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# Woodland transformation under palaeogeographic constraints and fuelwood use on a coastal lagoon during the Antiquity, according to charcoal analysis (The Prés-Bas *villa* and Le Bourbou, Loupian, Hérault)

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**Summary:** Charcoal remains from the villa of Prés-Bas and the pottery workshop of Le Bourbou reveal that, during Antiquity, the mixed oak woodland and the alluvial plain vegetation were both exploited for fuelwood. Based on local ecology, these results illustrate the long term opposition between the northern and the southern shores of the Thau lagoon.

**Key words:** Roman villa, Antiquity, palaeobotany, coastal environment, effects of human activities.

## INTRODUCTION

The margins of the Thau lagoon, occupied since the early Neolithic, provide abundant archaeological, palaeobotanical and palaeogeographic information. Our palaeoenvironmental study is based on charcoal analysis carried out at the roman *villa* of Prés-Bas. Long term coastal morphological evolution and vegetation history are used as reference to distinguish the role of physical conditions and human incentive.

## A PROSPEROUS GALLO-ROMAN VILLA

The *villa* of Prés-Bas (Loupian, Hérault) located in the Narbonnaise, 1.2 km away from the lagoon of Thau, was occupied from 50 BC to 600 AD. Built first as a modest farm it was later transformed into a rich patrician domain with *thermae*. The cellar, with a capacity of 1500 hl bears witness to an economy based on viticulture. The amphorae for the *villa* were produced by the lagoon in the port and pottery workshop of Le Bourbou, active between 50 and 425 AD. During the 5th century the *villa* was transformed into a magnificent residence with mosaic floors (Bermond and Pellecuer, 1997).

## CHARCOAL SAMPLING AND RESULTS

Charcoal was sampled from the domestic deposits of the *villa*, the *praefurnium* and the pottery kilns by dry sieving (4 mm mesh), to ensure the reliability of data, their palaeoenvironmental representativity and the correct identification and interpretation of the area targeted for wood collecting (Chabal, 1997). Charcoal analysis provided a large plant spectrum with 33 species, at least. The study of 4600 charcoal fragments from domestic residues sampled in the *villa* (Fig. 1), shows that *Quercus ilex* dominated woodland during all

the occupation. The abundance of *Olea europaea* and the presence of *Vitis vinifera* and *Juglans regia* are particularly noted. *Cupressus*, probably introduced in France and rarely identified during the Antiquity, is present. Data from the *praefurnium* (300/375 AD) also reveal the use of diverse species (9 taxa/540 charcoal fragments). *Quercus* (deciduous), *Quercus coccifera/ilex* and *Ulmus* predominate; their frequencies vary slightly according to the 8 sampling areas. The potters from the Bourbou (3500 charcoal fragments) used 23 species, at least; fragments of *Quercus coccifera/ilex* and associated species predominate. Wood calibre and humidity seem important factors to take into account for this activity, while the species used seems to be of no consequence (Chabal, 2001).

## DISCUSSION AND CONCLUSIONS

*Quercus coccifera/ilex* (certainly the holm oak) and associated species are the main components of fuelwood used both in the *villa* and in the pottery kilns. The wood supply must have been a well organised activity. Based on the species identified (cultivated species and plants from the alluvial plain) it appears reasonable to think that the supply area must have included the very near proximity. Inside the *villa*, differences between the domestic spaces and the *praefurnium* are observed and must be explained. Intentional choice appears as an unlikely explanation, as the three main species identified in the *praefurnium* are hardwoods, with similar behavior during combustion. Moreover, deciduous *Quercus* and *Ulmus* could have been the dominant species of the ancient woodlands situated close to the northern shore of the lagoon. At present, *Ulmus* and *Fraxinus* still survive further west, as residual groves on alluvial soils. Therefore, our hypothesis is that the differences observed may reflect different supply areas. Coppices of holm oak, providing

most of the fuelwood, could have been exploited on the hills behind the *villa*, beyond the cultivated areas, and even further away. A more reduced area of ancient woodland could have provided a separate provision of fuelwood for the *prae-furnium*. Can we guess why? This mixed or alluvial woodland, older than the oak coppices, could have provided wood of larger calibre, more appropriate for the slow and continuous heating of the hypocaust.

The ecological connotation of this interpretation is supported by our knowledge of the long term transformations of the coastline. Some studies highlight the complex palaeogeographic evolution of the littoral area during the Holocene (Court-Picon *et al.*, 2010). Abundant organic remains (wood, charcoal, seeds and fruits) have been recovered from the Late Bronze Age dwellings built on the shores of the lagoon, when the sea level was -2m asl. On the southern shore, the majority of the agrarian activities and wood cutting took place in the xero-thermophilous areas of the 'lido' and Mont St-Clair. On the northern shore, two contrasting habitats are noticed: the alluvial/mesophilous areas, with deciduous *Quercus*, *Ulmus*, *Fraxinus*, *Juglans* and the drier areas colonised by *Quercus ilex* (Bouby *et al.*, 1999; Chabal *et al.*, 2010).

During the Antiquity, sea level was *ca.* 1.5 m higher. In the northern shore, the alluvial plain may have been partially submerged. The mesophilous forest may also have been cleared for agriculture during the Iron Age. Then, oak dominated areas may have become the main available woodlands. In mixed woodland, the exploitation of wood would quickly favour *Quercus ilex* over *Quercus pubescens* (Chabal, 1997). People living in the *villa* exploited the drier areas of the low hills, as well as the more humid areas/older stands. This was complemented by a more opportunistic supply (pruning of cultivated trees). Our perception of local woodlands based on fuel used during the Antiquity is in conformity with the ecology characterising the northern shore of the lagoon; it also reflects the differences noted since the Bronze Age, taking into account the rise of sea level.

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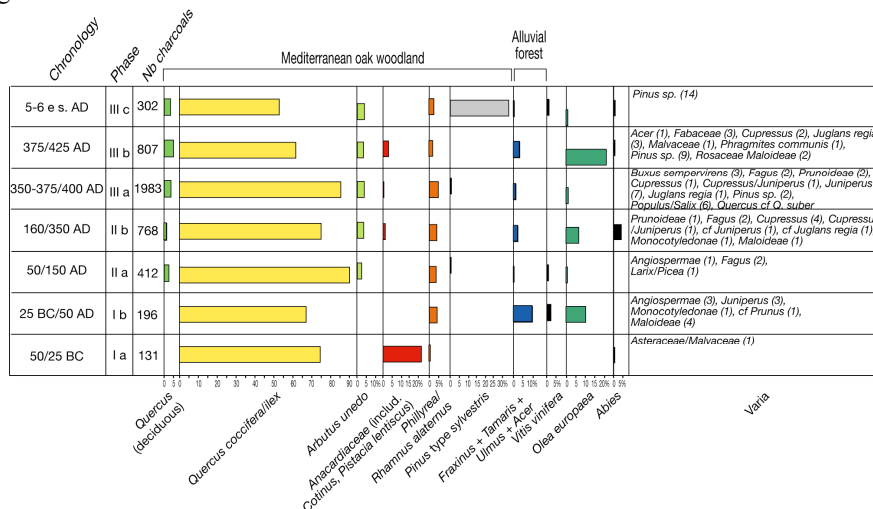


FIGURE 1. Charcoal analysis diagram of the villa of Prés-Bas (Loupian, Hérault).