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RESEARCH

A quarry for the construction of a Roman camp next to the Celtiberian city of Deza during the Sertorian Wars (Soria, Spain)

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Abstract

Through an interdisciplinary investigation, a hastily exploited individual quarry of limestone is studied. The quarry was made all at once for the construction of a nearby military camp to improve the defence of a remarkable Celtiberian city during the Sertorian Wars. This is a perfect Roman military engineering project: on the one hand, the geological deposit was exploited selectively, differentiating the areas of extraction of large and small blocks of stone, according to the needs of the work. On the other hand, the material was transported by means of small roads along a carefully studied and laid out road of about 600 m in length and of clear Roman origin. The archaeological evidence shows the existence of a large camp that, according to previous surveys, adopts the known classical models of rectangular plans and the typology of Roman construction. In the camp environment, there are enough scattered remains that seem to point to a battlefield. All this indicates the importance of the primitive Celtiberian settlement, which is justified by an analysis of the territory by the existence of springs of high guarantee for human water supply, livestock and irrigation. The existence of silver mines is another added economic value. Due to the predominance in the monetary findings of the mint of *Titiakos*, the possibility is raised that the Celtiberian city was linked to the ethnic group of the Titos indicating their active participation during the Sertorian Wars.

Keywords Geoarchaeology · Roman military archaeology · Sertorian Wars · Digital photogrammetry

Introduction

For many years, the study of ancient quarries has been a common topic in archaeological studies (e.g. Coli et al. 2011; Uchida and Shimoda 2013). Today, these studies are sometimes conducted with the use of UAV (Unmanned Aerial Vehicle) and other recent techniques (e.g. Fabbri 2021; De Laet et al. 2015; Verhoeven et al. 2012). Local use quarries are increasingly gaining momentum in recent geoarchaeological research, and, within the Iberian Peninsula, more and more important works are being carried out. These works explain the modalities, processes or techniques of exploitation, which are different depending on if they are for sculptures, for the construction of the walls of a fortification or if they are individual quarries or a group of them. The chronology, techniques and organisation of the exploitations are also addressed. It can be cited, for example, studies of limestone quarries for the construction of the Roman city of Bilbilis, Zaragoza (Aguilera et al. 1995), those of Roman origin in Catalonia (Gutiérrez García 2009) and in Álava (Martínez-Torres 2009). There are also studies identifying

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quarries exploited for the construction of fortresses in the late antiquity in Formentera Island (González Villaescusa et al. 2018), as well as others for the construction of Roman dams, such as the one in Muel, Zaragoza (Uribe et al. 2011), or the highly appreciated limestone and conglomerate quarries that have been exploited since Roman times in the area of Espejón, relatively close to and from the same period as those studied here (García-Entero et al. 2018).

On the other hand, the beginning of the research of Roman military archaeology in the Celtiberian area shares its origins with those of this discipline in Spain. The first archaeological excavations of Roman military camps were carried out in Numantia (Schulten 1927, 1928), linking, for example, camps IV and V with the Sertorian Wars (75–74 B.C.). Later, and referring to these Sertorian Wars, the archaeologist Blas Taracena Aguirre discovered the Roman military enclosure of Navalcaballo (Soria) (Taracena Aguirre 1941). In recent years, the study of Roman military archaeology in the Iberian Peninsula has undergone an important methodological renovation with the growing open access to new aerial and satellite photographic coverage, as well as LiDAR (Light Detection and Ranging) data. This has led to the discovery of dozens of new settlements on a European scale (e.g. Bernardini et al. 2015; Driver et al. 2020), in the peninsular territory (e.g. Cordero Ruiz et al. 2017; Martín Hernández et al. 2020) or at the regional level (Vicente García and Díaz Jiménez 2021).

The quarry and the Roman camp which are presented here are located in the surroundings of the city of Deza (Soria, Spain) (Fig. 1) and has not been the subject of any study and remains unknown until today. We emphasise that this is the only case of quarry recognised for military purposes in the Celtiberian-Roman area, so it is of great interest to study it to know the procedures of stone extraction in periods of war since, in this case, they have not been affected by subsequent extractions.

In addition, given the state structure and the articulation of the territory of the cities in the Celtiberian society, identifying the cities becomes a key piece of historical analysis. The cities appear as autonomous political entities that decide their alliances and war participation with authority to mint coins and issue other public documents (Burillo Mozota 2007).

The Celtiberian origin of a city like Deza poses an archaeological problem that is difficult to solve if it is based on the study site of the current urban area. It must be considered that the continuity of this city throughout history and expansion of the population has surely led to the destruction of

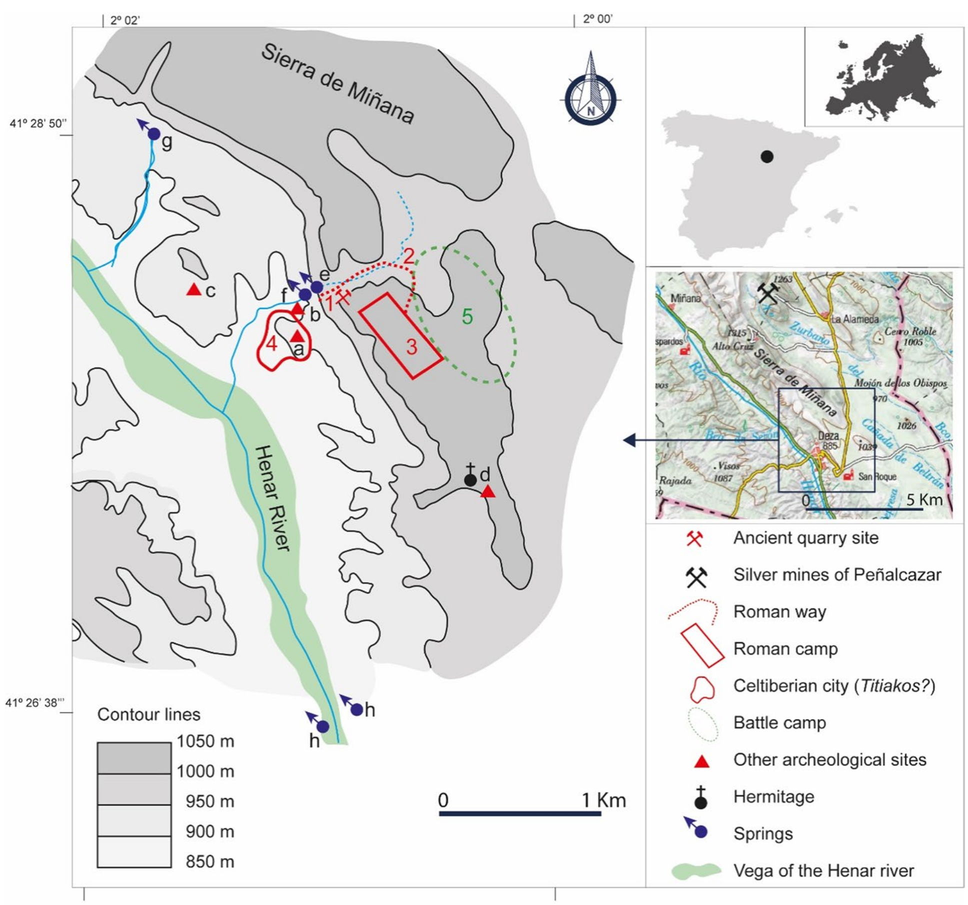


Fig. 1 Studying area situation and location of the Roman archaeological sites and the Celtiberian city. Legend: 1. Ancient quarry site; 2. Roman way; 3. Roman camp; 4. Celtiberian city (Titiakos?); 5. Battle camp. Other archaeological sites: a. Cerro del Cabezuelo; b. La Huertaza; c. Cerro del Mediano; d. San Roque hermitage; e. Suso spring; f. Algadir spring; g. Valdezuziel spring; h. San Roquillo spring

much of the oldest strata. If any strata have been preserved, it cannot be deduced if the settlement reached the category of city. This could have happened in other cities with an established historiography such as Arekorata, which is still unlocated. Its possible location could be in the important town of Agreda (Soria), which has been given continuity with the primitive nucleus throughout history.

The strategies to know when a city arose do not have to focus exclusively on the site where the human settlement is located but should be directed towards the territorial context in which it is immersed, especially in the surroundings of the city itself, where there is some sign that has been preserved that can provide with an indirect testimony about its origin and development. This territorial context not only explains the when, but also the why.

Thus, the strategy of archaeological research to solve the origin of a Celtiberian city will have to develop a prior theoretical-methodological framework to which the subsequent actions of prospecting and excavation will be subordinated. And here, as it will be seen later, the main sign has been the existence of the remains of a path sculpted in rock that has led it to an unknown ancient quarry. The materials exploited from this quarry were used for the construction of a remarkable Roman military camp. The purpose of this camp was to protect an important Celtiberian city located nearby (present-day Deza), possibly Titiakos. The aims of that work are as follows:

- To study the quarry with the identification of the existing exploitation fronts, chronological ascription, organisation and strategy of the extractive activity in relation to the construction of a military camp, transport routes of the extracted stone, etc.
- Start the study of the Roman camp that was built with the stone extracted from the quarry.
- To compose a vision closer to the historical-archaeological reality of the quarry and Roman camp in the context of the Sertorian Wars next to an important Celtiberian city within the territory of the Titos.

Materials and methods

In this type of work, the interdisciplinary approach is a constant, which includes a real programme of research area, resources on historical written sources, geology and archaeology and the use of drones. Due to the absence of previous systematic research, the following methods have been applied:

- Classical methods of archaeological and historical research for the Celtiberian predecessor city of Deza and Roman camp including the extensive, exhaustive and systematic archaeological survey of the territory surface, as well as the monitoring for decades of the findings on the surface or due to works of various kinds that are known in Deza or its surroundings. Classification of these archaeological materials, including mainly ceramics and coins. (Alejandre Alcalde 2011) has also been applied.
- Geological prospecting of the Deza site environment that includes geological cartography and visual recognition of the geological materials used in civil, religious and military constructions and their degree of alteration.
- Spatial analysis of the territory in order to assess the habitability, defence and economic importance of the Celtiberian predecessor city of Deza. Special mention is made of the quantification, availability and distribution and guarantee of the hydraulic resources of the area with the comparison and guarantee for supplying the springs of the region with those of Deza. In particular for the springs in the Deza region, a parameter has been used that we could call the "average life" (t_m) of the spring. The average life of a spring is defined by the time it would take to reduce its flow by half, assuming that the aquifer did not receive any recharge. This is a measure that reflects the regularity of the springs in the face of drought events. Its analytical expression is (Sanz Pérez and Yelamos 1998):

$$t_m = 0.693/\alpha$$

where α is the coefficient of depletion of the spring. The depletion coefficient of the springs in the Deza region and its surroundings have been obtained from the hydrographs of the springs taken from Sanz Pérez (1999), or from the depletion coefficient formula (Sanz Pérez and Yelamos 1998).

- Geoarchaeology of the quarry: surveys aimed at discovering the quarrying fronts in aerial photography and on the ground, detailed geological and geomorphological mapping, engineering of the quarry and its road, looking up of written sources and documentation from municipal archives on quarrying works, cubing of extracted rock.
- Digital photogrammetry using UAV (Unmanned Aerial Vehicle): commonly known as a drone, as well as an innovative flight app, Dronelink, that automates drone missions for the generation of reality meshes. Due to the insufficient accuracy of previous data such as LiDAR (Light Detection and Ranging) from the National Geographic Institute and the abruptness of the relief, the use of UAV was proposed. This methodology is very suitable for obtaining data such as longitudinal profiles with the slope and layout of the access road to the quarry, volumes extracted from the quarry or perimeters of the camp enclosures. The drone used is a DJI Mavic 2 Zoom; its

4 K camera has a 24 to 48 mm optical zoom lens, 12MP ½0.3-inch CMOS sensor that generates HDR photography up to 48 MP. The flight Fig. 2 has been programmed with Dronelink on a 400 × 400 m^2 grid at approximately 45 m altitude taking pictures automatically every three seconds with a 75% overlap.The data collected in the flights have been processed with the specific software of the Bentley brand, Context Capture, giving rise to the generation of the 3D model which in turn allows the generation of an orthophoto, a digital terrain model (DTM) or contour lines from which geometric data can be extracted with centimetric precision. The characteristics of the drone and the flight performed result in a ground sample distance (GSD) of 0.54 cm. From the above data, it can be estimated that the accuracy is 1 to 3 times the GSD, so in our case, it will be 1 to 2 cm. Additionally, for details where higher accuracy is required, a handheld laser scanner system combined with photography has been used. Figure 2 shows the flight plan programmed in Dronelink within the study area.

Results

Evidence of Deza as a Celtiberian and Roman city

There is sufficient evidence in or around Deza to affirm that it was a Celtiberian and later Roman city. Firstly, there is news of the discovery in Deza of a helmet with similar characteristics to others found in the Celtiberian area (Cabre and Cabre 1933; Pastor Eixarch 2005–2006). Apart from this, and as a result of the monitoring of the works that have been carried out in the town, in its surroundings and the exhaustive survey of its territory, various archaeological materials have been found on the outskirts of the historic centre of the town in "El Cabezuelo-La Huertaza" and in "La Tañeria" (Alejandre Alcalde 2011). In this regard, abundant Celtiberian pottery has been found throughout "Cabezuelo Hill" (2 ha), with some fragments decorated with concentric circles and horizontal lines. Campanian pottery has also been found at this site, confirming the continuity of the settlement during the Roman-Republican period. Celtiberian pottery, *terra sigillata*, slag and two coins, one Celtiberian and one High Imperial Roman coin, were found at the source of the Algadir River. Iron slag, various fragments of Celtiberian pottery, Campanian pottery and *terra sigillata* were also found at a depth of 1.5 m on the site of the current sewage treatment plant. On the other hand, the chance discovery of several Celtiberian coins, specifically from the *Sekaisa*, *Bilbilis* and *Karaues* mints, as well as a High-Imperial Roman piece, in the surroundings of the urban area of Deza, supports the hypothesis that an important ancient Celtiberian settlement was located on this site (Alejandre Alcalde 2011).

The importance of Deza in the Celtiberian-Roman period: territory spatial analysis

The economic and defensive importance of Deza in antiquity is explained below.

The determining factor for a location as a place to live: water

Often, the origin of many villages and human settlements in arid areas such as this one is due to the existence of a spring. In the case of Deza, the location was ideal for a settlement in ancient times. The hill on which the Celtiberian city was built not only had acceptable defensive conditions but was also next to a spring with a large flow (140 l/s) (Sanz Pérez 1999) and very little variability, constituting almost the entire base flow of the Henar River, to which it provides. This river, upstream from Deza, hardly carries any water

Fig. 2 Screenshot of Dronelink with the scheduled plan over part of the study area

and in the summer months, it is practically dry. According to the depletion curve of the spring's hydrograph, this spring would take 2 years to reduce its flow by half if there were no rain at all (Sanz Pérez and Yelamos 1998). This regular and constant flow regime offered an exceptional guarantee for supply and irrigation in the fertile plain of the River Henar downstream of Deza (about 3 km^2 up to Cihuela). In an area where the average rainfall hardly exceeds 400 mm and is subject to frequent droughts, harvest was assured in the irrigated plain of the Henar River. It is likely that in ancient times, it served as a refuge for herds of cattle during low water and dry years.

In addition, the waters of this source are of high quality and are semi-thermal (19–20 °C), which helped to combat the harsh winter cold. As the spring is 50 m above the plain of the River Henar on the hillside, it can be used for horticultural crops by means of ditches on slopes and terraces that are not subject to the River Henar’s dreaded floods. Something similar happens in the mountainous surroundings of the Celtiberian Castro of “San Felices” (Soria), where the slopes are completely terraced and used for vegetable gardens irrigated with the different springs that flow from the headwaters of the ravines.

By making a spatial analysis of the territory in which Deza is located and comparing its spring with others in the area of the Iberian Mountains, we can assure that there is no other case of these characteristics in the surrounding area of 40–50 km, especially towards the south-west, where there is a desert with no appreciable water sources up to “Aguaviva de la Vega” (32 km) where there are springs of no more than 20 l/s (Fig. 3). This inertia flow capacity over time is also present in the thermal springs of Alhama de Aragón (about 450 l/s at 32 °C) and Jaraba (about 100 l/s at 31 °C) (about 4 years), located on the banks of the Jalón and Mesa rivers, 22 km and 32 km south of Deza, respectively. These two springs, together with the Deza spring, are part of the same hydrothermal aquifer system (Sanz Pérez and Yelamos 1998). However, the location of the springs on the banks of the aforementioned rivers reduced their strategic value with respect to the Deza River, where it could be said that the water flowed practically inside the Celtiberian city itself, halfway up the slopes of the Miñana mountain range. Even so, the Alhama springs contributed to maintaining the base flow of the Jalón River, which had a very irregular regime, benefitting the Celtiberian settlements on its banks. Further north of Deza (Fig. 3), we can find large cold-water springs, such as Aranda de Moncayo (600 l/s, but with a very irregular flow, as it can drop to less than 20 l/s during low water), Bijuesca, Berdejo, Torrelapaja, etc. Others can be found further north, such as the spring of San Juan, in Tarazona, with a very constant flow of 200 l/s (Turiasu); in the Agreda area we have the “Ojillos del Queiles” in Agreda itself (100 l/s but of mediocre quality for drinking water), those of Añavieja and Devanos (about 500 l/s in total), Vozmediano (1,150 l/s), etc. It is no coincidence that the location of these springs determined the existence of important Celtiberian cities and forts, as in the case of Turiasu (Tarazona), Devanus (Débanos), Arekorata (Agreda?), Aratikos (Aranda de Moncayo), etc. The great regularity of the flow of the Vozmediano spring (number 22 in Fig. 3), for example, meant that this river had a guaranteed flow of no less than 600 l/s. Which made it possible to maintain irrigated agriculture throughout its valley until its confluence with the River Ebro in Tudela and Tarazona. It made possible the existence of numerous Celtiberian settlements studied by Gómara Miramón (2017).

Also, it can be seen that the springs of Deza have a greater area of influence, apart from being of exceptional regularity, as is reflected in some of them in Table 1.

Habitability and defence

Apart from the favourable conditions that Deza had in regard to its water supply, it is worth mentioning that the town was located on a hill at an altitude of 900 m above sea level and covering an area of 8 or 9 hectares, surrounded by steep slopes, except for the gentle hill that joins it to the mountainous alignment of “Miñana” mountain, where the Cabezuelo rises only 5 m. The top of the hill runs into the historic centre, which is within the perimeter of the medieval wall. This area makes it a medium-sized town, with approximately 2,000 inhabitants, slightly more than Numantia (Burillo Mozota 2007), although its population spread in periods of peace to the nearby Mediano Hill, as is currently the case with the neighbourhood of “La Taranzana” in Deza. The hill of Deza faces south and is protected from the cold north winds by an elongated high plateau of about 1000 m in altitude, which is the continuation of the Sierra de Miñana (1315 m). This meant that the weather conditions were not very extreme.

The hill is occupied by a vertical strata crest of marly limestones, sandstones, soft clays and two overhanging terrace levels of calcareous tuff left by the spring in Pleistocene times, which are 3 m vertically from each other. The horizontal tuff slabs are supported by detrital sections. The limestone and sandstone hill has been modified by man in ancient times and is now a small, flat, horizontal plateau (Cerro del Cabezuelo) which rises above the medieval walled enclosure. The calcareous tuff terraces constituted a relatively extensive horizontal platform that crowns the hill with steep edges of about 10 m, except on the side of the hillock to the east (Fig. 4).

The Celtiberian city was built on this flat area (Fig. 4). The detrital levels below the horizontal tuff layers offer good possibilities of being inhabited in caves excavated in ancient

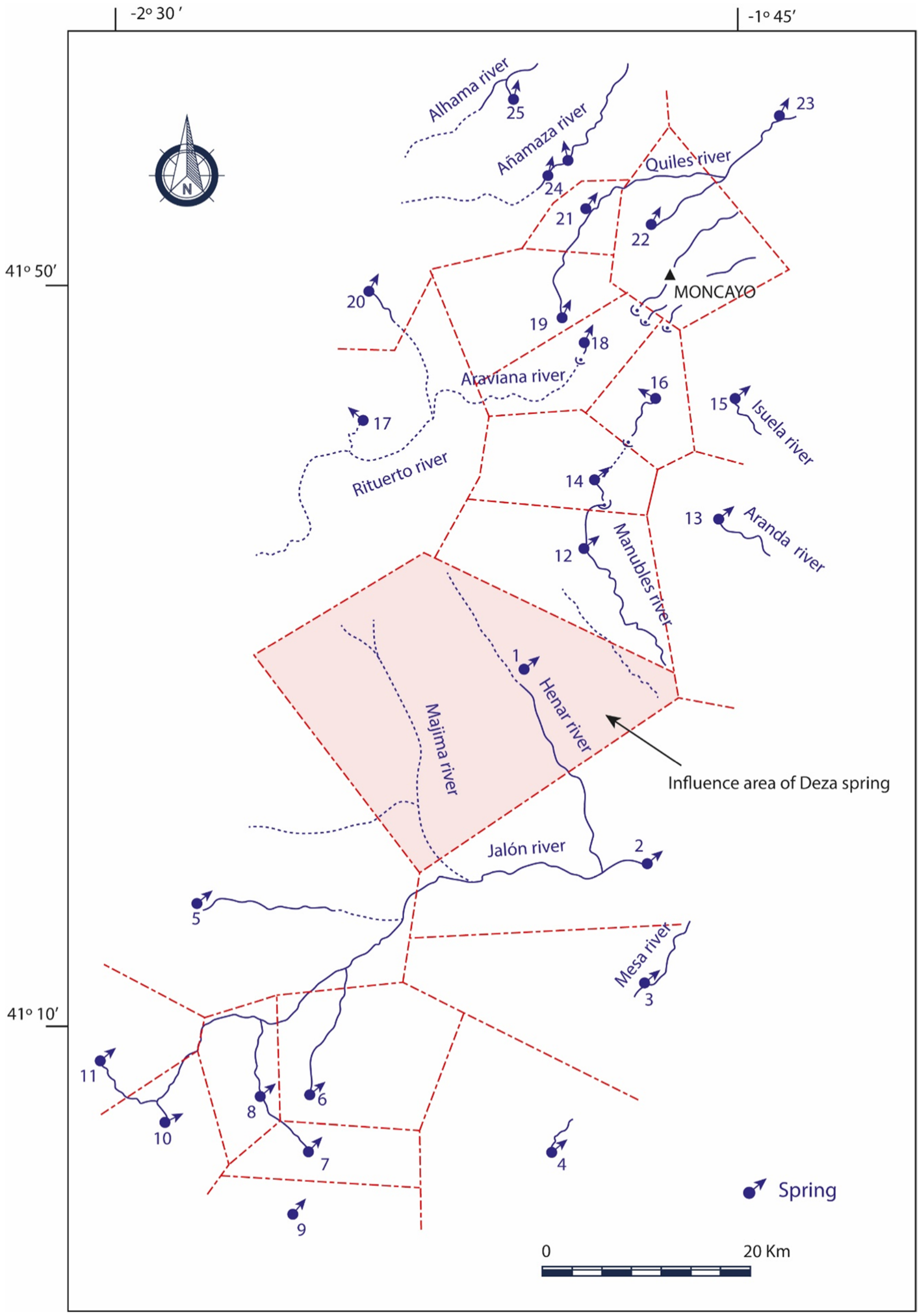


Fig. 3 Comparison of the areas of influence of the surrounding springs in the Celtiberian area of the Iberian Mountain range on the left bank of the Jalón River, the Moncayo area and the headwaters of the "Rituerto" in the Duero basin (calculated approximately according to Thiessen polygons). Springs: 1. Springs of Deza (140 l/s). 2. Thermal springs of "Alhama de Aragón" (450 l/s). 3. Springs of Jaraba (100 l/s). 4. Source of the River Mesa in Mochales (1500 l/s). 5. Springs of "Aguaviva de la Vega" (25 l/s l/s). Chaorna (16 l/s) 7. Laina (60 l/s) 8. Urex (60 l/s) 9. Anguita in the River Tajuña (200 l/s) 10. Source of the River Jalón in "Esteras de Medinaceli" (30 l/s) 11 Ambrona, Fuencaliente spring (30 l/s). 12. Torrelapaja, Berdejo and Bijuesca in the Manubles (200 l/s) 13. Source of the River Aranda (600 l/s) 14. Ciria in the Manubles (20 l/s) 15. Spring of Purujosa on the Isuela 16. Spring of Borobia, source of the River Manubles 17.Almenar de Soria spring (20 l/s). 18. River Araviana in the Estrecho (15 l/s)19. Spring of Vomitrosa, source of the River Keyles (10–15 l/s). 20. "Peña" spring, source of the Rituerto (20 l/s) 21. "Ojillos del Keyles" (60 l/s) 22. Vozmediano, source of the River Queiles (1150 l/s). 23. "San Juan" spring (200 l/s). 24. Springs of Añavieja and Débanos (500 l/s). 25. San Felices springs (The average flows are taken from various sources of information, such as the Confederación Hidrografica del Ebro; San Roman Saldaña, 1994; Sanz Pérez and Yelamos 1998 and Sanz Pérez 1999)

Table 1 Regularity of the springs in the Deza area

Spring (number of order in Fig. 3)	Mean flow rate (l/s)	Depletion ratio (days-1)	Half-life (years)
Deza (1)	140	0.0008	2.30
Urex (8) and Laina (7)	90	0.0016	1.18
River Jalón in Jubera	500	0.0048	0.39
Aranda de Moncayo (13)	600	0.0100	0.19
Vozmediano (22)	1150	0.0030	0.60
Devanos (24)	150	0.0094	0.20

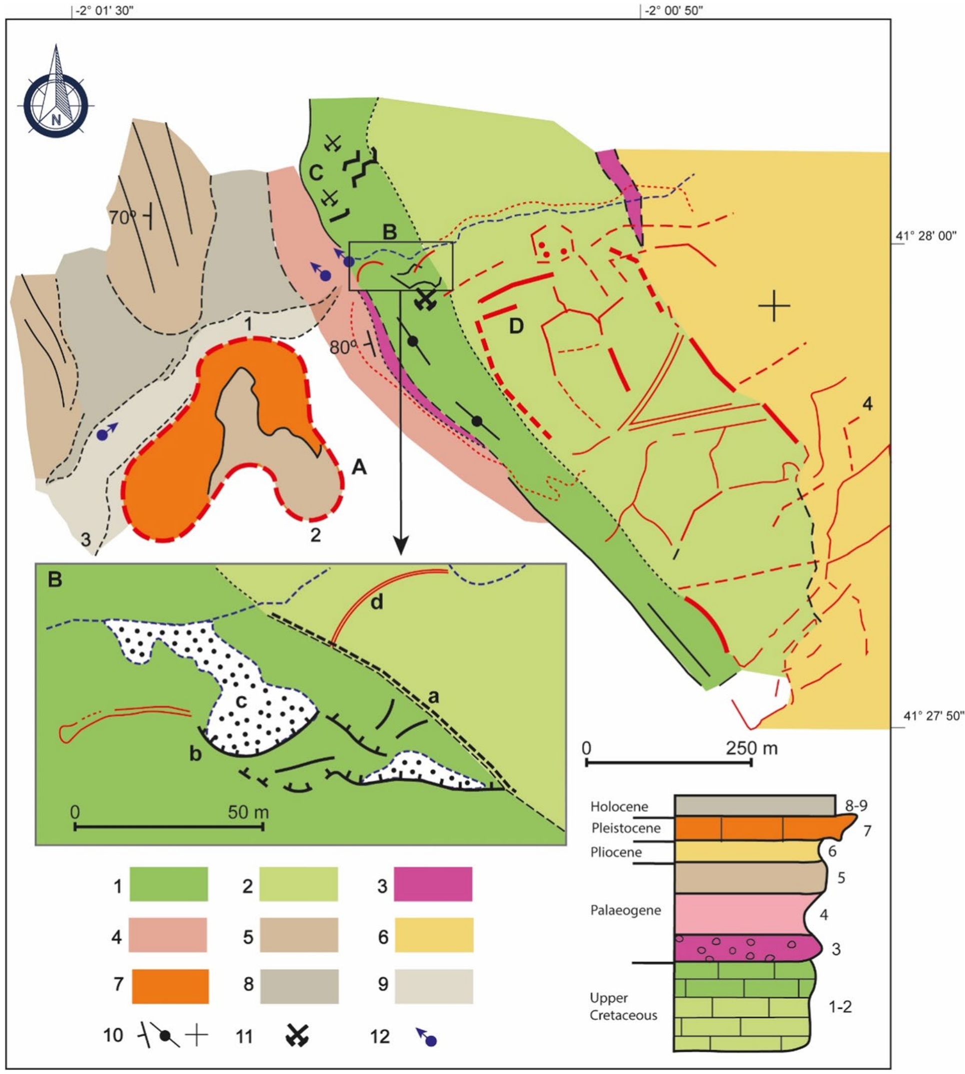


Fig. 4 Geological sketch of the study area and detail of the Roman quarry. 1. Massive Upper Cretaceous limestones; 2. Highly fractured Upper Cretaceous limestones; 3. Cemented rounded cobble conglomerates (Palaeogene), Fm. El Hocino (Huerta Hurtado 2006); 4. Red clays (Palaeogene), Fm. Bordalba (Huerta Hurtado 2006); 5. Marly limestones, sandstones and clays (Palaeogene), Fm. Deza (Huerta Hurtado 2006); 6. Clays and silts (Pliocene); 7. Calcareous tuffs (Pleistocene); 8. Alluvial deposits and riverbed deposits (Holocene); 9. Alluvial (Holocene); 10. Dips (inclined, vertical, horizontal); 11. Roman quarry; 12. Springs. GENERAL AREA: A. Assumed perimeter of the Celtiberian city; B. Quarry area; C. Quarries for the construction of Deza in the "Peñón" area; D. Roman camp and walls of farms with stones recycled from the camp. Places of monetary and ceramic findings cited in the general area: 1. Cabezuelo; 2. La Huertaza; 3. La Tañeria—Water purification plant; 4. El Alto de las Escaleras. QUARRY AREA: a. Boundary of the exploited area; b. Mining fronts; c. Mudslide debris; d. Road excavated in rock

times, similar to the present-day cellars. Clay and sandstone are also excavated and well maintained in the form of semi-subterranean caves, as can be seen today in the houses and haystacks in the "La Taranzana" neighbourhood of Deza and on the nearby Mediano Hill, very similar to those of Contrevia Leukade (La Rioja). Both lithologies have been used as quarries for the construction of medieval walls, houses, churches and hermitages. With a prior visual recognition of the civil, religious and military monuments and constructions of Deza, it is evident that the sandstones are much more altered than the Cretaceous tuffs and limestones. This is very well observed in the ashlars of the Deza church, for example, in which the three types of lithology have been used. For this reason, a large part of the wall and the buildings of Deza are built with tuffs and Cretaceous limestone, especially with tuffs, since in addition to not being altered as much, they were located in the vicinity and are carved very well. The Cretaceous limestones were harder and their work was expensive.

Part of the hill of Deza has been walled off and functioned as an important Muslim fortress, of which some remains still exist. Although this castle was very important in the Reconquest and is cited on numerous occasions (Alejandre Alcalde 2011), it nevertheless had a weak point: the nearby plateau that rises 100 m above the castle was a visual obstacle to prevent a surprise attack from the north-east. The support of watchtowers to control the territory was necessary. The current site of the San Roque hermitage, where *terra sigillata* has been found, was the point of greatest visual control of the territory near Deza, as it overlooked not only the fertile plain of the River Henar but also a large part of the high plains in the area. There was, however, another negative factor in the event of an attack: the edge of the aforementioned plateau was 100 m above and less than 250 m away horizontally, making Deza vulnerable to the Roman poliorcetic machinery, for example. It was necessary to defend Deza by means of a military camp on the plateau.

An important economic value: the silver mines of Peñalcazar

Iron and silver mining in the Celtiberian area of Moncayo and its surroundings had an important value (Sanz Pérez et al. 2001). The important silver mines of Peñalcazar are located 7 km from Deza. They are now abandoned, but in the nineteenth century, they were intensively worked and more than 4000 t of the silver mineral were extracted from them (Sanz Pérez 2003).

These deposits of argentiferous galena and other minerals were rediscovered between 1846 and 1848 but were previously worked, but incompletely. Although no geo-archaeological study of the mines has been carried out, the fact that the silver seams were identified by their outcrops could not have gone unnoticed by the people of that period, so their exploitation in Roman or Celtiberian times is certain. The main sign is the existence of a seam traditionally called Roman, where Palacios Saénz (1890) identified ancient workings. This is the richest silver seam (5 kg of silver per tonne of ore) of the six that are found on the surface of this deposit. In the so-called “Eloísa” mine, where new workings were started between 1861 and 1877, a very old tunnel (or gallery) was discovered, along with mining tools from antiquity at the bottom (Lacasa Moreno 1960).

A Roman quarry with a military character

Previous research and state of knowledge

The limestone quarry located in the narrow bed of a river that flows between mountains in Navaseca was not known, nor was there any oral tradition about it. The quarrying has gone completely unnoticed because the site and the rock are so naturalised that the quarry faces were considered to be natural features of the terrain. However, some sections of a path dug out of the rock that led to the quarry from the upstream side of the “Hocecilla” have been preserved. These are easily identifiable sections that end at a 40 m cliff where there is a large 2.5 t stone block, visible from the village (Fig. 5D). This path was shrouded in mystery as it was not understood why it had been built, and it fed local legends and storeys. Despite its importance, this site has never been studied and has remained unknown. To date, no systematic study has been carried out to discover its historical importance.

Quarry identification

As has been said, this quarry has gone completely unnoticed. There are no obvious traces of exploitation because the exploitation fronts are not very precise on the ground. In addition, as it will be seen later, although the quarry was exploited in an organised manner by a military engineering authority, it was done quickly and somewhat indiscriminately because the construction of a defence camp for the Celtiberian city was urgent. On the ground, the appearance of the relief at first glance is like that of a natural landscape (Fig. 5B). The rock has aged on the surface due to the environmental conditions of constant exposure over two millennia, which in many cases has erased the traces of the extraction area and the areas destined for the first transformation of the building material.

The key to its identification has been the comparison of the geomorphology of the slopes of this sickle with the hollows of the rest of the streams that cross the high plateau of the foothills of Miñana mountain range. All the sickles have an identical relief with very regular slopes down to the erosion surface except for this one, which had relatively large hollows on its left slope at its outlet. This was a morphological anomaly that could be explained by the exploitation of a quarry, which was later confirmed on the ground.

The road was then justified, as it was the quarry road along which the stone was extracted. One of the secondary elements of a quarry, such as a road, has been another of the keys to identifying it.

A quarry for a Roman camp

Yet the road did not go to the Celtiberian-Roman city, it climbed inexplicably and gently uphill for some 700 m upstream of the gorge until it reached the plateau. Above was a labyrinth of long, thick walls, and Celtiberian and Roman coins had been found in the immediate fields. We will see later that this was a Roman camp so the limestone quarry was opened. To build the Roman defensive enclosure since the stone could not be removed towards Deza due to a topographical step of 10 m in the Navaseca gorge and it could not be saved for any road. Also, Deza had a limestone outcrop from which it could be supplied and where there is evidence of having been exploited (Fig. 5, A2).

Geology and quarry selection

From a geological point of view, the area belongs to the southern edge of the Aragonese branch of the Iberian Mountain Range with the Almazán Basin, filled with tertiary materials. This border appears at the exit of the Navaseca gorge where there is a vertical contact between the limestones of the Hontoria del Pinar formation and the limestones of Burgo de Osma from the Upper Cretaceous Santonian-Campanian, with layers of red clays and sandstones from the Palaeocene that are 80 m thick (Lendínez and Ruiz 1991). These layers act as an impermeable roof for the karstic limestone aquifer (Fig. 4). In this contact of different permeability, an important semi-thermal water

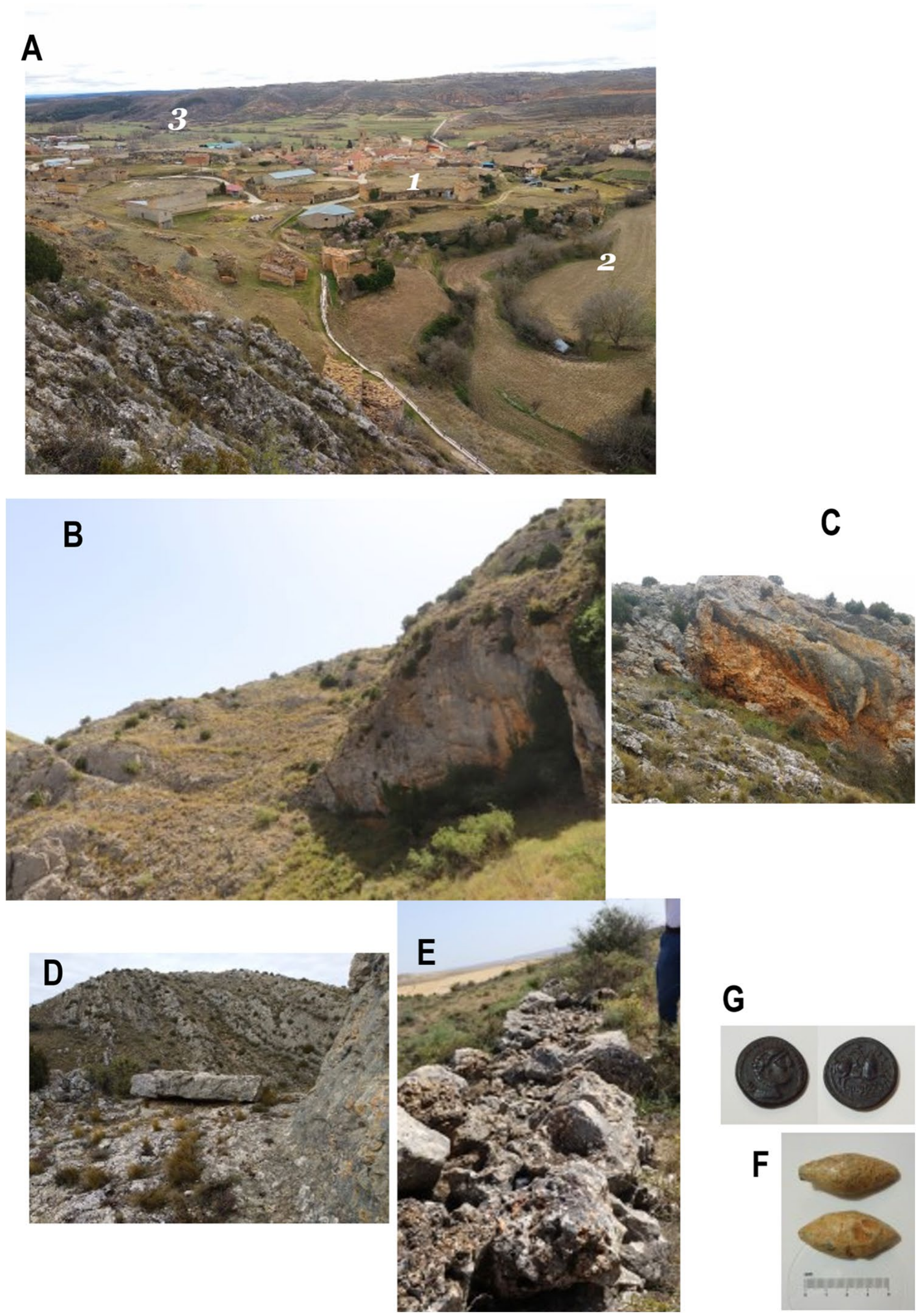


Fig. 5 **A** Panoramic view of Deza from the "Rueda del Cañón" (1. Calcareous tuff terraces; 2. "La Huertaza"; 3. "El Cabezuelo"). **B** Main front of the limestone quarry and access road trench. **C** Another front of quarry exploitation. **D** The stone of the "Rueda del Cañón". **E** Wall of the Roman camp built with the *emplecton* technique. **F** Lead glans (slingshot projectiles) (Deza); **G**. Ace of *Titiakos* (Deza)

spring known as the Suso spring is located, while a few metres further down, a second spring of the same temperature emerges, much more abundant than the previous one, known as Algadir, which gives rise to the stream of the same name. Following the same hydrogeological contact, a kilometre further north there is another smaller semi-thermal spring called Valdezuciel, with a flow rate of around 5 l/s. The limestone contains fossils such as rudists and miliolides, and depending on the area, the rock can be intensely karstified, with very characteristic tubiform karren. On the other side of the gorge, at the top, there is a concordant layer of conglomerates with large, very rounded limestone pebbles of 20–30 cm in average diameter (1 m centile) and cemented limestone from the base of the Palaeocene. This is followed by a broad valley that appears to be occupied by clays with Neogene quartzite cobbles.

This area is highly tectonised, and along the gorge, the limestone strata are vertical and highly fractured, affected by important regional faults, so that the limestone series is densely fractured and densely stratified. This density of discontinuities affects the thickness of the layers unevenly. The most widely spaced discontinuities are found in the strongest and most homogeneous banks. This is very important for practical purposes and in order to identify areas of quarriable rock, as the size of the block that can be extracted is determined by the thickness of the layers, and this is a determining factor in the location of this quarry. Only the bank of about 80 m thick in the area of the springs can blocks larger than 1 m^3 be extracted. That is why the Roman engineers went to look for it in this area, at the exit of the gorge (Fig. 4).

On the other hand, and given the same geological characteristics on both sides of the gorge, the Roman engineers chose the left side, which is the hill where the provisional camp would be. This made it easier for the soldiers walk to work without having to go up and down the gorge. In addition, the quarry is shaded for much of the day, which is suitable for outdoor work in summer. The latter would seem to indicate that the quarry was built quickly.

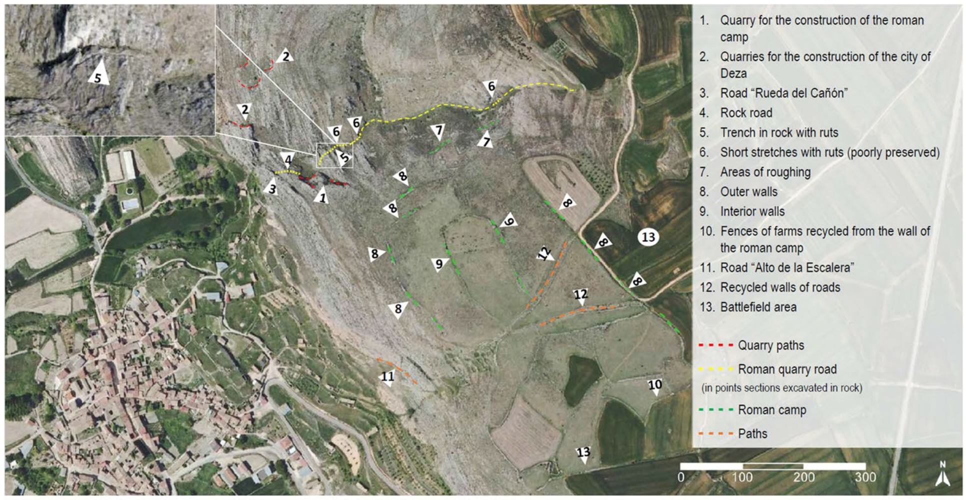
The path

In order to remove the stone material and take it to the camp, a road had to be made. The best route was to access the top of the gorge (about 600 m long), since, from below, taking it along the "Alto de las Escaleras" path that goes up to the camp passing through Deza (which is also 600 m long (Figs. 6 and 7), there is a vertical step of 7 m that would have been difficult to overcome. The alternative via Deza was another added difficulty, as the average gradient of this route would have been 16%, which would have made it difficult to transport by cart. By the Navaseca gorge, however, the road was built with a fairly constant gradient of between 5 and 6%, so that the use of the cart was feasible. Moreover, the stone from the quarry was for the construction of the new military camp, and not so much for the Celtiberian city, which it is assumed that it would have been fortified.

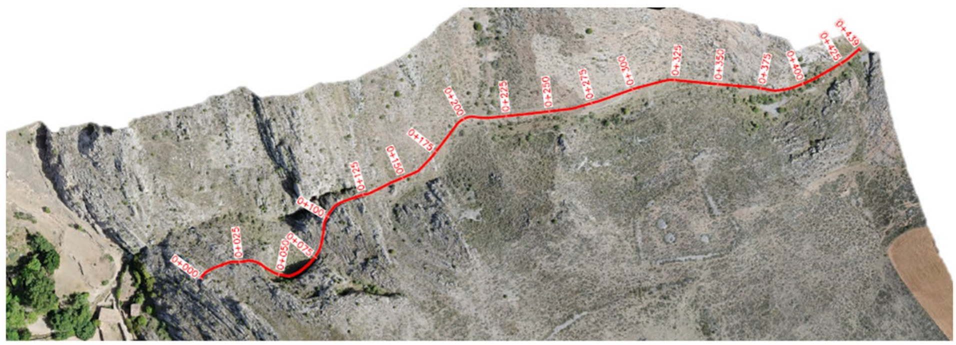
As mentioned above, the access road to the quarry is 600 m long through the gorge of the Navaseca gorge (or Peñón), which has a rocky gorge relief in the final 200 m before its exit at the aforementioned springs, while the 400 m at the head belong to a relatively wide and less steep valley. Of this path, only the cuttings and trenches excavated in rock remain, totalling more than 100 m in different sections, almost all of which are located on the left slope of the gorge (Fig. 6). The masonry walls, embankments or wooden structures that the path had in order to achieve a more or less constant width have disappeared over time due to the steepness of the terrain or because the fillings and stones have been reused in small pieces of cultivation, which are now also abandoned. On other occasions, we have seen cases of rocky wedges falling and taking part of the excavated rocky esplanade with them. As this path was only useful for accessing the quarry, it was not intended to be preserved, and so it has gradually disappeared except for the excavations in the rock. It is even possible that the road was also rendered unusable in wartime by the victorious enemies in order to cut off stone supplies and thus to prevent the camp from being extended or rebuilt. The road was supplemented with wooden bridges to cross the riverbed of the gorge and to maintain the slope. In this respect, it should be remembered that the "Hoz de Navaseca" is prone to significant floods during storms, such as the one that occurred in the summer of 1996, when it reached a peak flow of some 1000 l/s. Some of the details of the careful construction of the road in the gorge area are striking, where the rock trench that serves as a guardrail to prevent carts from falling down has been preserved. There is also a large block at the end of the road which serves as a "guardrail" for the same purpose, as we have seen in other Roman roads in the area, such as the one at Visontiun (Soria) (Sanz Pérez et al. 2009).

Video 1 In the rocky sections of the path, at several points there are two parallel tracks carved into the rock, which have given rise to the common name of the "Rueda del Cañón" (Wheel of the Canyon), as this area is known. The general characteristics of this path are best seen in a trench completely excavated in the limestone rock (Fig. 8). In this trench, the trackway has a width varying between 2.00 and 2.20 m, depending on the points. The ruts have approximately the following dimensions: outer width = 1.40–1.50 m; inner width = 1.00–1.10 m, width from centre to centre of the tracks 1.20 + / − 0.05 m (Fig. 8E). The width of the road and the width of the tracks fits quite well with the dimensions of the Roman foot.

The path ends at the quarry and at a platform a little further on, carved out of the hard limestone rock, which is rectangular in shape and sloping down to a 40 m high precipice. This platform measures 5.40 m by 3.70 m and contains a large block of limestone that has been removed from the vertical strata of the slope of the platform's clearing. This large stone is known by the Deza inhabitants as the "Rueda del Cañón" It has a prismatic shape with a trapezoidal base whose dimensions are base: long side 2.20 m, short side 1.20 m, height: long side 1.20 m, height: short side 0.46–0.50 m. Its volume is approximately 1 m^3, and thus it has a mass of 2.5–2.7 tonnes. This large stone blocks the end of the road and looks like a guardrail to prevent the waggons from falling off the cliff when turning around. It may also have been a counterweight for a lifting machine or a machine for the graded or controlled descent of water, e.g. to provide drinking water for the soldiers and quarry workers.



(a)



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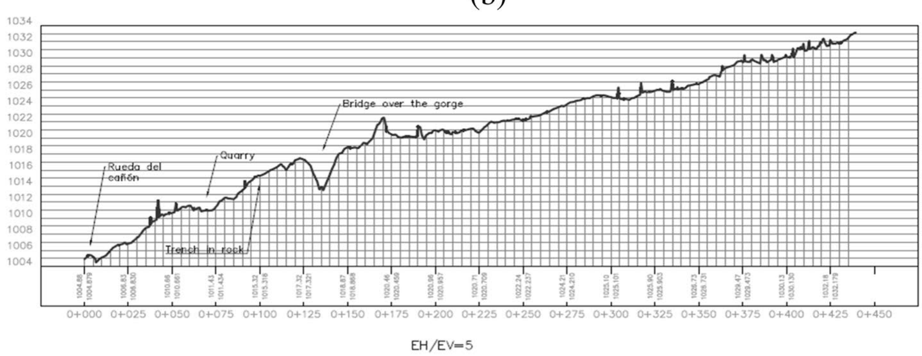

(c)

Fig. 6 a Roman camp aerial view, quarry and access roads to the quarry and camp. b and c Location and longitudinal profile of the roman quarry road with a 6% of average gradient

The Quarry: organisation of exploitation

The absence of evidence of later apparent exploitation causes us to reflect on a situation of quarry exploitation in a single period of time, most likely very short and linked to the rapid construction of a military camp for the defence of a Celtiberian city during a period of war. On the other hand, the village of Deza has other accesses to the same rock bank past the springs, where its exploitation is easier; there are clear traces of this, as shown in Fig. 4.

The carving of a camp wall required blocks of a suitable size and shape. For the construction of *emplecton* type walls such as this one, both large, more or less coarse prismatic blocks were needed for the foundations, and small and medium-sized stones were needed for the interior infill. Smaller blocks could be used for the plinths of the contubenia and other interior rooms. As mentioned above, the original fracturing of the rock is intense and widespread to the extent that, in most of the territory, obtaining large blocks was prevented except in the quarry bench and in other smaller stratigraphic levels. However, as small- and medium-sized stones were also necessary, we will see below that in this area, the maximum use was made of the stone resources of the limestone outcrops.

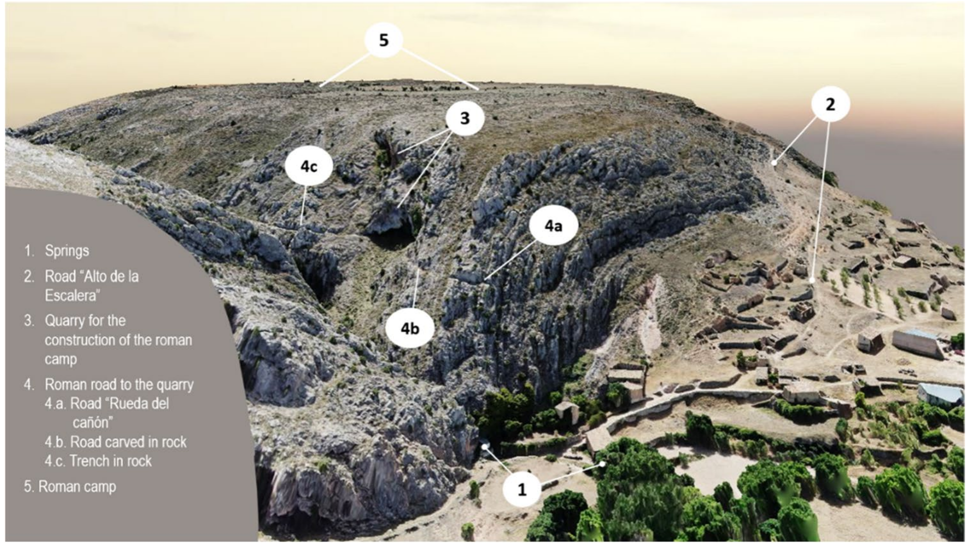

Fig. 7 Panoramic view taken in a 3D drone flight showing the location of the main archaeological elements of the quarry for the Roman camp

The road served as an exit conduit for the material obtained from the coexistence of two different exploitation strategies and processes: on the one hand, there is the main quarry, where the best quality of the rock, compact and uniform, made it possible to obtain large blocks. Evidence of the extraction of large blocks can be found in the same stone of the "Rueda del Cañón" and in others that have fallen to the bottom of the gorge, abandoned and which have a coarse parallelepiped shape. On the other hand, we have the extraction of blocks of modest dimensions from the slopes with rocky outcrops with intense fracturing located around the path between the quarry and the camp, or the simple collection of naturally disintegrated stones.

The deposit of the main open-cast quarry is made up of a group of thick limestone strata, which have been exploited upstream of the road. The quarry was exploited in steps or terraces of between 4 and 20 m in height, the quarrying of which was carried out in extension with the workings progressing horizontally.

The working faces do not belong to an exact orthogonal logic, but have a discontinuous and irregular development in the plan, determined by the physical characteristics of the outcrops, although they tend to have a semi-circular and sub-rectangular morphology, typical of Roman quarries (Fig. 4). As mentioned above, the working faces are variable and are arranged in two tiers, as there is a tendency to use an orderly system of regular steps. Underneath the working areas are rubble heaps; these bland features are shown as spatial markers of these working areas. The main front is semi-circular in shape, similar to the hollow of a circus, with a height of 20 m and sloping, vertical, extra-plumb walls. At the foot of this, there is an accumulation of rubble, debris and waste from mining. It can be seen that these belong to a single phase of exploitation with no subsequent work has taken place, leaving this area protected from the most recent extractive activities.

The large stones were obtained by taking advantage of the vertical stratification planes and the tubular karren o insert the wedges, which would facilitate the extraction of blocks. In the quarry, there are signs of quarrying marks and tool marks on several blocks of the camp walls made with iron wedges.

An approximate calculation allows us to establish a volume of material extracted from this quarry of around 12,000 m^3, to which another 500 m^3 must be added from the extraction of rock from the road cuttings.

On the other hand, it must be considered that this exploitation centre had a relatively large area of extraction by retouching and pecking on the medium-sized rocky outcrops that protrude from the gorge slope, as well as the simple collection of loose stones from the area broken up from the substratum and where the road was the axis of extraction and transport. It is an indiscriminate exploitation scattered over the slopes to extract medium-sized stone and where the descending access ramps leading to the main road are still preserved. At the foot of these exploited rocky outcrops, there are small fields of scattered debris and rubble that are not of natural origin due to the effect of the cold but are the result of an initial roughing up of the irregularity of the stones.

Evidence of post-extractive processes: working areas and dumpsites

The rubble dumps at the foot of the quarrying fronts indicate that the first roughing out and organisation

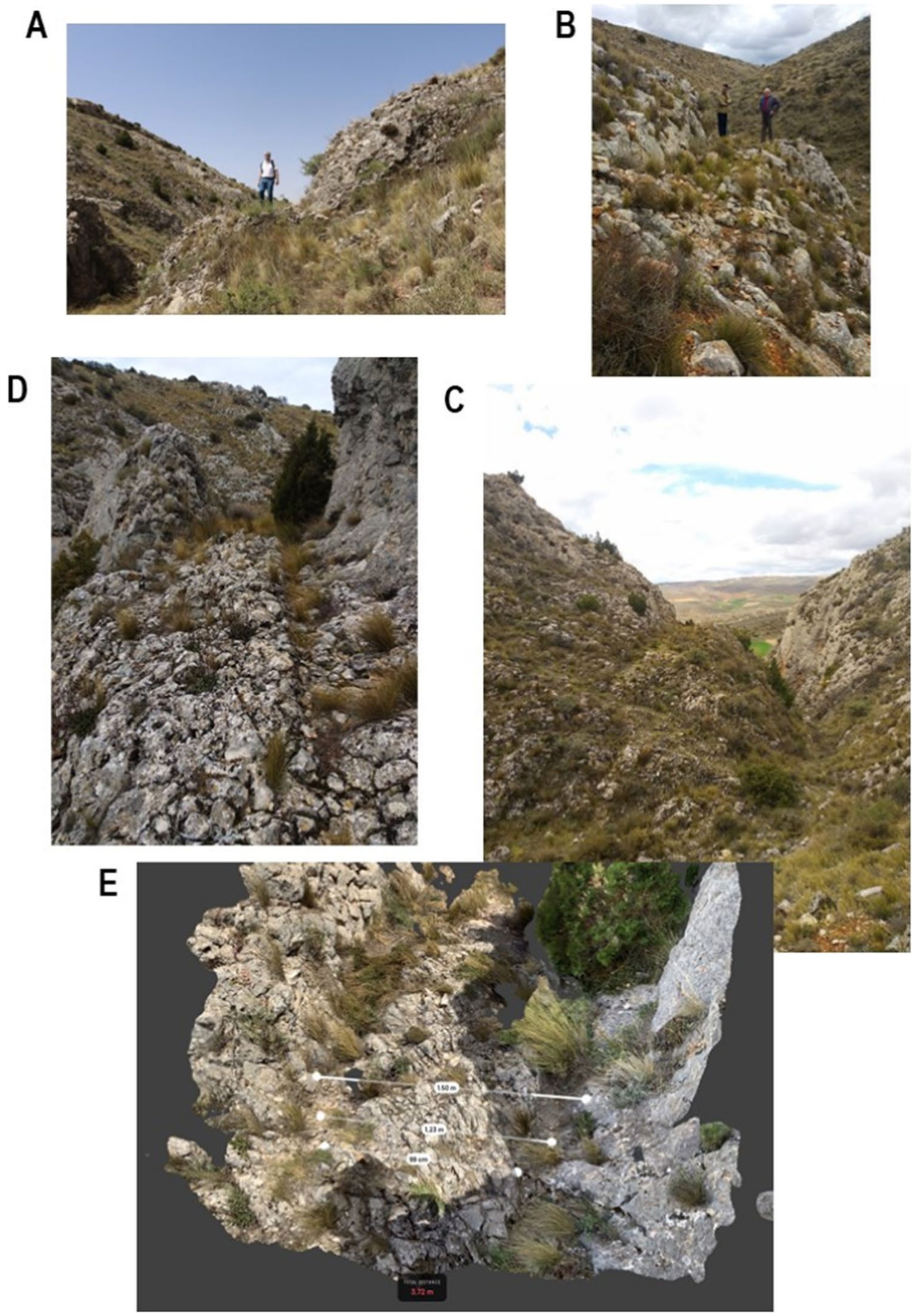

Fig. 8 **A** and **B** Photos of the quarry path. **C** Rock clearing and pass of the Navaseca valley. **D** Detail of the quarry road with ruts. **E** Measurements of the routes

of the large blocks was carried out at the foot of the quarry, but the lack of space on the steep slopes in the vicinity meant that there were no workshops for the later phases of working. After the materials were transported in carts from the quarry, these workshops were chosen in the upper area of the Navaseca Valley or on the periphery of the camp where there are numerous traces of rubble dumps.

The Roman camp: a preliminary study

Archaeological evidence

As can be deduced from systematic surface prospecting and aerial surveys of the high plateau overlooking Deza to the north-east, there is sufficient archaeological evidence to verify the presence of a Roman military settlement. There is a relatively large number of constructions, structures and materials of clear military affiliation. Although the stones of the walls have been partly reused, and the walls have been modified by new road and farm boundaries, there are still enough remains in situ to identify a large part of a rectangular defensive enclosure, especially in the northwest corner. The large limestone walls of the camp, like those of the boundaries of the nearby farm buildings or farms built at the expense of the previous ones, are of a unique typology in the Deza area, where the predominating feature of the area is the lack of them. However, an archaeological intervention would be necessary in order to have more archaeological evidence to determine the structure of the camp in greater detail.

Location choice

As already mentioned, although Deza is situated on a high plateau rising 50 m above the valley of the river Henar, in the event of war it was vulnerable to attack from the high plateau 100 m above it to the north-east. A military camp was necessary to protect the Celtiberian city on this more vulnerable side. The choice of the location of the campsite was carefully considered. Several factors influenced the selection of the site, including topographical and spatial conditions of strategic value:

The fortification was built on the area of the plateau closest to the Celtiberian city, close to the corner formed by the edge of the plateau and the Navaseca gorge at right angles (Figs. 4, 6 and 7). The Celtiberian city, with which it formed a defensive association with the camp, was thus protected. Between the two was the water source, which was also protected, so that the attackers could not have access to this supply point (Video 1).

Camp enclosure

It seems that this camp adopts the known classical models, drawing the enclosure in a rectangle in a north-west and south-east direction which, in principle, and in the absence of a more detailed study, had a minimum size of approximately 850 × 330 m, i.e. some 28–30 ha, ideal measurements for the military settlement of a 5-year unit, i.e. a cohort. As mentioned above, the northern and western limits seem to be well defined, while the south-east is quite altered by agricultural ploughing.

The construction is built directly on the limestone outcrops flush with the erosion surface of the natural substrate. This rocky substratum has good conditions for underground drainage in case of rain. It was built on flat, slightly elevated ground on the northeast plain, where a wide, slightly lower plain associated with the Pliocene loamy facies that favours the presence of crops and which would be the area of fighting in the open field (La Mata-Llano de San Roque sector) extends. The northern side was protected by the natural moat of the gorge. Its southern side is naturally defended by the escarpment of the hillside, which is about 100 m high.

On the north side, part of the 1.5 m wall is preserved, resting directly on the bedrock and is built of limestone using the characteristic *emplecton* technique. The walls of large, well-arranged facing stones and the interior are filled with smaller limestone stones and earth (Fig. 5E). The south-east wall had the same dimensions and was built with the same technique but has been dismantled, and the large stones were taken for the construction of the roadsides and nearby farmsteads. They have left the elongated piles of unusable small stones inside, which are identified as aligned in an aerial photograph. On this side, a low embankment has been preserved in two or three extensive terraces. Taking advantage of the small step in the rectilinear geological contact between the limestone-marls, the outer north-eastern wall was raised on the limestone, which is still largely preserved, measuring 1.90 m in thickness. Camp structures and inner enclosure walls, some 1.5 m thick, are also preserved. Inside the camp is a pentagonal-shaped inner enclosure (Fig. 6 (9)). There is a possible gateway on the south side that would communicate with Deza and the spring by means of a road that is still preserved today called “Alto de las Escaleras” and along which the roads to Peñalcazar, La Alameda and Bijuesca begin. This path has a small slope dug out of the rock on one side and a half-slope filler supported by a masonry wall on the other. The rock of the path, like that of the quarry, has been used for the construction of the Roman camp. On the upper part of the road, the path has a variant, or short cut, open in a trench that has been excavated in the rock: another small work that was used both for levelling and for extracting material for the walls of the Roman camp. A Roman coin has been found on the surface of the road. From all that has been said, we have no doubt that this road dates from that period and was used to access the camp. On another road, located to the south-east of the camp area, a Roman coin has been found on the surface. It is a Republican denarius belonging to the Rustia family and was minted in 74 BC, an important find as it places Roman military activity in this sector of Celtiberia around the time of the Sertorian Wars.

With the exception of a few isolated remains of terra sigillata from the Imperial Period found around the camp sector, it is worth noting the virtual absence of other ceramic materials and structural remains of stone or adobe masonry, which leads us to assume that this was not a long-term stable site, but rather a temporary camp.

Correspondence materials from the Roman camp with those extracted from the quarry

There is a perfect lithological correspondence between the rocks of the quarry and those of the walls preserved in the

Roman camp and those that have been reused for the farmsteads. The largest limestone blocks (up to 1 m on one side) used for the foundations of the wall and the exterior walls come from the front of the quarry, the only place where the stratigraphic series of Upper Cretaceous limestones is present in a massive form and is capable of supplying large sizes. We can identify in some of the large blocks the same rudist fossils as in the quarry and the tubiform Karren that also have a layer of reddish karstified limestone from the quarry. In the rest of the outcrops, the rock is so fractured that it is not possible to extract sizes larger than 30 cm. However, the stones used to fill the walls and the material for the peripheral embankments were extracted from these outcrops. On the other hand, the large, rounded boulders (20 to 40 cm in diameter) of limestone from the terminal facies of the stratigraphic series, where they are highly cemented in a calcareous matrix, have not been seen in the Roman camp. These pebbles, extracted from the matrix of the stratum, were later used for the walls of farms and for the walls of some nearby sheepfolds.

A rough calculation allows to establish a volume of stones used in the surviving walls of the Roman camp, plus those reused in the fences of the nearby agricultural estates, of about 12,000 m^3, which is well in accordance with the volume of rock extracted from the quarry. This means that the reused stones do indeed come from the Roman camp and that these farms would never have been fenced in as they are now if they had not had the opportunity to have the "quarry" that the camp provided. That is why this place is called "The Quarry" (La Cantera, in Spanish), perhaps more because of the abundance of stones or blocks (cantos, in Spanish), available for any use. This case of fencing off farms with stones is unique in Deza, as mentioned above, and tells us about the uniqueness of the place. It can also be deduced from this calculation that these stones have not been reused for the construction of buildings and garden walls in the town of Deza. A detailed survey of the building materials of Deza concludes that limestone is very hard for ashlars and has only been used as ashlars in the walls of the sixteenth century village church, which, because of its size, is the main historical monument of the village that is still preserved today. Furthermore, it is known that these limestone materials were extracted from the Peñón area (Fig. 4), as is known from the contract documents of the stonemasons and masons who built the church (Alejandre Alcalde 2011). The Palaeogene sandstones that outcrop on the Deza site and its surroundings are soft and can be worked very well, but they are also easily altered. The corners of the church, the doorway and the ashlars of the large interior columns, unaffected by damp and rain, have been built with them. The coats of arms emblazoned on the sandstone of the old houses and palaces of Deza have been erased by weathering. Much more interesting are the limestone tuffs for the construction of the ashlars of palaces (such as that of the Fernández Abarca family, popularly known as the Finojosa family), castle and wall. This rock is easy to work, is resistant, does not alter, is light and insulates. The walls of the orchards around the village are made of some of the three lithologies described, but there is also an abundance of Cretaceous limestone.

The camping environment: a possible battlefield of the Sertorian Wars

In addition to these finds, there is another series of news items that tell it about fortuitous discoveries that have been made over time in the surroundings of the military enclosure, and which we consider necessary to publish in order to avoid the total loss of the information they provide. Thus, in the aforementioned plain which extends outside the military enclosure to the north-east and south-east and over an area of half a square kilometre, various materials of military affiliation have been collected on the surface, and in which coins, fastenings for belts, objects of ornamentation or clothing and lead glandes have been found (Fig. 7I). All these elements are consistent with the existence of a Roman camp and even a battlefield. It can be assumed that these lead bullets were thrown by the slingers defending the core, falling on the external area of the defences.

As for the numismatic material found in these fields, it has been found in a dispersed manner in the aforementioned area, making up a batch of 30 coins from the Roman and Celtiberian periods, which is surely a small representation of those that would exist if a geophysical survey were carried out (Alejandre Alcalde 2011). The publication of the numismatic finds that are continually being produced is a necessary task to avoid the total loss of the information that these finds provide.

The agricultural work on some of the farms in this sector, as well as the work to improve the access roads to them, led to the discovery of several Celtiberian and Roman numismatic pieces, the latter dating from the Republican period, as well as some Roman military items such as some lead glandes, already mentioned.

In this area of the camp, hardly any medieval coins have been found, and only a few from the modern period. However, Celtiberian coins are the most abundant, followed by Roman coins. Among the thirty or so Celtiberian coins found, aces predominate, although some denarii and divisors have also been found. The mint with the largest representation is *Titiakos*, whose pieces account for around 30% of the total finds (Fig. 7H). The rest of the mints represented include Celtiberian, Iberian and even Basque mints: *Sekaisa, Ekualakos, Bilbilis*, *Arekorata, Bolskan, Baskunes, Arsaos, Belikiom, Bursau* and *Turiasu*, listed in decreasing order of the percentage of their coinage. The whole group can be dated to between the middle of the second century BC and the first third of the first century BC. The predominance in this group of certain mints, such as *Sekaisa* and *Bilbilis,* which are undoubtedly located in the Jalón valley or its tributaries, could lead it to think that others such as *Ekualakos* or *Titiakos* must also have been located in this same sector of Celtiberia, or in some other not very distant area. In the specific case of the latter, in view of the high percentage of pieces, it could be hypothesised that this mint could have been located in Deza.

The Roman Republican coins are two denarii, belonging to the Marcia and Rustia families, and a Janus. The denarius belonging to the Marcia family gives us a mint date of 119–110 BC, while the coin belonging to the Rustia family was minted in 74 BC. As mentioned above, the latter date allows it to affirm that these numismatic materials must be related to some episode of the Sertorian Wars.

This money continued to circulate during the Imperial Period, as in the Roman villas around Deza, together with coins from the High Imperial Period, minted at Hispanic mints, there are some bronzes and denarii from Celtiberian mints, among which two from *Titiakos* can be recognised.

Dismantling of the Roman camp?

The construction of the boundaries of the roads leading to Peñalcazar and to La Alameda and Bijuesca has a typology of ancient Roman cobbled road construction that seems to indicate that the dismantling was immediate after the destruction of the camp. It is as if they wanted to destroy the camp so that there would be no opportunity to rebuild it.

Discussion

As far as is known, this quarry is unique in the Celtiberian-Roman context. It was an individual and temporary quarry, exploited all at once with the aim of obtaining material of sufficient quality and more or less easily and quickly exploited during a period of war. It is a perfect engineering project, since before the quarrying began, the most suitable stone materials were selected by the Roman quarrymen by means of superficial surveys of the terrain. Within the stratigraphic column of the nearby Upper Cretaceous limestone, the quarry was opened in the only small outcrops in the northern part of the camp to obtain large blocks for the base of the camp walls. Meanwhile, the rest of the areas were used for the small masonry and stone infill of the walls built with the *emplecton* technique, from which only small-to-medium sizes can be obtained as they are affected by a significant and generalised fracturing This is therefore an integral exploitation of the stone resources in the vicinity of the site of the Roman camp, with a massive but organised exploitation where it seems that many soldiers and stonemasons must have worked at the same time, allowing for the rapid construction of this military work. The lack of space in this quarry meant that there were working areas for roughing and preparing the stone, which seem to have been identified on the periphery of the camp near the Navaseca gorge. The study of the materials and the estimated volume extracted pertain to the Roman camp walls and agree with the rock balance used in the camp, which is currently preserved on the boundaries of the agricultural estates. Although not preserved in its entirety, the camp follows the classic Roman rectangular plan typology (Morillo Cerdán 1991). Its large size indicates the importance of the military contingent it housed, as well as the importance of the Celtiberian city it protected and the strategic value of the area.

The exit path of the quarried stone indicates that we are looking at a Roman engineering work: the design of the road layout, the width of the road that fits in with Roman feet, etc. The separation width of the ruts (90 cm) fits very well with a small two-wheeled load cart, like the one on the ancient Aquileia-Virunum-Lauriacum road, which had a wheel axle distance of 94 cm (Alonso Trigueros 2014). This small cart would have been appropriate for this type of rough terrain. On the other hand, if we assume that such a cart could transport 2.5 t of stone (1 m^3, approximately), the 12,000 m^3 extracted imply some 24,000 trips one way (loaded) and back (empty). This explains how in this type of limestone rock, and according to the wear tests carried out by Alonso Trigueros (2014), in a matter of a few months of intense work, these ruts of considerable depth in the area could be formed.

In the absence of more in-depth archaeological surveys, the quarry, the Roman camp and other material remains attributable to a battlefield area of significant historical value. Everything leads it to bear witness to unknown historical events since we do not know how the Sertorian Wars took place in this sector of the Celtiberian area, as there is no written documentation. Everything seems to indicate that the camp was built because of the strategic and economic importance of the site. The aim was to garrison an important Celtiberian city, probably in the territory of the Titos, as well as to control the silver mines and the Peñalcazar fortress.

As is known, there is no certainty about the geographical distribution of the territory occupied by the Celtiberian ethnic group of the Titos. It is known that they were neighbours of the Belos, adjacent to the city-state of Segeda (Poyo de Mara, Zaragoza) of the Belos, which was destroyed in 153 BC and where the Titos had taken refuge (Burillo Mozota 2007). According to Beltrán and Caro Baroja (1946), the *Titiakos* mint has an apparent toponymic relationship with the Titos, and Villar (1995) also raises this possibility. It is relatively indicative that in certain numismatic finds, the coins of Titiakos have been related to those of *Sekeiza, Segeda*, the city of the Belos, territorially linked to the Titos. This is exactly what is happening here, where coins from the *Sekeiza* and *Bilbilis* mints are also very abundant. Burillo Mozota (2007) wonders whether the territory of the Titos was located on the left bank of the Jalón, to which this area belongs. Domínguez Arranz (1988) also suggests that the *Titiakos* mint may have been located in this area.

Conclusions

This work offers a clear example of deductive archaeological research on how, from the remains of a road carved into the rock that led to an unknown ancient limestone quarry, the historical importance of the city of Deza in antiquity has been rediscovered. In fact, the materials extracted from this quarry were taken along this path to be used in the construction of an unpublished Roman military camp located near the point of exploitation. Other conventional archaeological surveys have confirmed the rapid construction of this camp during the Sertorian Wars in order to protect a nearby Celtiberian city (present-day Deza), which may have been an important settlement within the territory of the ethnic group of the Titos.

The results obtained are relevant for the advancement of scientific and historical knowledge of the Celtiberian and Roman world in the context of the Sertorian Wars. On the one hand, it points to the existence of the capital of the Titiakos ethnic group and of a Roman military camp of considerable importance. Further studies would be necessary to confirm this statement with a systematic geophysical survey of the battlefield in order to increase the monetary record. The excavation of part of the camp and the geoarchaeological prospecting of the old silver galena mines of Peñalcazar would also be important.

Finally, it should be noted that this quarry and the other archaeological sites mentioned present a rich record of elements preserved in situ and a privileged place to study the processes of ancient stone exploitation during the war period. Here, we can recognise the quarry fronts, the associated dumps, the road for the disposal of the stone carved out of rock and rolled stones, areas for working with waste material, etc., and the Roman camp as the final destination of the work. Although some details about the mode of exploitation remain to be studied (possible start of exploitation from the top, working platform made with rubble, etc.), this site has a great interpretative potential in the study of ancient quarrying. These are reasons to expect the involvement and commitment of the competent bodies, establishing as a priority the continuous research and permanent protection of this geological and historical-archaeological heritage of special interest.

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