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Crop production and plant consumption on coastal Languedoc (France) in the Second Iron Age: new data from Pech Maho (Aude), *Lattara* (Hérault) and Le Cailar (Gard)

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Abstract

Archaeological and archaeobotanical research in coastal Languedoc (southern France) has been strongly developed for the last 30 years and concerns several major sites to understand not only the role of local crop productions but also exchanges with many Mediterranean societies. As regards to the Iron Age period, recent excavations and studies have provided new information to the knowledge of the agricultural systems and plant consumption practices during the 6th-4th centuries BC. They highlight a well-structured crop production based on cereals and pulses together with an increasing development of fruit growing, especially grapevine. During the 3rd and 2nd centuries BC one can observe the appearance of changes announcing the new Roman trends. The main aim of this article is therefore to discuss about these Second Iron Age periods focusing on both economic and cultural aspects through their comparison. For this, we present new archaeobotanical data (seed and fruit analysis) concerning three archaeological sites (Pech Maho, *Lattara* and Le Cailar) sharing many environmental, economical and cultural characteristics.

Keywords

Archaeobotany; Seed and fruit remains; Agriculture; Plant food; Second Iron Age; Southern France

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Introduction

Iron Age archaeobotanical studies based on seeds and fruit remains have been developed in Languedoc (southern France) since the second half of the 20th century (e.g. Erroux 1966, 1980 and 1984; Erroux and Courtin 1974; Marinval 1988a and b, 2000 and 2004; Ruas 1989; Ruas and Marinval 1991; Buxó 1992, 1997 and 1999; Bouby *et al.* 1999; Bouby 2000 and 2014; Alonso *et al.* 2007 and 2008; Alonso and Rovira 2010 and 2016; Rovira and Alonso 2010; Pinaud-Querrac'h 2016) following a very dynamic and significant archaeological research conducted especially from the 80's onwards. Iron Age is one of the best-explored and known period as shown not only by the numerous sites revealed, but also by the abundant literature concerning particularly the multiple interactions between the indigenous people, the Gauls, and several Mediterranean people such as Greeks, Etruscans and Iberians (e.g. Gasco 1999; Guilaine and Py 2000; Bats 2000; Carozza 2000; Garcia 2002 and 2004; Py 2012; Janin and Py 2012; Gailledrat 2014). Indeed, the Languedoc, in particular the coastal areas, is a land of contact and mixing where economic and cultural trends are constantly evolving. So, it is not surprising that this region, together with Provence and particularly Marseille, gives some of the oldest evidences of socioeconomic change during the Iron Age.

For instance we can thus observe, if we focus on crop production and plant consumption, the early development of viticulture from the 6th c. BC, probably supported by Etruscan merchants, in the region where one century later the city of *Lattara* would be founded (Py and Buxó 2001; Py 2009; McGovern *et al.* 2013; Rovira and Alonso 2014; Bouby 2014; Alonso and Rovira 2016). In this city, the presence of exotic fruits/legumes such as garlic (*Allium sativum*) (Alonso and Rovira 2016), melon or cucumber (*Cucumis* sp.) and bottle gourd (*Lagenaria siceraria*) is also certified in early 5th c. BC archaeological contexts, but their local growing is not certain whether these were grown locally or not.

With the exception of this latter aspect, which seems to concern so far only this particular site, indigenous crop production in Iron Age Languedoc is based on cereals, pulses, oil plants and fruits. However, there are differences during this vast period concerning all these productions (Table 1). A diversified agriculture, probably adapted to the climatic cooling that would have occurred during this period (Berger 2003), characterises the First Iron Age (675-525 BC). Cereals are mainly represented by hulled barley (*Hordeum vulgare*), emmer (*Triticum dicoccum*) and free-threshing wheat (*T. aestivum/durum/turgidum*), together with naked barley (*H. vulgare* var. *nudum*), millets (*Panicum miliaceum* and *Setaria italica*) and einkorn (*T. monococcum*). Among pulses, usually less abundant than cereals, lentils (*Lens culinaris*), peas (*Pisum sativum*) and grass/red peas (*Lathyrus sativus/cicera*) tend to be predominant, followed by broad beans (*Vicia faba*) and bitter vetch (*Vicia ervilia*). Few findings of chickpea (*Cicer arietinum*) and common vetch (*Vicia sativa*) show the quite great variety of this group. Oil species are not well recorded everywhere, but opium poppy (*Papaver somniferum*), flax (*Linum usitatissimum*) and gold-of-pleasure (*Camelina sativa*) are cultivated. Finally, fruit growing seems limited to grapes (*Vitis vinifera*), figs (*Ficus carica*) and possibly olives (*Olea europaea*), being the gathering of wild fruit an activity still in use and important. We can note the common presence of acorns (*Quercus* sp.), blackberries (*Rubus fruticosus*), blackthorns (*Prunus spinosa*) and hazelnuts (*Corylus avellana*), as well as fruits from the Strawberry tree (*Arbutus unedo*) and the Mastic tree (*Pistacia lentiscus*) (Marinval 1988a and b; Bouby *et al.* 1999; Bouby 2000 and 2014; Bouby and Marinval 2000; Alonso *et al.* 2007).

During the transition period between the First and Second Iron Age (525-425 BC) and in the early Second Iron Age (425-300 BC) agriculture seems progressively to intensify due to the increasing adoption of iron tools and a better crop rotation system consisting on a shorter summer fallow (Garcia 2004; Py 2012), even if this last point still needs to be confirmed (Bouby 2014). The number of species cultivated will also somehow decrease, in particular among cereals, attesting the gradual disappearance of naked barley and the progressive increase of free-threshing wheat at the expense of hulled wheat (Marinval 1988a; Buxó 1997; Alonso and Rovira 2010; Bouby 2014). Finally, this period will see the development of arboriculture, mostly centred in grapevines for the Languedoc (Buxó 1996 and 1997; Py and Buxó 2001; Alonso and Rovira 2010; Bouby 2014).

All these changes would progressively result in the establishment of a market economy based on surplus exchanges for trade, notably of cereals in exchange of wine, encouraged by Mediterranean merchants (Dietler 2007; Py 2012). This new agricultural system set up at the end of the 6th-5th c. BC would culminate from the 3rd century onwards and would lay the foundations of the Mediterranean model that would rise during the next period. The 3rd and 2nd centuries BC may therefore represent another transition period between two forms of economic and cultural practices, where we can still find Bronze and Iron Age heritages but where we can already perceive the new characteristics of Roman agricultural and consumption practices. The difficulty in Languedoc is that archaeobotanical studies for these last periods are not abundant. We are thus going to present in this work new data concerning especially the major crops of three coastal sites in order to discuss crop production and plant consumption during the Second Iron Age by comparing these two different periods.

The archaeological sites

The three archaeological sites presented here, Pech Maho, *Lattara* and Le Cailar, share many environmental, economic and cultural characteristics (Fig. 1).

Pech Maho (Sigean, Aude)

Pech Maho is a small-fortified littoral habitat (1.5 ha), located at the end of a limestone plateau culminating at 29 m altitude and dominating two rivers (Berre and Aude) and an ancient lagoon probably opened to the sea. It was occupied from 560 BC to about 200 BC (Gailledrat and Solier 2004).

The fortification is quite singular because of its complexity and great dimensions, and the habitat is characterized by multi-room houses, often associated with open or semi-covered spaces, the morphology of which is quite similar to the one known in the Iberian world, and more specifically in Catalonia (Gailledrat and Beylier 2009). Iberian influences are by the way very abundant not only from an architectural point of view, but also concerning pottery and written lead sheets of commercial contracts. Greek and Punic elements are also well recorded. During the 4th and 3rd c. BC, numerous grain storage pits were built in the plateau outside the city walls and warehouses with *dolia* (large pottery containers) and amphorae inside, which suggest an intense activity related to trade in plant products around the Mediterranean.

Pech Maho also has several cult spaces at least from the 4th c. BC and especially important during the 3rd c. BC. They are organised around the main gate and street where several public spaces and buildings presented ritual deposits of cut heads, weapons and animal bones (Gailledrat *et al.* 2011). The site is burnt at the end of the 3rd c. BC but a later occupation is attested mainly through the installation of another ritual deposit comprising Equidae in the corridor that leads to the courtyard of one of the previous cult buildings. Archaeobotanical data presented here come from unpublished analyses done by N. Alonso and N. Rovira.

Lattara (Lattes, Hérault) and its surroundings

Lattara (Saint Sauveur site, LSS) was a port city founded toward 500 BC and abandoned around the 2nd c. AD (Py 2009). It was established directly on the edge of a lagoon, between two branches of the river Lez. It is noteworthy that Mediterranean merchants (Etruscan and later Greek) and local authorities and people (probably coming from the nearby Bronze and First Iron Age village of La Cougourlude and depending on the *Sextantio Oppidum*, located 7 km to the north-east) founded this commercial enclave in order to protect and regulate exchanges between the Mediterranean maritime space and the inland hinterland (Daveau and Py 2015). The space inside the fortification built on the lagoon shore and covering around 3.5 ha is quite dense, at least from the 4th c. BC onwards, and it is composed of small (1 or 2 rooms) and big houses (3, 4 or more rooms), sometimes with courtyards. Two main streets, as well as several alleys and squares, organise the circulation. The earliest occupation levels of *Lattara* (5th c. BC) show the presence of Etruscans, but from 475 BC Greek elements will quickly prevail in a strong indigenous context (Py 2009). Since the 3rd c. BC, some small granaries or cellars are located along and at the edges of the main streets. Large storage structures or places (such as warehouses) are not found until the 1st c. BC, when a port area was built against the city walls. Storage pits are not used because of the soil moisture conditions. Archaeobotanical data used here is partially published (Buxó 1992, 1999 and 2003; Alonso and Rovira 2010 and 2016).

As an extension to the south of the older village of La Cougourlude (unpublished archaeobotanical analyses done by L. Bouby and I. Figueiral are not used here) and close to *Lattara* we also find ritual and living areas on the place called “Mas de Causse” (LMC) globally dated from the 7th c. BC to the Roman times (Newman and Silvéreano 2010; Daveau and Py 2015). Among the most relevant evidences from the Iron Age we can note a ditch and several pits (7th-6th c. BC), a deposit of Etruscan small bronze discs with pearl patterns around the rim and an “L-shaped” probably ritual building (4th c. BC). Archaeobotanical data is unpublished (Rovira in Newman and Silvéreano 2010).

Finally, the third site presented here is Port Ariane (LPA), located less than one kilometre to the north and presenting archaeological levels dating from the Middle Neolithic to the Late Medieval period (Daveau 2007). The Iron Age levels are dated from the 7th to the 4th c. BC and concern some ditches and many pits. A vineyard of at least 2.4 ha is going to settle at this place from the 3rd-2nd c. BC but archaeobotanical remains are not found in the planting pits. Archaeobotanical data is published (Alonso *et al.* 2007). Henceforth, the use of the term *Lattara* includes the three sites mentioned above except in special cases that will be referred appropriately.

Place de la Saint-Jean (Le Cailar, Gard)

The site “Place de la Saint-Jean” only covers a very small surface of the ancient city (around 150 m²) and consists mainly on a public square against the city wall containing a ritual deposit of particularly weapons and cut heads dated to the 3rd c. BC (Py and Roure 2002; Roure *et al.* 2009; Roure and Girard 2011). The fortified city was built at the convergence of two rivers (Vistre and Rhône), near an ancient lagoon, at the end of the 6th c. BC and it was abandoned about the 2nd c. BC. Exchanges with Greek populations, probably merchants coming from *Massalia*, are well recorded through the numerous Massaliote amphorae found in the older contexts of the 6th-5th c. BC. Archaeobotanical data presented here come from unpublished analyses done by N. Alonso and N. Rovira.

Materials and methods

The general recovery techniques applied to *Lattara*, Pech Maho and Le Cailar can be consulted in detail in several publications from the 90s (Buxó 1991; Py 1997). From a methodological standpoint, stratigraphic units sampled are chosen from the most homogeneous and most likely to provide data about plant and animal resources. These layers may have a short and well-established date range (ideally 25 years). These sampling protocols are common to most of zooarchaeological and archaeobotanical disciplines. The samples are so the same, except for concentrations of specific remains, but using a suitable processing method for recovery of plant and animal remains.

Sample processing has consisted on water-sieving the sediment on a sieve column (meshes of 4, 2 or 1 and 0.5 mm) or using a flotation machine (with an inner 4 mm sieve and an outer column of 5, 1, 0.5 mm meshes and optionally 0.25 mm). The choice of the sieving technique has been based on the type of remains to be collected, but also on the volume of sediment. Data for each sample has been recorded using the software Syslat Terminal (Michel Py, CNRS).

The data presented here takes into account the total number of remains (NR) per taxon. These absolute values, as well as ubiquity values (the number of samples in which a given taxon appears), have been converted into percentages of all crops in Figs. 3, 4 and 5 in order to compare samples of different sizes, but which show

similar tendencies of taxa predominance Ecological units proposed in ESM Table 1 have been taken from Flora europaea (Tutin *et al.* 1968-1980). The “*varia*” group includes taxa not identified to the species, uncertain identifications or those having unspecific habitat requirements.

Concerning other methodological aspects, the term of “concentration” is used when one taxon presents more than 1,000 individuals, representing at least 80% of the individuals of the sample. These individuals consist either of whole or fragmented remains that retain a unique morphological feature permitting their identification, for instance the area of the embryo for cereals caryopses (Jones 1990).

In the three sites most of the seeds and fruit remains are charred and only a small number mineralized. *Lattara* (LSS and LPA) also presents waterlogged material in some levels of the 7th-5th c. BC (see ESM Table 1).

The archaeological contexts are quite varied for each site, especially for *Lattara* during the older periods (Table 2). Concerning the 3rd-2nd c. BC a diversity of habitat structures and layers have been studied for *Lattara*, some habitat layers but particularly a ritual pyre and deposit for Pech Maho and a ritual deposit and several pits for Le Cailar.

Results: general distribution and changes in crops

In general, the number of stratigraphic units, the volume of sediment and the quantity of plant remains are not equivalent in all the sites (ESM Table 2). In the case of Pech Maho, 23 stratigraphic units (SU) giving 1115 items (for 455 litres of sediment) have been studied for the 6th-4th c. BC, while 33 SU giving 17457 items (1596 litres) are available for the 3rd-2nd BC period. Cereals are the predominant group among crops, with only a few pulses and fruit remains, especially during the last period (Fig. 2a; ESM Table 1). Cereal grain is predominant over weeds and chaff during both periods (Fig. 2b; ESM Table 1).

The case of *Lattara* is sensibly different (Fig. 2; ESM Table 1, 2). A total of 277 SU provides 238832 items (for 12203 litres of sediment) for the Transition period and the early Second Iron Age, while 78 SU only give 3242 items (4515 litres) for the 3rd-2nd BC period. While cereals are the predominant group of crops during the older period, fruit remains subsequently become predominant. Pulses are in general scarce. Cereal grain is also more abundant than weeds and chaff, being the latest absent of the 3rd-2nd BC contexts.

Le Cailar only had 3 SU (90 l) for the 5th century bc, but they provided 6,614 plant remains (Fig. 2; ESM Tables 1,2). The 3rd century bc had 12 SU and 835 l sediment giving 2,668 items. The last period at this site showed a situation similar to that of Pech Maho in which cereals were predominant over fruit remains. The difference with the two other sites is that pulses were much more important at Le Cailar. Cereal grain was also predominant over weeds and chaff, which were also absent from the middle and late Second Iron Age samples.

The figures showing the numbers of remains (NR) and ubiquities (Ub) demonstrate the importance and the changes with time for each taxon; the total numbers of remains are shown as percentages of all crops (Figs. 3, 4, 5). The cereal results, shown as percent NR of crops in the graph bars (Fig. 3; ESM Table 1), show that in Pech Maho hulled *Hordeum vulgare* is the most abundant taxon during the first period and decreases in the next period in favor of free-threshing wheat. However, the importance of both cereals is in fact quite similar during the two periods when looking at the ubiquity values shown by symbols (100 and 60–70%), since these correct for a concentration of *Triticum aestivum /durum /turgidum*. The results from *Lattara* show higher proportions of hulled *Hordeum vulgare* during the first period compared to free-threshing *Triticum*, but this is also a consequence of the presence of several concentrations of *Hordeum*. Ubiquity values are in fact similar for both taxa (90%). During the 3rd–2nd century bc, *Hordeum* and free threshing *Triticum* both decrease according to the NR and ubiquity, especially the last. The results from Le Cailar show a reversal of the quantities of both cereals with more *Triticum* and less *Hordeum*, but once again this is a consequence of a concentration of free-threshing wheat in the oldest period. However, ubiquity values show a similar status for both cereals during the two periods. It is interesting to note the ubiquity values of a more compact type of free-threshing wheat during the last period.

T. dicocum is only really abundant in Le Cailar during the earliest period but clearly regresses afterwards, even if the ubiquity values are still quite high (70%). The same is true for *Lattara*, especially if we observe the ubiquity rates. Pech Maho is the only site where this tendency seems inversed even if values are very low. Millets, especially common millet, have few remains all time and tend to regress everywhere in the last period. The high ubiquity rates that they have at Le Cailar during the 5th-4th c. BC (70%) may be an anomaly due to the small number of samples. Naked barley and einkorn are occasionally present at *Lattara* during the earlier period, where we can also note the low presence of oat (*Avena cf. sativa*) and rye (*Secale cereale*). Few caryopses of this last cereal have been identified in three different samples together with a rachis node in one of them (Alonso and Rovira 2010). However, we can suggest that they are not crops at this time but probably a minor admixture of other cereals, maybe wheat.

Pulses do not have a high NR but they are quite diversified (Fig. 7; ESM Table 1). The ratios obtained by most of them do not exceed 1% of the total number of crop remains, with the exception of Le Cailar where some of them, such as broad beans or peas, can reach 1.5% and 2.2% respectively. If we observe the ubiquity values, Le

Cailar and *Lattara* have the highest: between 10% and 35% with a peak up to 42% for broad beans at the first site. Lentils seem especially important at *Lattara*, where we also find quite good proportions of grass/red peas and bitter vetch. Few remains of common vetch are found in Le Cailar and *Lattara*, and alfalfa (*Medicago cf. sativa*) has been maybe identified at the last site. In short, the role of pulses at Le Cailar seems different if we look in particular to the ubiquity values during the two periods.

Regarding the fruits, we can see that grapevine is predominant during the two periods everywhere according to both the NR and the ubiquity values (Fig. 8; ESM Table 1). It is noteworthy to emphasize the enormous difference between the NR values of *Lattara* during the 3rd-2nd c. BC (around 70%) and those of the two other sites. We must not forget that during this period fruits, in particular grapes are the most abundant remains in the site and that they have been mainly identified as winemaking waste (Buxó 1992; Py and Buxó 2001). We can also see, regarding the ubiquity values, that *Vitis vinifera* reaches around 80-90% in Pech Maho and Le Cailar (even if NR rates are still quite low) and that they are stable at *Lattara*.

Olives are found in very few quantities everywhere but not always, while almonds (*Prunus dulcis*) are occasionally present during the 5th-4th c. BC at *Lattara* and Le Cailar. Fig pips are especially found at *Lattara* during the first period, mostly waterlogged. This taxon does not have high NR values but ubiquity percentages reach around 20%, what seems quite significant and place it as the second fruit resource of this city. Figs are also occasionally present at Le Cailar during the second period. Other cultivated fruits are very rare during the whole sequence; we can mention, for instance, cherries (*Prunus avium/cerasus*) and maybe cultivated plums (*Prunus cf. domestica*) at *Lattara* during the first period. Many other edible fruits would have been gathered from the wild, such as acorns, blackberries, blackthorns or hazelnuts, but they are only attested in low quantities at *Lattara* for the 5th-4th c. BC period (ESM Table 1).

Discussion: plant production, trade, processing practices and consumption trends

The results presented reflect general trends that can help us better understand socioeconomic characteristics of the Second Iron Age societies of the three coastal Languedoc sites. It is noteworthy that plant remains attesting agricultural and consumption practices do not come from the same archaeological contexts and number of samples, they do not hold the same NR and they are not all preserved in the same way (even if waterlogged material has been omitted in the graphics). However, we must note that the majority of the samples studied here have a household origin and represent essentially waste from various activities, mainly consumption or processing of plant products. Even the remains that come from the great ritual deposits of Pech Maho and Le Cailar are not offerings or have been used in ceremonies, but were scattered in the sediment that was used to seal these deposits once their uses or functions were finished.

Concerning agricultural practices, we have attested during the 3rd-2nd centuries a reduction of the diversity of cereal crops compared to the previous period. Hulled barley and free-threshing wheat become the predominant taxa, naked barley disappears and emmer regresses. The place of millets is still difficult to know even if they seem less abundant than in the previous period.

According to wild taxa (Fig. 9), winter cereals seem to be preferred to spring cereals during the whole chronological sequence, as traditionally done in Mediterranean agriculture to better manage irregular rainfall and summer drought (Marinval 1988a; Buxó 1997; Bouby 2014). Even if we can admit the possibility that a part of the ruderal/wastelands species could also be spring weeds, with the exception of *Lattara* both groups of taxa never exceed that of the winter cereals weeds. It is also interesting to note that grasslands/meadows taxa are not very abundant during the second period. Is it a consequence of changes in animal husbandry and/or crop production? Are animals leaving these urban areas? Are the nearby fields being cultivated more intensely by abandoning fallow practices? It is difficult to be affirmative on these issues because of the low number of wild plant remains collected in the sites and the general quite high rates of the “*varia*” group. The only exception concerns again the oldest phases of *Lattara*. The number of samples and remains is significant enough to obtain a reliable image of the main local ecological groups that are dominated by wetlands taxa together with ruderal/wastelands species and winter cereals weeds. It is noteworthy to mention that wetlands seeds, as well as those of coastal plants adapted to saline soils, are found charred and mixed to cereal grains in many samples, while other sets rather represent drylands. Therefore we can deduce that farmers cultivate fields (maybe permanent) at least in two different ecosystems with the conceivable intent to intensify agriculture by exploiting their immediate environment. Recent studies based on stable isotopes ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) analysis of bone collagen from domestic and wild animals as well as charred grains and pulses also confirm this hypothesis (Alagich 2015). Free-threshing wheat and emmer were grown under similar moisture conditions, maybe on the same fields, while barley were likely grown on dryer fields. Cattle and ovicaprids consumed in turn plants growing in wetlands or salt marshes, directly grazing them or indirectly being fed with crop by-products originating in these areas.

Several different pulse taxa were found but, with the exception of Le Cailar, they were usually found in small quantities probably because they were processed and cooked using other methods than those used for cereals,

which require a much more direct contact with fire and hence a greater chance of being charred. However, these pulse taxa are found in larger amounts and contexts in accidental fire levels, showing their regular growing and consumption. *Lens*, *Pisum*, *Vicia faba* and *Lathyrus sativus* /*cicera* seem to have been the main pulse crops during all the Iron Age periods. We know that in *Lattara* pulses were grown under wet conditions (Alagich 2015), but we cannot say whether they were cultivated in extensive fields or in orchards.

Fruit is the last important crop production reflected by our results. Viticulture is progressively developing in coastal Languedoc from the 6th-5th c. BC to the 3rd-2nd c. BC, probably turned to winemaking. This activity is already documented in *Lattara* from mid-late 5th c. BC (Alonso and Rovira 2010; McGovern *et al.* 2013) and we have seen that *Vitis vinifera* is the major taxon of the site during the last period, when the vineyard of Port Ariane is planted (Daveau 2007). The importance of local wine production is also perceived in the decrease of the arrival of Massaliote or Italic amphorae and the increase of dolia especially from -225 to -125 (Py and Buxó 2001). The difficulty lies in determining the destination of that wine, since the production of local Gauloise amphorae destined for wine export does not seem to begin until the 1st c. BC (Py 2009). Before this, is it reasonable to think that the wine produced in *Lattara* is for own consumption responding maybe to supply problems? Or perhaps the Greek merchants of *Massalia* installed in the city develop an on-site wine production and export this product in Massaliote amphorae? Whatever it is, this process or situation seems so far to have only a local scope and to be circumscribed to the single city of *Lattara*.

Trade organisation is another issue we must take into account in order to better understand crop production not only in relation to a local small-scale but also to a regional or supra-regional economic system. It is well established in our region that Mediterranean merchants encourage exchanges of specific goods among which are plant products such as cereals and wine (Bats 2000; Garcia 2004; Dietler 2007; Py 2012; Gailledrat 2014). From the Second Iron Age, especially at the end, a certain specialisation of Mediterranean France is already in progress and can be detected through the decline of annual oil plants, hulled wheat and millets, and indigenous fruits (such as acorns), together with the particular development of cereal growing (based on hulled barley and free-threshing wheat) and viticulture (Bouby 2014). This author proposes to identify this specialization on the basis of the increase in the volumes of stored goods as well as an orientation of agriculture towards trade and not only subsistence.

If we return to the three Languedoc sites and analyse the storage practices, we can observe everywhere, especially in *Lattara* and Pech Maho, that extra-domestic storage structures, using for keeping collective stocks and/or exchangeable goods particularly of cereals and wine, are increasing from the 3rd c. BC onwards. Some of these structures are found inside the cities and concern warehouses (with ceramics containers such as dolia and amphorae, as well as granaries or cellars. During this period storage pits or silos began also to develop outside the city walls, in particular around Pech Maho (Gailledrat and Solier 2004). If we can have doubts about the contents of the dolia, silos are certainly reserved to cereals (Sigaut 1981), and their presence would confirm the increase of cereal farming at least in the last site.

Archaeobotanical remains can also give direct and indirect information about processing and culinary activities related to plants and plant products. Cereal processing and consumption waste represent the majority of the assemblages in the three sites. During the old phases, we have found at *Lattara* crushed emmer grains and chaff remains showing activities of dehusking and cleaning. Weeds are in general quite abundant. During the 3rd-2nd c. BC, however, we have seen that chaff remains and weeds are not abundant or not present (Fig. 5b). One reason can be the regression of emmer (which supplied almost 90% of chaff remains for the previous periods), but we can also suppose the development of new strategies for acquiring foodstuff prepared outside the urban spaces. With reference to this last question, we know that at least milling was regularly done inside the cities and still had a household nature (Gailledrat and Solier 2004; Py 2009). Individual querns, mostly rotary querns, are indeed frequently found in domestic spaces such as houses and courtyards.

We cannot provide data about pulses processing and cooking practices, but at least we can suppose that they are rarely in direct contact with fire. That seems also true for fruits, although the common presence of grape remains in the 3rd-2nd c. BC levels may suggest the use of winemaking waste as fuel in domestic hearths, or at least its burning for hygienic reasons.

Regarding plant consumption, we want to highlight again the progressive decrease of the diversity of food plants, especially the wild ones, a sign of, as we have seen, a progressive tendency towards agricultural specialization in obtaining surpluses for trade. Can it also be related to the emergence of new culinary practices? The making of beer (with hulled barley) is confirmed in at least one site of southern France (Bouby *et al.* 2011), but we do not have any proof in the three sites analysed here. Free-threshing wheat is also supposed to increase because of the developing of leavened bread (Marinval 2008).

Fruits also become less diversified: grapes are predominant, and we found few evidences of the consumption of figs (probably because of the different preservation conditions) and olives are very rare. In fact, we must point out not only the absence of evidences of olive tree cultivation in coastal Languedoc during the Iron Age or even the Roman times (Chabal 1997; Puertas 1998; Azuara *et al.* 2015; Dolez *et al.* 2015), but also of the consumption of (imported?) fruits (Alonso *et al.* 2008). Finally, it is interesting to note that “exotic” species such as bottle gourd, cucumber/melon or almonds are rare in Languedoc during the Iron Age and do not become more

frequent until the Roman period (Tillier 2013; Bouby 2014). At least for the first two, their presence is strongly determined by the existence of anaerobic preservation conditions in the archaeological sites.

Concerning pulses, they are generally diversified and present few items. But since these plant products can easily be consumed green, it is reasonable to suppose that this situation rather reflects different consumption practices and/or taphonomy. The only exception is Le Cailar, where the consumption of these species seems to be more important and it is closer to what has been identified in Provence (Bouby 2014), perhaps because of greater Greek influences?

Finally, as we have noticed regarding storage, there is no evidence of public spaces dedicated to consumption (like taverns or bakeries) until the 1st c. BC (Luley and Piquès 2016). Cooking structures such as hearths and ovens are usually of small dimensions and they are located in household contexts in houses, courtyards, streets/alleys.

Conclusions

The new archaeobotanical data provided by Pech Maho, *Lattara* and Le Cailar has contributed to increase the knowledge on crop production and plant consumption in coastal Languedoc in relation to several aspects of crop growing and plant consumption in coastal Languedoc.

First, these new results reinforce the idea of the Second Iron Age as a pivotal period between two agrarian and socioeconomic systems, with a former phase (6th-4th c. BC) attached to the diversity of crops characteristic of the Bronze and First Iron Ages, and a second one (3rd-2nd c. BC) based on an initial specialisation that could suggest the establishment of the basis for a regional and/or supra-regional trade of agricultural surpluses (Marinval 1988a; Alonso *et al.* 2007; Bouby 2014; Alonso and Bouby 2017). Farming in coastal Languedoc seems indeed to be focused on cereals (especially hulled barley and free-threshing wheat), pulses and grape growing. Even if these general trends seem widespread, we must not forget the fact that this last period is worse known than the first one with relation to the number of sites, samples and remains available, as well as to the diversity of archaeological contexts analysed.

Secondly, although the three sites present comparable general results, some specificities have been highlighted. On the one hand, western Languedoc (region of Pech Maho) is clearly turned towards the north-east of Iberia (Catalonia), sharing many socioeconomic and cultural characteristics with this civilization (see for instance, Gailledrat 2014). Northeastern Iberia shows a quite similar development of cereals, pulses and fruits (Pérez *et al.* 2007; López *et al.* 2011; Alonso and Pérez in press). The only difference is that viticulture seems early developed in Languedoc, even if this hypothesis needs a more detailed analysis of the results obtained in the archaeological sites of both regions to be confirmed. On the other hand, eastern Languedoc (region of *Lattara* and Le Cailar) is thought to present similar dynamics to those of Marseille and Provence. We have seen the particular importance of pulses at Le Cailar, which corresponds well with the general trends observed in Provence (Bouby 2014). The only site standing out is *Lattara*, which presents particularly the singularity of a great development of grape growing during the 3rd-2nd c. BC. The importance of this city in the regional frame of economic and cultural influences and exchanges between the indigenous Celt communities and the Mediterranean people has been already reported in the literature (see for instance, Py 2012). The comparison of the archaeobotanical results of *Lattara* and those of the two other Languedoc sites confirms this specificity. However, this question about an early development of viticulture also needs further research to be clarified, especially when comparing it to two close big colonies such as *Massalia* and *Emporion*.

Legends

Fig. 1. Location of the three archaeological sites in southern France

Fig. 2. *A* Proportions of the major crops per site in percent NR total crops (cereals, pulses and fruit); *B* Percentages of total grain, weeds and chaff. *Lattara* values for the 6th-4th bc period include data from Saint Sauveur (LSS), Port Ariane (LPA) and Mas de Causse (LMC)

Fig. 3. On the left; proportions of cereals as percentages of the absolute numbers of remains (NR) of all crops (cereals, pulses and cultivated fruits) per site and period, shown as graph bars. On the right, proportions of cereals in percent ubiquity (Ub) of all crop remains per site and period, shown as symbols on the graph. Only charred material has been taken into account for *Lattara*

Fig. 4. On the left; proportions of pulses as percentages of the absolute numbers of remains (NR) of all crops (cereals, pulses and cultivated fruits) per site and period, shown as graph bars. On the right, proportions of pulses in percent ubiquity (Ub) of all crop remains per site and period, shown as symbols on the graph. Only charred material has been taken into account for *Lattara*

Fig. 5. On the left; proportions of fruit as percentages of the absolute numbers of remains (NR) of all crops (cereals, pulses and cultivated fruits) per site and period, shown as graph bars. On the right, proportions of fruit in percent ubiquity (Ub) of all crop remains per site and period, shown as symbols on the graph. Only charred material has been taken into account for *Lattara*

Fig. 6 Pie diagrams showing the proportions of the seven plant communities identified from the remains of wild plants, for the various sites and time periods; “varia” represents taxa not identified to species level as well as those having a wide habitat range. Only charred material has been taken into account for *Lattara*

Table 1. Chronology used in Languedoc for the Iron Age (Py 2012)

Table 2. Number of stratigraphic units (SU) analysed according to the archaeological contexts per period and per site

ESM Table 1. Taxa identified at Pech Maho (Sigean, Aude), *Lattara* (Lattes, Hérault) - Port Ariane (LPA), Saint Sauveur (LSS) and Mas de Causse (LMC)- and Le Cailar (Gard) for the 6th-4th and 3rd-2nd c. BC from the absolute number of remains (NR). Data concerning the 7th c. BC of Port Ariane is given in order to compare the results discussed to the First Iron Age trends but it is not used for graphics. * It contains waterlogged remains. # It contains mineralized remains

ESM Table 2 General archaeobotanical results per site (LPA, Port Ariane; LSS, Saint Sauveur; LMC, Mas de Causse) and century with the number of stratigraphic units (SU) studied, the absolute number of remains (NR) and taxa identified, the volume of sediment sieved and the general density of remains/litre (DOC 48 KB)

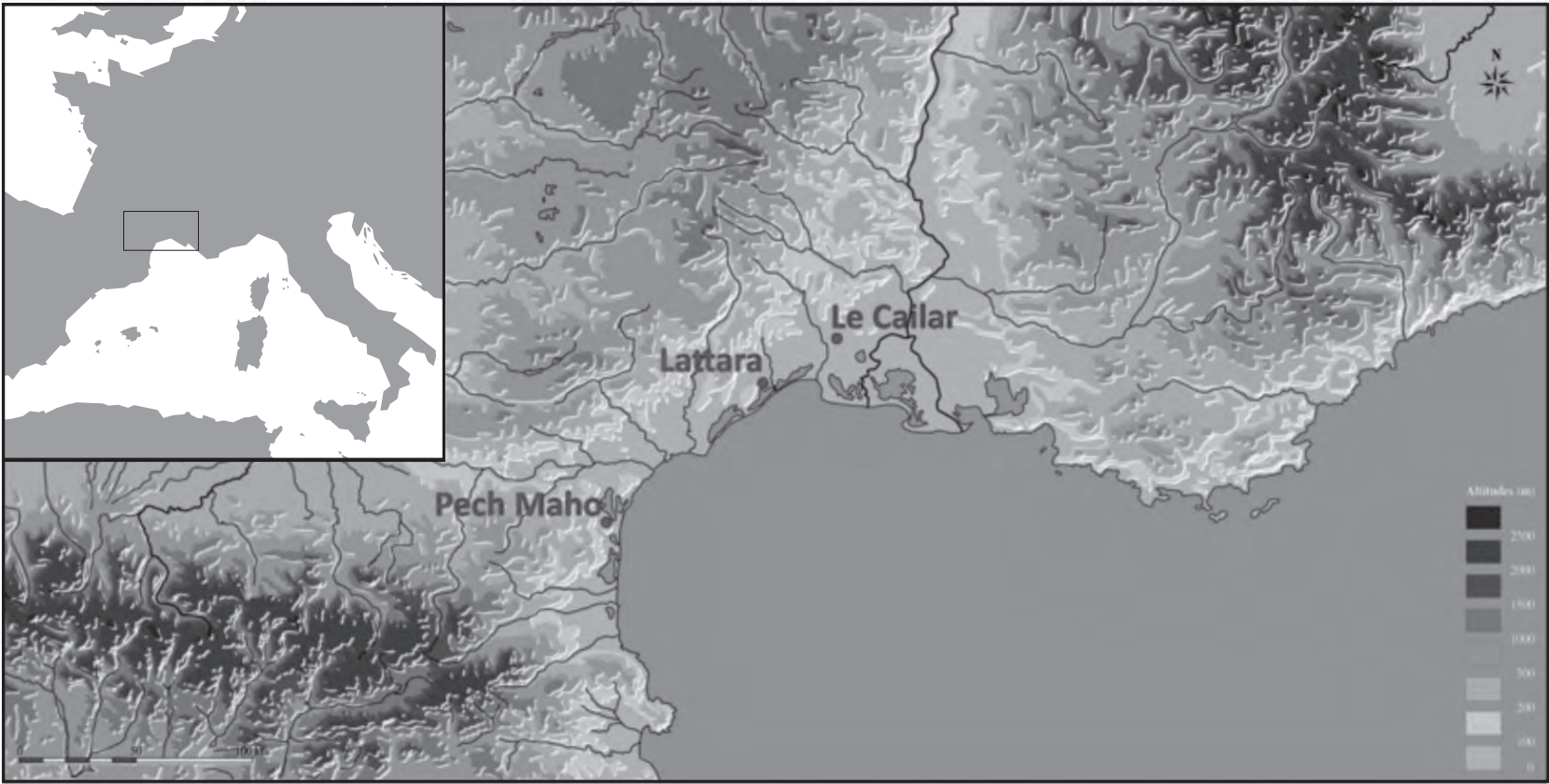
References

- Alagich R (2015) A Diachronic Investigation of Animal Husbandry and Farming Practices at Iron Age Lattara Using Stable Isotopes. Dissertation submitted in partial fulfilment of the requirements for the degree of Master of Science in Archaeological Science, University of Oxford
- Alonso N, Bouby L (2017) Plant resources from the Bronze Age and the First Iron Age in the North-western Arc of the Mediterranean Basin, *Paleovol*, in press.
- Alonso N, Pérez G (in press) Elites and farmers in Iberian Iron Age cities (6th-2nd centuries BC): storage and processing of agricultural products, In: Garcia D, Orgeolet R (ed.), *Country in the city. Forms and functions of agro-pastoral activities in Mediterranean pre-Classical cities (Aegean and Western Mediterranean Protohistory)*, Archaeopress.
- Alonso N, Rovira N (2010) Consommation et traitement des produits végétaux à *Lattara* entre -475 et -350. *Lattara* 21: 329-388
- Alonso N, Rovira N (2016) Plant uses and storage in the 5th century bc Etruscan quarter of the city of Lattara, France. *Vegetation History and Archaeobotany* 25: 323-337
- Alonso N, Buxó R, Rovira N (2007) Recherches sur l'alimentation végétale et l'agriculture du site de Port Ariane : étude des semences et fruits. *Lattara* 20: 219-249
- Alonso N, Buxó R, Rovira N (2008) Archéobotanique des semences et des fruits de *Lattara*: bilan des recherches. *Gallia* 65: 193-200
- Azuara J, Combourieu-Nebout N, Lebreton V, Mazier F, Müller SD, Dezileau L (2015) Late Holocene vegetation changes in relation with climate fluctuations and human activity in Languedoc (southern France). *Clim. Past* 11: 1769-1784
- Bats M (2000) Les Grecs en Gaule au premier Age du fer et le commerce emporique en Méditerranée occidentale. In: Janin T (dir.), *Mailhac et le Premier âge du Fer en Europe occidentale. Hommages à Odette et Jean Taffanel*. Monographies d'Archéologie Méditerranéenne 7: 243-248
- Berger JF (2003) Les étapes de la morphogenèse holocène dans le sud de la France. In : van der Leeuw S, Favory F, Fiches JL (dir.), *Archéologie et systèmes socio-environnementaux. Etudes multiscalaires sur la vallée du Rhône dans le programme ARCHAEOMEDES*. Monographie du CRA 27: 87-167
- Bouby L (2000) Production et consommation végétales au Bronze final dans les sites littoraux languedociens. *Bulletin de la Société Préhistorique Française* 97 (4): 583-594
- Bouby L (2014) *Agriculture dans le bassin du Rhône du Bronze final à l'Antiquité. Agrobiodiversité, économie, cultures*. Archives d'Ecologie Préhistorique, Toulouse
- Bouby L, Marinval P (2000) Ressources végétales à Marseille et dans les sociétés indigènes au Bronze Final et au Premier Age du Fer : premiers éléments de comparaison. In: Janin T (dir.), *Mailhac et le Premier Âge du Fer en Europe occidentale*. Monographies d'Archéologie Méditerranéenne 7: 205-214
- Bouby L, Leroy F, Carozza L (1999) Food plants from late Bronze Age lagoon sites in Languedoc, southern France: reconstruction of farming economy and environment. *Vegetation History and Archaeobotany* 8 : 53-69
- Bouby L, Boissinot P, Marinval P. (2011) Never mind the bottle. Archaeobotanical Evidence of Beer-brewing in Mediterranean France and the Consumption of Alcoholic Beverages During the 5th Century BC. *Human Ecology* 39: 351-360
- Buxó R (1991) Echantillonnage et enregistrement des prélèvements. *Lattara* 4: 101-106
- Buxó R (1992) Cueillette et agriculture à Lattes: les ressources végétales d'après les semences et les fruits. *Lattara* 5: 45-90

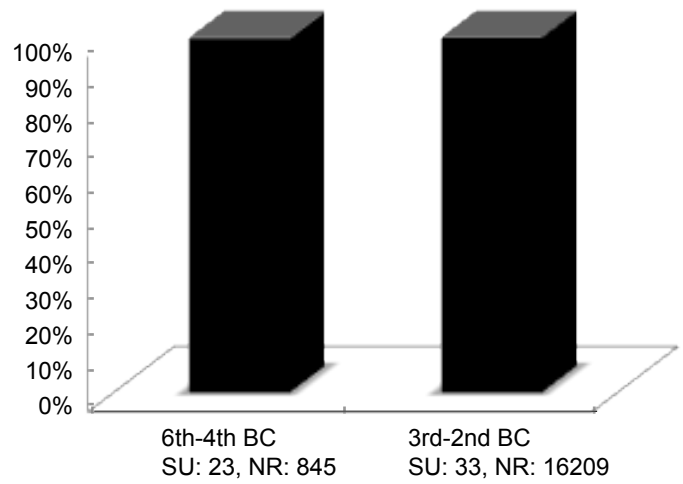
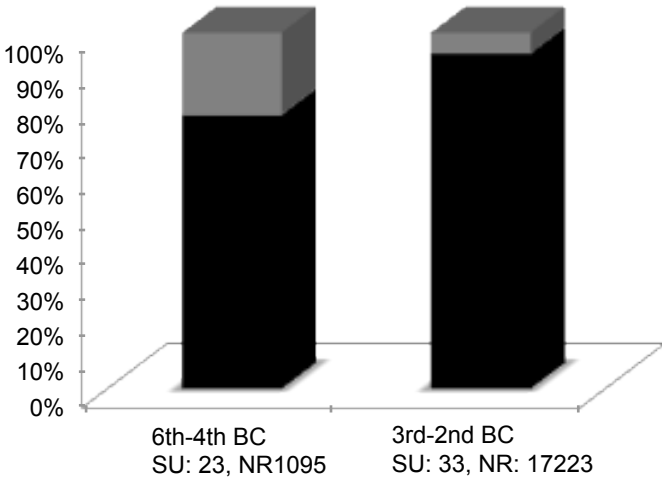
- Buxó R (1996) Evidence for Vines and Ancient Cultivation from an Urban Area, Lattes (Hérault), Southern France. *Antiquity* 70: 393-407
- Buxó R (1997) *Arqueologia de las plantas*. Crítica, Barcelona
- Buxó R (1999) Première approche des plantes exploitées au IV^e siècle avant notre ère à Lattes. *Lattara* 12: 525-535
- Buxó R (2003) Etude carpologique de la place 123: problématique de la présence de restes de semences et de fruits dans un espace urbain non construit. *Lattara* 16:193-217
- Carozza L (2000) A la source du premier âge du Fer languedocien. In: Janin T (dir.), *Mailhac et le Premier âge du Fer en Europe occidentale. Hommages à Odette et Jean Taffanel*. Monographies d'Archéologie Méditerranéenne 7: 9-23
- Chabal L (1997) *Forêts et sociétés en Languedoc (Néolithique final, Antiquité tardive)*. Documents d'Archéologie Française 63
- Daveau I (2007) *Port Ariane (Lattes, Hérault). Construction deltaïque et utilisation d'une zone humide lors des six derniers millénaires*. Lattara 20
- Daveau I, Py M (2015) Grecs et Etrusques à Lattes: nouvelles données à partir des fouilles de la Cougourlude. In: Roure R (ed) *Contacts et acculturations en Méditerranée occidentale. Hommages à Michel Bats*. Etudes Massaliètes 12-Bibliothèque d'archéologie méditerranéenne et africaine 15: 31-42
- Dietler M (2007) The Iron Age in the Western Mediterranean. In : Scheidel W, Morris I, Saller R (dir.), *The Cambridge Economic History of the Greco-Roman World*. Cambridge University Press: 242-276.
- Dolez L, Salel T, Bruneton H, Colpo G, Devillers B, Lefèvre D, Müller SD, Sanchez C (2015) Holocene palaeoenvironments of the Bages-Sigean lagoon (France). *Geobios* 48: 297-308
- Erroux J (1966) Les orges hallstattiennes du Lycée Technique de Montpellier. *O.G.A.M.* 18 (5-6): 455-456
- Erroux J (1980) Etude des vestiges paléobotaniques (plantes cultivées et pépins de raisin). In: Dedet B (dir.), *Premières recherches sur l'Oppidum du Plan de la Tour à Gailhan (Gard). Sondages 1975-1977*. Caveirac: 117-122
- Erroux J (1984) Etude de quelques graines de la Liquière. In: Py M (dir.), *La Liquière (Calvisson, Gard), village du Premier âge du Fer en Languedoc oriental*. Revue Archéologique de Narbonnaise Suppl. 11: 349-350
- Erroux J, Courtin J (1974) Aperçu sur l'agriculture préhistorique dans le sud-est de la France. *Bulletin de la Société Languedocienne de Géographie* 8 (3-4): 325-336
- Gailledrat E (2014) Espaces coloniaux et indigènes sur les rivages d'Extrême-Occident méditerranéen (Xe-III^e s. avant notre ère). Presses Universitaires de La Méditerranée, Montpellier
- Gailledrat E, Solier Y (2004) L'établissement côtier de Pech Maho (Sigean, Aude) aux VI^e-Ve s. av. J.-C. (fouilles 1959-1979), Monographies d'Archéologie Méditerranéenne 19
- Gailledrat E, Beylier A (2009) La fortification de Pech Maho (Sigean, Aude) au IV^e-III^e s. av. n. è. In : *Les fortifications préromaines en France méridionale*. Documents d'Archéologie Méridionale 32: 99-120
- Gailledrat E, Anwar N, Bardot A, Beylier A, Boulbes N, Curé AM, Cençon C, Durand A, Faïsse C, Munos S, Sanz S, Vacheret A (2011) Pech Maho (Sigean, Aude). Unpublished Archaeological Report, Regional Archaeological Service of Languedoc-Roussillon (France) <halshs-00680385>
- Garcia D (2002) Dynamiques territoriales en Gaule méridionale durant l'âge du Fer. In: Garcia D, Verdin F (dir.), *Territoires celtiques. Espaces ethniques et territoires des agglomérations protohistoriques d'Europe occidentale*. Errance: 88-103
- Garcia D (2004) *La Celtique méditerranéenne*. Errance, Paris
- Gasco J (1999) Lieux et modes de production à la fin de l'âge du Bronze et au début du Premier âge du Fer en Languedoc. In: Buxó R, Pons E (dir.), *Els productes alimentaris d'origen vegetal a l'edat del Ferro de l'Europa Occidental: de la producció al consum*. Museu d'Arqueologia de Catalunya, Sèrie Monogràfica 18: 203-219.
- Guilaine J, Py M (2000) Le Sud de la Gaule et les relations méditerranéennes et occidentales (-1000/-500). In: Janin T (dir.), *Mailhac et le Premier âge du Fer en Europe occidentale. Hommages à Odette et Jean Taffanel*. Monographies d'Archéologie Méditerranéenne 7: 413-432
- Janin T, Py M (2012) Grecs et Celtes en Languedoc. In: Hermay A, Tsatskheladze GA (dir.), *From the pillars of Hercules to the footsteps of the Argonauts*. Colloquia antiqua 4: 141-162
- Jones G (1990) The application of present-day cereal processing studies to charred archaeobotanical remains. *Circaea* 6.2: 91-96
- López Reyes D, Valenzuela-Lamas S, Sanmartí Grego, J (2011) Economia i canvi socio-cultural a Catalunya durant l'edat del ferro. In: Valenzuela-Lamas S, Padrós N, Belarte Franco MC, Sanmartí Grego J (Eds.), *Economia agropecuària i canvi social a partir de les restes bioarqueològiques. El primer mil·lenni aC a la Mediterrània occidental*. Arqueo Mediterranea 12: 71-92
- Luley BP, Piquès G (2016) Communal eating and drinking in early Roman Mediterranean France: a possible tavern at Lattara, c. 125–75 BC. *Antiquity* 90: 126-142
- Marinval P (1988a). *Cueillette, agriculture et alimentation végétale de l'Épipaléolithique jusqu'au 2^e âge du Fer en France méridionale. Apports palétothnologiques de la carpologie*. PhD dissertation, EHESS, Paris

- Marinval P (1988b) *L'alimentation végétale en France du Mésolithique jusqu'à l'Âge du Fer*. Editions du CNRS, Toulouse
- Marinval P (2000) Agriculture et structuration du paysage agricole à Marseille grecque et dans les sociétés indigènes aux Premier et second âges du Fer. *Pallas* 52: 183-194
- Marinval P (2004) Des Gaulois aux Gallo-Romains : l'agriculture du midi de la France. *Pallas* 64: 233-242
- Marinval P. (2008) *Histoire du pain du Néolithique au Moyen Age*. Archéo-plantes 4, Toulouse
- McGovern P, Luley BP, Rovira N, Mirzoian A, Callahan MP, Smith KE, Hall GR, Davidson T, Henkin JM (2013) Beginning of viniculture in France. *PNAS* 110 (25): 10147-10152
- Newman C, Silvéreano S (2010) Lattes–Mas de Causse, Hérault, région Languedoc-Roussillon. Unpublished Archaeological Report, Oxford Archéologie Méditerranée/Regional Archaeological Service of Languedoc-Roussillon (France)
- Pinaud-Querrac'h R (2016) *Etude carpologique de La Monédière (Bessan, Hérault): agriculture et économie végétale entre le premier et le second âges du Fer*. Dissertation submitted for the degree of Master of Science in Archaeological Science, University Paul Valéry-Montpellier 3
- Pérez G, Alonso N, Iborra MP (2007) Agricultura y ganadería protohistóricas en la Península Ibérica: modelos de gestión In: Rodríguez A, Pavón I (Eds.), *Arqueología de la tierra: paisajes rurales de la protohistoria peninsular*. Universidad de Extremadura, Servicio de Publicaciones: 327-373
- Puertas O (1998) *Palynologie dans le delta du Lez. Contribution à l'histoire du paysage de Lattes*. Lattara 11
- Py M (1997) *SYSLAT 3.1, Système d'Information Archéologique, Manuel de référence*. Lattara 10
- Py M (2009) *Lattara, comptoir gaulois méditerranéen entre Etrusques, Grecs et Romains*. Errance
- Py M (2012) *Les gaulois du Midi. De la fin de l'Âge du Bronze à la conquête romaine*. (2nd edition) Hachette, Paris
- Py M, Buxó R (2001) La viticulture en Gaule à l'âge du Fer. In: Brun JP, Laubenheimer F, *La viticulture en Gaule*. Gallia 58: 29-43
- Py M., Roure R. (2002) Le Cailar (Gard). Un nouveau comptoir lagunaire protohistorique au confluent du Rhône et du Vistre. *Documents d'Archéologie Méridionale* 25: 171-214
- Roure R, Girard B (2011) Les armes du dépôt du Cailar (Gard). In: *De armas, de hombres y de dioses, el papel de las armas en la conquista romana de la peninsula iberica e los Iberos*. Consejo Superior de Investigaciones Científicas 30: 43-60
- Roure R, Piquès G, Leroux B (2009) Note préliminaire sur le rempart du site de Le Cailar (Gard). In: *Les fortifications préromaines en France méridionale*. *Documents d'Archéologie Méridionale* 32: 151-160
- Rovira N, Alonso N (2010) Thanatocoenoses of seeds and fruits from Zone 1 at Lattara (Lattes, France) during the 5th-4th centuries BC: the preliminary results. In: Bakels CC, Fennema K, Out WA, Vermeeren C (eds.) *Of Plants and Snails. A collection of papers presented to Wim Kuijper in gratitude for forty years of teaching and identifying*. Sidestone Press, Leiden: 217-226
- Rovira N, Alonso N (2014) La production de vin à Lattara. Ce qu'en disent les pépins. In: Esposito A (coord.) *Le goût et l'alimentation dans l'Antiquité. Sacrifices, banquets et pratiques alimentaires*. *Dossiers d'Archéologie* 362 : 72-77
- Ruas MP (1989) Etude carpologique. In: Fiches JL (dir.), *L'Oppidum d'Ambrussum et son territoire. Fouilles au quartier du Sablas (Villetelle, Hérault) : 1979-1985*. Monographie du CRA, 2: 169-180
- Ruas MP, Marinval P (1991) Alimentation végétale et agriculture d'après les semences archéologiques (de 9000 av. J.-C. au XVe siècle). In: Guilaine J (dir.), *Pour une Archéologie agraire*. Armand Colin, Paris: 409-439
- Sigaut F (1981) Identification des techniques de conservation et de stockage des grains. In: Gast M, Sigaut F (dir) *Les techniques de conservation des grains à long terme*. Editions du CNRS, 2: 156-180
- Tillier M (2013) *Carpologie en context portuaire romain: économie végétale et environnement des sites de Caska (Ile de Pag, Croatie), du Castélou (Narbonne) et Arles-Rhône 3*. Dissertation submitted for the degree of Master of Science in Archaeological Science, University Paul Valéry-Montpellier 3
- Tutin TG, Heywood VH, Burges NA, Valentine DH, Walters SM, Webb DA (1968-1980) *Flora europaea*. Cambridge University Press, 5 vol.

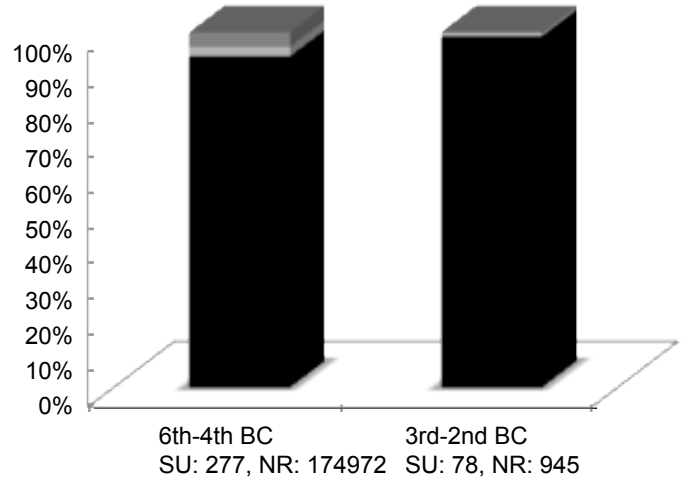
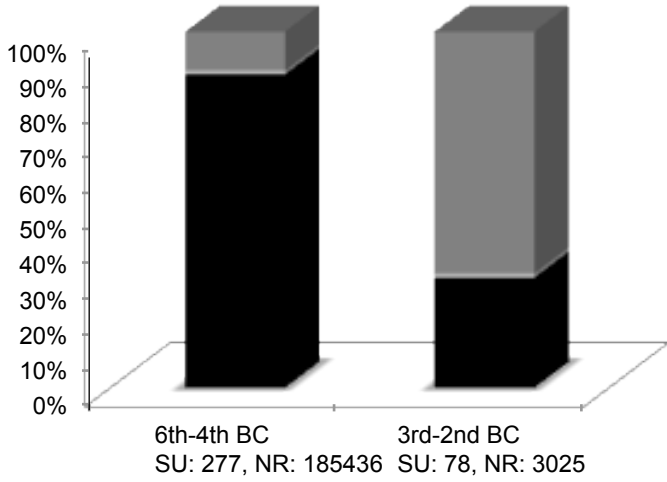
Figure 1



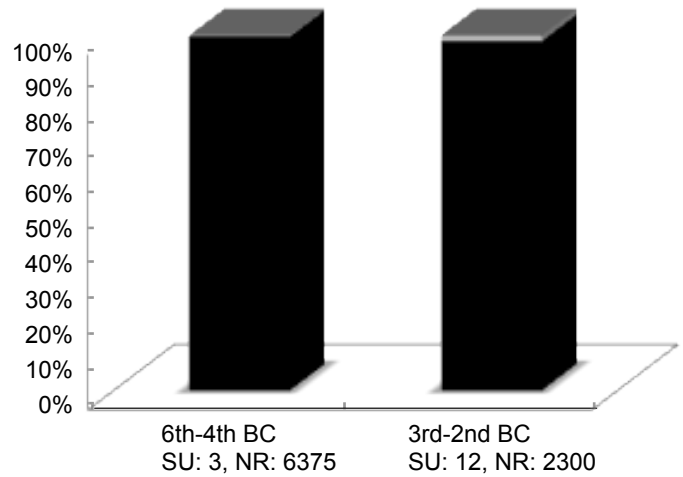
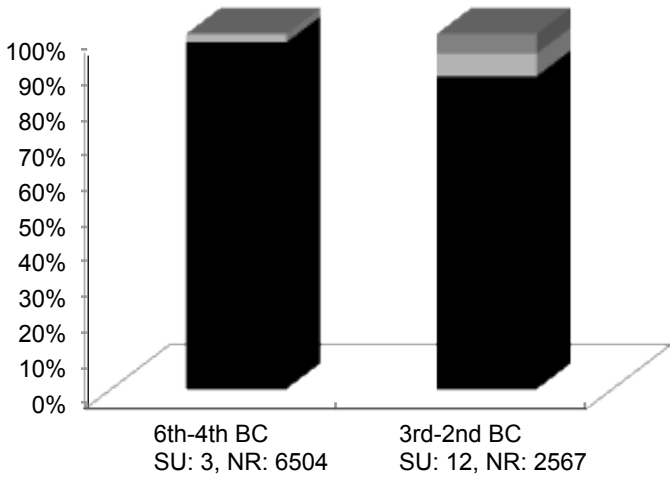
Pech Maho



Lattara



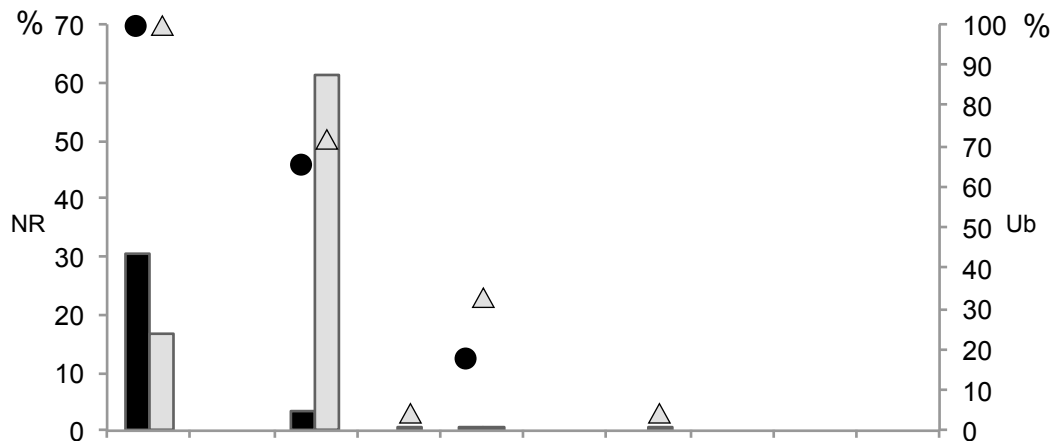
Le Cailar



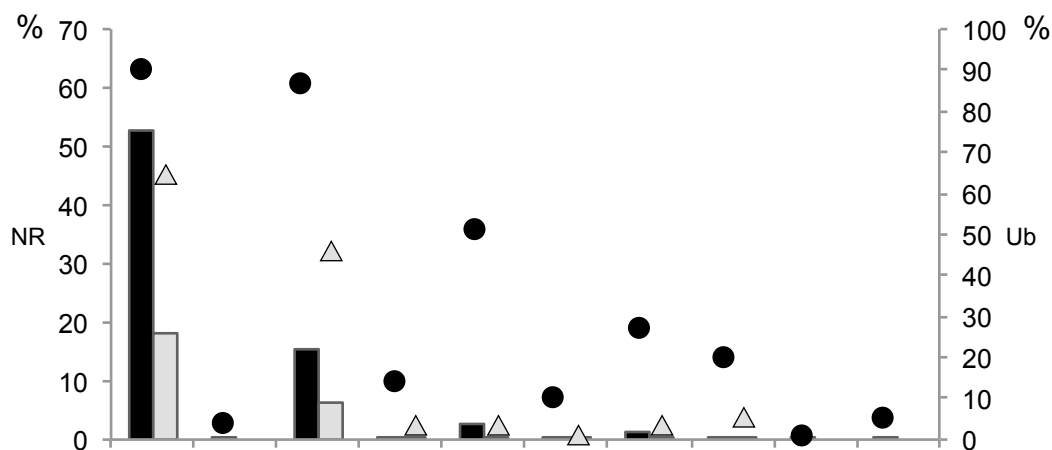
A ■ Cereals ■ Pulses ■ Fruits

B ■ Cereal grain ■ Weeds ■ Chaff

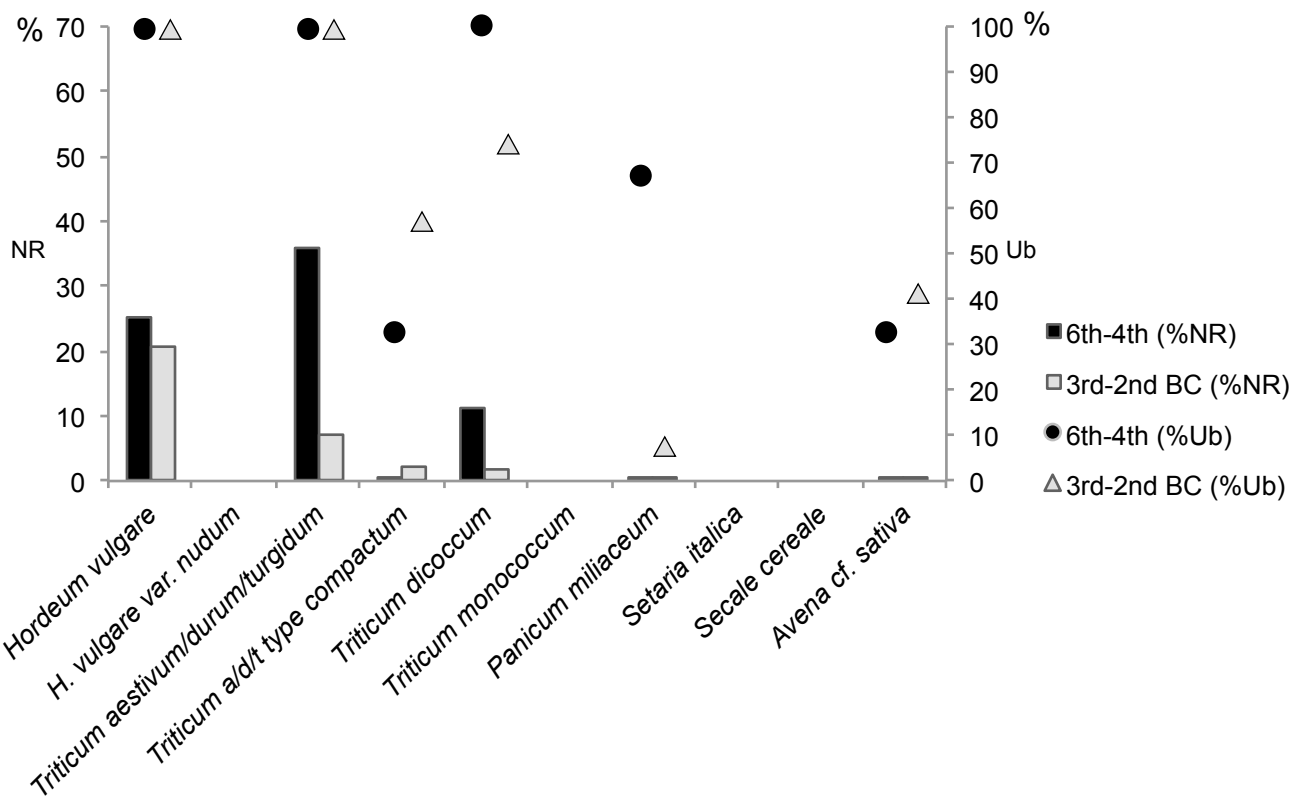
Pech Maho (SU: 23 and 33; NR: 841 and 16184)



Lattara (SU: 277 and 78; NR: 163400 and 933)

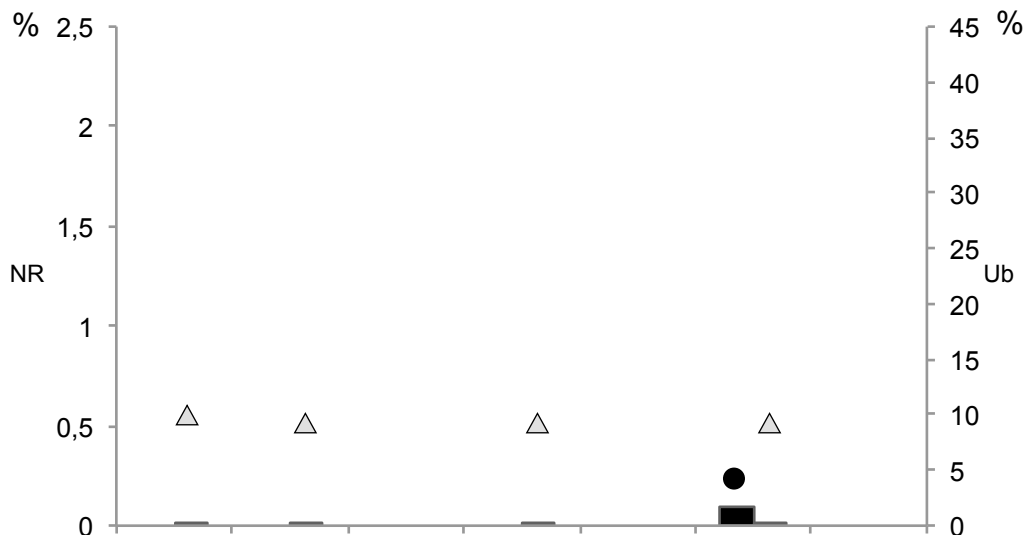


Le Cailar (SU: 3 and 12; NR: 6347 and 2261)

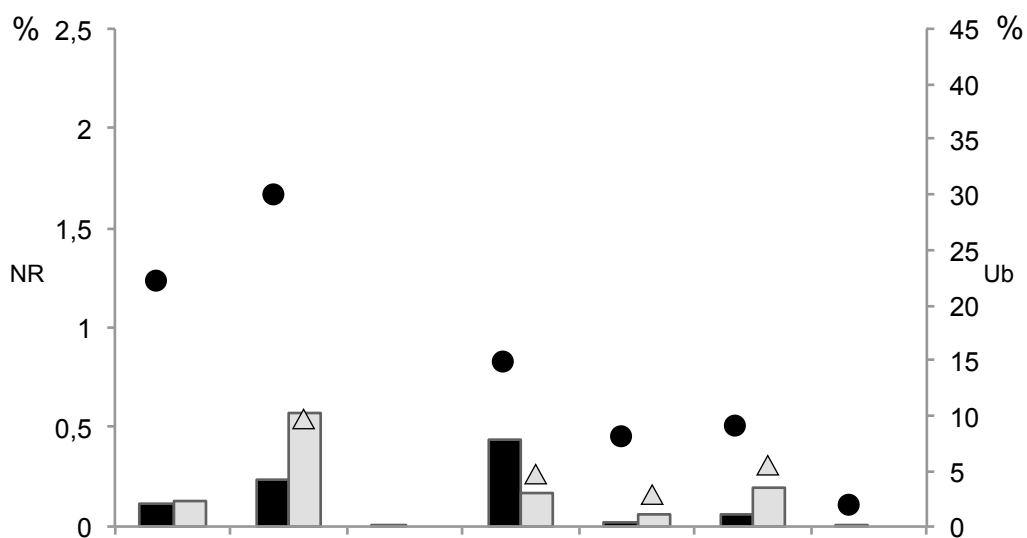


■ 6th-4th (%NR)
 □ 3rd-2nd BC (%NR)
 ● 6th-4th (%Ub)
 ▲ 3rd-2nd BC (%Ub)

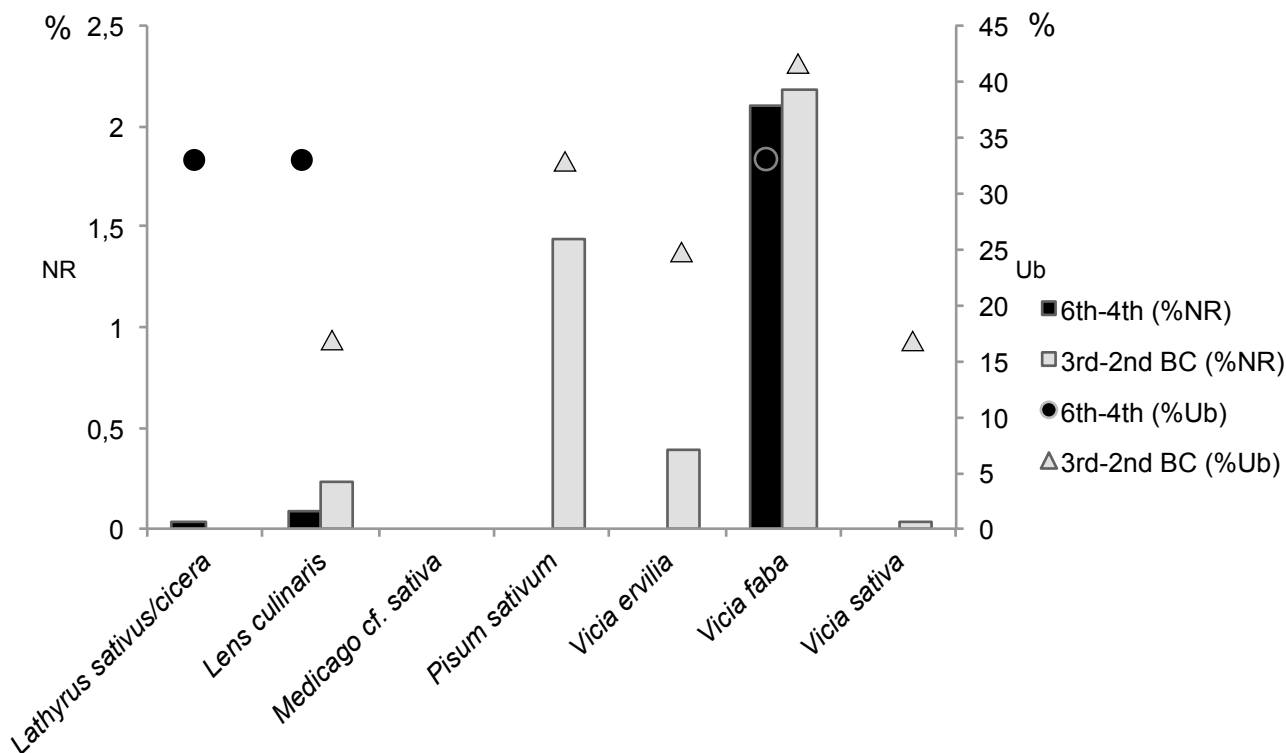
Pech Maho (SU: 23 and 33; NR: 4 and 20)



Lattara (SU: 277 and 78; NR: 2184 and 39)

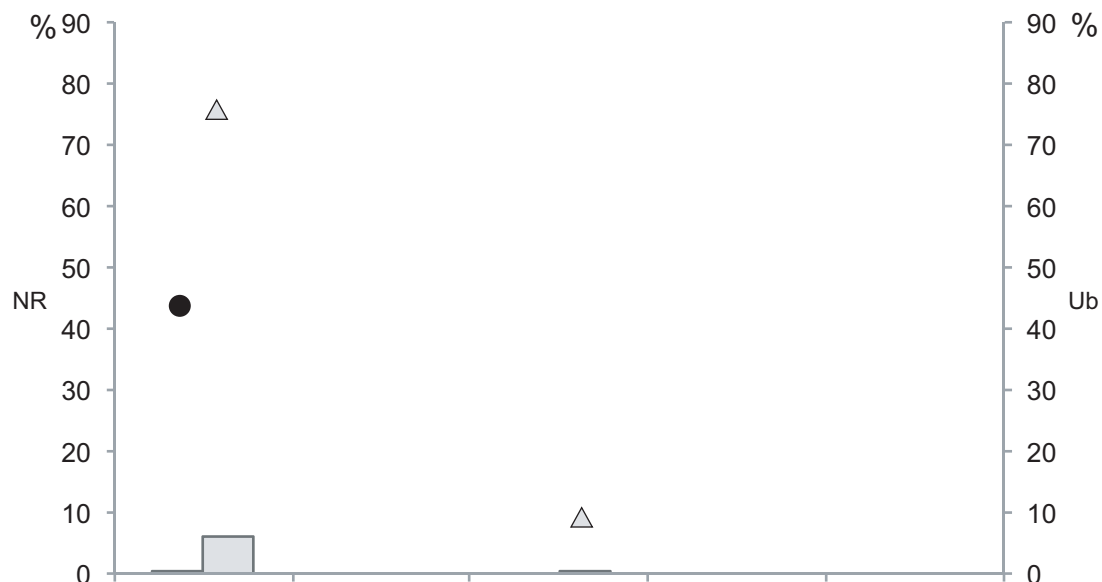


Le Cailar (SU: 3 and 12; NR: 154 and 164)

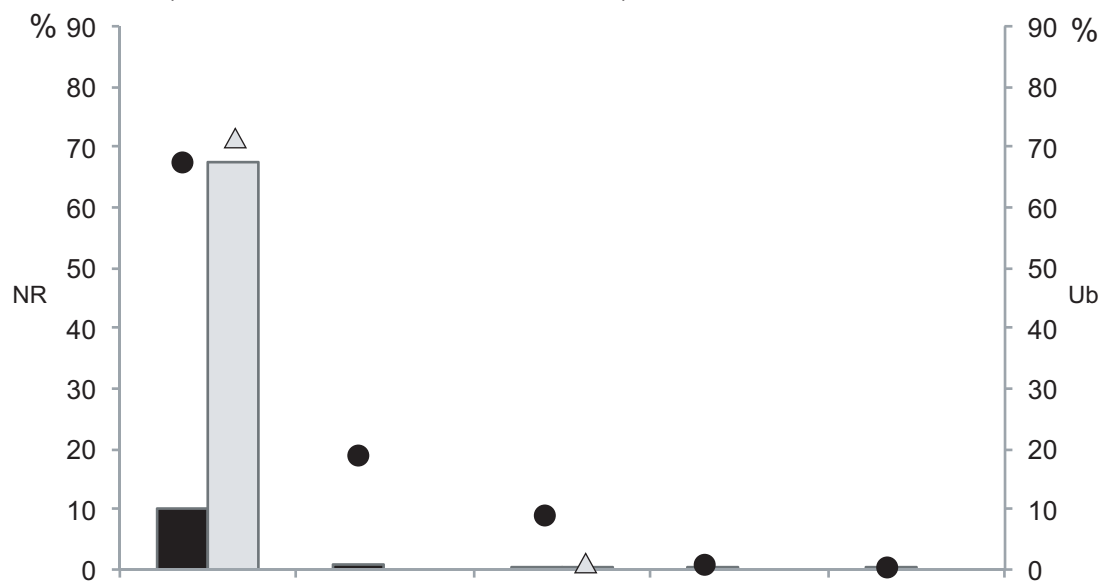


■ 6th-4th (%NR)
 □ 3rd-2nd BC (%NR)
 ● 6th-4th (%Ub)
 △ 3rd-2nd BC (%Ub)

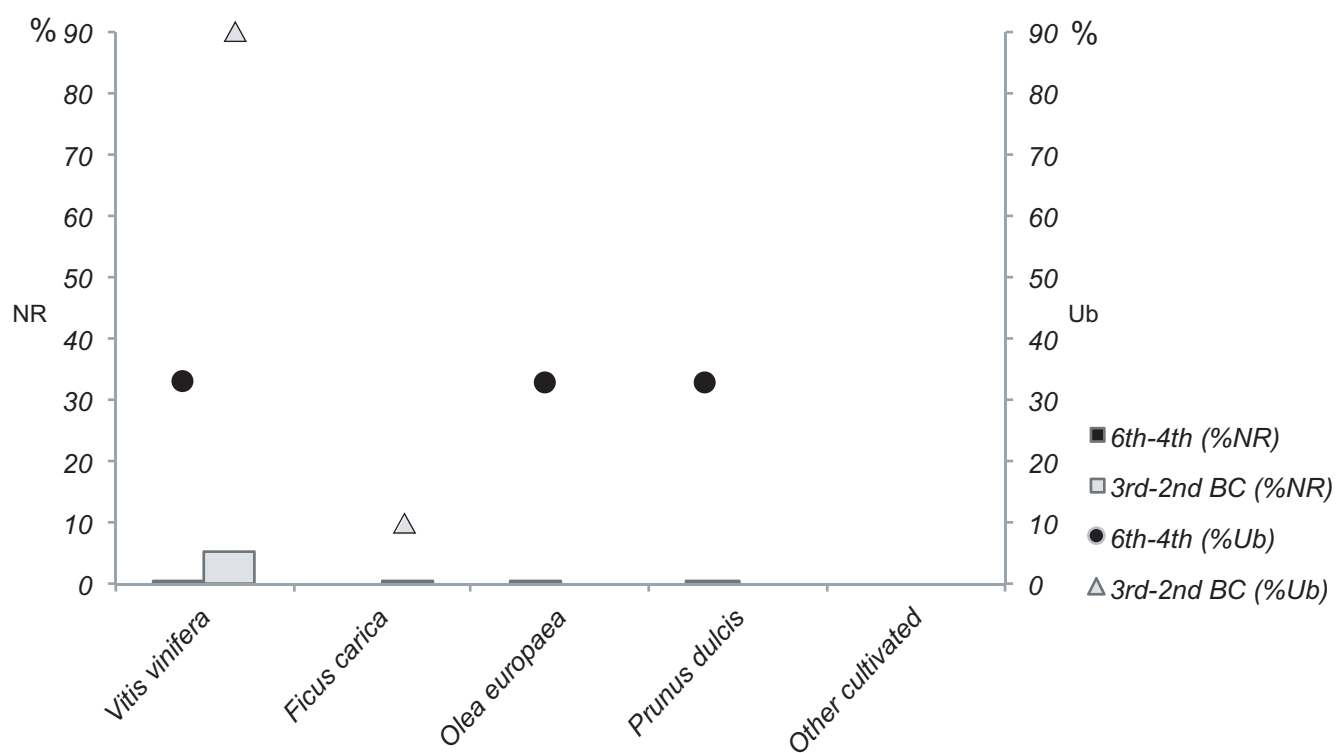
Pech Maho (SU: 23 and 33; NR: 1 and 1018)



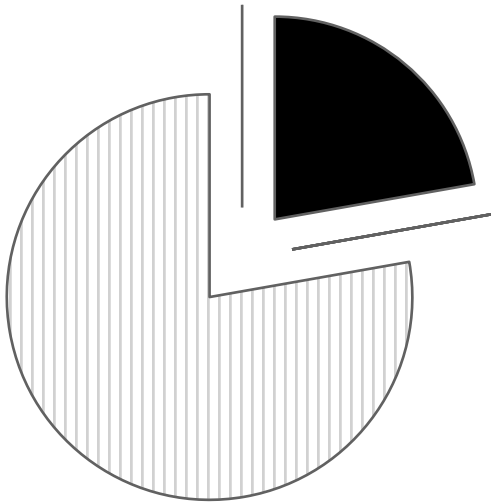
Lattara (SU: 277 and 78; NR: 19962 and 2032)



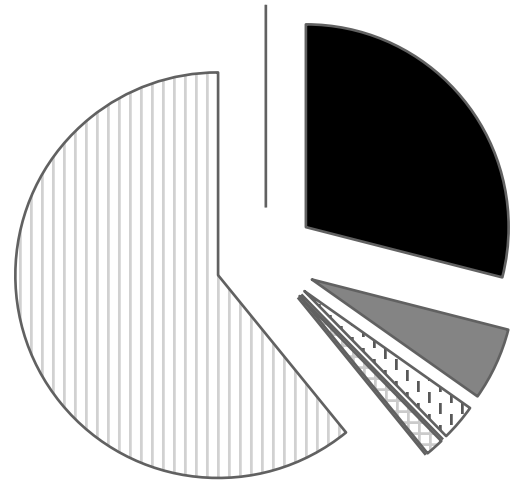
Le Cailar (SU: 3 and 12; NR: 3 and 141)



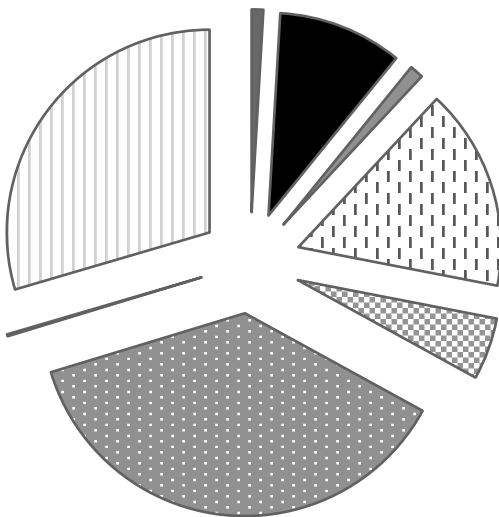
Pech Maho (6th-4th BC)
SU: 23, NR: 18



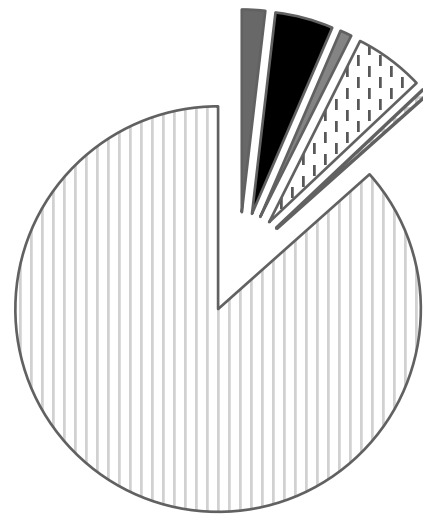
Pech Maho (3rd-2nd BC)
SU: 33, NR: 69



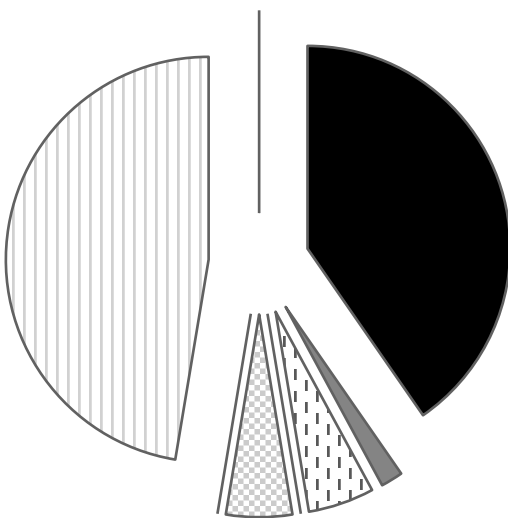
Lattara (5th-4th BC)
SU: 277, NR: 41809



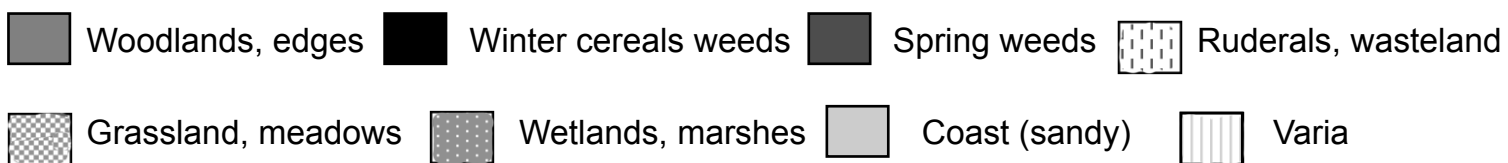
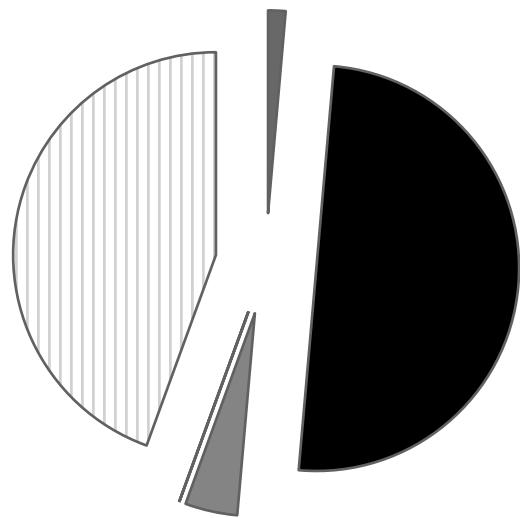
Lattara (3rd-2nd BC)
SU: 78, NR: 216



Le Cailar (5th BC)
SU: 3, NR: 57



Le Cailar (3rd BC)
SU: 12, NR: 72



First Iron Age	675-525 BC
Transition First/Second Iron Age	525-425 BC
Early Second Iron Age	425-300 BC
Middle Second Iron Age	300-125 BC
Late Second Iron Age	125-25 BC

Table 2

	<i>Lattara</i>								
	Pech Maho		LPA		LSS		LMC	Le Cailar	
	6th-4th BC	3rd-2nd BC	7th BC	4th BC	5th-4th BC	3rd-2nd BC	6th-4th BC	5th BC	3rd BC
Hearth	3	4			25	8			
Hearth cleaning		1			2				
Oven					10	3			
Container filling					12	2			
Basketry					1				
Ritual deposit		14			3		4		4
Ritual pyre		5							
Pit filling	3	2	14	4	31	11	7		7
Posthole filling					6	3			
Trench filling					11				
Dump layer	1	4			11	3			
Backfill layer	2				39	24		3	1
Ditch				1			7		
Concentration organic remains					11	5			
Occupation layer (habitat)	3	2			38	11	1		
Occupation layer (street)	11				2	4			
Occupation layer (square)					5				
Destruction layer (habitat)		1			23	1			
Other					23	3			
Total layers (SU)	23	33	14	5	253	78	19	3	12

ESM Table 1 Taxa identified at Pech Maho (Sigean, Aude), *Lattara* (Lattes, Hérault) - Port Ariane (LPA), Saint Sauveur (LSS) and Mas de Causse (LMC)- and Le Cailar (Gard) for the 6th-4th and 3rd-2nd c. BC from the absolute number of remains (NR). Data concerning the 7th c. BC of Port Ariane is given in order to compare the results discussed to the First Iron Age trends but it is not used for graphics. * It contains waterlogged remains. # It contains mineralized remains

		<i>Lattara</i>								
		Pech Maho		LPA		LSS		LMC	Le Cailar	
		6th-4th BC	3rd-2nd BC	7th BC	4th BC	5th-4th BC	3rd-2nd BC	6th-4th BC	5th BC	3rd BC
Cereals (grain)		841	16184	957	298	163036	933	52	6347	2261
<i>Avena cf. sativa</i>	seed					96			2	9
<i>Hordeum vulgare</i>	seed	335	2889	81	8	97730#	539	17	1639	526
<i>Hordeum vulgare var nudum</i>	seed				3	80				
<i>Hordeum sp.</i>	seed		1		14	9		2		3
<i>Hordeum/Triticum</i>	seed	447	2722	269	194	25659#	165	21	1368	1413
<i>Panicum miliaceum</i>	seed		1	367		2165	4		3	1
<i>Panicum/Setaria</i>	seed			14		84				
<i>Secale cereale</i>	seed					23				
<i>Setaria italica</i>	seed			5		506	18			
<i>Triticum aestivum/durum/turgidum</i>	seed	35	10537	31	33	28541#	194	4	2326	188
<i>Triticum a/d/t type compactum</i>	seed		4			843	9	3	4	57
<i>Triticum dicoccum</i>	seed	6	16	113	5	4546#	3	3	730	49
<i>Triticum monococcum</i>	seed			12		43#	1			
<i>Triticum sp.</i>	seed	18	14	65	41	2711#		2	275	15
Cereals (chaff)		0	1	33	10	7139	0	0	4	0
<i>Hordeum vulgare</i>	lemma base					296			1	
<i>Hordeum vulgare</i>	lemma frag.					159				
<i>Hordeum vulgare</i>	rachis node					27				
<i>Hordeum vulgare</i>	rachis segment				1	505				
<i>Hordeum vulgare</i>	rachis frag.					21				
<i>Hordeum sp.</i>	lemma frag.					2				
<i>Hordeum sp.</i>	rachis segment					2				
<i>Hordeum/Triticum</i>	rachis frag.					2				
<i>Hordeum/Triticum</i>	lemma base					17				
<i>Hordeum/Triticum</i>	lemma frag.					84				
<i>Hordeum/Triticum</i>	rachis node					15				
<i>Hordeum/Triticum</i>	culm node					2				
<i>Hordeum/Triticum</i>	rachis segment					1011				
<i>Secale cereale</i>	rachis node					1				
<i>Secale cereale</i>	rachis segment					1				
<i>Triticum a/d type compactum</i>	rachis segment					5				
<i>Triticum aestivum</i>	rachis segment					21				
<i>Triticum aestivum/durum/turgidum</i>	glume base					3				
<i>Triticum aestivum/durum/turgidum</i>	rachis node					940				
<i>Triticum aestivum/durum/turgidum</i>	rachis segment			2		24				
<i>Triticum durum</i>	rachis segment		1			30				
<i>Triticum dicoccum</i>	spikelet fork			15	8	1647			1	
<i>Triticum dicoccum</i>	glume base			14		1389				
<i>Triticum dicoccum</i>	internode					37				
<i>Triticum dicoccum</i>	rachis node					27				
<i>Triticum dicoccum</i>	rachis segment					14				
<i>Triticum sp.</i>	spikelet fork			2		254				
<i>Triticum sp.</i>	glume base				1	154			1	
<i>Triticum sp.</i>	internode					1				
<i>Triticum sp.</i>	rachis node					90				
<i>Triticum sp.</i>	glume					1				
<i>Triticum sp.</i>	rachis node					138				
<i>Triticum sp.</i>	rachis segment					3				
Cereal	chaff undetermined					28				
Cereal	spikelet fork					1				
Cereal	glume base					26				
Cereal	glume					105				
Cereal	rachis node					2				
Cereal	culm node					9			1	
Cereal	rachis segment					19				
Cereal	culm					26				
Pulses		4	20	3	56	2124	39	4	154	164
<i>Lathyrus cicera</i>	seed				1	24	2			
<i>Lathyrus sativus</i>	seed		1		2	153			1	
<i>Lathyrus sp.</i>	seed		2		17	34	2		1	
<i>Lens culinaris</i>	seed		2	3	7	440	17		6	6
<i>Medicago cf. sativa</i>	seed					3				
<i>Pisum sativum</i>	seed		2			820	5			37
<i>Pisum/Lathyrus</i>	seed				1	7				

<i>Pisum/Lens</i>	seed					4				
<i>Vicia ervilia</i>	seed				9	41	2			10
<i>Vicia faba</i>	seed	1	1		2	103	6	1	137	56
<i>Vicia sativa</i>	seed					24				1
<i>Vicia/Lathyrus</i>	seed					33	2			
<i>Vicia/Lens</i>	seed		2			2			1	1
<i>Vicia/Pisum</i>	seed		2			17	2	3		1
Undetermined pulses	seed	3	8		17	419	1		8	52
Oil plants, spices, vegetables		0	0	0	0	37	0	0	0	0
<i>Allium sativum</i>	seed					18				
<i>Coriandrum sativum</i>	seed					1				
<i>Linum usitatissimum</i>	seed					18				
Edible fruits (wild & cultivated)		250	1019	521	33	20276	2053	55	3	142
<i>Arbutus unedo</i>	fruit					1				
<i>Cornus mas</i>	stone					3*				
<i>Corylus avellana</i>	nut					69*	1			
<i>Crataegus monogyna</i>	seed					1				
<i>Crataegus sp.</i>	seed									1
<i>Ficus carica</i>	pip					1465*		4		1
<i>Olea europaea</i>	stone		4	6*		52*	2		1	
<i>Physalis sp.</i>	seed					1				
<i>Pistacia lentiscus</i>	seed					1				
<i>Prunus avium/cerasus</i>	stone					6*				
<i>Prunus cf. domestica</i>	stone					1				
<i>Prunus dulcis</i>	nut					2			1	
<i>Prunus spinosa</i>	fruit stone			43*		5	1			
<i>Prunus sp.</i>	stone					1				
<i>Pyrus communis/pyraster</i>	pip					1				
<i>Quercus sp.</i>	cupula					4				
<i>Quercus sp.</i>	acorn					8	1			
<i>Rubus caesius</i>	seed					1				
<i>Rubus fruticosus</i>	seed			311*	2*	218*	1			
<i>Rubus idaeus</i>	seed					2*				
<i>Rubus sp.</i>	seed					6				
<i>Sambucus nigra</i>	seed			33*		41*		26		
<i>Sorbus sp.</i>	seed					2				
<i>Sorbus/Malus</i>	seed					1				
<i>Vitis sp.</i>	pedicel					1				
<i>Vitis sp.</i>	pip	1				1				
<i>Vitis vinifera</i>	fruit					5*				
<i>Vitis vinifera</i>	pedicel		1	1*	3*	454*	16			
<i>Vitis vinifera</i>	pip	249#	1014#	127*#	28*#	17923*#	2031	25	1	140#
Woodlands, edges		0	0	104	0	24	0	0	0	1
<i>Bryonia dioica</i>	seed			45*						
<i>Cornus sanguinea</i>	stone			59*						
<i>Fagus sylvatica</i>	bract					2*				
<i>Juniperus/Tamarix</i>	branch					8				
<i>Pistacia terebinthus</i>	seed					1				
<i>Rosa sp.</i>	thorn					1				
Rosaceae	seed					1*				
<i>Rumex sanguineus</i>	seed					2				1
<i>Silene dioica</i>	seed					8*				
<i>Spartium junceum</i>	seed					1				
Winter cereals weeds		4	20	3	12	4335	10	2	23	36
<i>Adonis annua</i>	seed			3*	1*	10*				
<i>Aegilops sp.</i>	seed					27				
<i>Agrostemma githago</i>	seed					3				
<i>Ajuga chamaepitys</i>	seed					7*				
<i>Ajuga sp.</i>	seed					1#				
<i>Ammi sp.</i>	seed					1				
<i>Asperula arvensis</i>	seed				4	5				1
<i>Avena fatua</i>	awn					5				
<i>Avena fatua</i>	flower base					2				
<i>Avena fatua</i>	lemma frag.					11				
<i>Avena fatua</i>	seed					10				
<i>Bromus arvensis</i>	seed					1				
<i>Bromus secalinus</i>	seed					19				
<i>Bupleurum sp.</i>	seed					2				
<i>Galium aparine</i>	seed	1	2			41		1		
<i>Galium spurium</i>	seed	2	2			15				
<i>Lathyrus arvensis</i>	seed					3				
<i>Lithospermum arvense</i>	seed					92#	1			
<i>Lolium temulentum</i>	seed	1	16		4	3769			23	33

<i>Medicago lupulina</i>	fruit					1				
<i>Medicago lupulina</i>	seed					2				
<i>Neslia paniculata</i>	seed					1				
<i>Papaver dubium/rhoeas</i>	seed					10*				
<i>Papaver somniferum (setigerum?)</i>	seed					1				
<i>Phalaris paradoxa</i>	seed					15	4			
<i>Reseda phyteuma</i>	seed					13*				
<i>Rumex acetosella</i>	seed					145*		1		2
<i>Sherardia arvensis</i>	seed					78				
<i>Vaccaria hispanica</i>	seed					1				
<i>Valerianella dentata</i>	seed				3	35				
<i>Veronica hederifolia</i>	seed					9	5			
Spring weeds		0	4	3	15	463	2	2	1	3
<i>Anagallis sp.</i>	seed					2				
<i>Atriplex hastata/patula</i>	seed					4*				
<i>Brassica nigra</i>	seed					8				
<i>Brassica sp.</i>	seed					2				
<i>Chenopodium album</i>	seed		2	1*	1*	235*	2	1	1	3
<i>Chenopodium polyspermum</i>	seed					6				
<i>Echinochloa crus/gallii</i>	seed					2				
<i>Echinochloa sp.</i>	seed					12				
<i>Eragrostis minor</i>	seed					1				
<i>Euphorbia helioscopia</i>	seed				13*	16*				
<i>Fumaria officinalis</i>	seed					26*				
<i>Medicago arabica</i>	fruit					3*				
<i>Medicago arabica</i>	seed					2*				
<i>Mercurialis annua</i>	seed					1*				
<i>Polygonum persicaria</i>	seed					8				
<i>Portulaca oleracea</i>	seed					107*		1		
<i>Raphanus raphanistrum</i>	seed		2			6				
<i>Raphanus/Rapistrum</i>	seed					1				
<i>Setaria viridis/verticillata</i>	seed			1		12				
<i>Solanum nigrum</i>	seed			1#	1	5				
<i>Stellaria media</i>	seed					4				
Ruderals, wasteland		0	2	69	117	6919	12	10	3	0
<i>Anthemis cotula</i>	seed					308				
<i>Anthemis sp.</i>	seed					1				
<i>Asphodelus fistulosus</i>	seed					1				
<i>Bromus molis</i>	seed					9				
<i>Bromus sterilis</i>	seed					271				
<i>Chenopodium murale</i>	seed					7				
<i>Daucus carota</i>	seed				1*					
<i>Glaucium corniculatum</i>	seed					3*				
<i>Heliotropium europaeum</i>	seed		1		23*	130*				
<i>Hordeum murinum</i>	seed					26				
<i>Hyoscyamus niger</i>	seed					29*				
<i>Isatis tinctoria</i>	seed					632				
<i>Malva nicaeensis</i>	seed					11				
<i>Malva sylvestris</i>	seed					28*	1			
<i>Medicago littoralis</i>	fruit					1				
<i>Medicago littoralis</i>	seed					4				
<i>Medicago radiata</i>	seed					1				
<i>Melandrium album</i>	seed					1				
<i>Nepeta cataria</i>	seed					2				
<i>Poa annua</i>	seed					9				
<i>Polygonum aviculare</i>	seed				30*	92*				
<i>Polygonum convolvulus</i>	seed				1	124*	1		3	
<i>Polygonum minus</i>	seed					2				
<i>Reseda lutea</i>	seed		1#			47*				
<i>Reseda luteola</i>	seed					4*				
<i>Rosmarinus officinalis</i>	leaf					4706*	10			
<i>Rumex pulcher</i>	seed					2*				
<i>Sambucus ebulus</i>	seed			67*	2	249*#		10		
<i>Saponaria officinalis</i>	seed				1*	12*				
<i>Saponaria sp.</i>	seed					5*				
<i>Silene alba</i>	seed					1				
<i>Silene gallica</i>	seed					43*				
<i>Silene vulgaris</i>	seed					130*				
<i>Urtica dioica</i>	seed					1				
<i>Urtica urens</i>	seed					2				
<i>Verbena officinalis</i>	seed			2*	55*	25				
<i>Xanthium cf. strumarium</i>	fruit					4*				
Grasslands, meadows		0	0	0	0	2164	0	1	0	0

<i>Agrimonia eupatoria</i>	seed					1				
<i>Bromus racemosus</i>	seed					49				
<i>Lolium perenne/rigidum</i>	seed					1469#				
<i>Medicago minima</i>	fruit					8*		1		
<i>Medicago minima</i>	seed					296*				
<i>Medicago polymorpha</i>	seed					2*				
<i>Phleum pratense</i>	seed					7				
<i>Phleum sp.</i>	seed					16				
<i>Plantago lagopus/ovata</i>	seed					4				
<i>Plantago lanceolata</i>	seed					13*				
<i>Poa pratensis/trivialis</i>	seed					32				
<i>Ranunculus repens</i>	seed					9*				
<i>Rumex acetosa</i>	seed					29*				
<i>Rumex crispus</i>	seed					56*				
<i>Sanguisorba minor</i>	seed					3				
<i>Silene nutans</i>	seed					41*				
<i>Trifolium pratense</i>	seed					114				
<i>Trifolium repens</i>	seed					13				
<i>Trinia glauca</i>	seed					2				
Wetlands, marshes		0	1	134	61	16277	1	2	3	0
<i>Alisma plantago/aquatica</i>	seed					2*				
Alismataceae	seed					1*				
<i>Apium graveolens</i>	seed					5				
<i>Bolboschoenus maritimus</i>	seed					946*		1	1	
<i>Carex divisa/divulsa</i> -type	seed					237*				
<i>Carex elata</i> -type	seed					31*				
<i>Carex flava</i> -type	seed					98*		1		
<i>Carex hirta/distans</i> -type	seed		1		49*	158*				
<i>Carex leporina/ovalis</i> -type	seed					12*				
<i>Carex paniculata</i> -type	seed					4				
<i>Carex riparia</i> -type	seed					71*				
<i>Carex sp.</i>	seed coat					2*				
<i>Carex sp.</i>	seed					105*	1		2	
<i>Chara sp.</i>	seed					64*#				
<i>Cladium mariscus</i>	seed					25*				
<i>Cyperus fuscus</i>	seed					2				
<i>Cyperus longus</i>	seed					7*				
<i>Cyperus sp.</i>	seed					33*				
<i>Eleocharis sp.</i>	seed					20*				
<i>Galium palustre</i>	seed					4				
<i>Glyceria sp.</i>	seed					8				
<i>Juncus sp.</i>	capsule					6731				
<i>Juncus sp.</i>	rhizome					2				
<i>Juncus sp.</i>	seed					6978				
<i>Lycopus europaeus</i>	seed			133*						
<i>Persicaria hydropiper</i>	seed					6				
<i>Phragmites sp.</i>	stalk					417				
<i>Phragmites/Juncus</i>	rhizome					5				
<i>Phragmites/Juncus</i>	stalk					1				
<i>Polygonum hydropiper</i>	seed					13				
<i>Polygonum lapathifolium</i>	seed				9*	18*				
<i>Polygonum mite</i>	seed					1				
<i>Ranunculus sardous</i>	seed			1*	3*	1*				
<i>Rumex conglomeratus</i>	seed					3				
<i>Schoenoplectus lacustris</i>	seed					153*				
<i>Schoenoplectus sp.</i>	seed					8				
<i>Schoenoplectus/Bolboschoenus</i>	seed					93				
<i>Schoenus nigricans</i>	seed					2				
<i>Solanum dulcamara</i>	seed					5				
<i>Sparganium erectum</i>	seed					5				
Coast (sandy)		0	0	0	0	68	0	0	0	0
<i>Poa palustris</i>	seed					52				
<i>Polypogon monspeliense</i>	seed					8				
<i>Ruppia maritima</i>	seed					2				
<i>Salicornia sp.</i>	seed					1				
<i>Silene neglecta</i>	seed					1				
<i>Suaeda maritima</i>	seed					4*				
Varia		14	42	78	148	12780	187	7	27	32
<i>Adonis sp.</i>	seed			5*						
<i>Ajuga/Teucrium</i>	seed				1					
<i>Alopecurus sp.</i>	seed					40				
<i>Amaranthus sp.</i>	seed					19*				
<i>Apium sp.</i>	seed					4*				

Apiaceae	seed			5*	1	25*	1		2	
Apiaceae/Asteraceae	seed					1				
<i>Asperula</i> sp.	seed					29				
<i>Asperula/Galium</i>	seed					11				
Asteraceae	seed			4*		31	1	1		
<i>Astragalus</i> sp.	seed					3			1	
<i>Atriplex</i> sp.	seed				3	53*				
<i>Atriplex/Chenopodium</i>	seed					43*				
<i>Avena</i> sp.	awn					395				
<i>Avena</i> sp.	lemma frag.					48				
<i>Avena</i> sp.	seed		16	1		940	8	1	9	
<i>Beta</i> sp.	fruit					1*				
<i>Beta</i> sp.	seed					1*				
Boraginaceae	seed					1				
Brassicaceae	seed			2*	2	15*				
<i>Bromus</i> sp.	seed				1	213			2	
Caprifoliaceae	seed					2#				
<i>Carduus/Cirsium</i>	seed					120				
<i>Carthamus</i> sp.	seed					5				
Caryophyllaceae	seed					13				
<i>Centaurea</i> sp.	seed					12*				
<i>Cerastium</i> sp.	seed					10*				
<i>Chenopodium</i> sp.	seed					177*	3			
Chenopodiaceae	seed					32		1		
<i>Chrysanthemum</i> sp.	seed					1				
<i>Cirsium</i> sp.	seed					5*				
<i>Cistus</i> sp.	leaf					1358				1
<i>Cistus</i> sp.	seed					54				
<i>Coronilla</i> sp.	seed					5				
Cyperaceae	seed					133*			1	
Cyperaceae/Polygonaceae	seed									1
<i>Digitaria</i> sp.	seed					1				
<i>Echium vulgare</i>	seed					1				
<i>Euphorbia</i> sp.	seed					4	1			
Fabaceae	seed					74	23			
<i>Festuca</i> sp.	seed					9				
<i>Galeopsis</i> sp.	seed					1				
<i>Galium</i> sp.	seed	1	2			344				
<i>Gypsophila</i> sp.	seed					2				
<i>Helianthemum</i> sp.	seed					6*				
<i>Leucanthemum</i> sp.	seed					2				
Labiatae	seed			1*		10*				
Liliaceae	seed	1				4				
<i>Linum</i> sp.	seed					14*				
<i>Lithospermum</i> sp.	seed					22*				
<i>Lolium</i> sp.	seed	8	9		12#	3323#	118	1		5
<i>Lolium/Festuca</i>	seed					183		1	2	2
<i>Malva</i> sp.	seed					123*			1	
Malvaceae	seed					3				
<i>Medicago</i> sp.	fruit					5*				
<i>Medicago</i> sp.	seed					242*	1			
<i>Medicago/Melilotus</i>	seed					19				
<i>Melilotus</i> sp.	seed					51				1
<i>Melilotus/Trifolium</i>	seed							1		
<i>Nigella</i> sp.	seed					1				
<i>Onobrychis</i> sp.	seed					2				
<i>Ornithopus</i> sp.	seed					1				
<i>Phalaris</i> sp.	seed		2		6	603		1	1	2
<i>Plantago</i> sp.	seed					6				
<i>Poa</i> sp.	seed					38				
Poaceae	awn					5				
Poaceae	spikelet fork					5				
Poaceae	glume base					2				
Poaceae	glume					16				
Poaceae	seed	4	10	50	98	2478	15		7	12
Poaceae	rachis segment				4	22				
Poaceae	culm			1		2				
<i>Polygonum</i> sp.	seed					29*	2			
Polygonaceae	seed			1		7*				
<i>Potentilla</i> sp.	seed					30*				
<i>Ranunculus</i> sp.	seed				3*	25*				
Ranunculaceae	seed					40	1			
<i>Reseda</i> sp.	seed					2				

Rubiaceae	seed					18				
<i>Rumex crispus/conglomeratus</i>	fruit					2*				
<i>Rumex crispus/conglomeratus</i>	seed					9*				
<i>Rumex</i> sp.	fruit					3				
<i>Rumex</i> sp.	seed				3*	130	2			1
<i>Scorpiurus</i> sp.	seed					3				
<i>Scrophularia/Verbascum</i>	seed					3				
<i>Setaria</i> sp.	seed			3		72	1			3
<i>Silene</i> sp.	seed	1				192				
<i>Silene/Stellaria</i>	seed					2*				
<i>Sisymbrium</i> sp.	seed					17			1	
<i>Solanum</i> sp.	seed					4				
Solanaceae	seed					1				
<i>Stachys</i> sp.	seed				12*	10*				
<i>Stellaria</i> sp.	seed					1				
<i>Teucrium</i> sp.	seed					5				
<i>Thymelaea</i> sp.	seed					146*				
<i>Trifolium</i> sp.	seed	1				400	3			2
<i>Trifolium/Melilotus</i>	seed					96				2
<i>Trigonella</i> sp.	seed					35				
<i>Urtica</i> sp.	seed					2				
<i>Valerianella</i> sp.	seed				2	2				
<i>Vicia</i> sp.	seed	1		1		66	7			
<i>Viola</i> sp.	seed				4	3				
<i>Vulpia</i> sp.	seed					1				
Undetermined		2	164	29	22	2269	5	11	49	18
Undetermined	seed	2	22	9*	8*	1156*	5	9	8	1
Undetermined fragments	varia		142	20*	14*	1113*		2	41	17
	Total NR	1115	17457	1929	776	237911	3242	145	6614	2657
	Total NRD	1113	17293	1900	754	235642	3237	134	6565	2639
	Total levels (SU)	23	33	14	5	253	78	19	3	12
	Total volume (litres)	455	1596	470	120	11703	4515	380	90	835

ESM Table 2 General archaeobotanical results per site (LPA, Port Ariane; LSS, Saint Sauveur; LMC, Mas de Causse) and century concerning the number of stratigraphic units (SU) studied, the absolute number of remains (NR) and taxa identified, the volume of sediment sieved and the general density of remains/litre

	SU	NR	Taxa	Volume (l)	Density (rems/l)
<i>Pech Maho</i>					
6th c. BC	7	292	3	125	4
5th c. BC	8	446	7	180	3
4th c. BC	8	377	8	150	3
3rd c. BC	5	4,213	13	70	60
2nd c. BC	28	13,244	22	1,526	9
<i>Lattara (LPA)</i>					
4th c. BC	5	776	33	120	7
<i>Lattara (LSS)</i>					
5th c. BC	159	215,721	152	6,731	32
4th c. BC	94	22,190	78	4,972	4
3rd c. BC	48	2,062	19	3,499	1
2nd c. BC	30	1,180	10	1,016	1
<i>Lattara (LMC)</i>					
4th c. BC	19	145	20	380	0.4
<i>Le Cailar</i>					
5th c. BC	3	6,614	25	90	74
3rd c. BC	12	2,668	28	835	3