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Metal Detecting for Surveying Marching Camps?

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Some thoughts regarding methodology in light of the results of the lower Ebro Roman camps project.

The following article is a methodological reflection in the light of the results of surveys conducted in the sites of La Palma and Camí del Castellet de Banyoles, in North-eastern Spain, as a part of the lower Ebro Roman camps project (2006-2010). Both camps are dated around 200 BC. La Palma is related to the Second Punic War, and Camí del Castellet de Banyoles to the repression of the successive Indigenous uprisings between 200 and 180 BC. Both interventions are in their final phase of study, the second being resumed as a teaching project since 2010. Now, the project has been expanded to two new sites with a wider chronology: Les Aixalelles, a possible Roman camp of the Sertorian Civil War, and Terrer Roig, from the Caesarean Civil War. In this situation, we consider it necessary to reflect on the viability of our methodology (**fig. 1**).

1. Identifying Roman Camps

1.1.The conventional way: the use of architectural evidence

Roman military camp identification lies in two different kinds of archaeological evidence: architectural and artefactual ones. The architectural evidence is far more commonly used as the main argument. It is essentially based on the archaeological identification of some structures considered to be characteristic of a Roman camp, like the defensive system (*vallum*), generally the only structure preserved, but also military barracks, *horrea* and other buildings. Such is the case of classic sites like Numantia or the Limes fortifications (Morillo 2008: 79-85).

Following this criteria, many camps have also been found through aerial photography or even just satellite visors like Google Earth (Kennedy, Bishop 2011). Sometimes, if the defensive structures can be seen clearly enough, its identification is supported even without excavations and the existence of related materials. This is the case of some of the marching camps documented in the United Kingdom (Swan, Welfare 1995; Davies, Jones 2006; Jones 2011), in the Near East (Kennedy, Riley 1990) or more recently in Spain (Didierjean 2008). At the same time, preventive excavations have been able to document the existence of Roman camps that were not previously visible or recognizable on the surface or from the air only, just through the excavation of a small fraction of their defensive perimeter. This has been possible thanks to the documentation of structures, but also artefacts of clear military nature: weapons, equipment, etc.

1.2. The "other" way: the use of artefactual evidence

But what happens if we do not have structures? As a response, a method based on artefact finding is being adopted: the metal detector survey. This technique coming from Conflict Archaeology (Freeman 2001; Coulston 2001) has obtained a huge success in projects such as the Battle of Teutoburg (Harnecker 2004) or the Battle of Baecula (Bellón et al. 2009). As a consequence, its use has been extended to other sites with similar problems, like marching camps, gradually replacing other methods eliminate. This is not a problem in itself but, sometimes, it leads to an indiscriminate use of metal detector under the theoretical coverage of a research project. This unconscious application in the study of camps, where there can be layers susceptible of being excavated, sometimes might have catastrophic results. That is the reason why it cannot be applied indiscriminately without first performing a series of tests using other less destructive methods.

Still, we consider that it is possible to document a military camp without structures. Indeed, that is what distinguishes the sites presented here: La Palma and Camí del Castellet de Banyoles. Both were identified due to metal findings discovered by locals, and after 12 archaeological campaigns no structure has been found so far. Consequently, in order to develop our study, we counted only on artefacts found through surveys. However, we consider that the volume of materials allows us to identify a Roman military occupation at both sites (Noguera 2008; 2012).

2. Sites Description

The site of La Palma is located in the municipality of L'Aldea (Tarragona), on a large river terrace on the north bank of the Ebro. Currently, several roads cross the site. In addition, a large area was subject to an urban operation that destroyed the majority of the site. As a consequence, the original area of some 30 ha has been reduced to only a 7 ha plot located in the northwest corner. This prospectable surface was divided into two zones: A and B, separated artificially by the railroad embankment. For planning purposes, we divided zone B into two subzones: B1, in the north, and B2, in the south, both separated by a track (**fig. 3a**).

Regarding Camí del Castellet de Banyoles, this site is located in the municipality of Tivissa (Tarragona). It is situated outside an important Iberian town (Castellet de Banyoles), just across a narrow passage of 8 m wide and almost 120 m long that restricts the access to this town. It occupies a large and almost flat platform of 11 ha with quite steep limits. The level of preservation is better than that of La Palma, although a gas line crosses most of the site in an east-west direction. The area could be studied almost entirely, except for plot 36 of 8,700 m^2. Moreover, a part of plot 17 could only be prospected with metal detector because of the dense vegetation preventing visual exploration. Unlike La Palma, this area is cultivated with orchards of olive and almond trees. This fact prevented the use of some methods, such as mechanical ground stripping.

3. Methodology Analysis

This paper aims to show that, both in La Palma and Camí del Castellet de Banyoles, and by extension in any military camp which has no preserved structures, the methods that best suit the needs of the research are the ones that focus on the documentation of artefacts, i.e. field and metal detector surveys. To defend this position, we intend to describe all methods we applied, whose different results have led us to this conclusion. Nevertheless, we must bear in mind that our primary objective was the documentation of archaeological layers that could be excavated. The failure in this regard, in addition to the unexpected results of the survey with metal detector, made us reconsider the focus of our research towards the study of artefacts.

3.1. Aerial photography analysis

We considered essential as the first step in the project to conduct a detailed study of the aerial photography available for both sites. This included the photogrammetric flights made by the Institut Cartogràfic de Catalunya (ICC) in the years 2006, 2008, 2009, 2010 and 2011, along with the earlier flights of 1955-56, 1977 and 1984-86, and also the ones made by Italian air force during the Battle of the Ebro in 1939, or the Confederación Hidrográfica del Ebro in 1927.

Overall, the conclusions drawn from this study were not very outstanding, as we could not document any trace of structures attributable to a military settlement. Still, it was possible to point out some anomalies that were subsequently revealed

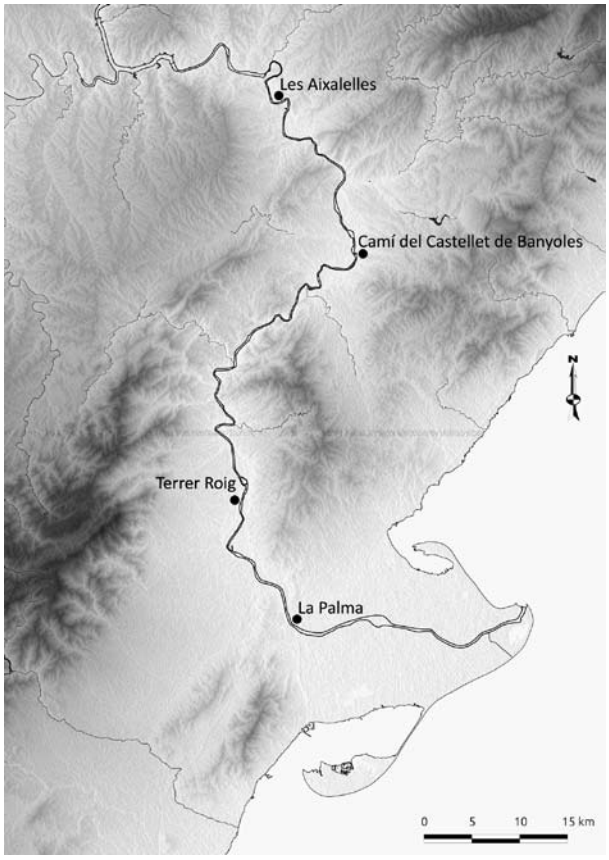

Fig. 1. Map of the Lower Ebro with the sites included in the project

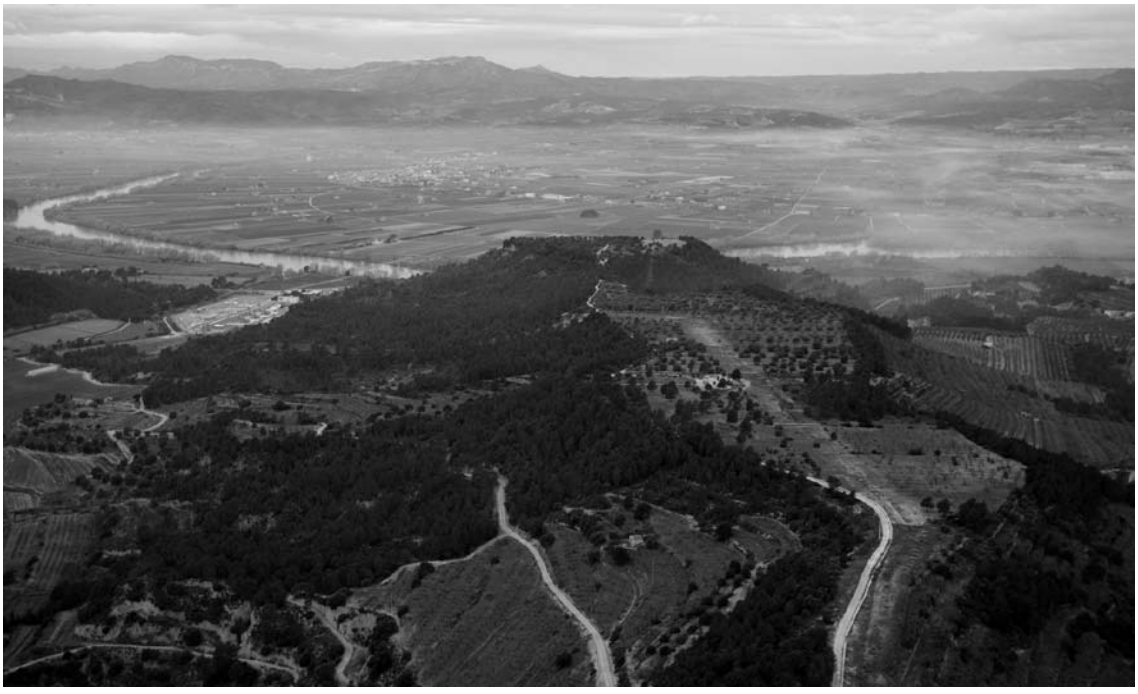

Fig. 2. Aerial photography of Camí del Castellet de Banyoles taken by a balloon

by other methods: cropmarks showed zones with greater stratigraphic depth at both sites.

In La Palma, we observed a strip that traverse the site from north-west to south-east, linked to a ravine that leads to the Ebro. In addition, a photograph took in 1955–56 showed the existence of a U-shaped wall that closed the northern end of the deeper strip. In Camí del Castellet de Banyoles, this type of analysis was hindered by orchards. Still, we could identify on the western plateau an area where the almond trees were thickener, an evidence of deeper soil.

Besides the use of conventional cartography, in 2009 we conducted a photographic documentation from the air with a balloon. Aerial photography did not reveal any evidence to suggest the existence of hidden structures in the ground, but we got oblique and vertical perspectives of both sites, further indicating the strategic nature of their location (**fig. 2**).

3.2. Intensive field survey

Intensive field surveys were also carried out. In the case of La Palma, the survey was conducted in 2006. Zone B1, of nearly 40,000 m^2, was ploughed to facilitate field survey. Then it was divided using a 30×10 m grid with 131 units, which were systematically surveyed by a team of 7 people. In zone B2 of 10,000 m^2, we conducted a field survey without a grid, but positioning each element with a total station (**fig. 3a**).

In the case of Camí del Castellet de Banyoles, due to its largest surface, survey lasted for three campaigns. The field works conducted in 2007 focused on 4.3 ha, following the same method of intensive survey with 300 m^2 units used in La Palma, so that the results could be compared. In 2008, plot 17, which occupies 45,632 m^2, was prospected. However, we could only work on 26,000 m^2 because of the dense vegetation in some areas. We used the same criteria with a new systematic survey grid of 86 units. Finally, in 2009 we focused on plot 68. We set a survey grid of 50 units, covering nearly 15,000 m^2. This time the work was conducted by a team of students from the University of Barcelona, who completed the study in a single day (**fig. 4a**).

Thanks to the continuous repetition of the same system each campaign, we have been able to improve the method, especially regarding ground preparation and the survey team. After the first time, we were aware of the importance of ploughing the ground with a tractor before the survey. Turning over the soil, the vegetation cover is removed, while it helps pottery emerge to the surface. In 2009, we also decided to wait some time so that it had rained before surveying started. Rain eliminates the dust deposited on pottery and makes it easier to identify it.

3.3. Mechanical ground stripping

Because of the large size of the study area and the absence of any visible structures, we put into prac-

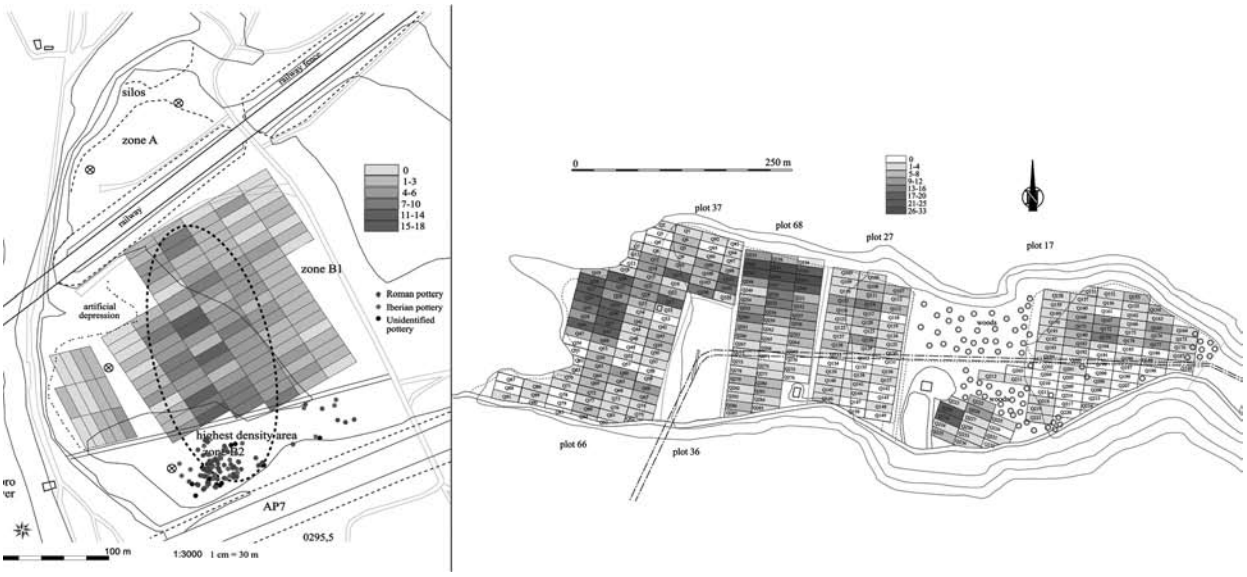

Fig. 3. Results of the intensive field survey with the 30×10 m grids and the division of the sites by areas in the case of La Palma (right) and by plots in Camí del Castellet de Banyoles (left)

tice a general stripping of the ground. This method allows tracking the existence of architectural structures (positive and negative) quickly, effectively and, above all, without problems to cover a wide area. We consider this method much more valid than the more common test pits, which have the inherent risk of sampling.

The downside, of course, is the highly destructive nature of this system, which involves the removal of large amounts of soil. That is the reason why it is essential to ensure a continuous monitoring of the mechanical work, and to always keep the same criteria and configuration in the strips. Nevertheless, this method is frequently used in archaeology (Wilson 1982), especially in preventive interventions, but was never applied before in the field of military camps.

This method could only be used in La Palma. The initial objective was to document structures that had not been detected by aerial photography and that were likely to be excavated. We used a motor grader, a machine that enables controlled stripping of the ground, by moving the soil laterally; and the display of a large surface. With each pass, the motor grader striped about 10 cm, reaching a total depth of about 30-40 cm.

The first intervention took place in 2007 and was concentrated on a strip of land of around 15,000 m^2 parallel to the river Ebro. This was the area where the field survey of 2006 had detected a high concentration of pottery. The result was entirely negative, but the method showed itself as very useful in combination with metal detector survey. Because of that, we decided to continue applying it in each campaign as a soil preparation system.

In the next year, we intervened in the same sector of subzone B1 (12,400 m^2), where the motor grader knocked down the mounds and then stripped the ground about 20-30 cm more. In 2009 we proceeded in the same way, but extending the system to the sector of zone B that had not been lowered so far, covering an area of 17,400 m^2 in subzone B1 and 7000 m^2 in B2. Then, we decided to continue stripping the natural depression identified by cropmarks and also documented via ground-penetrating radar (GPR) survey, totalling an area of 6,000 m^2. In 2010, we undertook a final general stripping reaching nearly the entire area B, and again with special emphasis on the northwest-southeast strip. Finally, in 2011, considering the absence of any structure, we decided to flatten the plot again (**fig. 5**).

The works were closely monitored at any time, in order to detect changes in the stratigraphy. Unfortunately, we could not identify any excavated structure, much less walls. Bedrock is shallow and generally emerges within few centimetres. The only element detected was a greater depth in the already mentioned strip that crosses the site northwest-southeast.

Instead, mechanical stripping has shown itself as an ideal ground preparation system for metal detector survey; in the same way that ploughing is for field survey. This method enables the removal of the topsoil, which contains more contemporary material intrusions and has been heavily affected by the

Fig. 4. Field pictures showing the works of field survey in Camí del Castellet de Banyoles (above) and metal detector survey in La Palma (bellow)

activities of amateur detectorists. Indeed, there was an exponential increase of metallic findings once we implemented this method.

The only drawback of stripping is the accumulation of leftover soil in the same field forming mounds that divide the area of exploration in different lanes. This fact has hampered the works by disabling the survey of the entire surface with the same intensity (the penetration of the signal detector is lower in the mounds). At the same time, it caused the same soil to be surveyed each campaign as we had to knock down the mounds before a new strip was done.

3.4. Metal detector survey

The other technique that has given us more data is metal detector survey. It allows us to identify the rest of artefactual evidence characterizing a military camp: numismatics and weaponry/military equipment (*militaria*). In the case of La Palma, this method was tested during the campaign of 2006 using the same grid created for field survey. Thus, in parallel, a team of three people equipped with metal detectors of different types were responsible for the recovery of metallic objects.

Next year, facing the impossibility of documenting structures with the mechanical stripping and the difficulty of putting into practice a field survey because of the mounds, the campaign was exclusively dedicated to metal detector survey. Thereafter, this was our main activity in all the campaigns, introducing, year after year, more detectors and operators, and also improving the data collection system.

In 2007, the team consisted of 4 people equipped with Teknetics T2, and a support person who led the work. Finds were positioned using a dumpy level by triangulation from two elements of known situation. In 2008 and 2009 we kept the same methodology, but with a team of 6 operators. Since 2010, we introduced the positioning of finds with a GPS Garmin Etrex, which has a margin of error of less than 5 m. This georeferencing system, at the cost of losing some precision, has enabled us to accelerate the process of data recording. This has increased the number of findings per campaign and simplified the information post-processing facing toward a study of geospatial dispersion (**fig. 4b**).

In the case of Camí del Castellet de Banyoles, without having carried out a ground stripping, metal detector survey has always been done in parallel with field one. The equipment used was the same as in La Palma and finds were positioned by triangulation from the 30×10 m grid.

It should be pointed out that the use of metal detectors in Camí de Castellet de Banyoles has been hampered by the presence of several country houses, around which there is a large concentration of metal debris that interfere with the signal. Metal findings related to a possible Roman camp were infrequent, but still we have recovered some key elements that allow us to support a military role for the site. Undoubtedly, these problems could have been solved through ground stripping, but orchards prevented it.

3.5. Geophysical survey

Given the negative results of all the attempts to locate structures, we tried to exhaust all possibilities resorting to geophysics. The survey was performed by SOT Prospection. The methods used were the magnetic gradiometer type fluxgate and the GPR, with profiles in a reading density of 0.025 m for each scan (40 scans/m) and a scan depth set at 70 ns equivalent to a maximum of 2.8 m.

In La Palma, in 2009 we surveyed the area where the campaign of 2006 located a higher density of pottery. This work aimed to identify architectonic structures, especially negative ones, which could indicate the existence of a defensive system belonging to a camp. The magnetic survey was performed on about 8,300 m^2, as 700 m^2. of the western squares were excluded. To this, several GPR profiles were added to complement the survey. Preliminary results showed a number of anomalies that could correspond to underground structures, while the GPR profiles confirmed the existence of a large natural depression following a northwest-southeast direction, in full agreement with cropmarks.

In the case of Camí del Castellet de Banyoles we made the surveyed area coincide with the transects that in 2007 provided more amphorae fragments from the third or early second century BC. Thus, we used a grid of 60×90 m (5,400 m^2). The results suggested the presence of isolated structures in this sector. The structure in area 1 was especially interesting: a possible rectangular building with walls around 50-100 cm wide and a door facing north. The situation of this underground structure coincided with an area where the almond trees are thicker. Areas 2 and 3 had other possible structures, although less clear. The negative result of the test pits led to another attempt next year. We extended the surveyed area about 1,500 m2 more westward. This new intervention identified another zone of anomalies near the western boundary of the river terrace where the site is located.

3.6. Excavation

The aim of the whole project has always been to identify archaeological structures susceptible to be excavated. Therefore, the excavation phase was not only a goal, but also a final verification of the various archaeological traces and geophysical anomalies pointed out by the rest of the methods.

In the case of La Palma, in 2007 we intervened on a set of 10 silos that had been documented in surface in area A. They were excavated in the limestone rock that forms the river terrace and surfaces within few centimetres. None of the silos was covered with stone slabs. Many were empty and others fully filled with the same gravel that covered the entire sector. Only 4 silos that had a fill with a different colour and texture from the outside were selected for excavation. The initial hypothesis was that these structures could be linked to the occupation of the camp. Unfortunately, the levels were much altered and provided no evidence to date their collapse. The materials were virtually non-existent. We can only highlight a tile fragment, two fragments of medieval or modern pottery and a much worn out iron fragment. In view of the result, the silos seem to be abandoned over time, but in any case, they are not Roman.

Another attempt took place in 2009, when we conducted an excavation to date the wall documented from aerial photography. This structure seemed to close on three sides a slope that connects the terrace on which the site is located with the riverbank, making us consider the possibility that it might be a fortification that defended a ramp toward a possible anchorage. The excavation of a trench revealed a large wall about 4 m wide, but with very uneven walls: one made of small stones and the other with large blocks mixed with soil. This system, away from the Romans constructive canons, added to the non-existence of archaeological materials, led us to reject this dating. Without much more certainty, the current assumption is that it would be a fortification linked to the War of Spanish Independence (1808-14) or The III Carlist War (1872-76), conflicts that had an impact on the archaeological record of La Palma, or even a storage structure related to the construction of a railway in the early twentieth century.

Finally, during the campaigns of 2006 and 2009 of La Palma, and 2009 and 2010 of Camí del Castellet de Banyoles, several test pits were dug to verify whether the anomalies detected via geophysical survey team could correspond to archaeological structures. Unfortunately, all the excavations were unsuccessful, and all that we were able to document were differences in the underlying geological layers,

Fig. 5. Mechanical ground stripping performed by a motor grader and evolution of the stripped area in 2007, 2008 and 2009

like an oblique stripe that crosses La Palma, which could explain the results of the geophysical surveys. In the case of La Palma we always identified a single layer of variable thickness (from 1 m to 20 cm), with some fragments of pottery, corresponding to the layer stripped by the motor grader, and beneath just the natural gravels. In Camí del Castellet de Banyoles, after a completely sterile layer of 30-40 cm, we found the bedrock, often in the form of slabs of limestone.

4. Assessment of the Results

In conclusion, we can see how only two methods have provided significant results from an archaeological point of view. On one hand, there is field survey. In this sense, the origin of pottery bears great importance, especially when it marks a contrast with the dynamics of other sites from the same area. In the case of La Palma, 548 shards were collected, of which 66% were Greco-Italic amphorae, 28% were Iberian and 6% were indeterminate. In Camí del Castellet de Banyoles in 2007, 708 shards were collected, of which 88% corresponded to Iberian pottery and 12% to Greco-Italic amphorae. This map is clearly different from the one we found in a common Iberian settlement from c. 200 BC. The same Iberian town of Castellet de Banyoles constitutes a good example, with 98% of Iberian pottery, and just 1% of Campanian A ware (almost non-existent in both camps) and 0.5% of Greco-Italic amphorae.

On the other hand, there is metal detector survey. Its results are much more evident in La Palma. Here, the discovery of more than 200 coins dated from the Second Punic War, together with an important set of weaponry and military equipment, make the military role of the site undeniable. Among the military equipment, we have to highlight the presence of two socketed pyramidal projectile-heads, some suds from *caligae* and two *bullae*, all of them of clear Italic origin. Comparing the numismatic ensembles of both sites (presence of Hispano-Carthaginian coins in La Palma and Roman *denarii* in Camí del Castellet de Banyoles) we are able to specify their

chronology with a difference of less than 20 years (Noguera 2008; 2012).

Furthermore, in case the method used in La Palma could be questioned, the results of the reiterative repetition of metal detector survey points towards another conclusion. We have never detected a decrease in the number of findings, rather the opposite, nor a decrease in the proportion of modern materials (a fact that would be expected if we had altered archaeological layers beyond the surface level). The only change that could be perceived, especially during the last year, was the decrease in the mass of the items found. This is especially important in the case of coins, as it has involved changes in their classification by origin. Hispano-Carthaginian and Massaliote bronze divisors, significantly smaller than Roman coins in mass, have significantly increased their rates in last campaigns. A clear indicator of how intensive the survey has been conducted.

The successful results obtained validate the suitability of this methodology. Indeed, during 2010 and 2011 Camí del Castellet de Banyoles was again surveyed by undergraduate students from the University of Barcelona. The quantitative results and the percentages were almost identical to those obtained by the research project, a final validation of the method used. As a consequence, for the first time, we are capable of asserting the identification of two Roman military camps exclusively from archaeological artefacts. In this regard, artifacts, i.e. pottery, weaponry and numismatic, are valid indicator of military presence in a site, provided that they are contrasted with other contemporary archaeological contexts.

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