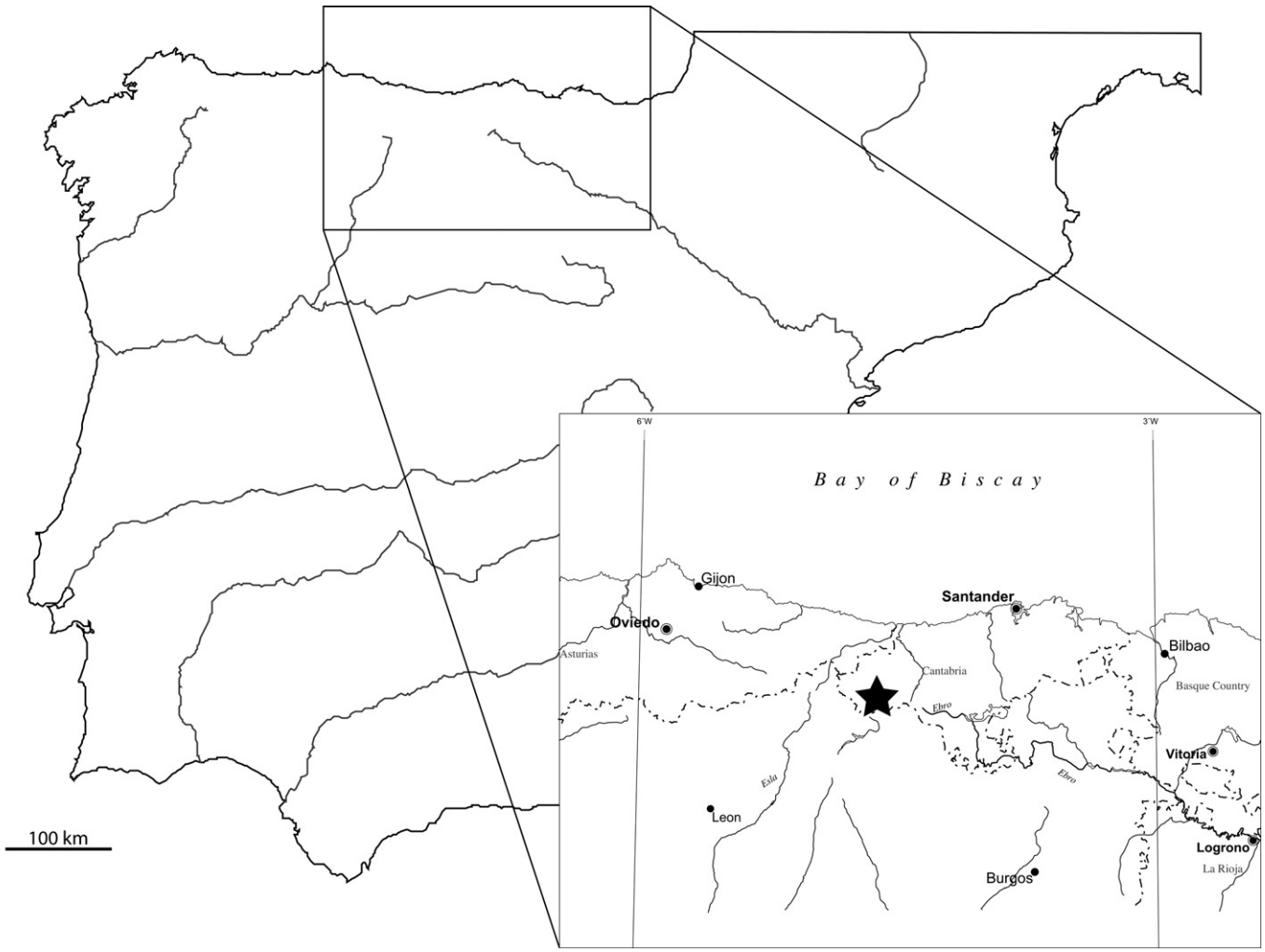

Fig. 1. Map showing the location of the site.

1.1. The Esquilleu cave

Pilot excavations at Esquilleu took place between 1997 and 2006. Two trenches and a test pit exposed a 4.20 m-deep stratigraphic sequence divided into four sedimentary units, A–D, and subdivided into 41 layers (Jordá Pardo et al., 2008). FTIR and micromorphological data pointed to a good preservation of unit B with weak to moderate diagenesis in units C and D (Mallol et al., 2010). Diagenesis in units C and D was defined by the presence of dahllite (carbonated hydroxylapatite), the existence of reaction rims on limestone fragments and the presence of weathering crusts, especially in unit D. Although core soundings indicated that there are at least nine additional meters of sedimentation, the lowermost layers were archaeologically sterile. The bottom portion of the deposit (unit D) comprised massive clayey sediment with strongly altered limestone clasts (Mallol et al., 2010).

The Esquilleu sequence has been dated with ^{14}C AMS and TL. ^{14}C AMS dates range from 58–48 Ky Cal BP (layer C18) to 41–37 Ky Cal BP (layer B6). TL dates were obtained from burned sediment from layer 21, yielding dates of 51–53 Ky Cal BP (Baena et al., 2005). Further information and a detailed description of the stratigraphy can be found in Jordá Pardo et al. (2008). New samples from the upper layers have put 5 and B4 dates between 31 and 28 Ky Cal BP, and increased the layer 3 formation span from 24 to 3.7 Ky Cal BP.

Lithic artifacts recovered from the overall sequence were technologically homogenous and they have been associated to the late Mousterian, exhibiting patterns of Quina reduction alternating with Levallois and discoidal reduction. In addition, microblades and bladelets obtained from unipolar prismatic cores have been recovered in some of the excavated levels but always as a secondary technological schema (Baena et al., 2005).

The faunal assemblage was dominated by goat (80% of the sample), but also chamois and deer were present. Carnivore impact was absent in the middle units and increased in the uppermost part of the sequence (Baena et al., 2005). It must be noted that in the layers 21 and 23 the bone remains exhibited a high degree of fragmentation, and some of them were evidently burned. This has been interpreted as use of bone as fuel (Baena et al., 2005, Yravedra et al., 2005).

The highest concentration of archaeological remains has been recovered from the middle part of the sequence. This unit comprised a series of bedded dark gray layers of fine-grained sediment. They were almost 1 m thick, and have been previously interpreted as an ash accumulation (Jordá Pardo et al., 2008). More detailed microstratigraphic analyses showed a succession of secondary anthropogenic combustion structures comprising thick accumulations of reworked wood ash, burnt bones and artifacts overlain by horizontal laminae exclusively composed of phytoliths in anatomical connection (Fig. 2) (Mallol et al., 2010).