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Selection of firewood in northern Iberia: Archaeobotanical data from three archaeological sites

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ABSTRACT

This paper presents the combined results of archaeobotanical studies, of both macro-remains (carbonised wood, seeds and fruit) and micro-remains (pollen, spores and non-pollen microfossils), at three sites in Sierra de Cantabria (Basque Country, northern Iberian Peninsula): Peña Larga, Peña Parda and San Cristóbal, dated from the early Neolithic to the Bronze Age (5500–900 cal BC). The main results show that, despite the abundance of deciduous trees, the taxa used as fuel included both deciduous species (deciduous *Quercus*, *Corylus avellana* and birch) and conifers, mainly *Taxus baccata*. Yew (*Taxus baccata*) was the wood most used in the Neolithic, but its importance declines in the Chalcolithic and it disappears in the final occupation phases at the rock-shelters, in the Bronze Age. Instead, the use of deciduous *Quercus* increases.

1. Introduction

In the current methodological framework of archaeological studies in Europe, the application of botanical analysis (anthracology, carpology, palynology, phytoliths, starch grains, etc.) is a common practice to determine the palaeovegetation and its evolution in connection with anthropic activities. However, few studies have combined and developed interaction between these botanical disciplines, either in Iberia or in the rest of Europe (Leroyer and Heinz, 1992; Emery-Barbier and Thiebault, 2005; Peña-Chocarro et al., 2005; Newman et al., 2007; Iriarte et al., 2007/2008; Delhon et al., 2009; Allevato et al., 2010; Carrión et al., 2010; Nelle et al., 2010; Burjachs et al., 2012; Pérez-Díaz et al., 2015).

The integration of the results obtained by different archaeobotanical disciplines, in this case anthracology, carpology and palynology, offer interesting possibilities in palaeoenvironmental research. Although in principle they contribute different information, they are complementary. The study of charcoal found in archaeological deposits mainly provides two types of data: i) the composition of the local woodland around the sites, and ii) the preferences in the choice and use of firewood by the human groups. Both aspects are important to interpret the results reached in an anthracological study, with the final objective focusing on such points as ecological reconstruction or the selection patterns guiding human behaviour (Smart and Hoffman, 1988; Heinz, 1990; Shackleton and Prins, 1992; Badal et al., 1994; Thompson, 1994; Chabal, 1997; Théry-Parisot, 2002; Asouti and Austin, 2005; Théry-Parisot et al., 2010, among others). Palynology, which studies both pollen and non-pollen palynomorphs, is of vital importance to reconstruct vegetation history at local or regional scales. However, it is not only an instrument of palaeoenvironmental reconstruction but also contributes towards identifying evidence of anthropisation, such as anthropic deforestation and agrarian and husbandry practices (López-Sáez et al., 2003). In the case of seeds and fruits, they provide information about agrarian practices, crops, domestication of wild plants, the processing and transformation of foodstuffs, harvesting and the exploitation of the landscape (Zapata and Peña-Chocarro, 2013). Consequently, the best way to study changes in the vegetation at a particular site is by comparing the results of the different archaeobotanical records.

The anthracological, carpological and palynological records at the rock-shelters of Peña Larga, Peña Parda and San Cristóbal (Sierra de Cantabria, northern Iberian Peninsula) are here contrasted for a more reliable picture of the composition and evolution of the

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† In the process of writing of this paper we have lost one of its authors. Lydia Zapata was a brilliant researcher, but shone more as a friend.

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vegetation from the early Neolithic to the Bronze Age, anthropic impact and subsistence. Finally, these records are cross-checked to assess their joint possibilities in palaeoenvironmental reconstruction of the Sierra de Cantabria.

In recent decades, archaeological researchers have paid particular attention to the northern sector of the Middle Ebro Valley, where an intensive programme of archaeological fieldwork has been undertaken. In this sense, the development of multidisciplinary research projects has favoured new archaeobotanical studies in this area.

2. Geographical setting

The study area is Sierra de Cantabria, in the south of the Basque Country (northern Iberian Peninsula) (Fig. 1). It is a relatively small area, but with great scenic variety, located between the Bay of Biscay (to the north), the River Ebro basin (to the south), the Pyrenees (to the east) and the Cantabrian Mountains (to the west). In this region, mountain ranges form a series of East-West barriers, parallel to the coast, which progressively restrict the arrival of Atlantic flora in a North-South direction, as well as creating particular refugia for Mediterranean flora in relatively protected coastal areas.

Sierra de Cantabria is the southernmost barrier, with a very complex geological structure. Calcareous rocks predominate, particularly hard limestone. Conglomerates usually contain calcareous cement and, like the limestone, they bear basophilic vegetation. Siliceous substrates are less extensive and mainly consist of sandstone (González and Serrano, 1995; Aseguinolaza et al., 1996; González et al., 1998).

This barrier restricts Atlantic influences towards the south. From a climatic point of view, this area belongs to the Mediterranean biogeographical region, in a transition zone between Atlantic and Mediterranean climates. In this montane environment, the temperatures are lower than in surrounding areas and precipitation more copious, with a relative seasonal decline (Ollero et al., 1996). Mists are common throughout the year and in winter the peaks are affected by severe frosts and snow for several months (Aseguinolaza et al., 1996; Ollero et al., 1996).

The rugged nature of the relief has restricted human impact to a moderate level. Forestry has scarcely affected the formations of natural woodland. The dominance of *Fagus sylvatica* begins above about 800 m a.s.l. and reaches the summits. The types of beechwoods in the area, related directly with the relief and the lithology, are: calcicolous beechwood with *Buxus sempervirens* on steep slopes with limestone outcrops and very thin soils; slopes with mobile soils or flat areas with deep humiferous soils develop eutrophic beechwood; while acidophilic beechwoods form on siliceous substrates with steep slopes. Scrub forming on calcareous soils consists of dense formations dominated by *Buxus sempervirens*, with high heaths (*Erica scoparia*) in siliceous terrain with quite fresh rich soils. As well as beechwoods, other formations are favoured by human action, such as the pinewoods (*Pinus sylvestris*). Pyrenean oak (*Quercus pyrenaica*) grows on south-facing slopes with a siliceous substrate and loose sandy soils. *Betula celtiberica* is a pioneer species in areas with sandstone outcrops and places affected by burning. Small enclaves of *Quercus robur* are found on the lower edge of the beech, while *Quercus faginea* covers areas of sun or shade, and the *Quercus faginea*–*Buxus sempervirens* formation is widespread in the whole area. In the west, *Pinus sylvestris* is spontaneous and forms copses amidst the domain of *Quercus faginea*. *Quercus ilex* subsp. *rotundifolia* is, in these mountains, found in areas with the driest air and soils, with calcicolous montane *Quercus ilex* and *Buxus sempervirens* the most common formation in those areas. Two main types of scrub replace it; *Buxus sempervirens* and calcicolous pre-heath. Vegetation associated with the bedrock develops on the high limestone escarpments (Aseginolaza et al., 1996).

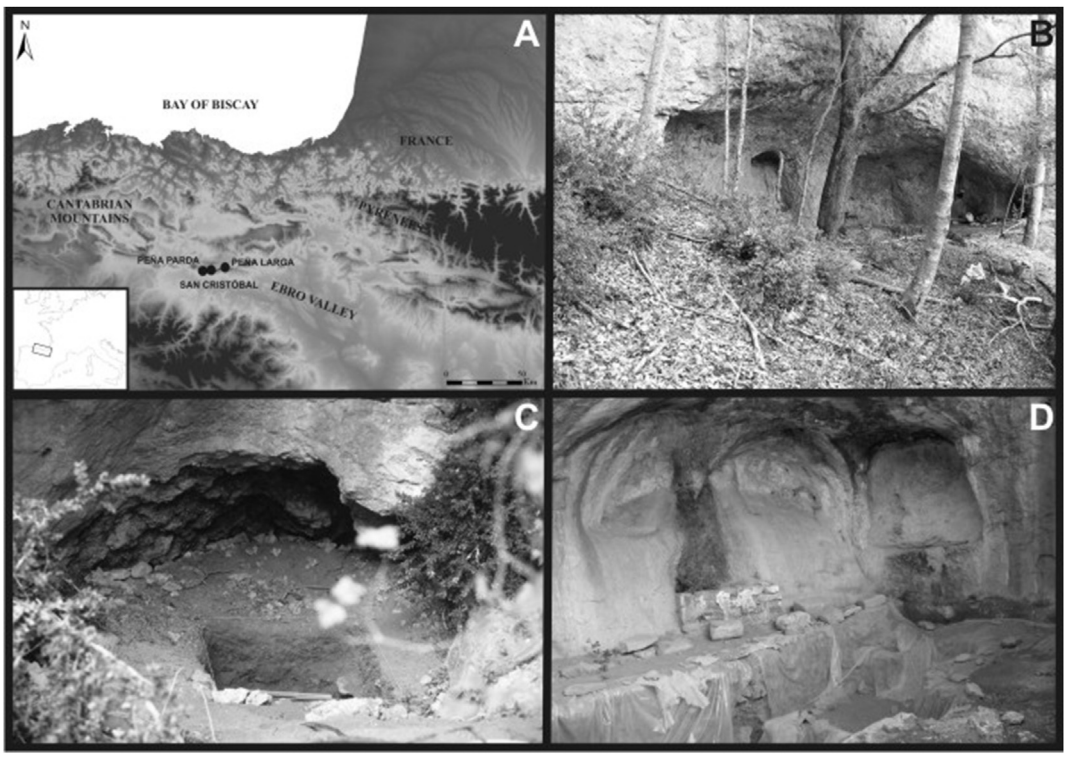

Fig. 1. A: Study area. B: Peña Larga. C: Peña Parda. D: San Cristóbal.

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