

## Chapter 6

# New Contributions on Subsistence Practices during the Middle-Upper Paleolithic in Northern Spain

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### Introduction

Subsistence studies demand a cross-disciplinary analysis, incorporating spatial data about mobility, the management and acquisition strategies of raw materials, and a detailed examination of animal and plant resource exploitation. In this paper I analyze the different strategies chosen by hominids for animal acquisition in northern Spain during the Middle-Upper Paleolithic transition. The taphonomic studies presented here provide information from new sites, as well as an alternative interpretation for previously excavated ones, supplementing earlier research on the topic (Freeman 1973; Straus 1976, 1977, 1992; Bernardo de Quirós 1980, 1982; Altuna 1989, 1992; Yravedra 2002a, b).

Traditional studies of the Middle-Upper Paleolithic transition in northern Spain were based on a series of sites including Morín, Pendo, Castillo, Amalda, Lezetxiki and Axlór. The new sites discussed in this paper enlarge this list, incorporating Otero, Hornos de la Peña, Esquilleu and Covalejos. Furthermore, new taphonomic data from the caves of Morín, Cuco, Cofresnedo, Ruso and Amalda are considered.

Most previous work assumed that the faunal remains found in these sites were accumulated by human beings, suggesting that both Neanderthals and *Homo sapiens* practiced specific hunting behaviors (Altuna 1972, 1989, 1990, 1992; Freeman 1973; Straus 1976, 1977; Bernaldo de Quirós 1980), whereas scavenging was restricted to Neanderthals (Straus 1982, 1992; Klein and Cruz Uribe 1994). Nevertheless, these interpretations are problematic when taphonomic studies are incorporated, as exemplified by the case of Amalda.

At Amalda, chamois dominates the faunal record. Lately, Yravedra (2005, 2006a, 2007, 2009, 2010a, b) has questioned the classic interpretation of an anthropogenic origin for all faunal remains found at the site (Altuna 1990; Altuna and Mariezkurrena 2010). Based on a taphonomic analysis of the sample, in which an abundance of tooth and digestion marks—as well as an absence of cut and percussion marks—were identified on small-sized ungulates (the latter of which were otherwise frequent on larger ungulates), Yravedra concluded that although larger animals such as deer, horse and aurochs were consumed by humans, small animals such as chamois were not. However, there is little agreement on this topic. Some authors (e.g., Mallye et al. 2010) also question the degree of human involvement with the small-sized ungulates at Amalda and Noissier caves, while others (e.g., Altuna and Mariezkurrena 2010) support the idea of an anthropogenic origin for these animals.

Other Cantabrian sites present a varied situation. The fauna from some levels of Mirón has been interpreted as being accumulated by vultures (Marín-Arroyo et al. 2009), and in Lezetxiki cave and Esquilleu levels III-IV, carnivores seem to have had a great impact on the bone assemblage (Arrizabalaga et al. 2005; Yravedra 2005, 2006b). Pendo's record is not significant in this case due to serious stratigraphic problems, which resulted in a palimpsest of materials from many levels (Montes et al. 2005). On the other hand, new studies at Castillo, Morín 17 and Esquilleu VI-XXX confirm that humans played a significant role in animal resource accumulation (Martínez 1998; Dari 2003; Yravedra 2005, 2006b; Landry and Burke 2006).

Faunal remains from Paleolithic sites in northern Spain clearly require detailed taphonomic analyses in order to identify factors that may affect the interpretation of these assemblages. The taphonomic studies presented here aim at filling this gap, allowing for an analysis of subsistence behaviors in the Middle and Upper Palaeolithic in northern Spain, and a consideration of whether Neanderthal and *Homo sapiens* subsistence strategies were similar.

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I propose here another innovation in faunal studies for the area. So far, subsistence strategies in northern Spain have been considered at a general level, grouping a number of sites together (Altuna 1989, 1992; Straus 1992; Yravedra 2002a, b). In this paper, I analyze subsistence practices during the Middle and Upper Paleolithic from a particularistic perspective, selecting sites that cover the complete chronology and considering each site separately. After the individual analysis, however, the data is synthesized to describe general patterns for the whole period.

Thus, this paper enlarges on the small number of sites in northern Spain from which taphonomic data for the Middle and Upper Paleolithic are available—mainly Castillo (Dari 2003; Landry and Burke 2006) and Amalda caves (Yravedra 2005, 2007)—by presenting data from several sites with Mousterian and Aurignacian-Gravettian levels such as Otero, Morín, Ruso, Hornos de la Peña and Covalejos.

## Methods

Understanding taphonomy as the discipline that evaluates the multiple processes operating on any archaeological site, this paper presents the taxonomic and anatomical identification of the assemblages, an estimation of age and seasonality patterns and, finally, the taphonomic analysis of the aforementioned sites.

Regarding methodology, taxonomic identification was based on reference material and the models described by Lavocat (1966), Pales and Lambert (1971), Fernandez (2001), and Barba and Domínguez-Rodrigo (2005). Where exact taxonomic determination was not feasible, epiphysis and shaft fragments were assigned to approximate animal weight/size classes, separating then into three categories: (1) small-sized carcasses: <150 kg (i.e. *Capra pyrenaica*, *Rupicapra rupicapra*, *Capreolus capreolus*); (2) medium- and large-sized carcasses: >150 kg (i.e. *Cervus elaphus*, *Equus caballus*, *Bos primigenius*, *Bison priscus*); and (3) very large-sized carcasses: >800 kg.

The quantification of remains was based on the estimation of NISP and MNI in order to determine which measures better describe the taxonomic representation of the fauna. Both variables were also compared to describe their differences at each site. NISP determination follows Lyman's synthesis (1994), whereas MNI is based on Brain's (1969) model, which includes bone laterality and animal age. Furthermore, skeletal profiles and MNI calculation consider shaft thickness, section shape and the properties of the medullar surface (Barba and Domínguez-Rodrigo 2005).

Bones were divided into four anatomical regions: cranial (including antlers, skull, mandible and dentition), axial (vertebrae, ribs, pelvis and scapula, sensu Yravedra and

Domínguez-Rodrigo 2009), upper limbs (humerus, radius, ulna, femur, patella, fibula and tibia) and lower limbs (metapodials, carpals, tarsals, phalanges and sesamoids, sensu Blumenschine 1986). Additionally, a systematic examination of bone surface modifications such as cut, percussion and tooth marks was carried out with 10X–20X hand lenses and different types of lighting, as proposed by Blumenschine (1995). The diagnostic criteria defined by Bunn (1982) and Potts and Shipman (1981) guided the identification of cut marks. Tooth marks were recorded following Binford (1981) and Blumenschine (1988, 1995). Finally, percussion marks were identified according to Blumenschine and Selvaggio (1988), and Blumenschine's (1995) criteria.

For comparative purposes, surface modifications were recorded using the values for epiphysis and shaft areas defined by Blumenschine (1988, 1995). Modifications were also quantified by type of element and bone section (Domínguez-Rodrigo 1997; Domínguez-Rodrigo and Barba 2005), based on NISP values. The presence of tooth, percussion and cut marks was quantified for the total number of remains, whereas estimated percentages include only well-preserved bone surfaces.

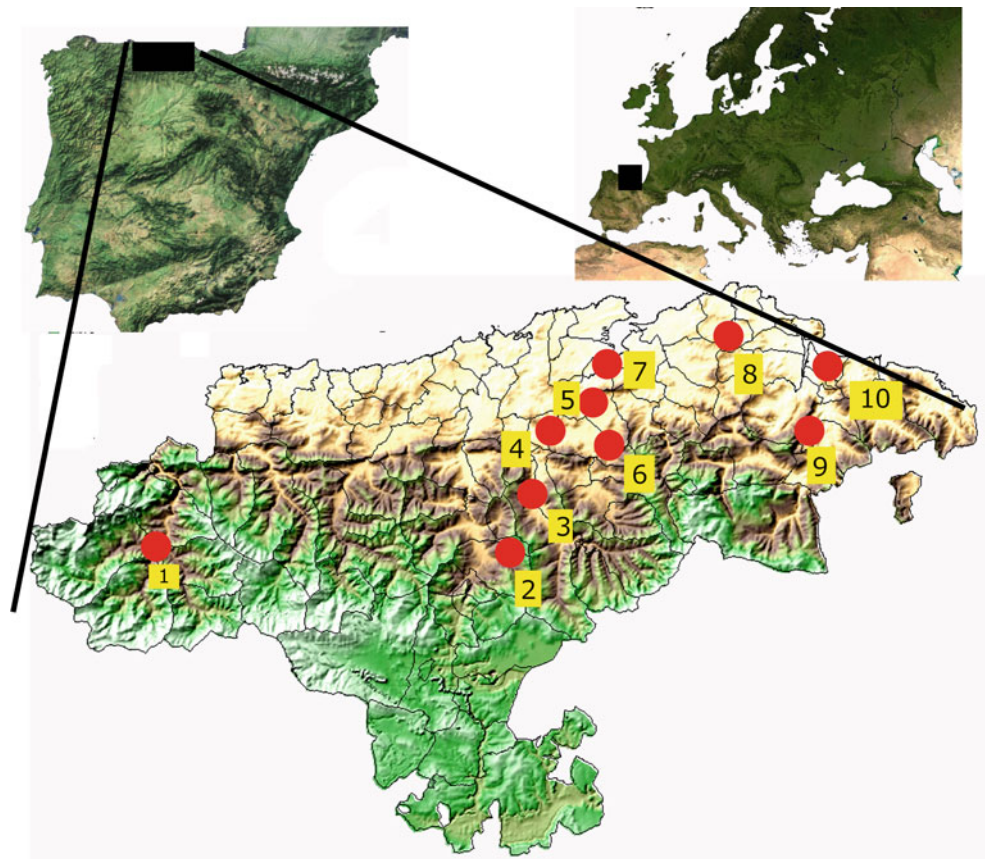
Considering the current view that anthropogenic bone concentrations yield a higher degree of fragmentation than assemblages accumulated by carnivores, bone fragmentation was studied from different perspectives. Characterization of the type of shaft circumference followed Bunn (1982), and the length of the fragment was measured against the total surface of the original bone. This author proposes three categories, where (1) stands for shaft circumference <25 %; (2) covers the 25–75 % range; and (3) groups remains with >75 % of the shaft circumference. The total dimensions were considered for fragmentation indexes and later compared to the complete bone, with fragments classified into three categories: (1) for <3 cm elements; (2) for 3–5 cm; and (3) for >3 cm.

The dental wear on *Capra* specimens which were less than 3 years old was used for age-pattern and seasonality determination (Coutourier 1962; Pérez Ripoll 1988). Finally, deer were analyzed following Steele (2002).

## The Sample

The Cantabrian coast in northern Spain extends from eastern Galicia to the Basque country, and from the Cantabrian Sea to a series of mountain ranges including the Picos de Europa. The sites studied here are concentrated in the Cantabrian province, in the middle of the region (Fig. 6.1; Table 6.1). The proximity of the mountains to the coast produces a peculiar geography where valleys, mountains

**Fig. 6.1** Geographical location of the sites: 1 Esquilleu, 2 Hornos de la Peña, 3 Castillo, 4 Covalejos, 5 Pendo, 6 Morín, 7 Ruso, 8 Otero, 9 Cofresnedo, 10 Cuco



and plains are interspersed, resulting in a highly variable landscape with a large number of animal and plant resources which would have supported populations during the Middle and Upper Paleolithic.

Esquilleu Cave (Cillorigo de Liébana, X:371520, Y:4790700, page M. T. N: 1:50000 Carreña-Cabrales; 350 MASL) is found in the steep Hermida cliff limestone complex, some 40 km from the coast. It was excavated from 1997 to 2006 by J. Baena, revealing 35 Mousterian levels dated from  $34,380 \pm 670$   $^{14}\text{C}$  BP to  $53,491 \pm 5,114$  BP (TL) (Baena et al. 2005).

Hornos de la Peña (Tarriba, San Felices de Buelna; 280 MASL) is located 18 km from the coast in the Corrales de Buelna valley, characterized by a mountain landscape open to many different ecological niches. Excavated in 1906 by Alcalde del Río and in 1909–1912 by H. Breuil, H. Obermaier and J. Bouyssonie, the stratigraphy was first published by Breuil and Obermaier (1912) and later adapted by Bernaldo de Quirós (1982). Its five levels span from the Mousterian to the Neolithic. In this paper, only levels V (Mousterian) and IV and III (Aurignacian;  $20,930 \pm 370$   $^{14}\text{C}$  BP; Soto Barreiro 2003) will be considered.

Ruso (Igollo, Camargo, X:427800, Y:4808670 UTM; 60 MASL) is an archaeological site situated in the coastal plain of Santander Bay, some 6 km from the coast.

Excavations at this site, supervised by E. Muñoz Fernández, started in 1984. The site presents seven archaeological levels from the Mousterian (levels V and VI, and Evolved Aurignacian level IVb,  $27,620 \pm 180$   $^{14}\text{C}$  BP) to the Bronze Age (Muñoz Fernández 1991; Muñoz Fernández and Serna 1994). Otero (Secadura, Voto, N:43°21'10'', E:0°09'30'', pages 18–35, plane 1/50000, I.G.C.; 60 MASL), is located some 12 km from the coast. Excavated in 1963 by J. González Echegaray, M. A. García Guinea and A. Begines Ramírez (González Echegaray et al. 1966), it yielded nine archaeological levels from the Mousterian to the Azilian. Only Mousterian (level 9) and Aurignacian (levels 8, 6, 5 and 4) levels are discussed here.

Morín (Villanueva de la Escusa, N:0°10'10'', E:43°21'43'', page 34 Torrelavega, plane 1/50000 I.G.C.; 60 MASL) is situated 6 km from the coast. Many fieldwork seasons (J. Carballo and Sierra in 1912; J. Carballo in 1917–1919; J. González Echegaray and L. Freeman in 1966–1969) revealed 22 archaeological levels that cover an important sequence with Azilian, Magdalenian, Solutrean, Aurignacian, Châtelperronian and Mousterian levels. We include the Aurignacian (levels 5–10; from  $36,590 \pm 770$   $^{14}\text{C}$  BP to  $27,336 \pm 735$   $^{14}\text{C}$  BP; Maillou et al. 2001), Châtelperronian (level 10;  $35,905 \pm 6,585$   $^{14}\text{C}$  BP; González Echegaray and Freeman 1978) and Mousterian

Table 6.1 Main features of the sites mentioned

	Esquilieú	Hornos de la Peña	Ruso	Otero	Morín	Covalejos	Cuco	Cofresnedo
Location	Cillorigo de Liébana	Tarriba, San Felices Buelna	Igollo Camargo	Secadura Voto	Villanueva Escusa	Piélagos, Cantabria	Castro urdiales	Cibullas Matienzo
MASL (m)	350	280	60	60	60	110	43	160
Kilometer from coast	40	18	6	12	6	3	1.5	>20
Landscape	Steep Hermida Cliff Complex limestone	Variable ecologic niche	Bay seashore	Bay seashore	Bay seashore	Bay seashore	Bay seashore	Variable ecologic niche
Year of excavation	1997–2006	1906–1912	1984	1963	1912/1917–1919, 1966–1969	1879, 1914, 1997–2003	1996	2000–2001
Culture	Mousterian	Mousterian-Neolithic	Mousterian-Bronze Age	Mousterian-Azilian	Mousterian-Azilian	Mousterian-Aurignacian	Aurignacian-Gravettian	Mousterian-Roman
All levels	III–XXXV	I–V	I–VI	1–9	1–22	A–Q	I–XIV	–
Moust. level	III–XXXV	V	VI and V	9	22, 17–11	D–Q	–	–
Moust. chronol.	34,380 ± 670 <sup>14</sup> C BP (AA-37883; AMS; level VI), 36,500 ± 830 <sup>14</sup> C BP (AA-37883; level VIF), 36,500 ± 830 <sup>14</sup> C BP (AA-37882; AMS; level XIF), 39,000 ± 300 <sup>14</sup> C BP (Beta-149320; AMS; level XIII), 49,700 ± 1,600 <sup>14</sup> C BP (OXA-11414; AMS; level XVIII), 51,034 ± 5,114 BP (Mad 3299; TL; level XXId), 53,491 ± 5,114 BP (Mad 3300; TL; level XXIII)	–	–	–	39,770 ± 730 <sup>14</sup> C BP (GIF 96264; level 11)	40,650 + 2,300 – 1,800 <sup>14</sup> C BP (AMS-level D top), 41,640 + 650 – 530 <sup>14</sup> C BP (AMS-level D bottom), 101,000 BP (U/TH, level Q)	–	–

(continued)

Table 6.1 (continued)

	Esquilleu	Hornos de la Peña	Ruso	Otero	Morín	Covalejos	Cuco	Cofresnedo
Chat. level	-	-	-	-	10	-	-	-
Chat. chronol.	-	-	-	-	35,905 ± 6,585 <sup>14</sup> C BP (SI-951a)	-	-	-
Aurig. Level	-	IV and III	IV b	8, 6, 5 and 4	9-5b	B and C	VII-XIV	4
Aurig. chronol.	-	20,930 ± 370 <sup>14</sup> C BP (BM-1883R; level III)	27,620 ± 180 <sup>14</sup> C BP (BETA-12036; AMS)	-	36,590 ± 770 <sup>14</sup> C BP (GIF-96263; level 8), 27,685 ± 1,285 <sup>14</sup> C BP (SI-956; level 8a); 27,336 ± 735 <sup>14</sup> C BP (SI-952), 32,840 ± 280 <sup>14</sup> C BP (SI-955; level 7), 30,465 ± 901 <sup>14</sup> C BP (SI-954; level 6-7)	30,380 ± 250 <sup>14</sup> C BP (GRA 22443 - AMS; level B), (GRA-24200-AMS; level C)	30,020 ± 160 - 150 <sup>14</sup> C BP (GrA 32436; AMS; level XIII)	31,360 ± 310 BP (GrA-20267, level 4)
Grav. level	-	-	-	-	5a-4	-	III-VI	-
Grav. chronol.	-	-	-	-	29,710 ± 340 <sup>14</sup> C BP (SI-953; level 5b)	-	23,400 ± 250 <sup>14</sup> C BP (GrA-32097; AMS)	-
Zooarch. ref.	Yravedra (2005)	Yravedra (2010b)	Yravedra et al. (2010)	Yravedra and Gómez-Castanedo (2010a)	Altuna (1971, 1973)	Castaños (2005)	Castaños and Castaños (2007)	Castaños (2003)
Taphon. ref.	Yravedra (2005)	Yravedra (2010b)	Yravedra et al. (2010)	Yravedra and Gómez-Castanedo (2010a)	Yravedra and Gómez-Castanedo (2010b)	Yravedra (submitted)	Yravedra Ms.	Yravedra Ms.
Bibliog. ref.	Baena et al. (2005)	Breuil and Obermaier (1912) Bernaldo de Quirós (1982)	Muñoz Fernández (1991) Muñoz Fernández and Serna (1994)	González Echegaray et al. (1966)	González Echegaray and Freeman (1978); Maillo et al. (2001)	Sanguino and Montes (2005)	Muñoz Fernández and Montes (2007)	Ruiz and Smith (2003)

levels (levels 11–17, 22;  $39,770 \pm 730$   $^{14}\text{C}$  BP; Maillo et al. 2001).

Covalejos (Piélagos, Cantabria, UTM: X:424560, Y:4805500; 110 MASL) is 3 km from the coast in an undulating landscape. Pedraja first excavated this site in 1879 and later H. Obermaier, M. R. Sallcras and L. Rozas excavated in 1914. A new excavation in 1997–2003 by J. Sanguino and R. Montes (2005) recovered the bones analyzed here, from the two Aurignacian ( $30,380 \pm 250$   $^{14}\text{C}$  BP to  $32,840 \pm 280$   $^{14}\text{C}$  BP) and 10 Mousterian ( $40,650 + 2,300 - 1,800$   $^{14}\text{C}$  BP to 101,000 BP) levels.

Cuco rockshelter (Urdiales, Castro Urdiales UTM: X:481507, Y:4804428; 43 MASL) is found 1.5 km from the coast. The site was excavated in 2006 by E. Muñoz, P. Rasines, S. Santamaría and J. M. Morlote, who documented 14 Gravettian ( $23,400 \pm 250$   $^{14}\text{C}$  BP, level III) and Aurignacian ( $30,020 + 160 - 150$   $^{14}\text{C}$  BP, level XIII) levels (Muñoz Fernández and Montes 2007).

The excavation at Cofresnedo (Cibullas, Matienzo; 160 MASL) in 2000–2001 was directed by J. Ruiz and yielded a series of discontinuous occupations by humans and carnivores alternatively dated in the Middle and Upper Paleolithic ( $31,360 \pm 310$   $^{14}\text{C}$  BP, level 4; Ruiz and Smith 2003).

All these sites cover a similar chrono-cultural range, spanning from the end of the Middle Paleolithic to the beginning of the Upper Paleolithic (40,000–25,000 years ago). Nevertheless, each of them presents certain peculiarities regarding environmental and climatic contexts. They were also excavated at different times, with a variety of field methods. Due to these differences, it is crucial to assess them individually in order to draw an accurate picture of the area in both periods.

## Results

### *El Esquilleu*

*Capra pyrenaica* dominates all levels, followed by chamois and deer (Table 6.2). *Bos/Bison* is only found in levels VIII, XI, XIF and XIII, which differ from the rest of the site due to the presence of animals from distant areas and the incorporation of new raw materials, suggesting longer-distance mobility patterns (Baena et al. 2005). Additionally, the determination of seasonality for these levels indicates extensive occupations spanning several seasons (Table 6.2), while in the remaining levels, human occupation was restricted to one specific season.

The taphonomic analysis also indicated some differences throughout the sequence. The upper levels (III–V) constitute

a palimpsest with badly defined human occupations, where carnivores were the main accumulators of meat resources (Yravedra 2006a, b). In these units, bones with cut marks were not frequent (Fig. 6.2a, b), whereas tooth marks were present in more than half of the remains (Table 6.2). Moreover, the fragmentation index was lower in these two levels than in the rest of the sequence: only 65 % of the remains were <3 cm, whereas more than 80 % of the remains from other contexts fell into this category. The circumference of the diaphyses also differed in level III—28 % of the sample preserved more than 25 % of the circumference, whereas in the rest of the levels almost 99 % of the diaphyses yield values lower than 25 % (Table 6.2).

From level VI to XIII, cut and percussion marks increased, as did the percentage of bones showing thermal alteration (Fig. 6.2a, b). These levels also showed a higher degree of bone fragmentation. At the same time, evidence of carnivore action decreased (Table 6.2). Skeletal profiles indicate the transport of complete ibex to the site in all levels, together with deer in level XIF (Yravedra and Domínguez Rodrigo 2009). Finally, in levels XXI, XXIII, XXV, XXVIII and XXIX, the concentrations of burnt and intensively fragmented bones may be interpreted as fuel for hearths (Yravedra et al. 2005, 2010).

### *Hornos de la Peña*

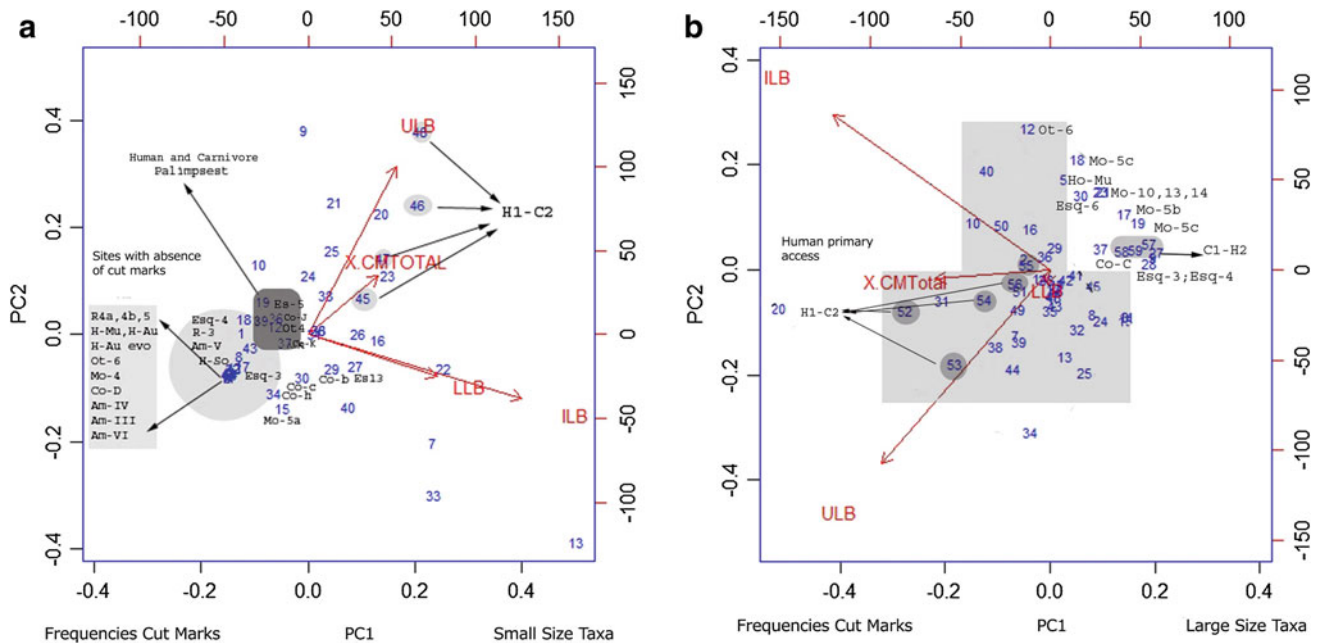
Given the field methodology in fashion at the beginning of the twentieth century, bone was rare at Hornos de la Peña, restricting the faunal analysis to a few observations. The Mousterian and the Aurignacian levels together yielded 655 remains. During the Mousterian, chamois is the best-represented animal both in NISP and MNI, followed by horse and deer (Table 6.3). The Aurignacian level 4 shows a predominance of horse over deer, chamois, ibex, roe deer and aurochs. In level 3, however, deer dominates over horse and other animals (Table 6.3).

In both the Middle and Upper Paleolithic, the only animals that preserve evidence for human activity are deer, horse and aurochs (Fig. 6.2b). Evidence for human involvement with *Rupicapra* is lacking; apparently at Hornos de la Peña, these animals were not consumed by humans (Fig. 6.3). This suggests that any differences in hunting strategies during the Middle and Upper Paleolithic should have been negligible. Taking into account both periods, horse dominates in levels 5 and 4, amounting to 56 and 43 % of the remains, as well as 58 and 55 % of MNI respectively. Deer follows with 43 % of NISP in both levels, and 36 and 33 % of MNI respectively, while *Bos/Bison* makes up less than 10 % of the MNI (Fig. 6.3; Table 6.3).

**Table 6.2** Main zooarchaeological and taphonomic features in Esquilieu

Esquilieu	Capra		Rupicapra		Cervus		Bos/Bison		Seasonality	Cut mark (%)		Tooth mark (%)		Burnt bone (%)	Bone $\leq 3$ cm (%)	Shaft circumference $< 25$ %
	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI		Small	Large	Small	Large			
III	369	5	27	4	5	2	-	-	Spring- autumn	2.7	-	53	12.5	9	65	72
IV	136	2	14	2	6	2	-	-	-	7.6	-	77	50	5	82	94
V	513	2	27	4	11	2	-	-	Summer- winter	14	100	42	-	19	84	95
VI	1,994	306	13	4	34	2	-	-	Summer- winter	42	31	31	28	33	74	99
VII	1,459	111	4	19	34	2	-	-	Summer- autumn	30	52	17	14	46	80	99
VIII	1,197	192	2	4	23	2	2	1	Autumn	39	42	4	37	31	88	97
IX	1,203	49	2	12	14	1	-	-	??	35	-	10	14	34	89	99
X	66	9	1	-	-	-	-	-	??	-	-	-	-	-	94	-
XI	1,382	133	5	9	15	1	1	1	??	27	50	2	13	15	86	99
XII	2,340	2,257	16	126	404	9	16	1	All year round	27	24	3	3	16	83	98
XIII	778	64	2	1	14	1	-	-	??	17	50	2	-	21	86	99
XIV	7,312	983	5	33	103	2	27	1	Summer- autumn	21	35	2	3.6	30	89	100
XV	1,144	376	1	-	11	1	-	-	??	Bad preservation of bone surfaces				63	95	100
XVI	1,014	188	1	-	-	-	-	-						80	99	100
XVII	202	76	1	-	-	-	-	-						77	100	100
XVIII	263	68	1	-	1	1	-	-						79	100	100
XIX	189	62	-	-	-	-	-	-						77	100	100
XX	376	72	1	-	-	-	-	-						89	99	100
XXI	3672	398	2	4	9	1	-	-						100	100	100
XXII	17,017	726	12	-	2	1	-	-						100	100	100
XXIII	1,704	297	1	-	3	1	-	-						99	100	100
XXIV	2,374	95	1	-	4	1	-	-						99	99	100
XXV	111	29	1	-	-	-	-	-						100	100	100
XXVI	42	13	1	-	-	-	-	-						95	100	100
XXVII	243	57	1	-	-	-	-	-						78	100	100
XXVIII	263	59	1	-	-	-	-	-						92	100	100
XXIX	11	1	1	-	-	-	-	-						100	100	100
XXX	48	1	1	-	-	-	-	-						96	100	100
XXXI	9	9	1	-	-	-	-	-						100	100	100

Ibex seasonality is estimated from the emergence of the dental crown (Pérez Ripoll 1988). Mark frequencies do not include teeth and bones with scarce bone surface preservation. Small animals include *Capra*, *Rupicapra*, *Capreolus* and small sized ungulates. Large animals refer to *Cervus*, *Bos*, *Equus* and large and medium sized animals.



**Fig. 6.2** **a** Plot graph showing the scores of the Principal Component Analysis of small animals (*Capra + Rupicapra + Capreolus* + smaller animals) from selected Mousterian and Upper Paleolithic sites, and the experimental samples described in Domínguez-Rodrigo and Barba (2005). Points 45–48 indicate the experiments where humans had a primary access to the prey. **b** Plot graph showing the scores of the Principal Component Analysis of large animals (*Bos + Equus + Cervus* + medium and large-sized indet.) from

selected Mousterian and Upper Paleolithic sites. Points 52–55 corresponds to the experimental samples described in Domínguez-Rodrigo (1997). Lupo and O’Connell’s (2002) point 56 shows values corresponding to a human intervention on the prey. Experiments regarding secondary access (Domínguez-Rodrigo, 1997) are exemplified in points 57–59. Key Cut marks frequencies on ULB (humerus and femur), ILB (tibia and radius), LLB (metapodial), CM total (total frequencies of cut marks in limbs, cranial and axial bones)

From level 3 upwards, some differences are evident. Deer dominates this unit, accounting for 60 % of MNI and 66 % of NISP. It is also the first time evidence of human processing is found on remains of chamois, ibex and roe deer (Yravedra 2010b), probably implying a change towards hunting strategies that incorporated a wider range of prey, including small-sized ungulates: from this unit, cut and percussion marks are found on small-sized animals with age profiles which show a large number of adult individuals (Yravedra 2010b).

Carnivore action was identified on deer, horse and aurochs bones, but there are also cut marks related to meat processing, suggesting human interaction with these animals as well (Fig. 6.2b). The presence of cut marks on ribs and upper appendicular (humerus and femur) or intermediate (tibia and radius) bones in levels 5–3 (Fig. 6.2b), together with fracture patterns defined by the absence of furrowing, and a predominance of adult individuals, are also characteristic of human action.

According to my observations, no significant differences exist between the taxa present in the Mousterian level 5 and in the Aurignacian level 4. In both levels, horse and deer are dominant. The absence of cut or percussion marks, together with a number of tooth marks, suggest chamois was not

introduced by humans: in both Mousterian and Aurignacian times, chamois in Hornos de la Peña appear to have been introduced by carnivore activity. Differences, however, appear from level 3: deer constitute the main species in both MNI and NISP, and roe deer, ibex and chamois were incorporated into the range of human processed prey (Fig. 6.2a).

## Ruso

Ruso is a small cave close to the Paleolithic sites of Pendo, Juyo and Santián. The Mousterian and Aurignacian materials from Pendo were described as similar, with a dominance of deer, followed by horse and large bovids (Fuentes 1980); however, this site is in fact a palimpsest of many different archaeological levels (Montes et al. 2005). Deer is also dominant in Santián, although the nature of the collection of this material raises questions about its value. In this context, the faunal assemblage excavated at Ruso is fundamental for defining a local sequence with contextualized materials spanning from the Mousterian to the Solutrean.



**Table 6.3** Main zooarchaeological and taphonomic features in Hornos de la Peña

H. de la Peña	Capra		Rupicapra		Cervus		Capreolus		Equus		Bos/Bison		Carnivore		Cut mark (%)		Tooth mark (%)	
	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	Small	Large	Small	Large
V	168	4	77	10	27	4	8	2	29	7	7	1	13	2	0	13.3	28	13.3
IV	75	5	12	3	21	4	-	-	26	6	2	1	6	2	0	3.6	75	0
III	412	4	92	9	183	18	12	2	82	10	1	1	10	4	0	9.1	48	42

Frequencies of cut and tooth marks are determined from NISP, excluding teeth and badly preserved bones

The taxonomic analysis showed that deer was dominant both in Mousterian level V and Aurignacian level IVb, accounting for 71 % of NISP and 33–38 % of MNI. Horse was second in importance in both periods, with 31 % of MNI in level V, and 20 % in level IV. After them, large bovids and other animals were scarcely represented (Fig. 6.4). Age profiles closely coincided in both periods: *Bos/Bison* correspond to adults only, young equids represent 66 and 50 % of the sample in the Aurignacian and the Mousterian respectively, and young deer ranged from 33 to 50 % of the sample (Table 6.4).

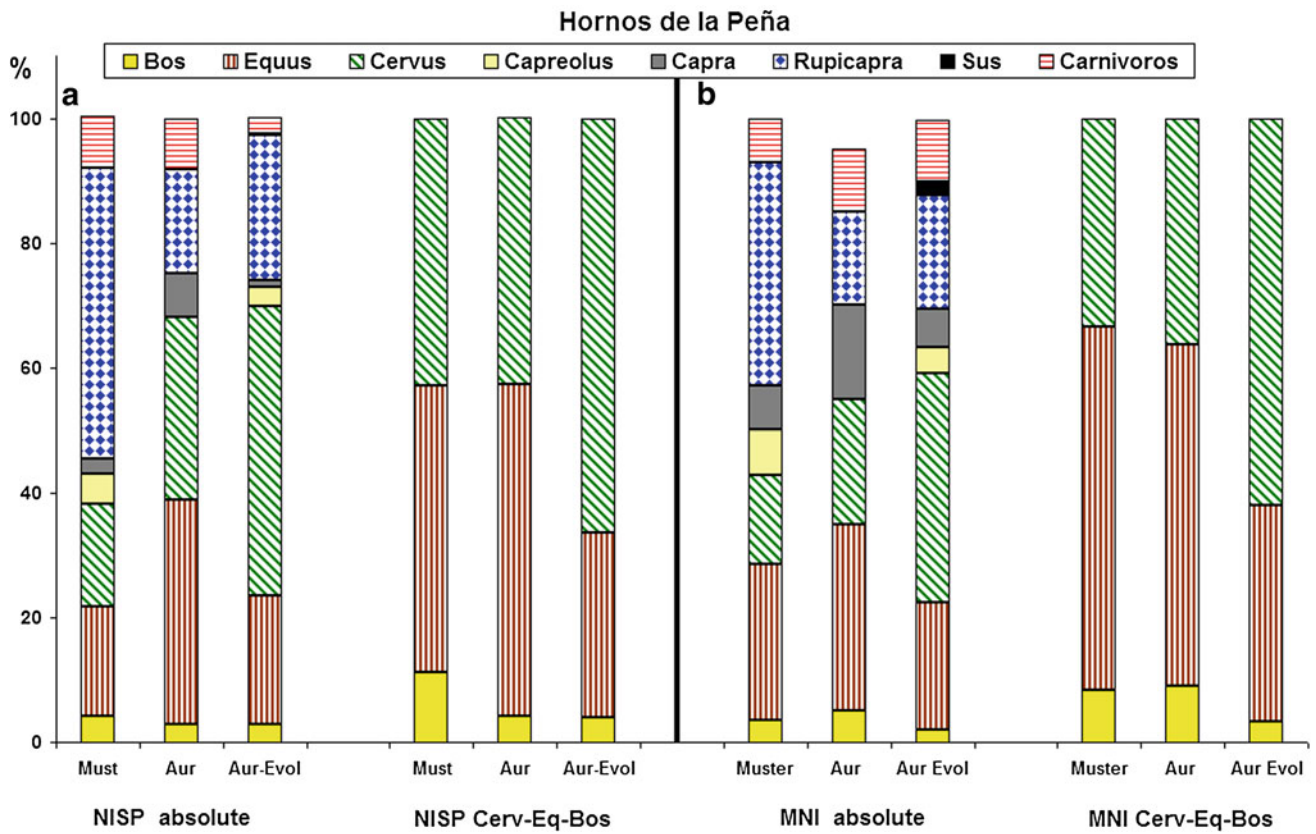
Taphonomically, the situation is similar to Hornos de la Peña. Deer, horse and aurochs yielded evidence of human activity in the form of cut and percussion marks (Figs. 6.2b, 6.5). On the other hand, chamois, ibex and roe deer showed no indication of human activity before the Solutrean (level III; Fig. 6.2a).

Both the recorded fracture patterns and the location and number of cut and percussion marks on highly nutritional parts (upper bones and axial elements) indicate humans had early access to meat resources, be they deer, horse or large bovids (Yravedra et al. 2010). Conversely, the scarcity of human marks and the abundance of tooth marks on small ungulates suggest accumulation by carnivores rather than human beings (Table 6.4; Fig. 6.2a). Medium- and large-sized animals also preserved tooth marks, but they were located over cut marks typical of defleshing and disarticulation, suggesting that carnivores may have acted as scavengers of human consumed prey. Nevertheless, the presence of a small number of cut and percussion marks on small ungulates from the Mousterian and Aurignacian deposits may suggest humans had occasionally hunted these animals. In the case of ibex, the lower degree of fragmentation, as well as the low frequencies of anthropogenic marks, probably indicates that they were not frequently hunted (Fig. 6.5). Summing up, in both the Mousterian and the Aurignacian periods, humans focused on bovids, horses and deer, showing a persistence of basic subsistence strategies.

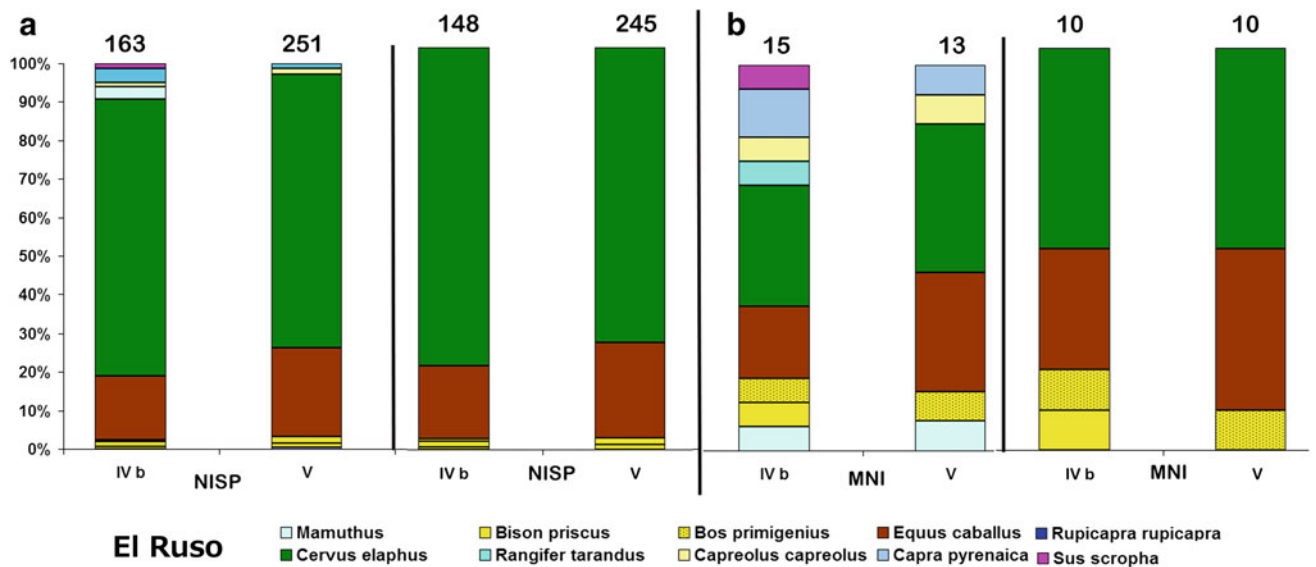
## Otero

Due to the antiquity of the excavation, only 700 bones were available from this site. This sample was both biased and pre-selected, with unequal representation of NISP and MNI, few indeterminate bones, and a clear dominance of certain parts in the skeletal profiles, as well as a higher representation of epiphysis versus diaphysis fragments (Yravedra and Gómez-Castanedo 2010a). Any conclusions about this site should thus consider this bias.

Throughout the sequence, deer dominates the assemblage, followed by horse and other ungulates such as



**Fig. 6.3** Taxonomic profiles for Hornos de la Peña. **a** Complete sample in NISP on the *left* and taxa with anthropogenic marks on the *right*. **b** Idem for MNI



**Fig. 6.4** Taxonomic representation in Ruso; NISP on the *left* and MNI on the *right*. Both variables are compared with the total number of animals present (on the *right*) and the animals introduced by humans to the site

chamois, reindeer, roe deer and ibex. When comparing Mousterian and Aurignacian assemblages, some differences become evident. Carnivore action is unquestionable in the

Mousterian, but horse dominates over deer in both NISP and MNI, which is in contrast to the lower Aurignacian deposits, at least as far as the reduced sample of less than 60

**Table 6.4** Main zooarchaeological and taphonomic features in Ruso

Ruso	Capra		Cervus		Capreolus		Equus		Bos/Bison		Carnivorous		Cut mark (%)		Tooth mark (%)		Percussion mark (%)	
	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	Small	Large	Small	Large	Small	Large
V Mous	1423	3	179	6	4	1	58	4	4	1	39	6	1.9	3.5	7.5	3.4	2.2	2.6
IV b Aur	667	6	117	5	2	1	27	3	7	2	29	6	2.5	8.4	35	8.4	0	6.4
V Mous	-	-	73 %	50 %	-	-	24 %	40 %	3 %	10 %	-	-	Seasonality from <i>Cervus elaphus</i>					
IV b Aur	-	-	79 %	50 %	-	-	18 %	30 %	3 %	20 %	-	-	Winter-summer and beginning of autumn					
													No data					

Seasonality is established from the emergence of the dental crown (Steele 2002). Frequencies of cut and tooth marks are determined from NISP, excluding teeth and badly preserved bones. Both large (*Bos* + *Equus* + *Cervus* + medium and large sized indet.) and small sized animals (*Capra* + *Rupicapra* + *Capreolus* + small sized ungulates) are included

specimens from levels 5 and 6 can be considered (Table 6.5). However, the better-represented level 4 has dominance of deer, followed by horse. Regardless of the unit, adult individuals outnumber juveniles and infants. Seasonality could only be estimated for deer in level 4, indicating a year-round hunting strategy, especially at the beginning of autumn and the end of winter.

Due to the bias in bone collection, taphonomic analysis was not possible for all levels. The absence of postcranial bones in the Mousterian assemblage prevented the determination of the agent that collected the animals. Between levels 2–6, cut marks on upper appendicular and axial bones of deer suggest human consumption (Fig. 6.2b); however, in other species evidence for human involvement was unclear. For some taxa, such as aurochs or ibex, no cut marks were identified, and for others like horse, roe deer or chamois, they appeared only in some levels (Table 6.5). Small-sized animals preserved human-generated marks only in level 4 and in the Magdalenian Unit 2 (Fig. 6.2a; Table 6.5).

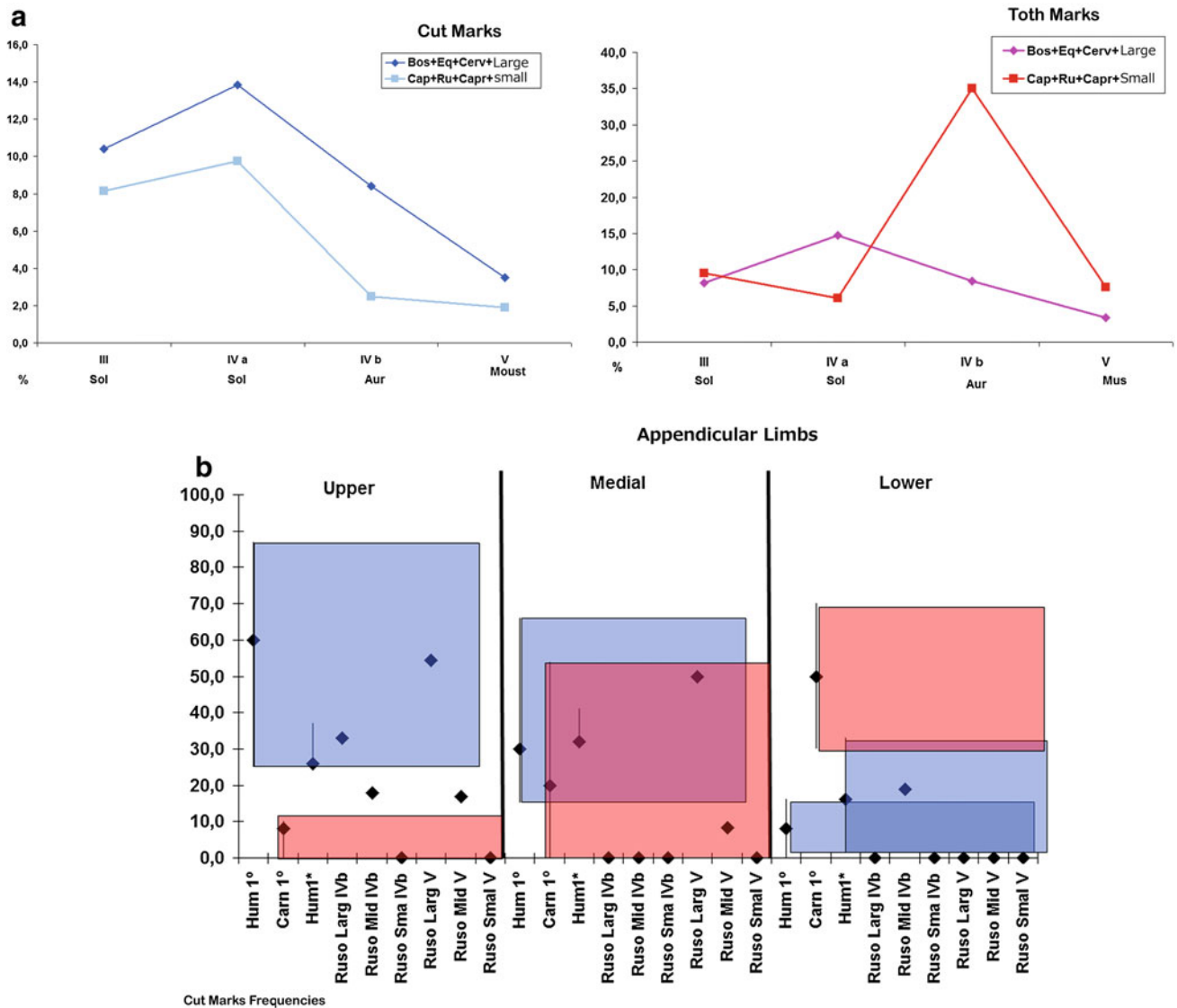
### Morín Cave

From the 6,500 remains from Morín Cave, deer was the most numerous species, followed by *Bos/Bison* and horses, confirming Altuna's analysis (1971, 1973). The comparison between Middle and Upper Paleolithic levels suggested some differences. Throughout the sequence, the most common animals were deer and *Bos/Bison*, with a rate of 40–50 % of the MNI for the former, depending on the level. Nevertheless, from the Aurignacian level 6 upwards the number of small-sized ungulates (ibex, chamois and roe deer) increased, matching the progressive reduction of *Bos/Bison* and horse from the Gravettian.

Altuna (1971, 1973) noted no evidence of chronological changes in age profiles or seasonality, while Pike Tay et al. (1999) identified occupation from the end of autumn to springtime in both the Mousterian and the Aurignacian.

Furthermore, no differences were seen in the skeletal profiles. For both periods, the representation of anatomical sections for small- and medium-sized animals suggests that the entire animal was incorporated into the site. On the other hand, skeletal profiles for large-sized animals suggest a differential transport strategy that favored upper limbs elements over axial and lower appendicular bones (Altuna 1971, 1973).

The results of the taphonomic analysis suggest that the absence of certain anatomical sections may be conditioned by carnivore and water action (Yravedra and Gómez-Castanedo 2010b). Tooth marks on epiphyses and axial bones prove that carnivores participated in site formation.



**Fig. 6.5** **a** Absolute frequencies of cut marks and tooth marks by levels, discriminating small sized ungulates from large ones. The low frequencies of small sized ungulates with human-related marks are remarkable. On the opposite, bones with carnivore-generated marks are most numerous for smaller taxa. **b** Comparison with the referential

framework for the identification of first consumption by humans. Appendicular elements were divided into upper (humerus, femur), intermedial (tibiae and radio) and lower bones (metapodials). Large sized animals data correspond to human consumption whereas in smaller ones human participation is scarce

Water was also important for sedimentation and water-action generated of a large number of rounded and polished bones (Yravedra and Gómez-Castanedo 2010b). And yet, when considered alongside the distribution of cut and percussion marks, it may be concluded that in all levels, humans had access to meat portions from all taxa (Table 6.6; Fig. 6.2a, b).

The frequency and distribution of cut marks suggests that human beings had primary access to meat from small-, medium- and large-sized animals in levels 17, 5a, 4, 3 and 2 (Yravedra and Gómez-Castanedo 2010b). The sample from the remaining levels was not representative, but some

evidence of anthropogenic defleshing marks was identified on many taxa (Table 6.6).

Both the taxonomic and taphonomic data suggest some persistence in subsistence strategies between the Mousterian and the Aurignacian: in both periods, the same prey were hunted. In the case of small-sized ungulates such as ibex, chamois and roe deer, information on the agent of accumulation was scarce due to the low representation of bones at the site. In level 17, however, these species seem to have been accumulated by human hunting behavior; a few cut and percussion marks found on the scarce remains from the other levels (Fig. 6.2a, b) may be interpreted likewise.

**Table 6.5** Main zooarchaeological and taphonomic features in Otero

Otero	Capra		Rupic		Cervus		Capreolus		Equus		Bos/Bison		Carnivorous		Cut mark (%)		Tooth mark (%)		
	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	Small	Large	Small	Large	
9 Mous	28				6	1			12	3	2	2	2	7	0	0	0	0	
6 Aur	86				14	2	3	1	6	1					0	20	100	40	
5 Aur	37	4	1		14	2		1	4	1					0	0	0	0	
4 Aur	408	13	2	20	177	10	4	2	71	10	12	4	7	2	6.3	7.7	19	18	
	Frequencies of taxa associated to human behavior																		
9 Mous	?																		Seasonality from <i>Cervus elaphus</i>
6 Aur	20				70 %	67 %			30 %	23 %									?
5 Aur	18				75 %	67 %			25 %	23 %									?
4 Aur	190				90 %	71 %													?
																			All year

Seasonality is established from the emergence of the dental crown (Steele 2002). Frequencies of cut and tooth marks are determined from NISP, excluding teeth and badly preserved bones. Both large (*Bos + Equus + Cervus + medium and large sized indet.*) and small sized animals (*Capra + Rupicapra + Capreolus + small sized ungulates*) are included

## Covalejos

The Mousterian and Aurignacian bone sample at Covalejos consists of 49,799 extremely fragmented remains, of which 64 % were indeterminate fragments (Yravedra 2011). As already described in Castaños (2005), the dominant animal in the whole sequence is deer and there are no significant differences between Mousterian and Aurignacian levels, except for an increase in the MNI of *Capreolus* and *Equus* in level B and the reduction of NISP and MNI percentages for deer in level B (Fig. 6.6). Furthermore, the Aurignacian unit C and the Mousterian unit D were similar in terms of taxonomic representation. The age profile shows a dominance of young adults (age 5–7) in all levels. Seasonality data indicate some variation in prey exploitation; during the Mousterian, hunting took place all year round, whereas in the Aurignacian, hunting was frequent between the end of summer and the beginning of winter (Yravedra 2011).

Taphonomically, the analyzed assemblage is well-preserved except for levels C, D and H, where 60 % of the bones yielded water-generated rolling, polishing and abrasion marks (Yravedra 2011). Other processes recorded in the site included spalling, breaching, calcification, and, above all, intense fragmentation that reduced most bones to less than 3 cm.

Despite this situation, taphonomic analysis of the well-preserved bones suggested different human uses of animal resources (Table 6.7). Cut marks were frequently identified on all species and showed the distribution typical of primary human consumption (Table 6.7; Figs. 6.2a, b, 6.6). Besides the anthropogenic marks, carnivore tooth marks were also found. However, their small size, the absence of digested bones, the high fragmentation, and the superposition of tooth marks over previous human traces suggests a secondary role for carnivore consumption. It is only in level H that an increase of tooth mark frequencies and a lower percentage of bones with human modifications indicate that small ungulates may have been consumed by carnivores (Fig. 6.2a).

Broadly speaking, from the taxonomic and taphonomic analyses, and the consideration of age profiles, a persistence of subsistence strategies may be postulated for the Mousterian and Aurignacian at Covalejos; the same species were hunted in similar frequencies, especially in units D and C.

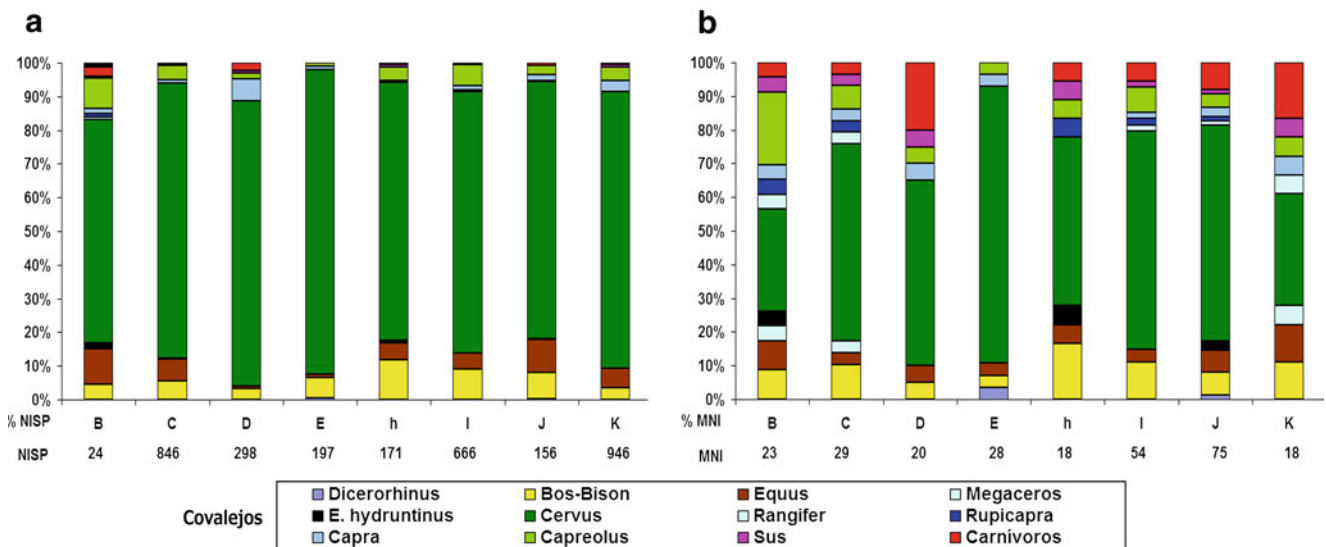
## Cuco

The sample from Cuco includes 12,000 extremely fragmented remains, from which less than 2 % are taxonomically diagnostic. According to Castaños and Castaños (2007), deer is the dominant species, followed by *Bos/Bison*

**Table 6.6** Main zooarchaeological and taphonomic features in Morín

Morín	<i>Equus</i>		Small ungulates		<i>Cervus</i>		<i>Bos/Bison</i>		Cut mark (%)		Tooth mark (%)		Percussion mark (%)	
	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	Small	Large	Small	Large	Small	Large
2	12	3	36	8	260	9	8	1	3.7	15	1.8	4.9	0	4.2
3	3	2	10	5	51	5	4	1	32	24.6	0	0	0	1.8
4	39	2	63	8	271	11	19	2	3.7	7.1	11.1	6.6	0	2.6
5a	30	4	106	10	388	12	29	3	1.8	7.2	23.6	13.8	0	3.8
5b	12	2	42	7	147	8	17	3	0	5.8	13.3	13.2	0	0
5c	6	6	24	16	120	21	9	8	0	2.9	0	0	0	1.4
6	19	2	23	5	77	4	31	4	21.4	2.1	28.6	2.1	0	1.5
7	8	1	8	2	86	5	26	2	0	3.2	0	0	0	0
8	8	6	2	1	7	3	4	3	0	28.6	0	0	0	0
8a	2	1	1	1	10	2	3	1	0	0	0	0	0	0
8b	2	2	–	–	3	2	8	1	0	0	0	0	0	0
9	1	1	1	1	7	2	3	1	0	57.1	50	0	0	7.1
10	1	1	–	–	3	3	25	2	0	6.1	0	3	0	0
13	–	–	–	–	4	1	5	1	0	16.7	0	16.7	0	0
14	14	3	1	1	16	2	40	2	0	6.3	0	3.1	0	3.1
15	44	4	1	2	55	3	60	2	0	8.7	0	10.3	0	2.9
16	5	1	1	1	3	1	8	1	0	15.4	0	0	0	0
17	124	11	16	4	142	8	215	10	4.8	9	4.8	7.4	0	4.5

Frequencies of cut and tooth marks are determined from NISP, excluding teeth and badly preserved bones. Both large (*Bos* + *Equus* + *Cervus* + medium and large sized indet.) and small sized animals (*Capra* + *Rupicapra* + *Capreolus* + small sized ungulates) are included

**Fig. 6.6** Taxonomic representation of species introduced by humans in Covalejos. NISP on the left; MNI on the right

and *Equus* (Table 6.8). The high fragmentation rate in Cuco may have resulted from a number of agents. Nevertheless, the fracture patterns and presence of cut, percussion and tooth marks suggest intentional damage produced by both carnivores and humans.

Cut marks on bones with nutritious muscle packages such as the humerus, femur and axial bones suggest primary meat consumption. In the same way, assemblages with high fragmentation rates are typical of human accumulations. From the patterns found in Cuco, the bone assemblages

**Table 6.7** Main zooarchaeological and taphonomic features in Covalejos

Covalejos	Cervus		Capreolus		Cap + Rup + Capreo		Equus		Bos/Bison		Carnivores		Cut mark (%)		Tooth mark (%)		Percussion mark	
	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	Small	Large	Small	Large	Small	Large
B	162	7	22	5	7	4	29	2	11	2	7	1	9	9	7.5	6.2	1.9	1.4
C	689	17	36	2	12	4	57	1	46	3	4	2	10.5	13.2	8.4	12.5	0.8	1.1
D	252	11	5	1	23	3	2	1	10	1	7	4	7.5	16.2	3.8	5.7	1.9	7.6
E	178	23	2	1	2	1	2	1	12	1	0	0	3.6	3.4	4.3	5.1	0.7	1
H	131	9	7	1	2	2	10	2	29	3	1	1	8.3	15.6	12.5	15.6	0	1
I	517	35	41	4	16	4	32	2	59	6	0	0	6.8	6.7	4.7	4.6	0.6	1.9
J	1198	48	43	3	31	5	159	7	120	5	13	6	7	3.9	8.3	8.7	1	1.9
K	776	6	37	1	40	5	54	2	33	2	5	3	6.5	6.8	8.5	10.9	1.8	3.7
Q	41	3	0	0	0	0	0	0	52	2	2	1	0	10.5	2.1	5.4	0	1.3

Frequencies of cut and tooth marks are determined from NISP, excluding teeth and badly preserved bones. Both large (*Bos* + *Equus* + *Cervus* + medium and large sized indet.) and small sized animals (*Capra* + *Rupicapra* + *Capreolus* + small sized ungulates indet.) are included

seem to have been first accumulated by humans and later consumed by carnivores. Further evidence for human activity is found in the circumference data, where 100 % of the sample presents values lower than 25 % of the circumference of the diaphysis.

## Cofresnedo

The fauna from the Aurignacian levels studied by Castaños (2003) shows a dominance of medium- and large-sized animals such as horse, deer and large bovids (Table 6.8). Taphonomic analysis identified some bones as having concretions, patinas and rounding produced by water, together with tooth marks from carnivores (Table 6.8). Although the incidence of tooth marks is negligible, pit dimensions between 3.5 and 5.4 mm suggest the presence of animals such as wolf, hyena, bear or large felids.

However, the presence and frequency of cut and percussion marks (Table 6.8), as well as the intense bone fragmentation of appendicular elements, suggest an anthropogenic accumulation of bones. In the case of large- and medium-sized animals, cut marks on upper appendicular elements indicate early access to flesh-bearing parts (Fig. 6.2b). Small sized animals, on the other hand, were scarce and preserved few traces of human activity (Fig. 6.2a), except for some defleshing marks on diaphyses and axial bones, and some dismembering marks on limbs, which could indicate primary human consumption.

## Other Paleolithic Sites

Besides the sites analyzed here, other sites, such as Castillo and Amalda, can provide useful information for reconstructing subsistence practices during the Middle and Upper Paleolithic. At Castillo, zooarchaeological and taphonomic studies carried out by Dari (2003) and Landry and Burke (2006) concluded that humans were the main contributors of animals to the site. Both studies estimated that the occupation in Castillo during Mousterian level 20 and Aurignacian level 18 took place from the end of summer to the beginning of winter. Age profiles indicated a dominance of young adults in both levels. Both papers reported the taxonomic dominance of deer, followed by chamois, *Bos/Bison* and horse (Dari 2003; Landry and Burke 2006).

According to the information available for the Middle and the Upper Paleolithic at this site, some persistence in human hunting behavior could be postulated. In both periods, animals from different environments were incorporated. A similar situation was reported for the nearby area,

**Table 6.8** Main zooarchaeological and taphonomic features in Cuco and Cofresnedo

	<i>Cervus</i> NISP	<i>Cap + Rup</i> + <i>Capreo</i> NISP	<i>Equus</i> NISP	<i>Bos/Bison</i> NISP	Carnivores NISP	Cut mark (%)		Tooth mark (%)		Percussion mark (%)	
						Small	Large	Small	Large	Small	Large
Cuco											
Grav	27	9	3	34	2	50	3.1	0	2.9	0	2.1
Aur	115	14	1	14	18	14	21.2	9.5	10.1	3.6	7.3
Cofresnedo											
NISP	42	27	28	72	4	28.0	20.5	7	6.4	9.3	3.5

Frequencies of cut and tooth marks are determined from NISP, excluding teeth and badly preserved bones. Both large (*Bos + Equus + Cervus* + medium and large sized indet.) and small sized animals (*Capra + Rupicapra + Capreolus* + small sized ungulates indet.) are included

such as the Mousterian site of Flecha, with a dominance of deer supplemented by other taxa like horses, bovids, chamois and ibex.

Amalda is another cave with evidence for persistence in subsistence strategies between the Middle and Upper Palaeolithic. The record from the Gravettian and Mousterian levels suggested that humans focused on the exploitation of cervids, equids and large bovids, and used the site seasonally, between summer and autumn (Yravedra 2005, 2006a, 2007).

Lezetxiki lacks taphonomic information relating to bone assemblage formation. Taxonomic representation was similar in Mousterian level 5 and Aurignacian level 4; deer dominates, accounting for 63 % of the remains in level 5 and 54 % in level 4. Large bovids follow, comprising 25 % of the assemblage in unit 5 and 18 % in unit 4, supplemented by ibex and chamois (Altuna 1972).

Due to the absence of taphonomic data for the remaining Middle and Upper Paleolithic sites in the area that preserve faunal remains (i.e. Labekokoba, Axlora, Arrillor, Atxagorta, Bolinkoba, Arenillas, Rascaño, etc.), it is impossible to determine the role of human activity in the formation of these assemblages. My reluctance to incorporate sites lacking taphonomic analysis is soundly justified by examples like the Mousterian sites of Moros de Gabasa (Blasco 1995, 1997) or Abauntz (Altuna et al. 2002), where different species were accumulated by different agents, with human responsible for the introduction of deer or horse, whereas carnivores gathered ibexes and chamois (Blasco 1995, 1997; Altuna et al. 2002). In other sites with the same chronology, such as Cova Beneito (Valencia), a similar situation is mentioned (Villaverde and Martínez Valle 1995). Furthermore, at sites such as Boquete de Zafaraya (Gerads 1997) or Grotte de Buraca Escura (Aubry et al. 2001), in which ibex are common, the presence of this species may be associated with carnivore consumption (lynx in the latter case).

Nevertheless, the aforementioned examples do not imply that carnivore agency for small-sized prey and human introduction of medium-sized prey is a universal feature. Counterexamples include sites such as Esquilieu (Yravedra

2005) or Valdegoba (Díez 2006), where the available taphonomic evidence indicates an anthropogenic role in the accumulation of small ungulates such as ibex or chamois.

## Discussion

Summing up, the data presented in this paper show a persistence of hunting activities in both the Middle and Upper Paleolithic (Figs. 6.3, 6.4, 6.6). This is evidenced in prey selection, particularly in the Mousterian and the Aurignacian-Gravettian, where medium- and large-sized ungulates such as horse, deer and aurochs dominate the record. This situation tends to change in the Solutrean, when the human use of small ungulates becomes frequent, as seen in the cut and percussion mark data from Amalda, Castillo, Ruso, Cobalejos, Hornos de la Peña and Morín (Dari 2003; Landry and Burke 2006; Yravedra 2006a, 2007, 2009, 2010a, b; Yravedra et al. 2010).

Although the possibility that human were utilizing small ungulates cannot be dismissed for the earlier periods under consideration, the available evidence does not support human interaction with small ungulates before the end of the Upper Paleolithic. Taphonomic analyses indicated that carnivores were the main agent responsible for the accumulation of small ungulates. These predators would probably have used these caves as shelter when humans were absent and introduced ibex and chamois carcasses at these times. It further suggests that human occupations in the area during the Middle and Upper Paleolithic were rather short, facilitating an alternating occupation of the sites by human and carnivores. Other sites in the Iberian Peninsula with Middle and Upper Paleolithic levels show a similar pattern. At Amalda, human agency was focused on large-sized ungulates whereas carnivores consumed ibex and chamois (Yravedra 2007, 2009, 2010a, b). In Moros de Gabasa (Blasco 1995, 1997) and at Cova Beneito (Villaverde and Martínez Valle 1995), human activity was identified on deer



and horse bones, with hyena and wolf tooth marks on ibex. Similarly, ibex in Grotte de Buraca Escura were introduced by lynx, while medium-sized ungulates were introduced by humans (Aubry et al. 2001).

Nevertheless, this change of focus from large-sized prey to smaller prey demands further explanation. We cannot enlarge on this topic here due to its complexity, but a number of hypotheses may be postulated: (1) Neanderthals may have lacked the technology and knowledge needed to hunt small-size ungulates; (2) human populations may have preferred different resources at different times; (3) territorial strategies may have changed from a selection of valleys and plains to the incorporation of the rocky and steep environments where chamois and ibex lived.

Briefly, we may easily discard the first hypothesis due to the large number of caves with evidence of Neanderthals hunting ibex and chamois. For instance, at Esquilleu (Yravedra 2005, 2006b), Valdegoba (Díez 2006), Covalejos, and Morín (Yravedra 2005, 2006b, 2011; Yravedra and Gómez-Castanedo 2010a) small ungulates were introduced by humans during the Middle Paleolithic.

Unfortunately, there is not yet enough data to evaluate the second and third hypotheses. The patterning could be a result of a number of variables, such as the reduced meat content of smaller-sized ungulates. Another factor may be the difficulties posed by the environments in which these animals lived. Future taphonomic studies in other contexts, alongside detailed topographic analyses of the site region—including sites located in different ecological zones—would probably help to address these issues.

## Final Remarks

An accurate analysis of subsistence strategies requires the incorporation of data from a number of disciplines. In this paper, zooarchaeological and taphonomic analyses of faunal remains from a series of sites were discussed in order to explore some aspects of human subsistence across the Middle-Upper Paleolithic transition in northern Spain. From the new and revised data presented here, we can postulate the persistence of subsistence strategies across the transition. In all of the sites studied, the same prey types were hunted in both periods. Moreover, the sites were always inhabited for short time periods, being used by carnivores during periods of abandonment. The rise of the Solutrean brought a change in this behavior, with the incorporation of smaller-sized ungulates and the use of sites for longer periods of time.

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