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Zooarchaeological Study of Quinta do Almaraz (Almada, Portugal)

Estudo Zooarqueológico da Quinta do Almaraz (Almada, Portugal)

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Abstract

Archaeological excavations conducted in Quinta do Almaraz (Almada, Portugal) between 1986 and 2001 have allowed to identify a settlement with an important Iron Age occupation. These interventions provided a large assemblage of faunal remains and its study has enabled a detailed analysis of the diet, lifestyle, and habits of the people who lived in Almaraz during the 1st millennium BC.
The most abundant mammal species are sheep and goat, followed by pig. Cattle and wild species, such as red deer, are also present. We likewise highlight a great variety of bird species, including the first remains of domestic galliformes, up to then an exotic animal in Europe.
Regarding malacofauna, we highlight the prevalence of clam, cockle, mussel, winkle, and limpet.

Key words: Archaeology, Fauna, Iron Age, Tagus Estuary

Resumo

As escavações arqueológicas levadas a cabo na Quinta do Almaraz (Almada, Portugal) entre 1986 e 2001 permitiram identificar um povoado com uma importante ocupação da Idade do Ferro. Destas intervenções resultou um amplo conjunto de restos de fauna cujo estudo permitiu uma análise detalhada sobre a dieta alimentar, modo de vida e hábitos da população que residiu em Almaraz durante o 1º milénio a.C.
As espécies de mamíferos mais abundantes são a ovelha e cabra, seguida do porco. A vaca e espécies selvagens, como o veado, foram igualmente registadas. Destaca-se, ainda, uma grande diversidade de espécies de aves, incluindo dos primeiros restos de galiformes domésticos, à época um animal exótico na Europa.
No que se refere à malacofauna, destaca-se o predomínio da ameijoa, berbigão, mexilhão, burrié e lapa.

Palavras-Chave: Arqueologia, Fauna, Idade do Ferro, Estuário do Tejo

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1. Introduction

The settlement of Quinta do Almaraz is one of the most important Iron Age sites in the Central/Southern Portuguese territory. Although well known in Portuguese archaeological literature, it has a relatively short research record. It was identified in 1986 and authorized excavation campaigns were held in 1988, 1994 and 1996, complemented by the fieldwork developed within the National Plan of Archaeological Work entitled "Indígenas e Fenícios no Almaraz" between 1998 and 2001. The first goal of the interventions conducted in the 1990s was to determine the preserved area of the archaeological site and thus mainly focused on the settlement's defensive structure (Barros, 2001), composed of a moat that apparently surrounded the settlement on its southern side, and possibly related to a wall (Barros, 2001; Olaio, Henriques and António, 2020). Although small excavation areas were opened in other places of the archaeological site, just a small fraction of the settlement's residential area were identified (Barros, Cardoso and Sabrosa, 1993; Olaio, Henriques and António, 2020). Interventions conducted until 2001 did provide, however, a large set of artefacts and fauna, which was only superficially studied until 2020.

In 2020 a new research project was launched, led by one of the authors (A.O.), and financed by the municipality of Almada. The present study was developed within the framework of this recent project.

Almaraz is located on a vast platform on the left bank of the Tagus River mouth, more than 60 meters above sea-level, which grants full visual control over the surrounding territory, good defence conditions, and a privileged access to the river. Nowadays this platform has almost four hectares, but it is quite evident that it suffered profound changes on nearly every side, which significantly decreased its original size. We thus estimate that the Iron Age settlement, on its most dynamic period, reached an area of 7 hectares (Olaio et al., 2019).

The platform leans towards the South, ending in a valley that converges in Cacilhas, where access to the river was facilitated by the existence of a sheltered beach area. Here, in Cacilhas, the identification of residential structures, associated with a diversified collection, confirmed the occupation of the area near the river during the first half of the 1st millennium BC (Olaio et al., 2019). These factors, in addition to being decisive to the importance acquired by the settlement during the Iron Age, were certainly critical to the exploration of the territory, and consequently to its community's relation with animals (figure 1).

The available records from the excavations carried out until 2001 do not allow a deep understanding of the settlement's stratigraphy and development, as they lack information regarding the different layers' location or even it's relationship within a certain context, which therefore make it very difficult to establish the precise chronology of some contexts. However, part of the artifacts collection was already studied, and even though important information regarding stratigraphy is lacking, it made it possible to present an interpretation regarding the Iron Age settlement's development chronology, which will naturally have to be confirmed by further fieldwork. That being said, Almaraz occupation seems to date back at least to the 7th century BC, reaching its peak in the 6th century BC (Olaio, 2018; Olaio et al., 2019), a development that doesn't appear to continue throughout the 5th century. At some point in the 5th century, for reasons we cannot yet understand, the settlement starts losing its previous vitality, being almost unpopulated in the 4th century BC (Olaio, 2018). This idea is not only highlited by the small presence of artifacts from the 4th century BC, but also by the fact that the moat looses its primarly function as a defensive structure, and starts to be used as a dumpster during the 5th century BC (Olaio, 2018).

Several remains associated with specialized activities demonstrate, however, the great productive dynamics that marked the development of Almaraz until this point. Artifacts associated with activities such as metallurgy and pottery, in addition to imported elements, mainly amphorae, alabaster vases, or Greek pottery from the Middle Corinthian (Melo et al., 2014; Cardoso, 2004; Olaio, 2018), demonstrate the importance of Almaraz as a structural centre in the Tagus Estuary during the first half of the 1st millennium BC.

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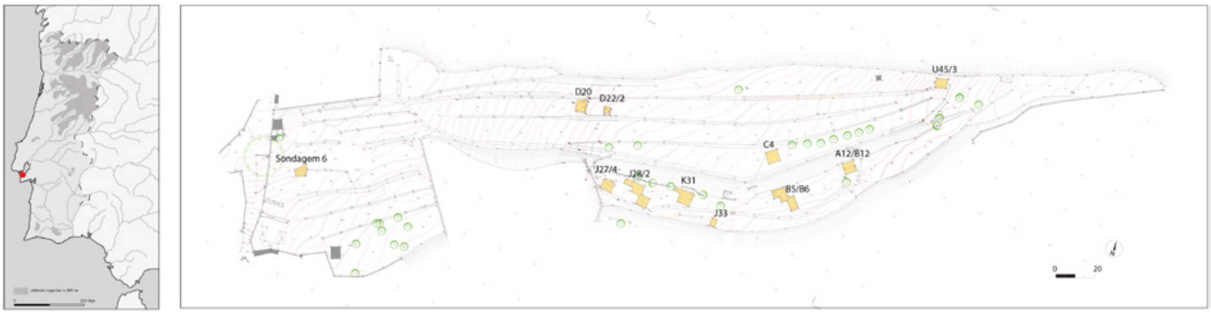

Figure 1. Location of Quinta do Almaraz archaeological site (left) and map of the site with areas excavated between 1986 and 2001 (right)

Figura 1. Localização do sítio arqueológico da Quinta do Almaraz (esquerda) e mapa do sítio com as áreas escavadas entre 1986 e 2001 (direita)

The main goal of this paper is therefore to revitalize the study of the fauna collected in the excavation campaigns carried out between 1988 and 2001, contributing to the analysis of the diet, lifestyle and habits of the people who lived in Almaraz during the Iron Age.

2. Materials and Methods

Part of the faunal remains recovered in the abovementioned fieldwork was already published by João Luís Cardoso, who dedicated his attention to a specific set of the first archaeological campaign, U45 (Cardoso, 2000: 324) — a set that was, however, reanalyzed within the present study. Later, Francisco Correia studied the skeletons of dogs collected in the moat (Correia, 2015), which were deposited, apparently, in the context of some type of burial ritual. Considering the specific nature of this context, the collection was not included in this study, although it's being reviewed within the scope of another work. Finally, ichthyological remains were separated but not studied for this article since they are going to be analyzed within a PhD project carried out by Miguel Rodrigues, that will analyze and compare different Iron Age Portuguese sites from the Tagus mouth and hopefully bring more relevant information in the future.

That being said, in this study we focus on mammals, birds, reptiles, amphibians and molluscs. A total of 207,599 remains, corresponding to 67% of the set, were collected in the moat filling deposits, mainly from the squares designated as A12/B12, K29, K31, J27, J28 (figure 2). Only 9% of the analysed collection was recovered in the habitational area, specifically the squares D20 and D22. The remaining 23% came from other intervened areas, for which we lack chrono-cultural information, and we do not know the recollection context of 1% of the set (corresponding to 2,364 remains).

The studied ensemble can be divided into five taxonomic groups: mammals, birds, arthropods, bivalves, and gastropods. The methodology used to record mammal bones is the one proposed by Simon Davis (1992), which registers only some diagnostic zones called "Parts of Skeleton Always Counted" (POSACS). Thus, we counted the bones in which more than 50 per cent of the distal articulation was preserved. As regards teeth, we counted the ones included in the mandible or loose, with at least half of the original dental structure preserved (Davis, 1992).

These criteria were chosen because these parts of the skeleton are representative of the entire bone structure of the individuals. They correspond to remains that allow a specific and reliable taxonomic characterization; since we only count the distal articulations, we avoid double counting the same bone (Detry et al., 2016: 70).

We only considered bones that were not listed in the POSACS index in exceptional cases; more specifically, those belonging to some individuals of less usual species. The record of bird bones was adapted, and the main long bones were registered.

Taxonomic analysis was supported by the reference collections of the Centro de Arqueologia da Universidade de Lisboa (UNIARQ) and the

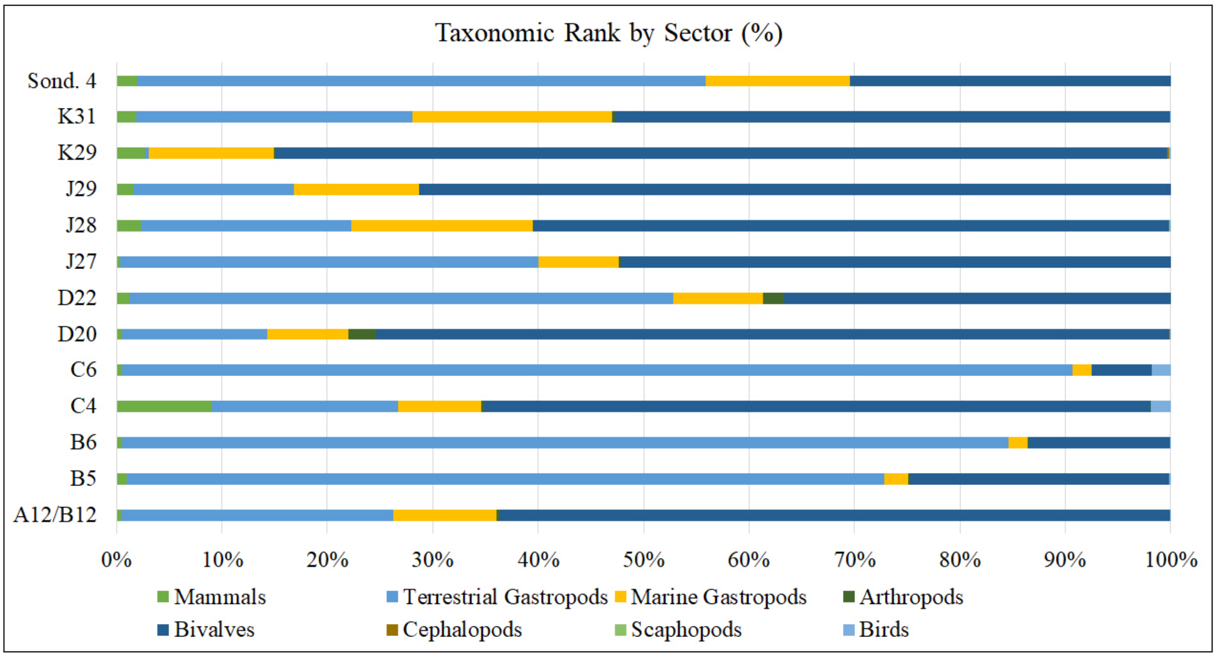

Figure 2. Percentage of the Number of Identified Specimens of the taxonomic groups by sector

Figura 2. Percentagem do Número de Restos Determinados dos grupos taxonómicos por sector

Laboratório de Arqueociências (LARC) of Direcção Geral do Património Cultural. To differentiate species with similar anatomies, such as sheep and goat, the ensemble underwent an osteometric and morphological analysis according to the criteria proposed by Sebastian Payne (1969; 1985) Melinda Zeder, Suzanne Pilaar, and Heather Lapham (Zeder and Pilaar, 2010; Zeder and Lapham, 2010) and Simon Davis (2017).

More specifically, osteometric data were obtained using a digital calliper, according to the measuring criteria presented by Driesch (1976).

The age at death profiles were based on estimates of bone developed, dental eruption, and dental wear (Grant, 1982; Payne, 1987; Zeder, 2006; Lemoine et al., 2014; Zeder et al., 2015). To determine the ages throughout the dental wear stages, we used the references of Deniz and Payne (1982) for Capra hircus, applying them to goat and sheep. Although it is possible to find a margin of error, we think this is suitable for comparisons, considering the ages may not be exact, and that different populations may have different diets — which affect the level of dental wear.

We also recorded some taphonomic features such as cut marks, which were analysed according to the area of the skeleton, marks caused by carnivores and rodents, and to a lesser extent, thermal changes. Regarding malacofauna, bivalve remains with preserved hinges were counted since they allowed for a more assertive MNI reading. As for gastropods, we counted those with the apex region but fragments of the rest of the shell were not included. Its taxonomic classification followed the WORMS (World Register of Marine Species) atlas and the studies of Luiz Saldanha (2003) and Maria Macedo (1996), which were used as reference for marine species. Terrestrial gastropods were classified with the names presented in the work of Rolanda Albuquerque de Matos (2014).

3. Results

3.1. Invertebrate

3.1.1. Bivalves

At the archaeological site of Quinta do Almaraz, 27 species of bivalves were documented, comprising a total of 160,091 remains and corresponding to a minimum of 80,053 individuals (MNI) (figure 3). In fact, these highly nutritious marine species had the great advantage of being available in

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Arthropods	**NISP**	**MNI**
Cancer pagurus	1	1
Carcinus maenas	42	21
Maja squinado	2	1
Balanus sp.	1403	1403
SUBTOTAL	**1448**	**1426**
Marine Gastropods	**NISP**	**MNI**
Bittium reticulatum	34	34
Calliostoma sp.	8	8
Carithium vulgatum	61	61
Cymbium olla	1	1
Gibbula sp.	478	478
Haliotis tuberculata	1	1
Littorina littorea	70	70
Naticarius sp.	1	1
Ocenebra erinaceus	104	104
Patella sp.	6077	6077
Phorcus sp.	16829	16829
Semicassis saburon	10	10
Stramonita haemastoma	8	8
Tritia reticulata	876	876
Trophonopsis muricata	1	1
Turritellinella tricarinata	38	38
Vermetus triquetrus	1006	1006
cf. *Lymnaea acutalis*	2	2
SUBTOTAL	**25605**	**25605**
Scaphopods	**NISP**	**MNI**
Dentalium sp.	41	41
Bivalves	**NISP**	**MNI**
Acanthocardia tuberculata	9	5
Aequipecten opercularis	2871	1436
Anomia ephippium	1134	567
Arctica islandica	7	4
Astarte sulcata	1	1
Callista chione	39	20
Cerastoderma edule	14034	7017
Donacilla cornea	2	1
Dosinia exoleta	1	1
Eastonia rugosa	27	14
Glycymeris sp.	6	3
Laevicardium crassum	7	4
Lima lima	2	1
Loripes sp.	1	1
Lucinella divaricata	12	6
Lutraria lutraria	51	26
Mactra stultorum	8	4
Magallana angulata	9	5
Mimachlamys varia	4284	2142
Moerella donacina	1	1
Mytilus edulis	44638	22319
Ostrea edulis	3564	1782
Pecten maximus	196	98
Pholas dactylus	73	37
Ruditapes decussatus	74733	37367
Solen marginatus	10752	5376
Venus verrucosa	3629	1815
SUBTOTAL	**160091**	**80053**
Cephalopods	**NISP**	**MNI**
Sepia officinalis	36	36
TOTAL	**NISP**	**MNI**
	187221	**107183**

Figure 3. Number of Identified Specimens (NISP) and Minimum Number of Individuals (MNI) of the Invertebrates found in Almaraz

Figura 3. Número de Restos Determinados (NRD) e Número Mínimo de Indivíduos (NMI) dos Invertebrados encontrados em Almaraz an area close to the settlement. Thus, it is no surprise that they correspond to the best represented class in Almaraz, 52% of the total number of identified specimens (NISP) found at the site until now (we recall that fish were not included in this study).

The most abundant species of bivalves is clam (*Ruditapes decussatus*), represented by 74,733 shells, corresponding to a total of 47% of the MNI of bivalves. This species is usually found in coastal regions and lagoons, living in sandbars or sludge areas (Hayward and Ryland, 1995), where they remain buried 10 to 15 cm deep (Vilela, 1950; Serdar et al., 2007). Their protein content is quite high. In this regard, it is important to refer to the research of Jaime Aníbal, Eduardo Esteves and Carlos Rocha (2011), who found that the protein levels are higher during the summer months — which is related to the higher average temperature — in contrast with the levels documented in the coldest time of the year. We thus conclude that, diet-wise, these bivalves become more useful during the hotter months of the year.

The second-best represented species of bivalve is mussel (*Mytilus* sp.), with 44,638 valves, corresponding to 22,319 individuals. Their presence in Almaraz is not atypical since these animals are quite frequent on the entire coast of the national territory and are easily collectible from the rock substrate, to which they are usually attached.

Other frequent species in our sample are cockle (*Cerastoderma edule*) with 7,017 individuals, razor clam (*Solen marginatus*), represented by 5,376 individuals, and oyster (*Ostrea edulis*) with 1,782 MNI.

Less frequent are variegated scallops (*Mimachlamys varia*), warty venus (*Venus verrucosa*) and queen scallop (*Aequipecten opercularis)*, species that are also present in the diet of today's communities. Other *taxa* were equally recognized, even if in residual amounts, and their relationship to the food habits of Almaraz during the 1st millennium BC is unclear (figure 3).

3.1.2. Marine Gastropods

Sea gastropods, with 25,605 remains, represent 11% of the minimal number of individuals in the total sample.

It was possible to differentiate 18 species, with a higher prevalence of sea snails (*Phorcus* sp.), with 16,829 individuals, and limpets (*Patella* sp.), with 6,077. *Vermetus triquetrus,* although abundant in the sample, corresponds to a species that was not consumed; this gastropod is usually attached to rock substrates and is characterised by its irregular and tubular shell with a circular cross-section. It appears in the zooarchaeological record mostly because it is frequently attached to the external surface of bivalves' valves, more specifically mussels and variegated scallops.

Remains of *Tritia reticulata*, *Gibbula* sp. and *Littorina littorea*, also known as winkles, were also documented. These three species of sea snails are very common along the coast of the current Portuguese territory, and all are edible.

As regards other species, their small percentage makes us question their actual consumption; their recollection may have been driven by unidentified factors. A not unlikely hypothesis is that they were accidentally picked, possibly during molluscs collection, an activity that was certainly relevant in the settlement's economy. Another possible explanation is that they were picked due to simple curiosity, or to the shell's aesthetic attributes.

3.1.3. Arthropods

Arthropods are represented in Almaraz by 1,448 remains, belonging to 1,426 individuals. Of these, 1,403 remains are from *Balanus* sp., which like *Vermetus triquetrus,* have a relationship of commensalism with other shells, especially with mussel and limpet, and are not consumed; they are simply attached to other shells.

Regarding edible arthropods, we identified claws of 42 shore crab (*Carcinus maenas*), two of European spider crab (*Maja squinado*), and two of edible crab (*Cancer pagurus*), all typically found in the intertidal areas of the Tagus mouth.

3.1.4. Other

Still on the matter of marine resources, we identified cephalopods, represented in the sample by 36 fragments of common cuttlefish (*Sepia officinalis*). In the

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Scaphopoda class, we recorded 41 shells of *Dentalium* sp., which are highly appreciated due to their aesthetic features and thus used to make adornments.

To conclude our remarks on invertebrates, we have one last comment on terrestrial gastropods, herein considered an intrusive species. They represent 53% of the MNI of the Almaraz faunal material, and we highlight four species that are still abundant in the national coastal territory.

119,150 are Mediterranean snails (*Theba pisana*), corresponding to 98% of terrestrial molluscs and present in every intervened area. The second-best represented group is the decollate snail (*Rumina decollata*), of which 2% are particularly concentrated in square U45. We found 48 remains of garden snail (*Cornu aspersum*) and 169 of milk snail (*Otala lactea*), which differs from the previous due to a bright dark-brown surface on its rim.

3.2. Vertebrates

3.2.1. Reptiles and Amphibians

Reptiles and amphibians are the least expressive groups in the Almaraz faunal ensemble, with just ten bones, mostly collected on square J28.

In fact, the small dimension of these species' bones does not favour their recovery and their identification during fieldwork is not always easy. They can only be collected through a careful sieving process with a fine mesh. Fortunately, Almaraz is a good example of this situation.

In the first group, only one in five identified remains was undoubtedly classified as *Bufo bufo* (common toad). This species, characterized by its great mobility, is present in the entire European territory, except in its most Northern area. Although their reproductive success occurs exclusively in still waters, or with weak currents, their distribution is not restricted to wet areas and a wide variety of biotypes is usually recorded (Loureiro et al., 2008: 116). In Almaraz, their identification is attested by a pelvis, collected in U.E. [5] of square J27.

Reptiles are represented in the sample by five remains, distributed into three species. Two correspond to *Lacerta schreiberi* (Iberian emerald lizard), collected in two different areas, close to the archaeological site (square K31 e J28). Like *Bufo bufo*, it is quite common in Portugal, although its presence in the moat filling is surely incidental.

In square J28, we also found two shell fragments of Mediterranean pond turtle (*Mauremys leprosa*) and a specimen of the *Testudines* order, which includes a wide variety of turtle species.

3.2.2. Birds

With 155 identified bones, the group of birds is a minority in the Almaraz faunal assemblage and does not even have a percentage representation in the sample. Even so, when we compare it to other sites occupied in the same timeframe, Quinta do Almaraz is an exemplary case, since we do not know any other Iron age settlement with such a large set of birds. This happens because bird bones are small and fragile and not always possible to identify in the context of an excavation. Thus, we were able to identify 32 species; only 24 bones were classified as undetermined, since it was not possible to determine their genus (figure 4).

In this class, galliform remains prevail, with a total of 41% of the birds NISP. We identified 46 chicken bones (*Gallus gallus domesticus*), 16 of Red-legged partridge (*Alectoris rufa*), and one belonging to an undetermined galliform.

The presence of *Gallus gallus domesticus* in Iron Age contexts has an increased relevance. In fact, its introduction in the Iberian Peninsula has been related to the arrival of oriental communities around the 8th century BC (Hernández Carrasquilla, 1992), and its presence was recorded in Iron Age levels in Alcáçova de Santarém (Davis, 2006: tab. 3B), Castro Marim (Davis, 2007), Monte Molião (Detry and Arruda, 2013: 221), as well as Castillo de Doña Blanca (Hernández Carrasquilla, 1992), Santa Ana (Miguel and Morales, 1983; 1986), and Cerro del Villar (Aubet et al., 1999). However, the remains from Quinta do Almaraz were collected in superficial layers, more specifically layer 1 of square A12/B12, layers 2 and 3 of square C4, layers 1 and 2 of square C6; one bone was recovered in the sieving process but lacks data concerning its origin. Besides the

Mammals	**NISP**	**MNI**
Bos sp.	336	11
Ovis/Capra	1039	44
Sus sp.	134	7
Cervus elaphus	50	3
Canis familiaris	197	12
O. cuniculus	257	26
Equus sp.	3	1
Lynx pardinus	1	1
Muridae	18	4
Lepus sp.	9	2
Feis catus	2	1
TOTAL	**2046**	**112**
Birds	**NISP**	**MNI**
Alca torda	1	1
Alectoris rufa	16	3
Anas cf. *Domesticus*	4	1
Anas platyrhynchos	6	2
Anatidae anas sp.	11	3
Branta bernicla	1	1
Aegypius monachus	1	1
Cf. *Anas crecca*	1	1
Cf. *Gallus gallus*	46	4
Cf. *Haematopus ostralegus*	1	1
Laridae Larus sp.	6	1
Larus cf. *Argentatus*	2	1
Larus cf. *Cachinnans*	4	1
Larus cf. *Fuscus*	1	1
Larus cf. *Marinus*	2	1
Cf. *Limosa laponica*	1	1
Cf. *Melanita fusca*	1	1
Cf. *Melanita nigra*	2	1
Cf. *Stercorarius*	2	1
Charadriidae	1	1
Columba livia	1	1
Columba palumbus	1	1
Corvus corax	2	1
Corvus frugilegus	1	1
Corvus sp.	1	1
Galiforme	1	1
Morus bassanus	1	1
Numenius arquata	1	1
Scolopacidae *numenius* sp.	3	1
Stercorarius cf. *Sicua*	1	1
Turdus merula	1	1
Tyto alba	7	1
Indeterminado	24	N/A
TOTAL	**155**	**40**

Figure 4. Number of Identified Specimens (NISP) and Minimum Number of Individuals (MNI) of the Mammals and Birds found in Almaraz

Figura 4. Número de Restos Determinados (NRD) e Número Mínimo de Indivíduos (NMI) dos Mamíferos e Aves encontrados em Almaraz

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collection contexts, the good preservation of these skeletons (two of them almost complete) allows to perceive, with some certainty, that these animals are from recent chronologies.

The only item to which we could attribute an older chronology is a proximal humerus collected in layer 12 of square K31. However, lacking more data on the context, or an analytical date, this theory is hard to verify.

Red-legged partridge is quite common in temperate regions of Southern Europe and it was also identified in other archaeological sites of the same timeframe, such as Castro Marim (Davis, 2007: 5-6) and Alcáçova de Santarém (Davis, 2006: tab. 4). Corvids are represented in Quinta do Almaraz by four NISP, corresponding to at least two individuals: one *Corvus corax,* known as the common raven, and one *Corvus frugilegus* or rook. Despite their small number in the assemblage, the association of these birds with sites with pre-Roman occupations is well attested in England (Serjeantson and Morris, 2011), Italy (Fiore and Tagliacozzo, 2001) and Germany (Boessneck et al., 1971). Sometimes they are given a symbolic value, and sometimes they are associated with rituals (Green, 1992; Hill, 1995; Aldhouse-Green and Aldhouse-Green, 2005; Woodward and Woodward, 2004; Serjeantson and Morris, 2011; among others). Other theories may be pondered: since it is a scavenger species, this potentiates a relationship of commensalism with human communities. They may have been consumed by that population, or as mentioned by classical authors Pliny and Macrobius in the Roman era (Toynbee, 1973), they could be kept as pets.

Still on the matter of scavenger birds, a first phalange of a cinereous vulture (*Aegypius monachus*) was identified in the Almaraz set. Its geographical distribution ranges from the peninsular West to Russia, and its presence in the estuary is not strange. Being an opportunistic raptor, its presence in the site may be related to the consumption of food scraps left in the moat; it may also be accidental, or eventually result from hunting.

Other point we must highlight regarding the sample is the large variety of aquatic and marine birds, a situation that is easily explained by the location of the site of Almaraz, where the species identified in this study can still be found today.

Anatids prevail in this set, with 26 remains, followed by the seagull group (*Laridae*) with 15 bones. The remaining 12 NISP belong to aquatic and marine birds attributable to razorbill (*Alca torda*), Northern gannet (*Morus bassanus*), curlew (*Numenius* sp.), Eurasian oystercatcher (cf. *Haematopus ostralegus*), bar-tailed godwit (*Limosa laponica*), skua (*Stercorarius* sp.), and the *Charadriidae* family.

Most of the represented marine birds are migratory wintering species that only stay seasonally on the national coast, so it is easy to determine their relationship with the community that lived in Quinta do Almaraz during the Iron Age. However, the same does not apply to anatids, especially since we collected mallard (*Anas platyrhynchos*) bones, which were eaten by human communities throughout time. The classification of the first was based on a comparative analysis with the reference collection from the Laboratório de Arqueociências (LARC) since these bones are not particularly easy to identify species-wise. On the other hand, we also do not know when these birds were domesticated. Thus, its classification is subject to reservations.

These animals were also identified in Castro Marim (Davis, 2007). Northern gannet (*Morus bassanus*) was identified in Iron Age levels in Monte Molião (Detry and Arruda, 2013) and Castro Marim, the latter presenting taphonomic traces possibly related to its consumption by the human community, as still happens today in Northern Europe (Davis, 2007: 7 and 8).

As regards the parts of the skeleton, due to their small size, the studied remains do not allow to suggest a consumption preference for a specific part of the carcasses. This applies to the entire group of birds since, like rabbits, their small size does not facilitate choice, the way medium and large mammals do.

3.2.3. Mammals

The set of mammals collected in Almaraz is now comprised by a total of 2,046 POSACS, from which we highlight caprines with 1,039 (51%), followed by bovines, with 336 (16%), and lagomorphs, with 266 remains (13%). With some numerical representativity, we documented remains of canids (10%), suids (7%), and cervids (2%) (figure 4).

Regarding felines, we identified an ulna and an incisive tooth belonging to a small felid (Felis sp. — wild or domestic cat), and a tibia from an Iberian lynx (Lynx pardinus).Equines are represented just by a femur and two first phalanges collected in the moat area, specifically in squares K31 and J28.

Belonging to small rodents we identified 18 remains, corresponding to at least four individuals, with a prevalence of long bones, especially femurs, as well as mandibular elements. Their representativity in the moat filling is not uncommon since the presence of these mammals in dumpster environments, where the access to food is practically endless, is still quite common these days. We also highlight that these may be intrusive animals, and thus it is not possible to determine if they date from the Iron Age occupation of Almaraz.

The distribution of the mammals identified in the several excavated sectors into taxonomic groups does not differ much; sheep and goats are always the best represented ones. Contrasting with this trend, we have square D22, in which we recorded more suid remains (10 NISP), followed by bovine, with six bones, and only three caprine bones.

This analysis by sectors revealed another interesting feature which is related to the identification of *Canis lupus familiaris*, with a total of 197 collected bones, of which 97% come from the moat area, with a larger concentration in squares K31 (50%) and J28 (35%). In both areas, this species is only exceeded by caprines. In fact, this situation had already been commented by Francisco Correia, who suggested that these animals could be used in ritual activities, for which the skulls were removed (Correia, 2015).

3.3. Represented parts of the skeleton

As mentioned above, sheep (*Ovis aries*) and goats (*Capra hircus*) dominate the sample, with 51% of the Number of identified Specimens (NISP), corresponding to 39% of the Minimum Number of Individuals (MNI) of mammals. In these remains, mandibular elements prevail, followed by appendicular extremities, namely phalanges, with 150 remains (figure 5). Although the preference for hindlimbs over forelimbs is not clear, the percentage of tibias and humeri suggests some preference for shank and shoulder, respectively, which correspond to areas with a high meat content.

336 bovine remains were documented, corresponding to 11 MNI. In this group, there was no prevalence of forelimb bones over hindlimb bones, suggesting there was no preference for a specific part of this species' carcasses. These remains seem partially incomplete, especially because there is only one femur in the ensemble. This situation may be attributable to the density of these bones, which is much smaller than that of humeri or tibias, for example.

The suid group (*Sus* sp.) is composed by 134 bones, corresponding to seven individuals. From this *taxon*, remains of the front side of the skeleton prevail, with a higher incidence of mandibular remains (56) and the shoulder area.

A total of 197 remains belong to canids and, unlike the previous case, remains from the hindquarters prevail, especially pelvises and metatarsi.

The group of wild species is dominated by lagomorphs, namely the European rabbit (*Oryctolagus cuniculus*); 257 POSACS were identified, in a total of 26 individuals.

Although the meat content of a rabbit is not comparable to that of other species, like suid or cattle, the available data allows us to attest the importance of cynegetic resources in the economy of Almaraz during the 1st millennium BC. However, unlike medium and large animals, the consumption of this species may be related merely to an individual or a family. This species remains show a preference for the hindquarters, especially pelvises and metatarsi. Rabbits can also be easily intrusive animals and although we have no elements with marks of human consumption (such as fire or cut marks) we also do not have clear indicators of being more recent (such as completeness of the skeleton or different preservation of the remaining elements).

Still related to the group of lagomorphs, nine hare (*Lepus* sp.) remains were documented, corresponding to two individuals. The low expression of this species does not allow to assess consumption patterns associated with specific anatomic parts.

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Mammalia		B	O/C	OVA	CH	S	CEE	CF	ORC	Muridae	EQ	FC	LEP	LYP
Hom/Antler		20	3	1	25		12							
I/C		22	126 [5]		[1]									
I						7 [6]		4 [7]	8 [7]	1 [3]		1	[2]	
dI			23											
C						12 [2]		3 (4)	5					
dC								2						
dP2			2 (13)		[3]	2 [1]		[2]						
dP3			11 (22)		1 [5]	1 [2]		[2]						
dP4		4	14 (23)		[6]	1 [6]		2 [2]						
P1								[2]						
P2		1	16 (19)	[1]	[9]	[1]		1 [3]						
P3		5 [1]	16 [41]	[7]	10 [17]	[3]		4 [2]	[1]					
P3/P4														
P4		[1]	9 (34)	3 [12]	1 [16]	1 [2]		1 [2]	[5]					
M1		[3]	[55]	[13]	[23]	[5]		3 [5]	[5]	[2]				
M1/2		13	83 [3]	9	18	7 [3]				[2]				
M2		[3]	2 [43]	[13]	[17]	[3]		2 [4]	[5]	[2]				
M3		8 [5]	14 [32]	2 [14]	1 [10]	2 [3]		1 [1]	[3]					
Molar									10 [28]	[6]			[8]	
Undet. dec. tooth								1						
Mandible		19	125	18	28	23		10	33	4			2	
Scapula	F	16	30			9	2	3	12					
	UM	1	1			1		2						
	UE		1											
	U	1												
Humerus	F	8	26	16	4	8	1	3	26	1				
	UM	1	5			6		1						
	FV		2	1	1									
	UE		3											
	U	3	2			3								
Radius	F	8	5			1	2		4					
	UM	2	7					2					1	
	UE		1					5						
	FV		1											
Metacarpal	F	12	5	1	1	3		18	7				1	
	UM		8				1	5						
	UE													
	U													
Pelvis	F	10	18			3	3	13	52			1	1	
	UM		1					5						
	U	1	3											
Femur	F	1	1			1	1	1	9	8	1			
	UM		3					3	2					
	UE		1					2	1					
	FV													
Tibia	F	15	43	1				4	13	3				1
	UM	1	7			2		5	4				1	
	UE	1	4											
	FV	1							1					
Calcaneus	F	10	10	3	2	1	4	8	15				1	
	UM	1	14			3								
	FV	1												
	U	3	1				1							

Mammalia		B	O/C	OVA	CH	S	CEE	CF	ORC	Muridae	EQ	FC	LEP	LYP
Astragalus	F	22	9	14	17	3	3	2	2					
	NF													
Metatarsal	F	13	7	6	1		5	14	28				1	
	UM		6			2		4	1				1	
	UE		1											
	U		1											
Metapodial	F	13	9			2	4	9	12					
	UM		2			2	1	1						
	UE		20				1							
	FV		1			1								
	U		1											
Phalanx	F	43	44			7	4	26	13	1	2			
	UM	2	23	1		2	1	1						
	UE		2											
	NF							1						
	FV		4			1		3						
Phalanx 2	F	32	39			7	3	14	4					
	UM	1	7			2								
	UE		1											
	FV	2	5			1								
Phalanx 3	F	19	24			7	1	6						
TOTAL NISP		**336**	**853**	**76**	**110**	**134**	**50**	**197**	**257**	**18**	**3**	**2**	**9**	**1**
TOTAL NMI		**11**	**26**	**9**	**12**	**7**	**3**	**12**	**26**	**4**	**1**	**1**	**2**	**1**

Figure 5. Number of Identified Specimens (NISP) by parts of the skeleton and species of mammals. B – *Bos* sp. (cattle or auroch), OC – *Ovis/Capra* (Caprines), OVA – *Ovis aries* (sheep), CH – *Capra hircus* (goat), S – *Sus* sp. (pig or wild boar), CEE – *Cervus elaphus* (red deer), CF – *Canis lupus familiaris* (dog), ORC – *Oryctolagus cuniculus* (rabbit), EQ – *Equus* sp. (horse or donkey), FC – *Felis catus* (cat), LEP – *Lepus* sp. (hare), LYP – *Lynx pardinus* (iberian lynx). With indication of the bones state of fusion: F – Fused, UM – Unfused metaphysis, UE – Unfused epyphisis, FV – Fusion visible, U – Undetermined

Figura 5. Número de Restos Determinados (NRD) das espécies de mamíferos identificadas com indicação das partes do esqueleto representadas. B – *Bos* sp. (bovinos), OC – *Ovis/Capra* (caprinos), OVA – *Ovis aries* (ovelha), CH – *Capra hircus* (cabra), S – *Sus* sp. (porco ou javali), CEE – *Cervus elaphus* (veado), CF – *Canis lupus familiaris* (cão), ORC – *Oryctolagus cuniculus* (coelho), EQ – *Equus* sp. (cavalo ou burro), FC – *Felis catus* (gato), LEP – *Lepus* sp. (lebre), LYP – *Lynx pardinus* (lince ibérico). Indicação do grau de fusão dos ossos: F – Fundido, UM – Metáfise não fundida, UE – Epífise não fundida, FV – Fusão visível, U – Indeterminado

Red deer (*Cervus elaphus*) has small representativity in the Quinta do Almaraz settlement, corresponding to just 2% of the total NISP, equivalent to three individuals. Hindquarters prevail, although this difference is relatively small.

3.4. Morphologic and osteometric analysis

Although it was not possible to elaborate a specific characterisation for 26 individuals, herein considered as *Ovis/Capra,* the morphological and osteometric analysis, following the criteria proposed by Sebastian Payne (1969; 1985) and recently by Melinda Zeder and Suzanne Pilaar (2010), has allowed to identify the species of 21 individuals.

Morphological observation, supported by the osteometric analysis, allowed us to distinguish 17 humeri, three calcanea, and 14 astragali of *Ovis aries*; and five humeri, two calcanea, and 17 astragali of *Capra hircus*. The use of the morphological criteria proposed by Zeder and Pilaar (2010) to distinguish mandibular remains allowed us to identify 18 mandibles of sheep and 28 of goat. Based on these criteria it was possible to identify a total of nine sheep and 12 goats in the assemblage (MNI).

The ratio between the measurements of sheep and goat astragali was calculated to corroborate the difference between the two species. However, as it seems to be the case of the Carnide ensemble (Detry et al., 2021), we see that the values of one of the goats from Quinta do Almaraz are compatible with sheep. This makes us consider that it may be an individual from a different race, as seen in the work presented by Simon Davis (2016), which also found these overlapping values in both species (*Capra hircus* and *Ovis aries*). In this context, it's important to

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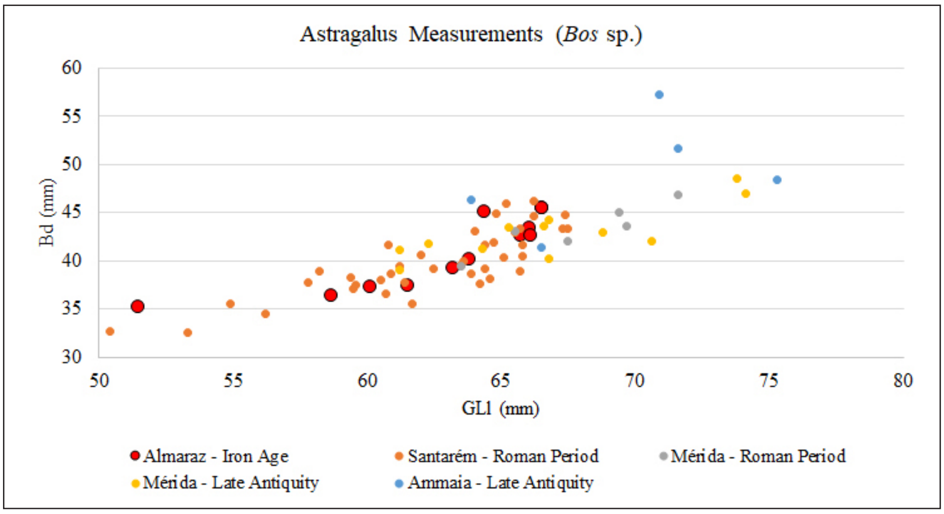

Figure 6. Measurements from the astragalus of bovines in mm, comparing Almaraz with other archaeological sites in Iberia. Measurements of Santarém from Davis (2006) and measurements from Merida and Ammaia from Detry et al. (2022)

Figura 6. Medidas dos astrágalos de bovinos em mm, comparando Almaraz com outros sítios arqueológicos na Península Ibérica. Medidas de Santarém segundo Davis (2006) e medidas de Mérida e Ammaia segundo Detry *et alii* (2022)

remember what was said about the possible introduction of exogenous caprine species, that probably came along with the inclusion of other animals in the Iberian Peninsula during this time, like, as mentioned above, *Gallus gallus*, *Rattus rattus*, and *Equus asinus* (Davis, 2007: 6).

More specifically, measures of the distal width and the height of sheep astragali are close to the values we know from Iron Age and Roman age levels in Chibanes and Alcáçova de Santarém. In more recent periods, the trend seems to suggest the animals were larger than in the Iron Age.

Concerning the humeri, when we compare the data from Almaraz with Alcáçova de Santarém we do not see significant differences, nor between the Iron Age and the Roman age of Santarém or between both sites. This goes slightly against the trend we saw in the astragali. It is possible that changes are more visible in the animals' height (the astragalus GLl can be a proxy for its height) and perhaps less in their width.

The graphic of figure 6 shows that bovine measurements from Almaraz do not differ much from those of the Roman age of Santarém, a site with an important pre-Roman occupation. The same does not apply when we compare them with data from the Mérida and Ammaia ensembles, which seem to include larger bovines. In fact, according to the picture presented in the work developed by Cleia Detry in collaboration with other authors (Detry et al., 2022) we see a prevalence of improved cattle in the cities or *villas* founded by the Romans.

We also have a very small element, whose size is comparable to an item from the Roman age of Santarém. It may be a specific race or morphotype of this region, or animals that were underfed during their growth. As regards the former, we will soon proceed to an analysis of diet isotopes. Analysis of ancient DNA are also planned and may help to understand this considerable difference.

The measures of the distal width of the metacarpus of *Bos* sp. from Almaraz seem compatible with the ones found in Mérida and Santarém (Detry et al., 2022; Davis, 2006). Since this bone presents sexual dimorphism, and considering the six elements we managed to measure, they are very likely five smaller elements — probably females — and only one larger element — probably male.

The presence of cervids and lagomorphs in Almaraz is proof of cynegetic activity in the settlement. However, it is not always possible to identify boar in the suid bones and teeth, which is why we attempted to distinguish the wild and domestic species through an odontometric analysis.

The widths of the humerus distal joint (Bd) of the *Sus* from Almaraz are all under 40 mm, which makes them compatible with pig measures. Analysing the relationship between the length of the third lower molar and the width of the first and second cuspids (Wa/Wb), we see that the teeth collected in Almaraz quite possibly belong to the domestic species, so there is no confirmation of boar hunting.

As previously mentioned, until now only three bones may belong to the Equine family, specifically two first phalanges and one femur. The ratio based on the measures of one of these phalanges has allowed to confirm that the specimen from Quinta do Almaraz belongs to a horse (a result based on the reference measures presented in Davis et al., 2012).

3.5. Age at death

Concerning slaughter patterns, it was possible to determine a tendency to slaughter goats earlier than sheep.

While the average for goats is between six months and six years old, sheep usually seem to be slaughtered after they completed a year, and some molars show dental wear suggesting they were slaughtered later, around nine years old.

As regards the group designated *Ovis/Capra*, for which the species could not be determined, the average slaughter age is between 1.5 and four years. However, the presence of teeth with higher dental wear, revealing slaughters in old age, can suggest they belong to the sheep group, since these were kept for a longer time.

This may be related to a larger duration of sheep breeding, since these animals were appropriated for the immediate consumption of their meat, but also for obtaining secondary products such as wool or milk, which justifies the later slaughter age.

In this context, it is still important to say that, in ideal situations, a sheep reaches its peak in wool production between three to four years of age, with an average yearly production of 3 to 4 kg (ARC, 1980; AFRC, 1993; Khan et al., 2012).

There is another possibility, related to the reproduction and characteristics of the species: it is possible that some individuals were kept for reproduction purposes because they were more fertile or had specific genetic traits.

Remains from other species do not allow us such a detailed interpretation as the one we were able to gather for the caprine. In this context, we made a first analysis that showed a general trend concerning the most frequent mammals of Almaraz.

The results suggest a trend for keeping bovines until an older age, while suids were slaughtered around two years old, when they reached the ideal size.

This situation can be related to the fact that suids were raised for meat, while cattle could perform other important tasks, which justifies their greater longevity.

Concerning wild species, from the 26 rabbits only two are juveniles, which can be related to selective capture, aimed at obtaining the highest yield while continuing the species.

Red deer bones suggest at least three individuals in Almaraz, although their bone structure was not completely fused, the individuals had a considerable size, and no juveniles were found.

3.6. Taphonomy

Regarding taphonomic traces, we documented 146 cut marks, and divided the analysed remains into size groups because it was not always possible to verify their species.

The first aspect we must highlight is the butchery of the carcasses in both groups; in the Almaraz assemblage we find remains of the axial and appendicular skeleton, which allows us to assume that this task was performed inside the settlement.

In both groups, the presence of cutting signs is predominant in the ribs, an area with high protein content.

The manipulation of macrofauna seems to have been more focused on parts with little meat, such as the head and appendicular extremities. In addition to these, it is important to highlight the percentage of these taphonomic signs in pelvises, more specifically 6% of the marks in the "macrofauna" group. The presence of "chop marks" in these specific areas of the skeleton may be related to an eventual

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primary cutting, to separate the carcass into more manageable pieces.

For medium sized animals, the signs of butchery are concentrated in the forelimbs, high in meat, especially in the radius, scapula, and humerus.

Thermal changes are relatively scarce in Almaraz. We recognized 40 countable elements (POSACS) with an altered surface due to exposure to high temperatures. From these, we point out the appendicular remains, specifically phalanges, which represent 40% of the burnt elements.

If thermal changes can be related to food preparation, namely roasts, the fact that we identified several other elements, such as fragmented long bones, splinters and 2,930 remains of malacofauna with carbonized and/or calcinated surfaces may relate these to sanitation actions, in which food leftovers were thrown into the fire or used as fuel (Almeida et al., 2020: 1046). Although it is not easy to accurate the reason why these remains were burned, if we consider the context in which they were identified, in this case a "dumpster" environment, it does not seem unlikely that it could be related to cleaning actions, or eventually accidents.

In addition to the parts of the skeleton found, the presence of carnivores is equally confirmed by the identification of digested remains and by marks caused by teeth, from which we highlight the phalanges of caprine bearing evidence of chemical changes caused by the digestive process. Regarding this situation, we also have examples of the humeri, consisting of 21% of remains with carnivore marks, metacarpals (7%), metatarsals (4%), and metapodials (8%).

3.7. Palaeopathological Signs

The size and endurance of cattle gave them a distinct significance when compared to other species, and they were often used as traction animals, to carry cargo or agricultural tools. The identification of arthropathies caused by the pressure exerted on the paws while performing these tasks is frequent in the archaeological record, and it was also found in individuals from the Iron Age in Alcáçova de Santarém (Davis, 2006: 52). In the Almaraz ensemble, these pathologies were documented in 11 first phalanges

Figure 7. First phalanges of *Bos* sp. with signs of exostosis

Figura 7. Primeira falange de *Bos* sp. com sinais de exostose

(figure 7) and four in second phalanges of *Bos* sp. These bones show deformities compatible with exostosis, which consists of a broadening of the bone caused by stress. In a set of 80 phalanges (I and II), the incidence of palaeopathologies in the cattle sample of Almaraz is 19%, a significant number when compared to other Iron Age sites. Nonetheless, it is important to mention that each of these animals has a set of 16 phalanges (I and II), so the bones with exostosis found in Quinta do Almaraz may belong to just two individuals.

In addition to bovines, pathologies were also found in a calcaneus and a phalange of *Cervus elaphus*, in two phalanges of *Ovis/Capra* (I and II) and in a third phalange of *Sus* sp.

4. Discussion

The invertebrates are abundant in Almaraz as we should expect since its close proximity with the Tagus estuary. The aquatic resources were certainly abundant and easy to collect. On the other hand proteins coming from mammals seem still more relevant if we consider the amount of meat represented by each individual which in invertebrates is much smaller. Molluscs do contribute with important nutrients and imply spending much less energy

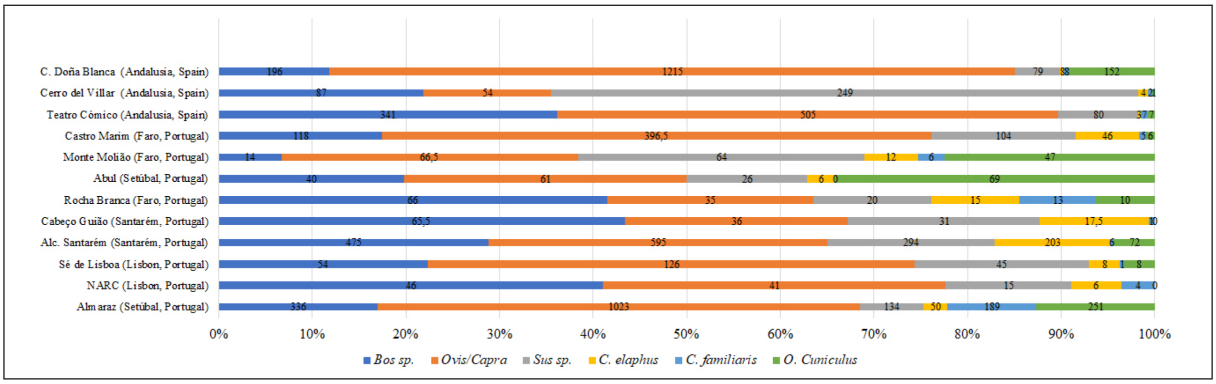

Figure 8. Relative frequency of *Bos* sp., *Ovis/Capra*, *Sus* sp., *Canis lupus familiaris*, *Equus* sp., *Cervus elaphus* and *Oryctolagus cuniculus* for different Iron Age sites: C. Doña Blanca (Roselló and Morales, 1994), Cerro del Villar (Aubet et al., 1999), Teatro Cómico de Cádiz (Estaca et al., 2015), Castro Marim (Davis, 2017), Monte Molião (Detry and Arruda, 2013), Abul (Cardoso, 2000), Rocha Branca (Cardoso, 2000), Cabeço Guião (Arruda et al., 2015), Alcáçova de Santarém (Davis, 2006), Sé de Lisboa (Cardoso, 2002) and NARC (Detry et al., 2016)

Figura 8. Frequência relativa de *Bos* sp., *Ovis/Capra*, *Sus* sp., *Canis lupus familiaris*, *Equus* sp., *Cervus elaphus* e *Oryctolagus cuniculus* para diferentes sítios arqueológicos da Idade do Ferro: C. Doña Blanca (Roselló e Morales, 1994), Cerro del Villar (Aubet *et alii*, 1999), Teatro Cómico de Cádis (Estaca *et alii*, 2015), Castro Marim (Davis, 2017), Monte Molião (Detry e Arruda, 2013), Abul (Cardoso, 2000), Rocha Branca (Cardoso, 2000), Cabeço Guião (Arruda *et alii*, 2015), Alcáçova de Santarém (Davis, 2006), Sé de Lisboa (Cardoso, 2002) e NARC (Detry *et alii*, 2016)

to catch, but still contribute with less calories than vertebrate meat.

When we compare the data from the Almaraz ensemble with other sites of the same chronology (figure 8), we observe that the percentage of caprines is usually the highest, with the exception of the sites of Cabeço Guião (Arruda et al., 2015) and Rocha Branca (Cardoso, 2000).

The abundance of rabbit, however, opposes the tendency found in most settlements, in which the presence of this species is small or non-existent, except in Abul and Monte Molião. The absence of rabbit in some sites can also be influenced by the fact that sediments were not sieved, and thus smaller specimens were not collected. Data from the excavations in Almaraz may also reflect the high recovery of these elements. We also have to keep in mind that some elements might be intrusive.

On the contrary, cervids are relatively scarce in Almaraz, with higher percentages in other settlements, possibly due to the sparse vegetation cover in that area.

We must highlight the small representativity of suids, corresponding to a mere 5% of the set. Although this may be due to Phoenician influence, researchers still have not reached a consensus on the consumption of this species by these cultural groups (Portas et al., 2015: 168). Even if we accept that this was not the most appreciated meat, some data have allowed us to assume that, when they occupied other Mediterranean regions, those communities adapted their diet to local habits, and remains of *Sus* sp. have been documented in several sites with Phoenician and Punic influence in Sardinia (Carenti and Wilkens, 2006). However, we must point out that there seems to be a tendency towards percentages below 10% of suid representativity in every Western Phoenician ensemble, and Almaraz is in the same interval as other sites with the same chronology (Valenzuela-Lamas, 2020: 133). Nonetheless, it is interesting to note that Abul, apparently more deeply connected to the Phoenician world and abandoned precisely in the 5th century BC, presents a higher percentage of suids than Almaraz (Cardoso, 2000: 323).

On the other hand, if we compare phase V of Castro Marim, which is chronologically coeval with the moat filling phase of Almaraz (late 6th/5th centuries BC), a time when the Punic influences from North Africa become clearer, while in Castro Marim the percentage of suid is 12%, still higher than in Almaraz.

According to this scenario, we may assume that this situation could really be attributable to the Phoenician origins of the settlement, or simply to a preference for eating other species, instead of suids, in the community that lived in Almaraz. We must

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underline, once again, that the studied ensemble comes mostly from the moat filling, and that the examination of samples from other areas, namely the ones from new excavations in the residential area, may yield different results — as found in the analysis of different areas in Huelva and Cartago (Valenzuela-Lamas, 2020: 136).

Finally, we must highlight the number of *Canis familiaris* remains identified in this settlement, which could be justified due to ritual practices in which these animals were used, as proposed by Francisco Correia (2015). Nonetheless, other explanations may be pondered, especially if we consider that they were deposited in the moat, which was, as we already mentioned, used as a dumpster.

Felids also make a curious presence in this assemblage. Cats are rare in prehistoric contexts. Iberian lynx and wildcat do appear in Portuguese mesolithic sites with proof of meat consumption and fur extraction (Detry, 2007). Indicators of cat taming date at least around 9000 years ago, with an association of a cat with a human burial in Shillourokambos (Cyprus, Vigne et al., 2004). At Almaraz the domestic context might indicate a domesticated animal which is possibly one of the oldest in Portugal.

Iron age faunal remains from Iberia have been the subject of more attention in the last decades, producing complex information on the patterns of consumption. Almaraz contributes with one more landmark from the Atlantic coast. In the other bank of the Tagus river, in front of Almaraz, we have a small assemblage from downtown Lisbon (Rua dos Correeiros, Detry et al., 2016). In this case oysters seem more common, and cattle also more frequent, wild animals are rare and rabbits are absent. The prevalence of bovines seems to along with the sites of Rocha Branca (Cardoso, 1993), Alcácer do Sal (Cardoso, 2000), Abul (Cardoso, 2001) and even previous works from Almaraz (Barros et al., 1993; Cardoso and Varela, 1997), has previous discussed by Detry et al. (2016). Monte Molião (Detry and Arruda, 2013), Castro Marim (Davis, 2007) and Mesa dos Castelinhos (Valenzuela and Fabião, 2012), show in the other hand the tendency for relying more on the small bovids. In this last one, big and small game hunting is more frequent.

In the Teatro Cómico (Cadiz, Spain), still in the Atlantic coast but towards the Mediterranean, the authors observe a tendency in the earlier period more dependance in cattle which is substituted by small bovids towards the final occupation.

When we have bigger samples such as Monte Molião we observe the same tendency for diversity in the invertebrates collected and birds present in the assemblage. Showing the intense use of coastal resources by these populations that would be later greatly reduced and more homogenous.

5. Conclusions

The study of the Almaraz fauna has allowed us to find that the ensemble reveals a tight connection between its community, livestock, and the capture of marine resources. In fact, mammal hunting does not seem to have been frequent, representing only 15% of the set of terrestrial species.

As regards mammals, we find a significant percentage of sheep and goats over other species. In fact, the breeding of domestic species had the purpose of satisfying feeding needs but also of obtaining secondary products, such as milk and fibres for textile production (Ryder, 2001; Rast-Eicher and Jørgensen, 2013).

In addition to these, the use of large animals was also relevant in Almaraz, facilitating tasks that required animal traction, as evidenced by phalanges with exostosis caused by the pressure exerted on their limbs.

On the other hand, hunting must have also played an important role in the settlement's economy, and this is particularly obvious by the high number of rabbits in the sample.

In general, the parts of the skeleton represented in Almaraz do suggest a preference of consumption for some parts of the carcase, except in the case of suids, in which remains of forelimbs are predominant.

The slaughter ages have allowed us to perceive that the settlement's economy was focused on both secondary products and meat consumption. Herds were not raised for the exclusive production of one product or another, and the age of slaughter certainly depended on several factors.

In general, the study carried out so far does not differ from the panorama observed in other Iron Age settlements, although some specific features do stand out, such as the percentages of dog and pig, which we cannot explain for the time being.

As regards marine species, the documented data allow us to confirm their importance in this population's diet, justified not only by the high protein and nutritional content but also by the proximity and availability of these resources.

We hope that some of the questions that have remained unanswered in this study will be clarified in the future, with further excavations on the site that will enable a more detailed diachronic understanding than the one on this study could provide.

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Bibliography

ARC (1980): *The Nutrient Requirements of Ruminant Livestock. Technical Review by an Agricultural Research Council Working Party*. Commonwealth Agricultural Bureau. Farnham Royal.

AFRC (1993): *Energy and proteinrequirements of ruminants*. CAB International. Wallingford. Oxfordshire.

Almeida, N., Dias, Í., Detry, C., Porfírio, E. and Serra, M. (2020): "As Faunas do final da Idade do Bronze no Sul de Portugal: Leituras desde o Outeiro do Circo (Beja)". In J.M.Arnaud, C. Neves and A. Martins (eds.): *Arqueologia em Portugal 2020 - Estado da Questão*. Associação dos Arqueólogos Portugueses. Lisboa: 1041-1054. <https://doi.org/10.21747/978-989-8970-25-1/arqa75>.

Aníbal, J., Esteves, E. and Rocha, C. (2011): "Seasonal Variations in Gross Biochemical Composition, Percent Edibility, and Condition Index of the Clam *Ruditapes decussatus* Cultivated in the Ria Formosa (South Portugal)". *Journal of Shellfish Research*, 30: 17-23. <https://doi.org/10.2983/035.030.0104>.

Arruda, A. M., de Sousa, E., Barradas, E., Batata, C., Detry, C. and Soares, R. (2015): "O Cabeço Guião (Cartaxo-Portugal): um sítio da Idade do Ferro do Vale do Tejo". In S. Celestino Pérez and E. Rodríguez (eds): *Territorios comparados: los valles del Guadalquivir, el Guadiana y el Tajo en época tartésica.* Anejos de Archivo Español de Arqueología, 80. Instituto de Arqueología de Mérida. Mérida: 320-361.

Aubet, M.E., Carmona, P., Curié, E., Delgado, A.; Fernandez, A. and Párraga, M. (1999): *Cerro del Villar – 1. Asentamiento fenicio en la desembocadura del río Guadalhorce y su relación con el hinterland*. Junta de Andalucía. Consejería de Cultura. Sevilla.

Barros, L. (2001)_ "Quinta do Almaraz: o princípio de Almada Cidade". *Anais de Almada,* 4: 11-24.

Barros, L., Cardoso, J.L. and Sabrosa, A. (1993): "Fenícios na margem Sul do Tejo. Economia e integração cultural do povoado de Almaraz - Almada". *Estudos Orientais,* IV: 143-173.

CuPAUAM 48|2| (2022). 135-155
https://doi.org/10.15366/cupauam2022.48.2.005
ISSN 0211-1608, ISSN Digital: 2530-3589

Cardoso, J. L. (2000): "Fenícios e Indígenas em Rocha Branca, Abul, Alcácer do Sal, Almaraz e Santarém. Estudo Comparado dos mamíferos". *Actas del IV Congreso Internacional de Estudios Fenicios y Púnicos* (Cádiz, 1995). Universidad de Cádiz. Cádiz: 319-327.

Cardoso, J.L. (2002): "Arqueofaunas – balanço da sua investigação em Portugal". Arqueologia e História, 54: 281-298.

Cardoso, J. (2004): "A Baixa Estremadura dos finais do IV milénio A. C. até à chegada dos romanos: um ensaio de História Regional". *Estudos Arqueológicos de Oeiras,* 12: 1-331.

Carenti, G. and Wilkens, B. (2006): "La colonizzazione fenicia e punica e il suo influsso sulla fauna sarda". *Sardinia Corsica et Baleares Antiquae: International Journal of Archaeology*, 4: 173-186.

Correia, F. (2015): "Enterramentos de Cães na Quinta do Almaraz". *Actas do Congresso Arqueologia em Transição: O Mundo Funerário*. Centro de História da Arte e Investigação Artística. Universidade de Évora. Évora: 113-124.

Davis, S. J. (1992): *A rapid method for recording information about mammal bones from archaeological sites*. HBMC AM Laboratory. London: 1-14.

Davis, S. J. (2006): *Faunal remains from Alcáçova de Santarém, Portugal*. Instituto Português de Arqueologia. Lisboa.

Davis, S. J. (2007): *The mammals and birds from the Iron Age and Roman periods of Castro Marim, Algarve, Portugal*. Trabalhos do CIPA, 107. IPA. Lisboa.

Davis, S. J. (2017): "Towards a metrical distinction between sheep and goat astragali". In P. Rowlwy-Conwy, D. Serjeantson and P. Halstead (eds.): *Economic Zooarchaeology Studies in Hunting, Herding and Early Agriculture*. Oxbow books: 50-82.

Deniz, E. and Payne, S. (1982): "Eruption and wear in the mandibular dentition as a guide to ageing Turkish Angora goats". In B. Wilson, C. Grigson and S. Payne (eds.): *Ageing and sexing animal bones from archaeological sites.* British Archaeological Reports, 109. Oxford: 155-205.

Detry, C. and Arruda, A.M. (2013): "A fauna da Idade do Ferro e Época romana de Monte Molião (Lagos, Algarve): continuidades e rupturas na dieta alimentar". *Revista Portuguesa de Arqueologia*, 15: 215-227.

Detry, C., Cardoso, J.L. and Bugalhão, J. (2016): "A Alimentação em Lisboa no decurso da Idade do Ferro: resultados das escavações realizadas no Núcleo Arqueológico da Rua dos Correeiros (Lisboa, Portugal)". *Revista de Prehistoria y Arqueología de la Universidad de Sevilla*, 26: 67-82. <http://dx.doi.org/10.12795/spal.2016i25.03>.

Detry, C., Tavares da Silva, C. and Soares, J. (2017): "Estudo zooarqueológico da ocupação romano-republicana do Castro de Chibanes (Palmela)". *Revista Portuguesa de Arqueologia*, 20: 113-127.

Detry, C., Tavares da Silva, C. and Soares, J. (2021): "O estudo da fauna dos níveis da Idade do Ferro do Castro de Chibanes (Palmela, Portugal)". In C. Tavares da Silva and J. Soares (coords.): *O Castro de Chibanes na Conquista Romana. Intervenções arqueológicas de 1996 a 2017.* Setúbal Arqueológica, 20. MAEDS/AMRS. Setúbal: 75-83.

Detry, C., Santos, A.B., Casimiro, T., Caessa, A. and N. Mota (2021): "Animal remains from 17th century Carnide, Lisbon, Portugal". In U. Albarella, C. Detry, S. Gabriel, C. Ginja and J. Tereso (eds.): *Themes in Old World Zooarchaeology. From the Mediterranean to the Atlantic.* Oxbow. London: 145-159.

Detry, C., Valenzuela-Lamas, S., Davis, S., Pires, A.E. and Ginja, C. (2022): "On the Improvement of Cattle (*Bos taurus*) in the Cities of Roman Lusitania. Some Preliminary Results". In E. Wright and C. Ginja (eds): *Cattle and People: interdisciplinary perspectives to an ancient relationship*. Lockwood Press. Columbus.

Driesch, A. von (1976): *A guide to the measurement of animal bones from Archaeological sites.* Peabody Museum Bulletin, 1. Harvard University Press. Harvard.

Estaca, V., Yravedra, J., Gener, J. M., Navarro, M.A., Pajuelo, J.M. and Torres, M. (2015): "Zooarqueología de los macrovertebrados del yacimiento fenicio del Teatro Cómico (Cádiz)". *SPAL*, 24: 55-76. <http://dx.doi.org/10.12795/spal.2015i24.03>.

Grant, A. (1982): "The use of tooth wear as guide to the age of domestic ungulates". In B. Wilson, C. Grigson and S. Payne (eds.): *Ageing and sexing animal bones from archaeological sites*. Archaeopress. Oxford: 91-198.

Hayward, P.J. and Ryland, J.S. (1990): *Handbook of the Marine Fauna of North-West Europe*. Oxford University Press. Oxford.

Khan, M.J., Abbas, A., Ayas, M., Naeem, M., Akhter, M.S. and Soomro, M.H. (2012) "Factors affecting wool quality and quantity in sheep". *African Journal of Biotechnology*, 11(73): 13761-13766.

Lemoine, X., Zeder, M.A., Bishop, K.J. and Rufolo, S.J. (2014): "A new system for computing dentition-based age profile in *Sus scrofa*". *Journal of Archaeological Science*, 47: 179-193. <https://doi.org/10.1016/j.jas.2014.04.002>.

Macedo, M. (1996): *Rei Dom Carlos: campanhas oceanográficas, estudo das colecções*. Edições Inapa. Lisboa.

Matos, R. de (2014): *Atlas dos Caracóis Terrestres e de Águas Doces e Salobras, Portugal Continental*. Edição da Autora. Lisboa.

Melo, A., Valério, P., Barros, L. and Araújo, M. (2014): "Práticas metalúrgicas na Quinta do Almaraz (Cacilhas, Portugal): vestígios orientalizantes". In A.M. Arruda (ed.): *Fenícios e Púnicos, por Terra e Mar. Actas do VI Congresso Internacional de Estudos Fenícios e Púnicos*. Centro de Arqueologia da Universidade de Lisboa. Vol. 2. Lisboa: 698-711.

Miguel, F. J. and Morales, A. (1983): "Informe de los restos faunísticos recuperados en el Cerro de Santa Ana (Entrena, Logroño)". *Berceo*, 1: 49-165.

Miguel, F. J. and Morales, A. (1986): "Nuevas recuperaciones de fauna en el yacimiento del Cerro de Santa Ana (Entrena, La Rioja)". *II Coloquio de historia de La Rioja*, vol. 1: 103-111.

Olaio, A. (2018): "O povoado da Quinta do Almaraz (Almada, Portugal) no âmbito da ocupação do Baixo Tejo durante o 1º milénio a.n.e.: os dados do conjunto anfórico". *Spal*, 27(2): 125-163. <doi: https://doi.org/10.12795/spal.2018i27.18>.

Olaio, A., Angeja, P., Soares, R. and Valério, P. (2019): "A ocupação da Idade do Ferro de Cacilhas (Almada, Portugal)". *Onoba*, 7: 133-159. <http://dx.doi.org/10.33776/onoba.v7i0.3398>.

Olaio, A., Henriques, F. and António, T. (2020): "Singularidades de uma matriz comum: arquitectura e urbanismo orientalizante na Quinta do Almaraz (Almada, Portugal)". In S. Celestino Pérez and E. Rodríguez (eds.): *Actas IX Congreso Internacional de Estudios Fenicios y Púnicos*. MYTRA, 5. Instituto de Arqueología de Mérida. Mérida: 1795-1803.

Payne, S. (1969): "A metrical distinction between sheep and goat metacarpals". In P.J. Ucko and G.W. Dimbleby (eds.): *The domestication and exploitation of plants and animals.* Duckworth. London: 295-305.

Payne, S. (1985): "Morphological distinctions between the mandibular teeth of young sheep, *Ovis*, and goats, *Capra*". *Journal of Archaeological Science,* 12: 139-147.

Payne, S. (1987): "Reference codes for wear states in the mandibular cheek tooth of sheep and goats". *Journal of Archaeological Science*, 14: 609-614.

Portas, L., Farina, V., Vais, C. del, Carcupino, M., Gazza, F., Sanna, I. and Zedda, M. (2015): "Anatomical study of animal remains from Phoenician-Punic amphorae found in the Santa Giusta Pond, Sardinia (Italy)". *Journal of Biological Research*, 88: 5073: 166-169. <https://doi.org/10.4081/jbr.2015.5073>.

Rast-Eicher, A. and Jørgensen, L.B. (2013): "Sheep wool in Bronze Age and Iron Age Europe". *Journal of Archaeological Science*, 40: 1224-1241. <https://doi.org/10.1016/j.jas.2012.09.030>.

Roselló, E. and Morales, A. (1994): *Castillo de Doña Blanca: Archaeo-environmental investigations in the Bay of Cádiz, Spain (750-500 B.C.).* BAR International Series, 593. <https://doi.org/10.30861/9780860547679>.

Ryder, M.L. (2001): Fibres in Iron Age Textiles from the Dürrnberg (Austria). *Archaeological Textiles Newsletter,* 33: 2-5.

Saldanha, L. (2003): *Fauna submarina atlântica*. 4ª edição. Publicações Europa-América. Lisboa.

Serdar, S., Lök, A., Köse, A., Yildiz, H., Acarli, S. and Goulletquer, P. (2007): "Growth and survival rates of carpet shell clam (*Tapes decussatus* Linnaeus, 1758) using various culture methods in Sufa (Homa) Lagoon, Izmir, Turkey". *Aquacultural Engineering*, 37: 89-99. <https://doi.org/10.1016/j.aquaeng.2007.02.004>.

Valenzuela-Lamas, S. (2020): "Colonos, mestizaje y ritmos de cambio en la dieta cárnica en las colonias fenicias de Occidente". In C. Gómez-Bellard, G. Pérez-Jordà and A. Betí (coords.): *La alimentación en el Mundo Fenício-Púnico: Producciones, Procesos y Consumos*. Editorial Universidad de Sevilla. Sevilla: 129-141.

CuPAUAM 48|2| (2022). 135-155
https://doi.org/10.15366/cupauam2022.48.2.005
ISSN 0211-1608, ISSN Digital: 2530-3589

Vilela, H. (1950): *Vida bentonica de Tapes decussatus (L.).* Travaux de la Station de Biologie Maritime de Lisbonne: Estação de Biologia Marítima, 53. Museu Bocage. Lisboa.

Zeder, M.A. (2006): "Reconciling rates of long bone fusion and tooth eruption and wear in sheep (*Ovis*) and goat (*Capra*)". In D. Ruscillo (ed.): *Recent advances in ageing and sexing animal bones.* Oxbow Books. Oxford: 87-118.

Zeder, M.A. and Lapham, H.A. (2010): "Assessing the reliability of criteria used to identify post-cranial bones in sheep, *Ovis*, and goats, *Capra*". *Journal of Archaeological Science*, 37: 2887-2905. <https://doi.org/10.1016/j.jas.2010.06.032>.

Zeder, M.A. and 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. <https://doi.org/10.1016/j.jas.2009.10.002>.

Zeder, M.A., Lemoine, X. and Payne, S. (2015): "A new system for computing long-bone fusion age profiles in *Sus scrofa*". *Journal of Archaeological Science*, 55: 135-150. <https://doi.org/10.1016/j.jas.2014.12.017>.