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The occupational pattern of the Galería site (Atapuerca, Spain): A technological perspective

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ABSTRACT

Galería is one of the main sites of the Trincheras del Ferrocarril (railway trench) in Atapuerca, together with Gran Dolina and Sima del Elefante. The Galería excavations took place mainly during the 1980s and 1990s and continued until 2010. Work has recently resumed in the upper levels of the sequence, which has prompted us to summarize the previously collected data and plan an entire new set of questions in order to be able to compare that earlier data with information yielded from the new interventions. Galería consists of a long sequence dating from around 500 ka to 250 ka, which has made it possible to conduct a diachronic study of the technology at the site. As a consequence of the sustainment of similar occupational patterns and a similar 'toolkit', the technology at Galería generally enjoyed a broad stability throughout the technology the Middle Pleistocene. Nevertheless, we have isolated technological characteristics which reflect technological changes through time.

In this case, we present a synchronic analysis of the human occupation phases of each subunit, which finally led us to a diachronic view of the site. Most of the knapping sequences occurred outside of the cave, making the *chaînes opératoires* very fragmented. This was the result of short and sporadic occupations for the basic purpose of obtaining the animals that had fallen into the cave through a natural trap created by the TN shaft, in successful competition with carnivores. Although lithic refits are very scarce, we used them in this study to characterize the spatial distribution not only of the activities performed, but also of the knapping sequences carried out inside the cave. The two knapping locations (outside and inside) reflect different knapping strategies.

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1. Introduction and context

Refits are a crucial instrument in the framework of lithic technological analyses. Spurrell (1980) was one of the first researchers to use this method, when he identified refits between Levallois flakes and cores at Crayford (UK). Around the same time, a refit of the shaping sequences used to make a handaxe was found in Caddington (UK) (Smith, 1984; Bradley and Sampson, 1986). The utility of refits has been related to three main spheres of knowledge (Ashton, 2004): firstly, to analyse horizontal and vertical displacements and time lapses; secondly, to find direct evidence of human behaviour through the knapping processes identified and the movements used by the knappers; and thirdly, to gain a deeper

understanding of human activities through the analysis of artefacts and their movements as a reflection of spatial use by humans, including determining the refitted artefacts' lifespan.

This study presents a diachronic analysis of the occupational pattern of the Galería site, combining previous studies on the main characteristics and spatial distribution of the faunal (Cáceres, 2002; Cáceres et al., 2010) and lithic remains (García-Medrano, 2011; García-Medrano et al., 2013, 2014, 2015; Ollé et al., 2013) with the current refit analysis; see Vallverdú et al. (1999) for a preliminary combined study. Few studies have focused on the spatial distribution and movement of pieces in Lower and Middle Pleistocene sites. Some exceptions are the site of Melka Kunture in Ethiopia (Galloti and Piperno, 2004); Lokalelei in Kenya (Roche et al., 1999); Boxgrove (Bergman et al., 1990; Roberts, 1999; Pope and Roberts, 2005), Barham (Ashton et al., 1998), and Eldeven in the UK (Ashton et al., 2005); Monte Poggiolo in Italy (Peretto et al., 1998); Maastrich-Belvedere in the Netherlands (Roebroeks, 1989);

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and Áridos (Villa, 1990) and Gran Dolina TD10.1 (López-Ortega et al., 2011), both in Spain. This work presents the refits and spatial analysis of the faunal and lithic remains recovered in the fieldwork seasons from 1981 to 2008. As fieldwork is currently under way, in the future we will be able to compare and expand upon the refit information and occupational interpretation of this site.

The Sierra de Atapuerca is located in the northern Iberian Meseta, 15 km east of the city of Burgos (Fig. 1). It is a small Cenozoic limestone elevation containing several caves (Pérez-González et al., 2001). Excavations at the numerous sites in Atapuerca have yielded a rich archaeological record spanning the last million years and including several items that have provided key information regarding our knowledge of Lower and Middle Pleistocene populations (Carbonell et al., 1995a, 1995b; Arsuaga et al., 1997a, 1997b; Bermúdez de Castro et al., 1999; Carbonell et al., 2008; Rodríguez et al., 2011; Ollé et al., 2013). The Galería complex is located on the western side of the Sierra. The cavity is roughly 14 m high, 18 m wide and over 12 m deep. The name Galería is used to refer to the entire cave system, which is comprised of three different areas: a central area (TG), joined at the northern end to a small chamber (TZ) and containing a vertical shaft that rises to the surface at the southern end (TN). Five main filling phases have been distinguished in Galería, from GI to GV and one paleosol, GVI (Ollé and Huguet, 1999; Pérez-González et al., 1999, 2001; Vallverdú, 2002). The archaeo-paleontological deposits are in units GII and GIII. Each one of them is subdivided into

two main subunits: GIIa, GIIb, GIIIa and GIIIb (from base to top). The site has been dated by means of various different methods: ERS, UTh, ESR-UTh, TL-IRSL, TT-OSL, pIR250, and pIR290 (Arnold et al., 2014; Berger et al., 2008; Demuro et al., 2014; Falguères et al., 2001, 2013; Grün and Aguirre, 1987; Pérez-González et al., 1999). In general terms, the timeframe of the site lies between 500 ka and 250 ka. These subunits are the divisions considered in this paper.

The Galería assemblage lacks the characteristic features of a home base (e.g. a high degree of hominin impact on the faunal remains, abundant and complete lithic reduction sequences, and a certain degree of spatial organization). In addition, the taphonomic data suggest conditions of waterlogged ground and semi-darkness that can, to some extent, explain the relatively limited domestic activities documented. The occupational model thus infers sporadic and repeated low intensity visits for the purpose of obtaining the herbivores that had fallen into the natural trap created by the TN shaft, in successful competition with carnivores (Díez and Moreno, 1994; Huguet et al., 2001; Cáceres, 2002; Ollé, 2003; Ollé et al., 2005; Cáceres et al., 2010). The activity in Galería correlates with the functionality and effectiveness of the natural trap. The gradual reduction in the meat supply must have led to a loss of interest in the cave, which thus became of marginal appeal to both the humans and carnivores in Sierra de Atapuerca. According to this model, the Galería site would have been a complementary settlement area in the complex karst network of Sierra de Atapuerca to which hominins made occasional planned visits (Carbonell et al., 1995b; Ollé et al., 2013). This type of strategy suggests that these



Fig. 1. Location of the Atapuerca sites, focusing on the Trinchera del Ferrocarril (Railway Trench) and the Galería site.

groups of hominins had a high degree of knowledge of the environment and good planning and organizational abilities. The faunal assemblage is composed of herbivores and carnivores (Table 1). Among the carnivores, there is higher taxonomic variety, although the herbivorous remains are predominant. Among the herbivorous, cervids and equids are the best represented, combined with other minor species.

Table 1

Relation of herbivore and carnivore species identified in the Galería site. For more detailed information, see Rodríguez et al., 2011.

Herbivore	Carnivora
<i>Dama dama clactoniana</i>	<i>Ursus deningeri</i>
<i>Cervus elaphus priscus</i>	<i>Panthera leo</i>
<i>Megaceroides solilhacus</i>	<i>Lynx pardinus spelaeus</i>
<i>Hemitragus bonali</i>	<i>Felis silvestris</i>
<i>Bison</i> sp.	<i>Cuon alpinus europaeus</i>
<i>Equus ferus</i>	<i>Canis lupus</i>
<i>Equus cf hydruntinus</i>	<i>Vulpes vulpes</i>
<i>Stephanorhinus cf hemitoechus</i>	<i>Meles meles</i>
	<i>Mustela nivalis</i>
	<i>Mustela putorius</i>

Two human remains have been recovered in Galería (both in the TZ area). The first (from unit GII) is a right adult mandible fragment containing M2 and M3 (Bermudez de Castro and Rosas, 1992). The second specimen, from the base of GIII, is a neurocranial fragment from the lambdatic area of an adult individual (Arsuaga et al., 1999). As both remains have features in common with the fossils from the Sima de los Huesos site (Arsuaga et al., 1997a) located less than 2 km from Galería, they can be ascribed to the same clade.

2. Materials and methods

2.1. Methodology of technological analysis

The lithic technology from the Galería site has been studied in several previous works (Carbonell et al., 1995b, 1999; García-Medrano, 2011; García-Medrano et al., 2013, 2014, 2015; Mosquera, 1995; Márquez, 1998; Terradillos-Bernal, 2010, 2013; Ollé, 2003; Ollé et al., 2005, 2013). Fieldwork has been conducted over an extended period, specifically from 1981 to 1996 and from 2001 to 2010. This work presents all of the findings from units GII and GIII from 1981 to 2008, and covers the entire area of the Galería site (including the three sectors, TZ-TG-TN, Fig. 1).

The Atapuerca lithic assemblage has been analysed using the Logical Analytical System, LAS (Carbonell et al., 1983, 1992, 1999; Rodríguez, 2004). In this study, we combined different methodological approaches in order to complement the processual (and not typological) view of the LAS. Knapping methods are defined by means of faciality (number of flaked faces), direction of removals and arrangement of striking platforms. (For more information, see Ollé et al., 2013.) The following size classes are used to provide a basic metric description: micro (≤ 20 mm), small (21–60 mm), medium (61–100 mm) and large (> 100 mm) (Carbonell et al., 1999).

We conducted a more detailed study of the large tools, due to the significance of these tools in Acheulean contexts. In order to better address this goal, we adapted the description of the configuration sequence defined by the British research tradition (Newcomer, 1971; Wenban-Smith, 1989; Wenban-Smith and Ashton, 1998). This method establishes several phases in the shaping process: Test, Rough-out, Shaping and Finishing. The tools have been assigned to a stage on the basis of their technological characteristics, such as the amount of cortex, the distribution, size and shape of the removals, the use of a hard or soft hammer or a

combination of both, the type of retouch, the angle between the two faces of the tool, etc.

This basic analysis has been completed by means of the use of several measurements that have traditionally been used in the study of the variability of large tools (Bordes, 1961; Roe, 1968, 1981). These measurements complement the information about morphologies and variations in size and shape (García-Medrano, 2011) and were combined into three main indices: elongation (ratio of total length to maximum width), refinement (ratio of maximum width to maximum thickness) and planform (ratio of total length to base length). To complete our analysis of the technological strategies carried out inside the cave, we performed refits and spatial analyses, which will be described below.

2.2. Methodology for analysing the spatial distribution of remains

Galería has an excavated area of approximately 124 m², using a grid of 1 m². The three main areas that make up Galería were excavated using independent grids (TG and TN together, and TZ separately). Therefore, in the last few years we have been working on making an exact correlation between the three areas. There was a disorientation of 24.727° (sexagesimal degrees) between TG and TZ. The coordinates from one area (TZ) were converted in relation to the others (TG-TN). To do this, square corners for computerizing the transformation parameters were used with the application of the Helmert transformation (Table 2) (Raquel Pérez, pers. comm.). With this data and the Excel program, the transformation parameters were applied to every object in the database. This yielded a single site, including the different archaeological levels and the whole archaeological assemblage, using the same grid. Given that the TG-TN grid was used as a reference, the X axis numbering of TZ has changed. The new gridlines from 9 to 14 in the TG area correspond to the original gridlines 1 to 6 in TZ (Fig. 2).

Table 2

Helmert transformation parameters to unify the two grids of Galería (TZ-TG-TN).

Helmert transformation Parameters		
Coefficient	A=	0.908309756
	B=	-0.418331707
Displacement	X:	11.262
	Y:	-3.35
Parameters	Scale:	1.000014015
	Angle:	372.5234

We used two primary software programs, ArchePlotter_v127 and Surfer, to analyse scatters and associations between the remains. The former was used to make a contingency matrix, which was used to obtain the scatter plots with the Surfer software, analysing the maximum concentrations of remains, the empty spaces and the distribution of different types of remains (i.e. lithic or faunal remains).

2.3. Methodology of refits

Within this paper, the refits are a key part of the technological analysis of the Galería assemblage. Although some were identified during previous studies (Carbonell et al., 1999b), many were identified later (Ollé, 2003; García-Medrano, 2011), and these could provide more information about the technological activities carried out inside the cave as well as the spatial distribution of the hominins' activities. The identification of refits requires that the pieces and their surfaces possess a certain degree of quality. Therefore, concretioned and degraded objects were excluded from the study. Seven raw materials have been identified in Galería: Neogene chert, Cretaceous chert, quartzite, quartz, limestone,

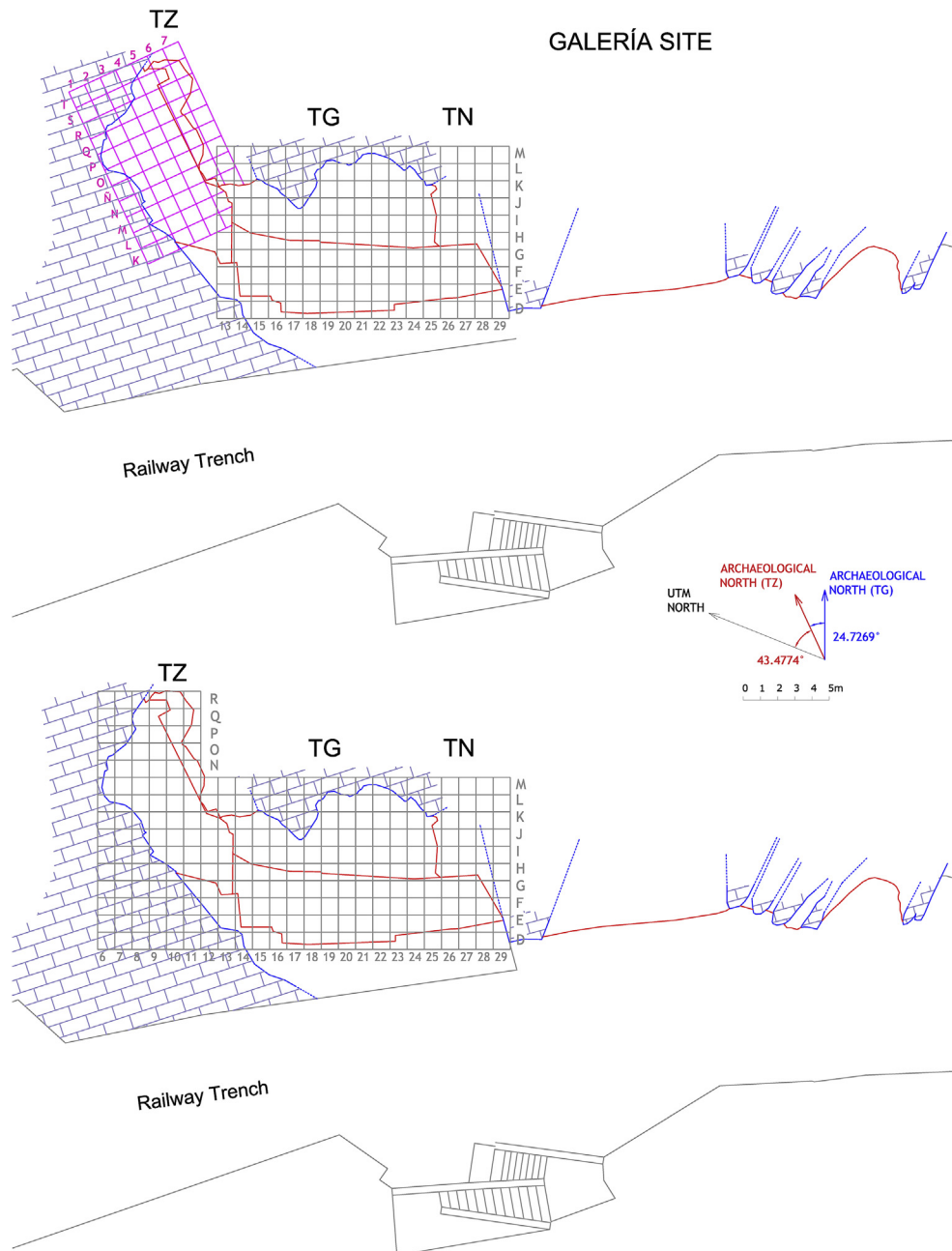


Fig. 2. Planimetry of the Galería site before (top) and after (bottom) the application of the Helmert transformation parameters (Raquel Pérez).

sandstone and schist. In this case, the sandstone and especially the Neogene chert exhibit a high degree of alteration (García-Antón et al., 2002). For this reason, a significant number of these materials was excluded.

After the selection of suitable materials for the study, the pieces were separated into units, subunits, levels, sublevels and, finally, into raw material units (RMU, Roebroeks, 1988; Odell, 2004). Within the same raw material, we made subgroups based on macroscopic features such as the colour of the cortical and non-cortical surfaces, grain size, internal inclusions (such as veins or incipient fractures), etc. (López-Ortega et al., 2011). In the next stage, the reassembly process *per se*, the skill of the researcher in identifying the morphologies or characteristics of each object is crucial.

In terms of types of refits, we followed the classical groups defined by Czesla (1990):

1. Knapping sequence refits: the refits of the products resulting from knapping.
2. Fracture refits: mainly the reconstruction of fragmented pieces and Siret fractures.
3. Modification refits: include the refits of the products obtained by the modification of a blank edge.

3. Technological characterization, spatial distribution and refits

3.1. Galería-GIIa subunit

Only partial faunal information can be gleaned from subunit Galería-GIIa due the poor preservation of the bone record. This is a consequence of the high degree of acidity of the organic layer in the TG-TN areas (Fernandez-Jalvo et al., 1999; Cáceres, 2002). The only

real data we can give is that there is a predominance of herbivore remains compared to carnivore remains and that axial and cranial remains are more abundant than appendicular elements. The few bone remains were recovered from the TZ area (Fig. 4). Nevertheless, they are insufficient to draw any conclusion.

For this reason, the analysis of this subunit focuses on the technological data. The Acheulean assemblage of Galería-GIIa is characterized by six raw materials, of which Neogene chert (around 50%) and quartzite (33.57%) were the most frequently used. Products including simple flakes, retouched flakes, broken flakes, flake fragments and angular fragments make up the largest category (54.51%), followed by retouched tools (24%) and non-modified cobbles (18%). Retouched tools were generally made from Neogene chert and quartzite. Large tools, which include handaxes and cleavers as well as choppers and chopping tools, were mainly made of quartzite. There are few cores, mainly knapped using longitudinal and orthogonal methods. Galería-GIIa exhibits a unique characteristic which is not found in the rest of the Galería levels or in other Atapuerca sites: the use of cobbles for shaping and knapping. The large tools are in the last stages of the shaping sequence. Most seem to have been made outside, and then introduced to the cave where they were abandoned. The shaping

strategy involved taking advantage of the morphological characteristics of the original blanks, keeping part of the cortical surface and focusing the extractions on a single part of the instrument (García-Medrano et al., 2014, 2015).

The lithic assemblage is mainly concentrated in the TN area (to the right of the cave) (Figs. 3 and 5). This is the only known illuminated point inside the cave, under the vertical duct. It more than 80% of large and small retouched tools and more than 90% of the knapping products (simple flakes, flake fragments, fragments of flakes and simple fragments) were found in this area. Natural bases and cores are distributed between TN and TG. In this case, TZ represents a marginal area for knapping activities.

The refits from Galería-GIIa are characterized by their scarcity. We found only five refits, made up of a total of 15 refitted pieces (Table 3). The aim of most of these knapping sequences was to produce flakes, such as GIIa-R01, GIIa-R02 and GIIa-R03 and 3 (Fig. 6). GIIa-R04 represents the fragmentation of a hammerstone with numerous marks on its cortical surface, related to the intensive use of this cobble for percussion activities. Therefore, this hammerstone was either brought previously used into the cave from the outside or its use inside the cave was more intense than the low number of refits would suggest.

Table 3

Refit and conjoin description (type of connection, pieces code, type of instruments, raw material and main remarks on each refit).

Subunit	Code	Connect	Pieces code	Tool type	Raw mat.	Type	Remarks			
GIIa	GIIa-R01	Refit	Ata93 TN2 F27,7 Ata94 TN2B G26,1	Core on flake Simple flake	Neo.chert	Knap. seq.	–			
	GIIa-R02	Refit	Ata93 TN2B E27,1 Ata93 TN2B E27,2 Ata93 TN2B E27,3 Ata93 TN2B E27,4 Ata93 TN2B E27,5	Core on cobble Retouch. flake Frag. of flake Frag. of flake Simple flake	Cretac.chert	Knap. seq.	Orthog.met			
			GIIa-R03	Conjoin	Ata95 TN2B G25,1 Ata95 TN2B G25,2	Simple flake Simple flake	Neog.chert	Fracture	Parasite flake	
			GIIa-R04	Conjoin	Ata93 TN2B H23,1 Ata94 TN2B F22,6	Frag. Nat. base Nat. base frag.	Quartzite	Fracture	Percus. marks	
			GIIa-R05	RMU	Ata87 TN2 S/C Ata93 TN2B F24,16 Ata93 TN2B G25,9 Ata93 TN2B G25,10	LCT on flake Simple flake Retouch. flake Flake frag.	Neog.chert	Modif. seq.	–	
					GIIb	GIIb-R01	Refit	Ata93 TN5 E24,6 Ata92 TN5 F25,48	Retouch. tool Frag. of flake	Neog.chert
	GIIb-R02	Refit	Ata92 TN5 G26,72 Ata92 TN5 G26,74	Retouch. tool Simple flake	Neog.chert			Modif. seq.	–	
	GIIb-R03	Refit	Ata96 TZ GIIc L2,48 Ata96 TZ GIIc L2,39	LCT on flake Simple flake	Neo.chert			Modif. seq.	–	
			GIIb-R04	Refit	Ata91 TN6DA F24,76 Ata91 TN6DA F24,32 Ata91 TN6DA F24,35 Ata91 TN6DA F25,93 Ata91 TN6DA F23,0			Retouch. tool Flake frag. Flake frag. Simple flake Frag. of flake	Quartzite	Modif.seq.
	GIIb-R05	Refit			Ata92 TG10B G18,78 Ata92 TG10B G20,125			Core on flake Retouch. flake	Quartzite	Knap.seq.
GIIb-R06	Refit	Ata92 TG10B G20,19 Ata92 TG10B F19,334			Core on cobble Simple flake			Sandstone	Knap.seq.	Centrip.meth.
GIIb-R07	Conjoin	Ata08 TZ GIIc N2,152 Ata08 TZ GIIc N2,177	LCT on flake Simple flake	Sandstone	Fracture			Diagen.fract.		
GIIIa	GIIIa-R01	Conjoin	Ata90 TG10A G20, 7 Ata90 TG10A G20, 8	LCT on cobble Frag. of flake	Quartzite	Fracture	–			
			GIIIa-R02	Conjoin	Ata90 TG10A G21,67 Ata91 TG10A G22,2	Nat. base frag. Frag. of Nat. base	Quartzite	Fracture	Percus.marks	
	GIIIa-R03	Refit	Ata90 TN7 F25,27 Ata90 TN7 F26,2	LCT on cobble Simple flake	Sandstone	Modif.seq.	–			
	GIIIa-R04	Conjoin	Ata90 TN7 E26,16 Ata90 TN8 E26,17	Nat. base frag. Frag. Nat. base	Quartzite	Fracture	Percus.marks			
GIIIb	GIIIb-R01	Refit	Ata04 TZ GIII N3,60 Ata95 TZ GIII L5,13	Core on cobble Frag. of flake	Quartzite	Knap.seq.	–			
	GIIIb-R02	Refit	Ata92 TZ GIII M5,21 Ata92 TZ GIII L5,14	LCT on flake Simple flake	Quartzite	Modif.seq.	–			

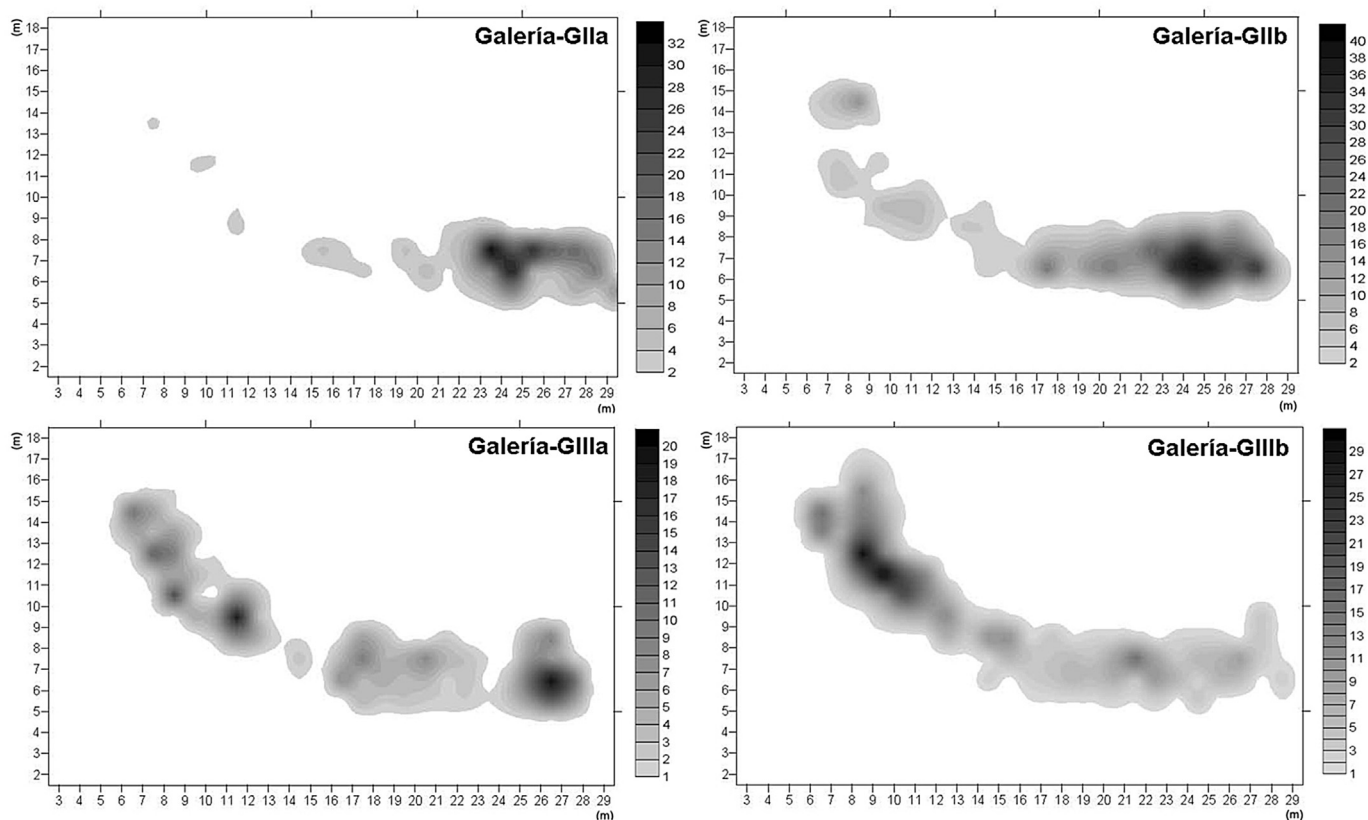


Fig. 3. Surfer density analysis of stone tools from Galería by subunits (GIIa-GIIb-GIIIA-GIIIB). The grey tones indicate the concentrations of remains. The dark grey indicates the areas in which the highest densities of remains were found.

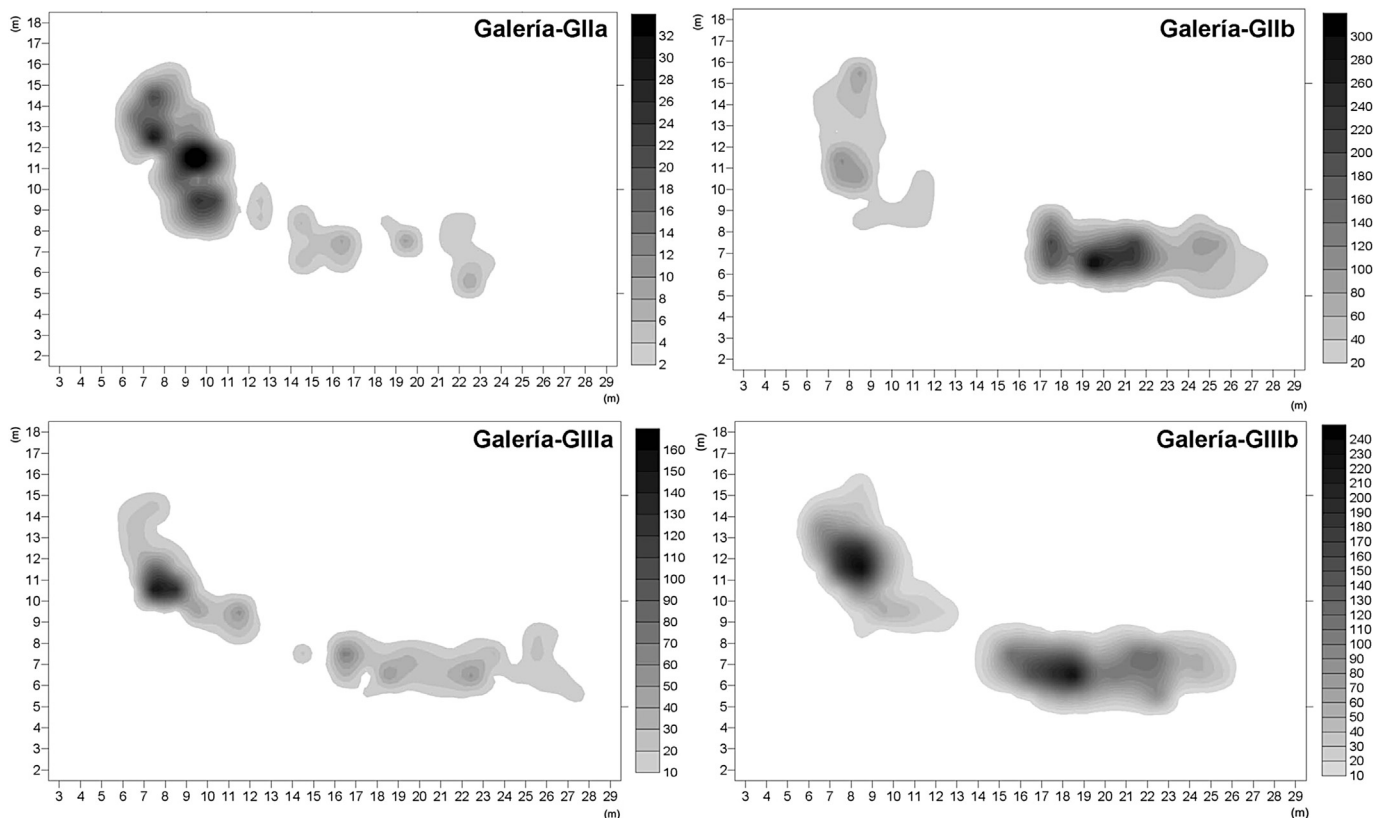


Fig. 4. Surfer density analysis of faunal remains from Galería by subunits (GIIa-GIIb-GIIIA-GIIIB). The grey tones indicate the concentrations of remains. The dark grey indicates the areas in which the highest densities of remains were found.

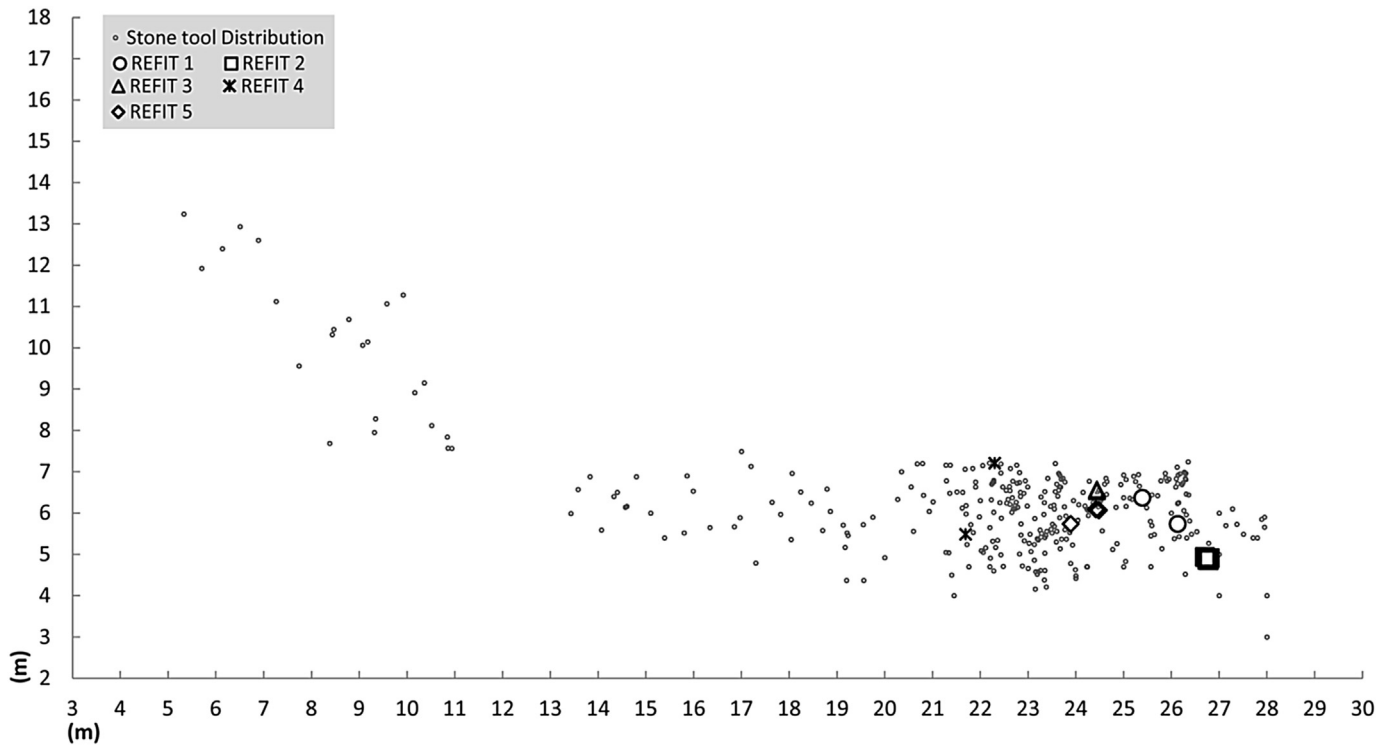


Fig. 5. Spatial distribution of the lithic remains in Galería-Glla indicating the refits documented.

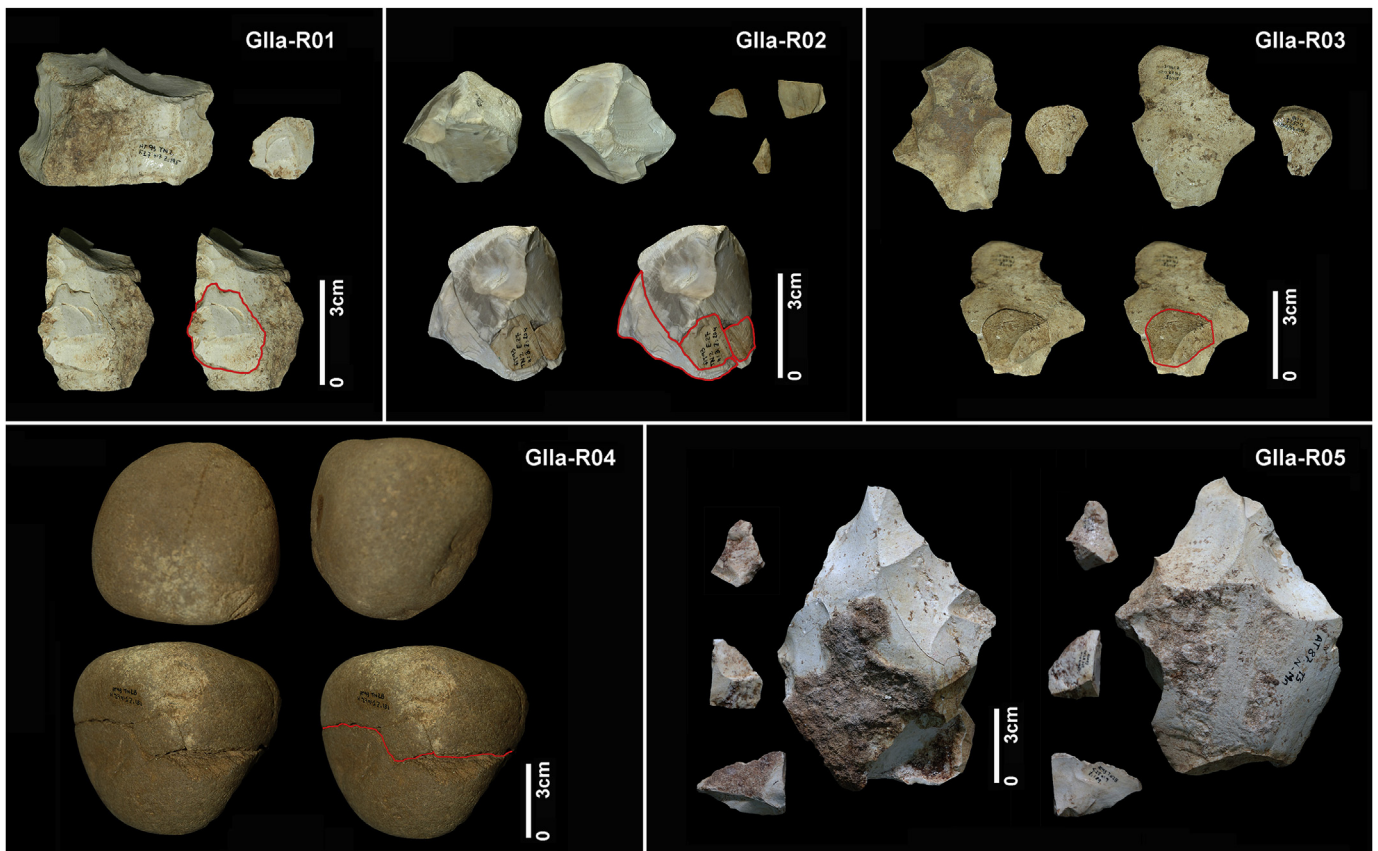


Fig. 6. Refits Galería-Glla. **Glla-R01**, Ata'94 TN2B G26,1 – Ata'93 TN2 F27,7; **Glla-R02**, Ata'93 TN2B E27,1 – Ata'93 TN2B E27,2 – Ata'93 TN2B E27,3 – Ata'93 TN2B E27,4 – Ata'93 TN2B E27,5; **Glla-R03**, Ata'95 TN2B G25,1 – Ata'95 TN2B G25,2; **Glla-R04**, Ata'93 TN2B H23,1 – Ata'94 TN2B F22,6; **Glla-R05**, Ata'87 TN2 S/C – Ata'93 TN2B F24,16 – Ata'93 TN2B G25,9 – Ata'93 TN2B G25,10.

Meanwhile, the RMU association (GIIa-R05) between a large tool and three flakes speak to shaping strategies (Fig. 6). The tool is a large flake and the shaping is located on its distal part. Three of the five refits are of pieces made from Neogene chert and one from Cretaceous chert. In contrast to the refit data, Galería-GIIa is characterized by the extensive use of quartzite cobbles, accounting for more than 70% of the artefacts (García-Medrano et al., 2015). We can therefore conclude that these populations mostly introduced shaped quartzite cobbles from the outside and the knapping activities documented inside the cave were mainly carried out using chert.

3.2. Galería-GIIb subunit

More than 75% of the faunal remains are located in the TG area (Fig. 4), while more than 50% of the lithic remains are in the TN area. However, the TG area also contains 30% of the lithics (Fig. 3). Herbivore remains (medium-sized and large) predominate in the faunal assemblage, mainly concentrated in TG. All of the skeletal elements are represented. We can therefore assume that the animals arrived to the cave complete and no fossilization processes disturbed the remains. Most of these remains are of infant and adult individuals (Cáceres, 2002).

The lithic assemblage from Galería-GIIb represents a significant technological change (García-Medrano et al., 2014, 2015). Firstly, the extensive use of quartzite is replaced by a combination of six raw materials, of which sandstone was the most common (36.8%). Secondly, concerning the retouched toolkit, a wider variety of raw materials was used, with sandstone representing 24% of the assemblage. Thirdly, knapping was mainly performed on large flakes, which required considerable planning to produce and which represents a different level of resource management.

The distribution of the lithic remains also reflects a significant change from that seen at Galería-GIIa. The remains are

mainly distributed between the TG and TN areas, and these two areas present a different tool composition. In TG, we found most of the cores, large and small tools. On the other hand, in TN we documented knapping products (simple flakes, flakes fragmented, fragments of flakes and simple fragments) and 40% of the unknapped cobbles, most of them with clear percussion marks and fractures. So, the Galería-GIIb occupation consisted of at least two main activity areas. The hominins continued using the point of light for their main knapping activities (in the TN area) and they probably used the instruments in the TG zone. In spite of the scarcity of the bone breakage documented in Galería, there is an increase in the percentage documented in TN, to 3.48%. TZ represents a marginal zone with respect to the general distribution of the tools inside Galería. Nevertheless, in TZ 30% of cores and more than 20% of unknapped cobbles were recovered from that area. This significant accumulation does seem to correspond to any postdepositional process, but to be the product of anthropic activities likely related to knapping.

In spite of the high degree of fracturing of the chaînes opératoires and the scarcity of refits, these point to the existence of both shaping and knapping activities inside the cave (Table 3). The modification refits are located in the TN area (Fig. 7), and these are mainly focused on the modification of the edges of small flakes to create tools, such as that in GIIb-R04 (Fig. 8). This is a complete retouching sequence of a medium-sized flake made of sandstone. It seems to consist of the recycling of a flake to extend the useful life of this instrument. The other two refits seem to be a part of longer retouching sequences. The refits of knapping sequences are located in the TG area. These do not correspond to final exploitations, but rather knapping continued after the detachment of the refitted flakes. This leads us to think that with the new excavations it would be highly likely to find at least some more elements of these technological sequences.

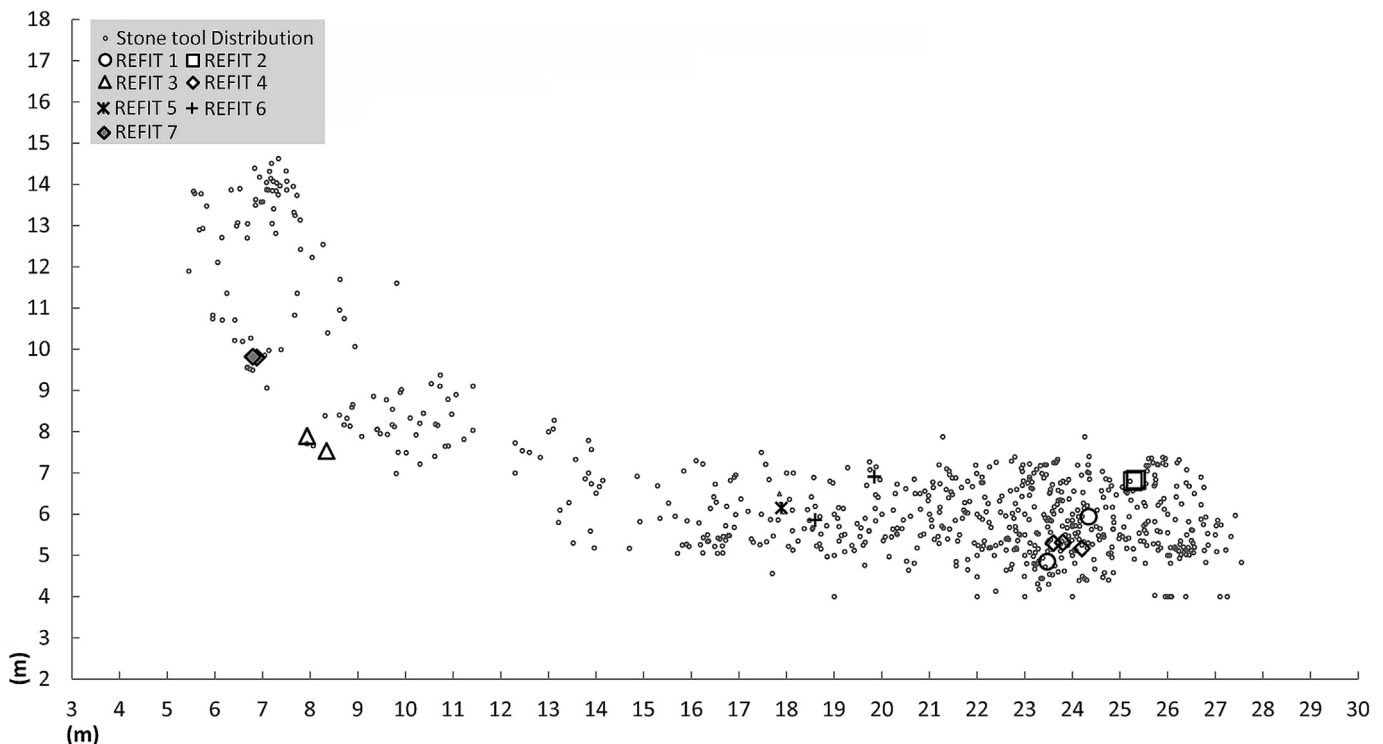


Fig. 7. Spatial distribution of the lithic remains in Galería-GIIb indicating the refits documented.

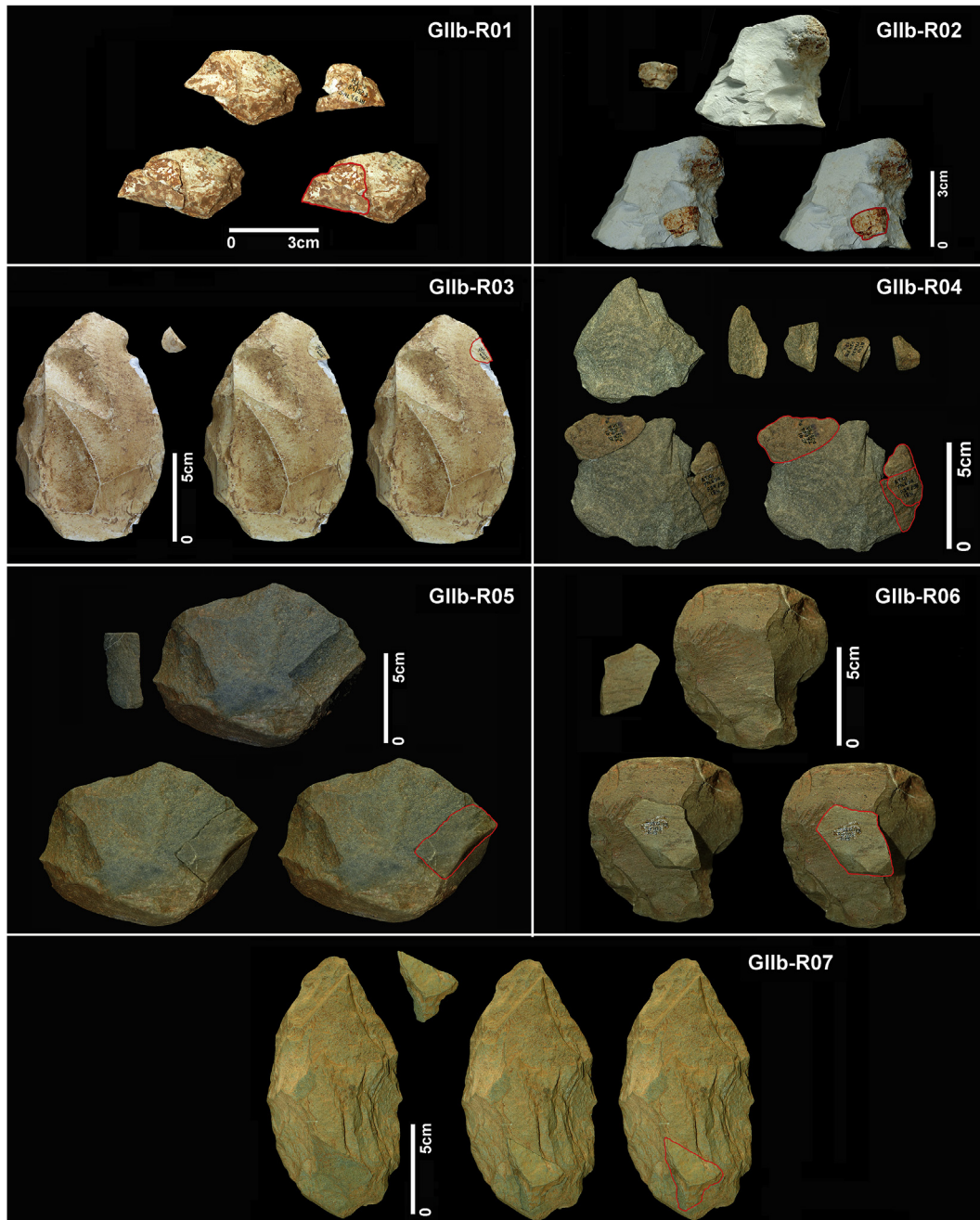


Fig. 8. Refits Galería-GIIb. **GIIb-R01**, Ata'92 TN5 F25,48 – Ata'93 TN5 E24,6; **GIIb-R02**, Ata'92 TN5 G26,72 – Ata'92 TN5 G26,74; **GIIb-R03**, Ata'96 TZ GIIc L2,48 – Ata'96 TZ GIIc L2,39; **GIIb-R04**, Ata'91 TN6DA F24,76 – Ata'91 TN6DA F24,32 – Ata'91 TN6DA F24,35 – Ata'91 TN6DA F25,93 – Ata'91 TN6DA F23,0; **GIIb-R05**, Ata'92 TG10B G18,78 – Ata'92 TG10B G20,125; **GIIb-R06**, Ata'92 TG10B F19,334 – Ata'92 TG10B G20,19; **GIIb-R07**, Ata'08 TZ GIIc N2,152 – Ata'08 TZ GIIc N2,177.

The abundant presence of manganese on the faunal remains and superficial concretions point to high degrees of humidity and waterlogged conditions. These cave conditions did not favour the use of the cave as a occupation site. In addition, the scarcity of trampling marks and fractures on the bones is related to the short duration of the hominins' visits to the cave (Cáceres, 2002). It is also important to note the scarcity of light in the cave. Very few fossils were altered by atmospheric agents or by plant action. To our knowledge, there is only one point of light, through the vertical duct in TN. Through the lithic analysis, the spatial distribution of the remains and the refit information, we can deduce that the TN area was the preferred zone for knapping activities, taking advantage of the natural light (Mosquera, 1995; Vallverdú et al., 1999).

3.3. Galería-GIIa subunit

Galería-GIIa exhibits another distribution of remains inside the cave. In this case, nearly 90% of the faunal remains are distributed between TG and TZ (Fig. 4). The faunal remains are mainly herbivores (Diez et al., 1999). The axial and cranial skeletons are the most abundant, and were mainly found in TZ, indicating a partial displacement of the occupation to the middle-left of the cave.

Galería-GIIa and Galería-GIIb confirm the technological trends documented in GIIb. Firstly, Neogene chert and quartzite continue to be the primary raw materials, but the progressive introduction of sandstone is significant. Secondly, there is also a progressive diversification in the representation of the raw materials, with less

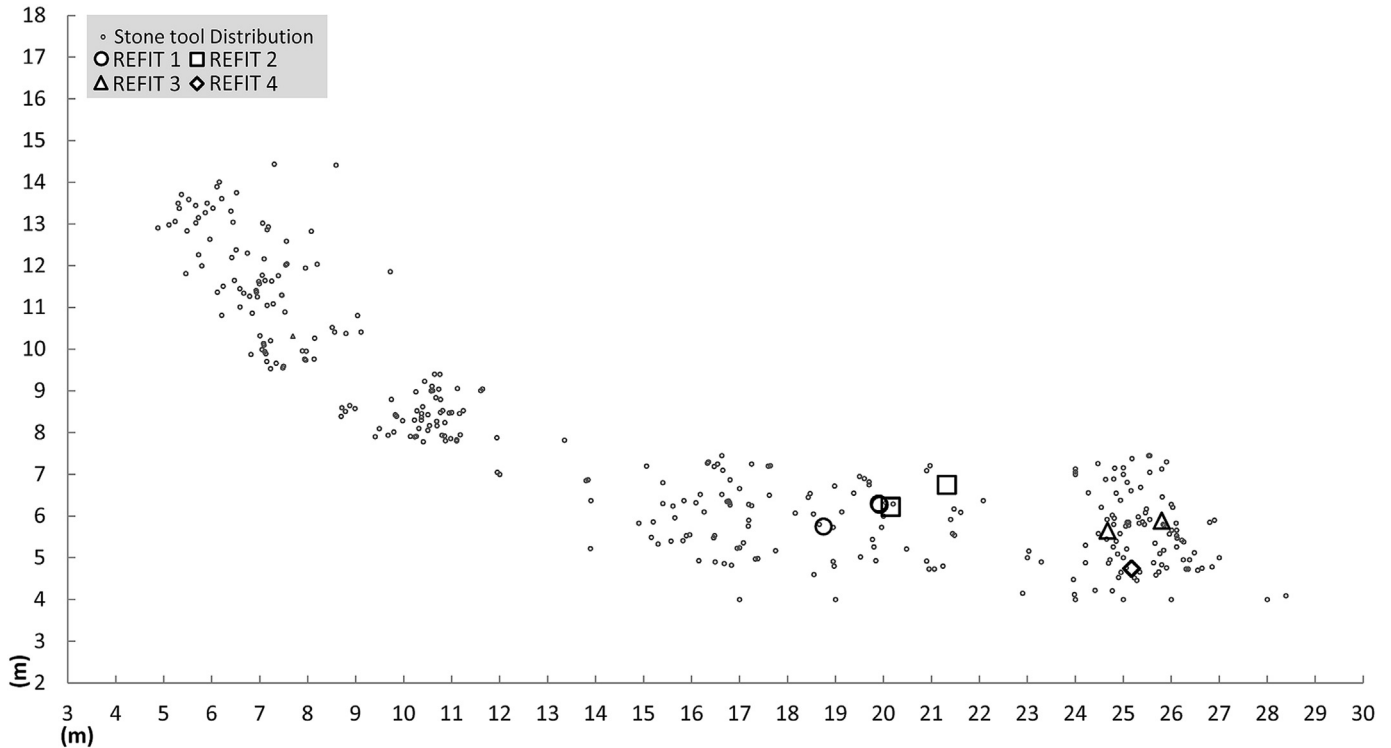


Fig. 9. Spatial distribution of the lithic remains in Galería-GIIIa indicating the refits documented.

common types taking on increased significance. Thirdly, the tool type representation also changes, with a higher number of cores (4.9% in GIIIa; 5.7% in GIIIb), and a lower number of large cutting tools (4.9% in GIIIa, 3.0% in GIIIb). Additionally, longitudinal and orthogonal exploitation methods are combined with the significant use of centripetal techniques. Lastly, the large tools are mainly made on flakes and the total length of the instruments decreases (García-Medrano et al., 2014, 2015).

The lithic remains are distributed between TZ (more than 40% of the remains) and TN (35% of remains) (Fig. 3). The distribution of tools is quite balanced, although in TZ there is a predominance of hammerstones, knapping products and some retouched tools. In TG, we found most of the cores and large and small tools. We documented four refits (Table 3) (Fig. 9), two of which are conjoins of intensively used fragmented percussors. The other two come from longer shaping processes (Fig. 10). In this case, the hominins expanded the space occupied inside the cave, although we cannot distinguish different areas in relation to different activities.

3.4. Galería-GIIIb subunit

In subunit Galería-GIIIb, we detected a decrease in the number of remains. The remains are faunal in over 88% of cases. There is a predominance of herbivore remains, distributed between TG and TZ (Fig. 4). The axial and cranial skeletons are the most represented. In this case, TZ is consolidated as the main activity area inside Galería, as more than 60% of the lithic remains and more than 50% of the faunal remains were concentrated in that area. In the TN area, occupation is very limited. In this subunit, both faunal and lithic remains exhibit equal distribution inside the cave. Considering the spatial distribution of the lithic remains, a significant concentration in the TZ and TG areas is clear, while there are practically no remains in the TN area.

Most of the lithic remains are located in the TZ area (Fig. 3), with the exception of the small tools, located between TN and TG. The only two refits came from TZ (Fig. 11). One corresponds to a knapping sequence and the other to a modification sequence, both on quartzite (Fig. 12).

From Galería-GIIIa we detected the total displacement of the occupation to the TZ area, where the hominins carried out the majority of their activities. In addition, in Galería-GIIIb we documented new taphonomic alterations such as trampling, which was favoured by dry environmental conditions (Cáceres, 2002). These two aspects are the clear consequence of the reduction of the cave environment and the loss of the effectiveness of the natural trap.

4. Discussion: the occupational pattern of the Galería site

Galería is one of the few European Middle Pleistocene sites containing an exceptionally long sequence (from c.500 ka to c.250 ka). In addition, this site has yielded information about the appearance of the Acheulean and its technological changes over the course of ~250 ky (García-Medrano et al., 2014, 2015; Ollé et al., 2013). The occupational pattern is crucial to correctly interpreting the lithic assemblage. Successive short-term hominin occupations had the main purpose of acquiring meat from the herbivores that had fallen into the cave through the vertical duct. The lithic assemblage is characterized by a high degree of fragmentation of the *chaînes opératoires* and a high degree of instrument mobility. However, the excavation process is ongoing and more remains will be recovered, which might complement existing data.

The connections found between the lithic instruments do not lead to a firm hypothesis due to their scarcity and degree of incompleteness. Nevertheless, combining the refit information with the faunal and lithic distribution and interpretation, we can

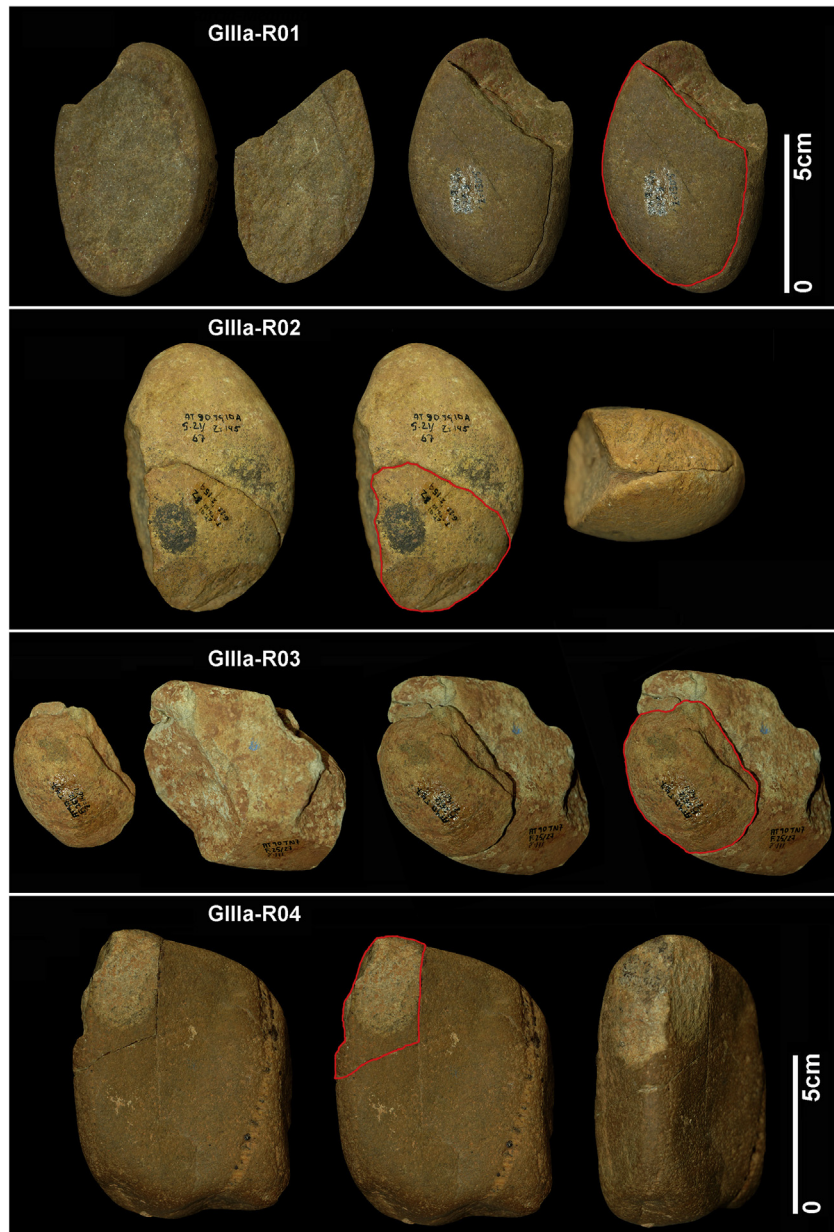


Fig. 10. Refits Galería-GIIa. **GIIa-R01**, Ata'88 TG10A G20,7 – Ata'88 TG10A G20,8; **GIIa-R02**, Ata'90 TG10A G21,67 – Ata'91 TG10A G22,2; **GIIa-R03**, Ata'90 TN7 F25,27 – Ata'90 TN7 F26,2; **GIIa-R04**, Ata'90 TN7 E26,16 – Ata'90 TN8 E26,17.

make some inferences about the occupational patterns and changes through time. The refits reveal little postdepositional displacement of the remains due to sedimentary processes or other disturbances such as trampling, produced by hominin and carnivore transit. For example, GIIa-R03 and GIIb-R07 represent the non-intentional breakage of two flakes. The pieces of these refits were very close to one another, so no postdepositional movements altered the original distribution of the remains. The refit distribution is consistent with the distribution of the total lithic and faunal dispersion. Therefore, by analysing the refit information, we can also detect the displacement of the occupation from the TN area, under the vertical duct, to the TZ area.

The refits also provide new information about the technological activities carried out inside the cave. In their first occupations (Galería-GIIa), the hominins made extensive use of quartzite

cobbles as blanks. However, most of the refits in these subunits are with artefacts made of chert. In the upper part of the sequence, the presence of quartzite decreases but most of the refits are of items made from this material. In spite of the scarcity of cores, most of the refits are related to knapping sequences, or are between flakes or between cores and flakes. We can therefore deduce that the shaping processes mainly took place outside and the tools were subsequently introduced into the cave and left inside. Spontaneous technological activities that took place inside the cave as needed were mainly related to the production of flakes, and less frequently, to tool (re)sharpening (Ollé, 2003; García-Medrano, 2011).

Taking into account the cave conditions of Galería (i.e. it was humid, waterlogged and dark), the occupation of this cave must revolve around the possible points of light. Contrary to a classical

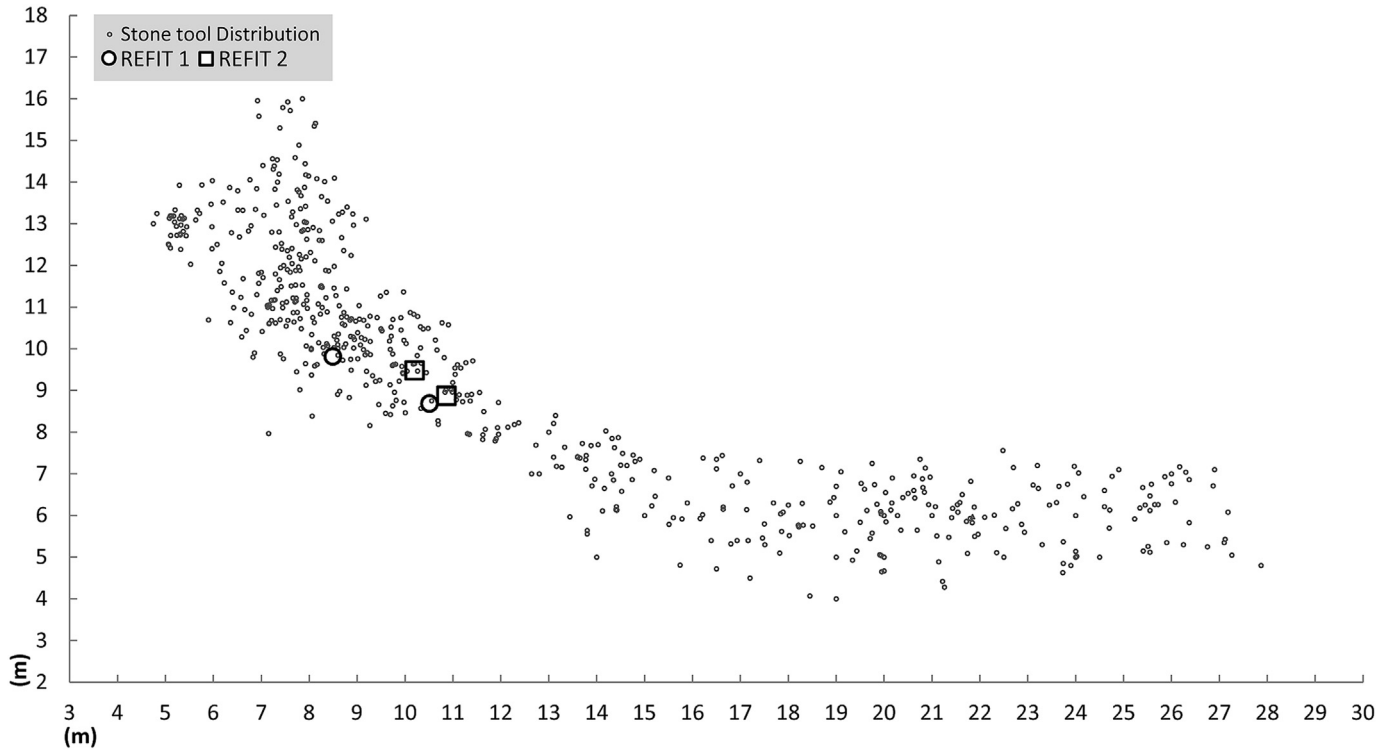


Fig. 11. Spatial distribution of the lithic remains in Galería-Gilla indicating the refits documented.

theory (Rosas et al., 1998), we believe that the accumulation of lithics under the vertical duct during the first occupations (Galería-Gilla) is related to the existence of light at this point. At that time, the cave was open and the vertical duct was operative. However, in

this case, we cannot make use of faunal information because of its poor state of preservation. In addition, together with the light, the efficacy of the vertical duct is a key issue in understanding the displacement of the occupation from the TN to the TZ area (Fig. 13).



Fig. 12. Refits Galería-Gilllb. **Gilllb-R01**, Ata'04 TZ GIII N3,60 – Ata'95 TZ GIII L5,13; **Gilllb-R02**, Ata'92 TZ GIII M5,21 – Ata'92 TZ GIII L5,14.

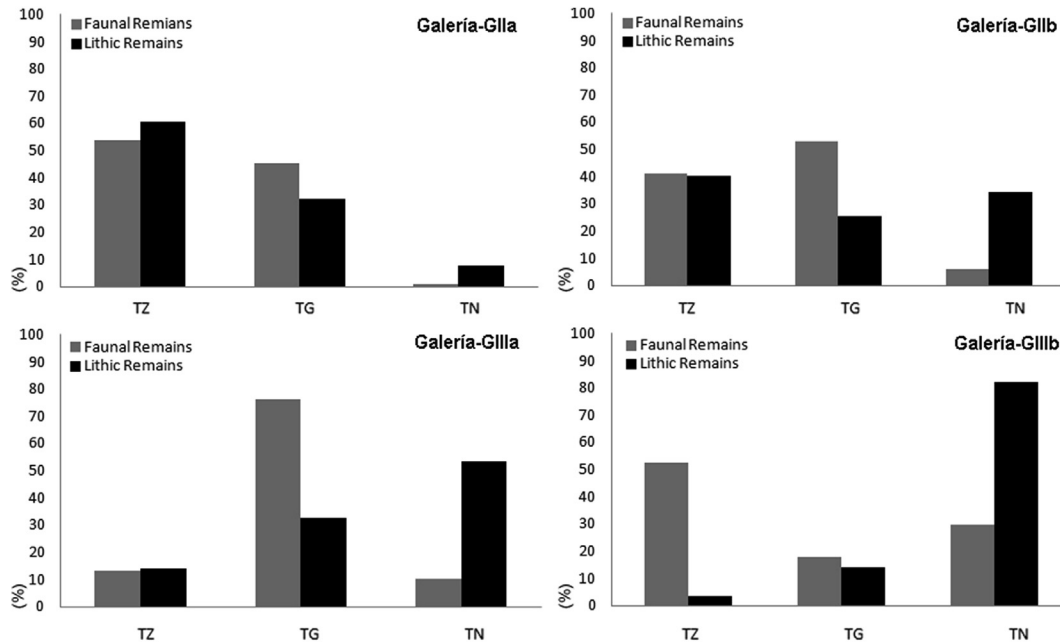


Fig. 13. Faunal and lithic histograms through the Galería subunits (GIIa-GIIb-GIIIa-GIIIb) and areas (TZ-TG-TN).

In the base levels, Galería-GIIa, most of the technological assemblage is located in the TN area, and all of the refits came from that zone. Galería-GIIb represents a higher occupational impact, due to the higher quantity of remains recovered from this subunit. More than 50% of the lithic remains are from the TN area, and more than 30% are from TG. Meanwhile, the faunal remains are mainly from TG (in more than 75% of cases). Therefore, TN continued to be a crucial point inside Galería, because of the light and because it is the zone in which the hominins found the herbivores. Nevertheless, the combination of the faunal and lithic data provides a more realistic vision. The TN area, containing most of the percussors and knapping products, seems to be the area where knapping and bone breakage activities preferentially took place, while the TG area yielded most of the faunal remains combined with cores and instruments. We can therefore interpret this zone as the place where the hominins carried out butchering activities.

Galería-GIIIa reflects two main changes. Firstly, the occupational impact decreases compared to the previous subunit. Secondly, the total internal space of Galería is occupied and used. We found more than 40% of the lithic remains in TZ, 35% in TN and 25% in TG. On the other hand, the fauna is located mainly in TG and TZ. With this data, we cannot deduce the distribution of activities by area, as the lithic remains are homogeneously distributed throughout the entire cave. The TZ area was a new preferred zone inside the cave, and the occupations relocated from TN to TZ. It is possible that the progressive loss of effectiveness of the vertical duct as a natural trap for herbivores (as the cave filled in with sediment) contributed to this displacement. In addition, the TZ area, which corresponds with the hominin and carnivore entrance, could be a new point of light inside the new cavity distribution.

From both the lithic and faunal data, subunit Galería-GIIIb points to the total displacement of the hominin occupation to the TZ area. In TZ there is a predominance of percussors, cores, products and small tools. In TG, we found most of the large and small tools. From this perspective, TZ seems to correspond to the preferential area for knapping activities and TG to a preferential butchering area. Nevertheless, the fauna remains offered a quite homogeneous distribution between these two zones. At that time, the cavity

would have been so filled with silt that the natural trap would have been practically useless.

5. Conclusions

The scarcity and degree of incompleteness of the refits documented in Galería do not lead to a firm hypothesis. Nevertheless, we can make some inferences about the occupational patterns and changes through time. The refits reveal little postdepositional displacement of the remains due to sedimentary processes or other disturbances. The refits also provide new information about the technological activities carried out inside the cave. In their first occupation moments, the hominins made an extensive use of quartzite cobbles as blanks. However, most of the refits in these subunits are with artefacts made on chert. In the upper part of the sequence, the presence of quartzite decreases but most of the refits are of items made from this material. In spite of the scarcity of cores, most of the refits are related to knapping sequences, or are between flakes or between cores and flakes. So, the shaping processes mainly took place outside and the tools were subsequently introduced into the cave and left inside. Spontaneous technological activities that took place inside the cave as needed were mainly related to the production of flakes.

The whole cave was equally occupied. However, the successive short-term occupations of Galería changed in relation with their main location (Fig. 14) and with their intensity. In the base of the sequence, the most of technological activities are produced under the vertical duct. In addition, together with the light, the efficacy of the vertical duct is a key issue in understanding the displacement of the occupation from the TN to the TZ area.

The new excavation process must focus on the resolution of several questions: is it possible to confirm the occupational pattern defined in this study? What is the authentic morphology of the cave? What influence did this morphology have on the occupational distribution inside Galería? Could it be possible to identify faunal refits which could complete the distribution of remains inside this cave?

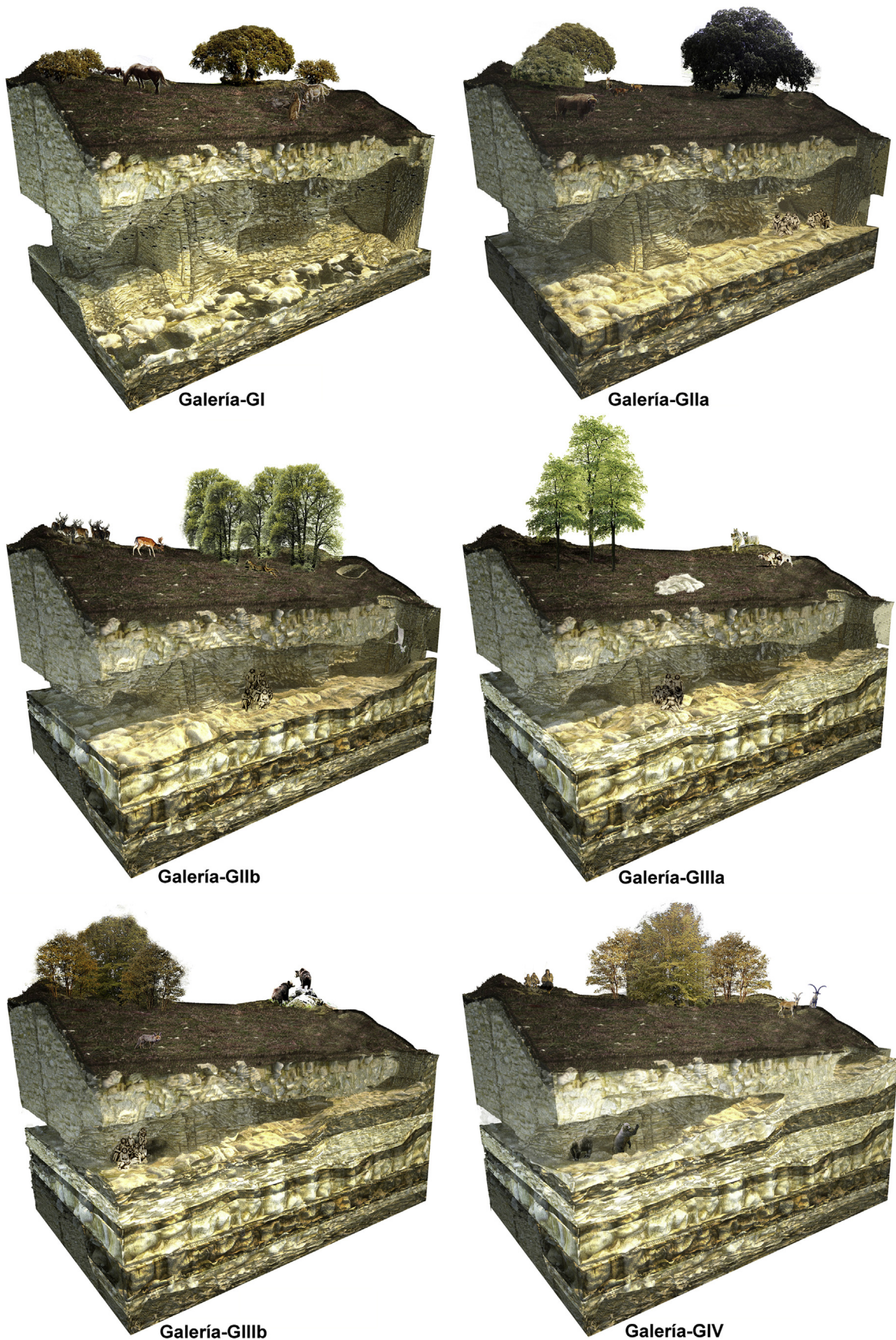


Fig. 14. Virtual reconstruction of the successive infilling phases of the Galería site and the location of the main occupational areas (Marco García-Medrano).

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