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*Site Catalogue*

Proefschrift voorgedragen tot het bekomen van de graad van Doctor in de Archeologie
Part II
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1. **Abri Bourgeois-Delaunay**

Location

La Chaise-de-Vouthon, Charente, France

1.2 **Excavation**

1850: J. Fermond

Bourgeois and Delaunay, Chauvet, Lartet and Vibraye and Trémeau de Rochebrune

1870: Suard

1950’s-1963: P. David

1967-1983: **A. Debénath**

The old excavations have erased the means to connect their stratigraphy to that exposed by the latter two excavators (Debénath 1990).

1.3 **Stratigraphy**

Layers 1-7: excavation P. David

Layers 8 – 8’ – 9 – 9’ - 10

1.4 **Chronology**

Based on the animal remains (see below), the 5 layers in question probably belong to MIS 5d, an assumption strengthened when the absolute dates (U-Th) of the stalagmitic floors (layers 7 and 11) are considered (Armand 1998a, Jaubert 2002), i.e.:

- Lower stalagmitic floor below layer 10: 164 ± 13 and 107 ± 6 ka BP (average date: 138 ± 12 ka BP; the floor is envisioned as the result of the interglacial conditions during MIS 5e)

- Upper stalagmitic floor, topping layer 8: a series of dates extending from 102 ± 12 to 90 ± 5 ka BP (average date: 101.3 ± 9.3 ka BP, i.e. MIS 5c)

Debénath provides some more dates (Debénath 1990): 150 to 112 ka BP for the lower floor (layer 11) and 106 ± 10 ka BP for layer 7 (the upper floor).
1.5 Palaeoenvironment

The reconstruction of the palaeoenvironment was based completely on the composition of the faunal assemblage and the characteristics of individual taxa (see above). They point to the first phase of the early Wurm, during which conditions were not that rigorous. The consistent presence of *Rangifer* (10.4 % in layer 8; 13 % in layer 8'; 11.5 % in layer 9; 12.7 % in layer 9'; and 9.9 % in layer 10) in all layers does point to a cold oscillation within MIS 5. Based on the absolute dates, this oscillation could be 5d (Armand 1998a).

1.6 Archaeological tradition

Typical Mousterian, no quantitative data found. According to Jaubert (Jaubert 2002), the dominant debitage method is Levallois.

1.7 Fauna

**Method of collecting**

- 

**Conservation and fragmentation**

Breaks turned out to be difficult to read, as most of the herbivore bones are very eroded. The bones also show signs of black (manganese) deposits, and sediment encrustations, both of which are indicative of water infiltration. The relative rareness of post-cranial elements (3-11 % of the NISP for horse for all layers, 25 % for reindeer in layer 9) may point to bad preservation as well (Armand 1998a). At the current state of research, the archaeozoologist believes that one of the greatest values of the site is paleontological in nature, rather than archaeological.

**Prey taxa**

- 

**Carnivore taxa**

It will be clear that the carnivore presence in all 5 assemblages is significant, mostly because of *Ursus spelaeus*, and to a lesser degree, *Crocuta spelaea* (maximum 3 %), suggesting a possibly large impact on the prey assemblage (Armand 1998a).

A closer look at the bear bones indicates that the animals used the cave as a hibernating den. Their bones were not as eroded as those of the herbivore assemblage, the surplus damage to the latter being ascribed to trampling by the bears.
Marks
Cut marks were observed on 7% of the herbivore long bones, while 6% of the herbivore bones display gnaw marks. Apparently, regurgitated bones have been attested as well, but no percentages are given (Armand 1998a). No human marks were found on the bear bones.

Seasonality
-

Carcass exploitation
-

Human remains
-

Remarks
-
2. Abri Pataud

Location
Les Eyzies, Dordogne, France

2.2 Excavation

Beginning of the 20\textsuperscript{th} century: small-scale excavations by amongst others, Rivière and Capitan.
1953-1978: H.L. Movius

2.3 Stratigraphy

Fourteen layers have been discerned, each of which separated from the next by an \textit{éboulis} layer, and resting on a basal \textit{éboulis} (Movius 1975). Of interest here are layers 7, 8, 11, 12, 13, and 14.

2.4 Chronology

The absolute chronology for Abri Pataud is somewhat problematic. Multiple \textsuperscript{14}C dates had been obtained by different laboratories by 1986, but those dates seemed too young. Consequently, in 1987, the Oxford lab produced a series of AMS dates, which were indeed older than the conventional dates (Bricker and Mellars 1987). Unfortunately, the new dates included no Aurignacian samples. Nevertheless, it is believed that the carbon dates of the Aurignacian obtained by Groningen in the 1960’s and 70’s are quite robust. This hypothesis was confirmed when leftovers from a sample (GrN-4719) were re-dated by means of Aspartic Acid Racemisation, and calibrated by using the new AMS dates for a younger layer. As such, layer 12 was positioned at 33350 BP, which corresponds to the carbon date of sample GrN-4719, i.e. 33260 ± 425 BP (El Mansouri, El Fouikar, and Saint-Martin 1996). For a full list of the \textsuperscript{14}C dates, see Bricker and co-workers (1995).

2.5 Palaeoenvironment

The original sedimentological study reported level 11 and the 10/11 \textit{éboulis} layer as relatively mild and moist (Farrand 1977). In contrast, the climate during the deposition of the underlying levels was reconstructed as being cold with a variable humidity, that of the levels above as cold and slightly humid. However, it isn't immediately clear from the text of the more recent study (Farrand 1995) whether level 11 is still considered to
be part of the mild and moist period that also includes the 10/11 éboulis. However, figure 10 on page 53 of the latter source suggests that it is not. Therefore, this new reconstruction (layer 11 as cold instead of mild) has been used here: all layers that are studied here are considered cold, with a varying degree of humidity.

In contrast, the pollen analysis in the site’s monograph suggests the existence of a wooded steppe throughout the sequence, while levels 5 to 6 were cold and dry, and accompanied by an open steppe (Donner 1975). More in line with the sedimentological evidence, the faunal analysis points to a cold climate with variations in humidity, intersected by a temperate period (éboulis 3/4), the latter being of no concern here (Bouchud 1975).

A more recent pollen analysis (Fellag 1998), set up to elucidate the earlier palaeoclimatic findings was hampered by problems of conservation, and, in the case of the Aurignacian levels, turned out to be difficult to confirm given the small amount of preserved pollen. Nevertheless, an open steppic vegetation seems to have been in place in the levels that concern us, indicative of a cold climate.

### 2.6 Archaeological tradition

Levels 14 to 6 were attributed to the Aurignacian. As Brooks explains, levels 14 and 13 were originally considered to be Aurignacian ‘0’ (in any case, pre-dating Aurignacian I), levels 12 and 11 Aurignacian I, and levels 8 and 7 Aurignacian II (Brooks 1982).

### 2.7 Fauna

#### Method of collecting

- 

#### Conservation and fragmentation

- 

#### Prey Taxa

- 

#### Carnivore taxa

- 

#### Marks

-
Seasonality

Carcass exploitation

Human remains

Remarks
The fauna of Abri Pataud has been studied by Bouchud (Bouchud 1975). However, only general patterns (of exploitation, seasonality) across the entire sequence have been indicated.

Level 14 represents a series of short but intense occupations in a relatively short period of time, accompanied by hearths. In level 13, no hearths were attested. Level 12, again containing hearths, most likely arose significantly later than 13, but probably as fast as 14. Level 11, like 7, constitutes the densest level of the sequence. It contains a set of seven hearths. Level 8 was occupied during at least three periods; those occupations were not found at the same place. Nevertheless, they are very similar typologically, and the sedimentological analysis indicated that the deposition of level 8 happened relatively quickly (as such, all three sub-levels were analysed as one). Likewise, the lack of a clear separation between levels 8 and 7 could indicate a relatively short span of time between both. Level 7 is the richest Aurignacian level, and contains several hearths (Bricker et al. 1995).
3. La Baume de Gigny

Location

Gigny (‘Sous la Roche’), Jura, France
(a.k.a. Grotte de la Baume)

3.2 Excavation

‘Excavations’ from 1797 onwards
1966-1977: M. Vuilleme (Campy and Vuilleme 1989b)

3.3 Stratigraphy

Campy and Vuilleme (Campy and Vuilleme 1989a) divided the sequence into 4 ‘ensembles’, based on geological arguments:

- the historical and protohistorical levels (‘Couches’ I to III)
- ‘l’ensemble supérieur’ (‘Couches’ IV to VI)
- ‘l’ensemble moyen’ (‘Couches’ VII to XX; Mousterian levels)
- ‘l’ensemble inférieur’ (‘Couche’ XXI to bedrock)

According to the sedimentological study of the middle ensemble, two units can be discerned (Campy 1989):

- XX–XVIa: moderately cold, probably humid in general. Three colder episodes occur within this period: XIXc, XXb, and XVII. Layer XVIa is very different from the underlying XV, indicating a prolonged sedimentation pause in the form of a major rise in temperature (interstadial?).
- XV–VII: four very cold but short episodes (XV, XIVa, XI and IX) exist in this generally cold unit. Layers VII and VIII, which are probably the remains of a more extensive sedimentary package, have been interpreted as the result of a rise in temperatures equalling that of an interstadial.

3.4 Chronology

Layer VIII:
Ly-566: 29500 ± 1400 ¹⁴C BP (Evin 1989)
Ly-789: 28500 ± 1400 ¹⁴C BP (Evin 1989)

Layer XV:
Ly-971: >32300 ¹⁴C BP (Evin 1989)

Layers XVI and XIX:
Layer XX:
Ly-804: >31500 $^{14}$C BP (Evin 1989)

The average date for layer VIII is 28900 + 1200 -800 $^{14}$C BP, i.e. the beginning of Wurm III. Both dates are compatible and the collagen content of the samples adequate; nevertheless, the date may seem a bit young. At least from layer IX onwards, from which the first infinite date originates, the filling is older than the Wurm II-III interstadial, i.e. the second half of MIS 3. The date for layer X is assumed to be too young, as the dates for the more recent layer VIII are older. Moreover, the organic content of the bone was minimal, which suggests that the sample was polluted (either as a result of a failure to eliminate the contamination, or because some bones of younger microfauna were able to migrate to layer X).

3.5 Palaeoenvironment

A reconstruction of the palaeoenvironment for the relevant layers has been based on the results of both the palynological study and those of the faunal remains (macro, micro and avifauna). The reconstruction has subsequently been fine-tuned by sedimentological data. Within the periglacial sequence covering the layers retained in the database, two distinct units can be found (Campy et al. 1989):

- a lower unit which is moderately cold, characterised by steppe, with a continental-boreal influence (XX-XVIa). Layers XIXc, XIXb and XVII represent less favourable climatic circumstances.
- an upper unit with a very cold climate: an arctic phase, with a boreal-Atlantic influence (XV-VII). Layers XV, XIVa, XI and IX are very cold, separated by short episodes with a more favourable climate.

According to the authors, these can be discussed in further detail, as follows:

- Level XX-XIXc: a moderately cold phase with a steppic touch (Pinus is dominant, but Quercus, Corylus, Alnus occur as well; Artemisia)
- Level XIXb-XVIb: a cold, moist phase, with a continuous reduction of the already open forest (Pinus goes from 52 to 8.2 %). Rodentia are associated with three types of biotope: cold swamp (valley floors), forest, and steppe with Artemisia (plateau).
- Level XVIa: palynologically, the environment can either be humid and cold with some bushes or with some Pinus stands. Based on faunal data, there appears to be a rise in temperature, resulting in a reduction of steppe and a growing importance of forest.
• Level XV(lower part)-XI: a slight amelioration of the climate
• Level IX-VII: can be divided into two parts: a cold steppe with woodland giving way to *Artemisia* (IX-VIII[middle]), followed by a rapid expansion of *Corylus, Tilia* and *Fraxinus*, with *Artemisia* disappearing (VIII[upper part]-VII), representing a major warming, which is equalled to the Arcy/Grand-Bois (La Grande Pile)/Denekamp interstadial, based on $^{14}C$ dating (29500 ±1400 BP), while palynologically, it resembles the Cottés interstadial, situated between 33 and 37 ka BP (Heim 1989). The latter goes against the carbon date for layer VIII.

Grayson and Delpech (Grayson and Delpech 2006) chose to incorporate the faunas of XVIa and XVIb into the assemblage of XVI, while doing the same for XIXa, XIXb, XIXc and XIX. However, as (significant) climate change is noticeable between these sub-layers based on the account above, implying increased time-averaging when lumping them, it may be more sensible to evaluate each on its own. It should also facilitate their description in climatic and environmental terms. However, when holding on to the same numerical criterion used by Grayson and Delpech (Grayson and Delpech 2006), i.e. a minimum herbivore (prey) NISP of 20, four sub-layers can no longer be retained: XVIa, XVIb, XIX and XIXa. This leaves us with **VIII, XV, XVI, XIXb, XIXc and XX**.

Unfortunately, issues remain: in their discussion of the stratigraphy, Campy and Vuilleme (Campy and Vuilleme 1989a), view layer XVI as being composed of an upper (b) and a lower (a) sub-layer, which is also displayed on all figures; the faunal list on the other hand (Chagneau et al. 1989), recognises both sub-layers, while adding a layer XVI proper. A similar thing happened to layer XIX, which exists as a non-composite layer only in the faunal account, while clearly, in neither case, the NISP’s of XVI and XIX represent the sum of the sub-layer NISP’s. As this study focuses on the fauna, the latter system has been followed¹, but this introduces the problem that the palaeoclimatic and – environmental reconstruction of XVI cannot be entered into the database as it consists of a cold and a temperate sub-layer. Strictly speaking, the same goes for XV and VIII, as both have been split into, respectively two and three climatic regimes based on the different the pollen samples for each of both layers (Campy et al. 1989, Heim 1989). These climatic regimes don’t turn up in the stratigraphy (Campy and Vuilleme 1989a), nor the faunal study (Chagneau et al. 1989). They also don’t appear in a sketch of the palaeoclimate in the monograph (Campy et al. 1989).

---

¹ Grayson and Delpech (2006) apparently did the same, as e.g., their count for XVI is in fact the sum of the NISP’s for XVI, XVIa and XVI as described by Chagneau et al. (1989).
A paper targeted specifically at remedying the fuzzy picture of the palaeoclimatic and palaeoecological reconstructions offered in the site’s monograph (Campy, Chaline, and Vuillemeuy 1989) by means of a multivariate analysis of the site’s rodent associations was published in 1995 (Chaline, Brunet-Lecomte, and Campy 1995). A new synthetic (in terms of combining faunal, pollen and stratigraphic data) sketch of the climatic chronology was constructed, on which subtle temperature differences are to be noticed compared to the 1989 table (e.g. layer XX or XVIIb) of the site’s monograph. The general idea, according to which the Middle Complex (containing the layers discussed in this study) displays an alternating climatic pattern (cold Gigny I stage – Saint-Julien interstadial – cold Gigny II stage – Loisie interstadial), has been retained. Additionally, this regional picture has now been correlated with the oxygen stage system, placing all layers considered in this study in MIS 3.

However, the authors of a subsequent analysis, estimating temperatures using arvicolid (Montuire et al. 1997) pointed out that the results of the previous study are not only incompatible with those of the old synthetic sketch, but also with those of their own study, and even that none of the reconstructions showed climatic trends that could be found back in the oxygen isotope curve.

Recognising the multiple stratigraphic lacunae at the site, which may impede a detailed comparison with the oxygen isotope curve, I choose to take the reworked synthetic sketch (Chaline, Brunet-Lecomte, and Campy 1995) as a base for the temperature entries in the database; as mentioned above, layer XVI cannot be described. All entries concerning vegetation and humidity must be considered highly provisional.

### 3.6 Archaeological tradition

Although, according to the author, the denticulate Mousterian of layer XVI (384 pieces) fits well within the usual scheme of this entity (despite an unusually high percentage of pseudo-Levallois points), the typical Mousterian of levels XIX (745 pieces) and XV (470 pieces), as well as that of levels XX (287 pieces) and VIII (280 pieces); the latter two enriched with side-scrapers), appears to represent a case of closed-circuit evolution because of the constant presence of a burin-like tool, which is specific for this site, according to the author (Vuillemeuy 1989).

---

2 The lithic material of VIII was grouped with that of XII (at the porch, both layers merge) and a few pieces from layer VII (Vuillemeuy 1989).
3.7 Fauna

Method of collecting
- 

Conservation and fragmentation
- 

Prey Taxa
The species list was taken from Chagneau and co-workers (Chagneau et al. 1989).

Carnivore taxa
The species list was taken from Chagneau and co-workers (Chagneau et al. 1989).

Marks
- 

Seasonality
- 

Carcass exploitation
- 

Human remains
None

Remarks
In layer XV, one swan (Cygnus cygnus) phalange was recovered, with multiple, more or less parallel striations, covering almost the half of the circumference (Mourer-Chauviré 1989). Tentatively, the author ascribes them to an attempt to saw the bone in half (rather than human exploitation; the latter is also unlikely because of a further lack of butchering marks, a lack of charring, and an overrepresentation of humeri and femora). Examination of the fish remains remained inconclusive as to the anthropic introduction of the animals to the site (Desse and Desse 1989). On the one hand, the largest part of the remains stemmed from specimens ranging from 22 to 26 cm (max. 4 years old), arguing against human consumption. Conversely, they appear to have been found in association with (Mousterian) lithic remains, not during phases of abandonment. Of 764 specimens, 50 % are attributed to Esox lucius, 20 % to Lota lota, 18 % to Salmo trutta and/or Thymallus thymallus and 12 % to Rutilus rutilus. They have been found 'in the layers dated to the Würm II, between 4 and 5 meters deep', i.e. XIV, XIII, XII, XI, X and IX (others than the
ones studied here). They have not been entered into the database given the tenuous link with human consumption.

Vuilleme (Vuilleme 1989) comments on layer XX that artefacts were uniformly distributed, although some concentrations were visible and probably linked to available light or temperatures. A small knapping place may have been located outside, just beyond the porch. In layers XIXa,b,c small ‘ensembles’ of lithics where found along the northern wall (and principally at the transition from a to b), centred on concentrations of charcoal. In composite layer XVI, charred bone and flint are found along the axis of the cave, suggesting a main habitation zone which extends towards the non-excavated interior of the cave. No concentrations could be pinpointed in layer XV, except perhaps a small locus against the south wall. The material of layer VIII has been displaced to a small extent, but large enough to erase signs internal organisation. Nevertheless, concentrations of charcoal coming from dispersed hearths are associated with the zones containing the most lithics; cores originate from the back of the excavated zone, suggesting a knapping area. Although the layers mentioned in this study correspond to those with the highest count of lithics, the latter are hardly overwhelmingly present. The same remark can be made about the faunal material (a NISP of 89 – in layer XIXc – being the highest).

The authors of the site’s monograph (Campy, Chaline, and Vuilleme 1989) don’t make any attempt to interpret the assemblages in palaeoethnographic terms.

4. La Baume Moula-Guercy Location

Soyons, Ardèche, France
4.2 Excavation

1972: sounded by Pierre Payen
1975 - 1982: Pierre Payen
1991 - 1999: Alban Defleur

4.3 Stratigraphy

Defleur remarks that the excavations performed by Payen didn’t reach a stratigraphic precision high enough to discern the different layers within the sequence as it was known at the time; therefore, he started his campaigns from the top (Defleur 1995), renaming the different layers as he went along. As can be deduced from the same paper, and a more recent one covering the palaeoclimate of the sequence (Defleur et al. 2001), Payen had apparently reached layer X/XI, as a sounding in 1991 by Defleur, which started at the base level reached by Payen in 1982, resulted in the uncovering of five new layers (XI/XII to XVI) corresponding to MIS5 (and termination II). The strata excavated by Payen – which provided the faunal assemblage for the current study – date back to MIS 4 (Defleur et al. 2001). Defleur excavated levels levels IV to XV; XVI to XIX are only known through a local sounding (which provided an abundant rodent microfauna, subsequently used to derive these layers’ palaeoclimate). Bedrock wasn’t reached however (Defleur et al. 2001).

In essence, the site consists of 14 layers, starting with IV. As mentioned above, because of a lack of precision, within the MIS 4 strata (IV to X/XI) three main archaeological layers have been recognised, the remains (faunal and lithic) of which were studied as one by Payen et al. (Payen et al. 1990) because of their homogeneity. However, it would appear that the site only has 3 main archaeological layers in total, i.e. IV, VIII, and XIV, of which only the first two were excavated by Payen, on an very small area of the original deposits (Defleur 1995). The latter source also mentions that layer XIV has been studied in more detail.

4.4 Chronology

Prior to the last series of excavation campaigns let by Defleur, phase I of the sequence (see below) was considered to harbour three main archaeological layers, the remains of which were treated as belonging to a single stratum due to their homogeneity. That composite stratum was attributed to a late Mousterian based on the characteristics of the lithic industry and the only carbon date (on bone collagen) that was considered to be more or less reliable, i.e. Ly-2488 (33 200 ± 1500 14C BP) for which bone samples re-
trieved from a depth of 4.1 meters were used, with a total weight of 1.3 kg (Evin, Maréchal, and Marien 1983, Payen et al. 1990).

However, the 2 to 3 metres thick ash layer between layers VI and VII has been TL dated by Sanzelle and co-workers (Sanzelle et al. 2000). The resulting date, 72 000 ± 12 000 BP is compatible with the more recent correlation of layers IV to XI to MIS 4 based on the species characteristics and associations (provided that the more recent end of the date range is considered).

4.5 Palaeoenvironment

The 8 metres thick filling of the site (which is provisional, as bedrock hasn’t been encountered yet) covers three climatic phases, correlated with MIS 6-4 (Defleur et al. 2001). Inferences were made based on the palaeontology and palaeoecology (species associations) of micro and/or macro fauna, and an anthracological study of 180 pieces of charcoal found in layer XV.

Phase I: the installation of a cold climate (layers IV to X/XI)
- Open vegetation: dry cold (continental) steppic zones in the higher areas, humid environments on the valley floors.
- This cold period corresponds to the Upper Pleistocene, the start of MIS4 (Wurm). Less extreme than phase IIIa.

Phase II: forested, temperate (layers XI/XII to XIV); MIS 5, Eemian sensu lato
- Phase IIa : levels XIII to XIV
  - the establishment of a temperate forest, attaining its maximum extent during level XIVa
  - a major warming of the climate, interglacial (MIS 5e)
- Phase IIb : levels XI and XII
  - a transitional phase
  - a regressing of temperate forest species, in favour of a growing amount of boreal/wet open zones, heralding a climatic turnover (MIS 5b or 5d)

Phase III: cold, steppic (layers XV to XIX) – only known through a sounding of 1 m²
- Phase IIIa: levels XVII to XIX
  - continental steppe, very cold, very arid, with in ecologically protected places islands of forest
  - a glacial maximum, corresponding to the end of the Middle Pleistocene (MIS6, Saalian)
- Phase IIIb: levels XV and XVI
o characterised by a progressive diminution of species associated with a cold continental steppe, and a growing number of species attributable to a temperate biotope (the appearance of closed, more humid environments?). A wooded steppe.

o transitional phase, probably describing the border between the Middle and Upper Pleistocene (= Termination II, MIS 6 – MIS 5e)

4.6 Archaeological tradition

Typical Mousterian (Defleur 1995). However, an earlier paper (Payen et al. 1990) reports that the industry can be associated with a Typical or a Ferrassie Mousterian.

4.7 Fauna

Method of collecting

Conservation and fragmentation

Prey Taxa

Carnivore taxa

Marks

Seasonality

Carcass exploitation

Human remains
Thirteen Neanderthal remains with a MNI of 6, have been found in layers XV and XVI (Defleur 1995).

**Remarks**
Interestingly, the Neanderthal remains (which have been found in XV and XVI, i.e. layers other than the ones under consideration here, and actually layers other than the main archaeological strata), bear traces of filleting and fracturing of the bones (while still fresh), which have been ascribed to cannibalism (Defleur et al. 2001).
As layers IV and VIII have only been excavated over a small surface, suggesting a functional interpretation is premature.
5. Beauvais

Location

“La Justice” (Beauvais), Oise, France

5.2 Excavation

1993: Locht and co-workers

5.3 Stratigraphy

Levels 0 – 1 – 2 – 3 – 4a – 4b – 5 – 6a – 6b – 7 – 8

The upper Mousterian layer (‘C2’) is located in the middle of layer 6a, while the lower Mousterian layer (‘C1’) is situated in the base of layer 6b, on the contact zone with layer 7 (basically, the lower part of the small depression). Archaeological deposits are found within eolian sediments (partly reworked from the tertiary mound); the 6b-7 contact zone was severely disturbed by gelifluction. In some parts of the site, a definite differentiation of both layers was not possible. Although sands of the tertiary mound next to the site have been exploited, the site itself seems to have been spared, although clearly, the site continues in north-eastern direction (Auguste and Patou-Mathis 1999, Locht et al. 1995).

5.4 Chronology

According to (Locht et al. 1995) the chronology of the site is unclear, as the archaeological layers could correspond either to the end of the Saalian (MIS 6), or the beginning of the middle Wurm (MIS 4). While sedimentological indications would favour the first, zoological data would back up the latter.

In 1995, two chronological ranges (irrespective of occupation layer) were established by means of U-Th-dating on reindeer bones: one containing dates between 160 and 210 ka BP, the other between 50 and 90 ka BP. Because these results were indicative of a complex uranium migration, a new series of combined U-Th/ESR dates were performed on rhinoceros dental enamels, firmly placing the occupation of the site between 40 and 60 ka BP, i.e. the end of MIS4 and the first half of MIS3 (Michel et al. 1999), more specifically, 41-58 ka BP for C1, and 42-61 ka BP for C2.

However, based on faunal data, the occupation is placed firmly in MIS 4 (Auguste and Patou-Mathis 1999).
5.5 Palaeoenvironment

Based on sedimentological arguments, conditions during the archaeological occupations were cold and dry, characterized by a very open steppe environment. Judging from the composition of the mammalian (micro-)fauna, as well as its functional characteristics, the reconstruction of the environment again centres around dry and cold to very cold, a steppe with herbs and no forested zones (the classic Mammoth Steppe) (Auguste and Patou-Mathis 1999, Locht et al. 1995).

5.6 Archaeological tradition

Layer C2 contains almost 11700 worked lithics; the less dense, younger C2 about 2000. Retouched pieces constitute only 2.28%. The authors tentatively ascribe the tools to the typical Mousterian, while pointing out a significant amount of UP-type tools. Discoid debitage (Locht and Swinnen 1994).

5.7 Fauna

Method of collecting

Although all lithic and bone materials have been three-dimensionally mapped, no information has been provided on the screen size.

Conservation and fragmentation

Bones have been preserved well given the circumstances, because the site was covered by marine shells, reworked from fossil-bearing lenses found in the tertiary mound (thus lowering the acidity of the sand). Nonetheless, and not surprisingly, the effects of weathering, biological agents (plants), and edaphic processes have been noticed to effect a non-homogeneous conservation of the bones. As well, preservation of the actual bone surfaces was rather bad (Auguste and Patou-Mathis 1999).

Potentially, given the large discrepancy between NMI and NISP in both archaeological layers (bison: 0.3333, horse: 0.2857, rhino: 0.0938, mammoth: 0.0556, reindeer: 0.0382 for layer C1, and bison 0.25, horse: 0.0625, rhino: 0.0667, mammoth: 0.1053; and reindeer 0.0250 for C2), fragmentation – anthropic or otherwise – of the material may have been considerable, especially in the case of reindeer (the horse NISP being rather low to draw firm conclusions). Another explanation for the phenomenon may be introduction of the prey animals to the site in parts, rather than whole (Auguste and Patou-Mathis 1999).

In order to further investigate the high degree of fragmentation (even of the teeth), the relationship between cranial and sub-cranial elements of layer C1 was considered
after reindeer bone weathering was attested. As it turned out, there was a clear absence or rarity of certain bones from young individuals (< 3 years). Reindeer in particular was investigated further, leading to the suggestion that humans were largely responsible for the high degree of fragmentation. Afterwards, taphonomic agents further influenced the already skewed bone representation, as evidenced by the fact that 24 bones could not even be recovered as they fell apart upon excavation. These agents also caused the underrepresentation of young individuals. While no determined bone had been burned, 147 undetermined splinters are totally or partially burned, which is considerable (Auguste and Patou-Mathis 1999).

**Prey taxa** (Auguste and Patou-Mathis 1999)
Bison: at least 1 prime adult
Horse: at least 4 individuals (2-3 months, 3-4 months, 4-5 years, 8-10 years)
Rhino: at least 3 individuals (a young aged 3-4 years, and two adults between 8 and 14 years; to one of the latter belongs a cut-marked talus)
Mammoth: at least 1 adult individual of over 6 years old
Reindeer: at least 6 individuals (1 young of indeterminate sex, a young male, an adult male, and three adult females; this is very close to the composition of a naturally occurring contemporaneous group). The rareness of very young reindeer should be ascribed to taphonomic agents.

**Carnivore taxa**
The presence and impact of carnivores is negligible (one wolf specimen in C1, 2 mustelid specimens in C2); a single bite mark of a small carnivore was found on the wolf specimen.

**Marks**
Percussion marks were found on horse and bison bones, and, significantly, a cut mark (disarticulation?) on a rhino bone. Only three cut-marks were found on reindeer bones, undoubtedly caused by the bad preservation of the bone surfaces (Auguste and Patou-Mathis 1999).

**Seasonality**
Based on the antler and dental data, reindeer have been exploited at the beginning and at the end of summer. Hypothetically, a group was hunted during their summer migration, as well as during their migration to warmer regions upon the onset of autumn. Horse was likely butchered during summer (Auguste and Patou-Mathis 1999).
Carcass exploitation
Horse and bison were probably butchered at the kill location, such that only parts of the carcass were brought to the Beauvais site. Their bones have been fractured to extract the marrow. Despite the attestation of a cut mark on a rhino bone, it is difficult to interpret the presence of this animal, especially when the large amount of dental remains is considered. Reindeer carcasses have apparently been brought to the site in one piece. Bone fragmentation among taxa was also highest for this species: evidently, humans extracted the marrow content, which facilitated posterior fragmentation by natural agents (Auguste and Patou-Mathis 1999).

Human remains

Remarks
The human impact on the fauna of layer C1 has been fully studied and published (Auguste and Patou-Mathis 1999); this aspect of layer C2 awaits full publication.

Most of the mammoth remains, and almost all those of rhino, are teeth, which strongly suggests that, for some reason, they were merely collected and imported to the site (Auguste and Patou-Mathis 1999). The site was implanted on the plateau in such a way that a view was obtained on the Thérain river valley and the open plateau, while at the same time being sheltered from the prevailing winds: the occupation occurred in a small depression at the base of a tertiary mound.

Activities at the site include knapping and carcass treatment. The excavators attribute the existence of two concentrations of burnt animal bones in layer C1 to two hearths, that may have been primarily sustained by burning bones. The hearths themselves however haven’t been attested; ashes derived from wood may have disappeared by wind action. While the bones of bison and horse are dispersed, those of reindeer, rhino and mammoth are found near the location of the presumed hearths. The latter were also found to be focal points for the refitting of bone fragments (Auguste and Patou-Mathis 1999). The site, at least C1, probably had a domestic character.

6. La Borde

Location
Livernon, Lot, France
6.2 Excavation

1971: M. Lorblancet

6.3 Stratigraphy

Layers I, II (= ‘couche’ III by H. Laville)
Layer III (= ‘couches’ IV and Va by H. Laville)
Layer IIIa (= ‘couche’ Vb by H. Laville)
Layer IIIb (= ‘couche’ VI by H. Laville)
Layer IV (= ‘couches’ VII and VIII by H. Laville)
(Jaubert and Lorblanchet 1990, Laville 1990)

The archaeological layer is IIIb, consisting of differently sized rocks in a clay matrix often consolidated in a breccia (the latter preventing a trace analysis on the material), with a thickness of 55 cm. The stratigraphy is easily discernable in the southern side of the excavation only; the western side has been disturbed by karstic action (Jaubert and Lorblanchet 1990).

6.4 Chronology

Based on the composition of the faunal assemblage and the characteristics of the species, the occupation can be dated either to MIS 5e or a Rissian interstadial (Slott-Moller 1990).

6.5 Palaeoenvironment

Reconstruction of the environment based on pollen analysis pointed to a very open, herbaceous landscape, with some pines and junipers (despite the rather bad preservation of the pollen), indicating a cold and dry climate. However, the filling of the site arose through colluvial action, such that the few pollen samples taken don’t correspond to the Mousterian occupation (Jaubert and Lorblanchet 1990, Laville 1990).

Based on faunal arguments, especially the overwhelming presence of Bos, climate must have been relatively benign and humid, pointing to interglacial or interstadial conditions (Slott-Moller 1990). Led by the preferences of Bos, the environment could be envisioned as open forest.
6.6 Archaeological tradition

Denticulate Mousterian, based on almost 2814 artefacts, mostly (except for 101 flint specimens) made of local quartz (Jaubert and Turq 1990). The predominant method ofdebitage applied to quartz is described as ‘informe’ (Jaubert 1990).

6.7 Fauna and taphonomy

Method of collecting
Although the collection of the fauna happened largely by sieving of a waste heap, the attribution to layer IIIb is quite secure. Screen size however, wasn’t indicated (Jaubert and Lorblanchet 1990).

Conservation and fragmentation
Because the site has been excavated after it was discovered during the construction of a pumping station, a large part of the site had been destroyed before excavation could begin. However, the sediments that were dug up in preparation of the construction (about 100 m³) were sieved in order to extract the archaeological material within (Jaubert and Lorblanchet 1990).

Fragmentation of the material turned out to be considerable; the preservation of the material can be called bad. As the fauna was imbedded in a breccia that arose post-depositionally through carbonate action, extracting the bones proved to be difficult. Moreover, bone surfaces are often eroded. The main focus of the faunal study was *Bos*, given its large numerical importance. As it turned out, *Bos* teeth e.g. are three times more numerous than post-cranial bones, which is a further indication of bad preservation (Slott-Moller 1990).

Prey taxa
The *Bos* MNI is 40. Young (< 2 years) animals are rare, again probably due to preservation issues. According to the author, the rest of the age distribution resembles that of a wild population (a catastrophic death profile), suggesting that the hunters didn’t select their prey according to age (Slott-Moller 1990).

Carnivore taxa
The percentage (NISP) of carnivores is 2.2 %, all made up of *Canis lupus* (10 specimens) (Slott-Moller 1990).

Marks
Significant erosion of the bone surfaces, and the fact that the latter are covered by a clayey concretion, prevented the detection of possible marks (Slott-Moller 1990).

**Seasonality**
Starting from the assumption that calves were born in April or May, 10 animals were butchered during spring, 8 during summer, 8 during autumn, and 14 during winter, suggesting a year-round frequentation of the site (Slott-Moller 1990).

**Carcass exploitation**
While encounters with (and exploitation of) other animals may have been much less planned, *Bos* was clearly targeted, most likely by extensive use of the sinkhole as a death trap. Carcasses were exploited thoroughly to obtain the marrow, although exploitation was not maximal (phalanges).

**Human remains**

**Remarks**
In conclusion to their monograph, the authors (Jaubert and Brugal 1990) propose to see the site as a palimpsest, being the result of multiple (and multi-seasonal) visits to and around the site (see, e.g. also the presence of a flint cache in the form of a Levallois core)(Brugal 1999). Given the high percentage of *Bos*, and of young and small specimens in particular, they believe the occupants focused on the exploitation of so-called nursery herds (composed of female and young individuals); these are easier to hunt than the bull groups. The herds are supposed to have been around fairly continuously (a lack of migration is ascribed to the temperate conditions of the time, which provide a fairly constant food supply in the form of grass and herbs), whereby the site functioned as a natural death trap. This function could have been part of a hunting tactic involving an indiscriminate exploitation of nursery-herds using the death trap as a way to impede the movements of the target animal, which could be corroborated, according to the authors, by the fact that the lithic assemblage doesn’t lend itself for active hunting (but rather for the phases that precede or follow it).

Given the heavy fragmentation of the bones (resulting from human exploitation), the presence of abundant lithics, as well as burned material (and indications for a hearth), the authors conclude that the activities at the site comprised more than just killing and butchering the animals. However, they don’t go as far as to interpret the site as a home base despite the ‘domestic’ character they attribute to it, and the possibilities it offers in terms of shelter (Jaubert and Brugal 1990). In their view, such a site would necessarily be characterised by a semi-permanent occupation, while they envision the duration of the occupation to be of ‘moyenne durée’, meaning more than a few hours. However, the
distinction between such a site and a ‘transient’ hunting camp on the basis of occupation time in a system of high residential mobility might well be difficult to make. Nevertheless, a secure interpretation of the site as either a domestic site with a predominant exploitation of Bos, or a temporal hunting camp ideally located to target Bos is indeed premature, as arguments for both can be forwarded.
7. La Brèche de Genay Location

Genay (Montagne de Girault), Côte-d’Or, France

7.2 Excavation

1864: J.J. Collenot
   - illegal excavations -
1985: Y. Pautrat and C. Verjux (rescue excavation)
   See (Joly 1987, Pautrat and Verjux 1987)

7.3 Stratigraphy

Joly (Joly 1987) discerned 12 levels, a composite picture based on 7 trenches made during the excavation campaigns of the 1950s:

   12: Néolithique (‘couche humifère’)
   8 - 11: Jaune (‘série plus clair jaunâtre’)
   5 - 7: Brun (6 = ‘limon brun’, ‘série brune’)
   3 - 4: Rouge moyen (3 = principal bone layer, ‘série rouge’)
   1 - 2: Rouge inférieur (‘série très rouge’)

The stratigraphy as revealed by the new (rescue) excavation, was as follows (Pautrat and Verjux 1987):

   A: fillings posterior to Joly's excavations
   B: Cryoclastic fine gravels
   C: Scree
   D: Brown clay loaded with fine gravels
   E: Pure brown clay
   F: Red silt gravel
   G: Red silt
   H: Mixed zone
   I: Breccia
   J: Orange silty gravel
   K: Clastic limestone

Although Pautrat and Verjux (1987) state that the rescue excavation made a refinement of the stratigraphy described by Joly possible (while the former ‘largely confirms’
the latter), they seem to make no particular effort to compare both in detail. They do mention in their text that G corresponds to Joly's 'série rouge', the main occupation layer (3 - 4), and K to layers 8 - 11. Naturally, not every layer is present in every 'secteur' of the site, and the rescue excavation covered a small area, which makes an in depth correlation difficult. Nevertheless, a similar lack of clarity also plagues the sketches of the sections where the palynological sampling took place (Renault-Miskovsky and Hakim 1987). It would have improved clarity if the latter authors had mentioned the letter codes used by Pautrat and Verjux (Pautrat and Verjux 1987).

All lithic materials that belonged to the same archaeological tradition have been described as a whole, as well as the faunal assemblage (see further below), notwithstanding the fact that Joly (Joly 1987) mentions two occupation levels ('série rouge', 'série brune'). However, according to Pautrat and Verjux (Pautrat and Verjux 1987), this is due to post-depositional pedological processes.

### 7.4 Chronology

According to Joly (Joly 1987), the Alpine chronology for the sequence should be as follows:

- **Very Red series** = Riss-Wurm interglacial
- **Red series** = Early Wurm
  - first a relatively cold episode (*Megaceros*, Neanderthal)
  - subsequently, a cold episode (Reindeer replaces *Megaceros*)
- **Brown series** = first interstadials of the Wurm
  - a new episode of higher temperatures, however shorter than the previous
- **Yellow series** = very cold phase(s) belonging to the end of the Wurm

The pollen analysis doesn’t entirely confirm Joly’s hypothesis however. Although Renault-Miskovsky and Hakim (Renault-Miskovsky and Hakim 1987) deem it possible that the first (coldest and driest) climatic phase they discerned belongs indeed to the early Wurm (MIS 5-4), they preferentially link the pollen spectrum to the second half of the Early Wurm (i.e., the Wurm II or first half of MIS 3). Their second, warmer and wetter phase could then correlate neatly to the second half of MIS 3 without the need to resort to the hypothesis of a sedimentary hiatus between both phases (covering the first half of MIS 3).

Patou (1987), based on the faunal data prefers a chronostratigraphic attribution to Würm II (first half of MIS 3):

- horse, the dominant species, is close to the subspecies *germanicus*
• *Rangifer tarandus* is present, and in Southwest France, this species appears during the beginning of Würm II
• *Cervus elaphus* and *Ursus spelaeus* appear in low numbers
• *Bos* and *Bison* are well represented
• *Mammuthus primigenius* and woolly rhinoceros (*Coelodonta antiquitatis?*) underscore the rigour of the climate

More specifically, she pleads for the second part of Wurm II, as forest animals are rare and steppic animals abundant. The corresponding landscape is very much open with only minor patches of trees.

Two animal bone samples (M1-25 and I2-4) from the same layer where the Neanderthal skull fragments have been found, have been U-dated, with the following results:
- 230th/234U: 82000 ± 20000 -16 000 BP
- 231Pa/235U: 75000 ± 6000 BP

These would place the Mousterian occupation during the beginning of the early Wurm, which would correspond to the age estimation made by Joly (Joly 1987), as well as the age proposed for the lithic (Pautrat 1987) and, perhaps more tentatively, the human remains (de Lumley 1987), but not to the age proposals based on palynological, and more importantly, faunal data.

Available ¹⁴C-dates on bone suggest yet another time frame (Delibrias and Fontugne 1990):
- Ly-2663: 26900 ± 1500 BP
- Ly-2664: 27400 ± 1000 BP
- Ly-3036: 32100 ± 1000 BP
- Ly-3037: > 33000 BP
- Ly-3038: > 31500 BP

However, Ly-2663 and Ly-2664 are too young, probably due to contamination (Delibrias and Fontugne 1990:42). Ly-3037 and Ly-3038 are minimum dates, while Ly-3036 may be too young as well due to an incomplete elimination of contamination (Delibrias and Fontugne 1990). As the chronology is obviously very problematic for the site, it has been entered into the database as MIS3-5d.

### 7.5 Palaeoenvironment

Despite a very bad (and differential) conservation of the pollen, Renault-Miskovsky and Hakim (Renault-Miskovsky and Hakim 1987) have been able to discern two climatic
phases, within the framework of the new (rescue) excavation performed in 1985. During the first, the landscape is very much open and steppic (cold and dry), typical of the most rigorous glacial periods. Only some Pinus remain, accompanied by Corylus. The second phase is characterised by somewhat less rigorous circumstances (relatively cold and relatively dry), such that some tree species can develop in the vicinity of water. The steppe retreats slightly to incorporate more humid grasslands.

According to Patou, who studied the faunal material as if belonging to a single occupation (Patou 1987), the environment was steppic, and the climate cold and dry. As most faunal material originated from the lower layer, her result closely follows that of the palynological study.

### 7.6 Archaeological tradition

Atypical Charentian Mousterian, based on 1345 flints. The industry displays a likeness to that of La Chapelle-aux-Saints and layer 9 of Bourgeois-Delaunay (Pautrat 1985, Pautrat 1987). The former belong to the Quina group, the latter to the Typical Mousterian, however.

### 7.7 Fauna

**Method of collecting**

The fauna that was tabulated in Patou’s Table 2 (Patou 1987) stems from three sources: the material available from the excavations by Joly (Patou’s Table I), enumerated by trench (I, II, IV D.S., V, VI, VII, VIII), as well as 15 bones on display in the Musée Archéologique of Dijon, 8 pieces identified in 1954 that were subsequently lost, and 6 or 7 other remains that turned up in reports by Joly. To this assemblage were added the bones without number. Not added were references to material from old excavations (1864, 1868, and 1879). It hasn’t been specified how the bones had been collected.

**Conservation and fragmentation**

Patou (Patou 1987) clarifies that conservation of the bones has been modest. Moreover, because of the imbedding of the material in a breccia, external surfaces couldn’t be studied. Dental remains dominate the assemblage, and little or fragile bones are under-represented due to dissolution.

**Prey Taxa**

All age classes are present; hunting focused on horses and bovids, species that are highly productive in terms of secondary materials such as skin and tendons.
MNI’s are as follows:

- **Bos primigenius**: at least 4
- **Bison priscus**: at least 2
- **Bos or Bison**: 24 (of which 1 young animal)
- **Sus scrofa**: 1
- **Megaceros**: 1
- **Cervus elaphus**: 2 (1 of which is a young adult of less than 2 years old)
- **Rangifer tarandus**: 3 (1 of which is a young adult)
- **Equus caballus** cf. **germanicus**: 62 (4 of which are young adults less than 2 years old; at least 3 of the 62 are male; all ages are represented)
- **Rhinocerotids**: **Coelodonta antiquitatis** (?): 1
- **Mammuthus primigenius**: 3 (2 young animals of less than 2 years old, 1 adult)

Given the average degree of conservation, the MNI can be assumed to be lower than the initial number present, especially for young individuals (Patou 1987).

**Carnivore taxa**

Carnivores are poorly represented at Genay, i.e. 1.15 % (NISP) of the assemblage. MNI’s for the different species are as follows:

- **Ursus spelaeus**: 1
- **Canis lupus**: 2 (one male, one female)
- **Crocuta crocuta spelaea**: 2
- **Panthera (Leo) spelaea**: 2

**Marks**

Some butchering marks are present, as well as (posterior) carnivore tooth marks (50 bones). Marks due to de-skinning or disarticulation haven’t been attested (Patou 1987).

**Seasonality**

- 

**Carcass exploitation**

Animals were transported whole to the site; horse and bovid extremities have been discarded in anatomical connection. All long bones were broken in order to extract the marrow, and about one hundred bone splinters have been burned (Patou 1987).

**Human remains**

All human remains could be ascribed to **Homo (sapiens) neanderthalensis**:

- 25 teeth and 65 skull fragments belonging to one very robust (male?) individual of about 40 years old, ‘Genay 1’ (de Lumley 1987)
- a single tooth, ‘Genay 2’ (Pautrat and Verjux 1987)
Remarks

Genay appears to be a home base, based on faunal (transformation of complete carcases, de-fleshing marks), as well as lithic evidence. This hypothesis is corroborated by the presence of hearth stones and numerous burned bones (Joly 1987). Pautrat (Pautrat 1987, Pautrat and Verjux 1987) argues for ‘une seule occupation’. Depending on what he means by that, I find it very unlikely that the MNI’s would have been produced during one occupation phase, as this would require a very long stay or a large group size. However, the possibility of repeated (seasonal?) visits during a short period of time, should not be dismissed just yet.

8. Caminade–EstLocation

La Canéda (‘Fontaine de Bontemps’), Dordogne, France

8.2 Excavation

Mousterian levels: F. Bordes
**Aurignacian levels: D. de Sonneville-Bordes (1953-1966)**
New excavations: Bordes and Lenoble (1999-2001)

### 8.3 Stratigraphy

Unit A (sterile): ‘Horizon’ A2, (B), C
Unit B:
- Levels D2 sup – D2 inf – E: Aurignacian II
- Levels F – G: Aurignacian I

Unit C (Mousterian): Layers M3 (M3a, M3b), M2, M1

### 8.4 Chronology


### 8.5 Palaeoenvironment

Layer F formed under a cold and humid climate according to Delpech (Delpech 1975) who used the 1973 Ph.D. study by Laville. However, according to an older source, also by Laville, the climate was cold and dry (Laville and de Sonneville-Bordes 1967). The is corroborated by the pollen analysis (Paquereau 1978).

### 8.6 Archaeological tradition

Aurignacian I

### 8.7 Fauna

**Method of collecting**

- 

**Conservation and fragmentation**

Destructive taphonomic processes were intense resulting in the preservation of mainly teeth (out of 59 remains for the 5 cultural layers, only 14 were bone and three antler).
Given the state of preservation of the fauna (few, and mainly teeth), the specimen counts should be treated with caution as far as representativeness is concerned.

**Prey Taxa**
- 

**Carnivore taxa**
- 

**Marks**
- 

**Seasonality**
- 

**Carcass exploitation**
- 

**Human remains**
- 

**Remarks**
Only layer F fulfils the requirements set out by Grayson and Delpech (Grayson and Delpech 2002, Grayson and Delpech 2006) for incorporation into the database (> 20 remains), see the original publication of the faunal data (Delpech 1970). Moreover, it was shown that layer G had been contaminated by the underlying Mousterian (Bordes 2000).

9. **Les Canalettes**

**Location**
Nant, Aveyron, France

9.2 **Excavation**

1964: G. Costantini and J. Maury (small excavation, 2 m²)
   Illegal excavations (perturbing a large zone around the previously excavated area)
1979-1987: L. Meignen
The data discussed here pertain to the material excavated between 1980 and 1986.

9.3 Stratigraphy

Layers 1 – 2 – 3

Although the layers that are relevant here are 2 and (the upper part of) 3, layer 1 also contained Mousterian remains (both lithic and faunal), and those of more recent periods. Possibly this upper layer, which is quite porous, is in fact a Mousterian layer with posterior soil formation. Plant growth and water percolation could then have introduced more recent elements. Layer 2 contains a few UP and even Mesolithic artefacts, which fell into the cracks in the vicinity of the wall arising from decomposition of stone slabs that broke off from the wall. Layer 3 contained only Mousterian artefacts. No significant perturbations due to erosion or water action have been noted (Meignen 1993a).

9.4 Chronology

Four TL-dates have been obtained from burned flint found at the base of layer 2. As the date obtained on sample CAN25 diverged about 25 % from the average of the other 3 (i.e. 73500 ± 6000 BP), it was approached with caution, and ultimately rejected on technical grounds, considering moreover that an occupation of about 20 ka (with a rather consistent spatial organisation) is unlikely (Valladas and Joron 1993).

Oddly, the dates as provided in another publication by Valladas (Valladas et al. 1987) are slightly diverging. However, both sources provide the same (weighted) average date of 73500 ± 6000 BP (calculated based on the dates of samples CAN22, CAN24, and CAN211), the dates given in the (more recent) site’s monograph have been followed to calculate the age range as presented in the database.

Considered together with the available palaeoenvironmental data, the site was placed in MIS 5a rather than 4 (Valladas and Joron 1993), although the possibility of MIS 4 hasn’t been totally rejected (Jaubert 2002), despite the fact that the latter author points out the current climatic rigor of the region in question (making MIS 4 incompatible with both anthracological and faunal data, and hence, unlikely).
9.5 Palaeoenvironment

Anthracological research suggested, in the form of a general impression, that layer 3 was more continental than 2, the latter displaying a more benign climate. In both layers conifers, *Pinus* in particular, dominate the assemblage with 89% in layer 3, and 51.9% in layer 2. Layer 3 also contains *Buxus* and *Quercus*, whose number incline significantly in layer 2 (Vernet 1993). To conclude, the environment during the Mousterian occupation at Les Canalettes consisted of a dry mountain vegetation with *Pinus* in the valleys and extensive grass plains on the plateau, which arose in a rather temperate phase, although layer 3 is a little colder (Théry et al. 1996).

Based on the microfauna, it’s layer 2, not 3 that is colder. Additionally, layer 2 is also a little more humid. The assemblage also shows that different ecological niches where in place around the site. Tentatively, the filling of the site is attributed to the very end of MIS 5 (Marquet 1993).

A reconstruction of the climate based on the macrofauna suggests a rather temperate environment in layer 3, with layer 2 being somewhat colder (thus confirming the pattern emerging from the study of the microfauna), while supporting the assumption of multiple ecological niches indicated by the topography: cliffs with mountainous species, and plateaus with forested as well as open spaces (Brugal 1993). Nevertheless, it is remarked (Brugal 1993, Patou-Mathis 1993b) that temperate species dominate throughout the entire Mousterian occupation of Les Canalettes, although the NISPs of the species that are most clearly temperate tend to be reduced to almost zero in layer 2 (Brugal 1993).

These results were entered as follows into the database: the temperature for both layers was considered to be relatively temperate, with a cooling of one layer relative to the other. As the different disciplines aren’t able to agree on which layer was colder than the other (fauna vs. anthracological), I designated both layers as ‘relatively temperate’. Nevertheless, this remains a personal take, which clearly demonstrates the limits of the approach used in the database. The same goes for the precipitation: again because of disagreements between disciplines, precipitation wasn’t mentioned at all by the authors of the conclusion to the monograph (Meignen and Brugal 1993), being either relatively humid (fauna) or relatively dry (anthracological). In this case, I chose not to assign the layers with a label since the excavators didn’t do so either.

9.6 Archaeological tradition

Typical Mousterian in layer 2, with a predominant Levallois production, based on 3314 pieces (Meignen 1993b). According to (Valladas et al. 1987), layer 3 also contains a typical Mousterian industry, both of which are rich in scrapers (Jaubert 2002).
9.7 Fauna

Method of collecting
Sediments were sieved “with a small screen size” (Meignen 1993a).

Conservation and fragmentation
While fragmentation is considerable in both layers, it is especially high in layer 3. The percentage of determinated bones (anatomically, or anatomically and taxonomically) is 7.11 % for layer 2, and 1.95 % for layer 3. Not counting bone splinters equal or less than 2 cm long, the percentages become, respectively, 16.74 % and 22.64 %. Fragmentation is due primarily to natural taphonomic agents such as cryogenesis, compaction, ... Similarly, when only teeth are considered, the fragmented part comprises about 50 % in layer 2, and about 45 % in layer 3, for *Equus*, *Cervus*, and *Bos* (Brugal and Patou-Mathis 1993).

When considering the contribution of cranial vs. sub-cranial bones to the total amount of determinated bones per taxon. Two taxa stick out in both layers, suggesting different exploitation strategies: *Equus caballus*, represented by a lot more cranial remains, and *Cervus elaphus*, represented by a surplus of post-cranial remains. Both categories are more balanced in the case of *Bos* (Brugal and Patou-Mathis 1993). The fact that the faunal material (including the bone surfaces) is well preserved (Patou-Mathis 1993b) indeed supports the hypothesis of differential exploitation.

Prey taxa
For NISP and MNI counts, see Patou-Mathis (Patou-Mathis 1993b). Herbivores of layer 3 were killed one by one, without age preference, selecting from herds primarily inhabited by female and young individuals. In both layers however, the animal exploitation seems to be focussed on average- and small-sized individuals (Patou-Mathis 1993b).

Carnivore taxa
For NISP and MNI counts, see Patou-Mathis (Patou-Mathis 1993b). As far as the relative contribution of carnivores to the assemblage goes (1.57 % in layer 2, 3.03 % in layer 3), carnivore impact should be minor. Still, taxonomic diversity is not small; most species are found in layer 3.

Marks
As far as layer 2 is concerned, marks are rare; those that were attested were all attributable to human action. In layer 3, most marks again point to human consumption; only three bones bear teeth marks inflicted by a small carnivore. On the indeterminate bone fragments as well, carnivore marks are rare (Patou-Mathis 1993b).
**Seasonality**
Both layers appears to be the result of multiple occupations in spring, but also during summer, and the beginning of autumn (Patou-Mathis 1993b). Given its location, overviewing a good part of the Durzon valley 100 meters below, the site may have been an ideal migration-season look-out post, but there’s no specific seasonality data to back this up.

**Carcass exploitation**

**Layer 2**
*Cervus* (females and young animals) were introduced whole to the site, where they were butchered; they were probably hunted in the lower parts of the karstic landscape. Horse and aurochs on the other hand were transported to the site in the form of meat-rich quarters (shoulder and hip), and hunted on the plateau. Bones belonging to meat-poor pieces of the carcass have also been introduced, possibly supporting the argument for human scavenging (Patou-Mathis 1993b).

**Layer 3**
In contrast to the layer above, lagomorphs in layer 3 (NISP: 109, MNI: 10) have two origins: one human, the other natural. Numerous bones have been fractured and burned. Average- or smallsized herbivores (*cervus, capreolus, capra* and *rupicapra*) were all killed by humans and transported whole to the site to be butchered; a lot of their bones, especially those of *Cervus* bear butchering marks. Most of the horses, and some of the aurochs were also hunted by men, and introduced in parts. Some pieces with a rather poor meat content (head, paws), which are often neglected by other predators, were attested as well. Similarly to layer 2, they could be the result of human scavenging (Patou-Mathis 1993b).

**Human remains**

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**Remarks**
The fauna discussed here were excavated between 1980 and 1986, covering 25 m² on top, and 13 m² at the bottom of the sequence. The excavated filling includes layer 2 (the upper part of which was perturbed), and the top of layer 3.

Rhino and mammoth remains include only dental specimens, which raises questions about their introduction into the assemblage (collected teeth?).

As no marks were found on lagomorph bones in layer 2, and as all bones (differential preservation kept in mind) were accounted for, it is suggested that they weren’t hunted (by humans or carnivores), but rather died in the rockshelter (Patou-Mathis 1993b).
Nevertheless, the author keeps open the possibility that some may have been consumed by humans, although this must remain conjecture.

The horizontal distribution of the faunal remains is higher in layer 3, compared to layer 2; this could be the result of a longer occupation, or, more likely, a larger number of seasonal occupations in the former layer. The more extensive distribution in layer 2 also produces a less clear spatial organisation of the site: in layer 2, places where animals were primarily butchered vs. consumed are more easily recognised (Patou-Mathis 1993b). Nevertheless, and despite the palimpsest nature of the site, concentrations of lithic and faunal material can be witnessed in both layers, and they can even be found roughly in the same place: kitchen waste was deposited against the northern wall, while domestic activities took place in the centre, before the east wall (although during the deposition of layer 2, the domestic area moved a little westwards). The fact that the latter can be recognised spread over a relatively small area, which remains relatively constant over time, isn’t necessarily due to a deliberate human choice over the years, but can also be attributed to pragmatic issues such as the presence of large stones on the floor in other areas, or to lack of sufficient shelter from wind or rain (Meignen and Brugal 1993). In conclusion, the site has a definite domestic, yet seasonal character.
10. Chez-Pinaud Location

Jonzac, Charente-Maritime, France
x=384.400, y=352.250, z=40 meters (Airvaux and Bouchet 2004b)

10.2 Excavation


10.3 Stratigraphy

Zone 2

- **Layer 8** (zone 2 and locus W): a lot of faunal and lithic remains
- Layer 9: sterile
- **Layer 10**: a lot of fauna, much less lithics. It very likely consists of multiple layers that are undistinguishable from within this section (i.e. zone 2).
- Layer 11: sterile
- **Layer 12**: very thin, especially fauna (1 lithic artefact)
- Layer 13: sterile
- **Layer 14**: abundant fauna and lithics
- Layer 15: sterile
- **Layer 16**: thin
- Layer 17: sterile
- **Layer 18**: thin, lithics are rare
- Layer 19: sterile
- **Layer 20**: lithics are rare
- Layer 21: sterile
- **Layer 22**: exceptionally large concentration of lithics and fauna, >1 m thick. Sub-layers couldn’t be discerned, and the material was spread throughout the deposit.
- Layer 23: practically sterile
- **Layer 24**: fauna not different from layer 22

(Airvaux and Bouchet 2004a)

The subsequent excavation campaign revealed a slightly deviating stratigraphy: while layer 8 remained the same, Airvaux’s layers 7 and 7s have been called 6 and 7 (the latter harbouring the Neanderthal tooth) (Richards et al. 2008). In total, 5 lithostratigraphic
units have been discerned, the oldest one (i.e. 5) containing layers (US) 024 to 08. Unit 4 contains US 07 and 06 (both MTA, the Chatelperronian inferred by Airvaux couldn’t be confirmed by the new team). Unit 3 contains Aurignacian, while the second corresponds to OIS2. No fauna have been found in the latter, and the artefacts are rather undiagnostic. Unit one corresponds to the top layer (Jaubert 2010).

10.4 Chronology

No dates available by 2004. By 2008, a preliminary radiocarbon date of 36 ka BP had been obtained on two pieces of cut-marked bone from layer 7 (= 7s, old numbering), somewhat extending the range of the MTA, which has been roughly dated to 55-40 ka BP (Richards et al. 2008). To that, a TL date of 49 ± 5 ka BP was added in 2008 (cited by Jaubert (Jaubert 2010)).

10.5 Palaeoenvironment

Based on ungulate associations (with a dominance of animals living in open, non-arctic environments) and the layers below, layer 8 was attributed to MIS 3 (Bourdillat 2004). The older layers have been attributed to MIS 4; more specifically, layers 10 to 24 can be correlated (based on faunal associations) with layers 17 to 31 of Combe Grenal, and 7 and 8 of La Quina. Moreover, like Chez-Pinaud, the latter ensembles are covered by strata dominated by horse or bison. According to the micromammal analysis (Cochard 2004), climate was cold and dry (steppe vegetation) in general, and a little wetter in the valley floors.

10.6 Archaeological tradition

Quina Mousterian (Lenoir 2004, Soressi 2004) in layers 10, 12, 14, 16, 18, 20, 22, 24, and MTA with some early Chatelperronian accents, possibly intrusive (Airvaux and Lévêque 2004), in layer 8. According to a subsequent campaign (Richards et al. 2008), layer 8 is considered to be a Denticulate Mousterian, overlain by two MTA layers (7 and 7s, or in the new numbering, 6 and 7). Therefore, contra Grayson and Delpech (Grayson and Delpech 2006), Chez-Pinaud 8 is no longer considered to be Chatelperronian. See Soressi (Soressi 2004) for the exact number of lithics for layers 10-24 (p. 80).
10.7 Fauna

Method of collecting
The archaeological remains have been extracted per square meter, in layers of 5 or 10 cm. Sediments haven’t been sieved systematically. However, in rich layers such as 22, sediments have been extracted in bulk. Consequently, lithic artefacts and bones were recovered in the lab, and washed above a sieve. As such, it is argued that all remains larger than 5 mm could be recovered (Beauval 2004).

Conservation and fragmentation
Layer 8 (Bourdillat 2004): badly preserved bone surfaces, high degree of fragmentation (13% of the remains were identifiable); however, *R. tarandus* bones had been preserved better, with less fragmentation. The latter may be compatible with the low percentage of teeth remains for that species. Overall, the fragmentation is cautiously attributed to humans, not carnivores.

Layers 10-24 (Beauval 2004): with the exception of layers 10 and 20, preservation has been good. Only in layers 10 and 14 was the representation of (reindeer) anatomical elements directly linked to their bone density (which implies differential preservation); no post-depositional physical, chemical or biological agent could be found to have significantly impacted the underlying strata.

Prey Taxa
Layer 8: (Bourdillat 2004), see also his figure 3. The total herbivore MNI is 15

*Bison/Bos*: NISP=377 (148 teeth)
*Equus caballus*: NISP=105 (42 teeth)
*Equus hydruntinus*: NISP=5 (3 teeth)
*Rangifer tarandus*: NISP=43 (3 teeth)
*Cervus* sp.: NISP=19 (no teeth); *Cervus elaphus* (Bourdillat 2004), see his figure p. 14
*Coelodonta antiquitatis*: NISP=1 (one tooth)
*Sus scrofa*: NISP=2 (2 teeth)
Elephantidae: NISP=2 (no teeth)

The large number of taxonomically unidentified bones has been subdivided according to animal weight class. Incidentally, the number of bovid and horse bones corresponds closely with that of class III-IV, while the percentage of reindeer and *Cervus* appears to correspond with that of class II-III. According to Bourdillat (Bourdillat 2004), this suggests that this classification appears coherent with respect to the taxonomic determinations. Importantly, it can be noted that class III-IV (indeterminate and taxonomically identified specimens) comprises more than 85% of the faunal assemblage.
Carnivore taxa

Layer 8: carnivores make up less than 1% of the fauna (NISP) see Bourdillat (Bourdillat 2004) for NISP and MNI; only Panthera (Leo) spelaea was attested through teeth remains.

Marks

Layer 8 (Bourdillat 2004): only 5% of the bones bare human induced marks (percussion and cut marks). The latter have mostly been found on long bone diaphyse fragments, and indicate filleting. While several agents (amongst which root etching has been the most prominent) must have had a considerable impact on the preservation of less pronounced human or animal induced marks, not a single gnaw mark has been found.

Layers 10-24 (Beauval 2004): root imprints are visible in all layers except layer 24. The worst (i.e. non-superficial) examples are essentially found in layer 10. Carnivore marks, attributed to small carnivores, have been found on a mere 19 bones (throughout layers 10 to 24). The amount of cut marks varies between layers (.79 % in layer 10, 25.67 % in 22). However, the number of cut marks is correlated with the extent of bone surface alterations caused by non-human taphonomic agents. Only in layer 22, cut marks are numerous enough to make the firm conclusion that all stadia of the butchery process (of horse, bovids and reindeer) have taken place; in other layers only particular instances of butchery could be discerned.

Seasonality

Layer 10 + 22 (Beauval 2004): while all age classes of horse, reindeer and bovids are present in equal amounts, most of the dental remains point to kills in winter or spring for horse and reindeer. Nevertheless, a single reindeer teeth from layer 10 may indicate a summer hunt.

Carcass exploitation

Layer 8 (Bourdillat 2004): practically all skeletal elements belonging to bovids and equids have been attested. In the case of Rangifer and Cervus, each anatomical region is more or less equally represented. The cranial/post-cranial ratio diminishes as a function of prey size: 0.87 (bovids) – 0.72 (horse) – 0.18 (Cervus) – 0.10 (reindeer). Overall, cranial elements and long bone diaphyse fragments dominate the assemblage. The large number of very small bone splinters, and the small proportion of long bone epiphyses, probably indicate the extraction of bone grease. About 10% of the splinters are partially or completely carbonised, and, to a lesser extent, calcinated.

Layers 10-24 (Beauval 2004): the use of specific exploitation strategies has been investigated for layers 22 and 10 (the most rich) only. No focus on particular age classes could be attested, while hunts (scavenging seems to be excluded) took place in winter.
and spring. Interestingly, the radio/ulna/tibia part of reindeer extremities is better represented than humerus and femur, while being less nutritious. As the author assumes that animals were brought to the site whole, the reason is sought with a differential treatment of the anatomical parts (either in the form of a more extensive fracturing of the distal part of the extremities - which thus become more frequent, or a very extensive fracturing of the proximal part, making the resulting splinters indeterminable). In any case, the pattern is compared with that of reindeer of locus 2 of la Quina, and with Combe-Grenal. While transport of equids and bovids is less well documented, in these cases too all skeletal parts have been accounted for, suggesting the transport of complete carcasses to the site. Burned bones have been found only in layers 24 (5.61 %), 22 (4.64 %), and 14 (5 bones); judged by the thickness of the bone fragments, they probably belonged to reindeer. None of the bones had cut marks. Interestingly, reindeer head remains are underrepresented in layer 10 (moreover, almost all cranial remains consist of antler), but whether this results from human activity, differential preservation or from the limited extent to which the site was excavated, remains unclear.

In conclusion for layers 10-24, the author indicates that for the three major taxa (equids, bovids and reindeer), all body parts were transported to the site, and processed in situ (skinning, dismembering and filleting). Extraction of marrow was attested. Despite some environmental variation, animal exploitation seems to be fairly constant.

**Human remains**

A Neanderthal (most likely) tooth in layer 7 (= layer 7s) (Richards et al. 2008). The isotopic dietary analysis revealed that Neanderthals were top-level carnivores, consuming little or no plant materials, while their most likely primary dietary components consisted of horse and bovids. Interestingly, the analysis also revealed that hyena primarily preyed on reindeer, suggesting a niche differentiation between hyena and Neanderthals.

**Remarks**

A four year excavation campaign was begun in 2004 by a team from Bordeaux I and the Max Planck Institute. During that campaign, a single (Neanderthal) tooth was found, which formed the basis for an isotopic dietary analysis (Richards et al. 2008). Moreover, more faunal remains were collected for layers 7 and 7s (renamed as 6 and 7 respectively), making them eligible for our database. Unfortunately, except for their total NISPs and the percentages of the main prey animals (bovids, equids and reindeer), precise numbers were not provided. Nevertheless, like layer 8, the assemblage, which arose mainly through human action, points to an open temperate environment.

As far as the carnivore impact for layer 8 could be ascertained, all evidence (absence of gnaw marks, presence of cut marks and large numbers of – sometimes burned – small
bone splinters, a small carnivore NISP) points to humans as the accumulator of the bone remains. Nevertheless, because the excavated surface was very small, attaching a function to the site is currently impossible. The conclusion to layer 8 is valid for 10-24 as well (Bourdillat 2004).
11. Combe-Grenal

Location

Domme, Dordogne, France

11.2 Excavation

1953-1956: F. Bordes

11.3 Stratigraphy

Sixty-four layers (‘beds’) have been discerned, the upper 54 of which are Mousterian (Bordes and Prat 1965, Chase 1986a, Dibble et al. 2009b, Guadelli and Laville 1990, Jaubert 2002).

11.4 Chronology

All dates obtained so far (14C, TL) have been contested, partly on technical arguments. They include the following (Guadelli 1987):

- GrN-4304: 39 ± 1.5 ka BP (burned bone, layer 12)
- GrN-4311: 30.3 ± 0.350 BP (‘material from hearth’, layer 12)
- : 44 ± 4 ka BP (burned flint, layer 20)
- : 68 ± 7 ka BP (burned flint, layer 49)
- : 62 ± 7 ka BP (burned flint, layer 50)
- : 61 ± 7 ka BP (burned flint, layer 55)
- : 105 ± 14 ka BP (burned flint, layer 60)
- : 113 ± 13 ka BP (burned flint, layer 60)

Most likely, the Mousterian assemblages are expected to date back to MIS 5–3 (the latter only partially), as the underlaying Acheulian (layers 64-56) are to be situated at the end of MIS 6 (Delpech 1996). More detailed, but nevertheless tentative correlations with the MIS chronology have been entered in the database following Delpech (Delpech 1996), Guadelli and Laville (Guadelli and Laville 1990) and Jaubert (Jaubert 2002). As the correlation between layers 46-54 with MIS 4 by the latter author were made, at least as far as we can tell, based on contested absolute dates, we chose not to retain that possibility in the database. The possible attribution of layer 39-40 to MIS 4 by the same author is also diverging from the others; therefore, it hasn’t been included in the database either (see also Guadelli and laville 1990:47).
Note that (other) discrepancies between authors remain. Following Delpech (Delpech 1996), the transition from stage 4 to 3 is placed between layers 17 and 14 (based on morphological arguments), contra Guadelli and Laville (Guadelli and Laville 1990), who place this transition between layers 22 and 21 (this discrepancy was included into the database). Judging from Chase’s fig. 1 (Chase 1986b), representing a composite of lithic, faunal and climatic data, he would probably also consider layer 22 as the beginning of MIS 3, as the arboreal pollen show an increase vs. the period before (i.e. layers 36-23); he also explicitly labels the period as ‘mild and humid’ vs. cold and humid/dry. Note that Guadelli and Laville (Guadelli and Laville 1990) place the MIS 4/3 transition at 65 ka BP, while we adhere to the chronology set out by van Andel and co-workers (van Andel, Davies, and Weninger 2003), who place this event at 59 ka BP.

11.5 Palaeoenvironment

The reconstruction of the palaeoclimate, as well as palaeoecology, depends in part on the proxy used to obtain estimates of temperature, humidity and vegetation cover, i.e. pollen, sediments or (micro/macro) fauna.

Delpech provides palaeoclimatic and –ecological parameters based on micro- and, predominantly, macrofauna (Delpech 1996), while Chase (Chase 1986a) presents the results of macrofauna, pollen and sedimentological analyses into a combined characterisation of the palaeoclimate (his figure on page 23). Guadelli and Laville (Guadelli and Laville 1990) discuss layers 54-36 (mainly on the basis of macrofauna), while Guadelli (Guadelli 1987) repeats the results of both sedimentological and palynological studies, adding his own insights based on macrofaunal data (layers 35-1), see also Guadelli’s figure on his page 431. Unsurprisingly, inconsistencies between the different disciplines remain.

For our purposes, the reconstruction of layers 54-36 was based on Guadelli and Laville (Guadelli and Laville 1990), while in the case of layers 35-6, Guadelli was followed (Guadelli 1987). The latter was the most detailed account, containing and weighing the results of three disciplines (see again Guadelli 1987:431). Noteworthy incongruities between disciplines are the following:

• Layers 35-26: temperate according to microfaunal indicators, cold according to the other disciplines. The majority view has been followed.

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3 Divergences have only been recorded further on in the body of the text when they represented three steps or more in the qualitative system used for the database, e.g. ‘very cold’ vs. ‘relatively cold’ (‘cold’ being the intermediate step).
Layer 24: sedimentology indicates a climatic deterioration (vs. layers 23 and 25), while all other disciplines point to a slight amelioration. As the latter hasn't been quantified adequately by Guadelli (Guadelli 1987), it hasn't been recorded into the database.

Layers 22-20: Chase perceives these as mild and wet (Chase 1986a); Guadelli (Guadelli 1987) also notes a climatic amelioration. However, according to the latter, layer 22 should be part, climatically, of the previous group of layers (25-23) based on macrofaunal arguments (indeed, this change was made in a subsequent publication by Guadelli and Laville (Guadelli and Laville 1990)), and in contrast to palynological data. Only layers 21 and 20 are then supposed to be milder, initiating MIS 3. However, following observations on reindeer morphology, Delpech (Delpech 1996) proposes that layers 20-22 represent the glacial maximum of the early Wurm, while the MIS 3/4 boundary is to be sought further up the stratigraphy. Because data from the various disciplines are not easily reconciled, I choose to keep the temperature at “cold” while admitting to a slight augmentation in humidity (“relatively dry” rather than “dry”).

Layers 10-6: Guadelli (Guadelli 1987) stresses the minor relevance of macrofaunal assemblages (which tend to contradict other data) for climate reconstruction in these layers, as NISPs are relatively low.

For the older set of layers, 54-36, discrepancies also exist. Guadelli and Laville (Guadelli 1987, Guadelli and Laville 1990) as well as Chase (Chase 1986a) provide the “classic” interpretation, based on sedimentological and palynological data. At certain points in the sequence, the latter diverge from the paleontological data (extracted from micro- and macromammals), as reviewed by Delpech (Delpech 1996). In these cases the faunal reconstruction is the first entry in the database, followed by the sedimentological/palynological reconstruction. An explanation for what are essentially cold and dry oscillations within a temperate and humid period as predicted by the fauna may not be easy to provide, but maybe they could point either to a much earlier onset of MIS 4 (thereby reducing the contribution of MIS 5 to the filling possibly to zero; see the paper by Jaubert (Jaubert 2002) in this context), or, more likely they could be linked to the alternation of stadials and interstadials within MIS 5, which could have been more outspoken climatically than would be inferred from faunal remains. For this set of layers, with the exception of 52-46, the vegetation cover as inferred from the micro- and macrofauna (and recorded into the database) either barely fits or doesn’t fit the climatic data.
11.6 Archaeological tradition

For the typological interpretation of the industries from layers 54-6, Bordes and Prat (Bordes and Prat 1965) have been followed. Guadelli and Laville (Guadelli 1987, Guadelli and Laville 1990) allowed for a cross-check, while also providing the dominant debitage method in a limited number of cases; Jaubert (Jaubert 2002) noted a few others. Interestingly, Guadelli’s overview was based on more recent articles by Bordes, indicating that the industry of layer 8 had been revised (‘denticulate’ had become ‘typical’). Despite some problematic issues with the lithic assemblages (Dibble et al. 2009b), it would seem that at least their typological attributions are solid, as type frequencies have been adequately preserved.

Delpech (Delpech 1996) argues for a close link between the open hunting grounds of MIS 4 and the Quina Mousterian in the Perigord region in general. Chase (Chase 1986b) reports to have found no regular relationship between faunal and lithic assemblages at Combe-Grenal, which was the next logical possibility to be considered.

11.7 Fauna

Method of collecting

Dibble and co-workers (Dibble et al. 2009b) comment, in the framework of an investigation of excavator bias and collection curation, that

‘Bordes spent relatively little time instructing and supervising excavators, and so rules concerning what should be provenienced were poorly developed and were not communicated nor enforced among individual excavators.’

The authors deem it likely that similar issues impact the faunal assemblages as well; moreover, the problematic of curation of this particular collection probably entails that faunal material has become lost or misplaced, like the lithic material did. Moreover, Chase (Chase 1986a) reports that shaft fragments of long bones haven’t always been collected; therefore, a relatively large part of the assemblages was identifiable to precise skeletal location, as well as to a low taxonomic level.

Conservation and fragmentation

Guadelli (Guadelli 1987) remarks that, based on his own research on layer 23, cranial remains are only a little more abundant than subcranial bones (55.85 %, 52.16 % of which are teeth). Guadelli’s (1987) figure on page 451 provides additional percentages of bones and teeth, i.e. for layers 52, 50, 35, 22, 14, and 13, however only for one species per layer (Cervus, Rangifer and Equus). All of the subcranial percentages are lower than was the case in layer 23 (reindeer as well as overall). With the exception of horse in layers 14
and 13 (resp. 98.7 and 98.1 %), dental percentages are (much) less or equal to 84 %. The high numbers for horse remain unexplained.

**Prey Taxa**
The NISP per taxon have been taken from Delpech (Delpech 1996). Chase (Chase 1986a) established that taxon representation doesn't correlate strongly with the vegetational or sedimentological environment, which he interprets as only one indication for hunting as the (predominant) method of carcass acquisition, rather than scavenging.

**Carnivore taxa**
The NISP per taxon have been copied from Delpech (Delpech 1996). Solely judging from their relative numbers (see database), carnivore impact seems to have been limited to very limited. In twenty six out of 44 layers, their relative contribution was less than 1 %; 13 other cases, this figure could be situated between 1 and 5 %.

**Marks**
Guadelli (Guadelli 1987) studied the faunal remains of layer 23, which consist largely of reindeer. According to him, no marks were found that hadn't been the result of human action. Chase (Chase 1986a) listed all cutmarks per precies, for all assemblages studied. As the number of cutmarked bones was rather small, he felt that examination of a sample smaller than all material from one species (instead of for each layer) was unwarranted. Unfortunately, he didn't list any percentages in terms of NISP. The most common practice appears to have been disarticulation (by cutting) of almost every red deer and reindeer joint, which, at least for unfrozen carcasses, is the most effective method of dismembering, still according to Chase.

**Seasonality**
Reindeer have been hunted throughout the year in layers 22 and 23, while the focus in layer 22 was on young adults more so than in layer 23 (Guadelli 1987). Nevertheless, according to the author a preference for immature animals and young adults, combined with a rareness of very old individuals, is typical for all ungulates in layers 1-35. Citing Laquay (Laquay 1981) he adds that a very similar pattern has also been found at the Würm I layers of Combe-Grenal as well as those of Pech de l’Azé II: *Cervus* of all ages was hunted, except for very old individuals. The horse sample of layer 14 has been scrutinized as well (Fernandez, Guadelli, and Fosse 2006), and again, a focus on prime age adults was attested.
**Carcass exploitation**

According to Guadelli (Guadelli 1987), reindeer long bones were broken to extract the marrow in layer 23. Chase (Chase 1986a)\(^4\) found that in the Typical Mousterian layers of the early Wurm I, only those parts of the skeleton were present that provide minor quantities of meat only, and in general, that are only useful for the extraction of marrow. However, crania and mandibles were also attested; these are not 'scrap' when the tongue and brains can still be extracted. Because of their high fat content, they would rather be considered as delicacies. Perhaps more importantly, they are also unsuitable for drying, and therefore must be consumed as quickly as possible after extraction. Based on these arguments, Chase believes that during the period in question, the site served as a hunting camp (for red deer). He applies the same reasoning to layers 35-26, where a similar pattern involving reindeer emerged, although in the latter case, the number of crania relative to mandibles is lower.

From layer 25 on (note the concomitant drop in humidity and the possible vegetation turnover as recorded in the database) till layer 20, the exploitation pattern differs (Chase 1986a): while the meatiest parts of red deer are still carried off to another location, the best and biggest portions of reindeer carcasses appear to have been consumed on site. Thus, according to the author, from the second part of Wurm II on, Combe-Grenal may either have played a dual role in a given subsistence system, or could have been part of two subsistence systems, perhaps belonging to different groups. In any case, exploitation of carcasses happened as thoroughly as possible, as even small bones were broken to extract the marrow (Chase 1986a).

**Human remains**

Homo neanderthalensis remains found in bed 25:

- ‘Combe-Grenal 1’: juvenile: mandibula, M1 and d[eciduous] m[olar];
- ‘Combe-Grenal 2’: adult: fragmentary cranium, fragmentary mandibula, isolated 2M, I, fragmentary humerus, os carpus, 3 fragmentary phalanges.

Homo neanderthalensis teeth in layer 50 (Oakley, Campbell, and Molleson 1971), cited by Davis (The Stage 3 Archaeological Database).

**Remarks**

While discussing the exploitation of small mammals on European Mousterian sites, Chase points out that 1 lagomorph bone bore a cut mark (Chase 1986a). Furthermore, he

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\(^4\) Note that Chase only investigated those layers where the lithic industry had been securely typologically determined, i.e. 4-8, 11-15, 17-30, 32-35, 37-38, 40-43, 50A-50, 52, and 54.
noted that no sturdy correlation can be found between lithic industry and faunal exploitation (see also above).

Although the site has been used frequently in lithic or faunal studies because of its long stratigraphy and rich assemblages, Dibble and co-workers (Dibble et al. 2009b) identified serious problems which involve biases during excavations as well as, more importantly, curation of the lithic (and perhaps also faunal) collections. The fact that the site has never been fully published by Bordes, brings down the potential value of the site further. Moreover, reliable absolute dates are unavailable, while the MIS-based chronology remains approximate as the climatic interpretation of faunal, pollen and sedimentological analyses can diverge significantly, which spawns questions regarding the accuracy of these methods at other sites as well; after all, they remain approximations based on assumptions which may or may not be valid (e.g. the problematic issue of animals living in refugia). The fuzzy transition from MIS 3 to 4 is but the most visible example of this fact. The usefulness of the database in these circumstances is limited to the faunal and lithic data.

There are indications that carnivore influence on the faunal assemblages is minor, but the fact remains that recuperation of bones was not as thorough as it could have been (disregarded shaft fragments). Studies that focus on each layer separately cover only a very limited number of assemblages, and even then important aspects such as (differential) preservation remain to be studied (Fernandez, Guadelli, and Fosse 2006). Rather, assemblages are scrutinized in the context of the entire site, e.g. (Chase 1986a), which severely limits a layer-based analysis required by the database.

According to a preliminary report by Bordes and Prat (Bordes and Prat 1965), hearths have been found in layers 38, 50A, 50 and 52. Traces of hearths were located in layers 46, 47, 48, and 49.

The site’s function shifts according to Chase (Chase 1986a). In layers older than 25, the site functioned as a hunting camp, while from 25 on, the site seemed to have acquired an additional function (of base camp ?), rather than replacing the former (see above). However, the author also points out that inhabitants of the site didn’t change their exploitation pattern except during major climatic shifts. According to him, it is difficult to explain this conservatism in terms of cultural continuity (culturally imposed subsistence behaviour) or economic rationalisation (optimisation of returns). He interprets this fact as evidence for the forgoing of purely economic goals, favouring others that remain elusive at the moment. He also adds that this must imply that subsistence during the MP was less tenuous than Mousterian technology might suggest.
12. **Espagnac**

Location

Espagnac (Pailhès), Quercy, France

a.k.a. Grotte de Sainte-Eulalie (Jaubert 2001)

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12.2 **Excavation**

1992-1993: Jaubert and co-workers

1993-1998: idem, this time with multidisciplinary involvement

1998-1999: idem (geomorphological and palynological study) (Jaubert 2001)

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12.3 **Stratigraphy**

’niveau’ I: practically sterile

’niveau’ II: (upper and most important) archaeological layer, especially rich in lithic remains

’niveau’ III: numerous faunal remains, lithics are sometimes found in concentrations

’niveau’ IV: contains two archaeological concentrations

- IVa: less rich than Iva
- IVb: rather large bone remains, more numerous than lithics

’niveau’ V: contains two archaeological concentrations

- Va: contained relatively large pieces of charcoal, and small burned remains
- Vb: contained bones and a 40-some lithic remains (primarily quartz)

Except for layer II, which was easily traced on the terrain, the other subdivisions are more subjective. They correspond, as much as possible, with concentrations of remains (e.g. IVb), often paleontological. Due to the site’s location on a slope, archaeological layers have more often than not, been re-deposited, such that artefacts can both occur dispersed as well as concentrated in lenses (e.g. ‘niveau’ II). Even the original stratigraphic succession of the layers may not have been preserved (Kervazo, Konik, and Jaubert 2001). However, various indications exist to support the idea of a displacement ‘on masse’ (see also below, ‘Fauna – Remarks’).

The site is topped by a slope deposit of 15 metres, apparently containing only sterile material. The latter got in the way of a large-scale excavation, such that it’s unsure whether the archaeological layers have been formed in a rock shelter or against a cliff wall. The fact that only (a minor) part of the site has been excavated (necessarily using a vertical grid) will undoubtedly have some effect on the representativeness of the
current interpretation. The second excavation campaign attempted to remedy this by refreshing the cut made during the first excavation (Jaubert 2001).

12.4 Chronology

The following dates have been obtained by U/Th-dating on bone, originating from layer II (Falguères and Jaubert 2001):

- ESP 9401: 46 000 ± 2000 BP
- ESP 9402: 39 000 ± 2000 BP
- ESP 9403: 44 000 ± 2000 BP

The weighted average date is 43 000 ± 1000 BP (early uptake model), which falls within the boundaries of MIS 3. Given de limits of the dating procedure, the authors consider the dates as being preliminary. In general, the occupation of the site is thought of as being confined to 40-70 ka BP (which accords well with all ancillary disciplines), and if the absolute dates are reliable, to the latter part of that period.

12.5 Palaeoenvironment

The site is (currently) situated between two vegetation zones: the valley of the Célé River, and the Quercy plateau. Pollen analysis is based on a limited number of badly preserved pollen; the 13 samples have been combined by layer in order to attain statistically significant numbers of pollen. Nevertheless, a cold and slightly humid climate is indicated, characterised by an open landscape with subarctic-steppic vegetation: Pinus is the only tree present, albeit in very small quantities. Taxa linked with wet environments, e.g. Cyperaceae and Typhaceae, are only marginally represented, but steppic taxa representative of cold and dry environments at the same time haven’t been attested (Diot 2001).

The reconstruction based on fauna was made with the assumption in mind that the remains of the ‘small herbivore’ and of the ‘indet. cervid’ classes actually belonged to Rangifer tarandus. The resulting image is the same as that predicted by pollen. Given the homogenous composition of assemblages across layers, Brugal believes that the latter’s accumulation happened quickly (Brugal 2001).

Given the fauna, and the attribution of the horse teeth to Equus caballus germanicus, Brugal ascribes the occupation to a cold period during the early Würm, corresponding either to OIS4 or a cold episode during OIS3. This is in accord with the U/Th date, as well as with the lithic industry (Quina) which is commonly associated (in the Midi region of
France) with cold episodes of the last glacial period (> 35 ka) characterized by an open landscape (Brugal 2001).

12.6 Archaeological tradition

Predominantly on quartz, 1975 pieces in total, 78.6 % (1585) in layer II. Debitage was opportunistic rather than organised, although a slight hint of discoidal debitage is discernable (Brugal 2001). Layer IVb possibly contains multiple Levallois products, which would set it apart from the others, which are classified as Quina.

12.7 Fauna

Method of collecting
The sediments excavated during the first campaign haven’t been sieved, as the matrix was very clayey with microfauna appearing to be absent or at best, rare. During the second excavation, tests with (water-)sieving were performed, but microfauna was again almost absent (Jaubert 2001).

Conservation and fragmentation
Destructive non-human taphonomic agents taking place after the final deposition of the material (frost-defrost cycle, compression, transport ...) have rendered the bulk of the assemblages undeterminable; fragmentation of the material has been considerable. Moreover, anthropic treatment (exploitation) of the material has been extensive. With the exception of layer III, bone splinters smaller than 2 cm represent a third to one half of the assemblage (Brugal 2001).

Preservation in terms of weathering was quite good, with the majority of the bones (289 out of 398) preserving the edges of breaks; the material of layer II has been preserved best.

Prey Taxa
Horse is obviously the most abundant prey animal. MNI’s and age distribution are listed by Brugal (Brugal 2001:36). Although the sample size is small, it would seem that prime adults were preferentially targeted.

Carnivore taxa
No carnivore specimens have been attested at Espagnac (Brugal 2001). Although there are barely any carnivore-induced marks (0.5 %) on the fauna, the authors don’t exclude a non-negligible carnivorous influence on the composition of the fauna left by humans (as suggested by the absence of extremities, or differential preservation of juvenile bones).

Marks
Percentages of cut-marked bones are listed by Brugal (Brugal 2001:45). On average, 13.7 % of the bones (with exclude teeth as well as splinters < 2 cm) have been cut-marked. Another 7.61 % show human alterations in the form of impact traces (resulting from bone fracturing), bone flakes and burned bone, see Brugal (2001:49); this time, bone splinters and teeth have been included (Brugal 2001).

Seasonality
The site is located at a crossroads of animal migration routes; one following the river, the other providing passage from one side of the plateau to the other, across the relatively narrow valley. This could argue for human occupations in-between seasons, translated to relatively short seasonal stays during spring or autumn. For layers IVa and IVb, spring has been suggested (Brugal 2001).

Carcass exploitation
As mentioned above, human exploitation of the material has been thorough (marrow extraction). With the exception of layer III, bone splinters smaller than 2 cm represent a third to one half of the assemblage (Brugal 2001).

Human remains

Remarks
Based on the occurrence of destructive taphonomic processes, it could be possible that the different archaeological ‘niveaux’ are to be considered as the cumulative result of the same occupation, which suffered differential displacement along the slope (as opposed to the different layers representing multiple occupation phases). Nevertheless, there are several reasons suggesting this is not the case: a first would be the thickness of the sequence. More importantly, there are (small) differences in the composition of the assemblages, e.g. the different stages of wear on the horse remains from one stratum to the other; more in general: the package of processes that could lead to differential preservation within an assemblage are differently distributed across the assemblages (with layer III being the least influenced). Thirdly, the few refits that could be made on the horse remains respected the stratigraphy. The same goes for the lithic material,
which pleads for a displacement ‘en masse’ of the sediments, rather than a differential
one that may have disturbed the different strata (Brugal 2001).

The site is the result of short bursts of hunting activity, probably seasonal (spring),
when animal migrate through the valley. Although not all bones are present in
comparable numbers (axial and distal bones, and long bone extremities are
underrepresented), it might still be possible that carcasses were introduced whole to
the site (dismembered in the case of larger fauna), as hunting grounds were near.
Subsequent ravaging of the bones by carnivores could have led to differential
preservation (Jaubert et al. 2001).

The lithic and faunal assemblages point to domestic activities (de-skinning, de-
fleshing and fracturing of bones), followed by the consumption of the meat and marrow.
The use of fire is attested through the occurrence of multiple kinds of charred materials,
i.e. small pieces of carbon, bone, and lithics (Jaubert et al. 2001). It is suggested that
lithic debitage took place on-site (Mourre et al. 2001). The fact that no clear debitage
method was discernable due to the rather disorganized way of knapping, may be
consistent with the idea of a short occupation.

The site probably functioned in a system of strong mobility (‘collectors’), according
to which movements across the landscape are dictated by subsistence needs (logistical
mobility); the fact that specific, sought after lithic materials were attested on-site,
supports this idea. It is likely that the strata arose in a relatively brief period of time,
given the physical location (slope deposits), the state of preservation of the fauna (and
pollen and spores), the occurrence of the same exploitation strategies of fauna and flint
in every assemblage, the same lithic technology, and a deposition during one and the
same climatic environment (Jaubert et al. 2001).
13. La Ferrassie

Location

Savignac-de-Miremont, Dordogne, France
44°57′06″N, 00°56′17″E (Bertran et al. 2008)

13.2 Excavation

The site (‘Le Grand Abri’) was discovered at the end of the 19th century during the construction of a road. Methodic excavations took place from 1907 on by D. Peyrony and L. Capitan. From 1968 until 1973 six campaigns were led by H. Delporte, meant to clarify the stratigraphy by resetting the frontal and sagittal sections, and to take samples for sedimentological, palynological, ... studies (Delporte 1984b).

13.3 Stratigraphy

There are several ‘stations’ at La Ferrassie (‘Le Petit Abri’, ‘La Grotte’, ‘Le Grand Abri’). The one considered here is ‘Le Grand Abri’. See Delporte (1984:25 and the following pages) for the section drawings (the ‘frontal’ and ‘sagittal’ suffixes refer to layers that belong to one section only; across sections, strata of this complex site proved to be difficult to correlate). The layers of relevance for this study are (Laville and Tuffreau 1984):

- Level F, frontal
- Level G, frontal
- Level H
- Level I
- Level J
- Levels K1-3
- Level K4
- Level K5 until the base of level K, i.e. K5 + K6
- Level L3a-b, sagittal

13.4 Chronology

The available dates are provided by Delibrias (Delibrias 1984), and Delpech et al. (Delpech, Grayson, and Rigaud 2000), and evaluated by Bertran and co-workers (Bertran et al. 2008), who also added 7 new dates to the list. The latter point out that the dates are highly scattered, a fact for which three explanations have been forwarded. Incorrect
stratigraphic correlation and subsequent incorrect attribution of the samples could be excluded, as well as taphonomic processes resulting in a chronologic discrepancy between dated sample and the stratum from which it originated. Following Mellars and co-workers (Mellars et al. 1987), Bertran et al. (Bertran et al. 2008) believe that dates have been rejuvenated (by 1 to 4 ka) by imperfect removal of modern contamination. As it turns out, Bertran et al. retain only 3 $^{14}$C dates on which to build an age model for the stratigraphic sequence:

- level D2h (OxA-15217, on bone): 29000 ± 370 $^{14}$C BP (Higham, Jacobi, and Ramsey 2006)
- level G1 (GrN-5750, on bone): 30970 ± 395 $^{14}$C BP (Delibrias 1984)
- level K3 (OxA-15218, on bone): 33610 ± 340 $^{14}$C BP (Higham, Jacobi, and Ramsey 2006)

Additionally, they also retain the date of 35000 $^{14}$C BP (Delibrias 1984), a minimum estimate for level K6. Based on archaeological arguments presented before (Zilhao and d'Errico 2000), they accept the time interval of 41000-37000 $^{14}$C BP for the Chatelperronian (in casu, layer L3a).

13.5 Palaeoenvironment

The palaeoenvironmental reconstruction by Delpech and co-workers has been followed (Delpech, Grayson, and Rigaud 2000), and supplemented with the older data (see amongst others the figure by Delpech (1984:84), which juxtaposes the climatic reconstruction according to the sedimentological and faunal studies).

**Faunal analysis** (Delpech 1984)

- Level F, frontal: relatively temperate/relatively cold and humid
- Level G, frontal: relatively temperate/relatively cold and humid
- Level H: cold and relatively dry
- Level I1: cold and relatively dry
- Level I2 + I3: relatively temperate/relatively cold and humid
- Level J: relatively temperate/relatively cold and very humid
- Levels K1-3: relatively temperate/relatively cold and very humid
- Level K4: cold and dry, Wurm III
- Level K5 until the base of level K, i.e. K5 + K6: cold and dry
- Level L3a-b, sagittal: cold and humid

**Sedimentological analysis** (Laville and Tuffreau 1984):  
- Level F, frontal: temperate and very humid
- Level G, frontal: relatively temperate and humid
Level H: very cold and dry
Level I1: relatively cold and humid
Level I2 + I3: temperate and very humid
Level J: relatively temperate and humid
Levels K1-3: relatively temperate and humid
Level K4: cold and humid, Wurm III
Level K5 until the base of level K, i.e. K5 + K6: very cold and dry
Level L3a-b, sagittal: temperate and humid, Wurm II-III interstadial

**Pollen analysis** (Paquereau 1984):
Level F, frontal: temperate and very humid
Level G, frontal: temperate and very humid
Level H: very cold and very dry
Level I1: very cold and very dry
Level I2 + I3: relatively temperate and relatively dry
Level J: relatively temperate and humid
Levels K1-3: relatively temperate and humid
Level K4: cold and relatively dry, Wurm III
Level K5 until the base of level K, i.e. K5 + K6: cold and relatively dry
Level L3a-b, sagittal: temperate and very humid, Wurm II-III interstadial (Les Cottés interstadial ?)

### 13.6 Archaeological tradition

Level F, frontal: Aurignacian III-IV (IV ?, according to Delporte)
Level G, frontal: Aurignacian III (IV ?, according to Delporte)
Level H: Aurignacian III ?
Level I: Aurignacian III (?) (I1: III ?, and I2: II-III, according to Delporte)
Level J: Aurignacian II final
Levels K1-3: Aurignacian II
Level K4: Aurignacian II
Level K5 until the base of level K, i.e. K5 + K6: Aurignacian I
Level L3a-b, sagittal: Chatelperronian
  (Bertran et al. 2008, Delporte 1984a, Laville and Tuffreau 1984)

### 13.7 Fauna

**Method of collecting**
Conservation and fragmentation

Prey Taxa
For the construction of the species list, we used the same source as Grayson and Delpech (Grayson and Delpech 2006), i.e. a paper by Delpech and co-workers (Delpech, Grayson, and Rigaud 2000). As stated by Delpech (Delpech 1984) in the monograph on the site, in which she updated her Ph.D. study (Delpech 1975) on the fauna, the material from the older excavations wasn't used as no NISP or percentage data were available.

Carnivore taxa
The number of carnivores is generally very small at the site.

Marks

Seasonality

Carcass exploitation

Human remains
None in the layers discussed here

Remarks
As the excavation consisted primarily of the cleaning of the profiles, they were very limited in extent (the edges of the profiles have been pushed back by one metre at most). Spatial data are therefore impossible to gain or interpret, and sample sizes of lithics and bones are small, but in some cases comparable with other sites in this study.

5 It must be noted that the NISPs in the monograph do not correspond to those in the 2000 paper, although the monograph chapter appears as a source in the latter. Given that Delpech wrote both, the most recent source (i.e. the 2000 paper, in which the NISPs equal those in Grayson and Delpech [2006]) has been followed.
14. Les Fieux Location

Miers (Les Fieux-Hauts), Lot, France

14.2 Excavation

Up until 1990, 23 years of excavation by F. Champagne and co-workers
14.3 Stratigraphy

The site consists of multiple loci, which occur on top of, or next to each other, which is not surprising given the extent and structure of the site. Les Fieux has therefore been divided into sectors, each of which representing a ‘site’. Chronostratigraphic or sedimentological correlations between them are problematic (Champagne et al. 1990). See Champagne et al. (1990:5) for an overview.

14.4 Chronology

The mousterian occupation of layers J and K are attributed to the early Wurm.

14.5 Palaeoenvironment

- 

14.6 Archaeological tradition

Layer J contains a non-Levallois, typical Mousterian, while the industry in K is attributed to a denticulate Mousterian (non-Levallois, non-laminar, non-facettted) (Champagne et al. 1990).

14.7 Fauna

Method of collecting

- 

Conservation and fragmentation

- 

Prey Taxa

- 

Carnivore taxa

- 

Marks
Seasonality

Carcass exploitation

Human remains

Remarks
Champagne and co-workers (Champagne et al. 1990) note that the microfauna of layer J contains several hundred fish vertebrae, but nothing is revealed about the way they have been introduced onto the site. Information about the macrofaunal remains has reached Grayson and Delpech through personal communication by J.-L. Guadelli only (Grayson and Delpech 2006); as a result, no further information is available.

Very little seems to have been published about the site in general, and the fauna in particular. Moreover, that fauna is minimal. The two assemblages, J and K, are at the moment at least, of only marginal importance.

15. Le Flageolet I

Location
Bézenac, Dordogne, France

15.2 Excavation

15.3 Stratigraphy
Layers 0 - III, IV, V, VI, VII: Perigordian
Layers VIII, IX, and XI: Aurignacian
(Delpech, Grayson, and Rigaud 2000)
15.4 Chronology

Layer VIII
Ly-1608: 23280 ± 670 14C BP (bone)
OxA-597: 24800 ± 600 14C BP (bone, AMS)
Ly-2724: 26800 ± 1000 14C BP (bone)
Ly-2725: 27350 ± 1400 14C BP (bone)
Gif-A: 95558: 26860 ± 420 14C BP

Layer IX
Ly-1749: 20070 ± 1760 14C BP
Ly-2726: 27000 ± 1000 14C BP (bone)

Layer XI
OxA-598: 33800 ± 1800 14C BP (bone, AMS)

Registered as dates for layer IX (Delpech, Grayson, and Rigaud 2000), but probably obtained on bone samples from XI (they are described as such by Zilhão and d'Errico (Zilhão and d'Errico 1999)):
GifA-95559: 34300 ± 1100 14C BP
GifA-95538: 32040 ± 850 14C BP

Registered as dates for layer XI (Delpech, Grayson, and Rigaud 2000), but probably obtained on bone samples from IX (Delibrias and Fontugne 1990, Delpech, Grayson, and Rigaud 2000, Grayson and Delpech 1998):
GifA-95560: 28520 ± 670 14C BP
GifA-95541: 29840 ± 750 14C BP

Given the large spread of the values for layers IX and VIII, no dates were entered into the database.

15.5 Palaeoenvironment

According to Delpech and co-workers (Delpech, Grayson, and Rigaud 2000):
Layer VIII: transitional (very wet to temperate)
Layer IX: transitional (very cold to very wet)
Layer XI: very cold
15.6 Archaeological tradition

Layer VIII: Late Aurignacian
Layer IX: Aurignacian
Layer XI: Early Aurignacian
   (Grayson and Delpech 1998)

15.7 Fauna

Method of collecting

Conservation and fragmentation

Prey Taxa

Carnivore taxa

Marks

Seasonality

Carcass exploitation

Human remains

Remarks
Faunal remains are claimed to be largely, if not entirely, introduced by humans (Delpech, Grayson, and Rigaud 2000).
16. La Grande Roche de la Plématrie

Location

Quinçay, Vienne, France

16.2 Excavation

Discovered in 1952 by G. Heily, excavations began in 1968 (Lévêque 1997).

16.3 Stratigraphy

From top to bottom of the sequence (Lévêque 1987, Lévêque 1997) (Léveque and Miskovsky 1983):

Upper sequence:

- **Level Ej**: although stratigraphically dividable into several layers (Ejp, Ejj, Ejo, Ejm), the lithics of this 55 cm thick layer have been considered as a whole (Châtelperronien ‘à caractères régressifs’)
- **Level Em**: although stratigraphically dividable into three layers (Emo, Emf, Emj), the lithics of this 25 cm thick layer have been considered as a whole (‘evolved’ Chatelperronian)

Lower sequence:

- Level En: contains hearths and a very rich lithic assemblage, ‘typical’ Chatelperronian (a more temperate and slightly humid climate)
- Level Eg:
Layer Egf: contains multiple small hearths and a ‘typical’ Chatelperronian industry (relatively warm and relatively dry circumstances, based on sedimentological studies)

Layer Egc: contains an archaic chatelperronian (‘Proto-Chatelperronian’) industry (warm and relatively dry circumstances, based on sedimentological studies)

Layer Egb: contains some lithics, too few to define in terms of a lithic tradition

Level Er: sterile

16.4 Chronology

The timeframe that can be mentioned here is that of the Chatelperronian tradition in general, e.g. 37000–41000 $^{14}$C BP (Zilhao and d'Errico 2000).

16.5 Palaeoenvironment

Based on the lithostratigraphic analysis, two climatic sequences (again top to bottom) stand out (Lévêque 1997)(Léveque and Miskovsky 1983):

- A period of climatic instability (the beginning of Wurm III)
  - Ej:
    - Ejo: relatively cold and relatively dry
    - Ejm: cold and dry conditions
  - Em:
    - Emo: relatively temperate and humid
    - Emf: very cold and very dry
    - Emj: relatively temperate + later relatively cold, humid

- En, Eg, and Er: a relatively warm or temperate, and dry climate, attributed to the end of the Wurm II-III interstadial

Based on the pollen analysis (Leroyer 1987):

- Ej:
  - Ejo: relatively cold and relatively dry, less open landscape
  - Ejm: cold and dry conditions, open landscape

- Em: basically the same as the lithostratigraphic analysis; trees remain present
The faunal analysis diverges somewhat from the former two, primarily because sediments (and pollen) register climatic changes more quickly than animal remains, according to the author (Lavaud-Girard 1987):

- Em: open landscape, a dry and cold climate
- Ej: more temperate and humid

The characterisation of Em could be compatible with the findings of the other studies, if the faunal analysis is considered as a composite of the different layers of level Em.

### 16.6 Archaeological tradition

According to Lévêque (Lévêque 1987):

- Ej: Chatelperronian ‘with regressive characteristics’
- Em: ‘Evolved’ Chatelperronian
- Egf + En: Typical (‘ancient’) Chatelperronian
- Egc: Archaic Chatelperronian (Proto Chatelperronian)

Roussel and Soressi however, interpret Egc as a MTA (Roussel and Soressi 2010).

### 16.7 Fauna

#### Method of collecting

#### Conservation and fragmentation

#### Prey Taxa

#### Carnivore taxa

The carnivore index is just below 0.20, which may suggest a considerable influence of carnivores on the prey assemblage.

#### Marks

#### Seasonality
Carcass exploitation
-

Human remains
None

Remarks
The absence of bones in levels En and Eg is probably due to the warm and humid climate (Lavaud-Girard 1987).

17. Grotte de l’Adaouste Location

Jouques, Bouches-du-Rhône, France
(a.k.a. Grotte de l’Adaouste)

17.2 Excavation

1903-1911: C. Cotte
1951-1954: M. Escalon de Fonton (sector I)
Illegal excavations
1986-1988: G. Onoratini (sector II)
See Defleur and co-workers (Defleur et al. 1994, Defleur, Onoratini, and Crégut-Bonnoure 1989)

17.3 Stratigraphy

Excavations have been performed in several sectors, each of which characterized by a distinct stratigraphy due to the complexity of sedimentological processes in the interior of the cave, as well as lacunae due to illegal excavations (Conrad and Onoratini 1997, Defleur et al. 1994):

Sector I
Relevant layers: 20, 21A (21B, 22 in the denomination of the ‘50s, were found to be sterile)

Sector II
layer R – α – β – A0 – A – B – C (C1 and C2) – D (D1 and D2) – E – F – G – H (C, E, F include fauna but no lithics)

Sector III
layer 8a – 8b – 9 (locally intersected by feeble, solidified horizons 9a and 9b2, and including 9c) – 10a – 10b – 11 (the latter two include fauna but no lithics)

Sector V
layer I – II – III – IV (the latter has more or less the same geological composition, but contains no lithics, and only a small amount of fauna)

The lithic and fauna material of all Mousterian layers has been considered as a single unit by the excavators, as according to them (Defleur et al. 1994) all layers belong to the same occupation. Moreover, some refits were obtained between layers 9 and 10; these are believed to result from turbation caused by bear occupations (Defleur et al. 1994). However, it is rather unclear which layers are considered to be Mousterian, as not all of the fauna layers contain lithics. Based on two papers (Defleur et al. 1994, Onoratini et al. 1997), I assume that the fauna count includes sector I, layers 20 and 21, sector II, layers C, D, E, F, sector III, layers 9 (with sub-layers), 10b, 11, and sector V, layers III and IV.

17.4 Chronology

No valid absolute dates are available; one U/Th date on a tooth was found to be incompatible with the chronological position of the stratum from which it originated. However, based on faunal data, the beginning of the Wurm glacial (first phase of Early Wurm) has been suggested as a time frame for the site (Defleur et al. 1994). Translated into the MIS-system, this would be MIS5d-a, perhaps including the first half of MIS 4. This seems to be corroborated elsewhere (Boyle 2000), although a recent publication by Daujeard (Daujeard 2008) situates the occupation in MIS 4-3.

17.5 Palaeoenvironment

Based on the avifauna in layer IV, the environment is judged to have been rather open and rocky. The microfauna on the contrary suggest an important forest cover around the site. Unexpected given its location, the surroundings of the cave consist of multiple ecological niches (Defleur et al. 1994). Still according to Defleur, the presence of O. cuniculus cuniculus (which currently occurs in northern Europe), suggests that
temperatures must have been lower than is currently the case in the Mediterranean, although a definite Mediterranean character was retained (Defleur et al. 1994).

17.6 Archaeological tradition

Charentian Mousterian (Oriental Ferrassie type), based on 49 pieces (Defleur et al. 1994). The sample is too small to conduct further analyses.

17.7 Fauna

Method of collecting
As part of their discussion of the technological aspects of the lithic assemblage, the excavators mention that sediments were sieved with a 0,5 mm screen size (Defleur et al. 1994).

Conservation and fragmentation
Bone surfaces have been well preserved, with clearly discernable butchering marks (Defleur et al. 1994). While data on human processing (breaking) of the prey fauna is provided, systematic information on the impact of (post-depositional) differential fragmentation or preservation among taxa is lacking.

To get an idea of the importance of differential fragmentation – preservation - transport, the relation between MNI and NISP was calculated (MNI/NISP; see below). As it turns out, Equus, Capra, and Cervus have quite similar (and low) values, while a second group consists of all the other herbivore taxa. While this may simply be an artefact of the very low NISP’s for the second group, a different exploitation pattern cannot be excluded. As it happens, the first group is the most numerous and displays the most cut marks. Horse appears to have been introduced whole to the site, based on the bones that were preserved (see below); fracturing occurred very often. If the MNI/NISP relationship has any value, it could strengthen the authors’ ideas on the species hunted by humans.

The comparison between cranial and sub-cranial NISP’s (in this case teeth vs. the rest of the skeleton), is as follows: Equus 37 vs. 102, Cervus 25 vs. 103, and Capra 31 vs. 57.

Prey taxa (MNI’s; MNI/NISP) (Defleur et al. 1994)

- Equus caballus: 5 (3 old individuals, one young adult, one juvenile); 0,036
- Sus scrofa: 1; 0,5
- Bison priscus: 2 (one adult, one young); 0,667
- Capra aff. caucasica: 6 (3 adults – 2 male & 1 female, 3 young); 0,034
Rupicapra sp. (most likely rupicapra): 2; 0,4
Cervus elaphus: 7 (3 adults, 4 juveniles); 0,054
Rangifer tarandus: 2 or 1; 1 or 0,5

Carnivore taxa
There are an abundant number of carnivore remains (the relative number of carnivores being 28,65 %, see database) for which MNI counts are as follows (Defleur et al. 1994):

Vulpes vulpes: 2 (young adults)
Panthera cf. pardus (with reservations): 2 (one young, one adult)
Lynx pardina spelaea: 3 (adults)
Felix silvestris: 3 (1 juvenile, 2 adults)
Ursus arctos: 18 (4 adults, 14 young)

Marks
Cut-marks attributed to skinning, evisceration, filleting and disarticulation were found on Equus (46 % of the bones, teeth excluded), Cervus (8.2 % of the bones, teeth excluded), Capra (15.8 % of the bones, teeth excluded), Rupicapra and Capreolus; carnivore tooth marks were also attested, indicating a carnivore contribution to the establishment of the herbivore assemblage. However, a large number of bones (horse in particular) contains both anthropic and carnivore marks; in these cases, carnivore action was posterior to human intervention (Defleur et al. 1994).

No human marks were detected on the carnivore bones, nor on the abundant (NISP: 1500, MNI: 42) lagomorph (Oryctolagus cuniculus, layers III and IV from sector V) remains. Together with other indications, the authors assume that the site was used as an Ursus hibernating den, while the lagomorphs remains are attributed to (average-sized) carnivore kills and later intrusions (Defleur et al. 1994).

Seasonality
Based on a cut-marked Capra mandible: spring or summer (Defleur et al. 1994).

Carcass exploitation
Judging by the number of (unexploited) carnivore bones, and the number of tooth-marks, carnivores contributed to the archaeofauna. It is believed that the accumulation of bones should be attributed to Neanderthals, as well as Canis lupus, and Panthera pardus (for the last two: of Cervus in particular). While on every bone bearing marks, gnawing marks were inflicted after the butchering marks (suggesting carnivore scavenging of human kitchen refuse), the contribution of carnivore kills to the assemblage may still have been considerable according to the excavator (Defleur et al. 1994).

In the case of horse, entire animals seem to have been introduced to the site, where they were thoroughly processed (extraction of marrow). Due to their low quantities, the
other ungulates are more difficult to interpret in terms of human exploitation. However, humans seem to have had primary access to *Cervus* and *Capra*, their ‘anatomical situation [sic] being comparable to that during the Magdalenian occupation of the site’ (Defleur et al. 1994). Based on the presence of cut marks, at least the following number of animals have been exploited at the site: three adult *Equus*, two *Capra* (1 juvenile), one *Cervus*, one *Rupicapra*, and perhaps one *Capreolus* (Defleur et al. 1994).

**Human remains**

**Remarks**

While the species list include *Castor fiber* and *Testudo aff. hermanni-graec*a, as well as an abundant avifauna (NISP: 1122), no comment was given on their status as human prey. I therefore assume that they represent carnivore kills or background fauna.

The site consists of a karstic cavity located on a contact zone between several ecological niches (valley floor, rocks, and plateau), i.e. ideal from a hunter's point of view, and rule rather than exception in the south of France (Boyle 2000). This ecological diversity is also found with regard to the species present at the site.

While no real spatial differentiation is present, the excavators (Onoratini et al. 1997) discern a kitchen waste zone (layers C and D, and presumably also E and F, sector II), a meat processing zone (sector III, layer 9c), and a habitat zone, where marrow extraction occurred. The latter zone also contained a hearth, but as with all other zones, here too the number of lithics was minimal (with a high percentage of tools, suggesting their import vs. manufacture at the site).

In 1994, the site was interpreted as resulting from a single hunting episode (Defleur et al. 1994), based on the fact that lithic and faunal remains are rather sparse, homogenous, and, as far as the archaeofauna are considered, refitable between layers and sectors. Three years later however (Onoratini et al. 1997), the excavators suggested that it might have functioned as a temporary residential site. Based on the amount of meat suggested by the minimum number of kills (7 or 8), which include three horses, a single occupation logistical camp seems improbable indeed. However, given the small amount of lithic material, the site may also be the result of multiple and short logistical visits to the site, by, as the excavators suggest, hunters of predominantly *Equus* and *Cervus*. The homogeneity of the site likely dictates that these visits occurred in a small timeframe, which wouldn't necessarily be at odds with the intermittent presence of scavenging (and hunting?) carnivores. In a general conclusion to the entire filling of the cave (Onoratini et al. 1997), multiple visits by Mousterian hunters are indeed considered probable by the excavators.
18. La Grotte de l’Hyène

Location
Arcy-sur-Cure, Yonne, France
The coordinates of Grotte du Renne have been used for the database.

18.2 Excavation

1948-1958: A. Leroi-Gourhan

18.3 Stratigraphy

Twelve levels have been discerned by Leroi-Gourhan, representing a filling of about 4 meters, see Girard (1978:18). The layer studied here is IV6b (=’couche 20’).

18.4 Chronology

(Early ?) Wurm (Girard 1978, Leroi-Gourhan 1952)

18.5 Palaeoenvironment

According to Girard (Girard 1978), the Mousterian filling can be divided into two sediment groups: one containing layers IVb7 – IVb3, and IVb1, while the second consists of one layer only (IVb2). The first is characterised by a humid and cold temperate climate, while the second is more humid and warmer. The pollen analysis on the other
hand suggests a relatively cold environment (AP = 15 %); the faunal assemblage is more
difficult to interpret in terms of the palaeoclimate, but extremes can be ruled out
(Girard 1978, Leroi-Gourhan 1952).

18.6 Archaeological tradition

Although the site contains 8562 lithic artefacts, 6898 of them were found in layers IVb1
and IVa. While numbers are small in layers IVb6 to b3, the proportion of tools is higher
than in layers containing the bulk of the material. The industry is described as ‘midway’
between the Typical and Quina Mousterian (Girard 1978), or ‘close to’ the Typical
Mousterian (David and Fosse 1999).

18.7 Fauna

Method of collecting
-

Conservation and fragmentation
-

Prey Taxa
No MNIs have been provided.

Carnivore taxa
Although the wolf NISP is impressive (170), and hyena marks (and coprolites) are
strongly represented, the relative contribution of carnivores to the assemblage is only
4.63 %. MNI’s are provided by Girard (Girard 1978):

Leo spelaea: 1
Indet. fox: 6
Canis lupus: 20
Indet. hyena: 13
Ursus spelaeus: 2

Note that while Girard (Girard 1978) identifies the bear remains as belonging to Ursus
spelaeus, the more recent publication by David and Fosse (David and Fosse 1999) doesn’t
specify the species. For our database, the latter was followed.

Marks
According to David and Fosse (David and Fosse 1999), carnivore marks (especially of hyena) are abundant: of a sample of 160 pieces, 27 % displayed gnaw marks. Marks produced by humans are also present, but to a smaller extent: only 3,7 % of the assemblage (or 5,4 % when dental remains are excluded) displays cut marks, while an unspecified number of bones show impact traces. Moreover, all metapodials have been broken. According to Girard (Girard 1978), coprolites were abundant in layer IVb6, further adding to the evidence of considerable carnivore influence. The author adheres to the suggestion by Leroi-Gourhan (Leroi-Gourhan 1952) of an alternating occupation by humans and carnivores.

**Seasonality**
Unknown

**Carcass exploitation**
Especially young adults where targeted among the bovids (David and Fosse 1999). The foreleg is prominently present, however with a strong underrepresentation of phalanges. This could point to human exploitation and posterior carnivore ravaging, according to these authors.

Interestingly, Girard (Girard 1978) reports that wolf bones had been cut-marked and broken while still fresh, which would indicate human consumption. This could explain their high numbers.

**Human remains**
Ten human remains have been found among the kitchen refuse in layer IV6b, belonging to about 6 individuals, ranging from adolescence tot senescence (Girard 1978, Leroi-Gourhan 1952).

**Remarks**
This concerns an old excavation, for which few certainties exist with regard to the human exploitation of the fauna and the latter’s conservation and collection, but also with regard to the chronology of the site. Moreover, despite a relatively low number of carnivores, their impact may have been considerable, judging from the number of gnaw marks and coprolites. It is however interesting that there are indications for the hunt on wolf.
19. **Grotte des Hyènes**

**Location**
Brasempouy, Landes, France

19.2 **Excavation**

1981-1995: H. Delporte
1996-2004: D. Buisson, Henry-Gambier and F. Bon
(Letourneux 2005)

19.3 **Stratigraphy**

The Brasempouy site consists of four cavities: Grotte du Pape, Abri Dubalen, Galerie médiane du Mégacéros, and Grotte des Hyènes. The deposits of the latter reach a maximal depth of four to five metres, and can be split up into two units, the lower (Unit 2) being the most important (counting about 60 000 artefacts). While about ten stratigraphic layers have been discerned, they cannot be considered as occupation floors, nor as the remains of a single occupation. Four of these layers have been retained for analysis by Letourneux (Letourneux 2005): 2A, 2C, 2DE, and 2F.

19.4 **Chronology**

Two aberrant dates excluded, the $^{14}$C dates are situated between 33600 ± 240 (GF-11034, base of the sequence) and 30600 ± 200 (GF-9658, top of the sequence) (Letourneux 2005).
19.5 Palaeoenvironment

- 

19.6 Archaeological tradition

Aurignacian

19.7 Fauna

Method of collecting

- 

Conservation and fragmentation

Letourneux (2005:table7) indicates that proportionally, more remains have been identified in layers 2C and 2A, than 2DE and 2F, which is due to a higher fragmentation rate in the latter two layers. The number of determined bones is never more than 20% of the total amount, about the average for most of the archaeological assemblages (Letourneux 2005). A-biotic agents have left little traces on the bones.

Prey Taxa

For prey MNIs, see Letourneux (2005:table10). The mortality curve of horses and bovids (catastrophic) suggests that there was no deliberate selection of prey, which could mean that humans as well as other carnivores were responsible for the kills. However, the systematic lack of winter kills may suggest a largely human exploitation. Moreover, reindeer mortality displays an attritional profile, and such a preferential consumption of adults is ascribed to humans only. Therefore, it is concluded that most of the (horse, bovid and reindeer) kills have been anthropic in nature.

Carnivore taxa

For carnivore MNIs, see Letourneux (2005:table11). For carnivore influence see “Marks”. Hyena, wolf, lion and bear (all species without anthropogenic marks; however, some bear and wolf teeth show traces of being used as ornaments) are considered to be intrusive.

Marks

Letourneux (2005:table8) indicates that the number of digested bones in layers 2A and 2C (revealing the action of hyenas) are much higher (about 10 times) than those of 2DE
and 2F, while the number of gnawed (and cut-marked) specimens remains more or less the same. Nevertheless, Letourneux believes that hyenas scavenged on the remains left by humans, as their actions seems to be more isolated than those of Unit 1 (NISP, MNI, bone alterations, coproliths). Burned bones are numerous (between 16 and 45 percent), while cut-marked bones are rather rare (about 5 % at most) probably due to the fragmentation and the action of hyenas (Letourneux 2005).

Oddly, the rhino remains in layer 2A belong to 15 individuals. Cutmarks, as well as gnaw-marks are found on a rhino scapula, which raises questions as to the respective roles of humans and hyenas. The few panther remains in layer 2A show signs of skinning. All phases of the butchery process have been attested for in the ungulate fauna, except for disemboweling. This is most clearly visible in the case of reindeer remains (Letourneux 2005).

Interestingly, fox seem to have been exploited for their skin, as well as (occasionally) their meat, judging from the cutmarks. Their mortality profile – adults only – goes into the same direction.

**Seasonality**

All seasons except winter in all of Unit 2 (Letourneux 2005).

**Carcass exploitation**

Letourneux (2005:table11) lists the MNIs per age class. The older the assemblage, and the large bovids not taken into account, the smaller the prey animal, the smaller the proportion of cranial remains. Cranial, and dental remains in particular, are always well represented, while axial elements are rare (for the site as a whole, 130 pieces of rib and 7 vertebrae ascribed to large bovids, horses or Megaceros have been recovered); reindeer however, is an exception to both. This could mean that the big animals (horse and large bovids) have been butchered at the kill site, and carried to the cave in pieces, leaving certain parts behind. Additionally, bones (with a high fat content) may have been used as fuel, rendering them indeterminable. Thirdly, hyenas more than likely consumed the greasy parts of the human leftovers. The latter doesn’t explain why reindeer ribs weren’t consumed by hyenas, however. One explanation may be that humans preferentially extracted marrow from the (less robust and thus more easily broken) reindeer long bones, which were consequently neglected by hyenas and ultimately better preserved compared to those of the larger ungulates. The latter were thoroughly exploited by scavengers because they hadn’t been broken to the same extent as those of reindeer, and so, were more worth scavenging. Additionally, hyena involvement could explain the relative lack of the distal parts of the extremities such as carpals (Letourneux 2005). To conclude, it would appear that hyenas scavenged Aurignacian leftovers, and in particular, horse and large bovids; reindeer was thoroughly exploited by humans, making this species less attractive to scavenge. Animals were probably
transported in pieces to the site, and certainly for reindeer (but probably also for horse and bovids), all parts of the animal were introduced.

**Human remains**

- 

**Remarks**

The INQUA database mentions an additional date of 32410 ± 370 $^{14}$C BP (on bone) for layer 2DE.

While it is assumed that reindeer, and most of the bovids and horses were exploited by humans (with first access), the author reminds that distinguishing the influence of carnivores and humans in a cave context is often illusory (Letourneux 2005).
20. Grotte du Renne

Location
Arcy-sur-Cure, Yonne, France

20.2 Excavation

1949: sounding by A. Leroi-Gourhan
During subsequent summers (until 1963): excavation of this cave and the ones around it (Grotte de l'Hyène, Grotte du Bison, Abri du Lagopède). In 1961, layer VII had been entirely excavated, except for a small witness section (Schmider 2002a). In 1998, a section has been re-cut to establish the chronological position of the Chatelperronian occupation.

20.3 Stratigraphy

Bottom to top (David et al. 2001):  
XV: sterile  
XIV: typical Mousterian  
XIII: Mousterian, transitional  
XII + XI (30 m²): denticulate Mousterian  
X – VIII: chatelperronian (IX + X: Neanderthal remains; Xa + Xc [43 m²] discussed here)  
VII: Aurignacian: locally, VIII and VII may have been mixed, which is a source of discussion regarding the makers of the bone ornaments (Schmider 2002b).  
VI, V: Gravettian  
IV: Solutrean  
III – I: sterile

20.4 Chronology

Layer VII: 2 old $^{14}$C dates (Schmider 2002a)
- GrN-1717: 30800 ± 250; burnt bone, 1962
- Ly-2162: 31800 ± 1240; collagen, 1981
This corresponds well with the date range for layers VIII to X (33-34 ka BP) (Roblin-Jouve 2002), with a hiatus (as suggested by the pollen analysis) envisioned between the Chatelperronian and the Aurignacian occupation (Schmider 2002b). This would mean that the Proto-Aurignacian of Arcy is late compared to that of e.g. l’Arbreda (38500 BP) and the base level at Fumane (37 ka BP). However, as Schmieder points out, the validity of these early dates have been questioned Zilhao and d’Errico (1999). Additionally, she calls attention to the fact that dates for the earliest Aurignacian, obtained from a given site, have quite a large chronological spread.

Despite the presence of a list of $^{14}$C dates obtained on charcoal and bones originating from the old excavations (1947-1963) (David et al. 2001:226), a consistent chronology was absent in 1998, such that a small-scale excavation was set up with the intent to gather datable samples for the Chatelperronian layers, and level 10 in particular. Unfortunately, the newly obtained dates are again highly contradictory (David et al. 2001:228).

### 20.5 Palaeoenvironment

**Layer VII**

According to Roblin-Jouve, layer VII marks the division, in the form of the Arcy interstadial, between two kinds of deposits that took shape in the 40-25 ka BP period (Roblin-Jouve 2002). She also argues that layers XII, XIb, and XIc represent a cold phase between the Hengelo II and Cottés interstadials, while XIa and Xc correspond to the Cottés interstadial. Xb and Xa (and IX and VIII) then correspond to the cold period between the Cottés and Arcy interstadials (see the figure on his page 40) (Roblin-Jouve 2002).

Based on the mammal fauna (of layer VII), David and Poulain (David and Poulain 2002) envison the environment as being more or less open, with perhaps partly wooded steppe but certainly dry and insolated spaces, noting the resemblance to the Aurignacian II fauna of La Grotte Walou (Belgium). They also remark that the faunal spectrum isn’t typical, and could be caused by an accumulation of occupations that took place over an extended period of time.

### 20.6 Archaeological tradition

Bottom to top (David et al. 2001):

- XV: sterile
- XIV: typical Mousterian
• XIII: transitional (Denticulate) Mousterian
• XII + X⅃a,b: Denticulate Mousterian
• X – VIII: Chatelperronian
• VII: While some evolved characters are present (a high relative number of burins, some of which heralding the Gravettian), the lithic production has been assigned to the Proto-Aurignacian (which is generally considered to represent a phase anterior to the classic/typical Aurignacian or Aurignacien ancient/I) (Perpère and Schmider 2002, Schmider 2002b). According to Schmieder (with references), the lithic tradition had previously been identified as Aurignacian II or Aurignacian I, with strong affinities to II (Schmider 2002b).
• VI, V : Gravettian
• IV : Solutrean
• III – I : sterile

20.7 Fauna

Method of collecting

Conservation and fragmentation
Layer VII: The assemblage is highly fragmented, mostly by humans, sometimes by carnivores, and significantly by the gradual collapse of the ceiling. In spite of this fragmentation, the bone surfaces have been relatively well preserved, i.e. being not or only slightly altered (David and Poulain 2002).
Layer X⅃ and XI: As about a third of the undetermined bone fragments have been burned, it is highly likely that a considerable number of bones have been lost. Moreover, there’s a high degree of fragmentation, which cannot be confidently ascribed to degradation of the ceiling. In fact, not a single reindeer long bone diaphyse has been left whole (average length: 3 cm), and has been broken at its weakest point (David and Poulain 1990).

Prey Taxa
Layer VII (David and Poulain 2002):
Equus caballus
• NISP: 2133, MNI: 54
• The authors suggest that 54 % of the undetermined diaphyse fragments belong to the horse (and bovid) size class, as they write about these fragments in general as
being divided into two size classes (the other being reindeer). They have been entered as such in the database.

- mostly female specimens, preferential hunt on harems (1 male, ± 10 females)
- 8 young of less than 2 years, 3 adults of about 2.5 - 3 years, 30 adults of average age, six old, 4 very old, three with completely worn teeth

**Rangifer tarandus**

- NISP: 1506, MNI : 12, 1683 specimens (46 % of undetermined diaphyse fragments) more could be attributed to an animal of this size. The extra number have been introduced into the database as 'Rangifer tarandus size'.
- older individuals of 5-7 years have been hunted preferentially (+ 3 young individuals).

**Mammuthus primigenius**

- NISP: 40, MNI : one young individual
- the worked pieces of ivory were not taken into account

**Rupicapra rupicapra**

- NISP: 10, MNI: 2 young adults

**Bovids**

- NISP: 8
- it is believed that the other remains of the individuals that were recognised (at least one foetus and an another, older animal) are part of the group of epiphyses that belong to the size class of 'horse', or belong to the epiphyses that are burned or broken beyond determination

**Rhinoceros**

- NISP: 3, MNI: 1
- 3 teeth: are they collected specimens (Arcy has the only rhino in an Aurignacian context)?

**Layer Xc:**

The NISP count has been based on two studies (David et al. 2001, David and Poulain 1990). The most recent publication results from a re-cutting of a vertical section of the stratigraphy, made to obtain new dating samples. For NISPs and MNIs, see David and Poulain (1990:320); for prey age estimates, see David and Poulain (1990:320). Mammoth has mostly been attested (75/87) through small pieces of ivory. Mostly adult animals were exploited, some of which were very old.

**Layer XI:**

Like layer Xc, NISP counts result from two studies (David et al. 2001, David and Poulain 1990). For NISPs and MNIs, see David and Poulain (1990:320); for prey age estimates, see David and Poulain (1990:320). Of the 173 mammoth bones, 82 are small pieces of ivory,
and 85 diaphyses. Mostly adult animals have been exploited, some of which were very old at the time of death.

**Carnivore taxa**

**Layer VII** (David and Poulain 2002)

*Ursus spelaeus*
- NISP: 415, MNI: 8
- 2 new born individuals (or foetusses), 4 juveniles, one old, one very old
- a natural death curve for cave bear

*Vulpes vulpes* and *Alopex lagopus*
- NISP: 223, MNI: 6 young adults
- some died naturally, others could have been imported by man
- human use of at least one animal (fur and maybe consumption) is corroborated by the distribution of the bones

*Hyena*
- teeth: NISP 30, MNI: 3

*Panthera [Leo] spelaea*
- like rhinoceros, its presence is probably accidental and not human-related

**Layer Xc**: some hyena coprolites have been found, as well as milk teeth of both hyena and bear (David and Poulain 1990). For NISPs and MNIs, see David and Poulain (1990:320). All in all, carnivore influence seems to have been minimal (David and Poulain 1990).

**Layer XI**: some hyena coprolites have been found, as well as milk teeth of both hyena and bear (David and Poulain 1990). For NISPs and MNIs, see David and Poulain (1990:320). All in all, carnivore influence seems to have been minimal; notably, at least one hyena (out of 6) has been hunted (David and Poulain 1990).

**Marks**

**Layer VII**: There are very little traces (bite marks or breakage) of carnivores on the herbivore bones; apparently, the presence of a hyena and some bear doesn’t seem to have had much of an impact (David and Poulain 2002).
- *Equus caballus*: occasional cutmarks
- *Rangifer tarandus*: some cutmarks, exploitation of marrow of the long bones, mostly broken and burned epiphyses
- *Mammuthus primigenius*: one burned bone, one with cutmarks
- *Rupicapra rupicapra*: no evidence of human (or carnivore) consumption in the form of marks or bone alterations
• Bovids: no evidence of human (or carnivore) consumption
• *Ursus spelaeus*: the adults (2) show traces of skinning, and frequent breaking of the long bones (marrow extraction). Consumption of meat itself is hypothetical: no butchery marks are seen on the (small number) of long bones.
• *Vulpes vulpes* and *Alopex lagopus*: one carnivore puncture mark, but several anthropic marks (snapping of the long bones, cut marks on a talus and a metatarsal – suggesting de-skinning, marks that suggest decapitation and a removal of the tail, and one cut mark on a dorsal vertebra, possibly suggesting consumption).

**Layer Xc:** less than 10 bones have been gnaw-marked; about 30 show discrete bite marks. About a third of the undetermined bone fragments has been burned (David and Poulain 1990).

**Layer XI:** less than 10 bones have been gnaw-marked; a little more than 30 show discrete bite marks. About a third of the undetermined bone fragments has been burned (David and Poulain 1990).

**Seasonality**

**Layer VII** (David and Poulain 2002):
*Equus caballus*: the end of autumn and the beginning of winter
*Rangifer tarandus*: it is suggested that they were hunted during winter

**Carcass exploitation**
Horse seems to have been brought to the site in its entirety, while the absence of e.g. sternum and ribs could be due either to taphonomic factors or to a preliminary cutting up of the animal at the kill site. The relative absence of reindeer vertebra and the top of the ribs points to primary butchery at the kill site as well, followed by the transport of the almost complete carcass to the cave (David and Poulain 2002).

**Human remains**
IX + X: about 20 Neanderthal remains (Hublin et al. 1996)
VIII : two teeth (probably modern humans) (Schmider 2002a)

**Remarks**

**Layer VII:**
*Lepus timidus* or *Lepus europaeus* has been attested (NISP: 39). While human consumption is possible, but there’s no evidence to support that idea (vs. the presence of one carnivore bite mark). Importantly, there’s a bone industry, while bone ornaments have been attested too (chapter V and VI of this layer’s monograph (Schmider 2002c)).

**Layer Xc:** in this layer, the presence of bone, for reasons other than/on top of foraging has been attested (mammoth cutting board, bone awls tusks, ornaments, fox canine
pendants) (Baffier and Julien 1990, David and Poulain 1990). Despite this, the animal assemblage is very similar to the (Mousterian) one of layer XI.

**General remarks:**
The fauna of layers Xb1 and Xb2 is minimal, because it's only known through a fairly recent (1998) re-cutting of a section (the same is true for Xa). While containing a high enough NISP to be entered into the database (as a composit layer Xb), it was not, because of the existence of a sterile layer between both sub-layers (risk of considerable time-averaging) (David et al. 2001).

Galerie Schoepflin, another locus at Arcy, hasn’t been considered here (nor by Grayson and Delpech (Grayson and Delpech 2006)). While about 200 lithic artefacts have been discovered (Typical Mousterian), it appears to have been a hyena den (David and Fosse 1999); as only 5 m² has been excavated, we consider the anthropogenic impact on the bone assemblage to be too uncertain until the site is excavated more thoroughly.

Layer VII which has been divided into 3 sub-layers (i.e. a-c) corresponds to an intense (palimpsestic) occupation on the cave terrace, right on the entrance of the cave, during winter. Clearly visible is a central occupation area, with (directly related ?) specialised structures at the periphery. The presence of multiple hearths and activity areas (hide preparation, butchering, the manufacture of bone ornaments) has been attested. Given the activity zones, the variety of lithic and bone artefacts, the fact that animals were imported whole and consumed entirely, the collection of fossils, the heavy use of the lithic industry, the site may present the remains of at least one camp that outweighs the importance of a simple hunting camp, according to the Schmider (Schmider 2002b, Schmider 2002d).

For layer X there is strong evidence for the existence of a tent-like structure in the form of postholes, mammoth tusks, and arranged stones, covering a surface of about 12 m². (Farizy 1990). Moreover, like layer 9, coloring by red ochre was attested.
21. **Grotte Ouest du Portel**

**Location**
Loubens, Ariège (Pyrénées), France  
Also known as Cap del Saut.

21.2 **Excavation**

1949-1985: M.J. Vézian and J. Vézian

21.3 **Stratigraphy**

According to Gardeisen (Gardeisen 1999) the stratigraphic sequence is divided into 4 main archaeological levels, each subdivided into several layers, and has a depth of 2 to 5 meters (top to bottom):

**Level A:** disturbed (amongst others, by badgers)

**Level B** (=layers B, B1 and B1A):
- includes faunal remains and a MTA type B industry (Prince, Saos, and Vezian 2005), not a Chatelperronian industry as indicated by Gardeisen
- disturbed by badger burrows
- has the highest number of hyena remains (e.g. coprolites)

**Level C-D** (= layers C and D)
- the second (upper) Mousterian level
- contains artefacts, faunal remains, and numerous hyena coprolites

**Level E:** no archaeological level

**Level F** (= layers G, F, F1, F2, F3)
- the first (lower) Mousterian level
- the most important samples of the archaeological record with faunal and Neanderthal remains, and lithics
- the highest concentrations have been found in layers F2 and F3

**Level H**:
- few faunal remains, no artefacts
- a carnivore occupation

**Level K** (= layers K and I)
- few faunal remains, no artefacts
- a carnivore occupation
21.4 Chronology

An absolute chronology is not available for this site. As noted by Gardeisen, a very preliminary ESR date of the base of the first Mousterian level is 134 ± 8 ka (Gardeisen 1997). However, this date is also cited as being obtained on the base of the filling, i.e. of the ‘ensemble inférieur’ (p. 329), which includes H, I, J, and K (p. 323). The date would therefore belong to layer K, and not to level G (i.e. the base of the first Mousterian level), which is corroborated by table 84 on page 332.

The site has been situated in time based only on faunal and lithic indicators. Layers K has been dated to the Riss III (OIS6), while the other levels of the ‘ensemble inferieur’ (J, I, H) appear to cover OIS 5-4. Level F, covering layers F, F1-3, and G was placed in OIS 3 (early Würm/Würm II). The second Mousterian level, C-D, should regarded as marking the transition of the first to the second half of MIS 3, while level B fits in the second part of MIS 3.

Prince and co-workers (Prince, Saos, and Vezian 2005) list a second date for the stalagmitic floor: 115 ka BP, i.e. close to the Eemian. They attribute G to F2 to MIS 4, F1 to C to (probably) MIS 3. B1 and B1a then correspond with the second half of MIS 3 (younger than 40 ka BP).

21.5 Palaeoenvironment

According to Gardeisen (Gardeisen 1997), the palaeoenvironment can be reconstructed as follows for the layers discussed in the current study:

- G: slightly cold, very dry, open spaces dominate
- F - F3: colder, much wetter compared to underlying levels
- C, D: warmer and drier than layers F-F3

The levels have been linked to the MIS system as follows (Gardeisen 1999):

- K: Riss III-Wurm I, stage 5-4
- F: Wurm II, late stage 4, stage 3
- C-D: Wurm II/II-III, stage 3
- B: Wurm II-III, stage 3

The site was implanted at the crossroads of biotopes, because of the presence of running water (the Baulou creek) and the elevation of the site vs. the valley floor, providing a panoramic view of the hills to the nord and the massif to the south. Moreover, the water runs through a space incased by two ‘walls’, which is an excellent place to corner wildlife.
Prince and co-workers’ reconstruction diverges somewhat (Prince, Saos, and Vezian 2005):

- layer L: rests on a discontinuous stalagmitic floor, which has been dated to 134 ka BP (see the date listed by Gardeisen), and 115 ka BP, i.e. close to the Eemian. The climate is temperate.
- layers K to H: a period of climatic instability, with rodent species belonging to a temperate forest, and continental steppe. During favourable phases, forest definitely developed, regressing during cold and dry phases. Only carnivores inhabited the cave.
- layers G to F2: cold period which favours herds of reindeer, horse and bison. The climate is considerably colder than previously, although some forest stands still persist. This phase corresponds with MIS4.
- layers F1 to C: a little less cold, but definitely more humid. There are several climatic oscillations with less cold conditions (layers F1 and D), or with colder conditions (layers F, D1 and C; the latter is characterised by an almost completely open landscape). Bovids and horses are hunted more frequently than reindeer in a landscape of the ‘prairie parc’ type. There is an alternation of carnivore and human occupation. The corresponding MIS phase is probably 3.
- layers B1 and B1a: reindeer and horse diminish while bovids and Cervus grow in importance. Again, ‘prairie parc’ dominates in a rather temperate climate. Like in D, Bos primigenius occurs, which feeds on grass and tree leaves (oak in particular) in a sufficiently temperate climate. The lithic industrie is of a final mousterian, announcing the Chatelperronian. They attribute the period to the Wurmian interstadial (= 2nd half of MIS 3, post 40 ka BP).
- layer B (sensu stricto): a return to cold circumstances, possibly MIS2. The most intensive occupation occurs during the period of maximum cold. Towards the top of the filling, where temperatures are less cold and more humid, the site is frequented less. Animals of open spaces, associated with rather cold and dry conditions diminish, although Bison remains, to become the preferred prey of Neanderthals, together with Cervus. The very open landscape of OIS4 becomes ‘prairie-parc’ with humid zones.

### 21.6 Archaeological tradition

Charentian Mousterian for all layers, according to Gardeisen (Gardeisen 1997). However, according to Prince and co-workers (Prince, Saos, and Vezian 2005), layer D holds a Denticulate Mousterian, while C contains a MTA type B. The latter authors go on to discern two main mousterian occupations: G-C (the main occupation), and Csup-A (mousterian, evolving towards the UP). Layer D marks the beginning of a climatic
turnover, in the form of an increase in humidity (contra Gardeisen; because of this difference in humidity, no indication in one or the other directed has been retained). It is also visible in the lithics, in the form of the appearance of denticulates accompanied by Levallois flakes. The latter become Levallois blades in C and Csup, accompanied by bifaces, while there’s also an increase in distances covered to obtain primary materials (112 km max.).

21.7  Fauna

Method of collecting

Conservation and fragmentation
Fragmentation of the material has been considerable (about 83% of the bones could not be determined to exact species) (Gardeisen 1999).

Prey Taxa
NISP and MNI per taxon are provided by Gardeisen, pages 320 and 321, i.e. tables 79 and 80 (Gardeisen 1997). Somewhat ambiguously, on the first the dental remains are listed, followed by the total number of bones per level (the number of bones per taxon being listed on the second figure). However, indicated below the total number of bones per level is the total NISP per layer, which is the sum of the total number of bones and the total number of teeth. This suggests that the total number of bones per taxon (the second figure) doesn’t include the teeth, but actually, when comparing with the numbers mentioned in the per taxon discussion of the book, it does. Additionally, there seems to be an error in Gardeisen’s NISP tables: the rhino bone NISP for layer D should be two (not one; additionally, the rhino dental remains are listed as 3 instead of 2).

In any case, the presence of Coelodonta antiquitatis is difficult to interpret: in the absence of any anthropic mark, the phalange in layer B (which hasn’t been discussed here) could be a manuport; the same reasoning is valid for the rhino tooth remains in layer D, and the single tooth fragment in F3 of Mammuthus primigenius.

Megaloceros was found in F1, F2, and G. Nevertheless, no human marks were attested. Moreover, the bone in layer F1 had gnawing marks, pointing, together with the fact that none of these (few) bones carry much meat, to exploitation by carnivores (Gardeisen 1997).

Hunting happened opportunistically (compared to sites such as La Borde, thus in the sense of ‘non-specialised’) and was linked to the environmental context (Gardeisen 1999). Nevertheless, still according to Gardeisen, individuals within herds were selected rather than taken at random.
Carnivore taxa
The presence of carnivores may be explained by natural occupation, or by scavenging/exploitation by other carnivores (the latter was definitely the case for canids). The action of carnivores in general have been attested in layers B, C, D, and level F, judging by the amount of bite marks on the bones. In layers older than C and D, wolf and fox dominated the carnivore assemblage; in C-D, the number of carnivores rises, and the balance shifts in favour of hyena, possibly in the form of a hyena den (coprolites, young animals, more gnawed bone – particularly of wolf and fox); level C-D may thus have known alternating occupations of humans, hyenas, and probably bear, wolf, and fox. This hyena occupation may, according to Gardeisen, be responsible for the dominance as well as the age profile of bovids. In layer B, hyenas (Crocuta crocuta) are the most numerous, while in F2, where the human occupation is the most intensive, the balance shifts in favour of canids, and fox (Vulpes vulpes; NISP: 428, MNI: 9) in particular (data for wolf: NISP: 111, MNI: 5). In the latter layer, given the presence of rare and isolated cut marks on wolf (and bear, and Panthera [leo] spelaea) bone, human exploitation of wolf (and fox) is possible, but unlikely: given data on sex, mortality profiles, carcass dispersion, anatomical distribution, ... carnivores don't seem to have been exploited for food (Gardeisen 1997, Gardeisen 1999); the current evidence merely points to an alteration of certain carnivore bones. The presence of Ursus spelaeus, in the form of hibernations, alternated with that of humans.

Marks
Importantly, Gardeisen (Gardeisen 1997) lists a group of ‘grands herbivores’, which include all bone fragments that couldn’t be attributed to genus, but that belong to big herbivores. In the case of Portel, these include horse, large bovids, Megaloceros and mammoth or whooly rhino (NISP: 9956), and therefore correspond to weight classes V, IV, and III (Bourdillat 2004). Twenty percent of them carry human or carnivore induced traces. Table 36 on page 182 (Gardeisen 1997) gives a summary of all marks per layer. Striations and impact traces are considered to be induced solely by humans:

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<td>1428</td>
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<td>F3:</td>
<td>252</td>
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<td>G:</td>
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Likewise, a group of small herbivores (NISP: 6692) was defined, including Cervus elaphus, Rangifer tarandus, Sus scrofa, Capreolus capreolus, Capra sp., and Rupicapra rupicapra, thus corresponding to weight classes I and II (Bourdillat 2004). The distribution of striations and impact traces per layer is as follows (Gardeisen 1997):
In any case, in the F-complex (F, F1, F2, F3, G) human traces outnumber carnivore traces, while in C-D, it’s the other way around.

**Seasonality**
Several lines of evidence (hibernating bears, birthing season of herbivores and carnivores) suggest that Neanderthals occupied the cave during autumn and perhaps winter (Gardeisen 1999).

**Carcass exploitation**
Horse: mainly exploited by humans; a shift from no apparent prey choice in level F to one based on selection of animals of 7-11 years old in C-D.
Bison: predominance of adult animals in F2 and F3. Carnivore damage, and juvenile ratios increase in F-F1 vs. F2-F3-G. Level C-D shows a catastrophic profile.
Reindeer: a catastrophic profile for C-D, a preference for juveniles and and male adults in F2-F3-G (the most anthropogenic part of the sequence), and a focus on young adults and adults in F-F1.
Deer: in the entire level F, young animals between 2 and 5 years old dominate, males being the majority in F2-F3-G. Juvenile and young animals were hunted in C-D.
Capra pyrenaica: most numerous in K, C-D, and B, so not truly related to humans. Nevertheless, a cut mark on a radius in level F suggests human exploitation; juveniles, males and females have been identified in F2-F3-G.
The richest parts of the carcass (bearing the most meat and marrow) were preferentially consumed, while limb extremities were neglected (Gardeisen 1999).

**Human remains**
Neanderthal remains (NISP: 45) were found in layer F1 (1), F2 (41) and F3 (3), representing a child of 7 years old, one of 11-13 years old, and probably an adult (Gardeisen 1997).

**Remarks**
Gardeisen (Gardeisen 1997, Gardeisen 1999) has performed an analysis in which patterns are sought throughout the sequence, rather than evaluating the sequence layer by layer. Such a diachronic account makes it difficult to extract the necessary information.
for each layer separately; therefore, only efforts towards a general description have been done.

Although layer K (sensu stricto) has a high enough total NISP (>20) to be admitted into the database, it hasn’t been retained by Grayson and Delpech (2006), presumably because there is no associated archaeological tradition. For that reason, I didn’t retain it either. Layer B wasn’t in their database either, although it does fulfill the criteria. Perhaps the fact that the layer has been disturbed by badger burrows (see Gardeisen 1999) made Grayson and Delpech reject the assemblage (although they explicitly state that taphonomic considerations were not taken into account when making up their database). Added to the disturbance by badgers is the presence of hyena, and the fact that the lithic assemblage contains only few characteristic pieces (Gardeisen 1997:9). For this reasons, we didn’t include the faunal assemblage in our database either.

As mentioned, Gardeisen discerned a small (Cervus elaphus, Rangifer tarandus, Sus scrofa, Capreolus capreolus, Capra sp., and Rupicapra rupicapra, thus corresponding to weight classes I and II (Bourdillat 2004)) and a big herbivore group (horse, large bovids, Megaloceros and mammoth or whooly rhino, i.e. weight classes III through V) (Gardeisen 1997). The number of specimens per layer can be found in Gardeisen (1997:182 table 36, and the figure on page 174).

Gardeisen (Gardeisen 1999) describes the site as a seasonal, and thus temporary, camp used by a small group of Neanderthal hunters in autumn and winter. Humans were the primary accumulators (in a role of hunters, not scavengers) of bone, while carnivore action was in most cases posterior to, and alternating with, the human occupation. Entire sequences of lithic production and animal processing have been attested in the cave, as well as cleaned out hearths (in the form of burned bones); indications exist for a limited degree of spatial organisation (Gardeisen 1999). All of this suggest domestic activities in a space that was not larger than 30 m². The most secure layers in terms of human accumulation of bones is the F complex (Gardeisen 1997).

22. Grotte Tourmal

Location

Bize-Minervois, Aude, France
  a.k.a. Grande Grotte de Bize, Moulin, Balmos de los Fados
22.2 Excavation

Excavations from 1826 on.
1970-1987: A. Tavoso

22.3 Stratigraphy

Unit I:
Level A (a composite of several layers)

Unit II (lower):
Level B + C

Unit II (middle):
Level D1 + D2

Unit II (upper):
Level E

Unit III:
‘Tournal breccia’ + F_A + F_B + coprolite levels (F_1, F_2, F_3, F_4; F_1-2: primarily carnivore dens, F_3-4: primarily human occupations)

Unit IV

While Grayson and Delpech didn’t retain level IIB, despite their statement that they didn’t take taphonomic factors into account when setting up their database (Grayson and Delpech 2006), it is treated here, but with the explicit caveat that carnivores (hyena) most likely contributed to the faunal assemblage (see further).

22.4 Chronology

Layer IA: ?

Layer IIB: between 48 and 38 ka BP
- 38 ± 8 ka BP (ESR)
- 33 ± 4 ka BP (Pa-231/U-235)
- 33 ± 8 ka BP (Th-230/U-234)
(Patou-Mathis 1994)

22.5 Palaeoenvironment

Level IA: early Wurm (2nd phase): rather cold and dry (horse and reindeer), steppe
**Level IIB**: biozone 26 (Guérin and Faure 1987), MIS3 (end of the 2nd phase of the early Wurm), and perhaps, at the top, the beginning of the early Wurm – recent Wurm interstadial; cold and dry winters, summer more temperate and wet, meadows in the valleys, steppes on the plateau, some wooded spaces

**Level IIC**: early Wurm – recent Wurm interstadial, cold but not excessively so, relatively dry, steppes and grassland

**Unit II (middle)**: early Wurm – recent Wurm interstadial, relatively temperate and humid, wooded zones and grassland

**Unit II (upper)**: end of the early Wurm – recent Wurm interstadial, cold but not excessively so, humid, grassland, steppe, and some wooded places

**Level III F1**: end of the early Wurm – recent Wurm interstadial, climate close to that of unit II (upper)

**Level III F2-3-4 and Tournal breccias F8 and Fb**: beginning of the recent Wurm, cold and relatively dry, steppes and grassland

The early Wurm – recent Wurm interstadial can be situated in the interval 38 ± 8 ka BP (IIb) – 34.2 ka BP (II sup, F), with an intermediary date of 33.6 ± 1.2 ka BP. The interstadial is apparent through a clear temperate/humid oscillation (Patou-Mathis 1994).

### 22.6 Archaeological tradition

**Level IA**: Mousterian (Levallois)

**Level IIB**: Denticulate Mousterian (Levallois)

The transition from a Mousterian with a lot of denticulates to an early Aurignacian took place during the ‘Würm ancient-Würm récent’ interstadial, and between 35 and 34 ka BP (end of unit II [middle] and layer E of unit II [upper]). This would make the Mousterian industry one of the oldest known (Patou-Mathis 1994).

### 22.7 Fauna

**Method of collecting**

**Conservation and fragmentation**

**Level IA**: the bone material has been badly preserved (oxidation, dissolution) primarily because of edaphic and climatic phenomena (such as an increasing humidity), and is
severely fragmented (400 indeterminate bone splinters, mainly fragments of long bone diaphyses) (Patou-Mathis 1994).

Prey Taxa
Level IA: for the NISP/MNI list, see Patou-Mathis (1994:29, table 1). A few rabbit bones have been found, but their introduction to the site has not been commented upon (Patou-Mathis 1994).
Level IIB: for the NISP/MNI list, see Patou-Mathis (1994:33, table 5). A few rabbit bones have been found, but their introduction to the site has not been commented upon. The more than 100 coprolites present at the site point to the existence of a hyena den. While hyenas must have brought in their own prey, the latter is difficult to separate from human prey. Most likely the two *Megaloceros* antlers were introduced by hyenas, as they had been chewed down to the marrow. Judging by their habitat, bison, reindeer, and horse were probably killed on the plateau of the Verdeyere, above the cave; *Capra* on the mountain Cayla before the cave; the other cervids, *Bos primigenius* and *Sus* along the river Cesse running in the valley at the foot of the cave (Patou-Mathis 1994).

Carnivore taxa
Level IA: the carnivore presence is minimal, for NISP/MNI list see Patou-Mathis (1994:29, table 1). The panther mandibula had been gnawed by a hyena (Patou-Mathis 1994).
Level IIB: carnivores are more numerous (25.4 %), but the largest part (more than 70 %) can be ascribed to *Ursus spelaeus* (which didn’t contribute to the prey assemblage, nor significantly to post-depositional processes on the bone remains themselves) (Patou-Mathis 1994).

Marks
Level IA: anthropogenic alterations of the bones are rare; cut marks on a horse scapula, indicating disarticulation, and percussion marks on a distal part of a horse humerus (marrow extraction). Two of the indeterminate bone splinters have been burned (Patou-Mathis 1994).
Level IIB: small carnivores left few traces on the bones (0.13 %), whereas 4.7 % of the bones bear traces left by hyena. As the marks were posterior to human induced traces (1.9 %, i.e. 119), one could forward the hypothesis of carnivore scavenging on human kitchen waste. Importantly, two hyena mandibles were cut-marked, pointing to skinning (and consumption ?) (Patou-Mathis 1994).

Seasonality
Level IIB: most kills occurred during winter and spring (Patou-Mathis 1994).
Carcass exploitation
Level IIB: human and hyena prey are difficult to discern: the remains of Alces, Sus, and Capra correspond largely to parts containing minor quantities of meat; those of Rangifer, Cervus, and bovines to more meaty parts. Horse (as well as bovids) has been carried into the cave in parts and treated further in situ; as most bones are represented, they are more likely to correspond to human hunting prey than scavenged carcasses. Provided that most animals are hunted by men, the strategy seems to be based on the capture of herds, composed mainly of females and young, especially in the case of Capra and Equus caballus (Patou-Mathis 1994).

Human remains
IIB: a Neanderthal proximal phalange (Patou-Mathis 1994)

Remarks
Regarding layer IIB:
- wolf, fox, and cave lion occupied the cave during brief periods; hyenas have gnawed on some of their bones
- at least 8 hyena individuals died in the cave, which served as a den. At least two hyenas were skinned (and eaten ?)
- the cave bear occupations (hibernations) were anterior to the human occupations
- human and hyena prey are difficult to discern

Patou-Mathis (Patou-Mathis 1994) notes that focus shifts from horse to reindeer, while horse remains abundant in the environment (theoretically). She claims that reindeer is easier to catch (i.e. in optimal foraging terms, a lower handling cost), while providing a source from which a lot of materials beyond mere food can be extracted. According to Patou-Mathis, the conditions that led to the final deposition of the archaeological material, i.e. a cave-in, don't allow for the construction of palaeoethnographic hypotheses regarding level IA. Nevertheless, the preserved bones are all interpreted as kitchen waste. As far as level IIB is concerned, human occupations were multiple, successive, and probably seasonal. The site is located at a crossroads of biotopes, providing an excellent view over the nearby hunting grounds (Patou-Mathis 1994).
23. Grotte Vaufrey

Location

Cénac-et-Saint-Julien, Dordogne, France
(also known as Grotte XV of the Conte massif)
x=507, y=280, z=180

23.2 Excavation

1930, 1931: sounding by R. Vaufrey
Until 1965: destruction of about 30 m³ of the site
(Rigaud 1988)
23.3 Stratigraphy

Layers I-VIII: formed during MIS 6 till 4 (Delpech 1996). Of these, I-III fall within the period of consideration (MIS5 and later), while III has a total NISP of only 18, leaving layers I and II (the latter consisting of three parts). In total, 15 layers have been discerned (Rigaud 1988).

23.4 Chronology

Layer I: MIS 4
Layer II: MIS 4; 74 ± 18 ka BP (U/Th)
Plancher B (under layer III): MIS 5e/5c/5a
(Blackwell and Schwarcz 1988, Delpech 1996, Jaubert 2002)

23.5 Palaeoenvironment

According to the palynological analysis, layer I formed under a rigorous climate, while layer II corresponds to a warmer and more humid oscillation (Diot 1988). Based on the faunal associations, conditions in both layers were cold and rather dry, with perhaps a few islands of trees (Delpech 1988). The rodent fauna suggest, for both layers, cold and dry conditions (Marquet 1988). See Delpech and Lavilles (Delpech, 1988 #392) for a summary of the different approaches. See also Delpech (1996:35, tabel 2).

23.6 Archaeological tradition

Layer I: Quina Mousterian
Layer II: Typical Mousterian
(Geneste 1988)

23.7 Fauna

Method of collecting
Disturbed deposits have been sieved, so possibly, the in situ deposits have been as well (Rigaud 1988).

Conservation and fragmentation
Prey Taxa
- 

Carnivore taxa
- 

Marks
- 

Seasonality
- 

Carcass exploitation
- 

Human remains
- 

Remarks
According to Delpech, the Quina Mousterian in the Perigord region is linked to (the maximum of) MIS4, and was produced by hunters of the open plains, hunting mainly on big herds, primarily reindeer. When warming sets in with MIS3, the Quina phenomenon migrates northwards, along with the herds, to be found in the caves of Spy, Engilhoul, and Fonds-de-Forêt, where the dominant animal is horse (Delpech 1996).
24. **Grotte XVI**

**Location**

Cénac-et-Saint-Julien, Dordogne, France

24.2 **Excavation**


24.3 **Stratigraphy**

Layer 0: Magdalenian
Layer As: Solutrean
Layer Abc: Gravettian
**Layer Abb:** Aurignacian
**Layer Aib:** Aurignacian (?)
**Layer B:** Chatelperronian
**Layer C:** Mousterian
Layer D-K: Mousterian

(Grayson and Delpech 2003)
24.4 Chronology

See table 1 in (Grayson and Delpech 2003). For the date range recorded into the database for layer B, GifA-95581 (-1σ) and AA-2997 (+1σ) were used. Likewise, the date range for Abb was calculated using the three available dates and taking into account the most extreme values based on a 1σ error margin.

There appears to have been a occupational hiatus between B and C, as guano accumulated after the deposition of the ash in layer C (Karkanas et al. 2002). This is corroborated by the absolute dates.

24.5 Palaeoenvironment

-

24.6 Archaeological tradition

Layer 0: Magdalenian
Layer As: Solutrean
Layer Abc: Gravettian
Layer Abb: Aurignacian
Layer Aib: Aurignacian (?)
Layer B: Chatelperronian
Layer C: Mousterian
Layer D-K: Mousterian

(Grayson and Delpech 2003)

24.7 Fauna

Method of collecting

A sieve with a mesh size of 2 mm was used (Grayson and Delpech 2008).

Conservation and fragmentation

Fragmentation across the different assemblages has been studied by means of the diaphysis NISP/epiphysis NISP ratio of reindeer and the other ungulates (Grayson and Delpech 2003). Only for layer Aib did this fragmentation ratio differ significantly from what would be expected from the entire set of assemblages, but this doesn't entail that
the degree of skeletal element fragmentation changes across the MUP transition (Grayson and Delpech 2003). A study of differential fragmentation across taxa learned that this phenomenon couldn't account for the pattern of declining evenness through time (which was ascribed to climate).

**Prey Taxa**

**Carnivore taxa**

Significantly, Grayson and Delpech (Grayson and Delpech 2003) notice that the relative amount of cave bear NISP decreases across the MUP boundary, which suggests the existence of what they call the Kurtén Response: the decline in cave bear remains as a result of a changing human demography (increasing residence times, increasing group size, or both).

**Marks**

About 8 % of the NISP is cut-marked in layers Abb, Aib and C, and about 7 % in layer B (see Grayson and Delpech 2003:1640). Overall, few bones show evidence of carnivore damage (1.42 %), see Grayson and Delpech (2003:1643).

**Seasonality**

No data (Grayson and Delpech 2003)

**Carcass exploitation**

**Human remains**

**Remarks**

According to Grayson and Delpech (Grayson and Delpech 2003), the older NISP list (Grayson et al. 2001) is provisional, while the one appearing in the former source is supposed to be final. However, discrepancies with their 2006 study do exist: the latter also lists the mammoth tusk specimens, and, in the case of layer C, 12 Megaceros specimens. In this study (see also the similar problem with [shed] reindeer antler in Saint-Césaire), the NISP list includes all tusk and antler fragments, for reasons of uniformity across the database (in other words, the 2006 study has been used as the base reference). Additionally, one of both *E. hydruntinus* specimens, found in Abc and C, and lumped in the *E. caballus* (Grayson and Delpech 2006) or *E. sp.* (Grayson and Delpech
2003) categories, have been properly assigned to *E. hydruntinus* in layer C (Abc was not considered here).

The conclusion of their research was that there is no evidence for major changes in the subsistence pattern in Western Europe at the transition, that can’t be attributed to climate change (Grayson and Delpech 2003): change in the form of resource intensification is first witnessed during the Magdalenian, according to both authors.

Layers C and Abb contain a lot of ash, visible in the case of the former, and invisible in the case of the latter (Karkanas et al. 2002). These point to hearths which were fired primarily with wood and grass. The authors suggest that grass may have been used to dry fish, for example, the remains of which are abundant in layer C.

### 25. Hortus Location

Valflaunès, Hérault, France

\[x = 720.70, \ y = 167.14, \ z = 390 \text{ m}\]

(de Lumley 1972b)

#### 25.2 Excavation

1906-1908: MM. Maurice Gennevaux and Albert Mauche

Multiple campaigns, unpublished, disturbing almost all superior layers

1949: J. Arnal

1952: J. Audibert and Luc Cazals

1953 - ... : Jules Boudou, Jacques Audibert, A. Ducros, Ph. Hisard and A. Vidal

1959: Jacques Audibert

**1960-1964: de Lumley: eastern porch**

See (de Lumley 1972b)

#### 25.3 Stratigraphy

Levels 42-7 belong to the Wurm II, and are clearly present and well-preserved in the eastern side of the cave (in contrast to the western side, where only remnants remain as a result of erosion. The layers considered in this study (situated between 29 and 9) all belong to that period.
Levels 42-30: sterile, with in some cases a few bones (chiroptera) and a few lithic artefacts.

**Level 29:** numerous bones
**Level 28 D:** no lithics, only two bone fragments
**Level 28 C:** no lithics, numerous bones
**Level 28 B:** no lithics, some bones
**Level 28 A:** 1 lithic artefact, numerous bones
**Level 27 E:** no lithics, some bones
**Level 27 D:** no lithics, numerous bones
**Level 27 C:** 1 lithic artefact, some bones
**Level 27 B:** sterile
**Level 27 A:** two lithic artefacts, numerous bones
**Level 26 C:** no lithics, numerous bones
**Level 26 B:** 3 lithic artefacts, numerous bones
**Level 26 A:** 4 lithic artefacts, some bones
**Level 25 B:** some lithics, numerous bones
**Level 25 A:** no lithics, numerous bones
**Level 24 C:** some lithics, numerous bones
**Level 24 B:** 2 lithic artefacts, numerous bones
**Level 24 A:** some lithics, numerous bones, 1 hearth
**Level 23 B3:** 1 lithic artefact, some bones
**Level 23 B2:** some lithics, numerous bones, 2 small hearths
**Level 23 B1:** 1 lithic piece, numerous bones
**Level 23 A:** fairly numerous lithics, numerous bones
**Level 22 D:** 3 lithic artefacts, numerous bones
**Level 22 C:** numerous lithics, some bones, 2 hearths, human teeth (MNI = 2)
**Level 22 B:** 1 lithic artefact, abundant bones
**Level 22 A:** abundant bones, one hearth
**Level 21 B:** some lithics, abundant bones (sometimes difficult to discern 21 B from 21 A)
**Level 21 A:** fairly numerous lithics, numerous bones, hearths (sometimes difficult to discern 21 A from 20 B; multiple objects belonging to the former have been attributed to the latter during the excavation)
**Level 20 B:** two lithic artefacts, very few bones
**Level 20 A:** numerous lithics, numerous bones, a few hearths (sometimes difficult to set apart from 19 B)
**Level 19 B:** 3 lithic artefacts, few bones
**Level 19 A:** numerous lithic, numerous bones, remains of at least one human individual
**Level 18:** numerous lithics, few bones
**Level 17:** numerous lithics, numerous bones (sometimes difficult to set apart from 16 B)
Level 16 B: numerous lithics, numerous bones, remains of at least three human individuals
Level 16 A: some lithics, very few bones
Level 15: some lithics, numerous bones
Level 14: numerous lithics, numerous bones, remains of at least six human individuals (sometimes difficult to set apart from 15 and 13)
Level 13 B: 3 lithic artefacts, a few bones
Level 13 A: numerous lithics, numerous bones, remains of at least two human individuals (sometimes difficult to set apart from 12 B)
Level 12 B: numerous lithics, few bones
Level 12 A: some lithics, few bones
Level 11 C: numerous lithics, numerous bones
Level 11 B: few lithics, no bones
Level 11 A: relatively numerous lithics, few bones, remains of two human individuals
Level 10 B: few lithics, few bones
Level 10 A3: relatively numerous lithics, relatively numerous bones
Level 10 A2: some lithics, few bones
Level 10 A1: some lithics, quite a lot of bones
Level 9 B: some lithics, relatively numerous bones, remains of at least two human individuals
Level 9 P: sterile (a bear hibernation den?)
Level 9 A: some lithics, some bones
Level 8: few lithics, few bones
Level 7: 1 lithic artefact, few bones

Note: the quantitative appreciation of the bones as mentioned above pertains to all faunal remains. Often, the majority are chiropterean or avian, not mammalian prey fauna (de Lumley 1972c).

25.4 Chronology

Despite attempts at $^{14}$C dating, no valid dates could be obtained (Mook 1972).

25.5 Palaeoenvironment

Sedimentologically, five cold phases can be discerned within the Wurm II filling (approx. between 55000 and 35000), each separated from the other by a more temperate phase (de Lumley, Guerrier, and Fournier 1972). Human occupations considered in the present study range from phase II to V.
Phase I (levels 42-37): cold and wet
Transition: Phase I-II (levels 37-36): warmer and dryer
Phase II (levels 36-32): cold and wet (after a short dry episode)
Transition: Phase II-III (levels 32-31): warm and dry
Phase III (levels 31-26 A):
- colder than the previous cold phases, but less wet (alternating episodes of wetter and dryer circumstances)
- mountainous deciduous oak woodland. Oak and fern dominate during wet episodes, Pine and Gramineae during dryer ones.
Transition: Phase III-IV (levels 26 A - 25 B):
- relatively warm
- the deciduous forest degrades, pine and lime progress
Phase IV A (levels 25 B - 21 B):
- more and more cold and dry
- the forest makes way for a bushy, Mediterranean environment
Phase IV B (levels 21 A - 18):
- cold and dry
- trees disappear, some pine remain (in clusters), while other species can only hold their ground in refugia. The forest has made room for a grassland dominated by Gramineae and Compositae.
Transition: Phase IV-V (levels 18-17):
- a warmer but still dry climate
- the trees making up the mixed deciduous wood return, but the aridity prohibits the full development of the forest
Phase V A (levels 17-15):
- cold and very dry (temperatures dropping as the phase develops)
- mainly pine is able to survive, and only in sheltered areas; the open zones are invaded by a Compositae-steppe
Transition: Phase V A - V B (levels 15 - 14)
- a little less cold and a little less dry
- trees begin to reappear
Phase V B (levels 14-12 A):
- very cold (the maximum of Wurm II), and very dry
- trees are very rare, and a Compositae-steppe covers the landscape
Transition: Phase V B - V C (levels 12 A – 11 C)
- a little less dry
- trees begin to develop again
Phase V C (levels 11 C - 7)

- a little less cold, the climate remains extremely dry
- pine is the last tree to disappear, although some trees survive in well-sheltered areas

The palaeoenvironmental parameters used in the present study have been derived from the synthetic table in de Lumley (de Lumley 1972c), which closely follows (but is more detailed than) the sedimentological analysis above. The reconstruction of the palaeovegetation has been derived from the palynological study (Renault-Miskovsky 1972).

25.6 Archaeological tradition

All determinable lithic assemblages are of the typical Mousterian type (Levallois). However, those of levels 12-14, 15-17, and 21B-25 are enriched with denticulates, while the others are not (de Lumley and Licht 1972). As the numbers of lithic artefacts per level were in some case not high enough to perform a statistical analysis (the total number of artifacts for all levels being 4256), assemblages have been grouped.

25.7 Fauna

Method of collecting

Large pieces of bone have been recorded in three dimensions, while excavation dirt was collected and water sieved per zone (1 m²) and per level, using mesh sizes of 8 and 0,6 mm (de Lumley 1972d).

Conservation and fragmentation

de Lumley (de Lumley 1972d) reports that bones were very fragile, almost always in a bad state of preservation, and broken in situ. They needed to be fixated upon extraction.

Prey Taxa

Registration of the various species differed depending on the species: for some, layers have been grouped, while for others, counting occurred for each layer or even sub-layer separately. The season for this is to be found with the fact that in the former case, contrary to the latter, skeletons of certain individuals (and even single bones) were found to be spread over multiple (sub)layers (Pillard 1972a). Grayson and Delpech (Grayson and Delpech 2006) took over this system in their study, and it is also the one adhered to here. The species counts (NISP and MNI) can be found in Pillard (1972:198).
Pillard (Pillard 1972b) discusses the somewhat problematic presence of *Oryctolagus cuniculus cuniculus* in levels 14-15 (NISP = 200 to 300). The species occurs in other layers as well, but always in the relative absence of humans, and always with an overweight of very young animals (introduced in the form of pellets, or naturally occurring on site). In levels 14-15, neither is the case (very young animals are even absent), strengthening the hypothesis of human exploitation. However, no indication of the latter has been found on the bones themselves: no incisions, striations or intentional breaks have been attested.

Similarly, there are statistical indications for the hunt on *Alectoris graeca* (MNI = 17) and *Columba livia* (MNI = 23) during the deposition of layers 10 till 16, and perhaps a few other species (de Lumley 1972a). However, no butchering marks or evidence of charring were present (Mourer-Chauviré 1972).

One fragmentary and patinated tooth of *Dicerorhinus* sp., cf. *Mercki* has been discovered in level 14. It has been suggested that the specimen was transported to the site by Neanderthals as a fossil, rather than belonging to a hunted animal (de Lumley 1972a, Guérin 1972).

**Carnivore taxa**

As mentioned above, the composite layers considered in this study have been assembled based on refits of herbivore remains. This entails that when the same exercise is done for the carnivore remains, it’s likely that other composite layers will be obtained. This is indeed the case, however only because of *Ursus spelaeus*, the distribution of which across levels in terms of NISP’s (and MNI’s) is presented below (Pillard 1972a):

**Levels 8 - 10 A 2:** 109 (MNI: 13) – mainly teeth  
Levels 10 A 3 - 13 B: 15 (MNI: 4)  
**Levels 14 - 17:** 72 (MNI: 8) – teeth as well as bones  
Level 18: 8 (MNI: 2)  
Levels 19 A - 19 B: 3 (MNI: 1)  
Level 20: 4 (MNI: 2)

The presence of *Ursus spelaeus* is, like that of the rabbits, problematic: as de Lumley and co-workers (de Lumley 1972a) point out, during the period in which the cave was most frequently visited by humans (levels 21 A – 7), bear remains are most abundant, and occur as part of the kitchen refuse. Given the fact that, at that time, human occupation took place during summer rather than winter, this could indicate that bears where hunted (occasionally) as opposed to having died during hibernation. All bones were present, and mixed with those of the other prey fauna. However, not all specimens belonged to hunted animals, as several bear living floors (characterised by an abundance of milk teeth, or even a nest on the surface in layer 9B) have been discerned within the above-mentioned composite levels. Therefore, the authors only wish to retain the remains of levels **16 B, 15, 14, 10 A 1** and **9 A** as indicative of bear hunting.
Their NISPs have been recorded into the database as such, with some reservations however, as no remarks were made concerning butchering marks or charring; the levels in bold in the list above represent those containing hunted remains. Note that the individual levels de Lumley and co-workers (de Lumley 1972a) recognise as containing hunted bears are grouped by Pillard (Pillard 1972a) with other levels. The data were entered into the database as follows:

- the 72 specimens contained in levels 14-17 were (tentatively) attributed to the combination of composite layers 15 - 16 B and 13a - 14. As such, they couldn’t be considered in the carnivore and total NISP counts.
- the 109 specimens contained in levels 8 - 10 A 2 where attributed to our combined layers 9A - 10 A 2. As level 8 wasn’t recorded into the database (it contains only a single Capra bone as well as two Felis (Panthera) parda specimens, making it an unimportant layer from a faunal perspective) this is less of an issue than the previous case.

The authors also suggest that some of the other carnivores (Felis (Panthera) parda, ...) were hunted, presumably for their skin; Chase (Chase 1986a) regards their evidence as convincing, especially for Panthera pardus (presence of primarily skulls, feet and caudal vertebrae). Lynx was most likely not hunted (adult specimens, contra the interpretation by de Lumley and co-workers (de Lumley 1972a)), while occurrences of bear phalanges in anatomical connection in layers 25A, 16B, and 9A may suggest skinning. Although killing carnivores to exploit their skin doesn't necessarily imply human consumption of the carcasses, it's perhaps difficult to image that the meat would have been neglected. Therefore, the Panthera parda remains were (tentatively) entered into the database as being probably hunted, as well as the bears in some layers. Their numbers however, have not been taken into consideration for the analysis.

**Carcass exploitation**

The numbers of young and old animals (Capra) for the different layers can be found in de Lumley (1972:612-613). When the site was used as a hunting stop (layers 24C-21B), the number of individuals (and the NISP) was significantly smaller than previously (butchery site, layers 30-26A); moreover, not all bones were represented. Things changed again when hunters of (primarily) Capra used Hortus as a temporary (hunting) camp (layers 21A-8), leaving a great number of bones (and individuals), corresponding to all parts of the skeleton, while being heavily fragmented and rarely in anatomical
connection. A lot of cranial parts (skulls and mandibles) where found, which suggests that hunters introduced complete prey. Prey other than Capra (hunted in the valley or on the plateau) were also more frequent, while bones of their thorax are practically absent, suggesting they were brought into the site already butchered to reduce their weight.

**Human remains**

With a NISP of 100 (71 teeth), most of the Neanderthal remains were located in the Wurm II levels (86). They belong to a minimum of 20 individuals, and a maximum of 36. They can be divided into two groups (although this is not entirely clear from the selection of layers made for the present study): those of the forested period during Wurm II phase IV A and those of the steppic phases IV B and V. The shattered remains were found among the kitchen refuse, which leads the excavators to keep open the possibility of cannibalism. All ages were represented, with a significant proportion between 15 and 30 years. For an inventory, see de Lumley (de Lumley 1972a, de Lumley 1972e). Incidentally, given the relative focus on small animals at the site (goat, but possibly also birds and rabbits), cannibalism could be in line with a reasoning of increased intensification, although the excavators deem it highly unlikely that if it occurred, it was practiced merely out of alimentary needs. For an inventory of the human remains, see de Lumley (1972:617).

**Remarks**

While no strict data are given concerning the (differential) conservation of the bones, and while the site’s function has shifted throughout its period of use, it certainly is eye-catching as far as the focus on smaller animals is concerned, i.e. primarily Capra, with the possible hunt on birds and rabbits.

Given the abundance of especially chiroptera and birds of prey in basically all levels, it is logical to conclude, according to the authors (de Lumley 1972a), that Neanderthal occupation of the site has been episodic, rather than long lasting/permanent. The use of the site differs according to the climatic phase in question:

**Phase I + II:**
- short visits, because of the extreme humidity (presence of running water) in the cave
- the corresponding levels are practically sterile (some lithics in levels 38, 34, 32; some bones in 33 A and 32; a small – 20 cm diameter – hearth in level 33 A)

**Phase III** (levels 31 - 26 A):
- frequently, but each time briefly, visited towards the end of winter (January-March), and used as butchery site
- a large number of bones (mostly Capra), a small number of lithics, chiroptera still abundant (humans visits don’t have any impact on the cave wildlife)
Phase IV A (levels 25 B - 21 B):
- hunting camps (‘haltes de chasse’) at the end of winter and beginning of spring (January-April/May), not merely butchering sites
- numerous lithics, but still not a lot of animal remains other than Capra
- human visits impact the cave wildlife, suggesting more frequent and longer stays

Phases IV B and V A,B,C (levels 21 A – 7)
- because of the climate getting significantly dryer, more comfortable stays become possible in the form of ‘temporary camps’, during summer (June-September)
- lithics become more abundant, and animals other than Capra are added to the menu much more frequently; hearths are more frequent and more extensive.

The spatial organisation of the site has been reviewed extensively by de Lumley and co-workers (de Lumley 1972a) for each individual layer; as the present study necessarily uses composite layers following Pillard (Pillard 1972a), reviewing the ground plans of the individual layers serves little purpose here. Instead, the interpretation of the excavators in terms of site use is followed. Noteworthy is the fact that hearths have been noticed in multiple layers in the form of ash concentrations, and that artefacts and bones were not randomly distributed: empty zones, as well as concentrations of bone refuse and lithic artefacts could be discerned.
26. **Maldidier**

**Location**
Roque-Gageac, Dordogne, France

26.2 **Excavation**
Rigaud, J.-Ph.

26.3 **Stratigraphy**
7 strata (Delpech 1983)

26.4 **Chronology**
-

26.5 **Palaeoenvironment**
See Delpech (1983:56)

26.6 **Archaeological tradition**
Aurignacian II in layer 5 (Delpech 1983).

26.7 **Fauna**

**Method of collecting**
-

**Conservation and fragmentation**
-

**Prey Taxa**
-
Carnivore taxa
Only fox was part of the assemblage.

Marks
-

Seasonality
-

Carcass exploitation
-

Human remains
-

Remarks
-

27. Mauran Location

Mauran (‘Balaresque’), Haute-Garonne, France
Lambert co: x=492,12; y=3099,70; z=275 m
27.2 Excavation

1974-1981: C. Farizy

27.3 Stratigraphy

About 20 m² have been excavated along the entire depth of the stratigraphy (Farizy 1994a), leaving aside a number of test pits that allowed to estimate the area of the site – a former sediment catchment area in a karstic system containing reworked sediments of nearby formations (Miskovsky 1994) - that has been preserved at 1000 m² or more. As such, thirteen levels have been discerned, from bottom to top (Krier 1994):

Layers VII – XIV ( -9,5 to -5,4 m)
Layer XV ( -5,4 to -3,2 m)
   Layer XV 1
   Layer XV 2: archaeological level C2
   Layer XV 3 - XV 5
   Layer XV 6 : archaeological level C1
   Layer XV 7
Layers XVI – XIX ( -3,2 to 0 m)

According to the author, the possibility exists that both archaeological layers are one and the same, their separation resulting from a sediment displacement.

27.4 Chronology

Establishing an accepted chronology for the site proved to be difficult (David et al. 1994). Both pollen and sediment analysis recognise a temperate phase at the bottom of the stratigraphic sequence, followed by a long cold steppic phase (containing the Mousterian layers) that becomes increasingly dry (see also ‘Palaeoenvironment’). Tentatively, the Mousterian occupation is ascribed to the early Wurm (prior to the pleniglacial) and based on the pollen analysis, MIS 5b has been proposed. While consisting of a small sample, the horse remains (a transition of *E. taubachensis* to *E. germanicus*) appear to support a general attribution to the beginning of the early Wurm, while similarities also exist with the horses of layers 22-25 at Combe-Grenal (i.e. MIS 4, or the Pleniglacial). Dental measurements of bison are similar to those at Combe-Grenal (36-1), which would point to the end of the early Wurm (i.e. MIS 4 or even 3). In conclusion, the authors lean towards an attribution of the archaeological layers to a cold phase of the early Wurm, probably 5b or 5d.
However, several samples have been dated by ESR. Using both the Early Uptake (EU) and the Linear Uptake (LU) model, date estimates can differ quite a bit (Grün 1994):

- the ages of samples 862 and 863 are spread between 26,5 ± 1,9 ka (EU) and 35,8 ± 3,0 ka (LU)
- age of sample 861 (containing less U): 41,0 ± 1,4 ka (EU) and 45,8 ± 1,6 ka (LU)

The latter set are deemed more reliable, and compatible with the LU average of samples 862 and 863. It is assumed that the most probable age is situated between 35 and 45 years ago, with a maximal age situated between 45 and 65 ka ago, strongly suggesting that the site is younger than stage 4.

### 27.5 Palaeoenvironment

Farizy reports that a palynological study of the archaeological layer performed in 1979 indicated a relatively cold landscape with grasslands in the valley and pine forests on the hills, that became progressively steppic – implying that the deposition of this layer took quite some time (Farizy 1994a).

Sedimentological analysis (Miskovsky 1994) revealed two distinct climatic sequences: a first (levels II and III) indicating a relatively temperate, interstadial climate, and a second (levels IV to XVIII, containing the archaeological levels) characterised by marked cold and dry conditions (sometimes alternated by more humid phases), probably corresponding to a glacial period.

Likewise, the pollen analysis recorded two climatic phases too, with the same properties (Girard 1994). Based on the ESR dates and the faunal data, the cold-and-dry phase (containing the archaeological layers) was attributed to the (middle) Wurm, rather than the end of the Riss (i.e. the two alternatives left after the pollen analysis).

### 27.6 Archaeological tradition

The lithics have been characterised as Denticulate Mousterian. The authors propose, based on a comparison of several sites (Les Fieux, Le Roc, Mauran, La Borde and Coudoulous) the fauna of which is dominated by a single species (in casu, bovids), that the Denticulate Mousterian may be an economical facies, without denying the importance of other determining factors such as the site’s function and chronological position, as well as the palaeoenvironment, including the available types of lithic raw materials (Jaubert 1993, Jaubert and Farizy 1994).
27.7 Fauna

Method of collecting
The faunal (and lithic) remains were imbedded into a very dense and hard matrix of green clay, making the excavation a difficult enterprise. Remains were painstakingly extracted with a small trowel and a brush (Farizy 1994a).

Conservation and fragmentation
8824 bone fragments were retrieved (4193 of which have been determined), together with 19436 bone splinters smaller than 3 cm. Overall bone preservation was not good, which is unsurprising as Mauan is an open-air site; moreover, the collapsing terrain contributed to the fragmentation of the bones, while their sometimes slow burial affected the preservation of their surfaces (David and Farizy 1994, Eisenmann and David 1994). Nevertheless, intentional fracturing of the bones could be attested (David and Farizy 1994).

Prey Taxa
Bovids heavily dominate the Mauan assemblage: 98.97 % (i.e. 4150 pieces) is attributed to Bison, 0.88 % (i.e. 37 pieces) to horse, and 0.12 % (i.e. 5 pieces) to deer (Cervus) (Eisenmann and David 1994). The minimum number of Bison individuals (MNI) has been calculated as 137. Extrapolating to the full extent of the site (more than 1000 m², of which only 24 m² was excavated), the number of bison on the site has been conservatively estimated as being 4000. Horse remains were attributed to three individuals (MNI) (David and Farizy 1994).

Carnivore taxa
Only a single bone points to the presence of a carnivore (Ursus sp.) (Eisenmann and David 1994), and gnaw marks are rare. The authors assume that the intervention of carnivores has been minimal (David and Farizy 1994).

Marks
The assemblage has suffered intense post-depositional fragmentation, and erosion of the majority of the bone surfaces. The latter could be the reason why cut marks are rare. When they occur, they point at filleting and disarticulation (David and Farizy 1994).

Seasonality
The hunt of bison (mostly young and female individuals; only 20 % males were recorded) occurred during summer and autumn (David and Farizy 1994).

Carcass exploitation
Primarily young and female individuals were hunted, as only 20% of the remains belonged to males (the mortality profile closely resembling a catastrophic one). Mostly meat was exploited, marrow to a somewhat lesser extent, presumably because marrow spoils quickly during summer. Additionally, only the marrow from the bones of young individuals was left unextracted, as the latter contain less of it. Nevertheless, carcasses seem to have been slightly under-exploited, perhaps in view of an abundance of food derivable from them (David and Farizy 1994).

**Human remains**
None

**Remarks**
The site is interpreted as a place where bison were killed, exploited, and consumed (Jaubert 1993). The presence of an actual hearth (rather than the remains of a hearth that has been emptied) has been attested, based mainly on the distribution, in an area of about 30 square centimeters, of charred remains (‘un amass charbonneux’) (Farizy 1994b). Occupations were discontinuous, but spread over a long period (Farizy 1994a).

With North American bison kill sites as a guide, the authors don’t interpret Mauran as a place where all animals present were killed at once (in such cases, most of the carcasses remain unexploited, which is not the case at Mauran), but rather as a place where animals, at that time of the year gathered in small groups of about ten individuals, were repeatedly killed in small quantities, servicing a group of people which includes females and children, given the large quantity of meat. As such, the assemblage composition bares the most resemblance to the Paleoindian Maple Leaf Site, a kill site of a small herd. Based on the amount of meat gained from one individual male bison or a female with her calves (450 - 500 kg), and the time after which fresh meat becomes inedible (5 days), the authors estimate human group size to be about 30 (when assuming that small groups of about 10 individuals were cornered and killed, this number amounts to 200). It is assumed that the humans used the topography of the area (the now disappeared rocky bank at the feet of which the site was located, the swampy area between the site and the hill) to drive and trap their prey, which requires, according to the authors, a twenty-some individuals participating in the event. Consumption of the acquired resources happened in the vicinity of the kill site, with the possible exception of the meat around the hip and the proximal part of the femur. Unfortunately, the latter cannot be confirmed (Farizy et al. 1994).

To conclude, the site arose out of a series of discontinuous seasonal occupations situated at the end of summer and/or the beginning of spring. The length of these occupations was estimated to about one or two months. Based on the total amount of meat represented at the site, a group size of 30 individuals, and the hypothesis that they returned every year, the authors calculated that it took a minimum of between two and
four centuries (with a likely guess of 1000 years) for the material on the site to accumulate. Bison were probably intercepted during their migration from the valley of the Garonne river to the plateau or vice versa, which is plausible during a cold climate. This would require for the hunters to take on a complete herd, and separate the eventual prey. Alternatively, being at the foot of a mountain range, it’s also conceivable that the large herds left the valley during summer as a result of insect infestation, splitting up in small groups to graze on the mountain flanks. Given the fact that no other sites are known from the direct area around Mauran, it’s possible that humans followed the herd (Farizy et al. 1994).

28. Mont-Dol

Location

Mont-Dol, Ille-et-Vilaine, France

28.2 Excavation

1872: S. Sirodot
1923: Vayson de Pradenne

28.3 Stratigraphy

Most likely, the archaeological remains have been largely recovered from layers 6 to 9, which rest on a layer of marine gravel representing an ancient beach (likely dating back to MIS5e), see Simonet and Monnier (1991:7).
28.4 Chronology

Based on the animal species, and more in particular the occurrence of *E. caballus germanicus*, the habitation at the site is situated during the Early Wurm. Because of the presence of *Dama*, a cold phase of MIS5, i.e. Mélisey I or II, is proposed. The authors feel strengthened in that assessment by the finding that the layer of marine gravel on which the archaeological layers rest, probably dates back to MIS 5e. Ultimately, they prefer Mélisey II, as a layer between the beach and the archaeological strata seems to have disappeared as a result of solifluction or colluvial action, after its deposition during the first cold phase of the early Wurm (i.e. Mélisey I) (Simonet and Monnier 1991).

28.5 Palaeoenvironment

Based on the macrofauna, which are dominated by horse, an open steppe environment could be envisioned for Mont-Dol, with a cold and wet climate. The abundance of mammoth and woolly rhino suggests the existence of, more specifically, a steppe tundra. However, forest species also occur, implying occasional forest stands, perhaps in the form of a gallery forest. The occurrence of *Megaceros* may suggest swampy patches (in the vicinity of the river) as well, and perhaps less cold temperatures (Simonet and Monnier 1991). As such, the inhabitants of the site seem to have had different patches available.

28.6 Archaeological tradition

Ferrassie Mousterian

28.7 Fauna

Method of collecting
According to Simonet and Monnier (Simonet and Monnier 1991) recovery of the archaeological material happened quite rigorous, as even microfauna was collected.

Conservation and fragmentation
Conservation of the material was good, leaving a lot of post-cranial remains. Practically all bones have been broken; mammoth and woolly rhinoceros long bones in particular were very fragmented. In any case, and despite the occurrence of natural fragmentation, fractures partly have a human origin (Auguste, Moncel, and Patou-Mathis 1998, Simonet and Monnier 1991).
Prey Taxa
See Simonet and Monnier (1991:10) for MNIs.

Carnivore taxa
See Simonet and Monnier (1991:10) for MNIs.

Marks
Only 20 cut-marks have been found, indicating dismemberment, and filleting (Simonet and Monnier 1991). Adding marks caused by marrow extraction, the total number reaches 4% of the total NISP.

Seasonality

Carcass exploitation
Several hundred small burned bone fragments have been found by Sirodot, who located at least one hearth during his excavation. Marrow extraction was attested, more so than butchery marks (Simonet and Monnier 1991). All anatomical elements were present (Auguste, Moncel, and Patou-Mathis 1998)

Human remains
None

Remarks
The authors mention a rhino NISP of 350 (MNI 19), while Auguste et al. (Auguste, Moncel, and Patou-Mathis 1998), following a recount of the rhino remains, report a NISP of 327, equivalent to only 8 individuals (in this study, the latter count was followed). This could question the validity of the formers’ count of the Mont-Dol macrofauna.

According to Auguste and co-workers (Auguste, Moncel, and Patou-Mathis 1998), the topographic situation (open air, next to a river, in a swampy area, at the foot of a cliff) is favourable to the acquisition of very large animals (see also their comparison of Mont-Dol to Biache, Taubach, La Cotte and Hofstade), of which in the case of rhinoceros, the most easily hunted animals were normally picked out (isolated young, old or weak individuals). According to that view, the fact that all rhino body parts were accounted for (Auguste, Moncel, and Patou-Mathis 1998), and the presence of at least one hearth (Simonet and Monnier 1991), Mont-Dol was a site where game was killed, butchered, and consumed.
29. Mutzig I

Location

Mutzig, Alsace (Bas Rhin), France

29.2 Excavation

1992: J. Sainty (re-cutting of a 0.9 metre high and 10 metre long transverse section, and a 3D excavation of a 3.5 by 2 metre area, such that a stratigraphic sequence with a total height of 1.8 metres containing six beds could be unveiled) (Patou-Mathis 1999)

29.3 Stratigraphy

See (Patou-Mathis 1999)

29.4 Chronology

No absolute dates have been obtained.
29.5 Palaeoenvironment

As Patou-Mathis summarises, the study of the micro- and macrofauna have indicated a marshy zone in the vicinity of the site, combined essentially with a mammoth steppe (containing open and wooded spaces), dominated by a cold, rather rigorous climate during winter. In C5, the climate was more moderate and humid, while during the deposition of C6, it was dryer (Patou-Mathis 1999). Given the location (on a hill slope, near a river, nearby marshes, panoramic view) multiple niches were again available for exploitation.

On biostratigraphic grounds, it was possible to place the site in the middle of the Last Glacial (corresponding to Gigny Stage 1), i.e. MIS 4 and/or the beginning of MIS 3 (Patou-Mathis 1999).

29.6 Archaeological tradition

According to Patou-Mathis, the lithic industry is attributed to the Middle Palaeolithic. Based on palaeoenvironmental data, MIS 4 and/or the beginning of MIS 3 is suggested (Patou-Mathis 1999), which translates to a Mousterian tradition.

29.7 Fauna

Method of collecting

Conservation and fragmentation

Overall, the faunal material has been poorly preserved (to the extent that some bones/anatomical parts are missing). In order of decreasing degree of preservation: layer 6, 5, 3-4. Fragmentation too is significant and mainly caused by a combination of human processing and post-depositional (e.g. freeze-thaw, percolation, weathering) agents. Bones from layers 5 and 6 are less fragmented than those of 3-4. For all layers, the unidentified fragments are most abundant, i.e. > 85 % (Patou-Mathis 1999).

Prey Taxa


The bones unidentified to the species level, and belonging to the bovid/horse size class, were indicated as such. However, a considerable number of fragments have been found in the three layers (297 in total), most of which having a diaphyseal thickness corresponding to that of reindeer. As no actual numbers were provided (other than
“most of”), they haven’t been taken up in the database as “C. elaphus/R. tarandus (size)”;
if they would have been, the importance of reindeer in the diet would have been stressed even further (see also table 5). Interestingly, the large herbivores in C3-4 are about equally represented, while in C5 and C6, reindeer and horse are more dominant. Given their age profile, reindeer seem to have been hunted as small groups consisting of mostly females and young, e.g. by using the bottleneck of the river (Patou-Mathis 1999).

**Carnivore taxa**
Carnivores are rare, as well as their reported activity on the bones. Nevertheless, fox and wolf have been clearly attested, and interestingly, in layer 6, cut marks have been discovered on the distal part of fragments of medial diaphyses of wolves’ ulnae, suggesting that the animals were skinned (Patou-Mathis 1999).

**Marks**
Anthropogenic marks, though uncommon, have been found on *Megaceros* (C5, marrow extraction), *Cervus elaphus* (C5, meat removal and disarticulation), and ‘deer’ (C6). Marks occur on horse as well, in the form of a cut mark and chipping for layer C6, and cut marks (indicating meat removal, disarticulation, and tendon-cutting) as well as percussion marks (extraction of marrow) in layer C5. In C6, 4 of the 25 bison remains bore anthropogenic marks indicating disarticulation, meat removal and marrow extraction; possibly a single bison was killed, defleshed at the killing site, and transported to Mutzig I. A similar account can be presented with regard to the young mammoth found in layer 5, of which 2 bones carried percussion marks (marrow extraction), one of those being partially burnt, and one bone fragment displayed cut marks due to meat removal. The reindeer were processed thoroughly: all long bones have been fractured, and fragments smaller than 2 cm are numerous (while there is a considerable deficit of extremities); this may indicate the extraction of fat or the preparation of stock (Patou-Mathis 1999).

**Seasonality**
Presumably, in layers C5 and C6, *Cervus elaphus* was hunted during the beginning of the summer (rutting season), when cervids exist only in (very) small groups. As *Capreolus capreolus* in C5 and C6, and *Cervus elaphus* in C3-4 were rare, specific hypotheses cannot be proposed. It is suggested that the young mammoth (3-4 years) found in C5 was hunted during the beginning of summer, perhaps using the marsh as a trap. In all layers, and as far as the seasonality of the different species could be established, all indications point to an occupation during spring and summer (Patou-Mathis 1999).

**Carcass exploitation**
Patou-Mathis proposes that the 4 horses in layer C6 have been scavenged, while those of C5 have been hunted, skinned at the kill site (e.g. the Alsace Plain), and transported to Mutzig I in pieces. Similarly to the horses of C5, the bison of C6 and the mammoth of C5 were killed elsewhere and brought to the site in pieces. In contrast, reindeer carcasses were brought in whole and either entirely processed on-site, or skinned outside the excavated area and disarticulated, their meat removed and their marrow extracted on-site.

**Human remains**

None

**Remarks**

Patou-Mathis offers a reconstruction of the site formation process for the different layers (Patou-Mathis 1999), which goes as follows:

**Layer 6**

- The construction of a small protective wall (0.6 meters high, 0.5 meters wide) on the side of the slope.
- The site was occupied once or several times (no discrete occupation floors have been found).
- After abandonment, the material was exposed for a short time, during which wolves exploited the remains.
- Afterwards, the latter slightly suffered from weathering, root etching and freeze-thaw cycles. Consequently, the site was gradually covered by red sands, followed by a new episode of alteration as water percolated through the sands colouring the bones.

**Layer 5**

- Under less cold and dry conditions, humans returned; this time they either stayed much longer, visited more frequently, or came in greater numbers.
- A knapping area and a combustion zone were attested.
- Layer 5 suffered the same kind of post-depositional alterations, but this time weathering was more pronounced (though still weak), while the influence of freeze-thaw cycles was much smaller; percolation was equally important
- Again, wolves scavenged the faunal remains (gnaw marks, punctures, a coprolite)

**Layers 4-3**
• The assemblages are to be found along the entire length of the site (more than 10 metres), but are very poor. While they occur basically in layer 4, in several locations, the latter cannot be separated from layer 3.
• It is assumed that this represents one short occupation by a few individuals, a site severely disturbed by post-depositional processes leading to an important loss of remains (stream action from uphill), or the secondary deposition of the archaeological materials originating from a site located higher on the river terrace.
• As percolation has been considerable, very heavy post-depositional humidity has been inferred. Abrasion from weathering and freeze-thaw activity are rare, indicating rapid burial.
• The rare carnivore marks are ascribed to fox and mustelids.
• No anthropogenic structures have been found.

In conclusion, Patou-Mathis suggests that Mutzig I probably functioned as a seasonal campsite with multiple and successive occupations, providing an ideal hunting location formed by the bottleneck of the Bruche valley, the presence of a panoramic view over this valley, and the presence of a marsh.
30. **Payre Location**

Rompon, Ardèche, France

30.2 **Excavation**

1990 - 2002: M.-H. Moncel
Mousterian material and/or a ‘cold fauna’ had been discovered in the 1950s, though through small-scale excavations or sounding (Moncel 2008).

30.3 **Stratigraphy**

The site consists of two loci, i.e. Payre I and II, with an excavated area of about 80 m². The stratigraphy is shared by both, so in essence, both loci represent the same site (Daujeard 2008, Valladas et al. 2008a). The 5 meter thick sequence has been divided into ten strata (A to J), four of which containing archaeological deposits (G, F, E, D-C) (Rivals, Moncel, and Patou-Mathis 2009), see Rivals et al. (2009: fig. 2):

- J: local breccia
- I: breccia
- H: stalagmitic floor (MIS 9-7)
- G: contains two occupation phases, one of which harbouring most of the Neanderthal remains (MNI: 3 or 4), which have been retrieved from a small area belonging to a single layer. The deposits have been dated to MIS 8-7 (U/Th, ESR and TL on bone and teeth), and have been deposited during a cold and dry climate.
- F: contains alternating occupations by Neanderthals (4: Fa, Fb, Fc, Fd) and cave bears. Again, dating results point to MIS 8-7. Pollen analysis suggests a semi-
forest environment with Mediterranean trends, while microfaunal patterns still point to a cold and dry climate.

- **E**: corresponds to the collapse of the cave ceiling and opening of the cavity at the beginning of MIS 5 (or end of MIS6), dated by U/Th and ESR. Few archaeological remains have been detected. The climate was temperate (pollen analysis).

- **D**: after the opening of the cave, the surface shrinks progressively. As such, the human occupations of these levels took place in open air under small shelters. This level (D1 + D2) has the richest archaeological deposits (that is, D2). In level D2, the rest of the Neanderthal remains were found (in casu, a second molar of a young Neanderthal). This layer has been excavated over a surface of 80 m², and suffered from significant bioturbation (roots), making it difficult to separate the occupation layers.

- **C**: filling took place in open air, archaeologically sterile

- **B-A**: archaeologically sterile

The site is currently an open-air site at the edge of a rocky outcrop. During the occupation that concerns us here (layer D), only very small sheltered spaces remained (Moncel and Patou-Mathis 2008).

### 30.4 Chronology

Absolute dates have been obtained on stalagmitic flowstones and palaeontological remains, i.e. bones and teeth (U-series and ESR), while burnt flints have been dated by TL (Valladas et al. 2008a). Of the entire series of dates meant to obtain a precise chronological framework (palynological, micromammal and lithic evidence didn’t allow for a correlation with the MIS-system), those on level D are the ones of consequence here:

- teeth: 145 +33/-23 ka BP and 144 +31/-22 ka BP
- bones: 139 ± 16 ka BP, 140 +40/-34 ka BP, and 186 +45/-33 ka BP

Dates on two bones from layer E give ages similar to the ones on the layer D teeth (145 +37/-27 ka and 146 +34/-26), suggesting that layers E and D were deposited fairly rapidly, during MIS 6 or the beginning of MIS 5 (the latter being the most likely based on palaeoenvironmental evidence). Layers F and G date to the end of MIS8 and the beginning of MIS7, which means the site is largely Middle Pleistocene (Valladas et al. 2008).

Valladas and co-workers also published a slightly different set of dates; in particular, the dates have smaller error margins, see Valadas et al (2008b:111). Also provided is a weighted average for the dates of layers D and E, i.e. 144 ± 11 ka (Valladas et al. 2008b), which is, for reasons of convenience, the number used in the database.
30.5 Palaeoenvironment

Based on palaeoecological arguments (Bouteaux 2003:102-106), the actual environment of the site is considered to be mixed (open and predominantly, closed), whereby the forested areas were well-developed and associated with areas dominated by herbs. The climate was temperate and humid. Given the topographic location, on the edge of a plateau, and overlooking the valley of the Payre river), the site was implanted in a mosaic of biotopes (forest, prairie, plateau, streaming water, i.e. the Payre and Rhône river), allowing a rich and diversified fauna to be sustained (Bouteaux 2003, Patou-Mathis et al. 2008).

30.6 Archaeological tradition

Mousterian rich in denticulates and racloirs.

30.7 Fauna

Method of collecting
Desclaux and co-workers (Desclaux et al. 2008) mention that sediment was systematically sieved so that small mammals and molluscs could be retrieved; however, they don’t elaborate on the mesh size.

Conservation and fragmentation
Part of the site has disappeared due to slope erosion (Moncel 2008, Moncel, Debard, and Dubois 2008). As such, only part of the fauna has been preserved. Moreover, post-depositional processes (e.g. bioturbation, karstic activity) have certainly led to a dissolution of the smallest bones and a disturbance of spatial patterning (Moncel and Patou-Mathis 2008). Moreover, bones are very fragmented: layer D has 15983 bone remains, while only 1123 could be identified (i.e. 16/m²) (Moncel and Patou-Mathis 2008).

A paper by Bouteaux which deals with all faunal remains retrieved up until 2000 (Bouteaux 2003), considers the preservation of the fauna material to be relatively bad, as more than half the remains are cranial, most of which are teeth.

Prey Taxa
*Cervus elaphus* is the most important taxon; as prime adults rather than young or old animals have been hunted, and as anthropogenic marks were found most frequently on *Cervus elaphus*, its remains were ascribed to human hunts exclusively (Bouteaux et al.
2008). This appears not to be the case with *Sus scrofa* (a young and a senile specimen), on which no indications of human intervention have been found (Bouteaux 2003, Bouteaux et al. 2008). As anthropogenic striations were found on an *Ursus arctos* phalange, this species could have been hunted for its fur (Bouteaux 2003); however, the author is reluctant to suggest the animal was consequently eaten. No explanation has been provided for the presence of lagomorphs and *Castor* in terms of human action. MNI data has been presented on page 244 of (Bouteaux et al. 2008).

**Carnivore taxa**

Carnivores left few traces on the bone surfaces (0.15 % of the total number, i.e. 20 specimens). The marks were found on carnivore and herbivore bones, and can be ascribed to canids (wolf ?). *Ursus spelaeus* is considered an intrusive species, individuals (mostly adults and seniles) of which having died during hibernation. While the carnivore NISP is high (38 % of the total NISP), it is argued that carnivores either scavenged the remains left by humans, or used the shelter when the latter left (Bouteaux et al. 2008). This conclusion equals that of an older study (Bouteaux 2003), which specifies that *Ursus* seem to have inhabited the rockshelter before humans did, as there are no trampling marks on the bones caused by hibernating bears. The same paper also suggests that the carnivore contribution to the (herbivore) prey fauna must have been small, as a lot of epiphyses have been preserved; carnivores other than *Ursus spelaeus* will have been attracted to the latter’s carcasses or to human kitchen waste.

**Marks**

Cutmarks on a brown bear (*Ursus arctos*) phalange suggest that the animal was skinned, and perhaps hunted by humans. In all 8.25 % of the total number of bones bore traces of human butchery activities, 0.35 % of which are cutmarks, and 7.90 % (i.e. 57) showed signs of breakage (although the exclusive action of humans could not stated with certainty). Additionally, 3.24 % of the bones showed signs of burning. Among cutmarks, disarticulation was attested the most (n=12), followed by skinning (n=3) and meat removal (n=3). However, among the non-identified bones, another 19 cases pointed to meat removal, which would make this the cutting activity that was documented best. In total, 11.50 % of the total number of bones bear traces of human activity (cut marks, percussion marks, burning) (Bouteaux et al. 2008).

**Seasonality**

Using dental (meso and, especially, micro) wear analysis, Rivals and co-workers suggested that, during the deposition of layer D, diets were more extreme for all species, i.e. a higher level of abrasive food for the open habitat species, and lower levels for the closed habitat species (in case *Cervus elaphus* and *B. primigenius*). Basically, this suggests a shift towards more grazing for the grazers, and more browsing for *Cervus elaphus*. As
microwear reveals clues to the diet on a shorter time-averaged basis than mesowear, this shift is explained as the feeding habits of animals during winter, when food sources are more limited. The underlying rationale would be that competition drives animals to less desirable food sources, such that *Cervus elaphus* for example would forage in open environments (which induce more extensive wear). According to the authors (Rivals, Moncel, and Patou-Mathis 2009), this finding supports the zooarchaeological analysis (Bouteaux et al. 2008) that indicates an exploitation of *Cervus elaphus* during winter.

**Carcass exploitation**
Given the diversity of the marks found on *Cervus elaphus* is it suggested that all the butchery phases of this species took place at the site, following the introduction of the complete carcass (Bouteaux et al. 2008). Boutreaux (2003) adds that other animals were introduced to the site in quarters rather than whole, with the most elementary butchering activities performed at the kill site, and secondary butchering (disarticulation and beyond) performed at the rockshelter (Bouteaux 2003). Still according to that author, the hunt focused on *Cervus elaphus*, whereas the rest of the herbivore fauna was hunted/scavenged opportunistically (with the exception of the probable carnivore exploitation of *Sus*). As the burnt bones (518 specimens, or 3.24 % of the total number) were mostly fragments smaller than 2 cm, the authors propose that they have been used as fuel (Bouteaux et al. 2008).

**Human remains**
*H. neanderthalensis* in G, F, E and D2 (NISP=1) (Condemi and Moncel 2008).

**Remarks**
Besides having been formed in an inherently unstable karstic system, the archaeological material of layer D was significantly perturbed by the proximity of the present soil surface, bioturbation caused by animals and roots, and erosion (Moncel, Debard, and Dubois 2008).

There are several publications tabulating the NISPs of the site. Grayson and Delpech (Grayson and Delpech 2006) cite Moncel and co-workers (Moncel et al. 1993), and another source from the 1990’s as the basis for their NISP count. However, as excavations progressed, more faunal material was excavated, resulting in more recent analyses, i.e. by Bouteaux, who studied the faunal remains of layer D recovered during 1998 to 2000 (Bouteaux 2003). In 2007, another update of the list was published in a paper on layer D (Moncel et al. 2007). From that, and the minor alterations that have been made to it in chapter 14 of the site’s monograph (Bouteaux et al. 2008), it can be concluded that the total counts were tabulated. Therefore, the final list, as published in the last reference, has been used in the current study.
While not entirely pertinent to the NISP count of layer D, a diet isotope study on bones originating from layer F (which was more humid and wooded than D) revealed that Neanderthal herbivore prey were feeding primarily on dense forest undergrowth, implying that Neanderthals were fully capable of exploiting a forest environment (Bocherens and Rousseau 2008). Interestingly, the excavators note a shift in animal exploitation between the upper and lower levels of layer F: the latter contain bigger and more heavy species, while the during the former, small and medium-sized prey have been hunted. As possible explanations they cite the change in climate and environment between those layers, and an change in subsistence behaviour (i.e. prey choice and season of occupation) (Moncel and Patou-Mathis 2008).

Besides seasonality, dental microwear also informs about the relative duration of the occupations (Rivals, Moncel, and Patou-Mathis 2009): high variability in the microwear signal indicates a long occupation (or repeated visits) over several seasons. Based on the data extracted from *E. ferus* and *C. elaphus*, the variability of layer D sits between that of F and G. As such, during the deposition of F, humans briefly occupied the site, but they did so multiple times and during the same season. In Layer G, the high variability would point to a single long, or multiple short occupations (during different seasons), the latter option being favoured by the authors. In any case, while they don't favour a model of successive short occupations for layer D, the intermediate position (in terms of microwear) of this layer makes it difficult to interpret the duration of the occupation(s); moreover, as the authors stress, this is more often the case than not, such that distinguishing between a butchery stop and a short or long unspecialized occupation, or between the opposing models of territory exploitation (radiating/collector/logistical vs. circulating/forager/opportunistic) is notoriously difficult for the Middle Palaeolithic. Nevertheless, they seem to go for seasonal short term occupations during the end of autumn and the beginning of winter. In an earlier publication, the interpretation of Payre D as being a hunting camp where a diverse set of species, with *Cervus elaphus* on top were consumed, has been suggested (Bouteaux 2003, Bouteaux et al. 2008).
31. **Pech-de-l’Azé I**

*Location*

Carsac, Dordogne, France  
44°50’N, 1°14’E (Soressi et al. 2007).

Pech-de-l’Azé I, II, III and IV constitute a complex of 4 sites, situated along the banks of a partially dried up valley of the Farge (a brook). Site I and II are to be found on the extremeties of a long cavity, site III is a small cave 30 meters to the west of Pech II, and site IV is a collapsed rockshelter 80 meters to the east of Pech I. Site II and III are known primarily for their Acheulean levels, while I and IV only possess Mousterian units (McPherron, Soressi, and Dibble 2001).

31.2 **Excavation**

Pech I has been excavated from the 19th century onwards (Jouannet, l’abbé Audierne, Lartet & Christy, Capitan & Peyrony, Vaufrey). The last excavation campaign, by F. Bordes, took place in 1970 and 1971, and hasn't been published, which is why a new, multidisciplinary research program was set up (led by M. Soressi) to publish the data, and to complement it with new, but small-scale excavations on-site (McPherron, Soressi, and Dibble 2001).

31.3 **Stratigraphy**

Excavation of the site happened for the most part in front of the cave, up until the dripline. As such, a series of MTA levels was discovered by Bordes during the 1949-1953 excavation, bottom to top (McPherron, Soressi, and Dibble 2001):

- **Level 4**: MTA type A
- **Level 5**: MTA type A/B (transitional level)
- **Level 6**: MTA type B
- **Level 7**: MTA type B evolved
The faunal material discussed here, and studied by Laparra (Laparra 2000), stems from the unpublished excavation by Bordes during 1970-1971. On a surface of about 25 m², the latter excavated about 15 000 (provenienced) pieces, of which more than 12 000 lithic artefacts. They occurred in the same constellation of levels that was witnessed on the terrace, away from the rock face (McPherron, Soressi, and Dibble 2001).

31.4 Chronology

A number of dates have been obtained (through different methods) for the different layers of Pech I (Soressi et al. 2007). The only date available for layer 4 is an old conventional $^{14}$C date on several kilograms of burnt bone (i.e. without applying ultrafiltration); it should therefore be considered a minimum: GrN-6784: 42230 ± 1340 $^{14}$C BP. This uncalibrated date is compatible with the minimum calendar (ESR/U-Th) date of 43 ka BP for the layer above (5).

For layer 6, more data are available. Two recent AMS $^{14}$C dates obtained from two unburnt specimens of cortical bone, i.e. GrA-25632 (38430 +560/-470 $^{14}$C ka BP) and GrA-25633 (37060 +490/-420 $^{14}$C ka BP) have been calibrated using two different curves; the combined calibrated age range for the two samples is 41.7 – 43.6 ka cal BP. The combined U-Th/ESR date range is 37-51 ka BP for layer 6, and 41-58 ka BP for layer 7. The latter may be constrained (i.e., younger) by the upper limit of the calibrated $^{14}$C age range, i.e. 43.6 ka BP.

31.5 Palaeoenvironment

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31.6 Archaeological tradition

**Level 4 : MTA type A**
Level 5 : MTA type A/B (transitional level)
**Level 6 : MTA type B**
**Level 7 : MTA type B evolved**
(McPherron, Soressi, and Dibble 2001)
31.7 Fauna

Method of collecting
The material of the recent excavations has been sieved with a mesh size of 3 mm; in contrast, during the 1970-1971 excavation, preferentially identifiable remains were collected (and recorded in three dimensions), thus introducing a bias that made studies involving carcass transport and prey selection impossible (Rendu 2010). As the author stresses, during the Soressi excavation, the different layers have been unequally sampled, such that no thorough analyses (e.g. skeletal part analysis) could be performed on layer 6.

Conservation and fragmentation
Due to marrow and grease exploitation, fragmentation has been considerable (Rendu 2010).

Prey Taxa
Importantly, only weakened deer were hunted in layers 7 (isolated individuals) and 6 (herds), despite the difference in prey aggregation. Two cut-marked eagle phalanges have been found in layer 4 (pointing to the gathering of raptor claws, not necessarily the hunt of this bird of prey for food), as well as two cut-marked beaver remains in layer 7 (Rendu 2010). The bird remains in layer 6 apparently show no signs of exploitation, nor do the *Lepus* sp. remains in layer 4.

Carnivore taxa
The number of carnivores in all assemblages is very small, so are carnivore marks on the bones. Together, these facts suggest that the carnivore impact on the assemblage has been very small, especially when the number of carnivore marks is compared to the number of anthropogenic marks (and the fact that the layers in question contained hearths and human remains) (Rendu 2010).

Marks
Based on the Soressi excavation: only 1.8 % of the remains of layer 7 bore traces of carnivore damage, while 0.9 % of the bones showed evidence of carnivore modification in layer 4. In contrast, bones with anthropogenic marks in layers 4 and 7 mount up to 35 % (Rendu 2010).

Seasonality
During the deposition of layer 7, deer (individual males) were hunted at the end of the warm season. Males stop feeding at that point, so that at the end of rut, they are
weakened. Possibly, the hunters used this weakness to trap the animals, or they scavenged on prime adult animals that show a high mortality during that period. 
In level 6 the deer hunt (matriarchal groups) occurred during the beginning and the middle of the warm season; the meat weight is then at its lowest level, and due to the presence of newborns, these groups exhibit a low mobility pattern. 
In level 4, juveniles, males, and females were hunted unselectively (catastrophic death profile); no season could be established (palimpsests of occupations with a different seasonality, or no seasonality/selection).

**Carcass exploitation**
Marrow and grease were recovered, leading to a high degree of fragmentation. In layer 4, the red deer (the most abundant prey taxon) age profile resembles an unselective, catastrophic profile, while in layer 7, preferentially prime adults were hunted.

**Human remains**
Level 6: Neanderthal skull and mandible (Soressi et al. 2007)

**Remarks**
The two primary sources used by Grayson and Delpech (Grayson and Delpech 2006) for the construction of the fauna list of this site – two theses, i.e. by Laparra (Laparra 2000) and Rendu (Rendu 2002), couldn’t be obtained. However, the data were contained within a very recent paper by Rendu (Rendu 2010). As the latter points out, the new excavations by Soressi and co-workers have increased the amount of faunal remains considerably. The faunal spectrum for the 1970-1971 excavation is presented by Rendu (2010:1800), while the spectrum based on the latest (Soressi) campaigns can be found in Rendu (2010:1801). To increase sample size, the species NISPs used here are those of both excavations combined. However, given the bias introduced by the 1970-1971 excavation, detailed results on e.g. carcass exploitation discussed above are primarily, if not entirely, derived from the new campaigns.

According to Rendu (Rendu 2010), level 4 is interpreted as a ‘camp site’, while a little further down the paper, he concludes that it must have been a home base, due to the fact that multiple animal transport strategies were attested, combined with an exploitation of marrow and grease on site. Numerous pieces of mineral pigments have been found, half of which showing signs of being applied to (a probably) soft material. In contrast, pigments are rare in levels 6 and 7. This difference, and especially the difference in archaeological tradition, has been interpreted as a shift from a subsistence system based on logistical, to one based on residential mobility, in absence of a clear climatological shift, and accompanied by a shift in lithic tradition. Still, layers 6 and 7 are also considered to be base camps. A determining factor may have been the size of the shelter, which schrank to 50 % after the deposition of layer 4; possibly, the decrease
in habitable area may have influenced the group size of the people who occupied the shelter (see Rendu (2010:1808) for a synthesis).

32. Pech-de-l’Azé II

Location

Carsac, Dordogne, France

Coordinates of site I have been copied as those provided by the MIS3 database for site II are too far away from those sited by Soressi and co-workers (Soressi et al. 2007) for site I.

Pech-de-l’Azé I, II, III and IV constitute a complex of 4 sites, situated along the banks of a partially dried up valley of the Farge (a brook). Site I and II are to be found on the extremities of a long cavity, site III is a small cave 30 meters to the west of Pech II, and site IV is a collapsed rockshelter 80 meters to the east of Pech I. Site II and III are known primarily for their Acheulean levels, while I and IV only possess Mousterian units (McPherron, Soressi, and Dibble 2001).

32.2 Excavation

Discovery of the site in 1949 during excavation (between 1949 and 1951) of Pech I by F. Bordes and M. Bourgon.

1967-1969: F. Bordes

32.3 Stratigraphy

The stratigraphy of Pech II is described by Laquay (Laquay 1981), see Laquay (1981:20). Following Laquay (Laquay 1981), Grayson and Delpech (Grayson and Delpech 2006) consider layer 4A as consisting of 4A1 and 4A2, but provide a separate species list for 4A, as in some cases, it hasn’t been possible to discern both sub-layers. In the current study however, the NISP count of 4A as a whole is considered, i.e. the sum of layers 4A, 4A1 and 4A2.
32.4 **Chronology**

Multiple ESR dates have been obtained on animal teeth by Grün and co-workers (Grün, Mellars, and Laville 1991). For layer 4 as a whole an age-range of 71-87 ka BP has been suggested. Similarly, layer 3 has been placed in the period ranging from 60 to 72 ka BP, while layer 2 has been situated between 54 and 59 BP (and layers 6-9 between 130-162 ka BP).

32.5 **Palaeoenvironment**

See Laquay (1981:21)

32.6 **Archaeological tradition**

See McPherron et al. (2001)

32.7 **Fauna**

**Method of collecting**

**Conservation and fragmentation**

**Prey Taxa**

**Carnivore taxa**

**Marks**

**Seasonality**

**Carcass exploitation**
**Remarks**
Layer 5 apparently has no associated lithic industry, and the number of carnivores is considerable (Laquay 1981). Hence, the human impact on the faunal assemblage must be questioned. Moreover, the percentage of carnivores in terms of NISP varies considerably throughout the sequence, going from 0 % to 53 %. As far as the latter may be interpreted as a proxy for carnivore influence, that influence may have been significant.
33. Pech-de-l’Azé IV

Location

Carsac, Dordogne, France

Coordinates of site I, provided by Soressi and co-workers (Soressi et al. 2007) have been used here.

Pech-de-l’Azé I, II, III and IV constitute a complex of 4 sites, situated along the banks of a partially dried up valley of the Farge (a brook). Site I and II are to be found on the extremeties of a long cavity, site III is a small cave 30 meters to the west of Pech II, and site IV is a collapsed rockshelter 80 meters to the east of Pech I. Site II and III are known primarily for their Acheulean levels, while I and IV only possess Mousterian units (McPheron, Soressi, and Dibble 2001).

33.2 Excavation

The site was discovered by Bordes in 1952, after which it was excavated by B. Mortureux between 1953 and 1956. Bordes himself continued the work between 1970 and 1977. To this date, the site hasn’t been properly published. Therefore a new, multidisciplinary research program has been set up (led by H. Dibble and S. McPherron) to publish the data, and to complement it with new, but small-scale excavations on-site (McPherron, Soressi, and Dibble 2001) in order to clarify the sequence, to obtain new samples for dating, and to get a grip on the formation processes of the site. To date, this has led to several publications (Dibble et al. 2009a, McPherron and Dibble 1999).

33.3 Stratigraphy

From Bordes’ preliminary publication of the site’s stratigraphy in 1975 (Bordes 1975), and his excavation notebooks, drawings and registration of the provenienced remains, the following (bottom to top) was distilled by McPheron and co-workers (McPherron, Soressi, and Dibble 2001):

- **Layers Z, Y, X**: consisting of multiple lenses made up of archaeological remains, not always easily separated, with multiple indications of hearths (about 10 % of the lithic remains have been burned); Typical Mousterian
- **Levels J (J1, J2, J3, with further subdivisions)**: most likely, the subdivisions are arbitrary (based on the vertical and sagittal projection of the remains). Level J contains a rich lithic industry, multiple faunal remains, and multiple traces of hearths; J1 and J2: Typical Mousterian; J3a-c: Asinipodian
- Levels **I1** and **I2**: could belong to the same unit; both harbour an extensive collection of Typical Mousterian artefacts.
- Levels **H1** and **H2**: poor levels, Typical Mousterian
- Level **G**: almost sterile
- Levels **F** (with subdivisions): again, the subdivision is likely to have been arbitrary

Laquay (Laquay 1981) provides a NISP count for layers J2 to J4 as a single unit (next to counts for the individual layers), stating that the separation of the layers was impossible in a given place of the sequence. While such a cumulative count is used here too (see e.g. below involving layers X, Y, Z, and 8, and 4A, 4A1, 4A2 for Pech II in the previous chapter), this happened for a different reason when layer 8 was involved, and not, as in the case of Pech II, in the context of layers with very different lithic industries.

As a result of the new excavation campaigns, a new stratigraphy came to light which is partly independent of Bordes’. Having pointed out that sublayers have been identified arbitrarily (McPherron, Soressi, and Dibble 2001), identification of the main units may not always have been straightforward either, as the new **layer 8** (new excavations) corresponds to the old layers Y and Z, and the basal part of X. The upper part of X, clearly distinct from layer 8, has been renamed to layer 7 (Dibble et al. 2009a). The new stratigraphic sequence is as follows (Dibble and McPherron s.d.):

- 8 = Z, Y, base of X
- 7 = upper 5 to 10 cm of X
- 6 B + 6 A = J3c-a, J3
- 5 B + 5 A = J2, J1, I2
- 4A + 4B + 4C = I1, H2, H1, G
- 3B + 3A = F4, F3, F2, F1
- 2 = 1-3
- 1D, 1C, 1B, 1A = not identified by Bordes

However, in a synthetic figure, the authors’ stratigraphy is slightly different. For layer 8, the only one published in detail so far (and therefore the only relevant layer here), they retain the spread of layer X over layer 8 and 7, while in their summary figure, they equate X with 7 (or even 6b +7).
33.4 Chronology

Layer 8: Five flint samples (out of 15) have turned out to usable for TL dating, see Dibble et al. (2009:193). A weighted mean was obtained for these dates, i.e. 99.9 ± 5.4 ka BP, which places the occupation in marine substage 5c (Dibble et al. 2009a).

33.5 Palaeoenvironment

Layer 8: The attribution to marine substage 5c appears to be corroborated by the anthracological study, which identified a temperate to cold woodland environment (slightly cooler than present day) (Dibble et al. 2009a). The paleontological study as well pointed to wooded conditions (prevalence of *Cervus elaphus*; presence of *Capreolus capreolus*, *Sus scrofa*, *Castor fiber*). The authors interpret the scant evidence for reindeer not as a mixing of find horizons, but as an indication that Pleistocene reindeer inhabited a broader range of environment than is currently the case, and therefore an indication of ecological conditions without a modern analog (Dibble et al. 2009a).

33.6 Archaeological tradition

Asinipodian (J3a-c), unspecified (G), or Typical Mousterian (the others in the database) (McPherron and Dibble 1999).

33.7 Fauna

Method of collecting

Layer 8: a 6 mm mesh waterscreen was used to recover faunal remains. Until the moment of writing, the sieved part is merely a preliminary sampling (Dibble et al. 2009a). However, in another paper, the authors mention a wet-screening using mesh sizes of 7 and 3 mm (Dibble, Raczek, and McPherron 2005). The latter authors also mention that Borde didn’t use screens in his excavation, but that nevertheless, few artefacts have been found in the sieved backdirt; this suggests that the actual excavators discarded only the smallest pieces (chips).

Conservation and fragmentation

Layer 8: The fragmentation of the material is reported as ‘extensive’, and characterised by either breakage of long bones in a context of marrow processing, or dry breakage after the organic content of the bone was lost (the majority was burnt and subsequently trampled). Despite the high level of fragmentation, the bone surfaces have been
preserved relatively well, such that cutmarks and striations could be identified. Density-meditated destruction was significant, although multiple fetal bones have been preserved intact. Therefore, it is suggested that multiple factors impacted the preservation of fragile bone, such as burning, trampling and chemical processes. All things considered, layer 8 has remained in a stable condition since the time of occupation; the damage that does occur seems to have been caused by human action (trampling), which, while leaving the assemblage relatively intact, was responsible for the fact that the burned zones couldn’t be excavated as individual features, prohibiting a spatial analysis. Nevertheless, it could be concluded that humans lived just inside the former dripline (Dibble et al. 2009a).

**Prey Taxa**

**Layer 8**: see Dibble et al (2009:195) for NISPs and MNIs. The NISP counts for the other layers can be found in Laquay’s thesis (Laquay 1981). Interestingly, while *Castor* had been exploited in layer 8, this also seems to have been the case in other layers (J3b, J3c, J4).

**Carnivore taxa**

**Layer 8**: the only carnivore recovered is wolf (NISP=2, MNI=1). Only a single gnaw mark was attested; the main accumulator of the faunal assemblage is therefore assumed to be humans. In contrast to Pech II, carnivore NISP never rise above 5 % of the total NISP count, suggesting that their impact was relatively limited, which has been substantiated at least for layer 8.

**Marks**

**Layer 8**: see Dibble et al (2009:195) for the (significant) percentage of burned and cutmarked bones (i.e. 13.2 %). Species include hare, beaver, red deer, reindeer, roe deer, a bird, and groups of indeterminate cervids, and small and large artiodactyls; activities include disarticulation, skinning, and meat removal. *Cervus elaphus* and *Capreolus capreolus*, which are the most frequent species, also bear the highest amount of cutmarks (Dibble et al. 2009a). Cutmarks have been described by Laquay, but only in a very limited way, for the other layers; he did publish a (presumably exhaustive) table with burned bones for layers J3c-a, J1 and I1 but the numbers are limited (Laquay 1981).

**Seasonality**

**Layer 8**: red deer was exploited during winter and late winter/spring, which corresponds well to boar (early spring) (Dibble et al. 2009a).

**Carcass exploitation**
Layer 8: red deer was the only species frequent enough to evaluate skeletal element frequencies. The analysis suggests that the animal was introduced in one piece. Marrow extraction was frequent, as 37.8% of the bones showed evidence of fresh helical breakage (Dibble et al. 2009a).

No apparent age or sex selection seems to have influenced animal exploitation. Except for the Asinipodian layers, where Capreolus was preferentially hunted, Laquay concludes that humans seem to have hunted those animals that were most frequent. Ungulates, except for bovids and equids, appear to have been brought to the site in one piece. A systematic fragmentation of the bones was performed to extract the marrow (Laquay 1981).

Human remains
During the 2002 campaign, a human teeth was found in layer 5A (a germ fragment of the crown of a third molar) (Dibble and McPherron s.d.).

Remarks
The dark organic, ‘greasy’ deposits of layer 8 contain evidence of multiple burning, trampling and hearth-cleaning events, which have been preserved because of a posterior roof collapse (as such, before reaching layer 8, water was saturated with carbonate before coming into contact with the carbonate containing materials such as ash) (Dibble et al. 2009a).

Small fauna is present in the form of a beaver and a medium-sized bird of prey. Both were cutmarked and burnt. While the former provides a good source of meat, equivalent to that of a roe deer, and a warm fur, the latter may have been exploited for non-subsistence goals, as the cutmarks point to the removal of the talon’s sheath (for as yet unknown reasons). The authors indicate that the importance of small fauna in the other layers is yet to be determined, but argue that partly, preservation or excavation techniques may be responsible for the generally low number of bones attributable to small fauna and birds (Dibble et al. 2009a).

Despite several issues that came up when the material from Bordes’ excavation was re-evaluated (e.g. the use of duplicate Unit-ID numbers, mislabelling of artefact drawers, the differential discard of flakes vs. tools and cores), the authors comment that the excavation had been performed very well (Dibble, Raczek, and McPherron 2005). Nevertheless, they acknowledge that current day excavation practices have higher standards, e.g. in terms of spatial resolution, such that old data should always be approached with caution (McPherron, Dibble, and Goldberg 2005). Based on the fact that the overall level of tool production is low in layer 8, while the assemblage appears to have been largely manufactured at the site, it is suggested that either occupations were highly ephemeral (the high number of hearths being ascribed to an accumulation resulting from numerous occupations), or predominantly
unretouched flakes were used to carry out the activities at the site (Dibble et al. 2009a). Based on several lines of evidence, animal bone was burned to both clean the area and as an additional fuel source next to wood, taking place over repeated occupations. However, the function of the fires themselves (in layer 8 at Pech IV, and other sites) eludes the authors, as there seems to be no correlation between the presence of hearths and stone tool variability (which suggests that the fire is related to activities in which stone tools play no part). Because of their low temperatures, their lack of internal structure, and their small size, the hearths are tentatively interpreted as domestic structures (e.g. for cooking and warmth), while their limited thickness suggest they have been used for a very limited time only. However, the question remains why these structures become less numerous in the younger (and colder) layers of Pech IV.

34. Le Piage

Location

Fajoles, Lot, France
34.2 Excavation

1953: test trench 2 meters wide and 13 meters long by F. Champagne and R. Espitalié
1958-1967: excavation of ± 80 m² by F. Champagne and R. Espitalié

34.3 Stratigraphy

Bordes and co-workers identified two principal zones (central, south) during their recent excavation, of which the southern one has been preserved best (Bordes and Le Brun-Ricalens). The interstratification of the Chatelperronian (F1) and the Aurignacian (Champagne and Espitalié 1967, Champagne and Espitalié 1981) in the northern zone of the site is reported as real but caused by solifluction. They go on to point out that the archaeosequence in the southern zone, as set up by Champagne and Espitalié (see Champagne and Espitalié 1981:17), may be simplified based on lithic (taphonomic) analysis: layers GI and F should be envisioned as a (single) sheet of remains, while K retains its autonomy and J seems to be a mix of the two previous units.

However, the recent excavation of ‘coupe sud’, the part of the site that’s been preserved best, suggested another, more complex archaeostratigraphy than the one proposed by Champagne and Espitalié:

- α: mix of Solutrean, Badegoulian and more recent periods
- b (b s.s., b1 and b2): Aurignacian I
- d (a, c, and d): Aurignacian I

At the end of the 2006 campaign, only the Aurignacian I of old levels F and the top of GI had been reached, i.e. the sheet of artefacts the new excavations designate als G-I + F. If the old (faunal) data are used, it makes sense to refer to layers G-I + F, and K only, as these turn out to be the only valid units of analysis. If only the new data are used, b and d become the only layers to be considered. In case the data of both old and recent excavations is to be used, which we have done⁶, the analytical units become layers (G-I + F + b + d) and K, J being a mix of (G-I + F) and K.

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⁶ while excavated with different methods and precision, b and d might be added to the classic layers to increase sample size
34.4 Chronology

The dates gathered for the 1981 publication were all too young. Gif-5027, on bone collagen from layer F was considered the best date (29 ± 1 ka BP), despite being 2-6 thousand carbon years away from what was expected based on carbon dates of Abri Pataud, Cottés, and La Quina (Champagne and Espitalié 1981).

34.5 Palaeoenvironment

The sedimentological analysis points to a cold climate in layers I, J, and K. The sterile lens H was deposited during a warmer and more wet phase. Layer G is again more cold and probably less wet, while F1, the local Chatelperronian layer is again much wetter. Layer F, harbouring the most recent Aurignacian occupation, formed during a cold and dry climate (Laville 1981). Still according to that author, K, I, H, and G form the four pulses of the first phase of the Wurm III, or Wurm III-Périgord Ia, b, c, and d. F then corresponds to Wurm III-Périgord II, while phase III, correlated to the Arcy interstadial, isn’t represented at Le Piage. Overall, the climate is cold with a varying degree of humidity.

The climatological interpretation of the (very limited) bird fauna is as follows (Mourer-Chauviré 1981): K is considered to have been cold, while F1 was a relatively temperate climate, leading to a landscape with open spaces.

In a concluding section (Champagne and Espitalié 1981), the following scheme was proposed:

- Layers K + J: cold and humid (Würm III – Périgord Ia)
- Layers G - I: cold and humid (Würm III – Périgord Ic)
- Layer F1 (not considered here): warmer and very humid (Würm III – Périgord Id)
- Layer F: very cold and dry (Würm III – Périgord Iib)

Given the dominant presence of reindeer throughout the series, climate must have been cold overall.

34.6 Archaeological tradition

K: Aurignacian I (cf. La Ferrassie F)
J: Aurignacian I (cf. La Ferrassie F)
G-I: Aurignacian I (cf. Abri du Facteur 21)
F: Aurignacian I (cf. Abri Caminade niveau inferieur [niveau superieur = Aurignacian II])
All layers have been considered contemporaneous with the Aurignacian I of Roc de Combe, with the Aurignacian 0 of La Ferrassie, and the ‘Aurignacien de base’ of Abri Pataud. F is contemporaneous (sedimentologically) with the Aurignacian I of Caminade, the Aurignacian I-II of Roc de Combe and La Ferrassie, and also with the ‘Aurignacien de base’ of Abri Pataud. Sedimentology left aside, it is believed on typological grounds that F corresponds with the Aurignacian I of the sites studied by H. Laville.

Following the re-evaluation of the stratigraphy based on lithic artifact taphonomy (Bordes and Le Brun-Ricalens), it was noted that if GIF contains an Aurignacian I, K must be different and reminiscent of the Proto-Aurignacian as found in the Mediterranean and the Pyrenees area (while retaining an Aurignacian I component).

### 34.7 Fauna

**Method of collecting**

While a sieve is present on pictures of the site during excavation, no information has been found on the mesh size, or on the collection method (selective sieving seems to have been the method used, as artefacts smaller than 3 cm are rare). Moreover, most recorded coordinates of the lithics have apparently been lost (Bordes and Le Brun-Ricalens). The latter authors, when comparing their excavation with the old one, note that their campaign proceeded 100 times slower, such that collections obtained from both are most likely not directly comparable. Mesh sizes during the new campaigns were 1 cm, 4 mm and 2 mm. Lithic artefacts were provenienced from sizes of 2 cm onwards, bones from 3 cm onwards. Readily identifiable remains smaller than that were provenienced as well. To compensate for pieces that were not mapped, decapages were kept as thin as possible (depending on the nature of the sediment and the formation processes of the layer in question) (Bordes and Le Brun-Ricalens). The old material was collected per layer and per square metre (Beckouche 1981).

**Conservation and fragmentation**

Conservation varies from average to good, depending on the layer. Layer b, which has been preserved best, contains about 7 % heavily damaged bones, while 17.2 % of the bone remains of layer d display the highest degree of damage. The lesser conservation in layer d is at least partly due to root etching. Fragmentation is considerable (Bordes and Le Brun-Ricalens).

The number of dental remains was about 67 % for the old excavations (Beckouche 1981). The same author reports that the bones have been preserved so badly that a skeletal part representation analysis hasn’t been performed except for reindeer.
See Beckouche (1981:166) for NISPs and MNIs of the old excavation. There's a statistically significant increase in reindeer remains from layer d to b, the layer above (Bordes and Le Brun-Ricalens).

**Carnivore taxa**
Carnivores are rare.

**Marks**
Carnivore marks in layers b and d are very rare (2 specimens in layer b have bite marks), while only a single cylindrical long bone shaft fragment has been found. On the other hand, anthropogenic marks are abundant (very fragmented burned bones and cut marks) (Bordes and Le Brun-Ricalens).

**Seasonality**
Based on dental measurements on three reindeer teeth from layer b, it is suggested that the site was occupied during autumn and winter (Bordes and Le Brun-Ricalens).

**Carcass exploitation**
Part of the bone fragments (the length of which is mostly between 0 and 1 cm) of layers b and d have already been studied; most of them have been burned (Bordes and Le Brun-Ricalens). It is suggested that in the case of reindeer, the heavy head was left at the kill site, with the mandible (and tongue) removed. Also underrepresented are vertebrae, scapulae, and the most distal parts of the extremities; their use as fuel is a possibility, which seems to be corroborated by a lack of epiphyses (spongy bones or parts thereof). Marrow extraction was very much practiced at Le Piage, even of those bones that contain only small amounts (e.g. phalanges, mandible) of it, suggesting periodic food stress (Bordes and Le Brun-Ricalens).

**Human remains**
J: neonate (1, occipital)
K: neonate (2 partial diaphyses of ulna and tibia). Possibly belonging to the same individual as the one found in J (as J seems to be a mix of K and the GIF complex above)
C-E: premolar, young adult
F: 2 permanent molars, adolescent (14 years old)

Yet another tooth was found during the recent excavation campaign, but its cultural attribution is uncertain (Bordes and Le Brun-Ricalens).

**Remarks**
The remains in layer b and d, which have been excavated over a very small area, have been accumulated almost exclusively by humans, according to the excavation report (Bordes and Le Brun-Ricalens).

35. **La Quina**

**Location**

La Quina, Charente, France

35.2 **Excavation**

1905 - 1935: L. Henri-Martin
1986 - 1995: A. Debénath and A. Jelinek: the material studied here is derived from the upper layers (1 to 8, top to bottom)

35.3 Stratigraphy

The site, which spans several 100 meters along the cliff wall, basically consists of two main parts: Station Amont (discussed here and containing a Quina, MTA and Denticulate Mousterian), and Station Aval. In the latter, a badly defined Mousterian is topped by a Chatelperronian and typical Aurignacian.

The new excavations by Debénath and Jelinek (Debénath et al. 1998) focused on two places, i.e.:

- **locus 1**: ‘tranchée C’ of Dr. Henri-Martin (‘main profile’). ‘Partie nord’, the upper zone in contact with the wall of the cliff, and ‘partie sud’, the lower zone have been excavated.
  - **‘Coupe Nord’** (top to bottom)
    - Layer 1: disturbed plough layer
    - Layer 2: 2a and 2b (most important archaeological layer of Layer 2)
    - Layer 3:
    - Layer 4: 4a and 4b (both sublayers, defined on the basis of sedimentological arguments, have abundant faunal materials)
    - Layer 5:
    - Layer 6: important archaeological layer, corresponds to ‘dernier habitat moustérien’ of G. Henri-Martin; consists of 6a-d
    - Layer 7: archaeologically poor
    - Layer 8: important archaeological layer, only partially excavated
  - **‘Coupe Sud’** (top to bottom)
    - ‘Terre végétale’
    - Layer A-B: sterile
    - Layer C: first archaeological layer; corresponds to couche 8 from the Coupe Nord
    - Layer D: D1 and D2
    - Layer E: discontinuous, only visible in certain areas, archaeologically poor
    - Layer F: archaeologically poor
    - Layer G: G1 (archaeologically rich), G2, G3
    - Layer J: transition to K is diffuse
    - Layer K:
    - Layer L: quite rich archaeologically, but only very partially excavated
- Layer M: locally subdivided into three sublayers; Quina Mousterian; abundant fauna, the composition of which is similar to the western zone of the site.
- Layer N: fauna and lithics present
- Layer O:
- Layer P:
- Layer Q:
- Bed rock

- Locus 2: a.k.a. ‘bone bed’, ‘station G’ of G. Henri-Martin. This part has been published by Chase, Armand and co-workers (Armand 1990, Chase et al. 1994).

35.4 Chronology

Four TL dates have been obtained (Q1 and Q3 for layer 6a; Q14 and Q15 for layer 8). Q15 is not considered very reliable:
- Q1 + Q 3: both are compatible, giving an average date of 43.0 ± 3.6 ka BP
- Q14 + Q15: 44.5 ± 4.2 and 53.0 ± 5.0 ka BP respectively; the last one has not been used in this study. An average for the latter two is given by Defleur (Defleur 1993), i.e. 48 750 ± 6000 ka BP.

35.5 Palaeoenvironment

Based on the composition and characteristics of the faunal assemblages, Debénath and co-workers places layer 8 in a cold phase of OIS4 (prevalence of reindeer), while 6c to 2b correspond to a less rigorous climate (dominated by bison, followed by horse), which is assumed to be OIS3 (Debénath et al. 1998).

However, based on pollen analysis two distinct phases are recognised: the first, covering layers 8 to 5, was cold and dry, characterised by an open landscape (corresponding to the early Würm in southeast France). Nevertheless, it is pointed out that 6c had more trees, and was warmer and wetter. It is tentatively equated to a period of modernate warming of the Moershoofd complex, dated to 44.4 ± 2.0 ka BP (Debénath et al. 1998). The second is found in layers 4b, 4a, 3, 2b, and 2a, and is more warm, and particularly, more wet (Debénath et al. 1998).
35.6 Archaeological tradition

Layers 2, 4, 6 and 8: Denticulate Mousterian. Layer 6d contains MTA (Debénath et al. 1998).

35.7 Fauna

Method of collecting

Conservation and fragmentation
In layers 6a and 6c, the bones seem to have been rather badly preserved, as there’s an overrepresentation of bison teeth (Armand 1998b). In contrast, Chase (Chase 2004) reports that the bones were in very good condition, although the long bones, and even the phalanges have been severely fragmented (due to marrow extraction).

Prey Taxa
MNI’s are not provided by Armand (Armand 1998b) nor by Debénath and co-workers (Debénath et al. 1998); their count should moreover be considered preliminary. Interestingly, DNA has been recovered from stone tools deriving from layers 6a, 8, and M2 (Hardy, Raff, and Raman 1997). A 100 % match could be found for Sus scrofa, a species rare at the site in terms of bone NISP; unfortunately, the exact layer from which the tool originated was not mentioned, but in the layers considered in our study, wild boar only features in layer 6d.

Carnivore taxa
Carnivore influence is believed to have been minor, and limited to the scavenging of remains left by humans (Debénath et al. 1998).

Marks
The marks that are present point to disarticulation, meat removal, and the use of bone as a tool (Debénath et al. 1998).

Seasonality

Carcass exploitation
Characteristic for layer 8 (and 7) is the exploitation of marrow from the distal parts of reindeer extremities (with contain the most greasy marrow, and continue to hold grease
when, it has disappeared from the other bones, e.g. as a result of malnutrition). It is a pattern that has also been witnessed in layer 6a. The best horse sample is to be found in layer 2b, where the extraction of the brain and the tongue is evidenced by an overrepresentation of mandibles and skulls; pelvic bones are overrepresented as well, but no explanation for this pattern exists. In layer 4, another pattern is present on top of the one attested in 2b: the exploitation of the tongue leading to an overrepresentation of mandibles only (Armand 1998b).

**Human remains**

The most recent excavation added 8 more Neanderthal bone fragments to the existing list, among which two human teeth in Coupe Nord in a pit (inhumation?) excavated in layer 6a and disturbing 6b, 6c, 6d, 7 and the upper part of 8. Three of the new finds originate from layers discussed in this study (i.e. 6b and 8) (Debénath et al. 1998). Verna reports the existence of 53 human remains for La Quina (Amont, all layers and all sectors), the most originating from the central zone of the site (the old ‘tranchées B-D’), and more in particular, levels D to N of the new stratigraphy (Verna 2010).

**Remarks**

A paper on the taphonomy and zooarchaeology of Locus 2 was published by Chase et al. (1994).

Based on dental characteristics, Debénath (1998b) believes all Bovidae to be Bison. The equids of layer 4b appear to be *Equus caballus gallicus*, not *E.c. germanicus*.

There's evidence for butchering on the site, and for scavenging by carnivores. However, Chase (1998) deems it unlikely that the latter had much influence on most of the animal assemblages.

As the analysis of the latest excavations on the site is only preliminary, the site hasn't yet been interpreted in terms of a mobility system.

36. **Ramandils**

Ramandils (Port-La Nouvelle), Aude, France

Also known as Rec Mendil

43º02' N, 2º59' E
36.2 Excavation

1925: discovery by T. Héléna
1930-1931: Ph. Héléna
1971: study of the lithic industry by H. de Lumley
  
  This was the study (Gerber 1973) referred to by Grayson and Delpech (Grayson and Delpech 2006).
1983-1994: Paul Boutié

36.3 Stratigraphy

5 'ensembles', on top of a fossil beach
  - Ensemble V: lithics and fauna
  - Ensemble IV: lithics, fauna, burnt bones and charcoal
  - Ensemble III: lithics and fauna
  - Ensemble II: the archaeological material is concentrated in pockets of a few centimeters in thickness; abundant lithics, fauna is rare but well-preserved
  - Ensemble I: archaeological remains are rare, the fauna is badly preserved

36.4 Chronology

Absolute dates have been obtained on bones, stalagmite and shells (ESR, U-Th) (Boutié et al. 2004). The only date that can be accepted is $128 \pm 15$ ka BP, i.e. the age of the beach (without anthropic remains); the others are very dispersed and contradictory. By way of hypothesis, the following age estimates have been proposed for the anthropic units, from an absolute dating point of view:
  - Ensembles I – II: between 60 en 40 ka (= first half of OIS3)
  - Ensembles III and IV: between 90 and 60 ka (= OIS5a/5b-OIS4), with a cold maximum between 60 and 70 ka
  - Ensemble V: end of OIS5

36.5 Palaeoenvironment

Based on the fauna (Banes and Dorigny 2005):
  - Ensemble V: temperate and humid. The assemblage of animals suggests a mix of landscapes (open and closed). The authors believe that this could be the result of
a climatic evolution from a period that was relatively cold and dry, towards a climatic warming, associated with more humidity.

- Ensemble IV: temperatures keep on climbing (well represented forest fauna, e.g. *Cervus*, with in contrast with *Bos*, needs actual forest). Forest prevails over open spaces.
- Ensemble III: turning point. A relatively forested environment, with open places which become more prevalent; temperatures remain temperate, while the climate becomes drier.
- Ensemble II: the environment becomes more open, the temperatures colder, while humidity keeps to decrease. Open prairies are more dominant than wooded patches. Ultimately, the climate can probably still be considered as temperate and relatively humid.
- Ensemble I: the coldest and driest period of the entire sequence. However, there’s still a slight air of humidity (presence and even rise of *Sus*). Temperatures are still relatively temperate. The landscape is still mixed however (forest with clearings, open spaces). The overall temperate climate is corresponds with the constant proximity of the sea.

However, it is difficult to evaluate the site in terms of the MIS chronology. There are two conflicting views (Boutié et al. 2004), both of which would compare well with the fact that only one archaeological tradition is present, and with the other signs of a fairly continuous multi-seasonal or multigenerational occupation of the site:

- Sedimentological analysis would suggest an interruption of sedimentation corresponding to MIS4. After the regression of the sea, marking the end of stage 5, the archaeological deposits took place during stage 3.
- The study of herbivore characteristics and associations (see also above) tends to give an older age to the site: the filling would be deposited during stage 5, (immediately) after the regression of the sea. The Saint-Germain II interstadial (80 ka BP, MIS 5a) has to be considered as a possible timeframe for ensembles V to III. Only the top of the stratigraphy (ensembles I and II) would point to the beginning of the climatic turnover at the start of MIS4. The separation of I-II from III-V has also been proposed on the basis of the sedimentological analysis, although according to the latter, all archaeological deposits date back to MIS3.

These two views contrast with the framework sketched by the (highly problematic) absolute chronology, i.e. an occupation of the site, more or less ‘continuous’ from the end of MIS5 till the end of the second part of MIS3 (40 ka). The latter would perhaps be unlikely given the relative stability of the lithic tradition, and of the (temperate) climate as attested on site.
While the faunal arguments for a deposition during MIS5 (d-a) and the beginning of MIS4 appear to be convincing, this timeframe is entered in the database (albeit) accompanied by question marks.

### 36.6 Archaeological tradition

V: typical Mousterian, enriched with denticulates  
IV: typical Mousterian  
III: typical Mousterian  
II: typical Mousterian  
I: Typical Mousterian, enriched with denticulates  
   (Moles and Boutié 2009)

### 36.7 Fauna

#### Method of collecting

- 

#### Conservation and fragmentation

In general, the faunal remains are highly fragmented and/or cemented (Banes and Dorigny 2005). However, while the fauna of for example, ensemble I is badly preserved, that of ensemble I is well preserved (Boutié et al. 2004).

#### Prey Taxa

Comments for the site as a whole:
- Rhino: at least one very young individual
- *Bos primigenius*: in general, mostly young and very young individuals were hunted

Layer V: especially adult *Cervus* and *Bos* have been hunted  
Layer IV: predominantly young adult *Sus* and *Bos* were exploited; *Cervus*, the most frequent species comes both in young and mature adults.  
Layer II: the big herbivore species were hunted as immature or young adult form, while the omnivores (*Sus* presumably) were hunted as adults.  
Layer I: while providing only a small sample size, the trend towards a greater presence of *Equus*, and the drop of *Cervus* numbers are clear. Adults, rather than young individuals (which is the general trend for the other layers) are hunted.

#### Carnivore taxa
Some carnivore bones suggest the exploitation by humans:

- *Canis lupus*: NISP = 15; one phalange is calcinated
- *Ursus spelaeus*: NISP = 6; 4 bones, 2 teeth; 'on note une importante calcination et quelques traces d'outil en silex'

The number of carnivores in layer II is higher than that of III or IV, while in all three layers, they were well adapted to the environment.

**Marks**

Overall:

- *Sus scrofa*: some bone show traces of calcination and some have bite marks
- *Rangifer tarandus* and *Dama clactoniana*: while NISPs are low, certain bones have probably been burnt
- *Cervus elaphus*: numerous bones show evidence of burning
- Rhino: 4 fragmented and burnt remains

Layer III: while the number of prey animals rises, the number of carnivores, and the marks they left on the bones, does too.
Layer I: a very small amount of marks (anthropic or carnivore); in contrast, there are a lot of alterations that point to the action of water (e.g. polish)

**Seasonality**

The site was used during layer II at the very least as a temporary camp during summer (July and August).

**Carcass exploitation**

**Human remains**

2 human teeth (Boutié et al. 2004).

**Remarks**

For this study, the most recent (and numerous) NISP counts have been used, i.e. those stemming from the 1983-1994 excavation (Banes and Dorigny 2005). From the latter source, it couldn’t be deduced however whether the NISPs from the earlier excavation by de Lumley (Gerber 1973) had been included.

For the site as a whole, the total NISP is 489, the total MNI, 91. The latter high figure has been attributed to the great diversity of species. The large population of *Oryctolagus*
cuniculus grenalensis hasn’t been included into these counts (Banes and Dorigny 2005); Meles meles (a single bone), in the absence of evidence for its exploitation, has been left out of our count, as well as the indeterminate bird (1 bone) and the porcupine (Hystrix sp.; 1 bone). For the NISPs and MNIs per unit, see Banes and Dorigny (2005:96).

The number of lithics of all ensembles together (29997) suggests a prolonged occupation (Moles and Boutié 2009). Moreover, given the homogeneous nature of the filling and archaeological remains, the nearby origin of the primary material, the preparation, and production of the lithic assemblage on site, the presence of only one cultural facies (Typical Mousterian), and the abundant archaeological remains, the site appears to have been occupied regularly, or even intense or continuously during certain times – multi-seasonally, or even multi-generationally, according to the excavator (Boutié et al. 2004).

37. RaysseLocation

Brive, Corrèze, France
37.2 Excavation

The site consists of a cave and a rockshelter. In the former, and the surrounding fields, some surface finds had been made by Ph. Lalande in 1866. Around 1930, P. and J.-F. Pérol found worked flint in rodent holes at the location of what turned out to be a rockshelter that had been hidden from sight. The flint was collected for several years, after which Pérol undertook a partial excavation of the site’s Solutrean layer. The site was excavated further by L. Pradel and his son from 1952 onwards.

37.3 Stratigraphy

See Pradel and Pradel (1966:227). From bottom to top:
1: base rock and éboulis
2: Aurignacian I
3: éboulis
4: Périgordien supérieur
5: éboulis
6: Solutrean
7: éboulis
8: top soil

37.4 Chronology

-

37.5 Palaeoenvironment

-

37.6 Archaeological tradition

According to Pradel and Pradel (Pradel and Pradel 1966) layer 2 contains an ‘evolved’ Aurignacian I industry, corresponding to that of La Ferrassie F. The latter however is considered to be Aurignacian III or IV.
37.7 Fauna

Method of collecting
-

Conservation and fragmentation
Most of the remains are either teeth or distal parts of the extremities (Pradel and Pradel 1966), which may point to bad conservation.

Prey Taxa
-

Carnivore taxa
None

Marks
-

Seasonality
-

Carcass exploitation
-

Human remains
-

Remarks
-

38. Regourdou

Location
Montignac-sur-Vézère, Dordogne, France
38.2 Excavation

1957: discovery of the ‘Neanderthal burial’ by R. Constant
1960-1965: E. Bonifay

38.3 Stratigraphy

Top to bottom:
- Layer S
- Layer 1
- Layer 2 (has several sublayers, 3 of which contain significantly more lithics and fauna)
- Layer 3 (has three sublayers)
- Layer 4 (two sublayers, presence of hearths)
- Layer 5 (traces of ash, charcoal, and pieces of burnt bones)
- Layer 6
- Layer 7 (two sublayers)
- Layer 8
- Layer R

According to Bonifay (Bonifay 1964), the geological history of the cave can be divided into seven stages. Layer R was presumably formed at the end of the Riss (MIS 6) or the beginning of the Wurm (MIS 5d). The rockfall making up layer R sealed the cave, after which two openings formed in the ceiling (beginning of the Wurm), such that layers 8-3 could form; these layers are attributed to Wurm I. The ‘first Wurmian interstadial’ seems to be visible at the top of layer 3 as an intensification of the red colouring of the sediment. During the beginning of Wurm II (bottom of layer 2), the ceiling collapses further. The climate is still relatively humid, which allows for the formation of numerous concretions and stalagmitic floors. During the Wurm II, and due to frost action, debris accumulates into the cave, forming layer 2, which is characterised by the development of a cold fauna. Towards the end of Wurm II, the ceiling falls on the archaeological levels, making the site uninhabitable. The dolina formed at the surface of the plateau is consequently filled with red sands and debris during the Wurm III.

38.4 Chronology

-
38.5 Palaeoenvironment

Based on a sedimentological analysis, two ‘ensembles’ can be discerned in the Wurmian deposits of Regourdou (Bonifay 1964), the oldest corresponding to layers 8 to 3. The fauna that appears is common: Ursus arctos, cervids (but no Rangifer), Bovids, Castor, Sus scrofa, an indeterminate elephant, (abundant) rabbit and hare, and lots of micromammals such as rodents, chiropterae, reptiles, and anurans. This probably suggests, still according to Bonifay, a fresh (but not rigorously cold) and humid climate. Layer 3 could exemplify a period of change. Layer 2 suggests the existence of a very cold climate, confirmed by a fauna with a high percentage of Rangifer tarandus, with also horse and some carnivores (Canis lupus, Panthera leo spelaea).

From the perspective of the big mammal assemblage (Delpech 1996), layers 7 – 5 were deposited during a wooded phase with an almost temperate climate (humid to very humid). The mammals of layers 4 – 3 in contrast point to an open environment with patches of trees, and a cold, humid climate. The environment during layer 2 is largely open, steppic with a few wooded islands during a cold climate with limited moisture. According to Delpech, the rodent fauna largely corresponds with this reconstruction (Delpech 1996). As this largely corresponds with the sedimentological findings as well, Delpech’s reconstruction is used here.

38.6 Archaeological tradition

Only the moustérien industry of layer 2 could be specified (as Quina Mousterian) (Delpech 1996).

38.7 Fauna

Method of collecting

Bonifay states that the site has been excavated by himself by using the most rigorous excavation techniques, such as 3D proveniencing of bones and lithic artefacts. However, no further information, e.g. on sieving has been mentioned (Bonifay 1964).

Conservation and fragmentation

- 

Prey Taxa
Carnivore taxa
While Bonifay (Bonifay 1964) mentions the occurrence of carnivores (wolf and lion), Delpech didn’t list their NISP (Delpech 1996).

Marks
-

Seasonality
-

Carcass exploitation
-

Human remains
Layer 4: numerous Neanderthal remains belonging to 1 individual (Defleur 1993)

Remarks
In general, the layers contain more bones than lithics (Delpech 1996). Bonifay too, states that the number of lithics is relatively minor compared to other Perigord sites (Bonifay 1964), which would argue for relatively brief occupations, or occupations by a limited number of people.

39. Roc de Combe

Location
Payrignac, Lot, France

39.2 Excavation

Discovered in 1950
1959: Jean Labrot
1966: François Bordes & Jacques Labrot
39.3  Stratigraphy

The sequence contains 10 layers, layer 7 consisting of a, b, and c (Grayson and Delpech 2008). Layers 9 and 10 constitute a mixture of different lithic traditions caused by post-depositional agents (Bordes 2002).

39.4  Chronology

See Grayson and Delpech (2008:353, table 13). However, only 4 of these dates are accepted (i.e. considered non-problematic) (Grayson and Delpech 2008):

- Layer 7b: 33400 ± 1100 \(^{14}\)C BP
- Layer 7c: 34800 ± 1200 \(^{14}\)C BP
- Layer 8: 39540 ± 970 \(^{14}\)C BP
- Layer 8: 40000 ± 1300 \(^{14}\)C BP

39.5  Palaeoenvironment

Delpech summarizes the results of the sedimentological analysis (Delpech 1972):

- Wurm III
  - Layer 5: cold and dry
  - Layer 6: relatively cold, more humid
  - Layer 7: cold and dry
  - Layer 8 (top): more temperate, more humid
- End of the Wurm II-III interstadial (instable climate)
  - Layer 8: more cold, less humid

Based on faunal data (macromammal associations, rodents and amphibians), Delpech concludes that this is largely correct. The fauna of layer 8 (as a whole) turns out to be quite different from the other layers (warmer and wetter), but not typically interstadial; the layer could represent either the end of an interstadial or the beginning of a glacial period. The layers on top of it must have been deposited under colder conditions (although a slight amelioration is visible in layer 6).

As the basis of the palaeoclimate reconstruction, the comparative analysis of Delpech and co-workers (Delpech, Grayson, and Rigaud 2000) has been followed, and completed with the results above when possible.
39.6 Archaeological tradition

See Grayson and Delpech (2008:342, table 1).

39.7 Fauna

Method of collecting
The material has been sieved with a screen-size of 2 mm, but not all items (i.e. in case of the bones, only those that were ‘identifiable’) seem to have been kept (Grayson and Delpech 2008). As such, the authors of the latter source, which contains the most up-to-date NISP counts, expect an underrepresentation of long bone shaft fragments.

Conservation and fragmentation

Prey Taxa
For reasons of consistency, the mammoth tusks that were present have been taken into account in this study.

Carnivore taxa
Carnivore influence, in terms of the carnivore NISPs, is rather small.

Marks
The percentage of cut-marked bones is considerable: 14.53 %, 7.57 %, 12.95 % en 27.66 % for layers 5, 6, 7, 8 respectively (Grayson and Delpech 2008). The number of carnivore marks on the ungulate bones is minimal (less than 1 % overall), see Grayson and Delpech (2008:359, table 24). Only 49 identified ungulate remains have been burned: 0.5% in layer 5 (i.e. 8), 3.4 % in layer 6 (i.e. 10), 2.1 % in layer 7 (i.e. 29), and none in layer 8. Given that, as a rule, no unidentifiable remains were collected, there’s no way to estimate the extent of burning on the site (vs. Saint-Césaire, e.g., where bones were used as fuel).

Seasonality

Carcass exploitation

Human remains
Remarks
Following Grayson and Delpech, the Mousterian layers have not been considered here because they had not been screened, and because their stratigraphic context is uncertain (Grayson and Delpech 2008). As in the latter source, stratum 7 has been considered as a whole, rather than divided into three sub-layers for reasons (e.g. the large amount of refits across these sub-layers) summarized by the authors.

40. Roc-en-Pail

Location
Roc-en-Pail (Chalonnes sur Loire), Maine-et-Loire, France
x=367520, y=264000

40.2 Excavation
1942-1976: M. Gruet (before, the site had been used as a quarry)
40.3 Stratigraphy

The sequence consists of three ‘ensembles’. The layer of interest has a Ferrassie-type Charentian lithic tradition (David and Fosse 1999), which could be layer 12 in the ‘ensemble moyen’ (Wurm II), or one of the two Ferrassie layers in the ‘ensemble inferieur’ (Wurm I) (Marquet 1982). The latter is more likely given the abundances for the oldest of both Ferrassie layers cited by Gruet (Gruet 1984), and the palaeoenvironmental context indicated by David and Fosse (David and Fosse 1999).

40.4 Chronology

- 

40.5 Palaeoenvironment

David and Fosse mention that the occupation that concerns us here is attributable to the Brørup interstadial (= MIS5c), placing it into the Wurm I (while they ascribe the industry to the final phases of the Mousterian).

40.6 Archaeological tradition

Ferrassie-type Charentian (David and Fosse 1999)

40.7 Fauna

Method of collecting

- 

Conservation and fragmentation

The conservation of the bone surfaces was sufficient to preserve a few butchery marks (David and Fosse 1999).

Prey Taxa

MNIs (David and Fosse 1999):

- Reindeer: 14
• Bovids: 11 (prime age adult bovids were not hunted; preferably, young or young adults, and a few old animals have been exploited.

• Horse: 3

Carnivore taxa
MNIs (David and Fosse 1999):
• Wolf: 1

Marks
Butchery marks have been found on reindeer, bovids and horse (on about 8% of the bones), and suggest disarticulation and meat removal.

Seasonality
With reservations: spring, winter (David and Fosse 1999)

Carcass exploitation
All skeletal elements have been attested, while axial elements were rare; presumably, animals were introduced to the site in the form of quarters. All bones had been broken in order to extract the marrow (vs. Mauran), which could be related to the season of exploitation (winter/spring vs. summer/autumn at Mauran)

Human remains
None

Remarks
The chronological/palaeoenvironmental position of the layer is uncertain. No signs of the use of fire have been attested, but still, according to David and Fosse, the site is reminiscent of domestic sites (David and Fosse 1999).

41. La Roche-à-Pierrot

Location
La Roche à Pierrot (Saint-Césaire), Charente-Maritime, France

41.2 Excavation

1969 – 1987: Lévêque
41.3 Stratigraphy

See Morin et al (2005:1086). During excavation, it wasn’t always possible to distinguish EJOPinf from EJOPsup, and EJOinf from EJOSup. Based on a major bone refitting effort (Morin et al. 2005), the authors concluded that mixing between the Chatelperronian (EJOPsup) and the underlying Denticulate Mousterian (EGPF) assemblage (crucial for the discussion on possible origin of the Neanderthal skeleton) is rare, thus providing no explanation for the strong ‘Mousterian’ lithic component in the Chatelperronian of EJOPsup. EJOPsup however, could be the result of a series of Mousterian and Chatelperronian occupations that accumulated over a very short time, postdating the Denticulate Mousterian EGPF occupation of ca. 41 ka BP, and the ‘Chatelperronian?’ EJOPinf level above the latter. However, as the authors accept the date of the earliest Chatelperronian occupations in France and Spain, i.e. around 38 and 39 BP (Zilhão and d’Errico 1999), it seems unlikely (but not impossible given the poor precision of the dating methods for that time span), according to them, that EJOPsup (36.3 ± 2.7 ka BP, TL) represents a mixture. Instead, they suggest that the Mousterian component is contemporaneous with the Chatelperronian, representing a different reduction sequence to produce sidescrapers and denticulates vs. Chatelperronian points. All things considered, the authors point out that ‘translocation of cultural remains across layers was an unusual occurrence’ at Saint-Césaire (Morin et al. 2005). In a more recent publication, Soressi reaches the conclusion, based on an analysis of the lithic remains, that EJOPinf should in fact be attributed to the Mousterian, while retaining only the upper segment of EJOP as Chatelperronian (Soressi 2010).

41.4 Chronology

A series of TL dates has been obtained for Saint-Césaire (Mercier, Valladas, and Valladas 1995). The averaged dates for the four sampled layers are as follows:

- **Layer 8**: 36.3 ± 2.7 ka BP
- **Layer 10**: 40.9 ± 2.5 ka BP
- **Layer 11**: 38.2 ± 3.3 ka BP
- **Layer 12**: 42.4 ± 4.8 ka BP

The authors elaborate on the systematic underestimation of age by radiocarbon dating methods, and thus the contemporaneity of the Chatelperronian with several $^{14}$C-dates Aurignacian sites.
41.5 Palaeoenvironment

Ferrié has interpreted the fauna of layers 10 and 14 in terms of the palaeoclimate (Ferrié 2001). The former seems to represent a slight climatic deterioration (colder and drier) when compared to the latter. Palynological data, as cited by Ferrié, seems to support the hypothesis of a rather cold steppe with isles of trees. Morin summarises a series of sometimes conflicting palynological studies (Morin 2004), the results of which have been entered into the database, with reservations. The pollen analysis by Leroyer (Leroyer 1987) can serve as an example of the magnitude of the differences (EJOP is characterised as a pine forest during the Cottés interstadial, while other studies see it as contemporaneous with a cold, dry, and open landscape, the latter being more plausible given the large percentage of horse and reindeer).

41.6 Archaeological tradition

See Morin et al (2005:1086)

Layer 1: humus
Layer 2: eboulis
Layer 3: EJJ (Evolved Aurignacian)
Layer 4: EJM (Evolved Aurignacian)
Layer 5: EFJ (Aurignacian I)
Layer 6: EJOsup (Aurignacian 0?)
Layer 7: EJOinf (low density)
Layer 8: EJOPsup (Chatelperronian)
Layer 9: EJOPinf (Mousterian)
Layer 10: EGPF (Denticulate Mousterian)
Layer 11: EGP (Denticulate Mousterian)
Layer 12: EGF (Denticulate Mousterian)
Layer 13: EGCsup (few artefacts)
Layer 14: EGC (Mousterian of Acheulean Tradition)
Layer 15: EGCinf (few artefacts)
Layer 16: EGBsup (Mousterian of Acheulean Tradition)
Layer 17: EGBinf (few artefacts)

41.7 Fauna

Method of collecting
The excavation took place by employing décapages and using a metric grid system of 1 m² units, divided into quadrants. As such, 50 x 50 cm horizontal slices were obtained, 5-10 cm thick. Artefacts that were considered informative (i.e. stone tools or taxonomically identifiable faunal remains) were piece-plotted in situ. The rest was collected by décapage and dry-sieved by using mesh sizes of 5 and 2 mm (Morin et al. 2005).

**Conservation and fragmentation**
Animal bones were well preserved, but those closer to the cliff wall (and in deeper layers) generally show a better surface preservation than those away from the cliff (and in the upper levels) (Morin et al. 2005). Ferrié notes a heavy fragmentation for layer 10, which he tentatively – as he didn’t perform a complete analysis on the bones – ascribes to humans rather than carnivores (Ferrié 2001). For EJOPsup as well, a high fragmentation is noted, accompanied by considerably bad fragmentation (despite the presence of shed reindeer antler) (Patou-Mathis 1993a).

**Prey Taxa**
There’s a natural division between the faunal assemblages: during Mousterian and Chatelperronian times, emphasis laid on bison, reindeer, and horse, while the Aurignacian is characterised by an abundance of reindeer (Morin 2004).

Layer EJOPsup: based on biogeochemical research, Balter and Simon (Balter and Simon 2006) indicate that the amount of plant food consumed by the Saint-Césaire Neanderthal must have been practically zero (corroborating the results of a previous publication (Balter et al. 2001)). While a proportion of 30 % fish could remain possible, the latter do not appear to be part of the archaeofauna. When considering the faunal assemblage as the dietary source, the following relative contributions to the diet could be calculated:

- bovids (without Rangifer tarandus): 58 %
- horse/rhino: 22%
- *Rangifer tarandus*: 13%
- mammoth: 7%

According to the authors, these percentages come close to those indicated by archaeozoological research (this is indeed the case if the antler fragments are not counted), suggesting that the Neanderthal individual imported all foodstuffs to the site before consumption.

**Carnivore taxa**
Carnivores are rare (Morin 2004); for their NISPs and abundance index, see the database.
Marks
Layer EGPF (10): despite the generally good preservation, bone surfaces had been corroded (32.8 %) or damaged by root etching (21.5 %) (Ferrié 2001). Consequently, the readability of the surfaces is considered to be bad. No carnivore marks have been attested, while two marks could be attributed to rodents. Four bones bear percussion marks (marrow extraction), and twelve cutmarks. These can be ascribed to skinning. Additionally, cutmarks have been found on a hyena tooth (P4) belonging to a very old individual, and are possibly due to the removal of the mandible. The animal was either hunted or scavenged.

Seasonality
For layers 10-3, Morin (Morin 2004) envisions a multi-seasonal occupation. Most assemblages testify of a procurement of food in winter and spring, the moment when, according to Morin, prey predictability is at its lowest. Summer and fall kills are either ambiguous or limited to a single taxon. Occupation during the warm months of the annual cycle may therefore have been limited, except perhaps for the more recent layers. The larger the assemblage, the more multi-seasonal is appears. The abundance of shed antlers (and perhaps the scarcity of male unshed antlers as well) suggests that the site may have been close to reindeer calving grounds. In any case, the seasonality of the site seems to have been roughly stable, despite significant climatic changes.

Carcass exploitation
Marrow extraction has been attested in layer 10 (Ferrié 2001). Overall, Morin (Morin 2004) describes the assemblages of Saint-Césaire as being ‘distal’: in a behavioural sequence of increasing carcass reduction, kill (open air?) sites can be considered proximal, whereas home bases (cave/rockshelter ?) can be considered distal assemblages. He points out that carcass exploitation was largely consistent throughout the studied layers (covering Denticulate Mousterian, Chatelperronian and Aurignacian): bones with significant grease contents were used as fuel, indicating that grease rendering was probably uncommon. Several utility models show that skeletal parts with low utility are underrepresented at Saint-Césaire, which is a very robust pattern at the site; animals must have been processed to a certain extent at the kill site. Low bones were cracked for marrow extraction, as well as some low-utility parts such as mandibles and phalanges (while scapula, innominates and calcanei have been ignored).

Human remains
Neanderthal remains were found in layers EGC (layer 14) and EJOPsup (layer 8) (Ferrié 2001, Morin 2004, Vandermeersch 1993, Vandermeersch and Mann 2001). A human proximal phalanx was found in the Aurignacian I occupation (Morin 2004).
Remarks
For the NISP, two complementary sources have been used (Ferrié 2001, Morin 2004). However, differences occur in the way the counts were made: Morin tabulates post-refit data only, while antler fragments are excluded. Moreover, for layer 10, only part of the total amount of bones has been used. Therefore, the data of the latter have been extracted from Ferrié (Ferrié 2001), and the antler fragments (for all layers) were added to the Rangifer tarandus count in order to conform to the way the NISPs of other sites have been represented into the database’. It is important to note too that all Morin’s detailed (per taxon) counts involve post-refit data, and that the indeterminate cervids of Class II, as described by Ferrié (Ferrié 2001), have been replaced by the numbers presented by Morin and co-workers (Morin et al. 2005) when both dealt with the same layer (in casu, layer 10). Additionally, Morin’s size III-IV was added as well; however, these classes concern only materials from a sample of 11 squares that were excavated in the layers relevant for another study, and not those of entire layers (Morin et al. 2005). Their numbers are therefore expected to be much larger.

It should be noted that an older source (Patou-Mathis 1993a) lists different NISPs for layer EJOPsup. While the total NISP is smaller, this is not necessarily the case for individual taxa (e.g. wolf NISP according to Patou-Mathis is 5, while Morin (Morin 2004) notes a NISP of 2). The most recent source has been used, as he states that the older study was preliminary (Morin 2004).

Evidence for the exploitation of small game and carnivores comes in the following form (Morin 2004):

- Lagomorphs: 10 fragments, two with carnivore damage (no anthropogenic marks)
- Fish: 3 fragments (Chatelperronian): natural or anthropogenic origin?
- Carnivores: 114 fragments (mostly fox), no cutmarks or burning, but 2 specimens are gnawed and 1 hyena tooth found in the Denticulate Mousterian layer was cutmarked. Metapodials and phalanges are relatively abundant (22), which could point to skinning, but the lack of cutmarks argues against this possibility.
- Birds: 49 specimens, no evidence of human, raptor of carnivore activity. They are most likely merely background fauna.

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Morin performed an analysis on the bone assemblages of layers 10-3 to evaluate if resource depression took place, assuming that such would be the result of a demic expansion of modern humans into Neanderthal territory (Morin 2004). More in particular, he investigated whether there was an ‘i) increased transport of parts of low utility and/or high processing costs (e.g. phalanges, vertebrae), ii) marrow exploitation of low utility parts, iii), an increase in scavenging, iv), grease rendering of long bone epiphyses and other fatty parts, and v) exploitation of low-ranked taxa’.

Morin used the following ungulate body classes, based on mean animal body size and average bone thickness. As *Cervus elaphus* and Irish elk (*Megaloceros*) are rare, most UNG3-4 specimens are likely to belong to horse or bison (Morin 2004, Morin et al. 2005):

- **Size 1**: *Capreolus capreolus*, *Canis lupus*, *Alopex lagopus/vulpes vulpes*, *Meles meles*
- **Size 2**: *Reindeer, Equus hydruntinus*, *Crocata crocata, Sus scrofa*
- **Size 3**: *Equus caballus, Panthera (Leo) spelaea, Cervus elaphus, Ursus spelaeus*
- **Size 4**: *Bos primigenius, Bison priscus, Coelodonta antiquitatis, Megaloceros giganteus*
- **Size 5**: *Mammuthus primigenius*

To test resource depression, and the replacement model, Morin checked whether low-ranked taxa (according to him, carnivores, lagomorphs, birds, and fishes) increased in abundance. This seems to be the case for carnivores, but when their number goes up (layers 8-6), the number of carnivore altered specimens does as well. As burned specimens correlate negatively with the number of carnivore specimens and the number of carnivore altered specimens, and supposing that burned assemblages are less attractive to carnivores (and potentially that the amount of burning is a guide to the extent of the human occupation), it would appear that carnivore abundance and human activity are inversely correlated; the presence (or relative absence) of carnivores has therefore nothing to do with shifts in prey selection. Consequently, low-ranked taxa are likely to have been accumulated by nonhuman foragers, which doesn't support the hypothesis of resource depression. Instead, and based on regional comparisons with Abri Pataud and Grotte du Renne, Morin concludes that resource depression occurred periodically during the Middle to Upper Palaeolithic, was limited in extent, and didn't cause changes in the subsistence strategies (Morin 2004).

Inclination towards a home base (i.e. a distal assemblage), for all layers. These appear to be palimpsests of yearly, multi-seasonal occupations. Based on information on burning, cut marks, taxonomic composition, bone fragmentation, carnivore marks and age profiles, the hypothesis of occasional scavenging by carnivores of assemblages created by humans can be suggested (Morin 2004).
Saint-Marcel

Location

Bidon, Ardèche, France

42.2 Excavation

1974-1988: R. Gilles

42.3 Stratigraphy

See Moncel (1998:fig. 2)
42.4 Chronology

A $^{14}$C date of 29 330 ± 650 BP has been obtained on layer E (which pre-dates our layers of interest), but its validity is uncertain (Daujeard 2008, Moncel 1998).

42.5 Palaeoenvironment

The sequence consists of two ‘ensembles’, the most recent of which covers the last glacial, while the first doesn’t contain human occupations. Sedimentological analysis has pointed to the existence of multiple cold oscillations alternated by episodes of minor warming, in an always humid context (Moncel 1998):

- Layers U-K: the end of MIS5
- **Layers J-G**: the end of MIS5, or MIS3 (with a stratigraphic lacuna), temperatures rise; possibly forest and open vegetation. Given the presence of the (important) lacuna between layers K and J, a position within MIS3 is highly likely (Daujeard 2008). Nevertheless, because of faunal evidence (i.e. the presence of *Cervus elaphus simplicidens*) which suggests an attribution to the lower Early Wurm (end of MIS5, beginning of 4), layers J – G are attributed to a temperate phase of the early Wurm in general (i.e. Wurm I, the end of MIS5, or Wurm II, MIS3).
- Layers E-F: cold episode

Moncel’s (1998) figure 3 indicates that temperatures were relatively cold, while the text mentions relatively temperate conditions favouring a wooded steppe (based on the faunal assemblage). Given the latter, temperatures have been described in the database as ‘relatively temperate’, which is corroborated by Daujard (Daujeard 2008).

42.6 Archaeological tradition

Typical Mousterian (Moncel 1998).

42.7 Fauna

**Method of collecting**

A systematic sieving has been performed, but mesh size was not mentioned (Daujeard 2008).

**Conservation and fragmentation**
Overall, the fauna is not very abundant, very fragmented (Daujeard 2008, Moncel 1998), but, according to Daujeard (Daujeard 2008), relatively well-preserved. Only about 11 % of the faunal material could be determined (Daujeard 2008). The latter author ascribes the fragmentation predominantly to humans.

**Prey Taxa**
Predominantly prime adults have been hunted (Daujeard 2008), see Daujeard (2008:295)

**Carnivore taxa**
Besides five cave bear remains, no carnivores have been identified (Daujeard 2008).

**Marks**
In the upper part of the site (presumably the one discussed here), two fragments of long bone show evidence of being digested by a big carnivore, while nine others show carnivore marks on their surface (Daujeard 2008). In contrast, and still according to Daujeard, anthropogenic marks (in all forms) appear on 30-50 % of the bones, and point to disembowelment, skinning, disarticulation, meat removal, and marrow extraction.

**Seasonality**
*Cervus* (the dominant prey) has been hunted throughout the year, equids and *Capreolus* during autumn, and *Sus* during spring (Daujeard 2008). The predominant season of exploitation is autumn.

**Carcass exploitation**
*Cervus* has been introduced to the site in one piece (Daujeard 2008), while horse and bovids were introduced in pieces. Overall, prey have been exploited intensively, up until the systematic extraction of marrow.

**Human remains**
None

**Remarks**
As according to Daujeard (Daujeard 2008), the stratigraphy of the layers excavated after 1982 isn't compatible, she only used the parts of the assemblages that had been excavated before 1982.

According to Daujeard (2008:569), the site can be described as a big, temporary, and seasonal encampment (the equivalent of a home base ?)
43. Salpêtre de Pompignan

Location

Pompignan, Gard, France

43.2 Excavation

1969: soundings by S. Cours, J.L. Roudil, and J. Coularou
   Sounding by M. Escalon de Fonton
1978: L. Meignen and J. Coularou

43.3 Stratigraphy

The following stratigraphy has been set up as a result of the excavation (1978), and most likely (see ‘Remarks’) doesn’t correspond to that of the soundings, which provided the faunal material studied by Gerber (Farbos-Texier et al. 1981). It is therefore mentioned here for informative purposes only.

Layer 1: reworked Neolithic and Chalcolithic material
Layers 2-6:
   - ‘Ensemble supérieur’
• Only 2 and 3 could be discerned through the entire sequence

Layers 7-10:
• ‘Ensemble inférieur’
• more easily recognisable

43.4 Chronology

No absolute dates for the layers used here.

43.5 Palaeoenvironment

The cave sequence is 2.20 metres thick, counting five climatic phases, four of which are to be situated in the Wurm II. Overall, they are always cold (more or less markedly so), with basically variations in humidity (Farbos-Texier et al. 1981, Miskovsky 1981-1982).

Phase A: deposition of layers 10, 9c, 9b inf
• episode A1: during layer 10: a cold and humid climate
• episode A2: less cold and less humid
• episode A3: again colder and wetter

Phase B:
• deposition of layers 9b and 9a
• less cold and more humid than previous layer

Phase C:
• deposition of layer 8
• more cold and less humid than previous layer

These phases formed under a climate generally more cold than the present, with the same amount of humidity, corresponding to a cold and more or less humid phase of the early Wurm, entirely posterior to the first Wurmian interstadial.

Phase D:
• deposition of layer 7
• less cold; wetter at the base and drier at the top

There are reasons to suspect a climatic rupture between layers 8 and 7 (i.e. phase C and D), attributable to the Wurm II-III interstadial (layers 10-9-8 would in this case represent the cold and humid phases at the beginning of Wurm II seen at Hortus – which means that the sediments corresponding to the end of the Wurm II (cold and dry)
would be missing from the Pompignan sequence). In this case, the actual layer 7 (phase D) would mark the beginning of Wurm III. If the rupture between 7 and 8 is minor (at Hortus: IVa and IVb), it could correspond to a sub-phase of Wurm II.

Phase E:
- an important deterioration of the climate, with the formation of an open steppe, practically devoid of trees

The 'ensemble superieur’, i.e. layers 6-2, is associated with a rigorous and dry climate, and an open steppe vegetation (UP at the base, probably Magdalenian on top), and is to be placed in the recent Wurm (for a large part Wurm III).

### 43.6 Archaeological tradition

Due to lack of data, we follow Grayson and Delpech (Grayson and Delpech 2006) by considering the relevant layers as Mousterian, without further specification (see also ‘Remarks’).

### 43.7 Fauna

**Method of collecting**

- 

**Conservation and fragmentation**

- 

**Prey Taxa**

- 

**Carnivore taxa**

- 

**Marks**

- 

**Seasonality**

-
Carcass exploitation
-

Human remains
-

Remarks
According to Chase (Chase 1986a), rabbits were found in 5 Mousterian layers. The percentage of juveniles in these layers varies from 1.4 to 5.0 %, while young animals in non-archaeological layers represent approximately 50 %, arguing for the hunt of these animals.

The primary source for the fauna of this site – a doctoral thesis by Gerber (Gerber 1972), couldn’t be obtained. As such, the faunal data tabulated by Grayson and Delpech (Grayson and Delpech 2006) – who used Gerber as their only source, has been used here. Consequently, not much data other than the herbivore NISP counts are available. Also, while Grayson and Delpech consider layers 5 and 6 to hold a Mousterian industry, a summarizing paper on the site (Farbos-Texier et al. 1981) suggests that these belong to the Upper Palaeolithic, while indicating that the macrofauna of layers 6 to 2 hasn’t been studied by Gerber. Most likely, a diverging system of layer-naming has been used between the sounding in 1969 and the excavation in 1978. While this couldn’t be verified by us, Farbos-Texier and co-workers (Farbos-Texier et al. 1981) hint at it by stating that the upper part of the sequence equals both to layers 2 and 3 (of the excavation), and 2 to 6 (of the sounding). As such, only the temperature interpretation (i.e. cold or relatively cold throughout the sequence, never temperate) has been retained in our database, while the palaeoclimate has always been interpreted as Wurm II, in the relevant cases (layers 5, 6, and 7, which could belong to the recent Wurm).
44. **La Salpêtrière**

Location

Remoullin, Gard, France

44.2 **Excavation**

1970's (?): F. Bazile

44.3 **Stratigraphy**

-

44.4 **Chronology**

Ly-1804: 28100 \( \pm \) 1000 BP (Brugal 1981).

44.5 **Palaeoenvironment**

Layer 14a could represent a small climatic amelioration (based on the faunal remains), which is largely due to the increase in humidity (Brugal 1981).

44.6 **Archaeological tradition**

Aurignacian
44.7 Fauna

Method of collecting

Conservation and fragmentation

Prey Taxa

Carnivore taxa
Carnivores (wolf and fox) represent 12 % of the faunal assemblage.

Marks

Seasonality

Carcass exploitation

Human remains

Remarks
45. Trou de la Chèvre

Location
Bourdeilles, Dordogne, France

45.2 Excavation

Excavations by R. Arambourou and P.E. Jude began in the spring of 1948, and ended in 1955 (Arambourou and Jude 1964a).

45.3 Stratigraphy

Twenty-three stratigraphic layers have been discerned (the 23th being rock bottom). The Aurignacian has been found in layers 9 to 14, the Chatelperronian in layers 15 to 18, and the Mousterian in layer 20 (Arambourou and Jude 1964c). See also Arambourou and Jude (1964:18).

45.4 Chronology


45.5 Palaeoenvironment

The palaeoclimate was reconstructed based on the geological study by Laville (Laville 1964): during the Aurignacian I of archaeological layer 3, a cold climate was installed, presumably the last local manifestation of the Wurm II-III interstadial. During the Aurignacian II of layer 4 (sub-layers 4a and 4b) the climate became less rigorous and much wetter. However, during 4c (strata 10-8) very cold and dry conditions were in place.
45.6 Archaeological tradition

Aurignacian I in archaeological layer 3 (i.e. stratum 14), and Late Aurignacian (‘évolué’, II) in layer 4, i.e. stratum 12 (4a), 10 (4b), and 9 (4c) (Arambourou and Jude 1964b).

45.7 Fauna

Method of collecting
-

Conservation and fragmentation
In both layers, cranial remains are abundant, which may point to bad conservation (Bouchud 1964).

Prey Taxa
In the case of reindeer and cervid remains, all age classes are represented, except for animals more than 5 years old in layer 4. *Lepus* has been attested in layer 3, but no indications exist that would argue for human (nor carnivore) exploitation (Bouchud 1964).

Carnivore taxa
Only a few wolf remains were found in layer 3 (Bouchud 1964).

Marks
-

Seasonality
The reindeer and cervid remains point to an almost year-round occupation in layer 3, and a summer/autumn occupation during layer 4 (Bouchud 1964).

Carcass exploitation
  All parts of the reindeer skeleton have been accounted for. The bovid mortality curve is that of a natural population (Bouchud 1964).

Human remains
-

Remarks
Layers 3 and 4 contain multiple hearths and burnt bone (Arambourou and Jude 1964b).
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