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Menga es una publicación anual del Conjunto Arqueológico Dólmenes de Antequera (Consejería de Cultura de la Junta de Andalucía). Su objetivo es la difusión internacional de trabajos de investigación científicos de calidad relativos a la Prehistoria de Andalucía.

Menga se organiza en cuatro secciones: Dossier, Estudios, Crónica y Recensiones. La sección de Dossier aborda de forma monográfica un tema de investigación de actualidad. La segunda sección tiene un propósito más general y está integrada por trabajos de temática más heterogénea. La tercera sección denominada como Crónica recogerá las actuaciones realizadas por el Conjunto Arqueológico Dólmenes de Antequera en la anualidad anterior. La última sección incluye reseñas de libros y otros eventos (tales como exposiciones científicas, seminarios, congresos, etc.).

Menga está abierta a trabajos inéditos y no presentados para publicación en otras revistas. Todos los manuscritos originales recibidos serán sometidos a un proceso de evaluación externa y anónima por pares como paso previo a su aceptación para publicación. Excepcionalmente, el Consejo Editorial podrá aceptar la publicación de traducciones al castellano y al inglés de trabajos ya publicados por causa de su interés y/o por la dificultad de acceso a sus contenidos.

Menga is a yearly journal published by the Dolmens of Antequera Archaeological Site (the Andalusian Regional Government Ministry of Culture). Its aim is the international dissemination of quality scientific research into Andalusian Prehistory.

Menga is organised into four sections: Dossier, Studies, Chronicle and Reviews. The Dossier section is monographic in nature and deals with current research topics. The Studies section has a more general scope and includes papers of a more heterogeneous nature. The Chronicle section presents the activities undertaken by the Dolmens of Antequera Archaeological Site in the previous year. The last section includes reviews of books and events such as scientific exhibitions, conferences, workshops, etc.

Menga is open to original and unpublished papers that have not been submitted for publication to other journals. All original manuscripts will be submitted to an external and anonymous peer-review process before being accepted for publication. In exceptional cases, the editorial board will consider the publication of Spanish and English translations of already published papers on the basis of their interest and/or the difficulty of access to their content.

Exvoto ibérico. Figurilla femenina realizando un rito de paso. Bronce.
Instituto Gómez-Moreno de la Fundación Rodríguez-Acosta (Granada).
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ÍNDICE





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Magnetometer survey at Piedras Blancas I, September 2013.
Photo: Leonardo García Sanjuán.

EVIDENCE OF NEOLITHIC ACTIVITY AT LA PEÑA DE LOS ENAMORADOS (ANTEQUERA, MÁLAGA, SPAIN): INTENSIVE SURFACE SURVEY, GEOPHYSICS AND GEOARCHAEOLOGY AT THE SITE OF PIEDRAS BLANCAS I

Leonardo García Sanjuán[1], David W. Wheatley[2], Marta Díaz-Guardamino Uribe[2], Coronada Mora Molina[1], Olga Sánchez Liranzo[3], Kris Strutt[2]

Abstract:

Piedras Blancas I is part of the La Peña de los Enamorados archaeological complex (Antequera, Málaga). This complex presents evidence dating from the Neolithic period to the 20th century AD. Research carried out in 2006 suggested that the northern sector of La Peña de los Enamorados had known significant activity between the Late Neolithic and Copper Age, which is basically materialized in the Matacabras rock shelter, where schematic rock art is found, and the Piedras Blancas I site. Fresh fieldwork and laboratory analysis undertaken between September 2013 and November 2015, including intensive surface survey, magnetometer prospection and geoarchaeological analysis, have provided new and more precise empirical evidence to understand this site. In this paper we present a summary of the results obtained as part of the research carried out at Piedras Blancas I, a site of major relevance given its landscape association with the dolmen of Menga.

Keywords: Neolithic, Copper Age, Lands of Antequera, Surface Survey, Magnetometry, Geoarchaeology, Thin Section Petrology, Lithic Studies.

EVIDENCIAS DE ACTIVIDAD EN EL NEOLÍTICO EN LA PEÑA DE LOS ENAMORADOS (ANTEQUERA, MÁLAGA, ESPAÑA): PROSPECCIÓN DE SUPERFICIE INTENSIVA, PROSPECCIÓN GEOFÍSICA Y GEOARQUEOLOGÍA EN EL SITIO DE PIEDRAS BLANCAS I

Resumen:

El yacimiento de Piedras Blancas I es parte del complejo arqueológico de La Peña de los Enamorados (Antequera, Málaga), que incluye registros materiales que datan desde el periodo Neolítico hasta el siglo XX DNE. Investigaciones realizadas en 2006 sugirieron que el sector norte de La Peña de los Enamorados conoció una importante actividad en el periodo Neolítico Final y en la Edad del Cobre, básicamente materializada en el abrigo de Matacabras, con arte rupestre esquemático, y el sitio de Piedras Blancas I. Las nuevas investigaciones realizadas entre septiembre de 2013 y noviembre de 2015, que han incluido una prospección intensiva de superficie, prospección geofísica por magnetometría y un completo estudio geoarqueológico, han servido para obtener mayores y más precisas evidencias sobre el yacimiento de Piedras Blancas I. En este artículo se presenta un resumen de los resultados obtenidos, y se discuten las implicaciones de cara a futuras investigaciones en este yacimiento, de relevancia muy especial por su conexión paisajística con el dolmen de Menga.

Palabras clave: Neolítico, Edad del Cobre, Tierras de Antequera, prospección de superficie, Magnetometría, Geoarqueología, Petrología de Lámina Delgada, industria lítica.

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1. INTRODUCTION

1.1. GEOLOGICAL CONTEXT

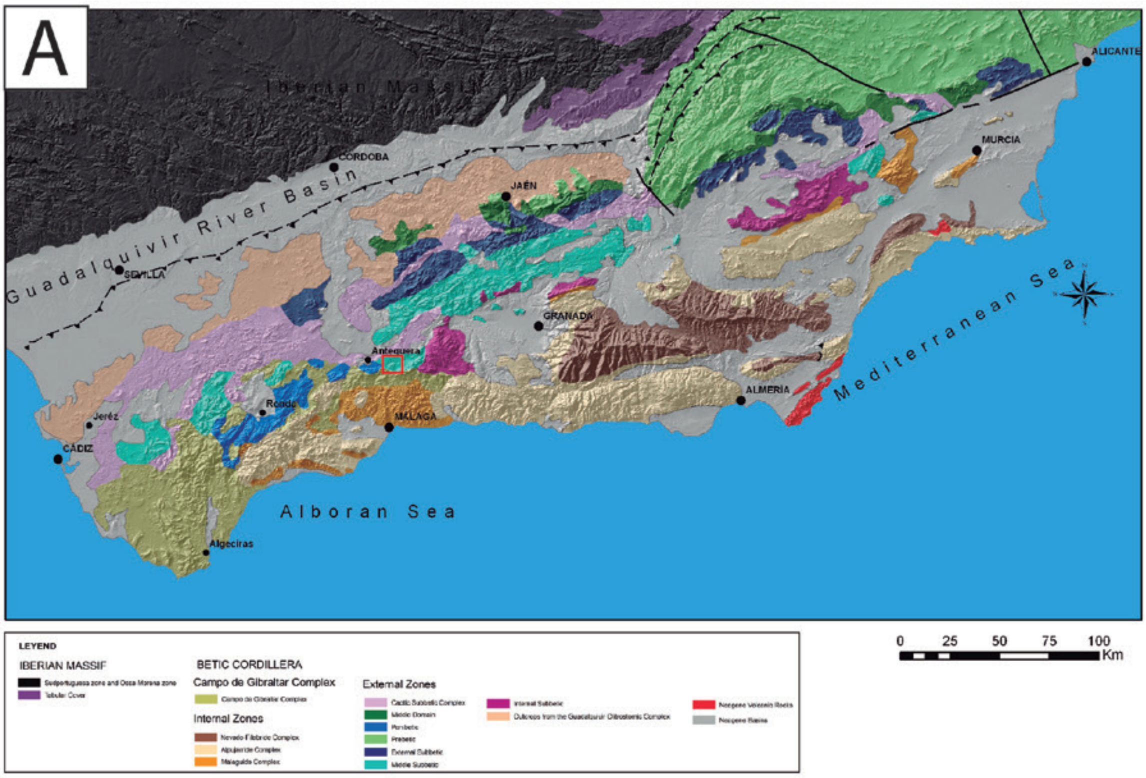
Located in the Antequera depression approximately halfway between the towns of Antequera and Archidona (Málaga), La Peña de los Enamorados (henceforth La Peña) is both a well-known natural formation as well as a major archaeological complex. Geographically speaking, it represents an elevation in the Sub-Betic zone in the Betic mountain range, the westernmost point of the Alpine system in Europe formed during the Miocene. In fact, La Peña stands as a somewhat isolated elevation within the Quaternary depression of Antequera, flanked South by the altitudes of the El Torcal karst system,dating back to the Triassic period, and North by the Guadalquivir complex and the External Sub-Betic domain (Guarnido Olmedo, 1984; Carvajal Gutiérrez and Ruiz Sinoga, 1984). On the eastern side of the Antequera plain La Peña appears as an enormous limestone outcrop with a north-south orientation, a 2,700m extension and a maximum altitude of 880m above sea level. These characteristics make La Peña clearly visible from far off in the north as well as from the east, the west and undoubtedly from the immediate surroundings of the Guadalhorce river which flanks La Peña by its southern and eastern sides. La Peña is difficult to access via the east and the west due to its steep-slope, while its northern face is formed by a vertical cliff almost 100 m high.

Thus, from a geological point of view, both La Peña and the Piedras Blancas I archaeological site, studied in this article, are located within the first of the units which make up the External Zones of the Betic Cordillera, more specifically within the Internal Sub-Betic. The Internal Sub-Betic is the area of sedimentation located farthest away from the emerged continent (South-Iberian Palaeomargin). It was a Pelagic swell between the mid Early Jurassic and the Late Jurassic, that is, an elevated region within the marine basin with scarce subsidence that during certain epochs was even partly emerged, as is demonstrated by the frequent paleokarstic levels. This Pelagic swell became increasingly shallower up until the end of the Jurassic, while during the Cretaceous period it formed part of a deep-furrow that was uniform throughout the entire South-Iberian Palaeomargin. At La Peña, the stratigraphic sequence consists of: 1) The Early Jurassic, formed by limestone mainly by micrite (microcrystalline limestone) with occasional oncolites and pellets; 2) The Middle-Late Jurassic, formed by oolitic limestone with some lamellibranchia and foraminifera in a carbonated cement which forms La Peña's northern vertical face; 3) The Late Jurassic-Early Cretaceous, formed by red, nodular limestone that erodes more easily and thus enabled the formation of the cliff in the proximity of Piedras Blancas I; 4) and finally, material from the Cretaceous-Palaeogene period formed by pink marlstone and marl-limestone (Fig. 1).

Clay and sandstone from a different paleo-domain were superimposed over the aforementioned Sub-Betic series as a result of tectonic activity. These overlapping materials date back to the Palaeogene-Aquitanian age from the mantle of Aljibe among the Numidian materials from the Campo de Gibraltar Complex (Fig. 1). These materials constituted the facies of the furrow of Betic flyschs (Martín-Algarra, 1987; Reicherter *et al.*, 1994).

Sandstone from Aljibe, or Numidian sandstone, is made up of very pure, ultra-mature quartzose arenites. It is predominantly a rounded, commonly recrystallised, medium to coarse mean grain which was derived from Africa (Didonet *et al.*, 1984; Guerrera *et al.*, 1990; Esteras *et al.*, 1995). Below the sandstone from Aljibe we can find the ''Base Series'': Sub-Numidian coloured clay from oceanic facies dating back to between the Late Cretaceous and the Late Oligocene-Late Aquitanian.

From a geological and geographical viewpoint, Piedras Blancas I holds a very strategic position given its location in a natural corridor that connects the Antequera basin with the Granada basin along the reliefs that belong, geologically speaking, to the Sub-Betic System (Fig. 1). The intra-orogenic basins are important communication routes within the Betic mountain range as well as key sites for accessing biotic, and particularly abiotic, resources –primarily flint, although ophites and iron oxides as well– (Aguayo de Hoyos *et al.*, 2006; Rodríguez-Tovar *et al.*, 2010a, 2010b; Morgado Rodríguez *et al.*, 2011; García-Alíx *et al.*, 2013; Morgado Rodríguez and Lozano Rodríguez, forthcoming).



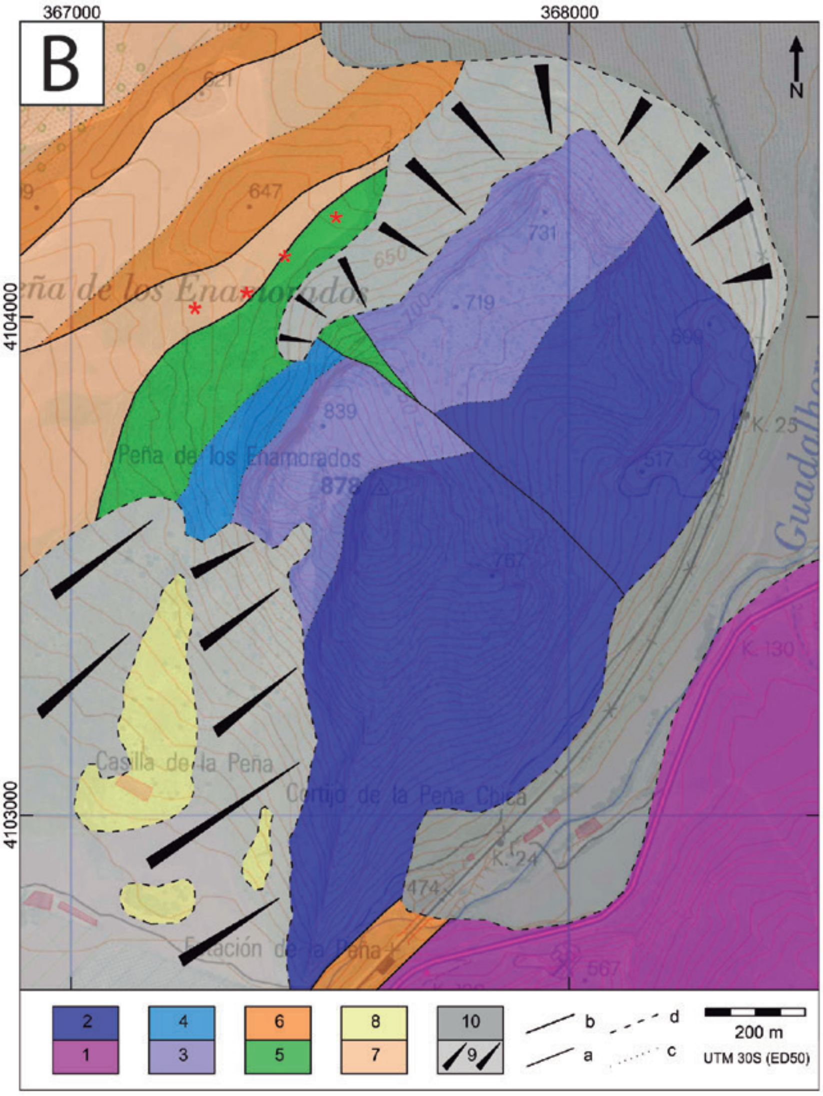


Fig. 1. A: Geological map of the southern Betic mountain range with the location of the study area.
B: Detailed geological map of La Peña de los Enamorados and Piedras Blancas I. Legend: 1) Triassic (Subbetic (SB); gypsum, clays and dolomites); 2) Late Jurassic (SB; micrite limestones withoncoliths and pellets); 3) Middle Jurassic (SB; oolithic limestones); 4) Upper Jurassic (SB; red limestones with nodules); 5) Cretacic – Paleogene (SB; marls and pink limestone marls); 6) Eocene (Flysch; calcarenites with nummulites); 7) Paleogene (Flysch; brown clays with banks of sandstones with quartzs); 8) Pliocene (Breccia cemented with carbonated pebbles); 9) Quaternary (piedmont, hillside deposits); 10) Quaternary (fluvial and flood plain deposits); a) Minor fault; b) Major fault between domains; c) Concordant normal contact; d) Discordant contact.
Design: José Antonio Lozano Rodríguez, Luis Alfonso Pérez Valera and Fernando Pérez Valera.

1.2. ARCHAEOLOGICAL CONTEXT

From and archaeological point of view, La Peña is a complex of the greatest interest presenting evidence of occupation not only during the Neolithic period (the purpose of this study) but also, as previous publications have shown, during the Copper Age, the Bronze Age, the Iron Age, Antiquity, the Middle Ages and even the Modern and Contemporary Ages.

The first archaeological study carried out on La Peña, based on a small collection of 55 knapped lithic objects collected from the surface, led to the suggestion that a lithic workshop dating back to the Copper Age or the Early Bronze Age had existed on the south-east face of the mountain (Moreno Aragüez and Ramos Muñoz, 1983: 71). A later study mentioned that new field surveys on the western face helped to identify, apparently on the ground, the outlines of circular huts with a central post and abundant archaeometallurgical evidence including two rivet-head daggers from a private collection, a square-shaped punch and more than a dozen metal fragments as well as a crucible. These items were also dated to the Copper Age and the Bronze Age (Rodríguez Vinceiro *et al.*, 1992: 227). A third study of La Peña site identified surface Chalcolithic materials consisting of plates with thickened edges and Bell-Beaker pottery (Suárez Padilla *et al.*, 1995: 74), in addition to ceramic remains from the Late Bronze Age featuring carinated vessels and excellent burnish (Suárez Padilla *et al.*, 1995: 78).

As far as the Iron Age and Antiquity are concerned, in the vicinity of the La Almagra stream on the left bank of the Guadalhorce just before passing La Peña to the south, possible defensive structures dating back to the Iron Age were discovered. It has been hypothesised that these structures were related to the control of a local iron ore (Suárez Padilla *et al.*, 1995: 82). Excavations carried out in 1984 at the site of La Angostura, located on the southern face of La Peña, uncovered more than 50 tombs dated to between the 2nd and 5th centuries AD. These tombs were individual inhumations in rectangular pits under gabled *tegulae* as well as multiple inhumations (with two or three individuals) in rectangular pits covered by horizontal limestone slabs (Cisneros Franco and Corrales Aguilar, 1994; Fernández Rodríguez and Romero Pérez, 1997: 426). Another Roman-time activity area is found at a short distance to the north of this necropolis, at the foot of La Peña´s west face. This site, which is unpublished and (to our knowledge) not included in the Antequera municipal inventory of archaeological sites, displays substantial architectural remains and is not to be mistaken with the site called Cerro de la Virgen (or Jardín), located a further 300m to the west.

In addition to evidence of occupation of La Peña during Late Prehistory, Protohistory and Antiquity, there is also clear surface-level evidence (which has never been studied nor published), pointing to its occupation during the Middle Ages as well as the Modern and Contemporary Ages. In the highest part of the mountain's northern half, on the eastern slope, there is abundant construction material and ceramic remains from an undetermined period of time during the Middle Ages. During recent historical times, La Peña was primarily used as an agricultural production space and limestone quarry, both for its use in construction as well as for the production of lime. This activity has left ample material evidence in the form of quarry fronts (of large size on the eastern side), and several lime kilns across the mountainside.

Surface field surveys conducted in 2006 in the north sector of La Peña (García Sanjuán and Wheatley, 2009; García Sanjuán *et al.*, 2010), uncovered the Piedras Blancas I site which is situated at the foot of the cliff on the mountain's northern face (Fig. 2). This site is within the 90 minute isochrone from the Menga and Viera dolmens and about four kilometres from El Perezón, a Late Neolithic settlement which was also discovered in 2006 (Fig. 3). In 2006 abundant knapped flint artefacts, a fragment of a quern and some hand-made pottery fragments were found in connection with a large block of local limestone measuring about three metres in length and roughly parallelepipedic in shape that appears to be associated with other smaller blocks of stone that are located nearby (García Sanjuán *et al.*, 2010: 3721-3722). From a techno-morphological point of view, the knapped lithic artefacts (mostly microlithic, including chipping debris, small blades and geometrics) were characterised as an Neolithic assemblage of Epipaleolithic tradition (García Sanjuán and Wheatley, 2009: 139). Subsequent visits to the site in 2009, during a time of the year when surface

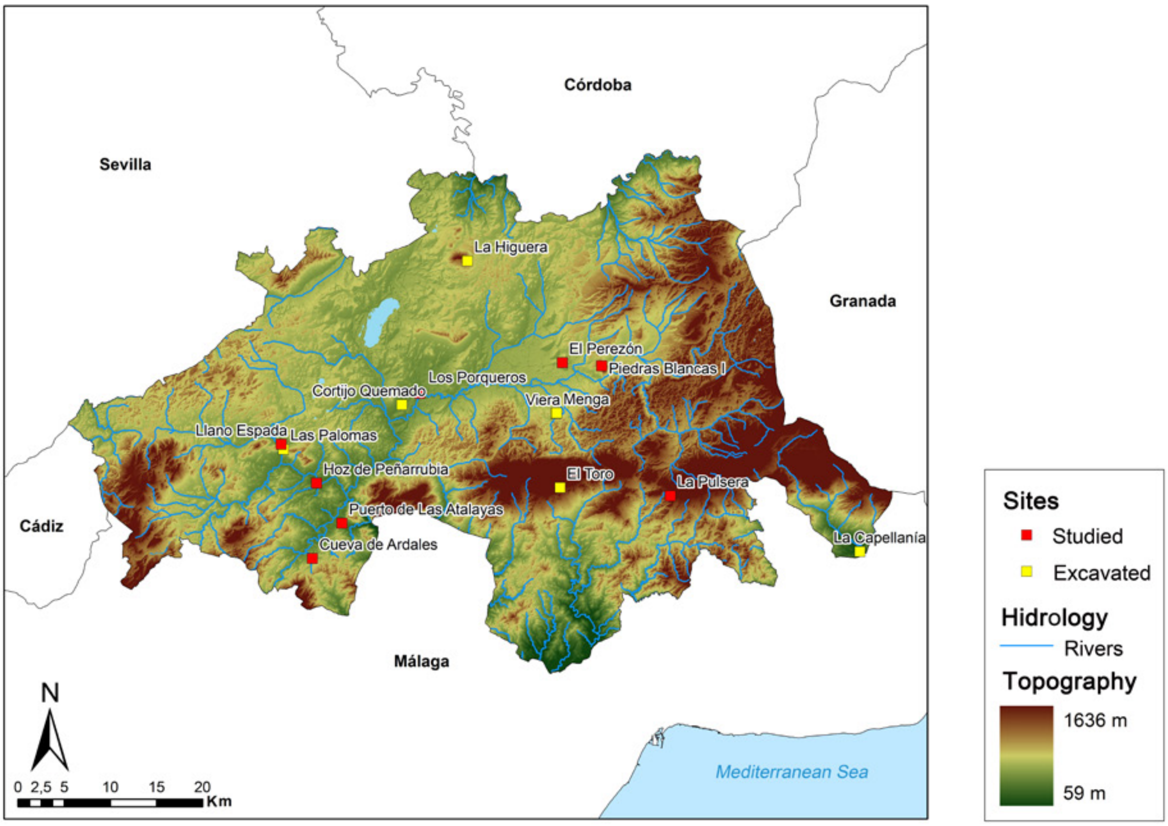


Fig. 2. Distribution map of Neolithic sites known in the Lands of Antequera. Source: García Sanjuán *et al*., forthcoming.

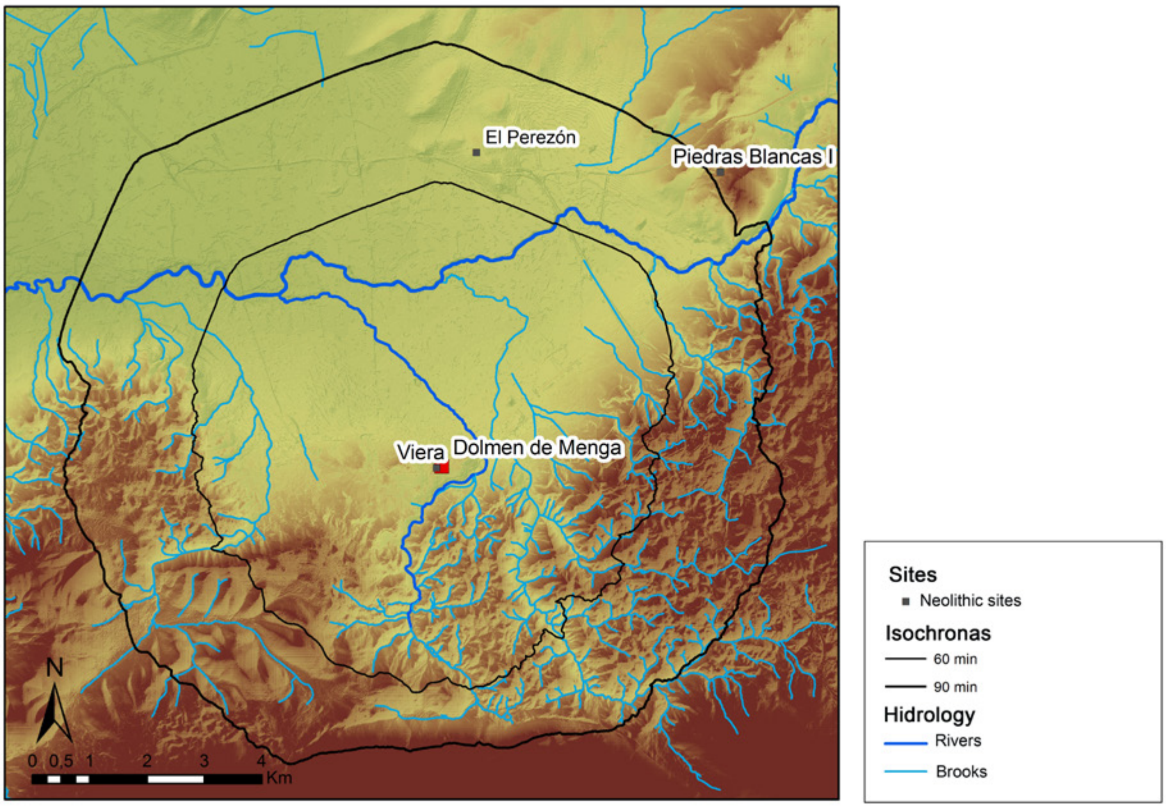


Fig. 3. Distribution map showing the relative positions of Menga, Viera, Piedras Blancas I and El Perezón. Source: García Sanjuán *et al*., forthcoming.

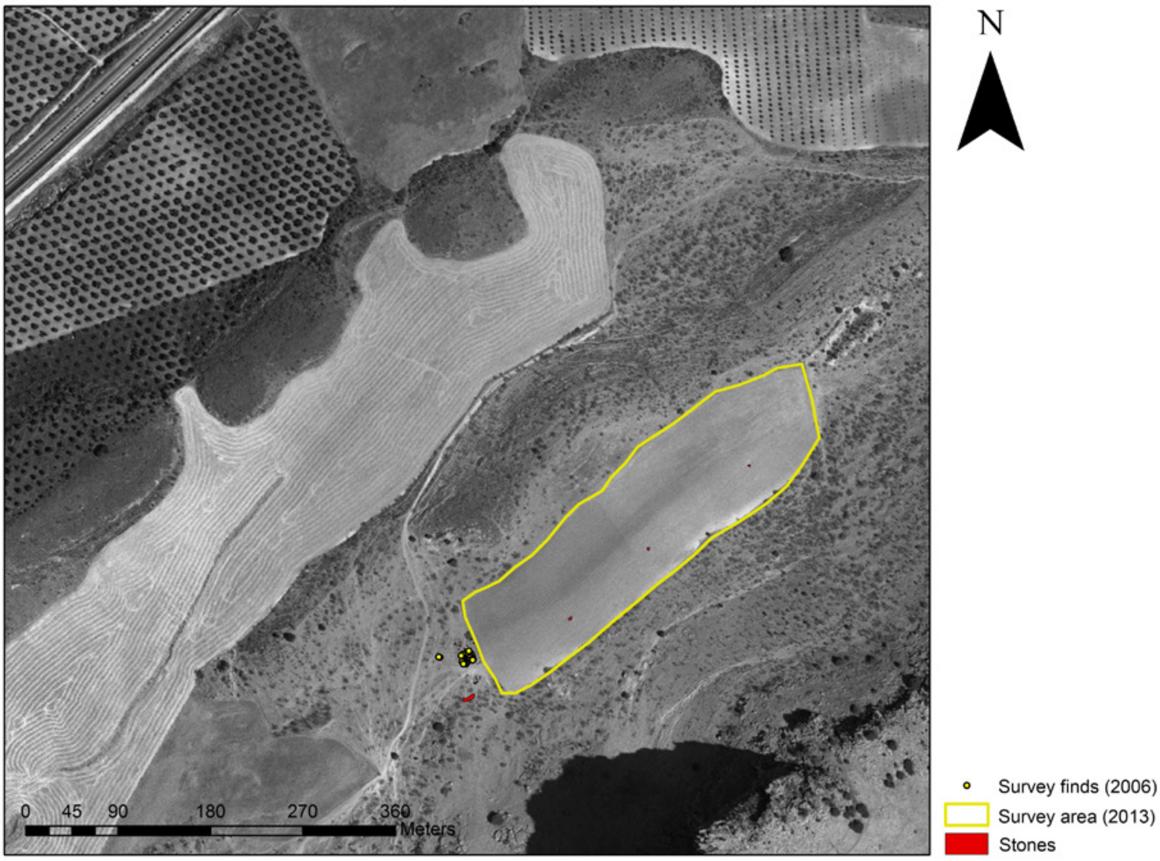
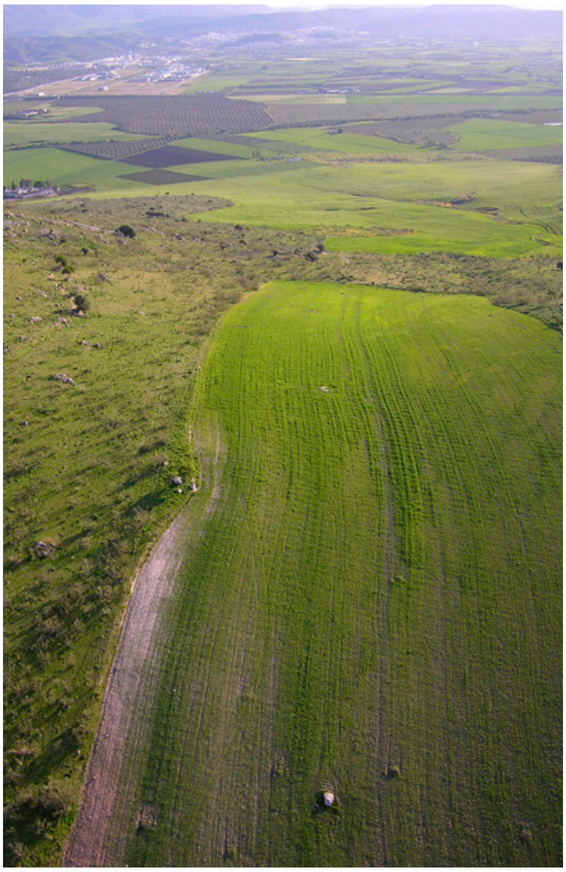


Fig. 4. Map showing the location of the 2006 and 2013 study areas together with the large stones visible on the surface. Design: Leonardo García Sanjuán.



Pl. 1. Balloon photograph of Piedras Blancas I looking west, with Antequera at the background and Stone 8 at the foreground. Photo: ICARO.Courtesy of Conjunto Arqueológico Dólmenes de Antequera (CADA).

Pl. 2. Balloon photograph of Stone 8. Photo: ICARO. Courtesy of Conjunto Arqueológico Dólmenes de Antequera (CADA).

visibility conditions were better, allowed for confirmation of the nearby presence, further to the east, of other stones of sizes and shapes similar to the one identified in 2006 (Fig. 4, Pls. 1 and 2), as well as a large quantity of surface material including knapped flint, hammers and grinding tools manufactured from hard stones as well as small quantities of hand-made pottery fragments (Figs. 5 and 6).

The Piedras Blancas I site stands barely 200m opposite to the enormous, almost 100m high cliff of intense reddish colour which makes up the northern section of La Peña. At the base of this rocky cliff lies the Matacabras rock shelter, which presents several motifs of schematic rock art. This rock shelter most likely corresponds to that briefly cited (without a specific denomination and no clear references to its location) in an article published in the early 1990s (Muñoz Vivas, 1992). The motifs painted in the Matacabras rock shelter have since been described in various studies (Bueno Ramírez *et al.*, 2009; Maura Mijares, 2011 for example). According to the characterisation proposed by P. Bueno Ramírez *et al.* (2009), the Matacabras rock shelter presents a painted stela, which is located in the area most visible from the outside, whose size and location is analogous to some of the anthropomorphic figures of macroschematic art. According to these authors, two possible phases can be distinguished at this shelter, the older of the two presenting double wavy motifs strongly reminiscent of Early Neolithic rock art (Bueno Ramírez *et al.*, 2009: 188-189).

Following the survey carried out in 2006 and further observations made therein, interest in the north sector of La Peña to understand the occupation of this region during the Neolithic period has increased substantially. This is especially true if we keep in mind that the projection of Menga's axis of symmetry does not point to sunrise, as it is common in southern Iberian megalithic monuments, but instead points directly towards Matacabras. Menga's non-solar[1] axis of symmetry establishes a landscape connection to a place that may have had an ancestral significance before Menga was constructed (García Sanjuán and Wheatley, 2010: 28-31; García Sanjuán and Lozano Rodríguez, forthcoming).

Bearing in mind these precedents, the research project "Societies, Territories and Landscapes in the Prehistory of the Lands of Antequera (Málaga)" (2013-2018), approved by the Ministry of Culture of the Andalusian regional government, has as one of its mains aims to carry out a more precise archaeological characterisation of the Piedras Blancas I site. A new survey was thus conducted in September 2013 at this site, along with a techno-morphological and geological characterisation of the materials collected. Furthermore, a geophysical prospection and a geoarchaeological study on the blocks of stone discovered in 2006 and 2009 were conducted[2]. The purpose of this field study is to more accurately understand the nature of the site prior to beginning excavation work. Naturally, interest in this field study lies not only in the assessment of Piedras Blancas I itself, but also in the potential relevance it has for helping us to understand the background and origins of Menga.

The intensive surface survey was conducted between September 16th and 17th, 2013 by Leonardo García Sanjuán, David W. Wheatley and Marta Díaz-Guardamino Uribe, with the assistance of five graduate students from the University of Southampton (United Kingdom), Joana Tonge, Josh Thomas, Thomas Hutchinson, Imogen Rogers and Luke Garland, and one post-graduate student from the University of Sevilla, Marta Cintas Peña. Kris Strutt provided further assistance concerning magnetometric data processing. The techno-morphological characterisation of the recovered surface materials was carried out by Olga Sánchez Liranzo during late 2013 and early 2014. The geo-archaeological study of the site was carried out between July and November 2015 by José Antonio Lozano Rodríguez, Luis Alfonso Pérez Valera, Fernando Pérez Valera and Juan Alberto Pérez Valera.

1 Although a recently published study has shown that sunlight did play a role in the design of Menga (Lozano Rodríguez *et al.*, 2014).

2 LOZANO RODRÍGUEZ, J. A., PÉREZ VALERA, L. A., PÉREZ VALERA, F. and PÉREZ VALERA, J. A. (2015): *Estudio Geoarqueológico de Piedras Blancas (La Peña de los Enamorados, Antequera, Málaga).* Unpublished Report.

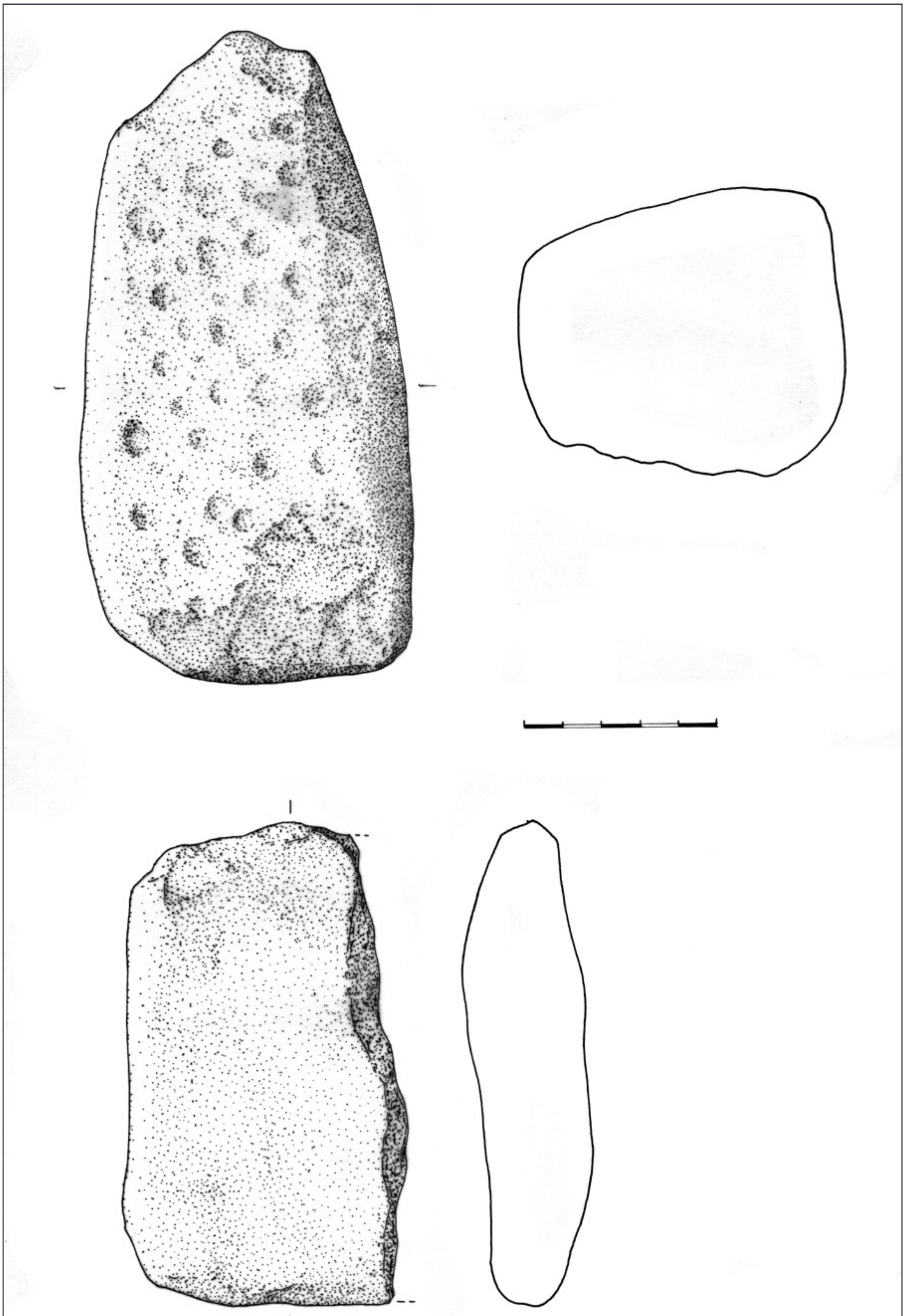


Fig. 5. Surface lithic material collected around Stone 8 in the non-systematic survey carried in March 2009. Drawing: Elisabeth Conlin.

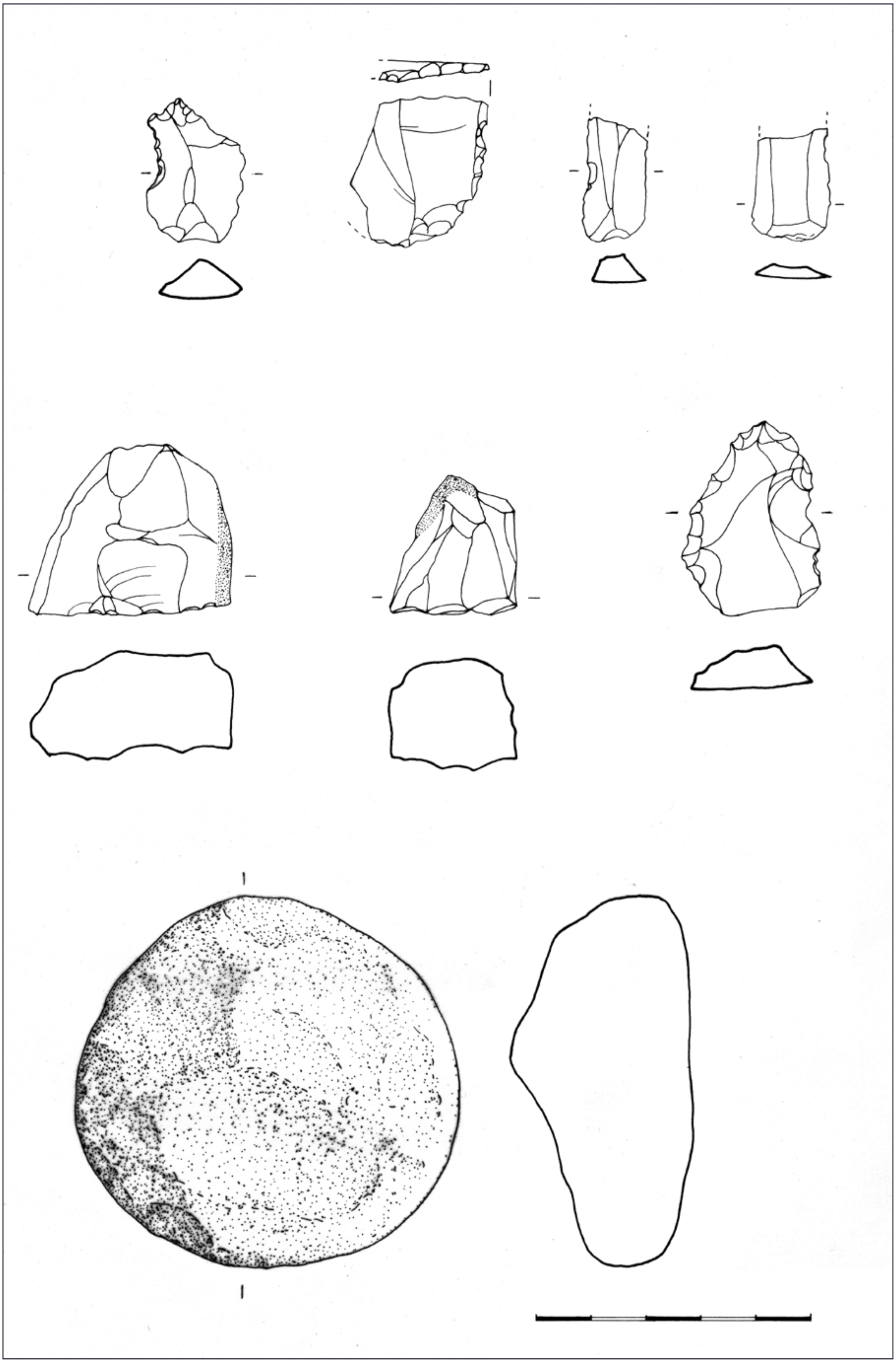


Fig. 6. Surface lithic material collected around Stone 8 in the non-systematic survey carried in March 2009. Drawing: Elisabeth Conlin.

2. SURFACE SURVEY

The first task was the surface delimitation of all of the stones identified by manually removing vegetation (Pls. 3, 4 and 5). This task did not fully clarify which of these stones are loose blocks and which are simply part of rocky outcrops (something that could only be confirmed with excavation work), but did however help decide which stones are the best candidates for excavation.

The surface survey was conducted under favourable visibility conditions with very dry soil covered with the remains of the last harvest of grains cultivated on the plot. The survey area was divided into 12 numbered squares measuring 30 x 30m, which served as a reference for the geophysical survey as well (see description below). The prospection grid was established using a Real-Time Kinematic (RTK) Leica Viva GNSS which calculated the positions in real-time over the UTM 30N projection with ETRS 1989 datum. Wooden pegs were used at 30x30 regular intervals, all of which were geo-referenced along with all the other recorded elements, both in 2006 and in 2009.

Seven of the squares (those numbered 6, 7, 8, 9, 13, 26 and 27) were extensively surveyed, thus amounting to a total surface area of 6,300m^2. These squares are located adjacent to the area that was surveyed in 2006. The surveyors were positioned at 5m intervals and transects were walked once until the entire length of the 30m square was covered. The prospectors collected all materials that could be identified in their line of sight. The prospection was conducted by one experienced and six non-experienced individuals (the latter were given a prior introduction regarding the types of materials likely to be found as well as the work method). Given the lack of experience of most surveyors the resulting sample distribution is likely to be biased in favour of the most experienced one, and therefore has not been considered significant for the purpose of spatial statistics.

A total 110 surface artefacts were recorded, which can be broken down as follows: hand-made pottery (13 items), wheel-thrown pottery (4 items), knapped lithic artefacts (61 items) and non-knapped lithic artefacts (32 items). A high number of non-knapped lithic tools (20 out of the total 32) were found in squares 13 and 8, mainly around stones 9 and 10, while a high number of knapped flint artefacts (19 out of the 61 objects identified) were found in squares 26 and 27 (Fig. 7).

Pl. 3. Stone 8. Photo: Leonardo García Sanjuán.

Pl. 4. Stone 4. Photo: Leonardo García Sanjuán.

Pl. 5. Surface clearance of the stones. Photo: Leonardo García Sanjuán.

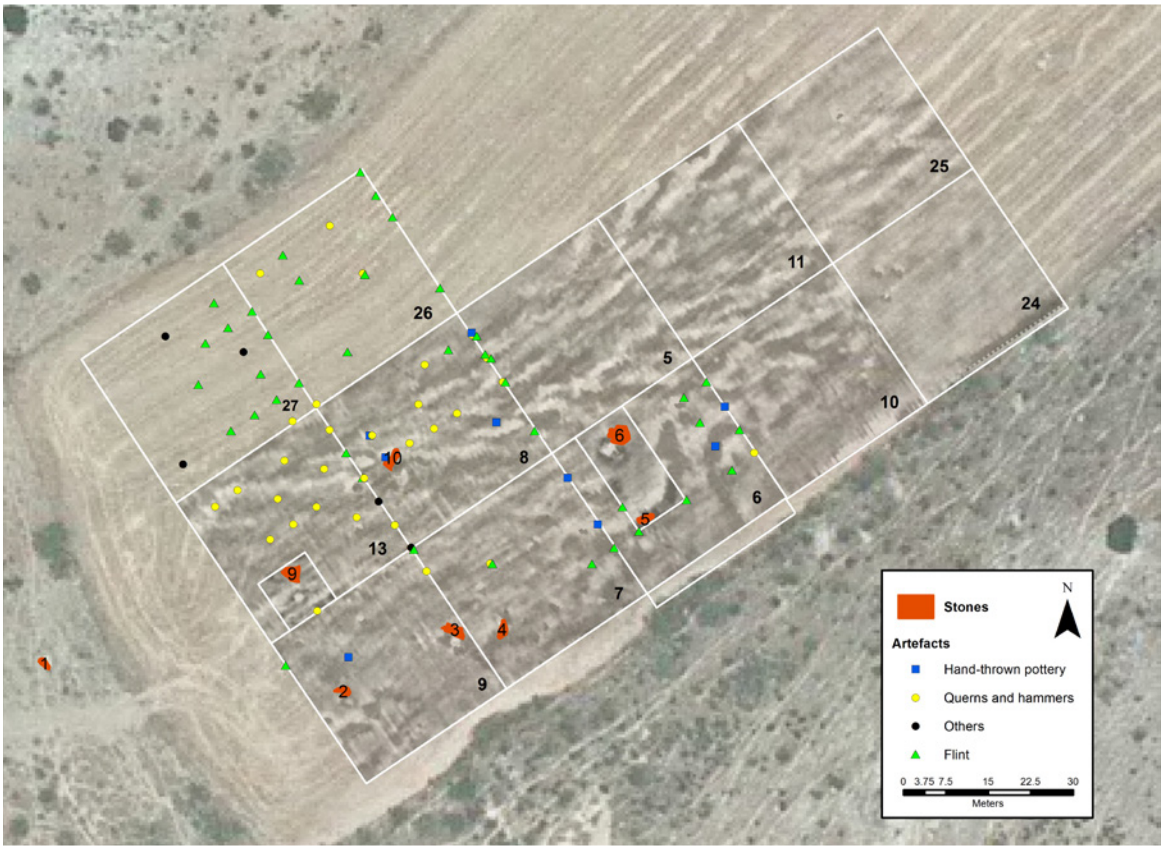


Fig. 7. Plan showing the 2013 survey grid and finds as well as the large stones visible on the surface of Piedras Blancas I. Design: Marta Díaz-Guardamino Uribe.

2.1. CERAMIC MATERIAL

The hand-made pottery (13 fragments) includes very small strongly eroded fragments (Pl. 6 and Appendix 1). Little can be said regarding the morphology of this small ceramic assemblage as all of the fragments, except for one rim, are non-diagnostic. With regard to the firing, five fragments show evidence of mixed firing environments, whereas one comes from an oxidizing atmosphere and seven from reduced ones. Except for a thin fragment, all others are rather coarse. In cases where the surfaces are more or less preserved, we can observe that they tend to be smoothed out. At the same time, fragments whose surfaces have not been smoothed out have greater thicknesses. The colours (of both the external and internal surfaces) of all the hand-made shards are brown, brownish-grey and reddish. Fragment No. 40 consists of the rim of a globular pot with a vertical rim (about half a centimetre high) that was flattened out on its edge.

Overall, the small quantity of ceramic material observed in 2013 at Piedras Blancas I is in line with what was observed during the 2006 field surveys at both Piedras Blancas I and the neighbouring site of El Perezón. This is characteristic of open-air settlements from the Neolithic period in the region.

2.2. KNAPPED LITHIC ARTIFACTS

The techno-morphological classification and description of the 61 knapped lithic artefacts has been based on the logical-analytical system (Mora Torcal *et al*, 1991; Terradas Batlle, 1995) (Tab. 1; Pls. 7, 8 and 9 and Appendix 2), although refe-rences to traditional typologies (Bordes, 1961; Laplace, 1964, 1972, 1986; Merino Sánchez, 1965, 1994; Bagolini, 1968; Fortea Pérez, 1973) have also been made.

The majority of the knapped lithics (57) are made from siliceous rocks, while only four of the pieces discovered correspond to other raw material (see discussion below). The predominant colours of the flint are beige, grey and brownish-grey, while colours such as white, pink and dark brown are less common (one item each). Almost all of the items, including the retouched areas, have patinas, while the degree of

Pl. 6. Ceramic ítems. Numbers refer to the full inventory shown in Appendix 1. Photo: Javier Pérez González.

erosion is not very significant. Even though we are dealing with surface archaeological material, the fracture rate of the tools is not too high. Of the 61 analysed items, only 21 display some type of fracture, while only 12 of those 21 present serious fractures that prevented us from orienting them (two 1GNB, four PB and six 2GNB).

Considering the global analysis of the assemblage (Tab. 1), the majority of the material corresponds to Second-Generation Negative Bases (2GNB) (37 items) (Pl. 9), followed by the Positive Bases (PB) (15 pieces) (Pl. 8) and First-Generation Negative Bases (1GNB)(nine pieces) (Pl. 7), of which the majority (eight pieces) are from the Exploitation 1GNB group (cores) and only one piece corresponds to the Configuration 1GNB group.

Only one pick is in the C1GNB group (Pl. 7). It is a piece made as a triangular-section pick with a distal knapping that forms a trihedral section (Pl. 7, nº 109). Given its morphology, it could qualify as a trihedral pick, but its association with the rest of the materials suggests that a better analogy could be the so-called 'Asturian picks' ("*picos asturienses*") dated to the Late Neolithic period and the early Cooper Age (Ontañón Peredo, 1996: 21; Martín Córdoba, 1988: 59). A total of eight cores belong to the E1GNB group: one of them is a fragment whose morphology cannot be clearly identified; three of them would belong to the pyramidal group; two would be diverse; one would be a polyhedral piece and one would have been in the early phases of knapping. These cores, which barely have any cortical remains, are very small –either from being used up or because the nodules chosen for carving were small–.

In terms of the Percussion Platforms (PP) we have identified 10 smooth ones, four multifaceted ones, three dihedral ones and three punctiform ones (Pl. 8). There were also 26 suppressed butts. Moreover, following the pattern of the cores, no cortical butts were found. For the typometrical analysis of the PP, the flakes and the blades, the model followed was that proposed by Bagolini (1968) which in principle can only be applied to ''knapping debris'', although in this case we have also applied it to the 2GNB that, in our opinion, are morphologically preserved. The only items not included in this analysis are the highly fractured and/or highly retouched ones. Broadly speaking, the PB and the 2GNB pieces are small and very small and can be identified as: one wide flake, one laminar flake, two small wide flakes, five micro-flakes, one wide micro-flake, two very wide micro-flakes, four laminar micro-flakes and one micro-blade. With regard to the types of PB blanks, there is a clear predominance of interior blanks, six flakes and two blades, as well as a piece that could be classified as a Levallois flake. With regard to the types of blanks used for the elaboration of 2GNB (a total of 33), the majority of the pieces were elaborated using interior blanks, 18 of which were identified as flakes and eight as blades. Yet, there is proof of other types that were used: one cortical flake, one semi-cortical flake, one Levallois flake, one pseudo-Levallois flake, one semi-cortical blade and one Levallois blade. Also just as interesting is the use of core debris.

KNAPPED LITHIC INDUSTRY			
I. FIRST GENERATION NEGATIVE BASES (1GNB)			**9**
I.1. Configuration First Generation Negative Bases (C1GNB)		1	
• Trihedral pick	1		
I.2. Exploitation First Generation Negative Bases (Cores)		8	
• Pyramidal cores	3		
• Early-knapping cores	1		
• Polyhedral cores	1		
• Diverse cores	2		
• Core fragments	1		
II. POSITIVE BASES (PB)			**15**
• Core debris	6		
• Core tablets	1		
• Internal flakes	6		
• Chips	2		
III. SECOND GENERATION NEGATIVE BASES (2GNB)			**37**
• Racloirs	7		
• Perforators	1		
• Scrapers	2		
• Retouched notches	9		
• Denticulates	6		
• Truncated tool	3		
• Dorsal facepoint	1		
• Marginal points	1		
• Sickle blade elements	1		
• Pieces with abrupt marginal retouch	2		
• Barbed arrow heads	1		
• Piece with flat retouch	1		
• Scraper and dorsal face point	1		
• Piece with very marginal retouch	1		
TOTAL			61

Tab. 1. Full inventory of Piedras Blancas I surface knapped lithic industry.

In terms of corticality, there is a scant presence of cortical blanks both in the PB and the 2GNB in accordance with the absence of a cortex in the E1GNB and the percussion platforms. In fact, of the 37 2GNB pieces, we can observe that 33 of them do not have cortical surfaces; the rest of the surfaces are: cortical, dominant cortical over non-cortical, and dominant non-cortical over cortical. Regarding the kind of retouch applied during the elaboration of the pieces corresponding to the 2GNB group, simple retouching prevails. However, there is also a very high percentage of pieces presenting abrupt retouch. It should also be pointed out that a piece was found which, although fragmented, shows proof of what could be smooth retouch on its surface. Following to the typological classification proposed by Laplace, 27 of the pieces can be included in the order of simple retouch: seven racloirs, one perforator, two scrapers, nine retouched notches, six denticulate pieces, one marginal projectile point and one piece with high marginal retouch, possibly attributable to use. Of the racloirs group, six are made from flakes and one is made from a blade; all are made from interior blanks except for one made from a cortical flake and another made from a semi-cortical micro-flake. We found one transversal marginal racloir (R1), another transversal racloir (R22), three lateral racloirs (R21) –one of which had a simple lateral retouch on its ventral surface–, and a diamond-shaped bifacial racloir made from a cortical flake. We discovered a perforator with a retouched lateral notch (made from an interior flake, more specifically a micro-flake), which helps to understand the shape of the tool.

Pl. 7. Knapped lithic tools: First-Generation Negative Bases (1GNB). Photo: Javier Pérez González.

Pl. 8. Knapped lithic tools: Positive Bases (PB). Photo: Javier Pérez González.

Pl. 9. Knapped lithic tools: Second-Generation Negative Bases (2GNB). Photo: Javier Pérez González.

There are also two scrapers in the simple retouch group. The first is a frontal scraper that was laterally retouched (G12) made from a limestone Levallois blade. The second one is a snub-nosed scraper (G22) with a retouched notch.

The largest group is formed by the retouched notches (D21) with a total of nine pieces out of the 37 that make up the 2GNB group. The blanks used for the notches are primarily interior flakes with the exception of one semi-cortical blade, one cortical flake and possibly two pieces of debitage. In some cases the notches have a very marginal retouch which leads us to doubt its typological affiliation. Six examples of denticulate objects were discovered: four marginal (D1) and two diamond-shaped ones (D3). Of these six objects, five were made from interior flakes and one from a semi-cortical flake. A marginal projectile point (P11) with simple retouch on its right side, was also recorded. This projectile point is made from an interior flake and has an eliminated butt.

Within the group of simple retouch, we can include an object whose retouch presents a morphology that can be classified as "simple"; however, its retouch is very marginal, possibly due to factors that are different from those responsible for shaping the piece, anthropic or not. Within the order of abrupt retouch we can find nine pieces corresponding to the following typological groups: three truncated pieces, two wide-bladed projectile points, one marginal projectile point, one sickle element and two pieces with abrupt retouch. In the order of abrupt retouch we can also find three truncated pieces. Two of these truncated pieces would be oblique (T22) and made from an interior flake, while the third piece would be a marginal truncated piece (T1) made from an interior blade. The wide-bladed projectile points also fall into the abrupt retouch group. On one hand, we can observe a marginal, double-bladed projectile point (PD12) as well as an object that might be a snub-nosed scraper (G22), although we are not positive about the latter. This piece was made from an interior flake that was small but wide. On the other hand, we can observe a piece that, typologically speaking, could be considered a marginal, double-bladed projectile point (PD12) was also made from an interior flake.

It is important to note the presence of a sickle element made from brown siliceous rock (Pl. 9, nº 59). It presents the typical sickle-gloss on its denticulate (marginal) edge and has a unifacial denticulate rim with a serrated frontal side. A fracture on its distal portion appears to be relatively recent. The piece was presumably elaborated from an interior blank, most likely from a blade (Ramos Muñoz, 1991-1992). This piece would have been used as part of a tool consisting of a wooden handle with a groove where this piece would be inserted. Some other pieces with obvious abrupt retouch have also been included in this group, but they do not correspond to any of the classic types within the abrupt order proposed by Laplace (1972): two pieces (A1) with marginal abrupt retouch, one made from a fragment of a flake and the other made from an interior blade.

In the group of smooth retouch, while being very prudent, we have included two pieces that are not particularly clear. On the one hand, we have a small fragment of an interior flake whose shape presents clear characteristics of possible foliaceous (leaf-like) lithic reduction on its surface. However, since the piece is fractured and quite small it is not possible to classify it into any specific category. On the other hand, there is an arrow head that appears to be in the process of being manufactured. It is an arrowhead with developed barbs made from an interior blade. Its sides are concave-convex. It would have been a medium-sized arrowhead with a short, broad morphology and a convex cross-section.

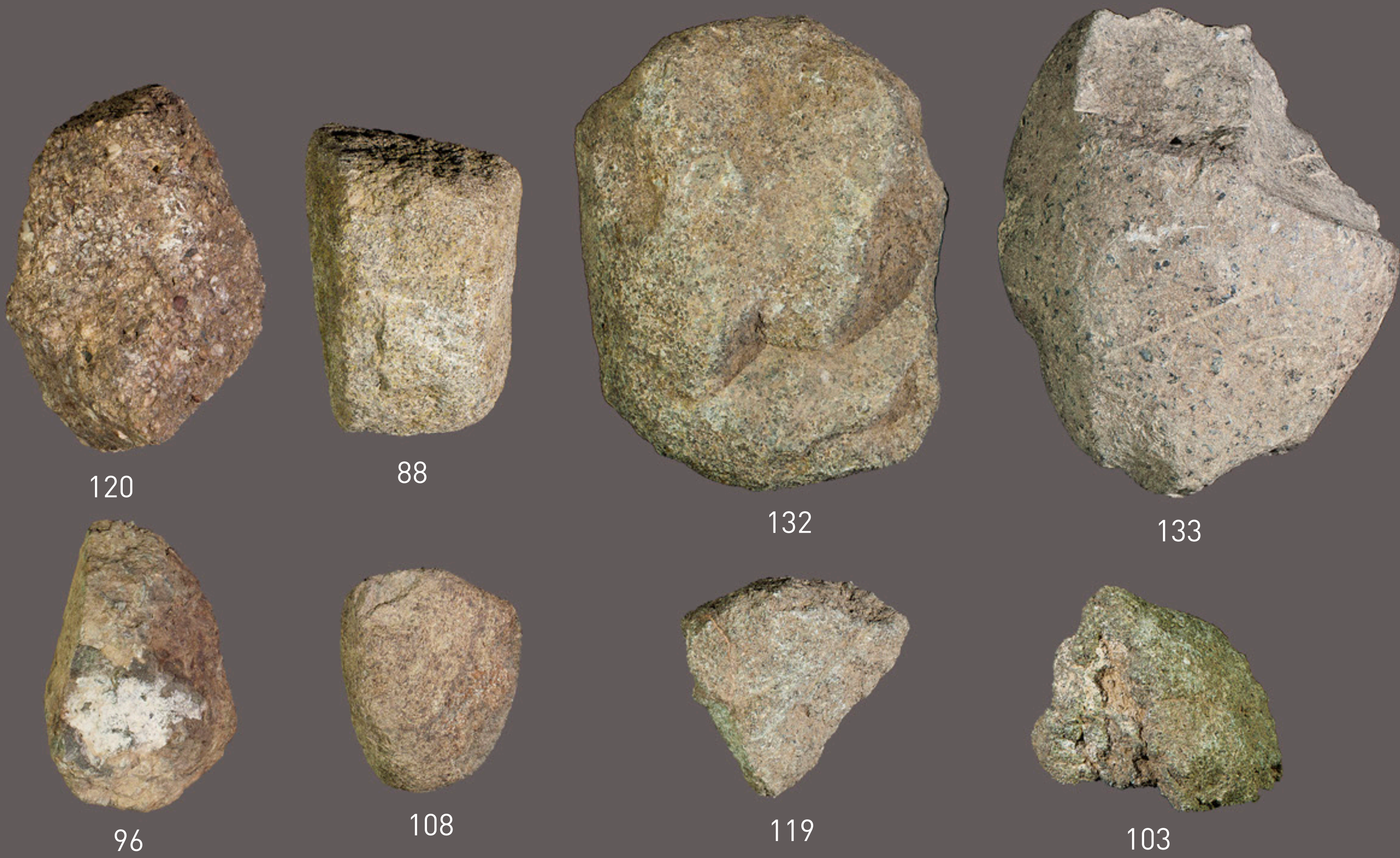
2.3. NON-KNAPPED LITHIC ARTEFACTS

The assemblage of non-knapped lithic artefacts (32 items) (Tab. 2, Pls. 10, 11 and 12 and Appendix 3), presents a higher degree of breakage than the knapped lithics, which is undoubtedly attributable to their much bigger sizes, which exposes them to more frequent fracturing by ploughing. Particularly noteworthy are those related to grinding activities (including fragments of querns and grinding stones), which account for almost 75% of all of the pieces in this category.

NON-KNAPPED TOOLS	
ADZE	1
MALLETS	3
MULLERS	6
QUERNS	15
UNDETERMINATE	5
TOTAL	**30**

Tab. 2. Count of Piedras Blancas I surface non-knapped lithic industry.

Pl. 10. Non-knapped lithic tools. Photo: Javier Pérez González.



Pl. 11. Non-knapped lithic tools. Photo: Javier Pérez González.

Pl. 12. Non-knapped lithic tools. Photo: Javier Pérez González.

There is an adze, a piece which is similar to an axe but which has an asymmetrically-shaped edge (Pl. 10, nº 92). It is a trapezoidal piece with an irregularly-curved edge, a flat base and an oval cross-section. On its surface it presents marks of pecking and extraction; however, the piece is not polished, meaning that it was in the process of being manufactured and had not yet undergone the final phase: polishing. Two pieces have been classified as "mallets" or hammers (Pl. 10 nº 78 and 123), although one raises doubts regarding its typological classification. These tools served a hammerstones which explains why one of their ends tends to be very blunt. Another large-sized hammer was found during a non-systematic surface survey carried out in March 2009 (Pl. 10, nº PB2009-1.10).

A group of 15 pieces have been classified as querns (Pl. 11, nº 132 and 133), although only two of them are preserved more or less in their entirety, the remainder including small and very small fragments that rise doubts as to their typological classification. Six mullers have been identified, three of which are fragments and another three which are pieces that have more or less been preserved with the exception of some fractures (Pl. 12, nº 102 and 124).

The rest of the pieces (a total of six) are difficult to classify due to the degree of fracturing and wear and tear. However, their general shape suggests their use as grinding or hammering objects.

2.4. LITHOLOGICAL CHARACTERISATION OF LITHIC MATERIAL

From a lithological point of view, the most abundant materials are by far flint (for knapped tools), and ophite (a volcanic-subvolcanic rock from the Triassic period), followed by calcarenite, volcanic basalt, peridotite, dolerite, and finally conglomerates (for non-knapped lithic material) (Tab. 3)[3].

The flint found at Piedras Blancas I is very fine with a wakestone-packstone texture, pellet-like non-skeletal grains and skeletal grains such as radiolaria, benthic foraminifera and sponge spicules. It is mainly characterised by visible hummocky cross-stratification (Morgado Rodríguez *et al.*, 2011). This flint is characteristic of the Middle Sub-Betic Milanos Formation in the Betic mountain range. The remains of black flint possibly belonging to the Turón class, which is also very fine with a mudstone-wackestone texture and radiolaria, abundant sponge spicules and, to a lesser extent, some filament and foraminifera[4] (Lozano Rodríguez *et al.*, 2010), are much less prevalent.

The recorded ophites can be subdivided according to their texture: fine-grained, medium-grained, medium-coarse-grained and coarse-grained, basically corresponding to the size of the minerals. Showing various degrees of alteration, these ophites present a principal mineral composition made up mainly of plagioclase, clinopyroxene and, on occasion, olivine. As for secondary minerals amphibole and ore are observed (Fig. 8 C and D). These ophites belong to the Triassic period and most likely come from the Trías de Antequera formation (Morgado Rodríguez and Lozano Rodríguez, 2011). The calcarenites are mainly bioclastic with an abundance of macrofossils such as Lepidocyclinas and Nummulites from the Oligocene-Early Miocene. They tend to have some intraclasts and hard calcite cementation which make them very consistent. They originate from outcrops close to Piedras Blancas I, specifically from the area north of La Peña de los Enamorados.

The materials formed from volcanic rocks-basalts tend to have a subophitic texture and, like all volcanic rock, a very fine grain. The presence of vacuoles, in this case without posterior mineral filling, is frequent. The principal mineral composition includes olivine and augite in a matrix made up mainly of plagioclase and iron oxide (Fig. 8 A and B). These minerals may have their origins in the Triassic period, although in order to ascertain this point geochemical analysis by XRF and ICP-MS data, at this point not available, would have to be obtained –in principle earlier origins cannot be ruled out given this is a very scarce typology in the Triassic period–.

3 LOZANO RODRÍGUEZ, J. A., PÉREZ VALERA,L. A., PÉREZ VALERA, F. and PÉREZ VALERA,J. A. (2015): *Estudio Geoarqueológico de Piedras Blancas (La Peña de los Enamorados, Antequera, Málaga)*. Unpublished Report.

4 Another interesting feature of this type of flint is the presence of trace fossils such as Phycosiphon and Chondrites (Rodríguez-Tovar *et al.*, 2010 a; 2010b).

ITEM NUMBER	LITHOLOGY	TEXTURE/OBSERVATIONS	SOURCE	THIN SECTION
PI-BL-1-10	Ophite	Fine grained	Local	
PI-BL-1-11	Ophite	Medium-fine grained	Local	
PI-BL-1-12	Ophite	Medium grained	Local	
PI-BL-1-13	Dolerite	Coarse-medium grained	Local	
PI-BL-1-14	Ophite	Coarse-medium grained	Local	
PI-BL-1-15	Ophite/Dolerite	Medium grained	Local	
PI-BL-1-16	Flint	Milanos type	Regional	
PI-BL-1-17	Flint	Milanos type	Regional	
PI-BL-1-18	Flint	Turón type	Regional	
PI-BL-1-19	Flint	Milanos type	Regional	
PI-BL-1-20	Ophite	Fine grained	Local	
PI-BL-1-21	Volcanic Rock	Mafic, vacuolar	Regional	
79	Ophite	Medium grained	Local	
80	Ophite	Medium grained	Local	
81	Calcarenite	Fine grained, packstone	Local	
82-86-1	Calcarenite	Coarse grained, bioclastic	Local	
82-86-2	Calcarenite	Coarse grained, bioclastic	Local	
82-86-3	Volcanic Rock	Vacuolar	Regional	
87	Basalt	Vacuolar	Regional	X
88	Ophite	Coarse-medium grained	Local	X
89	Ophite	Medium grained	Local	
90	Ophite	Medium grained	Local	
92	Ophite	Medium grained	Local	
93	Ophite	Fine grained	Local	
94	Ophite/Dolerite	Medium grained	Local	
95	Dolerite	Coarse-medium grained	Local	
96	Gabbro	Coarse grained	Regional	
98	Ophite	Medium grained	Local	
99	Calcarenite	Medium grained, bioclastic	Local	
102	Ophite	Coarse grained	Local	
103	Ophite	Coarse grained	Local	
105	Peridotite	Coarse grained, altered	Regional	X
108	Ophite	Medium grained	Local	
110	Ophite	Fine grained	Local	
111	Ophite	Coarse-medium grained	Local	
112	Ophite	Medium grained	Local	
113	Peridotite	Medium grained	Regional	X
115	Ophite	Fine grained	Local	
118	Calcarenite	Medium grained, bioclastic	Local	
119	Ophite	Medium grained	Local	
120	Conglomerate	Coarse grained, quartzite pebbles	Regional	
121	Calcarenite	Medium grained, bioclastic	Local	
123	Ophite	Medium grained	Local	
124	Ophite	Medium grained	Local	
129	Calcarenite	Medium grained, grainstone	Local	
133	Peridotite	Coarse grained, altered	Regional	
134	Ophite	Fine grained	Local	

Tab. 3. Lithological and textural characterisation Piedras Blancas I surface lithic tools.

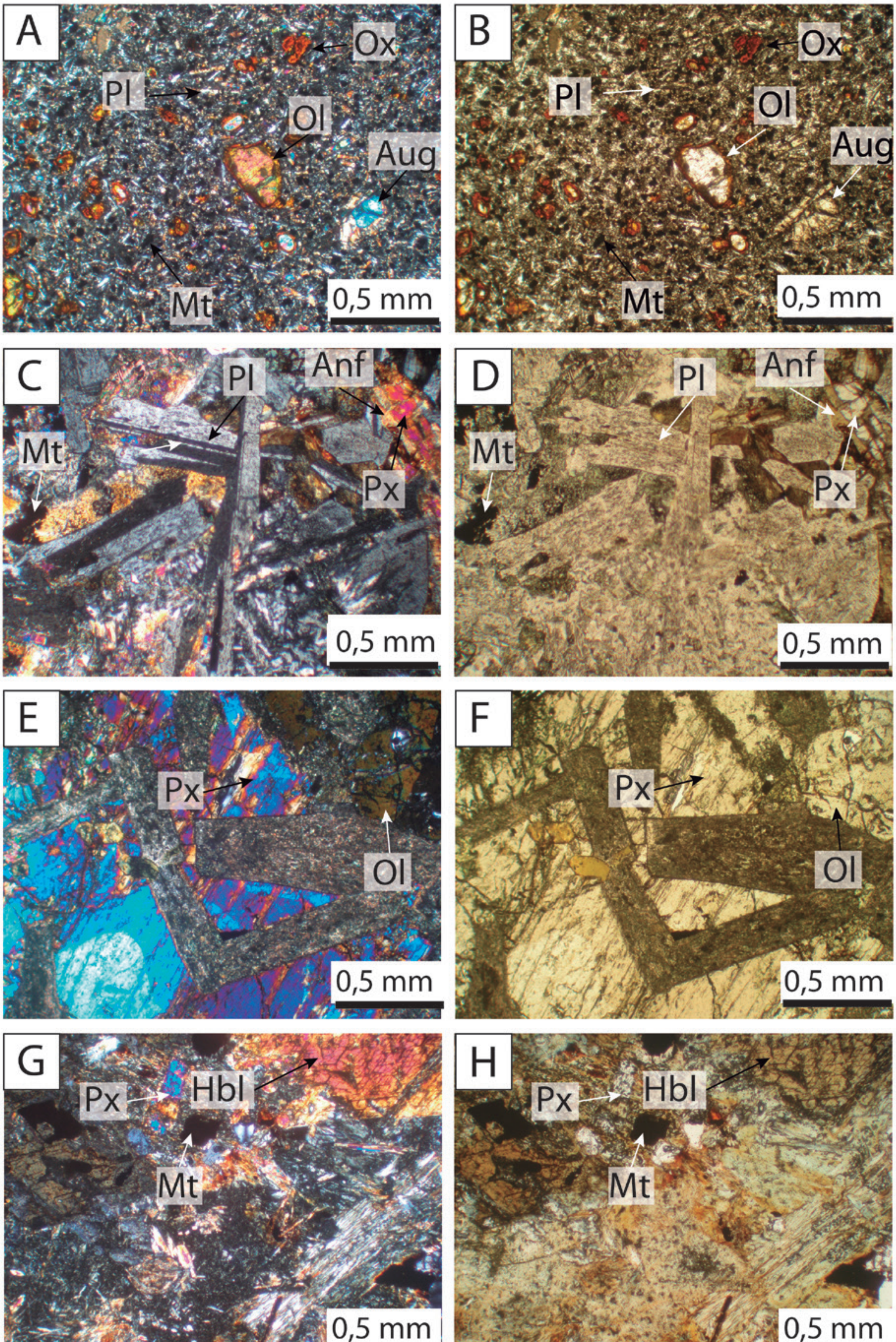


Fig. 8. Petrographic thin section of lithic tools. A and B: microphotographs of item nº 87 (basalt) taken with and without crossed nicols; C and D: item 88 (ophite); E, F, G and H; items 105 and 113 (two peridotites). Pl: Plagioclase; Ol: Olivine; Aug: Augite; Anf: Amphibole; Mt: Metal ore; Px: Pyroxene; Hbl: Hornblende. Photos: José Antonio Lozano Rodríguez, Luis Alfonso Pérez Valera and Fernando Pérez Valera.

The peridotites are ultramafic rocks which have a principal mineral composition including olivine, orthopyroxene, clinopyroxene, ore (spinel) and hornblende on occasion. These rocks present a granular texture and have generally suffered little change (Fig. 8 E, F, G and H). These rocks are particularly peculiar since they originate in the Earth's mantle and appear in very few places. They can be found at various locations within the Betic mountain range, including Sierra Bermeja, Sierra Alpujata, Sierra de Aguas and the Sierra de Carratraca (Málaga), with a small outcrop lying in the immediate surroundings of El Torcal, Antequera's major karst system.

Finally, the dolerites present the same chemical composition as gabbro or basalt but with a slightly larger grain. The rocks studied here present a dolerite texture and a principal mineral composition of augite, plagioclase and amphibole. They may also originate from the Trías de Antequera formation, although a geochemical study would be required in order to confirm their origins.

This combination of local and non-local raw materials is present in the Neolithic and Copper Age sites of the region for which characterization data are available. In the last section of this paper a discussion is made of the implications this may have in the particular case of Piedras Blancas I.

3. MAGNETOMETER SURVEY

The magnetometer survey was carried out with the aim of assessing the potential presence of subsurface features possibly connected to the material found on the surface, possibly associated with the large-sized stones. The survey was conducted in September 2013 on a day when the weather conditions were sunny, warm and dry and ground visibility was favourable (Pl. 13). A Bartington Instruments Grad 601-2 dual sensor fluxgate gradiometer was used, registering measurements every 0.25 metres in transects separated by intervals of 0.5m, with zigzag data collection. Three smaller areas in the proximity of three stones visible on the surface (stone numbers 6, 8 and 9) were surveyed using a higher resolution. This survey was conducted with a higher traverse resolution of 0.25m, and reading interval of 0.125m. The survey data were processed using Geoplot 3.0 software. The processing of data was necessary to remove any effects produced by broad variations in geology, or small-scale localised changes in magnetism of material close to the present ground surface. Magnetometer data were despiked to remove any extreme magnetic values caused by metallic objects. A zero mean traverse function was then applied to remove any drift caused by changes in the magnetic field. A low pass filter was then

Pl. 13. David Wheatley and Marta Díaz-Guardamino Uribe carry out the magnetometer survey in September 2013. Photo: Leonardo García Sanjuán.

Fig. 9. Survey grid for the magnetometry. Design: Marta Díaz-Guardamino Uribe.

applied to remove any high frequency readings, and results were then interpolated to 0.5m resolution across the traverses.

The results (Figs. 9 and 10) reveal the presence of important geo-morphological elements as well as possible negative features and stones potentially associated with the prehistoric activity recorded at the site.

The most significant results were obtained from the northern part of the prospected area (Fig. 10a). Here, a series of positive and negative linear anomalies were identified ([m1], [m2], [m3] and [m4]) running from the northeast to the southwest, marking possible channels and variations in the limestone that have resulted from the downward displacement of the sediments. Another set of discrete positive anomalies with diameters between 1.5 and 2m ([m5] and [m6]) point to the possibility of negative, subcircular features with a positive response area [m7] that may suggest possible occupation deposits. The presence of negative structures appears to continue towards the southwest [m8] and west [m9], with others ([m10] and [m11]) located in the proximity of a dipolar anomaly that suggests the presence of a possible buried stone. In the southern area (Fig. 10b), analogous positive and negative linear anomalies were recorded ([m12], [m13], [m14], [m15] and [m16]) running from the northeast towards the southwest, marking possible hillside erosion. Another series of dipolar anomalies ([m17], [m18], [m19] and [m20]) indicate the presence of buried stones, while another series of positive anomalies ([m21], [m22], [m23] and [m24]) suggests the possible presence of pits or analogous negative features.

The surveys that were conducted with a higher resolution in the immediate surroundings of stones 6, 8 and 9 indicated in all cases the presence of anomalies that are representative of possible negative, subcircular features close to the stones (Figs. 11 and 12). The anomaly that can be observed just west of stone nº 8 is particularly interesting (Fig. 12). Several pits are visible in the northern area, while two stones from the southern area also show evidence of possible pits or filled-in cavities in the subsoil.

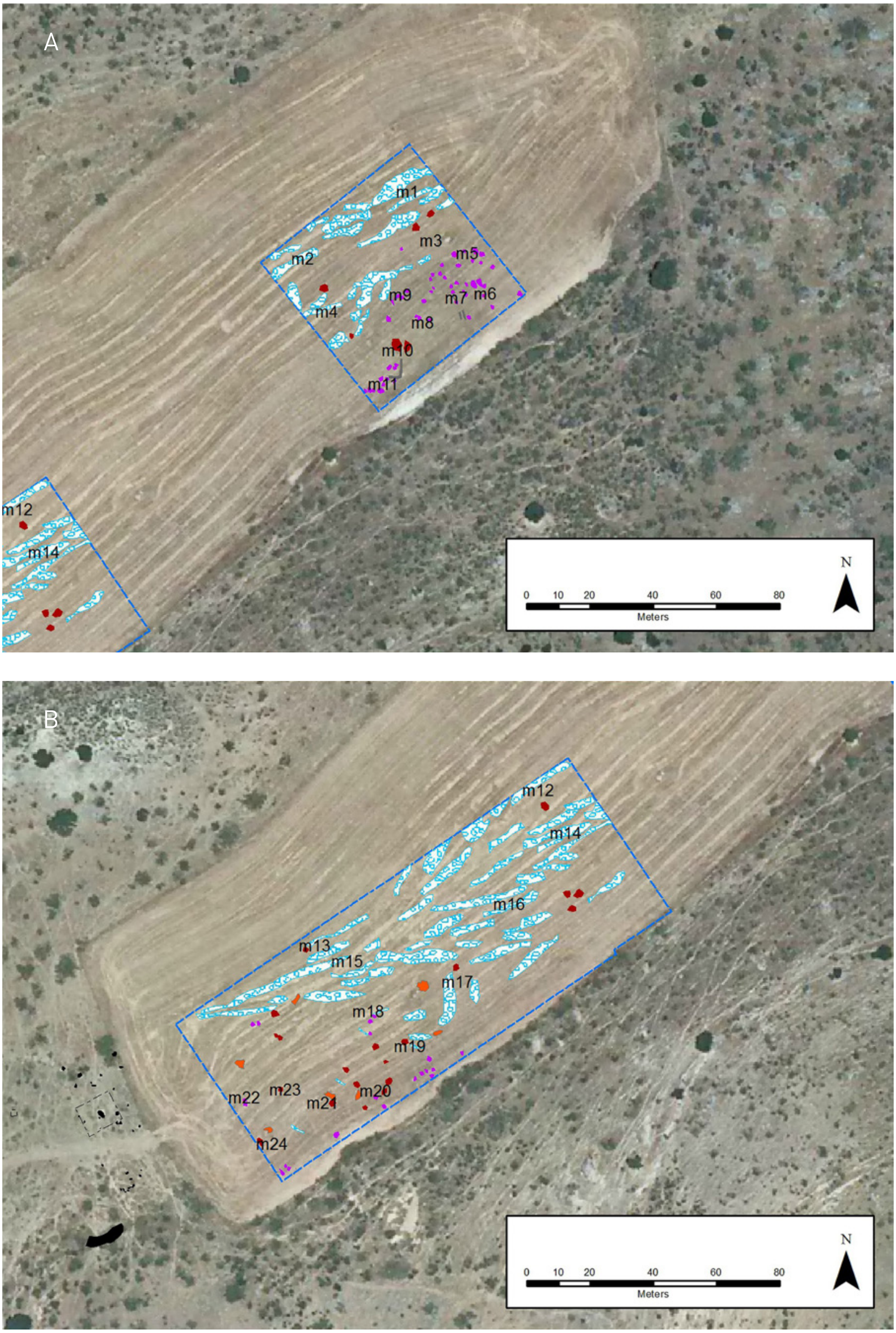


Fig. 10. Results of the magnetometry. A) North sector; B) South sector. Design: Kris Strutt.

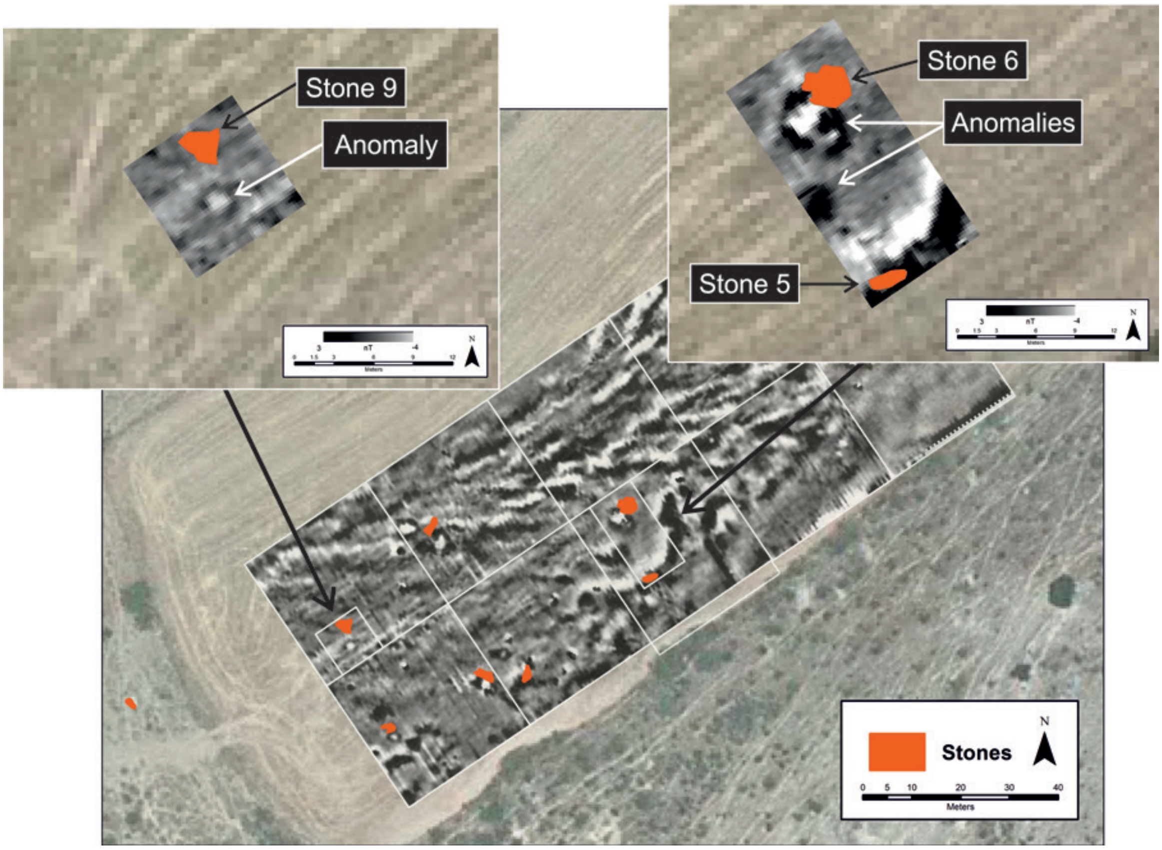


Fig. 11. Results of the higher-resolution magnetometry at Stones 6 and 9. Design: Kris Strutt and Marta Díaz-Guardamino Uribe.

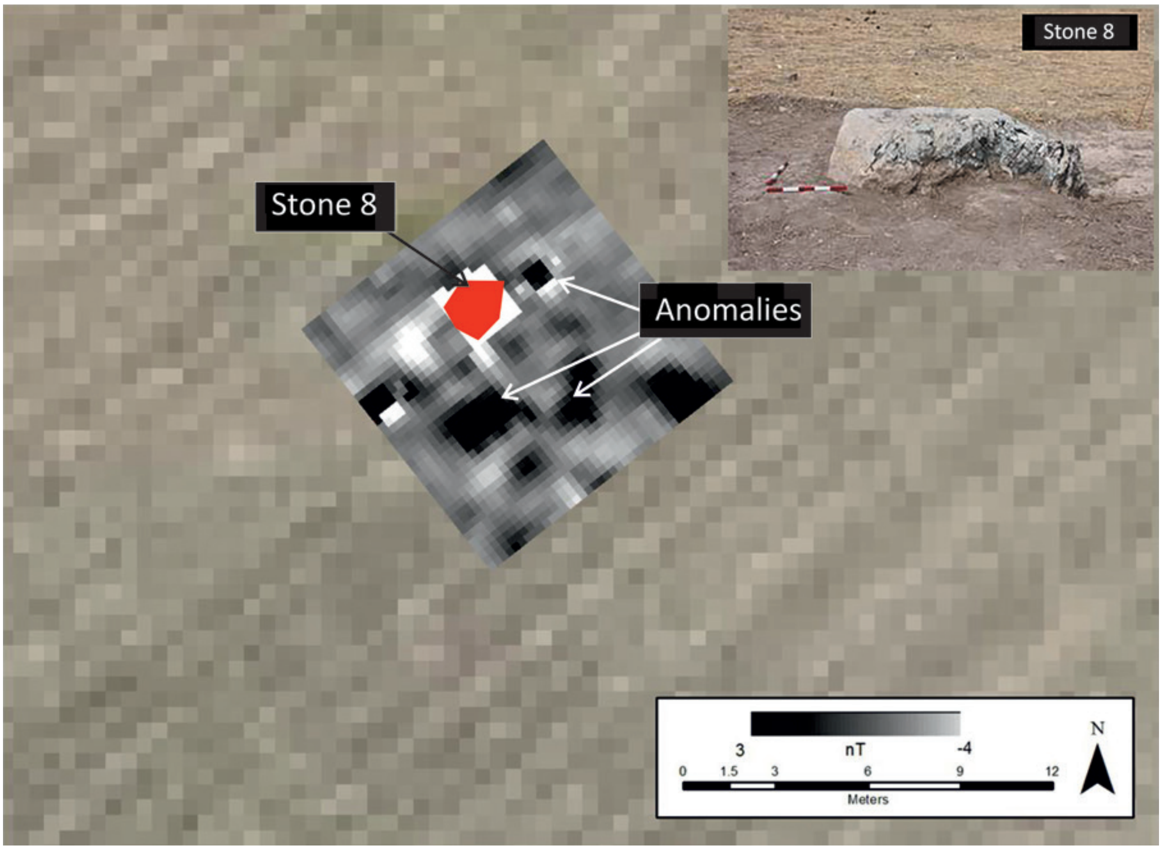


Fig. 12. Results of the higher-resolution magnetometry at Stone 8. Design: Kris Strutt and Marta Díaz-Guardamino Uribe.

4. GEOARCHAEOLOGY

4.1. OBJECTIVES AND METHODOLOGY

The three main objectives of the Piedras Blancas I geo-archaeological study[5] were as follows: (1) the overall geological and lithological characterisation of the site, with special attention to the geotechnical characteristics of the ground where the large stones are located; (2) the petrological characterisation of the large stones and (3) the lithic artefacts identified on the surface (already summarised above).

Concerning the first of these objectives, it was assumed that a fine detail geological cartography was a fundamental tool for in order to identify the origin of the stones by comparing the petrology of the stones with that of their immediate geological surroundings as well as by helping to assess whether their current location is the result of anthropogenic causes or, if not, the result of purely natural (geological) causes. The detailed geological cartography was made using the 1:50.000 National Geological Map of Spain (MAGNA) (Archidona sheet) as reference. In addition, a digital cartographic base consisting of both digital orthophotographs as well as digitised analogue orthophotographs and several topographic maps on different scales was used. These were all obtained from the Spatial Data Infrastructure of Andalusia (IDEA) server via their various internet viewers[6] as well as direct download. In addition, orthophotographs with the most up-to-date images at the highest resolution from the National Plan for Aerial Orthography (PNOA) were used. These have served different purposes: for field recognition since they are installed in geographical information apps (OruxMaps-Android), and as the digital cartographic base. With this baseline data, an area of 3 km^2 was marked in order to conduct a comprehensive cartographic review of the IGME (Spanish Geological and Mining Institute) cartography (Pineda Velasco, 1990). During this review, each one of the different materials and lithostratigraphic discrepancies within the selected area were characterised, primarily in those areas most lithologically similar to Piedras Blancas I.

With the purpose of identifying the geotechnical characteristics of the soil, a vertical seismic profiling borehole with continuous core rotary drilling to a depth of about one metre was carried out. A TECOINSA hydraulic drill with the following features was utilised: TP-50 model, including batteries, Widia crown bits and diamond bits with diameters of 101 and 86 mm. Adhering to the corresponding UNE and NLT standards, the following tests were carried out on the samples extracted with the drill:

- U.S.C.S. classification, including a particle-size sieve analysis, according to Standard NLT-104. Atterberg limit test according to Standards UNE 103103 and 103104. Plasticity index testing according to NLT-106.
- Water Content Test, according to Standard NLT-102.
- Soil Density Testing, according to Standard UNE 103301.
- Simple Compression Rupture Test in Soil Test Specimens (UNE-103-400).
- Direct Shear Test.
- Low Load Oedometer Test.

Following this step, a petrographic study was conducted on four of the large stones identified at the site (numbers 1, 6, 7 and 8), as well as on different geological outcrops in order to compare the two analyses. For this step, thin sections were prepared in the laboratory for each of the chosen samples in order to observe them under an optical microscope (Olympus BHT).

To contribute to the overall geological and geomorphological characterisation of the stones, the areas on the site potentially affected by gravity-induced transportation of stones from the highest part of La Peña have been marked out. For this test, a Digital Elevation Model (MDT05) with a grid (raster) spacing of 5 m was created using the PNOA orthophotographs. Landserf 2.3 software was used to generate an automatic flow accumulation model from the Digital Elevation Model of the area studied, thus obtaining a map with flow accumulation lines. In terms of the hillside, these lines reflect the courses most likely followed by the blocks as they fell.

5 What follows here is a summary of LOZANO RODRÍGUEZ, J. A., PÉREZ VALERA, L. A., PÉREZ VALERA, F. and PÉREZ VALERA, J. A. (2015): *Estudio Geoarqueológico de Piedras Blancas (La Peña de los Enamorados, Antequera, Málaga).* Unpublished Report.

6 http://www.ideandalucia.es

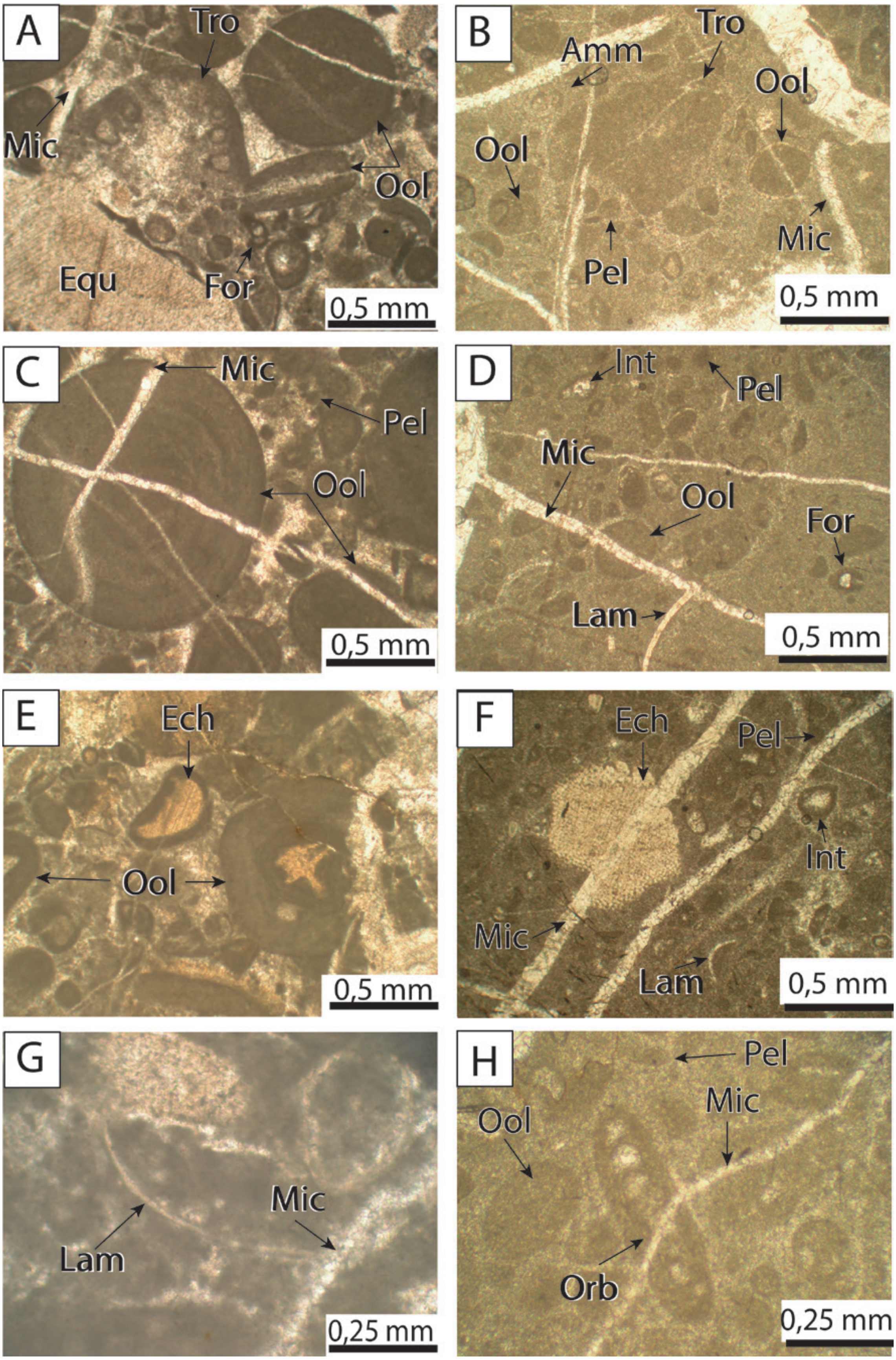


Fig. 13. Petrographic thin section microphotographs of two of the Piedras Blancas I large stones and nearby rocky outcrops (taken without crossed nicols): A, C: Stone 8; E, G: Stone 7; B, D, F and H: rocky outcrops on the NW side of La Peña de los Enamorados.Tro: Troctonita; Ool: ooliths; For: Foraminifera in a wide sense; Pel: Pellets; Ech: Echinnoderma; Lam: Thin-shell Lamellibranchia; Int: Intraclast; Mic: Micrite; Amm: Ammonite embryos. Photos: José Antonio Lozano Rodríguez, Luis Alfonso Pérez Valera and Fernando Pérez Valera.

Finally, different aerial photos taken from 1956 up until the present were compared with the aim of examining whether or not there has been any evolution regarding the location of these four stones over time.

4.2. RESULTS

Petrographic thin sections for the four selected stones were prepared in order to characterise the microfacies. Stones 8 and 7 correspond to white limestone with oolites, lamellibranchias with thin shells, bits of echinoderms, foraminifera (trocholines and orbitolinas), ammonite embryos, pellets and some intraclasts, supported by a matrix of micrite mud cementation (cryptocrystalline carbonate). These are typical of the Middle and Late Jurassic open platform (Dogger and Malm) within the interior Sub-Betic, and they present a packstone texture (Fig. 13). These two stones are located on the distal end of a Plio-Quaternary foothill, nourished by the same limestone as the NW face of La Peña. These materials correspond to those present in La Peña's northern cliff and therefore must have arrived to their present location by gravitational movement, anthropogenic action or a combination of both.

Stone 6, on the other hand, is a quartz sandstone with a large percentage of somewhat rounded quartz clasts, phyllosilicates, ore and matrix glauconite supported in siliceous cement (Fig. 14 A and B). It originated from the Mantle of Aljibe or the Numidian within the Mid-Southern Sub-Betic of the Campo de Gibraltar Complex dating back to the Miocene (Aquitanian). This stone appears together with three others of different sizes, forming round intrusions in a layer of sandstone, thus deforming the interior of the Aljibe clay. It appears that is present position may be explained by the stone being basically in situ (in fact, given its size and shape, we have reasons to suspect this stone is part of a larger rocky outcrop, although only excavation will confirm this point).

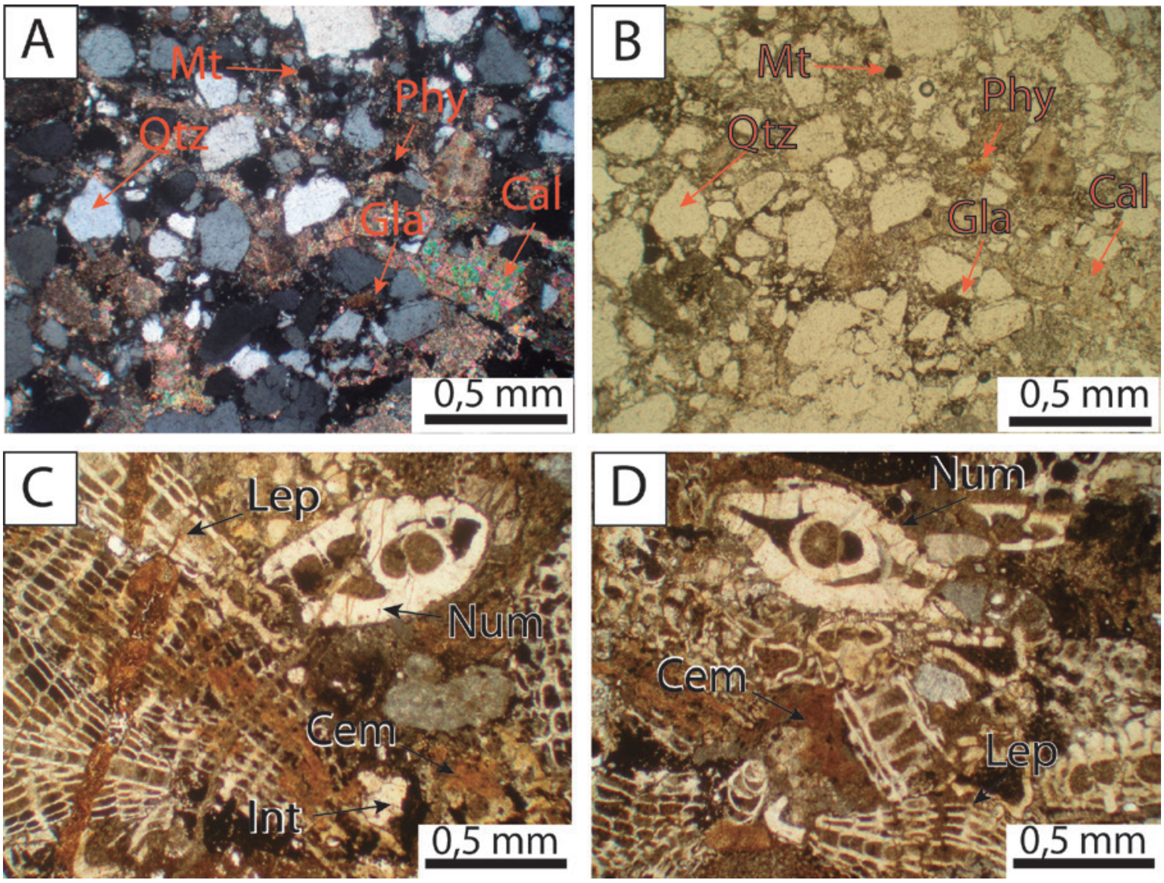


Fig. 14. A and B. Petrographic thin section microphotographs of Stone 6 taken with and without crossed nicols; Mt: Metallic ore; Phy: Phyllosilicate; Gla: Glauconite; Cal: Calcite; Qtz: Quartz; C. petrographic thin section microphotograph of Stone 1 taken with crossed nicols; D. petrographic thin section microphotograph of sample taken from the Piedras Blancas II quarrying area.Lep: Lepidocyclina; Num: Nummulites; Int: Intraclast; Cem: Cement. Design: José Antonio Lozano Rodríguez, Luis Alfonso Pérez Valera and Fernando Pérez Valera.

Finally, Stone 1, which was already explored in 2006, is a grey calcarenite with Microcodium from the Middle Sub-Betic dating back to the Palaeogene (Eocene). These calcarenites are composed of benthic foraminifera (lepidocyclina and nummulites), echinoderm spines and some intraclasts. They are strongly cemented (Fig. 14 C and D).

The results of the petrographic study show that stones 1, 6, 7 and 8 at Piedras Blancas I are geologically local. If they are not in their 'natural' position (as could be the case with Stone 6) they may have experienced short-distance movements (of less than 75 or a 100 m) as a result of gravitational displacement (resulting from erosion or earthquakes), anthropogenic activity or a combination of both. In effect, the representation of the gravitational flow accumulation model from the Digital Elevation Model of the site shows accumulation lines which reflect the courses most likely followed by the blocks as they fell along the La Peña hillside (Fig. 15). With certainty, Stone 8 and Stone 7 are located within the gravitational flow accumulation area and therefore the possibility that their present location is explained by natural reasons cannot be ruled out.

In order to better understand the current location of the Piedras Blancas I large stones, aerial photographs available from the second half of the 20th century up until the beginning of the 21st century were evaluated and compared with each other (Fig. 16). In the aerial photo dated 1956 (called *Vuelo Americano* –''American flight'– in Spain'), none of the stones seems to be visible (Fig. 16 B and C), while in the aerial photo dated 1986 only stone 8 is clearly visible (Fig. 16D). Stone 6, on the other hand, is only visible in the aerial photos taken after 1986. Given that it is embedded within layers of sedimentary soil (as we have previously mentioned), it could be speculated that Stone 6 may have been brought to the surface by recent deep-ploughing –an

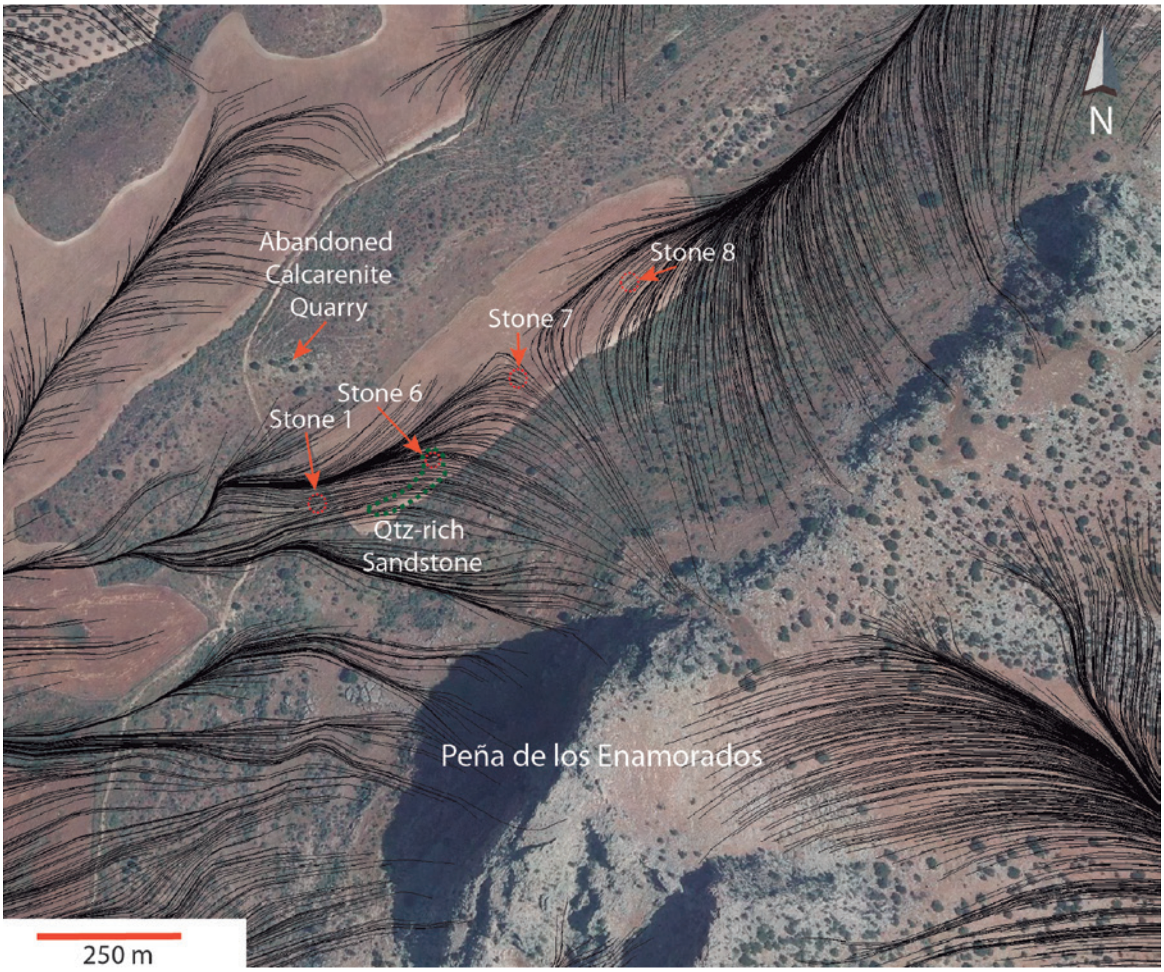
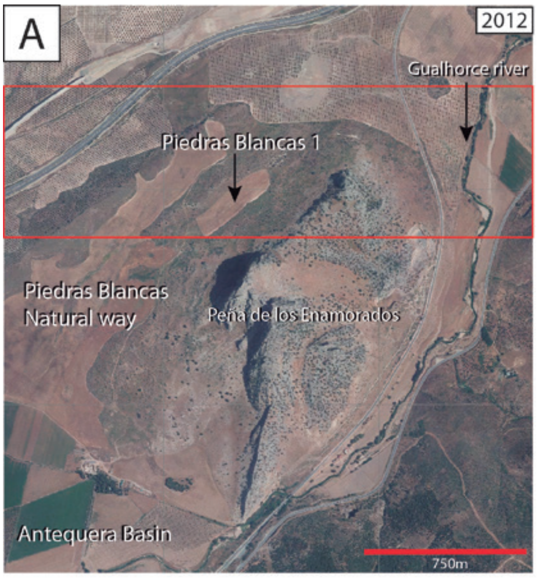


Fig. 15. Ortophotography of Piedras Blancas I and DEM-calculated accumulated flow lines of potential trajectories of stone blocks from the northern cliff of La Peña de los Enamorados by gravitational fall. Design: José Antonio Lozano Rodríguez, Luis Alfonso Pérez Valera and Fernando Pérez Valera.

activity which can significantly change the surface of the land–. Stone 1, however, is not visible in the aerial photo dated 1956 but could be present in the 1986 one (Fig. 16). We can additionally observe the presence of other rocks in the NW area of the cultivation site in the aerial photo dated 1986. These other rocks may be attributable to blocks of material extracted from a nearby quarry (Fig. 16 D and E) that were later removed from this cultivation area.

Altogether, the aerial photographs provide additional data that are useful for evaluating the presence of the large size stones which are visible on the surface of Piedras Blancas I. However, there are several factors that suggest that no final conclusions should be drawn from this dataset. Firstly, the resolution of the aerial photographs is not so high as to be certain that the apparent absence of some of the stones in some of them is not an observational problem: land-use patterns on the ground can produce significant changes in visibility, even during the annual cycle of cultivation, something we were able to confirm ourselves during consecutive site visits. Secondly, Piedras Blancas I is a complex site in geological and geomorphological terms as well as because of the land-use patterns prevailing in the last decades; the current location of some of the large stones visible on the site's surface may be the combined result of gravitational movements, quarrying and agricultural activity.

Finally, the geoarchaeological study was completed with a geotechnical analysis including ground drilling, sample retrieval and laboratory analyses. The objective of these final analyses was to assess the suitability of the soil for possible megalithic constructions. By carrying out the Particle-Size Sieve Analysis according to Standard NLT-104 the local soil was classified as clay of intermediate plasticity, while also bearing in mind the Atterberg



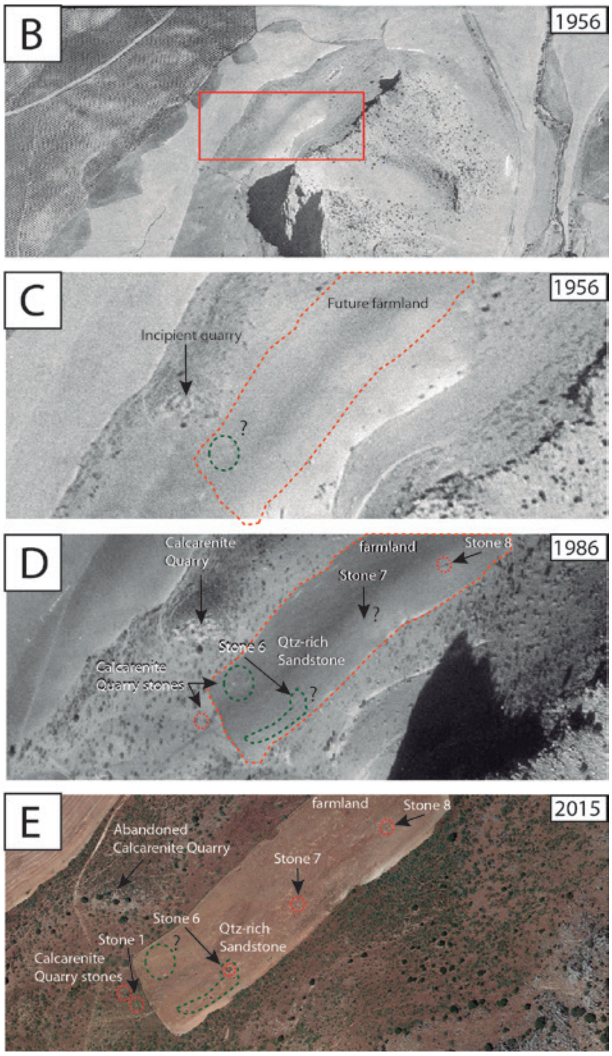


Fig. 16. Comparison of 20th and 21st centuries aerial photographs of Piedras Blancas I: A) Modern aerial photograph showing the Piedras Blancas I site at the NW sector of La Peña de los Enamorados; B) Aerial photographof the same area taken in 1956; C) Aerial photograph of the study area taken in 1956 (detail); D) Aerial photograph of the same area taken in 1986; E) Modern aerial photograph of the area. Design: José Antonio Lozano Rodríguez, Luis Alfonso Pérez Valera and Fernando Pérez Valera.

Sample		U.G.1	U.G.2	U.G.2
depth (m)		0.00-0.15	0.20-0.65	0.70-1.00
	T-20		100	
fineness	T-2		99,9	
	T-0.08		98	
Attetberg limit	LL% (Liquid limit)		35,5	
	LP% (Plastic limit)		21,2	
	IP% (Plasticity index)		14,2	
Clasificación A.S.T.M.D.			AC. Moderate plasticity clays	
Simple compression	Resistence (Kg/cm2)			3,16
	Dry density (gr/cm3)			1,66
Inflation pressure	Pressure (Kpa)			214,77
	Dry density (gr/cm3)			1,68
Expansivaness				Very high

Tab. 4. Results of the geotechnical analysis.

Limits according to Standards UNE 103103 and 103104 as well as the Plasticity Index according to Standard NLT-106 (Tab. 4). Moreover, the density and water content of the soil according to Standards UNE 103301 and NLT-102 respectively were also calculated. Likewise, the simple compression of the soil via the rupture test for soil test specimens (UNE-103-400) as well as the direct shear were calculated (Tab. 4). Finally, the consolidation and swelling parameters by conducting a low load oedometer test were established (Tab. 4).

As a results of these tests, it can be deduced that the resistance of the Piedras Blancas I soil to simple compression is good, although its swelling and consolidation parameters are high, meaning that the soil is unsuitable for building all types of structures.

5. CONCLUSIONS

Overall, the field and laboratory study carried out at Piedras Blancas I between 2013 and 2015 has allowed us to expand on the archaeological data obtained in 2006 as well as to obtain new geophysical and geoarchaeological data. This makes possible a more robust characterisation of the site as a place of prehistoric activity. In summary, this study fully confirms the presence of an important activity area of about *c.* 0.6ha if we strictly consider the spatial distribution of surface material, or over an area of about *c.* 1.5ha if we expand the site's sphere of activity to the Matacabras rock shelter (located just south of both Piedras Blancas I) and Piedras Blancas III –see discussion below– which is just to the north of Piedras Blancas I.

With regard to the chronology of Piedras Blancas I, *in situ* measurements were taken in July 2015 in order to obtain TL dating on samples of ceramic and lithic material[6] (Pls. 14 and 15). This TL dating, in addition to the possibility of radiocarbon dating following the excavation planned for 2016, could foreseeably help to establish the chronology of the site with greater precision. In the absence of numerical dating, the only currently available information comes from the techno-morphological classification of the lithic industry, both knapped and non-knapped. In this regard, the study of the knapped lithic industry shows the absence of large pieces while there is a generalisation and standardisation of small and very small tools. One of the main features of the Piedras Blancas I collection is the presence of microliths, including small and very small blanks both for the PB as well as the 2GNB. With regard to the typology of the 2GNB, we can observe a strong presence –though not very large– of traditional Epipaleolithic tools such as scrapers, perforators and truncated pieces, in addition to the emergence of sickle elements that appeared during the Neolithic period

7 At the time of writing this paper (October 2015), we are awaiting approval from the Andalusian regional governmentfor the proposed sampling.

Pl. 14. Isabel Dias and Guilherme Cardoso carry outiln situ TL measurements in July 2015. Photo: Leonardo García Sanjuán.

Pl. 15. TL. in situ TL measurements by Isabel Dias and Guilherme Cardoso (July 2015).Photo: Leonardo García Sanjuán.

and peaked during the Copper Age. We can also highlight the presence of an example of the so-called *picos asturienses* –''Asturian picks''– dated to the late Neolithic and the Copper Age.

In terms of the non-knapped lithic industry, it is worth noting the presence at Piedras Blancas I of hammers and mallets that are analogous (both in terms of morphology as well as the raw materials used –namely ophites and peridotites–) to those found in the infills of Menga's shaft and mound during excavation work carried out between 2005 and 2006 by the University of Granada. Menga's tools were interpreted by the excavators as evidence of "... the quarrying and dressing of Menga's capstones and orthostats"[7], most likely dating the tools to the early IV millennium BC.

Other indirect artefactual also suggests a possible IV millennium BC chronology for Piedras Blancas I. This is the case with the low amount of surface pottery found both in 2006 and in 2013 compared to the number of flint artefacts, which seems to be a relatively widespread characteristic among Late Neolithic sites in this region. The excavators of Huerta del Ciprés, a Late Neolithic site located barely 700m north of Menga and Viera, noted "...a relatively low number of pottery with the exception of storage vessels which are intentionally embedded in the soil..."[8]. We were ourselves able to confirm the same pattern on our surface survey of El Perezón, located a further 6 km to the North of Menga.

On the whole, the preliminary assessment made on the basis of the study of the lithic material found during the 2006 field survey, namely that Piedras Blancas I is likely dated between the IV and III millennia cal BC (Late Neolithic and Copper Age), seems supported. The Late Neolithic (IV millennium BC) is a period of intense activity in the Antequera depression as shown by the recently excavated settlements of Arroyo Saladillo and Huerta del Ciprés, or the megalithic monuments themselves –Menga, Viera and El Romeral–.

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7 CARRIÓN MÉNDEZ, F., MUÑIZ LÓPEZ, T., GARCÍA GONZÁLEZ, D., LOZANO RODRÍGUEZ, J. A., FÉLIX, P. and LÓPEZ RODRÍGUEZ, C. F. (2006): *Intervención en el Conjunto Megalítico de Menga y Viera (Antequera, Málaga)*. Granada. University of Granada (UnpublishedReport), pages 65-66.

8 CISNEROS GARCÍA, M. I. (2013): *Memoria Preliminar de Actividad Arqueológica Preventiva Mediante Excavación Arqueológica en el Yacimiento Huerta del Ciprés (Antequera, Málaga)*. Málaga. Taller de Investigaciones Arqueológicas SL (UnpublishedReport), page 264.

With regard to the site's character, although it is not possible to be certain on the basis of a surface survey, the newly obtained data suggest some ideas. One key issue, of course, is whether the large stones identified on the surface could have been megalithic monuments (i.e. menhirs) as has been previously hypothesised (García Sanjuán and Wheatley, 2009: 139; Bueno Ramírez *et al.*, 2009: Figure 003). In this respect, the newly-available data must be evaluated both contextually, as a whole, and in terms of each type of evidence.

The surface material suggests that hammering, grinding and polishing may have played a significant role at the site. As was previously mentioned, hammering tools analogous to those from Piedras Blancas I in terms of their morphology and raw material were discovered inside the infill of Menga's shaft. The site excavators attributed these tools to quarry work carried out for construction of the dolmen itself.

An interesting issue at Piedras Blancas I is the presence of non-local lithic raw materials. These include peridotites, which appear in very few places in the Betic mountains (Sierra Bermeja, Sierra Alpujata, Sierra de Aguas and Sierra de Carratraca, always in the province of Málaga, with the nearest outcrop located in the area immediately surrounding El Torcal de Antequera), as well as flint from the Milanos Formation (Middle Sub-Betic in the Betic Cordillera) and the 'Turón' type. Other lithic raw materials identified at Piedras Blancas I, however, are clearly local. This is the case with the ophites and dolerites –most likely from the "Trías de Antequera"– and the calcarenites located in outcrops near the north of La Peña. If we assume that Piedras Blancas I was a residential space, the presence of non-local raw materials could be explained by the widespread movement of people and goods during Late Prehistory in this region, which has already been established. If, on the other hand, Piedras Blancas I is hypothesized to have been a place for temporary aggregation, which would be consistent with the nearby presence of the Matacabras rock-art shelter, the presence of non-local raw materials could be explained by the periodical influx of non-local individuals.

As for the geophysical survey, the results revealed the presence of discrete positive anomalies with diameters between 1.5 and 2 m in the northern part of the site which could be negative, subcircular structures as well as a positive response area that may suggest possible occupation deposits. Likewise, the southern part of the site shows several positive anomalies that suggest the possible presence of pits or analogous negative features. Particularly interesting is the data obtained from the high resolution magnetometer survey conducted in the area surrounding stones 5, 6, 8 and 9 that pointed towards a presence of subcircular anomalies that could be representative of negative structures.

The geotechnical data also provides further evidence to be considered. The gravitational analysis demonstrates that the large stones at Piedras Blancas I are located in areas where blocks and boulders tend to fall from the northern cliff of La Peña, just a few hundred metres to the south. This suggests that it cannot be assumed that the stones were moved to their current locations by human activity, though we cannot rule out the possibility of short-distance, non-gravitational displacements within these fall zones either. The analysis of the aerial photographs reveals that the stones are not outwardly visible in the older photos. This may indicate that the stones either were not located in their current locations (which would obviously go against the possibility of these stones having had a social and symbolic meaning during Late Prehistory), or simply that the conditions of ground usage and surface visibility made these stones imperceptible in the photos. Our own experience after consecutive site visits during different times of the year suggestes, however that the visibility of the surface stones does indeed change drastically. Finally, the results of the geotechnical analysis show that the substratum presents elevated swelling and expansiveness parameters, thus making the soil unsuitable for erecting complex constructions.

In addition to the empirical evidence described above, it should be pointed out that during the surveys conducted in 2006 a possible megalithic construction was identified in the area surrounding Piedras Blancas I (just a hundred metres to the north of the area surveyed in 2013)(Fig. 09 and Pl. 16). This possible megalithic construction was named Piedras Blancas III to distinguish it from both the current-day adjacent limestone quarry (Piedras Blancas II) and from Piedras Blancas I itself. The surface cleaning carried out at the site did not result in any artefacts that could be assessed for possible functions or chronologies. Nonetheless, the architecture and morphology of this construction suggest that it was

Pl. 16. Overview of the possible megalithic structure at PiedrasBlancas III found after surface clearance in April 2006. Photo: Leonardo García Sanjuán.

a megalithic structure with a maximum length of about 5-6 m that took advantage of the orientation of the natural rock alignments (East-West) in order to create a closed space delimited by worked slabs. A structure of this kind, dated to the Late Copper Age and Early Bronze Age was documented at Cortijo de El Tardón (Ferrer Palma *et al.*, 1987; Fernández Ruiz *et al.*, 1997). The possible megalithic structure of Piedras Blancas III is visible from both Matacabras and Piedras Blancas I.

In short, the surface study conducted between 2013 and 2015 at Piedras Blancas I has provided evidence that considerably clarifies and expands on the observations made following the surface field surveys in 2006 concerning the site's chronological and functional characterisation. The data obtained, of course, is inconclusive regarding some of the more specific issues, particularly the nature of the large stones identified on the surface, an issue which only an archaeological excavation could clarify. We expect that the ongoing research project will provide further and better evidence concerning these questions.

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APPENDIX 1. CERAMIC MATERIAL

Nº	FORM	FRAG-MENT	FIRING	THICK-NESS	TREATMENT		COLOUR		OBSERVATIONS
					EXTERNAL	INTERNAL	EXTERNAL	INTERNAL	
21	Non-diagn.	Body	Oxidized	Fine	Smoothed	Smoothed	Brown	Brown	Hand-thrown
24	Non-diagn.	Body	Reduced	Medium	?	?	Brown	Reddish	Hand-thrown
25	Non-diagn.	Body	Reduced	Coarse	Smoothed?	Untreated	Brown	Brown	Hand-thrown
32	Non-diagn.	Body	Mixed	Medium	?	?	Reddish	Reddish	Hand-thrown?
38	Non-diagn.	Body	Mixed	Coarse	Smoothed	Untreated	Reddish	Black?	Hand-thrown
40	Bowl?	Rim	Mixed	Medium	Burnished?	Burnished?	Reddish	Reddish	Wheel-Thrown
41	Non-diagn.	Body	Oxidized	Medium	Smoothed	Smoothed	Beige	Reddish	Wheel-Thrown
44	Non-diagn.	Body	Reduced	Coarse	Untreated	Untreated	Brown	Brown	Hand-thrown
45	Non-diagn.	Body	Reduced	Coarse	Untreated	Untreated	Brown	Brown	Hand-thrown
65	Non-diagn.	Body	Oxidized	Medium	Smoothed	Smoothed	Reddish	Reddish	Wheel-Thrown
75	Non-diagn.	Body	Oxidized	Medium	Smoothed	Smoothed	Beige	Reddish	Wheel-Thrown
76	Non-diagn.	Body	Reduced	Medium	?	?	Brown	Gray	Hand-thrown
77	Non-diagn.	Body	Reduced	Coarse	Smoothed	Untreated	Gray	Gray	Hand-thrown
91	Non-diagn.	Body	Mixed	Medium	Smoothed	Smoothed	Reddish	Brown	Hand-thrown
97	Non-diagn.	Body	Mixed	Medium	Smoothed	Smoothed	Reddish	Reddish	Hand-thrown
117	Non-diagn.	Body	Reduced	Medium	?	?	Reddish	Reddish	Hand-thrown
127	Non-diagn.	Body	Mixed	Coarse	Smoothed	Untreated	Brown	Brown	Hand-thrown

APPENDIX 2. KNAPPED FLINT LITHICS

Nº	TIPOLOGY		COLOUR	FRACTURE	LENGTH	WIDT
1	Flake fragment with abrupt marginal retouch	A1	Brown	Orientation not possible		
2	Fragmented debris		Gray	Orientation not possible		
3	Flake fragment with flat retouch (foliaceous)	F	Brown	Orientation not possible		
4	Retouched notch	D21	Gray		1.1	1.9
5	Retouched notch	D21	Brown	Orientation not possible		
6	Chip		Beige		1.3	1
7	Internal flake		Beige	Orientation not possible	1.7	1
8	Retouched notch	D21 y T22	Brown		2.2	1.5
9	Marginal point	P11	Beige	Orientation not possible		
10	Core with two extractions		Beige		2.3	1.7
11	Perforator with retouched notch	P	Beige		1.9	1.2
12	Flake fragment		Beige	Orientation not possible	1.2	0.5
13	Core fragment		Gray	Orientation not possible		
14	Denticulated	D1	Beige	Distal		1.4
15	Racloir	R21	Gray	Orientation not possible	3.1	2.3
16	Core tablet		Brown		1.5	1.1
17	Retouched notch	D21	Brown	Left	1.9	
18	Pyramidal core		Gray		1.4	2.3
20	Debris		Beige		1.8	1
23	Simple marginal retouch/use?	RSm	Beige		1.3	1
26	Scrapper	G12	Brown		3.6	1.8
27	Truncated tool	T22	Gray	Distal		1.3
29	Internal flake		Gray		1.2	1.7
30	Quartz nodule		Traslucid beige		1.6	1.7
31	Racloir	R1	Gray	Proximal-Distal		1.4
33	Chip		Gray		1.3	0.9
34	Retouched notch	D21	Brown	Proximal		
35	Retouched notch	D21	Gray	Orientation not possible		
36	Pyramidal core		Gray		4.2	2.9
37	Racloir	R1	Beige		1.4	2
39	Fractured blade with simple-abrupt marginal retouch	RSAm	White	Distal-Proximal		1.8
42	Cortical flake with small notch	D21	Gray	Right		
43	Quartz nodule		Beige		1.7	1.2
46	Racloir	R22	Brown		3	3.6
47	Core debris		Pink		2.1	1.2

THICKNESS	BASE	SECTION	PB	1GNB	2GNB	BULB	TYPOMETRY
	Flakef ragment	Non cortical	No	No	Yes	Suppressed	
	Debris	Non cortical prevalent over cortical	No	Yes	No		
	Flake fragment	Non cortical	No	No	Yes	Flat	
0.5	Internal flake	Non cortical	Yes	No	No	Flat	Very broad micro-flake
	Internal flake	Non cortical	No	No	Yes	Suppressed	
0.3	Internal flake	Non cortical	Yes	No	No	Flat	Micro-flake
0.5	Internal flake	Non cortical	Yes	No	No	Suppressed	
0.6	Internal flake	Non cortical	No	No	Yes	Pointed	Micro-flake
	Internal flake	Non cortical	No	No	Yes	Suppressed	
0.9	Core	Non cortical prevalent over cortical	No	Yes	No		
0.3	Internal flake	Non cortical	No	No	Yes	Dihedral	Micro-flake
0.3	Internal flake	Non cortical	Yes	No	No	Suppressed	
	Core	Non cortical	No	Yes	No		
0.7	Internal flake	Non cortical	No	No	Yes	Faceted	Micro-flake
0.5	Internal flake	Non cortical	No	No	Yes	Suppressed	
0.5	Core	Non cortical	Yes	No	No		
0.5	Internal flake	Non cortical	No	No	Yes	Flat	
1.5	Core	Non cortical	No	Yes	No		
0.3	Debris	Non cortical	No	Yes	No		
0.3	Internal flake?	Non cortical	No	No	Yes	Suppressed	
0.7	Levallois blade	Non cortical	No	No	Yes	Suppressed	Micro-flake
0.5	Internal flake?	Non cortical	No	No	Yes	Dihedral	
0.4	Internal flake	Non cortical	Yes	No	No	Dihedral?	Very broad micro-flake
1.3	Nodule	Non cortical	No	No	No		
0.5	Internal blade	Non cortical	No	No	Yes	Suppressed	
0.3	Levallois flake	Non cortical	Yes	No	No	Pointed	Micro-flake
	Internal flake	Non cortical	No	No	Yes	Suppressed	
	Debris?	Non cortical	No	No	Yes	Suppressed	
1.6	Core	Non cortical	No	Yes	No		
0.8	Pseudo Levallois-flake	Non cortical	No	No	Yes	Flat	Broad micro-flake
0.5	Internal blade	Non cortical	No	No	Yes	Suppressed	
	Cortical flake	Cortical	No	No	Yes	Flat?	
0.8	Nodule	Cortical prevalent over non cortical	No	No	No		
1.5	Internal flake	Non cortical	No	No	Yes	Flat	Small broad-flake
0.5	Debris	Non cortical	No	Yes	No		

Nº	TIPOLOGY		COLOUR	FRACTURE	LENGTH	WIDT
48	Dorsal facepoint	PD12	Beige		2	2
49	Microflake		Beige		1.3	0.8
50	Polyhedral core		White		3.4	2.3
51	Denticulated	D3	Gray		3.6	2.6
52	Bifacial racloir	R	Beige		6.4	4
53	Core		Brown		3.1	2.4
54	Lateral racloir	R21	Brown		3.1	1.6
55	Core		Beige		3.4	4.6
57	Core debris		Gray		2.2	1.4
58	Debris		Gray			
59	Sikleblade element	EH	Light Brown	Proximal		2.2
60	Racloir	R21-D1	Beige	Distal		2.1
61	PB fragment		Gray	Orientation not possible		
62	Retouched notch	D21	Beige		4	3.2
66	Barbed point (in preparation)		Gray-Pink		3	2.6
67	Internal flake fragment		Gray	Orientation not possible		
68	Microblade with very marginal use retouch (usage?/accidental?)		Pink	Distal		0.6
69	Pyramidal core		Beige		3.6	1.2
71	Marginal abrupt	A1	Beige		5.1	1.7
72	Core debris		Gray		2.4	1.8
73	Denticulated	D1	Gray			
98	Retouche dnotch	D21	Gray		7.8	5.3
106	Truncated tool	T22	Brown		1.7	1.2
107	Retouched notch	D21	Brown		3	1.8
109	Trihedral pick		Greenish		10.4	8.2
112	Denticulated	D3	Gray		5.8	5.6
118	Scrapper	G2	Beige		2.5	2
119	Denticulated	D1	Beige	Proximal?	2.2	1.2
125	Dorsal face point and racloir	PD12	Gray	Distal	2.5	3
126	Retouched notch	D21	Brown		4.3	2.7

THICKNESS	BASE	SECTION	PB	1GNB	2GNB	BULB	TYPOMETRY
0.4	Internal flake	Non cortical	No	No	Yes	Pointed	
0.4	Internal blade	Non cortical	Yes	No	No	Faceted	Micro-flake
1.5	Core	Non cortical	No	Yes	No		
1.5	Internal flake	Non cortical	No	No	Yes	Suppressed	
2.4	Cortical flake	Cortical prevalent over non cortical	No	Yes	Yes	Suppressed	Laminar flake
2	Core	Non cortical prevalent over cortical	No	Yes	No		
0.7	Semicortical blade	Non cortical prevalent over cortical	No	No	Yes	Flat	Micro-flake
1.6	Core	Non cortical prevalent over cortical	No	Yes	No		
0.8	Debris	Non cortical	Yes	No	No	Suppressed	
	Internal blade	Non cortical	No	No	Yes	Suppressed	
0.8	Internal blade?	Non cortical	No	No	Yes	Suppressed	
0.3	Internal blade	Non cortical	No	No	Yes	Faceted	
	BP fragment	Non cortical	Yes	No	No	Suppressed	
1.8	Internal flake	Non cortical	No	No	Yes	Flat	
0.7	Internal blade	Non cortical	No	No	Yes	Suppressed	Middle
	Internal flake	Non cortical prevalent cortical	Yes	No	No	Suppressed	
0.4	Internal blade	Non cortical	Yes	No	No	Pointed	Micro-blade
1.1	Core	Non cortical	No	Yes	No		
1.4	Internal blade	Non cortical	No	No	Yes	Suppressed	
1.4	Debris	Non cortical	Yes	No	No		
0.3	Internal blade	Non cortical	No	No	Yes	Suppressed	
1.8	Cortical flake	Cortical	No	No	Yes	Suppressed	
0.4	Internal flake	Non cortical	No	No	Yes	Suppressed	
1.1	Internal flake	Non cortical	No	No	Yes	Suppressed	
2.7	Pebble	Cortical prevalent over non cortical	No	Yes	No		
1.7	Semicortical flake	Cortical prevalent over non cortical	No	No	Yes		Broad-flake
0.7	Internal flake	Non cortical	No	No	Yes	Flat	Micro-flake
0.5	Internal flake	Non cortical	No	No	Yes	Suppressed	
0.6	Internal flake	Non cortical	No	No	Yes	Faceted?	Small broad-flake
1.7	Coreor Debris	Non cortical	No	No	Yes		

APPENDIX 3. NON-KNAPPED LITHICS

Nº	TIPE	FRACTURE	INTEGRITY	LENGHT (cm)	WIDTH (cm)	THICKNESS (cm)	SURFACE	WEIGHT (gr)
78	MALLET?	Distal-Proxi-mal	Fractured		5.7	4.6	Pecked? Polished	320
79	INDETERMINED	Distal-Right	Fragment			3.9	Polished-Pecked	180
80	QUERN?		Fragment				Polished	60
81	INDETERMINADO	Convex	Fractured			3.6	Natural? Hammered?	57
87	MULLER?	Bi-convex	Fractured				Hammered-Pecked	910
88	QUERN?	Distal	Fragment	12.0	7.0	8.0	Pecked Polished?	1,100
92	ADZE	Bi-convex	Fractured	11.6	5.7	3.6	Polished Pecked	313
93	MULLER	Distal	Fragment			4.5	Polished	151
94	MULLER		Fragment				Polished	451
95	QUERN?		Fragment				Polished	198
96	QUERN		Fragment				Polished	441
99	QUERN?		Fragment				Polished	730
102	MULLER/MALLET?	Left	Fractured	8.2		5.5	Polished? Hammered?	440
103	QUERN?		Fragment				Polished?	582
104	MULLER?		Fragment				Polished?	58
105	QUERN		Fragment			3	Polished	439
108	QUERN		Fragment				Polished	427
110	INDETERMINED		Whole	11.4	8.7	5	Hammered	697
111	QUERN		Fragment				Polished	184
113	QUERN		Fragment			6	Polished	1,060
115	INDETERMINED		Fragment				Polished?	150
116	INDETERMINED		Whole	7.9	6.7	2.7	Hammered	233
118	QUERN?		Fragment			7.3	Polished	1,310
119	QUERN		Fragment			4.8	Polished	430
120	QUERN		Fragment				Polished	980
123	MALLET	Distal	Fractured		5.2	4.8	Hammered	337
124	MULLER	Distal	Fractured		9.5	4.7	Polished	540
132	QUERN	Proximal	Whole	19.2	14.8	5.6	Polished	2,600
133	QUERN	Left-Proximal	Fractured	20.5	15.6	7.8	Polished	3,100
134	INDETERMINED		Fractured		14.2	11.5	Polished? Hammered?	2,800
TOTAL WEIGHT								**21,278 Kg**