



# Landscape dynamics and human impact on high-mountain woodlands in the western Spanish Central System during the last three millennia



José Antonio López-Sáez<sup>a,\*</sup>, Daniel Abel-Schaad<sup>a</sup>, Sandra Robles-López<sup>a</sup>, Sebastián Pérez-Díaz<sup>a</sup>, Francisca Alba-Sánchez<sup>b</sup>, Diego Nieto-Lugilde<sup>b</sup>

<sup>a</sup> G.I. Arqueobiología, Instituto de Historia (CCHS), C.S.I.C., Albasanz 26-28, 28037 Madrid, Spain

<sup>b</sup> Departamento de Botánica, Facultad de Ciencias, Universidad de Granada, 18071 Granada, Spain

## ARTICLE INFO

### Article history:

Received 17 May 2016

Received in revised form 27 July 2016

Accepted 27 July 2016

Available online xxxx

### Keywords:

Pollen analysis

Forest clearance

Anthropogenic dynamics

Late Holocene

Gredos range

Central Iberia

## ABSTRACT

A multi-proxy palaeoenvironmental study (pollen, non-pollen palynomorphs, charcoal particles) of a mire, located in the western Spanish Central System (Gredos range), was undertaken to trace historic human activities related to woodland clearance and past land-uses at high altitudes during the last three millennia. The results of this study constrained by 4 AMS radiocarbon measurements are combined with archaeological data and compared with similar research carried out at the same altitude in mountains of central Iberia. The pollen data indicate that high-mountain areas were dominated by birch and pine woodlands until c. 2350 years. From this date on a strong forest decline is recorded during the Late Iron Age and a deeper one c. 1500 years ago in the Visigothic period, which may be related to increasing grazing activities and/or the occurrence of anthropogenic fires. Cereals and faba beans were cultivated in the surrounding valley since c. 2900 cal BP, while chestnut, walnut and olive tree are documented mainly from the Roman period onwards.

© 2016 Elsevier Ltd. All rights reserved.

## 1. Introduction

Since 2014, an integrated palaeoenvironmental and archaeological research program has been developed in the Spanish Central System using sedimentary records preserved in bogs and archaeological sites, with the aim of studying the long-term landscape shaping and the socio-ecological history of this high-mountain environment. Its main focus was on understanding human exploitation of natural resources and its environmental consequences (López-Sáez et al., 2014; Blanco-González et al., 2015). The current landscape of this territory is characterized by a remarkable variability, closely related to a pronounced spatial heterogeneity in terms of geomorphology and vegetation. Palaeoenvironmental data obtained from palynological analyses and megafossil evidences, excavations and radiocarbon dating suggest that such landscape variability would be also the expression of different land-use patterns developed over time (Rubiales et al., 2012; López-Sáez et al., 2014; Rubiales and Génova, 2015).

First evidences of human impact in the whole of this massif are recorded c. 5000 cal BP in lowlands, with traces of agriculture in the Gredos and Guadarrama ranges, although grazing activities were likely

developed much earlier in highlands (Fabián et al., 2006; López-Sáez et al., 2014). Subsequently, the use of fire, livestock grazing and cropping during the Late Holocene have been increasingly recognized as key drivers in the formation of present cultural landscapes (Balée, 2006; Pausas and Keeley, 2009; Mercuri et al., 2010; Walsh, 2014). An overall decline of forests during the Late Holocene has been reported in most of the previous studies conducted in the Spanish Central System, with distinct patterns according to each range (Génova et al., 2009; López-Sáez et al., 2014). Pine forests would have dominated on high-mountain landscapes during the Early-Middle Holocene in the Gredos range (Rubiales et al., 2012), with a greater presence of birch westward, specifically in the Béjar range (Abel-Schaad and López-Sáez, 2013). Currently, both of them are found on isolated stands with an uncertain future (Abel-Schaad et al., 2014b).

Long-term multi-proxy studies have been conducted in mountainous regions of central Spain (e.g., Peñalba et al., 1997; Franco-Múgica et al., 1998; Gil-García et al., 2002; López-Merino et al., 2008; Blanco-González and López-Sáez, 2013; López-Sáez et al., 2014). However, very few multidisciplinary approaches have been applied to the western Spanish Central System area (Abel-Schaad et al., 2009b; Abel-Schaad and López-Sáez, 2013; Morales-Molino et al., 2013; Silva-Sánchez et al., 2016), especially in terms of elucidating the organization and development of historical societies and their impact on high-mountain environments. In the whole of the Spanish Central System, palaeoenvironmental research related to the anthropic dynamics during the last three thousand years, has focused mainly on i) mining activities

\* Corresponding author.

E-mail addresses: [joseantonio.lopez@cchs.csic.es](mailto:joseantonio.lopez@cchs.csic.es) (J.A. López-Sáez), [dabel222@hotmail.com](mailto:dabel222@hotmail.com) (D. Abel-Schaad), [sandra.robles@cchs.csic.es](mailto:sandra.robles@cchs.csic.es) (S. Robles-López), [sebastian.perez@cchs.csic.es](mailto:sebastian.perez@cchs.csic.es) (S. Pérez-Díaz), [falba@ugr.es](mailto:falba@ugr.es) (F. Alba-Sánchez), [dinilu@ugr.es](mailto:dinilu@ugr.es) (D. Nieto-Lugilde).

in the Late Iron Age and Roman times and pinewoods deforestation probably due to the use of timber for construction or as fuel (Franco-Múgica et al., 1998, 2001; Ruiz-Zapata et al., 2006; Abel-Schaad and López-Sáez, 2013; Morales-Molino et al., 2013); ii) the impact of grazing activities and fire events on high-mountain birch and pine forests through mountain passes of the medieval transhumance (Franco-Múgica et al., 1997; Dorado et al., 2001; Abel-Schaad et al., 2009a,b; López-Merino et al., 2009; López-Sáez et al., 2009b, 2016a; Rubiales et al., 2007, 2012; Silva-Sánchez et al., 2016); iii) agricultural practices (faba bean, rye and other cereals) on both uplands and lowlands (Currás et al., 2012; Abel-Schaad and López-Sáez, 2013); iv) selective exploitation of different resources on Maritime pine (*Pinus pinaster*) and chestnut tree (*Castanea sativa*) forests (López-Sáez et al., 1996, 2010b, 2016b; Abel-Schaad et al., 2014a); and, finally, v) settlement patterns against climate variability (López-Sáez and Blanco-González, 2005; Blanco-González et al., 2009; López-Sáez et al., 2009a; Blanco-González and López-Sáez, 2013).

Former multiproxy palaeoenvironmental studies have indeed proved to be useful to characterize land-use variability in high-mountain environments at a regional scale. Nevertheless, the micro-regional scale within a single valley remains a largely unexplored research field (Ejarque et al., 2010). This is especially remarkable in the Spanish Central System regarding rough, wild and isolated landscapes, far from pre-historical archaeological sites, Roman *villae* or mining areas, rural and pastoral medieval settlements, where no data are known.

We present a record of the last c. 3000 years of landscape change through the pollen study of a peat core sampled in El Redondo (Cáceres, Spain; Fig. 1), a mire located in an isolated and remote area in the western Gredos range (Jerte valley). In order to redress this research gap and develop a complete picture of the complexity of human impacts on rugged and isolated high-mountain landscapes, we synthesize these new pollen data with other studies performed on the Spanish Central System. The specific aims of this study were i) to identify different human activities, ii) to evaluate the strategies followed on the resources at different cultural periods, and iii) to describe the high-mountain landscape response to human disturbances on a microregional scale.

## 2. Study area

The Gredos range is located at the western sector of the Spanish Central System, showing the highest altitudes (>2000 m a.s.l.) of the whole of this massif, which separates the basins of the Douro and Tagus rivers. This range is a chain of sunken and elevated blocks of granitic and metamorphic lithology, separated by intramontane valleys or troughs which have traditionally acted as natural corridors and the more suitable location for permanent settlements. The Jerte valley, declared of cultural interest since 1973, follows a NE-SW orientation and is characterized by a rough relief and a pronounced altitudinal range from 400 to 2405 m a.s.l. (Pedraza, 1994). Given its location in the southern slopes of the western Gredos range, the climate of the region is distinctively

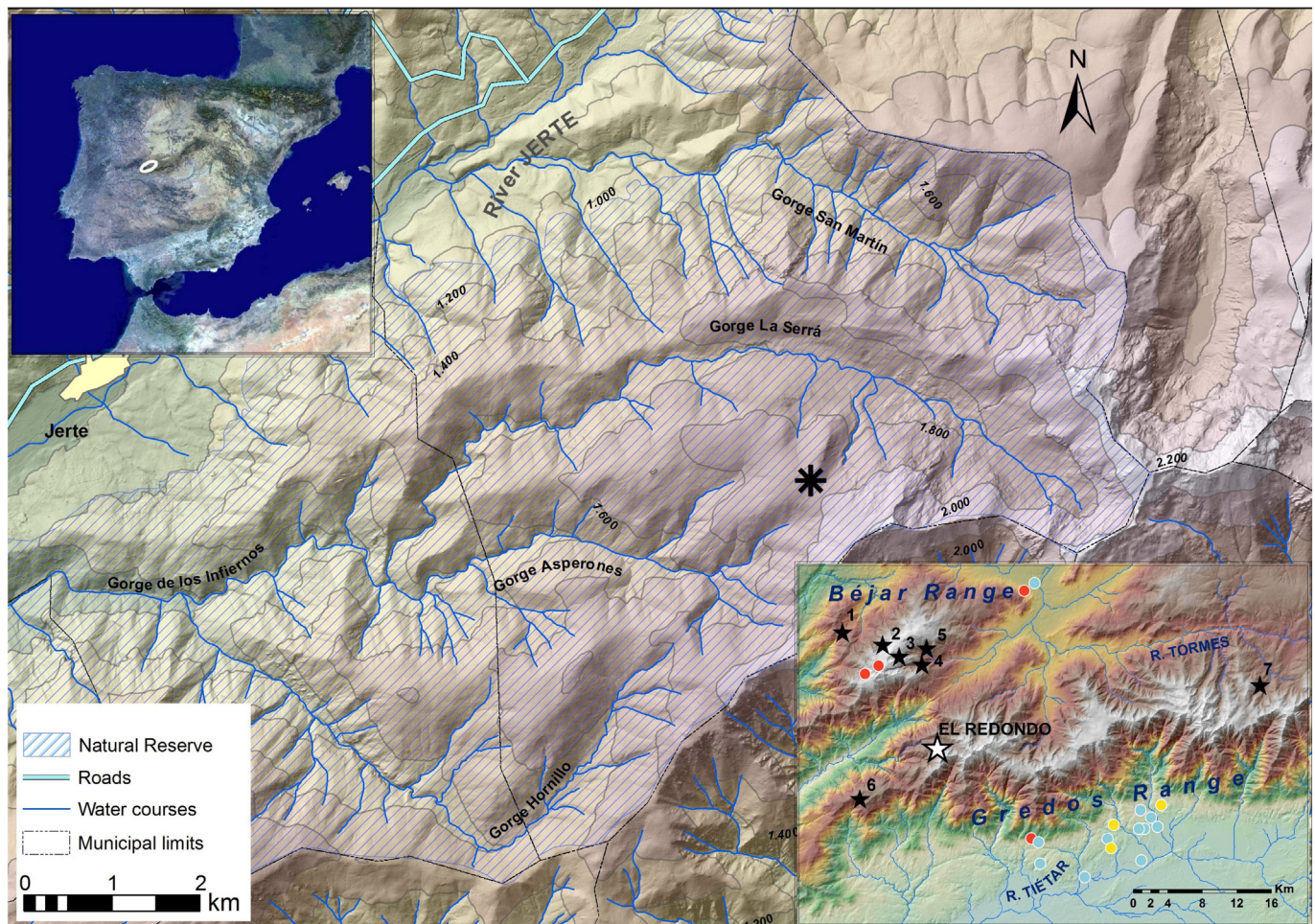


Fig. 1. Location of the study site (black star) in the western Gredos range (Spanish Central System). Pollen records cited in the text are shown in the lower right corner: 1, Peña Negra; 2, Navamuiño; 3, Cuerpo de Hombre; 4, Presa del Duque; 5, El Trampal; 6, La Panera; 7, Hoyos del Espino. Late Bronze Age (red circles), Early Iron Age (blue circle) and Late Iron Age (yellow circles) sites. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Download English Version:

<https://daneshyari.com/en/article/7445379>

Download Persian Version:

<https://daneshyari.com/article/7445379>

[Daneshyari.com](https://daneshyari.com)