Research Article

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Faunal Remains Associated with Human Cremations: The Chalcolithic Pits 16 and 40 from the Perdigões Ditched Enclosures (Reguengos de Monsaraz, Portugal)

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Abstract: Different funerary behaviors are recorded in the Iberian Peninsula during Late Prehistory. Cremation is not the most common practice and the association between human cremains and fauna is even scarcer. We present two Chalcolithic pits (pits 16 and 40) from the Perdigões ditched enclosures, Reguengos de Monsaraz, Portugal. Humans were accompanied by animals and other votive materials such as arrowheads, ivory anthropomorphic figurines, and marble idols. Differences between the two contexts are discussed regarding the selection of faunal anatomical parts, the abundance of species, and the manipulation of remains. The results obtained were compared to previously published data from anthropological analysis. Burning damage intensity is different among pits and between humans and fauna. Hence, this suggests that the latter also resulted from diverse practices, including the possible selection of animal body portions for cremation and/or the deposition of selected burned bones or even related to patterns existing in the contexts of the provenance of the cremated materials before the cremation events.

Keywords: zooarchaeology, taphonomy, copper age, burned remains, cremation

1 Introduction

The cremation of human body parts is a ritual practice present in different geographies, chronologies, and types of contexts (Cerezo-Román, Wessman, & Williams, 2017; Kuijt, Quinn, & Cooney, 2014; Thompson, 2015). Similar to what occurs in other Western European regions (e.g., Gatto, 2007), the cadaveric reduction through the cremation of human remains is being increasingly documented in archaeological sites from Iberian Late Prehistory (Agusti & Farjas, 2002; Bettencourt, Silva, Costa, Tereso, & Cruz, 2021; Boaventura, 2009; Boaventura, Ferreira, Neves, & Silva, 2014; Cardoso, 1994; Díaz-Zorita Bonilla, 2017; Fernández-Crespo, 2016; Godinho, Gonçalves, & Valera, 2019; Hurtado Pérez, 1999; Odriozola Lloret, Hurtado Pérez, Isabel Dias, & Prudêncio, 2008; Oliveira, 2000; Rojo-Guerra, Garrido-Pena, & García-Martínez De Lagrán, 2010; Sáez, Laguna, & Carrretón, 2002; Sanchez, 1984; Sánchez-Abellán, Cerrillo-Cuenca, Blasco Rodríguez, & Prada Gallardo, 2021; Serrão & Marques, 1971; Silva, 1995, 2020; Silva, Cunha, & Gonçalves, 2007; Silva, Leandro, Pereira, Costa, & Valera, 2015; Silva, Tereso, Cruz, & Bettencourt, 2013; Valera, Silva, Cunha, &

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Evangelista, 2014; Weiss-Krejci, 2005). In this region, the cremation of human remains is considered marginal and restricted in the number of individuals per sites or structures. Funerary practices during the Chalcolithic are varied and include mainly primary and secondary deposition of non-cremated human remains in different types of structures, such as dolmens, tholoi, pits, ditches, and hypogea (Valera et al., 2010).

The recording of damage due to contact with fire became a common practice in archaeological analysis after initial studies on the consequences of burning in bone and teeth (e.g., Baby, 1954; Binford, 1963). Experimental work developed in the last decades greatly improved our knowledge of the consequences of the use of fire. Its study is routinely based on macroscopic color changes, even if microscopic morphology and structural modifications also appear (Pijoan, Mansilla, & Leboreiro, 2007; Shipman, Foster, & Shoeninger, 1984; Ubelaker, 2009). While the use of bone color is by itself insufficient to identify the maximum temperatures reached – other factors have to be considered such as the duration of exposure – it can be used to deduce their variation (Devlin & Herrmann, 2007; Shipman et al., 1984; Spennemann & Colley, 1989). Caution is needed in discussing lower temperatures because soft tissues can insulate the bones (Hanson & Cain, 2007), thus not reaching macroscopically detectable temperatures (Taylor, Hare, & White, 1995). Smaller fragments (Stiner, Kuhn, Weiner, & Bar-Yosef, 1995) and crania (Méniel, 1994) tend to have higher damage and uniform colors can relate to the absence of soft tissues (Asmussen, 2009). Understanding if bones were burned during cooking, due to them being discarded to the fire, accidentally damaged, or used as fuel is not straightforward (Bennett, 1999; Nicholson, 1993; Spennemann & Colley, 1989). One must consider that bone combustion properties are significant (Costamagno, Théry-Parisot, Kuntz, Bon, & Mensan, 2010; Costamagno, Théry-Parisot, Brugal, & Guibert, 2005; Glazewski, 2006; Théry-Parisot, 2002; Théry-Parisot, Costamagno, Brugal, Fosse, & Guilbert, 2005; Yravedra, Baena, Arrizabalaga, & Iriarte, 2005) further hindering the discussion of faunal fragments significance for funerary practices.

Considering that human funerary practices can be heterogeneous (Carr, 1995), the analysis of fauna associated with human cremains is of relevance to better understand these practices by further supporting their assessment. This is acknowledged especially for historic times (e.g., Hincak, Mihelic, & Bugar, 2007; Kurilia, 2015) but the presence of fauna is even rarer in Iberian Late Prehistory and when found usually has a dubious relationship with the funerary use (e.g., Bettencourt et al., 2021; Cerrillo-Cuenca & González-Cordero, 2014).

In this paper, we present the zooarchaeological and taphonomical study of animal assemblages accompanying human remains from two Chalcolithic pits (16 and 40) from the Perdigões large ditched enclosures in Reguengos de Monsaraz, Portugal. This site is being researched for over 25 years and is interpreted as an aggregation center (Valera, 2017) which was used from the late Middle Neolithic to the Early Bronze Age (3400–2000 BC). It has a huge list of publications, covering a great variety of subjects, such as funerary practices, fauna, social interaction, human and animal mobility, provenance studies, and landscape analysis (list of publications can be obtained at https://perdigoes.org/en/bibliografia/). Negative features of this open-air site contained the cremains of hundreds of human individuals accompanied by votive artifacts (Godinho et al., 2019; Silva et al., 2015; Valera, 2020). Pits 16 and 40 were selected since they are the only known cases, at least for Southwestern Iberia Chalcolithic, where a large number of mostly cremated human remains are accompanied by unpublished collections of animal bones and teeth, some of which are also burnt. Our aim is threefold: i) to assess the characteristics of the faunal assemblages, their differences and similarities between pits, ii) to compare the practices involved in the deposition of human cremains and faunal remains between the two case studies presented, iii) and to discuss their relevance for the study of human cremation during the Late Prehistory.

2 Materials and Methods

2.1 Materials and Contexts

The present study comprises the faunal assemblages associated with human cremated remains deposited in pit 16 and pit 40 of the Perdigões ditched enclosures (Reguengos de Monsaraz, Portugal) (Figure 1). These

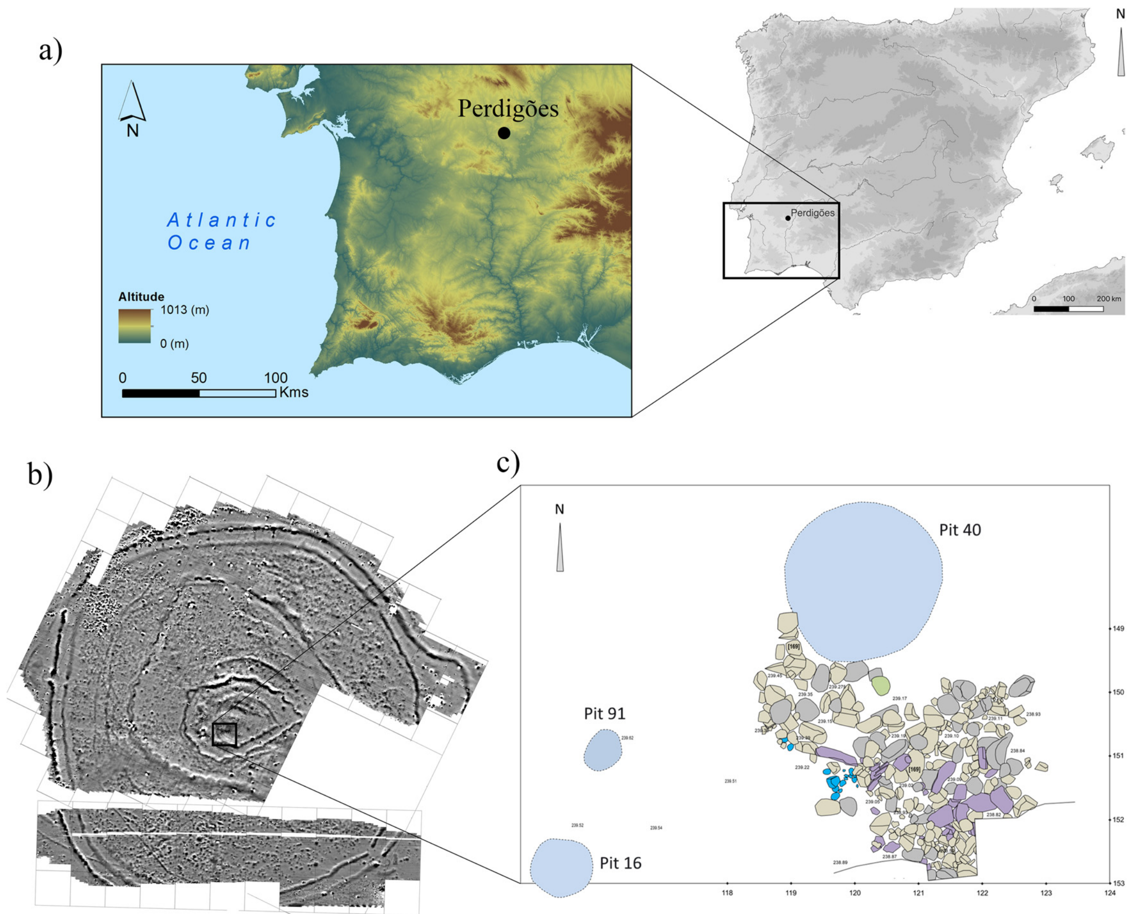

Figure 1: Location of Perdigões in the Iberian Peninsula and in the Alentejo region (a); magnetogram of the archaeological site with location of pits 16 and 40 (b); features with cremated remains in the central area of Perdigões (c) (after Valera, 2020).

structures are part of a scenario located in the central area of the Perdigões ditched enclosures where the secondary depositions of cremated human remains were performed, both in pit structures and in the open air over a stone agglomeration (Valera et al., 2014; Valera, 2020) (Figure 2).

Pit 16 is a circular feature with a 0.92 m diameter at the top, 1.50 m at the base, and a depth of 0.90 m. In the middle of the infilling, it presented a conical deposit of ashes and human cremated remains (corresponding to a minimum number of 9 individuals) together with faunal bones and artifacts (anthropomorphic idols, arrowheads, pottery fragments, and a copper awl), most of them also burned. The formation of this context corresponded to one event, when the human remains, cremated elsewhere, were deposited in the pit already partially filled, and then covered by other deposits with unburned materials, but with no human remains. This deposition in stratigraphic unit 74 was dated between 2621 and 2350 cal BC (Perdigões Global Research Program – Radiocarbon database – www.perdigoes.org). The fauna under analysis comprise remains from the different infilling phases, from the bottom to the top: phase 1 [126, 125] (n = 34, 3.9%), phase 2 [124, 74, 72] (n = 432, 49.2%), and phase 3 [90, 76, 71, 68, 58] (n = 412; 46.9%) (Figure 3).

Pit 40 is a larger circular feature, 2.5 m wide and 0.80 m deep. It presented two postholes in the center indicating that it had some sort of roof. Several phases of secondary depositions of human cremated and some unburned remains were identified, in associations with faunal bones and votive materials (anthropomorphic idols, pottery shards, copper awls, beads, and arrowheads), most of them also burned. The assemblage of human remains studied so far represents a minimum number of 240 individuals dated by several radiocarbon dates to the Chalcolithic. These individuals are from stratigraphic unit 193 which represents the early depositions from phase 1, with the remaining cremains from phase 1 and the total

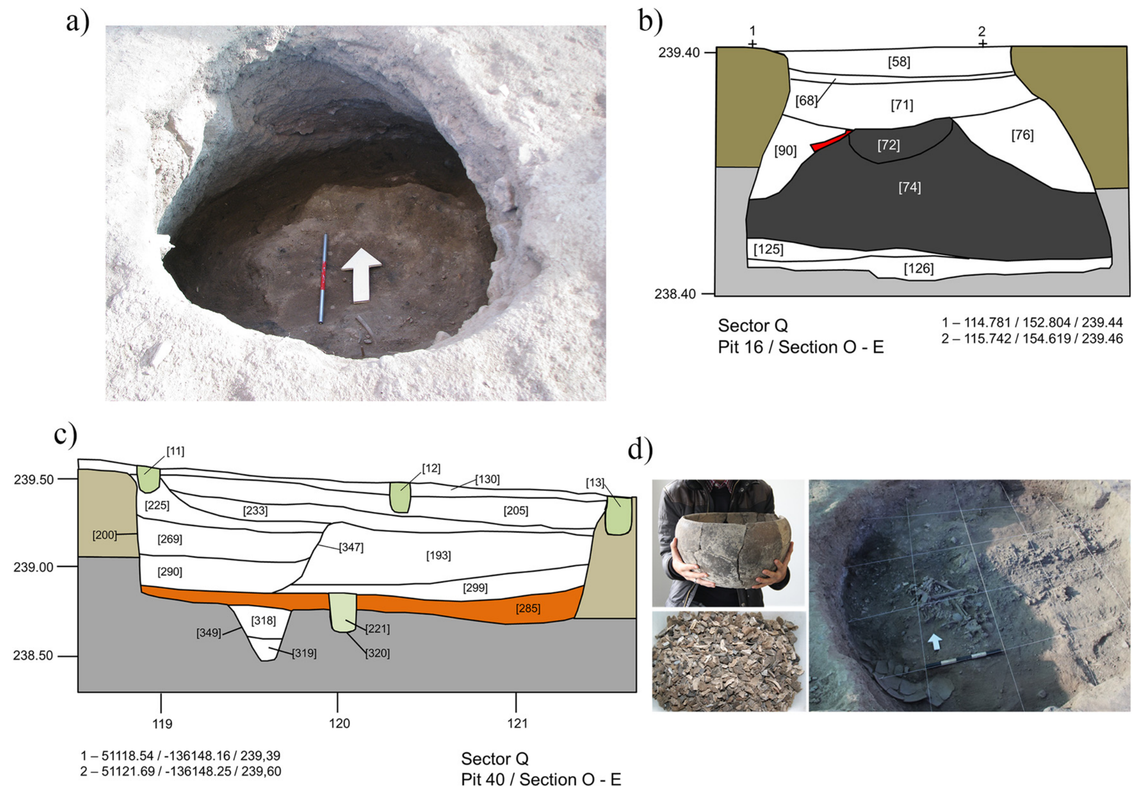

Figure 2: Detail of the conic-shaped deposit containing cremations in pit 16 (a); profile of pit 16 (b); aspect of the human cremated remains in pit 40 (c); profile of pit 40 (d) (after Valera, 2020).

assemblages from phases 2 and 3 still incompletely studied. Available published data represents ~60% of the full sample from pit 40 (Godinho et al., 2019). The formation of this context resulted from several depositional events spread over time but concentrated in the middle/third quarter of the 3rd millennium BC. It is possible that materials from different chronologies with different provenances were deposited together in each event. The fauna under analysis comprises remains from the different infilling sequence phases, from the bottom to the top: phase 1 [299, 193] (n = 209, 89.3%), phase 2 [290, 269] (n = 24, 10.3%), and phase 3 [203] (n = 1, 0.4%) (Figure 4).

All the available radiocarbon dates (n = 14, Perdigões Global Research Program – Radiocarbon database – www.perdigões.org/en/base-de-dados/) were obtained over human remains. Their Bayesian statistical treatment indicates they cover a period between 2700/2600 and 2400/2200 cal BC, showing that this context was progressively formed, even if occasionally reuniting materials with different chronological and contextual origins. All material culture associated, that is also burned, is typologically compatible with the scope of the obtained chronology. Fauna remains are in association with the human remains and material culture within these structures and integrate the same deposits. Stratigraphic and taphonomical evidence indicates that human, artefact and faunal remains were deposited together along with the several episodes of deposition identified. So globally, human, material culture and faunal remains can be considered generically contemporary within the time span covered by the absolute chronology. This must not be confused with the time span of the use of the structure, which could be shorter, since we are dealing with secondary depositions. Within that scope, their association can be evaluated by structure and by phase within the structure. These phases were stratigraphically defined and each one might congregate several depositional events that might themselves mix different original contexts. Although how, where and when these mixings occurred is difficult to establish without information about the contexts of origin, what is present and what is absent, and what could or could not be mixed in the funerary context.

2.2 Methods

Fauna analysis followed common methodologies in zooarchaeology and taphonomy (Lyman, 1994; Reitz & Wing, 2008). All faunal remains from pits 16 and 40 were analysed. The votive "idols" produced from equid and red deer phalanges are included to further assess taphonomical evidence and discuss the formation of these contexts. Their in-depth description and discussion of their perceived ritual function and/or prevalence in other regional funerary contexts were already considered elsewhere (Valera, 2015). Remains were anatomically and taxonomically identified or tentatively grouped in basic bone (long and flat bone, undetermined) and weight groups, hereinafter WG (WG 1: <20 kg, WG 2: 20–100 kg, WG 3: 100–300 kg, WG 4: >300 kg). Biometrical data were obtained using a digital Lux calliper following von den Driesch (1976) and other authors in specific cases (Albarella, Davis, Detry, & Rowley-Conwy, 2005; Davis, 1996; Payne & Bull, 1988). Biometrical and morphological information was used to try to differentiate between similar species of bovine, swine and caprine (e.g., Albarella et al., 2005; Zeder & Lapham, 2010; Zeder & Pilaar, 2010). Data is presented by using the Number of Specimens (NSP), Number of Identified Specimens (NISP) and Minimum Number of Elements (MNE) (Binford, 1984; Grayson, 1984).

Breakage was evaluated based on the size of the remains, the analysis of shaft length and circumference completeness, and cortical tissue fracture outline, angle and edge after Villa and Mahieu (1991). Bone and tooth were recorded according to relative preservation (<25, 25–49, 50–74, 75–99, 100%), presence of bone portions (e.g., proximal epiphysis, diaphysis plus proximal epiphysis) and surfaces (e.g., anterior, posterior, medial and lateral). Bone surface modifications (BSM) related to anthropogenic breakage and processing or consumption were documented according to their morphology, position and intensity (Binford, 1981; Blumenschine, Marean, & Capaldo, 1996; Shipman, 1981; Stiner et al., 1995).

After Cáceres (2002) and other studies (Buikstra & Ubelaker, 1994; Nicholson, 1993; Shipman et al., 1984; Stiner et al., 1995) bone colour related to burning damage was recorded according to degrees: 0 = absent; 1 = lightly burned with some light brown spots; 2 = lightly burned with a relatively homogenous (darker) brown colour throughout the bone surface; 3 = carbonized with a blackish colour; 4 = greyish tonalities with occasional blue inclusions; 5 = calcinated with white colour. Different colours appearing on the same surface or the external and internal surfaces of bones were recorded, together with the location and relative (%) area of the bone surfaces. The presence of thumbnail fractures and warping (Binford, 1963) was also documented. The application of these methodologies secured the possibility of comparing our data with the results from the analysis of human remains (Godinho et al., 2019; Silva et al., 2015).

Other taphonomical indicators that can give information on the depositional environment of the context were recorded. The presence of weathering followed the stages proposed by Behrensmeyer (1978). Root etching, chemical erosion, oxide precipitation, and concretions were qualitatively assessed after Almeida (2017) according to degrees: 0 = absent; 1 = lightly affected with isolated alteration present in <25% of the surface; 2 = lightly affected with alteration normally isolated present in 25–49% of the surface; 3 = moderately affected with alterations normally superimposed and present in 50–75% of the surface; 4 = highly affected with several alterations superimposed and present in >75% of the surface.

3 Results

3.1 Anatomy and Taxonomy

3.1.1 Pit 16

Swine are the most common group with a few remains being identifiable as *Sus* cf. *scrofa* and *Sus* cf. *domesticus* (Tables 1 and 2) but mostly as *Sus* sp. A higher frequency of loose teeth and distal appendicular bones such as proximal phalanges is clear. Anatomically compatible bones are common but no connections

Table 1: Number of specimens (NSP), number of identified specimens (NISP) and the minimum number of elements (MNE) calculated for pits 16 and 40, including undetermined remains identified to weight groups (WG)

	Pit 16				Pit 40			
	NISP	%	MNE	%	NISP	%	MNE	%
Mammalia								
Bos taurus					1	1	1	1.3
Bos sp.	11	5.2	3	2.2	3	3	1	1.3
Ovis aries	2	1.0	2	1.5	1	1	1	1.3
cf. *Capra hircus*	1	0.5	1	0.7				
Ovis/Capra	40	19.0	15	10.9	8	8	4	5.1
Cervus elaphus	10	4.8	8	5.8	6	6	5	6.4
Herbivore (small)	3	1.4			1	1		
Sus cf. *scrofa*	1	0.5	1	0.7	1	1	1	1.3
Sus cf. *domesticus*	4	1.9	4	2.9				
Sus sp.	71	33.8	46	33.6	59	59	45	57.7
Equus sp.	1	0.5	1	0.7	4	4	4	5.1
Oryctolagus cuniculus	23	11.0	19	13.9	10	10	10	12.8
Lepus sp.	1	0.5	1	0.7				
Leporidae	8	3.8	6	4.4	3	3	3	3.8
Canis familiaris	2	1.0	2	1.5				
Canis sp.	28	13.3	24	17.5				
Microfauna	2	1.0	2	1.5	2	2	2	2.6
Aves	1	0.5	1	0.7	1	1	1	1.3
Mollusca	1	0.5	1	0.7				
Total	210	100	137	100	100	100	78	100
Undetermined								
WG unknown	254	38.0			45	33.6		
WG 1	39	5.8			15	11.2		
WG 1/2	109	16.3			24	17.9		
WG 2	176	26.3			30	22.4		
WG 2/3	52	7.8			14	10.4		
WG 3	9	1.3			5	3.7		
WG 3/4	21	3.1			1	0.7		
WG 4	8	1.2			0	0.0		
Total	668				134			
NSP	878				234			

were identified during the excavation. The higher abundance of distal appendicular bones is also evidenced in caprine, which is prevalent in comparison to the less abundant remains specifically identified as *Ovis aries* and cf. *Capra hircus*.

Canis familiaris is represented by anatomically compatible radius and ulna. Several vertebrae and ribs were classified as *Canis* sp. The existence of two different-sized axis indicates a minimum of two individuals. Leporids comprise appendicular and axial cranial and post-cranial remains from *Oryctolagus cuniculus* and *Lepus* sp. *Bos* sp. is mainly related to horn fragments while *Cervus elaphus* astragalus relates to two different individuals. An *Equus* sp. proximal phalange was recovered. Taxonomically undetermined remains follow this profile with a preponderance of fragments from WG 2.

The majority of remains are from the infilling phases 1 (n = 107, 51%) and 2 (n = 95, 45%) (Table 3). In phase 3, the caprine prevail (n = 5, 63%) and the only equid bone were recovered. Caprine are surpassed by swine in phase 2 (n = 36, 38%) and 1 (n = 38, 35%). Apart from swine, leporid (n = 23, 24%) are more abundant than caprine (n = 19, 20%) during phase 2, while canids (n = 28, 26%) are more numerous followed by caprine (n = 19, 18%) in the phase 1.

Table 2: Number of identified specimens and the minimum number of elements (NISP/MNE) calculated for pit 16

	B	OA	cfCH	OC	CE	HER	ScfS	ScfD	S	EQ	ORC	LEP	L	CF	C	MI	AV	WG?	WG 1	WG 1/2	WG 2	WG 2/3	WG 3	WG 3/4	WG 4	Total
Antler/horn	8/1				2/1													1								11/2
Skull (maxilla)				2/2			1/1	1/1	2/2									4								11/6
Mandible	1/1	1/1		1/1	1/1				2/2		6/4					1/1					1					14/11
Loose tooth	1			22	1	3			15		2							3			2	1				50
Hyoid																				1				1		2
Vertebra									1/1				1/1		24/20				3	3	15	9	2		1	59/ 22
Sacrum													1/1							1						2/1
Rib															4/4	1/1			23	31	40	3	2	1		105/5
Scapula					1/1			1/1			2/2										1	1				6/4
Humerus				1/1				1/1	5/4		2/2	1/1						1			3					14/9
Radius									2/2					1/1						1						4/3
Ulna				1/1										1/1							1					3/2
Metacarpal									2/2																	2/2
Pelvis				1/1	1/1						3/3		2/2									1		1	1	10/7
Femur											2/2		3/1							1	1	1				8/3
Tibia					1/1				2/1		2/2										1					6/4
Fibula																						1				1
Astragalus		1/1			3/3			1/1	1/1																	6/6
Calcaneus				2/2					4/4		1/1															7/7
Tarso-metatarsal																	1/1									1/1
Metatarsal									5/5		3/3															8/8
Metapodial	1/1			6/3					9/1												2	1				19/5
Carpal/tarsal				2/2					1/1									1			3					7/3
Phalange 1				2/2					13/13	1/1			1/1								4					21/17
Phalange 2			1/1						3/3																	4/4
Phalange 3									4/4																	4/4
Phalange																					1					1
Long bone																		5	4	22	87	26	5	7	4	160
Flat bone																		66	3	19	12	2		4		106
Ivory																		1							2	3
Undetermined																		172	6	30	2	5		7		222
Total	11/3	2/2	1/1	40/15	10/8	3	1/1	4/4	71/46	1/1	23/19	1/1	8/6	2/2	28/24	2/2	1/1	254	39	109	176	52	9	21	8	878/ 137

B = *Bos* sp., OA = *Ovis aries*, cfCH = cf. *Capra hircus*, OC = *Ovis*/*Capra*, CE = *Cervus elaphus*, HER = herbivore, ScfS = *Sus* cf. *scrofa*, ScfD = *Sus* cf. *domesticus*, S = *Sus* sp., EQ = *Equus* sp., ORC = *Oryctolagus cuniculus*, LEP = *Lepus* sp., L = Leporidae, CF = *Canis familiaris*, C = *Canis* sp., MI = Microfauna, AV = Aves, WG = Weight group.
? = Unknown.

Table 3: Dispersion of number of identified specimens (NISP) per different phases of pits 16 and 40

	Pit 16						Pit 40					
	Phase 1		Phase 2		Phase 3		Phase 1		Phase 2		Phase 3	
	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%	NISP	%
Bos taurus							1	1.2				
Bos sp.	3	2.8	8	8.4			3	3.5				
Ovis aries			1	1.1	1	12.5	1	1.2				
cf. *Capra hircus*			1	1.1								
Ovis/Capra	19	17.8	17	17.9	4	50.0	7	8.2	1	7.1		
Cervus elaphus	8	7.5	2	2.1			5	5.9	1	7.1		
Herbivore (small)	2	1.9	1	1.1			1	1.2				
Sus cf. *scrofa*	1	0.9					1	1.2				
Sus cf. *domesticus*	4	3.7										
Sus sp.	33	30.8	36	37.9	2	25.0	50	58.8	9	64.3		
Equus sp.					1	12.5	3	3.5			1	100
Oryctolagus cuniculus	6	5.6	17	17.9			9	10.6	1	7.1		
Lepus sp.			1	1.1								
Leporidae	3	2.8	5	5.3			1	1.2	2	14.3		
Canis familiaris	1	0.9	1	1.1								
Canis sp.	27	25.2	1	1.1								
Microfauna			2	2.1			2	2.4				
Aves			1	1.1			1	1.2				
Mollusca			1	1.1								
Total	107	100	95	100	8	100	85	100	14	100	1	100

3.1.2 Pit 40

The assemblage is dominated by swine with a high number of distal appendicular elements: carpal and tarsal bones ($n = 7$), phalanges ($n = 27$), and metapodials ($n = 9$) (Tables 1 and 4). Some of these elements are anatomically compatible even though anatomical connections were not recorded during the excavation.

Caprine comprises one *Ovis aries* radius and several *Ovis/Capra* loose teeth and appendicular bones. Besides three Leporidae bones, some *Oryctolagus cuniculus* remains were recovered, with a higher frequency of the axial post-cranial and appendicular skeleton parts, with radius and femurs being more common. Large bovines are represented by scarce *Bos taurus* and *Bos* sp. remains. Besides some *Cervus elaphus* cranial remains and distal appendicular bones, we identified four equid proximal phalanges. Taxonomically undetermined remains show a higher abundance of WG 2, i.e., from animals with the weight of caprine and swine, which are the most abundant species.

One equid “idol” phalange is the only bone from phase 3 (1%). A small part of the assemblage corresponds to phase 2 ($n = 14$, 14%) which has mostly swine ($n = 9$, 64%) and leporid ($n = 3$, 21%) remains, as well as one *Cervus elaphus* “idol” phalange (Table 3). A total of 85% of the taxonomically identified remains are from phase 1. While this phase is dominated by swine ($n = 51$, 60%), leporids ($n = 10$, 12%), and caprine ($n = 8$, 9%), other species are present of which equids ($n = 3$, 4%) are noteworthy due to the recovery of three “idol” phalanges and another one from red deer ($n = 5$, 6%).

3.2 Taphonomy

3.2.1 Pit 16

A total of 87% of the assemblage consists of remains with a maximum size of less than 5 cm, 12% between 5 and 10 cm, and 1% over 10 cm. The smaller fragments predominate in all phases but fragments with 5–10 cm are more abundant (17%) in phase 3 in comparison to phases 2 (8%) and 1 (3%). Shaft

Table 4: Number of identified specimens and the minimum number of elements (NISP/MNE) calculated for pit 40

	BT	B	OA	OC	CE	HER	ScfS	S	EQ	ORC	L	MI	AV	WG?	WG 1	WG 1/2	WG 2	WG 2/3	WG 3	WG 3/4	Total
Antler/horn					1/1									1							2/1
Skull														3							3
Maxilla								2/2													2/2
Mandible										1/1								1			2/1
Loose tooth		2		3	1	1		9						1			1				18
Hyoid																		1			1
Vertebra								1/1						1		3	5	1			11/1
Rib											1/1				9	4	12	5	4		35/1
Scapula								1/1													1/1
Humerus								1/1													1/1
Radius			1/1	2/1						3/3											6/5
Ulna								2/2													2/2
Metacarpal								1/1			1/1										2/2
Pelvis				2/2						1/1							1				4/3
Femur										2/2					1						3/2
Patella		1/1																			1/1
Tibia							1/1				1/1		1/1								3/3
Astragalus				1/1	1/1			1/1									1				4/3
Calcaneus								3/3		1/1											4/4
Metatarsal								3/3		1/1											4/4
Metapodial								5/1													5/1
Carpal/tarsal	1/1							3/3													4/4
Phalange 1					3/3			15/14	4/4	1/1							1				24/22
Phalange 2								6/6													6/6
Phalange 3								6/6													6/6
Und. phalange														1			1				2
Long bone												2/2			4	8	4	3	1	1	23/2
Flat bone														16	1	4	2	2			25
Undetermined														22		5	2	1			30
Total	1/1	3/1	1/1	8/4	6/5	1	1/1	59/45	4/4	10/10	3/3	2/2	1/1	45	15	24	30	14	5	1	221

BT = *Bos taurus*, B = *Bos* sp., OA = *Ovis aries*, OC = *Ovis/Capra*, CE = *Cervus elaphus*, HER = herbivore, ScfS = *Sus* cf. *scrofa*, S = *Sus* sp., EQ = *Equus* sp., ORC = *Oryctolagus cuniculus*, L = Leporidae, MI = Microfauna, AV = Aves, WG = Weight group.
? = Unknown.

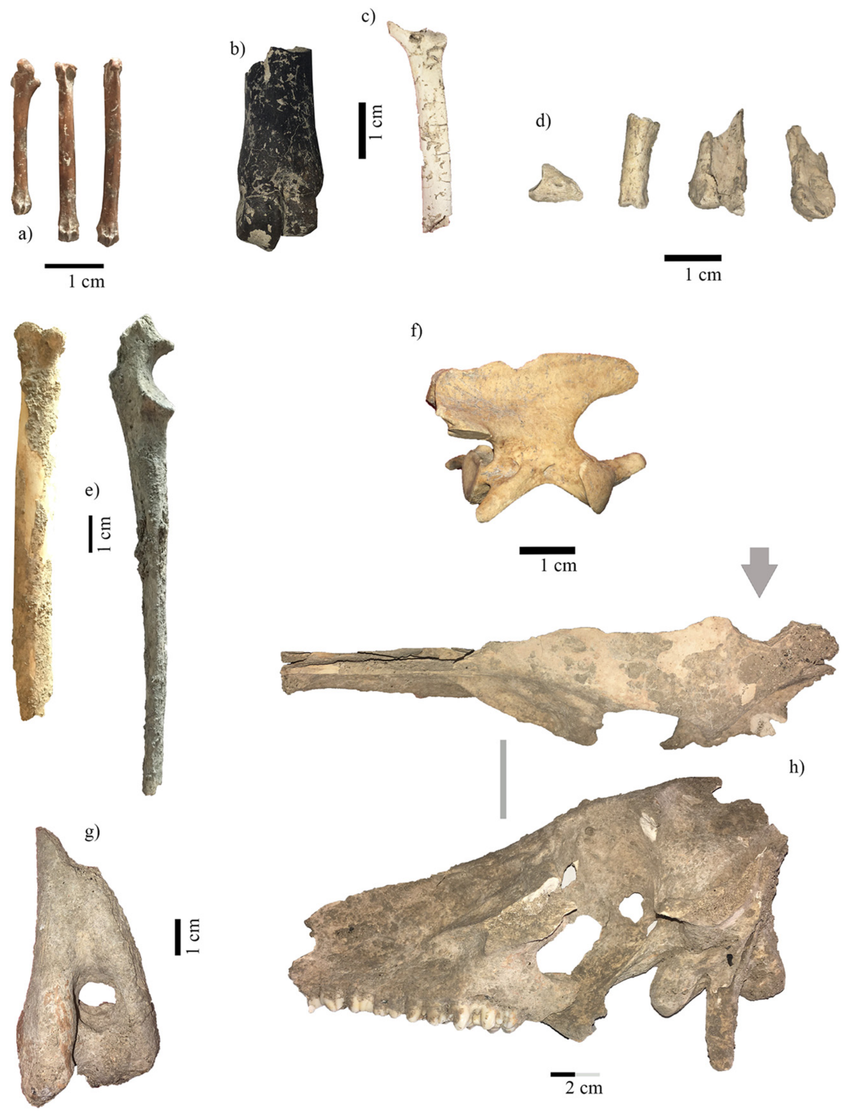

Figure 3: Selection of materials from pit 16: (a) *Oryctolagus cuniculus* metatarsals with burning in degree 2; (b) *Sus* sp. metapodial distal portion with burning in degree 3; (c) *Sus* sp. metatarsal 5 proximal portion with burning in degree 5; (d) *Sus* sp. phalanges with burning in degree 5; (e) *Canis familiaris* radius and ulna with concretions; (f) *Canis* sp. axis; (g) *Sus* cf. *domesticus* humerus distal portion; (h) *Sus* sp. cranium left half with anthropogenic breakage.

completeness (*n* = 119) is low with 68% (*n* = 81) having <25 and 28% (*n* = 33) between 25 and 50% of their original length. Shaft circumference follows this tendency with a higher abundance of remains with <25% (*n* = 92, 77%). Fracture analysis (*n* = 221) shows the higher frequency of oblique (*n* = 79, 32%) and longitudinal (*n* = 100, 45%) outlines, right angles (*n* = 179, 81%), and jagged edges (*n* = 173, 78%). Recent breakage is recorded on 15% (*n* = 132) and complete elements correspond to 5% (*n* = 47) of the assemblage (Figure 5).

Cutmarks and tooth marks are scarce (*n* = 1, 0.1% for each). Breakage (*n* = 9, 1%) is represented by impact notches (*n* = 6), cones (*n* = 2) and cortical extractions (*n* = 2) that were recorded on taxonomically determined and undetermined remains mostly from WG 2. A swine left half skull with two possible impact notches that allowed the sectioning of the cranium is worth mentioning.

Boiling indicators were not recorded but burning damage is abundant (*n* = 200, 23%) (Tables 5 and 6). Warping (*n* = 2, 1%) and thumbnail fractures (*n* = 6, 3%) are uncommon. Double coloration is recorded in 13 (7%) fragments. Damage degree 1 (*n* = 2, 1%) is scarce in comparison to more developed degrees 2 (*n* = 53,

Table 5: Absolute and relative values on the presence of burning damage according to taxa and degree (D) of damage for pit 16

	D1	%	D2	%	D3	%	D4	%	D5	%	Total	%
Bos sp.					1	1.5					5	2.5
cf. *Capra hircus*									1	2	1	0.5
Ovis/Capra					6	9			4	8.2	10	5
Cervus elaphus			1	1.9			1	3.8			2	1
Sus sp.			3	5.8	3	4.5	2	7.7	7	14.3	15	7.5
Equus sp.							1	3.8			1	0.5
Oryctolagus cuniculus			5	9.6	1	1.5					6	3
Lepus sp.					1	1.5					1	0.5
Leporidae			1	1.9	2	3					3	1.5
Microfauna			1	1.9	1	1.5					2	1
Aves					1	1.5					1	0.5
Undetermined	2	100	41	78.8	51	76.1	22	84.6	37	75.5	153	76.5
Total	2	100	52	100	67	100	26	100	49	100	200	100
Undetermined												
WG unknown			9	22	14	27.5	9	40.9	9	24.3	41	26.8
WG 1			3	7.3	9	17.6			2	5.4	14	9.2
WG 1/2			12	29.3	7	13.7	1	4.5	15	40.5	35	22.9
WG 2	2	100	9	22.0	12	23.5	10	45.5	10	27	43	28.1
WG 2/3			4	9.8	4	7.8	1	4.5	1	2.7	10	6.5
WG 3/4			2	4.9	3	5.9	1	4.5			6	3.9
WG 4			2	4.9	2	3.9					4	2.6
Total	2	100	41	100	51	100	22	100	37	100	153	100

Table 6: Absolute and relative values on the presence of burning damage according to element and degree (D) of damage for pit 16

	D1	%	D2	%	D3	%	D4	%	D5	%	Total	%
Antler/horn			1	1.9	4	5.6	1	3.8			6	3
Mandible	1	50	3	5.8	1	1.4					5	2.5
Loose tooth			1	1.9	6	8.5	1	3.8			8	4
Vertebra			1	1.9	3	4.2					4	2
Rib			9	17.3	11	15.5	5	19.2	6	12.2	31	15.5
Humerus					2	2.8					2	1
Radius					1	1.4					1	0.5
Metacarpal					1	1.4					1	0.5
Pelvis					1	1.4					1	0.5
Femur			2	3.8	1	1.4					3	1.5
Tibia			1	1.9					1	2	2	1
Calcaneus			1	1.9							1	0.5
Tarso-metatarsal					1	1.4					1	0.5
Metatarsal			4	7.7					1	2	5	2.5
Metapodial					2	2.8	1	3.8	4	8.2	7	3.5
Carpal/tarsal									1	2	1	0.5
Phalange 1							2	7.7	5	10.2	7	3.5
Phalange 2					1	1.4	1	3.8	1	2	3	1.5
Phalange 3									1	2	1	0.5
Phalange									1	2	1	0.5
Long bone	1	50	13	25	11	15.5	3	11.5	11	22.4	39	19.5
Flat bone			4	7.7	12	16.9	2	7.7	3	6.1	21	10.5
Ivory					3	4.2					3	1.5
Undetermined			12	23.1	10	14.1	10	38.5	14	28.6	46	23
Total	2	100	52	100	71	100	26	100	49	100	200	100

Figure 4: Selection of materials from pit 40: (a) *Sus* sp. metacarpal 3 proximal portion with burning in degrees 2 and 3; (b) *Sus* sp. proximal and mesial phalanges with burning in degrees 3 and 5; (c) *Oryctolagus cuniculus* femur with burning in degree 3; (d) hyoid bone burned in degrees 2 and 3 and detail of cutmark; (e) *Cervus elaphus* proximal phalange modified by thinning; (f) *Equus* sp. proximal phalange modified by thinning the mesial and distal portions and burning in degree 4; (g) *Equus* sp. proximal phalange with mesial and distal thinning and burning in degrees 2 and 3.

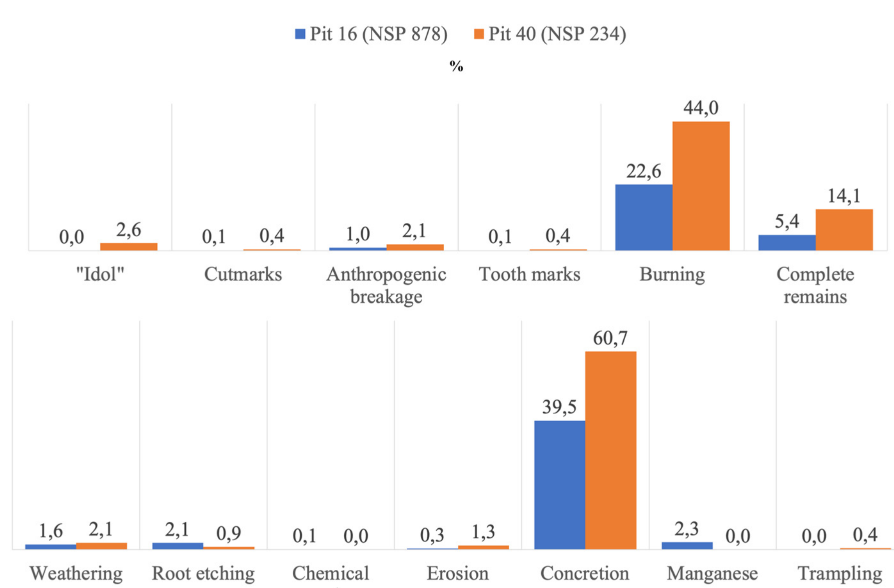

Figure 5: Relative abundance of the main taphonomical indicators observed in the assemblages from pit 16 and pit 40.

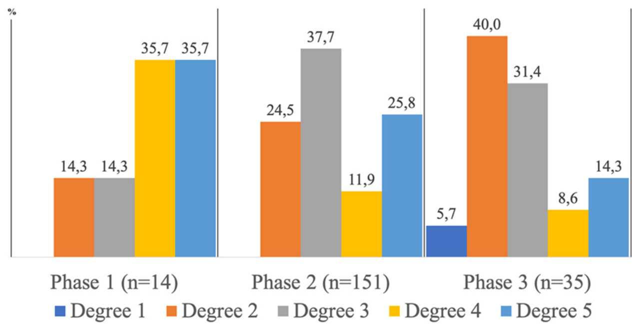

Figure 6: Histogram with the relative abundance (%) of burning damage degree according to the infilling phases of pit 16.

26.5%) and 3 (*n* = 70, 35%) that combined are greater than 50% (Figure 6). Degrees 4 (*n* = 26, 13%) and 5 (*n* = 49, 24.5%) are also common. The exposure of both external and internal bone tissues to fire damage (*n* = 92, 46%) is significant since it can also relate to the condition of remains prior to their burning. Remains have <50% of the surface burned (*n* = 15, 7.5%), between 80 and 90% (*n* = 2, 1%), and mainly completely burned surfaces (*n* = 183, 91.5%).

Weathering (*n* = 14, 2%), root etching (*n* = 18, 2%), chemical erosion (*n* = 4, 0.4%), manganese oxide precipitation (*n* = 20, 2%), and concretions (*n* = 347, 40%) were recorded. The latter are present in initial degrees 1 (*n* = 38, 11%) and 2 (*n* = 85, 25%) but more commonly reach degrees 3 (*n* = 117, 34%) and 4 (*n* = 107, 31%).

3.2.2 Pit 40

All remains size is lower than 10 cm with <5 cm being predominant in the assemblage (*n* = 211, 90%). Breakage analysis demonstrates some degree of preservation of the shaft completeness (*n* = 20): 65% (*n* = 13) have between 25 and 50% of their length and 45% (*n* = 9) >75% of their original circumference, but with <25% in both length (*n* = 6, 30%) and circumference (*n* = 7, 35%). Fracture planes (*n* = 16) have a higher abundance of transverse (*n* = 23, 50%) and longitudinal (*n* = 17, 37%) outlines, right (*n* = 38, 83%) and mixed (*n* = 7, 15%) angles, and smooth (*n* = 26, 57%) edges. Modern breakage is found in 13% (*n* = 30) of the assemblage, which has 14% (*n* = 33) complete elements (Figure 5).

Table 7: Absolute and relative values on the presence of burning damage according to taxa and degree (D) of damage for pit 40

	D2	%	D3	%	D4	%	D5	%	Total	%
Bos taurus			1	2					1	1
Bos sp.					1	5.9			1	1
Ovis/Capra	1	4.8	2	4.1					3	3.1
Sus sp.	6	28.6	14	28.6	3	17.6	3	33.3	26	27.1
Equus sp.	1	4.8	2	4.1	1	5.9			4	4.2
Oryctolagus cuniculus	1	4.8	1	2	1	5.9			3	3.1
Leporidae			1	2					1	1
Microfauna	1	4.8							1	1
Aves					1	5.9			1	1
Undetermined	11	52.4	28	57.1	10	58.8	6	66.7	55	57.3
Total	21	100	49	100	17	100	9	100	96	100
Undetermined										
WG unknown	3	27.3	7	25	2	20	1	16.7	13	23.6
WG 1	4	36.4	3	10.7	1	10	1	16.7	9	16.4
WG 1/2	3	27.3	3	10.7	4	40	1	16.7	11	20
WG 2			7	25	1	10	3	50	11	20
WG 2/3			7	25	2	20			9	16.4
WG 3			1	3.6					1	1.8
WG 3/4	1	9.1							1	1.8
Total	11	100	28	100	10	100	6	100	55	100

Table 8: Absolute and relative values on the presence of burning damage according to element and degree (D) of damage for pit 40

	D2	%	D3	%	D4	%	D5	%	Total	%
Antler/horn			1	1.8					1	1.0
Skull (maxilla)	2	9.5	1	1.8					3	2.9
Mandible			1	1.8					1	1.0
Loose tooth			1	1.8			1	11.1	2	1.9
Hyoid			1	1.8					1	1.0
Vertebra	1	4.8	4	7.1	1	5.9	2	22.2	8	7.8
Rib	4	19.0	9	16.1	1	5.9			14	13.6
Scapula					1	5.9			1	1.0
Radius	1	4.8	2	3.6	1	5.9			4	3.9
Ulna							1	11.1	1	1.0
Metacarpal			1	1.8					1	1.0
Pelvis	1	4.8	1	1.8					2	1.9
Femur			2	3.6					2	1.9
Patella					1	5.9			1	1.0
Tibia			2	3.6	1	5.9			3	2.9
Calcaneus							1	11.1	1	1.0
Metatarsal			4	7.1					4	3.9
Metapodial	1	4.8			1	5.9			2	1.9
Carpal/tarsal			4	7.1					4	3.9
Phalange 1	4	19.0	6	10.7	1	5.9			11	10.7
Phalange 2			2	3.6	1	5.9	1	11.1	4	3.9
Phalange 3			1	1.8					1	1.0
Long bone	4	19.0	7	12.5	3	17.6	2	22.2	16	15.5
Flat bone	1	4.8	2	3.6	4	23.5			7	6.8
Undetermined	2	9.5	4	7.1	1	5.9	1	11.1	8	7.8
Total	21	100	56	100	17	100	9	100	103	100

Taphonomical indicators associated with anthropogenic or carnivore action are uncommon: one cutmark in a hyoid bone from an undetermined animal and one *Oryctolagus cuniculus* pelvis with possible crenulated edges (0.4% each). Anthropogenic breakage (n = 5, 2%) comprises impact notches (n = 2), peeling (n = 2), and other indicators (n = 1) generally on taxonomically undetermined bones.

Boiling was not identified but burning damage is found in almost half of the assemblage (n = 103, 44%) (Tables 7 and 8). Double colors (n = 12, 12%), damage on both internal and external surfaces (n = 12, 12%) and warping (n = 1, 1%) are present. Damage in degrees 1 (n = 1, 1%) and 2 (n = 19, 18%) are not abundant in contrast to degree 3 (n = 45, 44%) that occasionally is recorded together with the lower degree 2 (n = 10, 10%) (Figure 7). Degree 4 (n = 16, 16%) is more common in comparison to double colors degrees 4/5 (n = 1, 1%) or degree 5 (n = 5, 5%). The remains surface is mostly completely damaged due to fire (n = 97, 94%) with a few cases having <60% of the surface altered (n = 6, 6%). Proximal "idol" phalanges from equid (n = 4) and red deer (n = 2) were modified through the thinning of mesial and distal portions.

Weathering (n = 5, 2%), root etching (n = 2, 0.9%), erosion (n = 3, 1.3%), and trampling (n = 1, 0.4%) are scarce. Concretions (n = 142, 60.7%) occur in different degrees: 1 (n = 23, 16.2%), 2 (n = 41, 28.9%), 3 (n = 41, 28.9%), and 4 (n = 37, 26.1%).

4 Discussion

4.1 Pit 16

This pit corresponds to the secondary disposal of intentionally cremated complete corpses from a minimum number of nine individuals (Silva et al., 2015). The human remains showed an extreme fragmentation

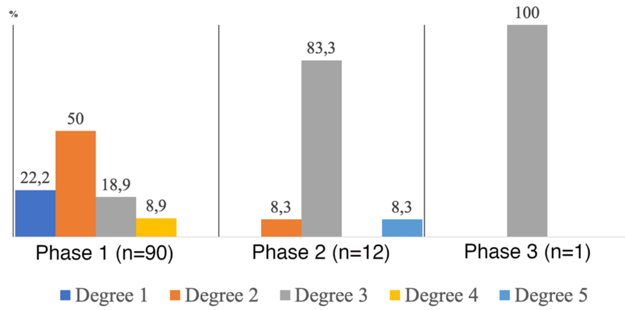

Figure 7: Histogram with the relative abundance (%) of burning damage degree according to the infilling phases of pit 40.

(mainly <2 cm) and a high degree of thermal alteration with all bones having been exposed to heat but with heterogeneous combustion. Grey and white colors are prevalent; when different colors exist in the same fragment, the higher temperatures reached are on the outer surfaces of the bones. The existence of curved transverse (or thumbnail) and longitudinal fractures in long bone fragments was interpreted as resulting from the cremation of fresh bones even if they can also occur in burned dry bones (Gonçalves, 2012). It was preliminarily suggested that faunal remains were exposed to fire together with human remains (Silva et al., 2015).

The fauna assemblage is very fractured and fragmented as was the case of human remains. Animal bone fracture planes have a high frequency of longitudinal and transverse outlines, right angles, and jagged edges. This together with the low number of breakage indicators indicates that even if anthropogenic breakage exists it had a low impact or at least that fragments were further broken due to fire and post-depositional processes. Besides concretions, the remaining taphonomical indicators, such as the scarce presence of weathering, suggest that this was not an important process during the formation of this assemblage.

Animal parts from infilling phase 2 were associated with the human cremains and comprised swine, caprine, leporids and, to a lesser extent, bovine and cervids. A total of 35% of this fauna was burned. Degree 1 is absent and degree 4 (12%) is less common than degrees 2 (25%), 3 (38%), and 5 (26%). On the one hand, contrary to the human collection, not all the animal remains were burned or at least not burned to an intensity that could allow for its macroscopic identification. On the other hand, the spread of degrees could relate to heterogeneous combustion, as suggested for the human cremains (Silva et al., 2015).

Some selection of animal body parts is evidenced: 50 remains are from distal appendicular bones (24 from swine, 8 from caprine, and 8 from leporids), such as carpal and tarsal bones, metapodia, and phalanges. Among them, 33% (n = 8) are complete elements and 46% (n = 23) are burned, of which 52% (n = 12) have degree 5 of burning. Appendicular long bone fragments (n = 19) from leporid (n = 8), swine (n = 4), caprine (n = 1), dog (n = 1), and undetermined animals (n = 5) were also recovered. However, only 26% (n = 5) were burned, mostly at degrees 3 (n = 4). This taxonomical and burning damage pattern persists if only the maxilla, mandibles, and vertebrae (n = 25) are considered. Hence, it is possible that a selection of distal appendicular extremities (mostly) from swine occurred, since they are the preferred cremated portions. The higher burning damage observed on distal appendicular bones could eventually relate to the lower amount of soft tissues shielding them from damage. Other appendicular or axial bones are comparatively rarely burned and to a lesser extent correspond to swine. Swine distal appendicular bones are found outside phase 2 but with lower numbers and burning damage. Even if not as relevant quantitatively, burning is also recorded in phases 1 (n = 14, 7%) and 3 (n = 35, 17.5%) showing that this practice is not only associated with human cremains.

4.2 Pit 40

Published data for pit 40 suggests the preferential cremation of fleshed human remains with some skeletonized remains and deposition of a few unburned remains (Godinho et al., 2019). This pit was used for secondary depositions resulting in a commingled deposit but with scarce articulated human body parts.

Color changes were recorded in the majority of the sample, which was subjected to high temperatures. Differences in color between outer and inner surfaces are rare and when present are generally in cranial fragments. Fractures are heat-induced in 34% of the cases with curved fractures/thumbnails (6%) and warping (3%) being scarce. It was concluded that the majority of remains result from cremations while fleshed although this behavior probably occurred together with the burning of skeletonized remains (Godinho et al., 2019).

Indicators of anthropogenic breakage are not common or were largely affected by the fragmentation and taphonomical history of the faunal assemblage that is commingled but shows higher completeness of shaft length and circumference in comparison to pit 16. The fracture planes' higher abundance of transverse and longitudinal outlines and right angles has a post-depositional origin but this does not seem to relate decisively with weathering which is scarce.

Phase 1 is dominated by swine (51%), leporid (12%), and caprine (11%); cervids, bovine, and equids total 12%. Twenty-three complete bones were recovered of which 91.3% (n = 21) are phalanges. Burning damage is documented in 28% (n = 24) of the taxonomically identified remains or 12% of the total sample from this phase, with initial and middle degrees of damage being most common (degrees 1 + 2 + 3, n = 18, 75%). Considering swine, 65% (n = 33) are bones from the distal appendicular skeleton of which 55% (n = 18) are complete and 29% (n = 15) burned, mainly in degrees 2 and 3 (n = 12, 80%). One must also emphasize the presence of *Equus* sp. and *Cervus elaphus* proximal phalanges (n = 3 and 1, respectively) that were modified to different degrees through the thinning of the mesial and distal portions resulting in "idol" phalanges.

Phase 2 is a smaller collection and again largely represented by swine (64%), in this case only by distal appendicular bones of which 5 (56%) are phalanges. One modified "idol" proximal phalange from *Cervus elaphus* was recovered. A total of 12 (50%) bones were burned: degree 5 (n = 1) is scarce in comparison to degrees 2 and 3 (n = 11). The infilling phase 3 comprises one *Equus* sp. "idol" proximal phalange. This shows that the differences in the number of faunal remain between pit 40 infilling phases, with the majority of remains corresponding to phase 1 for which information on the human cremains exists (Godinho et al., 2019).

Articulated faunal body parts were not observable during the fieldwork but several anatomically compatible bones from distal appendicular extremities exist especially for swine. The possibility that articulated appendicular extremities were being fed to the fire and that they became disarticulated during the burning, transportation, or deposition must be taken into account. Similar to pit 16, there seems to be a selection with a high prevalence of distal appendicular bones. On the contrary, the burning damage is different with a lower abundance in pit 40: 43% (n = 90) of the bones from phase 1 and 50% (n = 12) from phase 2 were burned. These values are lower than the results obtained for human remains from phase 1 but the absence of higher damage on the bones' inner surfaces in comparison to external surfaces also occurs in the faunal sample. When broken, the latter had the same color on both internal and outer surfaces suggesting that they could have been broken before the burning stage or that they fragmented during the burning and were further altered. The identification of different colors in the same bones for phases 1 and 2 could be due to the existence of soft tissue remnants.

4.3 Data from a Wider Perspective

As far as we know, the contexts discussed from the Perdigões ditched enclosures are unique in the Chalcolithic of Southwestern Iberia. These human cremated remains were deposited in negative features (pits), but they also correspond to a large minimum number of individuals, especially in pit 40 (Godinho et al., 2019; Silva et al., 2015). Further adding value to this is the fact that faunal body parts were recovered in close association with the human remains and other votive materials.

The only mentions of fauna collected in Southwestern Iberia Late Prehistory from contexts containing human cremains have been interpreted as accidental inclusions, intrusive or dubious (e.g., Bettencourt et al., 2021; Cerrillo-Cuenca & González-Cordero, 2014). Some cases are known elsewhere (e.g., Lombra &

Haber, 2016) but cremains in negative features accompanied by depositions of faunal remains are at least scarce if not absent. It is not possible to properly discuss this due to the lack of published information and the fact that we are not aware of their existence and absence in different archaeological records. In the occasional cases where faunal remains are mentioned, their characteristics are not discussed. Their presence in negative features is even more difficult to assess since these contexts are even rarer.

In the Neolithic pyre pit of Beisamoun (Israel), the lack of selection, spatial structure, and taphonomical data (small size of fragments, uneven pattern of burning, faunal remains with carnivores, and human damage) led the authors to discard the fauna presence as intentional (Bocquentin et al., 2020). As argued, even if this can be true for a part of the pits 16 and 40 assemblages, does not seem to be the case for all the remains, specifically considering the burned distal appendicular bones. The presence of animal bones in cremation rituals from northern Italy during the Bronze, Iron, and Roman Ages were recently discussed (Masotti, Mongillo, & Gualdi-Russo, 2020). A growth of fauna presence during the Roman periods was associated with a greater diffusion of the funeral banquet but the occurrence of these feasts was suggested for all periods. With some differences concerning the breakage and alteration of remains, one must also consider the possibility that the high breakage could have influenced anatomic and taxonomic identification, as well as the identification of butchering (Abe, Marean, Nilssen, Assefa, & Stone, 2002; Domínguez-Rodrigo, 2003) and consumption marks (Blumenschine, 1988). Thus, a slightly higher relevance of these activities must always be considered when dealing with this type of assemblage. Nonetheless, this would relate less to the distal appendicular bones since they are more complete than the remaining body parts in both pits. The low frequency of butchering or consumption indicators suggests that feasting or banquets if occurring were not of high relevance in our case studies.

Based on the faunal evidence presented, we can distinguish at least two different practices. One from pit 16 where faunal remains were highly altered due to fire reaching calcination degrees. Another from pit 40 where this damage was lower and remains generally only presented themselves charred or carbonized with calcination being less abundant. This is possibly indicating that the behaviors behind the inclusion of faunal remains were different, or that the observed disparities result from the fact that the deposition in pit 16 is one event while the depositions in pit 40 correspond to several events more spread in time. However, similarities seem to have occurred since a preference for swine bones and teeth is demonstrated. This is true mainly for distal appendicular portions, with an important frequency of carpal and tarsal bones, metapodia and phalanges, largely lacking breakage but affected by the fire. Other body parts are normally more fractured and fragmented and this could be due to their use during the combustion.

Similar to other Iberian regions (e.g., Martín, Albizuri, Cólliga, & Gibaja, 2019), the importance of isolated or anatomically connected distal appendicular bones is being increasingly recognized by colleagues that study Portuguese Late Prehistory. This is happening concerning disarticulated dry phalanges or articulated appendicular extremities included in burials (Melo & Silva, 2016; Valera & Costa, 2013a,b) and non-funerary structured depositions (Valera, Basílio, & Almeida, 2020). It also occurs with unmodified phalanges from larger species found in non-funerary ditches associated with votive materials (Almeida, Basílio, & Valera, 2020), and the relevance of the "idols" in equid and red deer phalanges, also present in pit 40 (Valera, 2015).

Previous studies mentioned the deposition of complete swine hooves in the Late Neolithic of Perdigões (Moreno-García & Cabaço, 2009; Valera & Godinho, 2009). An important corpus of data is forming showing that similar to what happens with other species, swine hooves' relevance is not only due to this species' economic importance during the Chalcolithic in Westernmost Iberia (Valente & Carvalho, 2014). Their relevance in funerary contexts and structured depositions can have a meaning that surpasses the one they develop in more traditional non-funerary contexts where they correspond to food refuse. Swine are more frequent than other species in other Chalcolithic sites in Southern Portugal such as in the larger assemblages of Porto Torrão (Arnaud, 1993; Pereira, 2016), Mercador (Moreno-García, 2013), or São Pedro (Davis & Mataloto, 2012). Still, swine are generally less common than other species in Perdigões, especially caprine between 2900 and 2200 BC, and this only changes later on in the transition/Early Bronze Age (2200–2000 BC) (Almeida & Valera, 2021). Hence, so far, the most common species in Perdigões in terms of the number of identified remains is not the one being more commonly used in these practices that accompany human cremains.

It is difficult to establish how and when the faunal remains were integrated with the human ones since we do not know the provenance of the materials of the depositions in pits 16 and 40. The study of the human remains indicates that they were burned in different states (dry bones and fleshed), suggesting that the cremation joined skeletal elements from several chronologies and possibly from different structures (Godinho et al., 2019; Silva et al., 2015). This mixture could have also occurred with the faunal remains that may have been present in the original funerary contexts. In other secondary burials at Perdigões which are broadly contemporary with the pits, animal bones are integrated into human ossuaries in Tombs 1, 2, 3, and 4 (Almeida, 2020; Cabaço, 2012). But it is also possible that these animal bones, or at least part of them, were introduced during the cremation process as part of the ritual and the ceremonial practices involving it. The complexity and variability of situations in the preceding contexts and the mixing processes during cremation ceremonies may help to explain the variability observed between pits 16 and 40 and within the two assemblages.

5 Conclusions

The recovery of fauna associated with other votive materials and human cremains from Chalcolithic negative features is not common, especially when the human cremated remains correspond to a minimum number of more than 250 individuals. The animal body parts from pits 16 and 40 from Perdigões ditched enclosures were analyzed and compared with the human cremains in terms of their taphonomical history.

Similarities are evidenced between the pit deposits, with a clear predominance of swine elements in both cases. With some differences between assemblages, other animal remains were recovered, such as caprine, bovines, cervids, leporids, canids, and equids. Distal appendicular bones have higher frequencies and present interesting taphonomical data related to bone preservation and burning damage incidence, with equid and red deer proximal phalanges also occurring altered in the shape of "idols," and therefore with a status different from the rest of the faunal remains (Valera, 2015).

Part of the faunal remains was considered associated with the practices involved in the cadaveric reduction of human body parts. These assemblages possibly comprise elements from different cremations or that were included in practices involved in these or the previous funerary rituals from other structures where the human remains originated before being recovered and deposited in pits 16 and 40. The existence of unburned faunal remains indicates that some were included in the pits infilling without passing through the fire-induced changes. These could result from the infilling matrix and not being directly related to the practices discussed, but the low incidence of weathering does not grant much sustainment to this hypothesis. They could be representing other types of behaviors related to the depositional practices, which must not only occur with cremation but can count with further additions during or between the deposition of human remains. Ultimately, animal remains were included in the complex biography that characterizes human cremated deposits.

The analysis of other human and faunal remains from Perdigões will further inform on human–animal relations during the 3rd millennium BC, not only concerning the more traditional non-funerary contexts, but also structured depositions in non-funerary and funerary contexts. Concerning the latter, the analysis of the practices involved in the fire-induced cadaveric reduction of human remains now counts with the initial addition of the faunal evidence. The selection of species and body parts that seems to have accompanied these rituals is noteworthy and must now be considered in the analysis of this and other similar contexts. The correlation of the data extracted from human and faunal remains concerning firing conditions will be crossed with the data coming from the analysis of charcoals, in the attempt to envision the possible cremation scenarios, from which we have no information so far.

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