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# Neanderthals, Carnivores and Caprines in two Upper Pleistocene sites of South-eastern France

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## Résumé

Les marges sud-est du Massif central livrent de nombreux abris-sous-roche et grottes avec des occupations néandertaliennes datant des Stades isotopiques marins (SIM) 5 à 3. Les Barasses II et l'Abri des Pêcheurs partagent les mêmes particularités topographiques, lithiques et fauniques, avec en particulier une abondance de restes de bouquetins associés à ceux de carnivores variés. Ce sont de petites cavités où les activités humaines sont limitées (de type bivouacs), avec peu d'éléments lithiques et de stries de boucherie. La topographie des sites et les conditions paléoenvironnementales posent la question de la présence de ces populations de bouquetins dans les cavités. Celles-ci ont probablement servi de refuge pour des individus ou des groupes venus y mourir ou s'abriter des intempéries, avec un impact limité des prédateurs.

**Mots clés :** Néanderthal, caprinés, archéozoologie, taphonomie, bivouac

## Abstract

The south-eastern margins of the French Massif Central yield many rock shelters and caves with Neanderthal occupations dated to the Marine Isotopic Stages (MIS) 5-3. Les Barasses II and Abri des Pêcheurs share the same topographic configuration with lithic and faunal peculiarities, especially the abundance of ibex remains as well as a diversified carnivore guild. In these small cavities, human activities were limited as demonstrated by scarce lithic remains and butchery marks, construed as such short-term occupations

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(bivouacs). The topographic setting of the sites, and past climatic and environmental conditions raise questions on the presence of ibex populations within the caves, and we suggest that they were probably used as shelter by individuals or groups who died naturally with a limited impact of predators.

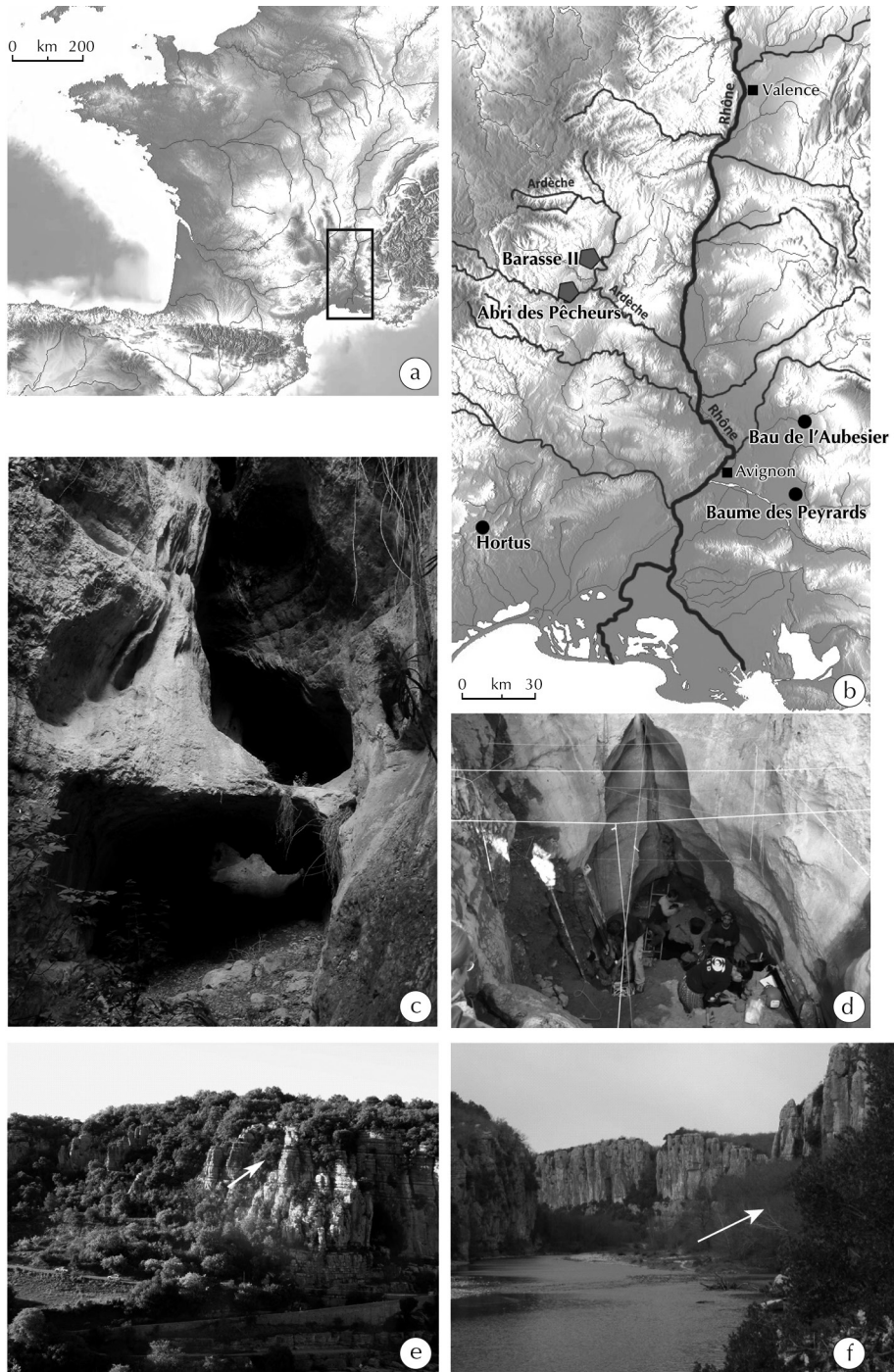
**Keywords:** Neanderthal, Caprines, Zooarchaeology, Taphonomy, Bivouac

## Introduction

Pleistocene faunal assemblages dominated by caprine and carnivore remains are common from Western and Central Europe to the Near East, in particular in rocky and highland areas (BRUGAL, JAUBERT, 1996; MONCEL *et al.*, 2008; DAUJEARD *dir.*, 2018). These sites generally testify of brief human occupations and belong to diversified ecosystems (GAMBLE, 1995). Caprine-dominant accumulations are found in specific contexts related to karstic environments, in narrow and deep caves, rockshelters or pitfalls. Among ungulates, caprine species (*Capra*, *Rupicapra*, *Hemitragus*, *Ovis*) are peculiar as most of them usually live on uneven ground and rocky landscapes in opposition to species living in forests or plains. Due to these differences in biotope, they are subject to specific modes of acquisition (hunting or scavenging) by both non-human and human predators.

Caprines are known to take refuge in shelters or caves during special climatic events (great heat, storms or heavy rain or snowfalls) and may also sometimes naturally die inside (cf. *infra*). They are often associated with other cave dwellers, such as ursids and other carnivores, whose presence is due to denning, natural death or predation. They may also be preys and be associated with remains of other ungulates (especially cervids) living in the surrounding plateaus and valleys. The scarcity or the absence of hyenids in these sites is noteworthy while canids and some medium- and small-sized felids (panther, lynx) are more frequent. The Pleistocene sites rich in caprine remains also raise specific issues such as the relationships between Neanderthal groups and these rupicolous herbivores. Indeed, since the Lower Palaeolithic, the relationship between small bovids and hominids represents an interesting case study about specific ecosystems and cynegetic behaviors (MONCEL *et al.*, 2008; YRAVEDRA, COBO-SÁNCHEZ, 2015). The reasons for these caprine accumulations are therefore a great challenge which can be addressed integrating ecology, ethology, taphonomy and contextual conditions. Many scenarios are possible which would be discussed: i) natural deaths in shelters or pitfalls; ii) prey or carrion accumulated and/or modified by predators (humans, carnivores) and iii) mixed scenarios.

This study is focused on two small cave sites in south-eastern France which yielded Middle Palaeolithic archaeological layers with Neanderthal and animal occupations. At Les Barasses II and Abri des Pêcheurs, ibex is the dominant taxon, associated with few other ungulates (cervids, equids and bovines) and various carnivores such as ursids (cave bears) and canids (wolves and foxes). The Middle Palaeolithic layers of these two sites have been recently revised by fieldworks and collection studies (MONCEL *et al.*, 2008, 2010; DAUJEARD, 2008; DAUJEARD *dir.*, 2018). In order to understand the site function both for human and non-human



**Fig. 1.** a) Map of France; b) Situation of Les Barasses II and Abri des Pêcheurs on the right bank of the Rhône Valley with those of some other Middle Palaeolithic sites (modified from Rufà et al., 2018); c) and e) The entrance of Les Barasses II cave and its location in the cliff; d) and f) The cave of Abri des Pêcheurs and its location within the surrounding cliffs.

predators and to infer the origin of the bone accumulation, especially the ibex ones, we will question the role of all potential factors or agents involved in such composite assemblages. The topography of the sites, the global environment and climatic condition with seasonality factors, will also constitute basic information to understand the presence of ibex populations in these caves and allow a brief comparison with similar western European sites, to propose a general interpretative framework.

## Site presentation

The sites of Les Barasses II and Abri des Pêcheurs are located in the Ardèche region, along tributary rivers on the right bank of the Rhône Valley, within limestone cliffs and plateau environments at 200-250 m a.s.l. (fig. 1). Close to each other (about 20 km) and both with layers dated to the Marine Isotopic Stages (MIS) 5b-d to 3, they yield a rich faunal corpus composed of various carnivores and herbivores. These two caves present a similar morphology with one single narrow gallery (fissure-like) and steep cliff entrance.

The site of Abri des Pêcheurs is a small and narrow southeast facing cave (total surface of 20 m<sup>2</sup>) first excavated in the 1970s (LHOMME, 1983). The opening is situated at 26 meters above the present-day Chassezac River. Recent excavations have provided new chronostratigraphic data for the entire Middle Palaeolithic sequence (MONCEL *et al.*, 2010). The cave looks like a pit with a stratigraphic sequence of almost four meters thick. The Middle Palaeolithic faunal assemblage comes from different sectors (from the bottom of the cave S4 to S2) found in layers of limestone rocks in a clay matrix. The deposit is related to a relatively cold sub-phase of the end of the MIS 5 (especially 5b) for the S4, to a wetter period contemporary of the MIS 4-3 for the S3-2 (DEBARD, 1988; MASAOUDI *et al.*, 1994; EL HAZZAZI, 1998; VALLADAS *et al.*, 1999; MONCEL *et al.*, 2008).

Les Barasses II is also a small and narrow cavity of almost 35 m<sup>2</sup> opening at 50 meters above the present-day Ardèche River. The cave opens in a steep and rocky south-facing cliff and was first excavated by J. Combiér (COMBIÉR, 1967, 1968). Since 2011, new investigations were undertaken to better understand the sequence, especially its poorly explored lowest part (DAUJEARD *dir.*, 2018). The sedimentary sequence is composed of a three meter silty deposit including weathering clasts from the limestone bedrock. Two main lithostratigraphic units are subdivided in eight stratigraphic layers. The Upper unit (layers 2-4) is composed of brownish colored silts with some altered limestone fragments due to phosphatation. The Lower unit (layers 6-8) is a brown-yellowish silty sediment richer in rock fragments. Past and recent datings on bone and calcite suggest that the Middle Palaeolithic layers were deposited from MIS 5d to 3. The Upper unit has been dated by ESR/U-series, providing a chronology from  $48 \pm 5$  to  $61 \pm 5$  ka (MIS 3). For the lowest part of the sequence, datings of  $111 \pm 13$  ka,  $89 \pm 6$  ka,  $107 \pm 13$  and  $79 \pm 8$  were obtained using the same method (RICHARD *et al.*, 2015; DAUJEARD *dir.*, 2018). According to the palaeoecological information, a colder episode coincides

with the deposit of the lower part of the sequence characterized by steppe vegetation and a rigorous environment, however with some forested patches. During the deposit of the upper part of the sequence, the climate was less severe with temperate and wooded biotopes (FOURY *et al.*, 2016; RUFA *et al.*, 2018; DAUJEARD *dir.*, 2018).

## Lithic assemblages

The lithic material of Abri des Pêcheurs (ancient and recent excavations) is composed of 315 pieces for S2, 649 for S3 and 222 for S4; mainly made in quartz (up to 95 %) and flint artefacts. Local quartz pebbles were flaked *in situ* by unifacial or bifacial core technologies to provide irregular end-products rarely retouched. Small flint flakes (unretouched or retouched) and some small cores on flake were introduced into the site already knapped. Some flint flakes are Levallois ones (MONCEL *et al.*, 2008). Twenty-seven different types of flint were identified, collected from alluvial deposits and colluviums from semi-local outcrops in an area extending in several directions up to 30 km from the site (FERNANDES *et al.*, 2010).

At Les Barasses II, the lithic corpus totals 813 pieces for the two main units (respectively 195 and 618 from Upper and Lower units). The local raw materials are mainly basalt, limestone, quartzite and quartz pebbles probably collected in the river bed under the cave and partially worked *in situ* (mostly flakes and one pebble tool). Fifteen types of flint were identified, collected from local outcrops up to 30 km mainly eastwards (FERNANDES *et al.*, 2018). The flint artefacts are diversified and represent circa 45 % (a bit less in the lower part of the sequence), mostly composed of products of reduction processes (small flakes and larger elongated flakes) and some small modified cores on flakes. The core technologies are various (Discoid, Levallois, Kombewa, Quina). The presence of very small flakes indicates an *in situ* activity of knapping or alteration. Scrapers and some points (including broken ones) compose the tool kits.

In short, the Middle Palaeolithic occupation layers of the two sites yield a relatively small quantity of artefacts compared to other sites in the region (MONCEL, DAUJEARD, 2012). The reduction sequences are incomplete and indicate regular introduction of ready-made tool kits made of flint coming from a restricted area (< 20-30 km), and also quartz and volcanic local stones. Those lithic assemblages may be related to short-term human occupations.

## Materiel and methods

We will compare the faunal sets on the base of abundance of taxa, skeletal representation, degree of bone breakage, anatomical connection, age mortality profile and presence of anthropogenic and carnivore marks, focusing on ibex remains. The methodological approach and raw data have been presented in different previous publications for the two sites (MONCEL *et al.*, 2008; DAUJEARD *et al.*, 2016; DAUJEARD *dir.*, 2018) and resumed here for comparative purposes.

	Barasses-Upper		Barasses-Lower	
	NISP	%NISP	NISP	%NISP
<i>Ursus spelaeus</i>	19	8.6 %	4	2.2 %
<i>Ursus</i> sp.	1	0.5 %	1	0.6 %
<i>Canis lupus</i>	8	3.6 %	4	2.2 %
<i>Vulpes vulpes</i>	30	13.5 %	16	8.8 %
<i>Panthera pardus</i>	2	0.9 %	1	0.6 %
<i>Felis silvestris</i>	1	0.5 %	3	1.7 %
<i>Martes martes</i>			2	1.1 %
<i>Lutra lutra</i>	1	0.5 %	1	0.6 %
<b>Total Carnivores</b>	<b>62</b>	<b>27.9 %</b>	<b>32</b>	<b>17.7 %</b>
<i>Capra ibex</i>	128	57.7 %	79	43.6 %
<i>Rupicapra rupicapra</i>			13	7.2 %
<i>Capra/Rupicapra</i>			4	2.2 %
<i>Bos/Bison</i>	7	3.2 %	5	2.8 %
<i>Rangifer tarandus</i>	7	3.2 %		
<i>Cervus elaphus</i>	13	5.9 %	30	16.6 %
<i>Equus caballus</i>	4	1.8 %	5	2.8 %
<i>Coelodonta antiquitatis</i>			1	0.6 %
<b>Total Herbivores</b>	<b>159</b>	<b>71.6 %</b>	<b>137</b>	<b>75.7 %</b>
<i>Castor fiber</i>			1	0.6 %
Lagomorphes	1	0.5 %	11	6.1 %
<b>Total NISP</b>	<b>222</b>	<b>100.0 %</b>	<b>181</b>	<b>100.0 %</b>

**Tab. 1.** Faunal spectrum for medium and large-sized mammals at Les Barasses II (Number of Identified Specimens: NISP).

The analysis concerns the faunal remains of medium- and large-sized mammals coming from recent (R) excavations (C. Daujeard for Les Barasses II and M.H. Moncel for the S2 to S4 of Abri des Pêcheurs) and ancient (A) excavations (G. Lhomme for S4 of Abri des Pêcheurs). Bone breakage and surface modifications were distinguished between those made by rodents, carnivores (gnaw-marks) or hominins (cut and percussion marks), as well as climatic and edaphic modifications (including cracking, desquamation, polish, concretion, root etchings, natural abrasion, chemical corrosion and oxide colorations) (BINFORD, 1981, LYMAN, 1994). Following HAYNES (1983) and BLUMENSCHINE (1988), carnivore marks were classified as follows: pits, punctures, scores, notches or corrosion by gastric acids, and their location on long bones were recorded. Ontogenic age-at-death for ibex is based on dental eruption and replacement patterns and then on

	Pêch-S2-3 (R)		Pêch-S4 (A)		Pêch-S4 (R)		Pêch-S4 (total)	
	NISP	%NISP	NISP	%NISP	NISP	%NISP	NISP	%NISP
<i>Crocuta crocuta</i>	2	1.7 %	79	4.2 %			79	4.0 %
<i>Ursus spelaeus</i>	21	17.8 %	46	2.4 %			46	2.4 %
<i>Canis lupus</i>	16	13.6 %	150	7.9 %	1	1.8 %	151	7.7 %
<i>Cuon alpinus</i>			1	0.1 %			1	0.1 %
<i>Vulpes vulpes</i>	9	7.6 %	45	2.4 %	1	1.8 %	46	2.4 %
<i>Panthera pardus</i>			7	0.4 %			7	0.4 %
<b>Total Carn</b>	48	40.7 %	328	17.3 %	2	3.6 %	330	16.9 %
<i>Capra ibex</i>	62	52.5 %	1536	80.8 %	49	89.1 %	1585	81.1 %
<i>Rangifer tarandus</i>	1	0.8 %	11	0.6 %	3	5.5 %	14	0.7 %
<i>Cervus elaphus</i>	5	4.2 %	23	1.2 %	1	1.8 %	24	1.2 %
<i>Capreolus capreolus</i>	1	0.8 %						
<i>Equus caballus</i>			2	0.1 %			2	0.1 %
<b>Total Herb</b>	69	58.5 %	1572	82.7 %	53	96.4 %	1625	83.1 %
<i>Castor fiber</i>	1	0.8 %						
<b>Total NISP</b>	118	100.0 %	1900	100.0 %	55	100.0 %	1955	100.0 %

**Tab. 2.** Faunal spectrum for small, medium and large-sized mammals at Abri des Pêcheurs (Number of Identified Specimens: NISP).

tooth wear (GRANT, 1982; COUTURIER, 1961; 1962). Three age groups were distinguished: juvenile, adult and old. However not all these taphonomical criterions will be fully developed in this contribution, and most were exposed in previous publications (MONCEL *et al.*, 2008; DAUJEARD *et al.*, 2016; DAUJEARD *dir.*, 2018).

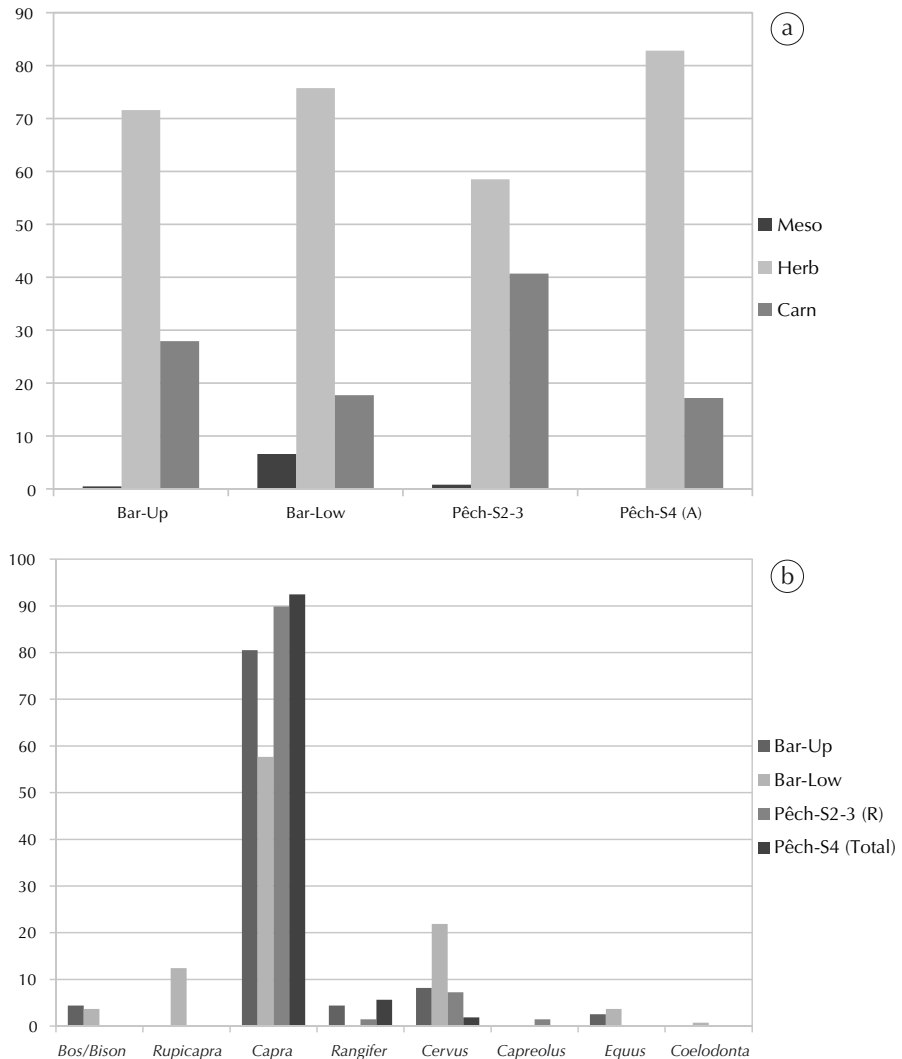
The Lower unit of Les Barasses II contains a total of 7,040 faunal remains (sieving and coordinated) of which only 348 were studied for taphonomy (number of recorded bone remains with readable surfaces) and with a number of identified specimens (NISP) of 181. The Upper unit has a total of 3,487 remains, including 349 that are taphonomically studied and a NISP of 222 (DAUJEARD *dir.*, 2018) (tab. 1). The total NISP for the sector 4 of Abri des Pêcheurs is of 1,900 for the earliest excavations and of 55 for the recent ones, while the NISP from the sectors 2 to 3 is of 118 (MONCEL *et al.*, 2008; DAUJEARD *et al.*, 2016) (tab. 2). For the sector 4 of Abri des Pêcheurs, given that the ibex series coming from the first excavations is the most abundant, we preferentially used those data for the graphs representing the carnivore/herbivore distribution and age categories (fig. 2-3).

### Zooarchaeological and taphonomic data

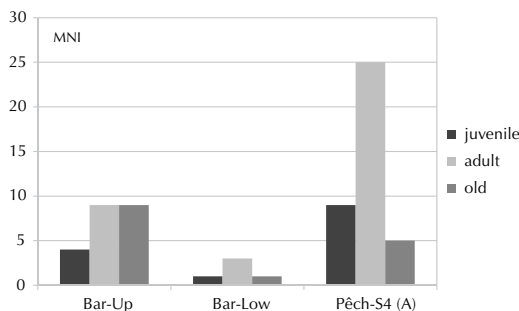
Ibex remains are largely abundant at Les Barasses (80.5 % of the NISP herbivore and 57.7 % of the NISP total for the Upper unit and respectively 57.7 % and



43.6 % for the Lower unit; tab. 1 and fig. 2b), followed by cervids such as red deer and reindeer, and by other secondary herbivores like bovines, horses, woolly rhinoceroses and chamois. Among the carnivores, which represent respectively 27.9 % and 17.7 % of the total identified specimens in the Upper and Lower units (tab. 1 and fig. 2a), we find in order of frequency; red foxes, cave bears, and wolves, and a few panthers, wild cats and mustelids. Some lagomorphs and beavers are present. Red fox is present in the Upper unit with one juvenile, two mature adults and one



**Fig. 2.** a) Large Taxonomical Distribution (Meso = mesofauna, Herb = herbivore, Carn = Carnivore) (% NISP); b) Detail of Herbivore distribution by taxa (% NISP). Bar = Les Barasses II, Up = Upper units (total NISP = 222) and Low = Lower (total NISP = 181) units; Pêch = Abri des Pêcheurs, S2-3 (R) = sectors 2 and 3 for recent excavations (total NISP = 118) and S4 (total) = sector 4 for ancient and recent excavations (total NISP = 1,955).



**Fig. 3.** Age profile of ibex (MNI = Minimum number of individuals). Bar = Les Barasses II, Up = Upper (total MNI = 22) and Low = Lower (total MNI = 5) units. *Pêch* = *Abri des Pêcheurs*, S4 (A) = sector 4 for ancient excavations (total MNI = 39).

old individual, and in the Lower unit by one juvenile and one adult. For the cave bear, the Upper unit counts two juveniles and one mature adult, and the Lower unit yields only juveniles. The wolf is the third most frequent carnivore in the cave, distributed all along the sequence, with the presence *a minima* of one young and one mature adult in the Upper unit and one old individual in the Lower unit. The panther is rare and present in both units while small carnivores, felids and mustelids, are only present in the Lower unit. All these communities of species are in correspondence with the local biotopes present around the two caves.

The faunal association of *Abri des Pêcheurs* is also dominated by ibex (89.9 % of the NISP herbivore and 52.5 % of the NISP total for S2-3 and respectively 97.5 % and 81.1 % for S4; tab. 2 and fig. 2b), completed by cervids (red deer, reindeer and very few roe deer). Carnivores are abundant with 40.7 % of the total identified specimens for S2-3 and up to 16.9 % for S4 (tab. 2 and fig. 2a), mainly wolf and cave bears, few foxes, and some scarce cave hyena remains. Carnivores are mostly adults with some old individuals. Beavers are also present (S2-3). This varied spectrum is closely related to the local environment, with many rocky cliffs and some forests and open grassland species along the rivers and on the plateau.

Skeletal profiles for ibex are similar between the two sites (*in* DAUJEARD *dir.*, 2018: 137, fig. 69 and *in* MONCEL *et al.*, 2008: 389, fig. 6) with all the skeletal parts represented (tab. 3 et 4), indicating the presence/introduction of some complete carcasses into the site. Limb bones, head (mainly isolated teeth) and axial portions are dominant, whereas small foot bones, such as phalanges, carpals and tarsals are fewer.

Among the ibex populations all age groups (juvenile, adult and old) are represented in the two sites, although adults (mature and old) are the most abundant (fig. 3). We can note the existence of both sexes, based on cranium (horn cores) and pelvis fragments, as well as metrical differences for some bone elements. Seasonal indices for ibex (periods of dental eruption for juveniles) at Les Barasses II give individual deaths from summer to winter. No seasonal evidence could be found for the other ungulate species.

Regarding bone preservation, the three main climatic and edaphic modifications (weathering, corrosion and concretions) have slightly affected the bone assemblages. Most of the bone surfaces are easily readable and cracking and flaking are moderate. Trampling is the post-depositional process which had

the greatest impact, with spatial disruptions and abrasion marks (striations and polishes). The bone assemblages are highly fragmented. The few complete elements are mostly small articular bones or vertebrae of carnivores and ungulates, with some very well-preserved ibex vertebrae found in anatomical connections. Complete long bones are scarce, with some long bone cylinders. For ibex we found only one complete radius and one metacarpal from the Upper unit of Les Barasses II. At Les Pêcheurs, at least 11 % of the ibex remains are complete, most of them are metapodials or short and compact bones (talus, phalanges). Dry bone breakage (weathering, trampling or sedimentary pressure) as well as green bone breakage (carnivores and humans) are both responsible of that intense

	NISP	%NISP	%MAU	Survival rates
cranial remains	4	3.1 %	16.7 %	10.0 %
maxillary	2	1.6 %	16.7 %	10.0 %
mandible	10	7.8 %	100.0 %	60.0 %
humerus	2	1.6 %	33.3 %	20.0 %
radius-ulna	7	5.5 %	66.7 %	40.0 %
carpals	2	1.6 %	5.6 %	3.3 %
metacarpal	6	4.7 %	66.7 %	40.0 %
femur	5	3.9 %	50.0 %	30.0 %
tarsals	7	5.5 %	19.4 %	11.7 %
metatarsal	1	0.8 %	16.7 %	10.0 %
metapodials	3	2.3 %	25.0 %	15.0 %
phalanges	9	7.0 %	12.5 %	7.5 %
ribs	21	16.4 %	21.8 %	13.1 %
cervical vertebrae	2	1.6 %	9.5 %	5.7 %
thoracic vertebrae	3	2.3 %	7.7 %	4.6 %
lumbar vertebrae	5	3.9 %	27.8 %	16.7 %
sacrum	2	1.6 %	66.7 %	40.0 %
unidentified vertebrae	2	1.6 %	0.0 %	0.0 %
coxal	1	0.8 %	16.7 %	10.0 %
scapula	2	1.6 %	33.3 %	20.0 %
upper isolated teeth	10	7.8 %		
lower isolated teeth	14	10.9 %		
unidentified isolated teeth	8	6.3 %		
<b>Total NISP</b>	128	100.0 %		

**Tab. 3.** Anatomical distribution of the ibex remains from the Upper units of Les Barasses II (Number of Identified Specimens: NISP; Minimal Animal Unit: MAU and Survival rates: MAU\*100/NMImax).

fragmentation. At Les Barasses II for example, green bone fractures are mostly associated to carnivore tooth marks throughout the sequence, with 32.5 % in the Lower unit and 40.8 % in the Upper unit. On the other hand, 6 % of the green bone fractures are associated with percussion marks in the Upper unit and 22 % in the Lower unit, suggesting some human activity of marrow extraction.

At Les Barasses II, carnivore activity is revealed by a high proportion of gnawing marks among the identified specimen, between one third and half of the NISP according to layers. On the whole, we count 9.2 % of carnivore tooth-marked elements in the Upper unit and 12.1 % in the Lower unit, with almost half of the ibex remains bearing carnivore traces, respectively 50.1 % and 44.6 % for the

	NISP	% NISP	% MAU	Survival rates
cranial remains (skull)	45	2.9 %	70.3 %	57.7 %
mandible	28	1.8 %	43.8 %	35.9 %
isolated teeth	255	16.6 %		
humerus	66	4.3 %	62.5 %	51.3 %
radius-ulna	92	6.0 %	82.8 %	67.9 %
carpals	27	1.8 %	7.0 %	5.8 %
metacarpal	41	2.7 %	50.0 %	41.0 %
femur	90	5.9 %	68.8 %	56.4 %
patella	6	0.4 %	9.4 %	7.7 %
tibia	72	4.7 %	48.4 %	39.7 %
tarsals	76	4.9 %	19.8 %	16.2 %
metatarsal	42	2.7 %	43.8 %	35.9 %
metapodial	35	2.3 %	23.4 %	19.2 %
phalanx I	64	4.2 %	22.3 %	18.3 %
phalanx II	28	1.8 %	10.5 %	8.7 %
phalanx III	23	1.5 %	9.0 %	7.4 %
sesamoids	10	0.7 %	1.3 %	1.1 %
ribs	99	6.4 %	7.0 %	5.7 %
costal cartilage	5	0.3 %		
vertebrae	296	19.3 %	35.6 %	29.2 %
sternebrae	14	0.9 %		
coxal	71	4.6 %	100.0 %	82.1 %
scapula	51	3.3 %	50.0 %	41.0 %
<b>NISP</b>	<b>1536</b>	<b>100.0 %</b>		

**Tab. 4.** Anatomical distribution of the ibex remains from the S4 (A) of Abri des Pêcheurs (Number of Identified Specimens: NISP; Minimal Animal Unit: MAU and Survival rates: MAU\*100/NMImax).



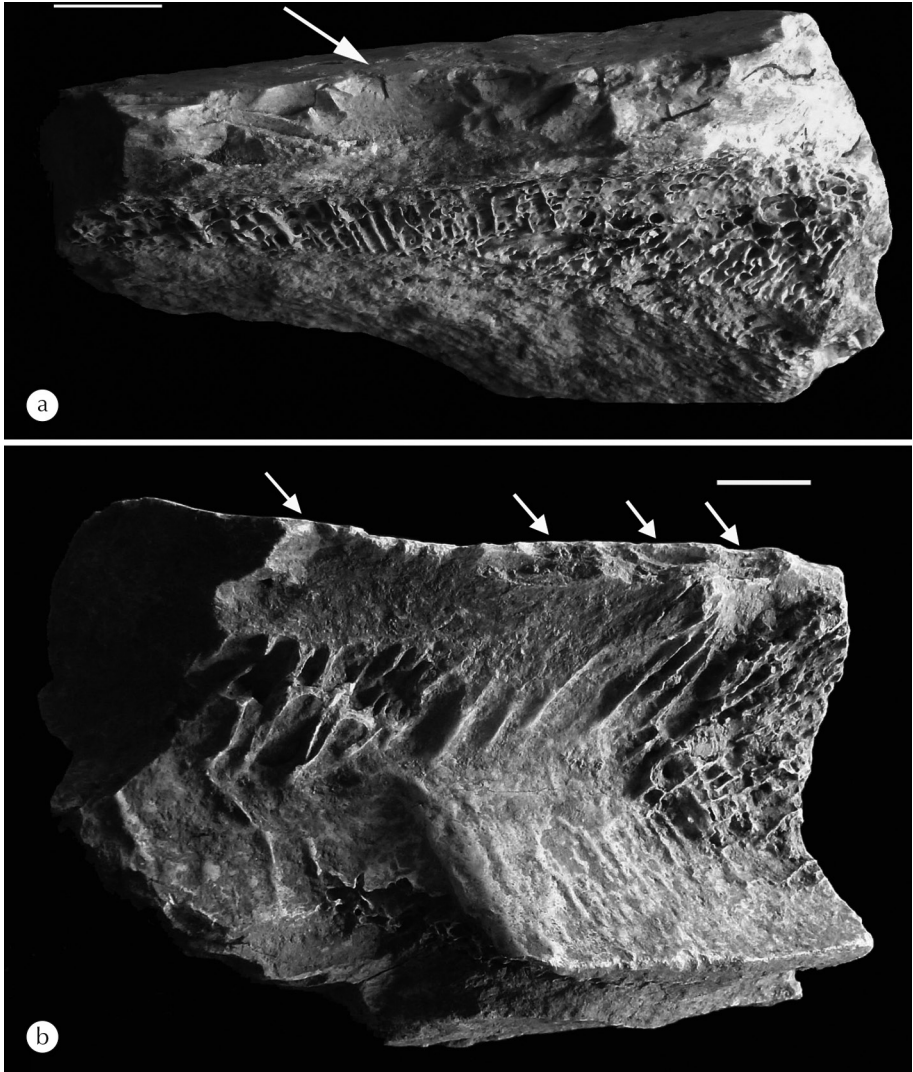
**Fig. 4.** Different stages of carnivore bone surface modifications (pits, punctures and scores) for ibex remains at Les Barasses II (Upper units – Combier excavations; DAUJEARD, 2008). a) calcanei; b) proximal ulnas; c) scapulas; d-e) proximal and distal metatarsals and f) distal metapodial.

two assemblages. Most of the bone surface modifications are pits, punctures and scores (fig. 4). Digested remains are scarce and count about twenty small carnivorous articular bones and unidentified fragments. Human cut marks on bones are globally uncommon with 0.5 % of cut-marked remains in the Upper unit and 0.8 % in the Lower unit (DAUJEARD *dir.*, 2018). However, the percentage is higher when considering only the herbivore stock, respectively 12 % of cut marks in the Upper unit and 23 % in the Lower unit, mainly found in stylopodial and zeugopodial skeletal parts. This main hominid exploitation occurred on secondary species such as red deer, reindeer or bovines; the ibex seems relatively less affected with 6.7 % of butchery marks from the Upper unit and nearly 19.6 % from the Lower unit. We notice that percussion marks and green bone fractures are both more numerous in the Lower units, which can be related to the greatest impact of humans in these layers. Skinning, defleshing, dismembering, scraping and marrow extraction are all recognized butchery actions in the two units.

A relatively different picture is observed for other ungulate remains at Abri des Pêcheurs (MONCEL *et al.*, 2008). Globally speaking, cut-marked elements are less frequent, only visible on few bones whatever the sectors: five from ibex, four from red deer and only one on reindeer (this count excludes the unidentified bone splinters). Percussion marks are also rare on ibex and reindeer long bones. Butchery marks are often located on metapodials, suggesting dismembering and skinning processes (figs. 5-6). Carnivore activity (gnawing marks) is largely present (10.9 % for ibex remains in S2-3 and around a third for identified species in S4,



**Fig. 5.** a) Dismembering cut marks on the medial face of a red deer talus (Pech86-C6) and b) on the distal part of a reindeer metatarsal (Pech86-C9) from the sector 4 of Abri des Pêcheurs (scale = 1 cm; the red line drawings were made in the past).



**Fig. 6.** *a*) Percussion notches on shaft fragments of a large ungulate humerus (Pech78-C9-D9) and *b*) of a red deer humerus (Pech89-D10) (scale = 1 cm).

including carnivores themselves), although with a low degree of bone destruction, lower than that observed in hyena dens (MONCEL *et al.*, 2008).

Thus, in both sites, taking into account the relative frequency of each species, the humans seem to have preferentially processed secondary ungulates, especially cervids. Ibex were sometimes exploited, as maybe it was more the case at the Lower unit of Les Barasses, although in a less systematic way. Carnivore actions are also apparent and could be related to moderate modifications left by canids such as wolves and foxes.

Finally, no clear evidence of fire-use exists at Les Barasses II. On the other hand, a large fireplace is present in the S4 of Abri des Pêcheurs, which induced the accidental burning of many bones.

## Discussion

### ***What types of accumulations for the various animals in these two small caves?***

The ibex is the main herbivore present in both sites of Les Barasses II and Abri des Pêcheurs. Several points stressed the presence of complete skeletons of many individuals of different age classes, mainly adults of both sexes, sometimes found in articulated connection (S4 – Abri des Pêcheurs). The study of bone surfaces showed a clear impact of carnivores for all the assemblages. The low degree of modifications and dimensions of the tooth marks shows that small-to-medium-sized carnivores (mainly canids) consumed the carcasses. Cut-marked elements are fewer, mostly present on some long bones of non-caprine elements. These bone surface modifications, along with skeletal and age representations, suggest diverse origins to explain the presence of this ‘rocky species’ within these two caves: carnivore, human and natural.

Indeed, according to the moderate carcass exploitation and the relative bone completeness, the ibex accumulations seem to be partly driven by several non-exclusive natural reasons such as trapping, wintering, calving or sheltering. The caprines are known to use karstic cavities as a shelter during harsh climatic conditions and, in our cases, they were also probably trapped due to difficulty of access (caves have a steep entrance) complicated by potential development of snowdrifts in winter time (deposit under cold glacial conditions) (see MONCEL *et al.*, 2008 and reference herein). Nevertheless, seasonal analyses based on mandibles highlight deaths all year long, excepting during spring. Their absence during this season could be the mobility of herds looking for better pastures and/or birth places in different regions, like the mountainous landscapes of the Vivarais about ten kilometers away. Humans and carnivores could be other minor agents of the ibex accumulation and modifications, either by hunting or scavenging.

The secondary ungulate species (cervids and bovines) are only represented by a few long bone elements showing some more anthropic and/or carnivore modifications. In our opinion it corresponds to direct predator activities or scavenging especially from human groups which transport carcass parts, and not complete skeleton, for *in situ* consumption during transient or crossing occupations.

Inversely, other species such as chamois, horse or small mammals, are represented by a very few limb elements and isolated teeth, bearing only carnivore marks. They could account for carnivore prey from medium-to small-sized predators.

Fox remains are numerous at Les Barasses II. Age and skeletal profiles, including juveniles and all parts of the skeleton, indicate denning activities, notably in



the Lower unit where the presence of mustelids, lagomorphs and bird remains bearing small-sized carnivore tooth marks, also point towards a great impact of the fox on this small vertebrate assemblage (accumulation and modification).

The large predators, wolves, cave hyenas and panthers are mainly represented by scattered skeletal elements belonging to adults and old individuals. Their presence in the cave mostly results from natural deaths in the cave, and possibly interspecific competition and encounters.

The case of cave bears is peculiar and they are well known for their hibernating behavior (winter lethargy). They are among the dominant carnivores and include foetal and juvenile individuals. Some of them died during winter, indicating hibernation. Animal or human trampling has caused significant damage (displacement, striations and fragmentation), particularly in the upper part of the sequence of Les Barasses II and in the S4 of Abri des Pêcheurs, where more cave bears used the cave.

### ***What type of accumulations for small bovids in European Pleistocene rocky landscapes?***

In order to decipher carnivore, human or natural origin within such small bovids assemblage, a description of the topographic (aspect of the cave and surroundings) and taphonomic features (age and skeletal profiles, completeness of bones, rates and distribution of the cut and tooth marks, seasonality and so on) can be used. Data will be also discussed regarding eco-ethological data of modern caprines and carnivores. Here, we aim to categorize some of the famous and already published (without being exhaustive) Holocene or Pleistocene caprine-dominant sites into four categories.

1. **Natural accumulations:** Holocene and Pleistocene fossil records yield natural caprine accumulations in caves, shelters or pitfalls in rocky landscapes, sometimes in highland mountains. Those caprine-dominant sites present almost complete carcasses and bone elements, some being in anatomical association, and moderate bone surface modifications, which may be related to natural deaths from animals finding themselves trapped, or during sheltering. These sites reflect the particular behaviour of these ungulates; visiting caves, sometimes deep karstic networks and natural traps. As stated above, the presence of living caprines in cavities can be explained by the need to find a refuge against heat or cold weather (COUTURIER, 1962; SCHALLER, 1977). This type of actualistic observation broadens the scope of interpretations for the fossil record. Natural accumulations of ibex have been observed among Pleistocene and Holocene fossil faunal accumulations in rocky landscapes: *e.g.* Grotte de l'Église in southwestern France (GRIGGO, 1992), Les Barasses II and Les Pêcheurs in southeastern France (this study), Observatoire cave in Monaco (BRUGAL *et al.*, 2017) and probably in some layers of the Hortus cave (LUMLEY, DE, 1972) and finally in some higher altitude caves in the Alps (for example the Tempiette cave) (BLANT *et al.*, 2012; LURET, CASTEL, 2012; GRIGGO, 2015;

among others). This behavior seems to be common to many caprine species, and we could also mention the case of the tahr (genus *Hemitragus*) in the early Pleistocene site of l'Escale (Bouches-du-Rhône, Bonifay 1974-1975) and in the late Middle Pleistocene of Les Cèdres cave (Var, DEFLEUR, CRÉGUT-BONNOURE, 1995). However, these accumulations are also partly due to predators and thus may belong to the fourth category (cf. *infra*).

2. Human accumulations: the predation and significant consumption of caprines by Palaeolithic human groups has been identified in many Pleistocene sites in France such as (among others) Caune de l'Arago for the mountain sheep (MONCHOT, 1996; 1997; RIVALS, 2002), West cave of Le Portel (GARDEISEN, 1999), Tournal cave (MAGNIEZ, 2009), Baume des Peyrards (DAUJEARD, 2008) or in the Magdalenian layer of les Eglises (DELPECH, VILA, 1993) for the ibex, Scladina cave in Belgium (MONCEL *et al.*, 1998) for the chamois and Bau de l'Aubesier in France (FERNANDEZ *et al.*, 1998) for the tahr. In the Iberian Peninsula, ibex and chamois were frequently hunted by Neanderthals in similar contexts (YRAVEDRA, COBO-SÁNCHEZ, 2015). Cut marks, percussion marks, green bone breakage and the presence of all age classes and high-meat portions for ibex carcasses are the main indicators of a human predation.
3. Carnivores accumulations: carnivores as potential predators and accumulators of caprines in caves or shelters are *a priori* uncommon. The most common species associated with remains of caprines are canids (wolf, cuon and fox) and medium-sized felids such as panther and lynx. Some of these taxa, considered as non-accumulators of carcasses on the basis of published studies, may have accumulated remains indirectly through their faeces (MALLYE *et al.*, 2012). They may also have been direct accumulators as well, behaving differently during the Pleistocene under harsher climatic and competitive conditions. Some fossil series would add weight to this argument. For example, those discovered in the Noisetier Cave in France suggest indirect accumulations (coprocoenosis) of large canids and those from the sites of Racó del Duc and Los Rincones in Spain and Soulabé cave in France indicate that large felids (*i.e.*, panthers) may have been predators and bone accumulators (SAUQUÉ *et al.*, 2014; 2016; SAUQUÉ, SANCHIS, 2017; FOSSE *et al.*, this volume). The Middle Palaeolithic site of Esquilleu in Spain may highlight carnivores (hyenids and canids) as the main agents in the introduction of caprines in the site, with some human activity evidence (YRAVEDRA, GÓMEZ CASTANEDO, 2014). The type of carnivores, the presence and distribution of tooth marks on the caprine carcasses, the degree of preservation of the bone elements (complete, cylinders or fragments) and the age (most vulnerable individuals) and skeletal profiles are criteria which can be used to identify the impact of carnivores on a caprine assemblage. According to COUTURIER (1962), ibex and especially young individuals have been and still are prey for the wolf, although the chamois is currently favored. Moreover, as COUTURIER also points out, the important presence of fox in certain caprine-assemblages should not be underestimated. It is an active carcass scavenger and can also attack very young individuals.

4. Mixed accumulations: usually, carnivores and even human accumulations of caprine remains go along with some natural and recurrent presence of those rupicolous animals. This is actually the majority of the caprine-dominant Pleistocene accumulations, which share criteria from the three types of accumulations described above. Some examples among others are the mixed accumulations at L'Hortus (LUMLEY DE, 1972; BOULBES, 2003), Les Cèdres caves (DEFLEUR, CRÉGUT-BONNOURE, 1995) and the two cave sites presented here, Les Barasses II and Abri des Pêcheurs, for the French Middle Palaeolithic (DAUJEARD, 2008; MONCEL *et al.*, 2008; DAUJEARD *dir.*, 2018), Zafarraya in Spain (CAPARRÓS *et al.*, 2012) and Buraca Escura in Portugal for the Middle and Upper Palaeolithic (AUBRY *et al.*, 2001; BRUGAL, 2010; ARCEREDILLO *et al.*, 2018). All document a scarce human exploitation.

## Conclusion

At Les Barasses II and Abri des Pêcheurs, ibex remains appear to have been mostly naturally accumulated. These two sites thus provided convenient shelters not only for humans but also for various animals, including caprines. Whether sheltered or trapped, the animals died in these small and narrow caves of peculiar topography and difficult accesses, and may have been consumed by secondary predators. We cannot rule out a few cases of direct predation by humans or medium – and large – carnivores either and we must note the predominance of canids, and especially wolves in these caves. We have highlighted punctual human activities in these sites due to some butchery marks mainly observed on secondary herbivore species. Besides Neanderthal occupations, there is evidence of the presence of small, medium, and large-sized carnivores (birth or death places). The caves have been frequently used by many animals and humans for sheltering, hibernating, denning or procuring food supplies. The scant human archaeological evidence illustrates recurrent and short-term visits. The caves were used for bivouacs (transient/resting sites) involved in larger scale mobility strategies. Human subsistence was mostly oriented towards cervids and bovines, rather than caprines inhabiting the cliffs surrounding the caves. The sites were not real hunting places but rather a waypoint briefly used (on a day-base) with ready-made lithic tools and some parts of herbivore carcasses brought in (snack).

The biological and chronological similarities between these faunal assemblages could indicate recurrent visits of the cave by Neanderthal groups sharing the same behavioral pattern. It could also suggest a specific type of occupation of these rocky environments by humans and animals, underlining at some point a determinant influence of topography on subsistence behaviours.

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# HOMMES ET CAPRINÉS HUMANS AND CAPRINES

*de la montagne à la steppe, de la chasse à l'élevage  
From mountain to steppe, from hunting to husbandry*

*Lionel Gourichon, Camille Daujeard, Jean-Philip Brugal*

Les 39<sup>e</sup> Rencontres Internationales d'Archéologie et d'Histoire d'Antibes ont porté sur la thématique de la relation Homme-Caprinés au cours des temps préhistoriques et historiques. Dans une démarche diachronique et pluridisciplinaire, archéozoologues, paléontologues, écologues, taphonomistes, ethnologues, anthropologues, archéologues et historiens se sont regroupés pour esquisser et illustrer l'Histoire de cette longue et étroite relation autour de ce titre ambitieux : « Hommes et Caprinés: de la montagne à la steppe, de la chasse à l'élevage ». Les interactions entre les Hommes et les Caprinés débute bien avant la domestication, dès le Paléolithique inférieur, au cœur des milieux rocheux d'Eurasie. À partir du Néolithique, la domestication de certaines espèces (mouton, chèvre) a joué un rôle majeur dans les changements socio-économiques des sociétés humaines au Proche-Orient, en Europe et en Afrique, et transformé les paysages par le pastoralisme, jusqu'au temps actuels et sur tous les continents. À travers les pratiques de subsistance, de la prédation à la domestication, et des pratiques pastorales les plus diverses, complétée par les dimensions biologiques, écologiques et sociales, l'iconographie et la symbolique, ce recueil met en lumière ce groupe particulier d'ongulés, les Caprinés, et leurs exploitations *sensu lato* par les groupes humains.

The 39<sup>th</sup> Rencontres Internationales d'Archéologie et d'Histoire d'Antibes focused on the topic of the Human-Caprines relationship in prehistoric and historical times. Within a diachronic and multidisciplinary approach, zooarchaeologists, paleontologists, ecologists, taphonomists, ethnologists, anthropologists, archaeologists and historians gathered to sketch and illustrate the history of this long and close relationship through this ambitious topic: "Humans and Caprines: from mountain to steppe, from hunting to husbandry". The interactions between Humans and Caprines starts well before the domestication, since the lower Palaeolithic, in the rocky Eurasian regions. From the Neolithic onwards, the domestication of some species (sheep, goat) played a crucial role in the socio-economic changes in the Near East, Europe and Africa, and transformed the landscapes through pastoralism till the present time and on all continents. Through subsistence practices, from predation to domestication, as well as through a large variety of dimensions: social, economic, biological, ecological, iconographic and symbolic, this volume deals with this particular group of ungulates, the Caprines, and their exploitation *sensu lato* by human groups.

