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Wild fruits, domesticated fruits. Archaeobotanical remains from the Roman saltworks at O Areal, Vigo (Galicia, Spain).

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Abstract
The exceptional preservation conditions at the saltworks of O Areal has meant that o numerous carpological remains have been recovered, which were connected to both the use of the salt works and to its phase of abandonment. The presence and introduction of various species indicates changes in woodland exploitation patterns, which reflect a different woodland management strategy –forestry– in NW Iberia.
Keywords. Saltworks, Roman era, carpology, forestry, fruit and berries.

Résumé
Les exceptionnelles conditions de conservation de la saline d'O Areal ont permis la récupération de nombreux restes carpologiques, liés autant au fonctionnement de la saline qu'à son abandon. La présence et l'introduction de certaines espèces indiquent un changement de modèle quant à l'exploitation des arbres et des arbustes, ce qui démontre une gestion différente du bois au nord-ouest de la péninsule Ibérique : la sylviculture.
Mots-clef. Saline, époque romaine, carpologie, sylviculture, fruits et baies.

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Introduction

Since the 1990s various archaeological interventions have taken place in O Areal, a suburb of the city of Vigo, revealing the existence of Roman salt works that extended over an area of more than 1 km. The site is located in what once was an important trading port in the northwest of the Iberian Peninsula.

In the Roman era, during a period of marine regression that began *c.* 1900 BP and ended around 1500/1400 BP (Martínez & Costas, 1997), a salt production complex was established on this beach and the salt marsh zone. The complex was in use during the Ist and IInd centuries AD and was abandoned in the IIIrd century AD. The abandonment phase was represented by the deposition of a large quantity of organic remains, followed by the sealing of the site by layers of sand. The urban centre of *Vicus Heleni* (Vigo) expanded onto this sand dune in the Vth century AD, and structural remains and a cemetery from this phase were preserved on the site (Iglesias, 2009) (fig. 1).

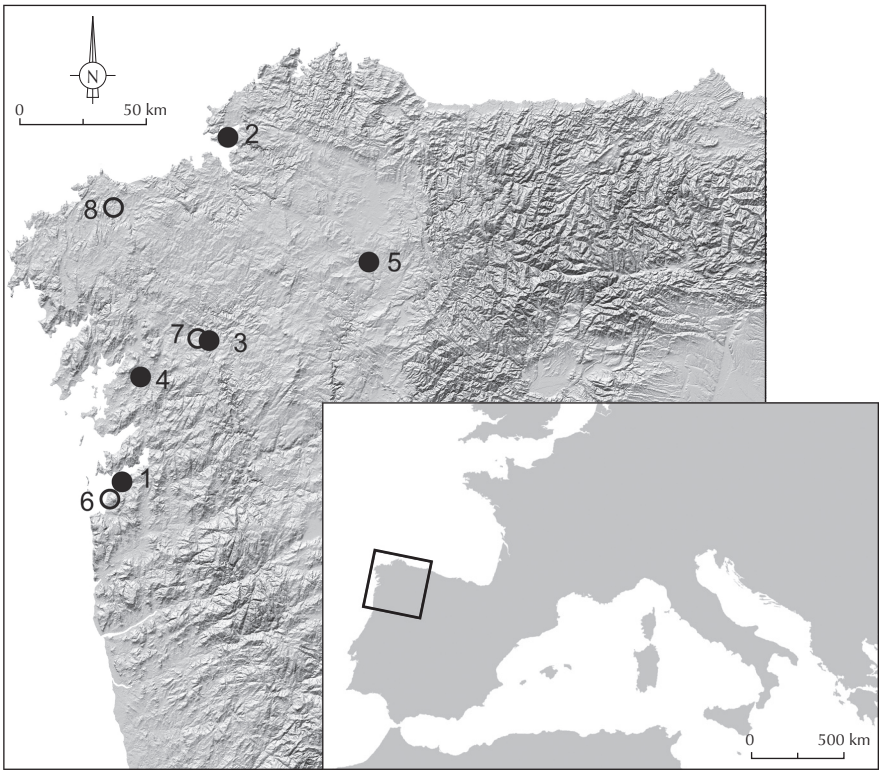

Fig. 1. *Sites mentioned in the text. Roman period: 1) O Areal saltworks, 2) Noville, 3) Agro de Ouzande, 4) rúa Ferreiría, 5) Lucus Augusti. Iron Age: 6) Castro de Navás, 7) Castrovite. Natural environment: 8) Braña Rubia lagoon.*

Material and methods

As the site of O Areal is partially located below present-day sea-level, large quantities of water-saturated archaeobotanical remains have survived. These extremely well-preserved remains mostly correspond to construction materials related to the salt works, as well as waste material from wood-working, naturally transported organic material, and other residues of human activities.

The analysed samples came from three archaeological interventions undertaken within the same proposed construction site. The total volume of samples consisted of more than 250 litres of organic material from the specific sampling of wood and seeds, nearly 100 litres of humid sediment from the abandonment phase of the salt works, of which 6.5 litres was sieved and 82.55 litres of dry soil from various levels of the site, all of which was sieved. The samples were processed through 2 mm, 1 mm and 0.5 mm mesh sieves.

The majority of the carpological remains were found within the water-saturated organic layers that were deposited on the clay floor of the Salterns after the abandonment of the site, and which were subsequently sealed by layers of sand. Although the carpological remains represent only a very small proportion of the overall volume, 1,082 individual and fragmentary remains were recovered. The remains were distributed in an unequal manner, reflecting the collection process and the type of sediment. The screening of the humid sediment was particularly significant, with the greatest variety of taxa recorded, even though this represented the least volume of sediment analysed.

In a water-saturated environment the organic structural remains, although maintaining an appearance similar to their original form, were degraded. Without consolidation treatment these could have become altered on transferral to a dry environment. For this reason it was considered necessary to conserve them in water, within semi-permanent rigid packaging that was then placed within a refrigerated chamber to avoid the proliferation of fungi and the attack of micro-organisms. Prior to packaging the remains were desalinated and oil residues were removed, these residues being the result of waste associated with a XXth century food preservation factory that was situated on the site.

Results

The carpological analysis of the saltworks at O Areal has yielded a total of 87 taxa. This taxonomic list provides information on the surrounding environment of the site as deduced from the ecological demands of each plant and its associations with other species. In this way it was possible to identify the existence of various habitats close to the salt works and the presence of non-native plants.

1. **Cultivation areas.** Crops, synanthropic and adventitious vegetation. *A triplex hastata, Chenopodium album, Chenopodium glaucum, Polygonum lapathifolium, Polygonum persicaria, Polygonum aviculare, Solanum nigrum.*

2. **Cultivated and fruit-bearing species.** *Castanea sativa, Juglans regia, Ficus carica, Prunus avium, Prunus avium/cerasus, Prunus domestica* subsp. *insititia, Prunus persic*a.
3. **Ruderal areas**: paths, route ways, habitation zones. *Cirsium arvense, Rumex* sp, *Urtica dioica.*
4. **Vegetation of forest clearings and forest limits, humid areas close to water sources.** Pre-forests and the shrubby formation of hygrophiles. *Carex* sp, *Corylus avellana, Rhamnus frangula, Rubus fruticosus agg, Silene* sp.
5. **Vegetation of humid zones.** Seasonal or permanent lagoons, meadows, fluvial courses. *Apium nodiflorum, Arundo donax, Carex* sp, *Elatine macropoda, Juncus conglomeratus/effusus.*
6. **Salt marsh vegetation**. *Juncus maritimus.*

Taxon	n	1/2	frag
Castanea sativa	5		592
Corylus avellana	4		3
Ficus carica	12		
Juglans regia		4	46
Olea europaea	1		
Pinus pinea (bract)	8		
Prunus sp.	1		
Prunus avium	20		
Prunus avium/cerasum		5	
Prunus domestica subsp. *insititia*	1		
Prunus persica	1	2	2
Rhamnus frangula (berry)	1		
Rhamnus frangula (seed)	2		3
Rubus sp.	1		
Rubus fruticosus agg.	95		1
Sambucus nigra	32		
Vitis vinifera			5
Vitis vinifera subsp. *sativa*	8		
Vitis vinifera subsp. *sylvestris*	1		
TOTAL	**193**	**11**	**661**

Fig. 2. *Table: Nuts, fruits and berries.*

The carpological remains do not correspond to any one definitive habitat. Fruits and berries comprise 47.71 % of the whole individuals found in the 2 mm and 1 mm sieves, the quantitative importance of the seeds of *Rubus fruticosus agg* standing out in particular. If we also include the fragments and the carpological remains from the 0.5 mm sieve this percentage increases to 80.04 % of the total, an increase owing to the large quantity of fragmented achenes and nuts, mainly of *Castanea sativa* and *Juglans regia* (fig. 2).

The majority of the carpological remains came from waste products and dumps associated with human activity, following the abandonment of the salt works. Although there is no direct relationship between presence and consumption, it is highly probable that the majority of species could have formed part of the human diet, except for the fruit of *Rhamnus frangula,* which is toxic, but can be used to create a vegetable dye. The fragmentation of the fruits of *Castanea* and *Juglans* indicates the dietary consumption of chestnuts and walnuts, which is shown by their high concentration and also by the absence of evidence for the natural abrasion of the fragments. The type of fragmentation of the bracts of the pine cones of *Pinus pinea* also suggests consumption, although no pine nuts were found.

The case of hazelnuts (*Corylus avellana)* was different, with entire individual examples found, some with rodent gnaw marks. It is probable that some of these remains were deposited by hydric sedimentation. It is more difficult to determine if the berries, for example *Rubus* and *Sambucus*, formed part of the diet or were deposited naturally.

The significance of the data becomes apparent when compared with the presence/absence of these plants in preceding cultural epochs. In the carpological, anthracological and pollen record (Aira, 1996; Dopazo *et al,* 1996; Martín & Piqué, in press.; Parcero *et al,* 2007) only *Castanea sativa*, *Corylus avellana* and *Juglans regia* have been identified prior to the Roman period. It is presumed that *Rhamnus frangula, Rubus fruticosus* agg., and *Sambucus nigra* were also present in the environment, forming part of the floral community. In other instances, it was only possible to determine the genus, not the species, as was the case with *Pinus* sp. and *Prunus* sp.

The analyses identified taxa that previously had not been found in the archaeological record of Galicia. The vine (*Vitis vinifera*) appeared in O Areal from a context just prior to the construction phase of the saltworks, and from the abandonment phase in the IIIrd century AD. Both the cultivated (*Vitis vinifera* subsp. *sativa*) and wild (*Vitis vinifera* subsp. *sylvestris*) varieties of the vine are present. Fruit-bearing trees that enjoyed a wide diffusion in the Roman period are also present: *Prunus domestica* subsp. *insititia*, *Prunus persica.* It is possible that the cultivation of other species (*Ficus carica*, *Olea europaea*, *Pinus pinea*, *Prunus avium*) was introduced or became widespread at this time but there is insufficient data to confirm this. Pollen analyses of Iron Age sites may indicate the presence of *Olea europaea* at this time, such as at the castro of Navás from contexts dating to the transition to the first millennium AD (Nigrán,

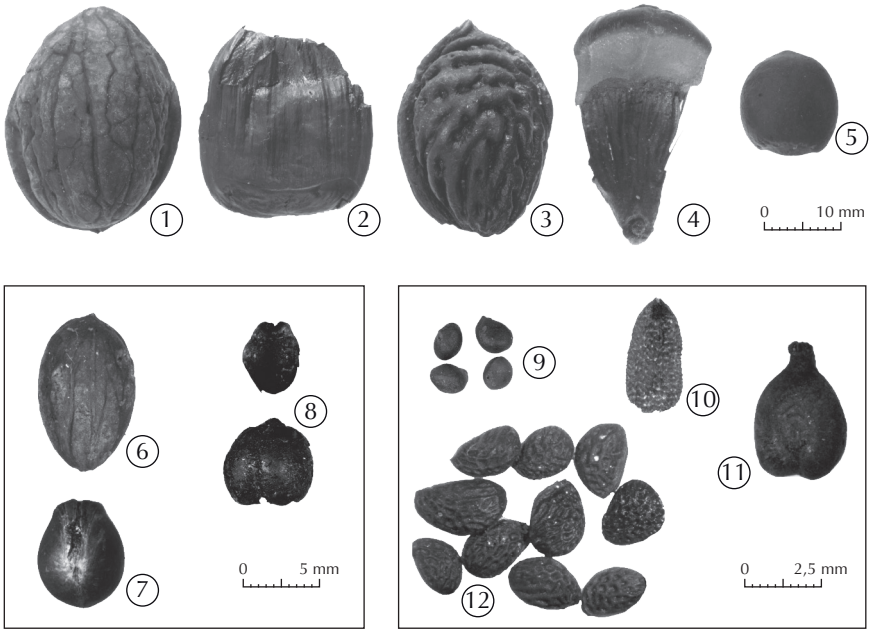

Fig. 3. *Carpological remains from O Areal: 1)* Juglans regia*, 2)* Castanea sativa*, 3)* Prunus persica*, 4)* Pinus pinea (*bract), 5)* Corylus avellana*, 6)* Olea europaea*, 7)* Prunus avium*, 8)* Rhamnus frangula*, 9)* Ficus carica*, 10)* Sambucus nigra*, 11)* Vitis vinifera *subsp.* sativa*, 12)* Rubus fruticosus *agg.*

Pontevedra) (Currás, unpublished), and *Olea europaea* pollen type from mid-first millennium AD contexts in Castrovite (A Estrada, Pontevedra) (Sáa, unpublised). However, there is not enough evidence to indicate its exploitation throughout the territory of the Northwest during the Roman period (fig. 3).

Discussion

The interpretation of Roman influence on forest exploitation activities in Northwest Iberia has been based on generalisations extrapolated from the classical texts. Evaluating the nature of the changes and transformations related to the Roman conquest of the northwest of the peninsula is complex, especially if the reconstruction can only be based on 5 diverse sites: the roman *villa* of Noville (Mugardos, A Coruña); the high imperial saltworks of O Areal in the commercial port of Vigo (Pontevedra), which has shown evidence of Mediterranean imports; the rural settlement of Agro de Ouzande (Silleda, Pontevedra); the rural settlement of Rúa Ferreiría (Caldas de Reis, Pontevedra) with evidence of possible surplus production for commercial activity; the city of *Lucus Augusti* (Lugo). It is therefore more prudent to speak in terms of general patterns rather than definitive norms.

The data were retrieved from diverse sources, ranging from carbonised and anaerobically-preserved carpological remains, phytoliths, cultivation features, and charcoal. At Noville and at O Areal the analyses were undertaken on carpological remains, with carbonised remains analysed at Noville (Dopazo, 1996), while at O Areal the remains came from an anaerobic water-saturated environment. In Agro de Ouzande phytoliths from pottery and quern stones were identified (Juan & Matamala, 2002), while at the site of Rúa Ferreiría (Calo, unpublished) excavation indicated the presence of cultivation features possibly associated with viticulture. Anthracological and palynological analyses have also been undertaken for *Lucus Augusti* (Lugo), the *conventus* capital. However, the quantitatively limited scale of these analyses and the problems of pollen conservation (Aira & Uzquiano, 1996) restrict the amount of new comparative information with respect to previous phases of activity that can be retrieved.

Fig. 4. *Cultivation structures in the excavation at Ferreiría (Calo, 2007).*

An examination of the species present at these sites shows that in the Roman period in Galicia the basic pattern of consumption of plant material was similar to that of the Iron Age, with an emphasis primarily on cereals (*Triticum* sp., *Hordeum* sp., *Panicum miliaceum, Setaria italica),* along with a presence of (*Vicia faba, Pissum sativum*) and vegetables (*Brassica/Sinapis*). With relation to collected wild plants, the acorns of *Quercus* sp, as well as that of *Corylus avellana, Pyrus* sp, and *Urtica* sp. are well represented (Dopazo *et al,* 1996, Parcero *et al*, 2007), all of which are also present in Iron Age contexts. This pattern of consumption was evident at the *villa* at Noville (Dopazo *et al,* 1996) and the site of Agro de Ouzande (Juan & Matamala, 2002).

Despite these similarities, there are various differences in the management of edible fruits and berries with respect to the Iron Age. One such difference, which is evident at O Areal, is the introduction of new species and the exploitation of other pre-existing arboreal species that formed an important part of the diet of Roman society, and which had a wide diffusion throughout the empire. Species like the vine spread throughout the territory, as demonstrated by the pollen analysis at Braña Rubia (Coristanco, A Coruña) that comes from contexts dated to 1600 BP (Aira, 1996), and the cultivation structures of the site of Rúa Ferreiría of the late Imperial period (fig. 4).

Another difference is the exploitation of certain species, such as the chestnut and its management as a resource. The increase in *Castanea* pollen is only

understandable if looked at in terms of anthropic causes (Aira, 1996; Conedera *et al*, 2004). This pollen increase is also paralleled in the representation of charcoal in archaeological sites related to the consumption of this wood as a fuel (Martín & Piqué, in press). Its exploitation was based not only on the management of naturally consolidated woods, but also through forestry. While archaeological and environmental data allow us to identify the occurrence of forestry practices with relation to the chestnut, it is not possible to determine exactly what type of cultivation was practiced.

Possibly the most significant difference at this time is evidenced in the choice of settlement location. From an earlier panorama dominated by a large number of small fortified *castros* (hill forts), which were located on elevated sites with a good all round view of the immediate environment, these changes, from the Ist century AD onwards, develops into a pattern of cities and villages of an open nature and of a clearly Roman settlement network pattern (Parcero *et al*, 2007). This suggests a reorganisation of the landscape that encompassed both agrarian and woodland spaces.

Conclusion

The significance of the archaeobotanical analysis of O Areal has been the identification of the presence of new species within the landscape of the north-west of the Iberian Peninsula during the Roman period. The results confirm that changes were taking place within the territory; these changes are also observable in the pollen analyses and in settlement patterns. The intensity of the introduction and expansion of new species varied, affecting areas with more commercial activity and cities to a greater extent, as compared to rural locations, where known crops continued to be cultivated, but with modifications in the manner of production and the management of the space of the *ager* and the *saltus*. Therefore we should consider forestry practices in relation to this.

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