

A REASSESSMENT OF THE FAUNAL EVIDENCE FOR NEANDERTAL DIET BASED ON SOME WESTERN EUROPEAN COLLECTIONS

by

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ABSTRACT

The faunal material from a number of Western European early Upper Pleistocene sites, caves, rock shelters and in the open air, has been re-examined in the light of research conducted over the last 10-15 years into patterns of *post-mortem* bone breakage and frequency of survival of different skeletal parts, on the basis of which it seems to be possible to distinguish bones accumulated by other carnivores from those reflecting human feeding behaviour. This taphonomic evidence suggests that it cannot be simplistically assumed that the faunal material recovered from an archaeological site invariably relates to human behaviour, frequently the bone assemblage appears to reflect other carnivore activity. It is further suggested that certain patterns of site usage can be delineated which may serve us in future to distinguish between potential carnivore dens and human activity areas. Finally, it is concluded that we know far less about the diet and food-getting behaviour of *Homo sapiens* than is currently assumed.

INTRODUCTION

People seem to have utilised caves and rock overhangs in the Old World for at least the last 500,000 years. However, the evidence for such probable occupation, in the form of charcoal lenses from fires and scatters of stone tool debris, only becomes common enough in Western Europe for analysis to demonstrate any inherent patterning in the Later Pleistocene, < 200,000 BP, when the Neandertals began to use such sites sufficiently intensively for the remains of their material culture to have been preserved for present day analysis. Among this occupational debris animal bones are frequently found. Their survival depends more on the density and rate of epiphyseal fusion in the specific body part and on differences in the soil chemistry at each site than on differences in human behaviour. Until recently it has always been assumed that these bones were the remains of human food and reflected Neandertal provisioning strategies, but recent actualistic studies by, for example, HILL (1979a and b), BEHRENSMEYER and HILL (1980), HAYNES (1980), BRAIN (1981) and ANDREWS and NESBIT-EVANS (1983) amongst others (CLUTTON-BROCK and GRIGSON, 1983), mainly in eastern and southern Africa, have begun to

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demonstrate that the faunal debris recovered from pre-Neolithic archaeological sites does not necessarily reflect the activities of people rather than that of other carnivores and to establish criteria for distinguishing between these agents of bone accumulation. The ethnographic record suggests that hunter-gatherers when butchering a large animal tend to deflesh most of the carcass and only remove from the kill site the smaller bones with the meat still attached. Carnivores tend to remove and later gnaw the larger bones with much cancellous tissue.

The problem of disentangling the taphonomic history of faunal remains is particularly acute at Palaeolithic cave and rock shelter sites, which may have served as animal lairs in the absence of people. Modern field studies have demonstrated the ability of most canids, some felids and even insectivores, all of whom sometimes lair in caves, to collect and modify skeletal debris. A set of criteria is now being formulated for distinguishing whether bones found on archaeological sites are the product of human butchery techniques and people's selection of preferred joints of meat, or other carnivore behaviour, or merely the product of the natural sequence of disintegration during decay. Most of the caves and rock shelters discussed here yielded the bones of carnivores such as the cave hyaena (*Crocota crocuta*), a known bone modifier (SUTCLIFFE, 1970), and the cave lion (*Panthera leo*), thought to have been similar to the modern lion which also modifies bones to a lesser extent. A reconsideration of the assumption that faunal material from sites with Middle Palaeolithic artefacts truly represents human activity was therefore considered worthwhile.

The time period during which the material discussed here was deposited is difficult to define but in broad terms covers from the end of the penultimate glaciation, possibly 200-150,000 BP, to the middle of the last glaciation, about 40-30,000 BP (WEBB, 1988c). Considerable climatic information is now available for this period in the deep sea oxygen isotope record of inferred temperature, and hence land ice, fluctuations (SHACKLETON, 1977), but this information cannot as yet be directly correlated with the fragmentary terrestrial glacial record. However, recourse can be had to the long and detailed pollen record from Grande Pile (WOILLARD, 1978) and other palaeobotanical work to indicate terrestrial vegetational conditions for part of the period. This palynological evidence suggests that for most of the last 150,000 years in Western Europe the vegetation fluctuated from open steppe tundra with some boreal coniferous forest in the colder periods, to closed deciduous thermophilous woodland in the warmer periods (FRENZEL, 1979). The effects of such vegetational shifts upon the dependent fauna are unknown since no biome within this range can still be observed unaltered by man. However, prior to the last glacial maximum, there is no evidence that either animals or the people who preyed on them were restricted in their distribution or exploitation strategies purely by environmental factors.

No attempt has been made to construct a relative stratigraphic timescale for the sites studied. The ages assigned to the sites discussed are taken directly from the original reports and based on geological and radiometric information. However, the data are sufficiently few and imprecise that no more than a general site sequence can be constructed. All these sites produced Middle Palaeolithic artefacts, which have been classified into various technological facies. The significance of these differences and their relevance to any accompanying changes in the associated faunal remains are not understood (BINFORD, 1973; BORDES, 1973). It is also clear that the deposits at most of these sites probably formed over a long period. Therefore, any one layer or group of layers at any of these sites could represent slow sediment accumulation over centuries, possibly millenia, in which bones from many discrete behavioural events became preserved. Therefore, the precise relationship remains obscure between the events, whether of human or animal origin, by which the food debris accumulated, and the faunal material actually surviving for study. Far more dates would be needed before these problems could be disentangled or the precise intercorrelation of these sites would be possible. Ultimately it would be interesting to plot faunal change over time. This could give a detailed picture of the effects of an environment such as temperate latitude glaciation, for which no known modern analogue exists, on both biomass density and changes in relative species frequency in the past. These might be reflected by changes in

human hunting preferences in response to shifts in animal distributions as they adjusted to changing environmental conditions, but such model building still lies far in the future. It may even be intrinsically beyond the scope of archaeological methodology.

Hence, whether the fauna recovered at any particular site directly reflects local environmental conditions is not clear. Several ecological groups would appear to be represented in the Western European fauna as a whole: open grassland/tundra; high altitude/mountainous; coniferous/deciduous woodland. Yet animals from apparently different biomes are found together at some sites. There is a large literature on the problem of interpreting 'disharmonious faunas' (GRAHAM and LUNDELIUS, 1984). Here it is simply suggested that either last glaciation herbivores could tolerate greater environmental diversity than is sometimes supposed or that the people hunting them were exploiting a variety of ecological patches whenever possible. We cannot assume that the faunal remains found on an archaeological site reflect a deliberate selection by people of preferred game animals from the local biomass. Animals might well have been hunted and were very likely scavenged on a catch-as-catch-can basis. The frequency of occurrence of any given species recovered from an archaeological site is as likely to reflect who, people or other carnivores, transported it to the site, as its relative frequency in the local biomass or its vulnerability as prey. A high frequency of a given species might mean that it was locally dominant, but it might equally have been the easiest game to take or been prized by people for cultural reasons. Simplistic interpretations such as that by COLLINS (1986: 235-245) are to be avoided at all costs. Most carnivores scavenge when they can, since that is a lower risk activity than hunting, which they only actively pursue when they must. It is entirely possible that people scavenged from kills by other carnivores when they could with impunity, but in turn they would have had to protect their own food from scavengers, especially the wolverine (*Gulo gulo*). SHIPMAN has shown that, in southern Africa at least, woman could have survived, even in the Lower Pleistocene, by scavenging alone (1986). However, we cannot therefore assume that people depended on scavenging as a deliberately chosen strategy for food acquisition, particularly in northwestern Europe during a glaciation. It is reasonable to suppose that, like other animals, people usually foraged opportunistically, if not optimally, within their environment (WINTERHALDER and SMITH, 1981; MARTIN, 1983; SMITH, 1983). The energy they expended on food acquisition must have been less than that they gained from its consumption or they would not have survived. However, the additional human dimension of culturally inculcated food preferences must never be forgotten, even if it is difficult to demonstrate for prehistoric peoples.

DISCUSSION OF THE DATA

This study represents an attempt to assess in taphonomic terms the faunal material from selected Western European Middle Palaeolithic sites. It is based on a re-examination of published faunal reports and was undertaken to demonstrate that such research is feasible, providing its limitations are recognised. Unfortunately, relatively few of the many reports potentially available specify the requisite information on the skeletal parts found or mention the nature of any surficial damage present. However, it has been possible to infer that information as well as the numbers of individuals of each species represented and probable individual age at death, from the reports on about 20 sites scattered throughout Europe, some of which have already been discussed elsewhere (WEBB, 1987, 1988b).

The European fauna is comparatively impoverished, however it is worth reviewing some of its aspects. The prey animals that would have been available to Middle Palaeolithic people in central Europe included the mammoth (*Elephas primigenius*), narrow nosed (*Dicerorhinus hemitoechus*), woolly (*Coelodonta antiquitatis*) and Merck's rhinoceroses (*D. kirchbergensis*), equids, and cervids and bovids of various sizes and habits. However, all these herbivores, except possibly adult rhinos and mammoths, would also have been preyed on by the felids and canids present at the time, especially the wolf (*Canis lupus*) and

cave hyaena. These carnivores probably represent the main competitors that people would have had to face during meat acquisition (TURNER, 1981). They are considered unlikely to have been human prey. While it is not inconceivable that people occasionally ate carnivore flesh, the untestable assumption is made here that they probably only did so under conditions of extreme need. Prior to the invention of the bow and arrow, by comparison with other predators people were disadvantaged. They cannot run at high speeds for long periods and their stalking and tracking abilities are inferior, but they are capable of intelligent co-operative premeditated actions, such as driving game into traps, pitfalls or snares. People may have made up in cunning for their comparative physical deficiencies. Despite TRINKAUS' arguments (1983a and b) for the robusticity of Neandertals, they were still of relatively small body size and their simple technology suggests (*contra* GEIST, 1981) that without the aid of traps, snares and pits, for none of which evidence has survived, healthy adult herbivores of large body size are unlikely to have been deliberately hunted. Common sense would suggest that game small enough to be carried with ease was probably taken back whole to the living site while larger game was processed into portable parcels at the kill site. Such behavioural differences should be recorded in the skeletal parts surviving on living sites. BINFORD's work among the Nunamiut (1981) and Navajo (BINFORD and BERHAM, 1977) is suggestive in this regard. However, the whole purpose of this study is to examine whether or not such an hypothesis can be substantiated from the bone remains found on Middle Palaeolithic sites.

The interpretation of the bear remains found in cave deposits presents a problem. Two species were commonly present: the cave bear (*Ursus spelaeus*), which was of great size, markedly sexually dimorphic and also seems to have been largely herbivorous, and the living brown bear (*U. arctos*), which is more omnivorous. Neither bear is known to modify bone to any extent except by *post-mortem* trampling of the skeletons of previous den occupants during preparations for hibernation. Re-examination of the age and sex ratios of bones found in cave accumulations (MUSIL, 1980-1) indicates that the majority of the animals were either extremely elderly or very young individuals of the same sex. While it is true that if bears were being deliberately hunted the very old and young might be preferentially selected by humans as being easier to kill, it is also true that such thanatocoenoses can be better explained as the deaths during hibernation of weaker individuals. Bears and people preferentially eat similar food resources but it is not clear to what extent they would have been in direct competition. People probably ate bear when they could get one with impunity, however, it is questioned whether they were deliberately hunted even as cult objects (SPAHLI, 1954).

Bones of the smaller fur-bearing species (Mustelidae, rodents and lagomorphs) are sometimes reported. Some may have been sought as food, others for their pelts to use as clothing. Different skeletal parts might be expected to survive in each case. The burrowing species, when present on archaeological sites, are an important guide to possible post-depositional sedimentary disturbance.

While I prefer the possibility that Woman-the-Gatherer (DAHLBERG, 1981) was the economic fulcrum of the Neandertal social unit, none the less Upper Pleistocene faunal evidence suggests more an unexpurgated scenario for Man-the-Hunter. It must be admitted that in northern temperate latitudes with a short cool growing season, especially under glacial conditions, plant foods were probably less abundant and possibly less nutritious than they are in more tropical regions. Simply not enough is known of the edible vegetation available in central Europe during the early part of the last glaciation (GAMBLE, 1986: 100-3). However, it is reasonable to suppose that 10-20 % of the total diet could have been provided by plant foods at certain times of year (LEE, 1968). It is probable, based on modern analogies, that people commonly ate the stomach contents of herbivores as a convenient way of obtaining nourishment. It is also not inconceivable that such partly digested material might have been more nutritious for humans than a raw food such as grass is usually thought to be.



FIGURE 1

Location of the sites mentioned in the text.

1. Pontnewydd, Dyfed; 2. Uphill Quarry and Wookey Hole, Somerset; 3. Kent's Cavern, Devon; 4. La Cotte de St. Brelade, Jersey; 5. Biache-St-Vaast, Pas-de-Calais; 6-7. Fontéchevade and la Chaise, Charente; 8-9-10. Combe Grenal, Pech de l'Azé II and Pech de l'Azé IV, Dordogne; 11. Mauran, Haute-Garonne; 12. Hortus, Hérault; 13. Rigarde, Var.

In the table that follow the number of identified specimens (NISP) recorded in the report are given wherever possible together with the minimum number of individuals (MNI) these bones might represent. The estimates of MNI given here have either been taken at face value from the reports or represent a reasonable guess made by this author using standard techniques. They are intended as approximations only. There is a large literature on the dangers inherent in derived faunal statistics (CLASON, 1972; PAYNE, 1972b; GRAYSON, 1973, 1978, 1979, 1981, 1984; DUCOS, 1975; CASTEEL, 1976-7; CASTEEL and GRAYSON, 1977; TURNER, 1980; FIELLER and TURNER, 1982; HESSE, 1982; WILD and NICHOL, 1983; NICHOL and WILD, 1984) the pertinency of whose arguments is acknowledged. However, some more proportional estimate of the relative frequency of the different species than that given by the NISP is useful, as a glance at Table 1 demonstrates. Several of these authors have emphasised the bias introduced into MNI calculations by variations in sample size, in particular when an animal is represented by only one or two bones. Here such animals are merely noted as present rather than interpreted as one individual. In line with current practice, no attempt has been made to distinguish the wisent (*Bison priscus*) from the aurochs (*Bos primigenius*), unless such research was specifically carried out by the original author, as at Mauran. Some account is taken in the final discussion of relative body size and probable meat yield in estimating the economic potential of the animals identified. The probable age of individuals at death is also given wherever possible. Each of the sites studied produced a characteristically archaeological non-normal species distribution: a few species were represented by many individuals and many species were represented by few individuals.

It is recognised that this study is open to error since some of the excavations on which it is based took place many years ago when recovery techniques were less meticulous than they ought to be now. PAYNE (1972a) has shown how deleterious partial recovery can be. It is realistic to assume here that of the bone recovered many fragments, such as ribs and vertebrae, were discarded as unidentifiable or uninteresting long before what remained reached the faunal analyst. Hence the NISP figures given here are almost certainly underestimates of the volume of bone originally excavated. Although DELPECH and RIGAUD (1974) have shown the information that can be extracted from the spatial distribution of such fragments, these aspects of human behaviour cannot usually be deduced from excavation reports. None the less, if these caveats are borne in mind the tentative conclusions which are drawn below at least indicate some useful avenues of future research.

Data relevant to some sites in Britain and France (shown in Fig. 1) are briefly discussed here. Many of the Palaeolithic sites in Britain were, unhappily, inadequately excavated. Fortunately, at some sufficient deposits still survive for re-excavation to be worthwhile. The faunal data from three caves which all demonstrate similar taphonomic patterning merit reconsideration, providing their limitations are recognised. A deep, dank cave at Pontnewydd, Dyfed, has recently been re-excavated by GREEN (1984). Despite a considerable number of radiometric determinations the age of the sediments, which have been redeposited, is not securely established, but they could be 200-100,000 years old. The artefacts, which are all rolled, appear to represent a variant transitional between the Lower and Middle Palaeolithic technologies. Most of the faunal material is too fragmentary for identification, although it is thought to have been broken during or after redeposition. However the following animals have been recognised by Current (in GREEN, 1984) on the basis of a few tooth and foot bone fragments, which have survived due to their robusticity: leopard (*Panthera pardus*), cave hyaena, wolf, red fox (*Vulpes vulpes*), both cave and brown bear, narrow nosed and Merck's rhino, horse (*Equus caballus*), red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), reindeer (*Rangifer tarandus*), musk ox (*Ovibos moschatus*), a bovid, and arctic hare (*Lepus timidus*). Some bones show the type of gnaw marks HAYNES (1982, 1983a) has attributed to chewing by young wolves and foxes. This fauna appears largely to reflect natural accumulation within the cave, partly by carnivores, not human activity.

Deposits in karstic caves about 25 km apart in the Mendip Hills at Uphill Quarry and Wookey Hole, Somerset, demonstrate similar faunal patterning to Pontnewydd. Uphill Quarry (HARRISON, 1977) comprises a complex of small caves three of which, 1, 7 and 8, contained Pleistocene deposits, but only 8 also produced artefacts, ten each of Middle and Early Upper Palaeolithic type. All the caves were excavated in the nineteenth century. The cave 1 fauna comprised predominantly hyaena, with fox, a mustelid, rhino, bear, a bovid, horse and wild boar (*Sus scrofa*). Most of the bones showed gnaw marks, probably by hyaena. The fauna from caves 7 and 8 was combined by the excavator, since the caves were interlinked, although the bones from 8 were more fragmentary. The species represented included those from cave 1 plus cave lion, mammoth, red deer, reindeer, giant deer (*Megaceros giganteus*) and badger (*Meles meles*). The occurrence of rather more herbivore bones in cave 7/8 might be linked to the human presence suggested by the artefacts, however these faunas probably all accumulated largely by natural processes and carnivore action. The aptly named Hyaena Den at Wookey Hole is large, low and light. It was largely emptied of its deposits in the nineteenth century, even then they were recognised as including a rich 'bone bed'. A few stone artefacts of Middle and Early Upper Palaeolithic type were also found, but not necessarily in association with the faunal remains. Re-examination (TRATMAN, DONOVAN and CAMPBELL, 1971) of the talus debris and re-examination of the preserved fauna yields the following data. Hyaena was the dominant species (NISP 477), wolf (7), fox (8), lion (15) and bear (49). The herbivores comprised mammoth (NISP 40), woolly rhino (433), horse (411), bovid (83), giant deer (35) and other cervids (52). Despite the slight evidence for human occupation, such a faunal complex is more likely to be the product of carnivore behaviour. A group of adult hyaenas would have been quite capable of tackling a rhinoceros, while horse is the preferred prey of most canids. The rarity of cervid remains and fact that many of the herbivore bones were gnawed reinforces this suggestion. A similar pattern of faunal remains: many hyaena bones (NISP 228), some cave lion (16) and other carnivores (23) and herbivores dominated by woolly rhino (NISP 131) and horse (309) with some cervids (100), was also noted for layer A2, at Kent's Cavern, Devon, which also produced a few Middle and Early Upper Palaeolithic artefacts (CAMPBELL and SAMPSON, 1971).

It would seem that all these British cave sites primarily record natural accumulation and carnivore, mostly cave hyaena, denning behaviour, but that occasional human occupation has left traces the precise nature of which it is now difficult to determine.

La Cotte de St Brelade, a large partially roofed chasm formed by wave action on the southern coast of Jersey, has a long and complicated excavation history (CALLOW and CORNFORD, 1986). The fauna was first briefly described by Marett in 1916, but has recently been re-studied in depth by SCOTT (1980, in CALLOW and CORNFORD, 1986). Some of the richest faunal layers from this site cannot be discussed because although bone was clearly present it had deteriorated so badly due to soil chemical conditions that it could not be recovered, hence much of the material is, unsurprisingly, unidentifiable. Interestingly those layers richest in identifiable bone were poorest in artefacts and *vice versa*. This difference suggests that the mammoth and rhino bone discussed below accumulated rapidly and reflects single, discrete events, while the artefactual levels reflect longer term but occasional human occupation. The artefacts themselves belong clearly within the Middle Palaeolithic technocomplex, although they represent an early facies of that tradition if the TL date from layers C/D of 250-200,000 BP is correct. Uranium series datings gave discordant results of 160-110,000 BP for layer G and 90-80,000 BP for layer B.

TABLE 1

NISP and NMI estimates for the mammoth and woolly rhino excavated from La Cotte de St Brelade, Jersey

layer	D	C	B	A	A/3	3	4	5	6
<i>E. primigenius</i>	5/1	9/1	24/2	70/1	26/1	118/7	1/1	13/1	84/11
<i>C. antiquitatis</i>	16/1	20/2	53/3	56/2	2/1	16/2	0/0	5/1	7/3

Scott has identified the following species from a limited range of skeletal elements, mainly dental fragments, rarely indicating the presence of more than one individual: wolf, arctic fox (*Alopex lagopus*), a bear, red deer, reindeer, giant deer, a bovid, chamois and hare. Teeth relating to at least four horses were recovered from layer A. The real interest of la Cotte, however, lies in the glimpse it appears to offer into at least two episodes during which people killed, by driving the animals over the cliff edge above the cave to fall to their death, and butchered, several mammoth and woolly rhino. Neither species is usually well-represented on archaeological sites. Indeed the lack of their remains caused GUERIN and FAURE (1983) to argue that there was no faunal evidence that rhinos were hunted by people. The piles of mammoth and rhino bones excavated from layers 3 and 6 at la Cotte are, therefore, among the rare remains of both species from an archaeological site which can be interpreted taphonomically as evidence for human predation. The bones were all located against the west wall of the site, against which they appeared to have been piled, and had been partly protected by subsequent rock falls. They are in good preservational condition which suggests that they were rapidly covered by loess after dismemberment. The majority of the mammoth remains are crania (NISP 13/MNI 11) and teeth, however scapulae (22/13) and pelvic bones (29/11) also survive. Only 13 tusks were found, and hardly any long bones survive intact [humerus (7/2), ulna (1/1), femur (9/4) and tibia (3/2)], while the foot bones are completely missing (SCOTT, 1980). The differences in body part representation in the two levels: layer 3 comprises mainly skulls with little post-cranial material while layer 6 comprises few skulls and more limb bones, are best attributed to accidents of preservation. The lack of foot bones appears to be real. Rhino is represented almost exclusively by cranial remains (4/4), the few postcranial bones which survive show no patterning [humerus (3/2), pelvi (3/3), femur (4/3) and some foot bones] (*ibid.*). She has assigned an age to dental remains representing 22 mammoths, 15 of whom were under 15 years of age and another 7 were less than 40 years old. The rhino remains show a stronger bias towards juveniles animals; of the 12 individuals to whom an age can be assigned, 11 were less than 10 years old at death. Very few carnivore remains were recovered from la Cotte and the other bones are not obviously gnawed. Therefore, her conclusion that layers 3 and 6 represent two incidents when small herds of mammoth, with a few attendant young rhino, were stampeded over la Cotte Point by Neandertals, seems inescapable.

The fauna from Biache-Saint-Vaast, Pas-de-Calais, has yet to be published in sufficient detail to be studied in depth, however as one of the few recently excavated sites in northern France where the archaeological deposits were clearly still in undisturbed primary context it is of considerable importance. Biache is an open air site now buried by thick loess deposits. TUFFREAU (1979, 1981) attributes the lithostratigraphic evidence to a warm oscillation within the Saalian glacial and the site may be 200-150,000 years old on the basis of one Uranium-series date. The artefacts present an early facies of the Middle Palaeolithic.

A great quantity of faunal material was recovered from the excavation. However as usual much of it represented unidentifiable fragments. The animals most frequently represented, mainly by teeth, are Merck's rhino, the aurochs and a bear. Some of the rhino bones show cut marks. Evidence for carnivorous species is very rare: one bone each of wolf and a large felid. Cervid remains are also surprisingly rare. POPLIN states categorically (1978) that the bear remains represent human food debris, but as has been shown for the Middle Palaeolithic site of Erd in Hungary (WEBB, n.d.a) this distinction is not that easy to make on the basis of bone fragments alone without the presence of supporting evidence such as cut marks. However, the absence of evidence at Biache for carnivore activity could lend support to Poplin's hypothesis.

The site of la Chaise-de-Vouthon, Charente, comprises two rock shelters. The faunal material described here comes from the Abri Suard levels X-II, radiometrically dated to 200-100,000 BP, and Grotte Bourgeois-Delaunay layers 4-10, dated to 150-100,000 BP (SCHWARCZ and DEBENATH, 1979). The cultural attribution of the artefacts recovered from Abri Suard has changed as perceptions of the duration of the Middle Palaeolithic have altered. The deposits are of late Middle Pleistocene age, but the artefacts have been attributed both to the Mousterian of Acheulean Tradition and to an evolved Upper Acheulean (DEBENATH, 1986). Probably they represent an industry transitional between the two technocomplexes.

The fauna from both caves has been published (DAVID and PRAT, 1965) in a way that makes its reinterpretation very difficult. However, some tentative comments can be made. The bones from layer I at Abri Suard record the presence in greater numbers of a greater range of carnivores, in particular cave hyaena, arctic and red fox, than the other layers. The herbivore bones comprise horse, reindeer, *Bos/Bison*, and red deer, in order of decreasing frequency. The lower layers at this site produced fewer carnivore remains and a greater frequency of a wider range of herbivores, always dominated by reindeer and horse, and including the saiga antelope (*Saiga tatarica*). Undamaged horns of the latter were recovered, suggesting an absence of carnivores during this period, otherwise they would have been gnawed. Bear remains were extremely rare, suggesting that they did not hibernate there. The fauna from layers VIII-II seems to reflect more human activity during which reindeer and horse were the chief animals exploited. By contrast the final level seems to have included a period of occupation by carnivores. This cave also produced a large number of human remains, mostly of very small children. All the bones are fragmentary and no evidence was found for formal burials (DEBENATH, 1986), but they do not seem to represent food debris either.

Three layers (10, 9 and 6) producing Middle Palaeolithic artefacts were found at Grotte Bourgeois-Delaunay. Layer 4 was archaeologically sterile. It was interpreted (DAVID and PRAT, 1965) as a hyaena den, from the frequency of their bones, found together with a considerable number of gnawed bovid and cervid bones. Remains of the mammoth and narrow-nosed rhino are also more frequent in layer 4. While no cave bear bones were found at all. Few identifiable bones, apart from teeth, were recovered from the basal layers whose faunas were dominated by cave bear bones which can be interpreted as the product of natural deaths during hibernation, given the presence of bones of cubs of all ages. All the herbivore bone is broken and represents chiefly horse, with some bovid, most frequent in layer 6, and a little cervid bone. Hyaena bones are also numerous in layer 6. It is suggested that layers 10 and 9 represent a sequence of occupations, whether simultaneous or sequential it is impossible to tell, by people and cave bears. To these occupants denning hyaenas were added in layer 6, while finally in layer 4 hyaena were the sole occupants of this shelter.

Fontéchevade lies close to la Chaise in Charente. The 8 m of deposits in this long, narrow north facing limestone cave now lie partly outside and partly within the overhang. The upper levels (C1/2) produced some Middle Palaeolithic artefacts beneath which in layer E was material called by the excavator 'Tayacian' (HENRI-MARTIN, 1957) but which

would now be regarded as late Acheulean or transitional to the Middle Palaeolithic. The age of the site is not known but is likely to be on the order of 200-50,000 BP. Its chief interest lies in the claim made by HENRI-MARTIN (1957: 213-230) that many of the cervid bones had been shaped by people for use as tools and in the human crania recovered from layer E neither of which came from burials. One showed traces of burning and the other recorded cutmarks concordant with it having been defleshed. Henri-Martin based her hypothesis for the existence of a bone technology at Fontéchevade on two main criteria: an apparent preferential selection of certain species, red and fallow deer (*Dama dama*), bovids and horse in order of decreasing importance; and the apparent choice of only certain skeletal parts for refashioning into tools: chiefly antlers, both shed and unshed, long bones and metapodials. However, her work has been overtaken by events.

Although she described in detail the putative techniques of tool manufacture used by the people of Fontéchevade, subsequent field studies have demonstrated that nearly all of her artefacts can be explained by other causes. However, it is impossible to explain them all away as due to carnivore activity. A total of 28 complete unshed cervid antler bases with skull attached were found together with another 64 unshed half antlers in which the skull had separated at the sagittal suture and 52 individual shed antlers. Both the shed and the unshed antlers must have been collected and brought to the cave since otherwise they would have been eaten soon after loss by the deer themselves, or scavenging carnivores. The problem here is whether the damage Henri-Martin reports as humanly-made could have been caused by other carnivores. In most cases the antlers have been broken off in the region of the brow tine and the marrow in the shaft has been removed. As far as one can tell from the illustrations there is no particular reason to suppose this process to have been due exclusively to human behaviour, although some of the antlers show traces of burning. Henri-Martin bases some of her arguments on the morphological repetition in the bone tools. This argument is still used (MORLAN, 1983; IRVING, JOPLING and BEEBE, 1986) but data demonstrating that the resultant 'tool' shape is inherent in the structure of the bone on which it is fashioned are now being considered (WEBB, 1989). Only the distal extremity of 27 cervid humeri and the proximal extremities of tibiae and radii have survived. Similarly for the bovids, only the distal end of both the humerus and tibia survive. Unfortunately, field research (MYERS, VOORHIES and CORNER, 1980; HAYNES, 1983b; MORLAN, 1984, 1986) in North America, where the problem of bone pseudo-tools is particularly acute, suggests that most breaks of this type are the product of natural fracturing processes, although it is hard to see how such breakage occurred within a cave. No equid long bones were recovered but some mandibles showed possible cut marks. About 12 fragments of horse pelvis survive which seem to have been chewed around their edges, damage now usually attributed to carnivores. Henri-Martin does record the presence of leopard, wolf and hyaena, represented by one coprolite and some long bones, together with beaver and small rodents in the lower levels, but they do not seem to have been numerous. While it is likely that many of the so-called 'bone tools' at Fontéchevade represent natural breakage or the products of carnivore behaviour, the presence of nearly 300 cervid antlers is more suggestive of human behaviour. This material clearly merits re-examination.

The Dordogne valley is famous for the large number of deeply stratified Palaeolithic sites located in the many caves and rock shelters which have formed karstically in the local limestone. Of these the sites of Combe Grenal, which lies on the south flank of the river, and the Pech de l'Azé complex, a mere 10 km away on the north side of the river, have been excavated sufficiently recently to merit consideration. The long sequence of deposits at Combe Grenal, thought to date from the end of the penultimate glaciation through the early part of the last glaciation (Riss III - Würm II in French terminology), has long been regarded as a key in any attempt to order the fragmentary data recorded in neighbouring sites, such as Pech II and IV. Radiometric assays recently undertaken at all three sites (BOWMAN *et al.*, 1982; BOWMAN and SIEVEKING, 1983; SCHWARCZ and BLACKWELL, 1983) have failed to clarify their age. However, whether the last glaciation began in oxygen isotope stage 5d or 4, it is clear that the deposits producing Middle Palaeolithic material at these sites

stage 5d or 4, it is clear that the deposits producing Middle Palaeolithic material at these sites formed over a long period from at least 80-30,000 BP, possibly beginning even earlier (WEBB, 1988, vol. 1). Therefore, any one layer or group of layers at any of these sites probably represents a palimpsest of many discrete behavioural events during sediment accumulation over several human lifetimes.

Combe Grenal is a large south facing cave comprising a 13 m sequence of 64 layers formed in three units representing progressive recessions of the protective cave overhang (BORDES, 1972). The basal complex, layers 64-56, is not discussed here since it produced Acheulean artefacts. Layers 55-36 are considered to represent Würm I and produced several interstratified facies of the Aquitainian Middle Palaeolithic. Layers 35-1 comprise the Würm II complex, which is not discussed in detail here. It produced different facies of the same Middle Palaeolithic complex. The faunal material dating to the Würm I period from Combe Grenal was originally briefly described by BORDES and PRAT (1965). It has recently been restudied in depth, together with the material of the same assumed age from Pech II and Pech IV, by LAGUAY (1981), whose data are used here, and CHASE (1986a and b). The faunal material from the different layers has been grouped following the climatic phases defined by LAVILLE (1973, 1975; LAVILLE, RIGAUD and SACKETT, 1980: 148-166). The MNIs given in Table 2 do not correlate with those given by CHASE (1986b: 149-154), presumably the MNI index was calculated differently. Laguay, of whose work Chase seems to have been unaware, usually arrives at a higher MNI figure. Unfortunately, the form in which Chase has published his data make them very difficult to reinterpret. Moreover, he only analysed the remains of selected herbivore species from just Combe Grenal and seems to have concentrated his attention on the Würm II deposits. The overall pattern of species representation does not change between the two analyses, merely different emphases are placed upon it. However it is a pity that the data are not more comparable since Chase's work to some extent complements that of Laguay.

TABLE 2

NISP and NMI estimates for the Würm I fauna from Combe Grenal, Dordogne

layers	55/53	52/50A	49/44	43/41	40/39	38	37/36
<i>F. lynx</i>		2/+					
<i>C. crocuta</i>		12/3		3/1			
<i>C. lupus</i>	5/2	7/2		1/+			
<i>V. vulpes</i>		2/2			2/+		4/1
<i>U. spel./arctos</i>	2/+	9/4					
<i>D. Hemitoechus</i>	1/+	3/2	4/1			2/+	
<i>E. caballus</i>	37/5	202/26	33/9	7/2	13/5	13/3	23/6
<i>E. hydruntinus</i>	2/+	11/6		3/+	8/2		
<i>C. elaphus</i>	238/12	1644/80	91/22	151/19	89/12	34/5	73/13
<i>C. capreolus</i>	25/4	84/13	7/7	35/3	6/2	8/2	
<i>R. tarandus</i>		5/2			1/+		6/3
<i>M. giganteus</i>	2/+	17/9					
<i>Bos/Bison</i> sp.	5/2	78/18	13/7	9/3	2/+	19/4	30/8
<i>R. rupicapra</i>					1/+		
<i>C. ibex</i>						4/1	2/2
<i>S. scrofa</i>	12/4	43/7	14/8	3/+			

Certain species not usually found further north during the last glaciation, for example the lynx (*Felis lynx*), are encountered at these sites. The wild ass (*Equus hydruntinus*), a gregarious animal moving in mare-led herds, rarely occurs in sufficient numbers to rival the horse. Two bovids, the chamois (*Rupicapra rupicapra*) and the ibex (*Capra ibex*), both adapted to hilly terrain with sparse vegetation who only moved away from the Pyrenees during periods of glacial advance, are occasionally found at many southern French Middle Palaeolithic sites. Here they are mainly represented by young adults.

According to LAGUAY (1981) the frequency of skeletal part survival varies little from species to species at Combe Grenal. CHASE would disagree and bases a complicated argument for differential butchering strategies (1986a) thereon. The data are not really conclusive, but arguments against Chase's thesis are in preparation (WEBB, forthcoming). In particular he seems to have ignored the considerable differences in meat yielded by the species he studied. All species are mainly represented by cranial and dental fragments, limb bones, metapodials and phalanges. Far more cranial remains were found in the upper than in the lower Würmian deposits. The lack of ribs and vertebrae is partly attributed by CHASE (1986b:33) to the fact that they were not kept during excavation at Combe Grenal. Female red deer antler was recovered from several layers. Its presence suggests, as at Fontéchevade, that it had been brought into the cave deliberately.

CHASE (1986b: 59-84) made a special study of the evidence for human butchery techniques on the fauna from Combe Grenal on the basis of which he argues that reindeer were eaten at the site whereas red deer were only butchered and then taken elsewhere (*ibid*: 57). Laguay agrees that red deer were butchered at the site. CHASE records (*ibid*: 79) a total of 21 foot bones, all but one from red deer, which had been split, presumably by people. He found cut marks on about 100 reindeer bones from the upper deposits, of which 30 came from layer 23. He also found about 100 cut marks on red deer bones, of which 25 came from layers 50 and 50A and another 15 from layer 52. Only 18 cut marks were found on equid bones, of which most came from layers 22 and 23. Finally a total of 14 cut marks were found on bovid bones. They showed no stratigraphic patterning. Unfortunately none of this material is illustrated, so it is impossible to assess it objectively. Most of the marks are located at joints or on the skull, suggesting they are the product of dismembering carcasses and removing the tongue. It these are true cuts not just random scratches, they would suggest that butchery episodes, particularly of red deer and reindeer, took place in at least layers 52, 50, 50A and 23. Moreover Laguay remarks on the presence of burned bone in layers 52 (13 pieces) and 50 (16). CHASE mentions (*ibid*: 43) the occurrence of bones showing traces of carnivore gnawing but gives no details.

Pech de l'Azé is a limestone hill in which several caves and shelters have formed, only two of which either contained sufficient material or were excavated adequately enough to merit study. Pech II is a spacious cave (IIa) with a wide porch (IIb) facing southwest (BORDES, 1972), while the deposits at Pech IV represent the collapse of a shelter some 100 m to its west (BORDES, 1975). The deposits in Pech IIb are considered to date from the penultimate glaciation into the beginnings of the last glaciation, only the fauna from the Würmian deposits is considered here. These layers produced interstratified facies of the Aquitainian Middle Palaeolithic. Pech IIa has yet to be excavated to any extent. The artefacts from Pech IV are comparable to those from Pech II.

The presence of badger (*Meles meles*) in several layers at Pech II (Table 3) suggests that they probably maintained setts there in the absence of people, but also alerts the zooarchaeologist to the possibility that the deposits have been disturbed by their burrowing, as does the presence of the articulated limb bones of rabbit (*Oryctolagus cuniculus*) in layers 5 and 4E, when they may have maintained burrows although there is no evidence for kittens. These levels also produced old adult and juvenile bear bones. Carnivore remains are rare at all these Dordogne sites, however at Pech II two young adult leopards are represented as well as several hyaenas, both very young and old individuals. Coprolites and the bones

of juveniles were found in layers 3 and 2G, suggesting the cave then served as a den. The remains of three adult wolves, one very old, and one juvenile were found in 4E. Again this could be a den. The remains of an adult female fox with a juvenile in layer 3 could also be natural. The presence of red deer antler throughout layer 4 suggests that carnivores were rarer then. Laguay notes that 15 burned bones were recovered from layer 4B. This evidence suggests that Pech II was probably occupied at different times by both people and other carnivores.

TABLE 3

NISP and MNI estimates for the Würm I fauna from Pech de l'Azé II, Dordogne

layers	5	4C2/1	4B+4	4A2/1	3	2G/1	2E
<i>F. lynx</i>	1/+					1/+	
<i>P. pardus</i>					1/+	3/1	
<i>C. crocuta</i>		1/+	2/+	2/2	4/3	7/3	1/+
<i>C. lupus</i>	2/+	10/2	2/+	2/2	3/2	5/2	3/1
<i>V. vulpes</i>		2/+	2/+		27/4	13/3	8/2
<i>Mustelidae</i> sp.		1/+			1/+	1/+	
<i>M. meles</i>	2/+	4/+		2/+	3/1	2/+	79/2
<i>U. spelaeus</i>	20/1			1/+	1/+	2/+	2/+
<i>D. hemitoechus</i>	2/+		2/2		6/1	1/+	
<i>E. caballus</i>	10/1	61/8	115/8	83/13	30/6	10/3	3/1
<i>E. hydruntinus</i>		3/+	3/1		2/1		
<i>C. elaphus</i>	6/1	413/27	155/9	28/9	78/6	71/13	3/1
<i>C. capreolus</i>		5/2	4/2	1/+	10/2	12/3	3/1
<i>R. tarandus</i>			1/+	4/2	7/2	9/4	35/4
<i>M. giganteus</i>			2/+				
<i>Bos/Bison</i> sp.	2/+	45/6	28/6	23/9	16/3	7/4	22/4
<i>R. rupicapra</i>		2/+			2/+		
<i>C. ibex</i>	1/+		5/2	3/2	5/2	4/1	
<i>S. scrofa</i>		1/+		2/+		10/4	
<i>O. cuniculus</i>	84/4	12/2					
		(4E)					
<i>Lepus</i> sp.					10/1	4/2	

The fauna recovered at Pech IV differs in two respects from that in the other sites (Table 4). The presence of beaver (*Castor fiber*) in layers J4 and J3, normally very rare in French Pleistocene sites, is unlikely to be natural since Pech IV lies reasonably far from water. These layers also produced a large number of roe deer bones, its only frequent occurrence at these sites. LAGUAY argues their presence suggests deliberately selective human hunting strategies (1981:389-429). A total of 276 broken red deer bones, mandibles and limb bone elements, were found in layer J3. LAGUAY (*ibid.*) thinks they were split for marrow extraction and would have been boiled to produce bone grease (NØE-NYGAARD, 1977). Little antler was recovered from Pech IV. Burned bone was found in layers Z, J3a/c and I1. The wild boar foot bones from layers J4 and J3b show signs of gnawing by rodents, they include remains of old adults, juveniles and new born carcasses.

Carnivore remains are even rarer here than in the other sites, perhaps because Pech IV provided insufficient shelter for pregnant females in search of a safe den to whelp in.

TABLE 4

NISP and MNI estimates for the Würm I fauna from Pech de l'Azé IV, Dordogne

layers	Y	X	J4	J3c	J3b	J3a	J3	I2/1	H2/1
<i>C. crocuta</i>						1/+		1/+	
<i>C. lupus</i>								1/+	
<i>V. vulpes</i>							2/+	1/+	1/+
<i>C. fiber</i>			1/+	8/1	2/+				
<i>U. spelaeus/arctos</i>			2/+	9/2	4/2	2/+	2/+		
<i>D. hemitoechus</i>					1/+	1/+			
<i>E. caballus</i>	17/5	24/4	5/2	14/2	46/6	12/3	19/5	19/4	4/4
<i>E. hydruntinus</i>			1/+	1/+			1/+	1/+	
<i>C. elaphus</i>	125/6	183/7	72/8	60/6	265/10	186/10	148/9	67/5	16/3
<i>C. capreolus</i>	10/2	26/2	85/6	117/10	163/11	47/5	49/5	14/5	2/+
<i>R. tarandus</i>				2/+	4/1	4/1	50/5	548/23	132/8
<i>M. giganteus</i>						1/+	1/+		
<i>Bos/Bison</i> sp.	2/+	4/1	6/3	1/+	11/2	5/2	21/3	137/7	5/3
<i>R. rupicapra</i>							1/+	3/1	
<i>C. ibex</i>	1/+						1/+		
<i>S. scrofa</i>	1/+	15/3	16/4	14/4	29/5	7/2	1/+		

The herbivore bones from all three Dordogne sites show very different patterning from the carnivore remains, which though rare are mostly undamaged. The herbivore remains comprised all age groups, but included foetal cervid and bovid bones suggesting that some females were killed in late spring or early summer. Bones from all parts of the red deer skeleton were found but cranial and antler material was rare. LAGUAY thinks (*ibid.*) the deer were brought back whole to the site, in which case such behaviour is unusual, if human. However carnivores usually abandon the skull at the kill site as being not worth the effort of transport back to the den. Most of the long bones have been split or broken open and some are burnt. Of the very few bones found of bovids, all old adults, and equids, mainly young adults, most were foot bones, suggesting that the animals were dismembered at the kill site. People tend remove from a carcass those smaller bones that carry meat, such as lower limb bones, while carnivores tend to carry back to their den bones comprising cancellous tissue but carrying little meat, such as foot bones, to gnaw on at their leisure. Hence some of these bones could have been brought into the site by carnivores, although no gnawing damage was reported. However, the fragmented and calcined bone is more suggestive of the food-getting behaviour of Neandertals who were exploiting a wide variety of game, rather than that of other carnivores. The zooarchaeological material from these sites probably represents a series of occupations by different species of carnivore, including hyaena and other canids, which probably laired in the caves during the absence of people, who played a part in its accumulation over the millenia that the sites were available. If each 'layer' formed as slowly as suggested above, then it is likely that occupation of these shelters whether by people or other carnivores was infrequent.

Only preliminary reports (GIRARD and LECLERC, 1981; GIRARD and DAVID, 1982) have so far appeared discussing the faunal remains from the open air site at Mauran, Haute-Garonne, therefore they cannot yet be commented on in detail. However the finds are sufficiently unusual in a Middle Palaeolithic context to deserve mention. The site lies on a terrace of the river Garonne where exclusively large bovids, both *Bos* and *Bison*, were butchered. Only teeth, metapodials and phalanges are preserved intact, due to their durability. Most of the long bones had been broken, presumably for marrow extraction. None of the bones show gnaw marks, nor have they been secondarily worked by people. The remains comprise at most three horses and 108 bovids of which 16 were identified as wisent and 16 as aurochs. The ages calculated from the mandibular teeth indicated at least 41 young and very young individuals, 27 young adults, 27 adults and 13 elderly animals. Such an age distribution suggests that the site is unlikely to represent either the products of carnivore kills or a random accumulation of natural deaths. It suggests instead that, at least at Mauran, either Neandertals sometimes pursued one prey as exclusively as the so-called 'specialised' hunters of the later Upper Palaeolithic or that these animals died catastrophically, but the site still poses problems of interpretation. If the people returned to the area repeatedly as Girard-Farizy suggests, there must have been some particular advantage for the exploitation of bovids at that specific location, but it is not clear why the animals died just there. Were they trapped or did they fall over a bluff? If the bones lay exposed at the butchery site from one season to the next it is curious that there is no evidence for scavenger activity, since people are unlikely to have so totally defleshed any carcass as to leave nothing for an opportunistic carnivore to gnaw on. It could be useful to compare the data from Mauran with that from some Folsom mass bison kill sites (WHEAT, 1972; FRISON, 1974, 1978; SPETH, 1983) in North America which are considered to represent discrete events but which present similar patterning to that found here.

The cave of Hortus, Hérault, a long, deep, narrow fissure in limestone, lies at the foot of a sheer cliff overlooking a valley, which provides the only access to it (de LUMLEY, 1972). The 7m of deposits are interpreted as spanning the first part of the last glaciation (Würm I-II in French terminology), however, only the later (Würm II) deposits yielded sufficient faunal remains for analysis. Their precise age is unknown but should be in the region of 50-30,000 BP. Most of the artefacts, which were never common but belong within a facies of the Middle Palaeolithic commonly found in the Midi, were recovered from layers 21-12. Considerable charcoal was found in layers 27-18. The fragmentary remains of at least 20 Neandertals (*H.s. neandertalensis*), mostly children and young adults were recovered mainly from layers 19-14 and 11-9. They were usually mixed with the other faunal debris (*ibid.*: 375-385), were represented by the same body parts, mainly dental fragments, hand and foot bones, and had suffered similar *post-mortem* damage. Predictably, they have been interpreted as evidence for cannibalism, but they might equally represent the remains of carnivore activity. The fauna is dominated by *ibex* and the site was therefore originally interpreted (*ibid.*: 527-624) as a hunting camp where people processed the carcasses of animals they had brought to the site.

However, other interpretations of the published data are possible even if correlating the information given in the different sections of the report presents problems. In Table 5 the layers have been grouped into the climatic units suggested by the sedimentology, however some of the remains, notoriously the wolf, thereby appear to be time transgressive. This problem has never been resolved. Careful re-examination of the vertical distribution data (*ibid.*: 531-560) for the different species recovered indicates that while artefacts, rabbit and bird bones are scattered throughout the deposits from layer 31 to the surface, the other remains show some stratigraphic separation. The rabbit bones probably represent the prey of both owls and other predators. The herbivore bones mostly occur in layers 21-12. Five of the red deer represent young fawns less than one year old. By contrast four of the five horses which could be aged are adults over three years old. The *ibex* remains are discussed in detail below. There appear to be two concentrations of bear bones, in layers 17-14 and

TABLE 5

NISP and MNI estimates for the Würm II fauna from Hortus, Hérault

layers	31-26	25-21B	21A-18	17-15	14-12	11-7
<i>H. sapiens</i>		2/2	2/2	2/+	25/5	10/4
<i>F. lynx</i>					59/4	
<i>P. pardus</i>			13/3	6/1	16/4	33/3
<i>P. leo</i>	3/1					
<i>C. lupus</i>				4/+	36/1	
<i>V. vulpes</i>					1/+	
<i>U. spelaeus</i>	1/+	3/2	15/5	72/8	14/?	124/17
<i>D. kirchbergensis</i>					1/+	
<i>E. caballus</i>		1/+	28/5	10/2	34/5	4/2
<i>E. hydruntinus</i>		3/1				
<i>C. elaphus</i>	9/1	16/4	16/1		24/4	9/3
<i>C. capreolus</i>						1/+
<i>R. tarandus</i>	1/+					1/+
<i>Bos/Bison</i> sp.		1/+	5/1	12/2		
<i>C. ibex</i>	555/19	89/6	121/12	233/23	468/27	273/14
<i>O. cuniculus</i>	15/?	26/?	10/?	19/?	27/?	19/?

10-8, mostly isolated finds, although a denning nest is reported in layer 9. The possibility that these could be natural deaths during hibernation was rejected by de LUMLEY (1972: 611) because not enough of the skeleton is preserved. However, he also comments that their remains and those of humans seem to be mutually exclusive. The case against denning remains inconclusive. The dentition only of a lion cub was recovered. The cranial and forelimb bones of a single very young wolf were scattered through layers 16-12, mainly in a pile also containing several human remains. Lynx occurs only in layers 14-12, but is represented by all parts of the skeleton, some still in anatomical connection. The leopard occurs twice, in layers 21-18 and 14-11, represented only by the cranial, foot and tail bones of 11 very young individuals. While it is true (*ibid.*: 609) that this might mean that only the skin was brought into the cave, these are also precisely the bones one could expect to survive if the cubs had died naturally. The horizontal spatial distribution demonstrate less patterning.

The bones of at least 103 ibex were recovered from layers 30-8. Sufficient taphonomic information is given (*ibid.*: 612-3) for a tentative reconsideration of their presence in Hortus. Although their bones were found in most levels, some individuals seem to represent discrete events. In layers 30-26 all of the 18 ibex found were adult. Although many of the bones were piled up pell-mell, many thorax were found still fully articulated, and in 26B an entire skeleton was recovered. It seems unlikely that these animals were human prey. Probably they entered the cave voluntarily, but having jumped down into the floor could not get out. In layers 24-21B only one juvenile was found with 7 adults, all the bones here were broken and scattered. In layers 21A-8 more of the ibex were juveniles and the bones were mostly broken and scattered: 5 adult and 7 juvenile in 21A-18; 14 adult and 7 juvenile in 17-15; 16 adult and 11 juvenile in 14-12; 7 adult and 7 juvenile in 11-8.

However, the foot bones were often recovered still articulated, while the ribs and vertebrae were usually lacking. Although de Lumley assumed that these ibex were brought into the cave by people, some may well represent the prey of other carnivores. The fragmentary state of the bones now could partly be due to trampling by bears during their preparations for hibernation. He argued (1972: 610) from the absence of chamois that the ibex reflected selective human predation, however it might equally reflect the animals' different behaviour patterns.

I would not want to argue that **none** of the ibex remains found at Hortus reflect human food-getting behaviour, I merely wish to suggest that the cave served as a bear den in the absence of people and that the presence of several juvenile carnivores coupled with the frequency of skeletal part survival for all species suggests that they not only laired there but may also have contributed to the ibex remains found. The number of bats recovered (over 900), especially the frequency of *Myotis* in layers 28-21 and 15-9, also suggests that people were rare visitors during most of the period represented by the deposits at Hortus. The rarity of waste flakes, hammerstones and retouched flakes reinforces that supposition.

The cave of Rigabe, Var, was originally excavated by Marion, who claimed to have found some remains of Merck's rhino. When the site was re-excavated by Escalon de Fonton, Bonifay and de Lumley (BONIFAY, 1960), this could not be substantiated, however they did not work in the same area. The deposits are conventionally attributed to the early part of the last glaciation (Würm I in French terminology), about 70-50,000 BP. Layer G was interpreted as a 'hearth'. The artefacts belong within a facies of the Middle Palaeolithic commonly found in the Midi. The single most commonly occurring species at Rigabe was the rabbit, represented by most skeletal parts, suggesting that the animals were brought into the cave whole, in their skins. That people might have exploited rabbit fur without eating the flesh seems inherently unlikely. BONIFAY assumed (1960: 45) that the faunal remains reflected human behaviour, however these rabbits might represent the prey of some other carnivore or they might have died naturally in the cave. This latter hypothesis is unlikely since most of the bones are fragmentary. For example, the shoulder blade is usually represented by only the glenoid region; only the articulations of long bones are preserved; the mandible has split into its component halves and the ramus rarely survives. Indeed most of the species listed in Table 6 are represented by those skeletal parts with good survivability or that can be identified to species even when fragmentary: either whole metapodials and phalanges or dental fragments. Contrary to BONIFAY's interpretation, based on the presence in most layers of charcoal and stone artefacts, of this fauna as reflecting human behaviour and her suggestion that the lynx remains had been brought into the cave by people (1960: 45), it could as well be argued that Rigabe represents rather a cave mainly occupied by carnivores, above all the lynx, known to prey preferentially on lagomorphs. Unfortunately Bonifay makes no mention of whether any of the rabbit bone showed gnaw marks. The low numbers of herbivore remains found, the fragmentary nature of their skeletal parts and the frequency of carnivore remains in layer G, the only layer which produced sufficient material to merit serious discussion, suggests that the undoubted evidence for a human presence in the cave most likely represent occasional occupation by people of what was basically a lynx lair. The presence of horse and red deer bones may well reflect such human occupations, which presumably took place in the absence of lynx, however the sequence of occupations cannot now be disentangled. The occurrence of hedgehog (*Erinaceus europaeus*) on archaeological sites is surprisingly rare given that people are likely to have been the only predators able to deal with its spines.

TABLE 6

NISP and MNI estimates for the Würm I fauna from Rigabe, Var

layers	B/2	C/3	D/E	F/6	G/7	H/J
<i>F. lynx</i>	+	20/2	6/+	+	26/3	+
<i>F. sylvestris</i>					+	
<i>C. crocuta</i>					5/+	
<i>C. lupus</i>		8/+			3/+	
<i>U. spelaeus</i>		+			+	
<i>U. arctos</i>					+	
<i>E. caballus</i>	+	4/2	+		7/+	+
<i>C. elaphus</i>		+	+	+	10/2	10/3
<i>Bos/Bison</i> sp.			+	+	+	+
<i>S. scrofa</i>					+	
<i>O. cuniculus</i>	40/3	140/7	12/1	130/7	350/22	220/13
<i>E. europeus</i>				2/+		

CONCLUSIONS

The ultimate aim of all archaeological research should be the reconstruction of past lifeways. However, due to the quality of archaeological information, this is often not possible. The interpretation put on the faunal remains discussed above is not intended to be definitive, too many potential sources of error have been necessarily ignored. However, some tentative conclusions can be drawn.

The Middle Palaeolithic technologies made by Neandertals remain at present one of our best guides to human presence at a given locality, but they offer us no chronological framework into which we can slot the known sites to create a sequence. As our understanding of the complexities of the Pleistocene climatic record continue to develop it is becoming increasingly clear that the period during which such industries were made lasted far longer than used to be thought (WEBB, 1988a) because of the inadequacies of the terrestrial geological record upon which our previous models of Upper Pleistocene chronology were based. It is also abundantly clear that any given archaeological layer, particularly when deposited in a cave or rock shelter, probably represents a period to be counted in centuries if not millenia and that the archaeological record we excavate represents a palimpsest of superposed discrete behavioural events which we can no longer untangle. Hence it is legitimate to question whether the faunal material apparently 'associated' with the stone artefacts from the same geological deposit does in fact relate to them significantly.

Most of the sites discussed here produced some evidence for the presence of carnivores other than people most of which are known to lair in caves and which modify the bones of their prey to a greater or lesser extent. Is it possible to disentangle these two behaviour patterns, human and non-human? Certain criteria do seem to be useful. The presence of cervid antler in any quantity is suggestive of human behaviour, since if it were not collected it would usually have been eaten during the winter after it was shed. Extreme fragmentation of herbivore limb bones can probably also be attributed to human activities, in the absence of evidence for porcupine. The single most easily applied criterion, however,

behaviour patterns, human and non-human? Certain criteria do seem to be useful. The presence of cervid antler in any quantity is suggestive of human behaviour, since if it were not collected it would usually have been eaten during the winter after it was shed. Extreme fragmentation of herbivore limb bones can probably also be attributed to human activities, in the absence of evidence for porcupine. The single most easily applied criterion, however, appears to be the frequency and range of carnivore species recorded compared with the range of herbivores. People and the other carnivores did not lead mutually exclusive lives (KING, 1975) but sites which can be argued on archaeological grounds to have been rarely used by people tend to preserve a greater number of individuals of a wider range of carnivore species together with a smaller number of individuals of a wide range of herbivores than do sites at which the density of stone artefacts suggests that people were frequent visitors. Most carnivores are eclectic hunters who do not pursue prey larger, faster or more dangerous than they can kill easily (HESPENHEIDE, 1975). However, the evidence from those sites with high artefact concentrations would suggest that people preferred to exploit gregarious herd animals of medium body size. Finally, it should be borne in mind that if people exploited animals of large body size such as the mammoth and rhino, only rarely we will be able to demonstrate such behaviour from the faunal record (PETERS and MECH, 1975). The interpretive problems posed to the zooarchaeologist by filleted food have long, if not widely, been known (GUILDAY, 1970).

These implications are discussed more fully elsewhere (WEBB, 1988b).

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