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Macrobotanical evidence (wood charcoal and seeds) from the Middle Palaeolithic site of El Salt, Eastern Iberia: Palaeoenvironmental data and plant resources catchment areas

Paloma Vidal-Matutano[a,b,*], Guillem Pérez-Jordà[c], Cristo M. Hernández[d], Bertila Galván[d]

[a] PREMEDOC Research Group, Universitat de València, Departament de Prehistòria, Arqueologia i Història Antiga, Blasco Ibáñez 28, 46010 València, Spain
[b] Université Côte-d'Azur CEPAM, CNRS, France
[c] IJCI - 2015-25082. GI Arqueobiología, Instituto de Historia, CCHS-CSIC, Albasanz 26-28, 28037 Madrid, Spain
[d] U.D.I. de Prehistoria, Arqueología e Historia Antigua, Facultad de Geografía e Historia, Universidad de La Laguna, Campus de Guajara, 38071 La Laguna, Santa Cruz de Tenerife, Spain

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ABSTRACT

Despite the current growing number of studies that focus on macrobotanical remains from Middle Palaeolithic contexts, plant use among hunter-gatherer societies remains unknown in many regions of Europe. Large-scale flotation of archaeological sediments has made it possible to recover a large amount of plant remains (fruits, seeds and wood) from units VIII, IX, Xa and Xb at El Salt, Eastern Iberia (49.2–52.3 ka BP). The combination of anthracological and carpological analyses has provided a more accurate picture of the Middle Palaeolithic landscape in the Serpis valley, as well as significant information about other possible uses of plants, not only as fuel, but for woodworking or food, for instance. A minimum of twenty different taxa have been identified among the plant remains. Charcoal analysis suggested that firewood was gathered from nearby sources (< 1 km), with a predominance of black-scots pine woodlands (*Pinus nigra-sylvestris*) and maples (*Acer* sp.). The carpological data reveal the use of some woody taxa not documented in the anthracological record (*Taxus baccata* or yew) and the presence of few mineralised seeds whose origin remains unknown (*Celtis australis* or hackberry, *Rubus* cf. *laciniatus* or evergreen blackberry). These data have significant implications for the interpretation of plant economy among Neanderthal groups, reinforcing the importance of available woody resources in the surroundings for the subsistence of the group.

1. Introduction

The study of the subsistence practices of hunter-gatherer societies has traditionally focused on hunting, leaving the role of the plants unknown (Haws, 2004; Aura et al., 2005; Pryor et al., 2013; Bigga et al., 2015). This is partly due to taphonomic problems and those regarding the preservation of organic remains, in addition to the lack of recovered plant remains based on the assumption that they are only preserved in exceptional conditions (Madella et al., 2002; Badal et al., 2012b; Pryor et al., 2013; Martínez and Badal, 2018). In recent decades, the increasing application of systematic recovery methods by flotation of sediments has made it possible to perform more studies that focus on macrobotanical remains from Palaeolithic and Mesolithic contexts (Uzquiano, 1992; Théry-Parisot et al., 1996; Gale and Carruthers, 2000; Goren-Inbar et al., 2002; Théry-Parisot, 2002; Aura et al., 2005; Arsuaga et al., 2012; Badal et al., 2012a; Uzquiano et al., 2012; Monteiro, 2013; Vidal-Matutano et al., 2015; Alcolea, 2016; Allué et al., 2016; Henry and Boboeuf, 2016; Vidal-Matutano, 2017; Badal and Martínez, 2017; Martínez and Badal, 2018; Vidal-Matutano et al., 2017a). More recently, the introduction of new archaeobotanical disciplines has led to the development of methodological advances in order to obtain essential information about different uses of plants, other than for fuel, among hunter-gatherer groups (Hardy and Garufi, 1998; Richards et al., 2000; Dominguez-Rodrigo et al., 2001; Madella et al., 2002; Albert, 2010; Cabanes et al., 2010; Hardy and Moncel, 2011; Henry et al., 2011; Albert et al., 2012; Hardy et al., 2012; Sistiaga et al., 2014; Rodríguez-Cintas and Cabanes, 2015; Estalrrich et al., 2017). In Iberia, although anthracological analyses in Middle Palaeolithic contexts are becoming increasingly frequent (Gale and Carruthers, 2000; Finlayson et al., 2008; Arsuaga et al., 2012; Badal et al., 2012a; Uzquiano et al., 2012; Vidal-Matutano et al., 2015; Allué et al., 2016; Vidal-Matutano, 2017; Zilhão et al., 2016; Vidal-Matutano

* Corresponding author at: PREMEDOC Research Group, Universitat de València, Departament de Prehistòria, Arqueologia i Història Antiga, Blasco Ibáñez 28, 46010 València, Spain.
E-mail address: paloma.vidal@uv.es (P. Vidal-Matutano).

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et al., 2017a, 2017b), there are still gaps that must be studied (Vidal-Matutano, 2016). In addition to this, few carpological remains have been recovered and identified in these chronologies where the only known assemblages from the Iberian Peninsula to date are the pine kernels from Gorham's Cave and Vanguard Cave (Gale and Carruthers, 2000; Metcalf, 1964) or the mineralised *Celtis* seeds from Cueva del Niño (García Moreno et al., 2014), fact possibly related to a lack of sampling.

In this paper we present the results of the analysis of macrobotanical remains recovered from units VIII, IX, Xa and Xb at El Salt, Eastern Iberia (49.2–52.3 ka BP). The main objective is to provide information about the use of plant resources during MIS 3 human occupations at El Salt, a Middle Palaeolithic site which has yielded significant information that contributes to a deeper knowledge of Neanderthal behaviour based on a multidisciplinary approach (Galván et al., 2014a). On the one hand, analysing fuel remains could shed light both on the local landscape that would have existed in the Serpis valley at that time and the areas that could have provided firewood resources. On the other hand, it is important to analyse the carpological remains that have been recovered in order to complement palaeoecological and palaeoeconomic data, as their presence may or may not be linked to the use of fuel.

2. Regional setting and excavation method

The site of El Salt is an open-air rock shelter located at 680 m a.s.l. in the mountainous region of Alicante, Eastern Iberia (Fig. 1). The Middle Palaeolithic sequence is represented by eight stratigraphic units dating between 60.7 ± 8.9 and 45.2 ± 3.4 ka BP (Galván et al., 2014b). A 38-metre high Palaeocene limestone wall formed at a thrust fault and covered with tufa and travertine gave refuge to the space occupied by humans at the bottom of the wall, which would have covered almost the entire excavated surface at times of maximum development. This deposit has been systematically excavated since 1986 with an integrated multidisciplinary approach based on obtaining a higher temporal resolution of analysis related to Neanderthal behaviour (Mallol et al., 2013b, 2013a; Galván et al., 2014b, 2014a; Garralda et al., 2014; Sistiaga et al., 2014; Machado and Pérez, 2016; Rodríguez-Cintas and Cabanes, 2015; Machado et al., 2016; Vidal-Matutano, 2017; Vidal-Matutano et al., 2017a). The stratigraphic sequence consists of a dense palimpsest originating from recurrent human occupations, during which several activities were carried out. These activities correspond to the generic model of “hearth-related assemblages” (Vaquero and Pastó, 2001), i.e. superimposed flat combustion features of various sizes (0.20–1 m diameter) associated with rich archaeological assemblages including faunal remains, lithic objects, limestone pebbles with use-wear and wood-charcoal fragments. Excavation of subunit Xb has led to the identification of an initial division of the palimpsest deposit into several fine-grained analytical units called archaeosedimentary facies associations (henceforth, AFA). These units correspond to the highest possible temporal resolution achievable within the studied context (Machado and Pérez, 2016; Machado et al., 2016).

2.1. Current climatic and plant formations data

The climate in the study area is determined by the topography. Rainfall is high compared with the local environment, with values close to 500 mm per year and reaching 800 mm at the highest points (Serra Mariola or Font Roja) (López Gómez and Rosselló Verger, 1978). Alcoy, where both sites are located, is currently framed in the mesomediterranean bioclimatic belt with mean annual temperature or MAT = 14.5 °C and a dry ombroclimate (mean annual precipitation or MAP = 479 mm) (Rivas-Martinez, 1987).

Nowadays the Aleppo pine (*Pinus halepensis*) is the predominant woody taxa in the region, followed by evergreen oaks (*Quercus coccifera, Quercus rotundifolia*) and legumes (*Ulex parviflorus, Genista scorpius*), terebinth (*Pistacia terebinthus*), mastic (*Pistacia lentiscus*), Mediterranean buckthorn (*Rhamnus alaternus*), blackthorn (*Prunus spinosa*), hawthorn (*Crataegus monogyna*) and elmleaf blackberry (*Rubus ulmifolius*). In the riverbank areas, poplar trees (*Populus alba*) and elms (*Ulmus minor*) are frequent. The presence of a mixed relict forest of Eurosiberian plant formations in the nearby mountain range of Font Roja should be pointed out, where taxa such as deciduous oaks (*Quercus faginea, Quercus pubescens*), ash (*Fraxinus ornus*), maple (*Acer opalus* subsp. *granatense*), whitebeam (*Sorbus aria* and *Sorbus torminalis*) and yew (*Taxus baccata*) are present (Costa et al., 2005; Serra Laliga and Soler, 2011). Evidence of relict formations of yew are also present in the higher altitude areas of Serra Mariola mountain range (Gualda Gómez, 1988; Costa et al., 2005).

3. Materials and methods

3.1. Sampling method

During the archaeological field seasons carried out between 2000 and 2012 all the sediment excavated from units VIII, IX and Xa was

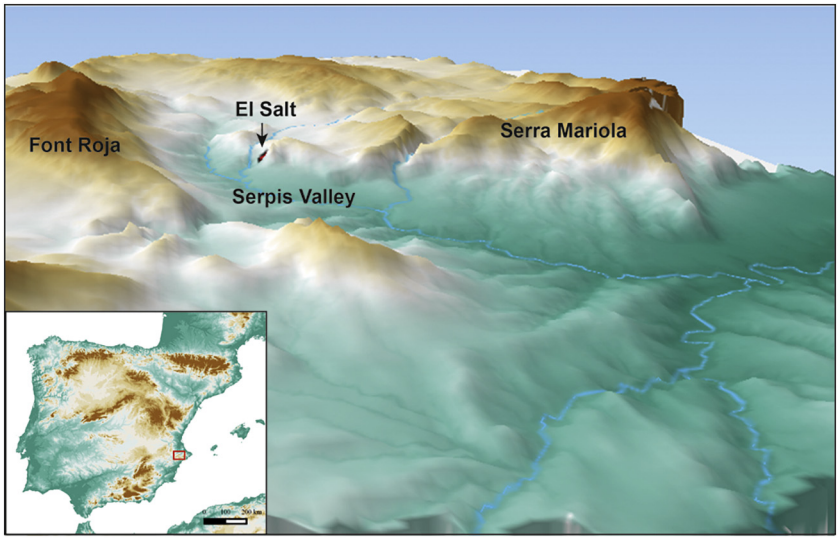

Fig. 1. Geographic location of the Middle Palaeolithic site of El Salt in the Iberian Peninsula and the Prebaetic System. The 3D map shows the Serpis valley and the mountain ranges of Font Roja and Mariola.