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Presentation of the lithic assemblage of the Toriles Cave arqueopaleontological site (Carrizosa, Ciudad Real, Spain).

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1. Introduction

The study area, situated on the southern sub-plateau of the Iberian Peninsula, has been characterized by investigations into sites on terraces associated with faunal remains, as highlighted by Mazo et al. (1990). However, despite the abundance of archaeological material from these chronologies, there have been no clear signs of human occupation, as noted by Santonja and Villa (2006). This absence of well-defined archaeological contexts has hindered comprehensive research into the territories spanning between the Guadiana and Guadalquivir basins during the Paleolithic period. The limited research in this region has hampered the development of regional syntheses necessary for understanding the populations that inhabited these lands during the earliest periods of Prehistory. Although some attempts have been made, as mentioned by Ciudad Serrano (2000), the overall scarcity of information persists. This knowledge gap becomes even more pronounced when focusing on the upper Guadiana basin, situated far from the last foothills of the Central and Iberian System. Despite the presence of approximately 70 sites with some evidence linked to the Pleistocene (2.6/0.11 Mya) in this area, only 14 of them possess known stratigraphic contexts, as reported by Fernández et al. (2005) and García-Martínez (2019). Furthermore, only one site, Molino del Emperador, located on the +13/16m terrace of the Guadiana River, has an absolute dating obtained through Optically Stimulated Luminescence (OSL), as indicated by Fernández et al. (2005).

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78 The challenging landscape described, as highlighted by previous authors
79 (Fernández et al., 2005; García-Martínez, 2019), stems from two key factors.
80 Firstly, there's a significant scarcity of karstic systems such as caves or
81 sinkholes where archaeological and paleontological materials could readily
82 accumulate. Secondly, the majority of Pleistocene materials originate from
83 alluvial plains within the basins of the Guadiana or Guadalquivir rivers, which
84 are now heavily impacted by agricultural activities, with cultivated surfaces
85 comprising approximately 50% of the total area (García-Martínez, 2019).
86 Consequently, much of the Paleolithic and Pleistocene material is exposed on
87 outcrops or agricultural lands, often found at the surface or mixed within the
88 soil layers. This situation complicates efforts to obtain absolute dating for
89 lithic assemblages, aside from rare exceptions such as the case of Molino del
90 Emperador. Without such dating, the formulation of overarching hypotheses
91 is severely hindered, restricting research to the organization and typological
92 seriation of materials.

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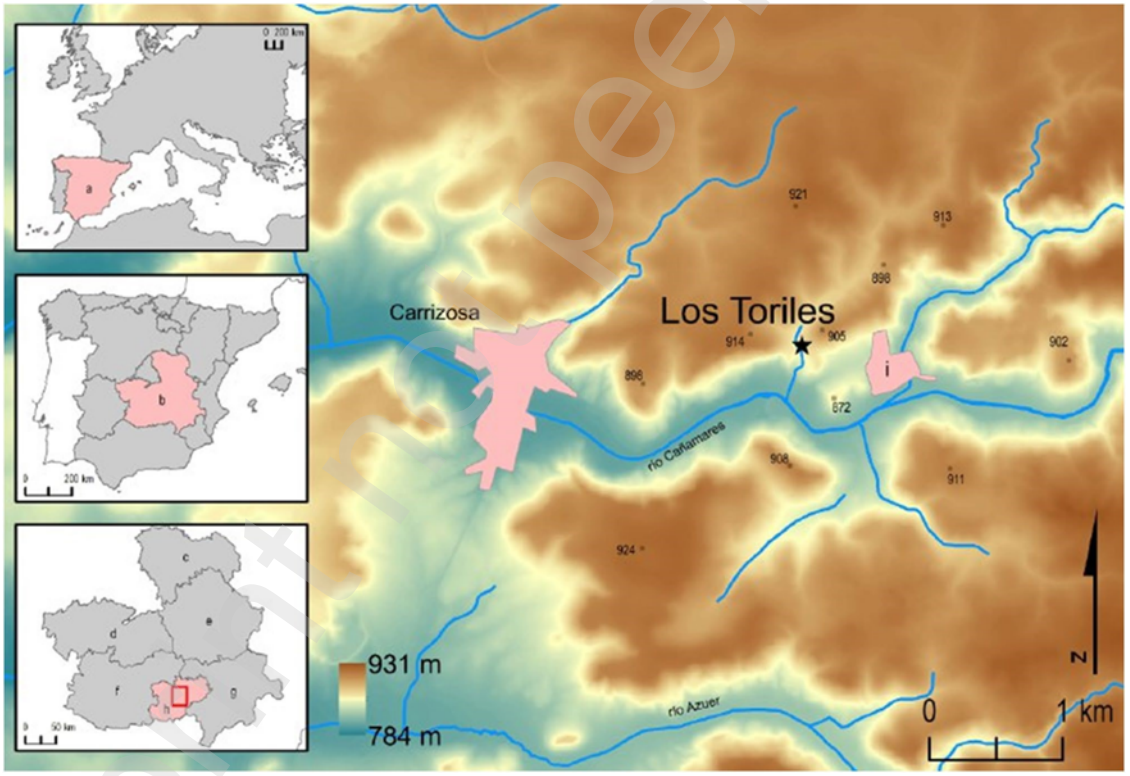
Additionally, the predominantly surface-level nature of these remains results in a dearth of faunal associations, essential for making climatic and biochronological inferences. Addressing these challenges requires intensified research efforts focused on systematic excavation, the application of precise dating techniques, and interdisciplinary collaboration to glean insights into the prehistoric populations of the upper Guadiana basin and beyond. This bias in the record has led academia to propose low levels of human occupation, particularly during the Upper Paleolithic through the Early Chalcolithic period (Ciudad Serrano, 2000). However, these hypotheses, based on the lack of



evidence, are entirely falsifiable through the work of certain research teams uncovering indisputable evidence of human presence during the coldest periods of MIS2 in inland Iberia (Alcaraz-Castaño et al., 2015; Castaño et al., 2019). Therefore, the lack of a robust archaeological record of Paleolithic

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phases in the Southern Iberian sub-plateau likely reflects the aforementioned limitations rather than a genuine absence of sites or human populations during the Pleistocene in the area under consideration.

Figure 1. The geographical location of the Toriles Cave in Europe (top-left), Iberian Peninsula (top-centre), and Castilla-La Mancha Autonomous Community (bottom left), as well as a detail, on a color map, of the position of the site between the two nearest towns. Legend: (a) Spain, (b) Autonomous Community of Castilla-La Mancha, (c) Province of Guadalajara, (d) Province of Toledo, (e) Province of Cuenca, (f) Province of Ciudad Real, (g) Province of Albacete, (h) Campo de Montiel (local term of a historical and administrative area) and (i) La Carrasca (nearest town to the cave). Taken from García-Martínez et al., 2020.

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1.1. Geographical and geomorphological framework

The study area is situated within the upper Guadiana basin, a geomorphologically distinct natural region located at the southeastern boundary of the Central Plateau, which spans a significant portion of the Iberian Peninsula. La Mancha's territory is predominantly traversed by river courses belonging to the Guadiana basin, with fewer rivers flowing southwards into the Guadalquivir basin.

Geomorphologically, the Campo de Montiel unit comprises a Mesozoic cover resting atop the Paleozoic plinth of the Iberian Plateau. This unit consists of two lithostratigraphic layers: a lower layer of Triassic age, composed of detrital elements overlain by margo-Kessic formations, and an upper layer of Jurassic age, consisting of carbonates upon which the current morphology has been shaped. The nearly tabular structure of the territory gives it the appearance of a high plateau, now intersected by various rivers, with the Jabalón, Azuer, and Cañamares being the most significant. This extensive plain, carved from Jurassic carbonate materials, known as the Ossa de Montiel Surface, has undergone significant karst processes, resulting in sinkholes, caves, and other endokarst formations with several meters of development (Rodríguez Fernández et al., 2015). Consequently, it is in the southern part of this surface where various archaeo-paleontological endeavors have been undertaken, with the partial findings of these efforts forming the subject of this publication (Figure 2).

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141 The Toriles Cave is situated on the eastern slope of an area known as the
142 Cañada del Pozo Hondo, where previous prospecting endeavors have been
143 conducted. This intermittent stream flows into the Cañamares River on its
144 right bank, a tributary of the Azuer River, one of the principal tributaries of the
145 Guadiana River. The cave is part of a cluster of karstic formations that have
146 been recognized since ancient times by the inhabitants of Carrizosa, the
147 municipality to which it belongs. Historically, the cave has been utilized for
148 recreational and leisure activities by the local population, leading to the
149 chance discovery of a significant fossil assemblage (García-Martínez et al.,
150 2020), including two mustelid teeth, which prompted further research in the
151 area.

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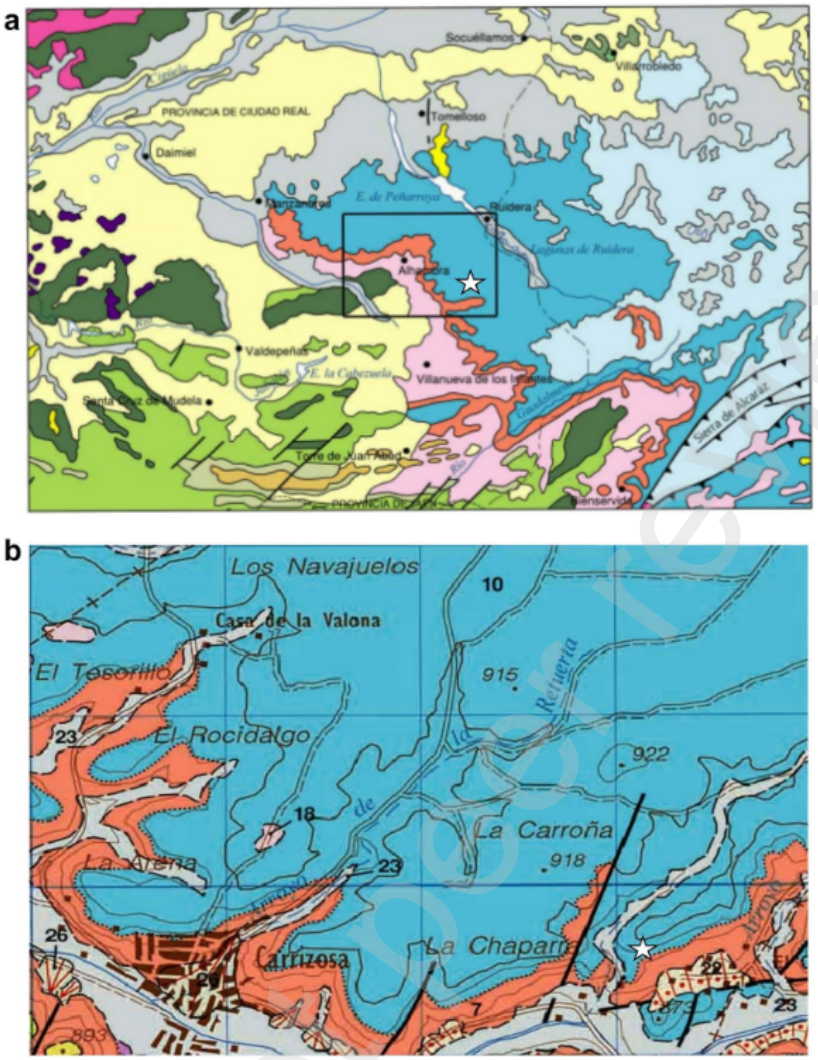

Figure 2. Location of the cave, marked with a star, on the regional geological map taken from the IGME, both at 1: 1.000.000 (a) scale and at 1: 50.000 (b) scale. The cave is located at the contact between the blue and red areas, corresponding respectively to the Jurassic and Upper Triassic (F. Keuper). Taken from García-Martínez et al., 2020.

1.2. The Paleolithic in the Upper Guadiana Basin

The scarcity of scientific studies on the Pleistocene era does not negate the existence of archaeological sites, albeit primarily documented through surface materials, as mentioned earlier. This phenomenon is a consequence of the abundant availability of quartzite cobbles in the region, leading to the proliferation of open-air surface knapping areas (Lopez et al., 2001). Quartzite

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was sourced from alluvial terrace materials or directly from quartzite outcrops, such as the nearby site of "Los Pizorros" in Villanueva de los Infantes, which is currently under investigation (Díaz-Pérez et al., 2022). These sites predominantly span from the Lower Paleolithic to well into the Middle Paleolithic, as evidence of the Upper Paleolithic in the study area is scarce.

Middle Pleistocene sites like Puente Picón, Laguna Blanca, El Carmelín, Puente Pozuelos, or Puente Morena (Ciudad Serrano, 1986a; Lopez et al., 2001) are renowned for shedding light on the earliest human occupation in the upper Guadiana region, with artifacts attributed to the Lower Acheulean. Notable features include bifacially worked cobbles, with an emerging typological diversification showcasing trihedral forms, cleavers, and scrapers (Ciudad Serrano, 2000).

During the Middle Pleistocene, contemporaneous with MIS6, several sites exhibit industries associated with the Middle Acheulean. Examples include Albalá (Arroyo and De La Torre, 2013; Santonja et al., 1977), El Martinete (Santonja and Querol, 1983), and the +13-16m terrace of Molino del Emperador, dated to approximately 153,867 ± 12,448 to 140,016 ± 9,405 years B.P. (Fernández et al., 2005; Lopez et al., 2001). These sites are characterized by classic bifaces, predominantly amygdaloid, along with trihedrons and cleavers following Tixier's typology (Tixier 1956; Ciudad Serrano, 2000).

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In MIS5, between the Riss and Würm glaciations, Upper Acheulean materials have been identified at sites like El Sotillo (Arroyo and De La Torre, 2013; Ciudad Serrano et al., 1983a) and Porzuna (Vallespí et al., 1985, 1979). The archaeological assemblage at Porzuna is particularly noteworthy, with an abundance of bifaces and cleavers. Some scholars interpret these materials as evidence of a local concentration of occupations extending throughout the Bullaque River basin, suggesting its role as a provisioning and knapping area for quartzite, as well as for processing game, possibly indicating long-term settlement. Furthermore, its use extends back to the Middle Paleolithic, as evidenced by numerous Mousterian industries.

During the Upper Pleistocene, there appears to be an increase in population density and territorial expansion, evidenced by the proliferation of Mousterian industry sites. The number of sites with this industrial complex, exceeding 70, surpasses those of previous periods (Fernández et al., 2005). In our study area, these assemblages are commonly referred to as Mousterian of Acheulean tradition (MTA), a term advocated by Bordes (1953), linking them directly to Upper Acheulean industries. However, recent studies indicate a complex coexistence between Acheulean and Mousterian industries in the Iberian Peninsula between 300 and 100 ky BP, challenging the notion of a straightforward chronological progression (Arroyo and De La Torre, 2013). Therefore, the chronological assignment based solely on the presence or absence of certain elements within an assemblage may not be entirely accurate, although a gradual decrease in bifaces during the Mousterian has

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been documented (Moncel et al., 2011). Thus, there is a pressing need to obtain more absolute dates for lithic assemblages throughout the Upper Guadiana area.

As previously mentioned, several sites in the region exhibit Mousterian industry, including La Atalaya, Casa Calares, La Celada, Casa de los Castillejos, La Fonteva, La Raña, and El Vicario (Ciudad Serrano, 1986b; Lopez et al., 2001). These assemblages are characterized by a predominance of discoid cores, alongside a significant presence of the Levallois technique. Additionally, they feature a diverse range of retouched tools on flakes, such as side scrapers, denticulates, and notched tools (Fernández et al., 2005).

1.3. Aims of this study.

This paper reports the results of archaeological surveys and excavations carried out in the Toriles Cave and its surroundings (Carrizosa, Ciudad Real, Spain) is part of this line of work aimed at correcting the bias in the archaeological and paleontological record. Since 2019, four field-seasons have been carried out in the cave with quite encouraging preliminary results, documenting, in addition to Pleistocene fauna (García-Martínez et al., 2020), evidence of occupation from at least the Middle Paleolithic (Megía García et al., 2020), Roman times (Moya-Maleno et al., 2021), and up to the present day. These good results led the team to survey the area around the cave to better understand the landscape around it and the characteristics of the territory that potentially played an important role in the development of

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231 Paleolithic populations. The aim of this study is to provide evidence of human
232 occupation at Prehistoric times of the cave and the surrounding area.

233 2. Material and methods.

234 The surveyed area encompasses 75,900 square meters in the vicinity of the
235 Cañada del Pozo Hondo, where the cave is situated on the eastern slope (see
236 Figure 1). Apart from the ceramic fragments also recovered during this
237 ongoing study (Moya-Maleno et al., in preparation), a total of 45 lithic pieces
238 have been collected, with four of them excavated within the cave in known
239 stratigraphic contexts, while the remainder were uncovered during the survey
240 of the surrounding area. We conducted a typological analysis of all the pieces,
241 and additionally, four of them underwent absolute dating using the uranium
242 series technique applied to the calcareous crusts formed by the precipitation
243 of calcium carbonate on various anthropic extractions present in the
244 materials. Furthermore, during the survey of the surrounding area, a fragment
245 of a speleothem was discovered. Given the rarity of such material in the area
246 and its potential to indicate the presence and minimum chronology of caves
247 and cavities, we also subjected it to dating using the uranium series method.

248 3. Results: The lithic assemblage from Toriles

249 3.1. Techno-Typological characterization.

250 Geo-archaeological studies have been carried out at Toriles Cave to
251 identify the mineralogical and petrological characterization of the lithic
252 industry of the site. The typological study is established in combination with

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253 the lithological analysis to determine the possible catchment areas of the raw
254 material, both autochthonous and allochthonous.

255 The lithic assemblage found in the Toriles Cave consists of 39 quartzite
256 tools, the predominant raw material, and 6 flint fragments. The material has
257 not been found contextualized in the stratigraphic units but has surfaced both
258 in areas of disturbed sediment and in survey areas. At the typological level,
259 handaxes, retouched pieces, blades, and cores stand out, followed by the
260 *debris* produced during the knapping process (Table 1). The variability of the
261 assemblage is also reflected in the size of the pieces, with small and medium-
262 sized pieces (flakes, triangular flake, and retouched pieces) and large-sized
263 pieces as quartzite cobbles being relevant.

Lithic categories	Nº. of pieces
Handaxe	2
Triangular flake	1
Simple flake	13
Retouched flake	5
Cortical flake	5
Flake fragments	15
Quartzite cobbles	2
Fragment of hammerstone	2

264 *Table 1. Lithic categories and number of items found at Toriles Cave*
265 *(Carrizosa, Ciudad Real).*

266 Different phases of the *chaine operatoire* can be observed in the
267 collection of raw materials, and the debitage of cores to produce flakes and
268 final products. There is evidence of a predominance of production systems

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oriented towards the production of simple flakes, flakes fragments, followed by bifacial production.

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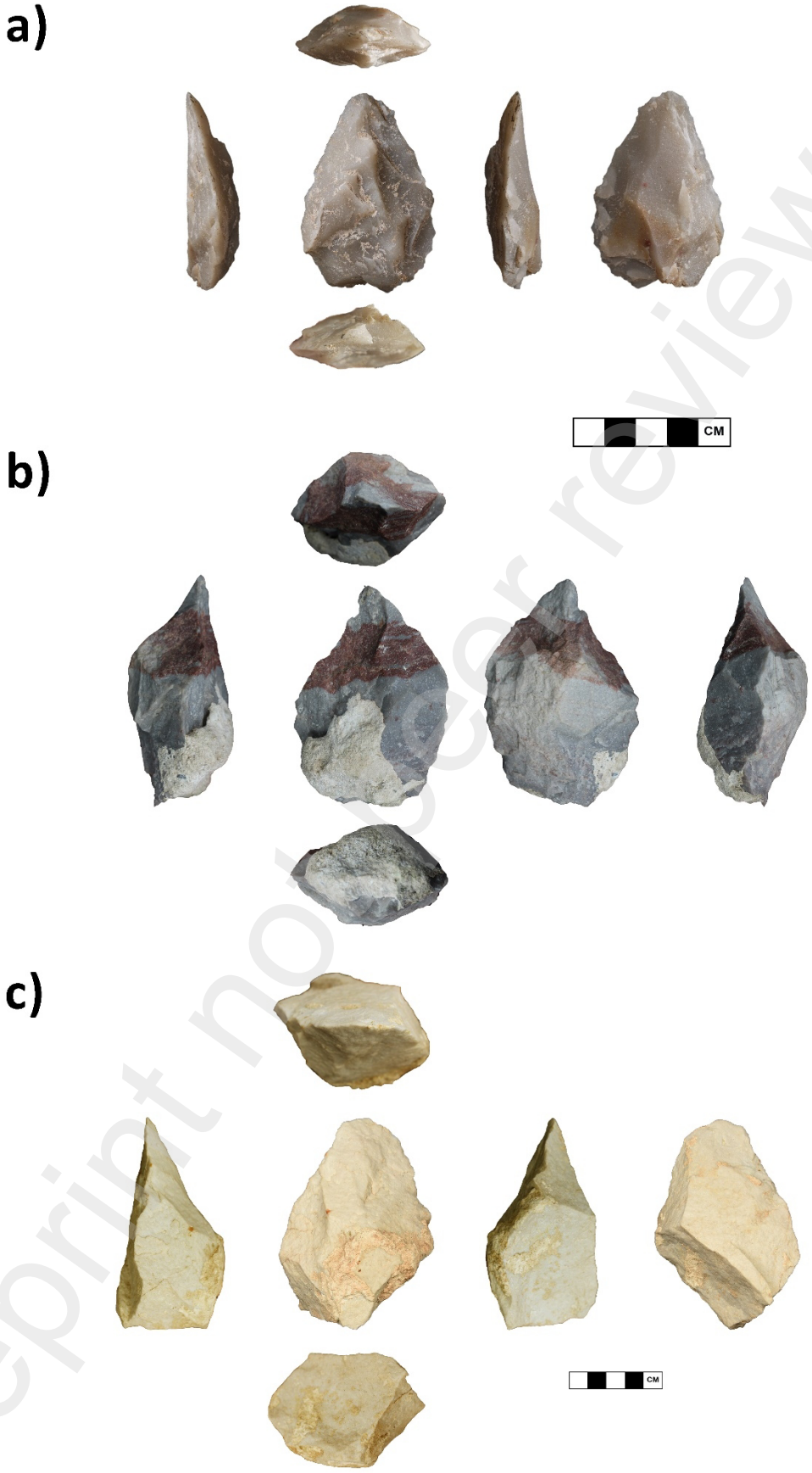

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Figure 3. Handaxes (a, b) and large-size distal fragment (c) from the Toriles Cave (Carrizosa, Ciudad Real).

Among the retouched products, three products made of quartzite stand out. One of them corresponds to a small bifacial sherd converging on flake (Figure 3, image a), but there is only a limited area left on the lower surface that could be interpreted as the rest of a ventral face. The upper face is shaped as a convergent sherd, with bifacial flaked/plano-invasive retouch on the left side, and unifacial flaked scalariform retouch on the right. On the lower face, the platform area is depressed. On the other hand, from the left edge, there is a series of flat, invading retouching that are step fractures towards the center of the piece, and form a bifacial, sharp, and straight edge. The second handaxe is a small piece with bifacial retouch (Figure 3, image a) on its left edge accompanied by a crushing of the surface, unlike the first biface, it does not maintain symmetry and the quartzite used for its production is coarser grained. Finally, one of the larger pieces is a distal fragment of a bifacial piece with removals toward the inside of one of its edges (Figure 3, image c).

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The presence of a triangular flake with a cortical platform with direct retouch on both edges following a continuous distribution, whose left edge has a rectilinear retouch while the right edge is concave in its mesial area.

Figure 4. Triangular flake from Toriles Cave (Carrizosa, Ciudad

The retouch has a semi-abrupt angle and a scalar unifacial morphology.

Most of the material is made from local rocks such as quartzite collected in the vicinity of the cave in the form of cobbles. Thus, quartzite constitutes 85% of the sample analyzed, while the flint tools found inside the cave correspond to 15% (Figure 4). Technologically, there is a great variety of tools found, the most abundant being flakes from the Levallois method, where the presence of smooth, faceted, and dihedral flakes stands out.

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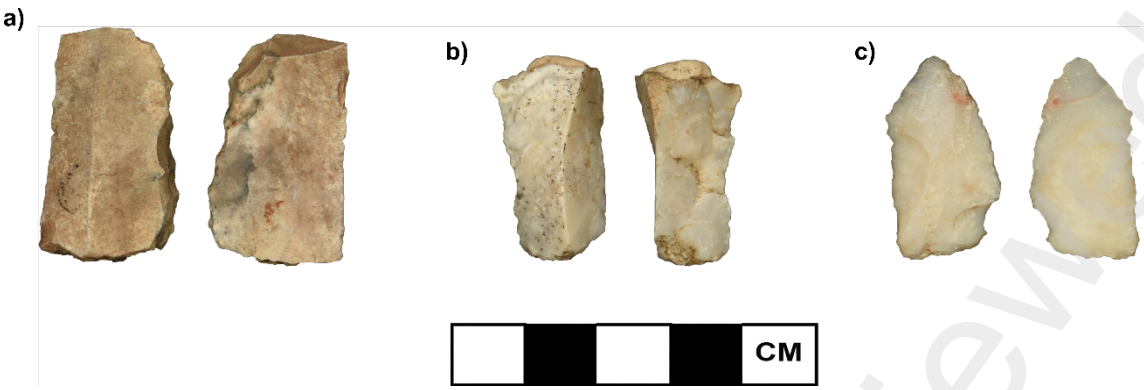

Figure 5. A) and b) could correspond to pieces of threshing or gunflints; c) corresponds to heat-treated evaporite silex, this type of object is common in the Chalcolithic period. All these pieces were found inside the Toriles Cave (Carrizosa, Ciudad Real).

Unfortunately, the lithic tools found inside the cave correspond to a disturbing context, even so, the quartzite pieces have not suffered too severe post-depositional rolling or alteration on their surface, as the edges and ridges hardly show any rounding. Of the few pieces of flint analysed, the thermal alteration processes which produce an alteration in the colour, fissures on the surface, and the presence of thermal domes stand out. Another type of alteration documented is the presence of a carbonate coating on several of the pieces analysed. These carbonates are formed by mineral transformations that can dramatically increase the silica concentration in interstitial waters (Pérez Jiménez, 2010).

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Figure 6. Flint fragment showing color change, a cracked surface, and the presence of thermal domes found at the site of Toriles Cave (Carrizosa, Ciudad Real).

The archaeological record we must understand during this first human occupation of the cave and its surroundings is still deficient due to the lack of archaeopalaeontological studies in the southern plateau of the Iberian Peninsula. This panorama is changing thanks to the advances made in the cave, through the recording of the material and the absolute chronologies obtained with the absolute Uranium-Thorium dating carried out on four lithic pieces.

Lithic tools are not the only archaeological evidence recovered from the cave. The presence of bone, ceramic and metallic remains suggest that the cave has been actively occupied during a very broad chronological period, ranging from the Middle Pleistocene to recent times, with the Paleolithic and Roman occupation being the best documented to date.

3.2. Uranium-Thorium (U-Th) Dating.

Four absolute dates were obtained using Uranium-Thorium applied to the calcareous crusts of four lithic pieces. A fragment of a speleothem, which was

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found during the survey work, was also analysed. Isotopic ratio measurements and quantification of uranium and thorium were carried out using a dual-focus magnetic sector mass spectrometer, multi-collector detector system, and inductively coupled plasma ionization mode MC ICP-MS Thermo NEPTUNE. Sampling has been carried out on the calcium carbonate layer present in the material under analysis, from which a small superficial part has been removed without affecting any of the pieces under study. The samples analysed are the following: TOR20PR - 4000, TOR20PR - 4001, TOR20PR - 4002, TOR20PR - 4003, TOR20PR - 0001.

Sample TOR20PR - 4000 was obtained from the calcium carbonate patina $CaCo_3$ present on a 7x4 cm biface of amygdaloid quartzite. As a result, a date of 28,604 Kya was obtained, which is the most recent of all the dates obtained.

Another of the amygdaloid bifaces analysed, TOR20PR - 4001, has yielded an older date of 158,694 Kya. The production of such small-sized, predominantly amygdaloid bifaces was continuous in the environment of the Toriles Cave during the Middle Paleolithic.

Sample TOR20PR - 4002 corresponds to a 6x4 cm quartzite flake with a carbonate crust attached. The result obtained is a dating of 44,983 Kya.

Sample TOR20PR - 4003 corresponds to a 3x3 cm quartzite core with a calcium carbonate crust. As a result of the analysis, it has yielded a date of 180,680 Kya, being the oldest of the set analysed at the moment.

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During the survey work, a fragment of stalactite that could be dated was found. The carbonate sample, TOR20PR - 0001, was taken from a part far from the central area of the stalactite. The result obtained is a dating of 153,925 Kya.

	TOR 20	TOR 202	TOR 203	TOR 204	TOR 205
Sample	**PR-4000**	**PR-4001**	**PR-4002**	**PR-4003**	**PR-001**
Lad-Id	SU-20205-3	SU-20205-4	SU-20205-1	SU-20205-2	SU-20205-5
SU-ID	SU477	SU478	SU475	SU476	SU479
^{238}U	81.8	73.9	63.4	72.0	36.9
[µg g^{-1}]	(0.008)	(0.002)	(0.004)	(0.007)	(0.001)
^{232}Th	34.9	107.4	91.5	109.0	1.3
[µg g^{-1}]	(0.1)	(1.9)	(0.2)	(0.8)	(0.1)
^{230}Th/^{232}Th x10-6	22.5	26.1	10.3	24.0	1309
[at/at]	(0.01)	(0.02)	(0.02)	(0.02)	-2
δ^{234}U	984.8	1249.8	496.4	1004.2	2181
[med]	(0.2)	(1.2)	(0.07)	(0.09)	-3
δ^{234}Uinit	1067.5	1955.9	563.6	1672.2	3367
[estimated]	(0.2)	(1.9)	(0.08)	(0.15)	(4)
230Th/^{238}U	0.552	2.185	0.856	2.092	2.593
[act/act]	(0.008)	(0.002)	(0.004)	(0.007)	(0.0003)
^{230}Th	34569	210311	87296	264662	153925
[y]	(574)	(460)	(594)	(2772)	(1000)
^{230}Th corr	28604	158694	44983	180680	141406
[y]	(549)	(429)	(423)	(1513)	(369)

4. Discussion and conclusions.

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363 The discovery of sites in the La Mancha plain is primarily attributed to
364 explorations and prospecting efforts conducted on Quaternary deposits,
365 within which in situ lithic materials, mostly composed of quartzite, have been
366 found. The emergence of numerous sites in this area has facilitated the
367 establishment of a clear Paleolithic sequence across the entire region.

368 In the Upper and Middle Guadiana Basin region, few remains of human
369 activity have been documented during the Lower Pleistocene. However,
370 during the Middle Pleistocene, the occupation of this territory became more
371 widespread. Most Lower Paleolithic findings are documented on the terraces
372 of the Guadiana River and its tributaries, such as the Jabalón. These are
373 predominantly Acheulean sites located in open-air settings, featuring surface
374 material primarily consisting of large tools like bifaces, cleavers or trihedrons
375 from quartzite. Surveys conducted in the 1970s and 1980s revealed abundant
376 Acheulean surface assemblages at sites like El Sotillo, Albalá, El Martinete,
377 and Porzuna.

378 The number of Mousterian sites surpasses that of older Acheulean
379 productions. Mousterian sites are more widely distributed throughout the
380 territory, extending into the valleys of tributary networks and the margins of
381 endorheic lagoons, and even occupying areas more distant from the valley
382 bottoms of the fluvial network. These deposits, dating between Isotopic
383 Stages 5 and 3, are crafted from locally sourced quartzite obtained from
384 nearby enclaves. The lithic exploitation strategies employed at these sites

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include discoid debitage, Levallois, and multidirectional methods, resulting in a plethora of flakes often retouched to form tools of simple typology.

In most cases, sites in the Guadiana basin are situated on Pleistocene terraces with favorable environmental conditions and abundant raw materials. However, the cave in question is a noteworthy exception within the region's site distribution. Despite the highly disturbed sediment in which lithic materials were found, caused by decades of use by local inhabitants until its closure in 2017, archaeological material within the cave remains relatively unaltered.

In conclusion, the lithic assemblage discovered in the cave exhibits a heterogeneous nature, with notable pieces including bifacial crafted from a raw material seemingly external to the cave environment. Unfortunately, these materials are situated within altered sediment containing fragments of more recent industries, complicating their specific technocomplex ascription and chronological analysis. Despite the challenges posed by the cave's disturbed sediment, the discovery of Toriles Cave represents a significant area of interest for the study of prehistoric occupation in La Mancha, offering insights into a diverse range of human activities spanning the Middle Paleolithic to recent times, including the presence of threshing blades. This complex palimpsest of successive deposition episodes or activity layers presents a unique challenge for archaeological interpretation, as layers are reworked and mixed, making it difficult or impossible to isolate original constituents.

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