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**What did the first food producers in the Lisbon region eat,
in the transition from the 6th to the 5th millennium BC?**

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What did the first food producers in the Lisbon region eat, in the transition from the 6th to the 5th millennium BC?

JOÃO LUÍS CARDOSO

BACKGROUND AND OBJECTIVES OF THIS STUDY

The Encosta de Sant'Ana archaeological site is located in the historic centre of Lisbon, in the parish of Santa Justa, at the following geographical coordinates: 38°43'02"N; 09°08'02"W. The site stands at the east-facing foot of the Sant'Ana hill, adjacent to a former inlet of the Tagus River, which no longer exists but once occupied the current Martim Moniz square, on top of the 'Areolas da Estefânia' sands, of Miocene age¹ (Fig. 1).

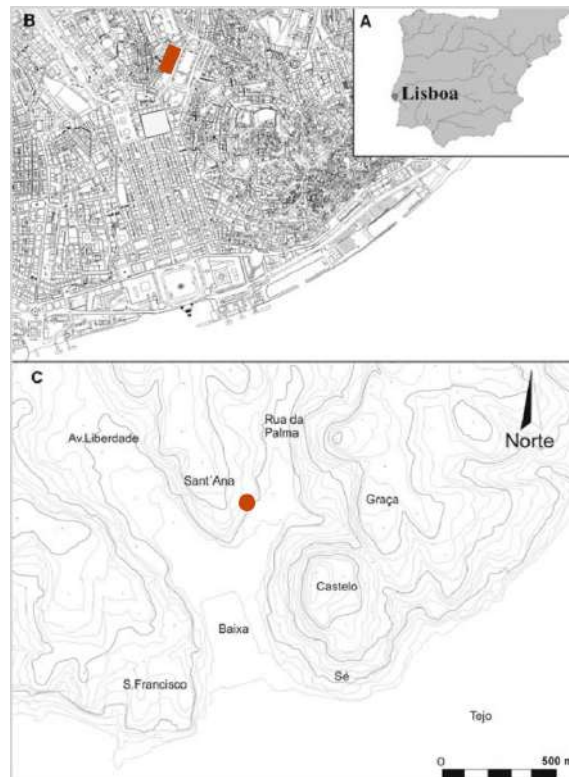


Fig. 1. Encosta de Sant'Ana. **A.** Location on the Iberian Peninsula; **B.** Location on Lisbon's current urban layout. **C.** Location of the Neolithic occupation on Lisbon's isometric plan (current contour lines).

¹ Muralha & Costa, 2006.

The archaeological intervention conducted at this site was required by a municipal housing development project, in the scope of the Lisbon City Council's 'Youth Housing' programme. The site yielded significant evidence of the earliest known agro-pastoral communities in the present-day city of Lisbon and was the first major intervention involving Early Neolithic contexts successively conducted by several municipal archaeology teams².



Fig. 2. Encosta de Sant'Ana. Overall view of the archaeological intervention at Encosta de Sant'Ana.

The first study of the faunal remains recovered at Encosta de Sant'Ana concerned the materials recovered in 2002; this was a chapter of a more comprehensive study of the site: out of a total of 256 recovered bone fragments, only 41 were determined (16% of the sample) and a list of the identified species was provided³. The excessively fragmented condition of the studied assemblage was subsequently emphasised⁴ and a paper published in 2017 reassessed the assemblage recovered in 2002, including a small assemblage from

² Muralha et al., 2006; Leitão & Henriques, 2014.

³ Muralha & Costa, 2006.

⁴ Leitão & Henriques, 2014.

Subsector VIII, excavated during the 2004–2006 field seasons, where a hut floor was recorded⁵.

Further on, our own study addressed all the Early Neolithic faunal remains recovered during the excavations conducted between 2004 and 2006, including the small assemblage previously published and the hitherto unpublished remains, which constitute the vast majority of all the remains recovered at the time, from one of the sectors of the excavated area, Sector E. These remains are reliably associated with the Early Neolithic occupation, well-dated to the transition from the sixth to the fifth millennia BC⁶.

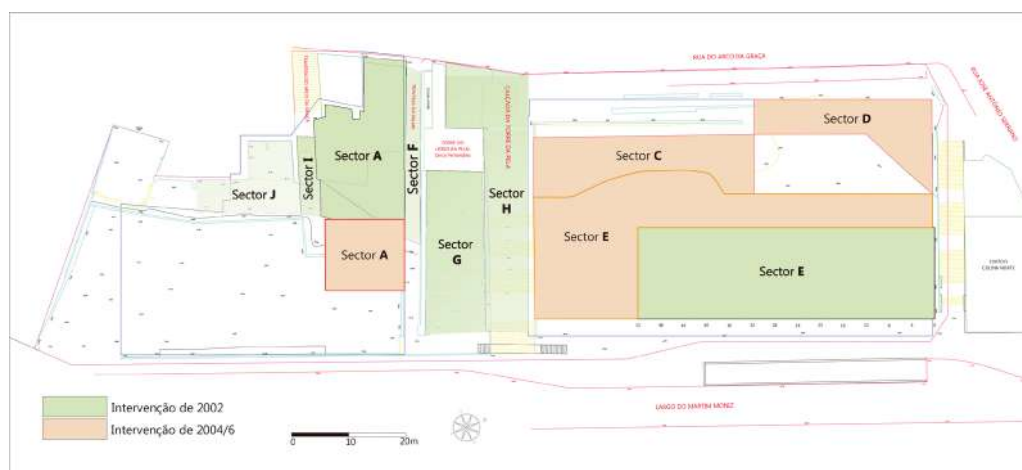


Fig. 3. Encosta de Sant'Ana. Plan of the sectors excavated during the two cycles of archaeological works (2002 and 2004–2006).

This paper is an abbreviated English version, essentially corresponding to the lecture given at the Academy's Science Class Session on February 17th, 2022, reflecting the author's contribution to the zooarchaeological study of the faunal remains recovered during these excavations. The remains were made available for study by Vasco Leitão, the Lisbon City Council archaeologist in charge of the excavations conducted in 2002–2006; the preliminary inventory of the remains was completed by Filipe Martins, a PhD student tutored by the author, whom we would now like to thank. This inventory supported the conclusions of a paper published in 2023.

⁵ Almeida et al., 2017.

⁶ Leitão, Cardoso & Martins, 2021.

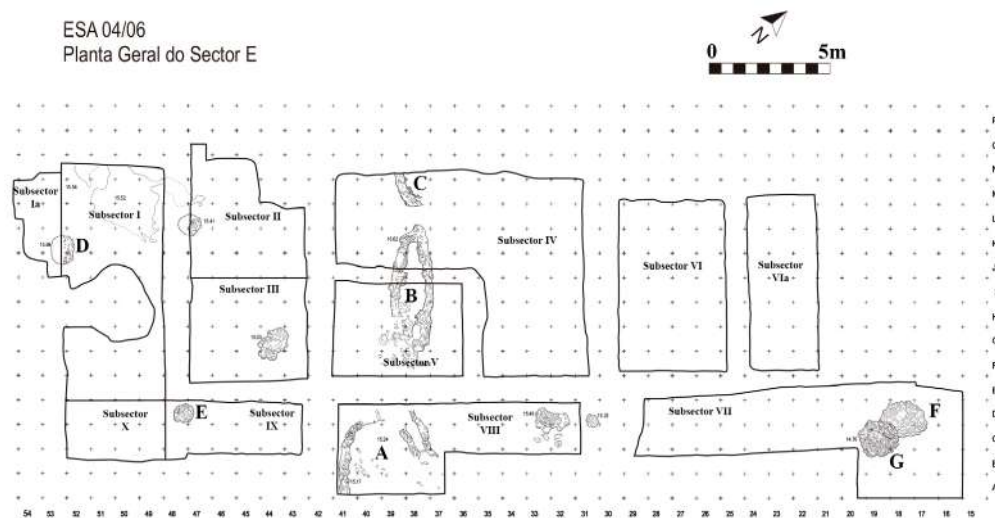


Fig. 4. Encosta de Sant'Ana. General plan of Sector E during the 2004/2006 archaeological field season, showing the adopted grid and the location of the main archaeological structures detected.

RESULTS ACHIEVED

Distribution by species

A total of 343 mammal remains from the Early Neolithic occupation (Layer 5) were determined. Overall, the assemblage is very fragmented, a consequence of the intense exploitation of carcasses for food purposes, including the extraction of bone marrow. Thirty-four determined remains were burned (9,9%).

TABLE 1. Encosta de Sant'Ana. Number of Determined Remains (NDR) and Minimum Number of Individuals (MNI).

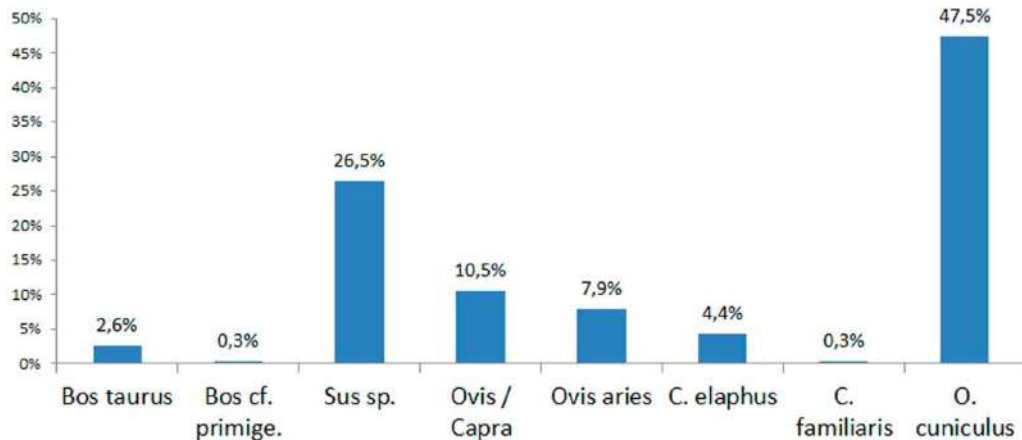
	NDR		MNI	
	No.	%	No.	%
<i>Bos taurus</i>	9	2,6%	1	3,1%
<i>Bos cf. primigenius</i>	1	0,3%	1	3,1%
<i>Sus sp.</i>	91	26,5%	5	15,6%
<i>Ovis/Capra</i>	36	10,5%	2	6,3%
<i>Ovis aries</i>	27	7,9%	2	6,3%
<i>Cervus elaphus</i>	15	4,4%	1	3,1%
<i>Canis familiaris</i>	1	0,3%	1	3,1%
<i>Oryctolagus cuniculus</i>	163	47,5%	19	59,4%
TOTAL	343	100%	32	100%

Table 2 shows the distribution by species of the determined remains. The assemblage includes remains of domestic and hunted animals.

The most frequent taxon is clearly *O. cuniculus*, with 163 remains, representing 47.5% of all the identified mammals and attesting to the careful excavation method and sieving. The second and third most abundant species are *Sus sp.* (91 remains, 26.5%) and *Ovis/Capra* (63 remains, 18%); 27 remains were morphometrically classified as *Ovis aries* (7.9%). The remaining taxa were jointly represented by less than 5%—in descending order, *Cervus elaphus* (4.4%), *Bos taurus* (2.6%) and, even more scarcely represented, *Bos cf. primigenius* and *Canis familiaris* (both 0.3%).

The results achieved are shown in Chart 1.

CHART 1. Encosta de Sant’Ana. Percentage values of the determined mammal remains (NDR).



We would like to comment on each of the identified taxa, as follows:

European rabbit – *Oryctolagus cuniculus* L., 1758

This is the most abundant taxon in the assemblage recovered from Encosta de Sant’Ana, indicating a specialised practice, i.e. the capture of these animals in the vicinity of the site.

One hundred and sixty-three remains of *Oryctolagus cuniculus* were recovered, corresponding to a MNI of 19 adult individuals. The most representative anatomical segment was the calcaneus. Twelve remains were charred, representing

7.4% of the total (Fig. 7, nos. 2, 3 and 4). The wild rabbits' contribution to the population's diet is not very relevant due to their small size and the amount of meat they provided. Nonetheless, the investment in small game hunting at this stage of the settlement's occupation is noteworthy, revealing a still weak attachment to the territory. Furs were certainly another resource that was also used.

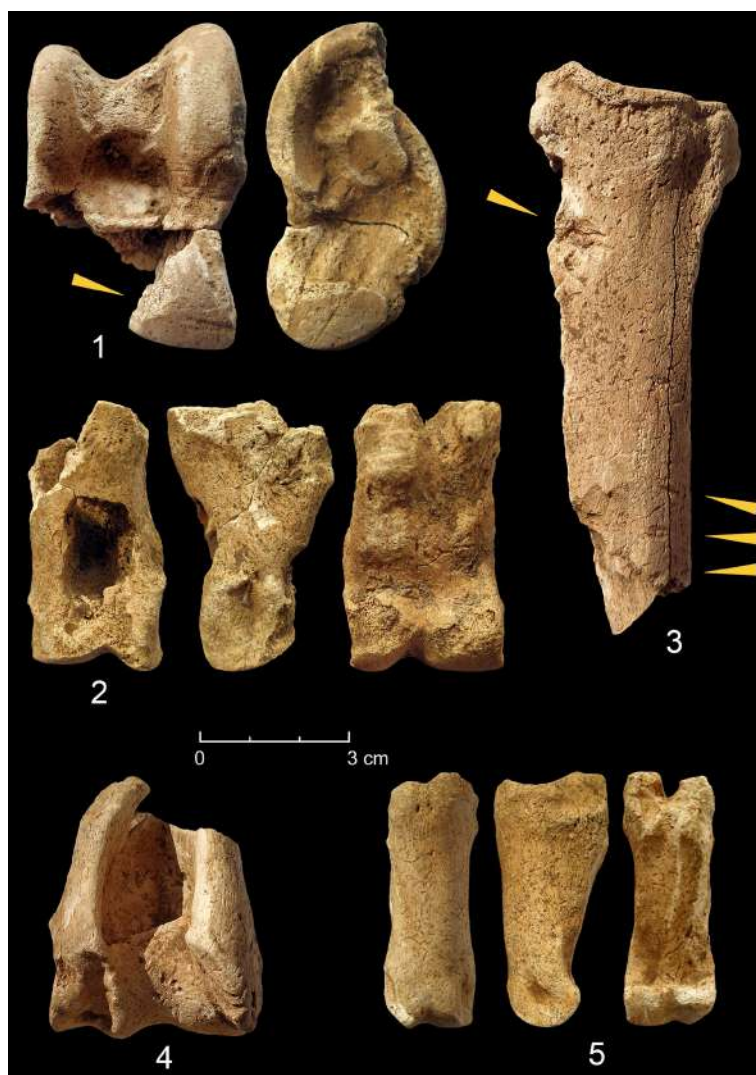


Fig. 5. Encosta de Sant'Ana. 1 – *Bos primigenius*, incomplete left astragalus, with cut marks; 2 – *Bos taurus*, left phalanx I, perforated, with marrow extraction marks; 3 – *Bos taurus*, left proximal metacarpal, vertically fractured, with deep cut marks (cleaver) near the joint and fine rodent gnaw-marks; 4 – *C. elaphus*, left distal humerus; 5 – *C. elaphus*, right phalanx I.

Fig – *Sus domesticus* Erxleben, 1777; and wild boar – *Sus scrofa* L. 1758

Both wild boar and domestic pig are present (Fig. 7, nos. 5 to 8). But differentiating between these two species is usually very difficult, even more so in western Iberia due to size overlap⁷.

In an attempt to distinguish between these two species, the dimensions of the single astragalus recovered at Encosta de Sant'Ana (Fig. 7, no. 8), with a lateral length of 46 mm (GLI), were compared to others recovered from the Mesolithic shell middens of Muge⁸, and at Chalcolithic settlements of mainland Portugal, such as Zambujal⁹. Following the criterion applied by the authors who studied the fauna from this Chalcolithic fortification, there would be at least one wild animal in the Encosta de Sant'Ana assemblage, since wild boars would feature an astragalus GLI in excess of 45 mm¹⁰; however, the application of this criterion requires some caution due to variations related to age and sexual dimorphism.

Several skeletal parts of this animal were found at Encosta de Sant'Ana, including cranial parts, with a large number of loose teeth, and forelimb segments. Some remains show traces of carbonisation (n = 8), suggesting that the meat was cooked directly over fire, a practice related to grilling or barbecuing. Fine cut marks were identified on three remains: on the distal end of a left humerus (Fig. 7, no. 5); on a left astragalus (Fig. 7, no. 8); and on a right phalanx I (Fig. 7, no. 7).

Carnivore (probably dog) tooth marks were observed on the distal end of a left humerus (Fig. 7, no. 5).

The estimated MNI is five (five distal portions of left humeri).

To conclude, at Encosta de Sant'Ana pigs were very important for meat production, with a predominance of young adults or sub-adults, as indicated by the high percentage of segments with still unfused epiphyses. The site's inhabitants obtained the largest amount of proteins in their diet from these animals, although the contribution of the wild species, which certainly existed, in comparison to the domestic species remains unclear.

⁷ Albarella et al., 2005.

⁸ Detry, 2007.

⁹ Driesch & Boessneck, 1976.

¹⁰ Ibid.

Sheep – *Ovis aries* L., 1758; and goat – *Capra hircus* L., 1758

Caprines are the third most represented taxon, which indicates their importance not only as a source of meat, but also of secondary products such as milk, as well as wool in the case of sheep.

No parts of the skeleton are particularly well represented, given the 63 determined remains, mostly of adult individuals, as only 8.1% of the remains belong to younger animals.



Fig. 6. Encosta de Sant'Ana. 1 and 2 – *Ovis aries*, two fragments of left shoulder blade; 3 – *Ovis aries*, right tibia distal end, with irregular transverse fracture of the diaphysis; 4 – *Ovis aries*, right astragalus; 5 – *Ovis aries*, proximal portion of left radius, with incomplete joint and impact point marks caused by percussion near the joint and gnawing evidence.

Charred or partially fire-darkened remains were also recorded (n = 3 remains).
Whenever it was possible to distinguish between sheep and goat, only sheep
was present in the record (n = 27 remains).

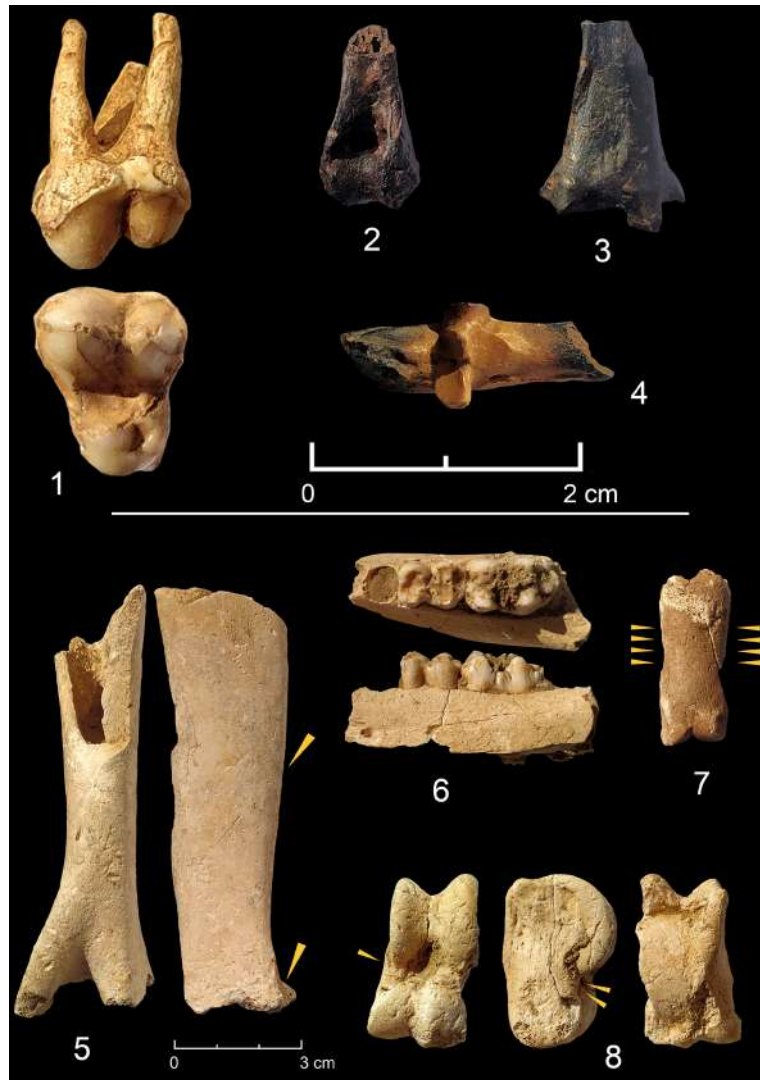


Fig. 7. Encosta de Sant'Ana. 1 – *Canis familiaris*, left upper M1; 2 – *O. cuniculus*, charred left distal humerus; 3 – *O. cuniculus*, charred left distal tibia; 4 – *O. cuniculus*, charred right calcaneus; 5 – *Sus* sp., left distal humerus, with incomplete joint due to gnawing and displaying fine cuts and irregular spiral fractures on the diaphysis; 6 – *Sus* sp. portion of left mandible with teeth, M/1 and M/2, showing little wear; 7 – *Sus* sp. right phalanx I with fine cut marks; 8 – *Sus* sp. left astragalus with fine cut marks.

The estimated MNI for undifferentiated *Ovis aries*/*Capra hircus* is two individuals; with regard to *Ovis aries*, individualised on the basis of morphometric criteria, the results also indicate the presence of two individuals (two shoulder blade portions from the same side). The proximal end of a left *Ovis aries* radius shows puncture marks near the joint, resulting from secondary consumption by dogs living among this population (Fig. 6, no. 5).

The presence of caprines, particularly sheep, when compared to the other identified taxa, clearly indicates the practice of pastoralism at Encosta de Sant'Ana.

In other Early Neolithic sites of Portuguese Extremadura, the weight of these two species in the population's diet is predominant: at Carrascal, the number of determined sheep and goat remains accounts for 39% of the total, of which 2.1% belong to sheep¹¹; at Lameiras, goats are the most numerous group, accounting for 49% of the assemblage. Amongst these remains, 11.9% belong to *Ovis aries* and 3.8% belong to *Capra hircus*, indicating the existence of mixed herds, with a clear predominance of sheep¹². In the case at hand, it is likely that the herds consisted exclusively of sheep, even because the site is close to the stream that once flowed into the former Martim Moniz inlet, with its abundant meadows, particularly well-suited to sheep grazing.

Red deer – *Cervus elaphus* L., 1758

The number of deer remains (n = 15) reveals the hunting of this species, which was probably abundant in the region. Fire marks were observed on six remains: a small antler fragment; a portion of the distal metapod articulation (medial condyle); two fragments of the first phalanx and two second phalanges, corresponding to segments less rich in meat and therefore more exposed to direct fire.

The MNI corresponds to one adult individual.

The carcasses were likely transported to the settlement, as suggested by the anatomical distribution of the few identified remains, mostly loose teeth and phalanges, corresponding to anatomical segments of little food value.

The presence of this species at Encosta de Sant'Ana (Fig. 5, nos. 4 and 5) contrasts with the absence recorded at the Carrascal settlement¹³, and at the Lameiras

¹¹ Cardoso & Valente, 2021.

¹² Davis, Gabriel & Simões, 2018.

¹³ Cardoso & Valente, 2021.

site¹⁴. It was also not identified in the small faunal assemblage recovered from the infilling of a pit burial from the same period, at the Armazéns Sommer site, in Lisbon's riverine area¹⁵.

Cattle – *Bos taurus* L., 1758

The diet of these populations included the consumption of cattle (*Bos taurus*) and probably aurochs (*Bos cf. primigenius*). The available osteometric data is indicative of the presence of both species.

With regard to *Bos taurus*, different segments of the skeleton of this domestic species are present, with a predominance of loose teeth.

Deep cut marks (cleaver) were observed near the joint of the proximal end of a left metacarpal, involving a vertical fracture, intended to tear the extremity of the forelimb apart (Fig. 5, no. 3).

A first left phalanx shows an irregular opening in the dorsal area for the intentional extraction of bone marrow (Fig. 5, no. 2). This element is paralleled by others detected in contexts from different ages, and cannot be mistaken for a wind instrument, or indeed any other instrument, because the edges were not evened out, either intentionally or as a result of use.

Fine gnawing marks were observed on the diaphysis of a left metacarpal bone (Fig. 5, no. 3); this probably occurred right after the disposal of food residues.

Bovine cattle must have played an important role at Encosta de Sant'Ana, given the average weight of each animal, despite the MNI of only one adult individual. We would emphasise the presence of this species at such an early date, particularly because it was also present, around the same time, at the Carrascal and Lameiras sites, as well as at the Armazéns Sommer site, in the older part of Lisbon.

Cf. aurochs – *Bos cf. primigenius* Boj. 1827

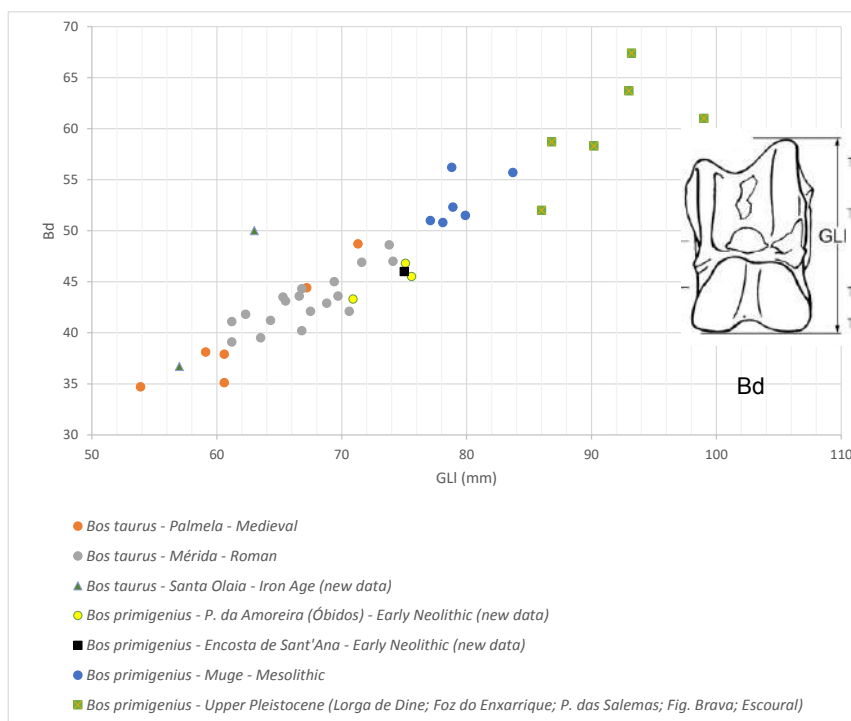
The probable presence of aurochs is embodied by a single left astragalus (Fig. 5, no. 1); even though it was incomplete, the two main dimensions could be obtained: GLI = 75 mm; Bd = 46 mm. These results are paralleled by three hitherto

¹⁴ Davis, Gabriel & Simões, 2018.

¹⁵ Cardoso et al., 2018.

unpublished specimens from the Early Neolithic settlement of Amoreira, Óbidos, as shown in Chart 2.

CHART 2. Encosta de Sant'Ana. *Bos* astragalus size variation over time, from Upper Pleistocene to the Middle Ages, based on specimens from western Iberian sites.

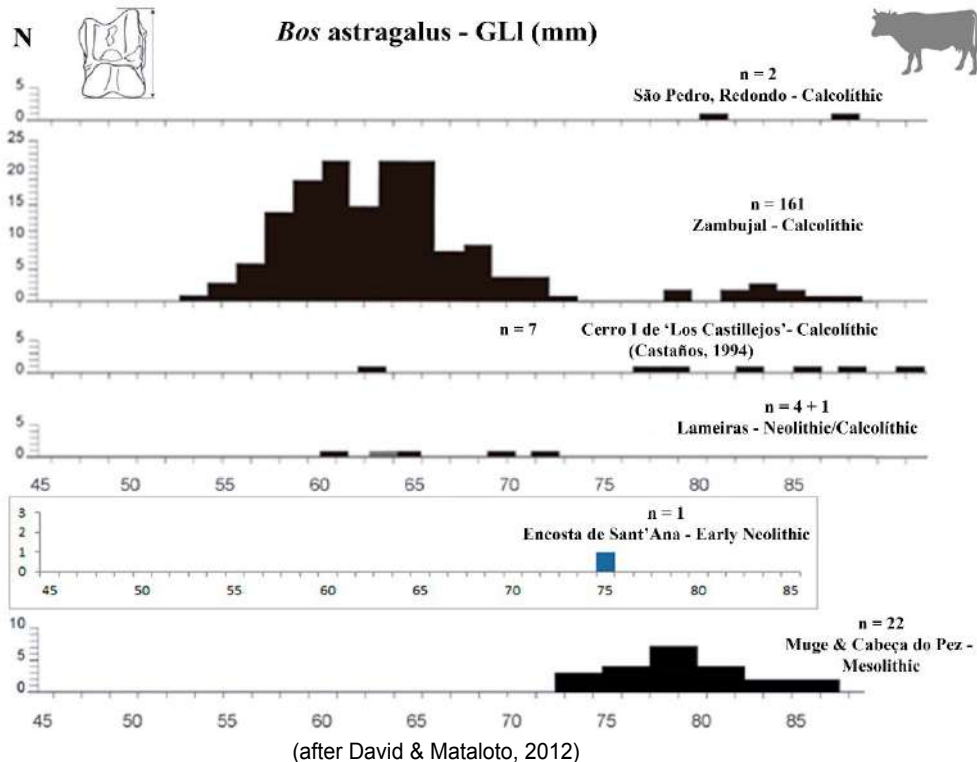


The existence of a biometric differentiation between aurochs and domestic ox astragali becomes more evident when we consider the maximum length measurements of the astragali in specimens from more recent times, e.g. from the Chalcolithic settlements of Zambujal (Torres Vedras) or São Pedro (Redondo).

The histogram pertaining to the Chalcolithic settlement of Zambujal (Chart 3) shows the existence of two well-differentiated groups, one made up of smaller specimens, corresponding to domestic oxen, clearly separated from the other, larger group, comparable to wild Mesolithic specimens from the shell middens of Muge and Cabeço do Pez¹⁶.

¹⁶ Davis & Mataloto, 2012.

CHART 3. Encosta de Sant'Ana. A series of histograms with measurements of the lateral length (GLI) of *Bos astragali*, showing the size variation of aurochs and domestic ox between the Mesolithic and Chalcolithic periods.



The dimensions of the astragalus from Encosta de Sant'Ana are close to the threshold of the wild species (GLI = 75 mm), similar to the smallest Mesolithic specimens. Thus, it can be ascribed to aurochs, just like the three coeval specimens from the Amoreira settlement (Óbidos).

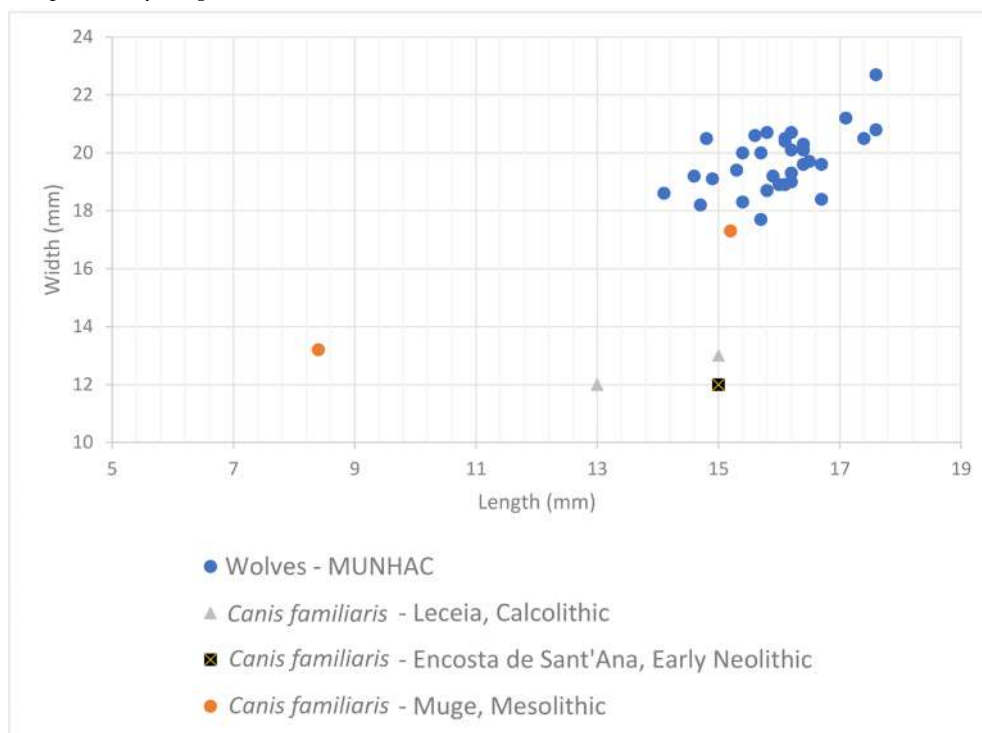
It is interesting to note that the dimensions of these specimens are similar to those of domestic oxen from the Roman period, in Mérida. The remarkable size of the latter can be explained by the genetic improvement achieved by the Romans in urban contexts (data and information provided by Cleia Detry).

This specimen features cut marks (Fig. 5, no. 1) that can be explained by the intention of separating the distal end of the hind limb, of lesser nutritional interest.

Dog – *Canis familiaris* L., 1758

This species is only represented by a single loose tooth, the left M1, without any wear (Fig. 7, no. 1), corresponding to an adult individual.

CHART 4 - Encosta de Sant'Ana. Comparing the size of the recovered *Canis familiaris* M1 with different specimens: present-day, Muge (Mesolithic) and Leceia (Chalcolithic).



According to the results shown in Chart 4, the dimensions of the Encosta de Sant'Ana specimen match the specimens recovered from the Chalcolithic settlement of Leceia¹⁷, which are much smaller than the set of present-day wolf teeth preserved in the collections of the National Museum of Natural History and Science (MUNHAC).

The presence of dogs in Neolithic contexts is associated with their role as guardians and herders of livestock or with hunting, without ruling out the possibility that they were also used in ritual practices, including their sacrifice, detected both during the Mesolithic and later periods. Indeed, dogs were an

¹⁷ Pires, Cardoso & Petrucci-Fonseca, 2001/2002.

integral part of the community, sustaining a mutualistic relationship to the benefit of both people and animals.

The specimen from Encosta de Sant'Ana shows no wear and is the only recorded record of this species, although other indirect traces of its presence have been detected, such as dental marks observed mainly on the articular ends of bone elements.

Cut and other marks

The faunal assemblage from Encosta de Sant'Ana shows a high degree of fragmentation, indicating that the animal carcasses were butchered and exploited to their full protein potential. Some anatomical segments were chopped up for stewing or boiling or sometimes cooked directly over the fire, on grills or barbecues, as evidenced by the fragments bearing marks of fire exposure (see especially Fig. 7, n.º 2-4), causing more or less localised darkening of the bone surfaces.

Some anthropogenic marks were observed, such as blows caused by sharp objects related to the various stages of carcass processing, starting with skinning, which certainly resulted in the use of the hides. This operation was followed by the portioning of the carcass into parts intended for consumption. The cut marks related to this process involved the use of other, more robust tools, resulting in short or broad strokes, usually deep, using polished stone axes or simple knapped quartzite cobbles, with robust cutting edges.

The use of bone marrow is evidenced by the extraction marks recorded on some remains. Because it was highly prized, marrow deserved some extra effort or labour compared to some long bones (e.g. the first phalanx referred to above) (Fig. 5, no. 2).

Animal gnawing marks were also detected (Fig. 6, no. 5; Fig. 7, no. 5), resulting from the secondary use of the remains after human consumption. Some elements were even chewed, certainly by dogs, as indicated by the marks produced by teeth pressure (Fig. 5, no. 3).

SPATIAL DISTRIBUTION OF FAUNAL REMAINS OVER THE EXCAVATED AREA

The spatial distribution of the bone remains is shown in the general plan of the excavated area (Fig. 8), in total amounts of recovered remains.

A number of clusters of faunal remains were recorded, mainly in Subsectors I, II and VII, in some cases associated with combustion structures (hearths), such as Structure D and with two cobbled areas with sub-circular outlines, partially overlapping, Structures F and G, previously described¹⁸.

The clusters of faunal remains recovered near these combustion structures may be related to food preparation and cooking areas, which in turn are consistent with the thermal marks recorded. Or they may correspond to simple dumps adjacent to consumption areas, e.g. as recorded inside Hut/Structure A, in Subsector VIII, and in Hut/Structure A, in Subsector V.

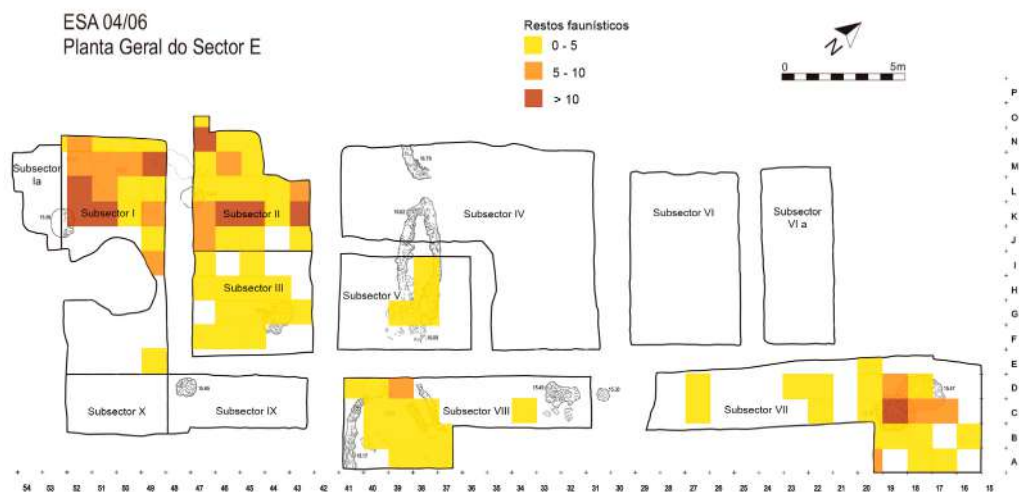


Fig. 8. Encosta de Sant'Ana. Distribution of the number of bone remains from Sector E recovered in the Early Neolithic occupation levels.

DISCUSSION

It is worth comparing the results now obtained with those pertaining to other Early Neolithic residential sites located on the Lisbon Peninsula, on the basis of the available literature (Fig. 9).

In terms of the number of determined remains, the assemblage recovered at Encosta de Sant'Ana is similar to the assemblages from the Early Neolithic residential sites of Carrascal (NDR = 340) and Lameiras (NDR = 374), which are also well characterised. The assemblage recovered at Armazéns Sommer

¹⁸ Leitão, Cardoso & Martins, 2021.

is quite small¹⁹ and the remains from the São Pedro de Canaferrim site are limited to scarce caprine long-bone splinters²⁰.

Knowledge of the absolute Early Neolithic chronology in the Lisbon region has made remarkable progress in recent years, as shown by the results summarised in TABLE 2. The absolute datings indicate, for a confidence interval of ca. 95%, a time span between 5400 and 4900 BC.

Regarding Encosta de Sant'Ana, the recent AMS radiocarbon dating on a deer phalanx II and a part of a caprine radius²¹ proved to be of major relevance

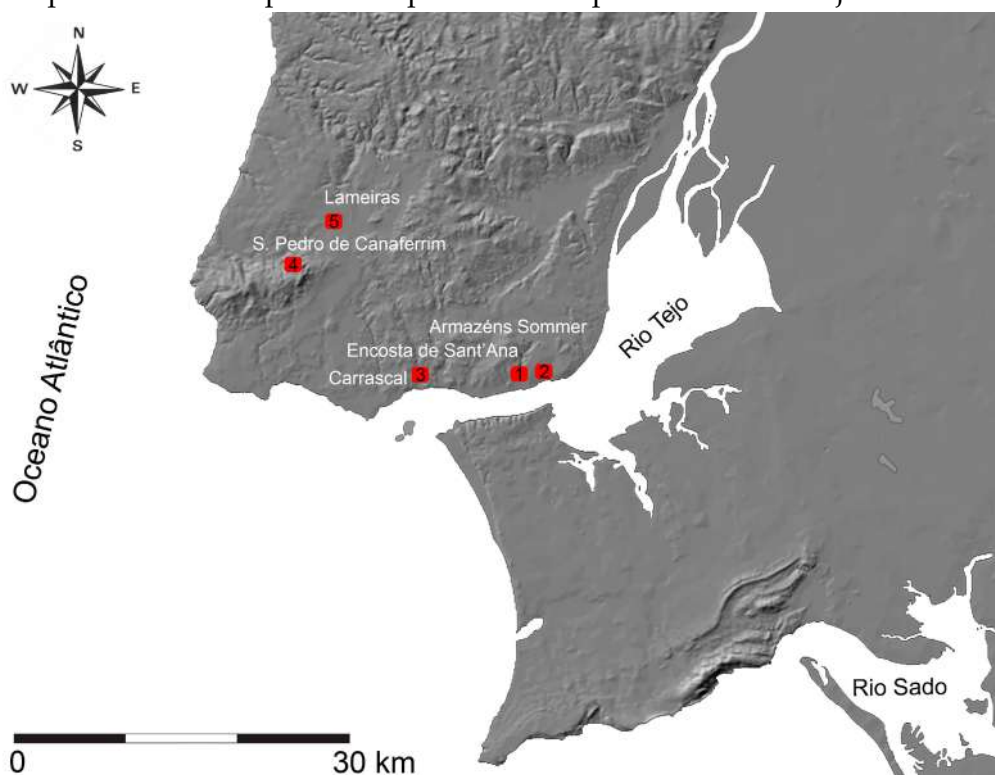


Fig. 9. Location of Early Neolithic residential sites of the Lisbon region with published faunal studies, referred to in the text: 1 – Encosta de Sant'Ana; 2 – Armazéns Sommer; 3 – Carrascal; 4 – São Pedro de Canaferrim; 5 – Lameiras.

¹⁹ Cardoso et al., 2018.

²⁰ J. L. Cardoso, In Simões, 1999.

²¹ Leitão, Cardoso & Martins, 2021.

TABLE 2. Early Neolithic dates from archaeological sites located on the Lisbon Peninsula.

	Lab. ref.	Excavation no.	Type of sample	Age (BP)	References
Encosta de Sant'Ana	Sac-2013	ESA 04/06 Sector E, Sub.S. I K-51 to Pl. 16	Charcoal (<i>Erica umbellata</i>)	6310 +/- 100	LEITÃO, CARDOSO & MARTINS, 2021
	Beta-546876	ESA/Sector E V - I-38 to Pl. 9	Bone (<i>C. claphus</i>)	6090 +/- 30	
	Beta-546877	ESA/Sector E VII - C-19	Bone (<i>Ovis/capra</i>)	6120 +/- 30	
Carascal	Beta-276401	C4	Tooth (<i>Bos cf. taurus</i>)	6280 +/- 40	CARDOSO & VALENTE, 2021
	Beta-276403	C4	Tooth (<i>Bos cf. primigenius</i>)	6230 +/- 40	
	Beta-296581	C4	Bone (<i>Sis sp.</i>)	6190 +/- 40	
	Beta-296582	C4	Bone (<i>Ovis/Capra</i>)	6200 +/- 40	
	Beta-296583	C4	Bone (<i>Sis sp.</i>)	6270 +/- 40	
Lameiras	OxA-29234	EU 53	Distal humerus (<i>Ovis aries</i>)	6186 +/- 36	DAVIS, GABRIEL & SIMÕES, 2018
	OxA-29111	EU 27-2	Distal humerus (<i>Ovis aries</i>)	6314 +/- 33	
	OxA-29110	EU 53	Distal metacarpal (<i>Ovis aries</i>)	6494 +/- 34	
	OxA-29109	EU 53	Distal humerus (<i>Ovis aries</i>)	6497 +/- 34	
	OxA-24533		Bone (<i>Homo</i>)	6256 +/- 35	LÓPEZ-DORIGA & SIMÕES, 2015
	OxA-24831	EU26	Seed (<i>Triticum nudum</i>)	6256 +/- 32	LÓPEZ-DORIGA, 2015
	OxA-24833	EU26	Seed (<i>Triticum monococcum</i>)	6310 +/- 33	
	OxA-24830	EU10	Seed (<i>Hordeum vulgare</i>)	6327 +/- 32	
	OxA-24832	EU27	Seed (<i>Triticum dicoccum</i>)	6381 +/- 34	
OxA-24829	EU39	Seed (<i>Hordeum vulgare</i>)	6424 +/- 32		
São Pedro de Canaferrim	ICEN-1151	EU 150/-152	Carbonized wood	6020 +/- 60	SIMÕES, 1999
	ICEN-1152	EU (-185)	Carbonized wood	6070 +/- 60	
	OxA-24835	EU 49	Seed (<i>Triticum nudum</i>)	6176 +/- 32	LÓPEZ-DORIGA, 2015
	OxA-24834	EU 62	Seed (<i>Hordeum vulgare</i>)	6179 +/- 33	
	Beta-146714	EU 49-7	Charcoal (<i>Erica umbellata</i>)	6200 +/- 40	SIMÕES, 2003
	Beta-164713	EU 70-12	Charcoal (<i>Erica umbellata</i>)	6240 +/- 40	
	OxA-24894	EU 70-1	Seed (<i>Triticum monococcum</i>)	6240 +/- 45	LÓPEZ-DORIGA, 2015
OxA-24906	EU 57	Seed (<i>Triticum dicoccum</i>)	6257 +/- 35		
Armazéns Sommer	Wk-45573	Inside the pit	Long bone	6315 +/- 24	CARDOSO, REBELO, NETO & RIBEIRO, 2018

The main mammal groups recorded at the sites considered for comparison are shown in Table 3.

TABLE 3 – Percentage representation of the main mammal groups recorded in Early Neolithic residential sites of the Lisbon Peninsula.

Site	Chronology	Taxa (%)													N	References
		BOS	BOP	SUS	OC	O	Ch	Cc	CEE	ORC	Can	Fs	Vv			
Encosta de Sant'Ana	Early Neolithic	3	< 1	27	11	8	-	-	4	48	< 1	-	-	343	This paper	
Carrascal (C4)	Early Neolithic	21	2	37	37	2	-	-	-	-	< 1	-	-	340	Cardoso & Valente, 2021	
Lameiras (EN)	Early Neolithic	4	-	32	32	12	4	1	-	12	1	2	2	374	Davis, Gabriel & Simões, 2018	

The percentages were calculated from the number of determined remains (N). In the case of suids, no distinction is made between pig and wild boar. BOS: domestic ox; BOP: aurochs; SUS: pig/boar; OC: sheep/goat; O: sheep; Ch: goat; Cc: roe deer (*C. capreolus*); CEE: deer; ORC: rabbit; Can: dog; Fs: wild cat; Vv: fox.

The results shown in Table 4 demonstrate that the importance of suids (pig or wild boar) in the diet of the Encosta de Sant'Ana inhabitants is mirrored, albeit less strikingly, by the faunal record of Carrascal (37%) and Lameiras (32%), given that both the latter feature a slight predominance of caprines, at 39% and 49% respectively. Whenever it was possible to distinguish between sheep and goats, there was an exclusive presence of sheep (8%), just like at Carrascal (2%). At Lameiras, the coexistence of both species (sheep and goats) is indicative of mixed herds, with a clear predominance of the former.

The percentage of deer, aurochs and rabbits, and possibly wild boar, reveals the greater weight of hunting at Encosta de Sant'Ana, including a specialised capture of wild rabbits (48% of the NDR), which is unparalleled amongst the records from other Early Neolithic sites. Deer, at 4% of the NDR, is also not represented at the other sites under consideration. Aurochsen are only present at Encosta de Sant'Ana and Carrascal, but their numbers are residual.

At Carrascal, domestic cattle (21% of the NDR)¹ are indicative of sedentary populations with an already evolved resource production strategy. On the other hand, the scarcity of bovine cattle and the importance of hunting, particularly rabbits, at Encosta de Sant'Ana suggests that this community was still not firmly settled in the territory it occupied, possibly on a seasonal basis. This is emphasised by the absence of milling implements (although some flint sickle inserts have been recorded) and the scarcity of large storage vessels, as opposed to the findings recorded at Carrascal.

Chart 5 summarises data on the frequencies of the main mammal groups found at Encosta de Sant'Ana and at the two other archaeological sites selected for comparison.

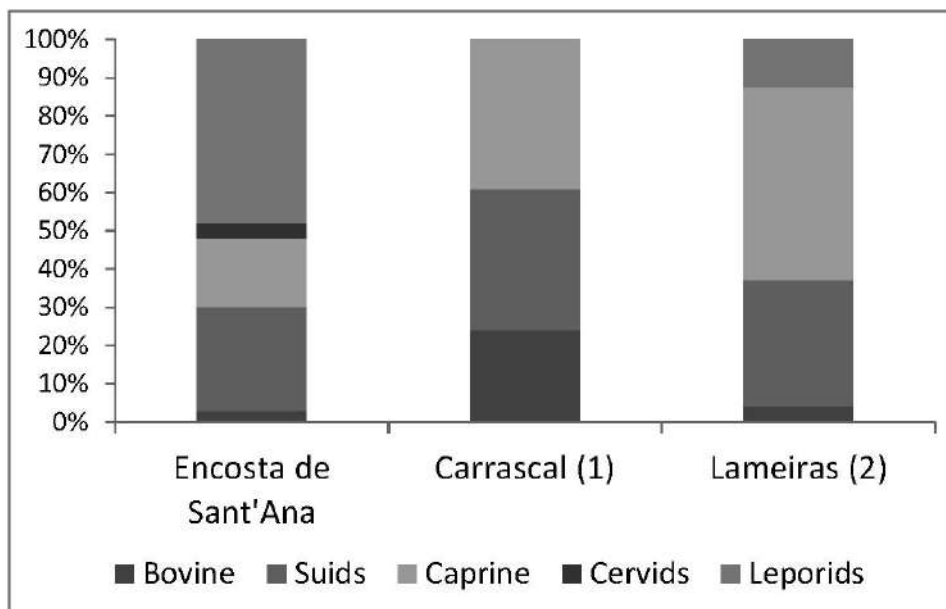
It is also relevant to consider the faunal assemblage recovered from the infilling of the Early Neolithic burial pit found in Lisbon's riverine area, at the former Armazéns Sommer². A layer overlying the burial, probably consisting of sediments originating from the nearby inhabited area, yielded a small but very heterogeneous assemblage containing *Bos taurus*, *Ovis aries*/*Capra hircus* and *Sus domesticus*, the same domestic species recorded at the other Early Neolithic sites

¹ Cardoso, 2015; Cardoso & Valente, 2021.

² Cardoso et al., 2018, fig. 10.

under consideration, confirming the importance of this trilogy in the dietary strategy of the first Neolithic populations that inhabited the Lisbon Peninsula between 6400 and 5900 years BC.

CHART 5 - Frequency of the main mammal groups in archaeological contexts from the Early Neolithic of the Lisbon Peninsula.



(1) – Cardoso e Valente, 2021; (2) – Davis, Gabriel e Simões, 2018.

CONCLUSIONS

This study addressed all the Early Neolithic mammal remains recovered from Encosta de Sant'Ana during the excavations conducted between 2004 and 2006, mainly from Sector E.

The following general conclusions can be drawn:

1. In broad terms, these remains featured a high degree of fragmentation, indicating an exhaustive dietary use.
2. Wild animals are represented, in descending order, by rabbit, probably followed by wild boar, deer and aurochs; and by the following domestic species: probably pig, caprines (sheep and goats), domestic ox and dog.
3. Pigs would have been the most important animals in the diet of the inhabitants of Encosta de Sant'Ana, in terms of the amount of meat consumed. Regrettably,

it has not been possible to establish the desirable distinction between the domesticated and wild varieties, due to the lack of reliable anatomical elements.

4. Within the caprine group, whenever it was possible to differentiate, we are dealing with sheep, at the expense of goats. This is consistent with the existence of meadows in the vicinity of the former watercourse that flowed nearby. This context explains the presence of domestic dogs, represented by a single remain, as a guardian of livestock and also as a pet.

5. The considerable abundance of rabbit, by far the most common species, reveals a specialised hunting practice. This investment is consistent with the capture of other, larger animals: in addition to wild boar, aurochs and deer were also recorded, the latter being absent from the previously studied settlements of the Lisbon peninsula. Aurochs, which has only been detected at Carrascal and Encosta de Sant'Ana, is only represented by a residual number of remains.

The analysed faunal record, including these wild species, along with other mammals, contributes to our knowledge of the ecosystem that surrounded the settlement, with deciduous and coniferous forests alternating with pastures and prairies, or with more or less dense woodlands and moorland areas extending northwards.

6. The cut marks related to carcass butchering and the subsequent consumption of the meat (including fire marks) indicate that these activities were carried out on site. The presence of fire-darkened rabbit remains is particularly interesting, as it indicates that they would have been cooked on barbecues or grills, using the recorded cobbled areas, which, once heated, were effective combustion structures, as evidenced by the rubefaction of the surrounding sediments and the lithic elements.

7. It was actually possible to establish a correlation between the distribution of all the faunal remains over the site's ground plan and the different domestic structures unearthed during the excavations. Two clusters were detected, one associated with a combustion structure and the other with two cobbled areas, which also served the same purpose. This evidence attests to the fact that meat was consumed close to the places where it was cooked.

8. Comparing these results with findings from other coeval sites of the Lisbon Peninsula highlights some differences with regard to subsistence strategies, partly explained by the environmental conditions prevailing at each site.

Encosta de Sant'Ana is located in an ecotone area of obvious strategic importance in terms of the food economy of the time. On the one hand, it is situated on the bank of an inlet of the former Tagus estuary, rich in resources, permanently available and easy to harvest all year round, according to the results already published. On the other hand, this scenario was combined with the location on the bank of the final stretch of a watercourse, which favoured incipient agriculture on limited strips of loose, sandy soils, as well as pastoralism. Furthermore, this situation also provided access to the interior of the territory, where raw materials, such as flint and basic rocks used to produce polished stone artefacts, could be exploited. The faunal record studied in this paper suggests that this was a community that occupied the site on a seasonal basis, as indicated by the considerable amount of hunted fauna. Rabbits are particularly noteworthy, followed by deer and possibly wild boar and, although to a much lesser extent, aurochs, suggesting territories that were essentially forest or Mediterranean scrubland, with occasional open spaces. As far as domestic cattle are concerned, the scarcity of bovines is also indicative of limited sedentation.

As far as the area of Lisbon's current historic centre is concerned, groups settling in the lowlands, such as the Encosta de Sant'Ana—with an immediate parallel in the occupation of the riverine area of Alfama (Armazéns Sommer)—coexisted with more extensive settlements occupying interfluvial areas such as present-day Bairro Alto. This mirrors the organised and integrated way in which the resources available in this remarkably diverse geographically area was exploited by a community divided into small but interdependent family clusters.

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