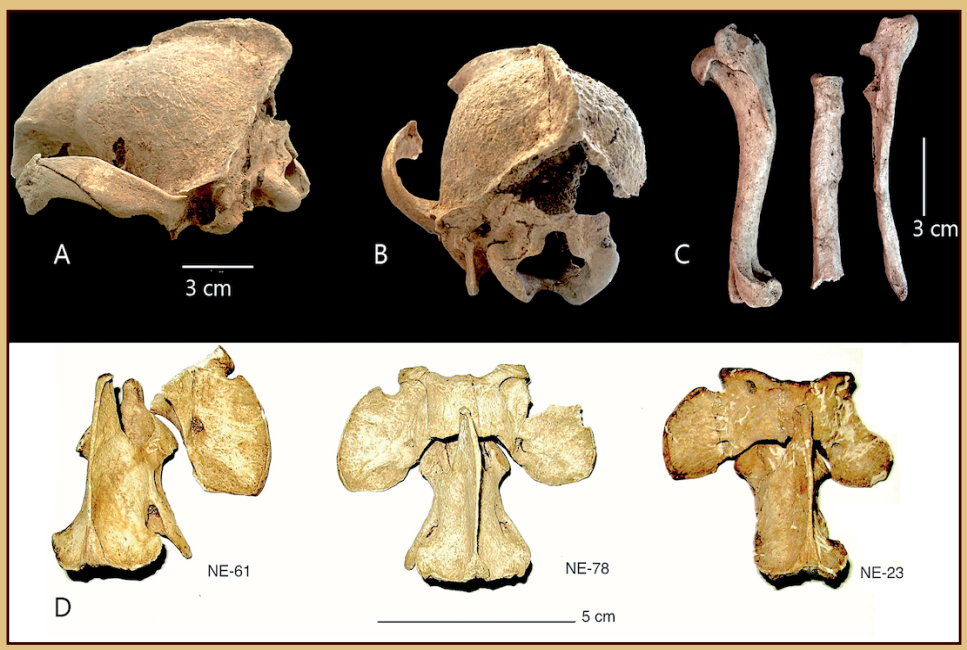
ARCHAEOFAUNA

INTERNATIONAL JOURNAL OF ARCHAEOZOOLOGY



2020

2ND IBERIAN ZOOARCHAEOLOGY MEETING
23RD-25TH JUNE 2021

Assistant editors for this volume:
Laura Llorente Rodríguez, Arantxa Daza-Perea,
Elena López-Romero González de la Aleja & Iratxe Boneta Jiménez

VOLUME 32(1) **https://doi.org/10.15366/archaeofauna2023.32.1** **October 2023**

ARCHAEOFAUNA

ARCHAEOFAUNA es una revista anual que publica trabajos originales relacionados con cualquier aspecto del estudio de restos animales recuperados en yacimientos arqueológicos. Los manuscritos deben enviarse a:

ARCHAEOFAUNA is an annual journal that publishes original papers dealing with aspects related to the study of animal remains from archaeological sites. Manuscripts should be sent to:

EUFRASIA ROSELLÓ IZQUIERDO
Laboratorio de Arqueozoología. Dpto. Biología. Universidad Autónoma de Madrid
28049 Madrid. España (Spain)

Para la elaboración de manuscritos, que serán evaluados por un mínimo de dos recensores externos, consultar las instrucciones de la contraportada. Todos los manuscritos no conformes con las normas de publicación serán automáticamente devueltos a los autores. Cada autor o grupo de autores recibirán un pdf de su trabajo.

For preparation of manuscripts, that will be evaluated by a minimum of two external referees, please follow the instructions to authors. All manuscripts no conforming to these instructions will be automatically returned to the authors. Each author (or group of authors) will receive a pdf of his/her (their) work.

Director: ARTURO MORALES MUÑIZ
Laboratorio de Arqueozoología. Dpto. Biología. Universidad Autónoma de Madrid
28049 Madrid. España (Spain)

Revista incluida en las bases de datos ICYT (CINDOC), Catálogo Latindex, Zoological Record, The Arts & Humanities Citation Index y Current Contents / Arts & Humanities (JCR)

ARCHAEOFAUNA
Laboratorio de Arqueozoología. Depto. Biología.
Universidad Autónoma de Madrid
Cantoblanco 28049. Madrid. España

Editor: Eufrasia Roselló Izquierdo
Editor Adjunto / Assitant Editor: Laura Llorente Rodríguez
Faculty of Archaeology, Universiteit Leiden, The Netherlands. l.llorente.rodriguez@arch.leidenuniv.nl

MUSEO ARQUEOLÓGICO Y PALEONTOLÓGICO

Diseño y maquetación:
Ismael Sánchez Castro
Tel.: 670 763 012
ismasan76@gmail.com

Imprime:
Impresores Digitales S.L.

FRONTISPIECE: A y B: restos craneales del ejemplar NE 78. C: húmero (vista lateral), radio (vista posterior) y ulna (vista lateral). D: atlas y axis de los tres perros de la necrópolis de Empúries.

ISSN - 1132-6891

ARCHAEOFAUNA

INTERNATIONAL JOURNAL OF ARCHAEOZOOLOGY

Volume 32(1) http://www.doi.org/10.15366/archaeofauna2023.32.1 Octubre 2023

Depósito Legal: M. 30872-1992

Diseño y maquetación:
Ismael Sánchez Castro
Tel.: 670 763 012
ismasan76@gmail.com

Imprime:
Impresores Digitales S.L.

23-25 JUNIO 2021
2º Encuentro de Zooarqueología Ibérica

2nd Iberian Zooarchaeology Meeting
23rd-25th JUNE 2021

Comité organizador · Organizing committee

Arturo Moralez Muñiz[1]; Marta Moreno García[2]; Corina Liesau von Lettow-Vorbeck[3]; Laura Llorente Rodríguez[1,5]; Arantxa Daza-Perea[6]; Elena López-Romero González de la Aleja[2]; Iratxe Boneta Jiménez[3]; Enrique Baquedano[4] & Susana Consuegra[2]

[1]LAZ-UAM: Laboratorio de Arqueozoología-UAM

[2]Laboratorio de Arqueobiología del Instituto de Historia-CSIC

[3]Depto. de Prehistoria y Arqueología UAM.
Grupo de Investigación Prehistoria en el interior Peninsular

[4]MARPA: Museo Arqueológico y Paleontológico de la Comunidad de Madrid

[5]Laboratory for Archaeozoological Studies-Universidad de Leiden, Países Bajos

[6]UNIARQ - Centro de Arqueologia da Universidade de Lisboa - Alumni UAM

Índices/Contents

Archaeofauna 32(1) (2023): 113-128

Into the circle. Animal and human deposits in a new Upper Guadalquivir site from the beginning of the 3rd millennium Cal BC (Grañena Baja, Jaén)

RAFAEL M. MARTÍNEZ SÁNCHEZ[1], ELISABET CONLIN HAYES[2], ANTONIO DELGADO HUERTAS[3], MANUEL GUIJO MAURI[4], ARSENIO GRANADOS TORRES[5] & JUAN ANTONIO CÁMARA SERRANO[6]

[1]University of Cordoba, Spain.
rmmartinez@uco.es

[2]Independent Researcher.
elisabetconlin@hotmail.com

[3]Andalusian Earth Sciences Institute (CSIC-UGR), Spain.
antonio.delgado@csic.es

[4]Independent Researcher.
jmgantropol@gmail.com

[5]Andalusian Earth Sciences Institute (CSIC-UGR), Spain. arseniog@iact.ugr-csic.es

[6]University of Granada, Spain.
jacamara@ugr.es

(Received *13 February 2022*; Revised *15 July 2022*; Accepted *20 October 2022*)

ABSTRACT: In 2014 due to the projected layout of the Madrid – Jaén high-speed railway line, a preventive archaeological intervention was carried out on a hill near the Guadalbullón riverbed within the farmland of Grañena Baja (Jaén). During the work, a multi-sequential Late Prehistory occupation, starting from the mid-5th millennium and reaching the end of the 3rd millennium, was documented. The phase corresponding to the last quarter of the 4th and the beginning of the 3rd millennium Cal BC stands out for the presence of circular features containing complete or partial human and domestic animal skeletal remains, in some cases, clearly related. The isotopic values of human collagen are relatively homogeneous ($\delta^{15}N = 9.0 \pm 0.6$; $\delta^{13}C = -18.9 \pm 0.4$) and consistent with a diet based on proteins of animal origin.

KEYWORDS: ANIMAL SACRIFICES, LATE NEOLITHIC, STRUCTURED DEPOSITS, CIRCULAR PIT GRAVES, STABLE ISOTOPES, SOUTHERN IBERIA

RESUMEN: En 2014, con motivo de los trabajos para el trazado de la línea ferroviaria de Alta Velocidad Madrid - Jaén, tuvo lugar una intervención arqueológica preventiva en una elevación próxima al cauce del río Guadalbullón, en tierras del cortijo de Grañena Baja (Jaén). A lo largo de dichos trabajos se pudo documentar una ocupación multisecuencial que se iniciaría desde mediados del V milenio hasta finales del III milenio cal AC. La tercera fase, correspondiente al último cuarto del IV y principios del III milenio cal AC, destaca por la presencia de estructuras circulares, algunas conteniendo restos esqueléticos humanos y de animales domésticos, completos o parciales, y en algunos casos, en clara asociación. Los valores isotópicos del colágeno de los humanos son relativamente homogeneos ($\delta^{15}N = 9.0 \pm 0.6$; $\delta^{13}C = -18.9 \pm 0.4$) y consistentes con una dieta con predominio de proteina animal.

PALABRAS CLAVE: SACRIFICIOS ANIMALES, NEOLÍTICO FINAL, DEPÓSITOS ESTRUCTURADOS, ESTRUCTURAS SILIFORMES, ISÓTOPOS ESTABLES, SUR DE IBERIA

http://www.doi.org/10.15366/archaeofauna2023.32.1.007

INTRODUCTION

The discovery of pits containing structured deposits of complete or partial animal skeleton remains has increased considerably in recent years. In Europe, most of these contexts are concentrated in late Neolithic phases (Pasaric & Vukičević, 2016). The interpretation of these contexts usually converges towards ideo-symbolic lectures in opposition to strictly functionalist approaches (Brück, 1999). The frequent presence of animals with anthropological assemblages entails the eventual association between mortuary contexts, composed of human remains, and animal deposits as accompanying sacrifices, in some cases interpreted as food offerings (Méniel, 2008; Morris, 2011).

In mainland Europe, faunal assemblages are frequent in the Chasséen and Michelsberg cultures, as well as among the Baalberge and Münchshofen cultures, dated between the mid-5th and 4th-millennium cal BC. The case of Gougenheim (Alsace) stands out for also having several cases of non-normalized anthropological deposits, among which there are proofs of interpersonal violence. Some of these cases have been interpreted as probable evidence of human sacrifice, or even, the accompaniment of other individuals interpreted as the main mortuary deposit (Hoffman & Husty, 2019; Lefranc *et al*., 2019).

Regarding the Iberian Peninsula, animal-human deposits can be found in the northeast, dating to ancient periods (Martín *et al*., 2019). Southwards, many deposits are dated to the second half of the 4th and reaching the end of the 3rd-millennium cal BC. There are some examples in the east (La Vital, Valencia, or Costamar, Castellón) (Flors, 2010; Pérez *et al*., 2011), Central Plateau, highlighted especially by the site of Camino de las Yeseras, Madrid (Liesau, 2012; Liesau *et al*., 2013; Daza, 2019), central and southern Portugal (Baptista, 2015; Senra *et al*., 2019; Almeida *et al*., 2021) and of course, Andalusia. There, ditches enclosures stand out especially, with the mega sites of Perdigões (Reguengos de Monsaraz), Valencina de la Concepción-Castilleja de Guzmán (Seville), Marroquíes Bajos (Jaén) or Polideportivo-La Alberquilla (Martos) (Cámara *et al*., 2010; Valera & Costa, 2013; Cámara & Riquelme, 2015).

THE ARCHAEOLOGICAL SITE OF GRAÑENA BAJA. PHASE III

This archaeological site was excavated between 2011 and 2014. It is located in the western *campiña* of Jaén, about nine kilometers north of the capital (Conlin *et al*., 2020) (Figure 1, left). The excavation documented 213 negative features, mostly round, as well as two large ditch structures. Both artifacts and dating obtained indicate four major occupation phases during Late Prehistory, spanning between the mid-5th millennium to the end of the 3rd-millennium cal BC (Conlin *et al*., 2020). Phase III, approached in this study, is defined by a group of 108 features (Figure 1, right), distributed between a northern cluster and another further south. Those structures (NE) are 1-18, 20-31, 34, 39-41, 43-58, 60, 62-63, 66-68, 70-78, 80-82, 84, 86-95, 104-107, 113, 117, 126, 128-132, 136a, 138-148, 151, 156, 169, 185-188, 206, 208 and North Trench.

Artifacts found include prismatic flint blades, many with glossed edges, pointing to the relevance of dry farming agriculture. Among the pottery types, there are large pans or carinated bowls known as *cazuelas carenadas,* characteristic of the last third of the 4th- early 3rd-millennium cal BC in southwestern Iberia (Martínez, 2013a).

METHODS

Zooarchaeology

The taxonomic identification was carried out using our comparative collection, together with assemblages found in the Archaeobiology Laboratory (ArqBio)-CSIC and the Instituto de Arqueociencias of Lisbon, coinciding with different stays made during the study of the material. Likewise, the criteria defined to separate goats and sheep, complemented mainly by recent studies (Halstead & Collins, 2002; Zeder & Lapham, 2010; Zeder & Pilaar, 2010), was used together with direct osteological comparison. Accordingly, the inclusion of loose teeth in the general accounting and the calculation of the MNI was considered. Age assessment has been determined following the dental eruption tables provided by Habermehl (1961), Barone (1976), and Silver (1969) for pigs, goats, and cattle, as well as the degree of epiphyseal fusion in the appendicular skeleton.

Arqueoanthropology

Morphological and metric parameters have been taken following Buikstra & Ubleaker (1994). Specifi-

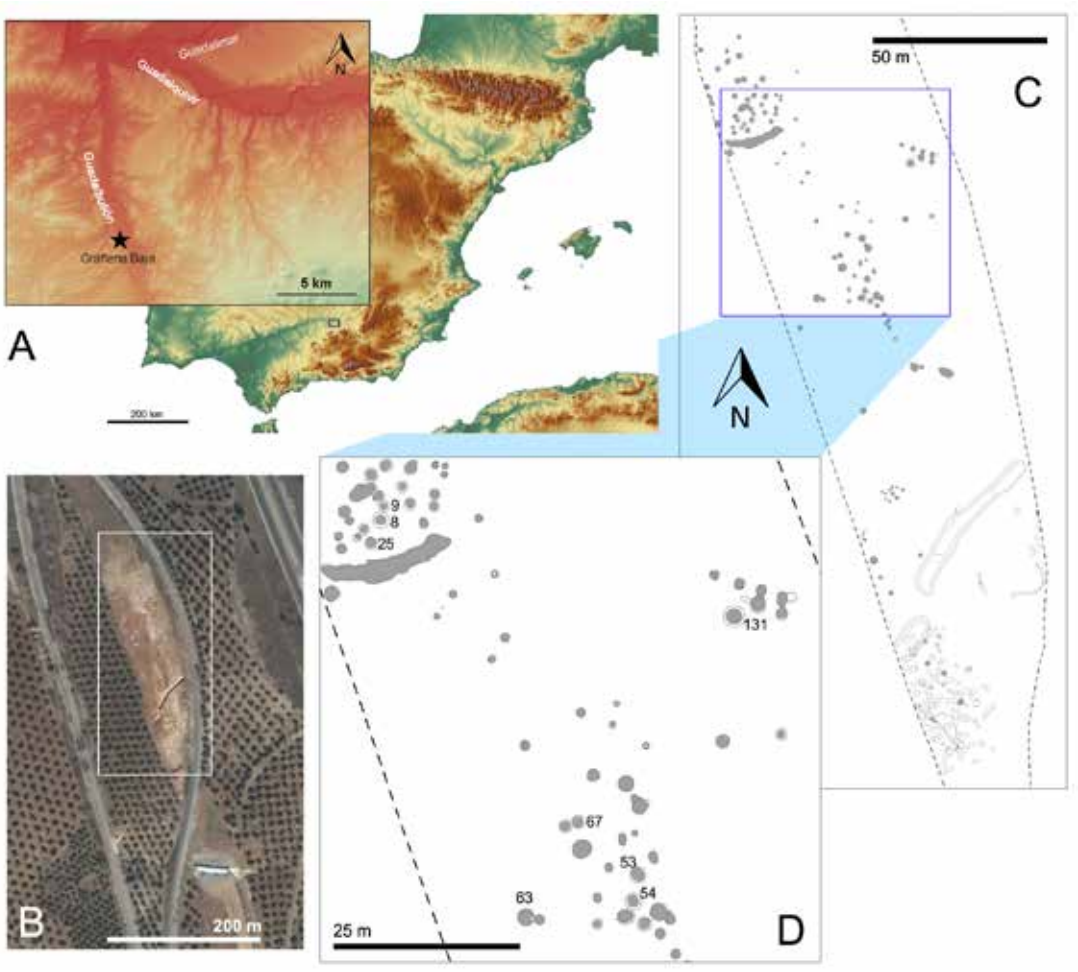


FIGURE 1

Left (A): Location maps of the site of Grañena Baja, in the Upper Guadalquivir and next to the Guadalbullón floodplain, B, aerial view. Right: C, Plan of the archaeological excavation with detailed indication of the structures highlighted in the text (D).

cally, for the body size evaluation, studies by Manouvrier (1893) and Trotter & Glesser (1952), and Olivier & Pineau (1958) were used. Sex was determined following Acsadi & Nemeskery (1970) in Reverte (1999), including the circumference of the humerus, whereas other studies were used for clavicle and radius (Jit & Singh, 1966; Singh *et al*., 1974; Alemán *et al*., 1997), for the tibia (Isçan & Miller-Shaivitz, 1984) and the fibula (Robledo *et al*., 2008).

Stable isotopes

The isotopic analysis ($\delta^{13}C$ and $\delta^{15}N$) of the bone samples has been based on the protocol described by Bocherens *et al*. (1991, 1997) for the collagen extraction and following the usual procedures of the Stable Isotope Biogeochemistry Laboratory of the Andalusian Earth Sciences Institute (CSIC, Granada, Spain).

HUMAN AND FAUNAL ARCHAEOLOGICAL CONTEXTS

Regarding to faunal remains, these come from (NE) 4, 6, 7, 8, 12, 13, 16, 24, 26, 27, 50, 52, 53, 55, 57, 58, 68, 71, 72, 81, 88, 94, 129, 132 and 132c, and 148. Human remains were also detected with animal remains in NE 8, NE 16, and NE 53, and without

faunal remains in NE 63 and NE 54. The faunal collection analyzed is composed of 1905 records, including terrestrial gastropods and fluvial malacofauna. A large part of the assemblage is highly corroded and leached. This significantly affected the anatomical and taxonomic identification, the measurements, the identification of anthropic marks, the manipulations, or other taphonomic processes. However, a large number of anatomical parts, although, as said, very affected by post-depositional conditions, have been identified through field photography and helped by the fact that, in various cases, articulated animals were found next to human remains, most likely interred as grave goods or sacrificial offerings.

The random zooarchaeological assemblages

When assessing the breakdown of the collection's different species, the articulated, and often complete, deposits numerically constitute a large percentage of the recorded remains. This affects the real representativeness of several species in the general context, such as dogs and pigs. Therefore, after a first breakdown (Table 1), the features containing this type of deposit were excluded from the overall counting. Thus, once NE 8, 9, 25, 53, 67, and 131 were excluded from the general calculation (NE 54 contained strictly human deposits), only 221 remains were computed, 53 of which are faunal remains identified. Caprines are the largest group, more than 62% of the mammals identified. This species is followed by domestic cattle (13.2%), pigs (11.3%, including wild boar), deer (7.5%, one of the remains is a complete talus in NE 54), and finally, dog, horse (found in NE 54 and consisting of a fragment of a female pelvis), and rabbit, with a single remain in each case. Although the sample is very small in number, it is comparable to other Copper Age assemblages from the Upper Guadalquivir (Riquelme *et al*., 2012; Martínez, 2013b).

GRAÑENA III	**PHASE 3 TOTAL**				**NO RITUAL**			
TAXA	**NISP**	**%**	**WISP (g)**	**MNI**	**NISP**	**% (% mammals id.)**	**WISP (g)**	**MNI**
Bos taurus	35	1,84	721,9	2	7	3,17 (13,21)	163,3	1
Sus scrofa	542	28,45	2435,7	11	6	2,71 (11,32)	36,3	1
Ovis/ Capra	94	4,93	407,5	2	26	11,76 (49,06)	167,1	2
Ovis aries	14	0,73	816,2	2	5	2,26 (9,43)	284,2	1
Capra hircus	35	1,84	98,1	3	2	0,9 (3,77)	5	1
Cervus elaphus	22	1,15	820,5	2	4	1,81 (7,55)	112,5	1
Canis familiaris	273	14,33	758,7	6	1	0,45 (1,89)	6	1
Equus caballus	1	0,05	126,3	1	1	0,45 (1,89)	126,3	1
Oryctolagus c.	5	0,26	2,2	1	1	0,45 (1,89)	1	1
LSMammals	55	2,89	256,7	-	26	11,76	112,2	-
LMSMammals	49	2,57	160	-	4	1,81	43,5	-
MSMammals	647	33,96	688,6	-	84	38,01	115,1	-
No det.	79	4,15	84,3	-	32	14,48	21,3	-
Mammals	**1851**	**97,15**	**7376,7**		**199**	**90,02**	**1193,8**	**-**
Microvertebrates	**2**	**0,1**	**1,2**	**1**	**-**	**-**	**-**	**-**
Birds	**1**	**0,05**	**2**	**-**	**-**	**-**	**-**	**-**
Ferussacia f.	6	0,31	1,2	6	-	-	-	-
Helicidae	16	0,84	6,7	16	-	-	-	-
Margaritifera auricularia	6	0,31	85,3	-	5	2,26	82	3
Potomida littoralis	9	0,47	76,5	-	7	3,17	56	4
Unio delphinus	1	0,05	2,8	-	1	0,45	2,8	1
Mityllus gal/edulis	1	0,05	4,6	-	1	0,45	4,6	1
Unionoida	12	0,63	23,6	1	8	3,62	19,5	-
Mollusca	**51**	**2,66**	**200,7**	**-**	**22**	**9,95**	**164,9**	**-**
TOTAL PHASE	**1905**	**-**	**7580,6 g**	**-**	**221**	**-**	**1358,7 g**	**-**

TABLE 1

Grañena Baja, phase III. Taxonomical distribution by the number of identified remains (NISP and percentage) and weight (WISP). Overall values (left) and segregated values of structured deposits (NE 8, 9, 25, 53, 67, and 131), right.

A significant part (from NE 7, 12, 13, 58, 71, 72, 81, 88, 94, 132c, and 148) are malacological remains, mostly valves and fragments of freshwater mussels. In some cases, the external surface or the edge has been polished, which could indicate their use as tools, smoothers or possibly spoons in the case of some large specimens (NE 13 and NE 71). In other cases, the production of mother-of-pearl powder cannot be excluded (Figure 2). The species are *Margaritifera auricularia* (the largest), *Unio delphinus,* and *Potomida littoralis*, the latter both still present in the Guadalquivir. A specimen of *Mytillus sp*. found in NE 148 is remarkable. No parallels are known for the occurrence of this genus in Copper Age contexts in the Mid and Upper Guadalquivir basin area.

Structured deposits

Those contexts for each of the features documented are described below:

NE 8: This feature, 2.04 m in diameter and 1.30 m in depth contained five layers of fills. The first of them (SU 957) included the partially articulated remains of a subadult suid, between 12 and 18 months (M_2 erupted and deciduous premolars

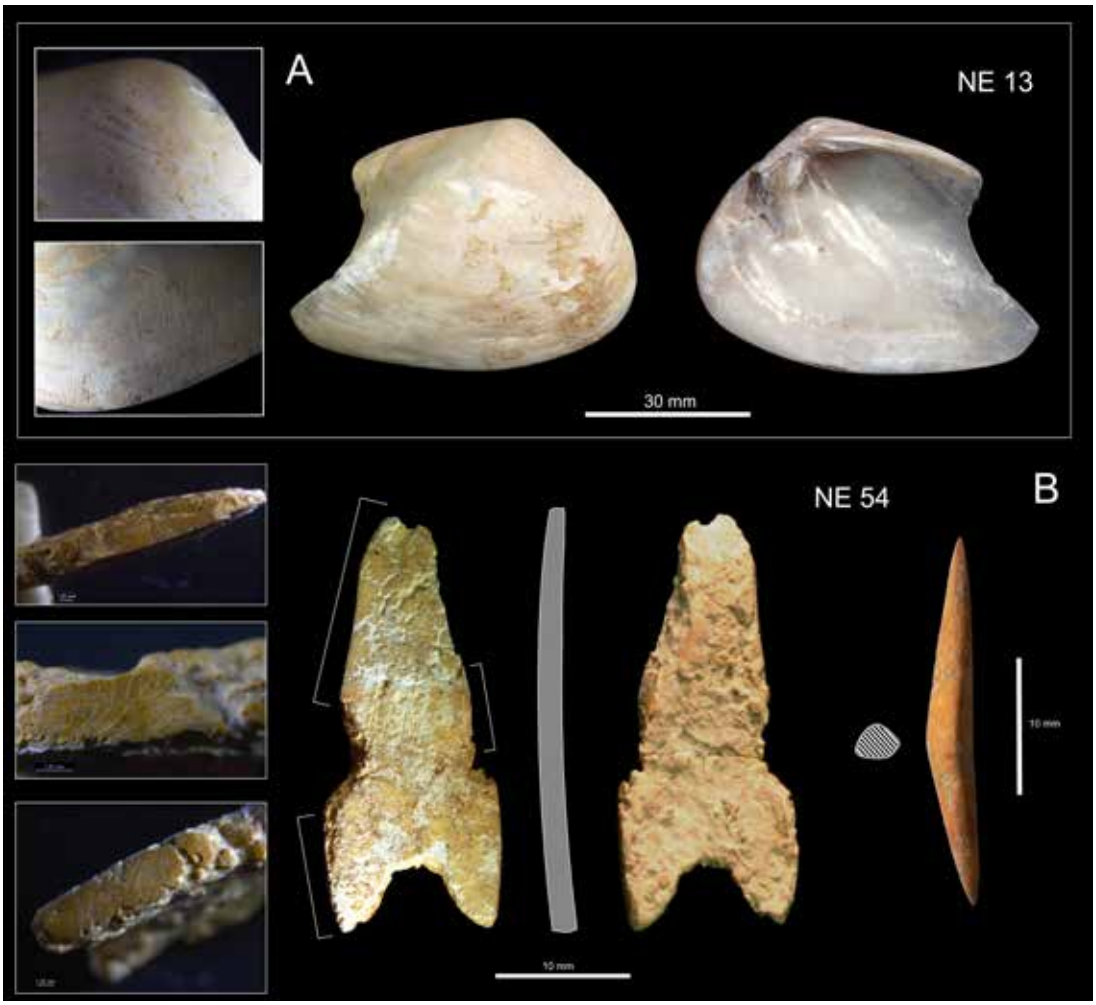


FIGURE 2

Artefacts in hard animal material. Above (A): *Margaritifera auricularia* right shell from NE 13, showing polishing along its entire surface (possible spoon?). Below left (B), probable arrowhead made of lingual face of a swine male lower canine from NE 54. Below right, probable two-pointed hook in bone, from the same context, this characterised by up to 11 human individuals deposited synchronously.

still to fall out), and evidence of other specimen between 6 and 12 months of age (onset wear in M_1, M_2 unerupted). Despite the greater postcranial skeletal representativeness of the first individual compared to the second, the presence of appendicular remains of immature pigs supports the deposit of complete individuals.

The second stratigraphic unit (SU 945) contained the skeletal remains of five suids: one approximately 18 months of age, another between 12 - 18 months, two between 6 - 12 months, and a possible 20-month-old female. A partial adult deer skull, with the basal part of the left antler with burr and brow tine, was also documented. Lastly, this entire faunal ensemble was completed with the remains of the deciduous dentition and several dental fragments of a human infant aged 9 months.

Superimposed on the previous layer was the SU 681, containing a burial deposit consisting of a pre-adult woman (between 13-15 years of age) placed above the corpse of a dog lacking the skull and mandible (Figure 3, above).

NE 9: This deposit stands out exclusively by the presence of a poorly preserved suid skull and mandible between 8 and 12 months of age.

NE 25: 1.80 m in diameter and 1.32 m in depth. It was filled by a succession of seven layers of sediments, with two of them, located in the middle of the sequence, containing animal deposits. The first one (SU 638) was a structured deposit consisting of three articulated piglets, all between 5 and 8 months of age. The successive unit (SU 583) provided the articulated remains of a possibly complete dog. The assemblage was completed by a partial frontal bone (including horncores) of an adult ram (Figure 1 in Supplementary Information, above).

NE 53: 2 m in diameter, and 1.40 in-depth. On a prepared soil surface, a deposit consisting of six human individuals and two animals was found in arrangement along the walls of the structure, leaving the central area free (Figure 4). The human assemblage consisted of two infant individuals, aged between 4 - 5 (IND 1) and six years (IND 5), and four male adults (IND 2, 3, 4, and 6). The faunal deposits involved a completely articulated, medium size, adult dog and a goat, partially preserved and disarticulated, between 3 and 5 months of age. Large pottery sherds were found on the prepared surface in association with the skeletal remains, consisting of two globular vessels, another globular one with a neck, and fragments belonging to a small ceramic spoon.

In this case, the depositional sequence was not synchronous, as the complete anatomical connection of the dog and the human individuals IND 3 and IND 4 indicate that they were the last to be placed within this crowded environment. Thus, following the sequence established, IND 2 in the northern area (the head was placed on a millstone), the goat in the southern area, and IND 6 in the west area would compose the primary deposit. Next, IND 2 was altered by the burial of IND 1, the goat by the internment of IND 4 in a prone position, and IND 5 overlapping IND 6. Subsequently, the last deposition was IND 3, superimposed on IND 4, and the dog, deposited next to the already disarticulated remains of IND 1 and 2, having its skull in contact with that of IND 1. In relation to the articulated dog, the strange position of the axis, associated with an atlas presenting an oblique fracture of the dorsal arch must be pointed out. In our opinion this hyper cervical luxation could be traumatic, linked to a deliberate sacrificial act.

Structure NE 54: 2.20 m in diameter and 1.64 m in depth. Contained a total of eleven complete human individuals, overlapped in different anatomical positions. A complete overturned bowl was located in an empty area next to the northwest limit, in addition to a similar vessel next to one of the female individuals (IND 5).

The sex and age range have been correctly established for all the individuals, except in one case corresponding to a non-specific preadult between 11 - 13 years of age (IND 9). Thus, IND 1 is a young male 11-12 years of age; IND 2, 3 and 6, adult females; IND 4, 5, 8 and 12, adult males (IND 5 between 45 - 49 and IND 12 between 35 - 39 of age); IND 7, young female adult; and lastly, IND 10, a mature adult, possibly female. Also, in the northern sector of the structure and on the surface of this depositional level, part of the skull (frontal and a partial maxilla) of an adult of non-specific sex was found, which was not related to any of the above, thus amounting to twelve individuals if it is included in the minimum general calculation.

The beginning of the mortuary sequence has been established with the deposition of IND 6, IND 9, and IND 2, followed by an intermediate moment when five individuals were interred, and ending with IND 12, IND 1, and lastly IND 4. As shown in the graphic material (Figure 3, below), the female individuals seem to be grouped to the south while the male ones are to the north, at least concerning the position of the skulls. This also seems to be

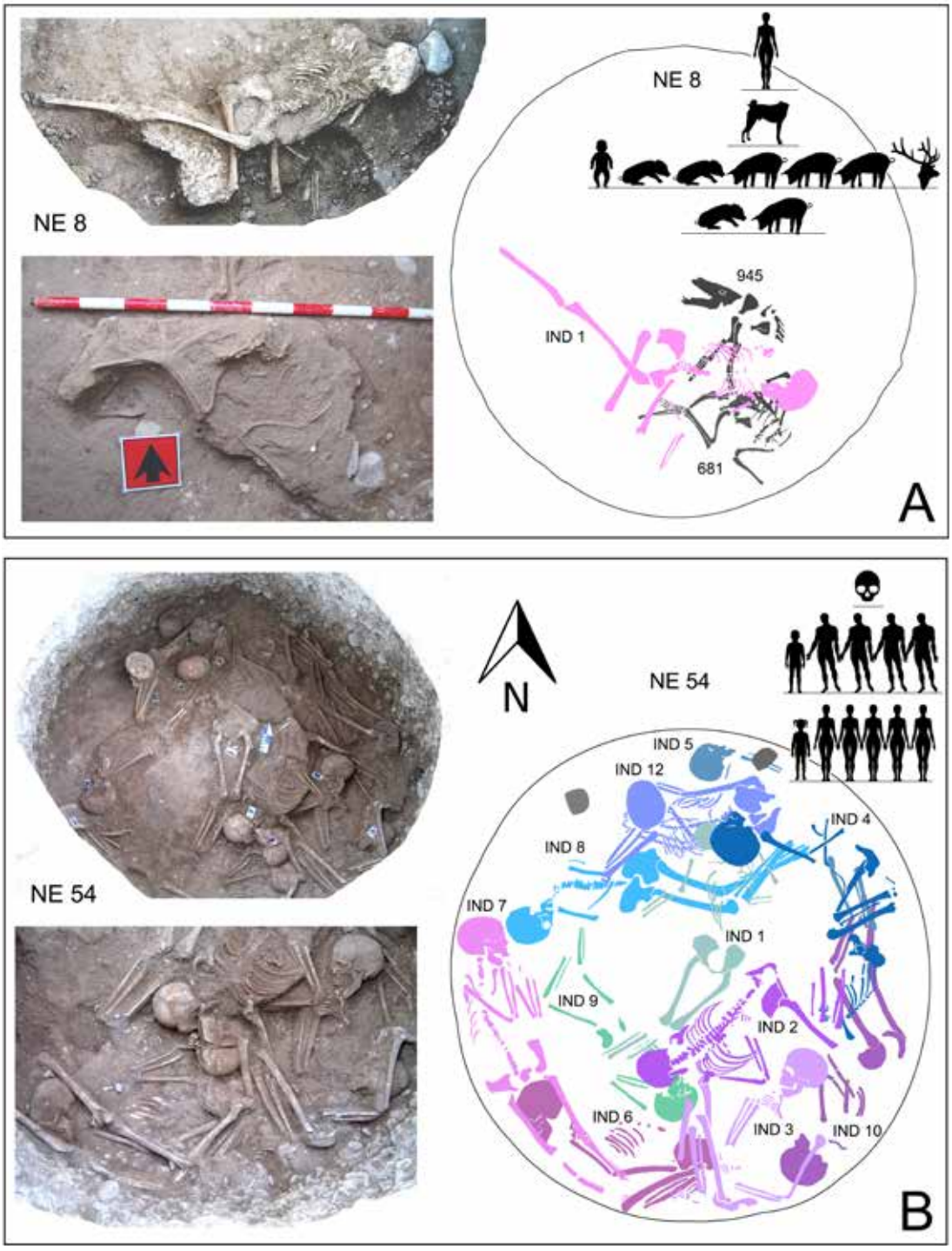


FIGURE 3

Top (A): NE 8, plan of the feature and detail of the deposits inside (female pre-adult and partial dog). Below (B): Structure NE 54 with detailed photos of the anthropological deposits inside and floor plan of the structure. Shaded in blue (digital version) tones, male individuals. Shaded in violet (digital version) tones, female individuals. Green (digital version), biological sex unknown. Grey shading, pottery vessel deposits. The silhouettes indicate depositional sequence ("stratigraphic" view: earlier down, later up).

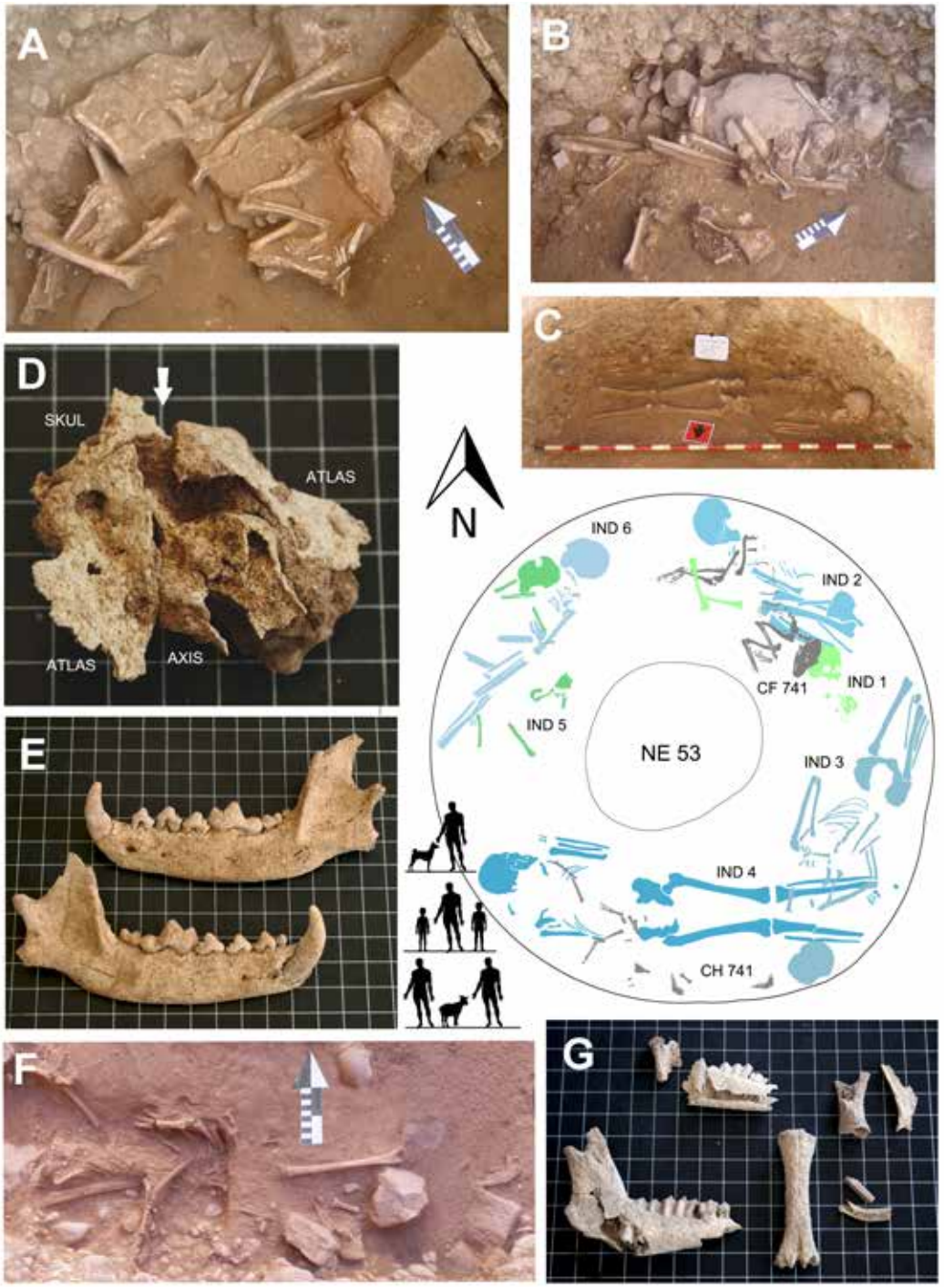


FIGURE 4

NE 53. Centre, plan of the structure, with shaded individuals. Grey, animal deposits (dog and goat kid). Blue tones (digital version), male human individuals, green tones (digital version), biological sex undefined (pre-adults). A-B, C, and F: Detail view of the deposits inside; A, dog CF-741, B, IND-5, C, IND 4, F, goat CH-741. D and E: details of the cranial skeleton of dog CF-741, with possible fracture due to hyperluxation in the atlas-axis joint, and E, detail of the mandibulae. G, detail of the goat kid CH-741 and its location in place (F). The silhouettes indicate depositional sequence ("stratigraphic" view: earlier down, later up).

related to the depositional sequence. The skeletal connections remained complete, suggesting a mortuary sequence that affected non-skeletonized individuals, indicates a synchronous event or a short lapse of time between each deposit. Only in one case (IND 4, the latest deposit), the bones appear altered, possibly by bioturbations.

Although no signs of traumatic or violent perimortem evidence have been found, the discovery of a possible arrowhead within the unit SU 716 is highly interesting. This pointed element, with a concave base and lateral slits ("Tour Eiffel" type), was carved out of the lower canine tooth of an adult male suid, as evidenced by the enamel surface. Also found in this unit is a bi-pointed bone fish hook, like those known from previous ages found in Andalusian coastal areas (Aura *et al*., 2010) (Figure 2, below).

NE 67: 1.40 m in diameter and 0.94 m in depth. Contained the partial skull remains of an adult male deer, preserving the pedicles, part of the beams, and both brow tines (Figure 1 in Supplementary Information, below).

NE 131: 2.85 m in diameter and 1.30 m in depth. The second and third levels in depositional order (SU 891 and 879), contained the partial and poorly preserved remains of two medium-size adult dogs and a deteriorated skull and jaw fragments (SU 879) of a calf, approximately 2 years old, as well as that of an old sheep.

Radiocarbon dating

Four human bone samples were selected from structures NE 8 (female pre-adult from unit SU 681), NE 53 (male adult, IND 4), and NE 54 (female adult, IND 1 and male adult, IND 8). Two of them were analyzed by the National Accelerator Center (CNA) (Seville, Spain) (IND 1- NE 8, IND 1-NE 54) whereas the other two (IND 4-NE 53 and IND 8 - NE 54) by Beta Analytic (Miami, USA). The results were calibrated following the atmospheric curve intcal20 (Reimer *et al*., 2020), showing a great chronological affinity, with only IND 4 of NE 53 (Beta-573496) offering a slightly more recent chronology (4230 ± 30 BP, 2900-2776, 68,3%, and 2910-2697, 95,4 %, with an average of 2858 cal BC). The results of two individuals of NE 54 (Beta-573497 and CNA-3197), and the female individual of NE 8 (CNA-3194) were statistically identical (3011-2898, 68,3%, and 3083-2891, 95,4 %) with an approximate mean value of 2960 cal BC for the three burials (Table 2). Similar data have been obtained in other Upper and Middle Guadalquivir contexts, such Polideportivo-La Alberquilla (Martos) or La Arruzafa (Córdoba) (Cámara *et al*., 2010; Martínez *et al*., 2020).

Stable isotopes

Up to 23 bone samples from structures NE 8, NE 53, and NE 54 were selected for stable isotopes analysis. Parts corresponding to articulated human and animal individuals (mainly long bones) were given priority. The results, although they have also been broken down by structures, will be analyzed together given the contemporaneity of these contexts.

The study of stable isotopes, specifically $\delta^{13}C$ and $\delta^{15}N$, is related to the ingested proportion of animal and vegetable proteins by the sampled individuals. In the case of $\delta^{13}C$, it is frequently used to determine the predominant biomass C3 or C4 plants, the latter often with warm climates, and with a much later incidence in European populations, such as millet, sugar cane, or corn (Laffranchi *et al*., 2018). Similarly, this isotopic marker in connection with $\delta^{15}N$ serves to determine the marine (sometimes even fluvial) or terrestrial origin of the proteins consumed. In the case of carbon, it shows enrichment of about 1‰ for each trophic level (De Niro & Epstein, 1978; McCutchan *et al.,* 2003). Nitrogen isotopes reflect protein consumption with an increase of between 3 and 5‰ in the

CONTEXT	SAMPLE	CODE	BP	SD	68,3 %	95,4 %	M	$\delta^{13}C$	$\delta^{15}N$
E53, ind4	Human femur	Beta-573496	4230	30	2900-2776	2910-2697	2858	-19,1	8,8
E54, ind8	Human tibia	Beta-573497	4330	30	3010-2898	3021-2891	2943	-19	9,6
E54, ind1	Human bone	CNA-3197	4347	35	3011-2908	3082-2895	2967	-19,12	
E8 UE681	Human femur	CNA-3194	4351	33	3011-2910	3083-2898	2968	-19,2	

TABLE 2

Radiocarbon dates for Grañena Baja Phase III. Calibration at 1 and 2 sigmas using Oxcal software from the IntCal20 atmospheric curve (Reimer *et al*., 2020).

food chain, between consumed and consumers (Bocherens & Drucker, 2003). As a rule, for $\delta^{13}C$ collagen values lower of -18‰ is assumed for C3 plant consumption and up to -12‰ in the case of C4 biomass or marine resources (Schoeninger & DeNiro, 1984; Richards & Hedges, 1999).

The isotopic ratio C/N of the remains sampled indicates that collagen is well preserved, 19 of the 23 plot in a normal range (2.9–3.6; De Niro, 1985), whereas the remaining four cases were subtracted from the calculation of the standard deviation by groups. However, all values have been included in the tables and graphs (Table 3, Figure 2 in Supplementary Information).

The isotopic values show little variability, which is consistent with a very homogeneous diet and a relatively uniform environment. Thus, an interesting absolute concordance is seen in the $\delta^{15}N$ and $\delta^{13}C$ values shared between the male and female individuals. Also, in the case of $\delta^{15}N$ ‰ (AIR), the average values are 9.04 ± 0.57 in adult men (N=7) and 9.03 ± 0.39 in adult women (N=5). As for the $\delta^{13}C$ ‰ (V-PDB), values are also very similar, with an average of -18.84 ± 0.24 in men and -18.88 ± 0.44 in female individuals respectively. In the case of the two subadult individuals, the irregular ratio C/N values observed suggest caution regarding potential inferences.

The rest of the species show the usual values about their trophic characteristics. Thus, dogs, with only two individuals sampled, present values of $\delta^{15}N$ ‰ (Air) = 8.98 ± 1.5 and $\delta^{13}C$ ‰ (V-PDB) = -18.22 ± 0.51, which places them close to humans, as waste consumers. Slightly lower values are observed in pigs for $\delta^{15}N$ ‰ (AIR) = 7.84 ± 0.23. However, $\delta^{13}C$ ‰ values (-18.7 ± 1.09) are similar to humans and dogs, indicating a C3 plant biomass.

As for the herbivores, the values shown in the rabbit sample are unusual face a strict herbivore diet ($\delta^{15}N$ ‰ (AIR) = 7.47 and $\delta^{13}C$ ‰ (V-PDB) = -18.87), as this species is problematic in isotopic studies (Beck *et al*., 2018). On the contrary, the goat values ($\delta^{15}N$ ‰ (Air-N2) = 5.94 and $\delta^{13}C$ ‰

EN 53		**□^{15}N ‰ (Air-N2)**	**□^{13}C ‰ (V-PDB)**	**RATIO**
E53-IND2	human M	8,40	-18,77	3,27
E53-IND3	human M	8,80	-18,36	3,96
E53-IND4	human M	9,02	-18,60	3,32
E53-IND6	human M	9,01	-18,62	3,36
EN53/CAF	Dog	8,15	-17,86	3,33
EN53/IND4	Goat	5,94	-17,86	3,48
EN 54		**□^{15}N ‰ (Air-N2)**	**□^{13}C ‰ (V-PDB)**	**RATIO**
E54-IND1	human F	8,65	-19,13	3,33
E54-IND10*	human F	9,02	-18,46	4,61
E54-IND12	human F	9,47	-18,78	3,26
E54-IND2	human F	9,37	-19,51	3,28
E54-IND3	human F	7,75	-17,93	3,08
E54-IND4*	*human Juv*	9,07	-18,62	5,51
E54-IND5*	*human Juv*	8,08	-18,88	6,05
E54-IND6	human M	9,64	-18,99	3,29
E54-IND7	human M	9,17	-18,93	3,43
E54-IND8	human M	9,78	-18,66	3,30
E54-IND9	human M	8,25	-19,25	3,20
EN54/UE716	Pig	7,67	-17,93	3,55
EN 8		**□^{15}N ‰ (Air-N2)**	**□^{13}C ‰ (V-PDB)**	**RATIO**
D2/EN8/681	Dog	9,81	-18,58	3,33
D2/EN8/681	Deer	5,27	-18,61	3,28
D2/EN8/945	Pig	8,00	-19,47	3,11
D2/EN8/945	Rabbit	7,46	-18,86	3,18
EN8-IND1	Human F	8,63	-18,50	3,33

TABLE 3

Isotopic values $\delta^{15}N$ ‰ (AIR) y $\delta^{13}C$ ‰ (V-PDB) by individual (animal and human) deposits from structures NE 8, 53, and 54. In italics and star, samples where the isotopic ratio deviates from the acceptable values (3.20).

(V-PDB) = -17.87), correspond to those observed in grazing animals. In the case of deer, the $\delta^{13}C$ values are highly negative and the nitrogen lower, which seems to be linked to a more browsing diet ($\delta^{15}N$ ‰ (AIR) = 5.27 and $\delta^{13}C$ ‰ (V-PDB) = -18.62), as previously observed in other samples from the Guadalquivir basin (Fontanals-Coll *et al.,* 2015). These values are in accordance with more humid and forested systems.

As the analysis suggests, the individuals buried show a strictly terrestrial diet, without any influence of C4 plants or marine resources, which would also support a local origin. Their diet, as shown, was based on C3 plants, presumably, rain-fed cereals and terrestrial herbivores. Given the values, pigs would perhaps have had less influence, although the age of the sampled specimens and their small number should be considered. These results are comparable to other sites of the Upper and Middle Guadalquivir, such as Úbeda (Molina *et al.,* 2019), Marroquíes Bajos (Beck *et al.,* 2018), Alcolea and La Arruzafa (Martínez *et al*., 2020), or even of the Lower Guadalquivir, such as Valencina de la Concepción – Montelirio (Fontanals-Coll *et al.,* 2015).

DISCUSSION

The different contexts documented offer a great diversity of situations. As said, there is a first group consisting either of erratic elements or consumption remains, clearly a minority among the total identified remains. A second group, often represented by articulated remains and various singular skeletal parts (mainly skulls), is remarkable, identified with structured deposits or contexts which can be originated from ritual or sacrificial purposes.

Thus, if the nature of these deposits is left out, and only the NISP corresponding to this phase (Ancient Copper Age or *Cazuelas Carenadas* Complex-CCC) is considered, dogs would appear as the most important taxon, followed by suids, both species being also the most represented among the articulated remains found in the structures. Once structured deposits excluded, domestic caprines seem to be the main livestock, however with a small representation in the general collection, as can be found in other contexts in areas of *campiña* and Upper Guadalquivir in the same period (Martínez, 2013b; Cámara & Riquelme, 2015).

Animal presence in prehistoric structured deposits constitutes, on its own, almost a subdiscipline in Iberian prehistoric archaeology. Generally, they include the common domestic species, such as the dogs and cattle in Martos mega-site, although some other exceptional cases are known (Lorca), as 18 dogs in a single structure and accompanied by three humans and a "feline" (Lomba & Haber, 2016), or exclusively wild species, such as the case of a deer in Las Beatillas (Puerto de Santa María, Cádiz) (Ruíz *et al.,* 1990) or a dolphin in La Vital site (Gandía, Valencia) (Pascual *et al.,* 2019). In opposition to a merely hygienic view, which is extended even to deposits generated by falls or accidents, other interpretations pop out in recent times. Although not void of certain epistemic vices (rituals as an interpretive cliché), they assumes that a large number of these deposits are significant elements linked to symbolic behavior: a kind of ritualized choreography provided with meaning. This perspective has been making its way since the end of the last century in our region (Lizcano *et al*., 1992; Márquez, 2006, Cámara *et al.,* 2008, 2010, 2016), accepting the ideological-symbolic character of the deposits and their sacrificial origin.

The concept of sacrifice has been analyzed from different approaches, especially highlighting its universal and cross-cultural character. Although its purpose, as well as its meaning, is specific to each culture, its presence is especially prominent in agricultural societies. This is linked with payment, or retribution to the natural and supernatural forces, in exchange for the resources provided by nature, either in the wild (hunting and gathering) or the humanized world (pastures and crops). This set of concepts can be the product of the dependence on agricultural and livestock production, as well as occasional critical fluctuations in the production yield. This is a part of the cosmogony shared by pre-scientific societies, where the function of physical phenomena is explained or justified by mythical stories (Schwartz, 2017) that, ultimately, assume that the community (or certain representatives of it) can control the functioning of the World.

Whether an animal or a human sacrifice, the victim must be killed, which generally leaves evidence on the archaeological bone record. In Andalusia, no evidence of trauma or direct physical violence has been found in the cases of strictly animal deposits other than the absence of certain parts, such as the head, which is usually associated with decapitation, whether it was performed or not, during

the sacrificial rite. In this sense, skulls become elements endowed with special significance, clearly suggesting a metonymic identification (*pars pro toto*) with the animal or any of its principal characteristics. The preference for skulls or parts showing horns, bony cores, or antlers, including old examples left in exposure for some time (as the auroch skulls in Camino de las Yeseras) (Liesau *et al*., 2013), suggests an important interest in the male attributes of these species (bull, ram, male deer) (Cámara *et al*., 2008). In the case of dogs, their role as a guardian or hunting companions has been highlighted (Lizcano *et al*., 1992). Thus, dogs have been described as "sealing" structured deposits, as observed in various Copper Age enclaves of the Iberian Peninsula, especially in Camino de las Yeseras, where also evidence of dogs sacrificed by blows to the head stands out (Liesau, 2017).

Among the animals appearing in structured deposits, probably the species mostly related to celebration and distribution are domestic cattle and pigs. Although their presence is frequent as domestic livestock, they have been associated with rites of collective consumption (Albarella *et al*., 2005). On the other hand, if the domestic caprines were part of the daily diet of the Upper Guadalquivir communities, this could reduce their presence in those deposits. The more frequent presence of pigs and cattle in these contexts could mirror ritualized consumption in an underground world, projecting the collective ritual in this lower sphere and perhaps also in the mortuary dimension. Once the sacrifice has been carried out, the animal can be intended for the community of the living (consumption), or taken from it, and offered to the underground world of supernatural agents or ancestors.

Human sacrifices are usually perceived quite differently. Traditionally, this phenomenon has been related to the consolidation of social hierarchy in pre-or proto-state agricultural social forms, where it functioned as part of the social control mechanisms (Watts *et al*., 2016). However, it is extremely complex to differentiate between the victims of an unorganized form of interpersonal violent event from direct intergroup violence, with outstanding examples of both types (Guilaine & Zammit, 2001; Chenal *et al*., 2015; Schroeder *et al*., 2019; Smrčka *et al*., 2019; Alt *et al*., 2020).

The meaning of the human deposits of NE 8, 53 (sequential), and 54 (synchronous) is difficult to reach beyond their mortuary character. In the latter case, none of the individuals had manifest signs of violence or perimortem trauma, therefore their deaths could have been of natural cause, whether accidental (drowning?) or infectious. However, this does not eliminate other possibilities, as undetectable forms of sacrifice throughout the observation of bone remains. In a system of meanings, each change in the script affects the role of the actors and the interpretation of the choreography. To define it as a mortuary or sacrificial deposit establishes very different meanings for the rest of the deposits, including the animals, which could be identified as individuals, pieces of meat, or having different meanings, emanating from attributes or symbols (Russell, 2012).

CONCLUSIONS

In this study, the faunal and anthropological assemblages of Grañena Baja Phase III have been addressed. In the case of the animal skeletal remains, a "background" group has been individualized, corresponding to erratic remains or consumption refuse, which reflect the livestock production of these societies, whereas a second group, composed of individualized remains, complete anatomical parts or elements in connection, has been interpreted as part of structured deposits arranged throughout successive events occurring close in time.

The human assemblages have been studied in conjunction with the fauna, as in some cases (NE 8 and 53), they form part of the same composition. In this sense, these structures contain successive depositions in which various animals were part of a deliberate depositional process. NE 54, located very close to NE 53, is a simultaneous deposit composed of a group of 11 human individuals without fauna associated, which seem to have died in a single or successive event very close in time. The assemblage contains individuals of both sexes in a wide age range, which share very similar isotopic values, evidencing a homogeneous diet and nutritional status.

Accepting the sacrificial role of animals in this study, it cannot be assumed unambiguously the funerary character of human deposits. Therefore, in the case of the simultaneous deposit of NE 54, the possible involvement of controlled violence or deliberate acts of sacrifice cannot be ruled out. In any case, the purpose of ritual as an instrument in social order would not change, but the role attributed

to the human remains present in these deposits would do. In funerary contexts, they would be the main subjects in a process of conversion into active ancestors, on the contrary, as human sacrifices, they would be identified with objects/offerings. Further, if the sacrifice had affected only some of the subjects buried, if contemporaries, their relationship would have been as an accompaniment to those of the group who had received formal mortuary treatment, opening new perspectives on their social role.

ACKNOWLEDGEMENTS

This work has been carried out in the framework of the Project "Archaeobiology of the Neolithic of the Southern Iberian Peninsula" (NeArqBioSI) A-HUM-460-UGR18 by Consejería de Economía, Conocimiento, Empresas y Universidad. FEDER Programme - Junta de Andalucía-Universidad de Granada. Call 2019. Isotopic analysis was funded by MICINN through European Regional Development Fund [SUMHAL, LIFEWATCH-2019-09-CSIC-13, POPE 2014-2020] and the research group RNM-309 (Junta de Andalucía, Spain). We would like to thank the reviewers, and specially Dr. C. Liesau von Lettow-Vorbeck, for their thoughtful comments.

SUPPLEMENTARY MATERIAL

See supplementary material at https://revistas.uam.es/archaeofauna/article/view/archaeofauna32.1_007

REFERENCES

Acsádi, G. & Nemeskéri, J. 1970: *History of human life span and mortality*. Akadémiai Kiadó, Budapest.

Albarella, U.; Davis, S.; Detry, C. & Rowley-Conwy, P. 2005: Pigs of the "Far West": the biometry of *Sus* from archaeological sites in Portugal. *Anthropozoologica* 40(2): 27-54.

Alemán, I.; Botella, M.C. & Ruíz, L. 1997: Determinación del sexo en el esqueleto postcraneal. Estudio de la una población mediterránea actual. *Arch. esp. Morfol*. 2: 7-17.

Almeida, N.J.; Basílio, A.C.; Silva, C.; Soares, A. & Borges, N. 2021: Faunal remains manipulation during the Chalcolithic in pits 13, 16 and 54 from Monte das Cabeceiras 2 (Beja, Southern Portugal). *Zephyrus* LXXXVIII(2): 41-64.

Alt, K.W.; Tejedor, C.; Nicklisch, N.; Roth, Szécsenyi Nagy, A.; Knipper, C.; … & Rojo, M.A. 2020: A massacre of early Neolithic farmers in the high Pyrinees at Els Trocs, Spain. *Scientific Reports*: 10.

Aura, E.; Jordá, J.F.; Badal, E.; Morales, J.V.; Avezuela, B.; Tiffagom, M. & Jardón, P. 2010: Treinta años de investigación sobre el Paleolítico superior de Andalucía: la Cueva de Nerja (Málaga, España). En: Mangado, X. (ed.): *El Paleolítico Superior Peninsular. Novedades del siglo XXI*: 149-172. Universidad de Barcelona, Barcelona.

Baptista, L. 2015: Contextos de inumação em "fossa" da Pré-história Recente no Interior Alentejano – Contributos para o conhecimiento das práticas de enterramento. *Actas del VII Encuentro de Arqueología del Suroeste Peninsular*: 29-62. Ayuntamiento de Aroche, Aroche-Serpa.

Barone, R. 1976: *Anatomie comparée des mamifères domestiques*. Vigot Frères, Paris.

Beck, J.L.; Díaz, M.; Bocherens, H. & Díaz, P. 2018: Feeding a third millennium BC mega-site: Bioarchaeological analyses of palaeodiet and dental disease at Marroquíes (Jaén, Spain). *Journal of Anthropological Archaeology* 52: 23-43.

Bocherens, H. & Drucker, D.G. 2003: Trophic level isotopic enrichment of carbon and nitrogen in bone collagen: case studies from recent terrestrial ecosystems. *International Journal of Osteoarchaeology* 13(1-2): 46-53.

Bocherens, H.; Fizet, M.; Mariotti, A.; Vandermeersch, B.; Borel, J.P. & Bellon, G. 1991: Isotopic biogeochemistry (^{13}C, ^{15}N) of fossil vertebrate collagen: application to the study of a past food web including Neandertal man. *Journal of Human Evolution* 20: 481-492.

Bocherens, H.; Billiou, D.; Patou, M.; Otte, M. & Mariotti, A. 1997: Paleobiological Implications of the Isotopic Signatures (13C, 15N) of Fossil Mammal Collagen in Scladina Cave (Sclayn, Belgium). *Quaternary Research* 48: 370-380.

Brück. J. 1999: Ritual and rationality: Some problems of interpretation in European Archaeology. *Journal of European Archaeology* 2(3): 313–344.

Buikstra, J. & Ubelaker, D.H. 1994: *Standards for data collection from human skeletal remains*. Arkansas Archeological Survey Research Series No. 44. Fayetteville.

Cámara, J.A. & Riquelme, J.A. 2015: Formas y condiciones de la sedentarización en el Alto Guadalquivir. Economía y hábitat entre el IV y el III milenios a.C. In: Gonçalves, V.S. & Sousa, A.C. (eds.): *Actas do 5º Congresso do Neolítico Peninsular*: 339-348. Uniarq, Lisbon.

Cámara, J.A.; Lizcano, R.; Pérez, C. & Gómez, E. 2008: Apropiación, sacrificio, consumo y exhibición ritual de los animales en el Polideportivo de Martos. Sus implicaciones en los orígenes de la desigualdad social. *Cuadernos de Prehistoria de la Universidad de Granada* 18: 55-90.

Cámara, J.A.; Riquelme, J.A.; Pérez, C.; Lizcano, R.; Burgos, A. & Torres, A. 2010: Sacrificio de animales y ritual en el Polideportivo de Martos-La Alberquilla (Martos, Jaén). *Cuadernos de Prehistoria de la Universidad de Granada* 20: 297-327.

Cámara, J.A.; Sánchez, R.; Riquelme, J.A.; Martín, S.; Afonso, J.A.; Pau, C.; García, M.F.; Nicas, J.; Spanedda, L.; González, A.; Jiménez, S.A. & Laffranchi, Z. 2016: Culte aux ancêtres dans la période chalcolithique de la péninsule ibérique? Le sacrifice d'animaux, la circulation des restes humains et la différence de traitement entre hommes et femmes dans les tombes du site archéologique à «Marroquíes » (Jaén, Espagne) trouvées dans les fouilles de la « Tranche 3 » du système du tramway. *L´Anthropologie* 120(2): 145-174.

Conlin, E.; Martínez, R.M. & Morgado, A. 2020: Hacia una nueva definición del Neolítico Medio en el sur de la península Ibérica: Grañena Baja, Jaén. *Trabajos de Prehistoria* 77(1): 30-47.

Chenal, F.; Perrin, B.; Barrand-Emam, H. & Boulestin, B. 2015: A farewell to arms: a deposit of human limbs and bodies at Bergheim, France, c. 4000 BC. *Antiquity* 89(348): 1313-1330.

Daza, A. 2019: *Estudio arqueozoológico del perro en la prehistoria reciente de la Península Ibérica: Caracterización de la especie y sus depósitos en contextos arqueológicos del calcolítico y la edad del bronce, finales del IV-II milenio AC*. Universidad Autónoma de Madrid, Madrid.

De Niro, M.J. 1985. Postmortem preservation and alteration of in vivo bone collagen isotope ratios in relation to palaeodietary reconstruction. *Nature* 317: 806–809.

De Niro, M.J. & Epstein, S. 1978: Influence of diet on the distribution of carbon isotopes in animals. *Geochimica et Cosmochimica Acta* 42(5): 495-506.

Flors, E. 2010: Enterramientos neolíticos en Costamar. In: Pérez, A. & Soler, B. (eds.): *Restos de Vida Restos de Muerte. La muerte en la Prehistoria*: 179-182. Diputació de Valencia, Valencia.

Fontanals-Coll, M.; Díaz, M. & Subirà, M.E. 2015: A Palaeodietary Study of Stable Isotope Analysis from a High-status Burial in the Copper Age: The Montelirio Megalithic Structure at Valencina de la Concepción–Castilleja de Guzmán, Spain. *International Journal of Osteoarchaeology* 26(6): 447–459.

Guilaine, J. & Zammit, J. 2001: *Le Sentier de la guerre. Visages de la violence préhistorique*. Éditions du Seuil, Paris.

Habermehl, K.H. 1961: *Die Altersbestimmung bei Haustieren, Pelztieren und beim jagdbaren Wild*. Paul Parey, Berlin.

Halstead, P. & Collins, P. 2002: Sorting the Sheep from the Goats: Morphological Distinctions between the Mandibles and Mandibular Teeth of Adult Ovis and Capra. *Journal of Archaeological Science* 29: 545-553.

Hoffman, D. & Husty, L. 2019: Enclosures, structured deposits and selective innovations: Riedling and the role of the South Bavarian Münchshofen Culture in the new networks of the Late Neolithic. In: Müller, J.; Hinz, M. & Wunderlich, M. (eds.): *Megaliths, Societies, Landscapes. Early monumentality and social differentiation in Neolithic Europe*: 939-956. Gedruckt mit Unterstützung, Bonn.

Iscan, M.Y. & Miller-Shaivitz, P. 1984: Determination of sex from the tibia. *American Journal of Physical Anthropology* 64: 53-57.

Jit, I. & Singh, S. 1966: The sexing of the adult clavicles. *Indian J. Med. Res*. 54: 551-571.

Laffranchi, Z.; Jiménez, S.A.; Delgado, A.; Granados, A. & Miranda, M.T. 2018: Infant feeding practices in a pre-Roman/Celtic population from Verona (Italy). *Journal of Archaeological Science: Reports* 17: 30-38.

Lefranc, P. & Chenal, F. 2019: Deposits of bodies in circular pits in the Neolithic period (mid-fifth to the mid-fourth millennium BCE): deposits, waste, or ritual remnants? *Human Remains and Violence* 5(1): 18-32.

Liesau, C. 2012: Depósitos con ofrendas animales en yacimientos Cogotas I: Antecedentes y Características. En: Rodríguez, J.A. & Fernández, J. (eds.): *Cogotas I. Una cultura de la Edad del Bronce en la Península Ibérica*: 219-258. Universidad de Valladolid, Valladolid.

— 2017: Fauna in Living and Funerary Contexts of the 3rd Millennium BC in Central Iberia. In: Bartelheim, M.; Bueno, P. & Kunst, M. (eds.): *Key resources and socio-cultural developements in the Iberian Chalcolithic*: 107-128. Tubingen Library Publishing, Tubingen.

Liesau, C.; Daza, A.; Llorente, L. & Morales, A. 2013: More questions than answers: the singular animal deposits from Camino de Las Yeseras (Chalcolithic, Madrid, Spain). *Anthropozoologica* 48(2): 277-286.

Lizcano, R.; Cámara, J.A.; Riquelme, J.A.; Cañabate, M.L.; Sánchez, A. & Afonso, J.A. 1992: El Polideportivo de Martos. Producción Económica y Simbolos de Cohesión en un asentamiento del Neolítico Final en las campiñas del Alto Guadalquivir. *Cuadernos de Prehistoria de la Universidad de Granada* 16-1: 5-101.

Lomba, J. & Haber, M. 2016: El registro funerario calcolítico en el extremo suroriental de la Península Ibérica: los valles del Guadalentín y Segura (Murcia). In: Bonet, H. (ed.): *Del Neolític a l'Edat del Bronze en el Mediterrani occidental. Estudis en Homenatge a Bernat Martí Oliver*: 349-364. Diputación de Valencia, Valencia.

Manouvrier, L. 1893: La Détermination de la taille d'après les grands os des membres. *Memoires de la Société d´Anthropologie de Paris* 4: 347-402.

Márquez, J.E. 2006: Sobre los depósitos estructurados de animales en los yacimientos de fosos del Sur de la Península Ibérica. *Actas do IV Congresso de Arqueología Peninsular, Braga, 2004*: 15-26. Universidade do Algarve, Faro.

Martín, P.; Albizuri, S.; Martín, A. & Gibaja, J.F. 2019: Offerings, feasting, and psychopomps in the north-east of the Iberian Peninsula: the role of animals in the Bòbila Madurell (Sant Quirze del Vallès, Barcelona) funerary ritual (late fifth millennium–early fourth millennium cal BC). *Archaeological and Anthropological Sciences* 11(12): 6615-6637.

Martínez, R.M. 2013a: *El IV milenio ANE en el Guadalquivir Medio. Intensificación agrícola y fragua de la comunidad doméstica aldeana*. B.A.R. (International Series) 2563. Oxford.

— 2013b: Cerdos, caprinos y náyades. Aproximación a la explotación ganadera y fluviar en el Guadalquivir entre el Neolítico y la Edad del Cobre (3500-2200 ANE). *Spal* 22: 29-46.

Martínez, R.M.; Tejedor, Ú.; López, I.; Delgado, A.; Granados, A.; Tovar, L.r. & Clapés, R. 2020: Archaeology, chronology, and age-diet insights of two late fourth millennium cal BC pit graves from central southern Iberia (Córdoba, Spain). *International Journal of Osteoarchaeology* 30(2): 245-255.

Méniel, P. 2008: *Manuel d´Archéozoologie funéraire et sacrificielle:* âge *du fer*. Infolio Éditions, Paris.

McCutchan, J.h.; Lewis, W.m.; Kendall, C. & Mcgrath, C.C. 2003: Variation in trophic shift for stable isotope ratios of carbon, nitrogen, and sulfur. *Oikos* 102: 378-390.

Molina, F.; Nocete, F.; Delgado, A.; Cámara, J.A.; Martínez, R.M.; Jiménez, S.A.; Miranda, M.T.; Riquelme, J.A.; Spanedda, L.; Pérez, C.; Lizcano, R.; Nieto, J.M.; Nájera, T.; Granados, A. & Carrión, F. 2019: Diet and environment in southeastern Iberia during the Bronze Age based on isotope analysis of human remains. *Oxford Journal of Archaeology* 39(2): 189-213.

Morris, J. 2011: *Investigating Animal Burials: Ritual, Mundane and Beyond*. B.A.R. (British Series) 535. Oxford.

Olivier, G. & Pineau, H. 1958: Détermination de l´âge du fœtus et de l´embryon. *Archives d´Anatomie Pathologique* 6: 21-28.

Pasaric, M. & Trbojević, T. 2016: Eneolithic Cattle Burials from Aljmaš-Podunavlje and Osijek-Retfala, Croatia. *International Journal of Osteoarchaeology* 26: 842-852.

Pascual, J.L.; Sanchís, A. & Pascual, J. 2019: Ballenas y delfines en la Prehistoria peninsular. Los restos de cetáceo de la Vital (Gandía, Valencia). In: Pascual, J.L. & Sanchís, A. (eds.): *Recursos marins en el passat. IV Jornades d´arqueozoologia*: 165-192. Museu de Prehistòria de Valencia, Valencia.

Pérez, G.; Bernabeu, J.; Carrión, Y.; García, O.; Molina, L. & Gómez, M. 2011: *La Vital (Gandía, Valencia). Vida y Muerte en la desembocadura del Serpis durante el III y el I milenio a.C*. Diputació de Valencia, Valencia.

Reimer, P.J.; Austin, W.E.; Bard, E.; Bayliss, A.; Blackwell, P.G.; Bronk Ramsey, C.; … & Talamo, S. 2020: The IntCal20 Northern Hemisphere Radiocarbon Age Calibration Curve (0–55 cal kBP). *Radiocarbon* 62(4): 725-757.

Reverte, J.M. 1999: *Antropología Forense*. Ministerio de Justicia, Madrid.

Richards, M.P. & Hedges, R. 1999: Stable Isotope Evidence for Similarities in the Types of Marine Foods Used by Late Mesolithic Humans at Sites Along the Atlantic Coast of Europe. *Journal of Archaeological Science* 26(6): 717-722.

Riquelme, J.A.; Lizcano, R.; Pérez, C.; Sánchez, R. & Cámara, J.A. 2012: Una introducción al análisis de los restos faunísticos de la zona arqueológica del Polideportivo de Martos. *Cuadernos de Prehistoria y Arqueología de la Universidad de Granada* 22: 199-230.

Robledo, M.; Sánchez, J.A.; Pumar, M.; Labajo, E. & Perea, B. 2008: Determinación de edad ósea en adolescentes. Estudio radiológico de pie y tobillo. *Revista de la Escuela de Medicina Legal* 7: 22-38.

Ruíz, J.A.; Pérez, E.; López, J.J. & Monclova, A. 1990: El Yacimiento protohistórico de las Beatillas. *Revista de Historia del Puerto* 4: 9-34.

Russell, N. 2012: *Social Zooarchaeology. Humans and Animals in Prehistory*. University Press, Cambridge.

Schoeninger, M. & DeNiro, M.J. 1984: Nitrogen and carbon isotopic composition of bone collagen from marine and terrestrial animals. *Geochimica et Cosmochimica Acta* 48(4): 625-639.

Schroeder, H.; Margaryan, A.; Szmyt, M.; Theulot, B.; Wlodarczak, P.; Rasmussen, S.; Gopalakrishnan, S.; Szczepanek, A.; Konopka, T.; Jensen, T.Z.T.; Witkowska, B.; Wilk, S.; Przybyła, M.M.; Pospieszny, L.; Sjögren, K.G.; Belka, Z.; Olsen, J.; Kristiansen, K.; Willerslev, E.; Frei, K.M.; Sikora, M.; Johannsen, N.N. & Allentoft, M.E. 2019: Unraveling ancestry, Kinship and violence in a Late Neolithic mass grave. *PNAS* 116(22): 10705-10710.

Schwartz, G.M. 2017: The Archaeological Study of Sacrifice. *Annual Review of Anthropology* 46: 223-240.

Senra, M.; Costa, C.; Bettencourt, A.; Baptista, L. & Gomes, S. 2019: Faunal remains from Torre Velha 12 (Serpa, Beja, Southwest of Portugal): relationship between animals and Bronze age communities. *Heritage* 2(1): 216-229.

Silver, I.A. 1969: The ageing of domestic animals. In: Brothwell, D.; Higgs, E. & Clark, G. (eds.): *Science in Archaeology: a survey of progress and research*. Praeger Publisher, London.

Singh, G.; Singh, S.p. & Singh, S. 1974: Identification of sex from the radius. *Journal of the Indian Academy of Forensic Sciences* 13: 10-16.

Smrčka, V.; Berkovec, T. & Erban, V. 2019: "Children as plants." Analyses of skeletal remains of suspected children sacrifices on a Neolithic settlement in Vedrovice, Czech Republic. *L´Anthropologie* LVII(1): 79-86.

Trotter, M. & Gleser, G.C. 1952: Estimation of stature from long bones of American Whites and Negroes. *American Journal of Physical Anthropology* 10(4): 463-514.

Valera, A.C. & Costa, C. 2013: Animal limbs in funerary contexts in southern Portugal and the question of segmentation. *Anthropozoologica* 48(2): 263-275.

Watts, J.; Sheehan, O.; Atkinson, Q.D.; Bulbulia, J. & Gray, R.D. 2016: Ritual human sacrifice promoted and sustained the evolution of stratified societies. *Nature* 532: 228–231

Zeder, M.A. & Lapham, H.A. 2010: Assessing the reliability of criteria used to identify postcranial bones in sheep, Ovis, and goats, Capra. *Journal of Archaeological Science* 37: 2887-2905.

Zeder, M.A. & Pilaar, S.E. 2010: Assessing the reliability of criteria used to identify mandibles and mandibular teeth in sheep, Ovis, and goats, Capra. *Journal of Archaeological Science* 37: 225-242.

SUPPLEMENTARY MATERIAL

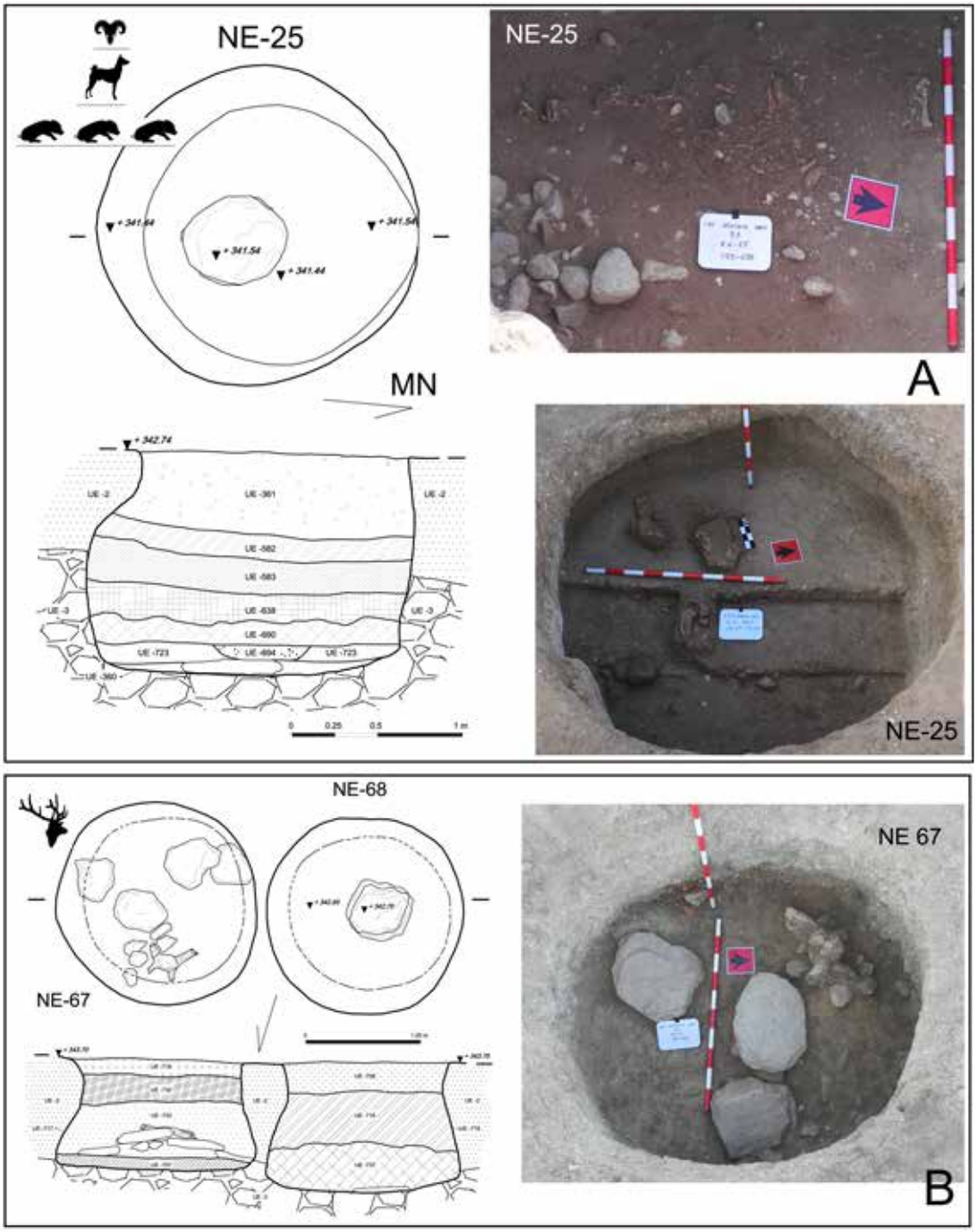


FIGURE S1

Above (A), plan, section, and photographs of structure NE 25, identifying the structured deposits inside it. Below (B), plan, section, and plan photo of NE 67 (and 68) showing the partial deer skull, with the antlers basal parts preserved. The silhouettes indicate depositional sequence ("stratigraphic" view: earlier down, later up).

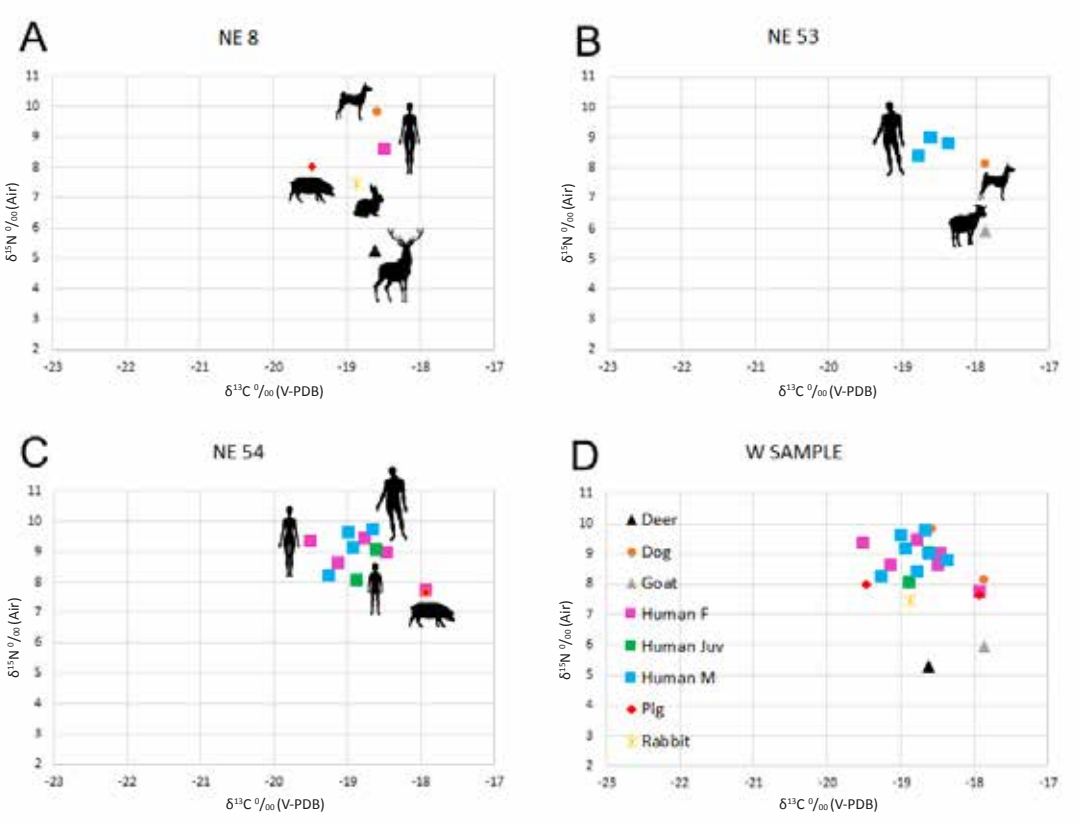


FIGURE S2

Collagen isotopic composition of individualised animals and humans from structures NE 8 (A), 53 (B), 54 (C) and in aggregate (D, Whole Sample).

INFORMACIÓN A LOS AUTORES

a) Los originales pueden redactarse en español, inglés, alemán o francés. Los editores pueden considerar, en determinadas circunstancias, la publicación de originales en otros idiomas. En cualquier caso se proporcionará un resumen y palabras clave en español y en inglés.

b) Los originales no deberían sobrepasar 20 páginas A4 (29,5 x 21 cm) incluyendo tablas y figuras. En caso de trabajos más extensos contáctese con el editor. Los manuscritos deberán remitirse a arturo.morales@uam.es.

c) Las figuras y tablas deberán ser originales y de gran calidad. Las leyendas de figuras y de tablas deberán remitirse, numeradas, en ficheros independientes y serán concisas e informativas.

d) Estructuración del manuscrito. El orden requerido en los manuscritos de carácter experimental es el siguiente: Título del trabajo; Autor(es) y Centro(s) de trabajo; Resumen y Palabras Clave; Abstract y keywords; Introducción; Discusión; Conclusiones; Agradecimientos (optativo); Referencias. Si el trabajo así lo requiere, resultados y discusión pueden agruparse en el mismo epígrafe. En manuscritos no experimentales, la estructuración del trabajo se deja a la libre decisión del(de los) autor(es).

e) las citas bibliográficas en el texto incluirán autor y año de publicación, por ejemplo (Smithm 1992) o (Smith & Jones, 1992). En trabajos con tres o más autores usar (Martín *et al*., 1993). En trabajos del(de los) mismo(s) autor(es) y año, se procederá a identificar cada trabajo con letras (a, b, c, etc…) tras la fecha.

f) Referencias. Sólo se incluirán aquellas citadas en el texto y se hará del siguiente modo:

PÉREZ, C.; RODRÍGUEZ, P. & DÍAZ, J. 1960: Ecologican factors and family size. *Journal of Bioethics 21:* 13-24.

RUIZ, L. 1980: *The ecology of infectious diseases*. Siglo XXI, Madrid.

g) Los autores son los únicos responsables de los contenidos de sus artículos.

INFORMATION FOR AUTHORS

a) Manuscripts can be submitted in Spanish, English, German and French. Under certain circumstances papers may also be published in other European Community languages. All papers will include an abstract and keywords in English and Spanish.

b) Manuscripts should usually not exceed 20 A4 printed pages (29,5 x 21 cm), including figures and tables. For longer manuscripts, contact the editor. Manuscripts should be submitted to arturo.morales@uam.es.

c) Figures and tables must be original and hight quality. Figure legends should be numbered with arabic numerals and given on a separate file. Figure and table legends should be concise and informative.

d) Papers should be organized as follows: Title, name and mailing address(es) of author(s). Abstract, Keywords, Introduction, Materials and Methods, Results, Discussion, Conclusions, Acknowledgements, References. Results and Discussion may be treated together if this is appropiate. Non-experimental works can be organized in the way whicht th author(s) think(s) is the most appropiate one.

e) Citations in the text should be with author and date of publication, e. g., (Smith, 1992) or (Smith & Jones, 1992) with comma between author and date; for two-author papers, cite both authors; for papers by three or more authors, use Martín *et al*., 1993. For two or more papers with the same author(s) and date, use, a, b, c, etc., after the date.

f) References: only papers cited in the text should be includen; they should be arranged as indicated in point «f» of the other column.

g) Authors are responsible for the contents of their manuscripts.

ÍNDICE / CONTENTS