

# The Evidence for Middle Palaeolithic Scavenging from Couche VIII, Grotte Vaufrey (Dordogne, France)

Donald K. Grayson

Burke Memorial Museum, University of Washington, Seattle, WA 98195, U.S.A.

Françoise Delpech

Institut du Quaternaire, UMR 9933 CNRS, Université de Bordeaux I, 33405 Talence Cedex, France

(Received 5 December 1992, revised manuscript accepted 5 February 1993)

Couche VIII, Grotte Vaufrey (Dordogne, southwestern France) provided a sample of nearly 1200 identifiable bones and teeth of ungulates and carnivores associated with artefacts assigned to the Typical Mousterian. Binford (Etude taphonomique des restes fauniques de la grotte Vaufrey, *Mémoires de la Société Préhistorique Française* 19, 535–564, 1988) has argued that the Couche VIII ungulates were introduced either by carnivores or by human scavengers. We present a taphonomic reanalysis of the Couche VIII fauna and show that neither Binford's data nor ours support his interpretations.

**Keywords:** PALAEOLOGICAL ARCHAEOLOGY, MIDDLE PALAEOLOGICAL, MOUSTERIAN, SOUTHWESTERN FRANCE, TAPHONOMY.

## Introduction

**G**rotte Vaufrey is one of 22 caves and rock-shelters known to dot the limestone cliff on the east side of the Céou River just south of its junction with the Dordogne River in southwestern France (Figure 1). Excavated under the direction of Jean-Philippe Rigaud between 1969 and 1982, this site proved to contain a remarkable sequence of Acheulean and Mousterian occupations distributed across 12 major depositional units (couches I–XII); three deeper units (couches XIII–XV) contained faunal material but no artefacts. This site has recently been the subject of an important monograph edited by Rigaud (1988b).

Couche VIII was the richest of the 15 stratigraphic levels at Vaufrey, providing some 2000 lithic objects and a sizeable vertebrate fauna. Rigaud (1988a) assigned the Couche VIII artefacts to the Typical Mousterian; Geneste (1988), Rigaud & Geneste (1988), and Simek (1988) concluded that this material had accumulated as a result of multiple occupations through time. Although it is clear that Couche VIII is Rissian in age, exactly where it falls within the Riss Glaciation is not clear. Basing their arguments on a variety of temporal indicators, Delpech & Laville (1988) concluded that the sediments of Couche VIII were deposited either during a minor climatic amelioration during Riss III times (oxygen isotope stage 6), or during the Riss II–III interstade (oxygen isotope stage 7).

The sizeable sample of ungulate and carnivore remains from Vaufrey was identified and analysed by Delpech (1988); Prat (1988) identified and analysed the bears (*Ursus* spp.). Delpech documented that the Couche VIII ungulate fauna was dominated by red deer (*Cervus elaphus*) and, to a lesser extent, by tahr (*Hemitragus* cf. *bonali*), with such species as horse (*Equus caballus*), chamois (*Rupicapra rupicapra*) and roe deer (*Capreolus capreolus*) represented in smaller numbers (Table 1). Delpech and Prat showed that the larger carnivores of Couche VIII (Table 2) are dominated by canids, including dhole (*Cuon* sp.), foxes (*Vulpes* or *Alopex*) and wolf (*Canis lupus*); lynx (*Lynx spelaea*), bear (*Ursus* sp.) and badger (*Meles meles*) are also represented.

Working from the identifications provided by Delpech and Prat, Binford (1988) conducted a taphonomic analysis of the Vaufrey ungulate and carnivore remains. We found Binford's data and conclusions sufficiently provocative that we reanalysed those remains. Here, we present the results of that reanalysis, within the context of the arguments presented by Binford (1988). We argue that little of what Binford claimed is supported by the Couche VIII fauna. We will present our own interpretations of this fauna elsewhere.

## Binford's Taphonomic Interpretations

Binford's analysis of the Vaufrey carnivores and ungulates was lengthy and complex. Since this analysis does

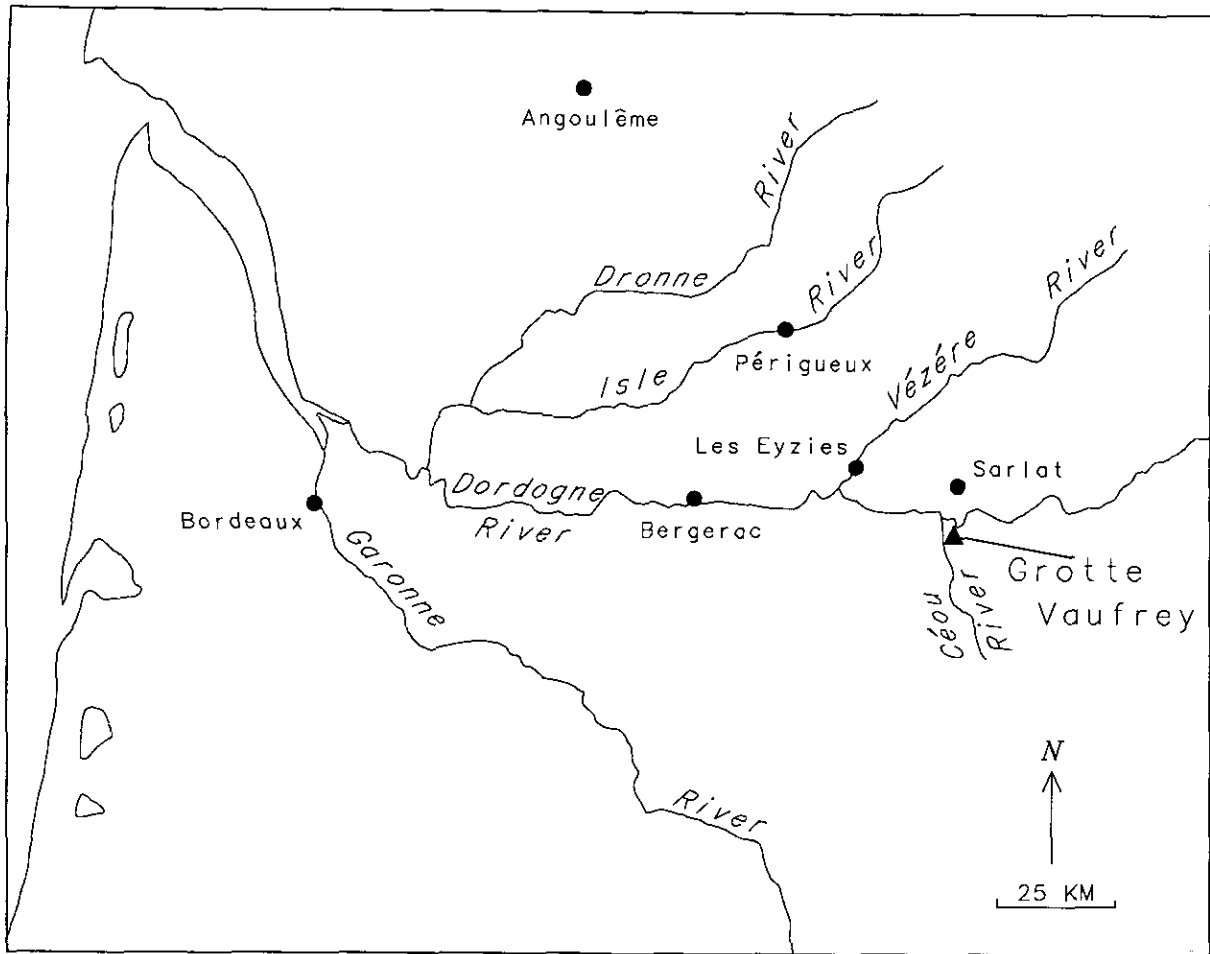


Figure 1. The location of Grotte Vaufrey.

not appear to be well-known to English speakers, we summarize the conclusions that he reached and briefly discuss the methods that he used to reach them.

*1. Two different models of skeletal part frequencies are represented in the Couche VIII fauna*

Basing his arguments on the skeletal patterning displayed by "Minimal Animal Units" (MAUs), Binford asserted that the remains of tahr, chamois, roe deer and carnivores are dominated by skulls and/or distal limb elements. This pattern, Binford suggested, could have been produced by the long-distance transport of body parts from a kill site by non-human predators.

The remains of red deer and horse were characterized by a second pattern of skeletal part representation Binford claimed to have detected. Horses, he argued, were primarily represented by cervical vertebrae and by proximal forelimb elements. This, he suggested, reflects the introduction, by people, of elements chosen for the attached meat. However, had entire horse carcasses been available, he argued, upper hind limb elements

would have been taken first. He concluded that either people or other predators had partially consumed these animals before the human occupants of Vaufrey found them, and that the elements within Couche VIII represent the leftovers.

The remains of red deer, Binford asserted, were also introduced into the site by people. As with horses, Binford found the red deer skeletal profile biased toward the presence of upper limb elements. In contrast with horses, however, Binford found the red deer assemblage to contain all parts of the skeleton, and to include significant numbers of skulls, mandibles, and lower vertebrae. He concluded that both people and carnivores were implicated in the transport of these specimens to the site.

Although Binford reached this set of conclusions from an analysis of MAU values, he attempted to test them by analysing the age structure of the red deer assemblage. For selected skeletal elements, he calculated the percentage of those elements that had unfused epiphyses. The resulting pattern implied to him that the upper limbs of juveniles were being transported to the

Table 1. Numbers of identified ungulate specimens, *Couche VIII, Grotte Vaufrey* (see text for scientific names of taxa)

	<i>Bos/Bison</i>	Elephantidae	Chamois	Horse	Red Deer	Roe Deer	Tahr	Total
Astragalus					3		1	4
Antler					35			35
Calcaneus					6		1	7
Carpal					15	2	5	22
Femur				11	22			33
Fibula					1			1
Humerus			1	4	19		2	26
Innominate					10		2	12
Mandible					25		5	30
Metacarpal					10	1	1	12
Metapodial					9	2	1	12
Metatarsal			1		20		1	22
Patella					9			9
Phalanx 1					17		5	22
Phalanx 2					22		8	30
Phalanx 3			2		30		4	36
Radius				4	10			14
Rib		1		2	60		6	69
Sacrum					4			4
Scapula					10		1	11
Sesamoid				1	12	1	4	18
Skull	2				30		11	43
Tarsal				1	10			11
Teeth	2		4	10	339	1	61	417
Tibia	1			7	9		1	18
Ulna				1	14		1	16
Vertebrae	1		1	13	82		8	105
Total	6	1	9	54	833	7	129	1039

Table 2. Numbers of identified specimens of larger carnivores, *Couche VIII, Grotte Vaufrey* (see text for scientific names of taxa)

	Badger	Bear	Canidae	Dhole	Fox	Lynx	Wolf	Total
Astragalus				2				2
Calcaneus				2				2
Carpal					1	1		2
Femur		1	1		1			3
Fibula		1				1		2
Humerus						1		1
Innominate				1	1	1		3
Metacarpal	2				3	1		6
Metatarsal			1	4		1		6
Patella			1		1	2		4
Phalanx 1		1	3		1	4		9
Phalanx 2			4			3		7
Phalanx 3		1	3		1	4		9
Radius					3	1		4
Rib			1			3		4
Sesamoid			4		3	1		8
Skull			1		1			2
Tarsal				4		1		5
Teeth		12		16	9		2	39
Tibia			1					1
Ulna		1	2			1		4
Vertebrae			4		1	1		6
Total	2	17	26	29	26	27	2	129

site by people, but that distal limb segments of adults (for instance, distal metatarsals) were most likely to have been introduced by carnivores. He also examined the large sample of red deer teeth that *Couche VIII* provided, and observed that over 60% of these teeth

came from adult animals. Binford concluded that two different mechanisms had introduced red deer elements into *Vaufrey* during *Couche VIII* times: people had transported the remains of juveniles, but carnivores accounted for distal limb elements and the skulls of

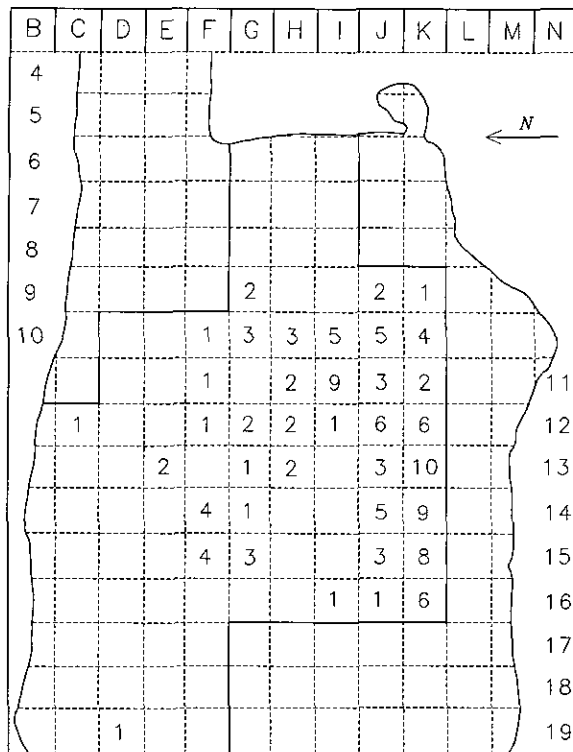


Figure 2. The distribution of tahr specimens within Couche VIII (three specimens lack grid unit provenance; all grid units are 1 × 1 m).

adults. In other words, "men and other animals had each exploited red deer in their own ways" (Binford, 1988: 540).\*

2. *Carnivores, and in particular dholes, were the primary agents responsible for the introduction of the remains of tahr, chamois and roe deer, and also played a significant role in the accumulation of the remains of red deer.*

Binford mapped the horizontal distribution of: (a) carnivore-damaged bones, (b) tahr, chamois and roe deer specimens, and (c) carnivore specimens. He claimed that these distributions overlapped, and took this as confirmation of his hypothesis, derived from MAU values, that "carnivores were the primary agents responsible for the introduction of tahr, chamois, and roe deer remains" (Binford, 1988: 542). Through reasoning that need not be recounted here, he concluded that dholes were the carnivore involved, and then reconstructed where the dholes had denned, where they had entered and left that den, where they had rested and gnawed bones, and where they had defecated.

Binford also attempted to confirm his hypothesis that dholes had been responsible for introducing red deer skulls and distal limb elements from adult animals into the site. From mapped element distributions, he argued that long bones with fused epiphyses and distal

\*All quotations in this paper were translated from the French by D. K. Grayson.

Table 3. MAU values as calculated here, and as reported by Binford (1988): *Cervus elaphus*

	This paper		Binford (1988)	
	MAU	%	MAU	%
Antler/Horn	n.d.	n.d.	1.00	11.0
Skull	7.00	n.d.	3.00	33.0
Mandible	4.00	n.d.	n.d.	n.d.
Upper teeth	5.95	n.d.	9.00	100.0
M1	9.00	81.8	n.d.	n.d.
All adult	7.00	n.d.	n.d.	n.d.
Lower teeth	5.58	n.d.	6.30	70.0
Incisors	11.00	100.0	n.d.	n.d.
All adult	6.60	n.d.	n.d.	n.d.
Atlas	2.00	18.2	1.00	11.0
Axis	1.00	9.1	1.00	11.0
Cervical vertebra	0.40	3.6	0.60	7.0
Thoracic vertebra	1.46	13.3	1.00	11.0
Lumbar vertebra	2.00	18.2	2.00	22.0
Sacrum	2.00	18.2	2.00	22.0
Rib	1.92	17.5	1.00	11.0
Innominate	2.50	22.7	1.50	17.0
Scapula	2.00	18.2	0.50	6.0
Proximal humerus	2.50	22.7	3.00	33.0
Distal humerus	2.50	22.7	4.00	44.0
Proximal radioulna	3.50	31.8	2.50	28.0
Distal radioulna	2.00	18.2	1.00	11.0
Proximal ulna	3.50	31.8	n.d.	n.d.
Distal ulna	1.50	13.6	n.d.	n.d.
Proximal radius	1.50	13.6	n.d.	n.d.
Distal radius	2.00	18.2	n.d.	n.d.
Carpals	2.50	22.7	1.30	14.0
Proximal metacarpal	1.00	9.1	0.50	6.0
Distal metacarpal*	3.00	27.3	1.00	11.0
Proximal femur	3.00	27.3	3.50	39.0
Distal femur	2.00	18.2	2.50	28.0
Proximal tibia	1.00	9.1	0.50	6.0
Distal tibia	0.50	4.6	0.00	0.0
Tarsals	3.33	30.3	1.50	17.0
Astragalus	1.50	13.6	1.50	17.0
Calcaneus	2.00	18.2	1.50	17.0
Proximal metatarsal	3.50	31.8	2.00	22.0
Distal metatarsal*	1.00	9.1	1.50	17.0
Phalanges:				
first	1.63	14.8	1.50	17.0
second	2.13	19.4	1.70	19.0
third	2.00	18.2	1.20	13.0

\*Includes 50% of specimens identified as distal metapodial (distal metapodial MNE=4).

n.d.=not determined

limb elements (metapodials) were concentrated in the carnivore-dominated part of the cave. Conversely, he also argued that long bones with unfused epiphyses and proximal limb elements were concentrated in what he defined as the human-dominated part of the cave. From mapped distributions of teeth, he asserted that upper teeth were primarily associated with the human-dominated part of the cave, but that lower teeth were primarily associated with the zone of carnivore occupation. He concluded that dholes had transported red deer mandibles to Vaufrey in numbers.

3. *Human use of the site during Couche VIII times was concentrated east of grid line 12/13, there was little breakage of bones for marrow, and almost no use of stone tools to dismember and deflesh carcasses*

Binford delineated a "human-dominated" part of

Table 4. MAU values as calculated here, and as reported by Binford (1988): *Equus sp.*

	This paper		Binford (1988)	
	MAU	%	MAU	%
Upper teeth	0.15	15.0	0.25	25.0
Lower teeth	0.10	10.0	0.16	16.0
Atlas	0.00	0.0	1.00	100.0
Axis	1.00	100.0	1.00	100.0
Cervical vertebra	0.60	60.0	0.40	40.0
Thoracic vertebra	0.17	17.0	0.15	15.0
Lumbar vertebra	0.17	17.0	0.00	0.0
Rib	0.06	6.0	0.08	8.0
Proximal humerus	0.50	50.0	0.50	50.0
Distal humerus	0.00	0.0	0.50	50.0
Proximal radioulna	0.50	50.0	1.00	100.0
Distal radioulna	0.50	50.0	0.50	50.0
Proximal femur	1.00	100.0	0.50	50.0
Distal femur	0.50	50.0	0.50	50.0
Tarsals	0.20	20.0	0.00	0.0

the cave by mapping the distribution of bone fragments—snapped ribs, bone impact flakes, and certain long bone fragments—that he felt to be characteristic of human occupation. Binford concluded from this that the bulk of human activities had occurred east of grid line 12/13 (see Figure 2).

In reaching this conclusion, Binford made no use of the single category of items recovered from Couche VIII that could be attributed unambiguously to human activity: the 2000 lithic artefacts that Couche VIII contained. Simek (1988), on the other hand, used both faunal material and stone tools in his detailed quantitative analysis of Couche VIII spatial structure, and reached very different conclusions concerning the human use of Grotte Vaufrey during Couche VIII times.

Binford found only three specimens in the Couche VIII faunal assemblage that carried possible cut marks. The almost total lack of such marks, he noted, contrasts with other sites of roughly the same age, in which cut marks are fairly common. Indeed, Binford found the lack of cut marks on the Couche VIII fauna to be “perhaps the most surprising fact that has resulted from the examination of this fauna” (Binford, 1988: 548).

#### 4. The red deer remains that were introduced into Vaufrey during Couche VIII times by people were obtained by scavenging

Binford's arguments here depended not only on an analysis of the relative abundance of skeletal parts, as we have discussed, but also on an analysis of the distribution of carnivore damage marks on red deer bones. In particular, he compared the distribution of carnivore gnaw marks on ungulate bones from a modern sample of South African ungulates that had undergone carnivore attrition (Richardson, 1980) with the distribution of carnivore damage on the Couche

Table 5. MAU values as calculated here, and as reported by Binford (1988): *Hemitragus sp.*

	This paper		Binford (1988)	
	MAU	%	MAU	%
Skull	2.00	n.d.	1.50	83.0
Upper teeth	2.78	n.d.	1.80	100.0
M1	3.00	100.0	n.d.	n.d.
All adult	1.42	n.d.	n.d.	n.d.
Mandible	2.00	n.d.	n.d.	n.d.
Lower Teeth	1.23	n.d.	1.20	67.0
M2	2.00	66.7	n.d.	n.d.
All adult	1.55	n.d.	n.d.	n.d.
Axis	1.00	33.3	1.00	56.0
Cervical vertebra	0.20	6.7	0.20	11.0
Thoracic vertebra	0.23	7.7	0.31	17.0
Lumbar vertebra	0.33	11.0	0.43	24.0
Rib	0.19	6.3	0.19	10.6
Innominate	0.50	16.7	0.50	28.0
Scapula	0.50	16.7	0.00	0.0
Distal humerus	0.50	16.7	0.00	0.0
Distal radioulna	0.00	0.0	0.50	28.0
Carpals	0.83	27.7	0.40	22.0
Distal metacarpal*	0.25	8.3	0.00	0.0
Tarsals	0.00	0.0	0.50	28.0
Astragalus	0.50	16.7	0.50	28.0
Calcaneus	0.50	16.7	0.50	28.0
Proximal metatarsal	0.50	16.7	0.50	28.0
Distal metatarsal*	0.25	8.3	0.50	28.0
Phalanges:				
first	0.38	12.7	0.25	14.0
second	1.00	33.3	0.63	35.0
third	0.50	16.7	0.38	21.0

\*Our figure includes 50% of specimens identified as distal metapodial (distal metapodial MNE=1).  
n.d. = not determined.

VIII red deer bones. He interpreted the results of this comparison as indicating that the red deer assemblage showed a pattern inverse to that shown by the modern, carnivore-damaged, assemblage. At Vaufrey, Binford asserted, carnivore damage is rare on axial elements, somewhat more common on upper limb elements, and very common on lower limb elements. To him, this meant that when carnivores gained access to these bones within Vaufrey, the least amount of meat was to be found on the axial skeleton, more on the upper parts of limbs, and more yet on the lower parts of limbs. From this, he inferred a three-fold attrition in available body parts. First, red deer had been exploited by carnivores. Second, people had brought the meatiest remaining parts back to the cave. Third, after people had finished removing the meat from those transported parts, carnivores within the cave gained access to them: “Men consumed the meat within the cave, and left the least interesting bones to scavengers” (Binford, 1988: 557). In addition, he argued, some bones were also brought directly to the site by carnivores. To Binford, the conclusion was inescapable: the human occupants of Vaufrey during Couche VIII times “nourished themselves on the remains of carcasses that had been abandoned by carnivores” (Binford, 1988: 557).

Table 6. *Cervus elaphus* and *Hemitragus* NISP and MAU values compared

	Red deer		Tahr		Standardized adjusted residual (Red Deer)	
	NISP	MAU	NISP	MAU	NISP*	MAU†
Carpals	15	2.5	5	0.8	-1.31	-0.35
Femur	22	5.0	0	0.0	1.98‡	1.04
Fibula	1	0.5	0	0.0	0.42	0.32
Humerus	19	5.0	2	0.5	0.69	0.51
Innominate	10	2.5	2	0.5	-0.19	0.02
Mandible	25	4.0	5	2.0	-0.30	-1.09
Metacarpal	10	4.0	1	0.3	0.53	0.57
Metatarsal	20	4.5	1	0.8	1.31	0.13
Phalanges	69	5.8	17	1.9	-1.38	-0.58
Radius	10	5.5	0	0.0	1.32	1.09
Rib	60	1.9	6	0.2	1.35	0.29
Sacrum	4	2.0	0	0.0	0.83	0.65
Scapula	10	2.0	1	0.5	0.53	-0.12
Skull	30	7.0	11	2.0	-2.28§	-0.43
Tarsals	19	6.8	2	1.0	0.69	0.32
Teeth						
Upper	119	6.0	25	2.8	-0.97	-1.22
Lower	145	5.6	32	1.2	-1.41	-0.04
Tibia	9	1.5	1	0.5	0.43	-0.30
Ulna	14	5.0	1	0.5	0.89	0.51
Vertebrae	82	6.9	8	1.8	1.67	-0.30

\*NISP: Chi-square=25.24 ( $P>0.10$ )†MAU: Chi-square=6.94 ( $P>0.20$ )‡ $P=0.048$ § $P=0.023$ 

### Binford's conclusions

Binford concluded that red deer, horse and large bovids were utilized by the Couche VIII occupants of Vaufrey, but that the remains of these animals were obtained by scavenging. That is, "the people who occupied Vaufrey were scavengers, choosing the meatiest portions left on carcasses that had already been partially exploited" (Binford, 1988: 558). From the fact that stone tools had apparently not been used to dismember the carcasses, he concluded that these carcasses must have been fresh, and must have "already been at least partially disarticulated by predator/scavengers that had fed on them before people arrived; for the latter, disarticulation with stone tools was thus not necessary" (Binford, 1988: 559). The facts of Vaufrey, he concluded, are surprising.

### A Taphonomic Reanalysis

In reanalysing the carnivores and ungulates from Couche VIII, our initial goal was to verify Binford's surprising facts. We gathered data on body parts, cut marks, carnivore damage and horizontal distributions with the goal of providing an independent assessment of his results. All aspects of our analysis were conducted jointly.

What we found differs significantly from what Binford reported. In this paper, we restrict our discussion to an evaluation of his analyses and arguments. We note that although Binford's arguments are usually

couched in numeric terms, they are almost entirely intuitive. Here, we test to see whether the differences he reports exist, and, if they exist, whether they are greater than can be accounted for by chance.

### Are two different models of skeletal representation present?

Table 1 provides numbers of identified specimens for all ungulates represented in the Couche VIII fauna; Table 2 presents corresponding information for the larger carnivores. Since Binford's analysis of red deer, horse and tahr skeletal representation depended on the analysis of MAU values, we present that information in Tables 3, 4 and 5. It is important to realize that work conducted after Binford's analysis led to the identification of a few additional Couche VIII specimens. As a result, some of our MAU counts may be higher than his, although cases in which our counts are lower than his cannot be accounted for in this fashion.

We calculated MAU values using the approach described in Grayson (1988). We first calculated Binford's "Minimum Number of Elements" (MNE) by counting the number of overlapping body parts for a given element type, and then divided that number by the frequency with which that body part occurs in the skeleton. Some of the differences between our MAU values and those presented by Binford must result from the additional identifications noted above. Others may simply reflect different ways of calculating MNEs;

Table 7. *Cervus elaphus* and *Hemitragus* compared using MAU values calculated by Binford (1988)

	MAU		Standardized adjusted residual (Red Deer)*
	Red Deer	Tahr	
Carpals	1.3	0.4	-0.26
Femur	6.0	0.0	1.12
Humerus	7.0	0.0	1.22
Innominate	1.5	0.5	-0.34
Lower teeth	6.3	1.2	0.02
Metacarpal	1.5	0.0	0.54
Metatarsal	3.5	1.0	-0.36
Phalanges	4.4	1.3	-0.47
Radioulna	3.5	0.5	0.21
Rib	1.0	0.2	-0.01
Sacrum	2.0	0.0	0.63
Scapula	0.5	0.0	0.31
Skull	3.0	1.5	-1.02
Tarsals	4.5	1.5	-0.61
Upper teeth	9.0	1.8	-0.05
Tibia	0.5	0.0	0.31
Vertebrae	5.6	1.9	-0.72

\*Chi-square=5.69 ( $P>0.20$ )

these values are, after all, akin to Minimum Numbers of Individuals (MNI), and are marked by the same debilities as MNI values (see Grayson, 1984), including the fact that different investigators bring different calculational rules to their determination.

Not all the differences can be so accounted for, however; here, we simply report our results, and array Binford's counts next to them in Tables 3, 4 and 5.

As we have discussed, Binford claims that the remains of tahr and of red deer follow two very different patterns of skeletal representation. Table 6 provides our NISP and MAU values for these two taxa. We have, in addition, calculated the standardized adjusted residuals that result from comparing red deer and tahr on the basis of the major skeletal element categories employed by Binford. Standardized adjusted residuals are read as standard normal deviates, and indicate the probability that a given single-cell comparison is statistically significant (Everitt, 1977); while we provide values for red deer in this table, values for tahr are identical, but have reversed signs.

Of the 20 NISP-based single-cell comparisons presented in this table, only two are significant: in comparison to the red deer sample, there are more specimens of skull ( $P=0.023$ ), and fewer of femur ( $P=0.048$ ), represented in the tahr sample than can be accounted for by chance. Of the 20 MAU-based comparisons provided by our data, none is significant. Using Binford's MAU values in this comparison provides the same result: there are no significant differences in skeletal part abundances between these two taxa in his data set (Table 7).

It might be objected that our chi-square analysis of MAU values has violated even the most liberal assessment of how small expected frequencies can be while

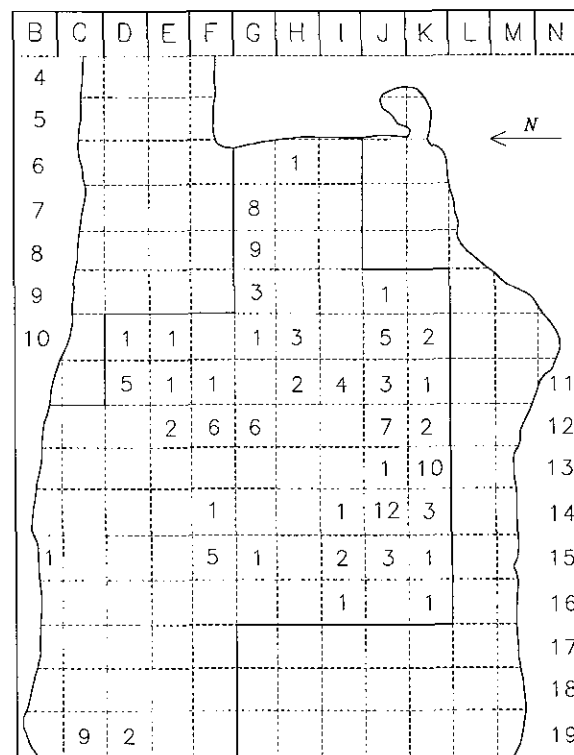


Figure 3. The distribution of carnivore specimens within Couche VIII.

leaving the assumptions of this technique inviolate. That assessment maintains that in the majority of cases, chi-square may be used as long as the smallest expected value exceeds 0.5 (Everitt, 1977). Such an objection would be appropriate. We note, however, that if these MAU values are too small to support chi-square analysis, then intuitive analyses of the same data are not likely to provide meaningful results.

We conclude that Binford lacked justification for his assertion that skeletal patterning in red deer differs significantly from that present in tahr.

#### *Are red deer and tahr differentially distributed?*

As part of his argument that the remains of tahr were introduced into Vaufrey by carnivores, Binford (1988: 541–542) asserted that “specimens of tahr, chamois, and roe deer show the same spatial distribution as those of bear, lynx, dhole, wolf, fox, and badger.” Binford supported this claim by referring to maps on which he had drawn density contours of carnivore specimens, on the one hand, and of tahr, roe deer and chamois specimens on the other.

Since Binford's arguments focus on tahr, and since there are only 16 specimens of chamois and roe deer, our analysis will focus on tahr as well. Because Binford did not provide his specimen counts, however, our analysis is conducted only with our own data.

Figures 2 and 3 provide the number of identified specimens per excavation unit for the Couche VIII tahr

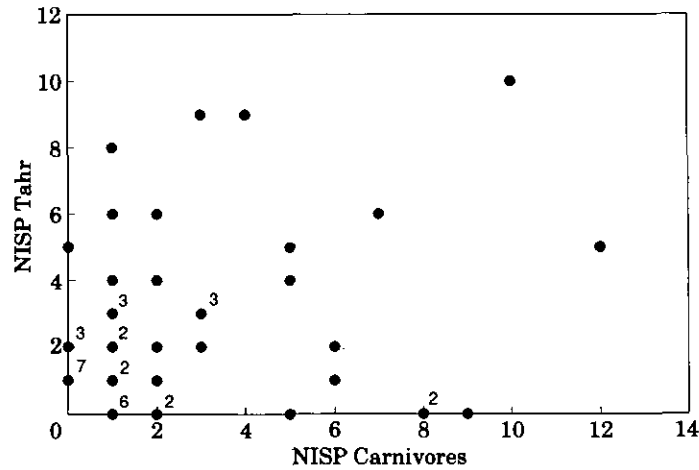


Figure 4. The relationship between the number of carnivore and tahr specimens per Couche VIII grid unit (grid units with neither taxon represented have been excluded).

and carnivores. Figure 4 displays the relationship between the number of carnivore and tahr specimens per Couche VIII unit, exclusive of units that contain neither carnivore nor tahr remains. Binford's argument requires that these specimens covary across excavation units, but the correlation (Spearman's coefficient,  $r_s$ ) between the two is very low (0.185), and is not significant ( $P > 0.10$ ). Although Binford concluded that dholes had introduced the tahr specimens into this site, a similar analysis based on dhole specimens alone is not possible, since only 29 specimens of dhole have been identified from Couche VIII.

Binford claimed that while all of the tahr material had been introduced by carnivores, the red deer specimens had a more complex taphonomic history, having been introduced by both people and carnivores. He bolstered this claim by examining the horizontal distribution of selected red deer specimens. He argued, for instance, that "the upper parts of limbs are concentrated in areas dominated by human activities, while metacarpals and metatarsals are primarily found in areas utilized by carnivores" (1988: 551). It follows from his reasoning that the correlation between the distribution of carnivore and red deer specimens (Figure 5) should be lower than that between carnivore and tahr specimens. However, this is not at all the case.

Figure 6 shows the relationship between the number of carnivore and red deer specimens across the Couche VIII excavation units, exclusive of units that contain neither carnivore nor red deer remains. This relationship is much stronger than that between carnivore and tahr remains:  $r_s = 0.403$  ( $P = 0.001$ ), a result that does not support the argument that tahr were introduced by carnivores, while red deer were introduced by both carnivores and people.

In fact, the strongest distributional correlation is not between the carnivores and any of the ungulates, but instead between red deer and tahr (Figure 7; units that

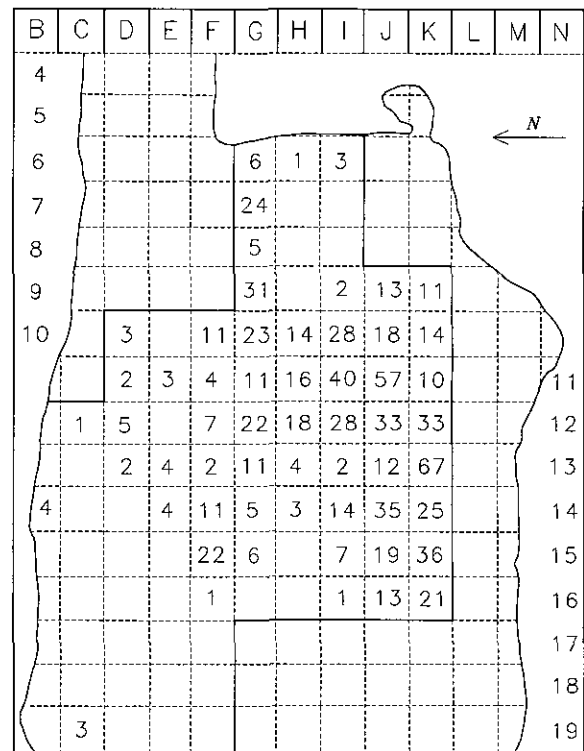


Figure 5. The distribution of red deer specimens within Couche VIII (two specimens lack grid unit provenance).

contain neither red deer nor tahr have been excluded from the analysis). The distributions of these two taxa are strongly correlated ( $r_s = 0.763$ ,  $P < 0.001$ ), suggesting that whatever accounts for the distribution of one of these taxa also accounts for the distribution of the other. This fact does not support Binford's argument that the horizontal distributions of these two taxa imply distinct taphonomic histories.



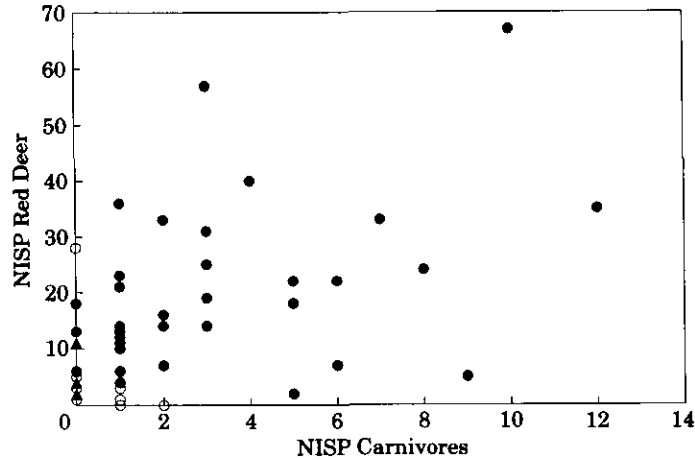


Figure 6. The relationship between the number of carnivore and red deer specimens per Couche VIII grid unit (grid units with neither taxon represented have been excluded; (▲)=four cases, (○)=two cases, (●)=one case).

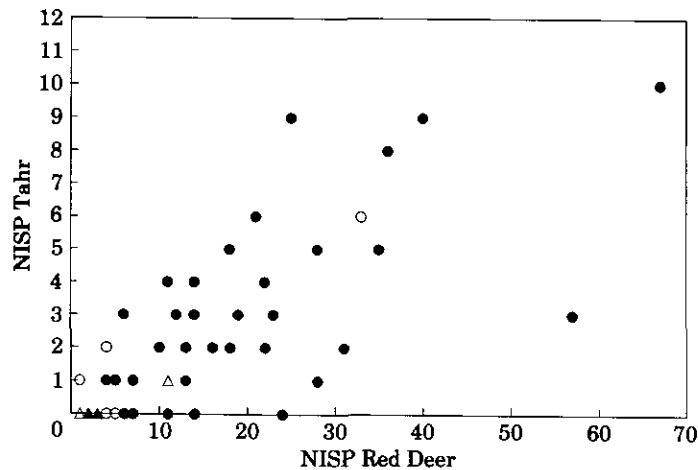


Figure 7. The relationship between the number of red deer and tahr specimens per Couche VIII grid unit (grid units with neither taxon represented have been excluded; (▲)=five cases, (△)=three cases, (○)=two cases, (●)=one case).

The results are similar if the analysis is broadened to include all 63 excavation units that contained any ungulate or carnivore specimens at all. In this broader analysis, the correlation ( $r_s$ ) between number of carnivore and tahr specimens per unit is 0.396 ( $P < 0.01$ ), between carnivore and red deer specimens, 0.417 ( $P < 0.001$ ), and between red deer and tahr specimens, 0.779 ( $P < 0.001$ ). No matter which way the analysis is done, no confirmation for Binford's assertions emerges.

*Do carnivore-damaged bones and tahr specimens follow the same distribution?*

Binford asserted that the distribution of carnivore-damaged specimens within Couche VIII coincides with the distribution of tahr, chamois and roe deer specimens, and that this coincidence supports his assertion that carnivores had accumulated the bones of those animals. As above, we focus our analysis on tahr and analyse only our own data.

The data we gathered concerning carnivore-damaged specimens in the Couche VIII faunal assemblage differs from that presented by Binford. Table 8 presents the number of carnivore-damaged specimens by skeletal element across the Couche VIII ungulates; Figure 8 provides the distribution of those specimens. While Binford does not tabulate all of his data on carnivore-damaged specimens, he does tabulate them for red deer. Table 9 presents both his results and ours.

It is important to understand that our tabulation provides the number of body parts (NBP), not NISP values. For instance, the Couche VIII red deer assemblage includes one complete femur, seven specimens of proximal femora, 10 of femoral shafts, and four of distal femora. While the red deer femur NISP is 22 (Table 1), in Table 9 we have tabulated an NBP of eight for the proximal femur, 11 for femoral shafts, and five for the distal femur in order to take into account the single complete specimen. All NBP values for our data set in Table 9 have been calculated in this way.

Table 8. The distribution of carnivore damage on the Couche VIII ungulate specimens

Element	<i>Bos/Bison</i>	<i>Cervus</i>	<i>Equus</i>	<i>Hemitragus</i>	<i>Rupicapra</i>	Carnivores
Antler		1				
Calcaneus		1				
Carpals				1		
Femur						1
Fibula						1
Humerus		4	2		1	1
Innominate		5		1		
Metacarpal		1				
Phalanges		14		3		1
Radius			3			
Rib		3				
Sacrum		1				
Sesamoids		1				
Tibia			1			
Ulna		2				2
Vertebrae	1	4	1			
Total	1	37	7	5	1	6

This table shows that the number of carnivore-damaged specimens counted by Binford (26) differs from our tally (37). However, Binford does not provide information on all skeletal parts, and the information he does provide differs from ours.

It is difficult to know what he has actually tabulated in the column he identified as "Number of Specimens" (Binford, 1988: table 3, column 8, p. 554). Clearly, it cannot be NISP: even a quick glance at the collection would reveal more than two fragments of antler. We assume that these columns are supposed to be his "minimum number of elements" (MNE), since multiplying his number of specimens by the number of times the element in question occurs in a red deer skeleton does come close to providing his MAU values, though they do not always match them (for instance, his six cranial specimens matches his cranial MAU of 3, but his 15 specimens of lumbar vertebra do not match his lumbar vertebra MAU value of 2). We ignore these problems in what follows.

Binford asserted that within Couche VIII, carnivore-damaged specimens follow the same distribution as those of tahr; this, he argued, "confirms the hypothesis that carnivores were the primary agent responsible for the introduction of the remains of tahr" (1988: 542). It follows from this reasoning that the number of carnivore-damaged specimens per excavation unit should be highly and positively correlated with the number of tahr specimens in those units. It also follows that if the distribution of red deer specimens is highly correlated with that of carnivore-damaged specimens, one could use the same reasoning to argue that the taphonomic histories of red deer and tahr cannot be distinguished on this basis.

As Binford's assertion requires, the relationship between the number of tahr specimens and the number of carnivore-damaged bones is significant ( $r_s=0.587$ ,  $P<0.001$ ; units devoid of both tahr and red deer specimens excluded). However, the corresponding

relationship for red deer is identical ( $r_s=0.587$ ,  $P<0.001$ ). No support is to be found here for Binford's claim that the remains of tahr were primarily introduced by carnivores while people played a major role in the introduction of red deer.

*Does the distribution of carnivore damage marks on red deer bones suggest scavenging?*

Binford used the distribution of carnivore damage across red deer body parts to support his argument that the Couche VIII people of Vaufrey were utilizing carcasses that had already undergone some carnivore attrition. As we have observed, he based this argument in part on data that suggested to him that carnivore damage on red deer bones is rare on axial elements, somewhat more frequent on upper limb elements, and very frequent on lower limb elements.

Table 10(a) provides the distribution of carnivore-damaged bones according to the three categories of body parts that formed the focus of Binford's analysis: axial skeleton, upper limb and lower limb. In our data, the lowest frequency of carnivore-damaged specimens is, in fact, on the axial skeleton (3.8%), but the highest is on the upper limb (14.8%). This difference is highly significant (chi-square=10.19,  $P<0.01$ ).

We also note that phalanges are among the most frequently carnivore-damaged element in the collection, and it is phalanges that cause the percentage of carnivore-damaged lower limb specimens to be as high as it is in our data set (10.2%). Binford, however, did not incorporate phalanges into his analysis of carnivore-damaged specimens. If they are removed, the frequency of carnivore damaged lower-limb specimens drops to 4.2%, only slightly higher than that shown by the axial skeleton. In addition, with phalanges excluded from the analysis, carnivore damage is not differentially distributed across axial and lower limb elements (chi-square=0.04,  $P>0.20$ ).

Table 9. The distribution of carnivore damage on *Couche VIII* red deer specimens

Element	Binford (1988)			This paper		
	MAU	Number damaged	% damaged	NBP	Number damaged	% damaged
Antler	2	0	0	35	1	2.9
Skull	6	0	0	30	0	0
Mandible	4	0	0	25	0	0
Vertebra						
Atlas-Axis	2	0	0	5	0	0
Cervical	3	0	0	7	0	0
Thoracic	12	4	33	41	3	7.3
Lumbar	15	1	7	24	1	4.2
Sacrum	3	1	33	4	1	25.0
Innominate	3	1	33	10	5	50.0
Scapula	1	1	100	10	0	0
Humerus						
Proximal	6	3	50	7	3	42.9
Shaft	n.d.	n.d.	n.d.	8	1	12.5
Distal	8	2	25	6	0	0
Radioulna						
Proximal	5	3	60	8	1	12.5
Shaft	n.d.	n.d.	n.d.	9	1	11.1
Distal	2	0	0	7	0	0
Carpals	13	0	0	15	0	0
Metacarpals*						
Proximal	1	0	0	2	0	0
Shaft	n.d.	n.d.	n.d.	9.5	1	10.5
Distal	2	0	0	7	0	0
Femur						
Proximal	7	1	14	8	0	0
Shaft	n.d.	n.d.	n.d.	11	0	0
Distal	5	0	0	5	0	0
Tibia						
Proximal	1	1	100	2	0	0
Shaft	n.d.	n.d.	n.d.	6	0	0
Distal	0	0	0	1	0	0
Tarsals	9	0	0	10	0	0
Astragalus	3	0	0	3	0	0
Calcaneus	3	1	33	6	1	16.7
Metatarsals*						
Proximal	4	0	0	7	0	0
Shaft	n.d.	n.d.	n.d.	15.5	0	0
Distal	3	0	0	2	0	0
Phalanges	n.d.	n.d.	n.d.	69	14	20.3
Sesamoids	n.d.	n.d.	n.d.	12	1	8.3
Rib						
Proximal	27	7	26	30	3	10.0
Shaft	n.d.	n.d.	n.d.	32	0	0.0
Total Damaged		26			37	

\*Includes 50% of four specimens identified as distal metapodial, and five identified as metapodial shaft.

n.d.=corresponding data not available in Binford (1988).

NBP=number of body parts.

Given Binford's approach, our data do not provide a warrant for concluding that carnivore damage is differentially distributed across the three skeletal categories defined by Binford. With phalanges included in the analysis, however, lower limb elements do show a greater incidence of carnivore damage than can be accounted for by chance (chi-square=6.80,  $P<0.01$ ).

Binford's data on carnivore-damaged specimens (Table 10(b)) provide no support for his position. Here, it is not the axial skeleton that has the lowest frequency of carnivore-damaged specimens, but lower limb elements—precisely those elements that he

claimed were most frequently carnivore-damaged. However, this difference is not significant (chi-square=1.00,  $P>0.20$ ).

In short, Binford asserted that carnivore damage is differentially distributed across the lower limbs, upper limbs and axial skeleton of red deer in *Couche VIII*. Binford would be better off using our data than his to support this assertion, since no such pattern exists in the data he presents. Our data do support the claim that red deer axial elements show less carnivore damage than lower limb elements, but this support comes only when we consider specimens that Binford did not include in his analysis. In addition, it is the upper, not

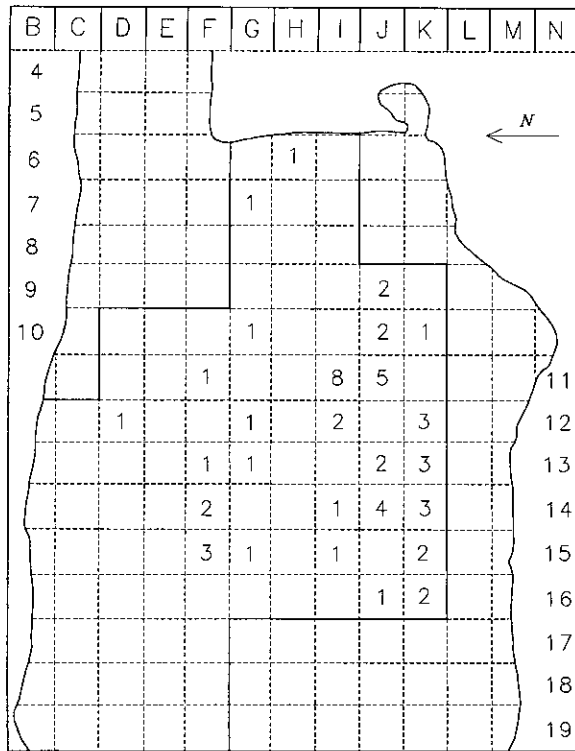


Figure 8. The distribution of carnivore-damaged specimens within Couche VIII (one specimen lacks grid unit provenance).

the lower, limb that displays the highest proportion of carnivore-damaged specimens in our data set.

*Are cut marks lacking on the Couche VIII bones?*

Although Binford found the Couche VIII fauna to be full of surprises, most surprising to him was the virtual lack of cut marks—only three—in the entire assemblage. From this, he concluded that the carcasses that were scavenged were already falling apart, and did not need to be disarticulated using stone tools.

In strong contrast, we found 44 specimens that bear cut marks [see Table 11 and Figure 9; the criteria used to identify these marks closely followed those discussed in Grayson (1988)]. Of the three cut specimens listed by Binford, two appear on our list: an *Equus* tibia (G7-23) and a *Hemitragus* accessory metacarpal (G15-35). Binford identified his third cut specimen as a large bovid humerus shaft (K10-154). Although a long bone fragment with this number exists, we can identify it only as large mammal, and thus do not include it in our analysis.

We cannot account for the magnitude of difference between our observations and those of Binford concerning cut marks on the Couche VIII specimens. Indeed, although Binford (1988: 559) asserts that “not a single bone bears cut marks that can be interpreted, with certainty, as indicating disarticulation”, five specimens bear marks at or near positions identified by Binford (1981) as indicating precisely that function (see Table 12). We do not presume to have deep insight into

Table 10. The frequency of carnivore-damaged red deer specimens by major skeletal region, Couche VIII

	(a) Delpech and Grayson data			(b) Binford (1988)		
	NISP	Number damaged	% damaged	MAU	Number damaged	% damaged
<b>Axial Skeleton</b>						
Antler	35	1	2.9	2	0	0.0
Skull	30	0	0.0	6	0	0.0
Mandible	25	0	0.0	4	0	0.0
Vertebrae	82	4	4.9	32	5	15.6
Sacrum	4	1	25.0	3	1	33.3
Rib	60	3	5.0	27	7	25.9
<b>Total</b>	<b>236</b>	<b>9</b>	<b>3.8</b>	<b>74</b>	<b>13</b>	<b>17.6</b>
<b>Upper Limb</b>						
Scapula	10	0	0.0	1	1	100.0
Humerus	19	4	21.1	14	5	35.7
Innominate	10	5	50.0	3	1	33.3
Femur	22	0	0.0	12	1	8.3
<b>Total</b>	<b>61</b>	<b>9</b>	<b>14.8</b>	<b>30</b>	<b>8</b>	<b>26.7</b>
<b>Lower Limb</b>						
Radioulna	24	2	8.3	7	3	42.9
Carpals	15	0	0.0	13	0	0.0
Metacarpals	14.5	1	6.9	3	0	0.0
Tibia	9	0	0.0	1	1	100.0
Tarsals	19	1	5.3	15	1	6.7
Metatarsals	24.5	0	0.0	7	0	0.0
Sesamoids	12	1	8.3	n.d.	n.d.	n.d.
Phalanges	69	14	20.3	n.d.	n.d.	n.d.
<b>Total</b>	<b>187</b>	<b>19</b>	<b>10.2</b>	<b>46</b>	<b>5</b>	<b>10.9</b>

n.d. = corresponding data not available in Binford (1988).

Table 11. *Couche VIII* ungulate specimens bearing cut marks

Taxon	Element	Unit (specimen number)	
<i>Bos/Bison</i>	Nasal	G6 (64)	
	Tibia	J14 (61)	
<i>Cervus elaphus</i>	Femur	K13 (238)	
	Femur	K13 (263)	
<i>Equus</i> sp.	Humerus	H6 (19)	
	Humerus	J12 (261)	
	Humerus	K13 (271)	
	Humerus	K14 (351)	
	Mandible	J14 (203)	
	Metacarpal	J11 (164)	
	Metatarsal	G7 (—)	
	Metatarsal	K9 (145)	
	Phalanx 2	J11 (166)	
	Phalanx 3	G10 (64)	
	Rib	H11 (40)	
	Rib	H12 (112)	
	Rib	I12 (158)	
	Rib	I12 (191)	
	Tarsal	I10 (160)	
	Vertebra (dorsal)	I12 (186)	
	Vertebra (dorsal)	J13 (212)	
	Vertebra (lumbar)	K13 (429)	
	<i>Equus</i> sp.	Femur	E10 (35)
		Femur	I14 (19)
		Femur	J11 (178)
		Femur	J11 (181)
Femur		J12 (186)	
Femur		J12 (258)	
Femur		K11 (235)	
Femur		K13 (193)	
Femur		K14 (240)	
Humerus		F10 (144)	
Radius		K12 (281)	
Tibia		G7 (23)	
Tibia		I12 (190)	
Tibia		K10 (177)	
Vertebra (cervical)	K14 (239)		
Vertebra (lumbar)	J14 (77)		
Vertebra (thoracic)	J12 (194)		
Vertebra (thoracic)	K13 (220)		
<i>Hemitragus</i> sp.	Hyoid	J14 (118)	
	Metacarpal	G15 (35)	
<i>Rupicapra rupicapra</i>	Rib	K14 (361)	
	Humerus	K14 (252)	

the meaning of the cut marks on the Vaufrey specimens, but according to Binford's own criteria, a minimum of 11.4% of those marks were produced during disarticulation. Scant support is found here for Binford's twin assertions that the *Couche VIII* faunal

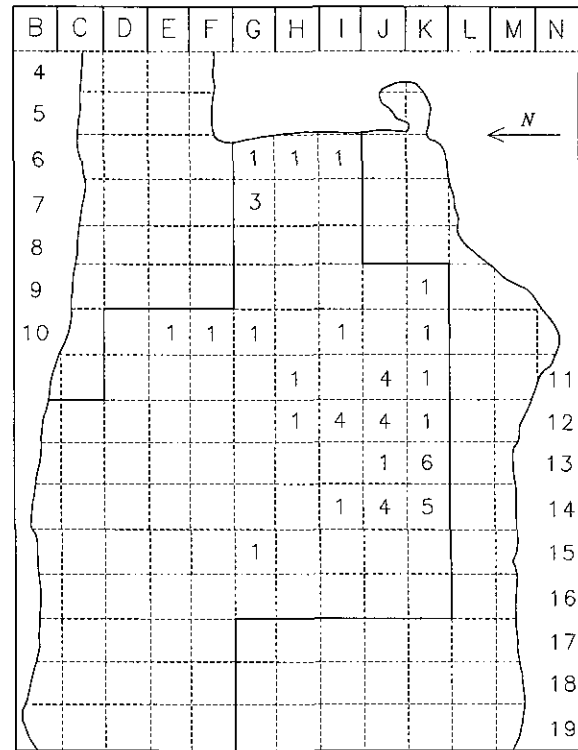


Figure 9. The distribution of cut specimens within *Couche VIII*. (Two first phalanges of *Castor* (beaver) from I6 and G7 are included.)

assemblage contains little evidence for the use of stone tools, and little evidence for dismemberment.

As we have discussed, Binford also argues that tahr were introduced entirely by carnivores, while red deer were introduced by both carnivores and people. It would follow that cut marks should be differentially distributed across these two taxa, with significantly more found on red deer than on tahr. This, however, is not the case. Of 494 red deer bones, 20 bear cut marks; of 68 tahr bones, three bear cut marks, a distribution that is virtually identical statistically ( $\chi^2=0.02$ ,  $P>0.20$ ). Insofar as frequencies of cut marks are concerned, there is no distinction to be had between these two taxa.

This is not the case for *Equus* specimens, however. Compared to the combined tahr and red deer samples

Table 12. *Cervus elaphus* specimens bearing cut marks from *Couche VIII*, with cut mark locations at or near those described in Binford (1981); see Table 11 for specimen numbers

Element	Unit	Binford code	Binford interpretation
Humerus	H6	Hd-2, Hd-3	Dismembering
Humerus	J12	Hd-3	Dismembering
Humerus	K14	Hd-2	Dismembering
Metatarsal	K9	MTp-3	Dismembering
Tarsal	I10	TNC-1	Dismembering
Vertebra	I12	TV-2	Filleting
Vertebra	J13	TV-2	Filleting

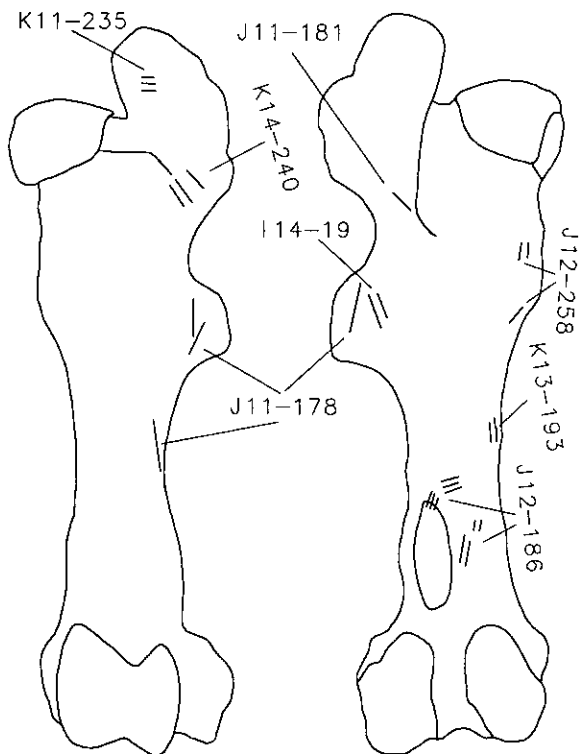


Figure 10. The location of cut marks on specimens of horse femora, Couche VIII (the side of one shaft fragment could not be determined, and so has not been depicted).

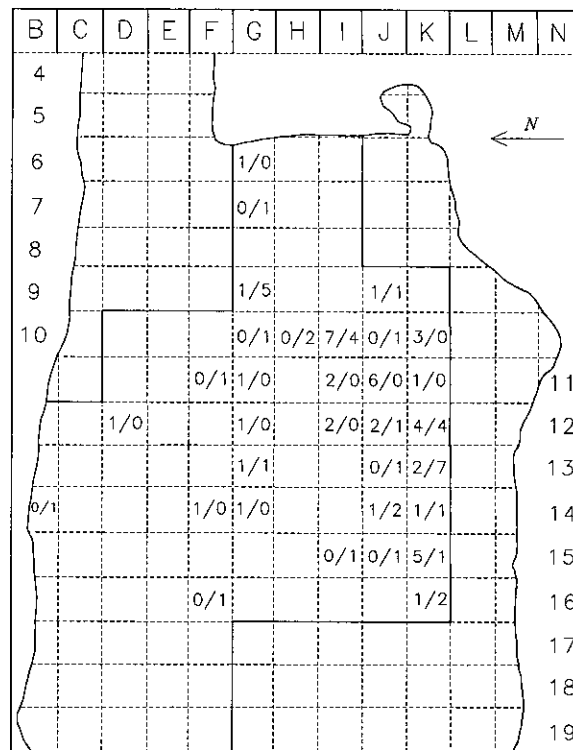


Figure 11. The distribution of red deer molars (upper/lower) within Couche VIII.

(23 of 562 bones with cut marks), horse specimens bear far more cut marks (18 of 44 bones) than can be accounted for by chance (chi-square=87.68,  $P < 0.001$ ). Of these, half are on the femur (Figure 10), while the remainder are either on long bones (five) or on vertebrae (four).

Binford (1988: 558) claimed that the skeletal profile of the Couche VIII horse remains indicated that horse carcasses “had been heavily exploited before the men of Vaufrey had exercised their selection”. To reach this conclusion, he called on his MAU data, and argued that the horse skeletal parts of highest meat utility—upper hind limbs—were under-represented in Couche VIII. We observe that in his MAU data (Table 4), upper hind limbs are as well represented as upper forelimbs. In our MAU data (Table 4), upper hind limbs are somewhat better represented than upper

forelimbs, and specimens of horse femora are almost three times more abundant than those of humeri (Table 1). The cut mark data alone show that the femur was a heavy focus of stone tool use.

Table 13 shows the joint distribution of cut marks and carnivore marks on the Couche VIII ungulates (roe deer show neither cut marks nor carnivore damage). This table also provides standardized adjusted residuals for cut specimens (those for carnivore-damaged specimens have opposite signs but are otherwise identical). Within Binford’s view of the accumulation of the Couche VIII red deer and horse remains, in which both species were scavenged, remarkable contortions would be required to account for the fact that cut marks and carnivore damage tend to coincide on red deer specimens, while they tend not to coincide on those of horse.

Table 13. The joint distribution of cut marks and carnivore marks on the Couch VIII ungulates

Taxon	Number of cut specimens	Number of carnivore-damaged specimens	Standardized adjusted residual (cut specimens)
<i>Bos/Bison</i>	2	1	0.72
<i>Cervus elaphus</i>	20	37	-2.68*
<i>Equus</i>	18	7	3.00*
<i>Hemitragus</i>	3	5	-0.52
<i>Rupicapra</i>	1	1	0.11

$P < 0.01$ .

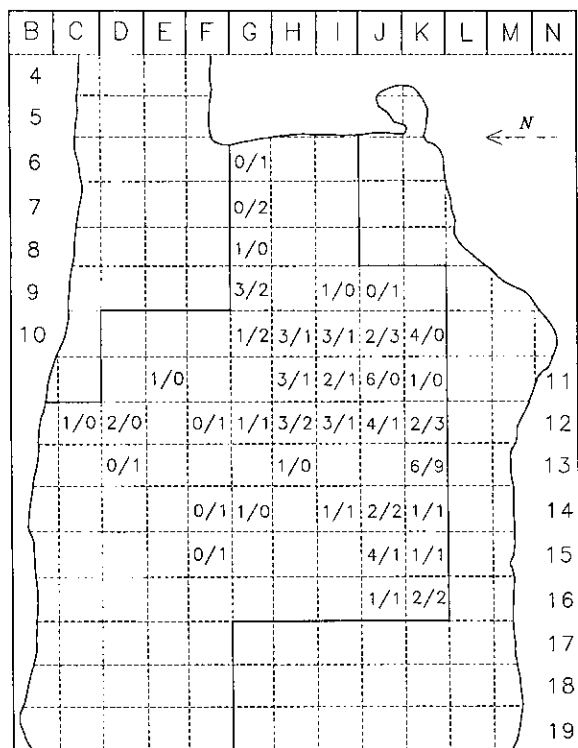


Figure 12. The distribution of red deer premolars (upper/lower) within Couche VIII.

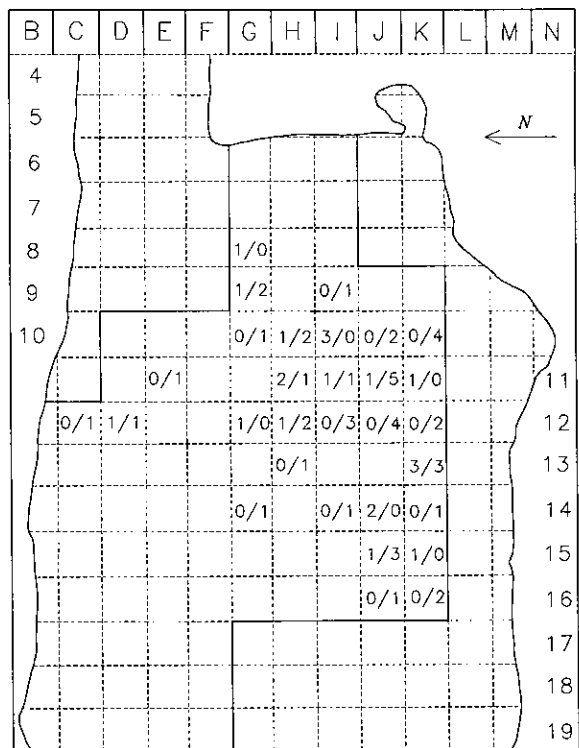


Figure 13. The distribution of red deer upper premolars (deciduous/permanent) within Couche VIII.

Given all this, there is no reason to think that horse remains were scavenged from carcasses that had already been utilized by carnivores. Once again, the Couche VIII fauna does not support Binford's assertions.

*Does the distribution of upper and lower red deer teeth differ east and west of grid line 10/11?*

As part of his attempt to determine whether skulls and mandibles of the Couche VIII red deer were introduced by people or by carnivores, Binford examined a plot of the distribution of upper and lower cheek teeth. He asserted that this plot documented "clearly that the maximum density [of upper cheek teeth] is found in the zone of predominantly human activities" (Binford, 1988: 552). Lower cheek teeth, on the other hand, he found "very numerous in the zone of animal occupation" (Binford, 1988: 552). This discovery led him to claim that many red deer mandibles were introduced into the site by carnivores.

Neither Binford's data nor our own support that conclusion. In this part of his analysis, Binford used grid line 10/11 (not 12/13) as the dividing point between the human- and carnivore-dominated parts of Couche VIII. He plotted 34 upper cheek teeth east of this line, 79 west of it; likewise, he plotted 23 lower cheek teeth east of the line and 61 west of it (Binford, 1988: figure 17 and 18). The differences are

not significant (chi-square=0.17,  $P>0.20$ ). Our data also do not agree: we find 31 red deer upper cheek teeth east of grid line 10/11 and 82 west of it; for lower cheek teeth, the corresponding numbers are 28 and 57. Again, the differences are not significant (chi-square=0.70,  $P>0.20$ ; see Figures 11 and 12).

Binford also asserted that the upper and lower cheek teeth had been drawn from animals of different ages, and that these ages are differentially distributed across the human- and carnivore-dominated parts of Couche VIII. In particular, he calculated that east of grid line 10/11, the ratio of deciduous to permanent upper cheek teeth is 0.24, while west of that line, it is 0.33; he found this difference, 0.09, to be "slight" (Binford, 1988: 552). His calculations of the deciduous/permanent ratio for lower cheek teeth provided a value of 0.27 east of line 10/11, and a value of 0.22 west of it. The difference involved here (0.05) is less than that which he concluded was "slight" for the upper teeth, yet Binford concluded that the meaning was clear: "there were a few more young animals in the zone of human occupation" (1988: 552). "This", he concluded, "is confirmed by the fact that carnivores customarily transport the mandibles of large animals" (Binford, 1988: 552). These results, Binford felt, supported the inference that juvenile red deer are over-represented, and that the mandibles of adult red deer were primarily introduced by carnivores.

Figure 11 provides our data on the distribution of red deer molars in Couche VIII; Figures 13 and 14

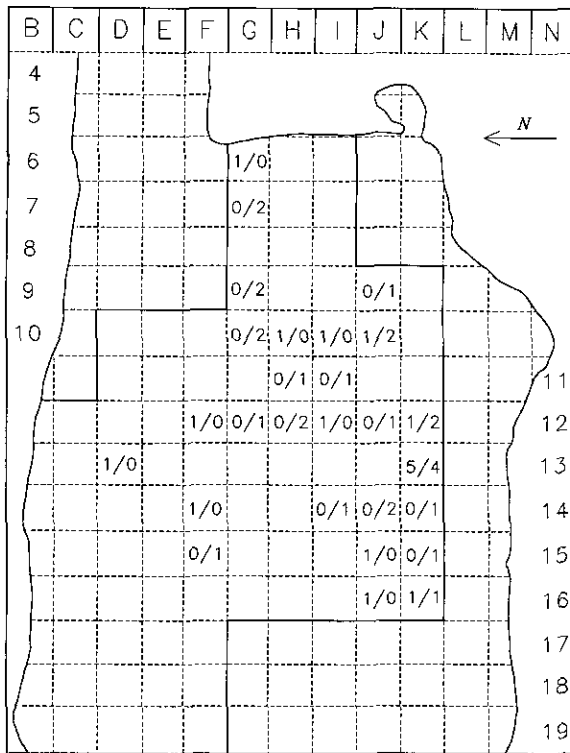


Figure 14. The distribution of red deer lower premolars (deciduous/permanent) within Couche VIII.

provide corresponding data for deciduous and permanent premolars. Summing the values in these figures shows that there are 25 permanent upper cheek teeth east of line 10/11 and 67 west of it; there are 6 deciduous upper premolars east of this line and 15 west of it. The difference could hardly be less significant ( $\chi^2=0.02$ ,  $P>0.20$ ). The results are virtually identical for lower cheek teeth. There are 24 permanent lower cheek teeth east of Binford's line, 44 west of it. There are 4 deciduous lower premolars east of the line, 13 west of it. The differences are not significant ( $\chi^2=0.85$ ,  $P>0.20$ ).

Performing the analysis with Binford's data provides the same results. He plots 27 permanent and 7 deciduous upper cheek teeth east of 10/11, and 63 permanent and 16 deciduous upper cheek teeth west of that line ( $\chi^2=0.02$ ,  $P>0.20$ ). He plots 20 permanent and 3 deciduous lower cheek teeth east of 10/11, 48 permanent and 13 deciduous lower cheek teeth to the west ( $\chi^2=0.74$ ,  $P>0.20$ ).

Once again, simple statistical analyses, using either Binford's data or ours, demonstrate that his assertions are without foundation.

## Conclusions

Binford also performed a series of comparisons of the Vaufray data with modern faunal assemblages from Alaska and Africa, and with archaeological data from

Klasies River Mouth [Binford (1984) but see also Klein (1986, 1989)]. We have not repeated those exercises. In addition, Binford said that he counted and measured 17,222 unidentified bone fragments, but we did not examine the unidentified component of the Couche VIII fauna.

Nor have we duplicated all of the other analyses of the Couche VIII fauna that Binford (1988) presents. We see little reason at this time to do so. We have duplicated the bulk of those analyses. Our results are dramatically different from those reported by Binford (1988). Most importantly, we have shown that his assertions are not supported by statistical analysis of either his data set or ours. Within the context of Binford's own arguments, his claims that the Couche VIII red deer and horses were scavenged, and that the Couche VIII tahr were introduced by carnivores, are not supported by the faunal assemblage itself.

We conclude that Binford's analysis of the Couche VIII fauna from Grotte Vaufray, the sole detailed analysis suggesting that the Middle Palaeolithic human occupants of southwestern Europe were not fully efficient hunters, is fatally flawed.

## Acknowledgements

Our thanks to Richard G. Klein, Robert D. Leonard, R. Lee Lyman, Richard G. Milo, James F. O'Connell, Jean-Philippe Rigaud and Erik Trinkaus for commenting on a draft of this paper. Grayson's work on the Couche VIII fauna was supported by the National Science Foundation (BNS88-03333) and by the L. S. B. Leakey Foundation.

## References

- Binford, L. R. (1981). *Bones: Ancient Men and Modern Myths*. New York: Academic Press.
- Binford, L. R. (1984). *Faunal remains from Klasies River Mouth*. Orlando, FL: Academic Press.
- Binford, L. R. (1988). Etude taphonomique des restes fauniques de la grotte Vaufray. In (J.-P. Rigaud, Ed.) *La Grotte Vaufray à Cénac et Saint-Julien (Dordogne): Paléoenvironnements, Chronologie et Activités Humaines. Mémoires de la Société Préhistorique Française* 19, 535-564.
- Delpech, F. (1988). Les grands mammifères de la grotte Vaufray à l'exception des Ursidés. In (J.-P. Rigaud, Ed.) *La Grotte Vaufray à Cénac et Saint-Julien (Dordogne): Paléoenvironnements, Chronologie et Activités Humaines. Mémoires de la Société Préhistorique Française* 19, 213-290.
- Delpech, F. & Laville, H. (1988). Climatologie et chronologie de la grotte Vaufray: Confrontation des hypothèses et implications. In (J.-P. Rigaud, Ed.) *La Grotte Vaufray à Cénac et Saint-Julien (Dordogne): Paléoenvironnements, Chronologie et Activités Humaines. Mémoires de la Société Préhistorique Française* 19, 381-386.
- Everitt, B. S. (1977). *The Analysis of Contingency Tables*. London: Chapman & Hall.
- Geneste, J.-M. (1988). Les industries de la grotte Vaufray: Technologie du débitage, économie et circulation de la matière première. In (J.-P. Rigaud, Ed.) *La Grotte Vaufray à Cénac et Saint-Julien*



## The Evidence for Middle Palaeolithic Scavenging 375

- (Dordogne): Paléoenvironnements, Chronologie et Activités Humaines. *Mémoires de la Société Préhistorique Française* **19**, 441–518.
- Grayson, D. K. (1984). *Quantitative Zooarchaeology*. Orlando, FL: Academic Press.
- Grayson, D. K. (1988). Danger Cave, Last Supper Cave, Hanging Rock Shelter: the faunas. *American Museum of Natural History Anthropological Papers* **66**(1).
- Klein, R. G. (1986). Faunal remains from Klasies River Mouth. *American Anthropologist* **88**, 494–495.
- Klein, R. G. (1989). Why does skeletal part representation differ between smaller and larger bovids at Klasies River Mouth and other archaeological sites? *Journal of Archaeological Science* **6**, 363–381.
- Prat, F. (1988). Les Ursidés de la grotte Vaufrey. In (J.-P. Rigaud, Ed.) La Grotte Vaufrey à Cénac et Saint-Julien (Dordogne): Paléoenvironnements, Chronologie et Activités Humaines. *Mémoires de la Société Préhistorique Française* **19**, 291–318.
- Richardson, P. R. K. (1980). Carnivore damage to antelope bones and its archaeological implications. *Paleontologia Africana* **23**, 109–125.
- Rigaud, J.-P. (1988a). Analyse typologique des industries de la grotte Vaufrey. In (J.-P. Rigaud, Ed.) La Grotte Vaufrey à Cénac et Saint-Julien (Dordogne): Paléoenvironnements, Chronologie et Activités Humaines. *Mémoires de la Société Préhistorique Française* **19**, 389–440.
- Rigaud, J.-P. (Ed.) (1988b). La Grotte Vaufrey à Cénac et Saint-Julien (Dordogne): Paléoenvironnements, Chronologie et Activités Humaines. *Mémoires de la Société Préhistorique Française* **19**.
- Rigaud, J.-P. & Geneste, J.-M. (1988). L'utilisation de l'espace dans la grotte Vaufrey. In (J.-P. Rigaud, Ed.) La Grotte Vaufrey à Cénac et Saint-Julien (Dordogne): Paléoenvironnements, Chronologie et Activités Humaines. *Mémoires de la Société Préhistorique Française* **19**, 593–611.
- Simek, J. (1988). Analyse de la répartition spatiale des vestiges de la couche VIII de la grotte Vaufrey. In (J.-P. Rigaud, Ed.) La Grotte Vaufrey à Cénac et Saint-Julien (Dordogne): Paléoenvironnements, Chronologie et Activités Humaines. *Mémoires de la Société Préhistorique Française* **19**, 569–592.