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The territory of Roman *Barcino*: methodological advances applied to the study of a centuriated landscape

Josep Maria Palet Martínez[1]
Catalan Institute of Classical Archaeology. Landscape Archaeology Research Group (GIAP)

Maria Jesús Ortega Pérez[2]
Catalan Institute of Classical Archaeology. Landscape Archaeology Research Group (GIAP)

Carme Miró Alaix[3]
Barcelona Archaeological Service. Barcelona City Council

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Abstract

Landscape archaeology has contributed greatly to the advance of centuriation studies, a research area widely considered marginal in recent decades. This was due in large part to a multiplicity of unreliable studies from the 1970s to the 1990s, some of which were proved wrong by large-scale excavation. Despite this, the last decade has seen a revival of archaeomorphology-based studies that has helped put this discipline back on the map. Moreover, current research has adopted multidisciplinary approaches which include archaeological evidence, spatial analysis and palaeoenvironmental data. Environmental sources offer important insights on the effects a *deductio* had on the landscape. The incorporation of new digital methods and Geographic Information Systems (GIS) represents a major qualitative leap forward in the planimetric accuracy of field system restitution, improving the quality and reliability of archaeomorphological analyses. These new methodological advances have been largely developed in the territory of Roman *Barcino* (Barcelona), an Augustan colony in which the *centuriatio* embodied the ideal territory of a Roman town. The results allow a move from purely economic or materialistic approaches to more socially and culturally focused explanations. Linking centuriation with Roman settlements and landscape dynamics, our text proposes a rethink of *Barcino* centuriation which brings out both its economic impact through its influence on land use and the significance of its conceptual and representative dimension.

Keywords: Centuriation, settlement, *ager*, road network, archaeomorphology, land use, *villae*, *Barcino*.

1. Introduction

Centuriation, the grid-based parcelling of landscapes for land distribution and field allotment, is a key evidential paradigm for tracing how the Romans transformed the environments they colonised in order to fit their economic and productive needs. In its division of land into rectilinear units (*centuriae*) through a grid of parallel planning lines based on right-angled axes (*limitatio*), centuriation reflected the rational thinking of the Classical world. This also linked it to urban development so that, as described in ancient land-surveying treatises, it represented for the Romans the ideal extension of a city into its adjacent territory (López, 1994).

Advances in research have demonstrated that centuriation's apparent uniformity is in fact relative. Transported from the Italic world to the provinces from *c.* 100 BC, particular features within individual territories depended on chronology, cultural/social background and geographical features. Written sources mention the existence of undivided areas within the *centuriae*, the integration of woods and grasslands and the adaptation of these systems to

1. E-mail: jpalet@icac.cat
2. E-mail: mjortega@icac.cat
3. E-mail: cmiro@bcn.cat

mountain areas, the natural relief and streams. A number of examples and studies reveal wide spaces without limits as well as variations in the equidistance of the main axes and adaptations to topography and drainage (Ariño, Gurt, Palet, 2004, 157-164). The complexity of these reconstructions is increased by the selective conservation of features, their re-use and deformation over time. Furthermore, in the Mediterranean, research has demonstrated that large areas within centuriated landscapes were never exploited for agriculture or pastoral purposes, which may suggest that centuriation had a symbolic background beyond its economic uses (Palet, Orengo, 2011).

Despite these nuances, the phenomenon of centuriation remains crucial for understanding the Roman idea of territory. Various approaches have been applied in the study of centuriated areas but a particularly influential approach reached its peak during the 1980s with the work by the Besançon group (Clavel-Lévêque, 1983; Chouquer, *et al.* 1987). This school developed a methodology based on two criteria: constant orientation and modulation based on the *actus* (120 Roman feet, about 35.5 metres) and identification of the canonical model of grid squares with sides of 20 *actus*. This method, applied through aerial photography both in France and later in the rest of Europe, increased the number of centuriations identified without any critical interpretation of agrarian morphology. In some cases archaeological evidence, itself difficult to obtain, has proven these hypotheses wrong, further discrediting this approach.

During the 1990s researchers developed a suite of complementary methods and techniques that resulted in a wiser use of metrology, long-term and multidisciplinary approaches (Chouquer, Favory, 1991; Palet, 1997) and the development of archaeological (especially fieldwork and surveys) and geomorphological techniques (Berger, Jung, 1996) that allowed the archaeomorphological sequence to be analysed from a diachronic perspective. Centuriation studies have now evolved further with the application of techniques based on Geographical Information Systems and the increased availability of digital materials, together improving the quality and reliability of results.

However, archaeomorphological studies provide a sequence of relative chronology but not absolute dates, while surveys and test pits cannot always be carried out because of local conditions, with landscape changes especially remarkable in urban and peri-urban areas (Palet, 1997, 28-29). Regressive study (from the most recent to the oldest) of historical documents, including maps, is an essential source of information. It provides *ante quem / post quem* dating for structures and proves that archaeomorphological analysis is based on relevant historical landscape elements. The relationship between paths and routes and the distribution of rural settlement and sites is another relevant dating technique. Moreover, the incorporation of historical and palaeoenvironmental data enables an interdisciplinary approach based on landscape archaeology, offering insight into the complex relationship between territorial structuring, settlement and landscape change (Franceschelli, Marabini, 2007; Palet, Orengo, Riera 2011; Matteazi, 2019). These methodological advances have contributed to the reintegration of centuriations into landscape archaeology (Orengo, Palet, 2016).

2. Methodological advances and the study of *Barcino* centuriation

These studies have been carried out largely in the territory of *Barcino*. The research on landscape dynamics on the Plain of Barcelona, today an immense urban agglomeration, and specifically the territorial impact of the foundation of *Barcino*, had a reference study in J.M. Palet (1997) (Fig. 1). The analysis was updated by the same author and H.A. Orengo in 2009 and 2010, incorporating information from archaeomorphological, archaeological and paleoenvironmental data into a GIS project (Palet, Fiz, Orengo, 2009; Palet, Orengo, Riera, 2011). This update made it possible to rethink the impact of centuriation within the context of the foundation of *Barcino*.

Most recently there has been a significant advance in urban archaeology research in the city of Barcelona thanks to the development of rescue excavations by local authorities. Also

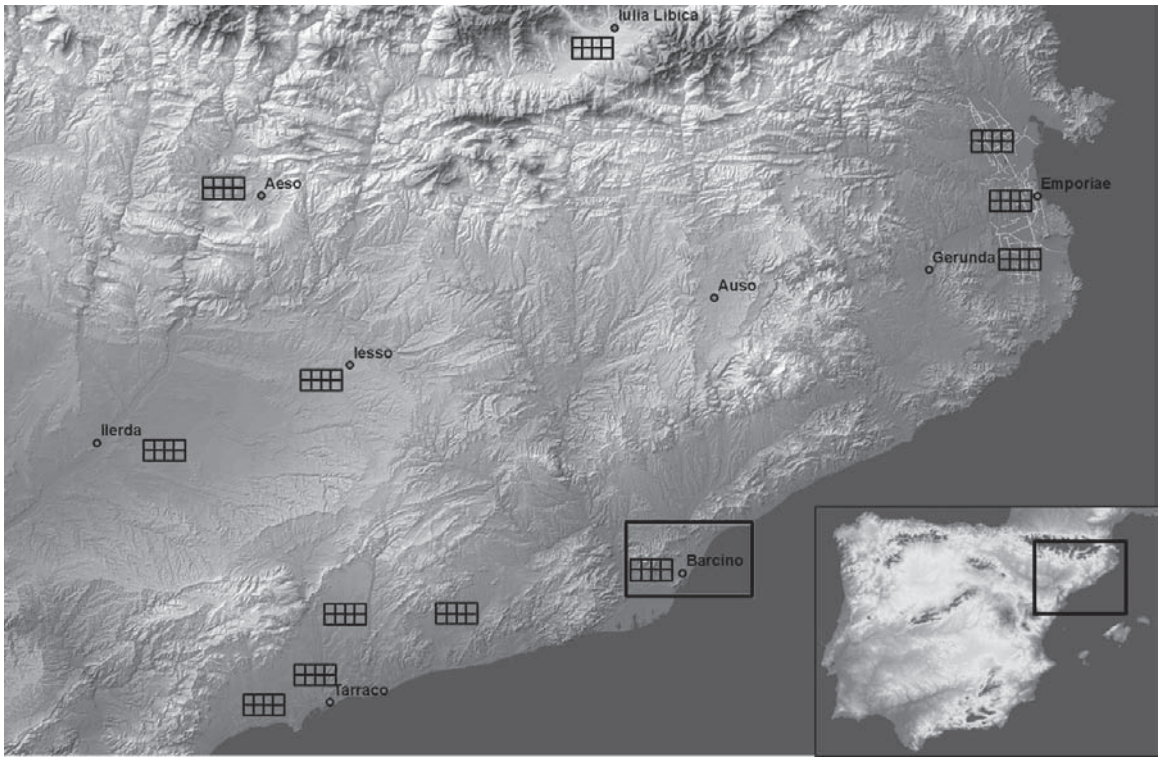

FIGURE 1. Location of the study area, indicating the impact of centuriation in north-east *Tarraconensis*.

noteworthy is the quality of the Archaeological Map produced by the Archaeological Service of the municipality and available via open access on the *Pla Barcino* website (http://cartaarqueologica.bcn.cat/). The Archaeological Service and GIAP-ICAC began a research collaboration in 2018 based on the revision of these new archaeological data. The aim was to correlate this database with the archaeomorphological geodatabase updated from 2010 and paleoenvironmental evidence. As an urban landscape, much of the Plain of Barcelona has not been able to be prospected. This gap in the research may explain certain blanks visible, especially in the Eixample area of the 19th century. However, the changing urban landscape of Barcelona also involves archaeological research, rescue excavations that have often confirmed previous hypotheses.

Developed in a GIS environment, cartographical documents were incorporated, specifically the digital 1:5,000 topographical base and 1:5,000 orthophotographic series, using ICGC WMS servers. This enabled the georeferencing of the 28 sheets of the city plan of Barcelona from 1933-1936, covering an important extent of the Plain of Barcelona[4] and the topographical map of Ildefons Cerdà from 1855[5]. In turn, their combination made it possible to geo-reference and rectify historical maps of major interest, such as the 1851 land division map from the municipality of Barcelona[6] Also incorporated were the aerial photographs taken by CETFA in 1947 using scales of 1:10,000 and 1:2,000, as well as the American aerial survey from 1956-1957. These show large parts of the surrounding area of Barcelona before the urbanisation of the second half of the 20th century. A digital terrain model (DTM) was

4. *Plano de la Ciudad de Barcelona (1933-1936)*, Servicio Topográfico del Ayuntamiento, S. 1: 5,000. PC. Ajuntament de Barcelona (digital source ICGC).

5. *Plano de los alrededores de la ciudad de Barcelona*, I. Cerdà, 1855, 1/10,000 (digital source ICGC).

6. *Plano geometrico del término jurisdiccional de la Ciutat de Barcelona separado del termino de la Villa de Gracia que antes estaban reunidos*. J. Soler 1851. (Arxiu Històric de la Ciutat de Barcelona 2943).

created (cell/2 × 2 m), downloaded from the ICGC website.

The oldest edited cartography for the city of Barcelona, from the 18th and 19th centuries, is of great interest and especially useful for the study of an area now entirely urbanised (Galera, Roca, Tarragó, 1982; Alberch, Caballé, 2001). The earliest maps of Barcelona and its surrounding area are military surveys from the end of the 17th and the beginning of the 18th century which plot physical elements of the landscape (streams, lagoons and relief), as well as roads and paths, the largest rural settlements and military defences, but with no reliable indications as to how the land was divided.

This geodatabase enabled previous works to be revised regarding the historical morphology of the landscape (Palet, 1997; Palet, Fiz, Orengo, 2009). A vector layer was created associated with a table in which the previous archaeomorphology was digitised. In this way, the table helped to detect differences between the types of plotted lines and allowed them to be attributed to periods of time. This methodology not only enabled the rectification and correct geographical referencing of the lines in the landscape but also led to the discovery of new lines from comparing the information in the constituent layers. The Roman coastline was also corrected, based on the latest published paleoenvironmental and geomorphological data (Julià, Riera, 2012).

An updated archaeological map was produced with all the available information relating to the Iberian and Roman periods, with contributions from the Archaeological Service of Barcelona, the Inventory of Catalan Archaeological Heritage and the Geoportal of Cultural Heritage of the Catalan government. The aim was to analyse settlement chronology and distribution in Roman times and especially the relationship between sites and remains associated with Roman roads and centuriation axes.

Finally, archaeological reports and topographical plans from different rescue excavations in Barcelona kept in the Archaeological Service were consulted. As a result, we were able to incorporate into the GIS project 14 plans of archaeological sites that were of interest due to their chronology and preserved structures. The most recent plans, in dwg format, were incorporated by merely correcting the coordinates. The older ones, available in jpg format, were georeferenced by identifying geographical points via current and historical orthophotography (ICGC) and cadastral mapping. Analysis of these plans in the GIS project has allowed us to contrast and compare the relationships between the layouts of particular settlements and the orientation of the grid and axes of the centuriation.

3. The centuriation of the territory of Roman *Barcino*

The foundation of the colony of *Barcino* on a small promontory next to the shoreline in the Augustan period (*c.* 15-13 BC) and the structuring of the adjacent territory on the *centuriatio* model gave the immediate landscape an appearance characteristic of the ideal territory of a Roman town. The centuriation based on a module of 15 × 20 *actus* (Palet, 1997; Palet, Fiz, Orengo, 2009) extended over the littoral plain between the Besòs and Llobregat rivers, and from the shore to the Collserola mountain range, whenever necessary adapted to natural slopes, promontories and streams. It seems likely that, in inland areas, this would be the reason why some *decumani* were displaced from the theoretical grid axes, in certain cases creating smaller *centuriae* of 15 *actus.* By basing their south-west/north-east orientation on the general direction taken by the coastline and littoral range of hills, it seems the surveyors were intent on ensuring efficient land use and good drainage. The project's effective implementation can particularly be seen in the south-west and south-central sectors, where the plain is wider and allows greater implementation and conservation of the grid axes (Fig. 2).

The articulation between the urban layout of *Barcino* and the centuriated grid undoubtedly reflects coordinated planning. The grid is delimited by the *Via Augusta* to the south-west and north-east, the main Roman road dated by milestones in 9-7 BC (IRC I, 183, 184). In different sections this road constitutes the diagonal for several *centuriae* of the theoretical grid, following the system of the *varatio* (Chouquer, Favory,

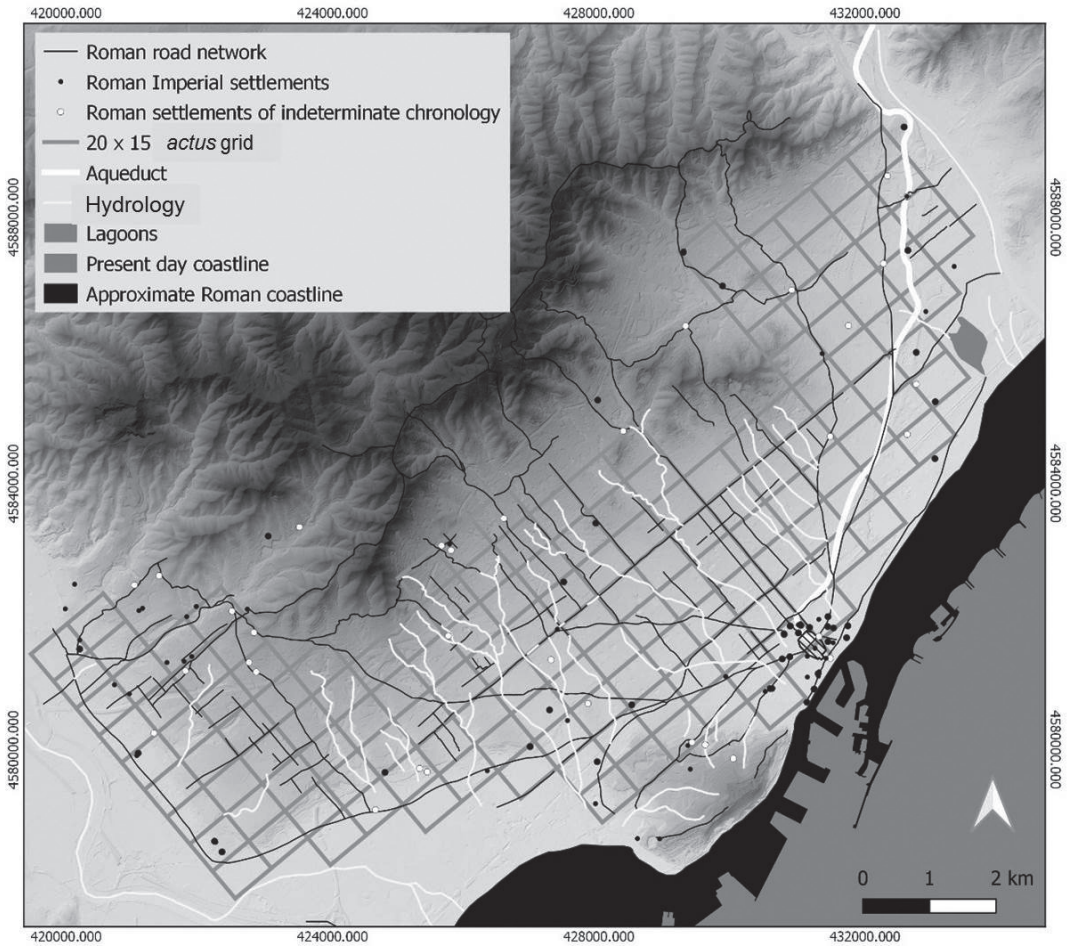

FIGURE 2. Archaeomorphological analysis of the study area, showing the centuriated grid surrounding *Barcino* and the distribution of Roman settlement in Imperial times.

2001, 89-94; Roth-Conges, 1996). This is especially visible along the Llobregat valley in the south-west. In the north-east extreme of the grid, the place called *Finestrelles* (today in La Trinitat Vella, Sant Andreu district) was probably used as a *gromma* point for surveyors laying out the grid. From this hypothesised *gromma* point at *Finestrelles*, the *Via Augusta* provides the hypotenuse for the successive triangles of 40x45, 20x30, 60x45 and 40x30 *actus* (Fig. 3)

The Augustan *colonia* was a focal point for the centuriated network. Especially remarkable is the relation between the *centuriatio* axes and the temple of Augustus in the forum of *Barcino*. The place of Santa Madrona at Montjuïc was probably also another *gromma* point. This relationship between the town, the new Roman road and the *limitatio* reinforces the Augustan dating of the whole system (Palet, Fiz, Orengo, 2009) (Fig. 2 and 3).

The promontory of Montjuïc is a good example of the selective conservation and adaptation to the relief revealed by the surviving traces of the centuriation, which in general avoided mountainous areas and promontories. This can also be observed in inland areas and in the first spurs of the littoral range. In fact, selective conservation of the axes can be seen as they disappear in certain sectors. The axes parallel to the coast form *saltus* of three *centuriae*. In addition, in certain sectors it seems that streams were incorporated into the grid and adapted with the addition of paths laid in a sea-to-mountain direction, thus avoiding the construction of new *limites* and favouring drainage and use of the natural landscape.

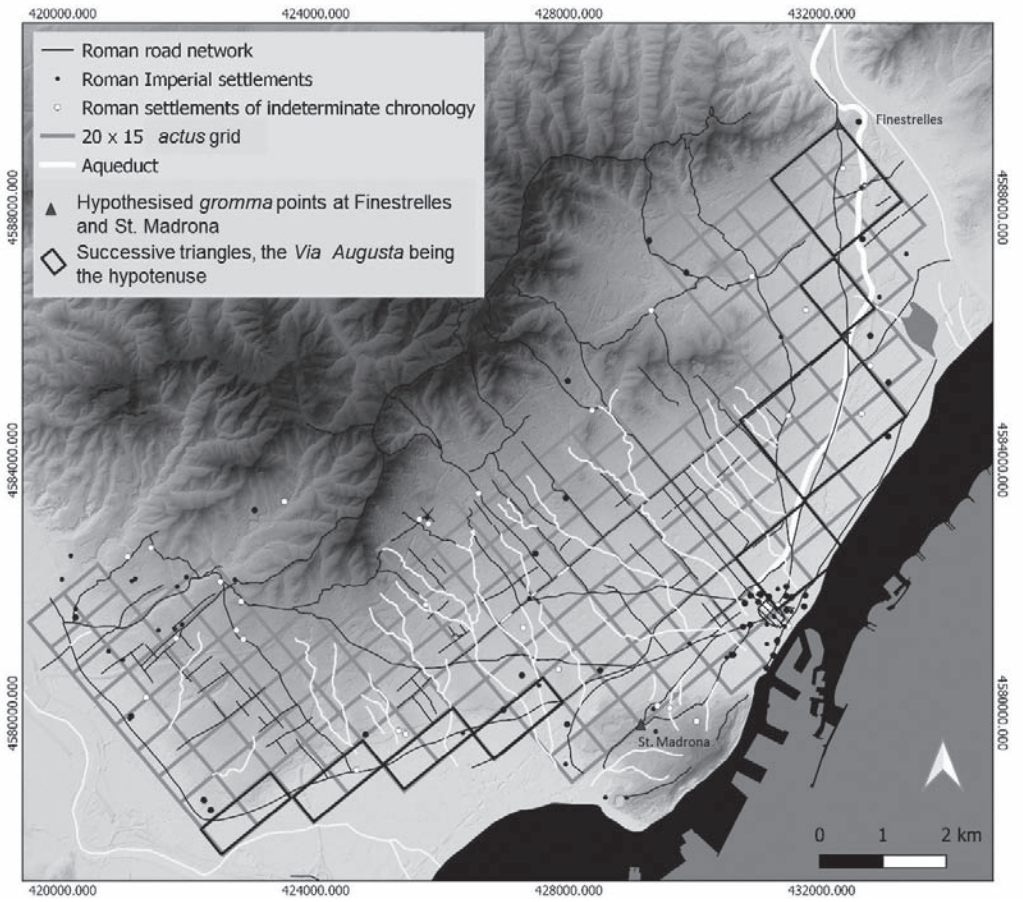

FIGURE 3. Location of the hypothesised *gromma* points at Finestrelles and Santa Madrona and how the *Via Augusta* provides, from there, the hypotenuse for the successive triangles.

In the *Tarraconensis*, it's important to emphasise the parallels between *Barcino* and the colony of *Caesaraugusta* (Zaragoza), where a foundation centuriation with a module of 15 *actus* is documented (Ariño, Gurt, Palet, 2004, 55-57). The inscriptions on the Roman bridge in Martorell suggest that the same legions that founded *Caesaraugusta*, the IIII *Macedonica*, the VI *Victrix*, and the X *Gemina*, were involved in founding *Barcino* and in the construction of public works within the territory. In fact, the Martorell bridge itself and the Roman arch there, where the main Roman road crossed the Llobregat River, might have marked the boundary between the *territoria* of *Barcino* and *Tarraco*.

The Plain of Barcelona was integrated by means of a radial road network connecting inland areas with the Roman city on the coast. It should be noted that the territory of *Barcino* extended beyond the limits of the Plain of Barcelona and the centuriation. Its hypothesised boundaries included the Martorell bridge in the south and, in the north, the confluence of the Congost and Mogent rivers in the Vallès pre-littoral depression, in the municipality of Montmeló where a *terminus augustalis* was located (Járrega, Rodà, 1999; Ariño, Gurt, Palet, 2004, 26-27; Gurt, Rodà, 2005). The whole of the littoral ranges of hills and part of the pre-littoral depression were therefore included in the territory.

These territorial boundaries formed part of a broader programme to organise the territory that included major intervention in the road network. Town, roads and centuriation are

evidence of wholesale restructuring within the context of Augustus's reorganisation of Hispania and other provinces of the Empire (Ariño, Gurt, Palet, 2004, 126-134; Flórez, Palet, 2012). The parallel with *Caesaraugusta* is especially significant since the foundation of that city, like that of *Barcino*, is best understood as part of the Augustus's programme in Hispania (Beltrán, 2016). Moreover, the 15x20 module has also been attested in *Tarraco*, *Emporiae* and *Valentia*, other places with Augustan chronologies (Ariño, Gurt, Palet, 2004, 126-134; Ortega, 2021).

4. The impact of centuriation on rural settlement

Barcino's Augustan centuriation has been related to an intensification of settlement in the early Imperial period, especially noticeable in the immediate surroundings of the city, along the littoral and in the Llobregat valley (Palet, 1997; Miró, Ramos, 2013). Despite the large gaps in archaeological information from certain areas of the Plain of Barcelona, especially those sectors affected by urban growth in the second half of the 19th century, the pattern of settlement points to a close relationship between early Imperial sites, certain axes of centuriation, the route-lines of the main roads, the centuriation grid and the urban layout. The study also allows us to trace the evolution and nature of settlement from late Republican to early Imperial times and to rethink the territorial impact of *Barcino* being founded and the significance of its centuriation.

Archaeological evidence points to the importance of farming and agriculture in these settlement patterns. Most Roman sites have been identified as *villae* or farmsteads with rural structures such as vineyard ditches, elements of production (e.g. *cella vinaria*, presses, *amphorae* kilns) and storage elements such as silos and *dolia* (Miró, Ramos, 2013). Intensity of land use is implied, particularly in the surroundings of the Roman town, on the lower littoral plains and wetlands near the Besòs and Llobregat rivers, on the promontory of Montjuïc next to *Barcino* and more specifically in inland areas close to main roads and centuriation axes.

The connection between rural settlement and centuriation provides new keys to unlock the meaning of the *limitatio* within the context of the colony's foundation. In certain cases, settlements are placed at the intersection between *limites*, roads and axes of the centuriated grid. Certain sites seem to be especially significant for understanding the relationship between the distribution of rural settlements and Roman territorial structure. Their location and the orientation of walls and structures, as well as the general layout, are directly related to the grid, the alignment or crossing of *limites* or the main roads which connected the *ager* and the Roman town. This relationship is attested in inland areas, at sites such as the *villa* of Can Cortada in the Horta valley, in settlements along the Roman coastline (e.g. Can Ricart farmstead in the Poble Nou district), in the surroundings of the Roman city and on the promontory of Montjuïc with the *villa* of Sant Pau del Camp and that of Nostra Sra. del Port. Moreover, the accuracy of the reconstructed centuriation grid and the significance of the global planning of the plain in Augustan times are confirmed by the close relationship between these sites and the orientation of the grid (Fig. 4 and 5).

Looking at individual sites, Can Cortada *villa* on the inland plain, on a rural site dating from the 1st to the 6th century AD (Miró, Ramon 2013, 145), is located near a secondary Roman road (the ancient "Camí d'Horta") which linked *Barcino* with *Octavianus* (Sant Cugat del Vallès) through Valldaura and Sant Medí valley in the Collserola littoral range. The *villa* stood in the north-west corner of a *centuria* and most of the excavated structures associated with the *pars rustica* are perfectly aligned with the orientation of the centuriated network. This suggests the presence of the grid even in these inland areas of the Plain of Barcelona (Fig. 4).

In the low littoral and alluvial plain of the Besòs, the Can Ricart site occupied a similar situation. The farmstead lay next to a coastal path over the line of dunes, near marshes and wetlands. The chronology begins in the late Republican period, with structures dating from the 2nd-1st centuries BC. The best preserved remains correspond to an early Imperial farmstead, founded in the 1st century AD and

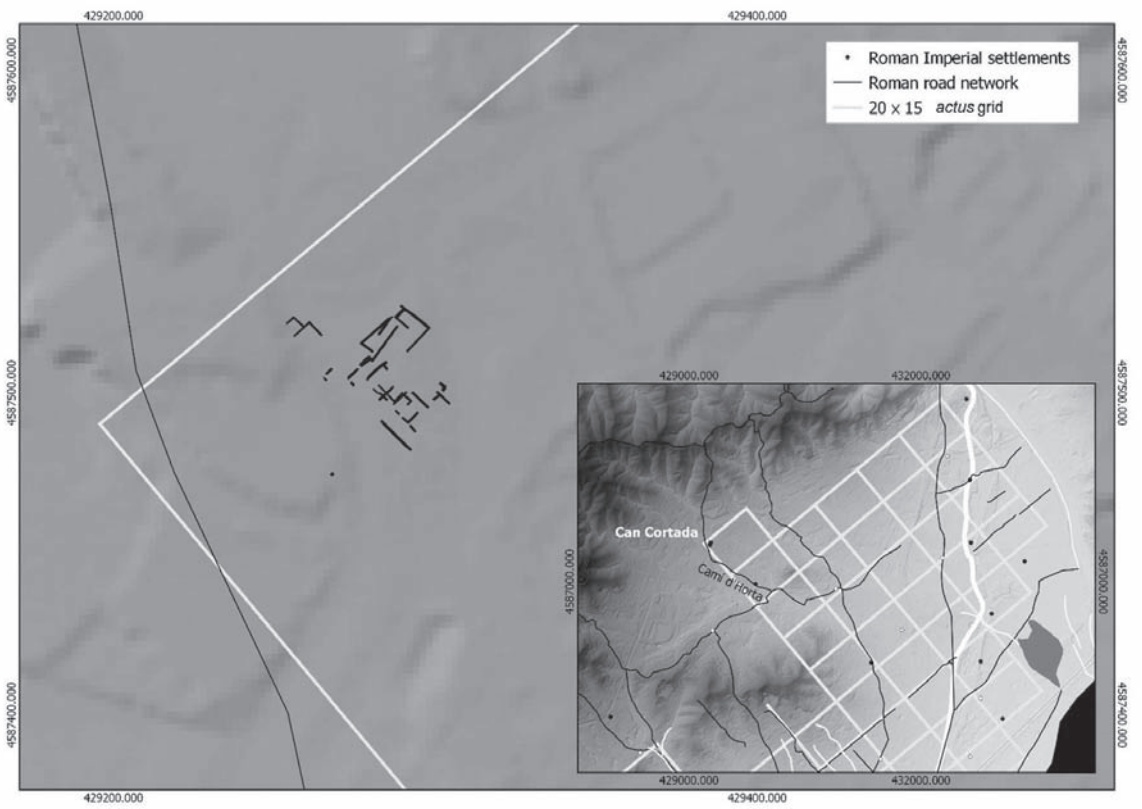

FIGURE 4. Can Cortada *villa* located in the centuriation of *Barcino*, showing the relationship between the excavated structures and the centuriated grid orientation.

deserted in the 5th. The structures attested are aligned with the centuriation grid and, since the settlement lay near the ancient coastline, it seems likely that the centuriation extended northwards towards the alluvial delta of the Besòs and close to the Roman shoreline.

Two sites at the foot of the Montjuïc promontory also present interesting examples of the congruence of centuriation and settlement patterns. The structures of the rural settlement of Sant Pau del Camp are oriented in line with the grid, as well as with a branch of the *Via Augusta* in the direction of Montjuïc (the current Carrer de Sant Pau). It should be noted that, in this sector, the road does not follow a straight line but changes direction, diagonal to the grid. Further south, the *villa* of Nostra Senyora del Port is also oriented in line with the centuriation, with a slight deviation probably due to its proximity to the road that surrounded Montjuïc (the current Carrer de la Mineria and Carrer Nostra Sra del Port).

Another remarkable case is that of the Pont del Treball-La Sagrera *villa*, excavated in advance of the high-speed train civil engineering works at La Sagrera railway station (Alcubierre, Hinojo, Rigo, 2014). The structures of the urban *pars*, dating from the 1st to the 4th centuries AD, were oriented along the axes of the centuriation. In this case, the imperial *villa* was built taking as its basis the hypotenuse of the triangle in a *centuriae* of 20x15 *actus*. This axis marks exactly the centre (the axis of symmetry) of the structures corresponding to a large rectangular courtyard and different associated buildings from Early Imperial times. To the south, the rustic *pars* was also attested, with different areas oriented in the same way (Fig. 5 and 6).

Apart from the evidence of the centuriation regarding rural settlement, rescue excavations have provided outstanding traces of its preservation in more urban settings. Excavation beneath Sant Antoni Market, located in the Eixample district of Barcelona, revealed the intersection of the *Via Augusta*, abandoned here

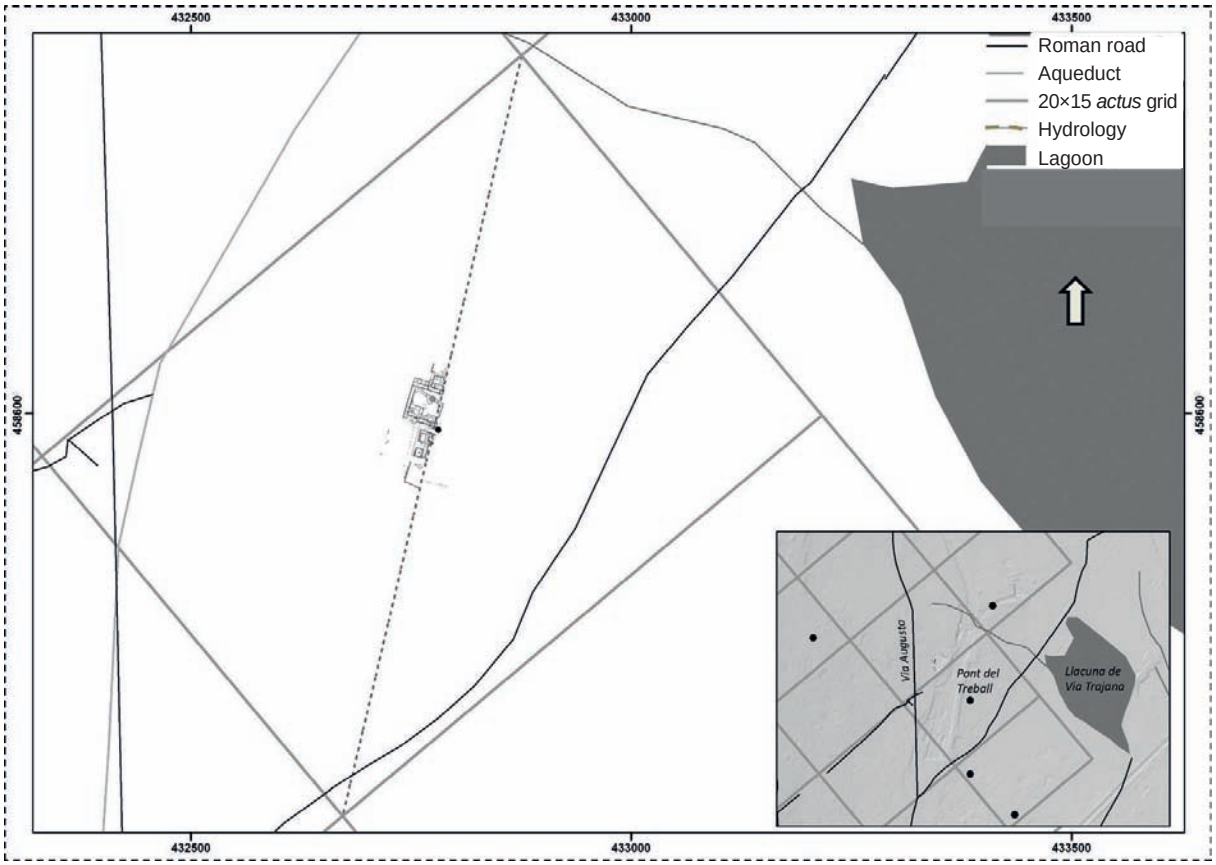

FIGURE 5. Pont del Treball–La Sagrera *villa* located within a *centuria* of *Barcino*, the building's axis of symmetry being the hypotenuse of the triangle.

FIGURE 6. View of the archaeological excavations at the Pont del Treball–La Sagrera site during the works carried out for the new railway station (Photo: Josep Maria Palet).

FIGURE 7. View of the archaeological remains attested under Sant Antoni market in Barcelona (Photo: Josep Maria Palet).

in the 2nd century AD after a flood, with a *limes* of the centuriation (Hinojo, Miró, in press). This line of division for the agrarian landscape was a deep road preserved along 27 metres (Fig. 7). It's on a parallel alignment with the *decumani* and corresponds to an axis of the centuriation deduced by archaeomorphological analysis, offset by 6-8 metres (Fig. 8). The archaeological map of Barcelona's Eixample is largely unknown. However, the only extensive archaeological intervention carried out in this central area of the city has attested the *Via Augusta* and a *decumanus* of the centuriation, two outstanding elements that suggest a much richer supply of archaeological elements in the area.

Underneath a building on the Avinguda del Portal de l'Angel, archaeologists uncovered a section of paved road corresponding with a *kardo minor* of the centuriation. The road was perpendicular to the *decumanus maximus* and subdivided the first *centuria* next to the north-west gate of the town, at a distance of 2 *actus* (approximately 71 metres) of the *kardo*, reproducing an ideal centuriated landscape in this access area next to the city (Fig. 9).

The fact that Roman roads and centuriation had symbolic importance can arguably be inferred from the distribution and orientation of a number of funerary monuments. The plan of an Early Imperial mausoleum excavated in Carrer dels Arcs, located at around 71 metres (2 *actus*) from the north-west gate of the city, is oriented in line with the *decumanus maximus*, the inland main road that connected *Barcino*, the plain, and the Collserola littoral range (the ancient Camino de Jesús, at present Carrer dels Arcs/Avinguda del Portal de l'Àngel) (Fig. 9). This can also be observed in the plan of the mausoleum discovered in Sant Agustí Nou, a monument placed near the south-west gate of *Barcino* and next to the *Via Augusta* (here the modern day Carrer de l'Hospital). The

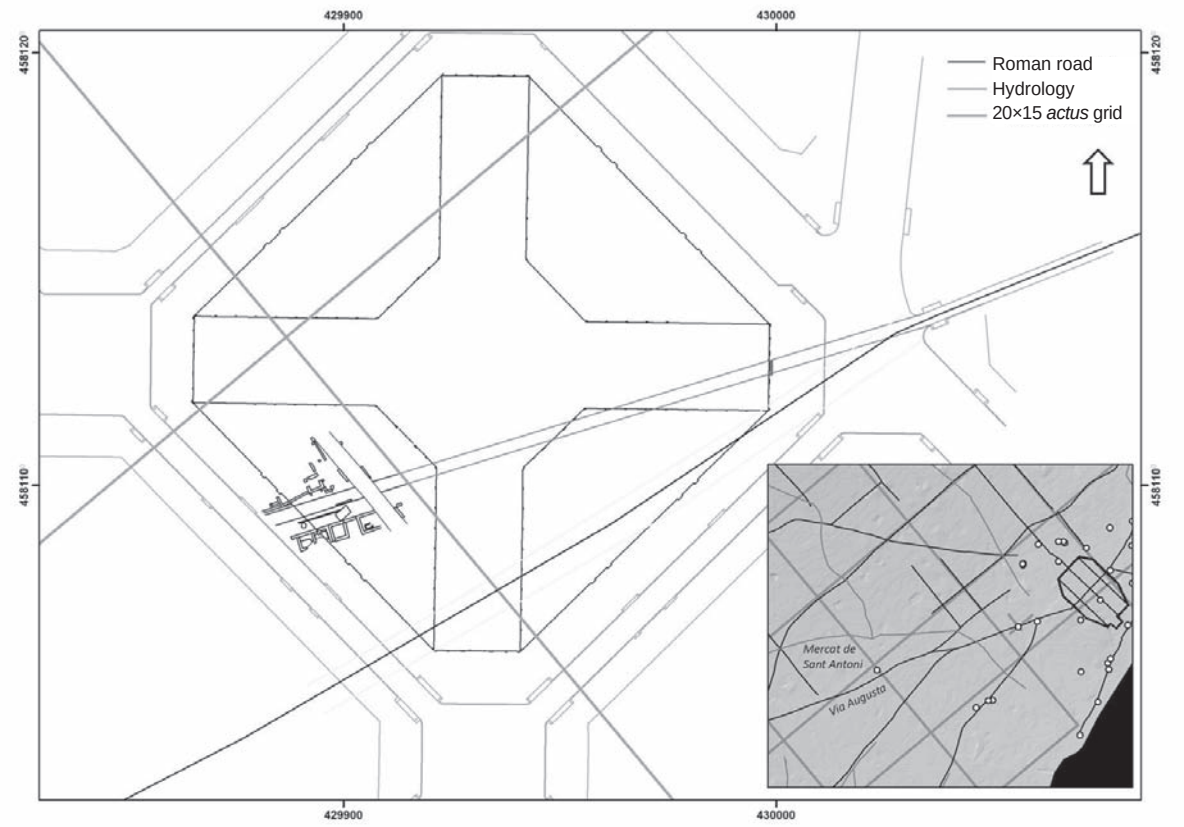

FIGURE 8. Plan of the crossroads between the *Via Augusta* and a *limes* of the centuriation in relation with the general grid, preserved under Sant Antoni market in Barcelona.

orientation of the walls corresponds to the hypothesised grid but not with the main road next to which it is located and which crosses the grid diagonally.

One more example is the burial area with several funerary monuments and structures excavated in the Drassanes Reials. These were linked to a littoral path south to *Barcino* (today Carrer Josep Anselm Clavé and Carrer d'En Gignàs). The necropolis and road follow the dune ridge parallel to the shoreline. In this case, the funerary monuments follow the orientation of the path, avoiding the theoretical axes of the centuriation which seems not to be present in this area. The path appears to determine both the location of the burials and the orientation of the structures.

The Plain of Barcelona is also one of the study cases where palaeoenvironmental research has been most fruitful. For the Roman period, a larger amount of pollen data is available, although a lack in the chronological definition of data limits accurate interpretations (Riera, 1995).

Pollen diagrams indicate an absence of widespread loss of woodland on a regional scale across the Plain of Barcelona in the Roman period (Palet, Riera, 2009; Riera, Palet, 2008). Although some sequences indicate open areas, the landscape appears to have been generally characterised by the presence of woodland, with only limited felling. Woodland was dominant in inland parts of the Llobregat plain but with evidence of human disturbance, allowing the expansion of shrubs. A similar situation was also recorded in the northern sector of Barcelona, where the Besòs pollen diagram indicates, for the Roman period, the presence of large woodlands of mixed holm oak (Riera, 1995; Riera, Palet, 2008; Palet, Riera, 2009). In addition, the scarcity of charcoal particles in the sedimentary records suggested limited clearings and human activity that was pre-eminently

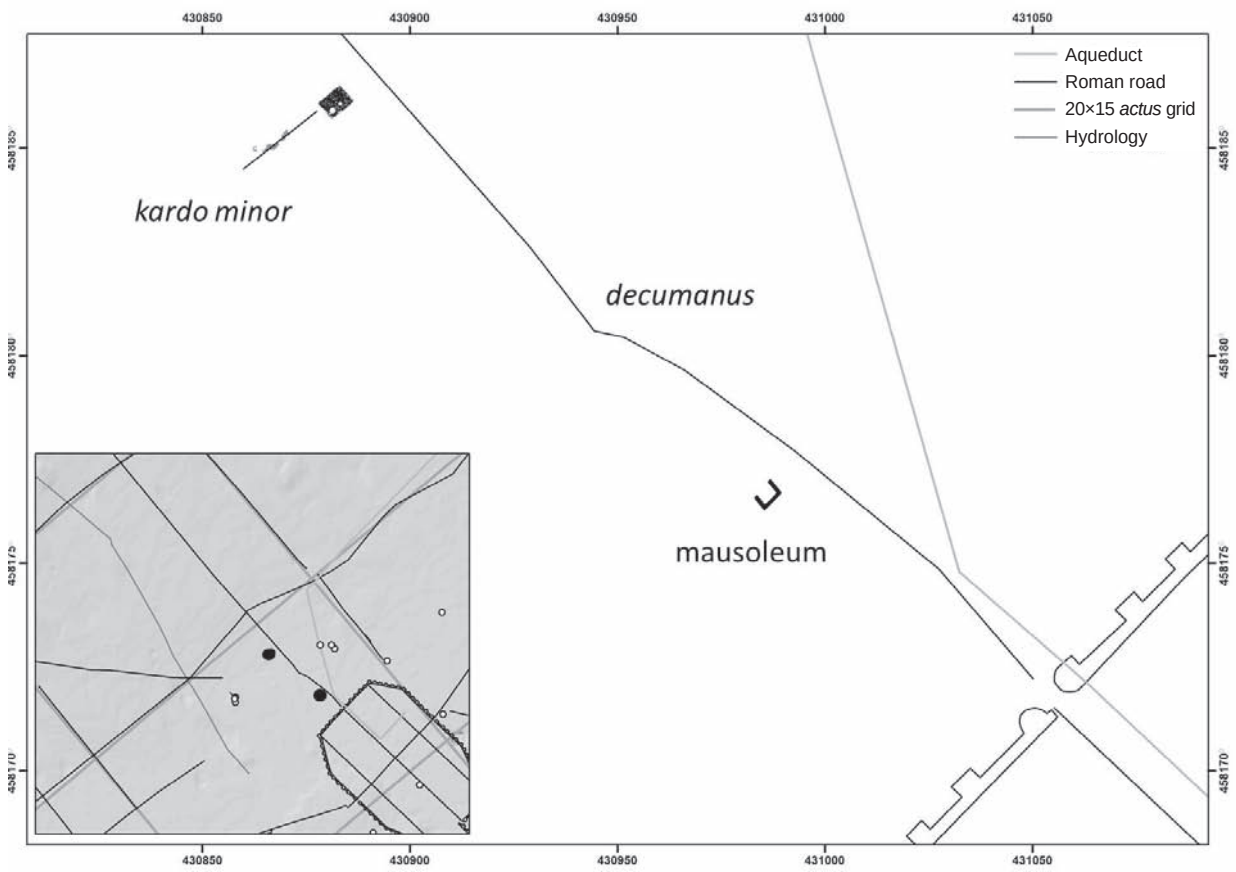

FIGURE 9. Plan of the mausoleum excavated in Carrer dels Arcs, the *decumanus maximus* and centuriated grid.

stable. There is also evidence of agricultural activity, especially in littoral areas and around the Llobregat Delta plain (Palet, Riera, 2009). Pollen records show an increase in crops, such as grapes, cereals and rye, during the Roman period. In addition, the expansion of hemp production is well attested across the plain as a whole.

On a more local scale, pollen data at Montjuïc highlight a certain expansion in the cultivation of grape vines during this period, though part of the promontory would still have been covered by woodland. Recent bioarchaeological research at the Sotstinent Navarro site, located near the north-east gate of *Barcino*, shows a huge expansion in the cultivation of grape vines in the area surrounding the Roman city (Miró, 2017). Anthracological and various bioarchaeological data from the Turó de la Rovira Iberian site, an inland promontory occupied in the 3rd century BC, suggest an open, deforested landscape around the settlement and the expansion of shrubs, as well as agricultural activity, even before the Roman foundation (Riera, *et al.* 2018).

Paleoenvironmental evidence helps to provide greater insight into the significance and function of centuriation. The Plain of Barcelona seems to have been heavily structured, including a centuriated landscape and a new road network, together with considerable intensification of settlement. At the same time, a complex land use system seems to have developed in Roman times, characterised by the unequal exploitation and transformation of the territory, limited woodland clearance at a regional level and relative expansion of agriculture (Palet, Riera, 2009).

These data underline the representative and symbolic character of centuriation, closely linked to the concept of the Roman city (Purcell 1990: 15). In the central sector of the plain near

the city and in the coastal areas towards the Besòs and Llobregat rivers, the impact of the founding of *Barcino* seems to be more extensive and agricultural activities more than likely occupied larger areas. The pollen records therefore suggest the existence of an intensive, specialised but localised agriculture, which suggests significant landscape change, albeit on a local scale.

5. Conclusions

On the Plain of Barcelona, the indigenous settlement pattern indicates relative stability until *Barcino* was founded. This Augustan foundation had a great impact on the territory, creating a new territorial structure and resulting in a series of changes in settlement patterns, locally intensive land use, the occupation of littoral areas and parts of the inland plain and a marked concentration of settlement in relation to the road network, centuriation and the coastal plain.

Augustan centuriation had a strong impact on the arrangement and structuring of the territory of *Barcino* until the end of the Roman period in the 5th century, as shown in the chronology and orientation of *villae* and farmstead structures in relation to the reconstructed grid. Furthermore, the study allows us to rethink the significance and function of centuriation, in particular highlighting its representative, symbolic nature alongside the economic. A strong spatial organisation has been demonstrated, together with complex land use. Pollen evidence shows a landscape characterised at a regional level by the absence of generalised expansion on the part of farming or extensive loss of woodland, suggesting the presence of field systems in specific areas around rural settlements. The intense structuring associated with centuriation would not have necessarily led to extensive exploitation of the whole territory (Palet, Orengo, Riera, 2011).

Centuriation had a fiscal and planning purpose, *ager divisus et adsignatus* representing a system of dividing and allocating land. However, it has been pointed out that the concept of centuriated landscape also seems to be related to religious ideas and the founding ritual of a city. It carried symbolic value, associated with the ideal model of Roman landscape (Palet, Orengo, 2011) and how the ideal territory of a Roman town should be designed and organised (López 1994). It was a true conceptual appropriation of the landscape based on a specific mythical and religious idea. This aspect has also been highlighted in relation to the centuriation of *Tarraco* (Palet, Orengo 2011¸ Palet, Orengo, Riera, 2011).

At a regional level, the lack of evidence for intense human impact in the palaeoenvironmental record is consistent with the presence of areas with no evidence of settlements and others where rural settlement was concentrated. Large areas of centuriation would be characterised by a low intensity of occupation. The territory of *Barcino* therefore reflects a complex reality, with the existence of woods and fields not assigned within the hypothesised grid, or of *centuriae* that were not fully cleared.

However, this general picture must be nuanced. In the absence of a generalised transformation of the landscape, the impact that certain settlements and the intensive exploitation of their surroundings would have on a local scale should be also relevant. In this respect, installations such as rural hydraulic aqueducts for domestic and agricultural purposes must be added to the evidence of agrarian activities. The connection between *villae* and centuriation demonstrates a project aimed at enhancing land-use according to a Roman economic model, while at the same time reinforcing its representative character.

Centuriated landscapes therefore respond to complex socio-environmental interactions so that an interdisciplinary approach is needed in order to understand them in all dimensions; socially, economically, culturally and ecologically. A recent study carried out by T. Haas in the *Pontino ager*, south-east of Lazio (Haas, 2017), an area characterised by a wet coastal plain, shows the importance of centuriation to enhance underexploited areas, one of the first Roman projects in this respect, carried out between the end of the 4th century and early 3rd century BC. Centuriation is an instrument that facilitated use of the landscape and management of resources but it also embodied the Roman concept of space. The

centuriated littoral plain of *Barcino* therefore reflects a complex, diverse reality. The perspective provided by landscape archaeology reinforces the symbolic and representative nature of centuriation, beyond its economic function and as an instrument of conquest. In fact, centuriated landscapes can also be defined as "transported landscapes", in which the ideal Roman city was conceptually recreated in distant provinces[7].

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