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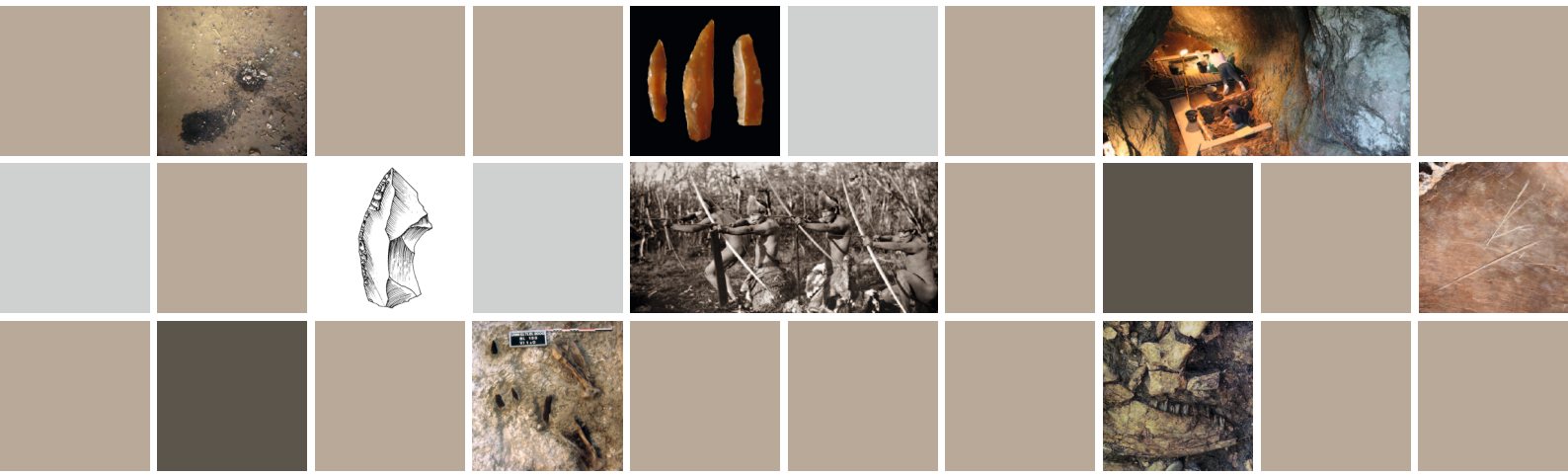

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Article outline

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A Specialised Hunting Stop or a Short-term Camp? An Example of a Multidisciplinary Approach

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WHAT OCCUPATION TYPE IN THE UNIT F AT PAYRE (ARDÈCHE, FRANCE)?

A Specialised Hunting Stop or a Short-term Camp? An Example of a Multidisciplinary Approach

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Abstract
The middle Rhône Valley in the south east of France offers an opportunity to address the question of Neandertal mobility and the status of their occupations by comparing a broad corpus of sites in a limited chronological and geographic context. The combined study of occupation levels from ten deposits has revealed three occupation types defined based on the management and use of animal resources (Daujeard, 2008). This diversity is represented by technical choices and diverse tool assemblages. In addition to faunal criteria, this work compares other parameters, such as archaeostratigraphy, lithic artefacts and dental microwear to determine site function and occupation duration. We present the example of unit F at the site of Payre, dated to MIS 8/7 and defined as a recurring short -term camp.

Keywords
Middle Pleistocene, Neandertal, territorial exploitation, occupation duration, site function, zooarchaeology, dental microwear, technology.

1 - Introduction

The transitional position of the Rhône valley between two mountainous areas – sectors rich in lithic raw materials, watercourses, valleys and limestone plateaus containing numerous karst rock shelters – favoured recurring human occupation throughout the Middle and Late Pleistocene, particularly in its narrowest section (the middle valley).

The archaeozoological study of several Middle Palaeolithic deposits located on the right bank of the Rhône led to the proposition of three occupation types defined through territorial organisation and the use of animal resources (Daujeard, 2008):

- long-term residential camps;
- seasonal shorter term camps;
- brief stops.

Payre is one of these sites. The study of unit F offers the opportunity for a multi-disciplinary examination of a recurring camp dated to the end of Marine Isotopic Stage (MIS) 8 and the beginning of MIS 7 (Moncel *et al.*, 2008) and a discussion of the function of the site during the Palaeolithic.

2 - Presentation of the site and unit F

The site of Payre is located on a rocky dominating by around sixty metres the Rhône valley and the small canyon of Payre (figure 1). The site consists of a small terrace oriented to the south east, delimiting the location of an ancient cave whose ceiling collapsed during its filling (figure 2). The sequence of more than five metres includes four major units (G, F, E and D from bottom to top; figure 3) dated by ESR, U-TH, TL and TIMS to MIS 8 to 5 (Valladas *et al.*, 2008). Neandertal human remains (teeth and fragments of parietal bones) are dispersed throughout the whole of the sequence (figure 3). Environmental data suggests that the three main units (G, F and D) correspond to temperate humid phases (El Hazzaai, 1998; Kalaï *et al.*, 2001; Moncel *et al.*, 2002, 2008), from Marine Isotopic Stage 8/7 for the bottom of the sequence (units G and F) and from the end of MIS 6 and the start of MIS 5 for unit D. In all units, red deer is the most common ungulate, followed by bovids and equids (Moncel *et al.*, 2002, 2008). The biometric data obtained from the red deer indicate the existence of two different eco-phenotypic populations (Liouville, 2007). For the equids, the biometric data indicate a large type that can be attributed to *Equus mosbachensis*, which is consistent with occupations prior to the last glacial period. The analyses of carbon isotopes from the dental enamel of these two herbivores indicate an open habitat (Bocherens and Rousseau, *in* Moncel, 2008; Rousseau *et al.*, submitted). The evolutionary stage of the tahr also confirms the absolute dates (Crégut-Bonnoure, *in* Moncel *et al.*, 2008). Among carnivores, *Ursus spelaeus* dominates, particularly in unit F, which is considered as a bear den during the winter periods. The typically speleal morphological and morphometric characteristics of bears in this unit argue for a more recent period, such as MIS 6, and therefore an intrusion of ursids into this level. The only marks observed on the bear bones are marks of carnivore bites (Auguste, *in* Moncel *et al.*, 2008).

Unit F was excavated over 25 m² in the east and central part of the terrace, where the ceiling height was the greatest (figure 2). The receding of the hillside by erosion led to the disappearance of the front of the site and the excavations were therefore conducted mainly in the interior of the occupation site. During the deposition of this unit, the site was still a cavity but the extent of the habitable area was smaller than for unit G below. Unit F is characterised by its thickness (more than 1 m at certain points) and contains several sub-units defined according to their granulometry and the nature of the large fragments, the characteristics of the sand and the abundance of the loamy clay matrix. Three main phases can be observed (Dubois, 2000; Moncel *et al.*, 2008):

- sub-units F6 to F5: cold climatic conditions, receding of the cave but phase still linked to the endokarst;
- sub-unit F4: the same climatic context but with the presence of large limestone plates resulting from the collapse of the level known as “Chomérac marble”, and significant recession of the walls and ceiling;
- upper sub-units (F3 to F1): clearly more humid conditions.

The presence of a speleothem in the central part of the site indicates the arrival of carbonated water filtering through the sediments of unit F, drained by the karst conduits leading to the ceiling of a cavity that had not yet completely collapsed.

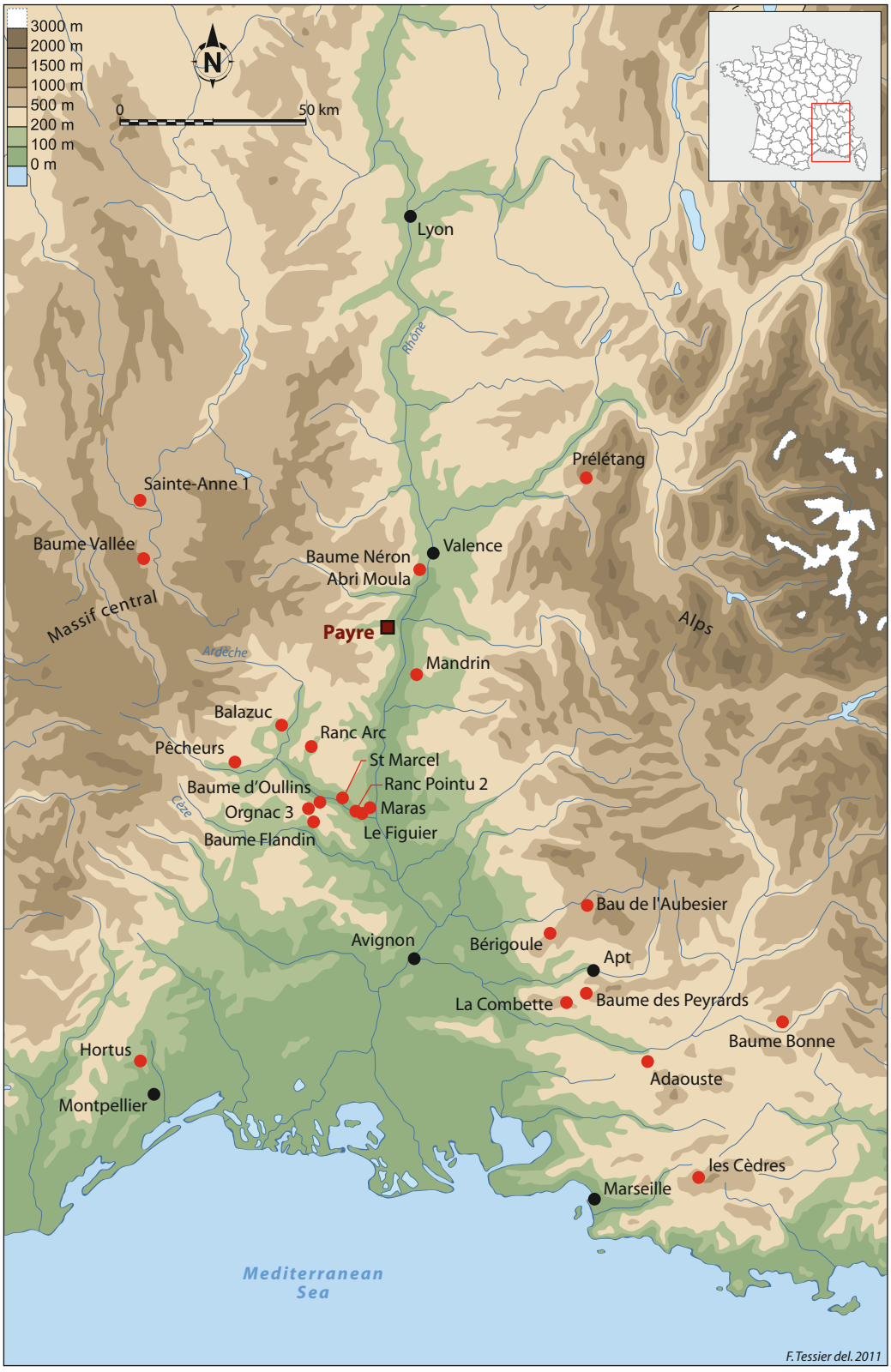

Figure 1 - Location of the Payre site on the edge of the Rhône valley.

The vertical distribution of the archaeological material highlights sectors where the concentration of ursids bones is higher and others where artefacts dominate. The major phases of frequentation of the cavity by bear are attested in the upper half of the deposit (Auguste, *in* Moncel *et al.*, 2008). The vertical distribution of the artefacts falls into four major concentrations: Fa, Fb (sedimentary lens ≈ 15 m²), Fc and Fd, from the top to the bottom, with ten sets of bone and lithic refittings carried out in the same levels and sometimes even from the same surface and the same square. None of the artefacts display notches that would indicate a large-scale mixing of the objects in the very stony cave floor. The in situ post-depositional bone fractures and the anatomic connections are consistent with this observation. However, numerous pieces of micro-charcoal dispersed in the sediment indicate the action of post-depositional phenomena. It was not possible to estimate the recurrence of the occupations and attempts to correlate the results of the sedimentological analyses with the artefact concentrations have not been convincing.

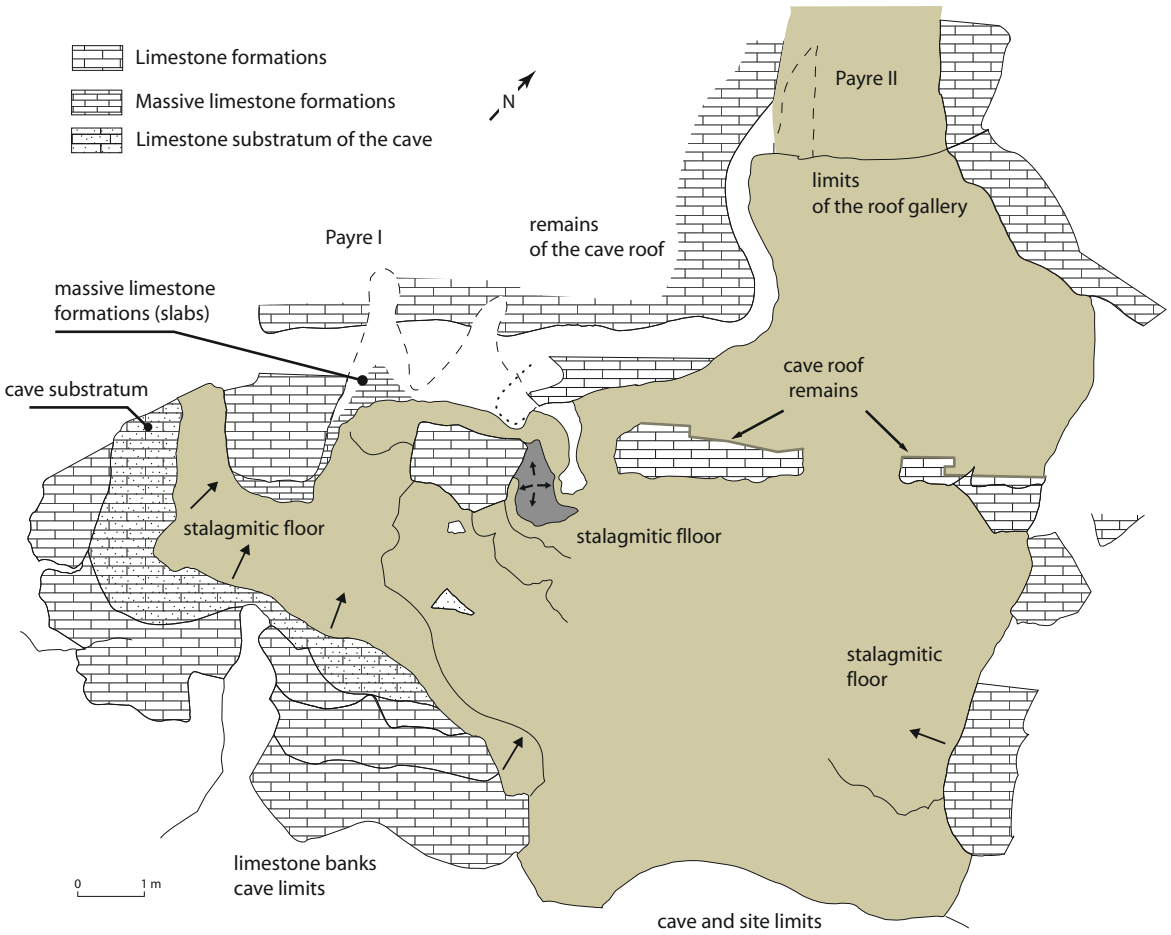

Figure 2 - Plan of the Payre terrace (after Moncel *et al.*, 2008).

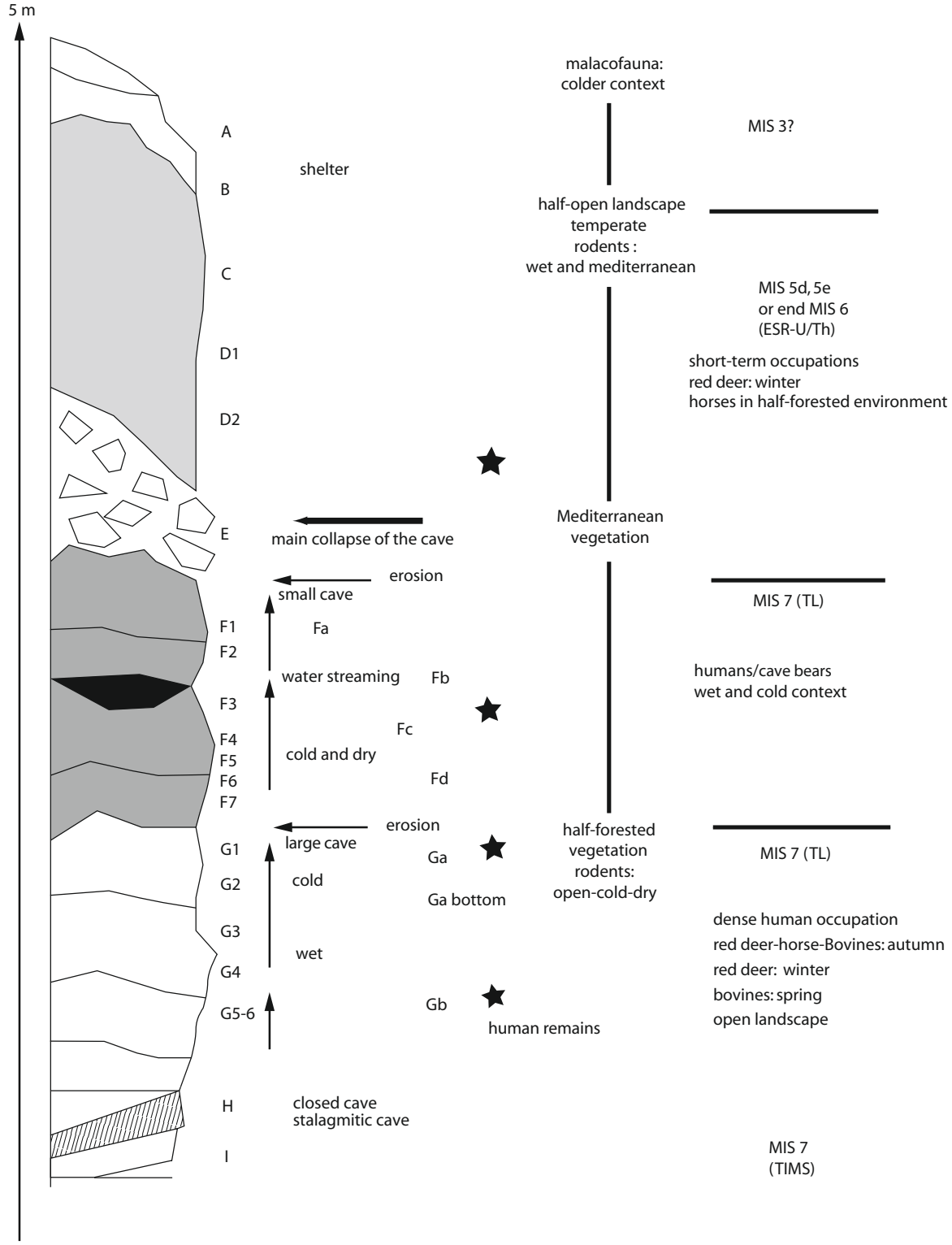

Figure 3 - Schematic representation of the sequence of the Payre site (modifed after Moncel *et al.*, 2008).

3 - Presentation of the faunal series

The taphonomic and archaeozoological study presented here for occupation levels Fa, Fb and Fc-d concerns the ungulate remains and the undetermined bone fragments (sieving debris included; table 1).

Tableau 1 - Number of anatomically Identified Specimen (NISPa), Number of Remains (NTR), Fragmentation index or Index 1: NISPa/NTR and Bone destruction index or Index 2: Isolated teeth/NISPa; Remains with dry bone fractures; Epiphysis/Diaphysis and gelifract ratios in unit F.

	Isolated teeth	NISPa	NTR	Index 1 (%)	Index 2 (%)	Dry bone breaks (%)	Gelifracts (%)	Epiph/Diaph
Fa	247	1307	24541	5,3	18,9	61,0	4,6	0,27
Fb	49	211	3115	6,8	23,2	63,7	4,8	0,23
Fc-d	147	753	8868	8,5	19,5	66,0	4,6	0,22
Total	**443**	**2271**	**36524**	**6,2**	**19,5**	**62,7**	**4,6**	**0,24**

Carnivores represent 46.8% of the Number of Identified Specimen (NISP). Among the carnivores, cave bear is predominant and has been subject to a separate taphonomic study indicating natural deaths during hibernation, with consumption of the carcasses by carnivores (Auguste, *in* Moncel *et al.*, 2008). Numerous other carnivores are present, including some large predators such as wolf, hyena and cave lion (Auguste *et al.*, *in* Moncel *et al.*, 2008). The list of ungulates varies only slightly between the various occupation levels, except by the absence of chamois, proboscid and steppe rhinoceros in level Fb and megaceros in Fc-d (table 2). Red deer, horse, bovines and rhinocerotids dominate the ungulates (Auguste *et al.*, *in* Moncel *et al.*, 2008; Lacombat *et al.*, *in* Moncel *et al.*, 2008; Daujeard, 2008). This faunal list reveals a temperate, humid climate and different biotopes: the forest environments of the surrounding plateaus, the sparse prairie-park type environments, the steep rocky sides of the Payre canyon and the open environments of the Rhône valley, a few kilometres away.

Tableau 2 - Faunal list of herbivores from unit F expressed in NISP and Minimum Number of Individuals (MNI).

	Fa		Fb		Fc-d		Fa		Fb		Fc-d	
	NISP	NISP (%)	NISP	NISP (%)	NISP	NISP (%)	MNI	MNI (%)	MNI	MNI (%)	MNI	MNI (%)
Proboscidea	2	0,2	0	0,0	10	1,7	1	1,9	0	0,0	1	2,2
Dicerorhinus hemitoechus	1	0,1	0	0,0	3	0,5	1	1,9	0	0,0	2	4,3
Dicerorhinus kirchbergensis	2	0,2	1	0,6	2	0,3	2	3,8	1	4,5	2	4,3
Dicerorhinus sp.	105	9,9	21	13,0	60	10,1	3	5,8	2	9,1	2	4,3
Equus mosbachensis	107	10,1	17	10,6	165	27,6	5	9,6	2	9,1	9	19,6
Sus scrofa	8	0,8	2	1,2	2	0,3	2	3,8	1	4,5	1	2,2
Cervus elaphus	499	47,3	71	44,1	193	32,3	13	25	7	31,8	13	28,3
Capreolus capreolus	84	8,0	5	3,1	12	2,0	8	15,4	1	5	3	6,5
Dama dama	18	1,7	1	0,6	2	0,3	3	5,8	1	4,5	1	2,2
Megaloceros giganteus	3	0,3	1	0,6	0	0	1	1,9	1	4,5	0	0,0
Rupicapra rupicapra	5	0,5	0	0	2	0,3	1	1,9	0	0,0	1	2,2
Hemitragus bonali	71	6,7	6	3,7	34	5,7	7	13,5	2	9,1	6	13,0
Bison priscus	19	1,8	1	0,6	24	4,0	2	3,8	1	4,5	2	4,3
Bos primigenius	3	0,3	1	0,6	2	0,3	1	1,9	1	4,5	1	2,2
Bovines	129	12,2	34	21,1	86	14,4	5	9,6	4	18,2	5	10,9
Herbivores	**1056**	**100,0**	**161**	**100,0**	**597**	**100,0**	**52**	**100,0**	**22**	**100,0**	**46**	**100,0**

Fragments of skull, dental germs, deciduous teeth, foetus remains, costal cartilage and vertebral discs, which indicate the general good state of conservation, are lacking only from level Fb (sedimentary lens). Only the deep layers Fc-d suggest that differential conservation has significantly affected the most fragile elements (% MAU and density indices positively correlated to the threshold of p=0.05; Lyman, 1994; Daujeard, 2008). These levels are also those that have the highest rates of dissolution and that contain the greatest number of fragments presenting breakages on dry bone. However, the condition of the surfaces permitted the study of the great majority of the bones and articular portions of long bones are well represented (table 1; Daujeard, 2008).

4 - Actors and strategies in the acquisition and processing of carcasses

In unit F, the site functioned as a cave in which cave bear regularly hibernated and where hyena, wolf and cave lion also found an occasional refuge, although the latter represent only between 0.5 and 2 % of the NISP. The actions of large predators on the bones are minimal. Level Fb shows the greatest modification by their presence and the large ungulates were the most affected (tables 3-4; figure 4). Bones with butchery striations are much more common, represented by more than 15 % of bones in each of the levels. The highest rates of cutmarked bones concern the main species: red deer, bovines (with the exception of level Fb), equids and rhinocerotids, together with fallow deer for Fa (tables 3-4). All taxa, with the exception of chamois and wild boar, include numerous bones fractured for their marrow, associated with percussion indicators in almost 20 % of cases (Blumenshine, Selvaggio, 1991; Villa, Mahieu, 1991). The proportions and distribution of the cut-marks and carnivore marks along the long bones suggests that hominins were the primary agents in the accumulation and consumption of the main ungulates (table 5; Blumenshine, 1988; Lupo, O'Connell, 2002).

Tableau 3 - Number of Remains with carnivore marks (NRc) and/or butchery striations (NRs) in different levels of unit F (NR: Number of readable bone remains > 5 cm, excluding isolated teeth).

	NRc (%)	NRs (%)	NR
Fa	2,3	17,4	1821
Fb	6,6	18,0	289
Fc-d	3,0	15,6	1125

Tableau 4 - Frequency of bones with carnivore marks (NRc) and/or butchery striations (NRs) by taxa in different levels of unit F.

	Rhinocerotids			Bovids			Equids			Red deer		
	NRc (%)	NRs (%)	NR	NRc (%)	NRs (%)	NR	NRc (%)	NRs (%)	NR	NRc (%)	NRs (%)	NR
Fa	12,1	15,2	33	3,7	24,6	134	6,5	17,2	93	1,9	16,7	419
Fb	0,0	25,0	4	13,8	6,9	29	20,0	20,0	10	3,5	19,3	57
Fc-d	10,3	10,3	29	6,4	19,1	94	4,1	14,8	122	4,4	22,5	160

	Tahr			Roe deer			Chamois			Fallow deer		
	NRc	NRs (%)	NR	NRc (%)	NRs (%)	NR	NRc (%)	NRs (%)	NR	NRc (%)	NRs (%)	NR
Fa	5,4	8,1	37	2,8	7,0	71	33,3	0,0	3	0,0	14,3	14
Fb	0,0	25,0	4	50,0	0,0	4	/	/	0	/	/	0
Fc-d	0,0	0,0	23	0,0	0,0	10	0,0	0,0	1	0,0	0,0	1

Tableau 5 - Proportions of areas with carnivore marks (NZc) or butchery striations (NZs) along diaphyses of ungulates long bones in the different levels of unit F.

	Articular portions			Diaphysis extremities			Medial diaphyses		
	NZc (%)	NZs (%)	NZ	NZc (%)	NZs (%)	NZ	NZc (%)	NZs (%)	NZ
Fa	6,4	10,5	172	2,3	20,6	388	2,1	24,9	466
Fb	20,8	4,2	24	6,3	30,2	63	7,2	26,1	69
Fc-d	11,9	7,1	84	2,2	20,1	318	4,6	21,8	262

Figure 4 - Fragment of a rhinoceros ulna displaying impacts from large carnivore teeth (Fa) (photograph: C. Daujeard).

All age classe for red deer are represented, roughly equivalent in Fa and Fc-d and with a majority of juveniles in Fb. (table 6). The presence of juveniles implies kills within the herds of females and young. Seasonality indices for this taxon (shed antlers; decidual and unworn teeth; foetus remains) indicate hunting periods throughout the year with a recurrence in the autumn. Autumn and/or spring were also periods marked by the mortality of other ungulates (table 7). Among rhinoceros, the majority of juveniles and old individuals indicates scavenging activities. However, the presence of mature adults may indicate the killing of animals, probably using the natural traps of the humid areas of the Rhône valley (table 6).

Tableau 6 - MNI for the main herbivores for each age category (for the determination of the age, replacement periods and dental wear periods were used, cf. Payne, 1973; Grant, 1982; Klein, Cruz-Uribe, 1984).

	Red deer						Rhinocerotids					
	Fa		Fb		Fc-d		Fa		Fb		Fc-d	
Juvenile	3	23,1 %	3	42,9 %	3	23,1 %	2	33,3 %	1		2	33,3 %
Young adult	3	23,1 %	1	14,3 %	3	23,1 %	1	16,7 %	1		1	16,7 %
Mature adult	3	23,1 %	1	14,3 %	4	30,8 %	1	16,7 %	1		0	0,0 %
Old adult	3	23,1 %	1	14,3 %	2	15,4 %	0	0,0 %	0		1	16,7 %
Very old adult	1	7,7 %	1	14,3 %	1	7,7 %	2	33,3 %	0		2	33,3%
Total	**13**		**7**		**13**		**6**		**3**		**6**	

Tableau 7 - Indices of seasonality (deciduous teeth; buds of permanent teeth; foetal remains; shed antlers) for the main herbivores in the different levels of unit F.

	Boar	Red deer			Bovids		Roe deer		Tahr		Fallow deer	
	Fa	Fa	Fb	Fc-d	Fa	Fc-d	Fa	Fc-d	Fa	Fc-d	Fa	Fb
Winter			2	1								
Spring				2			2	1			1	
Summer		3		1								
Autumn	1	3	4	1	1	1	1		2	1		1

The recovery of whole red deer carcasses is indicated in all levels. The MAU and MNI percentages for each of the osseous elements are consistent with this (figure 5; Daujeard, 2008). Elements of the axial skeleton are less common, which may indicate abandonment, differential destruction or consumption by carnivores. For bovids, equids and rhinocerotids, the best parts of the limbs – leg and shoulder – are well represented. However, no correlation has been discovered between the utility indices (FUI, *Food Utility Index*) and the MAU percentage (*Minimal Animal Unit*) (Metcalfe, Jones, 1988; Outram, Rowley-Conwy, 1998). The scarcity of cranial bones in all taxa in Fc-d may be evidence of the differential preservation indicated in this level and/or abandonment on the kill site to facilitate transport (figure 5). Other less common species, such as chamois, wild boar, megaceros and proboscidea are indicated only by a few isolated teeth and bones from the autopod, representative of scavenged elements (Hill, 1980; Blumenshine, 1986; O'Connell *et al.*, 1990a-b; Marean, Spencer, 1991; Fosse, 1996).

Whether the butchery was primary, with complete treatment of carcasses on the site for red deer, or secondary, with initial butchery on the kill site for the large ungulates, defleshing of the best parts is ubiquitous, confirming the preferential access to carcasses by hominins (table 8). Other operations such as dividing up and dismembering the carcass were carried out on the site. The presence of significant numbers of spongy parts (joints and axial skeleton) and the low percentage of burned bone means that we cannot consider as common the use of bones as fuel (Costamagno *et al.*, 1998; Théry-Parisot *et al.*, 2005). Evidence has been found for the use of fire

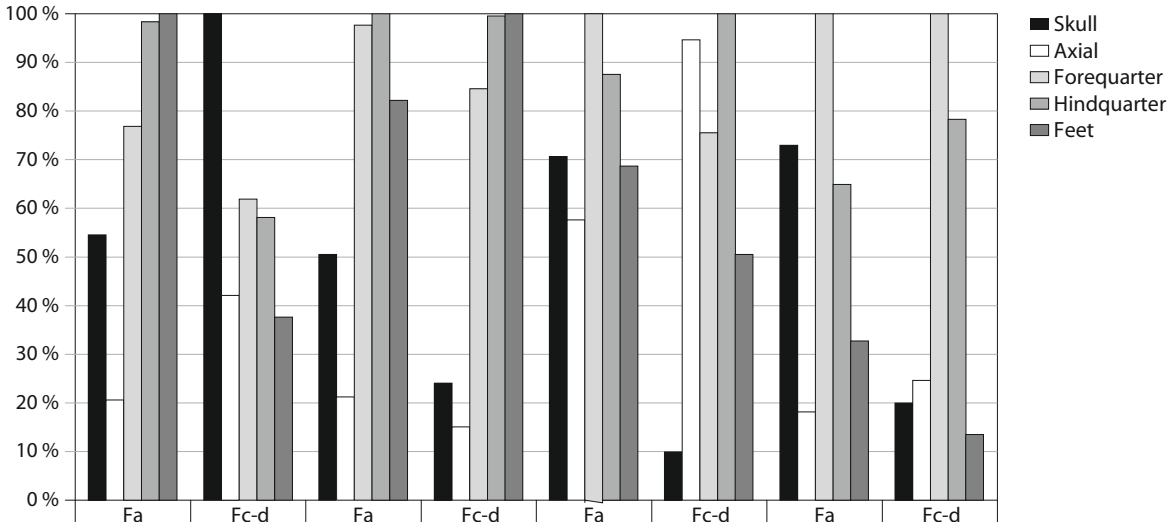

Figure 5 - Distribution of portions of carcasses for the four main ungulates (%MAU; Skull: cranial fragments and mandibles; Axial skeleton: spine and ribs; Upper limbs: scapula, humerus, radioulnas and carpus; Lower limbs: pelvis, femurs, tibias, patellas and tarsus; Extremities: metapodes, phalanges and sesamoids).

(charcoal, heated flint and bone), and for the consumption of meat *in situ*, but no well-preserved combustion structure has been discovered in this unit (Moncel *et al.*, 2008). The series of bone retouchers is composed of only 15 artifacts. The majority were made on the long bones of equids, bovids, rhinocerotids and even proboscidea. The used areas are very extensive and intensively notched, denoting a surprising economy of animal materials for this use (figure 6).

Figure 6 - Diaphyseal fragment of large herbivore with a retoucher area and scraping striations (Fb) (photograph: C. Daujeard).

Tableau 8 - Distribution of cut-marks on the carcasses of main ungulates in Fa and Fc-d (% of cutmarked remains by anatomical element, illegible remains and isolated teeth excluded).

	Red deer		Bovids		Horse	
	Fa (%)	Fc-d (%)	Fa (%)	Fc-d (%)	Fa (%)	Fc-d (%)
Skull	0,0	25,0	/	/	0,0	50,0
Hemi-mandible	0,0	13,3	0,0	0,0	50,0	0,0
Hyoid bone	/	0,0	/	/	/	/
Petrous bone	0,0	0,0	0,0	/	/	/
Bone/antler peg	0,0	/	/	/	/	/
Cervicals	11,1	0,0	20,0	33,3	0,0	0,0
Thoracics	25,0	0,0	30,0	30,0	0,0	0,0
Lumbars	0,0	50,0	40,0	14,3	0,0	/
Coccyges	/	0,0	/	/	0,0	0,0
Sacrum	0,0	0,0	100,0	0,0	/	/
Ribs	11,1	18,2	55,6	11,8	0,0	12,5
Scapula	42,9	18,2	33,3	0,0	0,0	0,0
HUMp	0,0	/	/	0,0	0,0	/
HUMdiaph	50,0	/	28,6	50,0	25,0	25,0
HUMd	33,3	/	0,0	0,0	0,0	0,0
RADp	15,4	25,0	33,3	25,0	20,0	33,3
RADdiaph	50,0	0,0	50,0	0,0	66,7	40,0
RADd	33,3	0,0	100,0	0,0	/	/
Carpal	19,0	0,0	20,0	/	20,0	0,0
Sésamoids	0,0	0,0	0,0	0,0	0,0	0,0
METcp	14,3	0,0	0,0	0,0	50,0	0,0
METcdiaph	26,7	10,0	33,3	0,0	100,0	100,0
METcd	0,0	/	/	0,0	0,0	/
Coxal bone	27,8	50,0	40,0	50,0	100,0	33,3
FEMp	0,0	0,0	0,0	/	0,0	16,7
FEMdiaph	23,1	33,3	100,0	28,6	100,0	0,0
FEMd	0,0	0,0	0,0	/	0,0	0,0
Patella	0,0	0,0	0,0	/	/	0,0
TIBp	0,0	33,3	0,0	/	/	/
TIBdiaph	60,0	40,0	66,7	75,0	60,0	10,0
TIBd	28,6	50,0	0,0	0,0	0,0	0,0
Tarsal	17,4	30,0	28,6	0,0	/	60,0
METtp	29,4	25,0	0,0	/	0,0	0,0
METtdiaph	23,9	33,3	25,0	/	100,0	50,0
METtd	0,0	50,0	/	0,0	/	/
METp indet	0,0	0,0	0,0	0,0	0,0	22,2
Phalanges	6,1	33,3	6,7	28,6	7,7	18,2
Total	**16,7**	**22,5**	**24,6**	**19,1**	**17,2**	**14,8**

5 - Data on the tooth microwear of herbivores

Rivals *et al.*, (2009a) described a new application for the analysis of dental microwear that enables the relative estimation of the occupation duration for an archaeological site using the dietary signal present in the form of microwear on the enamel of ungulate teeth. The microwear analysis was carried out according to the protocol established by Solounias and Semprebon (2002)

We used the Coefficient of Variation (CV) to evaluate the variability (or stability) of the microwear for the samples studied. The CV directly reflects the parameter of interest, which is the variation in dietary behaviour by the animals. The influence of the occupation duration of an archaeological site is evaluated for through the CVs of the samples of each species using the Levene test. Among the variables analysed, the number of scratches on the enamel shows significant differences that reflect the occupation duration. Long-term occupations are indicated by a high variability (high CV) in the microwear, while a low variability indicates occupations of shorter duration.

The coefficients of variation observed for the teeth of *Equus mosbachensis* (CV = 0.085) and *Cervus elaphus* (CV = 0.101) in unit F are compared to the references established by Rivals *et al.* (2009a). The microwear analysed shows a very low variability signal, of the same order of magnitude as that observed for other archaeological levels identified as short-term occupations (Caune de l'Arago or Abric Romani) (Rivals *et al.*, 2009a). The differences are not significant (Levene's test: *C. elaphus*, F=2.404, p=0.105; *E. mosbachensis*, F=1.708, p=0.203). However, they become significant when the data from Payre are compared to that of long-term occupations (Levene's test: *C. elaphus*, F=12.018, p=0.000; *E. mosbachensis*, F=3.911, p=0.026).

These results suggest a short-term occupation or a successive repetition of short occupations by Neandertals at a recurring season (autumn) over several years (Rivals *et al.*, 2009b).

6 - Lithic characteristics: technical choices and tools

The majority of the remains are located in the upper part of the deposit (level Fa; table 9). The lithic series are composed of five major categories of rock, the most abundant being flint, as is the case for all of the other phases of occupation (table 10).

The basalt, quartz, limestone and quartzite were found in proximity to the site. These rocks were shaped (quartzite and basalt) and / or knapped on the site or outside the site (limestone and quartz).

Basalt was transported mostly in the form of whole pebbles or large unmodified or retouched flakes. The smallest pebbles were worked on the site.

Quartz is present in the form of thick, unmodified, triangular flakes and pebble fragments. The few large flakes were retouched. The over-representation of flakes and the absence of flake refitting suggests the that some of the flakes were imported. The presence of micro-debris indicates that this rock was worked on site, in the form of discoid or polyhedral cores, even if only one core was found. The presence of two whole pebbles indicates that quartz was also periodically used as a hammerstone.

Grey marl and beige or black siliceous limestone is rare, but is present in the form of flakes, a few pebbles, tools on pebbles or large flakes and a few cores. The role of this rock and how it was treated are difficult to evaluate accurately due to the small number of pieces found. However, it appears that this rock type was flaked (flakes and cores) and shaped (flakes, pebbles, tools on pebbles or flakes). The flaking *chaîne opératoire* is partial. In the upper part of the sequence (level Fa), the richest part of the assemblage allows us to conclude that the debitage of flakes was

Tableau 9 - Number and density of lithic remains in the occupation levels of unit F.

	Thickness	Surface excavated (m²)	Number of pieces	Density/m²	Density/m³
Fa	60 cm	25	2489	100/m²	166/m³
Fb	20 cm	15 (lens?)	804	54/m²	161/m³
Fc-d	30 cm	25	1104	41/m²	74/m³

Tableau 10 - Proportion of different raw materials used in the occupation levels of unit F (* including micro-flakes).

	Fd		Fc		Fb		Fa	
Basalt	20	3,4 %	39	7,6 %	32	4 %	209	8,4 %
Quartz	26	4,4 %	55	10,6 %	40	5 %	197	7,9 %
Limestone	0	0,0 %	6	1,1 %	2	0,2 %	42	1,7 %
Quartzite	2	0,3 %	2	0,2 %	7	0,9 %	27	1,1 %
Flint	541	91,8 %	413	80,2 %	732	89,9 %	2014	80,9 %
Total *	**589**		**515**		**804**		**2489**	

periodically carried out on site. The fine, sharp flakes were generally left unmodified. Finally, it is also probable that some fragments of clastic limestone were recovered and retouched.

Quartzite is rare, being found essentially in the form of unmodified or retouched flakes. This rock was knapped away from the site or outside the excavated area, and transported in the form of large unmodified or retouched cortical products (figure 7). Quartzite was treated in the same way as limestone and basalt in terms of tools on large flakes. Very clear crushing macro-traces on the edges indicate an intensive and repeated use of the cutting edges.

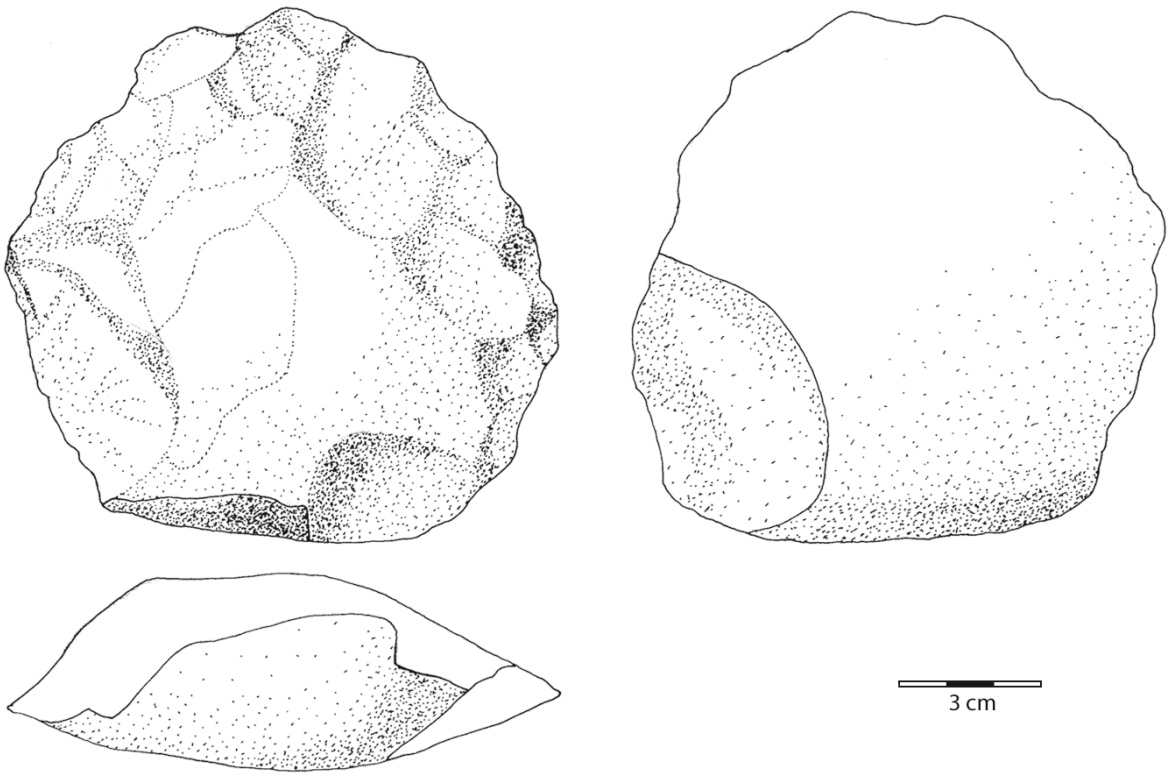

Figure 7 - Large quartzite tool from unit F (Fa) (drawing: M-H. Moncel).

The *chaîne opératoire* of flint is complete for broken nodules and flakes originating from sources located between 10 and 30 km to the south, on the plateau bordering the Rhône valley. The petrographic study in progress also shows the transport of more distant isolated pieces, coming from a perimeter of 30 to 60 km (Fernandes *et al.*, 2008). The varying quality of the flint nodules indicates that collection may have taken place during other subsistence activities (Raynal *et al.*, 2008).

The abundance of micro-flakes (all unmodified), flakes (15-60 mm) and cores indicates on site production and consumption activities. The over-representation of flakes relative to cores suggests the transport of previously knapped flakes, some of which were used for debitage. Flakes without cortex and small flakes are always the most common (table 11). The recovery of broken nodules may explain the under-representation of cortical flakes.

Tableau 11 - Flint material from occupation levels of unit F (* excluding debris and fragments).

Flint	Fd	Fc	Fb	Fa
Whole nodules	2	2		2
Cobble tools				1
Flakes < 15-20 mm	271	298	549	1199
Flakes > 20 mm * % tools	261 17,2 %	109 30,6 %	167 11,6 %	789 13,5 %
Cores and fragments	9	6	7	25
Total	**543**	**415**	**723**	**2016**

Cores with two intersecting surfaces and unifacial debitage are the most common. The debitage, whether discoid or on flake surfaces, shows little standardization, with the production of very small flakes in the final phase. The presence of cores on flakes attests to a branching of the *chaîne opératoire*. A few other cores are of the Kombewa type, with multi-directional unipolar debitage on one face or semi-rotating "prismatic". This production method produced flakes of varying shapes and cross-sections (figure 8). This diversity, together with the high proportion of elongated products, is due in part to the core management strategy employed, which combines lateral edge flaking and debitage through successive series of unipolar or centripetal removals. The rate of retouching varies between 11 and 30 %. The blanks are all flakes. The rare flakes of a distant origin do not display a greater retouching intensity (Moncel *et al.*, 2009). The tools consist of scrapers and convergent tools whose modification is rather partial and insignificant (table 12). The resharpened pieces compose no more than 5-7 % of each unit. The recycling of some cores as tools indicates an opportunistic behaviour (a rapid transformation of other blank types recovered from previous occupations?).

Tableau 12 - Tools on flakes from level Fa.

Types of flint tools	number	%
Total scrapers	143	
Simple	75	52,9
Double	20	52,4
Peripheral	17	14,0
+ Notches or end scrapers	12	15,2
Crushing	11	10,7
Undetermined	8	7,7
Denticulates	10	3,7
Convergent tools	81	30,0

Types of flint tools	number	%
Borers	1	
End scrapers	3	
Clactonian notches	5	
Becs	1	
Burin or small blade cores?	1	
Crushing on unworked flakes	20	7,4
Thinning	2	
Undetermined fragments	3	
Total	**270**	

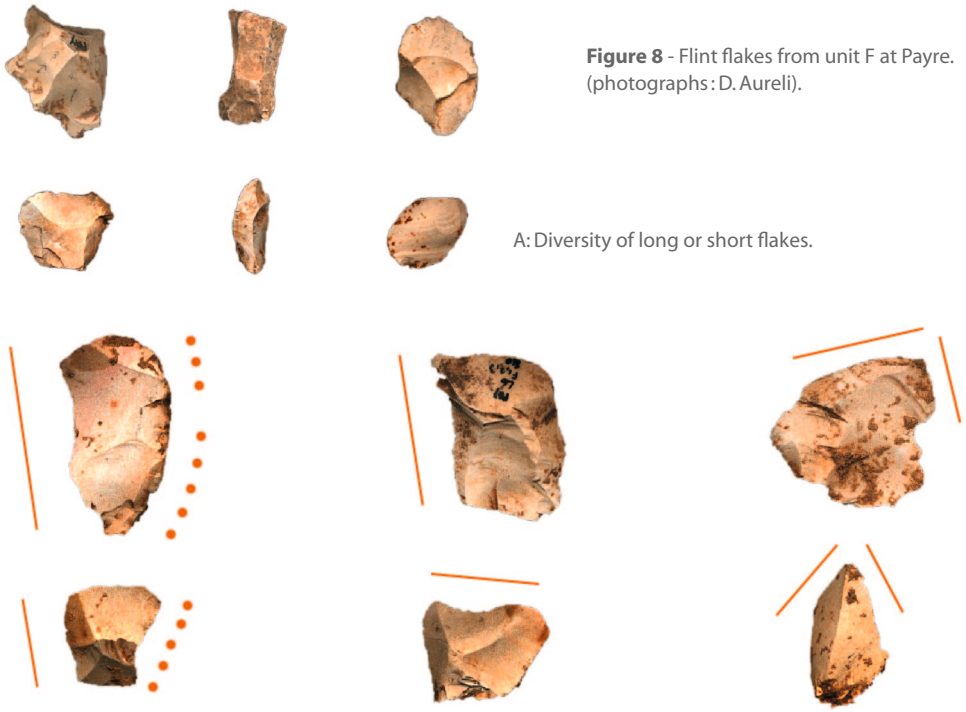

Figure 8 - Flint flakes from unit F at Payre. (photographs : D. Aureli).

A: Diversity of long or short flakes.

B: Examples of types of the most common backed flakes with a long cutting edge and two converging edges.

7 - Discussion: specialised hunting stop or short-term camp; what was the mobility strategy in this territory?

The categorisation of sites, whether based on data of archaeological (Isaac, 1971; Marks and Chabai, 2001) or ethnographic origin (Binford, 1982) remains arbitrary and difficult to apply to all cases (due to the diversity of archaeological deposits, post-depositional processes, hominin type, etc.). The use of certain terms can, however, be informally based on the division of various data unique to domestic activities within a well-defined territory (cf Marks, Chabai, 2001, in the Crimea: "ephemeral butchering sites"; "ephemeral camp"; "short-term camps"; "base camps"). Given that it requires a consideration of the data inherent to the territories occupied (climate, topography, biotopes, mineral resources, human groups, etc.), the distinction between site occupation categories is more effective in studies at a regional scale (Gamble, 1998; Texier *et al.*, 1998, 2005; Conard, Prindiville, 2000; Boyle, 2000; Hoffecker, Cleghorn, 2000; Burke, 2006; Szmidt, 2003; Fiore *et al.*, 2004; Valensi, Psathi, 2004). The position of the Payre site on the right bank of the middle Rhône valley, at the heart of a region rich in sites with Middle Palaeolithic levels, is well adapted to a comparative regional study. The relative density of the indicators of human activity for each site in the studied region, whether relating to butchery, fire or lithic production, is informative in terms of occupation type: residential sites, shorter-term seasonal sites or bivouacs (Moncel, 2003; Daujeard, 2008; Daujeard, Moncel, 2010). The completeness of the butchery and debitage sequences also depends on the occupation type. Provisioning (fauna and lithic) and tool management strategies enable an interpretation of the functional variability between the sites (Khun, 1992; Conard, Prindiville, 2000; Costamagno *et al.*, 2006; Daujeard, Moncel, 2010). Finally, the recurring alternation of occupation of the site by humans and by carnivores is a criterion that can be associated with short-term camps.

In all levels of unit F, humans favoured the local or semi-local use of animal and mineral resources (flint: 10-30 km and other rocks from the foot of the site), exploiting the different environments around the cavity (figure 9).

Regarding the fauna, various data tends to suggest intermittent short-term human occupations rather than long occupations spread over several seasons: the consumption of a part of the carcasses by carnivores, alternation with cave bear levels, low levels of indicators for the use of fire, incomplete butchery sequences for several of the main taxa, and marked autumnal mortality for the majority of the ungulates. The study of the tooth microwear of herbivores also indicates short-term occupations. As for the lithic data, it indicates occupations that may be considered as short-term occupations having necessitated domestic activities: mostly complete flint *chaîne opératoires* on broken nodules and imported flakes, tools with only slightly invasive retouch and rare resharpening, importation of already knapped flakes from the most frequently exploited sources and large tools from nearby the site and greater distances (30-60 km). The density per square metre is variable (between 40 and 100 pieces, table 9); it is high for level Fa and everywhere greater than for the regional bivouacs (Daujeard, Moncel, 2010). They indicate activities that produced objects that were later abandoned.

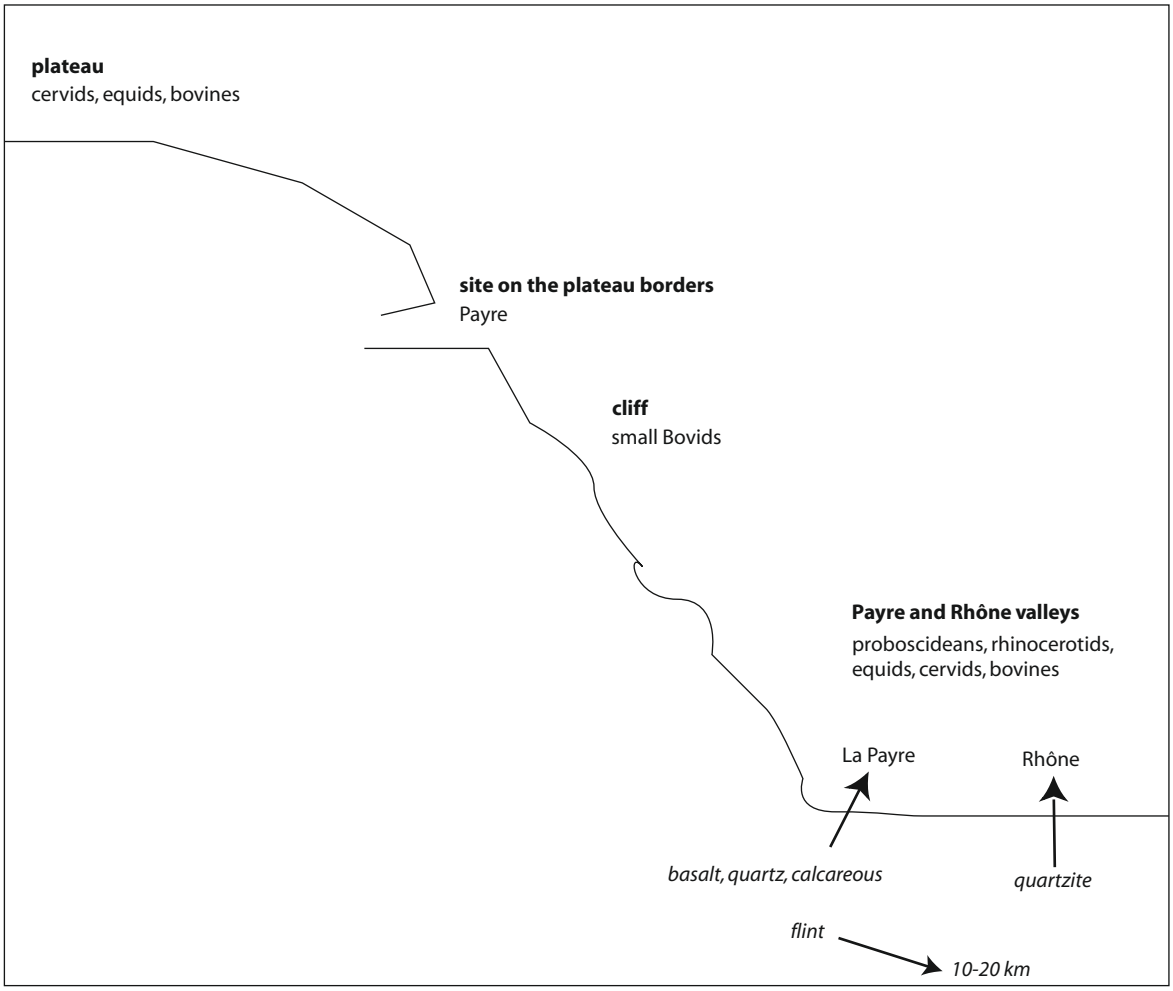

Figure 9 - Local exploitation of mineral resources and varied environmental biotopes near Payre (modifed from Moncel *et al.*, 2008).

Meanwhile, several criteria oppose the interpretation of this unit as being associated with "hunting camps". The breadth of the faunal spectrum, a treatment of carcasses linked to consumption and to the recovery of skins, largely *in situ* debitage and a significantly local exploitation of the environment suggest a habitation site rather than a logistical site of the "hunting camp" type. However, the apparently short duration of the occupations here blur the residential base / logistic halt camp dichotomy (Binford, 1982). The use of the term "short-term camp" for unit F at Payre seems to be more suitable.

In this region of south east France, the cave and rock shelter sites studied consist of habitation sites where consumption occurred on site and there was a largely local exploitation of the lithic and faunal resources (Moncel, 2003; Moncel *et al.*, 2008; Daujeard, 2008). The observed variability is above all linked to the durations of occupation, with long-term residential camps, regular camps of shorter duration and brief halts. Each of these categories has its own characteristics in terms of the management of the environment and the strategies for the acquisition of animals (Daujeard and Moncel, 2010). The recurrence and similarity of the occupation types throughout the sequences also indicates reoccupations of the same caves in the same manner by Neandertals over time and therefore of relatively small territories with a variable degree of mobility within them (Binford, 1982). This differential organisation of the management of the territory and the significant internal homogeneity throughout the sequences may be associated with the "logistical" model generally attributed to modern humans. Can we nonetheless speak of intentional planning and organisation of the territory in the "logistical" sense used by Binford (Binford, 1980, 1982)?

The comparative regional study carried out by Burke (2006) in the Crimea demonstrates significant mobility by small human groups centred on a predominantly local exploitation of resources. The contradictory data from the lithic and faunal material, together with the rarity of residential base camps and specialised sites of the "hunting camp" type do not permit the author to propose a model of the "radiating / logistical" versus "circulating / foraging" type (Mortensen, 1972; Binford, 1980, 1982). In the absence of models adapted to this region, Marks and Chabai (2001) have proposed a new approach combining the "circulating model" and types of specialised activities, thereby differentiating between residential camps of varying duration: *ephemeral butchering sites*; *ephemeral camps*; *short-term camps* and *base camps*.

The similar system observed in the south east of France raises the same questions (cf Burke, 2006). How can we discuss territorial use types according to current mobility models? The type of exploitation of the sites observed in the middle Rhône valley shares characteristics with two major systems, "logistical" and "circulating". The diversity of durations and types of occupation within the territory and their stability and those of the seasons throughout the sequences indicate a logistical system. But it may also be related to the "circulating" model if we consider the residential and non-specialised character of the variable duration camps and the significant exploitation of local resources linked to topographic and environmental aspects of the sites (Binford, 1981; Khun, 1995). In addition, the human remains indicate the presence of family groups in unit F at Payre. The teeth have been attributed to a young adult and to two children (7-8 and 12 years) (Condemi, *in* Moncel *et al.*, 2008). Unfortunately the sexual division of tasks on the sites, as used by Binford in the establishment of these models, remains unknown. Therefore, as they do not correspond to one or the other of the two major mobility models described above, this regional data defines another type of mobility: a planned "circulating" model. This type of organisation associates non-specialised occupations with the planning and regularity of occupations within a territory depending on the available resources, which is quite different from a mobility strategy of the "day to day" circulating type demonstrated by example in the south of France by Boyle (2000). Therefore, a comparison of data related to microwear, physical anthropology, fauna, lithic production, topography and the palaeoenvironment indicates reduced an image of small territories

in which small and highly mobile family groups circulated and where occupation models fluctuated according to the seasons and the types of environment (Grove, 2009). These may be habitations brief stopping-places between two long-term residential camps and shorter-term hunting camps in zones convenient for their variety of biotopes and / or by the gathering of animals during favourable periods (rut or migration).

Such a territorial approach to the function of sites, carried out on the macro-topographic scale, must in the future be supplemented by micro-topographic data. The knowledge of the activities carried out within each site on a more local scale (for example through microwear analyses) could provide elements for the discussion of the function of sites and of the organisation of human groups on a larger scale.

This type of organisation has been observed, not just in the Crimea (Burke, 2000, 2004, 2006), but also in the north of France (Goval, 2008), along the Rhine (Conard, Prindville, 2000) and the Northern Caucasus (Hoffecker, Cleghorn, 2000). In the south west of France, the existence of specialised sites – sites of mass killing and primary butchery (Mauran); secondary butchery sites (Les Pradelles) or residential camps (Abri du Musée) – together with the greater mobility of human groups, demonstrate a completely different type of territorial organisation; one that is more strictly logistical, centred on a base camp with very specialised satellite camps (Costamagno *et al.*, 2006; Rendu, 2007, 2010; Delagnes, 2010; Rendu *et al.*, this volume).

8 - Conclusion

The comparative regional analysis of Middle Palaeolithic sites in the Rhône basin carried out over recent years enables a comparison of the main data obtained for Neandertal subsistence, raw material provisioning and technical behaviours. While we are not dealing with occupation levels as clear and distinct as those observed in other regional sites, such as La Combette (Vaucluse, Texier *et al.*, 1998, 2005), the archaeozoological criteria used in this regional study of cave sites enables us, through the intensity and the types of activities, to examine the modes and durations of occupations. The data from sedimentology, lithic analysis and dental microwear supplements and clarifies the approach of the occupation models. The hypothesis of a habitat having served as a "short-term camp" for hunting and consumption (primary and secondary butchery), interspersed by occupation by carnivores may thus be advanced for unit F at Payre. The seasonal exploitation of the varied local biotopes has been demonstrated.

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Bibliographic references

Aureli D., 2006 - *Analisi technologica dell'insieme litico dello strato F del sito di Payre, (Ardeche, Francia) – Paleolitico medio arcaico (OIS 6)*, Mémoire de Master, Ferrare, université de Ferrare.

Binford L. R., 1980 - Willow smoke and dogs'tails: hunter–gatherer settlement systems and archaeological site formation, *American Antiquity*, 45, 4-20.

Binford L. R., 1981 - Bones: Ancient Men and Modern Myths, New York, Academic Press, 320 p.

Binford L. R., 1982 - The archaeology of place, *Journal of Anthropological Archaeology*, 1, 5-33.

Blumenshine R. J., 1986 - Carcass consumption sequences and the archaeological distinction of scavenging and hunting, *Journal of Human Evolution*, 15, 639-659.

Blumenshine R. J., 1988 - An experimental model of the timing of hominid and Carnivore influence on archaeological bone assemblages, *Journal of Archaeological Science*, 15, 483-502.

Blumenshine R. J., Selvaggio M. M., 1991 - On the marks of marrow bone processing by hammerstones and hyenas: their anatomical patterning and archaeological implications, in Desmond Clark J. (ed.), *Cultural beginnings – approaches to understanding early hominid life-ways in the african savanna*, UISPP, 1987, Mainz, 17-32.

Boyle K. V., 2000 - Reconstructing Middle Palaeolithic Subsistence Strategies in the South of France, *International Journal of Osteoarchaeology*, 10, 336-356.

Burke A., 2000 - The view from Starosele: faunal exploitation at a Middle Palaeolithic Site in Western Crimea, *International Journal of Osteoarchaeology*, 10, 325-335.

Burke A., 2004 - Karabi Tachim: faunal remains, in Monigal K., Chabai V. P., Marks A. E. (ed.), *The Middle Palaeolithic and Early Upper Palaeolithic of Eastern Crimea*, ERAUL, 104, 283-287.

Burke A., 2006 - Neanderthal settlement patterns in Crimea: a landscape approach, *Journal of Anthropological Archaeology*, 25, 510-523.

Conard N. J., Prindiville T. J., 2000 - Middle Palaeolithic hunting economies in the Rhineland, *International Journal of Osteoarchaeology*, 10, 286-309.

Costamagno S., Griggo Chr., Mourre V., 1998 - Approche expérimentale d'un problème taphonomique : utilisation de combustible osseux au Paléolithique, *Préhistoire Européenne*, 13, 167-194.

Costamagno S., Meignen L., Beauval C., Vandermeersch B., Maureille B., 2006 - Les Pradelles (Marillac-le-Franc, France): A mousterian reindeer hunting camp? *Journal of Anthropological Archaeology*, 25, 466-484.

Daujeard C., 2008 - *Exploitation du milieu animal par les Néandertaliens dans le sud-est de la France*, Oxford, Archaeopress (« BAR International Series » 1867), 634 p.

Daujeard C., Moncel M.-H., 2010 - On Neanderthal subsistence strategies and land use: A regional focus on the Rhone Valley area in southeastern France, *Journal of Anthropological Archaeology*, 29, 368-391.

Delagnes A., 2010 - *Systèmes techniques, subsistance et mobilité au Paléolithique moyen : interactions et implications diachroniques*, Mémoire d'Habilitation à Diriger des Recherches, Bordeaux, université Bordeaux I, 323 p.

Delagnes A., Rendu W., 2011 - Shifts in Neandertal mobility, technology and subsistence strategies in western France, *Journal of Archaeological Science*, 38, 1771-1783.

Dubois J.-M., 2000 - *Évolution du site Paléolithique moyen ancien de Payre (Ardèche) au cours des stades isotopiques 7 à 4. Analyse des sédiments*, Mémoire de maîtrise, Lyon, université Lyon I, 24 p.

El Hazzazi N., 1998 - *Paléo-environnement et chronologie des sites du Pléistocène moyen et supérieur : Orgnac 3, Payre et l'Abri des Pêcheurs (Ardèche, France) d'après l'étude des rongeurs*, Thèse de doctorat, Paris, Muséum National d'Histoire Naturelle, 246 p.

Fernandes P., Raynal J.-P., Moncel M.-H., 2008 - Middle Palaeolithic raw material gathering territories and neandertal mobility in the Southern Massif Central of France: first results from a petro-archaeological study on flint, *Journal of Archaeological Science*, 35, 2357-2370.

Fiore I., Gala M., Tagliacozzo A., 2004 - Ecology and subsistence strategies in the Eastern Italian Alps during the Middle Palaeolithic, *International Journal of Osteoarchaeology*, 14, 273-286.

Fosse P., 1996 - La grotte n° 1 de Lunel-Viel (Hérault, France) : repaire d'hyènes du Pléistocène moyen – Étude taphonomique du matériel osseux, *Paléo*, 8, 47-79.

Gamble C., 1998 - Palaeolithic society and the release from proximity: a network approach to intimate relations (Human social evolution), *World Archaeology*, 29, 426-449.

Goval E., 2008 - *Définitions, analyses et caractérisations des territoires des Néandertaliens au Weichsélien ancien en France septentrionale*, Thèse de doctorat, Lille, université de Lille, 543 p.

Grant A., 1982 - The use of tooth wear as a guide to the age of domestic ungulates, in Wilson B., Grigson C., Payne S. (ed.), *Ageing and sexing animal bones from archaeological sites*, Oxford, Archaeopress (« BAR International Series » 109), 91-108.

Grove M., 2009 - Hunter-gatherer movement patterns: causes and constraints, *Journal of Anthropological Archaeology*, 28, 222-233.

Hill A., 1980 - A modern hyaena den in Amboseli National Park, Kenya, in Leakey R. E., Ogot B. A. (ed.), Proceedings of the 8th Panafrican Congress of Prehistory and Quaternary Studies, Nairobi, 1977, 137-138.

Hoffecker J., Cleghorn N., 2000 - Mousterian hunting patterns in the Northwestern Caucasus and the ecology of the Neanderthals, *International Journal of Osteoarchaeology*, 10, 368-378.

Isaac G., 1971 - The diet of early man: aspects of archaeological evidence from Lower and Middle Pleistocene sites in Africa, *World Archaeology*, 2, 278-299.

Kalaï C., 1998 - *Reconstitution du paléo-environnement végétal et du paléoclimat de la fin du Pléistocène moyen et du Pléistocène supérieur d'après les analyses polliniques de la Baume Moula-Quercy, du site de Payre et de l'abri des Pêcheurs (Ardèche, France)*, Thèse de doctorat, Paris, Muséum National d'Histoire Naturelle, 175 p.

Kalaï C., Moncel M.-H., Renault-Miskovsky J., 2001 - Le Paléo-environnement végétal des occupations humaines de la grotte de Payre à la fin du Pléistocène moyen et au début du Pléistocène supérieur (Ardèche, France), *Trabajos de Prehistoria*, 58, 1, 143-151.

Khun S. L., 1992 - On planning and curated technologies in the Middle Paleolithic, *Journal of Anthropological Research*, 48, 185-214.

Khun S. L., 1995 - *Mousterian Lithic Technology. An Ecological Perspective*, Princeton, Princeton University Press, 208 p.

Klein R. G., Cruz-Uribe C., 1984 - *The analysis of animal bones from archaeological sites*, Chicago, University of Chicago Press, 265 p.

Liouville M., 2007 - *Variabilité du cerf Élaphe (Cervus Elaphus Linné 1758) au cours du Pléistocène moyen et supérieur en Europe occidentale : approches morphométrique, paléo-écologique et cynégétique*, Thèse de doctorat, Paris, Muséum National d'Histoire Naturelle, 408 p.

Lupo K. D., O'Connell J. F., 2002 - Cut and tooth mark distributions on large animal bones: ethnoarchaeological data from the Hadza and their implications for current ideas about early human carnivory, *Journal of Archaeological Science*, 29, 85-109.

Lyman R. L., 1994 - *Vertebrate Taphonomy*, Cambridge (MA), Cambridge University Press, 524 p.

Marean C. W., Spencer L., 1991 - Impact of Carnivore ravaging on zooarchaeological measures of element abundance, *American Antiquity*, 56 (4), 645-658.

Marks A. E., Chabai V. P., 2001 - Constructing Middle Palaeolithic settlement systems in Crimea, in Conard N. (ed.), *Settlement Dynamics of the Middle Palaeolithic and Middle Stone Age*, Tübingen, Kerns Verlag, 179-204.

Metcalfe D., Jones K. T., 1988 - Bare bones archaeology: bone marrow indices and efficiency, *Journal of Archaeological Science*, 15, 415-423.

Moncel M.-H., 2003 - *L'exploitation de l'espace et la mobilité des groupes humains au travers des assemblages lithiques à la fin du Pléistocène moyen et au début du Pléistocène supérieur. La moyenne vallée du Rhône entre Drôme et Ardèche*, Oxford, Archaeopress (« BAR International Series » 1184), 179 p.

Moncel M.-H., Debard E., Desclaux E., Dubois J. M., Lamarque F., Patou-Mathis M., Vilette P., 2002 - Le cadre de vie des hommes du Paléolithique moyen (stades isotopiques 6 et 5) dans le site de Payre (Rompon) : d'une grotte à un abri-sous-roche effondré, *Bulletin de la Société préhistorique française*, 99 (2), 249-274.

Moncel M.-H. (dir.), Auguste P., Ayliffe L., Bahain J.-J., Bocherens H., Bouteaux A., Condemi S., Crégut-Bonnoure E., Crépin L., Debard E., Desclaux E., Dubois J.-M., Dashek E., Dubar M., El Hazzazi N., Falguères C., Fernandes P., Froget L., Navarro M. A. C., Julien M.-A., Joron J.-L., Lacombat F., Lamarque F., Liouville M., Mallye J.-B., Masaoudi H., Mercier N., Moncel M.-H., Patou-Mathis M., Pautret-Homerville C., Péan S., Reyss J.-L., Rousseau L., Valladas H., Villette P., 2008 - *Payre. Des occupations humaines de la moyenne vallée du Rhône en contexte de grotte et d'abri de la fin du Pléistocène moyen et du début du Pléistocène supérieur. Bilan des fouilles 1990-2002*, Paris, Société préhistorique française (« Mémoires » 46), 476 p.

Moncel M.-H., Chacón-Navarro M. G., Coudeneau A., Fernandes P., 2009 - Points and convergent edges in the Early European Middle Paleolithic site of Payre (SE, France), *Journal of Archaeological Science*, 36, 1892-1909.

Mortensen P., 1972 - Seasonnal camps and Early villages in the Zagros, in Tringham R., Dimbleby G. W. (eds.), *Man, Settlement and Urbanism*, Ucko P., London, Duckworth, 293-297.

O'Connel J. F., Hawkes K., Blurton-Jones N., 1990a - Hadza hunting, butchering, and bone transport and their archaeological implications, *Journal of Anthropological Research*, 44, 113-161.

O'Connel J. F., Hawkes K., Blurton-Jones N., 1990b - Reanalysis of large mammal body part transport among the Hadza, *Journal of Archaeological Science*, 17, 301-316.

Outram A. K., Rowley-Conwy P., 1998 - Meat and marrow utility indices for horse (Equus), *Journal of Archaeological Science*, 25, 839-849.

Payne S., 1973 - Kill-off patterns in sheep and goats: the mandibles from Asvan Kale, *Anatolian Studies*, 23, 281-303.

Raynal J.-P., Moncel M.-H., Fernandes P., Santagata C., Guadelli J.-L., Fernandez P., Patou-Mathis M., 2008 - Espace minéral et espace de subsistance au Paléolithique moyen dans le sud du Massif Central en France : les sites de Sainte-Anne I (Haute-Loire) et de Payre (Ardèche) in Moncel M.-H., Moigne A.-M., Arzarello M., Peretto C. (dir.), *Raw Material Supply Areas and Food Supply Areas. Integrated approach of the behaviours*, Actes du 15e congrès de l'UISPP, Lisbonne, 2006, vol. 5, session WS23, Oxford, Archaeopress (« BAR International Series » 1725), 141-161.

Rendu W., 2007 - *Planification des activités de subsistance au sein du territoire des derniers Moustériens. Cémento-chronologie et approche archéozoologique de gisements du Paléolithique moyen (Pech-de-l'Azé I, La Quina, Mauran) et Paléolithique supérieur ancien (Isturitz)*, Thèse de doctorat, Bordeaux, université Bordeaux I, 363 p.

Rendu W., 2010 - Hunting behaviour and Neanderthal adaptability in the Late Pleistocene site of Pech-de-l'Azé I, *Journal of Archaeological Science*, 37, 1-13.

Rivals F., Schulz E., Kaiser T. M., 2009a - A new application of dental wear analyses: estimation of duration of hominid occupations in archaeological localities, *Journal of Human Evolution*, 56, 329-339.

Rivals F., Moncel M.-H., Patou-Mathis M., 2009b - Seasonality and intra-site variation of Neanderthal occupations in the Middle Palaeolithic locality of Payre (Ardèche, France) using dental wear analyses, *Journal of Archaeological Science*, 36, 1070-1078.

Rousseau L., Moncel M.-H., Bahain J.-J., Falguères C., Ayliffe L., Beauchamp J., Ghaleb B., Bocherens H., soumis - Paleoclimatology and paleoecology of Pre-Neanderthal and Neanderthal occupations at the end of Middle Pleistocene in southeastern France: isotopic studies in Payre site, *Quaternary Research*.

Solounias N., Semprebon G., 2002 - Advances in the reconstruction of ungulate ecomorphology with application to early fossil equids, *American Museum Novitates*, 3366, 1-49.

Szmidt C., 2003 - *The Mousterian in Mediterranean France: A Regional, Integrative and Comparative Perspective*, Oxford, Archaeopress (« BAR International Series » 1147), 305 p.

Texier P.-J., Brugal J.-P., Lemorini C., Wilson L., 1998 - Fonction d'un site du Paléolithique moyen en marge d'un territoire : l'abri de La Combette (Bonnieux, Vaucluse) in Brugal J.-P., Meignen L., Patou-Mathis M. (dir.), *Économie préhistorique : les comportements de subsistance au Paléolithique*, XVIIIes Rencontres Internationales d'Archéologie et d'Histoire d'Antibes, Juan-les-Pins, APDCA-CNRS, 325-348.

Texier P.-J., Brugal J.-P., Lemorini C., Théry I., Wilson L., 2005 - Abri du Pont de La Combette (Bonnieux, Vaucluse) : variabilité intrasite des comportements néandertaliens, in Jaubert J., Barbaza M. (dir.), *Territoires, déplacements, mobilité, échanges durant la Préhistoire*, Actes du 126e congrès national des sociétés historiques et scientifiques, Toulouse, 2001, Paris, édition du CTHS, 115-130.

Théry-Parisot I., Costamagno S., Brugal J.-P., Fosse P., Guilbert R., 2005 - The use of bone as fuel during the Palaeolithic, experimental study of bone combustible properties, in Mulville J., Outram A. K. (eds.), *The Zooarchaeology of Fats, Oils, Milk and Dairying*, Proceedings of the 9th Conference of the International Council of Archaeozoology, Durham, 2002, 50-59.

Valensi P., Psathi E., 2004 - Faunal exploitation during the Middle Palaeolithic in south-eastern France and north-western Italy, *International Journal of Osteoarchaeology*, 14, 256-272.

Valladas H., Mercier N., Ayliffe L., Falguères C., Bahain J.-J., Dolo J.-M., Froget L., Joron J.-L., Masaoudi H., Reyss J.-L., Moncel M.-H., 2008 - Chronology of the Middle Paleolithic sequence of Payre (Ardèche, France) based on radiometric dating methods, *Quaternary Geochronology* (Quaternary Science Review), 3 (4), 377-389.

Villa P., Mahieu E., 1991 - Breakage patterns of human long bones, *Journal of Human Evolution*, 21, 27-48.

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