Vegetation and firewood uses in the western Catalan plain from Neolithic to the Middle Age

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Summary: *In this study is presented the synthesis of the results of the anthracological analysis in the western Catalan plain from the Neolithic to the Middle Ages. The data is evaluated in order to provide a preliminary approximation on the development of vegetation and forest exploitation.*

Key words: *western Catalan plain, forest exploitation, vegetation, synthesis, human activity.*

INTRODUCTION

The western Catalan plain is located in NE Iberian Peninsula. This plain has been a densely populated territory since prehistoric times. The exploitation of forest resources in recent millennia has meant an important modification of vegetation and landscape. To characterize this exploitation since the beginning of agricultural production is of much importance to infer the relationship of the people who inhabited the plain with their environment.

The forest history is the result of environmental variables but also the interaction between people and their environment. The main objective in this study is to assess the evolution of the western plain's forests, in relation to human societies.

DATA AND RESULTS

Charcoal studies from the area, which have a long tradition, started in 1988. To date, materials from 18 archaeological sites (Fig. 1) of various periods and regions have been analyzed (Ros, 1994-1996, 1995a, 1995b; Piqué, 1998; Martín-Seijo and Piqué, 2008). However, such studies did not follow a predetermined order within the framework of a specific project.

The reason of this study is the lack of a synthesis that encompasses all these anthracological results and offers the evolution of the landscape in the plain from Neolithic until the Middle Ages. The data from all these previous studies were collected (Vila, 2010). This is a considerable volume of remains, with a total of 13,893 charcoal fragments from 455 samples. In order to make a regional synthesis from anthracological data and interpret the results in a palaeoenvironmental sense, there are several problems. One should keep in mind that the social activity that has generated the charcoals and the postdepositional processes have been specific to each site and may be the cause of the observed variability, especially in quantitative terms (Piqué, 1998: 7). On the other hand, the differences in the size of the analyzed samples for each site and the methods of recovery of the remains may have also influenced the results. If this aspect is kept in mind when developing their interpretation, it may offer some surprising results.

The data processing focuses, on the one hand, in the analysis of diversity (number of consumed taxa), the analysis of ubiquity (recurrence of use from the number of stratigraphic units in which the use of a taxon is documented) and the analysis of intensity of uses (from the number of remains, or frequencies per taxon). On the other hand, the continuity and the change in the most representative taxa are evaluated. We consider as representative taxa those which have provided more than one hundred pieces of charcoal. The objective is to determine the woods with economical value for each period and evaluate the causes of the differences observed throughout time. With the obtained results, we can see that the forest landscape of the Western Catalan plain from the Neolithic to the Middle Age presents a shifting panorama, always directly related to its social management.

With the adoption of agriculture, from the Neolithic/Chalcolithic periods, increasingly effective tools (stone axes, adzes, etc.) are made that allow more sophisticated logging activities. Due to the lack of data from previous periods we cannot affirm that those performances affected the vegetation cover. Still, we can document the most important taxa in the economic sphere. The best represented taxa and the ones that show a higher ubiquity are deciduous *Quercus* (oak) and evergreen *Quercus* (holm oak). Both are clear temperate climate indicators.

In the following period (Middle Bronze Age, 2700-1650 cal BC), with the emergence of large and scattered villages, we can see a different landscape use. The dominant species are now two kinds of trees, *Pinus halepensis* (white pine), evergreen *Quercus* (holm oak), and two shrubs, *Pistacia lentiscus* (mastic tree) and *Arbutus unedo* (strawberry tree). In this case, those tree and shrub species are the evidence of a dry climate. One should also keep in mind that the appearance of shrubs is an indicator of deforestation. However, the shrubs are important in the maquis

formations, which occupy part of the Mediterranean coastal lowlands and the interior today.

These people from the Middle Bronze Age constitute the elementary substrate on which, in the middle of the second millennium BC, an emergence of new cultural, economic, and social attitudes takes place that will characterize the Segre-Cinca-Group (GSC) (1650-1250 to 1000-800/750 cal BC). In the three substrates that form GSC: GSC I (1650-1250 cal BC), GSC II (1250-1000 cal BC) and GSC III (1000-800/750 cal BC) (Alonso *et al*., 1999), a change in the use of resources can be observed. While in the GSC I the predominant taxa are resistant to dry climate (*Pinus halepensis, Pistacia lentiscus, Rosmarinus officinalis*), in the GSC II *Pinus halepensis* stands out above all the species. On the opposite, in the GSC III we can observe the predominance of a shrub, *Pistacia lentiscus*, followed by evergreen *Quercus*, *Pinus halepensis* and *Rosmarinus officinalis*. The population growth and its effect in relation to a possible deforestation could be the cause of these changes.

During the early Iron Age we can see an increase of the consumption of evergreen *Quercus* and deciduous *Quercus*. This change in the consumed taxa may relate to the existence of a more temperate climate. The increasing importance of other low shrubs of dry weather is also attested. This shift has been suggested by Gutiérrez and Peña (1992: 119), who state that at this time there is a trend towards a cooler and wetter climate, and assumes a progressive increase in the percentage of vegetation cover. Notwithstanding this, the data do not allow a clear verification of this change, mainly because of the scarcity of available data. We must not overlook other issues that could affect the final results, such as a possible change in the catchment areas due to fuel resources extinction in the areas that were closer to the settlements.

In the Iberian era the use of woods of higher quality such as evergreen oak and deciduous *Quercus* is attested again. But with the Romanization a radical change takes place, suddenly using a wide range of taxa. This is caused by the large deforestation that occurred everywhere during the Roman occupation, which probably meant a still greater enlargement of the catchment area of forest resources. The most notable event of the Middle Ages is the large increase in the number of taxa, possibly because of the lack of wood of the best quality in the surroundings of the settlements. Improved means of transport would allow a greater movement of wood.

The plant landscape evolution of the Western Catalan plain and its uses display the Mediterranean character of most of the preferentially used taxa throughout the history in this area. The increasingly intensive exploitation of the forest shows a clear deforestation, a fact that forced the societies of the time to look for wood in more distant areas, to collect increasingly larger numbers of tree and shrub species, and economize their use.

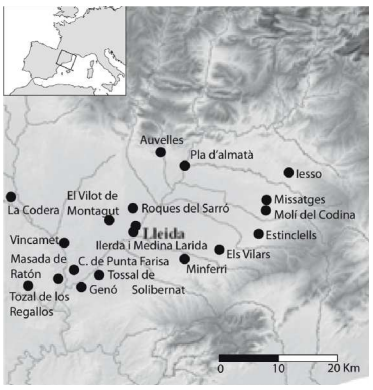

FIGURE 1. Map of the northeast of the Iberian Peninsula. Location of the 18 archaeological sites under study.

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