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## **Humans, macromammals and microvertebrates during Pleistocene and Holocene in Praileaitz I cave (Deba, northern Iberian Peninsula)**

Naroa Garcia-Ibaibarriaga, Jone Castaños, Aitziber Suarez-Bilbao, Pedro Castaños, Salvador Bailon, Xabier Peñalver, Sonia San José, José Antonio Mujika, Juan Rofes, Xabier Murelaga

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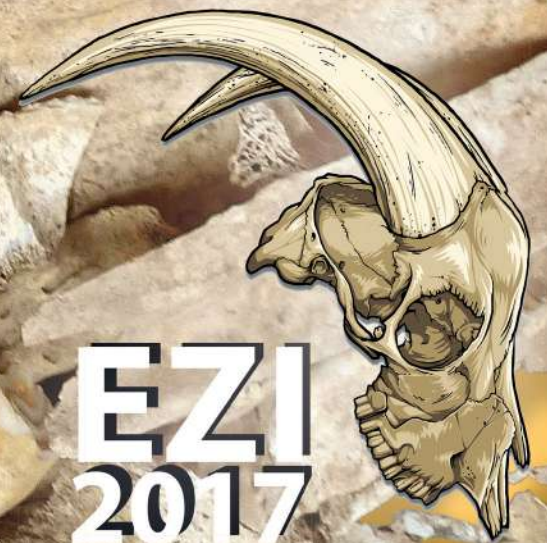
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# New Trends in Iberian Zooarchaeology

MARIA JOAO VALENTE  
CLEIA DETRY  
CLAÚDIA COSTA  
(eds.)



**EZI**  
**2017**

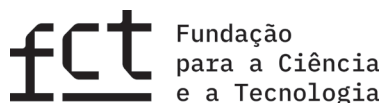
# New Trends in Iberian Zooarchaeology

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Centro de Estudos  
em Arqueologia  
Artes  
e Ciências do Património



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# FOREWORD OF THE EDITORS

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In recent decades, there have been great developments in the study of past human-animal interactions, clearly demonstrated by the influx of researchers to the Meeting of Iberian Zooarchaeology (EZI, or *Encontro de Zooarqueologia Ibérica*), held April 2017 in Faro, Portugal. Its organisation was a joint effort of three Portuguese Research & Development Units in Archaeology – CEAACP<sup>1</sup>, ICArEHB<sup>2</sup> and UNIARQ<sup>3</sup> – and was hosted by the University of Algarve. This volume, entitled *New Trends in Iberian Zooarchaeology*, is the final product of that meeting.

One of the highlights of EZI 2017 was the closing keynote given by Arturo Morales, Full Professor at the Universidad Autónoma de Madrid, and a researcher with vast experience. That keynote serves as the basis for the first text of this volume. Here, Morales leads the reader on a brief yet motivating chronological journey through the development of zooarchaeology as a discipline in the Iberian Peninsula from 1975 to the present day, following his personal experiences in the field.

After this introduction, the articles begin with a set dedicated to prehistory. Naroa Garcia-Ibaibarriaga and colleagues summarise what is known for the Praileaitz I, a cave located in the Basque Country, throughout the Solutrean to the Epipaleolithic sequence. Esteban Álvarez-Fernández and colleagues review zooarchaeological materials (both molluscs and vertebrates) from an intervention carried out in the 1930s at Cova del Solà del Pep and give us a glimpse into the final phase of the Mesolithic period in Catalonia. The paper presented by Nelson Almeida and colleagues focus on two cave assemblages located in central Portugal dominated by leporid remains. Their article explores the possibility that such remains were accumulated by non-anthropogenic agents, namely carnivores, despite the well-documented human occupations in the caves. Carlos Pimenta and colleagues analyse the small vertebrates from the Chalcolithic site of Penedo do Lexim, located in Portuguese Estremadura. Using the Habitat Weighting Method, and comparing its results with other Chalcolithic sites in the region, they were able to identify the coexistence of two bioclimatic domains (Atlantic and Mediterranean).

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1. Universidade do Algarve; CEAACP – Centro de Estudos de Arqueologia, Artes e Ciências do Património.

2. ICArEHB – Interdisciplinary Center of Archaeology and Evolution of Human Behaviour.

3. UNIARQ – Centro de Arqueologia da Universidade de Lisboa.

Finally, Rafael Martínez Sánchez and Dolores Ruiz Lara present the study of fauna recovered in two ditches at La Minilla (Córdoba) during the Middle-Late Copper Age. These materials show features indicative of possible “banquets” (i.e., collective consumption during a festive occasion).

Next, we explore protohistory, starting with Íris Dias and colleagues describing fauna from the Late Bronze Age of Outeiro do Circo in South interior Portugal. The assemblage is dominated by domestic animals and hunting seems to have been a minor activity. Rafael Bolado and colleagues present the zooarchaeological results of El Ostrero, a shell midden located in Cantabria and dated between the eighth and fourth century BC. In addition to cattle, pigs, sheep and goats, they recorded the abundance of oysters collected in an estuary.

Ana Beatriz Santos and Nuno Mota describe a small assemblage dating from the first and second centuries AD in downtown Lisbon, an area with few zooarchaeological studies from the Roman period. Domestic animals such as cattle, caprine and swine dominate the collection, in addition to a significant presence of red deer which, together with leporids, is indicative of wild game in the Roman *Olisipo*. From the North of Portugal, Vera Pereira and colleagues describe a faunal assemblage from Torre Velha (Castro das Avelãs), near Bragança, in the Roman province of *Gallaecia*, a region with few known faunal data so far. This is the territory of the Zoelas, and the materials date from the first and second centuries AD, the first phase of Roman occupation. Livestock is abundant, but hunted game is also present (leporids, red deer and red partridge). Thierry Argant describes more than two thousand faunal remains, most from unclassified mammals, from another Portuguese site also in Northern Portugal: Vale do Mouro (Meda). The fauna comes from the last phases of occupation of a Roman villa in the fourth century AD. The identified fauna is quite diverse, both domestic and wild. The author suggests that some animals, such as cattle, were obtained through a network with other local settlements.

For the Medieval period, Patrícia Aleixo and colleagues present a classic study on materials collected in an intervention carried out in the city of Loulé (Southern Portugal) with Almohad chronology. The faunal assemblage is unusual for the area and period, displaying a large number of red deer and rabbit remains. The authors suggest the deposits may result, at least partially, from unusual (perhaps festive) meals. Idoia Grau and colleagues studied an unusual assemblage from Vitoria-Gasteiz (province of Álava, Basque Country, Spain), dated from the 13th and 14th centuries. It mainly consisted of sheep and goat horncores for manufacturing handles or other objects at an iron-working workshop.

The last two articles concern methodological issues. Esteban García-Viñas and colleagues write of their experience of immersing modern bones in seawater to study the taphonomic processes (erosion and chemical change) in the fauna collected in two shipwrecks dated from the 16th and 17th centuries and located in the Bay of Cádiz.

In all, this volume shows the diversity of themes in Iberian zooarchaeology, one of the greatest values of the EZI conferences. We hope it will be a valuable contribution to the knowledge of zooarchaeology in the Iberia Peninsula.

Maria João Valente  
Cleia Detry  
Cláudia Costa

Loulé, Lisbon and Faro, September of 2022





1. General photo of the participants at EZI 2017; 2. Opening session (April 26th); 3. Opening keynote (April 26th) by Marta Moreno García; 4. General view of the participants during the oral presentations; 5. Official reception at the cloister of the Convent of Our Lady of the Assumption in Faro, offered by the Municipal Museum of Faro; 6. Researchers having a good time at the reception; 7. General view of the posters presented at EZI 2017; 8. The Organizing Commission addressing the participants.



9. One of the coffee-breaks (28th April); 10. Closing keynote (28th April) by Arturo Morales Muñoz; 11. Official dinner at the Market of Loulé (28th April), offered by the Municipality of Loulé; 12. Another view of the official dinner; 13. Photo of the EZI 2017 participants (Campus of Gambelas, University of Algarve, Faro).

# HUMANS, MACROMAMMALS AND MICROVERTEBRATES DURING PLEISTOCENE AND HOLOCENE IN PRAILEAITZ I CAVE (DEBA, NORTHERN IBERIAN PENINSULA)

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## Abstract

Praileaitz I cave is located on the northern Iberian Peninsula and preserves a long sedimentary deposit spanning between 21 and 10 ka BP. Excavated since 2000, the use of the cave by humans seem to be different from other caves known in the Basque Country. The Lower Magdalenian singular anthropic remains suggests that this space would have been occupied most probably for worship activities instead of most common domestic purposes. The study of both macromammal and microvertebrate remains stresses the common use of this cave by both carnivores and avian predators.

## Keywords

Cave-use, Vertebrates, Palaeoenvironment, Upper Palaeolithic, Epipalaeolithic, Cantabrian Range.

## Introduction

The Vasco-Cantabrian region is worldwide known for its rich Palaeolithic archaeological heritage. The archaeological record shows that the population of the time display a certain interest in transcendental matters, as the abundant and variety of rock and cave art manifested – places like Ekain (Ochoa et al. 2018), Danbolinzulo (Iriarte-Chiapusso et al. 2015) or Astuigaina (Iriarte-Chiapusso et al. 2017), among others. In Praileaitz I cave (Deba, northern Iberian Peninsula), archaeological remains such as lithic industry, stone tools and faunal remains are scarce when compared with other archaeological sites in the region – as those of Amalda (Altuna et al. 1990), Ekain (Altuna and Merino 1984), Santimamiñe (López-Quintana et al. 2011), among others. On the contrary, pigments, personal ornaments, and hearths are well represented (Peñalver et al. 2017a). All the evidence may suggest that ritual activities could have been performed in this cave although we can only guess the what they consisted of.

The excavations carried out between 2000 and 2009 in Praileaitz I cave revealed a singular sequence for the Vasco-Cantabrian region of Spain. The detailed results of these investigations were recently published in a monograph (Peñalver et al. 2017a). This paper presents the first archaeozoological synthesis combined with the data provided by other archaeological records (i.e. tools and ornaments).

Data will be compared with anthracological and palynological data from Praileaitz I cave in order to synthesize the study of palaeoenvironmental and archaeological information and reconstruct the occupational history of this unique cave.

## General setting and site description

The archaeological site of Praileaitz I is located in the municipality of Deba (Gipuzkoa, northern Iberian Peninsula), in the lower part of the Deba river valley (Figure 1a). It is located at 55 m.a.s.l, on the right bank of a meander formed near the mouth of the river. The cave opens onto the NE side of the Praileaitz hill, which is practically destroyed due to the presence of an active quarry (Figure 1b). From a geological point of view, the site is located in an area characterized by Aptian-Albian (Cretaceous) shelf carbonates with rudists (Urgonian Complex). The scarce vegetation of the area is composed mostly of Cantabrian Holm oak and mixed Atlantic Forest, together with large *Pinus radiata* plantations (Peñalver et al. 2017a).

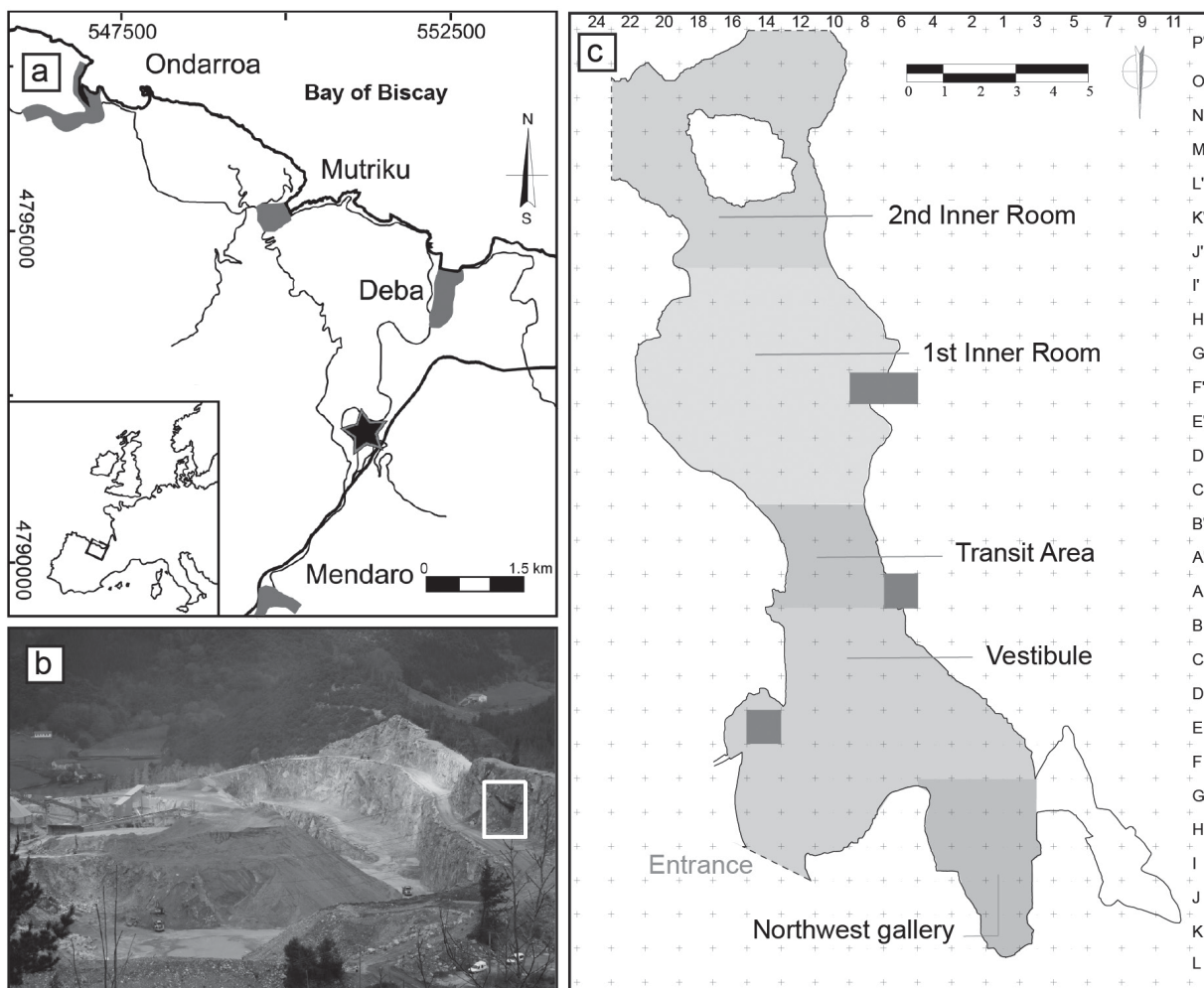


Figure 1 - Location and general view of the site. a: Geographical location of Praileaitz I cave (Deba, Basque Country). b: General view of the limestone quarry in which the site is located. On the right, framed in white, you can see the exact location of the cavity. c: Plan view of Praileaitz I Cave (Deba, Basque Country). In dark grey the location of the squares where the sedimentological samples were retrieved.

The entrance of the cave, oriented NW, has a triangular shape and is 6 m high and 2.5 m wide at the base (San Jose et al. 2017). The cave runs approximately 100 m long in NE direction, and is divided into three independent, semi-circular, chambers joined by sub-horizontal vestibules. The entrance opens to a vestibule (an area of 34 m<sup>2</sup> and a maximum height of 10.4 m), where the most complete stratigraphic sequence has been recorded. On the northwest, there is a small gallery named Northwest Gallery. To the south of the Vestibule, there is the access to the 1st Inner Room, of 43 m<sup>2</sup>, 7 m diameter, and a maximum height of about 2.25 m (Figure 1c). The 2nd Inner Room (42 m<sup>2</sup> and a maximum height of 1.57 m) was completely covered by a stalagmitic crust. From this point, the cavity extends into various galleries that have not been excavated but contain cave paintings (García-Diez and Ochoa 2017). These are a set of red dots and lines spread randomly over the surface that are traced with the fingers. They have been considered Palaeolithic without any other marker to specify more accurately their chronology.

The cave was discovered in 1983 by M. Sasieta and J. Arruabarrena, who carried out preliminary archaeological prospections during the 80s. These yielded scant lithic remains and some animal bones. Since 2000, and up to now, systematic excavations have been conducted focused on the use of the cave (Peñalver et al. 2017c).

## Material and methods

### Excavation

During 2000-2009 field seasons, about 191 m<sup>2</sup> from different areas of the cave were excavated using standard archaeological and palaeontological techniques (Peñalver et al. 2017b). In order to facilitate the understanding of the space, six excavation areas were defined: Ledge, Vestibule, Northwest gallery, Transit area between Vestibule and 1st Inner Room, 1st Inner Room and 2nd Inner Room (Figure 1b; see Appendix 1 for more information about the studied area). Since the works had been carried out in distant areas with different characteristics, the numbering of the layers do not correspond between zones, although they have been stratigraphically correlated with the establishment of standardized layers (see Appendix 2a and 2b).

More than 450 tool objects of a different kind were recovered (Mujika-Alustiza 2017), including 29 perforated, and mostly decorated, lithic and bone pieces (Peñalver and Mujika-Alustiza 2017).

### Chronology

Several samples from different fossiliferous layers and areas have been dated by different methodologies and laboratories (Peñalver et al. 2017b). The absolute datings obtained from bone remains or charcoal have been complemented with the archaeological information from the successive excavation campaigns. In this way, different phases of occupation have been identified, ranging from the Solutrean to the Epipalaeolithic (between 21 to 10 Ka BP; Appendix 3).

### Palaeontology

More than 25,500 macromammal complete or fragmentary bones and teeth were recovered at Praileaitz I cave. Each remain has been studied individually and identified anatomically and taxonomically whenever possible (Castaños and Castaños 2017). The quantification was defined by the number of remains (NR) and the minimum number of individuals (MNI). In the case of certain species (Spanish ibex, wolf

and chamois), the minimum number of elements (MNE) and the minimum number of animal units (MAU) have been also analysed. Bones were measured following Driesch (1976).

Since sampling for micropalaeontological analysis was not carried out, some of the samples taken for the sedimentological study have been used to recover disarticulated small vertebrate fragments (Table 1). The sediment was processed with the water-screening method using a 0.5 mm mesh. The fragments were identified following the general criteria of systematic palaeontology (e.g. Bailon 1991, 1999; Daams 1981; Heinrich 1978; Reumer 1984; Van der Meulen 1973). Specific attribution of the small vertebrates is based on the best diagnostic cranial and/or postcranial diagnostic element. The fossils were quantified using the MNI method, taking into account the side whenever possible. Additionally, with the fossil remains collected during excavation campaigns with a 2 mm sieve, we have estimated the distribution of remains throughout the Vestibule area, 1st Inner Room and 2nd Inner Room (García-Ibaibarriga et al. 2017). In order to reconstruct the environment at Praileaitz I cave, we used the MNI of each small mammal taxa and their relative proportion in the assemblage, considering the autoecological affinities of each taxon in accordance with Cuenca-Bescós et al. (2008), Pemán (1985), and Sesé (2005).

Identification	Standardized Layer	Area	Chronology	Sediment weight
V1	1	Vestibule	Superficial	1998,1 g
V2	3	Vestibule	Superficial	
V3	5	Vestibule	Epipalaeolithic	
V4	7	Vestibule	Epipalaeolithic	
V5	9	Vestibule	Epipalaeolithic	
V6	11	Vestibule	Lower Magdalenian	
V7	11	Vestibule	Lower Magdalenian	
S1	7	1st Inner Room	Lower Magdalenian	1336,1 g
S2	7	1st Inner Room	Lower Magdalenian	
S3	13	1st Inner Room	Solutrean	

Table 1 - Relation of the acronyms used for each small vertebrate sample from Praileaitz I cave (Deba, Basque Country), their stratigraphic location, chrono-cultural attribution and weight of the sediment.

## Results

### Macromammals

Out of +255,500 macromammal remains studied, 20.5% could be identified at the genus and/or species level (Castaños and Castaños 2017). Regarding the distribution of the remains according to areas (Table 2), the largest assemblage of remains (both determined and not determined) was recovered at the Vestibule (NR = 11.670, Identified NR= 2373). On the contrary, the Transit area has provided the smallest amount of remains (NR = 908, of which 82 were determined).

The 5247 remains identified correspond to 22 species, being ungulates the most abundant group (NR = 3690), represented by seven species (Figure 2, Table 2). The assemblage is dominated by *Capra pyrenaica* (NR = 2282), especially in the Solutrean and Lower Magdalenian levels of the Vestibule, Transit area and 1st Inner Room. Most of these remains (77.3%) correspond to immature individuals (i.e. infantile, juvenile and subadult age groups). Large bovids and reindeer are barely represented, while horse and roe deer are each represented by four and one remain, respectively.

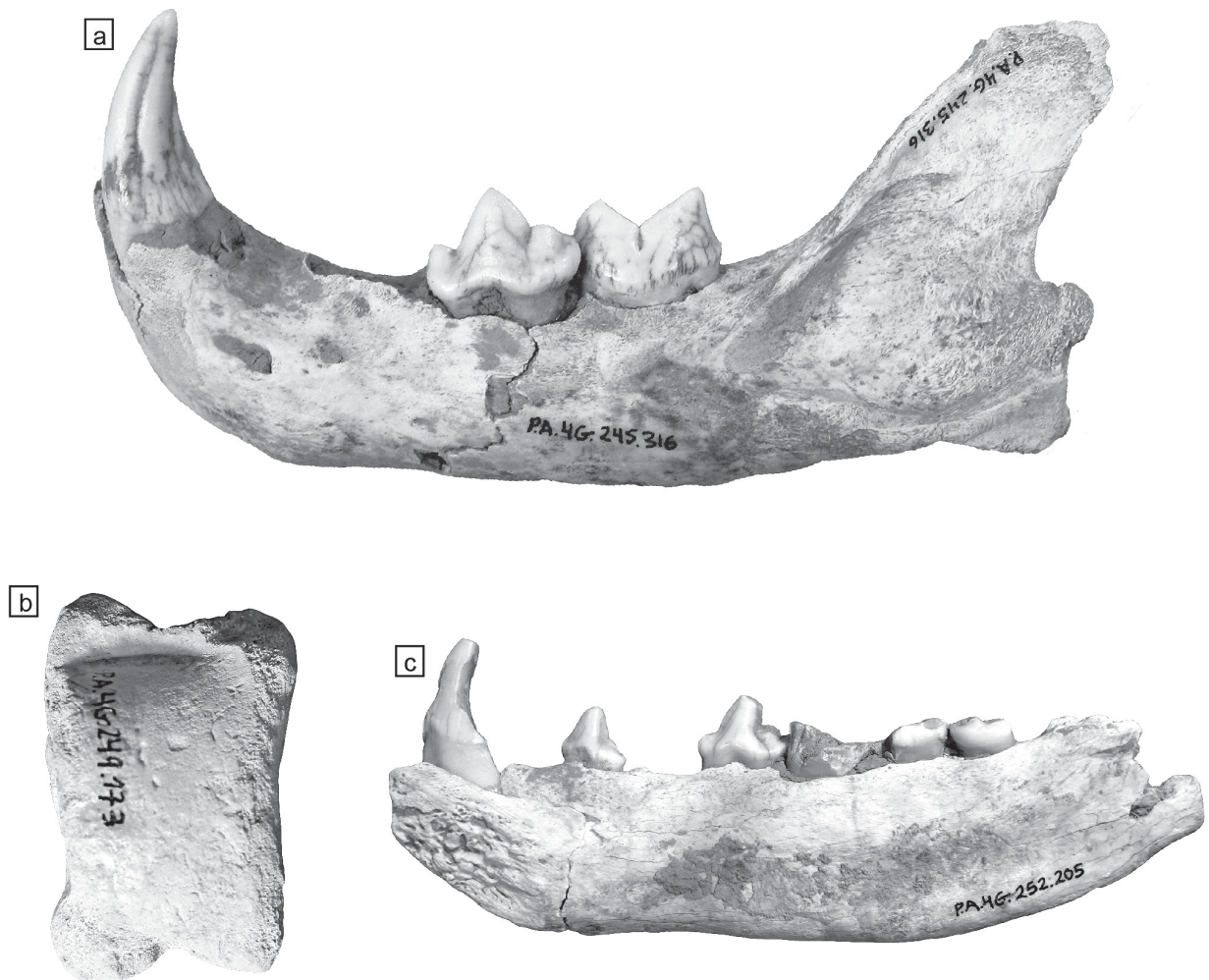


Figure 2 - Some large mammal fossil remains from Prailleitz I cave (Deba, Basque Country). a: *Panthera pardus* right mandible, labial view; b: *Cervus elaphus* left talus, plantar view; c: *Cuon alpinus* left mandible, lingual view.

Carnivores are worse represented in terms of the number of NR (1519) but are nonetheless taxonomically more diverse with fourteen species recorded (Figure 2, Table 2). Canids are the best represented predators in Prailleitz I cave with fox as its main representative in all areas and levels, followed by felids. The presence of the mustelids is practically testimonial

Taphonomic analysis of macromammals evidenced that almost of the ungulates' long bones are mostly complete and exhibit gnawing marks, especially in the epiphyses. More than 80% of the bones and teeth correspond to infant or juvenile individuals of deer, goat and Pyrenean chamois. Therefore, the assemblage has little or nothing to do with an accumulation of bones as result of a human consumption. In addition, the relative frequency of carnivores in the Ledge (NR = 25.8%) and the Vestibule (NR = 31%) is similar to that identified at other deposits that served exclusively as carnivore dens, such as Sima de Labeko Koba and Unikoté I (Castaños and Castaños 2017). Furthermore, the anatomical representation of carnivores indicates that most animals died in the cave, while in the case of the ungulates the skeleton is not complete, in view of the almost complete absence of backbones and ribs. For these reasons, we consider the large mammal assemblage of Prailleitz I primarily related with the predatory activity of different carnivores, mostly with canids. In general, human action is barely observed on bones.

Area	Ledge		Vestibule		NW gallery		Transit area		1st Inner Room		2nd Inner Room	
	NR	MNI	NR	MNI	NR	MNI	NR	MNI	NR	MNI	NR	MNI
<i>Equus ferus</i>	-	-	4	3	-	-	-	-	-	-	-	-
<i>Bovini</i> sp.	18	4	5	3	1	1	-	-	-	-	4	1
<i>Capra pyrenaica</i>	182	11	1115	21	454	7	46	4	119	6	366	5
<i>Rupicapra pyrenaica</i>	256	11	300	10	103	3	3	1	18	3	30	2
<i>Cervus elaphus</i>	76	5	321	12	142	4	7	2	45	4	63	3
<i>Rangifer tarandus</i>	2	1	3	3	2	1	3	2	1	1	1	1
<i>Capreolus capreolus</i>	-	-	1	1	-	-	-	-	-	-	-	-
<i>Ursus arctos</i>	-	-	14	2	-	-	-	-	-	-	7	1
<i>Ursus spelaeus</i>	26	4	6	4	2	1	-	-	-	-	60	3
<i>Ursus</i> sp.	-	-	-	-	-	-	-	-	-	-	18	2
<i>Crocota crocuta</i>	9	3	-	-	-	-	-	-	-	-	5	1
<i>Panthera pardus</i>	8	2	6	1	13	1	1	1	2	1	-	-
<i>Lynx lynx</i>	7	2	24	3	4	1	2	2	-	-	2	1
<i>Lynx spelaeus</i>	-	-	3	1	-	-	-	-	-	-	-	-
<i>Lynx</i> sp.	-	-	23	4	-	-	-	-	8	2	-	-
<i>Felis silvestris</i>	1	1	2	1	-	-	-	-	-	-	1	1
<i>Canis lupus</i>	96	5	242	8	182	4	6	2	13	2	19	1
<i>Cuon alpinus</i>	7	2	17	4	8	2	-	-	-	-	-	-
<i>Vulpes vulpes</i>	42	3	281	11	198	8	14	2	61	3	69	1
<i>Meles meles</i>	2	1	-	-	-	-	-	-	-	-	-	-
<i>Mustela nivalis</i>	-	-	2	2	-	-	-	-	-	-	2	1
<i>Mustela putorius</i>	1	1	-	-	-	-	-	-	-	-	-	-
<i>Mustela erminea</i>	-	-	2	1	1	1	-	-	-	-	-	-
<i>Marmota marmota</i>	15	-	2	-	19	5	-	-	-	-	1	1
<b>TOTAL</b>	<b>748</b>	<b>56</b>	<b>2373</b>	<b>95</b>	<b>1129</b>	<b>39</b>	<b>82</b>	<b>16</b>	<b>267</b>	<b>22</b>	<b>648</b>	<b>25</b>

Table 2 - Number of remains (NR) and minimum number of individuals (MNI) of macromammals from Praileaitz I cave (Deba, Basque Country).

### Small vertebrates

Based on the residue extracted for the sedimentological study, we studied the small vertebrate assemblage from the Solutrean to the Mesolithic periods (García-Ibaibarría et al. 2017). The assemblage comprises 83.662 identified and unidentified disarticulated bone fragments (teeth, isolated mandibles, skull fragments, and postcranial bones). The identified assemblage at the genus and/or species level correspond to 676 individuals (MNI), representing a total of 18 taxa (Figure 3 and 4; Table 3).

When relative proportions of the different skeletal elements are observed, it is possible to differentiate two groups in the assemblage. In one group (samples from the 1st Inner Room and V1 and V2) all the skeletal elements are represent, whereas in the second group some of them are missing (samples V3, V4 and V5). The relative proportion of isolated teeth is higher in the first group (nearly 60% of the remains). Regarding the distribution of the remains, in the Vestibule they were accumulated only in some squares, most probably related with the fact that birds of prey concentrate pellets around their nesting and roosting sites. On the contrary, in the inner rooms and samples V3, V4 and V5, bones and teeth are randomly distributed, suggesting a water flow transport of these remains from the Vestibule.

The assemblages from each area of the cave provide evidence of different palaeoenvironments depending on the chronology. The samples from the 1st Inner Room (Solutrean and Lower Magdalenian)



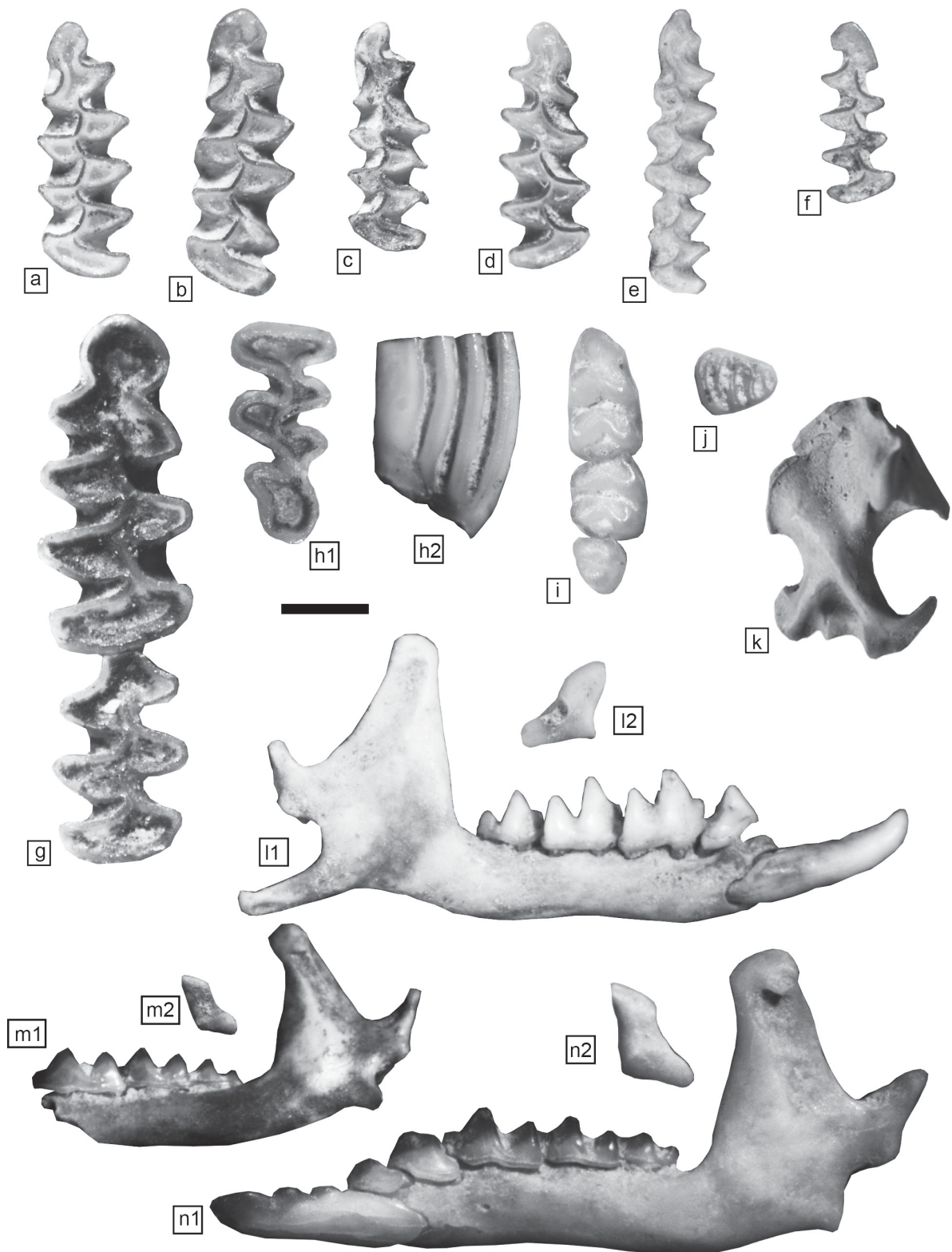


Figure 3 - Some small mammal fossil remains from Praileaitz I cave (Deba, Basque Country). a-b: *Microtus* (*Microtus*) *arvalis* left m1; c: *Microtus* (*Microtus*) *agrestis* left m1; d: *Microtus* (*Terricola*) sp. right m1; e: *Microtus* (*Alexandromys*) *oeconomus* left m1-2; f: *Chionomys nivalis* left m1; g: *Arvicola amphibius* right m1-2; ha-h2: *Clethrionomys glareolus* right m3; i: *Apodemus sylvaticus-flavicollis* right m1-3; j: *Glis glis* right p4; k: *Talpa* sp. right humerus; l1-l2: *Crocidura russula* right mandible and; m1-m2: *Sorex minutus* left mandible and condyle; n1-n2: *Sorex araneus-coronatus* left mandible and condyle. Scale bars = 1 cm (figure k) and 1 mm (other figures).

Area	Vestibule							1st Inner Room				
	V1	V2	V3	V4	V5	V6	V7	S1	S2	S3		
Identification	NR	MNI	NR	MNI	NR	MNI	NR	MNI	NR	MNI	NR	MNI
<i>Arvicola cf. sapidus</i>	1	1	-	-	-	-	-	-	-	-	-	-
<i>Arvicola amphibius</i>	-	-	-	-	-	-	-	-	1	1	6	4
<i>Microtus (Microtus) agrestis</i>	-	-	-	-	-	-	32	21	-	-	3	2
<i>Microtus (Microtus) arvalis</i>	-	-	-	-	-	-	284	161	1	1	25	14
<i>Microtus (Terricola) sp.</i>	1	1	-	-	-	-	41	27	1	1	28	17
<i>Microtus (Alexandromys) oeconomus</i>	1	1	-	-	-	-	31	18	4	3	49	27
<i>Clethrionomys glareolus</i>	4	1	-	-	-	-	-	-	-	-	-	-
<i>Chionomys nivalis</i>	-	-	-	-	-	-	12	6	-	-	2	2
<i>Apodemus sylvaticus-flavicollis</i>	70	9	13	3	3	1	2	1	1	1	1	8
<i>Glis glis</i>	1	1	-	-	-	-	-	-	-	-	-	-
<i>Sorex araneus-coronatus</i>	-	6	10	1	2	1	-	-	-	41	-	4
<i>Sorex minutus</i>	-	1	-	-	-	-	-	-	5	-	1	-
<i>Crocidura russula</i>	-	8	-	-	-	1	-	-	-	-	-	-
<i>Talpa sp.</i>	-	-	-	-	-	-	-	-	-	-	2	-
<i>Rana temporaria-iberica</i>	-	-	-	-	-	-	22	3	-	-	19	3
<i>Bufo bufo</i>	-	-	-	-	-	-	-	-	2	1	-	-
<i>Alytes cf. obstetricans</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>cf. Lacerta</i>	1	1	-	-	-	-	-	-	-	-	-	-
<b>TOTAL</b>	79	30	23	4	5	3	2	1	1	1	422	282
	8	11	128	91	235	179	104	73				

Table 3 - Number of remains (NR) and minimum number of individuals (MNI) of small vertebrate species from Praileaitz I cave (Deba, Basque Country).

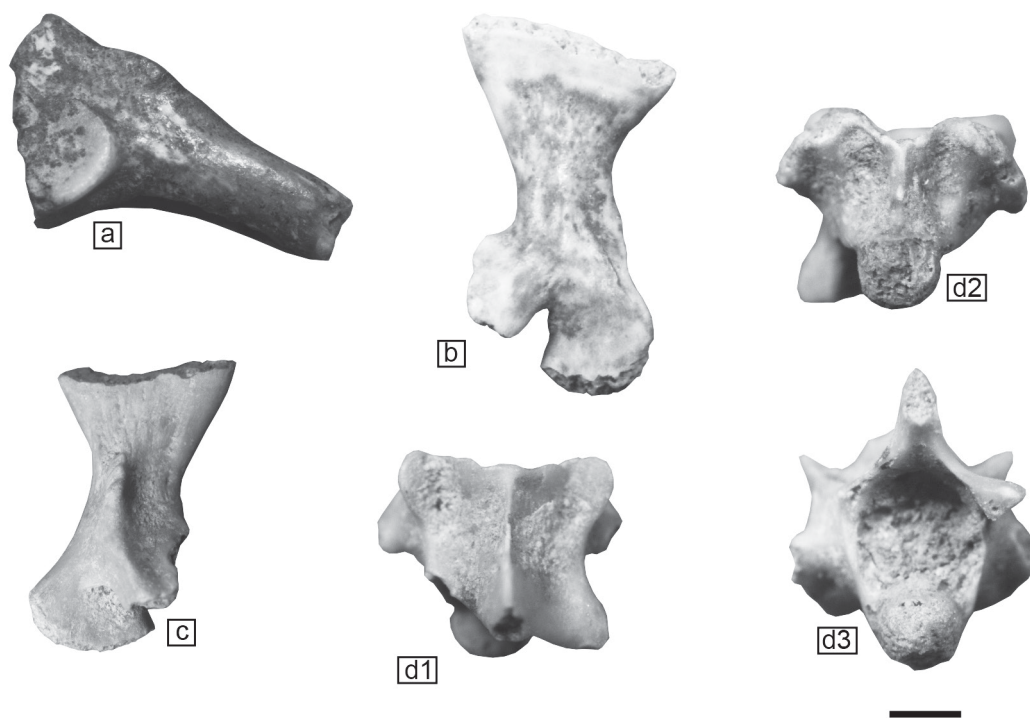


Figure 4 - Some amphibian and reptile fossil remains from Praileaitz I cave (Deba, Basque Country). a: *Alytes cf. obstetricans* right ilium; b: *Bufo bufo* left scapula; c: *Rana temporaria-iberica* right scapula; d1-d3: *cf. Lacerta* trunk vertebrae. Scale bars = 0.5 mm (figures a-b) and 1 mm (figures c-d).

are dominated by species associated with open humid areas, such as *Sorex araneus-coronatus* and *Microtus (Alexandromys) oeconomus*. These levels have provided the few amphibian and reptile remains recovered in the site. In the Vestibule, the open-meadow species are still dominant during the Lower Magdalenian, although *Microtus (Microtus) arvalis* prevails. Finally, during the Epipaleolithic, the few remains obtained belong to *Apodemus sylvaticus-flavicollis*, *Sorex araneus-coronatus* and *Talpa* sp., although the scarcity of the remains (MNI = 5) does not allow a proper palaeoenvironmental reconstruction.

### **Lithic and bone tools**

The number of recovered lithic objects is less than 100 remains at each level, making a total of 416 lithic artefacts (Mujika-Alustiza 2017). With the exception of 16 bone elements, flint is clearly the dominant raw material. They are generally well preserved, since only 12 cases (3.1%) display an intense patina (Tarrío Vinagre 2017). This raw material was collected mostly from the Flysch (NR = 306), Treviño (NR = 14), Urbasa (NR = 10), and Chalosse (NR = 8), although flint from two other North Pyrenees sites has been identified anecdotally (Tercis, NR = 3; Salies-de-Béarn, NR = 1). The functional analysis applied to the lithic remains from the Lower Magdalenian level reveal their use in butchering processes (Clemente Conte et al. 2017).

The bone industry is still more limited. It is worth highlighting a perforated baton found in the Vestibule because of its material (reed), shape (sinuous pattern) and the presence of two perforations (Mujika-Alustiza 2017). It belongs to the end of the Final Magdalenian or the beginning of the Epipalaeolithic (a bone sample from the same level was dated at 10740±50 BP).

### **Personal ornaments**

The recovery of a set of pendants made with river stones of unique shapes is of a great interest (D'Errico et al. 2017). All these remains correspond to the Lower Magdalenian, and they were found distributed throughout the Vestibule and the 1st Inner Room (Peñalver and Mujika-Alustiza 2017). Twenty-one of them present human-made perforations at one end, while other five display natural perforations. Additionally, 18 pendants were decorated with sets of notches on their edges or various patterns engraved on their flat faces. Fourteen elements were found in a series at the northwest of the 1st Inner Room, and considered as part of a necklace (Peñalver and Mujika-Alustiza 2017) or cloth decorating elements (D'Errico et al. 2017). Particularly noteworthy is a thin bright black pebble with a rhomboid shape, reminiscent of the rounded Palaeolithic 'Venus' figurines found in several locations throughout Europa (Peñalver and Mujika-Alustiza 2017).

## **Discussion**

### **Palaeoenvironmental reconstruction**

The Praileaitz I cave sequence is associated with a period from the beginning of MIS2, as well as the beginning of the MIS1. The sedimentological, and biotic studies provide information about the changes in the environmental conditions throughout the stratigraphic sequence.

The charcoal data indicate the predominance of *Quercus* subg. *Quercus* in all the stratigraphic levels and a low taxa diversity (Ruiz-Alonso and Zapata 2017). This pattern suggests that the area was characterised by large forest masses of oaks. Based on ecological and biogeographical data, *Quercus* is well adapted to harsh climatic conditions, but in summer it requires moisture in the soil. Unfortunately,

too few pollen grains were recovered so that the study is considered statistically insignificant (fewer than 250 specimens) to make a comparison of palynological and anthracological records at Praileaitz I cave. The available data suggest the presence of open landscape with low forest cover dominated by pine during the Solutrean, and low presence of juniper and birch (Iriarte-Chiapusso 2017).

The microvertebrate assemblage attests all throughout the sequence to an environment clearly dominated by open landscape (García-Ibaibarriaga et al. 2017), although there is a clear increase in the arboreal component from the base of the sequence (sample S3) to the top (samples V1 and V2), as suggested by the notorious increase of *A. sylvaticus-flavicollis*. Cold, rigorous climatic conditions during the Solutrean (sample S3) are evidenced also by the presence of the willow ptarmigan (*Lagopus lagopus*; Moreno-García 2017), species considered as indicative of cold climate during the Quaternary (Mourer-Chauvire 1993). The samples dated to the Lower Magdalenian (sample S2, S1, V7 and V6) indicate slightly warmer conditions. The few small vertebrates present in the Epipalaeolithic levels (*A. sylvaticus-flavicollis*, *S. araneus-coronatus* and *Talpa* sp.) can be associated with dense forest areas.

The most abundant species among the ungulate remains are the Iberian ibex (*Capra pyrenaica*) and the chamois (*Rupicapra pyrenaica*), especially in the Solutrean and Lower Magdalenian levels. This is in agreement with the cave location in a rocky, mountainous area (Castaños and Castaños 2017) and the general climatic conditions. In terms of abundance, they are followed by red deer, which mostly inhabits open deciduous woodland or broadleaved woodland interspersed by large meadows (Lovari et al. 2016). In addition, cold-adapted species such as the reindeer (*Rangifer tarandus*) have been identified in levels with harsh climatic conditions, especially during the Solutrean.

### Site function

The position of Praileaitz I is somehow strategic because of its location close to the coast corridor (currently flooded), which probably was used by hunter-gatherer groups as a transit area (Edeso-Fito and Mujika-Alustiza 2017). Human occupations of the cave were sporadic and most probably of seasonal character, as it is suggested by the abundance of carnivores throughout the entire stratigraphic sequence.

The first well contextualized human evidences at Praileaitz I cave correspond to Solutrean and Magdalenian periods. The lithic and bone industry is rather scarce, but clearly attributable due to the recovery of remains assigned to these periods by their techno-typology. Because of this reason, Praileaitz I cave was probably used as a secondary settlement, dependent or related to other caves. In this way, the near sites of Urtiaga (Mujika-Alustiza 1993) or Ermitia (Esparza and Mujika-Alustiza 1999) have yielded more archaeological remains, despite the fact they have been also considered as seasonal settlements.

Human occupation of the cave during the Lower Magdalenian remains sporadic, and not consistent with the characteristics of the hunting sites. No raw material processing sequence has been identified, neither other activities such as carcass processing. However, singular characteristics seem to occur. In this period, the Vestibule seem to have worked as the main occupational area, where a soil formed by abundant clasts of limestone of small size was probably created by anthropic activity (Peñalver et al. 2017c). Additionally, and distributed among different areas inside the cave, a variety of ornamental elements of remarkable homogeneity was found, some of them located near a hearth. These all findings do not seem to have a direct relationship with daily life, and might maybe they respond to worship activities that we are not able to fully identify at this point (Peñalver et al. 2017c).

All in all, the cavity seem to have been recurrently visited but always sporadically during the Upper-Final Magdalenian and Epipalaeolithic. This explains the scarce human activity, which was apparently restricted to the Vestibule, Transit Area and the 1st Inner Room.

## Conclusions

Praileaitz I cave (Deba, Gipuzkoa) offer a remarkable sequence that begins in the Solutrean and spans to the Lower Magdalenian, Upper-Final Magdalenian and Epipalaeolithic.

According to the taxonomic and chronological information from the different areas of the site, human presence in the cavity has been very sporadic, occasional, with short periods of occupation as suggested by the low number of industrial remains, slightly manipulated fauna and the low diversity of wood used as fuel. During uninhabited periods on the part of humans, the cavity was used as a den of different carnivores and as a birds of prey shelter. Therefore, it was used for short-term occupations involving few individuals and alternating with animal predators occupations, similar to what happens in relatively close deposits such as Astigarraga, Ekain, Amalda, Zerratu, Labeko Koba or Lezetxiki. The archaeological sequence described for the Lower Magdalenian depicts a more complex use of the cave, since the singularity of the remains (a large number of decorated pendants of unique characteristics, the formation of a soil and the reduced number of evidences recovered) pointed out that this space would have been occupied for non-domestic purposes, probably related to ritual activities.

The palaeoenvironmental reconstruction reported in this study indicates that hard and cold climatic conditions dominated at the base of the sequence, i.e. Solutrean, with significant humidity variations. These conditions seem to persist during Lower Magdalenian, though a trend towards a decrease in environmental humidity is observed. Finally, the arboreal component increases during the Epipalaeolithic, stablishing forest or woodland landscape.

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## APPENDIX 1. STUDIED AREAS

### Ledge

It represents the area located to the East of the entrance. Nineteen layers of 2 cm were excavated in 22 squares of 1x1 m, identifying six stratigraphic levels (named I-VI). Given the scarcity of lithic tools, it was not possible to establish a well-defined chronocultural sequence. Even so, two distinct phases were identified: the upper dated to Azilian-Final Magdalenian and the lower dated to the beginning of Upper Palaeolithic (40,225–38,853 cal BP).

### Vestibule

This is a zone in which the excavation area has been widened on several occasions, especially after the removal of a large block of stone that obstructs part of the entrance. In total, 48 squares have been excavated in this area. The 26 layers were synthesized in seven archeostratigraphical layers (0-VI) that range from the Solutrean to the Epipalaeolithic.

### Northwest gallery

The excavated area affects to 17 squares. It has been excavated 19 layers that can be grouped into seven levels (levels I-VII). The accumulation of archaeological materials against the wall, and the specific characteristics of this space, suggest that the layers from this area do not have a direct relationship with those identified in the Vestibule, except for Level V (related with Level IV from the Vestibule).

### Transit area between vestibule and 1st Inner Room

Like the Vestibule, this zone was excavated in several phases of successive extensions. The excavated area has affected to 17 squares, including a hearth of large extension. The 26 layers can be grouped into five levels (I-V) that extended from Solutrean to Epipalaeolithic.

### 1st Inner Room

The archaeological works in this zone were carried out at 48 squares. Five levels (I-V) were differentiated in this room, which have been dug into 16 layers. Three of these levels have been ascribed to a cultural period: Epipalaeolithic (Level II), Lower Magdalenian (Level IV) and Solutrean (Level V).

### 2nd Inner Room

A large stalagmitic column occupies 10 squares, totally or partially, in the centre of the room. Even so, the excavated area has affected 42 squares. Eighteen layers, divided into nine stratigraphic levels, have been differentiated (levels I-IX). The deposit of this area may have been altered, with the sediment being probably transported by water flow from more outer areas of the cave.



## APPENDIX 2.

STANDARDIZED LAYER	EXCAVATED AREA												
	Ledge	Vestibule	Northwest gallery	Transit area	1st Inner Room	2nd Inner Room							
0		0			0								
1	I	I	I	I	I	I							
Concretion													
2	II	I	II		II	II	II						
3							III						
4	III	II	II			II	IV						
5								IV					
6	IV		III										
Concretion													
7	IV	II	IV	I	IV		IV						
8													
9	V	III	V	II		V	IV-V-VI						
10													
11		IV	VI				II	V	IV-V-VI				
12													
13					II				V	IV-V-VI			
14													
15	IV	VII	II	V		IV-VI							
16													
17	VI					II	V	VII					
18													
19					II			V	VIII-IX				
20	IV								II	V	VIII-IX		
21			II	V							IX		
22											II	V	
23		V				II	V						
24													
25					II			V					
26									II	V			

LEVEL	EXCAVATED AREA					
	Ledge	Vestibule	Northwest gallery	Transit area	1st Inner Room	2nd Inner Room
0		Mixed			Mixed	
I	Azilian-Final Magdalenian	Superficial	Epipalaeolithic-Lower Magdalenian	Superficial	Superficial	Epipalaeolithic
II	Azilian-Final Magdalenian	Epipalaeolithic	Epipalaeolithic-Lower Magdalenian	Epipalaeolithic	Epipalaeolithic	Epipalaeolithic
III	Azilian-Final Magdalenian	Upper-Final Magdalenian	Epipalaeolithic-Lower Magdalenian	Upper-Final Magdalenian		Epipalaeolithic
IV	Initial-Upper Palaeolithic	Lower Magdalenian	Epipalaeolithic-Lower Magdalenian	Lower Magdalenian	Lower Magdalenian	Epipalaeolithic
IV-V-VI						Epipalaeolithic
IV-VI						Epipalaeolithic
V	Initial-Upper Palaeolithic	Solutean	Lower Magdalenian	Solutean	Solutean	
VI	Initial-Upper Palaeolithic		Gravettian			
VII			Gravettian			Middle Palaeolithic
VIII						Solutean
IX						Solutean

### APPENDIX 3

Level	Area	Material	Lab. code	C14 Date	Cal BP	Cultural period
IV	2nd Inner Room	Charcoal	GrA-38340	8800±35	9940-9678	Epipalaeolithic
II	1st Inner Room	<i>Quercus</i>	GrA-28030	8840±45	10156-9734	Epipalaeolithic
II	1st Inner Room		GrA-38266	8845±40	10157-9740	Epipalaeolithic
IV	2nd Inner Room	Charcoal	GrA-38794	8925±40	10100-9914	Epipalaeolithic
II	Transit area	Charcoal	GrA-28028	8940±50	10216-9912	Epipalaeolithic
VIII	2nd Inner Room	<i>Quercus</i>	GrA-44404	8985±45	10238-10119	Epipalaeolithic
II	1st Inner Room	Charcoal	GrA-28031	9010±50	10250-10122	Epipalaeolithic
II	2nd Inner Room		GrA-38267	9200±40	10440-10248	Epipalaeolithic
IV	2nd Inner Room		GrA-38265	9225±40	10505-10260	Epipalaeolithic
II	Transit area	<i>Littorina saxatilis</i>	KIA-39657	9320±40	10660-10404	Epipalaeolithic
II	Transit area	<i>Littorina obtusata</i>	KIA-39658	10560±50	12662-12410	Epipalaeolithic
II	Vestibule		GrA-28029	10740±50	12738-12594	Epipalaeolithic
III	Vestibule	<i>Rangifer tarandus</i>	BETA 341897	12920±50	15666-15231	Upper-Final Magdalenian
IV	Vestibule	Bone	GrA-20462	14700±100	18153-17614	Lower Magdalenian
IV	Vestibule	Bone	BETA 162880	15190±50	18611-18310	Lower Magdalenian
IV	Vestibule	Bone	BETA 162880	15300±50	18720-18428	Lower Magdalenian
IV	Vestibule	Bone	GrA-20464	15460±100	18920-18516	Lower Magdalenian
IV	Vestibule		GrA-24685	15530±100	18982-18578	Lower Magdalenian
IV	Vestibule		GrA-24688B	15810±110	19396-18827	Lower Magdalenian
IX	2nd Inner Room	Baton	BETA 341898	17530±70	21440-20919	Solutrean
V	Vestibule	Bone	BETA 16279	17760±70	21785-21244	Solutrean
V	Vestibule	Bone	BETA 16279	17850±70	21860-21390	Solutrean
V	Vestibule		GrA-24687	19330±150	23680-22890	Solutrean
IV	Transit area	<i>Cervus elaphus</i>	BETA 341896	22900±110	27492-27004	Gravettian
VI	Northwest gallery		GrA-28025	25320±40	29774-28976	Gravettian
IV	Ledge	<i>Panthera pardus</i>	BETA 341895	35010±280	40225-38853	Chatelperronian
VII	2nd Inner Room	<i>Ursus spelaeus</i>	Racemization	50100		Middle Palaeolithic