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5.3 The occupation of the Antequera Depression (Malaga, Spain) through the 1st millennium BC: A geographical and archaeological perspective into Romanisation

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ABSTRACT

This article presents a GIS-based approach to investigations of Romanisation in the Antequera Depression, (Málaga, Spain). Two geographic variables, visibility and relative height, were appraised to investigate territoriality and social dynamics during the Iberian and Roman periods. The results indicate both the continuity of Pre-Roman tendencies and the appearance of new trends in settlement, interpreted as the re-orientation of competitive behaviour amongst local communities from warfare and conflict to more symbolic concerns.

KEYWORDS

Antequera Depression, settlement patterns, Geographical Information System, statistics, Iberian period, Roman Republican period

INTRODUCTION

Over the last 20 years, Geographical Information Systems (GIS) have been widely but unevenly applied to archaeological data across Europe (Wagtendonk et al. 2009, 75-78), mostly in Northern Europe. Spanish, and more precisely Andalusian, archaeology has been slower to take advantage of GIS methods. This does not to imply a total lack of GIS application; a number of researchers in the Guadalquivir valley and the campiña of Seville have been using GIS to positive effect (e.g. González Acuña 2001; Keay et al. 2001).
An insight into the development of human occupation in the Pre-Roman and Roman periods in Central Andalusia is considered invaluable due to the central position of the Antequera Depression, which has served as a natural crossroad since prehistoric times. These factors are crucial for gaining a better understanding of the process of Romanisation in Andalusia, as well as an insight into the changing territorial organisation of the area during a historically dynamic period in the Mediterranean basin. In working towards this improved understanding, well-established computing and quantitative methodologies were applied to the Antequera Depression, an area in which spatial analysis has not been previously carried out.

**GEOGRAPHY AND ARCHAEOLOGY OF THE ANTEQUERA DEPRESSION**

The significance of the Antequera Depression is hard to interpret without a clear image of its spatial context, i.e. its location in relation to the Andalusian region. Andalusia occupies the southern part of the Iberian Peninsula, having an area of 87,268 km². Its topography is diverse, resulting in varied ecological niches, from fertile lowlands close to the Guadalquivir River, to the mountainous chain of the Sierras Béti-

Figure 1. Map showing the location of the study area, the Antequera Depression (Malaga, Spain). The location of the Roman town of *Singilia Barba* is shown in the detailed map (see Fig. 2 for its calculated viewshed).
cas, which hosts the highest peak in the Iberian Peninsula, and the desert of Tabernas in Almería province. In such a geographical and ecological mosaic, ecotones have played an important role in the historical development of the entire region. One of these areas of interest is the Antequera Depression, which links the fertile plains of the Guadalquivir valley through Fuente Piedra, the Mediterranean coast through the Guadalhorce valley, and the mountains of Eastern Andalusia through the Intrabetic Hollow (it is noteworthy that several modern communication links, including the newly built high speed railway, cross the Antequera Depression). The Antequera Depression itself has a marked agricultural character due to the richness of soils and the relative abundance of water, with an emphasis on crops and olive trees farming (Guarnido Olmero 1977; Mata Olmo et al. 2003, 578-579).

The geographical and ecological setting has favoured human occupation since the Palaeolithic (SIPHA). However, several periods stand out in the historical development of the area, specifically, Late Prehistory (Neolithic, Copper Age and Bronze Age) and the Roman period. In the first case, outstanding evidence of the density of human occupation across the landscape is evidenced by the megalithic monuments of El Romeral, Viera and Menga, which are amongst the most important expressions of the megalithic phenomenon in Southern Europe (refer to García Sanjuán & Wheatley 2009 for a recent update of research in this field). The prominence of the area during the Roman period is shown by its high density of urban centres, such as Arastipi, Antikaria, Singilia Barba, Nescania, Ulisis and Osqua, amongst others.

In addition to these characteristics, it is important to note the abundance of archaeological studies in the Antequera Depression, thanks both to academically led research and rescue archaeology. The creation of local inventories of archaeological sites in the municipalities of this territory has provided a useful mechanism to investigate settlement dynamics of the study area, notwithstanding their limitations and problems as products of field survey (See Barker 1991, and Terrenato 2004 for a detailed account). Rescue archaeology performed at different points of the Antequera Depression in the last three decades has provided high-quality information about the nature and organisation of settlement dynamics across the area.

Although research has focused on the Antequera Depression, few projects have performed spatial analysis, with the exception of the ongoing Societies, Landscapes and Territories in Late Prehistory of the Antequera Depression project (García Sanjuán & Wheatley 2009). However, this has not prevented the development of theories regarding settlement patterns and occupation dynamics in this area. Corrales (2002) postulates a progressive transformation of the countryside from the Roman conquest to Imperial times. In her hypothesis, alterations primarily occur in the most fertile areas, and secondly in regions where agricultural exploitation would be less suitable. An alternative hypothesis considers continuity of the Pre-Roman territorial layout during Roman Republican times (Prieto et al. 2001). Two major periods of change are identified: first, the governments of Caesar and Octavianus, when important transformations would affect Baetica after the civil war between Pompeius and Caesar; and second, the Flavian period (second half of the 1st century AD), after the extension of Ius Latii to the provinces of Hispania. Neither of these studies made use of spatial analysis as a means of testing these potential transformations.

Given that the archaeology of the Antequera Depression is relatively well known and in light of the suggested transformations as a consequence of the Roman conquest, spatial analysis was applied to investigate the changing territorial layout of the area.
This study serves as an initial attempt to investigate transitions and continuities in the settlement patterns of the Antequera Depression after the Roman conquest. It offers an overview of their nature and organisation in both Pre-Roman (Iberian period) and Roman Republican times (5th-3rd century BC, and end of 3rd-1st century BC, respectively). The spatial distribution of archaeological sites across the study area were analysed in relation to different geographical variables, such as visibility and relative height. This had the aim of investigating whether the location of settlements in both periods was chosen in relation to these variables or not, therefore investigating the logic behind settlement patterns and possible changes that the introduction of Roman territorial models might have brought to the Antequera Depression.

These two variables were chosen to integrate into a specific pre-existing framework of research on Pre-Roman societies in Spain. Studies by Parcero Oubiña (2002) on Pre-Roman communities in the north-western Iberian Peninsula (sociedades castreñas) emphasise the relevance of defensibility/accessibility, relative height and visibility to site location during the Iron Age. Research carried out in the former Contestania (Valencia province, Spain) by Grau Mira (2006) and in the former Layetania (Barcelona province, Spain) by Ruestes i Bitrià (2006) have demonstrated the same tendency for Iberian settlements, with a significant emphasis on visibility, as demonstrated by the existence of ‘visibility networks’ between the main contestanos sites.

Based on this past research, the need to examine visibility and relative height for the Antequera Depression is clear. Visibility is important because of the relationship between visual dominance and territoriality, i.e. what can be seen, can be more efficiently controlled. Relative height, on the other hand, is important as a way to show the prominence of site locations in relation to their surroundings, as well as being partially associated with concepts like defensibility and accessibility. However, these latter factors should be investigated in more detail through the application of GIS techniques like Cost Surface Analysis.

Concerning the first of the tools employed in this study, GIS are ‘collections of interrelated computer programs designed for the handling and processing of spatially referenced information.’ (Kvamme 1999, 154). Since its introduction in archaeology, it has been employed for managing historical and archaeological heritage, for organising and recording the evidence produced in surveys and excavations and for analytical purposes (Conolly & Lake 2006, 33-50). In terms of its application across Europe, GIS has not been widely applied to Roman Archaeology, although some specific examples are worthy of being highlighted: in the Arroux valley (France) (Madry & Rakos 1996), on the island of Brač (Croatia) (Stančič & Veljanovski 2000), and, more recently, the Western Baetica by Keay and Earl (2007). However, it should be noted that, despite the advantages of GIS in managing and analysing archaeological data, notes of caution have been expressed (Llobera 1996; Tschan et al. 2000; Wheatley & Gillings 2000). GIS have been used in this project in three different ways:

- As a management tool: given the multiplicity of data sources for archaeology in the study region and the importance of its spatial dimension, the use of GIS was employed primarily as a means for organising this information.
- As an extraction tool for deriving information related to the organisation and nature of the archaeological data, such as the prominence of sites in their surroundings, calculated through an index of relative height.

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RESEARCH QUESTIONS AND METHODOLOGIES

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As an analytical tool to discover relationships in the data, like the percentage of visible area from each site location in order to relate this to hypothetical territorial control measures from individual settlements.

Regarding the use of statistics, no studies focused on the Pre-Roman and Roman archaeology of the Antequera Depression have made use of this as a research tool. However, combining statistics and GIS is of considerable value to landscape archaeology since it allows the validation of hypotheses relating settlement locations to other factors (e.g. environmental, symbolic) (Kvamme 1999; Keay et al. 2001). In general, statistics have not been widely applied in archaeological research, in part due to their association to Processual archaeology by post-processual archaeologists (Shennan 1998, 2-3) and the increasing complexity of the analyses applied to social research (Fotheringham et al. 2000, 8-9) amongst other arguments exposed. By offering a rigorous means of hypothesis testing, simple statistical analyses can offer insights into issues of continuity/discontinuity in territorial layouts, encouraging their use in landscape studies such as that developed for the Antequera Depression. Therefore, statistics were employed to identify patterns in the archaeological data and the comparisons between the characteristics of the archaeological samples. Given the ordinal nature of the data (both the relative height index and high visibility areas were expressed in numerical format), the Kolmogorov-Smirnov (K-S) test was considered to be the most suitable significance test. This is employed for determining the existence or lack of association between the variables and the site distributions in both periods, as a means to interpret site locations as related to the singular characteristics of their surroundings in terms of visual control and prominence in the landscape, or as a matter of chance.

THE ANALYSES AND THEIR PARAMETERS

An indirect selection was introduced into this study based on the chronological classification of sites, due to the poor quality of surface remains in some of the sites. This resulted in a reduction in sites studied from 108 to 47, since these were occupied during either Middle Iberian, Roman Republican or both periods. From these, 17 were inhabited in the period before the Roman conquest (Middle Iberian) and 39 during Roman Republican times, with nine occupied throughout both periods.

ESRI ArcGIS version 9.3 was employed to derive information from the archaeological data, such as the visible area from any site as well as their absolute and relative heights. These data were used in subsequent statistical tests to investigate the existence or absence of correlation between the geographical variables studied and site locations.

In these analyses a Digital Elevation Model with a resolution of 20m was employed. This model is based on data derived from the Andalusian Cartographic Institute. Regarding visibility analyses, individual viewsheds were created for sites in both periods (fig. 2). Two main parameters were established: the radius of visibility and observer height. For the former, a maximum of 15 km was set, which contrasts the two or three km calculated as a maximum of reliable human visibility (García Sanjuán 1999, 133), since the aim of these experiments was to establish the maximum visible area for each site. The environmental and climatic characteristics of the Antequera Depression (more than 300 days of sunshine, dry climate, somewhat hilly landscape) make the radius of visibility considerably greater than in other areas of the Iberian Peninsula and Europe, as acknowledged for the Guadalquivir Valley (Keay et al. 2001).
Regarding observer height, due to the lack of information about structure heights in Pre-Roman and Roman times, various estimates were calculated based on the partially-preserved Iberian wall located in Cortijo Catalán (Archidona) (Recio Ruiz 1984), to which the height of an adult was added, resulting in 6.20m (which falls between the theoretical heights of Pre-Roman walls considered within research on Iberian architecture (Moret 1996, 95; Zamora Merchán 2006, 35)). This theoretical height was applied to analyse visibility from sites classified as Fortress. In the case of sites classified as Settlement or Not determined the observer height was set at 1.7m. Additionally, the curvature of the Earth was also considered, since this influences visibility by approximately 7.86m for every 10 km from the viewpoint (Conolly & Lake 2006, 229).

Once all the viewsheds were calculated, the visible areas from each site were translated into percentages, tabulated and analysed using the K-S test. It is a significance test that allows the comparison of two datasets with ordinal format in order to acknowledge these as randomly generated or as related (a detailed account of this test can be found in Shennan 1997, 56-61). In this case, two random distributions were created (one for each period) through the Monte-Carlo simulation in order to tabulate the characteristics of the study area (Wheatley & Gillings 2002, 136-137). Viewsheds were calculated for each point of these distributions and the visible areas from each location translated into percentages and tabulated.
to provide a second entity to compare to the archaeological site distributions. Once the percentages were tabulated and categorised, the K-S test was carried out.

In the case of the sites’ relative height, an index was created through the equation:

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RH = \frac{h_{site} - h_{min}}{h_{max} - h_{min}}
\]

Where

- \( h_{site} \) is the site elevation
- \( h_{max} \) is the maximum height in the surroundings of the site in a radius of 15 km
- \( h_{min} \) is the minimum height in the surroundings of the site in a radius of 15 km

The application of this equation generated a result between 0 and 1 as an index of relative height for each site in regards to its surroundings, which was then grouped in different categories.

As with visibility analyses, two random distributions were created for checking the characteristic relative height of the study area, again using the Monte-Carlo simulation and applying the same equation to the heights of each point randomly generated. These were tabulated against the indexes of the archaeological distributions in each period to perform the K-S test.

**RESULTS AND THEIR INTERPRETATION IN THE REGIONAL CONTEXT**

A number of interesting outcomes were achieved from this study and these will be discussed in relation to research carried out in the municipalities of: Marchena (Seville) (García Vargas et al. 2002); El Coronil (Seville) (González Acuña 2001; Keay et al. 2001), located in the Guadalquivir valley, and in the campiña de Jaén (Jaén) (Castro López & Gutiérrez Soler 2001), as well as in the Iberian areas of Eastern Spain Contestania and Layetania (Ruestes i Bitrià 2006) (fig. 3).

Overall, the results demonstrate a change in patterns of territorial organisation in the Antequera Depression after the Roman conquest.

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**Figure 3.** Map showing the location of Marchena and El Coronil (Seville) (A), campiña de Jaén (Jaén) (B), Contestania (Valencia province) (C) and Layetania (Barcelona province) (D). The territorial layouts of these areas have been studied for the Iberian and/or Roman times, and therefore, their territorial dynamics have been compared to the ones developed in the Antequera Depression.
Pre-roman period: the Iberian settlement pattern

The viewshed and statistical analyses demonstrate that siting of settlements took into account visual dominance of the surrounding areas. This would have allowed for greater control of the territory of each community (van Leusen 2002, 16-?1). Since each had the capability for self-organisation and governance, and a tendency towards increased complexity, it is likely that this would have been reflected in the territorial layouts (Recio Ruiz 1994; Grau Mira 2006; Ruestes Bitrià 2006) (fig. 4).

Regarding the relative height of site locations, this factor had an obvious influence for Iberian settlements, and would likely have been key to increasing social complexity. By choosing highly visible areas for settlement locations, it could be speculated that this served as symbolic competition amongst the Iberian communities for social enhancement, as well as providing greater defensibility.

Roman period: the republican settlement pattern.

In contrast with the previous phase, during the Roman Republican period settlements do not appear to be located based on visibility as a parameter. This, together with the abandonment of eight sites (repre-
senting 47% of the Iberian sites in the area) and the appearance of 30 new settlements (almost 77% of the Republican sites), demonstrates the potential impact that incorporation into the Roman world could have had for the communities established in the Antequera Depression, since they were the ones who perceived, organised and modified their landscape (Tort 2006; Delgado Bujalance & Ojeda Rivera 2009).

However, in spite of the transformations in the territorial layout, some elements of continuity remain, for example, the influence of relative height in relation to settlement location (fig. 5). The results demonstrate that this was still taken into account, probably in relation to symbolic competitions amongst communities as they were in prominent places across the landscape. The dynamics involved in these processes are more clearly understood when considering the wider contexts of Southern Iberia and the Iberian Peninsula.

Figure 5. Map showing both the random and archaeological distributions of sites during the Roman Republican period in the Antequera Depression, combined with a table showing the different categories of relative height, and the number of sites counted in each category. Both distributions were employed for investigating the randomness/relationship of the Republican settlement pattern with regard to visibility and relative height. See also the full colour section in this book.
Assuming visibility from settlements towards their surroundings as a locational factor, its importance in the Pre-Roman period and its irrelevance in Republican times may be interpreted as a consequence of the imposition of a higher level of political power (the Roman state) over the region. The indigenous communities may have lost a certain degree of autonomy and the capacity of controlling their own territories. As such, the interest of locating the settlements on places with high visibility decreased, explaining the lack of association between the site distribution in the Roman Republican period and the factor ‘high visibility’ shown by the statistical analysis. Notwithstanding the previous, it is not necessary to suppose the passive submissiveness of local communities to the Roman state. On the contrary, several interpretative models of Romanisation developed in the last decades highlight the dynamism and prominence of local communities in the transformation of the provinces after the Roman conquest, as well as in the process of constructing Roman Imperial culture (Millett 1990; Woolf 1995; Keay & Terrenato 2001; Bendala 2005; van Dommelen & Terrenato 2007; Revell 2009).

Research undertaken on visibility in Andalusia and other areas of the Iberian Peninsula may illustrate the dynamics shown in the Antequera Depression, although further work is necessary to validate the hypotheses proposed herein. In a number of these investigations, the changes in the territorial organisation has emphasised the decomposition of the Pre-Roman territorial layouts as a consequence of the Roman conquest, as in the case of coastal Layetania (Barcelona) (Ruestes i Birità 2006). However, the changes in settlement patterns and the influence of visibility upon them after the Roman conquest may be understood also as the development of a new perception, comprehension and organisation of the landscape where the settlements are located (Ojeda Rivera 2003). Visibility and its relation to site location were also investigated within the former province of Baetica for Pre-Roman (Turdetanian) and Roman periods by Keay et al. (2001). The authors demonstrated a visual relationship between rural settlements and the urban centres of Salpensa (El Casar), Siarum (Torre del Águila) and Callenses (El Molino Pintado), all located in the municipality of El Coronil (province of Seville). They argued that the visibility of urban areas might have been a means of enhancing Roman authority, instead of the more traditional economic or strategic concerns underlying the development of the Roman territorial layout.

In the Campiña of Seville, visibility has been suggested as a factor in selection of settlement location both in the Late Bronze Age and Early Iron Age, as shown by González Acuña (2001). It may have been a means of territorial control of areas of higher agricultural potential and communication routes in the area, mostly between the coast and the interior of the Andalusian region. However, in this case it was not demonstrated statistically that settlement locations were chosen due to their visibility properties, although sound GIS-viewshed analyses were carried out for settlements in the area, relating site location to agricultural potential and communication routes. Still within the provincial context, although visibility analyses have not been made in Marchena (García Vargas et al. 2002) or the Campiña de Jaén (Castro López & Gutiérrez Soler 2001) the authors suggest in both cases the potential role of visibility in choosing sites dated in Pre-Roman times, such as some Turdetanian sites located on hilltops and the set of towers surrounding the site of Atalayuelas, respectively. In the case of Marchena, the sites were progressively abandoned or their size and status decreased throughout the Republican period, whereas in Atalayuelas the towers were in use during Roman times.

Apart from visibility as a means of control of the surrounding area, additional arguments concerning
the location on hilltops emphasise not only the visual control of the surrounding areas, but also the desire of avoiding the occupation of areas suitable for agricultural exploitation by the communities (Zamora Merchán 2006, 37). This will be the subject of future research on the Romanisation of the Antequera Depression.

Regarding the analyses focused on sites’ relative height, the results show the importance of this topographical factor in relation to settlement locations for both Middle Iberian and Roman Republican periods. This may be related to different concerns throughout these periods, such as social prominence of the community and defensibility. The location of sites in areas of on high ground could be interpreted in Pre-Roman times as a means of competition between communities, through the symbolic lens, in addition to other concerns such as defensibility, within a wider context of conflict (as shown also by the high relative height index of some sites, such as Cerro Pozuelos (Cañete la Real) and Cerro Sabora (Cañete la Real). In contrast, during Roman Republican times it could have represented the continuation of the social competition as an alternative for actual warfare between communities. In any case, computational simulation models should be used to investigate these hypotheses relative to other factors, such as the relationship with communication routes (both terrestrial and river) and the location and accessibility of other settlements.

Furthermore, the combined association of Middle Iberian site distribution with both high visibility and relative height factors offers support to the issue of territorial control held by the local communities that inhabited the Antequera Depression between the 5th and 3rd centuries BC.

**CONCLUSIONS AND FURTHER WORK**

The analyses demonstrate the changing situation of the Antequera Depression between the 5th and 1st centuries BC. Firstly, the Iberian communities would have experienced increased social complexity, reflected in the territorial layout as the appearance of settlements in highly specific locations. Iberian communities chose elevated positions above the surroundings, as a means of visual control, and as a display of their significance within the wider context of the Antequera Depression. Therefore, the territorial layout would show not only political and strategic issues underpinning the historical development of the area, but also some of the mechanisms of competition between the Iberian communities from a symbolic perspective. These social developments would be altered to a certain degree after the Roman conquest, leading to the transformation of the territorial structures within the Antequera Depression. These changes were represented by the disappearance of many of the Iberian sites and the development of many new sites, following a different spatial logic. In Roman Republican times, communities abandoned their previous interest in visual control of the surroundings (and hence, warfare) for an emphasis on the symbolic meaning of settlement locations as a means of social competition. As such, the incorporation of this area within the Roman Empire would have meant not only the transformation of the territorial layout, but also the change of the social dynamics within and between the local communities. However, further research is required, given that this was a pilot study on the Romanisation process in the Roman province of Bética. Some aspects to be studied in the future will be, amongst others:

- The study of other geographical variables, such as the proximity of settlements to springs and rivers, accessibility, proximity to routes of trade and communication, and cultural variables such as proximity to sanctuaries and other meaningful places.
- Explore in greater detail the implications of visibility: smaller radii of visual control and the existence of visibility networks.
- Explore the settlement pattern for the Imperial period, as a means of detecting the continuation of trends and new developments.
- The analysis of these aspects in other parts of former Baetica, to investigate similarities and differences in the Romanisation process over areas of contrasting characteristics.

REFERENCES


5.3 THE OCCUPATION OF THE ANTEQUERA DEPRESSION THROUGH THE 1ST MILLENNIUM BC


