Food for Thought: Late Magdalenian chronology and faunal exploitation in the north-western Ardennes.

Dissertation submitted for the degree of Doctor of Philosophy

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ABSTRACT

This dissertation examines certain aspects of the Belgian archaeological record during the Lateglacial. It is geographically centred on the north-western Ardennes and has two main themes. The first is a re-evaluation of the known chronology and archaeology for this region during the Lateglacial. The main part of this is presented in chapter 2, and includes a discussion of recent radiocarbon dates from the Oxford AMS system, including some obtained in the course of this research. The second theme is an examination of a series of supposedly Lateglacial faunal assemblages from 5 cave sites in the north-western Ardennes, namely the Trou de Chaleux, the Trou des Nutons at Furfooz, the Trou du Frontal at Furfooz, the Grotte du Coléoptère and the Grotte de Sy Verlaine. All of these sites have yielded late Magdalenian archaeological finds, and the prime objective of the study of the faunal assemblages is to identify direct evidence for the human modification of animal bone. The study reveals some good evidence for the latter, but also certain bars to the interpretation of these assemblages, which are discussed in detail within the relevant chapters. This dissertation concludes with an overview of the results and interpretations presented in the dissertation. The final pages of this dissertation include a tentative exploration of the notion of *ethnicity*, and how this concept may be relevant to the interpretation of butchery evidence.

Frontispiece: **Édouard Dupont.** **IRScNB archive.**

LIST OF CONTENTS

Volume 1

Volume 2

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

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THE LATEGLACIAL ARCHAEOLOGY OF THE NORTH-WESTERN ARDENNES: AIMS AND METHODS

INTRODUCTION

This dissertation examines in detail certain aspects of the evidence for Late Upper Palaeolithic human settlement of Belgium. The ideas behind this research project grew from a number of sources. The first was my undergraduate readings of the studies in Palaeoeconomy undertaken by E.S. Higgs and his research students during the 1970s and early 1980s (Higgs 1972 & 1975; Jarman *et al.* 1982) which left me with the firm conviction that there was more to prehistoric archaeology than lithic typology and technology, and that the study of faunal remains could provide an alternative approach. My own interests in faunal studies were developed whilst I was an undergraduate at Cambridge, when I was able to undertake some limited archaeological research for a final year dissertation entitled *Faunal Remains and the 'Human Factor'*. During the course of this work I drew on methodologies developed by Richard Potts and Pat Shipman (1981) and by Lewis R. Binford (1978 & 1981), to identify humanly induced modification of animal bones and to differentiate humanly modified bone from that accumulated and modified by carnivores and a range of 'natural' accumulators of bone, by the recognition of cut marks.[1] The dataset I chose to work on for this research came from the Robin Hood Cave at Creswell Crags, a site radiocarbon dated to the Lateglacial and one of the type sites for the Creswellian (defined by Garrod (1926a, 301) as material "sufficiently well-characterised to deserve a name of its own, and I would suggest "Creswellian," since Creswell Crags is the station where it is found in greatest abundance and variety."). The results of my work were finally published in 1994 (Charles & Jacobi 1994).

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[1] It should be noted that researchers working during the 19th century and the earlier part of the 20th were clearly aware of the significance of such marks. Lartet and Christy (1875) refer to and illustrate cut bone (Plate B.XVII N°s 2 & 4). Henri Martin (1921) described modified bones from La Quina in the Dordogne. William Boyd Dawkins referred in 1874 (p. 339) to cut bone as evidence for human predation.

complementing earlier research (Parkin *et al.* 1986) on the large mammal fauna from Gough's Cave, Cheddar, another British Creswellian site. This pilot study crystallised my particular interest within the general field of the Lateglacial archaeology of north-western Europe.

In 1989 I attended the Oxford conference on the Late Pleistocene archaeology of north-western Europe, the proceedings of which were later published as "The Late Glacial in north-west Europe: human adaptation and environmental change at the end of the Pleistocene" (Barton *et al.* 1991). Research presented during this conference by Bodil Bratlund and Martin Street on large mammal exploitation linked with my own work on the Robin Hood Cave and sparked my imagination. A paper by Rupert Housley highlighted the dramatic changes which had taken place in our understanding of the Lateglacial chronology of north-western Europe over the last decade, almost entirely through the use of AMS dating, whilst Bernd Becker presented a radiocarbon calibration for the early Holocene, and held out the possibility of a calibration for the Lateglacial in the not too distant future. All of these papers were subsequently published in Barton *et al.* 1991.

These presentations were formative influences in the drafting of my D.Phil. research proposal in 1990 for the project which is the basis of this dissertation. At the outset I identified 3 primary objectives: first, to re-evaluate the evidence for human presence in north-western Europe during the Lateglacial; second, to identify evidence for the human exploitation of large mammals during this period; and third, to examine critically and, if appropriate, revise the existing Lateglacial chronology for this region. The original scope of the research was to take in British, Belgian, German and Dutch Lateglacial material, focusing on sites with good faunal preservation and recovery. I had been invited to speak at the conference "La Chasse dans la Préhistoire" in the small village of Treignes, in the south of Belgium in October 1990, and during this conference met up with Bodil Bratlund and Martin Street. We discussed my project at some length and, on the basis of these discussions, I decided to centre my research on faunal collections with a much tighter geographic and chronological focus. Eventually it was decided that I should channel my efforts into researching carefully selected Belgian Lateglacial material, thus complementing the research of other workers dealing with the northern European Lateglacial. As the project developed further I decided to focus specifically on Late Magdalenian faunal assemblages from the north-western Ardennes in Belgium.

Why the north-western Ardennes ?

There were many reasons for selecting this region for detailed analysis. It was clear from the published literature that many of the Belgian Lateglacial sites had good faunal preservation, that research relating to the large mammal faunas from this region had so far focused primarily on species identification and biostratigraphic issues (*cf. Cordy* 1975, 1983, 1984), that there were a number of important well excavated (and apparently well documented) faunal collections available for study, many of which had been unexamined for many years. The archaeological record during the Belgian Lateglacial was also quite similar to that from Britain, in that humans did not appear to have been present in the region during the Last Glacial Maximum (LGM) *circa* 18,000 BP. The Creswellian was said to be present in Belgium, alongside the Magdalenian, Tjongerian and Ahrensburgian, and so in principle I would be able to work on at least some material with which I already had some familiarity, thus being able to work from the known to the unknown. As four archaeological entities had been identified by previous researchers in the study region, the possibility that characteristically different dietary preferences, prey selectivity and butchery practices existed both within and between these groups was acknowledged, and their identification (if present) was a component of the initial research design.

The result of a preliminary literature search was the selection of a short list of sites which (a) appeared to have good faunal preservation and recovery, (b) had archaeological material which could clearly be identified to one of the four Lateglacial techno-complexes in the north-western Ardennes, and (c) already had radiocarbon dates 'associated' with the archaeological material. The sites initially selected were the Trou de Chaleux (Magdalenian), the Trou des Nutons, Furfooz (Magdalenian), the Trou du Frontal, Furfooz (Magdalenian), the Grotte de Sy Verlaine (Magdalenian), the Grotte du Coléoptère

(Magdalenian and Ahrensburgian), the Grotte de Remouchamps (Ahrensburgian) and the Grottes de Presle (Creswellian) (Figure 1.1).

A short research visit to Belgium during March 1991, made possible through the kindness of Michel Dewez, Nicholas Cauwe, Mietje Germonpré, Daniel Cahen and Marcel Otte, established the availability and accessibility of the collections from the sites listed above. During this visit I was also able to assess the quantity and quality of the material available for study and ascertain that the research proposal I had devised was indeed likely to become a viable project. One practical result of this visit was a reduction in the original list of sites: the faunal collections from Presle were removed from the list as I was only able to locate a small amount of fauna, all from the most recent excavations undertaken by the Université de Liège during the 1980s (Leotard & Otte 1985 & 1988; Leotard 1985b). This material was held in the Service de Préhistoire at Liège, but it was not possible to locate the faunal collections recovered during earlier excavation campaigns by either Professor Helène Danthine or Dr Druart from the caves at Presle.

As research progressed my interest in the Belgian Magdalenian also became dominant, and the Magdalenian assemblages seemed to me to provide a unified subject of sufficient interest in itself. Accordingly, although I also made studies of the faunal assemblages from two Ahrensburgian findspots (the Grotte de Remouchamps and level 6b at the Grotte du Coléoptère), the results of that aspect of my work are not presented directly in this dissertation; I plan to publish them separately in the future. Instead this dissertation deals primarily with the Late Magdalenian in the north-western Ardennes, although discussions in various chapters will range beyond this where appropriate.

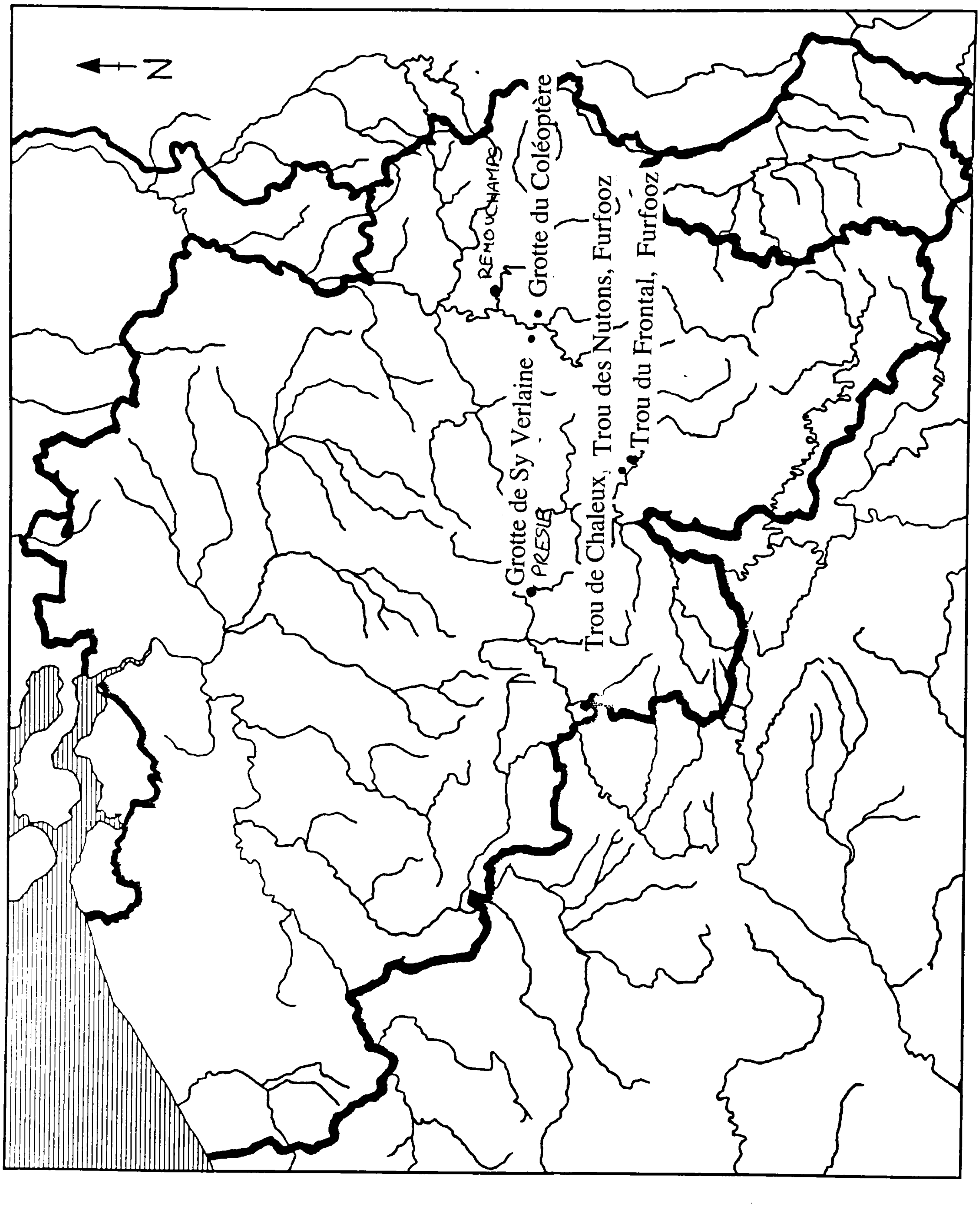

Figure 1.1: Location map of the major sites discussed within this dissertation.

Organisation of this dissertation

Following this introduction, chapter 2 deals with the chronology and archaeology of Belgium, putting the sites directly discussed within this dissertation in their local context. As a part of this, the sets of archaeological material which make up the Belgian Magdalenian, Creswellian, Tjongerian and Ahrensburgian are each described and to varying degrees re-assessed. An AMS dating project on the Belgian Lateglacial was undertaken as part of the research presented here and the results are given in their entirety, and conclusions are drawn about the evidence for the earliest human re-colonisation of Belgium after the LGM. Chapters 3 to 7 inclusive each deal with an individual site as a case study - the Trou de Chaleux (chapter 3), the Trou des Nutons, Furfooz (chapter 4), Trou du Frontal, Furfooz (chapter 5), the Magdalenian layer from the Grotte du Coléoptère (chapter 6) and the Grotte de Sy Verlaine (chapter 7). The concluding chapter (8) brings together the results of these case studies, and then discusses the broader relevance for European prehistoric studies of the Belgian Late Magdalenian. These chapters are of quite variable length. Whilst this may not be aesthetically pleasing, in each case the length of each chapter is mainly determined by the amount of information which could be extracted from that particular set of chronological, typological and faunal evidence. In retrospect, I am still satisfied with the selection of sites for study and think that these were the most appropriate for the objectives I set, although it will become apparent in the following pages that there were serious problems associated with the interpretation of some of these assemblages, which in some cases this precluded the discussion of certain aspects of the archaeological record I had initially hoped to address. This is perhaps inevitable when one is depending on information gathered many decades ago and where one has no control over what has happened to the collections themselves since their discovery. My aim has been to let the quality of each set of material speak for itself, and I have been careful not to over-exaggerate the relevance of the problematic assemblages, but instead to present a realistic re-evaluation of both the potential and the shortcomings of the Belgian Lateglacial archaeological record.

Methodology

The methodology used throughout my fieldwork was very simple. Each faunal assemblage was examined, and initially sorted into identifiable elements and unidentifiable bone fragments. The unidentifiable bone fragments were then quantified (i.e. counted, and in the case of the Trou de Chaleux also weighed) and set aside. The remaining pieces were identified to anatomical element and species using available comparative collections at the Institut Royaux des Sciences Naturelles de Belgique (IRScNB) and the Université de Liège and also bone identification manuals, such as Pales & Garcia 1981a & 1981b. Even so, in some cases it was not possible to give a definitive species identification. In such instances specimens were identified to the most detailed level of identification possible.

A further sorting then took place, in which all specimens with butchery marks, or suspected butchery marks, were identified and drawn (many of these drawings are reproduced in this dissertation). Originally it had been intended to verify these marks with a scanning electron microscope (SEM). In the event this proved not to be possible due to purely practical reasons (see below). The main form of butchery evidence identified consists of cut marks, left by the contact of sharp stone edges on bone during butchery activities. Such marks have a distinctive 'V' shaped cross-section and have multiple parallel striae on the interior of the mark (Potts & Shipman 1981). Cut marks are fairly distinctive, even to the naked eye, and can be easily distinguished from other forms of bone modification made by carnivores and/or by rodents (compare, for example, the butchery marks in Plate 2.2 with the gnawing marks in Plate 4.1 and the acid etched bone fragments in Plate 7.5). However, there are instances where marks of the same general morphology may be produced by 'natural' taphonomic processes, rather than having been caused by human agency. For example, bones within cave sediments that have been subject to cryoturbation may accidentally have had contact with stones (and indeed with worked stone artefacts) leaving behind the distinctive 'cuts' without the intervention of direct human activity.

The process of extracting resources from a mammalian carcass also involves the removal of unwanted waste (such as the removal of periosteum). Marks caused during butchery activities generally occur in groups, and in locations and orientations which can be related to specific objectives (for example the extraction of a muscle group or a tendon). It is not, therefore, simply the 'V'-shaped morphology which defines butchery marks, but also their occurrence in groups, at predictable points on a bone surface. These criteria can be used to distinguish marks left as the by-product of butchery from similar marks caused by natural processes (as described above). It should be remembered that cut marks are generally unintentional, and occur as a by-product of butchery. Contact between a flint tool's edge and a bone surface reduces the use life of the tool, in the sense that it increases the rate at which it is blunted. The main objective in animal butchery is not to leave behind traces of such actions on the bones nor to blunt a stone tool: it is to extract the resource being sought, whether that be hides, antler/horn/ivory, meat, sinew, fat/blubber, marrow, brains, blood, or viscera (or any combination of the above). While not all body parts and bones which have been butchered will show traces of this activity, those which do can be said unquestionably to have been the subjects of human activity. The data considered in this dissertation, then, is a selection of that which can clearly be demonstrated to have been the subject of human exploitation, rather than the result of taphonomic processes or the actions of other predators.

By no means do humans appear to have been the main occupants of the Ardennes caves discussed in this dissertation. As will be seen in later pages, a wide range of carnivores and predatory birds also appear to have resided at many of the sites, during different parts of Pleistocene and Holocene time. These include brown bears, wolves and/or dogs, foxes, a range of felids, badgers, wolverines, hyaenas, owls, eagles and falcons. Many of these animals are known to bring food back to their dens and to discard bones, antlers and horn within these dens. It cannot, therefore, be assumed that all bones found within a cave site, or even within an 'archaeological' layer, are there purely as the result of human actions. I will argue in chapter 2 that the evidence for human presence in the north-western Ardennes during the Lateglacial is patchy, and will suggest that once humans had returned to this region of Europe after the Last Glacial Maximum (*circa* 18,000 BP), colonisation was by no means continuous. Instead, I will argue for highly punctuated periods of human settlement in this region. Assuming that this was the case, the potential activities of a range of denning predators alongside those of humans become highly relevant to the accumulation of the faunal assemblages discussed here. This is another strong reason for concentrating this study on only those bones which show incontrovertible evidence for a link between human activity and their incorporation within a site.

I shall now go on to discuss how the faunal assemblages discussed in this dissertation were recorded, and the various analytical techniques that were used.

Quantifying the assemblages

Once specimens had been identified to anatomical element, species and side, they were catalogued. The written catalogue was then transferred into an Excel™ 3.0 spreadsheet, and then imported into the database Filemaker Plus™. The database was then sorted to provide NISP (Number of Identifiable Specimens Present) counts, and then more detailed BPR (Body Part Representation) data. BPR tables were then compiled for individual species from the different sites to give a detailed picture of assemblage composition. Such BPR tables appear at the end of chapters 3 to 7, and relate to the main species present at the sites discussed in these chapters.

Number of Identifiable Specimens Present (NISP)

NISP counts provide the basic unit of comparison within any faunal assemblage. However, it is common to find faunal composition quantified on a relative scale e.g. "most abundant', "abundant", "less abundant", "rare", and "absent". This type of quantification is certainly commoner in older faunal accounts, especially those of the last century, but it can still be found even today. The presentation of NISP counts gives a far clearer basis on which to give an overview of the broad composition of an assemblage and its size.

MNI, Binford MNIs & Binford %MNIs

In addition to containing the most basic NISP counts, the species tables at the end of chapters 3, 4, 5, 6, & 7 include Minimum Number of Individual counts, calculated using the two most common methods. The columns headed "MNI" are calculated simply by taking the greatest of the left or right counts for each anatomical element or part thereof. The column headed "Bin. MNI" contains MNI counts calculated using L.R. Binford's method (Binford 1978, 69-72). This figure is obtained by dividing the total number of a particular element by the number of that element present in a skeleton. Édouard Dupont, whose pioneering research will be discussed in some detail later in this thesis, used a very similar technique (1872, 182-3) to determine an MNI of 56 for the horses at the Trou de Chaleux (see chapter 3), based on a division of the 661 lower horse teeth he recorded by 12. The MNI and Binford MNI methods achieve slightly differing results, and each has its own merits. Both sets of results are given in this dissertation to allow others to make comparisons in future, although when discussing MNI counts for different species I will use the basic MNI rather than the Binford MNI technique.

The column "Bin. % MNIs" is itself derived from the Binford MNI column. In this case the highest of the Binford MNIs for any species (the overall Binford MNI for that species) is taken as 100%, and the rest are calculated as percentages in relation to that one. This allows one an undistorted view of Body Part Representation (BPR) for different skeletal elements, species by species. I will discuss all BPR data using this approach. Amongst the reasons for looking at the varying proportions of different elements is the fact that, as Binford notes (1978), it is rare for animal carcasses to be completely dismembered at one time. Instead animal bones may be brought to a site as 'butchery units' (partially dismembered components of carcasses), which are then subjected to further processing. Since this thesis is concerned with the entire range of butchery activities, it is considered important to examine varying frequencies of different anatomical elements. In ideal circumstances they may be able to tell us much about human butchery strategies and objectives.

Indeed Body Part Representation (BPR) data have much to offer. The idea itself is not particularly new: the use of this technique is frequently found in the works of Binford (*cf.* 1978, 1981, 1984) and is now widespread, while a less formalised version of it can even be found in the writings of Dupont (1872). The advantage of this approach is that it permits the archaeozoologist to look in detail at the relative proportions of anatomical elements and carcass units rather than simply giving NISP counts. However, it should be noted that this technique is only really appropriate when the NISP count is relatively high; with this in mind I decided that it would only be a valid exercise to discuss trends observed in BPR data when a significant proportion of the totals for each of the Body Part categories exceeded 30. Consequently, BPR data based on %MNI calculations could only be discussed in relation to a few of the species present at each site. This was felt to be preferable to going through the motions of discussion when the results were based on so little data that they would be effectively meaningless.

The BPR tables

As mentioned above, at the end of each chapter which relates to a particular faunal assemblage discussed in detail, BPR tables are given. A table has been compiled for each species identified within the relevant collections (see, for example, Tables 3.3 to 3.14). The first three columns of these tables (reading from left to right) give a breakdown of the NISP count for that species at that site, and detail the number of left, right and indeterminate anatomical elements present. These are usually followed by two further columns giving details of the number of adult and juvenile specimens present for each anatomical element (juvenile specimens were identified by the presence of epiphysial fusion lines, unfused epiphysial ends and juvenile dentitions. Only fully fused and fully erupted permanent dentitions were counted as 'adult'). Where relevant, a further column giving details of the number of cut specimens present is inserted. This is followed by a column giving the total counts for each anatomical element. The final three columns give details of the MNIs, Binford MNIs and %MNIs, calculated following the procedures outlined above.

It will be noticed that in various places, areas of the tables have not been completed and are hatched. This was intentional, and occurs in instances where certain classes of data were not calculated. It may be best to explain with the use of examples why certain data classes were not presented and/or calculated. Cranial fragments are never broken down into left and right categories, but instead always placed in the indeterminate column as some areas of a skull are easier to side than others. Similarly MNIs, Binford MNIs and %MNIs were not calculated from them. This is because a single cranium may be broken into many pieces, with an unequal distribution between left and right; in some instances it might be possible to calculate MNI data from them, but these would be relatively rare. It seemed best to exclude these from any analysis of the BPR data, as, if attempts were made to calculate MNI, Binford MNI and %MNI data from this particular category, the results would not be particularly reliable or reflect the actual distribution of body parts.

Mid sections of bones, some of which may have been identifiable to element and species, are accounted for in the breakdown of NISP information (the first three columns) where relevant, but are not used in any of the MNI, Binford MNI and %MNI calculations, as I could not be certain that some or all of the mid-sections for each species were not from the same bone, and would thus distort the counts.

Teeth are not used for MNI, Binford MNI and %MNI calculations for similar reasons. The BPR tables are not so detailed that teeth of each species are broken down into incisors, canines, premolars and molars; similarly they have not been divided into upper and lower, left and right or adult and juvenile, and instead have simply been grouped together in the indet column. It was felt that an analysis of the detailed breakdown of these elements would not be particularly useful with regard to evidence of Magdalenian butchery patterns, and certainly not worth the very large amount of time it would have taken.

However, before any inferences can be confidently drawn about human behaviour from the apparent patterning in the proportion of mammalian anatomical elements present at the sites discussed here, one has to consider whether there is adequate evidence to support the suggestion that humans were the main (or indeed only) bone accumulating agency. One of the major problems encountered throughout this study was the identification of humanly accumulated animal bone from that of bones collected by other carnivores. In the next section I shall go on to discuss this issue directly.

Human accumulation of bones

Arguments for humans as the accumulating agents behind faunal asssemblages have been based on a number of criteria. Some of these are certainly valid, but all need to be considered critically before they are accepted. For example, one species may show unusual predominance, or certain anatomical elements may be strikingly over- or under-represented (*cf.* Mellars 1968, 1973; Klein 1977). However, this may simply reflect the robust nature of the surviving bones (*cf.* Brain 1981; Binford 1981), or the make up of the fauna available in an area at any given time, but even this may be difficult to determine. For example, a major part of the Devensian lies beyond the range of radiocarbon dating, and given the lack of modern analogues, it is difficult to assess the range of biological variation at any particular point in time. Without detailed studies documenting the evidence for other taphonomic processes it is difficult to evaluate the relative roles of the processes that may have operated in creating a faunal assemblage.

Certain kinds of spatial patterning may also be a diagnostic indicator of human activity. A good example of this would be the concentration of artefacts and fauna in one area. However, this may not always be as good an indicator as first thought. Cave sediments are potentially subject to a wide number of processes during and after their initial deposition, including weathering, flooding and cryoturbation, any one of which may affect the distribution of artefacts and fauna quite independently of any humanly-induced patterning. The mere proximity of artefacts to bones does not in itself indicate an association between the two. In addition to the possible factors outlined above, trampling of cave sediments by later occupants can cause a high degree of both vertical and lateral displacement from the original point of discard. Some degree of trampling is likely to have occurred in any cave which shows signs of human and/or animal occupation. In any case, the faunal assemblages discussed in this dissertation lacked information about their spatial patterning.

The presence of burnt bones and charcoal is another piece of evidence often used to support arguments of human accumulation. However, natural fires may occur within and around caves, and later human occupants of caves might light fires on a surface strewn with ancient bones (just such a scenario was suggested by Dawkins (1863) for the hyaena den at Wookey Hole). Fossil bones may also have been collected as a potential fuel in extreme permafrost environments (*cf.* Klein 1973, 53-54).

Age or mortality profiles are often cited as evidence for differing hunting strategies. These rely on the assumption that all fauna included in an analysis was the result of human predation. Without direct evidence of humans as the accumulating factor this type of evidence (on its own) is inadequate for identifying human involvement as the logic is circular.

I have already mentioned that there is evidence from all of the faunal assemblages discussed here to suggest that other predators were also actively accumulating components of them (see Plate 3.13 for a gnawed mandible of *Ursus arctos* from the Trou de Chaleux, and Plate 7.3 for partially digested bone fragments from the Grotte de Sy Verlaine). In summary, *it cannot simply be assumed that all or any of the bones present in any of the faunal assemblages discussed here were brought to the sites and processed there by humans.* At the time of writing there still appears to be one clear and reliable feature of bone modification which is diagnostic of human activity and that is the presence of cut marks produced as an accidental by-product during butchery. The distinctive morphology of such cut marks has already been discussed above and their position in general indicates the activities performed.

Quantification of butchery marks

Various authors have claimed that the frequency with which butchery marks occur is a significant factor (*cf.* Lyman 1994, 303-306). It has been suggested that there is a direct correlation between the number of individual butchery marks on an anatomical element (or particular region of that element) and the butchery objectives of the human who processed that particular carcass and/or butchery unit. Various techniques have been proposed to quantify the 'intensity' of butchery activities, and wildly differing conclusions have been drawn from such quantifications. For example, Bunn and Kroll (1986) suggested that relatively high proportions of cut marks on a particular anatomical unit within a faunal assemblage reflect a regular and intensive butchery activity, and from this they inferred regular access to a high quality dietary resource by early hominids from specimens dating to the Plio-Pleistocene boundary found at Olduvai Gorge. Binford (1986) replied to this claim that instead of reflecting access to high quality resources, the intensity of the butchery marks instead indicated access to a relatively 'poor' resource, the remains of the meals of other predators, scavenged by early hominids. Neither of these scenarios is necessarily correct, and arguments based solely on the absolute quantity or even the percentage of observed marks on an anatomical element do not particularly inspire confidence. For example, at the Trou de Chaleux (chapter 3), the largest sample of cut marked bone available for study, a relatively high proportion of cut marks occurs on the lower limbs of various large mammals, most notably the equids (44.72% of all cut marked *Equus ferus* specimens are lower limbs - metapodia, accessory metapodia, phalanges and sesamoids). This suggests an *apparent* emphasis on tendon extraction, rather than on the exploitation of other resources (meat, marrow, hides, etc.). However, these elements are precisely those which have little (if any) flesh between the skin and bone and are therefore the easiest bones to be cut accidentally. This is not to say that tendon extraction was not an activity at the Trou de Chaleux (it clearly was - see chapter 3), but that there are reasons why it is highly visible in the archaeological record. Meat removal, often assumed to be the primary objective during butchery, is attested by filleting marks on many of the meat bearing elements of a carcass, but these are regions of an animal's body where a skilled butcher is far less likely to contact the bone surface accidentally, as the distance between the point of incision and the bone itself is likely to be much greater. Atlases of animal anatomy such as Getty (1975) show thick layers of muscles on the upper parts of the limbs and trunk of the larger mammals. Consequently, whilst butchery with meat extraction as an objective may have been (and is likely to have been) a major activity, the traces of this may be less visible in the archaeological record, simply because of the skills of prehistoric butchers and the cushioning effect of the meat itself.

Bearing all of these points in mind I would advocate a more 'holistic' approach to the study of prehistoric butchery practices, whereby one does not merely aim at a crude estimate of the intensity of butchery marks, but also takes into account the location and orientation of any marks present. This is what I have attempted to do in the following study. I do not, therefore, propose to advocate any rules or laws in correlating marks located on a particular bone or region of that bone with particular activities such as skinning or dismemberment. Instead, I will suggest specific activities only after I have taken into account other factors, and discussed the cases individually. Marks may be located on the same anatomical element in broadly the same location due to a number of different activities; for example marks located on a proximal femur may relate to meat extraction, disarticulation or a combination of the two: it is only by examining the precise location and orientation of the marks themselves that one can establish which of these options is most likely. In some of the cases discussed in the following chapters the precise butchery activities will be ambiguous. In such instances, the likely options will be discussed.

A further factor which should be born in mind whilst reading the following case studies is that ribs and vertebrae may not have been preserved in some of the collections studied, and in others they may not be identifiable to species with the same degree of accuracy as many of the long bones. Consequently there is an inbuilt bias towards the recognition of butchery marks on the limbs, and within these on the lower portions of the limbs, away from the main meat bearing elements.

To SEM or not to SEM ?

Unfortunately the facilities available to me for SEM studies at Oxford did not extend to an SEM chamber large enough to take any sample greater than 80 x 25 mm (Chris Salter pers. comm.), which in practical terms meant that very few complete faunal specimens could be examined in their original state. Attempts were made to produce latex casts of a selection of specimens, which could be cut to fit with the chamber of the only SEM available to archaeologists in Oxford throughout the duration of my research. However, this was not without its own set of problems. Initially I attempted to obtain a supply of Xantropen Blue or CutterSil Light to use as casting agents, following the recommendations of Rose (1983), but neither substance was available through any of the suppliers I contacted, and letters to the two companies which produced the products in 1983 requesting information on British suppliers (Unitek Corporation and Healthco-Baltimore, both based in the USA) failed to elicit any response. I next tried contacting colleagues also using replications for SEM studies, asking whether they could tell me which materials they used and suggest suppliers. Only one took the trouble to reply, Ms. Corinne Duhig, then in the Dept. of Physical Anthropology at Cambridge, who suggested that I should use Araldite EM mix for best results with the SEM, and in her letter dated 1 March 1991 she suggested that I should contact the makers of Araldite EM direct, as it was not "generally in the shops". This I duly did by telephone, and was told that the product was no longer in production and that there were no supplies held in stock which were available for sale.

I then turned to other studies which had used a replication technique and had been undertaken in the UK. Sandra Olsen's Ph.D. thesis (1984, 79-80) recommended the use of silicone rubber as a moulding material as it was "resistant to deterioration caused by light, air or ozone, stable in a wide range of temperatures (-100°C to 260°C), adhesion repellent, and physically inactive when hardened... The linear shrinkage of silicone rubber is less than 0.6% when prepared correctly. Although it should not be applied to very friable bone, it normally releases readily from solid bone without the aid of a releasing agent. This is important because releasing agents reduce the amount of fine detail that can be reproduced in the negative replica".

In her dissertation, Olsen specifically recommended the use of Dow Corning Silastic 9161 for the casting of bone and stated that it was available in Britain. This was also recommended by Larsen (1981). I first contacted the conservation department of the Pitt Rivers Museum, and was told that they neither had a supply of this silicone rubber, nor were able to obtain one. I then made enquiries in other departments at Oxford (Chemistry, Biochemistry & Materials) as to whether a supply was available within the University, or whether we might wish to place a joint order. The answer was again negative. I next contacted the manufacturers of Dow Corning Silastic 9161, (Dow Corning LTD) who replied that they would be happy to provide a supply, although their minimum order was a tonne. Enquiries to other suppliers merely referred my request back to the manufacturers of Dow Corning Silastic 9161. Eventually, discussions with the departmental administrator at the Pitt Rivers Museum established that there were neither storage facilities available for such quantities nor the funding available to purchase either the silicone rubber or the storage equipment necessary.

I was eventually able to obtain a small supply of Dow Corning Silastic 9161 from the conservation department at the Natural History Museum in London (formerly the British Museum (Natural History)) through the kindness of Andrew Currant, which I used to make some replicas of modified animal bone from Gough's Cave, Cheddar. However, when I attempted to buy a small supply (2 or 3 litres) from the same source, the request was refused, and no further supplies of the silicone rubber were made available. Instead I was referred to A. Tiranti, of Warren Street, London, a dealer in art supplies and casting materials. He was not able to obtain a supply of Dow Corning Silastic (or any of the other brands previously mentioned), but instead recommended the use of Stag Silicone. Attempts at using this material on a small selection of horse phalanges from the Trou de Chaleux held in the IRScNB did not prove very successful; a further problem was that the water content of the rubber proved too high for satisfactory use within the SEM (Chris Salter pers. comm.). It was at this point that I decided to discard the possibility of using a SEM as a verification tool, as neither sufficient time nor funding was available to experiment with a wide range of other silicone rubbers to establish which might be the most suitable casting agent.

Instead, my identifications were made in the first instance by eye, and then verified by the use of a 10x hand lens. Specimens with marks which were considered to be dubious are not considered in the discussions of butchery activities below. In my experience, visual identification backed up with the use of a hand lens or low powered optical microscope is effective in accurately identifying a high proportion of cut marks present on bone surfaces. The SEM is an extremely useful verification tool, but is best used in cases where the identification is uncertain. Clearly, not all genuine butchery marks present in the assemblages discussed in this dissertation will have been identified; however it is believed that those excluded were correctly excluded at the time because they were felt to be questionable. Overall, it is assumed that the cut-marked bones discussed in the following chapters, and the patterning observed within them are a representative sample of all the bones with butchery marks from the site.

Carnivore accumulation of bone

Several predators were identified in all of the assemblages studied from the north-western Ardennes, many of which are known to leave distinctive traces of their activities on the bones of their prey (*cf.* Potts & Shipman 1981, Brain 1981, Andrews 1990 and J. Cook pers. comm.). Such damage patterns can be divided into 4 broad categories: bone splintering, bone gnawing, scooping out cancellous tissue from the proximal and distal ends of bone shafts and the partial digestion of bone fragments. Not all predators will cause all of these types of damage: for example, owls have not, to the best of my knowledge, been observed gnawing bones, but they do ingest the bones of small mammals and are frequently the agency responsible for their accumulation in cave sediments (*cf.* Andrews 1990). In general, marks produced by non-human predators can be readily recognised, and are quite distinct from the 'V' shaped butchery marks left by flint tools. Damage induced by such predators was present in varying quantities in all of the assemblages studied.

Bone breakage patterns

Why would humans consciously break animal bones ? To gain access to the resources inside the bone (marrow and bone grease) and to prepare the bones themselves for use as tools or the blanks for tool production. Many studies have invoked bone breakage as a definite sign of human activity. Since the creation of the so called *Osteodontokeratic culture* by Raymond Dart (1957), claims that broken bones may have been used as tools by prehistoric humans, and that certain forms of bone breakage (such as spiral fractures) can be linked directly to human agency, have found varying levels of acceptance by researchers. C.K. Brain provided a coherently argued case against the over-interpretation of bone breakage patterns in his 1981 volume *The Hunters or the Hunted ? An introduction to African Cave Taphonomy*, in which he demonstrated that many of the bone breakage patterns which had been suggested to be the results of early hominid exploitation of these resources could in reality be attributed to a wide range of taphonomic factors, only one of which was human.

Various attempts have been made to identify bones broken by humans and to differentiate these from other patterns of bone breakage. Spiral fractures are often cited as one of the most distinctively 'human' methods of breaking bones. Brain (1981, 5 & 140) terms this a "crack and twist" method, whereby a long bone is given a blow on the shaft and the two ends are then twisted apart. Gary Haynes defined spiral fractures more formally when he described how "[the] fracture outline curves as a helix, partial helix, or combination of helixes around the shaft, and the fracture occurs in the part of the shaft enclosing marrow and not in trabecular bone tissue" (Haynes 1983, 140). Brain has shown that this distinctive bone breakage can also be the result of the bone cracking of spotted hyaenas, brown hyaenas and leopards (*ibid.* 140-141), and Myers *et al.* (1983) have convincingly argued that spiral fractures occur in relatively high frequencies in non-human contexts such as the north American Miocene.

The problem of differentiating humanly induced bone breakage from that caused by other agencies, makes any discussion of bone breakage patterning rather problematic. However, I will suggest that certain aspects of the bone breakage observed at the Trou de Chaleux (chapter 3) do not match any descriptions I have read of carnivore damage, nor any of the damage patterns I have observed in carnivore accumulated faunal assemblages I have examined. An example of this would be the longitudinal splitting of metapodials and phalanges. Taking this in conjunction with the relatively high proportion of cut bone found at the Trou de Chaleux (17.35% of the NISP) compared with gnawed bones in the same assemblage (0.30% of the NISP), I felt justified in discussing the breakage patterns I observed, showing that they did not parallel any form of predator or 'natural' damage I had encountered before, and eventually attributing them to human agency.

Conclusions

I have briefly outlined here the basic methods used in the study which follows. In some cases (such as the use of the SEM) use of certain other techniques would have been desirable, and would certainly have enhanced the research described here, but proved impossible for purely practical reasons. I have also been selective in the techniques used in the analysis of the different assemblages. Readers may feel that I have erred on the side of caution in restricting my use of statistical methods, for example my limited use of %MNIs. I feel that this is wholly justified, as my primary intention is to give an accurate account of the raw data, and base discussion upon this, rather than pushing interpretation beyond the bounds of what I believe to be realistic for this particular body of material.

The next chapter will focus on the existing radiocarbon chronology for the north-western Ardennes. One of the major themes will be the problems of demonstrating a direct contextual link between material dated by conventional means and any archaeological material present at the site. A revised chronology will be proposed on the basis of radiocarbon dates obtained using the Accelerator Mass Spectrometry technique.

THE CHRONOLOGY OF THE LATEGLACIAL AND EARLY POSTGLACIAL ARCHAEOLOGY OF BELGIUM.

INTRODUCTION

Chronological evidence in general can be broadly divided into two categories - absolute and relative dating. This chapter will deal in detail with the former class of evidence: radiocarbon (^{14}C) and thermoluminescence (TL) dating are the two major techniques which have been utilised in Belgium. Climatic terms such as Bölling and Alleröd will be used throughout the following text following a modified version of Mangerud *et al.* (1974; Figure 2.1) which is widely used by Belgian and French archaeologists and palaeontologists. Correlations between this and other schemes for the European subdivisions of the Lateglacial can be found in the preface to Barton *et al.* (1991) a modified form of which is presented here as Figure 2.1.

All radiocarbon[1] dates which were believed to be associated with Upper Palaeolithic industries from Belgium in 1990 (when research began) are presented in Table 2.1. At first sight these may appear to give comprehensive coverage of the Upper Palaeolithic period, and notably to those segments of it which fall within the Lateglacial (*circa* 14,000 to 10,000 BP) and Early Postglacial (*circa* 10,000 to 8,500 BP), but on closer inspection a number of problems can be observed. These relate either to what can be regarded as idiosyncratic occurrences and/or abnormally extended continuations of archaeological technocomplexes, or to more general problems associated with sample selection.

In this chapter, I shall address the major problems of dating each of the Lateglacial/Early Postglacial technocomplexes in Belgium, specifically the Magdalenian, Creswellian, Tjongerian and Ahrensburgian. The approach varies somewhat in each case, according to the quantity and nature of dates available. As the time available for D.Phil.

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[1] All dates and associated tables will be quoted in uncalibrated radiocarbon years before present (BP), unless otherwise stated.

research was limited, a number of fundamental problems of Belgian Lateglacial archaeology were identified at the outset of research, and it was upon these that research subsequently focused. Foremost amongst these were the many problems associated with the Belgian Lateglacial chronology; this chapter deals with the problems perceived and subsequent efforts to resolve them.

Radio-carbon years BP	**Pollen zones** (after Iversen 1954)	**NW Europe chronozones** (based on Mangerud *et al.* 1974)	**NW Europe chronozones used in Belgium**	**NW Europe climato-stratigraphic units** (after Lowe & Gray 1980)
	IV	Preboreal	Preboreal	Flandrian Interglacial
- 10,000	III	Younger Dryas	Dryas III	Transition
				Younger Dryas Stadial
-11,000	II	Alleröd	Alleröd	Transition
	Ic	Older Dryas	Dryas II	
-12,000	Ib Ic	Bölling	Bölling	Lateglacial Interstadial
- 13,000		Weichselian Stage	Dryas I	Transition
				Late Devensian/Main Stadial

Figure 2.1: Schemes for the European divisions of the Lateglacial modified from Barton *et al.* 1991.

Lab Code	Date	Site	Cultural ascription
OxA-943	2230 ± 70 BP	Rekem	Tjongerian
OxA-1375	5220 ± 100 BP	Rekem	Tjongerian
OxA-944	6390 ± 100 BP	Rekem	Tjongerian
IRPA-93I	7080 ± 290 BP	Meer II	Tjongerian
Lv-713	7210 ± 100 BP	Helchteren	Tjongerian
Lv-687	7400 ± 120 BP	Helchteren	Tjongerian
Lv-1137	7720 ± 110 BP	Trou des Nutons, Furfooz	Magdalenian
Lv-879	7730 ± 100 BP	Achel	Tjongerian
GrN-911	7790 ± 100 BP	Lommel	Tjongerian
IRPA-93 II	8025 ± 315 BP	Meer II	Tjongerian
Lv-482	8630 ± 130 BP	Achel	Tjongerian
GrN-5706	8740 ± 60 BP	Meer II	Tjongerian
GrN-7939	8930 ± 150 BP	Meer II	Tjongerian
GrN-4960	8940 ± 85 BP	Meer I	Tjongerian
GrN-4961	8950 ± 80 BP	Meer I	Tjongerian
OxA-945	9900 ± 110 BP	Rekem	Tjongerian
Lv-535	10380 ± 170 BP	Remouchamps	Ahrensburgian
Lv-1135	10720 ± 120 BP	Trou du Frontal, Furfooz	Magdalenian
OxA-1344	10950 ± 200 BP	Presle	Creswellian
OxA-942	11350 ± 150 BP	Rekem	Tjongerian
Lv-1238	11840 ± 100 BP	Grotte de la Princesse	Aurignacian II
Lv-1472	12140 ± 160 BP	Presle	Creswellian
Lv-686	12150 ± 150 BP	Grotte du Coléoptère	Magdalenian
Lv-1568	12370 ± 170 BP	Trou de Chaleux	Magdalenian
Lv-717	12400 ± 110 BP	Grotte du Coléoptère	Magdalenian
Lv-1386	12440 ± 180 BP	Trou des Blaireaux	Magdalenian
Lv-1136	12710 ± 150 BP	Trou de Chaleux	Magdalenian
Lv-1569	12990 ± 140 BP	Trou de Chaleux	Magdalenian
Lv-1434	13730 ± 400 BP	Trou Blaireaux	Magdalenian
Lv-690	13780 ± 220 BP	Grotte de Sy Verlaine	Magdalenian
Lv-1314	13790 ± 150 BP	Trou des Blaireaux	Magdalenian
Lv-1309D	13850 ± 335 BP	Trou des Blaireaux	Magdalenian
Lv-1433	13930 ± 120 BP	Trou des Blaireaux	Magdalenian
Lv-446	16070 ± 450 BP	Oetrange	Perigordian
Lv-1558	16130 ± 250 BP	Trou des Blaireaux	Magdalenian
Lv-1385	16270 ± 230 BP	Trou des Blaireaux	Magdalenian
Lv-467	16770 ± 390 BP	Oetrange	Perigordian
IRPA-132	22105 ± 550 BP	Spy	Perigordian V
IRPA-202	22105 ± 455 BP	Spy	Perigordian V
Lv-307	23160 +550, -510 BP	Maisières-Canal	Perigordian
GrN-9234	23170 ± 160	Station de l'Hermitage	Perigordian
IRPA-201	23460 ± 500 BP	Grotte de la Princesse	Aurignacian II
Lv-305/2	24100 +650, -610 BP	Maisières-Canal	Perigordian
Lv-721	24530 ± 470 BP	Trou de Renard, Furfooz	Evolved Aurig.
Lv-353	25280 +1040, -920	Maisières-Canal	Perigordian
IRPA-203	25300 ± 510 BP	Spy	Aurignacian
Lv-1241	25440 ± 680 BP	Grotte du Haleux	Aurignacian
OxA-2452	26750 ± 460 BP	Couvin	-
Lv-720	25800 ± 700 BP	Couvin	-
GrN-5523	27965 ± 260 BP	Masières-Canal	Perigordian

Table 2.1 Radiocarbon dates covering the Belgian Upper Palaeolithic in 1990 (cont./)

Lv-304/2	30150 +1890, -1540 BP	Masières-Canal	Perigordian
GrN-5690	30780 ± 400 BP	Masières-Canal	Perigordian
Lv-304/1	31080 +2040, -1620 BP	Masières-Canal	Perigordian
Lv-305/1	35970 +3140, -2250 BP	Masières-Canal	Perigordian
Lv-1559	46820 ± 3290 BP	Couvin	-

Table 2.1 Radiocarbon dates covering the Belgian Upper Palaeolithic in 1990.

DEFINITIONS

It may be helpful first to define the terms used throughout this discussion. Almost all the 'cultural' names used in Table 2.1 originated during the 19th or early 20th century, to describe different lithic, bone and ivory artefact assemblages found in countries other than Belgium: the Magdalenian originating in France, the Creswellian in Britain, the Tjongerian in the Netherlands and the Ahrensburgian in Germany. These terms have come into common usage during this century, and are now used to refer to individual archaeological assemblages which can then be grouped into technocomplexes spanning much of Europe. Although the names originally contained within their meaning quite definite notions of ethnicity and social groupings, these have become either generalised or lost in their current use. Broad definitions for each of the 'cultural' terms are given at the beginning of the subsequent sections: these are derived from a variety of published sources, and also include opinions offered to me personally by R.N.E. Barton and R.M. Jacobi, to both of whom I am indebted. As the research reported in this dissertation did not include much direct study by myself of lithic assemblages from Belgium, discussions of the cultural attribution of lithic assemblages are based on published illustrations, often of a highly variable quality.

Any understanding of the relationship between differing archaeological cultures during the Lateglacial and early Postglacial must rely heavily upon a detailed knowledge of chronological patterning throughout this period. Whether different technocomplexes can be considered as contemporaneous or as temporal successors must influence strongly any interpretation archaeologists attempt to construct for the Lateglacial/early Postglacial. The construction of a composite sequence by the comparison and the 'interleaving' of stratigraphic sequences from a number of sites (a technique commonly used in many regions to form a base-line chronology) is not really applicable to the Belgian data. Few sites have more than one Upper Palaeolithic and/or Mesolithic layer, and consequently dating evidence for these has centred primarily on the radiocarbon chronology, and secondarily on biostratigraphic and geological data. In the following pages I will focus primarily on radiocarbon evidence. This dating technique is so well known that it is unnecessary to describe its basic principles and applications here, and the refinements of calibration crucial to the later periods of prehistory are only now beginning to be extended to become of direct relevance in Upper Palaeolithic research. At the time of writing a terrestrial calibration curve which is not simply a projected straight line between one or two data points per millenium is not yet available.

The relatively recent development of Accelerator Mass Spectrometry (AMS) has revolutionised our understanding of the Mesolithic and Late Palaeolithic periods, which lie within its temporal range, not least by making it possible to use far more appropriate samples for dating than ever before. By 1990 this technique had only been used to anywhere near to its full potential for the Lateglacial and early Postglacial periods in Britain, via dating humanly modified bone and antler. The available dates for the Belgian Lateglacial and early Postglacial were, by contrast, almost all measured from conventional samples (large amounts of material taken from bone, charcoal or wood, often ‘bulking’ a number of specimens to obtain the requisite quantity). In many cases, precise details of samples submitted and their relationship to the archaeology which they purport to date are unclear. The bulking of material from whole layers has major implications for sample integrity and subsequent interpretation of any dates obtained. Organic material may accumulate within a geological or archaeological layer over a considerable period of time due to a range of taphonomic processes. Consequently, dating samples of ‘bulked’ material can only give an average of all the individual ages of the elements of which the sample was actually composed. At best, such dates may give an indication of the antiquity of at least part of the material within a layer; at worst, they can be highly misleading, bearing little relationship to the ‘real’ age of apparently associated archaeological residues. In contrast to all this, the tiny samples required for AMS dating can be taken from individual artefacts or modified bones, which have an unequivocal association with a single episode of human activity or presence.

Another major problem in dealing with the Palaeolithic and Mesolithic chronology of Belgium exists in the fact that the main laboratory involved in providing radiocarbon determinations for this region, Louvain (Lv), has failed to publish a datelist in *Radiocarbon* since 1974. This has meant that even the compilation of radiocarbon dates for Lateglacial and early Postglacial Belgium presented here cannot claim to be wholly comprehensive, as it is drawn from the available site reports and other publications which discuss the Belgian sequence, and not from the complete data one would find in *Radiocarbon* or *Archaeometry*. However, I believe it to be the most through and systematic synthesis of this information yet produced.

Thermoluminescence, or TL, is a dating technique which has only recently been applied to Palaeolithic datasets (Huxtable & Aitken 1986). Consequently, few dates are currently available. The actual technique involves the measurement of an emission of light from a sample after heating and exposure to alpha, beta and gamma radiation from ^{40}K. It does not seem appropriate to detail the finer points of this technique here. Burnt flint is the raw material usually used from Palaeolithic contexts, although the technique has also been widely applied to ceramics and sediments. TL dates are given in calendar years, and as such cannot be directly compared with uncalibrated radiocarbon dates (which are in radiocarbon years). TL dates are currently available for four Lateglacial sites in Belgium: Orp-le-Grand East and West (Magdalenian), Rekem and Meer IV (Tjongerian).

TL dating of the Belgian Magdalenian is still in its infancy. Dates are currently available for two sites, Orp-le-Grand East and West, which are open air lithic scatters lacking associated fauna. The dates (Figure 2.2) indicate use of these sites during the Lateglacial, with Orp West apparently slightly later than Orp East. The standard deviations attached to the dates are too great to give any precise indication of temporal patterning, although one can be fairly confident that the real ages lie between 14,000 and 10,000 years before present.

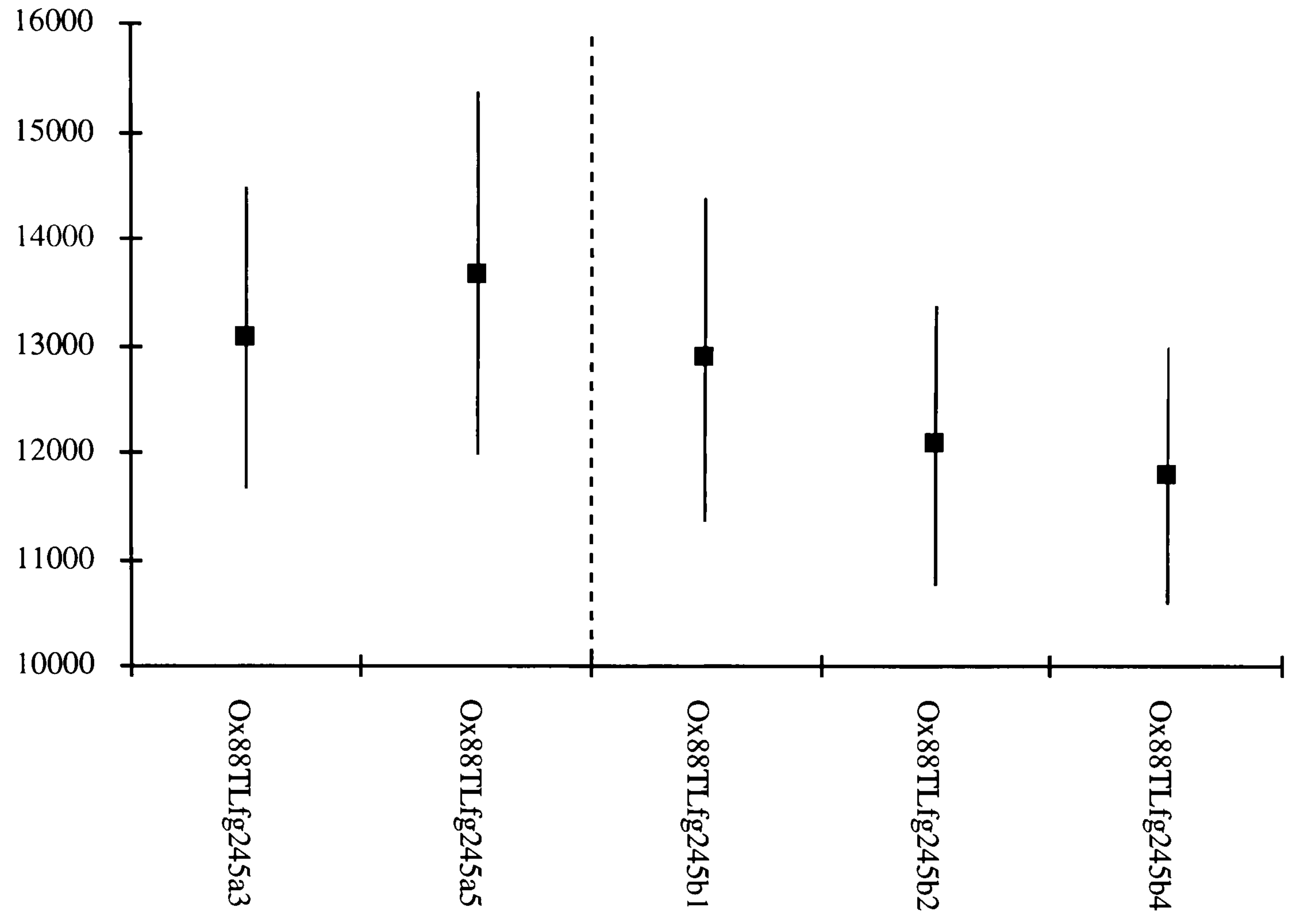

Figure 2.2: TL dates from Orp-le-Grand east (left) and west (right).

Introduction to the AMS dating of the Lateglacial Archaeology of Belgium.

Throughout my research I was extremely fortunate to have available the resources of the Accelerator Unit of the Research Laboratory for Archaeology and the History of Art at Oxford University, and the support of the Accelerator Committee which decides upon the allocation of research council funded dates. The destructive element of the AMS technique is so limited as to preclude the usual objections to sampling worked bone or palaeontological specimens (see for example Hedges 1986). However, it cannot be stressed too strongly that, given the problems of association between archaeological residues and faunal remains, specimens of human or humanly modified bones present ideal radiocarbon samples, as the association between these and human activity at a site is unquestionable.

At the outset, I decided that the scope of my dating project should be limited to those sites whose faunas were already under study (Trou de Chaleux, Trou des Nutons at Furfooz, Trou du Frontal at Furfooz, Grotte du Coléoptère, Grotte de Sy Verlaine and the

Grotte de Remouchamps) and to bones with a clear archaeological association. In all cases these sites already had one or more conventional radiocarbon dates, and indeed this was one of the criteria used when initially selecting sites and assemblages for study. In the latter stages of research it became appropriate to expand the scope of the dating project to include sites at which I was not among the primary investigators (Trou da [sic] Somme, Trou Burnot and Trou des Blaireaux).

Between 1991 and 1993 I was able to initiate and organise two AMS projects entitled *The AMS dating of Lateglacial Archaeology in Belgium, parts I and II.* The original project (part I) resulted in 6 dates on human or humanly modified bones (Hedges *et al.* 1993). The second part of the project (part II) gave a further 11 dates (Hedges *et al.* 1994).

These two projects were specifically selected to address several of the problems which will be outlined in greater detail in subsequent pages. The results have been of major significance in re-assessing the Belgian Lateglacial. The individual dates will be discussed in context below.

THE MAGDALENIAN IN BELGIUM

Originally defined on the basis of the stone, bone and ivory formal artefacts found from the site of la Madeleine in South West France, Magdalenian assemblages have been recognised in Belgium since the excavations of Édouard Dupont during the 1860s and 1870s. The basic typology of the Magdalenian in its 'core' area is traditionally divided into six stages, generally accepted as having at least some genuine chronological significance (these are usually noted in Roman numerals), the final stage being subdivided into groups 'a' and 'b'. Recent work by Hemingway (1980) has helped to develop our understanding of the earlier stages of the Magdalenian and their definition, the later stages being fairly well defined by the presence/absence of certain artefact types and their typology, notably bone and antler 'harpoons' (a type of barbed point).

Although in other areas of Europe the Magdalenian technocomplex has been clearly defined chronologically by the use of radiocarbon dating, at the outset of my research in

1990 there were few radiocarbon dates for the Magdalenian in Belgium (a total of 15 were claimed: see Table 2.2 below, they are extracted for convenience from Table 2.1). Instead, the dating of the Belgian Magdalenian has relied heavily on inter-regional comparisons. These few Belgian radiocarbon dates supposedly 'associated' with the Magdalenian covered a broad temporal span ranging from 7720 ± 110 BP (Lv-1137) to 16270 ± 230 BP (Lv-1385). However, the majority of these fell within the range 12,000 to 14,000 BP.

Lab code	Date	Site
Lv-1137	7720 ± 110 BP	Trou des Nutons, Furfooz.
Lv-1135	10720 ± 120 BP	Trou du Frontal, Furfooz.
Lv-686	12150 ± 150 BP	Grotte du Coléoptère.
Lv-1568	12370 ± 170 BP	Trou de Chaleux.
Lv-717	12400 ± 110 BP	Grotte du Coléoptère.
Lv-1386	12440 ± 180 BP	Trou des Blaireaux.
Lv-1136	12710 ± 150 BP	Trou de Chaleux.
Lv-1569	12990 ± 140 BP	Trou de Chaleux.
Lv-1434D	13730 ± 400 BP	Trou des Blaireaux.
Lv-690	13780 ± 220 BP	Grotte de Sy Verlaine.
Lv-1314	13790 ± 150 BP	Trou des Blaireaux.
Lv-1309D	13850 ± 335 BP	Trou des Blaireaux.
Lv-1433	13930 ± 120 BP	Trou des Blaireaux.
Lv-1558	16130 ± 250 BP	Trou des Blaireaux.
Lv-1385	16270 ± 230 BP	Trou des Blaireaux.

Table 2.2: Radiocarbon dates available for the Belgian Magdalenian in 1990.

In the following pages I shall argue that many of these conventional radiocarbon dates give a 'rough' impression of the probable age of the Belgian Magdalenian. However, they cannot pass unquestioned and on closer inspection many, if not all, have a range of problems associated with them.

For example, the youngest of these dates (Lv-1137 7720 ± 110 BP), taken at face value, would appear to be totally inconsistent with current understanding of the temporal occurrence of the Magdalenian across Europe. The date comes from an undocumented sample of bone from the Trou des Nutons at Furfooz, one of the many caves in the Lesse Valley. It appears to be far too recent (the Magdalenian is usually dated between 18,000 and 12,000 BP), and inspection of the lithics and fauna from the site indicates that this Magdalenian findspot has strong affinities with other Magdalenian locales in the valley (e.g. the Trou du Frontal at Furfooz and the Trou de Chaleux). These sites will be discussed further below and in subsequent chapters. One is thus immediatly confronted with the problem which has frequently arisen during the course of research: if the Belgian dates are accepted at face value, then the Lateglacial and Early Postglacial archaeology of Belgium differs dramatically from the rest of north-western Europe in its spatio-temporal distribution. Should this be acknowledged at the outset and incorporated as a fundamental aspect of research, or should the basic assumptions which underlie it be questioned ? I decided on the latter course of action, and consequently looked in detail at the dating evidence available for the Belgian Lateglacial. The conclusions I eventually drew were that much of the existing radiocarbon chronology was highly dubious due to problems of sample selection and association.

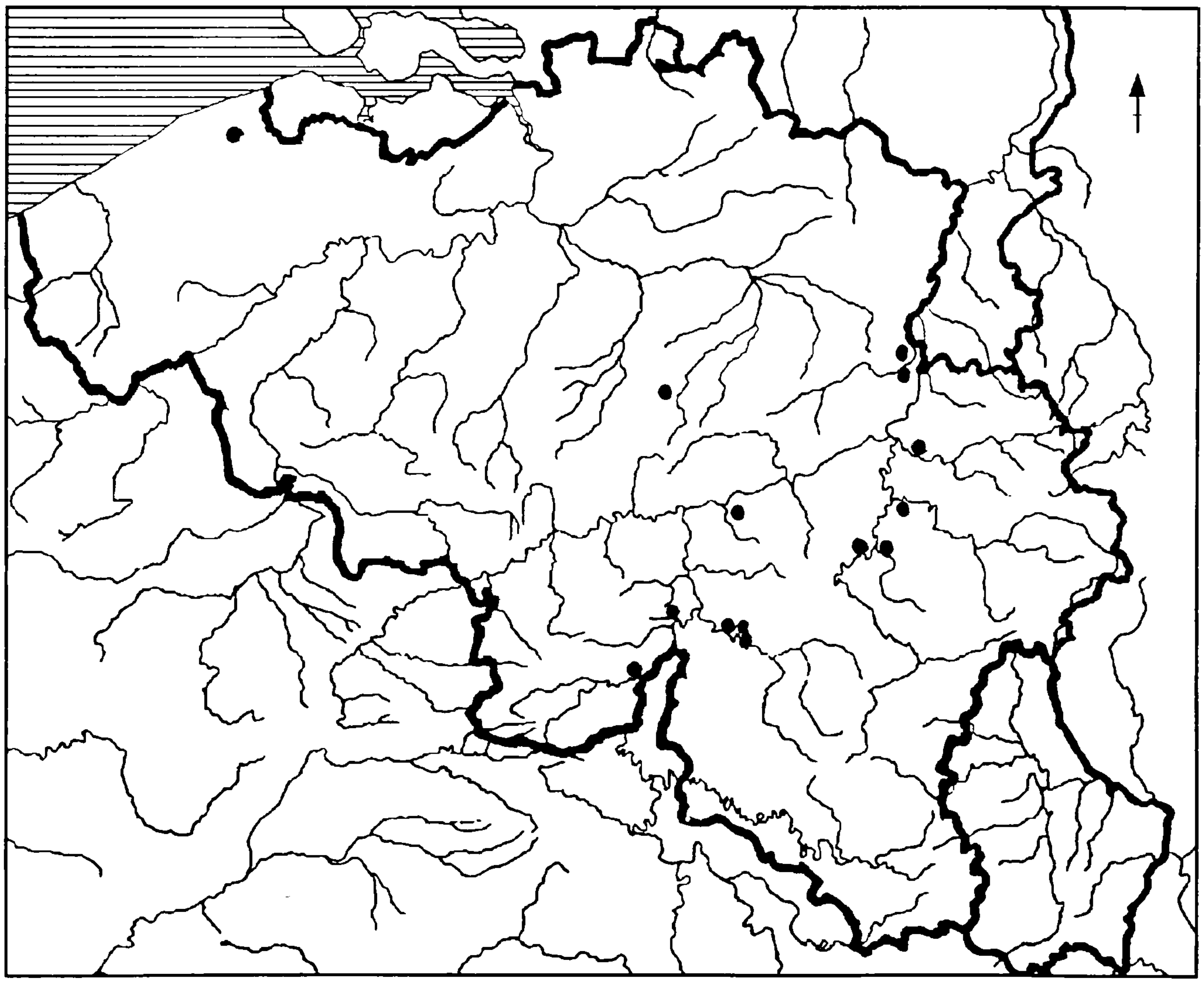

Figure 2.3: Distribution map of Magdalenian and ? Magdalenian sites in Belgium.

If one is justified in rejecting the existing radiocarbon dates for the Belgian Magdalenian, which are at best unsatisfactory, then one is in the unenviable situation of being left with no more than the typological structure developed by the Abbé Breuil (1912, 1927 & 1954) and subsequent workers such as Mme de Sonneville-Bordes (1960) for the

French Magdalenian (predominantly from south -western France) from which to deduce chronological patterning. There would of course be predictable problems of regional variation to add to the shortcomings of relying on such a strategy.

On the basis of published descriptions of Magdalenian assemblages from Belgium, one would have to say that only the later stages of the Magdalenian as recognised in France (V & VI) actually appear to be present in Belgium. Comparisons with other European assemblages ascribed to these stages indicate that the Belgian sites may span a range of perhaps the very late Dryas I/Bölling to Dryas II (roughly 13,000 to 12,000 BP). In fact, this would be consistent with suggestions that the origins and early development of the Magdalenian occurred in southern France and expanded to other parts of Western Europe only in its later stages (*cf.* Dewez 1992a).

What follows is an overview of particular Belgian Magdalenian sites at which radiocarbon dating has been applied, outlining the perceived problems, detailing more recent AMS work on the chronology and suggesting an explanation for some of these problems.

Trou des Blaireaux à Vaucelles (50° 07' 14" North, 5° 44' 16" East)

This cave is situated in the south-western part of Belgium, to the south of Phillippeville. The site itself was first investigated archaeologically in 1904 (de Loë and Rahir 1913). More recent excavations by Claire Bellier and Pierre Cattelain (1983, 1986a, & 1986b) have revealed an important Lateglacial sequence, which is thought to give strong evidence for the earliest human re-colonisation of north-western Europe by "Magdalenian" hunter-gatherers (Straus 1991).

The radiocarbon sequence from this site is one of the most impressive for the Belgian Lateglacial (Table 2.3). However, a closer inspection of the published details of the site reveals some major problems. The ascription of the archaeological residues from this site to the Magdalenian appears to be based on the dates obtained for the site, rather than the presence of any diagnostic *fossiles directeurs*. Indeed the lithic industry, as published so far, would appear to consist merely of a few undiagnostic backed pieces

Lab code	**Date**	**Material dated**
Lv-1385	16270 ± 230 BP	-
Lv-1558	16130 ± 250 BP	-
Lv-1433	13930 ± 120 BP	
Lv-1309D	13850 ± 335 BP	-
Lv-1314	13790 ± 150 BP	-
Lv-1434D	13730 ± 400 BP	-
OxA-4200	13330 ± 160 BP	? cut ulna of *Equus ferus.*
Lv-1386	12440 ± 180 BP	-

Table 2.3: Radiocarbon dates from the Trou des Blaireaux

and debitage (which would not be out of place in any part of the Upper Palaeolithic) found in association with a faunal and floral spectrum of Lateglacial age. Almost all the dates from this site come from samples found in three stratigraphically distinct bone accumulations in the lowest excavated level of the site (*Couche III*). The one exception to this is Lv-1386, which comes from *Couche II.* Lv-1385 and Lv-1558 come from the lowest concentration in *Couche III* (stratigraphically the oldest). This concentration appears to be purely faunal and lacks any artefacts (Bellier & Cattelain 1986a, 54). Worked reindeer antlers have been claimed (*ibid.*) although these have not been confirmed (see below). Lv-1309D, Lv-1433 and Lv-1434D come from the middle concentration, approx. 80 cm above the lowest, which is said to have included bones of reindeer, horse, fox, hare, and ibex as well as several flints (*ibid.*). Lv-1314 comes from the uppermost concentration in *Couche III*, which had a high abundance of micro-mammal remains; whether any lithics were recovered from this concentration is unreported, though worked antler debitage is again claimed (*ibid.*). As the dates from the Trou des Blaireaux have yet to be formally published in *Radiocarbon*, it has not been possible to determine precise details of the samples; where sample details have been reported in publications, the dates have been taken from bulk samples of reindeer antler.

During two research visits to Belgium I was able to visit Claire Bellier and Pierre Cattelain at the Musée du «Malgre [sic] Tout» in Treignes, where it was possible to examine briefly a substantial part of the faunal assemblage from the Trou des Blaireaux.[2]

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[2] Unfortunately only a part of the faunal assemblage was available in Treignes, the remainder being with Prof. A. Gautier in Ghent.

Reindeer antlers were among the most abundant anatomical elements recovered during the excavation of *Couche II* and *Couche III*. The antlers examined from the site did not appear to have been humanly modified in any way (*pace* Bellier & Cattelain 1986a, 54 & 56) and I was unable to confirm any of the "traces de coups de silex, cassures par flexion, ..." (*ibid.*, 56) reported by the excavators.

Reindeer antlers which retained their basal portions were all shed, and all specimens were either female or juvenile as previously reported (*ibid.*; Bellier and Cattelain 1986b, 41). Numerous antler beam and tine fragments were present within the assemblage; however, I cannot agree with Bellier & Cattelain's suggestion (1986a & 1986b) that these specimens are debitage from antler working[3]. I was unable to locate any specimens which showed clear traces of human modification, such as groove and splinter technique, 'ringing', sawing or 'pecking'. None of the specimens illustrated as humanly worked by Bellier & Cattelain (1983, fig. 5, reproduced here as Figure 2.4) show any clear signs of human modification, and when I was able to examine these in Treignes at least some of the damage illustrated was clearly due solely to carnivore activity.

It also seems unlikely that female and/or juvenile reindeer antlers would have been collected as raw material for artefact manufacture - female/juvenile antler is inappropriate for this function, as it has neither the length nor breadth to provide adequate blanks for effective working. Additionally, no artefacts were found associated with the lower antler accumulation. Consequently, it seems probable that instead of dating the human re-colonisation of Europe after the Last Glacial Maximum (*pace* Straus 1991, 271-272), the two dates from this layer (Lv-1385 & Lv-1558) might instead be thought to give only an indication of the period during which the lowest antler concentration was being formed.

The middle concentration in *Couche III* is reported to have contained "quelques silex" (Bellier & Cattelain 1986a, 54), however, a direct link between human presence and

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[3] "Le décompte des différentes parties conservées de la ramure montre une nette prédominance des fragments basilaires par rapport aux fragments de merrains et d'andouillers. Si l'on ne peut exclure une sélection liée à la conservation différentielle, il nous semble plutôt que nous sommes en présence de rebuts de débitage : les chasseurs-cueilleurs de Vaucelles ont abandonné les bases et emporté les merrains et les andouillers dans un but difficile à définir." Bellier & Cattelain (1986b: 41).

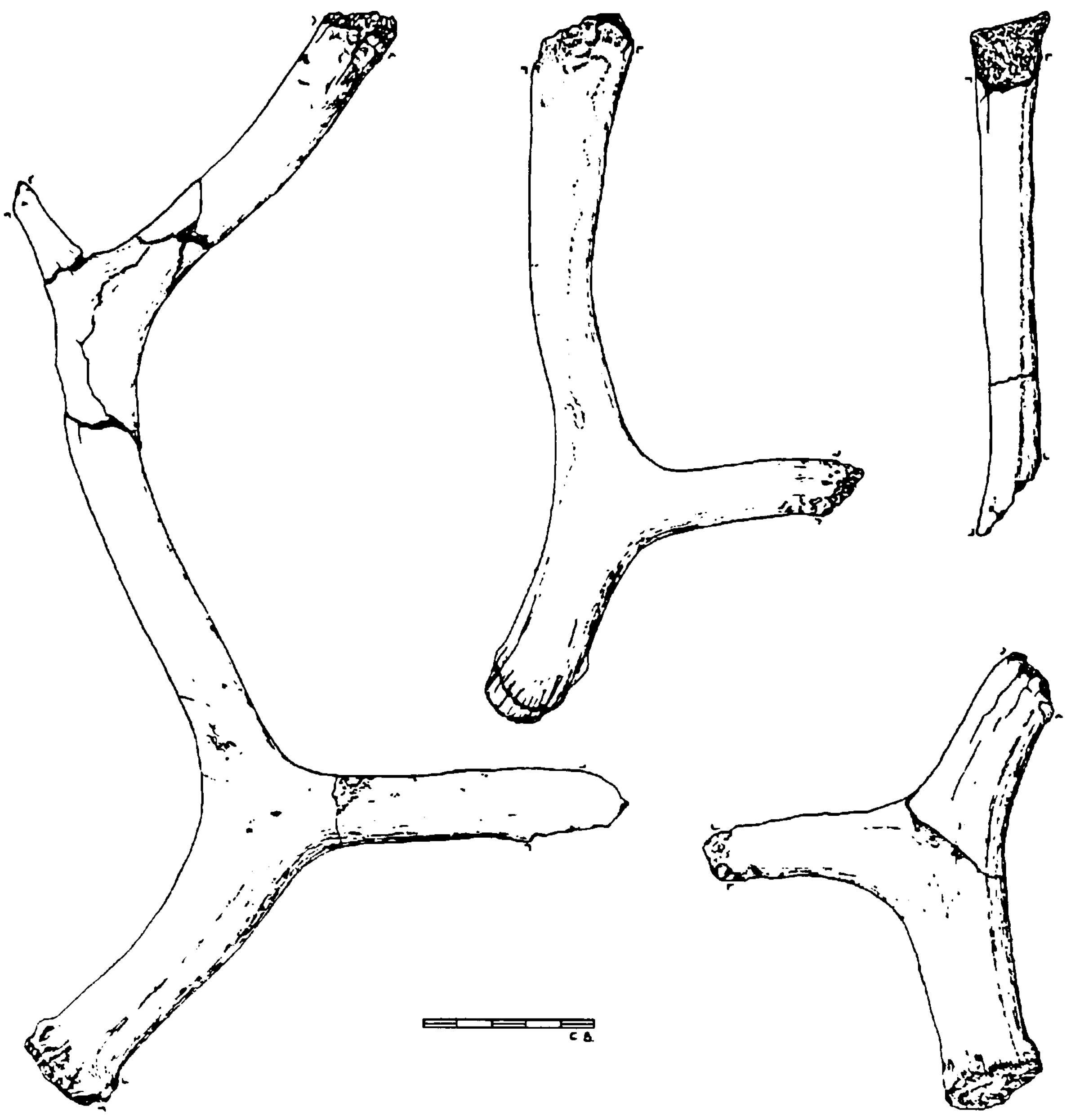

Figure 2.4: Claimed worked antlers from the Trou des Blaireaux, (from Bellier & Cattelain 1983: fig. 5).

any of the faunal assemblage remains undemonstrated. The dates associated with this concentration, as with those from the lower concentration, would seem to be solely of faunal relevance. A similar situation appears to be the case with the uppermost concentration in *Couche III*: it is unclear whether any artefacts were recovered from this context, and again it seems that the dates may only indicate a period of faunal accumulation during Dryas I. Consequently the suggested Magdalenian use of the site during the early Dryas remains unproved. Even the association between the single date from *Couche II* (Lv-1314) and the reportedly more abundant archaeological remains from this concentration (Bellier & Cattelain 1986b, 39) is dubious. Indeed, it has been demonstrated in a number of cases for the Lateglacial of north-western Europe (for example at the Robin Hood Cave, Creswell Crags, see Charles & Jacobi 1994) that an apparent association between artefacts and faunal remains within an archaeological unit, but which however lack evidence of direct human modification, can not necessarily be taken as proof of contemporaniety. At best, such samples may yield dates indicative of the temporal span over which material might have been incorporated into a sediment; at worst, there may be no real association of any kind between lithics and fauna.

In the case of the Trou des Blaireaux, it appears most likely that, rather than documenting the earliest phases of the human re-colonisation of north-western Europe after the Last Glacial Maximum, the conventional dates instead document the local presence of reindeer during the earliest part of the Lateglacial. At present it is difficult to make any realistic assessment of the extent of human input to the accumulation of the faunal assemblage from this site. A small number of atypical backed blades, most probably Lateglacial in age, were found within both *Couche II* and *Couche III* by the present excavators and during previous excavations (Bellier & Cattelain 1986a, 53-55).

As has already been mentioned, during a visit to Treignes I was able to examine briefly part of the faunal collection, which included the reindeer antlers which had been published as 'worked'. Unfortunately I was not able to confirm this diagnosis. The specimens in question have clearly been damaged, but there is nothing to suggest that this was due to human activity. I examined all the bone and antler available in Treignes during my visit for clear signs of human modification. I noted only one specimen which appeared to show a possible butchery mark - a partial ulna of *Equus ferus* provenanced to *Couche II* (VTB D7 5: x = 65.0 cm, y = 25.0 cm, z = 82.1 cm; Plate 2.1). I was subsequently able to borrow this specimen as a potential dating sample. Before final submission of the sample to the Accelerator unit, I showed it to a number of colleagues including Martin Street, Andrew Currant and Nick Barton; amongst these, opinions were mixed as to whether it was or was not cut. It was decided to go ahead with dating of the sample, and the result (OxA-4200 13330 ± 160 BP) was of Lateglacial age.

Unfortunately, it was not possible to verify the butchery mark on this specimen using a Scanning Electron Microscope (SEM), as the equipment in the Research Laboratory for Archaeology and the History of Art was not able to cope with such a sizeable specimen.

The bone was in a relatively poor condition (de-mineralised), and it was felt that any attempt at taking a cast of the relevant area of bone surface would cause considerable damage. Unfortunately examination with an optical microscope proved ambiguous and so further attempts at verifying the butchery mark were then abandoned. Consequently, this has not helped clarify the position *vis-à-vis* the Lateglacial archaeology. If the specimen was modified, then it provides the only clear date for human activity at the site, suggest that the claims for an exceptionally early human presence in Belgium after the Late Glacial Maximum (*circa* 18,000 BP), based on the previous radiocarbon dating evidence from the

Plate 2.1: Partial right ulna of *Equus ferus* VTB D7 5 from the Trou des Blaireaux à Vaucelles. OxA-4200 13330 ± 160 BP. Scale in mm. Photo by Gwil Owen.

Trou des Blaireaux, might be unfounded. Similarly, the apparent lack of clear traces of human activity within the faunal assemblage would seem to argue for this.

Should the specimen be unmodified, however, the date would only be of interest for its biostratigraphic information, and could not be extrapolated to human activity. Consequently it would shed little light on the question of the human re-colonisation of north-western Europe after the Late Glacial Maximum. As the supposed nature of the sample has been brought into question, it seems wisest for the time being to treat this date solely as a faunal one. The specimen has been returned to Treignes.

It is clear from the preceding discussion that further work on the faunal assemblage is needed to clarify whether or not any of the faunal specimens from Blaireaux can be clearly linked to human activity. An analagous situation can be found in the arguments surrounding Reindeer Cave at Creag nan Uamh (Lawson & Bonsall, 1986a & b). The presence of an accumulation of reindeer antlers, thought to date to the Loch Lomond Stadial, was suggested (*ibid.*) as evidence for human activity at the site. More recent research on this material (Murray *et al.* 1993), however, indicates that this is not necessarily the case. As with Blaireaux, the vast majority of the antlers are from female or juvenile reindeer (*ibid.*, 6). The initial dating evidence from the site, based on bulked samples of antler and unmodified individual antlers, has also been brought into question. Further dating work using the AMS technique has suggested a far more complex situation, dates on individual antlers ranging between 22300 ± 240 BP (OxA-3792) and 47900 ± 3600 BP (OxA-3788) give some indication of the temporal spread of material within the accumulation. This has led Murray *et al.* to the conclusion that "there is less need to appeal to an agency of collection which behaved purposefully during a short period"(*ibid.*, 7-8). Consequently "the previous inference that the reindeer antlers were introduced to the cave by man during the Loch Lomond Stadial is not supported" (*ibid.*, 9). As with Blaireaux, the evidence for human agency in the collection of reindeer antler was highly circumstantial.

It is likely that the situation at Blaireaux could be at least in part resolved by the further application the AMS technique to individual faunal specimens, should appropriate samples present themselves. As part of the assemblage was with Professor Achille Gautier at the time of my visit to Treignes, the possibility of other modified specimens cannot yet be wholly ruled out. It has not yet proved possible for me to examine the remainder of this collection. Similarly, it remains unclear whether any of the archaeological residues so far published from the site can be definitively ascribed to the Magdalenian, or any other Lateglacial technocomplex. The final report on the recent excavations at the Trou des Blaireaux is currently being prepared by Bellier & Cattelain. It is hoped that the problems raised here will be addressed in the course of this work.

Grotte de Sy Verlaine (50° 24' 15" North, 5° 31' 30" East)

This cave lies between the two villages of Sy and Verlaine, near the river Ourthe. The cave itself is a small passegway in the limestone hillside, approx 40 m. from the rail line between Liège and Hamoir. There is no chamber to this cave, and the small passageway itself runs out after approx 10 m. The cave is also known as the Grotte de Verlaine and the Trou des Nutons[4].

The single Louvain date from the Grotte de Sy Verlaine of 13780 ± 220 BP (Lv-690) is another crucial piece of evidence for the earliest human re-colonisation of north-western Europe after the Last Glacial Maximum. The date was taken from bone splinters excavated by P. Destinez and L. Moreels during May 1888 (Destinez & Moreels 1888), and little documentation, either published or archival, survives in relation to any excavations at the site. The radiocarbon date is usually interpreted as dating human occupation, and consequently the site has been given the cultural label of 'Magdalenian IV' (Dewez 1987, 391), presumably because that is the stage usually found at the time of Lv-690. The lithic and worked bone material is certainly typologically Magdalenian, and

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[4] As the place name Verlaine is a common one (there are 3 Verlaines in Belgium), and many Belgian caves are called Trou des Nutons (see also footnote 5 below), the name of Sy Verlaine is preferred here to avoid any confusion, as it indicates that the site is located between the villages of Sy and Verlaine on the banks of the Ourthe.

though it perhaps corresponds most closely with Magdalenian V within the 'classic' sequence (ascription based on the presence of a uniserial harpoon/barbed point made of reindeer antler N° 1513 Musée Curtis, University of Liège) (Doize 1960). When I discussed this problem with Michael Dewez, it became apparent that the sole reason for the assignation of this assemblage to Magdalenian IV was indeed the early radiocarbon estimate. Professor Dewez and I agreed that further radiocarbon dates should be attempted on the material from this site if it were possible. It seemed that an ideal sample would have been part of the harpoon; however after consultation with Professor Otte at the University of Liège it became apparent that the use of this specimen for dating in Oxford would be highly problematic. The museum authorities were reluctant to release this specimen for dating and, in any case, inspection of the harpoon itself revealed that it had been treated at some point in the past with organic preservatives, so that any date obtained from the specimen could be open to doubt.

Subsequently the faunal assemblage was re-examined for butchery evidence and the verification of species identifications (see chapter 7), one primary objective of this being the identification of single cut bones which could serve as samples for accelerator dating. The Destinez and Moreels collection held in the Department of Paléontologie, University of Liège was studied, as was the collection in the Musées Royaux d'Art et d'Histoire, Brussels (excavation unattributed). The species present tallied with the description given by Destinez and Moreels (1888, CXLV-CXLVI), and the list, as they themselves commented, contains species not usually found in association with Magdalenian (Lateglacial) faunal assemblages - "le *Rhinoceros tichorhinus*, le mammouth, l'ours et l'hyène des cavernes" (*ibid.*, CXLV). Many of these are more characteristic of earlier parts of the Pleistocene. Although bones of mammoths (Lister 1991) and bears (see chapters 2, 3 & 4) have been found in Lateglacial contexts across Europe, Lateglacial occurrences of hyaena (*Crocuta crocuta*) and woolly rhinoceros have yet to be demonstrated. Indeed, recent work by myself and Roger Jacobi (Charles and Jacobi 1994; Jacobi comments *passim* in Archaeometry datelists) at Creswell Crags indicates that the local presence of hyaena and woolly rhinoceros in the British Isles does not extend into the latter part of the Devensian. The biostratigraphic distribution of these species in mainland Europe during the Lateglacial remains predominantly undocumented. Consequently I was alerted to the possibility that the faunal assemblage from this site could possibly be from a number of periods, especially as few stratigraphic observations were made by the nineteenth century excavators.

Cut bones were present in both collections; however, the Destinez and Moreels collection showed clear traces of having been treated with an organic preservative. Due to this, this collection had to be disregarded for the purposes of dating. Attention was switched to the material in the MRAH in Brussels. Within this collection, a number of potential dating specimens were identified. Eventually a cut left pisiform of horse (*Equus ferus*) was selected. As none of the faunal remains bore any provenance data beyond the name of the site, it seemed likely that as this specimen showed clear evidence of human modification it carried the greatest chance of dating human activity during the Lateglacial. The resulting date of 12870 ± 110 BP (OxA-4014) is, as expected, significantly later than Lv-690; given the potential complications of the original integrity of the Louvain sample, although the situation remains far from ideal, it does not seem unreasonable to suggest that the Oxford date should supersede it as a date for human presence. It is worth noting in passing that this date is far more in accord with other accelerator dates from the Belgian Magdalenian which will be discussed below.

Les Grottes de Furfooz:

Trou du Frontal (50° 12' 45" North, 4° 57' 30" East) **and Trou des Nutons**[5] (50° 12' 45" North, 4° 57' 29" East)

The caves at Furfooz are amongst the first sites excavated by Édouard Dupont in the 1860s. They are located by the banks of the river Lesse under 2 km upstream from the

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[5] The name "Trou des Nutons" is extremely common in Belgium: it is derived from local folklore, where the 'Nutons' were believed to be small subterrainean folk, who could work metals. They appear to be a cross between the English idea of 'Dwarves' and the mythical 'Barrow wrights' such as Wayland the Smith. There is no direct parallel in British folklore. Since the name is a common one for Belgian caves, it is necessary to specify within which commune the cave is found.

Trou de Chaleux, and are today part of a National Park. A far more detailed description of them will be presented in chapters 4 and 5. However, in summary, there are two sites with clear evidence for Lateglacial human presence - the Trou du Frontal and the Trou des Nutons. Initial excavations at these sites by Édouard Dupont during the 1860s (Dupont 1865 & 1872), revealed a wealth of Magdalenian material from a stratigraphically discrete unit termed the *1er niveau ossifère.*

In 1990 there were two radiocarbon dates believed to be associated with the Magdalenian use of these sites: Lv-1137 7720 ± 110 BP from the Trou des Nutons and Lv-1135 10350 ± 150 BP from the Trou du Frontal. Both were substantially later than the usual expectations for the late Magdalenian for this region, which does not normally extend beyond the Dryas II/Alleröd interface at any other known site; again, the relationship between samples submitted and the archaeology they are claimed to date is questionable. Two further conventional dates have since been reported from the Trou du Frontal (Leotard 1993), Lv-1749 12950 ± 170 BP and Lv-1750 13130 ± 170 BP. No details of the precise nature of the sampes used in either case has yet been reported. The samples for both Lv-1137 and Lv-1135 are reported as being 'cut bone splinters' (bulked samples), no photographic records were made of the samples, and without these it is impossible to determine precisely how many, if any, were actually cut; in any case, the resulting age determinations merely record a mean age for the bone splinters, and not a date for the Magdalenian archaeology. Indeed, examination of the faunal assemblages from both sites, recovered by Dupont between 1864 and 1865 (Institut Royale des Sciences Naturelles de Belgique collections) clearly shows a mixing of faunas ranging in age from at least the Lateglacial to the very recent past. Dupont left no guide to stratigraphic differentiation within these assemblages after their curation in the museum stores. Instead they are referred to in his museum labels as originating from the *1er niveau ossifère.* However, in published accounts of Dupont's excavations at these sites it is apparent that there was a far more complex stratigraphic sequence which he originally observed and recorded (Dupont 1865, planche I). Sadly, as no research notes from Dupont's time remain at the Institut (see chapter 3), it is impossible to say whether he left behind any key to re-attribute stratigraphic information to either the lithic or faunal collections.

The faunas from these two Furfooz caves are similar in many details. Although they will both be discussed in greater detail in chapters 4 and 5, for the sake of clarity some details will be given here. Both sites have a very high proportion of domesticates within their respective collections - sheep/goat (*Ovis aries* and/or *Capra* sp.) and pig (*Sus scrofa*). These domesticates are not usually considered to be components of north-western European Lateglacial faunal assemblages, and instead their presence within Lateglacial assemblages is often used as an indication of a possible contamination of Lateglacial material with later prehistric/historic material (see also discussions in chapters 4 & 5). Unfortunately, as mentioned above, no key to detailed stratigraphic differentiation exists for these faunal collections.

Later Prehistoric, Roman/Iron Age, Mediaeval, and post-Mediaeval archaeological residues have been recovered from the both the Trou du Frontal and the Trou des Nutons. Where butchery traces occur on the ovi-caprids, they have always been made by metal and not stone tools. The recent origin of many of the ovi-caprids is clearly demonstrated by the fact that some of the bones still retained their grease. The Suidae present a slightly more complex situation, the majority of these again being clearly of recent origin. However, it is possible that at least a few of these specimens are earlier or later prehistoric in age. It is currently unclear whether wild boar (*Sus scrofa*, which cannot be differentiated from domestic pig on purely morphological grounds alone) ever formed part of the Belgian Lateglacial megafauna (see, for example, the discussion below in connection with OxA-4193). Some of the butchery marks found on this species are ambiguous as to whether they were caused by metal or stone tools, suggesting that at least some specimens may be of greater antiquity than others.

Other species recovered from these sites include reindeer (*Rangifer tarandus*), horse (*Equus ferus*), red deer (*Cervus elaphus*) and at least one form of bovid (*Bos* sp.). In assessing these faunas, I have attempted to identify elements of the Lateglacial fauna by a combination of the following factors: species, preservation condition and butchery evidence. This has led to a much reduced selection of fauna attributed to the Lateglacial. This methodology was partially checked by the AMS dating of samples of cut bone which also dated human use of the caves. In all cases, specimens which were thought to be intrusive yielded significantly more recent radiocarbon dates. However, to fully check this methodology it would be neccessary to sample a far higher proportion of the faunal assemblage. At present neither the time or the requisite funding is available.

As the Furfooz sites are within 2 km of the Trou de Chaleux, one of the major Belgian Magdalenian sites (see chapter 3 for a full account of the archaeology and fauna from Chaleux) it seemed likely that these sites might have been in use by the same human group; before I examined the collections from Furfooz, I had studied the better stratified faunal assemblage from Chaleux, and so it was possible to base the selection of specimens from Furfooz on analogies with species represented, as well as butchery techniques observed, in the Magdalenian fauna from Chaleux. Reindeer (*Rangifer tarandus*), although present in the Furfooz assemblages and generally a common species during the Late Pleistocene in western Europe, did not occur in notably high proportions in either assemblage (the apparent dominance of reindeer at the Trou des Nutons is explained by the very high proportions of reindeer antler fragments included in the counts, see chapter 4). Consequently there were few cut specimens of this species. Instead two samples were selected from a species which appears to have been very significant within the Lateglacial economy - horse (*Equus ferus*), these specimens showed numerous parallels within the butchery traces found on bones from the Chaleux assemblage - with the intention of dating Lateglacial human presence. Two further samples were selected from the faunal assemblages because it was of particular interest to know whether they were Lateglacial or more recent. The four samples were thus a cut 2nd phalanx of horse (Plate 2.2) and a cut left navicular cuboid of red deer (Plate 2.3), both from the Trou des Nutons; a cut left metacarpal of horse (Plate 2.4) and a cut human right distal tibia (Plate 2.5) from the Trou du Frontal. The results are presented in Table 2.4:

Trou des Nutons (Furfooz)		
OxA-4194	Cut left navicular cuboid of *Cervus elaphus.*	2210 ± 80 BP
OxA-4195	Cut 2nd phalanx of *Equus ferus.*	12630 ± 140 BP
Trou du Frontal (Furfooz)		
OxA-4196	Cut right distal tibia of *Homo sapiens.*	4430 ± 80 BP
OxA-4197	Cut partial left metacarpal of *Equus ferus.*	12800 ± 130 BP

Table 2.4: Accelerator dates from the Grottes de Furfooz.

Both OxA-4195 and OxA-4197 confirm human activity during the Bölling Interstadial phase of the Lateglacial, whilst OxA-4194 and OxA-4196 confirm my suggestion that faunal specimens of significantly different ages are present with at both sites. OxA-4196 also confirms the use of the cave as an ossuary during the Neolithic. Human remains are abundant from this site, and are currently held in the IRScNB Dept. de Anthropologie et Préhistoire in Brussels. Although Dupont (1872) originally suggested that these human remains were of Palaeolithic age, this view has not been upheld by many subsequent researchers. A conventional date of GrN-10179 4430 ± 30 BP taken from human rib fragments almost mirrors the accelerator date. There seems to be no reason to treat the human remains as palaeolithic.

Returning to the broader problems of the Lateglacial chronology of Belgium, having discussed the dates at the extremes of the temporal range, one is left with a series of dates for the Magdalenian as shown in Table 2.2, ranging between 12150 ± 150 BP (Lv-686) and 12990 ± 150 BP (Lv-1569). Although at face value these would seem to fit well within current expectations for the presence of later Magdalenian groups in north-western Europe during the Bölling mild phase, one cannot operate a series of double standards and either accept or reject the validity of radiocarbon dates because they do, or do not, suit one's preconceptions of the archaeological data. In fact almost all of the remaining conventional dates are from bulked samples, subject to the same problems of interpretation as the dates already discussed above. As there are so few sites directly dated, I will continue to discuss sites individually.

Plate 2.2: Cut 2nd phalanx of *Equus ferus* from the Trou des Nutons, Furfooz. OxA-4195 12630 ± 140 BP. Scale in mm. Photo by Gwil Owen.

Plate 2.3: Cut left navicular cuboid of *Cervus elaphus* from the Trou des Nutons, Furfooz. OxA-4194 2210 ± 80 BP. Scale in mm. Photo by Gwil Owen.

Plate 2.4: Cut left metacarpal of *Equus ferus* from the Trou du Frontal, Furfooz. OxA-4197 12800 ± 130 BP. Scale in mm. Photo by Gwil Owen.

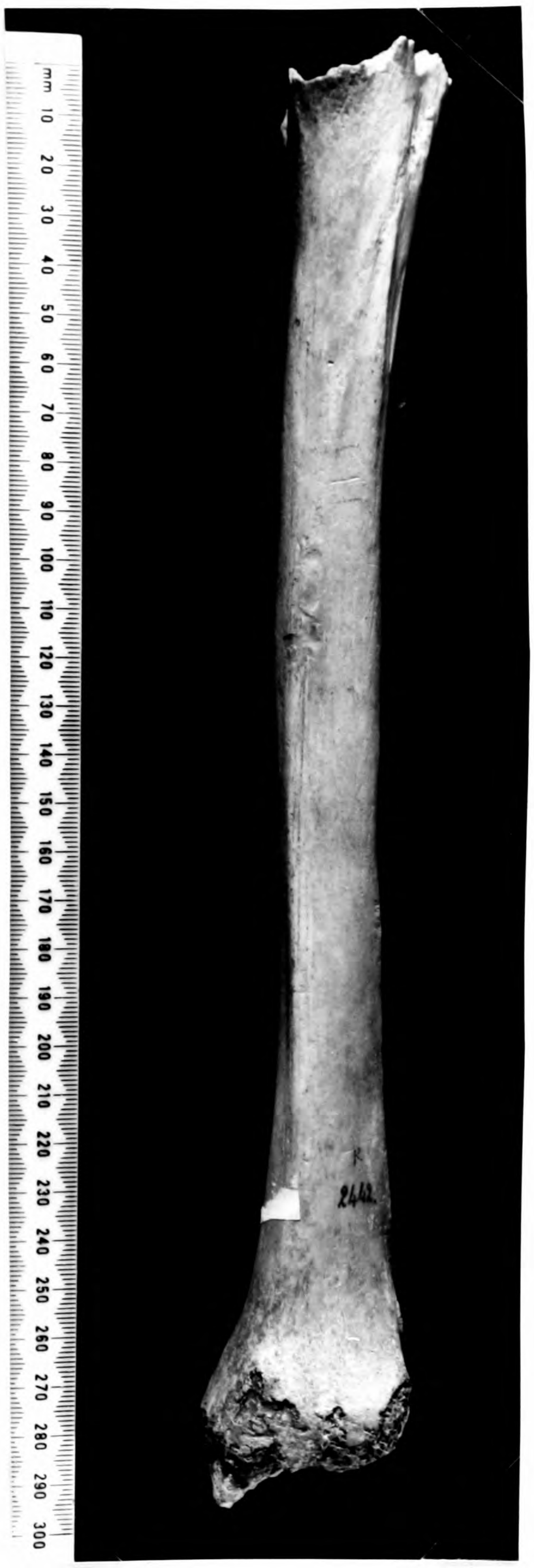

Plate 2.5: Cut right distal tibia of *Homo sapiens* from the Trou du Frontal. OxA-4196 4430 ± 80 BP. Scale in mm. Photo by Gwil Owen.

Trou de Chaleux (50° 13' 18" North, 4° 56' 30" East)

Amongst the first sites systematically investigated by Édouard Dupont during the 1860s along the river Lesse is the Trou de Chaleux. It is a relatively large cave, with an almost circular single chamber. More recent excavation were undertaken by the Université de Liège during the mid 1980s (Otte & Teheux 1986; Otte & Cabboi 1988). The final publication of this research excavation has just been published (Otte *et al.* 1994).

The archaeological assemblage recovered by Dupont includes 4,000 struck flints, a wealth of worked antler and bone, perforated semi-precious stones, as well as a number of fossil sponges, teeth, and shells from the Paris basin. The material is unquestionably Magdalenian, and is probably the most important Upper Palaeolithic collection from Belgium. Unfortunately, as with the Furfooz sites discussed above, the uppermost layers of the site have been grouped under the gross designation *1^er^ niveau ossifère* (Figure 2.5). As with the Trou du Frontal and the Trou des Nutons, there is clear evidence for the mixing of faunas of very different age, probably spanning both the Lateglacial and at least parts of the Postglacial. Another interpretative problem exists in the shape of a range of cave dwelling carnivores present within the assemblage: it is apparent that at least part of the faunal assemblage was accumulated by non-human agencies (demonstrated by carnivore damage on bones), and that the activities of carnivores at the site is unlikely to be concurrent with human presence. A detailed analysis of the faunal assemblage from the site is presented in chapter 3.

Three conventional radiocarbon dates are known from the site: Lv-1136 12 710 ± 150 BP, Lv-1568 12 370 ± 170 BP, Lv-1569 12 990 ± 140 BP (Otte & Teheux 1986), which span much of the Bölling Interstadial phase. As all these samples were documented as “bone splinters” it was felt appropriate to make a more precise selection of further specimens for accelerator dating, with the following objectives in mind:

1. To test whether Lateglacial human presence might be more temporally restricted than the conventional radiocarbon dates suggest.

2. To test whether certain elements of the fauna from the *1er niveau ossifère* were Lateglacial or more recent in age.

Overall, 4 new dates were obtained. All radiocarbon dates from the Trou de Chaleux are presented in Table 2.5.

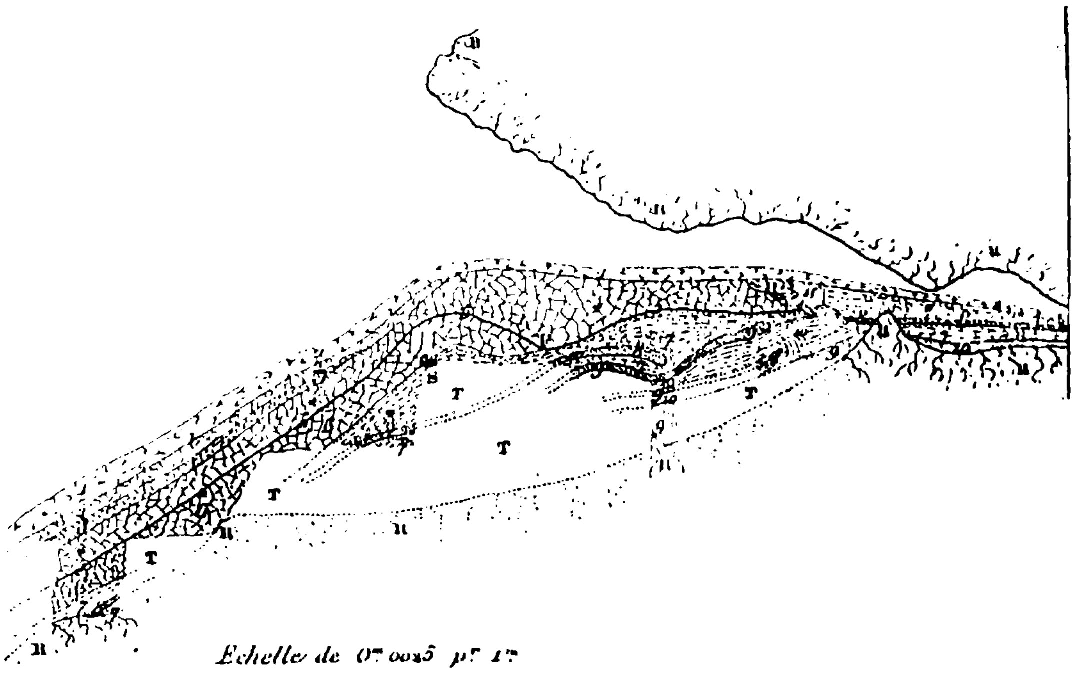

Figure 2.5: Dupont's section of the Trou de Chaleux (from Dupont 1865).

Lab code	Date	Sample details
OxA-4193	3060 ± 85 BP	Cut distal right humerus of *Sus scrofa.*
Lv-1568	12370 ± 170 BP	Bone splinters from Otte excavation.
Lv-1136	12710 ± 150 BP	Bone splinters from Dupont excavation.
OxA-3632	12790 ± 100 BP	Cut 3rd left cuneiform of *Equus ferus.*
OxA-4192	12860 ± 140 BP	Cut 1st phalanx of *Ovibos moschatus.*
OxA-3633	12880 ± 100 BP	Cut 3rd left cuneiform of *Equus ferus.*
Lv-1569	12990 ± 140 BP	Bone splinters from Otte excavation.

Table 2.5: Radiocarbon dates from the Trou de Chaleux.

OxA-4193, taken from a specimen of *Sus scrofa*, confirms the suggestion made above that material of substantially different ages is incorporated within the *1er niveau ossifère*. We still have no clear indication that wild boar was ever part of the local Lateglacial megafauna of northern Europe, although this must remain a possibility. The other three accelerator dates fall in the region 12,700 to 13,000 BP. These are of a similar order to Lv-1136 and Lv-1569, although as the accelerator dates come from individual cut specimens these are the only dates which can be directly linked to human use of the site. It is interesting to note that the only date lying apart from the cluster of early Bölling dates, Lv-1568, is from a sample documented as "bone splinters". It is tempting to suggest that this date may relate to faunal rather than human presence at the site, and that human presence may be restricted to the earlier part of the Bölling. However, current information about the spatio-temporal distribution of the Magdalenian in Belgium indicates that humans may well have been present in Belgium throughout the Bölling phase (see below). In fact, Lv-1568 cannot really be used in discussing that point at all, being, as we have seen, merely the average age of a collection of bone splinters of uncertain origin.

Grotte du Coléoptère (50° 22' 20" North, 5° 32' 15" East)

This cave is located by the banks of a small stream (unmarked on the Institute Géographique National map N° 49/5, 1:10,000 series), a tributary of the Ainse, within a small limestone outcrop. Initial excavations at the Grotte du Coléoptère by J. Hamal-Nandrin and J. Servais between 1923 and 1924 investigated the interior of the cave, as well as a portion of the platform. Both Ahrensburgian and Magdalenian material was recovered from the site in the course of these excavations, and was reported to occur in stratigraphically distinct units. Most striking amongst the Magdalenian material was the recovery of 5 uniserial harpoons; the collection also includes a typical range of Magdalenian diagnostic lithics (backed blades and bladelets, truncated blades and becs), worked bone and antler and manuports. More recent excavations by Professor Michel Dewez have confirmed the original observations of Hamal-Nandrin & Servais, as well as adding many further details (Dewez 1975).

The faunal remains have been re-assessed as part of the current research project (see chapter 6); however, one major problem was that little faunal material had been retained in the MRAH from the Hamal-Nandrin and Servais collection. Dewez reports (1987, 399) that part of this collection was disposed of in 1943. AMS work dating the Ahrensburgian use of the site will also be discussed later in this chapter.

Two conventional radiocarbon dates (Table 2.6) were linked to the Magdalenian occupation at the outset of research. In line with the majority of other Lateglacial dates for the Belgian Magdalenian, they fall within the Bölling phase. Only one date has any clear sample details (Lv-717 from a "reindeer bone"): it is not recorded, however, whether the bone was modified, or what its precise relationship with the archaeological assemblage was. After an evaluation of the faunal assemblage from the Dewez excavation, I felt that further dating might be profitable. Professor Dewez and Dr. J-M. Cordy were kind enough to release a modified 1st phalanx of *Equus ferus*. The resulting date (OxA-3635) appears to be significantly earlier than the two conventional dates, as Table 2.6 shows.

Lab code	**Date**	**Sample details**
Lv-686	12150 ± 150 BP	none recorded.
Lv-717	12400 ± 110 BP	"reindeer bone".
OxA-3635	12870 ± 95 BP	Cut proximal 1st phalanx of *Equus ferus*.

Table 2.6: Radiocarbon dates for the Magdalenian from the Grotte du Coléoptère.

The new date is the only one which can be directly linked to human activity at the Grotte du Coléoptère during the Bölling. It falls broadly in line with the accelerator dates from Chaleux, Furfooz, and Sy Verlaine. Indeed, the initial accelerator project which yielded 4 dates associated with the Magdalenian (OxA-3632, OxA-3633, OxA-3635 and OxA-4014) suggested that Magdalenian presence in Belgian might have been restricted to the earlier part of the Bölling Interstadial phase. One reason to extend the original project was to test this hypothesis.

Trou Burnot (50° 21' 45" North, 4° 51' 45" East)

The Trou Burnot is currently under excavation by J-M. Leotard and Ph. Lacroix. To date there are no published accounts of the work at the site. It is located in a limestone outcrop overlooking the river Burnot, between the towns of Dinant and Namur.

After the results of my original dating project were published, Jean-Marc Leotard suggested that the three *sagaie* bases recovered during his excavations at this site could be useful dating samples for further mapping of the temporal distribution of the Belgian Magdalenian. Leotard (pers. comm.) also indicated that the site had a complex stratigraphy, including a Magdalenian layer immediately overlain by Neolithic burials. The fauna was unavailable for inspection during my visit to to his laboratory in Liège; however, he informed me that he was concerned that it would prove extremely difficult to differentiate Lateglacial material from later prehistoric elements, as it had proved impossible to differentiate Neolithic from Magdalenian material in the stratigraphy during excavation (Leotard pers. comm.). We were both keen, therefore, to attempt to date one of the Magdalenian *fossiles directeurs* from this site, as there could be no subsequent arguments over association.

The resulting date, OxA-4198 12660 ± 140 BP, on a double-bevelled *sagaie* base (Plate 2.6) from excavation unit 3A, proved to be most satisfactory. Again, this date seems to fall in line with other dates for the Belgian Magdalenian discussed above.

Plate 2.6: Double bevelled *sagaie* base from the Trou Burnot. OxA-4198 12660 ± 140 BP. Scale in cm.

Trou da Somme (50° 13' 38" North, 4° 52' 45" East)

The Trou da [sic] Somme lies in a rocky outcrop known as the Roche-al-Rue, on the left bank of the river Meuse approx. 4.5 km west-south-west of the Trou de Chaleux. It was from this locality that J. Verheyleweghen (cited in Dewez 1987 and Leotard 1988) recovered Magdalenian material. Dewez (1987, 245) reports that many of the small limestone outcrops at Roche-al-Rue are very close to the Dinant-Givet railway, and that the construction of this line involved the destruction of many of these shelters. It is currently unclear whether the Trou da Somme is the same site as that excavated by Verheyleweghen, or whether the latter was one of the small shelters destroyed during construction of the railway.

Verheyleweghen recovered a small amount of typically Magdalenian material. The recent excavations at the Trou da Somme (Leotard 1988) have also recovered a range of Magdalenian artefacts. Two separate caves have been identified by Leotard, which he has termed TDS I and TDS II. It is TDS II which Leotard refers to as the “most important”, and which he subsequently refers to as the "Trou da Somme" (*ibid.,* 17).

A piece of worked antler, circular in cross section (Plate 2.7), which may well have been part of a *sagaie*, was submitted for accelerator dating. OxA-4199 (12240 ± 130 BP) came out slightly more recent than had been expected. However, few doubts can be raised about the validity of the date. R. Housley, of the Oxford Accelerator Unit has assured me (pers. comm.) that there are no chemical problems with the date, and there is no indication of the sample's having been ‘conserved’ or subjected to any other form of contamination. Instead, the date suggests that human presence in Belgium during the Lateglacial extended to the latter part of the Bölling Interstadial phase.

However, it should be noted that the worked antler fragment cannot be conclusively identified as a *sagaie*, and until the Lateglacial material is published in detail from the Trou da Somme, the identification of this site as a Magdalenian find spot is open to debate until a fuller publication of the finds. The antler fragment could equally have come from other artefact types which are not Magdalenian *fossiles directeurs*. One such possibility would be antler artefacts similar to the ‘marrow scoops’ found at Church Hole Cave, Creswell

Crags (one of these is illustrated in Dawkins 1880, figure 57). The two from Church Hole have been dated to 12020 ± 100 BP (OxA-3717 Acc. N°+8170) and 12250 ± 90 BP (OxA-3718 Acc. N°+8171). Another such 'scooped' antler rod is known from Fox Hole Cave, Derbyshire which has also been AMS dated (OxA-1493 11970 ± 120 BP). It is interesting to note that these three dates fall very much in line with OxA-4199 from Trou da Somme, however no such 'scooped' aretfacts from Late Upper Palaeolithic contexts have yet been noted in Belgium. It is not currently possible to establish the precise nature of the antler artefact of which the dated specimen from Trou da Somme originally formed a part.

Plate 2.7: Fragment of worked antler artefact from the Trou da Somme. OxA-4199 12240 ± 130 BP. Scale in mm. Photo by Gwil Owen.

Trou Walou (5° 40' 30" North, 50° 35' 15" East)

This collapsed cave site in the Magne Valley is currently under excavation by Professor Michel Dewez. Magdalenian archaeological residues have been claimed from the site (Dewez 1992), alongside Creswellian. The associated lithics from the site have not yet been published in any form, and the precise nature of Lateglacial use at the site is currently unclear. Two radiocarbon dates have been published as having Magdalenian associations: Lv-1582 13030 ± 140 BP and Lv-1593 13120 ± 190 BP (see also Table 2.10 below). Both are from samples of bone fragments, and there are as yet no published archaeological associations. The lithics from the Lateglacial layers are reputed to be culturally undiagnostic (S.N. Collcutt pers. comm.). Until the archaeological assemblages from the Lateglacial layers of the site have been published, the significance of these two dates is unclear, but given the nature of the samples, one cannot have much confidence that they accurately date a Magdalenian occupation. This site is also included in the subsequent review of the Creswellian archaeology of Belgium, where a more detailed account of the site can be found.

Overview of the Belgian Magdalenian

From the above discussion, it will be clear that many of the fundamental assumptions surrounding the radiocarbon chronology for the Magdalenian in Belgium, as known in 1990, are open to grave doubt. As has been described, there were as many problematic dates as there were ones in line with broad expectations (see Table 2.1), and as double standards cannot be used when deciding which dates to believe, I decided that it was a priority to obtain further radiocarbon dates for the Belgian Lateglacial, ideally on samples which could be unequivocally linked with human presence. The most logical way of doing this, was the application of AMS dating techniques to bones from stratified contexts which had clearly been modified by humans.

The initial series of six dates was almost wholly successful (Table 2.7). Each sample was either of human or humanly modified bone, clearly identifiable to species. The only exception was OxA-3636 from the Grotte du Coléoptère, which it had been hoped would date Ahrensburgian use of the cave. No suitable alternative samples were available from the site (see discussion on the Ahrensburgian below) and, whilst I was alerted to the possibility that the human tooth might have come from later prehistoric burials stratified above the Ahrensburgian layer, the excavator and I felt that the specimen had a good chance of dating Ahrensburgian presence. As can be seen from the resulting date, the tooth was not Lateglacial, and it seems most likely that it did indeed originate from the burials above. Nevertheless, the date does provide chronological information about the sepulchral use of caves in the Dinant region during the Neolithic.

Lab Code	**Date**	**Sample details**	**Culture**
OxA-3636	4695 ± 65 BP	Lower M2 or M3 of *Homo sapiens.*	Neolithic
OxA-3634	10320 ± 80 BP	Cut right maxilla of *Rangifer tarandus.*	Ahrensburgian
OxA-3632	12790 ± 100 BP	Cut 3rd left cuneiform of *Equus ferus.*	Magdalenian
OxA-3635	12870 ± 95 BP	Cut proximal 1st phalanx of *Equus ferus.*	Magdalenian
OxA-4014	12870 ± 110 BP	Cut left pisiform of *Equus ferus.*	Magdalenian
OxA-3633	12880 ± 100 BP	Cut 3rd left cuneiform of *Equus ferus.*	Magdalenian

Table 2.7: AMS results from the dating project "AMS dating of the Belgian Lateglacial, part I".

It is at least pleasing that this result will be of use to colleagues. Overall the project has demonstrated the validity of an approach dating only human or humanly modified specimens, and only those specimens which can be clearly identified to species, maximising the potential of the dating evidence gathered.

The four dates for the Magdalenian (OxA-3632, OxA-3633, OxA-3635, & OxA-4014) which resulted from this project were so close as to be statistically indistinguishable (Rupert Housley, pers. comm.). They led one to ask the further the question "what if the human presence in Belgium during the Lateglacial (and more specifically the Magdalenian) was not long-term, but instead highly punctuated ?"

After consultation with the Research Laboratory for Archaeology and the History of Art in Oxford, it was decided that an extended project with the following objectives was appropriate:

1. To expand the number of radiocarbon dates available for the Belgian Lateglacial by continuing to date human and/or humanly modified bone.

2. To test whether the apparent temporal grouping of the Magdalenian was real, or the product of small sample size.
3. To test whether certain specimens were intrusive within the faunal assemblages under study, thus enhancing biostratigraphic information for north-western Europe.

A further application was submitted under the title "AMS dating of the Lateglacial Archaeology of Belgium, part II" framed around these objectives. The extended project was approved in November 1992. This project yielded has 11 further dates and included a number of sites whose fauna is under study by other workers, and which consequently does not form a direct part of the research presented here. It would not have been possible without the generosity of J-M. Leotard, M. Otte, J-M. Cordy, M. Dewez, A. Cahen-Delhaye, C. Bellier & P. Cattelain, who allowed access to their research collections. Many of these dates have already been discussed in detail in the preceeding sections. The results of accelerator dates for the Magdalenian from the second project are set out in Table 2.8 below: The date of 13330 ± 160 BP (OxA-4200) from the Trou des Blaireaux has been omitted from this table on two grounds, both mentioned earlier in this chapter: firstly, that it remains unclear whether the lithics from the site can be attributed to the Magdalenian, and secondly, that there is some degree of question over whether or not the sample was modified.

Lab code	**Date**	**Site**	**Sample details**
OxA-4199	12240 ± 130 BP	Trou da Somme	Antler sagaie mid-section.
OxA-4195	12630 ± 140 BP	Trou des Nutons	Cut 2nd phalanx of *Equus ferus.*
OxA-4198	12660 ± 140 BP	Trou Burnot	Double-bevelled antler sagaie base.
OxA-4197	12800 ± 130 BP	Trou du Frontal	Cut left metacarpal of *Equus ferus*
OxA-4192	12860 ± 140 BP	Trou de Chaleux	Cut 1st phalanx of *Ovibos moschatus.*

Table 2.8: AMS results for the Belgian Magdalenian from the dating project "AMS dating of the Belgian Lateglacial, part II".

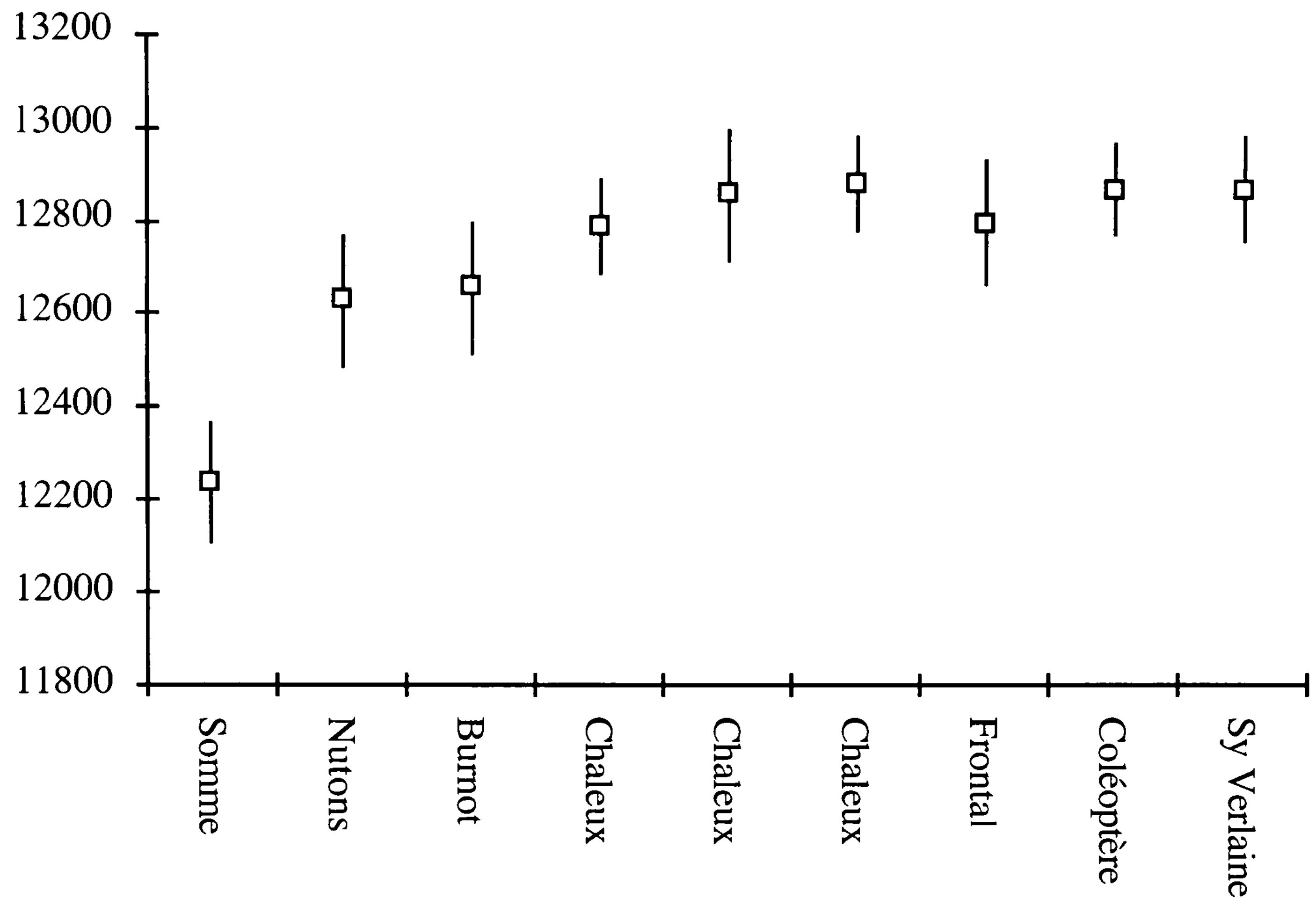

Figure 2.6: AMS dates with clear archaeological associations with the Belgian Magdalenian.

As can be clearly seen, the vast majority of dates lie in the earlier part of the Bölling, as indicated at the end of the initial phase of the project. However a few of these dates tend towards the latter part of the Bölling (Figure 2.6).

Only the date from the Trou da Somme (OxA-4199) lies clearly after the early Bölling. Rupert Housley (pers. comm.) has indicated that no anomalies were observed during chemical pre treatment of the sample, and that as there is no possibility of sample contamination due to 'conservation' (J-M. Leotard pers. comm.), this date clearly indicates Magdalenian presence in the Meuse Valley during the latter part of the Bölling. It is still unclear whether human settlement of Belgium (and more specifically the Ardennes) was continuous or punctuated. The number of undisputed Magdalenian sites is relatively few, and many of these are represented by almost ephemeral assemblages.

THE CRESWELLIAN IN BELGIUM

The Creswellian is an archaeological group centred on Britain, although Creswellian sites have been claimed from other areas of north-western Europe. It was originally defined by Garrod (1926a, 1926b) as a regional variant of the Magdalenian. Garrod chose Creswell Crags, on the Nottinghamshire/Derbyshire border, as the type site for her definition:

> 'It is clear that the Magdalenian of this country [Britain] is of a provincial type, with very important survivals from the Upper Aurignacian[6], such as the ordinary La Gravette point, the shouldered point and the Noailles graver (found at Creswell). Special forms are the trapezoidal point, almost unknown in Continental deposits, and a number of small semi-geometrical points and blades similar to those found at Martinrive, a late Upper Palaeolithic station of doubtful affinities, near Liège. Finally the scarcity of typical gravers is in striking contrast with their abundance in classical Magdalenian sites.
>
> Although I do not agree with Mr. Burkitt that this industry should be regarded as a completely independent local development of the Upper Aurignacian, similar to that seen in the Grimaldi caves, all Magdalenian intrusions being ascribed to a somewhat vaguely defined "culture-drift," I would claim that it does seem to represent a local and semi-independent facies of the Magdalenian sufficiently well-characterised to deserve a name of its own, and I would suggest tentatively, "Creswellian," since Creswell Crags is the station where it is found in greatest abundance and variety.' (Garrod 1926a, 301).

Almost all the known Creswellian sites are located in Britain. The terms *Creswellian*, alongside *Creswello-Tjongerian* or *Creswello-Hamburgian* have been used to describe the assemblages from a number of Belgian sites. The definition of these many Creswellians has rarely been made explicit, as will be discussed below.

The cultural ascription of many of the supposed 'Creswellian' assemblages is rarely discussed in publications. Instead, numerous sites have become fixed points on distribution maps of the Belgian Creswellian, without any critical re-appraisal of their actual status. Some of the leading sites identified at one time or another as 'Creswellian' (Bois de la Saute, Grotte de Martinrive, 4^{e} Grotte de Engis, Maldegem, l'Abri de Megarnie, Grottes de Presle, Obourg-«St. Macaire» and Orroir) are discussed briefly below. They have been

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[6] The term 'Upper Aurignacian', as used by Garrod in 1926, is an archaic term for assemblages which would now be called 'Gravettian' or 'Upper Perigordian'.

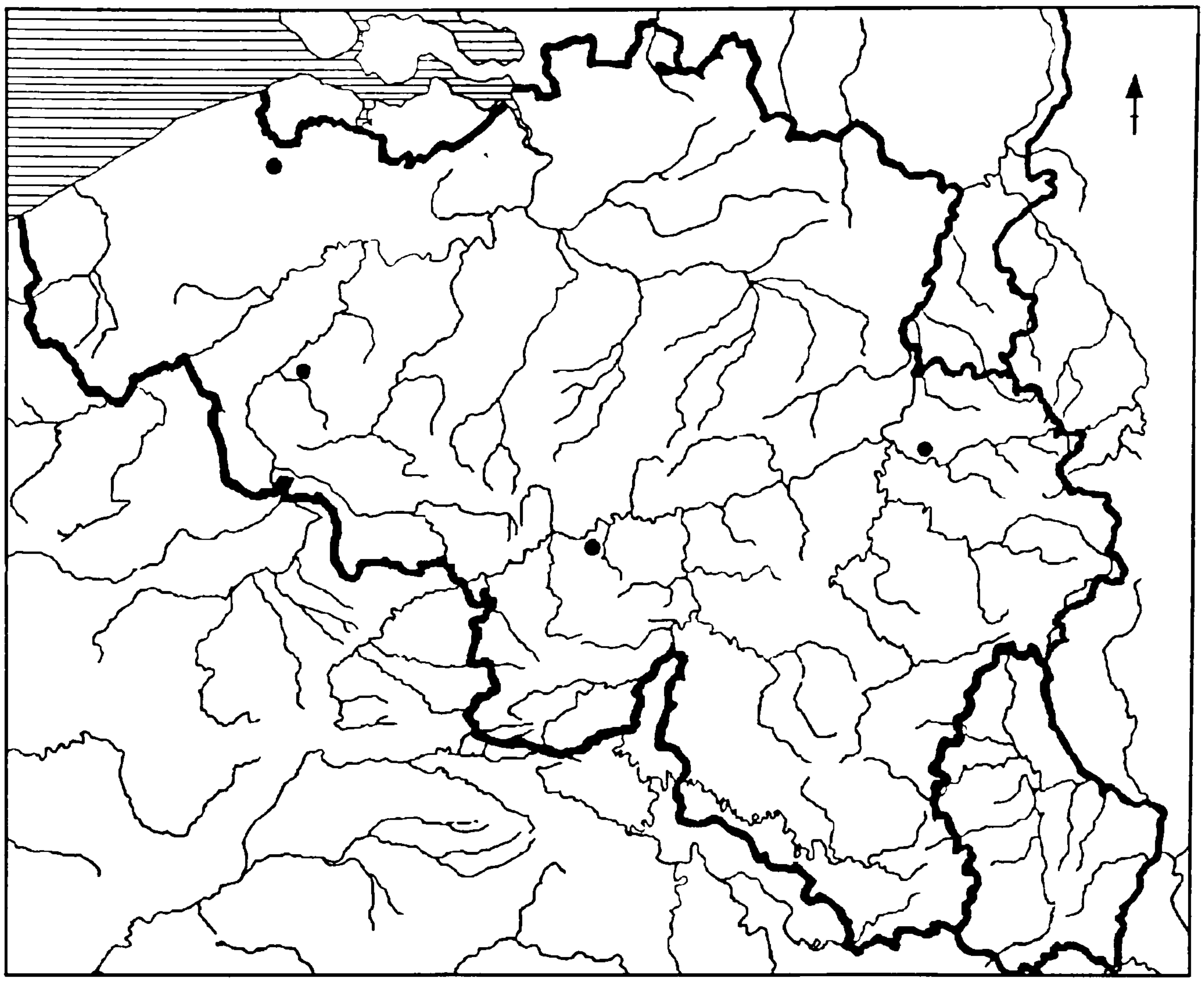

Figure 2.7: Distribution map of all claimed Creswellian findspots in Belgium.

selected due to their frequent inclusion in such distribution maps (Figure 2.7; *cf.* Otte 1984).

The characteristic *fossiles directeurs* of the Creswellian remain broadly those which Garrod originally identified, with a few additions. The 'Trapezoidal point' is now known as the *cheddar point*, and is further distinguished by the use of alternate retouch, where three of the margins (as opposed to two) are backed, as well as the lower portion of the point being trimmed to be narrower than the upper portion. The predominant forms of 'semi-geometrical' points are obliquely truncated and backed points, currently termed *Creswell points*, which are frequently, although not exclusively, broken *Cheddar points*. In addition to this, blade production is characterised by butt preparation *en éperon* (Barton

1990); the lithic assemblages lack, however, the *burin de Lacam*[7] (or Lacan) (Barton pers. comm.) and a microlithic component, both characteristic of the Magdalenian. Properly associated bone work, although present, does not include as yet any harpoons[8] or needles; both these types of artefact are found on contemporaneous Magdalenian sites. However, a small number of bone needle cores are present within the Lateglacial assemblages from both Creswell and Cheddar. Consequently, the absence of needles from these assemblages (R.M. Jacobi pers. comm.) is more likely due to the inadequate recovery techniques employed by earlier excavators than any true absence.

Bois de la Saute (50° 17' 30" North, 4° 49' East)

The *Caverne de Bois de la Saute* was discovered in 1952; major excavations were undertaken in 1977 by an amateur archaeological group (Toussaint & Toussaint 1983, 88). These excavations yielded a small lithic assemblage. Excavations in 1978 directed by Michel and Guy Toussaint recovered a few further lithics and faunal remains (*ibid.*). Amongst the lithic collections from these excavations are a number of curved backed pieces (*op cit.* figure 2 N°s 1-4) which Toussaint & Toussaint described as *Tjonger points*. Three of the four pieces are broken. The only complete specimen (N° 2) also appears to be the sole specimen with retouch present on the leading margin - one of the definitive features of *Tjonger points* (further discussion of such points will appear in the section on the Tjongerian below). Also present in the assemblage are three burins (*ibid.* figure 2 N°s 6 to 8), some broken backed pieces (*ibid.*, figure 2 N°s 9 to 11), mid-sections of backed bladelets (*ibid.*, figure 2 N°s 12 & 13) and a fragment of an engraved plaquette (*ibid.*, figure 2 N° 14). No *creswell* or *cheddar* points are illustrated or mentioned.

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[7] "Burin présentant une troncature retouchée concave très oblique postérieure à l'enlèvement de coup de burin et formant un bec, dont le biseau est parfois réduit par une retouche tertiaire". (Demars & Laurent 1989, 76).

[8] It is unclear whether the harpoon from Aveline's Hole, Somerset, was associated with Creswellian use of this site. The other British harpoon, from Kent's Cavern, forms part of the reputedly Magdalenian assemblage from the *Black Band*, although R.M. Jacobi (pers. comm.) has suggested that the lithics from the *Black Band* are actually Creswellian, but has yet to publish the basis for this ascription.

The lack of Creswellian *fossiles directeurs* indicates that this assemblage cannot be directly linked to the Creswellian. A tentative case could be made linking it with the local Magdalenian - this is suggested by the presence of fragments of backed bladelets rather than blades and the presence of part of a plaquette (which, incidentally, appears to have the upper fragment of an engraving of a bovid, similar to that from the Trou de Chaleux - see Dewez 1987, figure 113). However, Tjongerian affinities could also be suggested. The assemblage appears to be so small (13 secondarily worked pieces and 1 plaquette) that designating any cultural ascription beyond the umbrella term *Federmesser* appears to be unrealistic at the moment. The one clear statement which can be made about the material from Bois de la Saute is that there is no apparent reason why any of the material should be considered Creswellian. At the moment there are no radiocarbon dates, or any other form of absolute dates, available for this site.

Grotte de Martinrive (50° 29' North, 5° 38' East)

The cave of Martinrive, mentioned by Garrod in her original definition, can be found to the south of Liège, near the village of Comblain-au-Pont by the river Amblève. Unfortunately, it does not in fact appear to be part of what is currently accepted as the *Creswellian.* The lithics from the site (of which I have only seen the published illustrations) instead appear to fit within the general category of *Federmesser*: dihedral burins and burins on truncations are present. Piercers, *becs*, tools on blades and narrow backed blades all appear to be absent (see Lohest *et al.* 1922, fig. 3; Dewez 1977, abb. 2; and Dewez 1987 for the illustrations). One possible *Cheddar* point has been figured from the site (Dewez 1977, abb. 2 N° 1); however this specimen lacks the characteristic gibbosities (Jacobi 1986b, 76) frequently found on *Cheddar* points from the UK. Sadly, one possible *Cheddar* point does not a Creswellian assemblage make. This assemblage has also been classed as *Creswello-Tjongerian*, but many of the problems surrounding this are identical to those already mentioned above; further problems concerning the *Creswello-Tjongerian* will be discussed in a subsequent part of this chapter. The collection from Martinrive remains culturally undiagnostic beyond the *Federmesser.*

It is unfortunate that Garrod took Martinrive as the example within her definition, although understandable, since at the time of publication it was one of the few sites known in the archaeological literature which could be seen not fully to correspond with the 'classic' Magdalenian of southern France, instead being something more characteristically northern European. Schwabedissen's recognition of the *Federmessergruppen* still lay some decades ahead. No radiocarbon dates have yet been obtained from Martinrive, and the faunal collection was not available for study during the course of my research.

4e Grotte de Engis (30° 35' 45" North, 5° 24' 15" East)

The 4e Grotte de Engis (also known as the 'Caverne Funéraire') is situated on the left bank of the river Meuse, just to the south-west of Liège. As its name suggests, there are other caves situated nearby in the same limestone outcrop, most notably the Trou Caheur (also known as Grotte Schmerling) and the 2e Grotte de Engis. The site of the 4e Grotte was first explored either during or just before 1899 by E. Doudou, who communicated the results of his work to the Société d'Anthropologie de Bruxelles; unfortunately this paper was rejected for publication in their *Bulletin* (Jacques 1899, LII). Doudou's research was finally published privately in 1903 under the title *Explorations scientifiques dans les cavernes, les abîmes et les trous qui fument de la Province de Liège* (cited in Dewez 1987), but unfortunately it has not been possible to locate a surviving copy of this publication during the course of my research.

Further excavations were carried out during 1896 by Fraipont and Destinez (Fraipont 1900, cited in Dewez 1987, but the full reference does not occur in Dewez's bibliography). Apparently, these investigations revealed Neolithic burials, which appeared to occur in the same archaeological/geological unit as Palaeolithic material (Dewez 1977-79, 133).

The last recorded excavations were undertaken between 1908 and 1910 by the association *les Chercheurs de la Wallonie* (De Rasquin 1910). Found alongside both historic and prehistoric pottery were a number of flint artefacts. Included amongst these were:

> "En tout environ 150 pièces, fortement patinées, que nous croyons pouvoir ranger, malgré le peu d'instruments achevés et caractéristiques, dans le magdalénien." (*ibid.*, 190).

Unfortunately none of these were illustrated in the 1910 report. The only illustrations of lithics from the site are those published by Dewez (1977-79, fig. 1; 1987, fig. 200), reproduced here as Figure 2.8. Sadly, the suggestion that this assemblage might be Creswellian (Dewez 1987, 299) does not appear to be viable. Whilst the pieces illustrated are clearly Upper Palaeolithic in form - curved and angle-backed pieces, and a lone burin - the assemblage once again lacks the distinctive *Cheddar* and *Creswell* points. Indeed one curved backed piece with retouch along the leading edge (Figure 2.8, N° 1) could be called either a *penknife point* or, more optimistically, a *Tjonger point* - both Late Upper Palaeolithic types which are usually thought to post-date the Creswellian (R.M. Jacobi pers. comm.). It seems probable that this small assemblage (which also includes a core, 4 *lames à crête*, 25 blades, 5 bladelets and an *éclat à crête*) dates from the Lateglacial. However, it defies further cultural ascription. An indication of the absolute age of the archaeological material from the site would be helpful in gleaning a firmer idea of a cultural ascription. However, as with many of the other 'Creswellian' sites there are no absolute dates currently available from this locality.

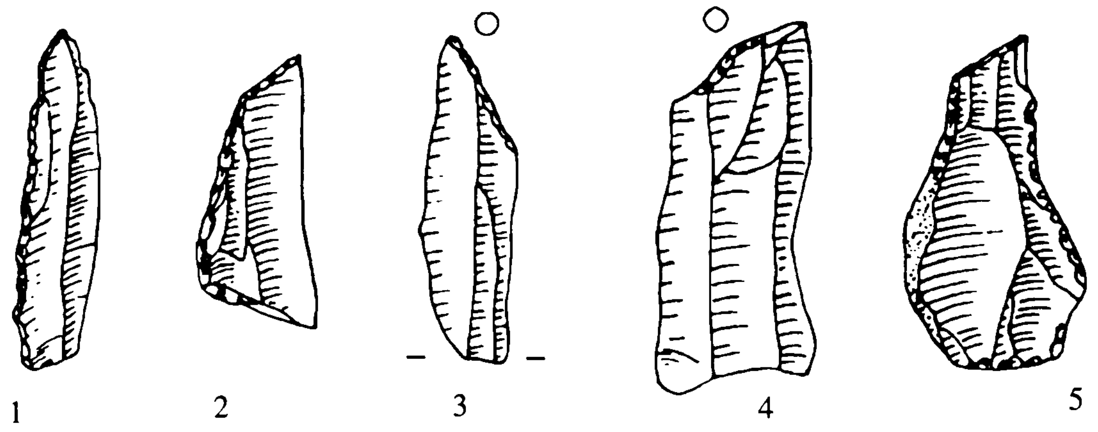

Figure 2.8: Lithics from the 4e Grotte d'Engis (from Dewez 1987).

Grottes de Presle (50° 24' 09" North, 4° 35' 14" East).

The caves lie in cliffs by the right bank of the river Biesme, within the estate of the Count d'Oultremont. The initial excavations in 1904 were carried out under the auspices of the Société Paléontologique et Archéologique de Charleroi, directed by Dr Druart, and involved the investigation of four caves (*Rapport sur les fouilles effectuées en 1904 dans les Grottes de Presle*, in Documents et Rapports de la Société Royale Paléontologique et Archéologique de l'Arrondissement Judiciaire de Charleroi; referenced in Danthine 1955-60). Of these, the Trou de l'Oussaire appears to have contained both later prehistoric inhumations and some curved and angle-backed blades (Debaille & Foulon 1926; Debaille 1945). This material alerted Prof. Hélène Danthine to the possibility of an Upper Palaeolithic assemblage with few existing parallels from Belgium (Danthine 1955-60, 3). Her subsequent excavations at the Presle sites (Trou du Renard, Trou des Nutons, Trou du Docteur and the Trou de l'Ossuaire) revealed numerous traces of human use and habitation. Most notable amongst these was an archaeological layer of Lateglacial age found within the Trou de l'Ossuaire. It was from this that Danthine recovered 1753 worked flints (Leotard 1985a, 53).

More recent excavations, instigated by Prof. Marcel Otte and Jean-Marc Leotard in 1984, recovered further Lateglacial material. To date details of this research have only been published as interim reports (Leotard & Otte 1985, 1988; Leotard 1985b); the final publication (Leotard in prep.) is eagerly awaited.

Only two radiometric age estimations are known from the Belgian 'Creswellian', both originating from the sites at Presle, Lv-1472 12140 ± 160 BP (Leotard 1985b, 132) and OxA-1344 10950 ± 200 BP (obtained by Marcel Otte; Hedges *et al.* 1988, 294). Published accounts of the Lateglacial archaeological assemblage suggest that it came from within a single discrete layer, although the two radiocarbon dates cited above are quite widely separated in time.

It seemed a profitable line of enquiry to attempt to study the fauna from Presle, with the possibility of choosing specimens for radiocarbon dating in mind. However, despite extensive correspondence and numerous visits to Liège, where the material from both

Professor Danthine's and Professor Otte's excavations are housed, I was not granted full access to either collection.

After extensive negotiations, the Musée Curtius in Liège released 2 specimens of antler which showed traces of groove and splinter technique (one of these is illustrated in Dewez 1987, fig. 13) from their collections for accelerator dating. These were selected by Jean-Marc Leotard, following the general criteria suggested (that they show distinct traces of human modification, and are known to have been clearly stratified in the Creswellian layer). Unfortunately both samples proved to have been saturated by an organic based preservative. After discussions with Rupert Housley at the Research Laboratory for Archaeology and the History of Art in Oxford, it was decided that any attempt to date these samples should be abandoned on two grounds. First, that the risk of contamination was too great; even if dates were to be obtained which were broadly in line with expectations, they would always be open to question. Second, dating of these samples would involve their complete destruction; neither I nor the University of Liège was willing for this to occur and so, the samples were not submitted for dating.

It does not fall within the direct remit of this research to re-evaluate the lithic assemblage from Presle; however, it seems relevant to offer some comments on this material. What follows is based on published accounts of the archaeological assemblage. At face value, the lithics from Presle seem to give the one clear cut piece of evidence for a Creswellian presence in Belgium. The assemblage is unquestionably Lateglacial and contains both curved backed and angle-backed elements (Figure 2.9 & 2.10). Pieces which can clearly be recognised as *Cheddar* and *Creswell* points are also present (Figures 2.9, 2.10 & 2.11). Butts *én éperon* were noted by Leotard amongst the blades he refitted (Leotard 1985a, 61 [N° 2], 64 [N°s 36, 40 & 47], 65 [N° 1]).

However, a microlithic element is also present (Figure 2.12), which suggests a strong link with the regional Magdalenian. Similarly, *burins de Lacam* are recorded by Leotard (1985a, 75). Both J-M. Leotard and R.M. Jacobi (pers. comm.) have indicated that they suspect that the collections from the Trou de l'Ossuaire may not be a single occupation (see Leotard 1985a, 52, 108, 159-184), and both have suggested independently that there may be a mixing of both Magdalenian and Creswellian material. Accordingly, it is appropriate to ask whether there is any Creswellian actually present at the site ?

As defined above, the Creswellian is similar to the Magdalenian in many ways, but lacks certain *fossiles directeurs*, such as the *burin de Lacam*, as well as a microlithic component. Both of these can be found within the assemblage from the Trou de l'Ossuaire. Similarly *Creswell* and *Cheddar points* may occur in assemblages which are not Creswellian - it is the predominance of them which is important. Without having made a detailed study of the assemblage from Presle, I cannot quantify the proportion of these points which are present. Added to this is the question of whether the collection should be treated as a single assemblage, or as a palimpsest.

In light of the above discussion, it seems difficult to argue that either of the existing radiocarbon dates gives much (if any) information directly relating to the Belgian *Creswellian*. If the lithic assemblage from Presle is a mixture of Magdalenian and Creswellian, then Lv-1472 (12140 ± 160 BP) tells us little about either group.

The Louvain date does fall within the range of British dates for the Creswellian (Table 2.9); however OxA-1344 (10950 ± 200 BP) is at least a thousand years later than the time band usually associated with the Creswellian (which is placed in Britain specifically within that part of the Lateglacial sequence that corresponds to Bölling and Dryas II). This may be explained at least in part by the fact that the date was on an unmodified mandible of red deer and, as Otte commented (Hedges *et al.* 1988, 294), its association with the Creswellian assemblage may be suspect. In fact, it is likely that this date simply gives biostratgraphic information about the local occurrence of red deer during the Lateglacial.

Following the arguments already applied, even if there were no questions as to a mixing of archaeological assemblages of potentially different ages, a bulked conventional date on bones and bone fragments can have little reliability even when in broad agreement with prior expectations. This very point is underlined by the two and a quarter page listing

Lab code	Date	Site	Sample details
OxA-2234	11480 ± 90 BP	Gough's Cave	Adult calotte of *Homo sapiens* GC2.
OxA-2236	11700 ± 100 BP	Gough's Cave	Adult mandible of *Homo sapiens* GC6.
OxA-2795	11820 ± 120 BP	Gough's Cave	Frontal of *Homo sapiens* GC2.
OxA-2797	11870 ± 110 BP	Gough's Cave	Antler bâton of *Rangifer tarandus* GC89/99.
OxA-2235	11990 ± 90 BP	Gough's Cave	Child calvaria of *Homo sapiens* GC3.
OxA-813	11900 ± 140 BP	Gough's Cave	Astragalus of *Bos primigenius* M 49744.
OxA-3717	12020 ± 100 BP	Church Hole	Antler rod +8170
OxA-588	12030 ± 150 BP	Gough's Cave	Bovine fragment M 49971.
OxA-4108	12110 ± 120 BP	Church Hole	Cut partial femur of *Lepus timidus* P2120.
OxA-1890	12170 ± 130 BP	Gough's Cave,	Mammoth ivory 'rod' from 1987 area I.
OxA-535	12210 ± 160 BP	Sun Hole	Left ulna of *Homo sapiens.*
OxA-735	12240 ± 150 BP	Church Hole	Humerus of *Lepus timidus* LL 7431.
OxA-3718	12250 ± 90 BP	Church Hole	Antler rod +8171
OxA-591	12260 ± 160 BP	Gough's Cave	Collagen of BM-2187. Atlas of *Equus ferus.*
OxA-1670	12290 ± 120 BP	Robin Hood Cave	Cut right humerus of *Lepus timidus.*
OxA-1071	12300 ± 180 BP	Gough's Cave	Cut bovine 2nd phalanx, M 49758.
OxA-2237	12300 ± 100 BP	Gough's Cave	Cut right scapula of *Homo sapiens* M.23.1/2.
OxA-1462	12320 ± 120 BP	Robin Hood Cave	Fragment of mammoth ivory in breccia block associated with arctic hare, charcoal and Creswellian lithics.
OxA-589	12340 ± 150 BP	Gough's Cave	Collagen of BM-2123. Atlas of *Equus ferus.*
OxA-3415	12340 ± 120 BP	Robin Hood Cave	Cut scapula of *Lepus timidus*, 294/1932.
OxA-1467	12350 ± 120 BP	Pin Hole Cave	Cut proximal radius of arctic hare, LL 7990.
OxA-1500	12350 ± 160 BP	Three Holes Cave	Cut bone fragment, sp. indet., 3H 57 II 8b.
OxA-465	12360 ± 170 BP	Gough's Cave	2nd phalanx of *Equus ferus.*
OxA-590	12370 ± 150 BP	Gough's Cave	Amino acids from BM-2183. Atlas of *Equus ferus.*
OxA-1122	12380 ± 130 BP	Aveline's Hole	Cut bovine 2nd phalanx.
OxA-463	12380 ± 160 BP	Gough's Cave	Calcaneum of *Saiga tatarica.*
OxA-2237	12380 ± 110 BP	Gough's Cave	Cut adult calotte of *Homo sapiens* GC87/190.
OxA-3452	12400 ± 110 BP	Gough's Cave	Cut dirst phalanx of *Equus ferus*, M49797.
OxA-1617	12420 ± 200 BP	Robin Hood Cave	Cut left femur of *Lepus timidus*, AI, OB, spit 16.
OxA-1619	12450 ± 150 BP	Robin Hood Cave	Cut right scapula of *Lepus timidus*, AI, LSB/A, spit 21.
OxA-464	12470 ± 160 BP	Gough's Cave	Metapodial of *Equus ferus.*
OxA-1618	12480 ± 170 BP	Robin Hood Cave	Cut right humerus of a Lepus *timidus*, AI, LSB/A, spit 21.
OxA-3412	12490 ± 120 BP	Gough's Cave	Cut tibia of *Cervus elaphus*, GC 86/1.
OxA-592	12500 ± 160 BP	Gough's Cave	Amino acids from collagen of BM-2187. Atlas of *Equus ferus.*
OxA-4107	12550 ± 130 BP	Gough's Cave	*Lepus timidus* tibia point, GC 89/68.

Table 2.9: AMS dates for the British Creswellian cont/.

OxA-3414	12570 ± 120 BP	Gough's Cave	Cut partial rib, Sp. indet. GC1990 E2/184.
OxA-3416	12580 ± 110 BP	Robin Hood Cave	Partial *Lepus timidus* tibia point, RH 69, AI, LSB, spit 18.
OxA-3404	12510 ± 110 BP	Pin Hole Cave	Cut distal tibia of *Lepus timidus* 40/4'-6".
OxA-587	12530 ± 150 BP	Gough's Old Cave	Cut right 1st phalanx of *Equus ferus*.
OxA-1616	12600 ± 170 BP	Robin Hood Cave	Cut left scapula of *Lepus timidus*, AI, USB/OB, spit 12.
OxA-3411	12650 ± 120 BP	Gough's Cave	Cut femur of *Lynx lynx*., GC 86/27A.
OxA-4106	12670 ± 120 BP	Gough's Cave	Cut vertebra of *Equus ferus*, GC 87/191.
OxA-466	12800 ± 170 BP	Gough's Cave	Metapodial of *Cervus elaphus*.
OxA-3413	12940 ± 140 BP	Gough's Cave	Cut vertebra of *Equus ferus*, GC 87/187.

Table 2.9: AMS dates for the British Creswellian.

in Leotard's thesis (1985a, 110-112) of the individual bones and bone fragments, with find numbers and depth, submitted to make up Lv-1472. The material has a vertical range between 87 and 146 cm, across an area of 5 m^2. Sadly, no identifications to either element or species are given in the text, and we must assume that the 75 specimens listed by Leotard were all unidentified bone fragments. This is confirmed by E. Gilot's letter to Leotard, reproduced in the latter's dissertation:

> "L'échantillon analysé était constitué d'une soixantaine de fragments osseux, d'un poids total de 80 grs. Ces ossements provenaient tous de la couche archéologique" (*ibid.*, 112).

Leotard (1985a, 159-184) devotes considerable attention to the problem of mixing, but the matter is further muddied by the fact that provenance details for part of the lithic collections has become confused over time. He notes that some pieces originating from particular excavations are unparalleled in the collections from other excavation campaigns. The example given is that of a group of hollow-based backed pieces from the 1904 excavations at the Trou du Docteur (*op cit.*, 176). It is perhaps an interesting point that, prior to reading Leotard's dissertation, I had also noted these pieces on a visit to the Museum in Liège, and had been permitted to make sketch drawings of them (Figure 2.13). They were quite unlike any Creswellian material I had seen in Britain, their most notable feature being the concave bases. It is possible that this feature could be ascribed to personal style on the part of the flint knapper. I also showed the drawings to R.M. Jacobi,

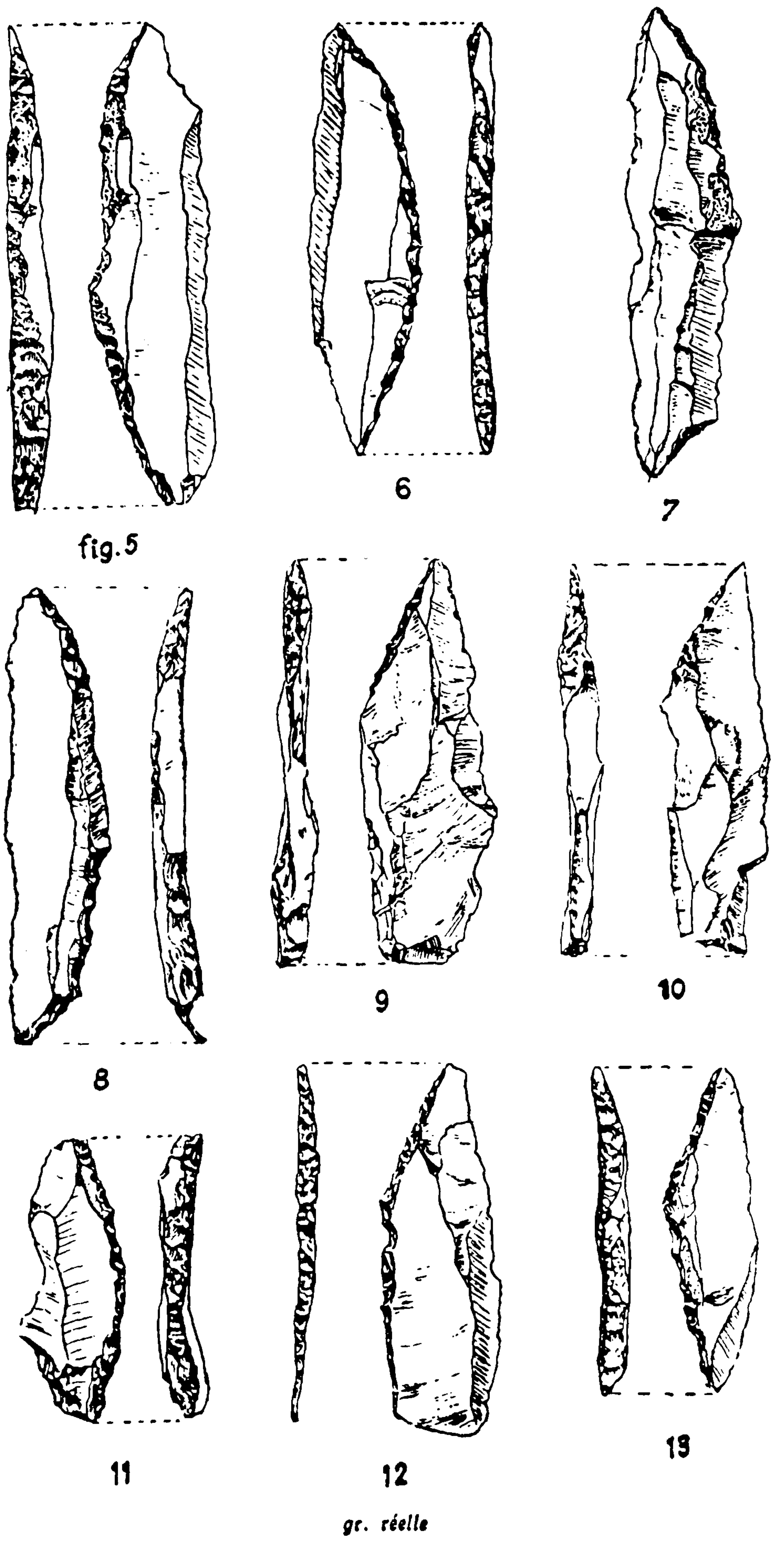

Figure 2.9: Points from the 1904 excavation in the Trou de l'Ossuaire, Presle (from Danthine 1955-60, figures 6 to 13). Scale 1:1.

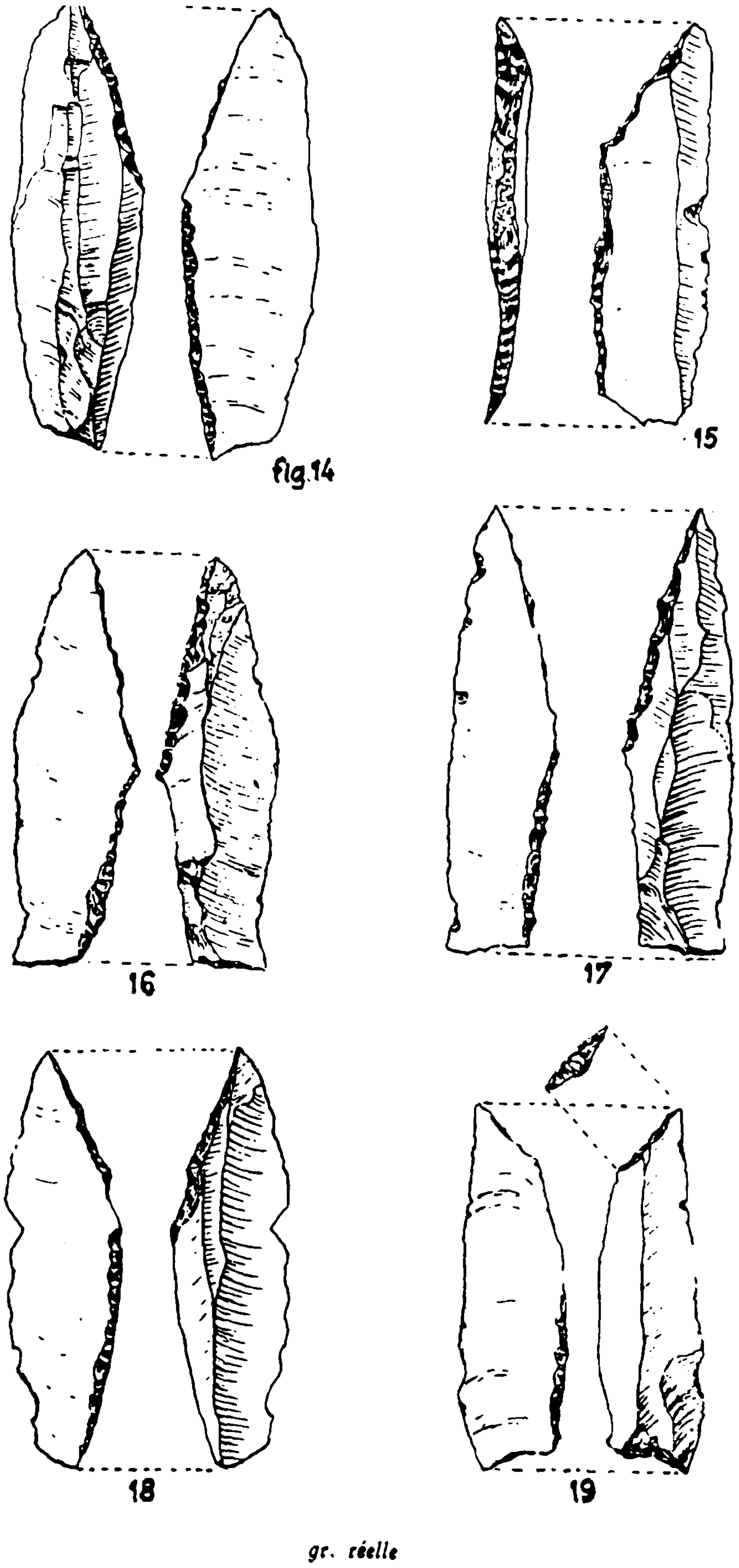

Figure 2.10: Backed pieces from the 1904 excavations at Presle (from Danthine 1955-60, figures 14 to 19). Scale 1:1.

who commented that the illustrations were not precisely similar to any British Lateglacial material he had studied.

Overall, the significance of the Lateglacial archaeology from Presle remains unclear. The use of at least three of the caves during the Lateglacial, and the subsequent confusion over the precise provenance of many of the finds complicates matters. This confusion over provenance can be highlighted by the fact that Pr. 216 in Figure 2.13 is also illustrated as No 7 in Figure 2.9; Danthine provenanced this piece to the Trou de l'Ossuaire, whilst Leotard ascribes it to the Trou du Docteur. Similarly Pr. 234 is also illustrated as No 14 and Pr. 225 as No 19 in Figure 2.10. Leotard suggests in his thesis that the collection recovered in 1904 from the Trou du Docteur represents a separate occupation from that at the Trou de l'Ossuaire (Leotard 1985a, 177). He also suggests that the lithics recovered by Danthine can be treated as a single coherent assemblage (*ibid.*). He then argues for affinities between the 1904 collection and Maldegem (*op cit.*, 178), as well as recognising parallels between the 1950-60, 1983 and 1984 collections and the Magdalenian (*ibid.*, 180-181). He also notes that there are differences. Finally he compares the material from Presle with the British Creswellian and finds close analogues with J.B. Campbell's Lower Creswellian (Campbell 1980), and notes differences (*op cit.*, 185-186) between the points from Presle and those from Britain. Finally he suggests that at least three separate human groups used the caves at Presle during the Lateglacial.

Whilst it is possible that at least part of the archaeological collection from Presle is Creswellian, there is also material which clearly suggests a Magdalenian presence at a number of the sites. Additionally the collection appears to have become inextricably jumbled, creating problems for future research. It is hoped that Leotard's final report on his research will clarify a number of these problems.

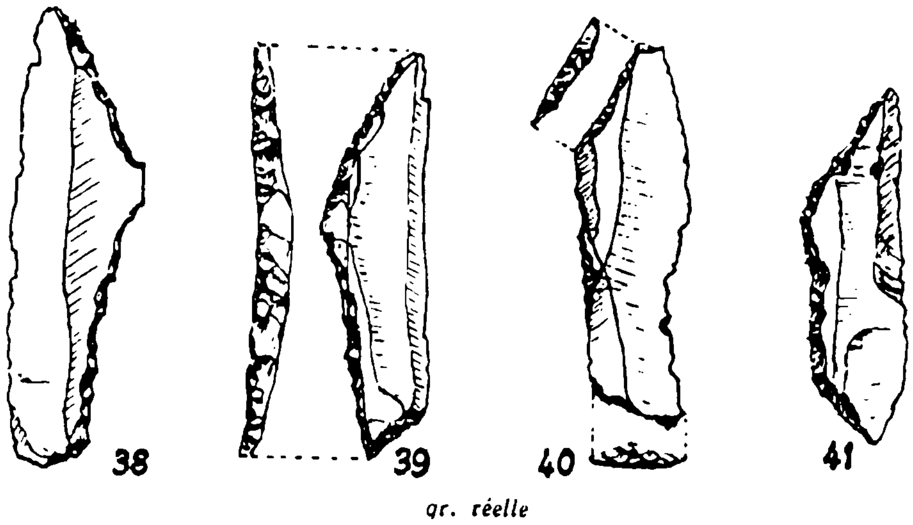

Figure 2.11: Creswell and Cheddar points from Danthine's excavation at the Trou de l'Ossuaire, Presle (from Danthine 1955-60, figures 38-41). Scale 1:1.

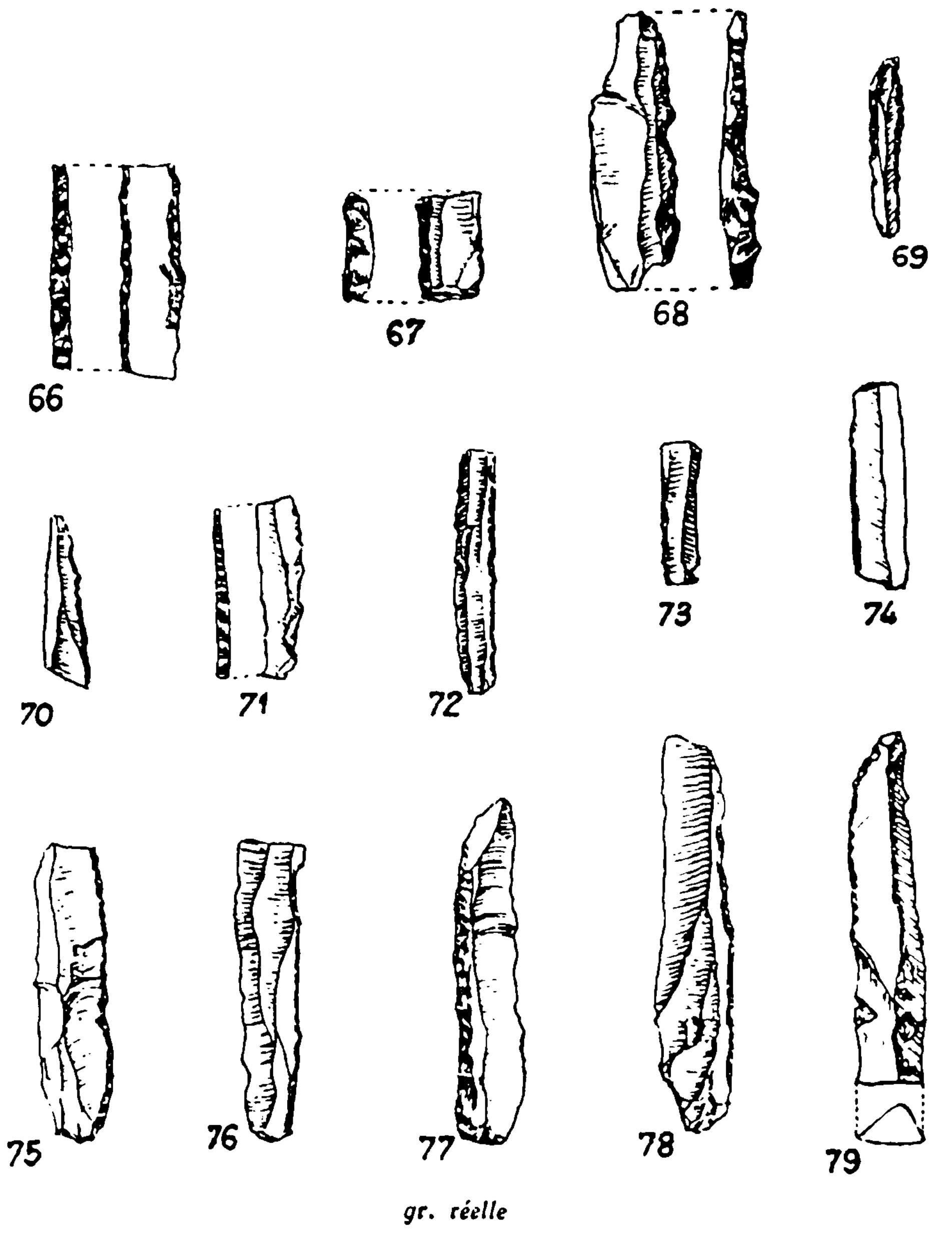

Figure 2.12: Backed bladelets from Danthine's excavations at the Trou de l'Ossuaire, Presle (from Danthine 1955-60, figures 66-79). Scale 1:1.

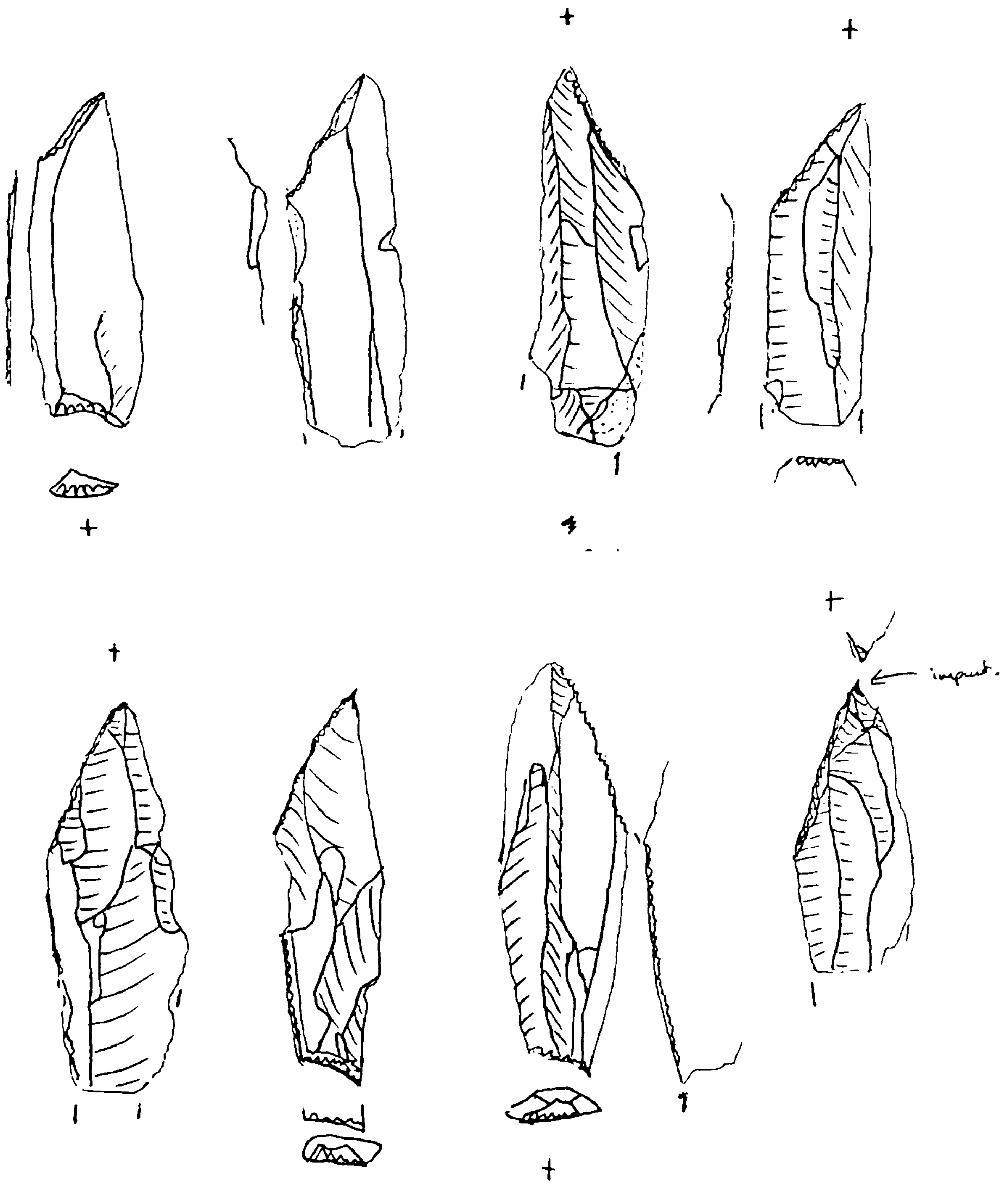

Figure 2.13: Points from the Trou du Docteur, Presle, sketched by the author. Top row (l to r) Pr. 225, Pr. 221, Pr. 214, Pr. 218; Bottom row (l to r) Pr. 219, Pr. 216, Pr. 234, Pr. 217. Scale 1:1.

l'Abri de Megarnie (50° 34' 46" North, 5° 25' 0" East)

Located on the right bank of the river Meuse near the hamlet of Engihoul, this small rock shelter has now been partially destroyed by quarrying. Initial excavations were undertaken by E. Doudou during the final years of the 19th Century (Dewez 1987, 301). Doudou's collection was subsequently donated to the University of Liège. Further excavations were initiated by the *Chercheurs de la Wallonie* between 1908 and 1909. These recovered lithics which were characterised as Magdalenian. Further excavations under the auspices of the *Chercheurs* took place in 1916 during the course of which they discovered a hearth. Final excavations by the *Chercheurs* in 1958 located material discarded by earlier excavations. It appears that the site has now been completely excavated. There are no radiocarbon or TL dates from this site.

Dewez (1987, 305) briefly discusses the cultural ascription of the site, and concludes that it is more likely to be Creswellian than Magdalenian. In another publication Dewez discusses a *concrétion excentrique* and its possible significance (Dewez 1976). This piece is an unmodified stalagmite fragment which is reminiscent of 'female figurines' and engravings from the late Magdalenian site of Gönnersdorf (*op cit.*, fig. 2).

It is difficult to comment in detail on any of this material since I have not studied the collection. However, Dewez reports a total of 434 flints in the assemblage. Of these, 24 are tools, 10 of which are illustrated (1987., fig. 201). None of the descriptions or illustrations seem to relate to Creswellian *fossiles directeurs* and the presence of backed bladelets (*ibid.*, fig. 201 N°s 1 to 4) and *burins de Lacam* (*ibid.*, fig 201 N° 6 and 7) is more reminiscent of the Magdalenian. However, the assemblage is far too small to make any credible claims about its affinities.

Obourg «Bois de St. Macaire» (5° 28' 30" North, 4° 00' 45" East)

This is an open air site with no radiometric dates. It is located on the crest of a hill overlooking the confluence of the rivers Haine and Obreceuil. Only one publication documents the site (Letocart 1970). Shouldered points are illustrated (*op cit.*, Tafel 111 N°s 1-4), as are curved backed (*ibid.*, Tafel 111 N°s 7-16) and angle backed pieces (*ibid.*, Tafel 113 N°s 1-14). Alongside these are figured tranchet arrowheads (*ibid.*, Tafel 113 N°s 23, 26 & 27) and a number of pieces which do not appear to be characteristically Upper Palaeolithic in form.

Letocart suggested that the material was Late Upper Palaeolithic, and that the Magdalenian would seem to be the most likely ascription (1970, 359). Subsequently it has appeared as a 'Creswellian' dot on Lateglacial distribution maps (e.g. Otte 1984). Whilst there are clearly Upper Palaeolithic elements in the collection, there is little to link it directly to the Lateglacial, let alone identify it as either Creswellian or Magdalenian.

Orroir «Mont de l'Enclus» (50° 45' 35" North, 3° 29' 40" East)

One relatively obscure publication describes the lithics recovered by two amateur archaeologists (R. Putman and l'abbé G. Coulon) from an unstratified context somewhere on the Mont de l'Enclus in the Province of Hainaut (Otte 1979). More precise location details are unavailable, and the longitude and lattitude given are for the trigometric point on the top of the hill. Since the 1979 publication, the locality has become a fixed point on distribution maps of the Belgian Creswellian (e.g. Otte 1984). There are no radiocarbon dates associated with any of the finds from Orroir. The published illustrations (reproduced here as Figure 2.14) do not show any distinctive *fossiles directeurs* of the Creswellian. Indeed the curved backed point illustrated as N° 1 bears a striking resemblance to either a *Tjonger point* or a penknife point (N° 2 is a suggested reconstruction of the piece overlain by its original blank). Otte himself comments (*op cit.*, 197) that there are some similarities between this specimen and a Châtelperronian point. However, this possibile affiliation is ruled out, and instead he suggests a Lateglacial affinity as the most likely ascription (*ibid.*). The argument then runs that the piece is not really a Magdalenian type fossil, but much more reminiscent of the Azilian. However, Otte notes (*ibid.*) that there are no other traces of the Azilian from Belgium[9], and so rules out this possibility. The question of whether the find might relate to the Creswellian is discussed, and similarities are drawn between the

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[9] The term *Azilian* comes from the type site Mas d'Azil, in Southern France. The Azilian itself is geographically restricted to south-western Europe (more specifically France and Spain).

Orroir point and specimens from Presles. The Tjongerian is considered briefly, but Otte suggests that "technique" used in point manufacture differs between the Orroir point and other Tjonger points (these differences are not, however, made explicit). Otte's conclusion is that the Orroir point has affinities with both the British Creswellian and the Belgian Tjongerian; he sees the links being strongest with the Creswellian, more specifically a subset of material he refers to as *Cheddarian*[10].

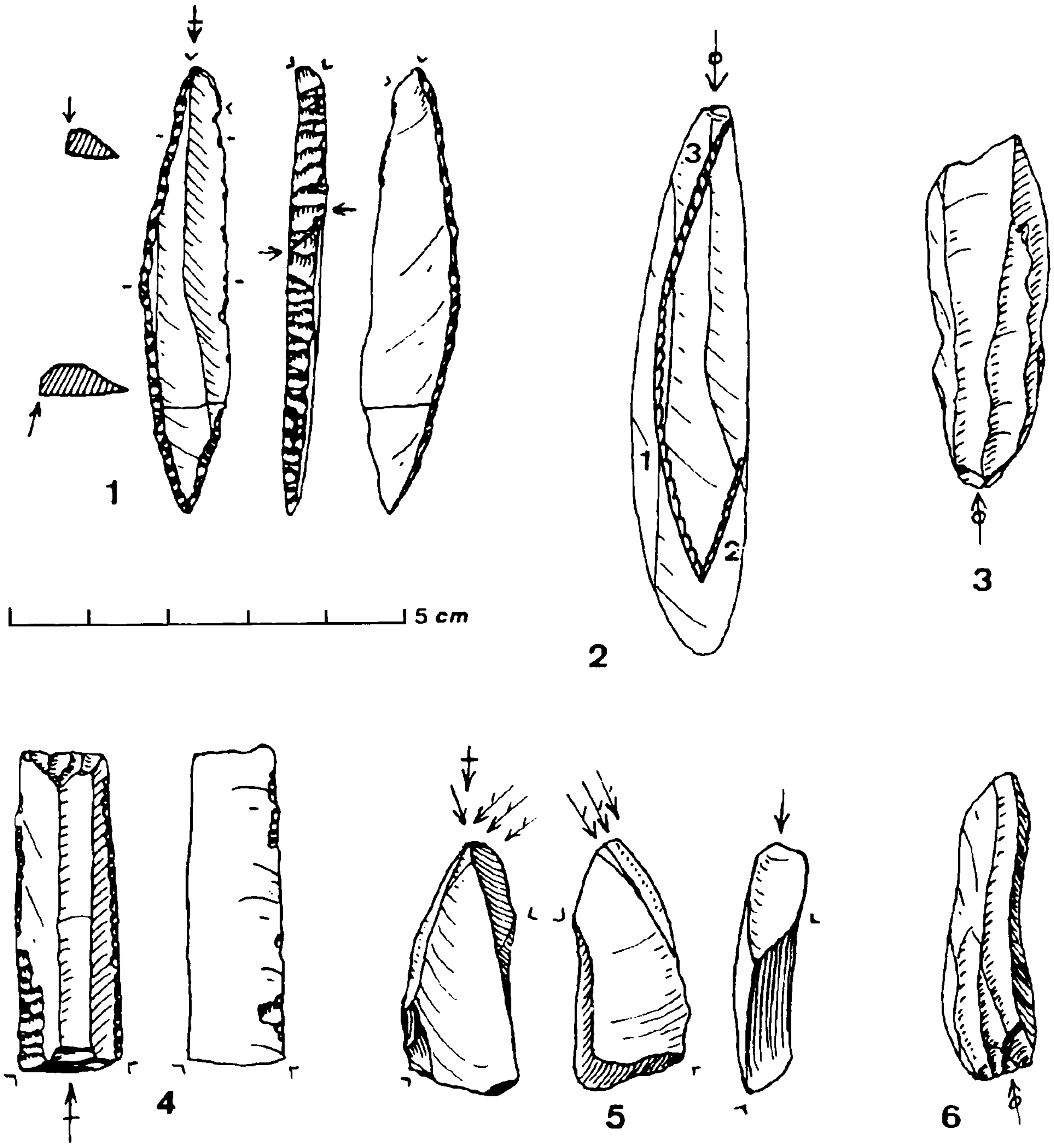

Figure 2.14: Lithics from Orroir (from Otte 1979).

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[10] The term *Cheddarian* has caused much confusion in the more recent archaeological literature. It originally refers to material found solely within the confines of the Gorge at Cheddar, Somerset. However, this has since been taken as a 'type site' for the Creswellian (alongside the Lateglacial finds from Creswell Crags, in Derbyshire and Nottinghamshire), due to the prevalence within assemblages from Cheddar of the trapezoidal backed point commonly known as a *Cheddar point*. It has even been suggested (Jacobi 1991, 138) that the term *Creswellian* should be abandoned, and replaced by *Cheddarian*, allowing a far stricter definition of Lateglacial lithic assemblages from the UK.

The reason for this soon becomes clear, when Otte makes it apparent that he is following the finegrained evolutionary progression suggested for the British Lateglacial by John Campbell (1977, 189).

This is precisely where the problem lies, for although I concur fully with Otte's comparison between the Orroir piece and penknife points from sites such as Mother Grundy's Parlour at Creswell Crags, this does not make the material *Creswellian*. Campbell suggested a tripartite division of the chronology of the British Lateglacial based partly on typology. Within this he saw an earlier *Creswell point phase*, followed by a *penknife point phase* succeeded by a *transitional to mesolithic phase*; it is the *penknife point* phase with which Otte has drawn a parallel. Certainly, with the aid of AMS dating it has become apparent that the two earlier phases do appear to be quite distinct from each other (see Jacobi 1991 for a more detailed argument for a 'tighter' typological and cultural definition of British Late Upper Palaeolithic industries), and that the typological basis proposed by Campbell does appear to be generally valid. However, it is highly questionable as to whether this *penknife point phase* could really be regarded as an integral part of the Creswellian (*sensu stricto*) rather than an essentially seperate and independent entity.

Consequently, one cannot support the suggestion that any of the material from Orroir could be linked to the Creswellian. It is extremely difficult to make suggestions about the cultural designation of any small assemblage, but it is clear that this material lacks both the distinctive *Creswell* and *Cheddar* points. The Orroir backed point does bear a strong resemblance to a *Tjonger point*; however without having personally examined the piece I am unwilling to argue that the material should be treated as Tjongerian. Indeed, the nature of the contextual associations (if any) between the individual pieces illustrated in figure 2.14 is not adressed in the only publication (Otte 1979), and so remains unclear.

The Creswellian 'variants': the *"Creswello-Tjongerian"* and the *"Creswello-Hamburgian"*

These are an apparently recent addition to the archaeological pantheon, and at first sight their occurrences appear to be contained within the borders of Belgium. The terms have been used by both M. Dewez and M. Otte to describe some Belgian Upper Palaeolithic assemblages (Dewez 1979; Otte *et al.* 1984). The term *Creswello-Tjongerian* is usually applied to assemblages which appear to be "like" the Tjongerian, but which lack the Tjonger *fossiles directeurs.* Similarly, those assemblages which are seen as "like" the Hamburgian, but again lacking the appropriate *fossiles directeurs* are classified as *Creswello-Hamburgian.* There are no associated radiometric dates. The general form of the industries so described appears to involve an element of angle backed-pieces, and various forms atypical of the other Lateglacial technocomplexes such as the Creswellian, Hamburgian, and Magdalenian. It is surprising to find an archaeological culture which respects modern day political boundaries; however, if one accepts the *Creswello-Tjongerian* and *Creswello-Hamburgian* at face value, this is precisely what happens. If one begins to look in detail at the precise make up of assemblages classified in this way, one begins to run into even greater problems than with those Belgian assemblages simply referred to as *Creswellian* (see above).

Maldegem (51° 11' 35" North, 3° 22' 00" East)

A good example of the problems of typological definition outlined above is the open air site of Maldegem, which lies to the south-east of Brugge, just to the south of the small hamlet of Veldhoek. The site is located on the border of the Flemish valley and the Oedelem hills. Published by Otte *et al.* (1984), the lithic assemblage was suggested to have affinities with both the Creswellian and the Hamburgian, and so was designated "Creswello-Hamburgian".

Amongst the lithics from the site are 2 possible *Creswell points*, 2 possible *Hamburg points*, 14 fragmented backed pieces, 6 burins, 24 scrapers, 6 blade cores and 128 pieces of debitage (data from Otte *et al.* 1984, 114-5). Two shouldered pieces are illustrated. One of these may be a *Creswell point* although Otte *et al.* refer to it as a *Hamburg point* (this it clearly is not); the other, which is also suggested to be a *Hamburg point* is a shouldered point but defies any further classification. Of the other three backed pieces, two are broken. The only complete backed piece is undiagnostic. Butt preparation *en éperon* is not reported. There seems to be little reason to give any more detailed ascription to this material than that of *Federmesser.* The assemblage is small and, as with many other sites already discussed, lacks any clear *fossiles directeurs.* The suggestion that the material has affinities with the Creswellian, Hamburgian and/or Tjongerian seems to reflect the actual situation, namely that the material can only be grouped within the broad term *Federmesser* rather than being given any more detailed designation.

There is no associated fauna. Indeed, faunal preservation from virtually all the archaeological sites in the Flemish valley is extremely poor. There are currently no radiocarbon dates from Maldegem, and it seems unlikely that there are any possibilities for such dating.

Trou Walou (5° 40' 30" North, 50° 35' 15" East)

Another claimed *Creswello-Tjongerian* site, the Trou Walou, is virtually unpublished as yet. It is a collapsed cave near the small village of Trooz in the valley of the river Magne (a tributary of the river Vesdre). I was fortunate to be able to visit this site for a day during 1992 with Michel Dewez and Jean-Marie Cordy.

Excavation is still in progress at this site by a multidisciplinary team led by Michel Dewez (Dewez 1986). The main evidence for human occupation of the site is an interesting series of upper Perigordian layers, underlain by what appears to be a Mousterian sequence (in the initial stages of excavation); there are small pockets of Lateglacial deposits at the top of the cave sequence, which have yielded lithic material (Dewez pers. comm.). However, S.N. Collcutt (pers. comm.), who has also examined the lithics from this site has commented to me that their designation as *Creswello-Tjongerian* in the initial publication (*op cit.*) was chosen because the site contains a series of undiagnostic flakes, blades and backed pieces, most probably of Lateglacial age. To date I have seen neither the lithics themselves nor any illustrations and so do not feel that I can make further comment.

More recently three radiocarbon dates have been published from the site (Dewez 1992) and are presented in Table 2.10. As with many of the other sites already mentioned, it is difficult to discuss dates in detail when so little is known about the nature and exact occurrence of the dated sample, or indeed the archaeology of the site as a whole.

Lab code	**Date**	**Cultural ascription**	**Material dated**
Lv-1556	9990 ± 160 BP	Creswellian	“debris osseux’
Lv-1582	13030 ± 140 BP	Magdalenian	“debris osseux”
Lv-1593	13120 ± 190 BP	Magdalenian	“debris osseux”

Table 2.10: Lateglacial radiocarbon dates from the Trou Walou.

The one date assigned to the Creswellian is early Postglacial, whereas in the traditional “heartland” of the Creswellian (Britain) it is usually dated to the Bölling Interstadial phase of the Lateglacial Interstadial (see Table 2.9 above). This date falls broadly in line with other radiocarbon dates from Ahrensburgian contexts across Europe (Table 2.14 below) than those for the Creswellian. The sample made up of “debris osseux” must be subject to the usual problems of bulk samples. It remains unclear what, if any, its relationship to any archaeological residues might have been.

The two Magdalenian dates cited carry with them the same problems of association. It is interesting to note that both Lv-1582 and Lv-1593 fall into Dryas I rather than the Bölling, and would be older than any Magdalenian accelerator dates already discussed; however, they cannot be regarded as reliable, for the reasons already discussed.

After extensive discussions with colleagues working on the Belgian Upper Palaeolithic, it became apparent to me that rather than representing an archaeological culture, in any sense of the word, the terms *Creswello-Tjongerian* or *Creswello-Hamburgian* were generally used as a shorthand for any undiagnostic, but apparently Lateglacial flint assemblages. The terms are only used to describe relatively small assemblages. This being the case, I suggest the immediate abandonment of these terms, as this has led to confusion in the literature, especially clouding the issue of the precise nature of the Creswellian. Given this, any discussion of spatial and temporal distribution of the *Creswello-Tjongerian/Creswello-Hamburgian* is meaningless.

Overview of the Belgian Creswellian

There appear to be numerous problems surrounding the Belgian Creswellian, not least of which are basic problems of classification. At present the only sites which seem at all likely to have had a clear Creswellian component are the caves at Presle. Even here the situation is far from clear cut. If the Creswellian is present in Belgium, then it is far more restricted than has been suggested by either Otte or Dewez. Over the course of recent research on the Belgian Lateglacial, it has become increasingly difficult to identify any distinctive Creswellian collections. The vast majority of assemblages suggested as either *Creswellian, Creswello-Tjongerian* or *Creswello-Hamburgian* are composed of a small number of backed pieces, only a few of which appear to be diagnostic in any way. Where larger broadly contemporary assemblages have been found, these have almost always been classified as Magdalenian, Tjongerian or Ahrensburgian.

Consequently, the opportunities for increasing the radiocarbon database for any 'Belgian Creswellian' are few and far between. Presle would be an extremely interesting site to examine, were the fauna from either Danthine's or Leotard's excavation to become available. It is unclear as to whether the material from the Trou Walou can be clearly attributed to the Creswellian, and there is little associated fauna (Dewez pers. comm.). This seems to be the situation with many of the other claimed Creswellian sites. No TL dates have yet been obtained for any of the claimed Creswellian sites in Belgium. Rather than concentrating further on attempts to date the Belgian Creswellian, it would seem a far more useful course for further research to instigate a systematic re-evaluation of the lithic assemblages which have been suggested as Creswellian, as it seems dubious that this variant even exists in Belgium.

THE TJONGERIAN IN BELGIUM

Lithic finds ascribed to the Tjongerian, a facies of the *Federmesser* group of northwest European Lateglacial industries, are geographically centred in the Netherlands, although Tjongerian material has been described from Belgium, Germany and France. Tjongerian lithics have been found throughout Belgium, the majority of these sites are located in the provinces of Brabant, Antwerpen, Oost-Vlaanderen and West-Vlaanderen. Very little work has been done on defining the Tjongerian (Schwabedissen 1954; Paddayya 1971), and certainly within Belgium the main criterion for a site or cultural level to be ascribed to the Tjonger group appears to be the lack of *fossiles directeurs* of the Magdalenian, Creswellian, or Ahrensburgian. The Tjongerian is reported to have a single type fossil, the *Tjonger* or *penknife point* (typologically somewhat similar to a Châtelperronian point, a curved backed point). However, this tool type cannot be used in the true sense of a *fossil directeur* as it is also found in other Lateglacial lithic assemblages in reasonably high proportions.

The original definition of the Tjongerian, or *Kuinder Culture* as it was originally termed, can be found in four papers, which are not easily available within the UK (Popping 1933a, 1933b, 1934; Popping & Beijerinck 1933). I have been able to locate only one of these - *Een and ander over de Palaeolithische Cultuur aan het Riviertje "De Kuinder"* (Popping 1933a).

The chronological patterning suggested by the dated samples for Belgium (Table 2.11) shows a distribution through time which does not accord well with the temporal range within which the Tjongerian is often assumed to lie. Paddayya (1971), whilst discussing the Tjongerian of the Netherlands, suggested that it might show typological signs of developing into the local Mesolithic with an increasing importance of obliquely blunted points in later assemblages; however, he did not suggest a continuation of the Tjongerian beyond the Younger Dryas, giving the two latest radiocarbon dates for this culture known at the time: GrN-1675 11440 ± 120 BP (from Budel II) and GrN-4871 11150 ± 190 BP (from Waskemeer).

Indeed only one date in Table 2.11, 11350 ± 150 BP (OxA-942), is in line with other dates for this culture complex in Europe and with assumptions of its age based on general typologial grounds. As with the other cultural groups already discussed, this apparently anomalous series of dates appears to relate more to the selection of samples than to any 'real' continuation of this culture into the Postglacial. Indeed, OxA-942 can be argued to be the only date which can clearly be demonstrated to be in direct archaeological association with the lithic technology present at any of the sites, as it was measured from the resin attached to a tjonger point (presumably used in hafting the point during its use-life). All the other dates known for the Tjongerian are on samples of charcoal, often dispersed across the site.

Lab code	**Date**	**Site**	**Sample details**
OxA-942	11350 ± 150 BP	Rekem	Resin attached to Tjonger point.
OxA-945	9900 ± 110 BP	Rekem	Charcoal.
GrN-4961	8950 ± 80 BP	Meer I	Charcoal.
GrN-4960	8940 ± 85 BP	Meer I	Charcoal.
GrN-7939	8930 ± 150 BP	Meer II	Charcoal.
GrN-5706	8740 ± 60 BP	Meer II	Charcoal.
Lv-482	8630 ± 130 BP	Achel	Charcoal.
IRPA-93 II	8025 ± 315 BP	Meer II	Charcoal.
GrN-911	7790 ± 100 BP	Lommel	Charcoal.
Lv-879	7730 ± 100 BP	Achel	Charcoal.
Lv-687	7400 ± 120 BP	Helchteren	Charcoal.
Lv-713	7210 ± 100 BP	Helchteren	Charcoal - pine only.
IRPA-93 I	7080 ± 290 BP	Meer II	Charcoal.
OxA-944	6390 ± 100 BP	Rekem	Charcoal fragment from stones of a destroyed hearth.
OxA-1375	5220 ± 100 BP	Rekem	Charcoal fragments.
OxA-943	2230 ± 70 BP	Rekem	Charcoal fragment from stones a of destroyed hearth.

Table 2.11: Radiocarbon dates for the Belgian Tjongerian.

These dates have a wide temporal span, so it is unsurprising that they are treated with scepticism by many researchers. It seems rather improbable that the Tjonger tradition could have continued uninterrupted until the Iron Age (one interpretation which could be drawn from the data presented in Table 2.11). Instead it seems far more likely that the majority, if not all, of the Postglacial dates bear little relation to Tjongerian lithic scatters. This will be discussed in greater detail below.

There are currently no faunal remains which can be linked with Tjongerian occupation from any known site in Belgium, which considerably reduces the opportunities for dating the Tjongerian. Added to this, the vast majority of Tjonger sites come from open air locations, rather than cave sites. The problems of taphonomy, site re-use and contamination are thus far greater, due to the extreme difficulty in maintaining stratigraphic control across sites. Many Tjonger findspots have been identified on the basis of the identification of individual points. The majority of sites are surface scatters, often collected by amateurs, which lack any form of stratigraphic data.

The dating of charcoal from these sites, either from supposed 'hearth features' or just bulk samples from across the site, is obviously a highly dubious activity. Hearths may not be contemporary with the Tjonger occupation, even when apparently associated with lithic densities; this offers one explanation for at least some of the anomalous dates. Charcoal collected randomly from across a site and assumed to be contemporaneous is even more problematic. As with bulked bone splinters, at best the dates will only give an average of all the burnt material incorporated into a sample. Chunks of charcoal collected with minimal stratigraphic control can be of extremely variable ages. However, until recently, dating of charcoal from these sites remained the only method likely to even give a vague indication of the age of human use of the site. Now major advances in the application of TL dating have led to some revisions of the chronology: eleven TL dates on burnt stone from two Tjongerian sites are given in Table 2.12.

Lab code	**Date**	**Site**
Ox88TLi246c10	11100 ± 1200 BP	Rekem
Ox87TLfg255AI	11500 ± 1200 BP	Meer IV
Ox88TLi246a1	11600 ± 1200 BP	Rekem
Ox88TLi246c8	11800 ± 1200 BP	Rekem
Ox87TLfg255A	11800 ± 1200 BP	Meer IV
Ox88TLi246c7	12100 ± 1300 BP	Rekem
Ox88TLi246b3	12300 ± 1400 BP	Rekem
Ox87TLfg255AI	12400 ± 1600 BP	Meer IV
Ox88TLi246b6	12600 ± 1400 BP	Rekem
Ox88TLi246c9	13000 ± 1500 BP	Rekem
Ox88TLi246d11	13000 ± 1400 BP	Rekem

Table 2.12: TL dates for the Belgian Tjongerian.

As is well known, TL dates will only give an indication of the last heating of burnt stone to a specified temperature, and so in some circumstances they may give misleading dates for associated archaeology. Dates are currently available only from the sites of Rekem and Meer IV, and although the associated standard deviations are quite large, at least a reasonably consistent patterning locating the Tjongerian within the Lateglacial does occur (Table 2.12). As many of the Tjonger sites lack clearly associated material ideal for AMS radiocarbon dating, it is hoped that further application of TL on Tjongerian assemblages may eventually lead to a more precise knowledge of the spatio-temporal distribution of these assemblages, although at the moment these dates lack the precision of the AMS technique. It is not yet possible to directly compare the results of the two techniques with any ease, as the TL dates are in solar years BP whilst the AMS dates are in radiocarbon years BP.

I do not intend to discuss the Tjongerian further in this dissertation, except where it may be relevant to the other sites dealt with in subsequent chapters. However, further details can be found about the Tjongerian by examining the published reports on the major sites, namely Achel - De Waag (Vermeersch 1979), Harelbeke (Vermeersch 1976), Helchteren, Sonnise Heide (Vermeersch 1974), Meer I (Van Noten 1966, 1967, 1968a, 1968b, 1969 & 1978; Cahen *et al.* 1979), Meer II (Van Noten 1975, 1978 & 1988), Meer IV (Van Noten & Otte 1981; Van Noten *et al.* 1985), Lommel (Hamal-Nandrin *et al.* 1935; Verheyleweghen & Gullentops 1956), Rekem (Lauwers 1985a, 1985b, 1985c, 1986a, 1986b &1988), Zonhoven (Huyge 1986) and Zolder (Vermeersch & Carolus 1975).

THE AHRENSBURGIAN IN BELGIUM

The term Ahrensburgian was first used by Rust (1943) to denote Lateglacial archaeological material found at the north German site of Stellmoor, in a level stratigraphically above the Hamburgian. The name Ahrensburgian is derived from the Ahrensburg tunnel valley in which Stellmoor, a suburb of Hamburg, is located. The culture is characterised by a high proportion of abruptly and semi-abruptly retouched blades, tanged points, a microlithic component, end scrapers and burins. It also has antler worked by groove and splinter technique, Lyngby type 'axes' and wood working, the latter documented directly by the presence of arrows recovered from waterlogged sites. Arrow 'shaft straighteners' (grooved sandstone blocks) have also been recovered from a number of these sites. Geographically, Ahrensburgian material has been located in much of the north-western part of Germany, especially Schleswig-Holstein (where the Ahrensburg valley is located), the distribution spilling over into the low countries. Temporally, it is usually placed during the final part of Dryas III: many of the sites are clearly concerned with reindeer hunting during the final cold stage of the last glaciation

Few Ahrensburgian sites have been recorded from Belgium. Five are cited by Otte (1980) - Zonhoven, Grottes de Fond-des-Forêt, Grotte de Remouchamps, Grotte du Coléoptère and La Préalle à Heyd (Figure 2.15). The only one of these which has yielded any relevant radiocarbon dates is the Grotte de Remouchamps. A large Ahrensburgian assemblage was recovered from this site, alongside a reindeer-dominated faunal assemblage. Four dates from this site have been obtained - one conventional (Lv-535 10380 ± 170 BP) on bone splinters and three accelerator (Table 2.13):

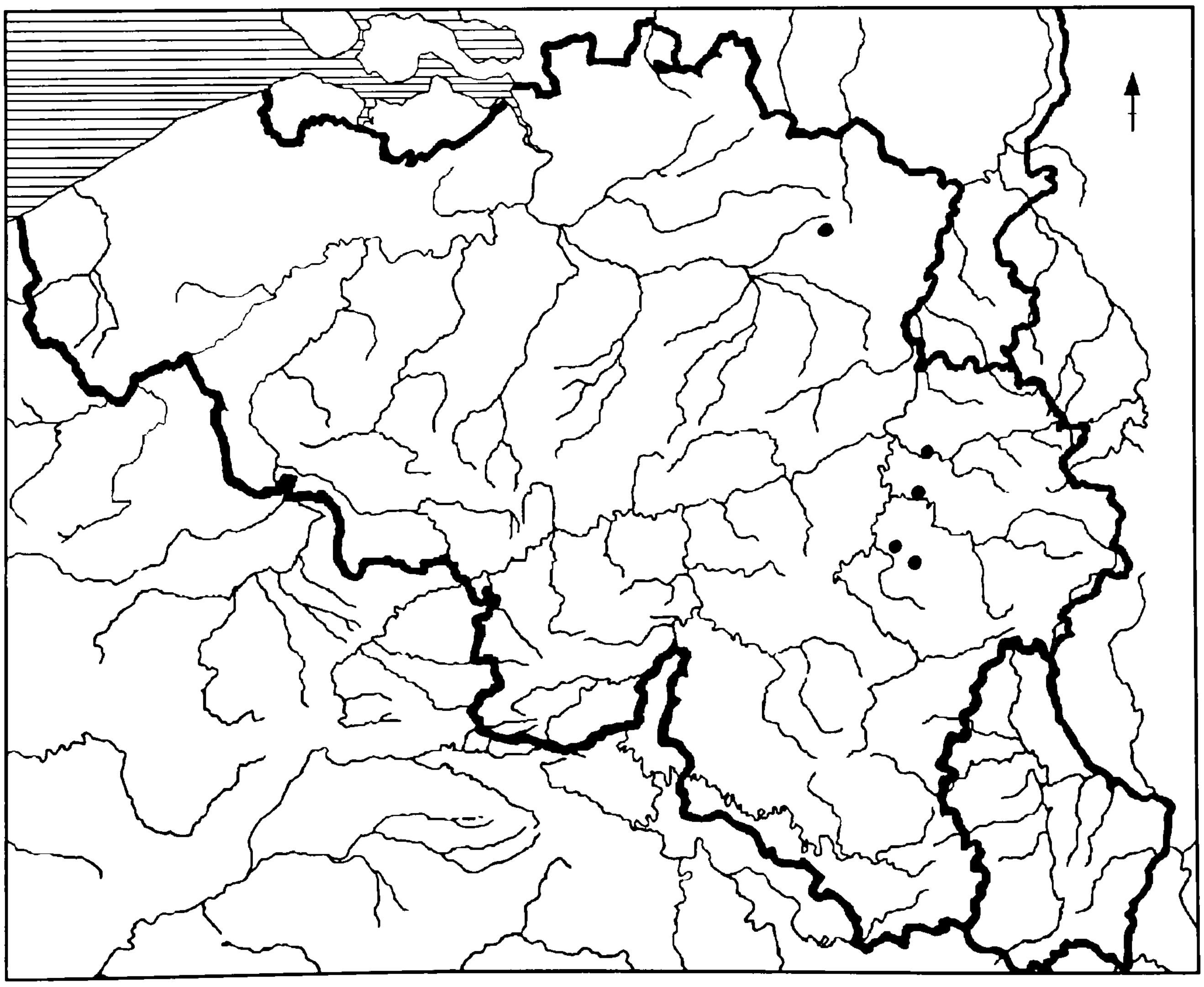

Figure 2.15: Distribution map of Ahrensburgian findspots in Belgium.

Lab code	**Date**	**Sample details**
OxA-3634	10320 ± 80 BP	Cut partial maxilla of *Rangifer tarandus.*
OxA-4190	10330 ± 110 BP	Cut proximal humerus of *Tetrao urogallus.*
OxA-4191	10800 ± 110 BP	Cut proximal right metacarpal of *Rangifer tarandus.*

Table 2.13: AMS dates from the Grotte de Remouchamps.

OxA-3634 and OxA-4190 are in close agreement with Lv-535, although it should be remembered that Lv-535 was taken from bulked unidentified bone fragments and so is potentially unreliable. OxA-4191 is significantly earlier than the other dates. This may indicate that human use of the site was spread over a longer period of time than originally anticipated; whether such use was continuous or episodic throughout Dryas III is unclear.

An attempt at dating the Ahrensburgian layer from the Grotte du Coléoptère was also made during the course of this research. An examination of the fauna recovered from the site by Michel Dewez between 1974 and 1976 revealed that very few specimens could be identified to species, and that even fewer showed signs of modification. Much, if not all, of the Ahrensburgian layer had been removed by previous excavators (Hamal-Nandrin & Servais 1925) and the collections they made were not readily available for study. It was apparent from the fauna recovered by Dewez that there had been at least some mixing of the fauna with later prehistoric material from above. Only two specimens presented themselves as suitable specimens for dating. One, a cut proximal left radius of a caprid, suggested as Chamois (*Rupicapra rupicapra*), was eventually omitted, as it proved impossible to differentiate it from more recent domesticates such as goat. This left the other specimen, a lower right human M2 or M3. There was a small possibility that this was later prehistoric, as there were some indications of Postglacial species present within the faunal assemblage, but, it was decided that this would be a preferable sample to the dubious caprid, and so it was submitted. Unfortunately the resulting date, OxA-3636 4695 ± 65 BP, clearly confirms suspicions that this layer was not uniquely Ahrensburgian. It is as well to know this for certain, and the age estimate does give a useful indication of the date of human presence at the site during the Neolithic; the tooth most likely originates from layer 4, where other human remains have been identified (Dewez *et al.* 1983).

I shall not discuss Zonhoven La Préalle à Heyd or Fond-des-Forêt here as no attempts have been made at these sites to date the Ahrensburgian material.

Overview of the Ahrensburgian in Belgium.

The four dates we do have for the Ahrensburgian from Remouchamps indicate human presence during Dryas III. The associated fauna is dominated by reindeer, which have been intensively processed by humans. There is also an extensive avian fauna, which has been similarly exploited. It is difficult, if not impossible, to discuss in detail any general chronology for the Ahrensburgian in Belgium as dates are only available for one site. The other occurrences are known only from the residues of earlier excavations and lack clear dating evidence. It is certainly to be hoped that future excavations of Belgian Ahrensburgian sites will produce better samples with which to work.

Dates for the Ahrensburgian outside Belgium are sparse, but they do exist (Table 2.14). They are broadly in line with the Belgian dates.

Lab code	**Date**	**Site**	**Sample details**
OxA-2873	7830 ± 80 BP	Stellmoor (D)	Mandibular artefact of *Castor fiber.*
OxA-2874	9220 ± 90 BP	Stellmoor (D)	Bone of *Castor fiber.*
OxA-2875	9680 ± 90 BP	Stellmoor (D)	Bone of *Vulpes vulpes.*
K-4580	9810 ± 100 BP	Stellmoor (D)	Antler.
K-4224	9900 ± 105 BP	Stellmoor (D)	Antler.
K-4323	9930 ± 100 BP	Stellmoor (D)	Antler.
K-4579	9980 ± 105 BP	Stellmoor (D)	Antler.
K-4518	9990 ± 105 BP	Stellmoor (D)	Antler
K-4325	10010 ± 100 BP	Stellmoor (D)	Bone.
K-4578	10100 ± 100 BP	Stellmoor (D)	Bone.
K-4262	10110 ± 100 BP	Stellmoor (D)	Antler.
K-4326	10140 ± 105 BP	Stellmoor (D)	Bone.
OxA-3634	10320 ± 80 BP	Remouchamps (B)	Cut partial maxilla of *Rangifer tarandus.*
OxA-4190	10330 ± 110 BP	Remouchamps (B)	Cut proximal humerus of *Tetrao urogallus.*
OxA-2563	10610 ± 100 BP	Geldrop-Mie Peels (NL)	*Pinus* charcoal from a hearth.
OxA-4191	10800 ± 110 BP	Remouchamps (B)	Cut proximal right metacarpal of *Rangifer tarandus.*

Table 2.14: Radiocarbon dates for the Ahrensburgian.

The vast majority of Ahrensburgian dates come from Stellmoor, a number of them falling in the Pre-boreal. However, most of the Stellmoor dates fall within the range 9,700 to 10,100 BP, and we should note the important research by Becker and Kromer (1991),which indicates that there is a plateau in the radiocarbon calibration curve at around 10,000 BP lasting for a minimum of 250 years, and quite probably 3-400 years. Some of the other Pre-boreal dates appear in any case to come from either fauna or bone artefacts which may not be directly associated with the Ahrensburgian archaeology from the site (see Bodil Bratlund's comments in Hedges *et al.* 1993).

CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

There are two main problems relating to the chronology of the Belgian Lateglacial which have been highlighted in the preceding pages. Firstly the number of well dated sites, and of actual dates from them, is inadequate to sustain any detailed analysis of temporal patterning. Secondly, and far more importantly, there is the poor quality of the majority of dates already available. This problem is not unique to Palaeolithic and Mesolithic archaeology; however, it is within these fields that such problems usually become the most acute. Sample selection and documentation are two crucial elements in the production of radiocarbon dates that make a date of lasting use, yet it is in this area that the Belgian chronology falls down again and again, as we have seen. Some of the problems created by poor sample documentation have been addressed by the two AMS dating projects outlined and discussed above. However, these can only be a beginning.

Ideally, there should be further dating work on sites which presently lack any absolute dates, and further dating of collections which have been recently re-evaluated. However, whether the human and financial resources will be available for such projects is a very open question. The dating evidence discussed within this chapter has gone some way towards resolving the question of the date of the earliest human re-colonisation after the Last Glacial Maximum. There seems to be no clear evidence for human presence in Belgium at or around the Late Glacial Maximum itself (*circa* 18,000 BP). Very early conventional radiocarbon dates, such as those from the Trou des Blaireaux or the Grotte de

Sy Verlaine, appear to be extremely dubious, probably because of the nature of the samples used. In the case of the Grotte de Sy Verlaine, one can argue convincingly that the conventional date (Lv-690) has been superseded by an accelerator date (OxA-4041) on a directly modified specimen. Sadly, the situation is left ambiguous in the case of the one accelerator date so far available from the Trou des Blaireaux (OxA-4200). Indeed, the earliest dates which can be seen as reliable are the accelerator dates from the Trou de Chaleux, Grottes de Furfooz, Trou da Somme, Trou Burnot, Grotte du Coléoptère and Grotte de Sy Verlaine. These all fall at the latter part of Dryas I/Bölling interface. A consistent chronology appears to be hinted at within these, suggesting that the Magdalenian may be restricted to a far more limited period of occupation in Belgium than hitherto expected. Perhaps humans did not move this far north until the milder Bölling phase was beginning. The precise nature of human 're-colonisation' and presence in Belgium (and more generally north-western Europe) after the Late Glacial Maximum and during the Lateglacial is still largely unknown. Of the techno-complexes discussed in this chapter, the Magdalenian appears to be the 'earliest' currently known.

One of the initial problems faced at the outset of this research was whether the Magdalenian, Creswellian and Tjongerian were broadly contemporary, or whether instead they were chronologically successive. The evidence to date indicates that the archaeological residues represent sequential but not necessarily continuous periods of human settlement during the Lateglacial.

THE FAUNAL ASSEMBLAGE FROM THE TROU DE CHALEUX

INTRODUCTION

In this chapter I will concentrate primarily on the faunal material recovered from the Trou de Chaleux, although where appropriate I will also compare this material with other relevant collections. I will start by discussing all known excavations at the site, and the stratigraphy reported by earlier excavators. This will be followed by an analysis of the faunal assemblage recovered by Édouard Dupont. Each species will be discussed in detail. Firstly the behaviour, ecology and biostratigraphy will be outlined. This will be followed by a more detailed examination of the Body Part Representation (BPR) information for each species. Finally the butchery evidence will be discussed and interpretations will be offered, where appropriate, of the butchery activities which took place at Chaleux. The presence of a relatively small proportion of intrusive specimens will be discussed, as will the occurrence and identification of 'exotic' species. The concluding sections of this chapter will present an overview of the arguments, and general comments relating to Lateglacial butchery practices at Chaleux.

BACKGROUND

The first excavations at the Trou de Chaleux, Province of Namur (50° 13' 18" North, 4° 56' 30" East), were undertaken by Édouard Dupont. He initiated, organised and supervised the first systematic survey and excavation of Pleistocene and Holocene cave deposits in Belgium since Schmerling's 1834 study *Recherches sur les ossements fossiles découvertes dans le Province de Liège*. Dupont's work began under the auspices of the Société Royale des Sciences, Lettres et Beaux-Arts de Belgique. During the initial stages of research, detailed accounts of these excavations and preliminary results were published in the Bulletin de la Société Royale des Sciences, Lettres et Beaux-Arts de Belgique

(Dupont 1865a & b; 1868a & b). Results were also presented in a series of published letters to the minister of the Interior, M. Alphonse Vandenpeereboom (Dupont 1865c; 1865d; 1867b) followed by the apparently final publication of his research on these sites in his 1872 monograph *L'Homme pendant les âges de la Pierre dans les environs de Dinant-sur-Meuse.* During the initial post-excavation work Dupont was aided by P.J. Van Beneden (fauna) and M. Hazeuer (archaeology) (Dupont 1865d).

Unfortunately, precise descriptions of the faunal collection from Chaleux have remained largely unpublished, and consequently unknown in detail to many archaeologists and palaeontologists. Instead the faunal collections have languished in the store rooms of the Institut Royale des Sciences Naturelles de Belgique (IRScNB) in Brussels for almost a century, virtually untouched. The results of Dupont's' final analyses are thus largely unknown, although it has become apparent during the course of current research that he continued to work on this material long after his 1872 account. No primary archives (letters, notes or notebooks) relating to any cave of Dupont's excavations during the 1860s remain at the Institut: it is believed that such material was lost during the occupation of Belgium during World War II (A. Leguebe pers. comm.).

However, some of the original museum displays and printed labels relating to the Trou de Chaleux have survived, and yield at least a little information about Dupont's later research. Those relating to the fauna held in the reserve collections are all initialed by Dupont, and dated *avril 1907.* The extent to which Van Beneden contributed to this later work is unclear, and it is assumed here that these labels reflect Dupont's research, and no-one else's. The labels outline the stratigraphy of the site, and discuss the archaeology and associated faunal assemblages. Minimum number of individual counts (MNI) are included for the different species present (based on the most frequent anatomical element). Details of the presence and location of butchery evidence on the animal bones is provided, bone breakage patterns are described and brief discussions of how these may relate to human behaviour are included. Sadly, although these relate to a large number of specimens, they are extremely brief; in effect they are a series of notes.

Few subsequent excavations have taken place at the Trou de Chaleux. In 1914 Étienne Rahir published an account of his research at the site between 1900 and 1902, detailing six small trenches placed in various areas of the cave floor. Their location and Rahir's comments suggest that Dupont's initial trench(es) covered much of the cave floor of the central chamber. Rahir (1914) reports finding large quantities of bones and bone fragments, but the only species named is bear. None of this material was located during my research (it should have been housed in the Musée Royaux d'Art et d'Histoire, which funded the excavation) and consequently it has not been included in the study.

More recent excavations at the site were undertaken by the *Service de Préhistoire, Université de Liège*, with the aim of clarifying many of the problems left unresolved by Dupont (Otte & Teheux 1986; Otte & Cabboi 1988). The final publication of this research appeared as the text for this dissertation was being finalised (Otte *et al.* 1994). Unfortunately, it was not possible for me to examine the fauna from this excavation, as it was already under study by another faunal analyst, Marylène Patou-Mathis. However, where appropriate in the following discussion, comparisons will be drawn between the Dupont collection and the Otte collection as published by Patou-Mathis (1994).

STRATIGRAPHY

Dupont recorded a complex stratigraphic sequence at the Trou de Chaleux (1865a, planche I), the layers of which he numbered 1 to 9 from base to top (Figure 3.1) the original French is given in italics, with my translations in plain text:

1. *Dépôt d'argile rouge, de sable, etc., stratfiés.* Deposit of red clay and laminated sand.
2. *Première habitation de cette caverne par l'homme. Cette époque d'habitation peut être fixée au moyen de la petite couche de graviers et rapportée ainsi aux coupes complètes du quaternaire.* Initial human occupation of this cave. This occupation can perhaps be correlated with the middle of the small bed of gravel and thus related to the sections spanning the Quaternary.

3. *Dépôt des sables argileux dans lesquels une tête d'Ursus spelaeus et d'autres ossements ont été recueillis.* Deposit of clayey sands from which a skull of *Ursus spelaeus* and other bones were recovered.
4. *Chute d'une partie de la voûte à l'entrée de la caverne.* Rockfall from part of the cave roof at the entrance of the cavern.
5. *Époque principale de l'habitation de la caverne par le homme contemporain de la faune du renne.* Main era of human occupation contemporary with the reindeer fauna.

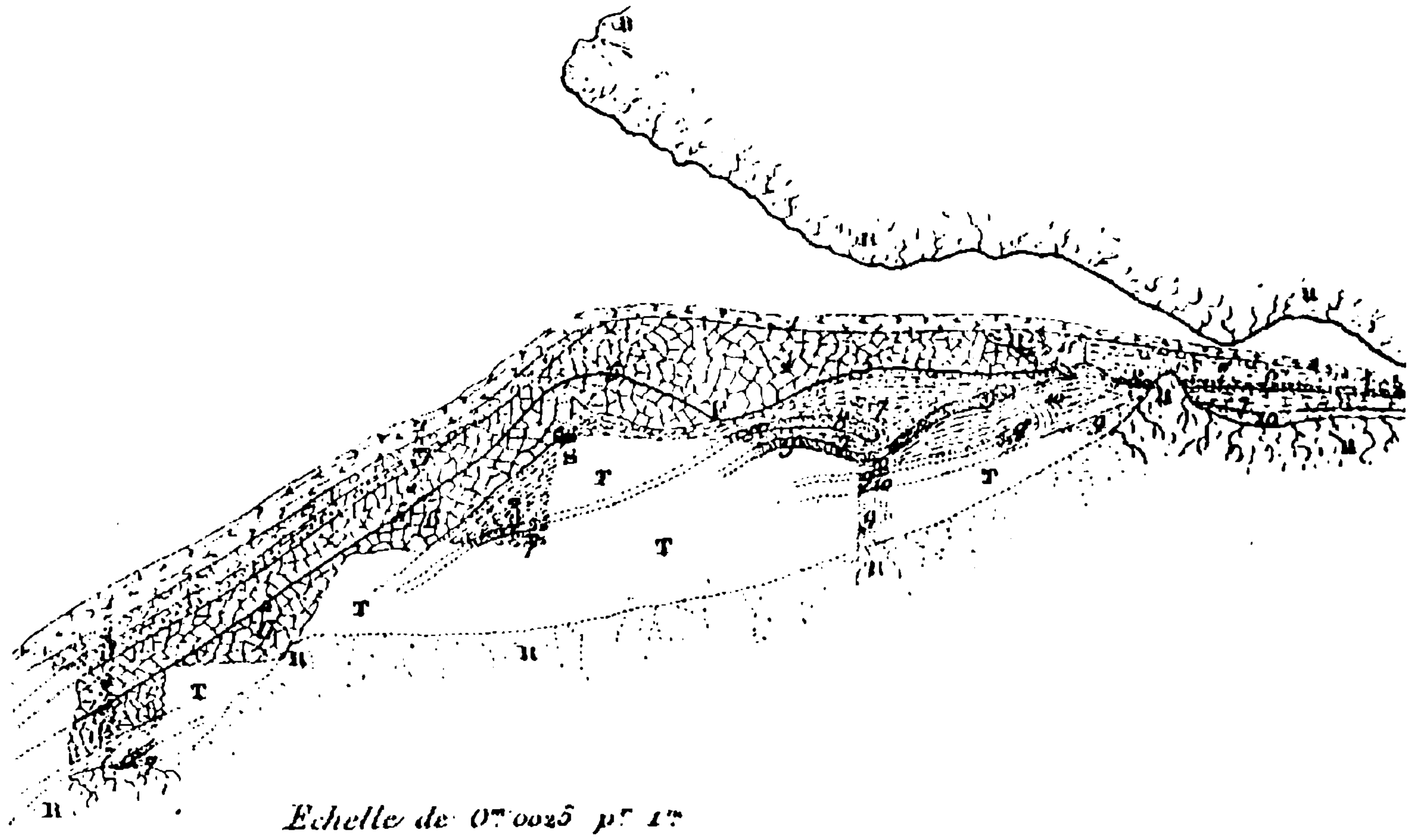

Figure 3.1: Section of the Trou de Chaleux (from Dupont 1865).

6. *Chute d'une partie de la voûte sur presque toute l'étendue de la caverne.* Rockfall of part of the roof covering almost the entire area of the cave floor.
7. *Troisième habitation de la caverne par l'homme. Il a laissé peu d'objets, mais il fut encore contemporain de l'age du renne*[1]. The third occupation of the cave by humans. They left behind few traces, but were clearly contemporary with the 'Reindeer Age'.
8. *Dépôt de l'argile jaune et du loess.* Deposit of yellow clay and loess.
9. *Argile rouge sableuse.* Sandy red clay.

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[1] "L'Age du Renne" was a term coined by Lartet & Christy (1875) and quite widely used throughout the latter part of the 19th and early 20th Centuries to correspond to the Upper Palaeolithic, and more specifically the Magdalenian.

10. *Argile rouge, pure, à râclure brillante.* Red clay, pure, shiny when scraped.

In a museum display dated *Août 1905*, currently held in the IRScNB reserve collections, layer 5 of the stratigraphy described in 1865 is referred to as the *1er niveau ossifère*. This is the only piece of the archival material which gives any indcation of the correlation between the fauna held in the IRScNB stores, attributed to the *1er niveau ossifère*, and the layer (*couche 5*) which yielded abundant Magdalenian artefacts (Figure 3.2) and indicates that they are, in fact, the same.

In July 1985 Eric Teheux directed a small excavation at the site under the auspices of the *Service d'Archéologie Préhistorique* of the University of Liège (Teheux 1985). He located an archaeological level (which he termed *couche 4*) sandwiched between two layers of cryoclastic scree (*couches 3 and 5*). A 'hearth' thought to be of Lateglacial age was also identified. Excavations continued in 1986, 1987 and 1988, confirming the initial stratigraphic observations made by Teheux (Otte & Teheux 1986; Lejeune 1987; Otte & Cabboi 1988; Otte *et al.* 1994).

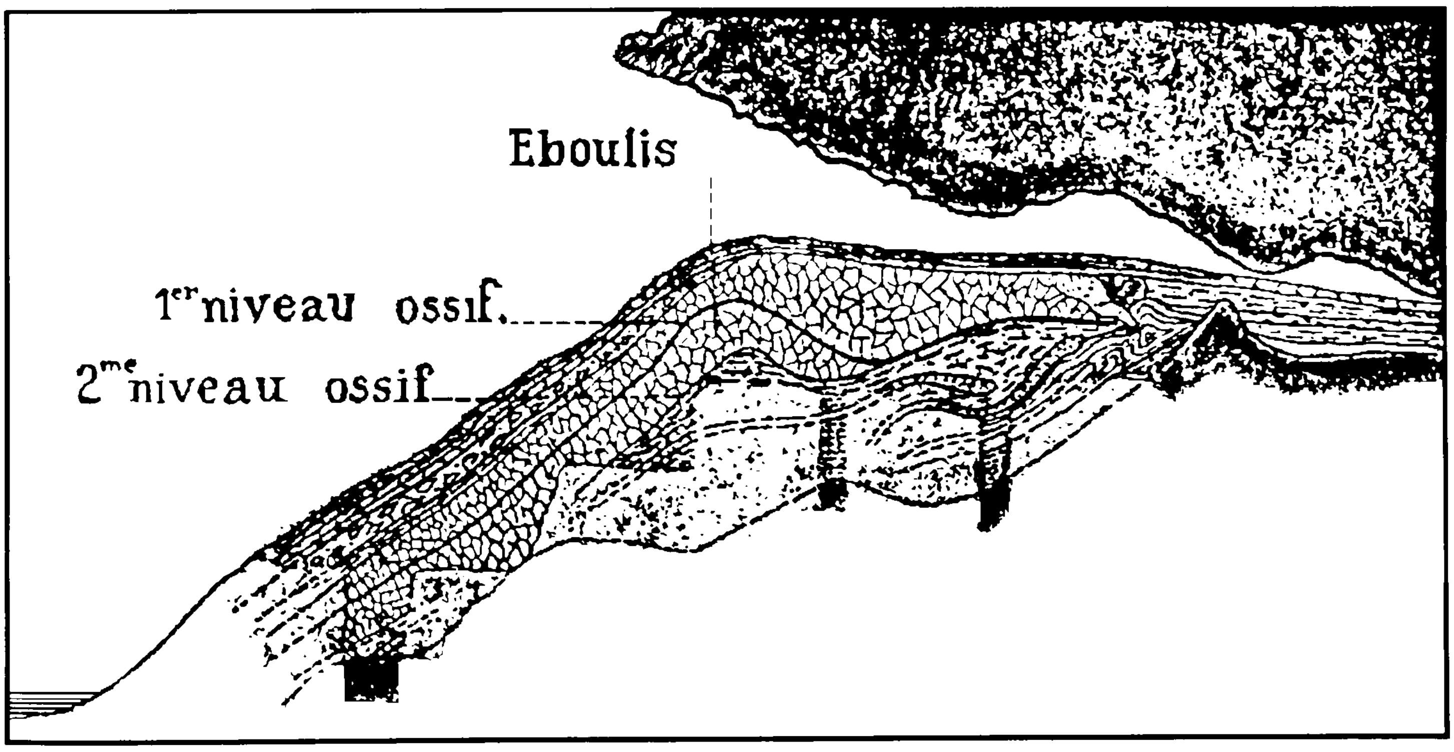

Figure 3.2: Section of the Trou de Chaleux dated *Avril 1905*. IRScNB archive.

Comparisons between Figures 3.1, 3.2, and 3.3 indicate close agreement between observations made by the most recent excavators and those of Dupont. The rockfall treated as a separate unit by Dupont (couche 6) is undifferentiated in the more recent work.

Inspection of the vertical distribution of artefacts from the recent excavation campaigns (Otte & Teheux 1986, planches II & III) confirms a tight artefact spread corresponding with the illustrated archaeological layer. Consequently it is clear that the observations made by Dupont, a trained geologist, who was after all in the best position of all the excavators who have worked at the site to observe the original stratigraphy, are accurate where it is possible to check them.

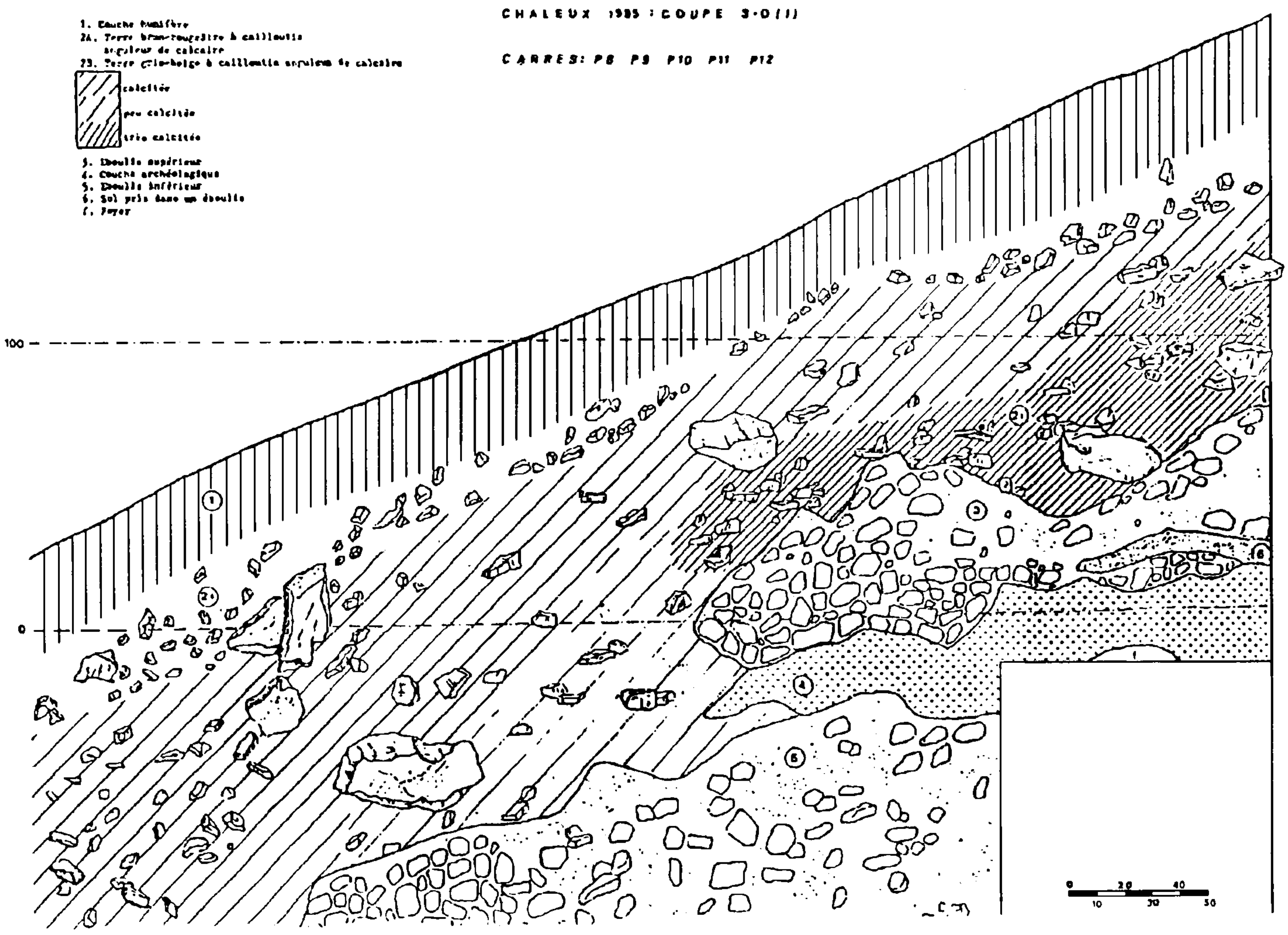

Figure 3.3: Section from the Trou de Chaleux (from Teheux 1985).

The term *2e niveau ossifère* is also used in the IRScNB stores by Dupont, and lay beneath the *1er niveau ossifère* (Figure 3.2). This appears to correlate with *couche 7* in the 1865 account. The material found here was again suggested to be Upper Palaeolithic by Dupont. However, Dewez (1987, 50) identified Dupont's *couche 8* as containing Middle Palaeolithic material, and no comment is made about Upper Palaeolithic material being provenanced to any layer apart from *couche 5*. No material from the *2e niveau ossifère* has been examined within the framework of this thesis, and it will not be discussed further here.

A final important feature of the stratigraphy recorded by Dupont was the presence of a hearth, at leat 1.5 m in diameter at the enterance of the cave. This contained abundant charcoal and burnt bones. The location of a second such hearth during the 1980's excavations has also been reported (Teheux & Otte 1989).

ARCHAEOLOGY

The archaeological material from the Trou de Chaleux is perhaps one of the most important Late Upper Palaeolithic collections from north-western Europe. Dupont recovered over 8,000 worked flints, of which 3,330 were formal artefacts (data from Dewez 1987), and a large amount of worked bone and antler. Of note amongst these latter finds are a series of bone and antler bevelled points (*sagaies*), eyed bone needles, needle cores of bird bone, pierced fox and horse incisors and two perforated ivory discs. In addition to these was a series of shells (many perforated) and fossils, presumably brought to the cave as manuports. Many of these are illustrated in Dewez 1987 (figures 66 to 111). Finally comes a small series of engraved[2] plaquettes. These were originally described by Twiesselmann (1951) and more recently by Lejeune (1987). Although lacking the 'harpoons' frequently found in many later Magdalenian assemblages across Europe and indeed found elsewhere within Belgium (at The Grotte de Sy Verlaine, Grottes de Goyet and Grotte du Coléoptère), the material is clearly Magdalenian. The term *Chaleuxien* was suggested by Rutot in 1903 in specific connection to this material. However, there seems to be no *prima facie* case to make this distinction from the Magdalenian, and the lithic assemblage includes a range of characteristically Magdalenian types (e.g. backed blades

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[2] More recently, Twiesselmann (1975) described the engraving of a female figure on a juvenile femoral head (species indet.); unfortunately this does not appear to be a true engraving of these characteristically stylised late Magdalenian representations. Instead, from the illustrations available (*op. cit.* figures 3 & 4), it appears to be a bone with both carnivore tooth damage and possible cut marks. These possible cuts do not appear to be intentional *engravings*. Unfortunately, I have not examined this particular specimen as it was not included within the faunal assemblage, consequently I do not wish to comment further upon it.

and bladelets (some denticulated), long end scrapers, *becs*, and *perçoir double type de Chaleux*[3]).

It is not within the scope of this dissertation to either describe or re-examine in detail the lithics and the formally worked bones, antler and ivory. A far more detailed discussion of the archaeological residues from the site can be found in Dewez (1987).

FAUNA

The faunal collection from Chaleux made by Dupont is quite remarkable given the date of recovery. Over 3,000 identifiable anatomical specimens are preserved in the IRScNB stores, alongside a further 24,000 (approx.) unidentifiable bone fragments from the *1er niveau ossifère*. Printed museum labels initialed *E.D.* and dated *avril 1907* are an integral part of this collection, each clearly giving a bulk accession number and provenancing the fauna to either the *1er* or *2e niveau ossifère*. It was the *1er niveau ossifère* which contained the Magdalenian archaeology and fauna, and research on the collections was restricted to this stratigraphic unit. It is apparent that this collection was extensively curated before the museum labels were printed in 1907. It seems most likely that this was with the aim of preparing an extensive comparative faunal collection and/or fuller publication of the material. All identifiable specimens were laid out on plaster trays (Plate 3.1), each tray having a printed label which described the material present and detailed the number of specimens cut, what butchery evidence was present and whether any had been smashed for marrow, and in some cases MNI counts are provided with details of what they were based on. Transcripts of all of these labels have been included for reference in Appendix I.

The collection appears to comprise a virtually complete faunal assemblage. All identified bones are labelled with species, anatomical element and (where possible) side information. Small bone fragments were identified to element and species by Dupont wherever possible. The trays are sorted by species and anatomical element. Unidentified bones and bone fragments are preserved in large quantities (Plate 3.2); these are stored

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[3] Brézillon (1983) describes these as "un object sur lame qui «affecte la forme d'un limace dont les cornes sont deux perçoirs latérales qui pointent en sens divergent»".

separately from the identified bones, and have also been sorted into ribs, vertebrae and indeterminate species/element groups. In a rough attempt to quantify the amount of this material, counts were taken of the number of unidentified bone fragments (Table 3.1):

Anatomical element	**Number**
Sp. indet bone fragments	20,689
Sp. indet. ribs and rib fragments	2,394
Sp. indet. vertebrae and vertebral fragments	464
Rangifer tarandus antler fragments	82
Total	24,656

Table 3.1: NISP counts of Sp. indet bone and *Rangifer tarandus* antler fragments.

Plate 3.1: Plaster tray containing specimens from the Trou de Chaleux.

The only material which was identifiable to species within the bone fragment drawers were reindeer antler fragments, some of them showing the distinctive traces of groove and splinter working. Overall this material has a combined weight of 86.135 kg.

These fragments had been sorted into size categories and into groups of fragments of similar morphology at some point in the past, presumably by Dupont himself, since he was the last person to work systematically on the collection.

Plate 3.2: Bone fragments recovered by É. Dupont from the Trou de Chaleux.

This is a vast and quite exceptional collection of bone material. It is common to find on even recent archaeological excavations that these elements of a faunal assemblage are discarded as of no research interest. Collections dating to the last century are frequently composed of a selection of specimens which the excavator/museum curator regarded as 'identifiable' or 'significant'. They rarely have any associated contextual data. As such they are generally considered unrepresentative, and are often shunned by researchers.

Given the sheer quantity of material preserved at the IRScNB from Dupont's 1865 excavations, and its meticulous curation, it seemed unlikely that this material was a 'selection'. Instead it showed all the signs of a faunal collection which has been extensively curated, but from which nothing had been discarded. Indeed, closer inspection showed the faunal assemblage to contain not only large and easily identifiable pieces but also the smaller bones (such as carpals, metacarpals, and sesamoids) in high numbers. The assumption that the collection held in the IRScNB is comprehensive and non-selective underlies the following analysis of the fauna.

Dupont retired from his post as Director of the Institut on the 31st November 1909, and died two and a half years later on the 31st March 1911, leaving behind a remarkable legacy of archaeological and palaeontological collections from a number of sites, including Chaleux. Subsequent research on this material has focused primarily on the lithic and worked bone artefact assemblages (see for example Dewez 1987; Lejeune 1987). In 1990 I began research on the Dupont faunal collection from Chaleux, specifically aimed at an examination of the butchery evidence; this is the first such study since 1907. In chapters 4 and 5 (the Trou des Nutons and the Trou du Frontal) I will discuss the similarites between the Chaleux assemblage and those from the two of the Furfooz caves (the sites are within 2 km radius and their human occupation during the Lateglacial appears to have been contemporaneous, possibly by the same human group), I will also consider similarities with other late Magdalenian sites in the South-East of Belgium. In this present chapter I will concentrate primarily on the evidence from the Trou de Chaleux.

Dating evidence

The radiocarbon evidence for this site has already been discussed in detail in chapter 2. It will be recalled that in total 7 radiocarbon dates are available for the site. Three of these are conventional age estimates, and fall within the Bölling Interstadial phase of the Lateglacial. A further four accelerator dates were obtained as part of this research project, all of which were on single modified and identifiable bones provenanced to the *1er niveau ossifère* (see Table 2.5). They unquestionably date human activity at the site; three of these dates fall in the earlier part of the Bölling, whilst the fourth (OxA-4193) confirms the suspected presence of later prehistoric elements within the assemblage. Both the radiocarbon evidence and the range of species present (discussed in detail below), especially that of saiga antelope (*Saiga tatarica* - albeit a solitary cranial fragment with partial horn core), indicate a Bölling age for the bulk of fauna recovered from the *1^er^ niveau ossifère* (*cf.* Delpech 1975 cited in Currant 1986). Species composition is broadly similar to other north-western European Bölling age sites, such as Gönnersdorf and Andernach in Germany, Gough's Cave at Cheddar, Church Hole Cave, Pin Hole Cave and Robin Hood's Cave in Britain.

The associated archaeology is clearly late Magdalenian, and although the site lacks some of the distinctive *fossiles directeurs* of final Magdalenian (such as barbed points), the presence of backed blades and bladelets, denticulated microliths, multiple piercers and elaborate worked bone, antler and ivory (especially double-bevelled sagaie bases) are undisputed indicators of the late Magdalenian in Belgium. The radiocarbon dates are also in line with other accelerator dates from a number of Belgian late Magdalenian sites, such as the Trou de Nutons, Furfooz (chapter 4), Trou du Frontal, Furfooz (chapter 5), the Grotte du Coléoptère à Bomal-sur-Ourthe (chapter 6) and the Grotte de Sy Verlaine (chapter 7).

Species range and identification

The large mammal assemblage from Chaleux is clearly dominated by wild horse (*Equus ferus*), although the following species are also present: red deer (*Cervus elaphus*), reindeer (*Rangifer tarandus*), saiga antelope (*Saiga tatarica*), a range of bovids (including those identified by Dupont as *Bison priscus* and *Bos primigenius* and *Ovibos moschatus*), Chamois (*Rupicapra rupicapra*), at least one other caprid (*Capra* sp.), wild boar (*Sus scrofa*), brown bear (*Ursus arctos*), wolf (*Canis lupus*), glutton (*Gulo gulo*), fox (*Vulpes* sp.), badger (*Meles meles*), at least one felid, identified by Dupont as *Felis chaus* (*Felis* sp.) and hare (*Lepus* sp.). The relative proportions of these are laid out in detail in Table 3.2 below.

All the bones from the *1^er^ niveau ossifère* appear to be in the same state of preservation. Species such as *Equus ferus*, *Rupicapra rupicapra*, and *Rangifer tarandus* alongside a large bovid do not appear to be out of place within a Belgian Lateglacial assemblage. However, the inclusion of the latter may indicate that faunal material was also incorporated in the *1^{er} niveau ossifère* during a cooler phase, most probably the end of Dryas I or possibly the beginning of Dryas II. At least some of the reindeer are present due to human agency; there is clear evidence for sinew extraction from the metapodials and other lower limb elements. Offcuts of grooved and splintered antlers (where identifiable all are reindeer) are apparent in the collection, so it seems clear that this raw material was worked at the site. A number of antler *sagaies* with double-bevelled bases were recovered by Dupont (Plate 3.3). This gives the overall impression that for the most part the assemblage is broadly contemporaneous and of Lateglacial age, more specifically spanning the latter part of Dryas I and the earlier phase of the Bölling.

Plate 3.3: ***Sagaie*** **bases from the Trou de Chaleux. Scale in mm.**

Certain *exotic* species, such as *Felis chaus* (jungle cat) and *Ovibos moschatus* (musk ox), present in Dupont's faunal list, would not normally be expected in a north-west European Lateglacial assemblage. The specimens identified as jungle cat (similar to the Kaffir cat in colouring and build, present day distribution ranging across the Nile delta, Algeria, India and South East Asia to Indo-China: unrecorded from other Lateglacial contexts in Europe) were re-examined by myself and Dr Mietje Germonpre in the Institut. We concluded that they were certainly felid, but inseparable from the comparative specimens of wild cat (*Felis sylvestris*) and/or lynx (*Lynx lynx*) available to us. Dupont's label described the specimens as:

> "Felis chaus. Appelé chat des jungles aux indes et chat rouge par les cafres, il habite toute l'afrique et le sud de l'asie jusqu'a la caspienne. A l'époque quaternaire il remontait jusque sous nos lattitudes. Schmerling l'avait déjà distingué du chat sauvage (1830-1833), mais, depourvu des pièces de comparison, il avait désigné sous le nom de Felis magna."

It is unclear why Dupont should select *Felis chaus* as his final species designation. In his 1872 book, the only felid referred to is *Felis sylvestris* (the European wild cat); however *Felis sylvestris* does not appear on any of the archive labels from the *1er niveau ossifère*. The only possible explanation I can suggest is that Dupont's later travels in Africa led him to consider this species as a possible component of the European Lateglacial megafauna. The specimens from Chaleux were more robust than any of the comparative specimens available, and the denomination of *Felis chaus* may have been chosen because it is larger than a wild cat, but smaller than a lynx. This does not seem fully satisfactory; however, without further access to comparative material and/or Dupont's original research notes, it is the only plausible explanation which has presented itself.

Musk ox (*Ovibos moschatus*) poses an entirely different problem. Musk oxen are found today in extremely cold, arid environments, often in exposed areas with light snowcover. Their modern distribution is restricted to areas of the Canadian arctic and Greenland. They have not been recorded elsewhere in Lateglacial contexts from Belgium or adjacent regions. Wilkinson (1975, 10) commented that he felt the identification of musk oxen within the Chaleux assemblage to be dubious, although he did not examine the specimens concerned. The specimens are clearly from medium sized bovids, smaller than *Bos primigenius*. A selection of the IRScNB specimens were taken to the Natural History Museum (London), where their identification as *Ovibos moschatus* was confirmed by Andrew Currant and myself. A number of these fossils displayed very clear butchery marks. Subsequently one specimen (a 1st phalanx) was submitted as a radiocarbon sample for the Oxford Accelerator. This resulted in OxA-4192 (12860 ± 140 BP; Table 2.5), which falls on the traditional boundary of the Bölling/Dryas I.

Glutton or Wolverine (*Gulo gulo*) is occasionally found in Lateglacial faunas from north-western Europe. A single left scapula identified by Dupont as *Gulo borealis* was located within the IRScNB stores. The identification of wolverine was verified by myself and A.P. Currant at the Natural History Museum in London. Wolverines rarely mix with humans; they are solitary predators. Marks on the bone surface were suggestive of butchery marks, although not conclusive. With this in mind, it seemed possible that the specimen could have been introduced into the cave by humans, and it was considered as a potential radiocarbon sample. However, further examination of the possible butchery marks on the specimen by J. Cook of the British Museum indicated that some of the marks might be natural, whilst others might be due to accidental modification during excavation and the remainder were inconclusive (J. Cook pers. comm.). Therefore it was decided not to proceed further with direct dating of the specimen.

The inclusion of *Capra* sp., *Sus scrofa*, *Meles meles*, *Lepus* sp. and *Vulpes* sp. within the *1er niveau ossifère* indicates some mixing with later Holocene sediments at the Trou de Chaleux. Our knowledge of the presence/absence of *Meles meles* and *Sus scrofa* during the Pleistocene and Holocene in Europe is extremely poor. The presence of *Meles* is often taken as an indicator of later Holocene material being included within an assemblage, although the presence of *Sus* is more ambiguous, as this species is frequently found in Late Weicheselian deposits in other parts of Europe without presenting any biostratigraphic problems (Boyle 1990, *passim.*). However, given the strong probability that more recent fauna was included within the *1er niveau ossifère*, it was decided to test this suggestion by submitting a single cut specimen for accelerator dating. A cut distal humerus of *Sus scrofa* was selected (Plate 3.4) and the resulting date (OxA-4193 3060 ± 85 BP; Table 2.5) is clearly later prehistoric, although the specimen was in the

Plate 3.4: Cut distal humerus of *Sus scrofa* from the Trou de Chaleux. OxA-4193 3060 ± 85 BP. Scale in mm. Photo by Gwil Owen.

preservation state typical of the majority of the Chaleux fauna. Other sites in Belgium, and more specifically the Lesse Valley, also include wild boar (see chapters 4 and 5) as part of the Lateglacial megafauna in their faunal lists. At present there is no clear indication as to whether *Sus scrofa* was ever truly part of any Belgian Lateglacial fauna.

Lepus sp. and *Vulpes* sp. are both present in the Chaleux collection in high numbers; indeed, they are two of the most numerous species represented (see Table 3.2). These specimens were highly variable in both size and condition, suggesting that they may include elements of very divergent ages, and possibly different species. It is possible that *Lepus timidus*, *Lepus europaeus*, *Vulpes vulpes* and *Alopex lagopus* are all present. Recent research at the Robin Hood Cave, Creswell Crags (Charles & Jacobi 1994) has outlined the difficulties of separating *Lepus timidus* and *Lepus europaeus*. The robust nature of many of the hare bones strongly suggests their Pleistocene age in the case of Chaleux. Indeed, intensive processing of many of these hares, reminiscent of that found at Robin Hood Cave (*ibid.*), was noted. This will be discussed in further detail below.

Similarly the osteological differences between *Alopex lagopus* (arctic fox) and *Vulpes vulpes* (common or red fox) are minute (the main points of differentiation are minor differences within the structure of the teeth) and the distinction is more commonly made on the basis of contextual information and relative size. Again, such information is ambiguous in the case of Chaleux. The collection clearly contains specimens of divergent ages, consequently variations in the size of individual bones may be linked with species size variation through time, rather than the presence of two separate but closely related species. Due to the time restrictions on my stay in Belgium, I did not consider the possible differentiation of the two fox species to be of primary importance, preferring to concentrate on documenting the butchery evidence from the site, and cataloguing the entire collection. As with the hares, butchery evidence was clearly present on a few of the foxes and will be discussed in the section on butchery below. An added problem was the lack of good comparative material with which to make a clear differentiation between the foxes. Whilst specimens of both species were available in the reference collections, these were fully articulated, and permission was not obtainable to de-articulate this material.

Notwithstanding the presence of some later material, it is assumed that the bulk of the fauna ascribed to the *1er niveau ossifère* and discussed here is undoubtedly of Lateglacial age. A large proportion of the identified fauna from the site has been the subject of human activity. As far as this material is concerned, human presence could have been restricted to an occupation of a few weeks duration in which a tremendous quantity of meat was processed (and some presumably dried and stored), or alternatively the residues could reflect a number of visits over extended period(s) of time. It is interesting that five of the radiocarbon dates (including the three Lateglacial accelerator dates) cluster in the earlier phase of the Bölling, and it seems probable that the human use of the site may be restricted to this time.

Within the Chaleux assemblage there is also a substantial quantity of bone which does not bear any traces of human activity. Its presence could be due to carnivore, human or natural agency, most likely to a combination of all three. Many carnivores and omnivores are known to den in caves, and members of both these groups are present in the Chaleux assemblage (bear, wolf, fox, badger, and wolverine). Indeed, carnivore damage in the form of gnawed bones is present, although in relatively low frequencies. There are numerous pieces of evidence suggesting that faunal material was accumulated within the *1er niveau ossifère* over a greater period of time than the period(s) of human occupation, perhaps by several agencies. Whilst the extant radiocarbon chronology for this site is more extensive than that of the majority of Belgian Lateglacial sites (see chapter 2) this is only a beginning. Further radiocarbon dates which can be directly linked with human activity are essential if we are to gain a more detailed indication of the time span(s) over which the site was in use during the Lateglacial. It would be an extremely interesting project to date further modified specimens of a number of species at the site. Of major interest amongst these would be the single specimen of *Crocuta crocuta* (hyaena) noted by Patou (1992 & Patou-Mathis 1994) in the Otte collection. This species was not recorded by Dupont in either the *1er niveau ossifère* or *2e niveau ossifère* (Dupont 1872). Although the material from the *2e niveau ossifère* was not part of my study, I can confirm that no specimens of *Crocuta crocuta*, nor any bone modification clearly attributable to them, were present within the Dupont collections from the *1e niveau ossifère*. Other suggested occurrences of hyaena dating to the Lateglacial remain dubious, and it seems likely that this species was already regionally extinct across much of north-western Europe (*cf.* Charles & Jacobi 1994).

Because of the problems involved in differentiating faunal material incorporated within the cave sediments by a number of agencies and the potential variability in age of components of the assemblage, my study focused on specimens which showed clear butchery marks. This approach identifies specimens within the assemblage which have been subject to modification by human agency, and permits the detailed reconstruction of economic activities.

Seasonality

Because of the problems of determining seasonality from horse remains (the primary Magdalenian prey species), few attempts have been made to re-construct a seasonality model for the Lesse valley. One notable exception to this has been the work of Aaron Stutz (Stutz 1993), who produced an undergraduate dissertation on the tooth cementum increment data from teeth provenanced to Upper Palaeolithic sites in the Meuse Basin. The technique itself is well established (see, for example, Pike-Tay 1991), and needs little comment here.

Amongst the material Stutz examined were caprids and cervids, all believed to be of Lateglacial age, from the Dupont collections from the Trou de Chaleux, Trou des Nutons and the Trou da Somme (a site not in the Lesse valley, but in close proximity). The results from 6 Chaleux caprids (Stutz 1993, 47-49) split evenly between winter and summer deaths. Results from the Trou des Nutons at Furfooz (*ibid.*, 48-49) were based on 15 caprid teeth (13 adult and 2 juvenile), 4 reindeer molars (2 adult and 1 juvenile) and a lone adult red deer lower P3. The caprid teeth suggested that death took place in the winter, spring and summer. The reindeer samples were interpreted as indicating a minimum of two seasons of exploitation for the reindeer - winter/early spring and summer. The red deer was a winter death. The two samples from the Trou da Somme, a *Capra* sp. lower right

M2 and a cervid left upper M1, gave results of spring/summer (the cervid) and winter (the caprid) deaths.

These results led Stutz to propose a reconstruction of Magdalenian settlement patterns in the Lesse valley. He suggested the Trou des Nutons data could not indicate a continuous base camp habitation because of the poverty of the archaeological assemblage from the site. Instead he suggested that Magdalenian hunter-gatherers did not visit the region seasonally, but 'instead, at least during some years, they remained in the Lesse Valley.' (Stutz 1993, 52). In contrast, the data from Chaleux suggested to Stutz that hunter-gatherers remained at that site to hunt horse and ibex during the autumn and winter. It was then suggested that the large numbers of horse from Chaleux represent a 'few intensive kill episodes that occurred over a short period of time' (*ibid.*), as the occupation of the site could have been punctuated during the year by small groups hunting other species. The conclusions from this, taken alongside the archaeological evidence of long distance links, are that the success of Magdalenian settlement of the region depended on an emphasis on flexibility. Hunting was intense, but episodic - a response to unpredictable resources such as migratory horses. Settlement, and by inference social organisation, 'involved frequent short-distance locational moves by groups of a few nuclear families surviving on a diverse subsistence base.' (*ibid.*).

One would not wish to criticise too harshly an unpublished undergraduate dissertation. However, certain points have to be made about Stutz's study, especially as it is now being used in the archaeological literature as a proven example (Straus *et al.* 1993). The vision of Stutz's work is admirable, and his objective (seasonality evidence for the Belgian Upper Palaeolithic and within that a model for the Lesse valley is much needed). However, this has not been fully achieved as yet. I will discuss the faunal collections from the Trou des Nutons and Trou du Frontal at Furfooz in greater detail in Chapters 4 and 5. But the relevant point is that they contain a far higher proportion of later prehistoric and possibly even historic species than the Trou de Chaleux. Because there are indications that certain components of the Chaleux assemblage are significantly more recent than the Lateglacial, especially the caprids from the site, there has to be some question as to the true age of specimens studied by Stutz. Also his analysis by necessity could not include the horse teeth (the technique used is only suitable for certain ungulate species, and before the very recent research of Ariane Burke (1992), horse was not believed to be one of these), although *Equus ferus* is one of the few species that can clearly be demonstrated to have been of primary significance during the local Magdalenian during the Bölling Interstadial (chapter 2).

The caprids in the assemblages from Chaleux and the Furfooz caves appear to be mostly recent. The species identifications in Stutz's dissertation are *Capra* sp. with the exception of one specimen from the Trou des Nutons (SFUR6), where a specimen is identified as *Capra ibex*. No comment is made throughout the dissertation as to who made these identifications, or when: as the Dupont collections are clearly labelled with Dupont's original identifications, it seems likely that it was these labels which were the source of these identifications. *Capra* sp. is as likely to be *Capra hircus* as *Capra ibex*, since it is very difficult to differentiate the two species osteologically. Given the mixed nature of the assemblages, especially at the Furfooz caves, I find it hard to accept that these specimens were ibex rather than domestic goat. Verification of the original identifications is desirable, but unfortunately the specimens in question were removed from the IRScNB before I had had the opportunity to study them, and at the time of writing have yet to be returned.

The other species included in Stutz's study (reindeer and red deer) are also problematic. Whilst it is unlikely that reindeer persisted in the Lesse valley much after the end of the Lateglacial (*circa* 10,000 BP), it is unclear whether the reindeer specimens examined by Stutz were present as a the result of human hunting or the actions of other predators. This can only be demonstrated by a direct contextual link, such as butchery traces. These are present in very low numbers on the reindeer from Chaleux (this chapter), The Trou des Nutons (chapter 4) and Trou du Frontal at Furfooz (chapter 5), but it is unclear whether the specimens examined by Stutz were modified in any way. Even if the specimens were modified, it would still be difficult to link them directly to the Magdalenian use of the site *circa* 12,800 BP. Indeed it would be a useful exercise to obtain AMS dates for samples of modified reindeer from the sites in question (preferably specimens examined by Stutz) to establish the absolute age of reindeer exploitation at the site.

The lone red deer P3 from the Trou des Nutons presents a similar problem. The one radiocarbon date for red deer from the site is clearly Roman or late Iron Age (OxA-4194 2210 ± 80 BP). Whilst red deer is likely to have been a component of some Belgian Lateglacial faunas, the red deer from Nutons have yet to be demonstrated to be of that age. Again the question of the relevance of Stutz's seasonality data on this specimen (which was unavailable during my own research) could be resolved by both examination of the specimen for evidence of human modification and accelerator dating if this were appropriate.

Leaving these difficulties with the Lesse Valley material aside, Stutz's data on both the caprids and red deer may well be of use to researchers working on later prehistoric use of the Lesse valley. The reindeer samples provide a useful indicator for seasonal presence of this species during the Lateglacial, although they have yet to be linked to either human activity or the major exploitation of horse which appears to have generated the overwhelming majority of the archaeological residues. The technique used is an excellent one, and recent developments by Ariane Burke (1992) suggest that a similar method may already be available for horse teeth, offering an ideal opportunity to test the model proposed by Stutz against the major prey species. An added bonus is that on my final research visit to the IRScNB, I was able to locate a substantial number of the horse teeth recovered by Dupont from the Trou de Chaleux. Until then these specimens were believed to be lost, and had been so recorded in the IRScNB archive. This occurred too late for a study of tooth thin sections to be included as part of my doctoral research, but it should offers prospects for future work.

Subsequent discussions with Aaron Stutz in April 1994, yielded more information about the specimens used in his dissertation. In an electronic mail message addressed to me, dated 11 April 1994, he wrote that in retrospect my suspicions about the presence of intrusive material could be strengthened by his own observation that the caprid remains from Chaleux and Furfooz were significantly larger than modern comparative of *Capra ibex* available in the Harvard Museum of Comparative Zoology, and in all cases were 'very well preserved'. It appears that the possibility that the material might have come from domesticates had not been considered during the initial project.

I suggested in reply that Stutz might be the best placed of all of the researchers working on the Belgian Upper Palaeolithic to undertake further seasonality work on Chaleux via the horse teeth, and he indicated that he would like to pursue this path.

1865 excavations versus 1980s excavations

In an ideal world it would be desirable to compare the data gathered by Dupont in 1865 directly with that from the recent University of Liège excavations (Table 3.2). However, such comparisons were initially only possible at a very basic level, making use of the provisional table published by Patou[4] (1992, 312). This paper was only a preliminary account, and so one had to be cautious in drawing any distinct conclusions until her research was published in greater detail (Patou-Mathis 1994). However it can be clearly seen from her initial account that the material recovered by Dupont by far outnumbers that from the more recent excavations. Many of the faunal counts given in her 1992 paper have been updated in her 1994 paper, and it is these, not the ones published in 1992 which are taken to be the definitive figures[5]. Under the circumstances, Patou appears to have done an excellent piece of work. Throughout her study she was unaware that the Dupont collection still existed (M. Patou-Mathis pers. comm.) and concerned herself solely with the more recently excavated material. A simple count of the relative percentages for different species in the two assemblages serves to illustrate the effect of this limitation. Eleven of the species present within the Dupont collection have not been identified by the more recent excavators. There are also three 'extra' species listed by Patou which are not included within the Dupont assemblage: *Alopex lagopus* (arctic fox) *Crocuta crocuta*

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[4] M. Patou is now publishing work under her married name, M. Patou-Mathis.

[5] It should be noted that *Oryctolagus cuniculus* (rabbit) appears in the 1992 list, but not in the 1994 one. Presumably these Lagomorphs have been included within the more general category *Lepus* sp.

Species	**NISP (1985-8)**	**MNI (1985-8)**	**% of ident. fauna**	**NISP (1865)**	**MNI (1865)**	**% of ident. fauna**
Equus ferus	123	10	41.27	2457	54	67.15
Equus hydruntinus	2	1	00.67	0	0	00.00
Ovibos moschatus	0	0	00.00	78	2	02.13
Bos sp.	5	2	01.68	58	2	01.59
Saiga tatarica	0	0	00.00	1	1	00.03
Capra ibex	3	1	01.01	0	0	00.00
Capra sp.	0	0	00.00	77	8	02.10
Rupicapra rupicapra	34	6	11.41	29	3	00.79
Ovis aries	0	0	00.00	1	1	00.03
Rangifer tarandus	7	2	02.35	149	4	04.07
Cervus elaphus	5	1	01.68	22	1	00.60
Cervus sp.	7	-	02.35	0	0	00.00
Capreolus capreolus	0	0	00.00	4	1	00.11
Sus scrofa	0	0	00.00	55	3	01.50
Ursus arctos	5	1	01.68	65	2	01.78
Gulo gulo	0	0	00.00	1	1	00.03
Meles meles	0	0	00.00	66	5	01.80
Crocuta crocuta	4	2	01.34	0	0	00.00
Vulpes sp.	14	3	04.70	473	17	12.93
Alopex lagopus	9	1	03.02	0	0	00.00
Canis lupus	6	1	02.01	29	1	00.79
Bear or Hyaena	3	-	01.01	0	0	00.00
Felis sp.	0	0	00.00	34	4	00.93
Castor fiber	0	0	00.00	1	1	00.03
Lepus sp.	71	4	23.83	50	2	01.37
Mustela sp.	0	0	00.00	9	2	00.25
Sub total	**298**		**100.01**	**3659**		**100.01**
Unidentified bones & bone fragments	1638			24574		
Total	**1936**			**28233**		

Table 3.2: Comparison between fauna from the 1985-8 & 1865 collections. Data relating to the 1985-8 excavations taken from Patou-Mathis (1994).

(hyaena) and *Capra ibex* (ibex). There is a fourth category which is empty within the Dupont fauna: *Cervus* sp. (indet. deer) as I was able to identify all cervids to species. It is obviously difficult to comment on these differences without having studied the 1985-8 fauna, but I would like to offer a few suggestions:

1. As the sample collected by the University of Liège during the 1980s is considerably smaller than the Dupont collection, it is probable that species are missing due to the effects of small sample size.

2. The inclusion of species characteristic on the one hand of the Holocene (*Oryctalagus cuniculus*) and on the other of the mid-Weicheselian (*Crocuta crocuta*) suggests that the 1980s excavation might have inadvertently included faunal elements of divergent ages.
3. Since the 1865 collection certainly contained species which are of distinctly different ages (see above), it seems possible that the 1980s material may be similarly composed.
4. The presence of *Alopex lagopus*, alongside *Vulpes vulpes*, clearly reflects the size variability of the foxes in the assemblage. It is, however, notoriously difficult to differentiate these two foxes. It is a common assumption that arctic fox (*Alopex lagopus*) rather than red fox (*Vulpes vulpes*) is present in Pleistocene faunal assemblages, and this may be the basis for Patou's identifications. However, we do not know that *Alopex lagopus* was the only fox present in north-western Europe during the Lateglacial, nor it is clear that the Otte collection is free from Holocene contamination.

Butchery Evidence - Overview

Cut marks, made by the accidental contact of sharp tool edges with bones during butchery activities, occur very frequently on the Chaleux bones. Examination of the surviving museum faunal displays show how far ahead of his time Dupont was in his concern with evidence for the human modification of bone and the inferences which may be drawn from this data. Carnivore damage and butchery marks are frequently indicated on the specimens in red ink. Points of bone fracture are also marked by ink annotations, and correlated with what Dupont identified as fixed points of impact along the shaft of the bones. Surviving illustrations from the turn of the century, stored alongside bone *montages* illustrating these impact points (Plate 3.5), graphically illustrate the ideas he developed over a century ago about systematic carcass processing.

It appears to have become part of popular archaeological mythology that Lewis R. Binford "discovered" cut marks and their archaeological potential. Binford made no such claim in his 1981 book (published in the same year as Potts' and Shipman's research on butchery evidence from East African faunal assemblages) and a search through the archaeological literature of the 19th and 20th centuries shows that earlier workers were well aware of this type of evidence, and to a greater or lesser extent its investigative potential (see, for example, Dawkins 1874, 339; Lartet and Christy 1875, Pl. B.XVII N°s 2 & 4; Martin 1921).

Plate 3.5: IRScNB museum display by É Dupont showing systematic bone breakage patterns.

As mentioned above, carnivore damage, in the form of gnawing, is also present, although less frequent. My research has focused on the identification and interpretation of humanly induced bone modification, seeking its correlation with particular hunting and butchery strategies. In general, evidence for such modification can be broken down into 3 broad categories:

1. **Bone lesions**, either 'fresh' or 'healed', some of which may contain fragments of projectiles (such as those illustrated by Noe Nygaard (1975, plate 1) or Bratlund (1991a, 195; figures 18.2 to 18.6).
2. **Cut marks**, produced during the processing of a carcass, in this case with stone tools. Such marks relate to skinning, dismemberment/disarticulation or meat filleting, depending on their location and orientation on individual bones.
3. **Bone breakage**, as a deliberate part of the process of marrow extraction.

Bone lesions

In the case of Chaleux, no hunting lesions, either 'healed' or 'fresh', were observed on any of the bones. Bratlund (1991a) observed 27 separate lesions on the bones from the Stellmoor collection, a by-product of hunting with sophisticated projectiles, including bows and arrows. During September 1993 I was briefly able to visit Dr Bodil Bratlund at Schloß Gottorf in Schleswig. There I was shown the specimens from Stellmoor with 'fresh' bone lesions. This visit confirmed my existing view that there were no such lesions visible within the Dupont collection from Chaleux. Given the size of the Chaleux faunal assemblage (3582 specimens identifiable to species and element) it seems worth considering the possibility that these animals were obtained by a form of hunting and/or trapping which did not involve the use of projectile technology.

Little is known in detail about Palaeolithic hunting strategies: the number of people involved in a hunt, the logistical arrangements and the technologies involved are often suggested on the basis of ethnographic parallels. Dealing with an environment with no precise modern day analogue, such parallels, often recorded only in passing by ethnographers and travellers during the last few centuries, can only provide general indicators and starting points for further speculation. It is extremely likely that the Lateglacial hunter-gatherers of Europe used a wide range of hunting and trapping techniques, some of which may not have been replicated by other groups in the more recent past. It is with this in mind that I suggest the possibility of the use of traps, or 'unattended facilities', to obtain both large and small mammals.

Cut marks

The evidence of cut marks clearly indicates that a large proportion of the animal remains were deposited at the site as the direct result of human activity. Analysis of the butchery marks makes it possible to identify a number of different butchery activities on the part of the Lateglacial occupants; to some extent this varies between species. Meat removal is foremost in this list, filleting marks (usually running obliquely and longitudinally along the shafts of the bones) being extremely frequent. Likewise there is evidence for the dismemberment of limbs from the trunk, and subsequent disarticulation (Figure 3.4). As with Gough's Cave at Cheddar (Parkin *et al.* 1986), there is consistent evidence for the systematic removal of tendons from the lower limbs. These tendons may have had many uses for late Palaeolithic hunter-gathers, although most can only now be guessed at. Among the more likely uses are as raw material for the manufacture of bindings (such as those used to help attach projectile points to shafts), bow strings (although it should be noted that there is no direct evidence for bows throughout the Belgian Magdalenian) and snares.

It is also probable that skins were removed, and used, either for the production of clothing, or for the manufacture of tents and/or wind-breaks. Evidence for skinning is notoriously difficult to identify from cut marks, not least because it is highly desirable to remove the skin without piercing the facia (a membrane which separates skin from muscle) and thus avoiding contact with bone; adhering meat increases the time needed for butchery and adequate hide preparation. If present at all, cuts are likely to be located transversely across specific areas of limb bones or on the skull or cervical vertebrae. On the limb bones, position will vary (for example, between the humerus, radius, carpals and

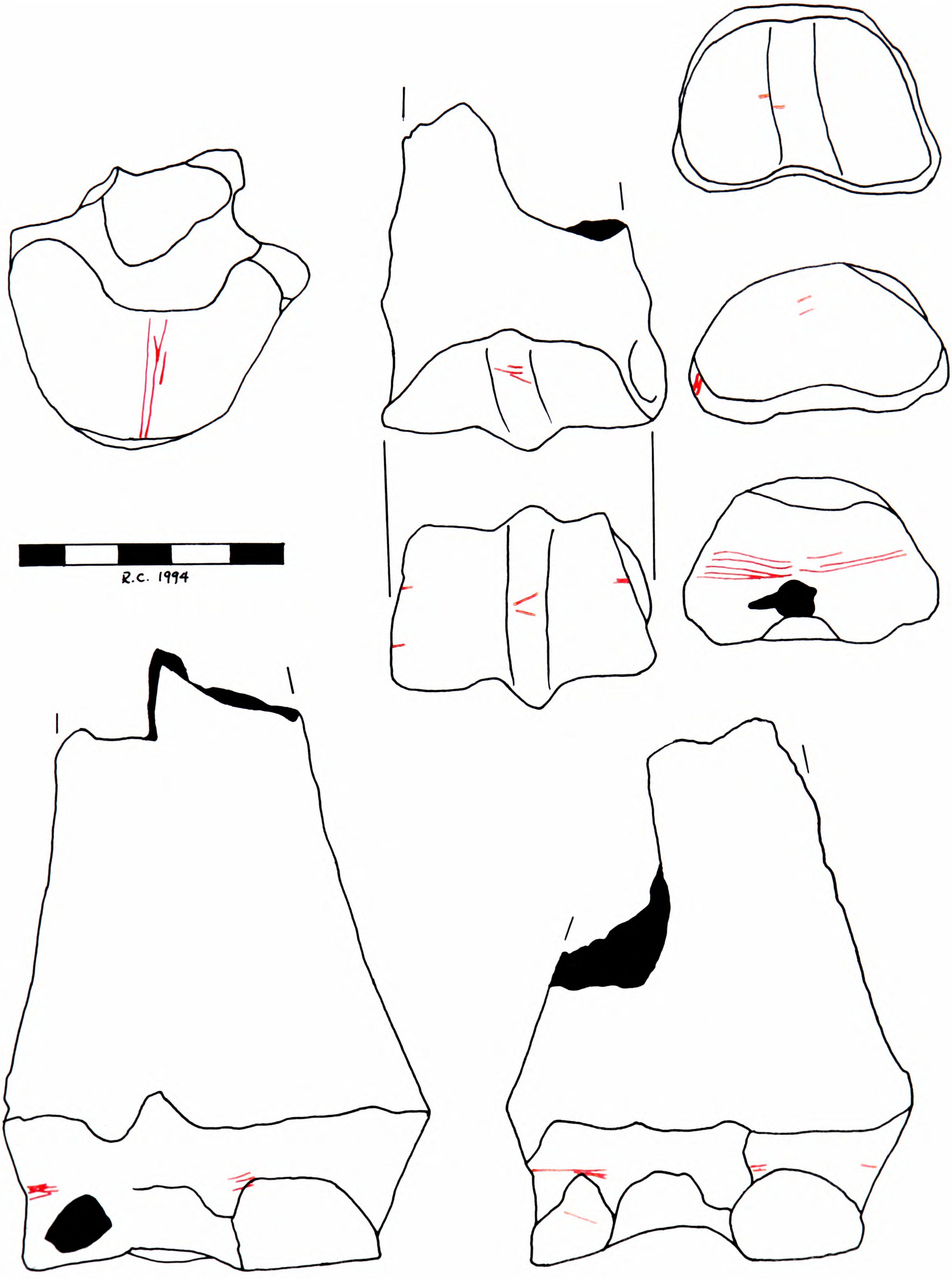

Figure 3.4: *Equus ferus* bones with cuts on the articular surfaces, indicating disarticulation. Trou de Chaleux IRScNB collection.

metacarpals, depending on how far down the limb it is required to remove the skin; frequently such marks circle the limb). Other variation will reflect specific specific cases, individual preference or group style/tradition. As an alternative, it is possible to butcher an animal wholly within its skin, which may then be used as a container for the residues (Penny Dransart pers. comm.). In such cases, skinning marks will not have been produced.

Bone breakage

It is particularly difficult to differentiate humanly induced bone breakage immediately post-mortem from later 'natural' breakage due to other agencies such as roof falls. I have not concentrated on this aspect because of the problems involved. However, the bones in the Chaleux assemblage have been extensively broken, and virtually no complete specimens are present for the large mammal species. This observation alone would not be sufficient to demonstrate that humans were the agents of breakage, but in addition a number of anatomical elements show a remarkable and recurrent pattern of breakage. Many of the bones have been longitudinally split, including the tibiae, metapodials and 1st phalanges (Plates 3.6 and 3.7). It is possible, though unlikely that such breakage patterns could be caused by 'natural' agencies: however, I have not previously observed such trends in other faunal assemblages I have examined. In all cases it occurs on a high proportion of the anatomical elements present. Indeed, with reference to the phalanges, it appears extremely unlikely that this type of damage could be due to natural factors alone; *Equus* phalanges are extremely robust, with a dense internal bone structure. I regard this type of fracture/breakage as wholly uncharacteristic of 'natural' damage, where phalanges usually break into proximal and distal halves. Whilst some longitudinal splitting might occur due to chance factors alone, it is extremely unlikely to be present in high frequencies as a natural phenomenon; instead, it seems likely that this breakage pattern is the result of human intervention.

It is possible to draw a striking parallel between the breakage patterns found on the *Equus* 1st phalanges from Chaleux, and those published by Bouvier (1979) from the Lateglacial faunal assemblage of La Madeleine. The more recent publication of the Late

Magdalenian fauna from Etiolles by Poplin (1994) shows the same breakage pattern (*ibid.* figure 65), although the large mammal fauna from this site is too poorly preserved to permit accurate identification of butchery marks. In the cases of La Madeleine and Chaleux clear points of percussion can be seen, generally located in the centre of the posterior face of the phalanx, towards the proximal end. Of the 153 *Equus* 1st phalanges from Chaleux, only 36 are complete, whilst 96 are longitudinally split, a further 21 show a variety of damage/breakage which generally following this pattern, but not completely split. Presumably, this splitting was done to provide access to the marrow in the 1st phalanges.

Plate 3.6: Longitudinally split *Equus ferus* tibiae from the Trou de Chaleux. Scale in mm and inches.

The 2nd phalanges (99 in total), are all complete. Bouvier (1979) is puzzled as to why the 2nd phalanges were apparently ignored for their marrow in his sample. An alternative suggestion from M. Levine (pers. comm.) is that the potential marrow reserves in the phalanges are minimal; she has noted that these bones were often used as cores for bone needles in other Upper Palaeolithic assemblages. In the case of Chaleux this does not, however, appear to be the case - no horse phalanges show traces of having been used as blanks for needle cores. There are no traces of secondarily worked *Equus* phalanges, so it appears that these bones were indeed split for their marrow content. There is a considerable relative size difference between the 1st and 2nd phalanges of *Equus*, and their respective marrow reserves are different. The 1st phalanges were worthwhile breaking (and perhaps easier) whilst the 2nd phalanges were apparently not.

Plate 3.7: Longitudinally split *Equus ferus* metapodials from the Trou de Chaleux. Scale in mm.

DISCUSSION OF INDIVIDUAL SPECIES

Within this section I will discuss each species identified within the Dupont collection from Chaleux seperately. In each case I will start by discussing the known information about that species' behaviour and environmental preferences. Then, where appropriate, I will discuss the known biostratigraphic information. This will be followed by the analysis of body part representation, butchery marks and any evidence for bone breakage.

Order Perissodactyla

Family Equidae

Equus ferus - wild horse

The wild horse or Tarpan is by far the most abundant species in the Chaleux collection. There are 2,457 individual identifiable bones of horse within the Dupont collection, accounting for 67.15% of the entire assemblage. The designation *Equus ferus* rather than *Equus caballus* (Dupont's designation) is followed here. *Equus caballus* is based on descriptions of modern domestic horses, which in turn have been the subject of intensive morphological change due to selective breeding. Whilst all true horses are caballoid, the designation *Equus ferus* is preferred here (*cf.* Webb 1994, 5-9). Consequently, a relatively recent palaeontological convention has been to ignore designations based on domesticates, instead reverting to the oldest available name for the wild form (Currant 1986; A.P. Currant pers. comm.). As Currant notes:

> "it is ecologically unlikely that dozens of distinct species ranged the Eurasian region during the Pleistocene. For the present, all British Late Pleistocene true horses are referred to as *Equus ferus* following Groves (1974)." (*ibid.*, 294)

Following this argument, the Belgian Lateglacial horses were termed *Equus ferus* throughout my fieldwork and this thesis. Minor differences of size and morphology are put down to variation between populations rather than considered to be of significance at the species level. Currant also stressed the possibility that, whilst it has often been assumed that all Late Pleistocene Equids were true wild horses, European Upper

Palaeolithic representations of Equids include a range of distinct morphologies which suggest that asses may also have been part of the regional megafauna (*ibid.*, 295). Indeed, the presence of *Equus hydruntinus* (European wild ass) was identified by Spiess (1979) at the Abri Pataud in the Dordogne. Webb's recent study of fossil equids in the Plymouth area clearly identifies *Equus hydruntinus* as a part of the Pleistocene megafauna of north-western Europe. Patou-Mathis (1994, 175) suggested that *Equus hydruntinus* might have been present within the fauna recovered by the Université de Liège from the Trou de Chaleux on the basis of 2 specimens - a fragment of calcaneum and a proximal right metacarpal (MC II). In this case the claim for *Equus hydruntinus* appears to be based on size criteria alone, and Patou-Mathis comments (*ibid.*) that neither of these two bones can really be attributed to *Equus hydruntinus* with absolute confidence. Webb's recent study (1994) gives details of the morphological differences between the two species and notes that there is also a marked size difference and supplies biometric data for the recognition of selected post-cranial elements. Clearly, in the light of Webb's study and Patou-Mathis' claim it would be a useful exercise to re-examine the equid material held at the IRScNB with the specific objective of establishing whether *Equus hydruntinus* also formed a part of the Chaleux assemblage.

As will be seen in subsequent pages, there are many striking parallels between the equid material from Chaleux and that from the British site of Gough's Cave. The first that will be noted here is that the bones from Chaleux, as with those from Gough's, are so fragmentary that they defy analyses of overall limb proportions essential to the differentiation of living groups of equids on the basis of skeletal material. Currant published measurements for the only complete Equid bones in the Gough's Cave assemblage, the 1st and 2nd phalanges (*ibid.*, Table 3). This information has been compared with the 1st and 2nd phalanges from Chaleux, the results of which are presented in Figures 3.5 & 3.6.

The measurements of both the 1st and 2nd *Equus* phalanges from Chaleux fall in and around the cluster of measurements from the Cheddar specimens. Some of the Chaleux specimens are smaller than the ones from Gough's, although this could be accounted for by the presence of juveniles in the Chaleux assemblage. The phalanges may not be the best bones upon which to base a comparison, but they are the only ones available, and certainly suggest that the Equids from both Gough's Cave and the Trou de Chaleux fell within the same size range. Whilst this cannot be taken as conclusive proof the species designation, it does indicate that the Lateglacial hunters at Chaleux were taking horses of similar size to those at Cheddar. The strongest possibility seems to be that these horses were true wild European horses (*Equus ferus*), rather than asses or hermiones.

Further work on the horse species attribution could have been done by examination of the morphology of the teeth. A small number remain *in situ* in maxillae and mandibulae, and a greater number of loose teeth were recorded by Dupont (1872, 182-183; Appendix I). The loose teeth were not with the main portion of the collection in the IRScNB stores during my main study visits, indeed, the printed labels which belonged with them were marked *manqué*. Only the fragmentary portions of mandibles and maxillae were available for research during this time, and the evidence which could have been extracted

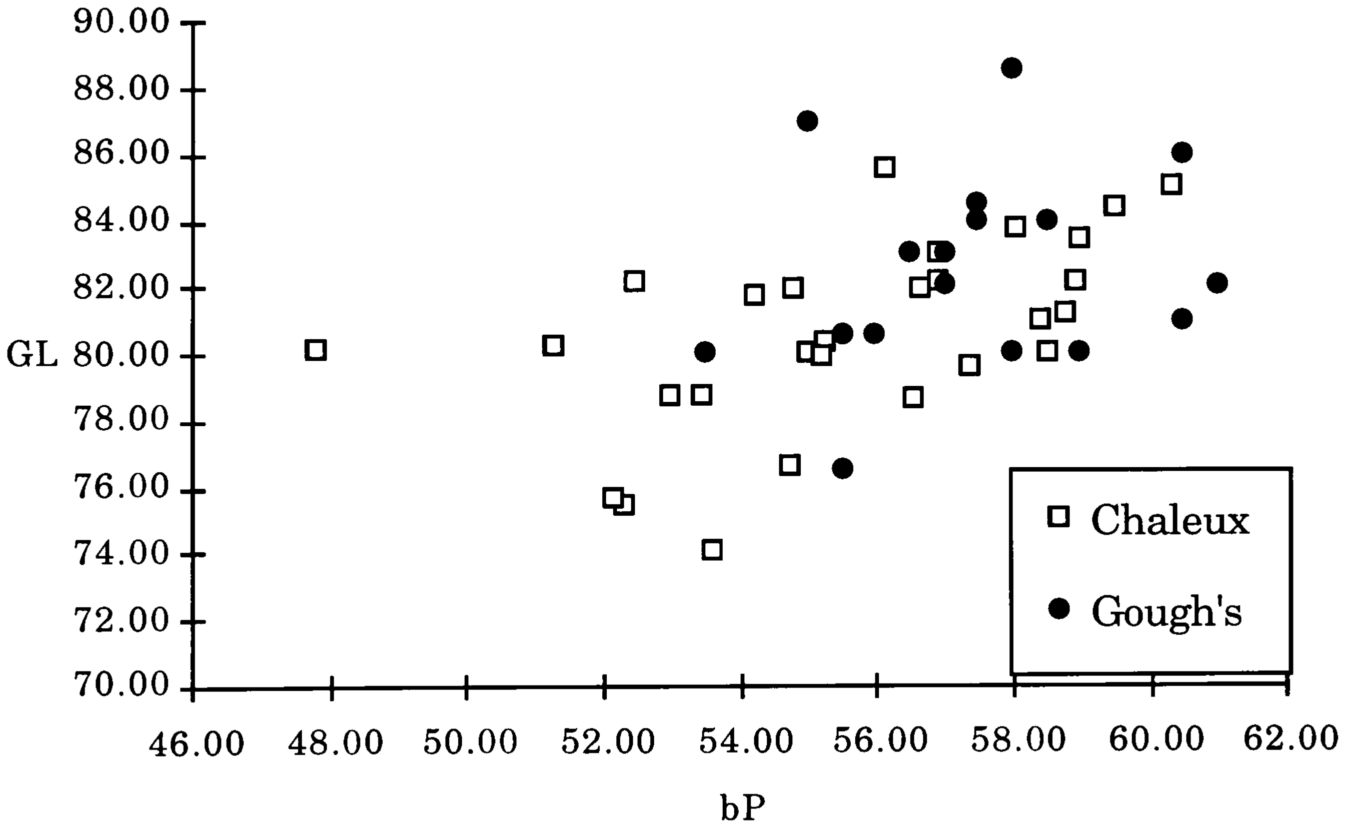

Figure 3.5: ***Equus*** **sp. 1st phalanges from Chaleux and Gough's Cave, Cheddar.** (all measurements in millimetres; GL = Greatest Length, bP = proximal breadth).

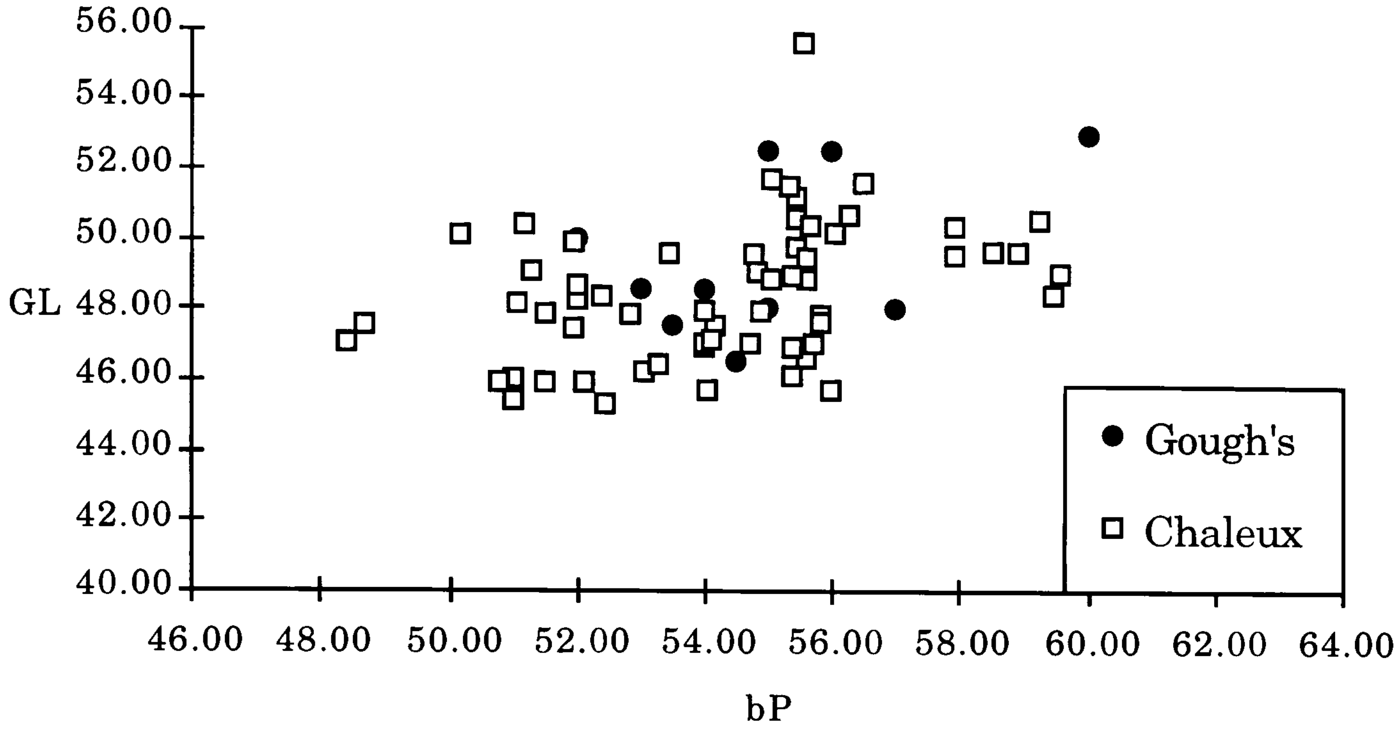

Figure 3.6: ***Equus*** **sp. 2nd phalanges from Chaleux and Gough's Cave, Cheddar.** (all measurements in millimetres; GL = Greatest Length, bP = proximal breadth).

from these seemed too slight to be worth the time involved. During a final visit to the Institut I located a part of the horse tooth collection from Chaleux in another part of the store, whilst undertaking a search among Middle and Early Upper Palaeolithic faunas. In retrospect, inspection of the dentine patterns of the extant teeth would have been a useful exercise. However, remaining time was so limited (2 days) that it was only possible to produce the most basic quantification of this material (specimen counts). Removal of specimens for destructive sampling is a sensitive matter and, given my inexperience with Burke's technique, I did not wish to make my first foray into this area using the Chaleux material. I have avoided using any estimates based on teeth data alone, as this material is only partial. Similarly the teeth are excluded from considerations of the %MNIs due to the complexity of calculating these when juvenile, adult and transitional dentitions are under consideration.

In theory, horse age data could have been obtained from both dental eruption sequences and crown height measurements. There is a problem with using this technique at Chaleux, in that the vast majority of the horse dental material is comprised of isolated teeth, and most of these are adult. These do not readily lend themselves to very precise age estimates, as it is highly difficult to identify specific teeth. Dupont claimed to have done this in his labels (see Appendix I), but the specimens which I located were incorrectly sorted into separate teeth (molars/premolars were mixed with canines and incisors). They had been separated from the rest of the collection after Dupont had labelled them, (they were in cardboard trays, inside a drawer in another part of the stores). In other areas of the collection where Dupont's identifications have been checked they were found to be almost always accurate. It is possible that the identifications of individual teeth also met Dupont's high standards, but that subsequent curation had inadvertently lost some of the detail of his original work. If time had been available it would have been an interesting exercise to identify these teeth individually and compare the overall counts with Dupont's totals. Crown height

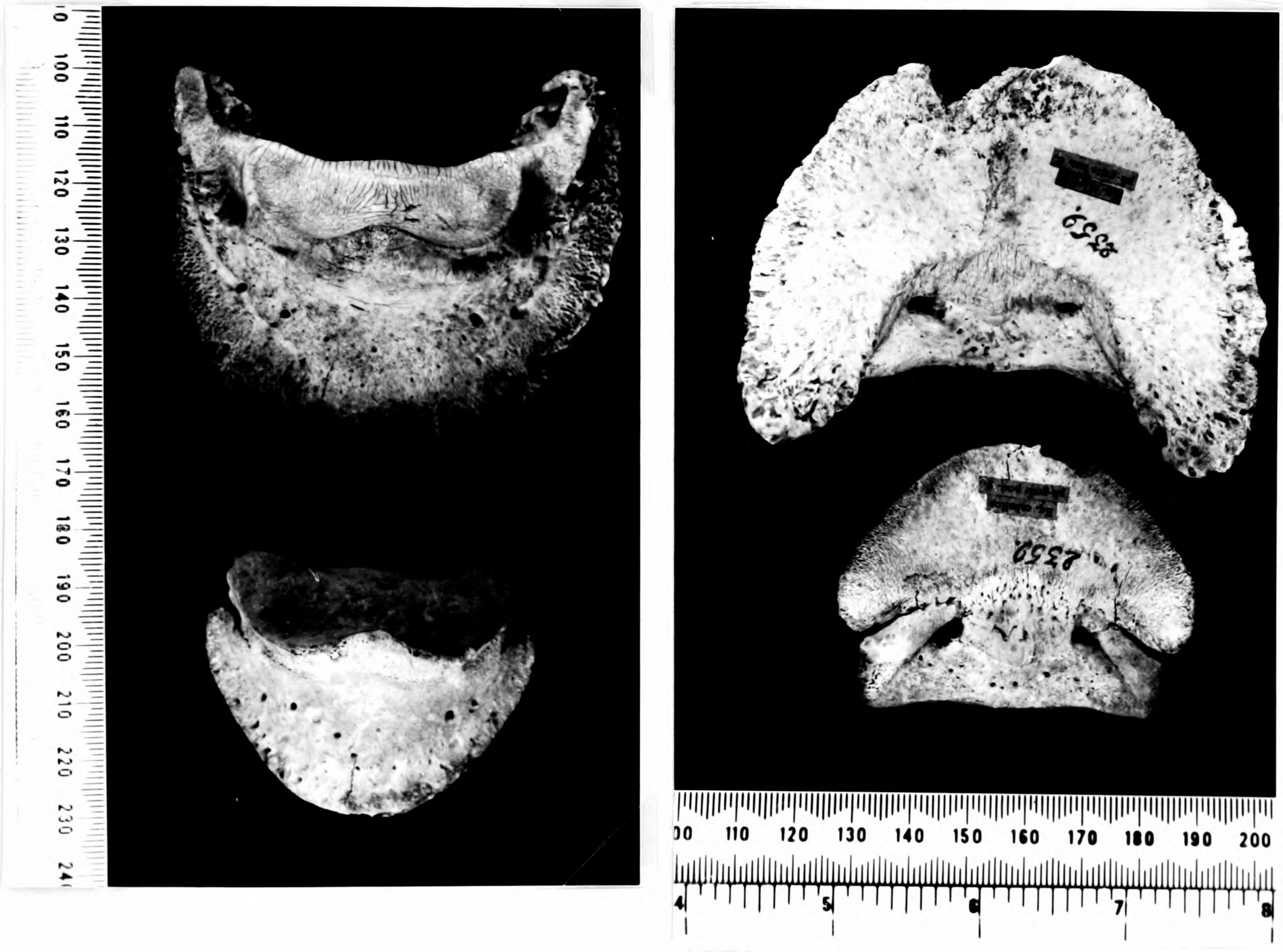

Plate 3.8: 3rd phalanges of *Equus ferus* from the Trou de Chaleux. Scale in mm and inches.

is highly difficult to identify specific teeth. Dupont claimed to have done this in his labels (see Appendix I), but the specimens which I located were incorrectly sorted into separate teeth (molars/premolars were mixed with canines and incisors). They had been separated from the rest of the collection after Dupont had labelled them, (they were in cardboard trays, inside a drawer in another part of the stores). In other areas of the collection where Dupont's identifications have been checked they were found to be almost always accurate. It is possible that the identifications of individual teeth also met Dupont's high standards, but that subsequent curation had inadvertently lost some of the detail of his original work. If time had been available it would have been an interesting exercise to identify these teeth individually and compare the overall counts with Dupont's totals. Crown height

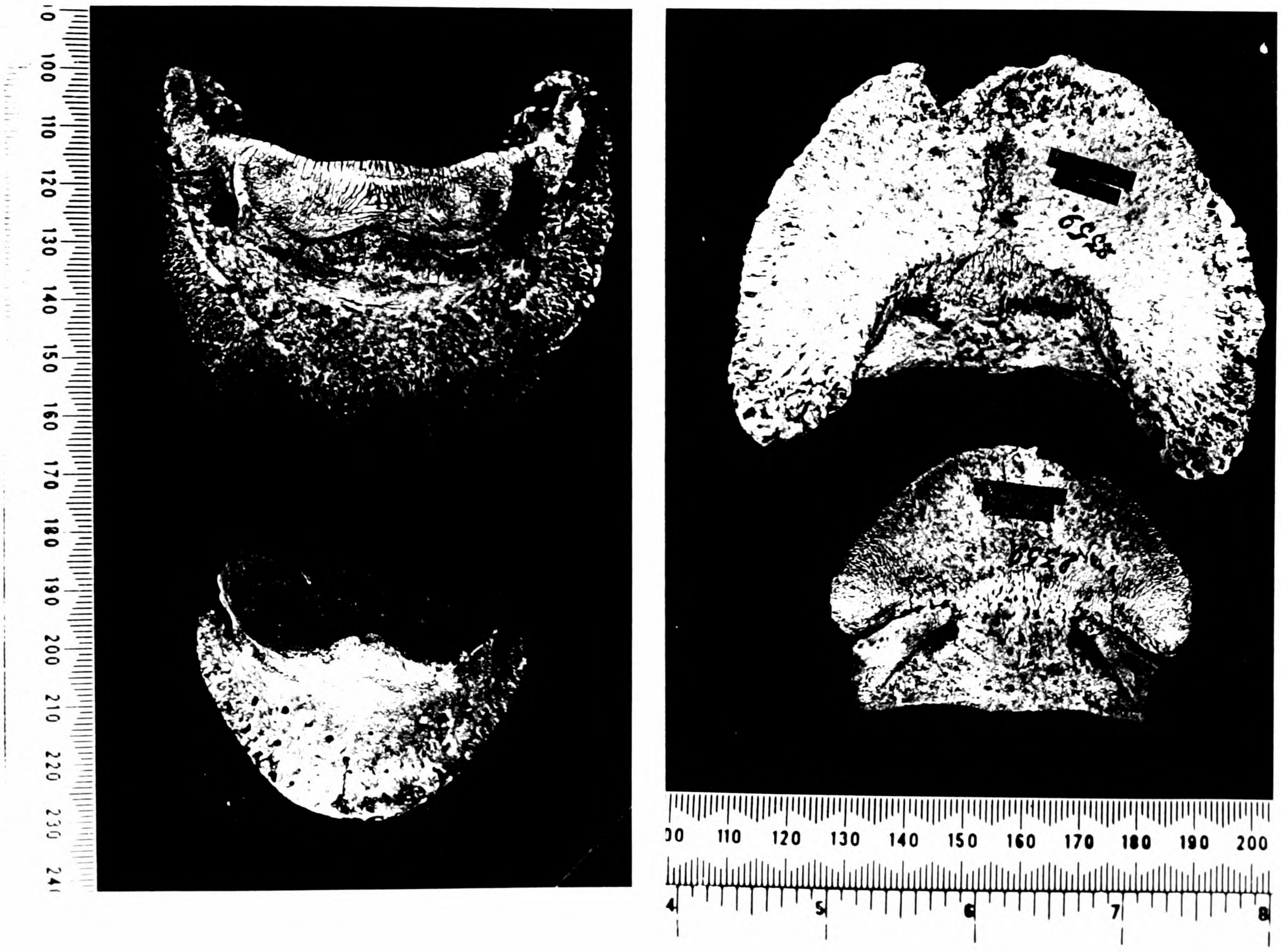

Plate 3.8: 3rd phalanges of *Equus ferus* from the Trou de Chaleux. Scale in mm and inches.

measurements offer an alternative method for establishing horse age structure from teeth (Levine 1982), but again time was simply too restricted to take the necessary measurements once these teeth had been located.

It should also be noted that Dupont used these teeth to produce his MNI calculation of 62[6] for the horses (Appendix I - archive label for accession N° 2387 based on upper right molars). There is evidence for at least two age groups of horses at the site, adults and new born foals. A small proportion of the collection is made up of juvenile horse bones, many of which correspond closely with the description by Getty (1975, 291-296) of neonatal up to six month old foals. Both first and second phalanges are fused distally but proximally unfused (the proximal ends are almost all missing in these cases), and there is a marked size between two clearly distinguishable groups within the third phalanges (Plate 3.8) corresponding to fully grown adult 3rd phalanges and those of new born foals illustrated again by Getty (*ibid.*, figures 15-66 & 15-67).

Behaviour and ecology of *Equus ferus*.

In truth, very little is known about the behaviour and ecology of the Late Pleistocene wild horse. The Tarpan is now extinct, the last known Tarpan died in captivity in 1918-19 (Spiess 1979, 256). In the most general terms its presence within an assemblage is usually taken to indicate regionally open conditions with dry grasslands most probably similar to the modern steppes. Today there are exceedingly few wild horse populations, the vast majority of modern horses being either feral reversions or domesticates. Behaviour patterns of geographically and evolutionary distant equids, such as Burchell's zebras (*Equus burchelli*) and the mountain zebra (*Equus zebra*), seem to have little relevance for the European Pleistocene populations. Studies of feral horse populations, such as the apparently wild horses of the Americas (imported alongside

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[6] My own MNI calculations based on right mandibles gave a count of 54. The teeth were not considered in my MNI calculations because of the difficulty in identifying them individually. Coincidentally this is close to Dupont's original MNI estimation of 56 based on a division of the total number of lower horse teeth (661) by the potential number of these teeth in each mandible (12). He appears to have made no allowance for juvenile teeth, although these are present within the collection.

numerous waves of invaders and colonists from the Old World), offer an unsatisfactory opportunity to attempt to discuss the possible behaviour of the Pleistocene horses. The other possible source of information are studies of the Przewalski horses, natives of the Russian steppes. These are considered to be the species of greatest similarity to the European Pleistocene horse by most researchers (Spiess 1979; Levine 1979; Boyle 1990). Specimens of Przewalski horses have been claimed to date to the Late Pleistocene (Bökönyi 1974). Both the Przewalski horse and the Tarpan stood between 125 cm and 145 cm at the withers (approx. 12 to 14 hands high). Western European cave paintings of horses bear a good resemblance to modern Przewalskis, showing the characteristic stiff manes and stocky bodies as well as the correct colouring. However, this group cannot provide an ideal analogy for Late Pleistocene horse behaviour. The modern distribution of the Przewalski horse is highly limited, Bökönyi (1974, 55) commented they are restricted to the salty steppe and the semi-desert, and that this habitat preference is due in part to the Prezwalskis avoidance of humans. If this is indeed the case, then their behaviour may well have been modified to allow them to inhabit such a region, and not reflect their original preferences. This only leaves the accounts of earlier zoologist and travellers, which are often highly anecdotal, from which to work (such as that by the brothers Grum-Grshmailo cited by Bökönyi 1974, 57-59). Whilst such accounts are often the only hints available to researchers about the behaviour of animals prior to intensive human contact, they may be very unreliable.

BPR for *Equus ferus*.

The Body Part Representation data and the graph derived from it using the Binford %MNI calculations are presented in Table 3.4 and Figure 3.7. This indicates that almost all anatomical elements originally present in a horse skeleton were recovered on site, the only exception being atlas vertebrae. However, even a cursory inspection of this diagram reveals dramatic troughs and peaks. Amongst the most notable troughs are those which signify the almost complete absence of whole long bones; elements such as, radii, tibiae,

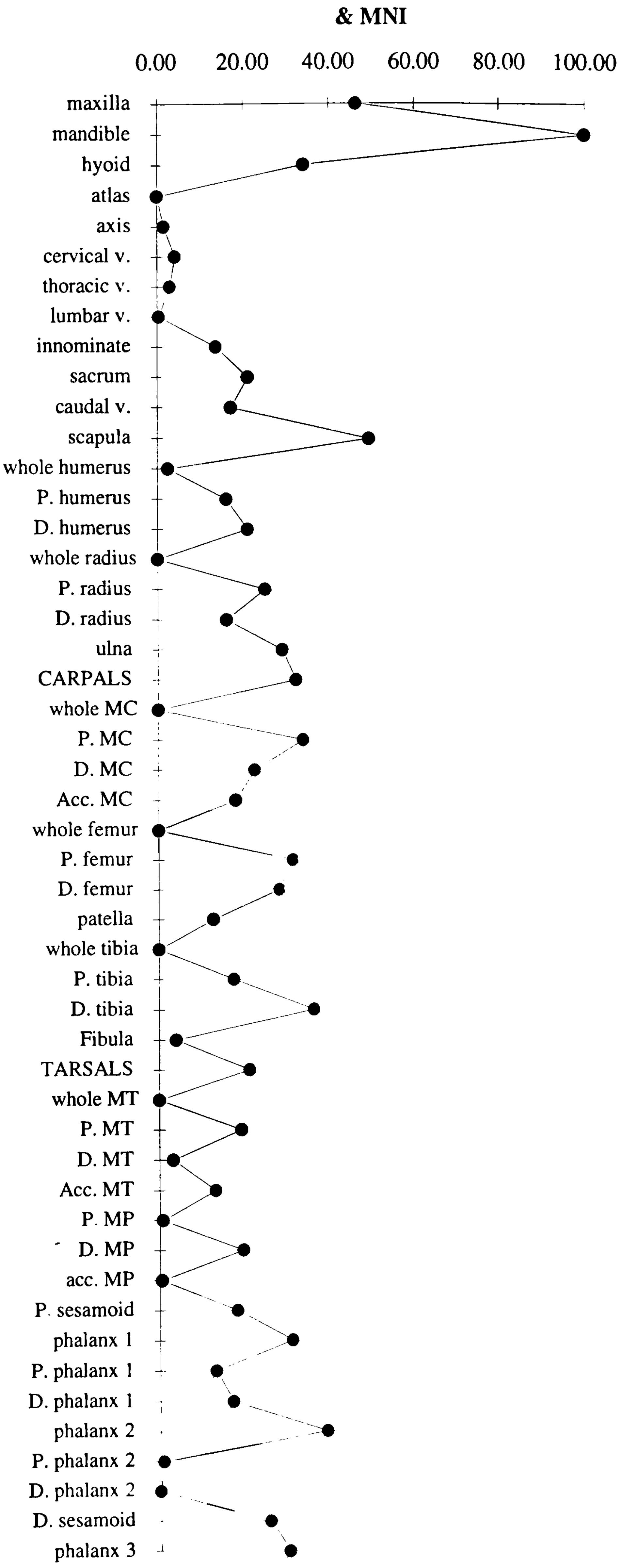

Figure 3.7: %MNI data for *Equus ferus* from the Trou de Chaleux.

femora, metacarpals and metatarsals are only present in the form of proximal, distal and shaft fragments. In general these fragments are preserved in broadly the same proportions, with the exception of the proximal ends of undifferentiated metapodials. These are present in low numbers since virtually all the metapodia could be differentiated as either metacarpals or metatarsals. The opposite is true of the distal ends of these bones; relatively low numbers of distal metacarpals and distal metatarsals are recorded, with the majority classified just as distal metapodials, reflecting the difficulty in differentiating these two elements, rather than any true absence. Only three complete humeri and five complete fibulae are present, the rest of these elements are broken. The only long bones which have completely avoided any breakage are the ulnae. This almost certainly reflects their relative lack of marrow reserves in comparison with other long bones.

It became clear as the study progressed that the surviving bones from Chaleux show a pattern of extensive and systematic breakage. Dupont was also apparently aware of this. In the surviving museum displays dating to the earlier part of this century he presented *montages* of complete long bones, which were marked alphabetically at various points along the length of the bone shaft. These points were also illustrated on accompanying illustrations of the long bones (Plate 3.5); it appears that Dupont felt that the bone breakage was so regular that systematic points of impact could be identified. It is extremely difficult to know the full extent of Dupont's thinking on these matters. In the majority of cases the accompanying text for these 'visual aids' is no longer with us, and there is always the danger of over-interpreting Dupont's own intentions and interpretations (hinted at within these displays) to fall far more in line with my own thinking than they ever did in reality. The level of bone breakage was certainly extremely high.

I have already mentioned in passing the difficulty of distinguishing bone breakage caused by humans from that induced by natural agencies. What can be remarked upon is the high degree of fragmentation; given the evidence for intensive butchery activities demonstrated by the cut marks, this is most likely to have been caused by humans. However, the possibility of at least some natural breakage remains. I have already discussed some aspects of the bone breakage patterning which I believe to have been humanly induced and will go on to discuss further breakage patterns below.

This high degree of fragmentation may also be reflected in some of the peaks visible on Figure 3.7. The increased representation of some elements is at least in part due to the intensive fragmentation of these bones within the assemblage: this is clearly the case for the cranial fragments, sections of mandible and 1st phalanges. In general this fragmentation does correspond strongly with marrow rich areas of the skeleton (although it should also be borne in mind that it is these very areas which are structurally the weakest, and consequently the most vunerable to breakage by 'natural' agencies).

Butchery evidence

Meat removal is documented by filleting marks found on virtually all long bones, innominates and vertebral spines. Filletting marks generally occurred along the shafts of long bones, rather than towards the articular ends. They indicate that horse meat was being removed from the extremities as well as the trunk; ribs from the Chaleux collection, which could not be identified to species, had butchery marks on both their internal and external surfaces, indicating the extraction of meat as well as the removal of the thoracic viscera.

Horse meat is extremely rich and dark in colour and has a distinctive and strong flavour. Its calorific value is relatively high, and it is an excellent protein source. Perhaps the more interesting aspect of the horse exploitation at Chaleux is not the evidence for meat extraction (which could have been anticipated by the high proportion of horse bones in the assemblage) but the evidence for other uses of the horse carcasses.

Marrow is a valuable resource which is likely to have formed an essential component of late Palaeolithic diets. John Speth (1983) has commented in great detail about the importance of fat in human diets. He highlighted the oversight by archaeologists who, whilst recognising that an animal's physiological condition was likely to influence its selection by hunters, rarely considered how this condition might influence subsequent carcass processing (*op.cit.*). Bone marrow is an especially rich source of fat and is also thought to contain sufficient quantities of vitamin C to avoid scurvy (*ibid.*, 148-149).

Although I have argued in chapter 1 that it is extremely difficult to identify humanly induced bone breakage from that caused by other predators, or ‘natural’ factors, I shall suggest that there are certain systematic patterns of bone breakage within the Chaleux assemblage which have no analogues with any form of predator and/or natural damage patterns I have previously encountered. In these instances I shall suggest human activity as the agency behind such breakage.

Virtually all of the horse mandibles from Chaleux were present only in fragments, many of which showed clear and abundant cut marks truncated by subsequent breakage. The breaking of mandibles to gain access to marrow is a well documented phenomenon (Binford 1984), although similar damage has also been noted to be caused by other predators (Brain 1981). In general the cuts on the mandibles seem to relate to skinning activities (on the basis of their location and orientation), although there was also clear evidence for the extraction of the tongue on the interior of the mandibles as well as the maxillae. Only one *Equus* cranium was present within the assemblage, and even that was not complete. Cranial fragments (which Dupont had identified as *Equus*) were present in high quantities (see Table 3.4). I considered 129 of these to be identifiable to species, the remainder being included in the counts for sp. indet. bone fragments (see Table 3.1). In ethnographic accounts of carcass processing in a variety of environments, if an animal’s head is to be utilised, it is generally disarticulated from the cervical vertebrae, skinned and then defleshed, before being broken into for access to the brain. Although butchery techniques/styles may influence how this is done, and the precise methods of disarticulation employed vary, the need for disarticulation is a prerequisite for gaining access to the brain - the weakest parts of the cranium (and consequently the easiest points of access) are those on the base, which are to a great extent protected from accidental damage by their articulation with more robust bones such as the atlas and mandible.

The brain itself has a particularly high dietary value, and so it is hardly surprisng that it was apparently exploited by the occupants of Chaleux. Stiner (1991, 471) comments that:

> "the nutritional value of head parts is unique relative to the rest of the prey anatomy. Head parts represent the final bastion of fat tissue in prey suffereing from seasonal or other causes of malnutrition, because the myelin sheaths enclosing nerves in the mammalian brain cannot be metabolised under conditions of food stress."

The complete lack of Equid atlas vertebrae is likely to relate to the initial processing and disarticulation of horse carcasses into 'butchery units' elsewhere; cut marks noted on the occipital region of horse cranial fragments confirm that the skull was disarticulated from the neck by prizing apart the occipital from the atlas, and it seems probable that the atlas vertebrae were removed during initial processing of both the neck and skull. In this context it is interesting to note the relatively high proportion of horse hyoid bones in the assemblage (34.15%). Although no %MNI figure has been calculated for the *Equus* cranial fragments (because of their highly fragmented nature), it seems likely that these bones formed part of a 'head butchery unit' brought to the site, rather than a 'neck unit', as the hyoid is present in a far higher proportion than the cervical vertaebrae.

There are some notable absences within the Chaleux collection. Components of the vertebral column are either absent or present in relatively low frequencies. A problem is present here, in that it is questionable whether I have seen all of the horse vertebrae from Chaleux[7], but for the purposes of the following discussion it will be assumed that this is the case. Such patterning is not consistent with the processing of a complete horse carcass. Instead the BPR pattern for horse indicates that certain anatomical units were discarded within the cave, specifically the lower limbs, crania and tails. Other areas of the carcass were either subsequently removed or never originally present. It seems unlikely that

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[7] Appendix I indicates that the material associated with three consecutive catalogue numbers in the Chaleux assemblage were not located and subsequently catalogued in the IRScNB. As has been noted elsewhere, there is no complete catalogue for the whole of the Dupont collection, other than my own. Whilst the vast majority of the large mammals are located together in the IRScNB stores, small 'pockets' of the collection have come to light mixed within collections from other sites and earlier periods. The material is stored on large shelves, each of which carries three trayloads, and human error appears to have led on occassion to these being replaced incorrectly in the stores.
As the collection is ordered within its number sequence into groups of species, and sorted anatomically within that, it is possible to suggest broadly the species and anatomical region that the blank numbers might relate to, although this cannot be conclusively demonstrated. This is most notable with numbers 2275, 2276, and 2280 to 2292 which may relate to cervical, thoracic and lumbar vertebrae, and (possibly) ribs of the horses. However, this cannot be demonstrated one way or the other, and Dupont's comments (1872, 171-172) about the apparent absence of vertebrae indicate that these 'missing' numbers may not relate to the large mammals, but some other part of the IRScNB collections.

Lateglacial hunters should choose to transport a complete carcass to a cave, rather than undertaking some preliminary butchery at the kill location (*cf.* Perkins & Daly 1968). Indeed, Dupont (1872, 171-172) remarked upon the relative absence of vertebrae[8]; given this, it seems unlikely that the vertebrae are absent due to post-excavation selection.

There is one exception to this trend, however, which is the high count for caudal vertebrae. The explanation for this abnormal representation is not immediatly clear, although it does appear to represent definite selection on the part of the Lateglacial hunters. Some of these vertebrae showed cuts, indicating that the bones of the tail were prized apart. Quite what use horses tails might have been to late Magdalenian hunter-gatherers is a mystery, although a few suggestions could be made: horse hair may have been used in rope, twine and thread manufacture, it could also have provided some degree of insulation and been used as stuffing for soft items (pillows, toys, even cushions - none of which we have direct evidence for in the palaeolithic), ornamentation and decoration on clothes and other tems of material culture. A final possible use was noted within my own ethnographic collection from Lesotho in Southern Africa, where horse tails are used as the basic components for whisks. The uses are potentially numerous, and the above list is by no means exhaustive. It should be noted that it is likely that the Lateglacial populations of north-western Europe were experienced campers, and probably enjoyed some degree of comfort - the idea of a small number of portable 'soft furnishings' such as pillows may not be so ridiculous as it first seems.

Turning attention to the horse limbs, a consistent butchery pattern is encountered. The scapulae have abundant butchery marks in the area surrounding the glenoid cavity (Figures 3.8 & 3.9), indicating that they were disarticulated from the humerus; this presumably took place at a relatively early stage in the butchery procedure. Other longitudinal marks on the body of the scapula indicate the filletting of meat from these bones. Many of the scapulae are fragmentary and in most cases only the glenoid and the bone immediately surrounding it has survived. Although a complete scapula is not among

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[8] However, my final counts for *Equus* vertebrae differ from Dupont's published ones (1872, 171-172). In each case the ones in Table 3.4 are slightly higher than Dupont's.

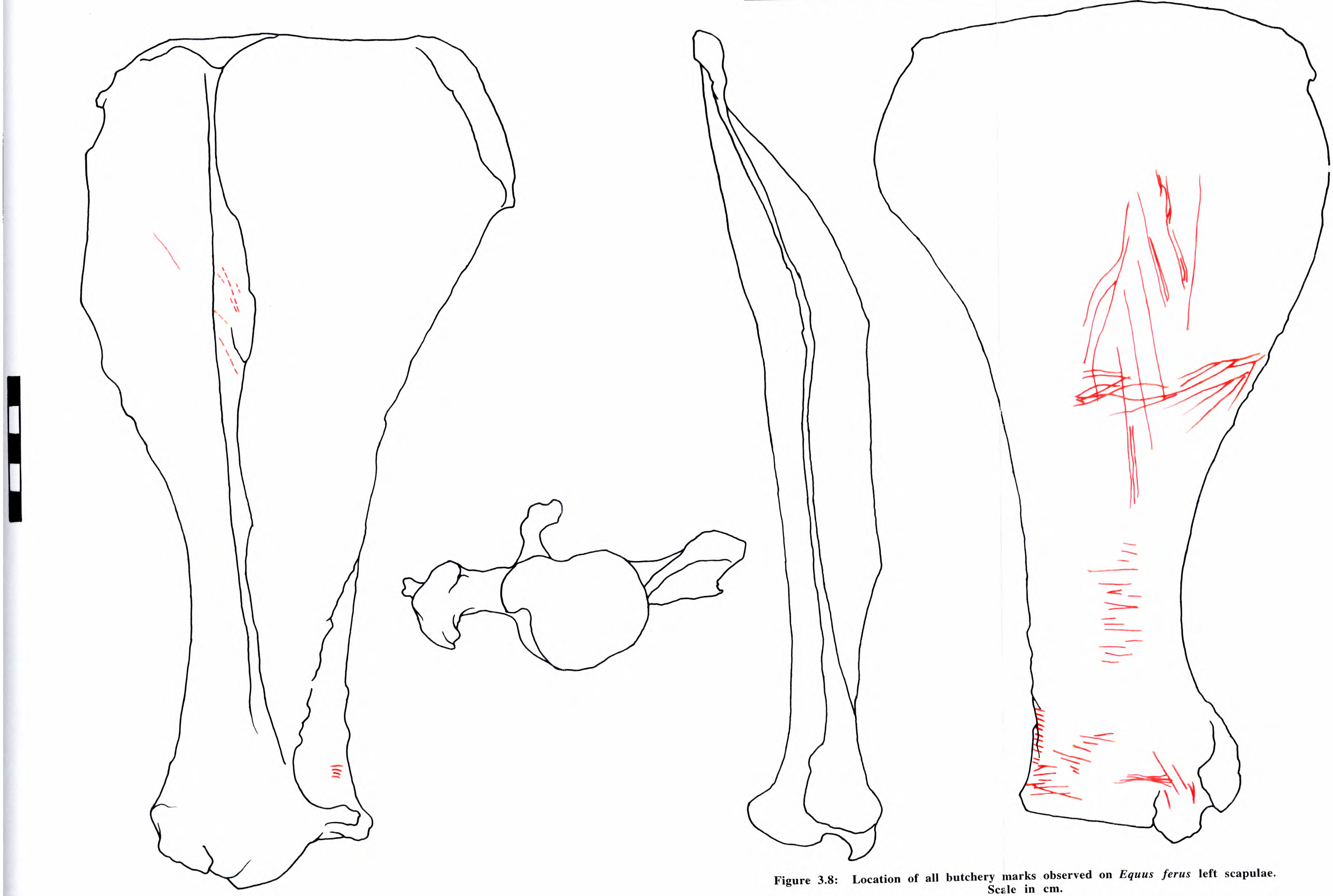

Figure 3.8: Location of all butchery marks observed on *Equus ferus* left scapulae. Scale in cm.

Figure 3.9: Location of all butchery marks observed on *Equus ferus* right scapulae. Scale in cm.

the most robust of anatomical elements, the glenoid region of these bones is relatively dense and prone to survive, even when the 'blade' has been damaged (*cf.* Brain 1981), it does seem likely in the case of Chaleux that humans were one bone breakage agency at work. One interesting feature of the butchery patterns on the horse scapulae was that there appeared to be both a different intensity and slightly different techniques involved in disarticulating the left scapulae from that used in disarticulating the right (Figures 3.8 & 3.9). The bulk of complete horse limbs creates difficulty for handling so one possible explanation for this patterning might be that left and right limbs were butchered in slightly different ways due to the butcher's own handedness. It is interesting to note in passing that butchery traces were found far more frequently on right scapulae than on the left.

The humeri showed abundant cut marks on their distal portions, although marks on the proximal regions were relatively rare. In part this can be explained by the fragmentary nature of the humeri. Proximal ends of humeri are rare in the collection, and when they do occur, they appear to have been 'sheared' from the humeral shaft (Plate 3.9). As with scapulae, the proximal humerus is not the most robust of bones, and so in principal this damage pattern again might be due solely to natural agencies. However, this 'shearing' does not appear to be caused by 'natural' breakage, and I was not familiar with this breakage pattern from any other archaeological assemblage I had studied. It seemed most likely that this pattern of breakage, which was visible on 13 of the 20 Equid proximal humeri in the collection, was again due to human intervention. In this context it is interesting to note that there were far more scapulae (61) than proximal and complete humeri combined (23), which suggests that the scapulae may not only have been brought to the site as part of a limb butchery unit, but also as single meat bearing elements. It is not possible to directly correlate the shearing of the proximal humeri with any single butchery activity although there seem to be two main possibilities. The first is that the proximal ends of the humeri were sheared off from the humerus shaft as part of the disarticulation procedure between the humerus and scapula. The other is that they were broken in this way to give access to the marrow cavity of the bone, removing much, if not all, of the cancellous bone which forms the proximal end.

Plate 3.9: Sheared proximal humeri of *Equus ferus* from the Trou de Chaleux. Scale in mm and inches.

The former explanation seems less likely, as the proximal ends of humeri occurr in broadly similar proportion to the rest of the humeri, but are less frequent than the scapulae. The scapulae were clearly being brought to the site, either on their own or as part of a larger ‘butchery unit’. The cut marks on the bones (Figures 3.8 & 3.9) clearly indicate meat removal along the length of the blade. Marks surrounding the glenoid cavity also document disarticulation from the humerus, consequently the shearing of these proximal humeri would seem to be surplus to requirements. As breakage facilitating marrow extraction is common throughout the horse bones, the suggestion that the longitiduional shearing of the proximal humeri is a part of this process is preferred here, and it is noted that this distinctive form of breakage may be more than simply utilitarian bone breakage, but may well carry within it a 'stylistic signature'.

Moving further down the fore limb, the radii are again highly fragmented (none are complete), with abundant cuts present in the articular regions correlating with disarticulation; indeed three distal radii had cut marks on the anterior articulating surface indicating that the joint between the radius and carpals had been prized apart (two of these are illustrated in Figure 3.4). Although the proximal radii are present in roughly the same quantities on either side, the distal portions of the same bones show a marked variation in frequency between left (15 specimens) and right (5 specimens). It is unclear why this patterning should occur, given that both left and right radii appear to have been brought to the site in broadly similar proportions. The ulnae are only represented by their proximal ends, and even some of these have been smashed for the minimal marrow reserves within.

A similar pattern is found in the hind limbs. Cut marks surrounding the acetabulum region of the innominates correlate with disarticulation activities and meat filleting marks are also present. The femora are highly fragmented (none are complete) and the butchery marks present correlate to disarticulation rather than meat removal. Similarly the tibiae are also highly fragmented, although on these bones the fragmentation takes a slightly different form. Many of the tibiae are longitudinally split (Plate 3.6): as shall be described below this pattern of breakage is very characteristic for the non-meat-bearing long bones. There are also some meat filleting marks, although for the most part the butchery marks present again correlate with disarticulation.

The longitudinal splitting of many of the long bones is a characteristic feature of the Chaleux equids. This splitting is quite unlike any bone breakage pattern I have seen on British Pleistocene faunal collections. Plates 3.6 and 3.7 show views of the proximal surface of *Equus* tibiae and metapodials split in this manner. The drawing of a proximal left metatarsal in Figure 3.4 shows cuts on the articular surface. Whilst these most probably relate to the disarticulation of this bone from the tarsals, cuts found in this position on other bones could have proved a useful starting point for this longitudinal splitting of the metapodia. The material technology involved in this practice is not clear; the longitudinal splitting appears to be the result of cleaving the bones, but no form of cleaver or *lames macherée* (which are more characteristically found within the slightly later *Long Blade* assemblages of Britain and Northern France) are known from Chaleux. An alternative approach could perhaps be to use smaller wedges to split the bones. This might go some way towards explaining the function of the enigmatic *pièces esquillées* found within many European Lateglacial assemblages (present at Chaleux; see Dewez 1987 figure 45).

To cause the longitudinal pattern of bone breakage, free access must have been available to the entire individual bone. Why this technique of breakage was preferred for the lowermost limb elements but not the uppermost is unclear when viewed from a purely functionalist perspective. However, this pattern of bone breakage has (to the best of my knowledge) never been documented from any 'natural' breakage agencies, and instead can only be humanly induced.

As it became apparent that one of the most striking aspect of this breakage was the recurrent evidence for the intensive processing of lower limbs (especially the extremities) my attention was drawn again and again to the evidence for the exploitation of non-meat resources from large mammal carcasses. It is abundantly clear that the Magdalenian hunter-gatherers had a detailed knowledge of the anatomy of their prey species and were extremely skilled in their butchery. Consequently is it unlikely that they would have paid much attention to primarily non-meat-bearing elements without a good reason.

Butchery marks on the phalanges were found repeatedly in the same locations, and demonstrate the skilled systematic removal of numerous tendons and ligaments (Figure 3.10, 3.11, 3.12 & 3.13). The cuts indicate careful severance of these at the points of attachment on individual bones. The reason why these were not simply severed further along the length of the tendon is probably dual: first, as mentioned above, to facilitate

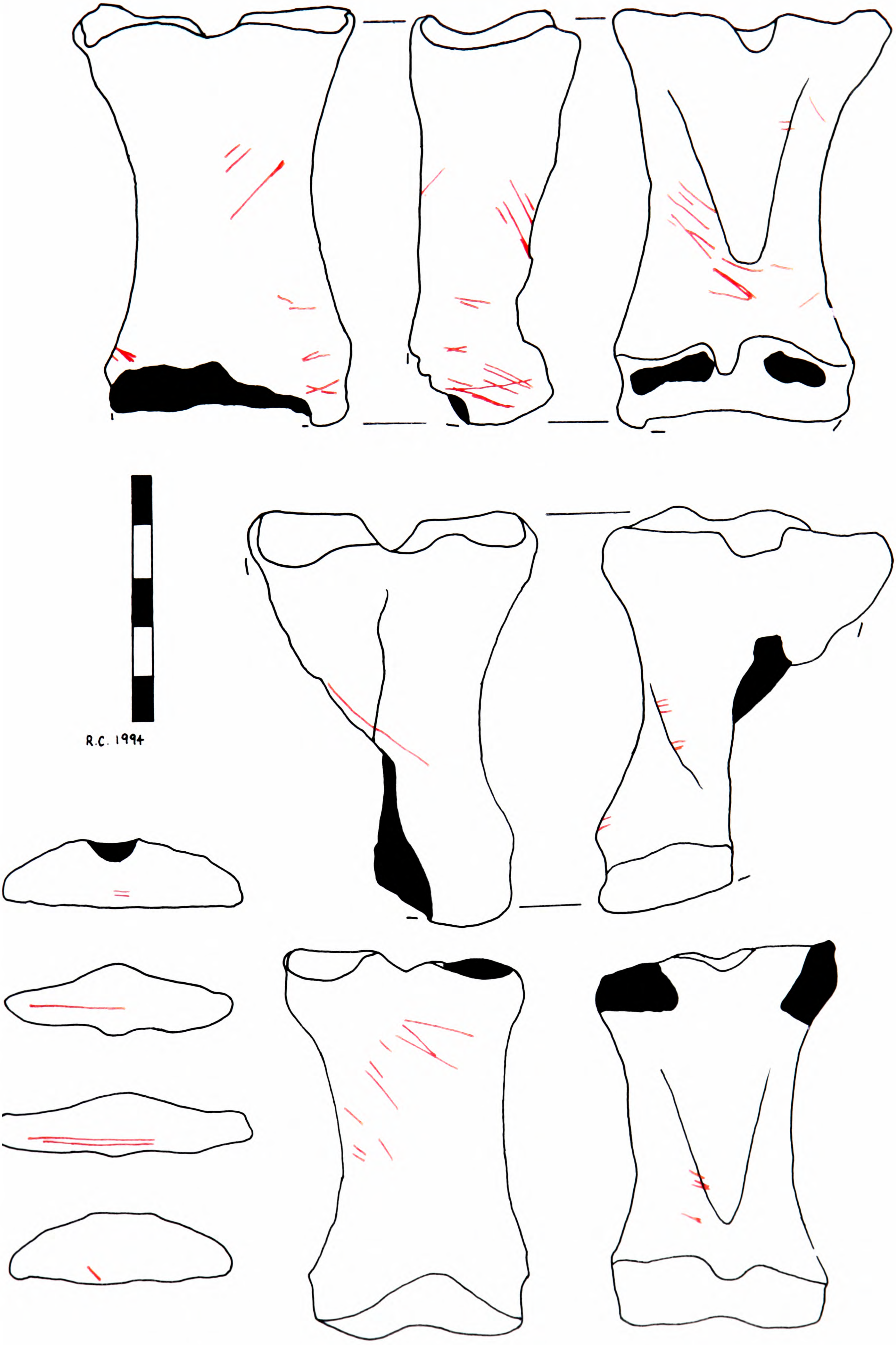

Figure 3.10: Cut *Equus ferus* 1st phalanges & sesamoids from the Trou de Chaleux. Scale in cm.

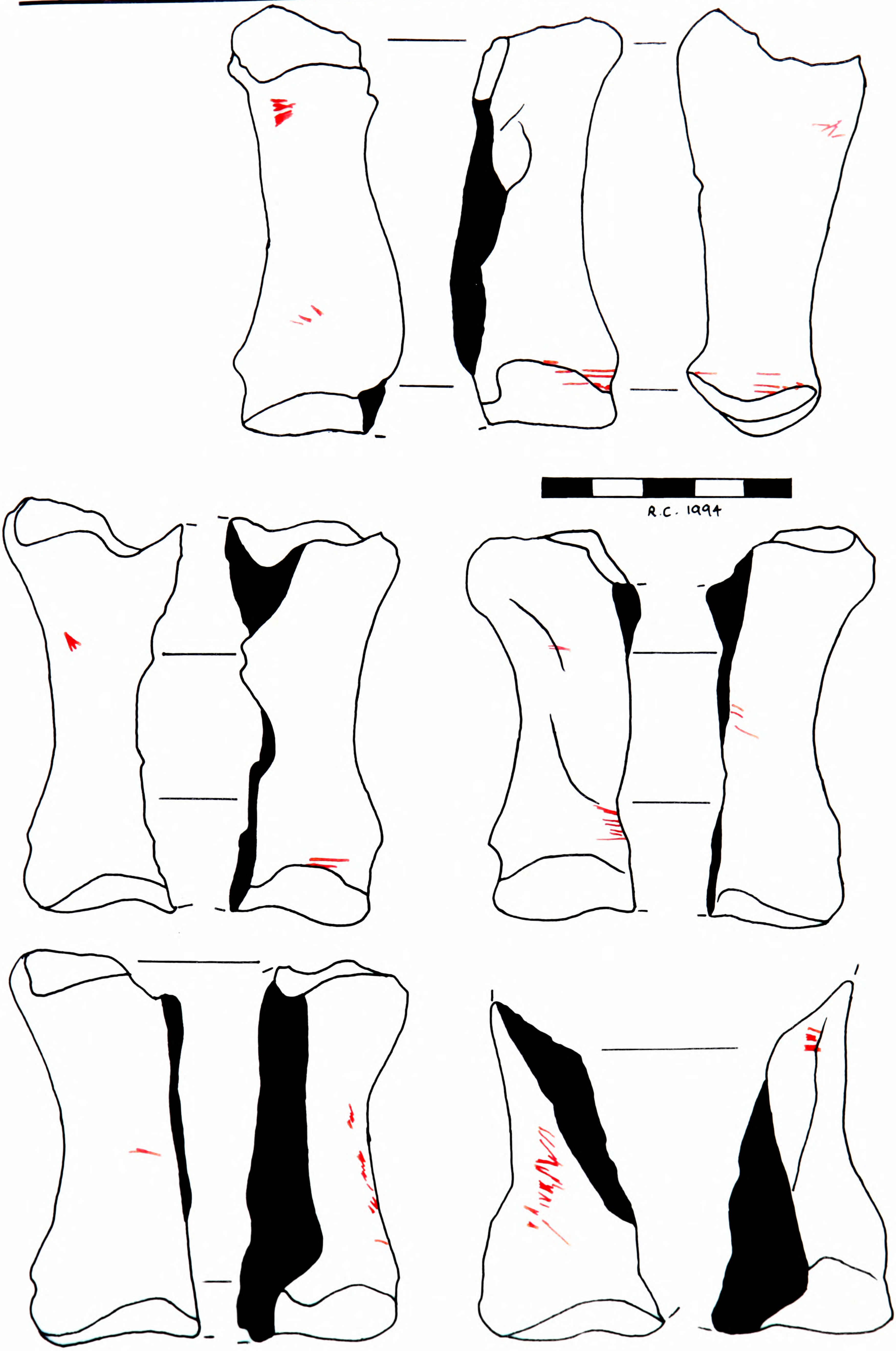

Figure 3.11: Cut and longitudinally split *Equus ferus* 1st phalanges from the Trou de Chaleux. Scale in cm.

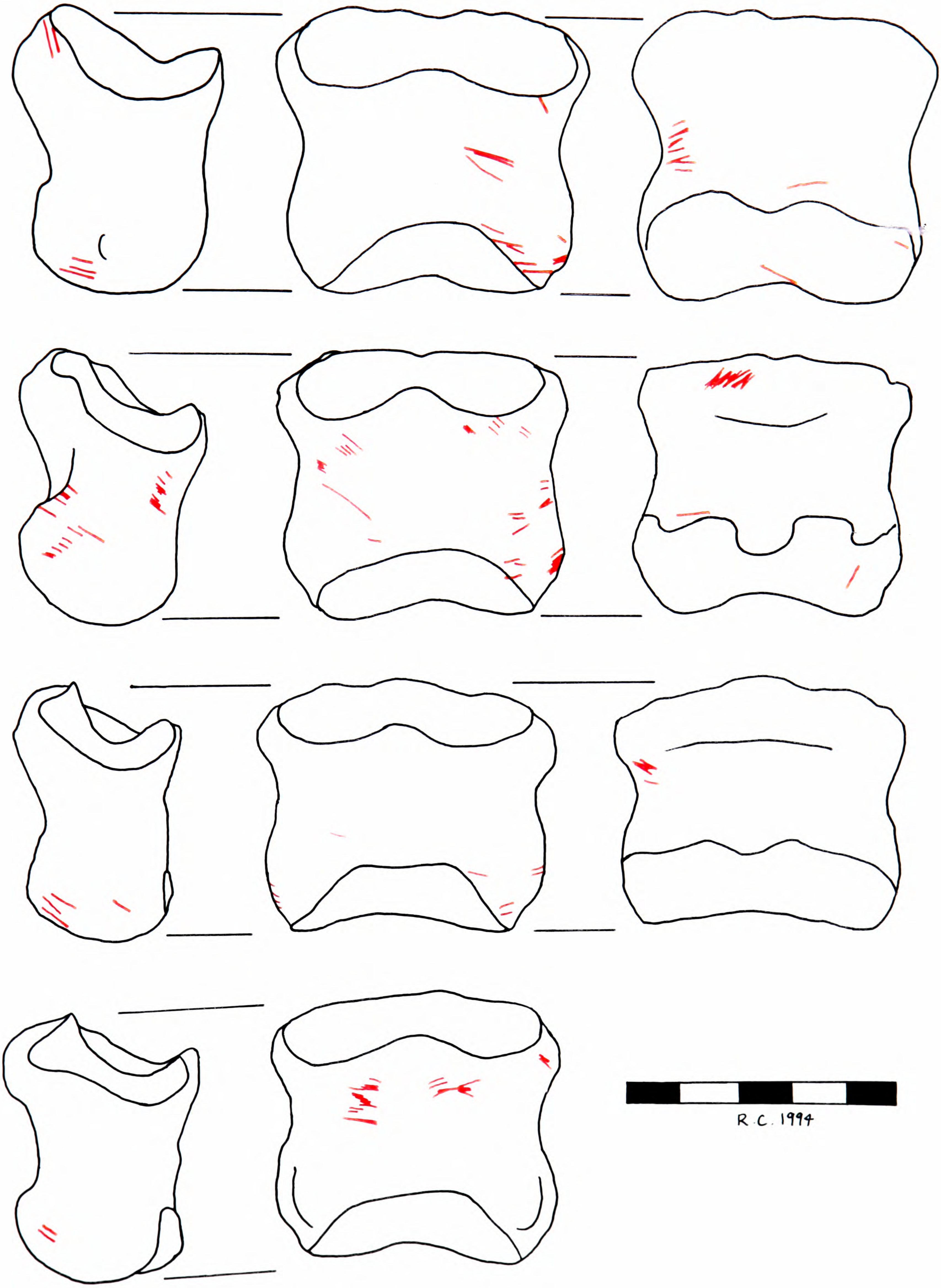

Figure 3.12: Cut *Equus ferus* 2nd phalanges from the Trou de Chaleux. Scale in cm.

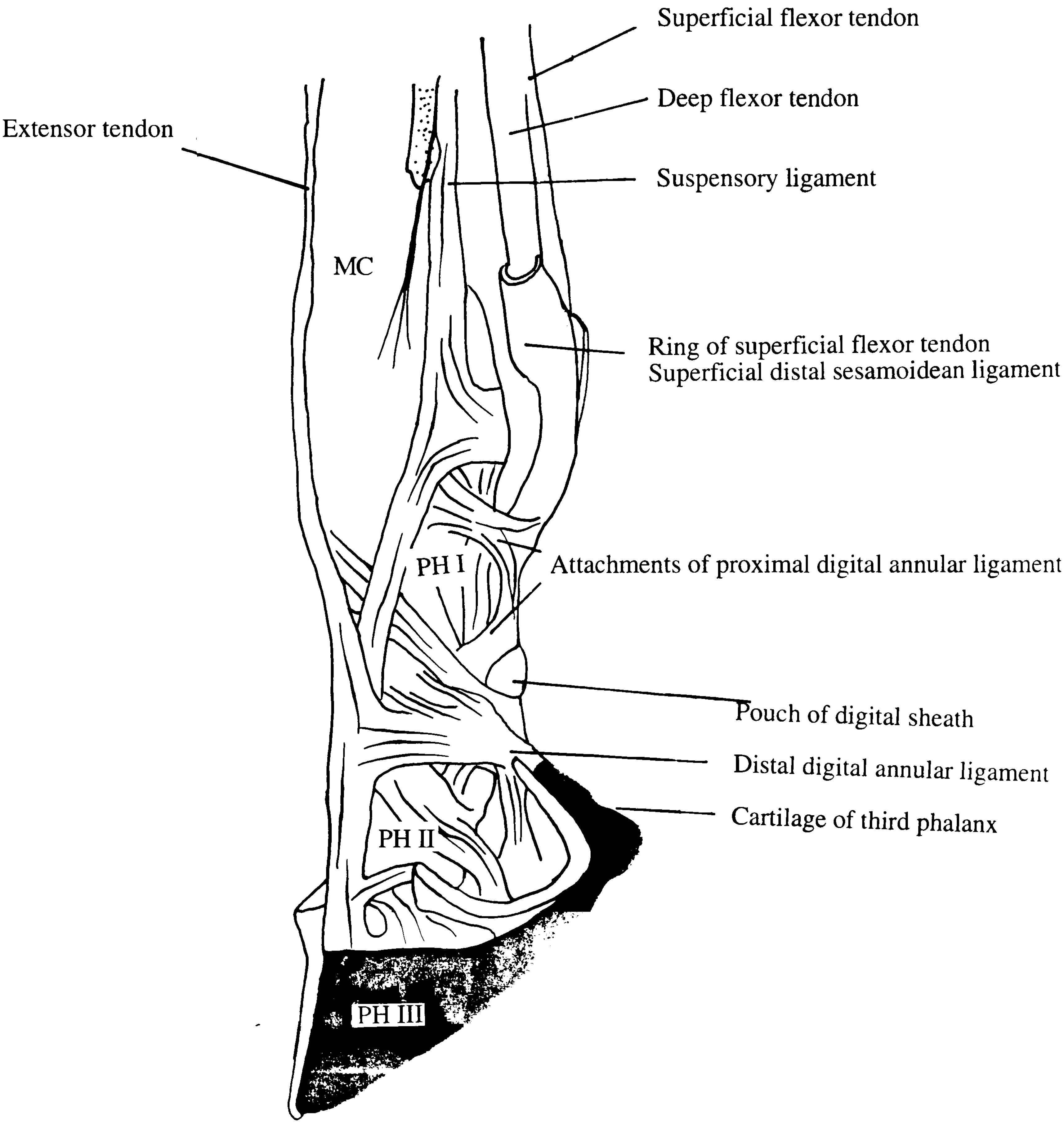

Figure 3.13: **Diagram of the tendons and ligaments attached to the phalanges of *Equus ferus*.**

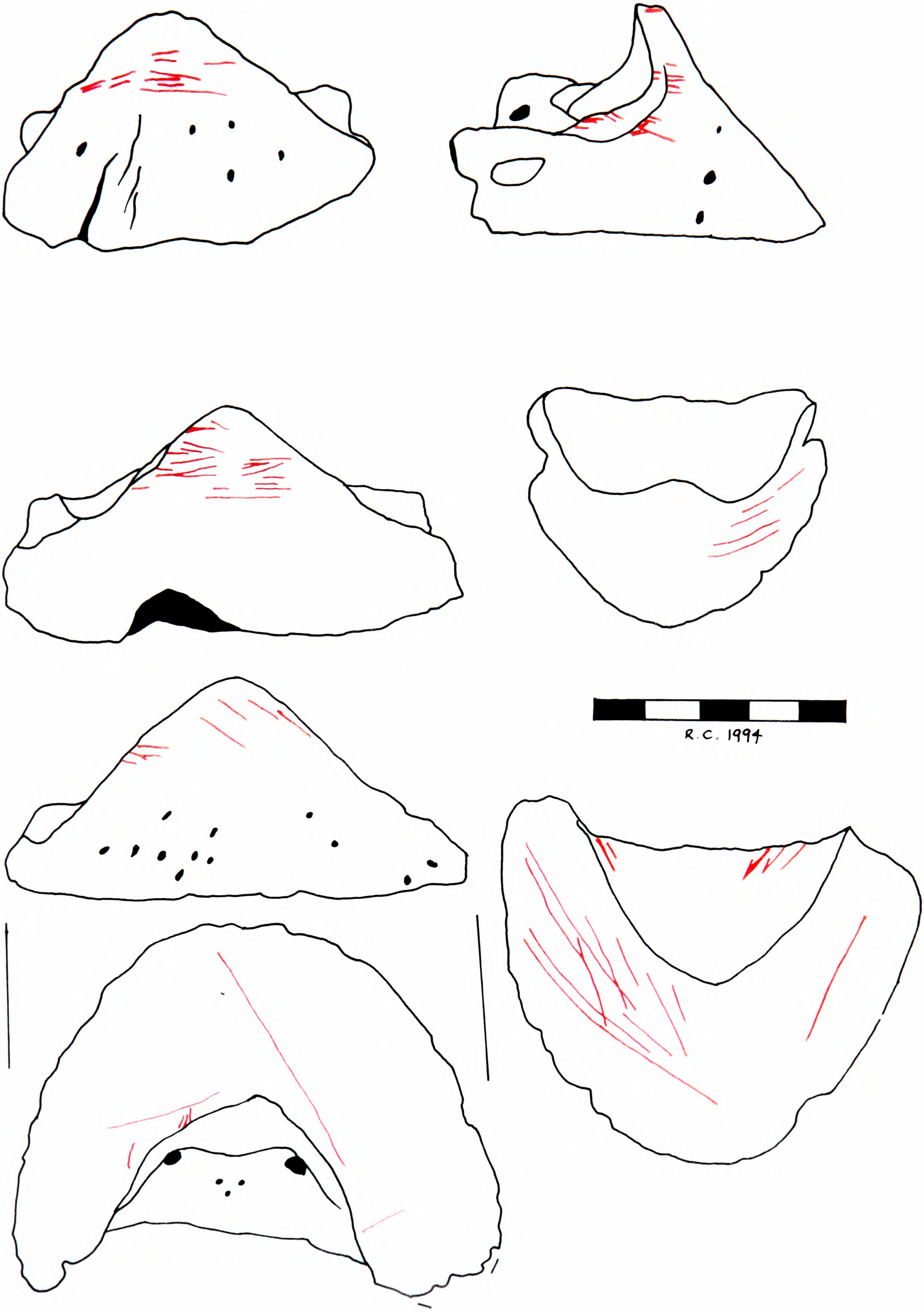

Figure 3.14: Cut 3rd phalanges of *Equus ferus* from the Trou de Chaleux. Scale in cm.

access to individual bones with adequate marrow reserves, and secondly to perhaps maximise the area and length of tendon/ligament removed. Cuts were even observed at the points of attachment on the 3rd phalanges and other, more enigmatic marks were noted on the distal surface of the 3rd phalanges (Figure 3.14); these seem to be marks caused during the processing of the underside of the hooves. Parkin *et al.* (1986) documented a similar phenomenon on the horse metapodials and phalanges from Gough's Cave, Cheddar. They argued convincingly that both tendon and keratin extraction were important aspects of the horse and red deer processing at Gough's Cave.

Overall, there are some remarkable consistencies within the Chaleux data, which indicate that the horse bones were brought to the site as part of larger 'butchery units'. The similarities between %MNIs for some of the articulating bones (e.g. proximal metatarsals and tarsals) indicate that these were introduced as part of a larger unit. Whether this unit was the complete horse carcass, parts of which were subsequently removed, or whether these butchery units were removed from the initial butchery sites cannot be resolved simply on the basis of the raw data available. However the location of the site, 50 m above river level in a steep slope seems to make it unlikely that whole carcasses were moved there from the kill site (*cf.* Perkins & Daly 1968).

Order Artiodactyla

Family Cervidae

Rangifer tarandus - Reindeer

The Upper Palaeolithic, and more specifically the Magdalenian, was first termed the *âge du Renne*, and is generally viewed as synonymous with reindeer hunters in many peoples' minds. In fact, throughout the 6,000 year span of the Magdalenian in western Europe, reindeer frequencies vary from 95% in some sites to 0% in others (Gordon 1988, 37). Spiess (1979, 20) has pointed out that a number of myths have been constructed around present and past reindeer communities and their archaeological significance. He gives three major examples of such misconceptions: that reindeer rely on lichen, particularly *Cladonia* as a major food source; that they migrate biannually in extremely large herds; and that human populations will migrate alongside these herds for hundreds of kilometres at a time. The last of these myths is convincingly dispelled by the fact that it is physically impossible for humans to keep up with the pace of a migrating herd without the aid of mechanical assistance (dog sledges, snowmobiles and planes for example); ambush-intercept techniques seem to be far more realistic methods of hunting (Burch 1972), although this strategy is far less precise than archaeologists usually presume. Reindeer herds cannot be relied upon to appear at a specific points in a landscape on their migration routes, as these migration routes themselves are highly flexible. The herd size itself is also highly variable and the pictures of huge reindeer herds painted in much of the Palaeolithic archaeological literature (and on the walls of museum display cases) are more an artefact of archaeological preconceptions than any true reflection of the data currently available for the western European Lateglacial. The occurrence of reindeer bones in relatively low frequencies at Chaleux supports this suggestion. Perhaps the most insidious of the common misconceptions about reindeer hunting is that one can transpose the behaviour of modern populations (or even a single population) onto late Pleistocene reindeer groups. Once again Spiess has discussed the inherent flaws in this assumption (1979, 20) in some detail. There is no clear evidence that north-western European late Pleistocene reindeer herds were highly migratory (for an alternative view see Gordon 1988); in fact, there is very little firm evidence for the behaviour patterns (including migration) of any of the late Pleistocene animal species present during the Lateglacial in north-western Europe.

The myth of lichen dependence is also false. Modern reindeer and caribou diet varies considerably both seasonally and geographically. In general, they will eat plants with the highest available protein and fat content, which of course fluctuates considerably through space and time. Willow leaves, herbaceous plants, new growing grass, fungi and sedge shoots - all contain varying proportions of protein and fat throughout the year and are selectively used by reindeer. Lichen is just one component of a complex series of dietary requirements (Speiss 1979, 31).

Seasonality evidence for reindeer during the Belgian Lateglacial is very restricted. Gordon (1988) used thin-sectioning evidence from eight reindeer teeth from the Ahrensburgian faunal assemblage from Remouchamps to yield seasonality data for his tentative 'northern range' alongside information from specimens from the Paris basin sites at Pincevent, Etiolles, Marsangy and Verberie (for a discussion of the dating evidence from Remouchamps see chapter 2). The results suggested that reindeer were present in south-eastern Belgium during the summer. Added to this was the suggestion of Bouchud (in Dewez *et al.* 1974) that two *Rangifer tarandus* dm3 from the Grotte de Remouchamps indicated that death took place during the summer. The justification for linking the reindeer specimens from Remouchamps (radiocarbon dates for reindeer from this site fall into Dryas III) with ones from Magdalenian sites in the Paris Basin (radiocarbon dated to the Bölling Intersatdial and Dryas I) as evidence for one vast migrating reindeer population, present over a minimum of 3,000 years of environmental change, seems to me to be highly dubious. It seems better to treat the seasonality evidence for the Remouchamps reindeer simply as evidence for Ahrensburgian activity at Remouchamps, and to keep that separate from any arguments developed with specific reference to the late Magdalenian.

As with many European Lateglacial sites, reindeer is by no means the dominant species within the Chaleux assemblage (see Table 3.2). 154 specimens (82 of which were antler fragments, overall 4.07% of the assemblage) make this species only the third most abundant in the collection, after horse and fox. Within the IRScNB stores a large number of antler offcuts from groove and splinter working were also present, although these could not be directly identified as *Rangifer tarandus* rather than *Cervus elaphus* or another cervid.

Only 18 of the reindeer bones were cut. A similar trend can be seen with the Bölling age fauna from Gough's Cave, Cheddar, where reindeer is present in extremely low proportions. In that case there was no direct link between the reindeer bones and human activity although a number of reindeer antler artefacts are present within the collection; whether these were actually fashioned at Gough's Cave is unclear (Currant 1986).

One feature of interest in relation to reindeer specimens from all the Late Magdalenian sites from Belgium I have examined is the almost complete absence of male antlers in the sites. Instead, there is a very high proportion of female and juvenile antlers (for the most part shed), and Chaleux is no exception to this rule. This seems to suggest that the Belgian caves, most particularly those in the Meuse region of the Ardennes, may well have been a region where reindeer cow bands, or cow-juvenile bands congregated. This aspect of reindeer behaviour does not appear to have a seasonal component (Miller 1975, cited in Spiess 1979).

Table 3.1 above gives a total of 82 *Rangifer tarandus* antler fragments. Where the basal portions of these are present, they are exclusively from females and juveniles. Far more highly fragmented and worked (groove & splintered) antler also appears in the worked bone, antler and ivory portion of the collection in the IRScNB stores. A small collection of bone and antler working offcuts from Chaleux is deposited in the Quaternary section of the British Museum within the Rutot collection (9 pieces in total), these specimen bear Dupont's characteristic blue labels stating "Trou de Chaleux", and presumably originate from his excavations at the site.

The MNI count of 4 for the Chaleux reindeer is based on 4 proximal left metatarsals. Although the NISP count of 149 is relatively high for non-equids in the assemblage (4.07%), over half of this is made up of antler fragments. As with virtually all of the animals from Chaleux, the sample size is so small that any observed patterning in the BPR data is hard to interpret (Table 3.5). However, only certain anatomical regions of the reindeer have been identified within the assemblage, notably 5 articulating thoracic vertebrae which appear to have belonged to the same individual, and the lower portions of both fore and hind limbs. This may well reflect the 'butchery units' in which parts of reindeer were brought to the site. The butchery evidence itself is considered below.

Butchery evidence for *Rangifer tarandus*.

Butchery marks indicating meat removal and disarticulation occur on a variety of anatomical elements. Transverse cuts on the spines of three thoracic vertebrae (part of the 5 which re-articulate mentioned above) were particularly prominent (one of these is pictured in Plate 3.10), documenting the removal of the muscle bundle which runs the length of the vertebrae in all ungulates, broadly the tenderloin region. Other butchery marks are scarce.

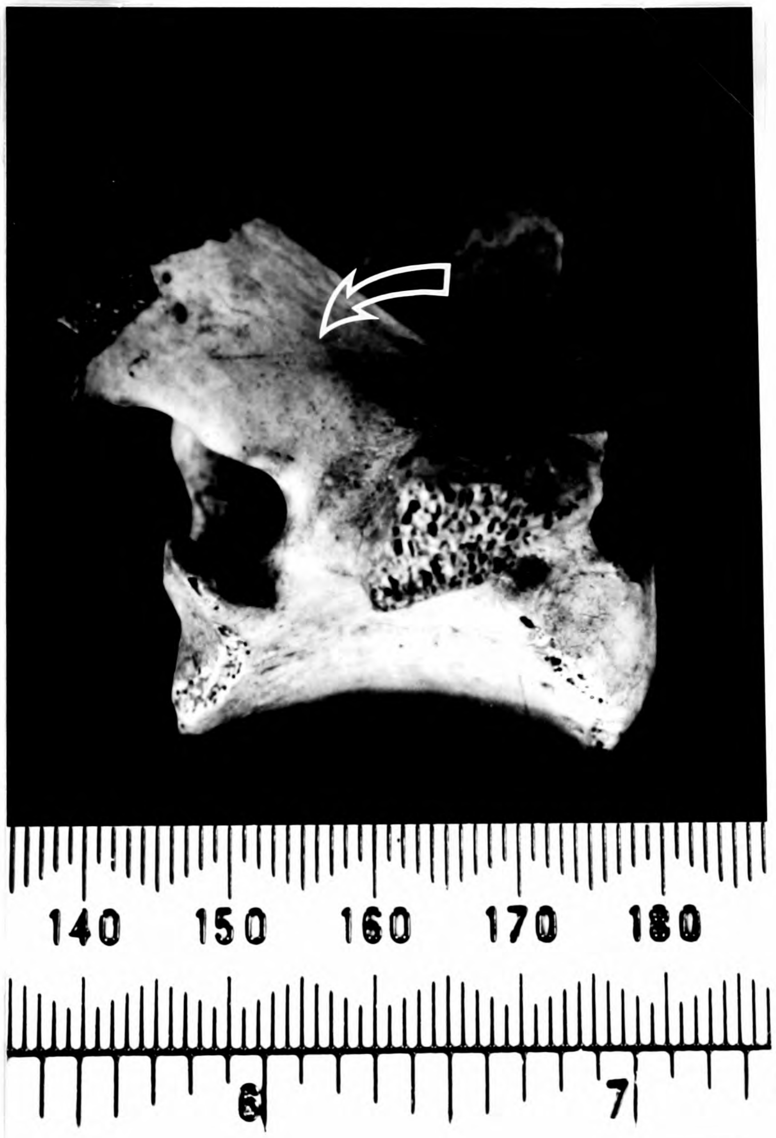

Plate 3.10: Cut thoracic vertebra of *Rangifer tarandus* from the Trou de Chaleux. Scale in mm and inches. Arrow indicates cuts.

Marks on the metapodia indicate the disarticulation of the lower limbs; as with the horses there are indications of subsequent tendon extraction. Longitudinal cuts within the ventral channel which runs the length of reindeer metapodia (most prominent in the metatarsals, but present in the metacarpals) clearly indicates the extraction of the sheath of tendons which lie within this groove and run the length of the bone. Binford (1981, 95) described this activity amongst the Nunamiut, although he also noted that these tendons could be stripped without the use of stone tools by simply pulling the phalanges (which have already been detached) back along the length of the metapodial until the tarsals or carpals are reached; these being severed at the points of attachement with the upper parts of the limb. Binford identifies this activity as corresponding solely with the preparation of long bones for marrow smashing, and does not recount any particular use for the tendons themselves. However, the possibility that these long and strong tendons may have been of use as rope, twine, bow strings etc. cannot be ruled out. The reindeer long bones from Chaleux are highly fragmentary, and although it is probable that these were smashed for marrow, there is no clear impact evidence visible. Unlike the horse long bones, there were no indications of the longitudinal splitting of reindeer long bones to gain access to the marrow cavity, it may be that this particular buitchery technique was used only on horse bones.

Given the low NISP counts for this species, it is difficult to make any broad statements about the use of reindeer at Chaleux. What does seem clear is that parts of at least four different animals were present in the site, and that meat removal, tendon extraction and marrow smashing took place. Whether entire reindeer carcasses were first processed at the site and then significant portions of these removed or selected units were brought to the cave seems unclear, although the latter suggestion seems to be the most likely given the low BPR numbers. The value of various body parts is both highly situational and cultural, and there is no reason for it to be constant between sites and different human groups. We have already seen that tendon and marrow extraction were important activities for the inhabitants of Chaleux, and so bones which are rich in these resources (but low in other, more obvious resources) may well have been brought to the site, rather than being abandoned during the preliminary stages of butchery. Reindeer, alongside many of the other large mammal species at Chaleux does not appear to have been of overiding economic significance. Whether this simply reflects the overall structure of the local megafauna during the earlier part of the Bölling phase, or a more selective hunting/trapping strategy on the part of the human occupants of Chaleux, is open to some degree of debate, and will be returned to in the latter part of this chapter.

Cervus elaphus - Red Deer

Modern red deer populations are found in a wide variety of habitats including open moorland, forests and agricultural land. Legge and Rowley-Conwy (1988) suggest that the core unit of social organisation adopted by red deer is the family group of one hind and her young (*ibid.*, 13). These core groups may aggregate, depending on the local terrain; open country populations tend to agglomerate loosely, whilst woodland populations maintain low group numbers. Whether the low number of red deer specimens from Chaleux can be taken to indicate a rarity of this species in the vicinity of Chaleux or selectivity on the part of the Lateglacial human population against this species is unclear. Certainly this species was utilised to a minor extent by the Magdalenian hunter-gatherers, but its exploitation seems almost co-incidental to the primary concern with horses discussed above.

The presence of red deer is generally taken to reflect a relative climatic amelioration. It seems reasonable to suggest that the relatively high proportion of red deer found at Gough's Cave may at least in part be explained by the fact that the radiocarbon dates for Gough's fall at the latter part of the Bölling, whereas those from Chaleux lie in the earlier part. Similarly, geographical distance and variation in local environmental conditions will also have been significant factors.

In theory the presence of red deer at the site could have given one line of seasonality evidence which might have been linked to human presence at the site, as well as giving details of the age structure of red deer at the site. However, the lack of any dentitions (there are in fact no cranial elements) excluded this possibility. Similarly the presence of only adult bone again ruled out the possibility of even establishing a loose idea of age structure based on the fusion state of complete bones. Consequently the red deer remains from Chaleux can give few insights into seasonality at Chaleux or any hints at the hunting/trapping strategies used, although detailed studies of red deer seasonality and mortality evidence have proved highly informative for other sites and regions (Klein *et al.* 1983; Pike-Tay 1991).

As with the horse remains, the red deer material from Chaleux is highly fragmentary, making comparisons of physical size between this material and other Pleistocene assemblages highly problematic. Only 22 specimens were preserved within the assemblage giving an MNI count of 1. A detailed discussion of the BPR based on these bones does not seem a profitable course of action due to the small sample size, however the data is presented fully in Table 3.5. As with the reindeer discussed above, it is possible that parts of a red deer carcass were brought to Chaleux as seperate butchery units. However, the paucity of bones with butchery marks (a left calcaneum, a 2nd phalanx, an atlas vertebra and a humeral shaft (all part of Acc. N° 2591) does not really offer any clear indicators of the nature of the human exploitation of this species at Chaleux.

The butchery marks on the 2nd phalanx are located in the general area of attachment for tendons, although they may equally relate to skinning - without a larger sample it is difficult if not impossible to attribute a specific activity or range of activities to such potentially ambiguous marks, though it has been noted in the case of the horses that the extraction of tendons seemed an important activity. The cuts on the humeral shaft (two feather-like cuts located mid way down the shaft) seem most likely to related to meat filleting. The cuts on the atlas probably indicate disarticulation of the neck from cranium. The marks on the tuber calcis of the calcaneum again are more consistent with processing the lower limb for tendon extraction than for meat removal.

The role of red deer in the Lateglacial economy presents one of the major differences between the Chaleux material and that from Gough's Cave. At Gough's Cave the red deer material is far more abundant, giving the second highest NISP count of all large mammal material in that collection (Currant 1986, table I), and shows traces of a wide range of butchery activities - skinning, meat filleting and tendon removal (Parkin *et al.* 1986).

Capreolus capreolus - Roe Deer

The roe deer is a highly adaptable animal, which today ranges from the Mediterranean to the arctic circle. They are relatively small deer: modern examples weigh between 18 and 20 kg and stand approx. 60-70 cm at the shoulder. They are vulnerable in open conditions, far more than red deer, as they depend much more on the senses of smell and hearing rather than sight. Strandgaard (cited in Legge & Rowley-Conwy 1988) has noted that group size is relatively small, with a maximum being about 14 individuals. In the main part these animals are solitary, staying within a range of between 0.01 to 0.1 km^2 (Boyle 1990) which varies with the quantity of cover, food and the behaviour of the dominant buck. However, they remain solitary during the rut, and it is only during the autumn that they form small bands, usually a family group of buck, doe and offspring. Juvenile mortality is relatively high (Boyle gives a figure of 30%).

Although primarily a woodland animal, the roe deer can adapt to relatively open conditions, in such cases their behaviour has been noted to change quite dramatically (see, for example, Bencze 1979, also cited by Legge & Rowley-Conwy 1988). As Legge & Rowley-Conwy note (*ibid.*), the roe deer is as flexible (if not more so) as the red deer, and the species have considerable overlap in their ranges. The roe deer is well adapted to changing environmental conditions, and may stop eating when deep snow covers their food sources - trees, shrubs, grass, berries, fungi and acorns. Their main environmental need appears to be access to sufficent ground flora and shrubs.

A study of the roe deer from Cranbourne Chase (Prior 1968) has shown that this species has a specific birth season - late April to the end of June, and this is supported by other studies and casual observations of roe deer populations (Legge & Rowley-Conwy 1988, 18).

Roe deer occur throughout various stages of the Pleistocene (Stuart 1982; Lister 1984) and have been documented in the Dordogne during parts of the Late Pleistocene, although their frequency in this area was never high (Boyle 1990, 127-128). Roe deer are absent from the cave assemblages in the Dordogne throughout the Magdalenian and Azilian (*op. cit.*, table 6.6), although Boyle comments that this may in part be due to a distortion of the data caused by small sample sizes rather than any true absence. The other zones (in France) considered by Boyle (Northern = Isle, Dronne and Charente; Western = Gironde; Eastern = Massif Central), exhibit a similar lack of roe deer throughout the Upper Palaeolithic.

Only 4 specimens of roe deer were identified from Chaleux, representing 0.11% of the overall assemblage. None of these were cut, so there is no direct evidence of the human exploitation of this species at Chaleux. It seems possible that some or all of these specimens are of a more recent age than the bulk of the fauna. Roe deer has not been convincingly demonstrated to be a component of the Lateglacial fauna of north-western Europe, and given that a part of the fauna from the *1er niveau ossifère* is of Holocene age it seems possible that the 4 roe deer specimens are of more recent origin. They will not be discussed further in this chapter.

Family Bovidae

Bos sp. - Aurochs and Bison

Dupont identified a number of bovids within the Chaleux assemblage, including those he termed *Bos primigenius major*, *Bos primigenius minor* and *Bison europoeus*. Another bovid, *Ovibos moschatus* (musk ox), is also present, but will be discussed separately below. *Bos primigenius* (the Aurochs) and what is today termed *Bison priscus* (steppe bison) are hard to distinguish from each other on the basis of post-cranial bone alone (Gordon 1988; Gee 1990). *Bos primigenius* is thought to be the ancestor of domestic cattle (Stuart 1982, 94).

Many of the differences identified by earlier zoologists may be specific to certain populations (Gee *passim.*). The precise indicators which Dupont used to separate these species is currently unclear. An added problem is that it has even been suggested that Pleistocene *Bison priscus* and *Bos primigenius* are not sufficiently distinct to justify different generic status (Van Gelder 1977; Brugal 1984). Regional patterning among Lateglacial bovids is thus still a very open question. Gee (1990) has observed that *Bos* and

Bison rarely occurred in equal proportions in Pleistocene assemblages, and suggested that they may have been close ecological competitors.

The Aurochs is traditionally seen as a grazer and a woodland animal, although Gee (*ibid.*) felt that its appearance in British Lateglacial assemblages might suggest rather more open country preferences, indicative of a wider environmental tolerance. This is not necessarily the case, as it has become clear over the past few decades that the rapid climatic and environmental changes which characterise the Lateglacial permitted the development and succession of a wide variety of ecotypes in the same geographical region. Woodland is likely to have been present in Belgium during at least parts of the Interstadial phases of the Lateglacial, although as yet there is little direct evidence for it. Of perhaps more interest is the question of whether *Bos* and *Bison* were contemporary components of the Lateglacial faunas from Belgium.

In the Neuwied Basin (approx. 180 km east of the Lesse valley), the nearest geographical region with a relatively well known and well stratified Lateglacial faunal and archaeological sequence (Turner 1991), there are hints of a faunal succession in which *Bison* and *Bos* seem to be successive rather than contemporary, with the former occurring during the Bölling, and the latter during the Alleröd. Only *Bison* sp. occurs in the Magdalenian fauna from Gönnersdorf, dated to the final part of the Bölling on the basis of pollen (*op cit.*, 30-31). In the Federmesser-associated (Alleröd-age) level at Andernach-Martinsberg, however, the only bovid present is the Aurochs (*Bos primigenius*). At Urbar, another *Federmesser*-associated assemblage again dating to the Alleröd, a bovid is present, but undiagnostic between *Bos* and *Bison.* A similar situation arises within the bovids from Miesenheim II and Niederbieber, again both associated with *Federmesser* assemblages and dating to the Alleröd. In any case, this suggestion can only be tentative, as our knowledge of the biostratigraphy of the Lateglacial bovids is currently so limited that it is impossible to state with any certainty whether the occurrence of *Bos primigenius* or *Bison priscus*, or even both, is of chronological significance. This suggested patterning may have varied regionally, and is likely to have been closely related to variations in ecological zones across of Europe. In Britain, this sequence does not appear to be valid.

Bos primigenius is present in the Lateglacial fauna from Gough's Cave, dating to the Bölling/Dryas II chronozone. Indeed, two AMS dates on bovid specimens from this site place this species at the notional boundary between these zones (OxA-813 11900 ± 140 BP (*Bos primigenius*); OxA-588 12030 ± 150 BP (Bovini)). Similarly at the Pin Hole Cave in Derbyshire, only *Bos primigenius* can be identified in the Lateglacial layers (Roger Jacobi, pers. comm.). Three specimens of *Bos primigenius* have been dated from the Pin Hole (OxA-1471 12400 ± 140 BP; OxA-1615 12480 ± 160 BP; OxA-1937 10970 ± 110 BP), coming from at least two individuals (see Roger Jacobi's comments in Hedges *et al.* 1989). The presence of *Bison* sp. during the Lateglacial in Britain has yet to be conclusively demonstrated (see Gee 1990 for a more detailed discussion of the occurrence of *Bos* and *Bison* during the Late Pleistocene).

As with many of the other species discussed within this chapter, the number of bovids identified as *Bos* sp. at Chaleux was so small (58 individual specimens and anatomical elements were represented by only 1 or 2 bones) that it was not possible to confirm the presence of both Aurochs and Bison within the Chaleux assemblage with any convincing degree of certainty. Instead, all three of Dupont's groups have been combined here within the category of *Bos* sp.[9].

The specimens identified as *Bos primigenius* were differentiated as *major* and *minor* within the museum stores, presumably on the basis of size. However, in Dupont's published account (1872, 169), the large bovids are divided between Aurochsen three and fifteen "Boeuf de petite taille"[10]. It is now known that there was very marked sexual dimorphism within the Aurochsen populations of Europe, which explains Dupont's classification into two separate sub species - a common occurrence during the last century (Clutton-Brock 1987, 64). It is now clear that although quite divergent in size, both sets of bones identified as *Bos primigenius* were bovids, and it is likely that they are both the same species.

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[9] It is also possible that specimens of *Ovibos moschatus* are grouped within the general category of *Bos* sp. although every effort has been made to avoid this.

[10] It seems likely that, given the material within the Dupont collection, "15" was a printer's error, and the real count was 1.

As it has been established that a few bones of domesticates are present within the assemblage (see below), it is possible that domestic cattle are also included within the assemblage from the *1^{er} niveau ossifère*. Indeed some 28 specimens, identified by Dupont as *Bison europoeus* may well be domestic cattle (*Bos taurus*) rather than steppe bison, the latter being relatively small in their overall dimensions. However, as has already been mentioned, the sample was too small and fragmentary to allow comparative measurements to be taken and used with any degree of confidence, so that it was not possible to compare these specimens with a 'modern' sample.

Bos primigenius was ubiquitous during the Late Pleistocene and early Holocene of Europe. Evidence for its hunting and butchery by humans is relatively rare, although many butchered bones are present in the early post-glacial fauna from Star Carr, and two skeletons of Aurochsen from Denmark testifies to the hunting of these animals during the Mesolithic (the first found in 1905 at Jyderup, near Vig in north-western Zealand - OxA-3616 9510 ± 115 BP - with three obliquely backed points in the chest region, (see Clark 1975, 137); the second from Prejlerup with 27 points associated, Soren Andersson pers. comm.). Bones of *Bos primigenius* with distinct butchery marks have also been reported from the mammal fauna from Gough's Cave (Parkin *et al.* 1986, Plates 31 & 32). Consequently it is of little surprise that 12 of the Chaleux bovid bones show clear cut marks.

The MNI count for *Bos* sp. is 3, based on proximal metatarsals; full details of this alongside full BPR data is presented in Table 3.7. As with many of the other animals discussed here, the NISP count for *Bos* sp. (potentially including at least two species of bovid) is so low that any general discussion of apparent exploitation strategies is problematic. Only certain portions of the skeleton are present. The absent parts of the skeleton present a potentially interesting pattern. The only parts of the head identified were 8 teeth, none of which showed any sign of modification. Surprisngly no cranial fragments, portions of horn cores or mandibles were identified. Four cervical vertebrae were present, which could have come from one individual (although Dupont split the species identifications between *Bos* and *Bison*). These may have been brought to the site as a single butchery unit. However, no cut marks were observed on any of these vertebrae. Other sections of the axial skeleton were notably missing: there were no thoracic or lumbar vertebrae at all. A sacrum and two caudal vertebrae were recorded, and again may have come from the same individual, possibly as part of a *butchery unit.* Some of the bones of at least one left forelimb are present (scapula, radius, ulna and metacarpal), although Dupont again identified these elements as belonging to both species. Perhaps of greatest interest amongst the bovid material are the phalanges. Dupont separated these into fore and hind, and again the identifications were split between *Bos* and *Bison.* Butchery marks on these indicate skinning, disarticulation and tendon extraction.

Overall, 12 of the bovid bones were cut. For the most part the marks corresponded with disarticulation of the lower limbs, although marrow smashing does not appear to have been a final objective. One of the most remarkable of these cut specimens was a 3rd phalanx (part of Acc N° 2591; Plate 3.11), with cuts clearly visible on the articular surface. This bone was obviously prized apart from the 2nd phalanx, although no corresponding marks could be located on any of the 2nd phalanges in the collection. This technique of

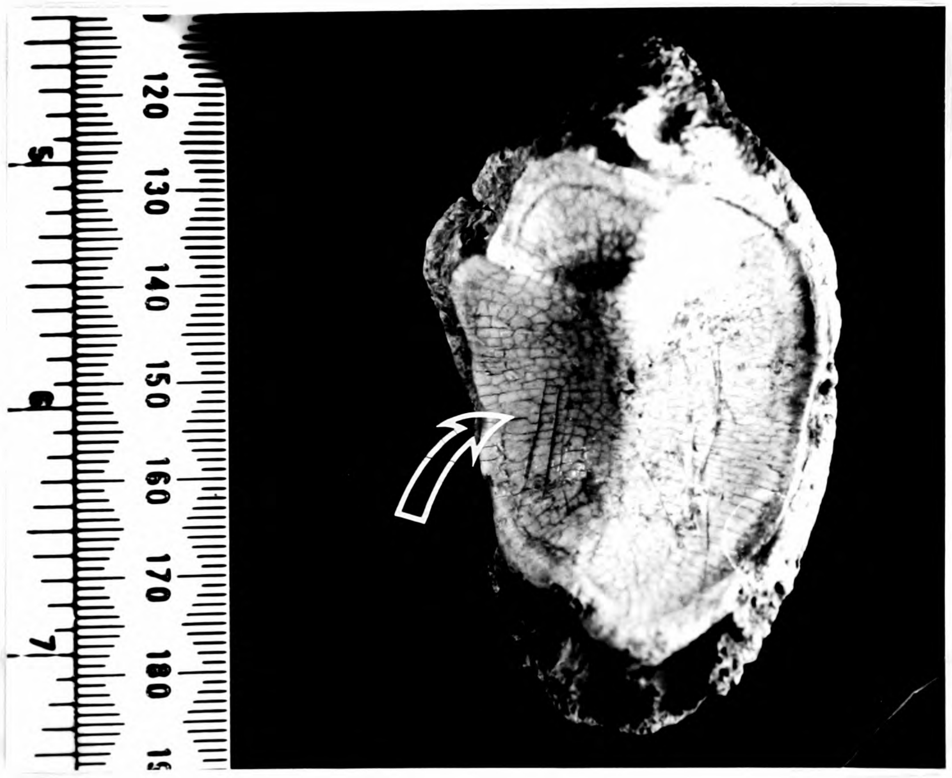

Plate 3.11: ***Bos*** **sp. 3rd phalanx with cuts on the articular surface, from the Trou de Chaleux. Scale in mm and inches. Arrow indicates cuts.**

disarticulation was noted on very rare occasions on a few of the horse 3rd phalanges. Cuts on two 2nd phalanges indicate the severance of tendons and disarticulation of these elements not only from the 3rd phalanges, but from the 1st as well. The cut marks on a sole 1st phalanx lie horizontal and are relatively deep across the lateral face of the bone, towards the proximal end. These are the only marks on any of the phalanges which indicate skinning rather than disarticulation.

Ovibos moschatus - Musk Ox

Although the fourth most abundant species (Table 3.2), the 78 specimens of musk ox represent a paltry 2.13% of the overall Chaleux assemblage. As mentioned above, musk oxen are not generally been considered part of a Bölling Interstadial fauna. Modern specimens are not well adapted for the equivalent of Interstadial conditions in contemporary sub-arctic lattitudes, and in previously published work the identification of musk oxen from the Chaleux has been brought into question (see above; Wilkinson 1975). The identification is however a valid one and was verified by myself in conjunction with Mr A.P. Currant at the Natural History Museum in London.

One of the accelerator dates for the Trou de Chaleux (OxA-4192, 12860 ± 140 BP; Plate 3.12) taken from a modified 1st phalanx of Ovibos clearly places it on the notional Bölling/Dryas I boundary. The possibility of a plateau in the radiocarbon record at about 12,800 BP (see chapter 2) complicates the matter somewhat, and leaves open the possibility that the Lateglacial component of the Chaleux assemblage may cover a potentially wider age range than that indicated solely by the radiocarbon dates. This problem has yet to be resolved. However, it is equally possible that the rate of climatic and environmental change during the Lateglacial is currently unclear; recent Oxygen isotope research on ice cores from Greenland (Alley *et al.* 1993; Fairbanks 1993), indicates that change may have been extremely rapid, possibly being counted in terms of years rather than decades.

What is clear is that the musk oxen present in the Chaleux assemblage (a MNI of 3 based on two adult left distal radii combined with the presence of at least one juvenile) came

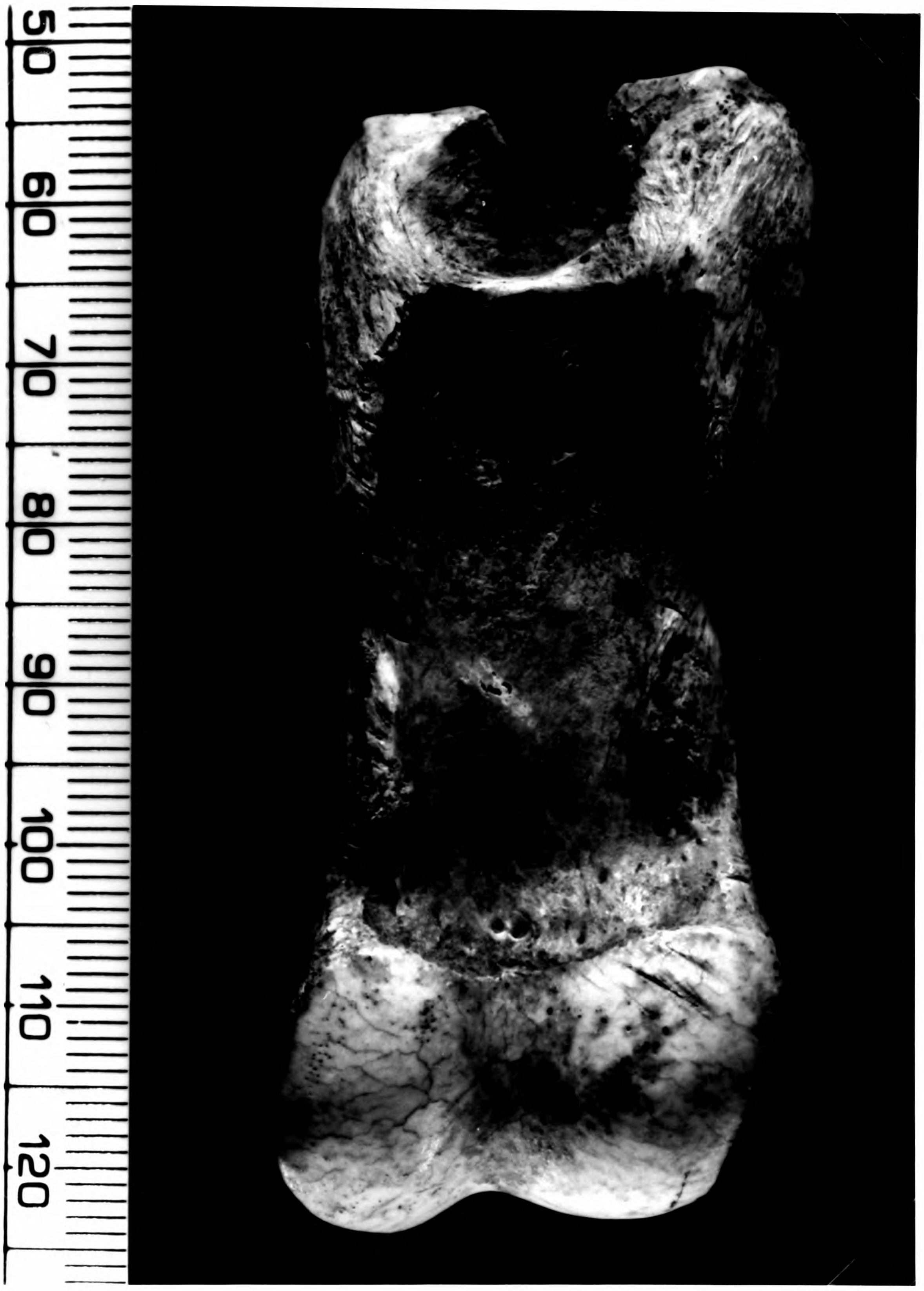

Plate 3.12: Cut 1st phalanx of *Ovibos moschatus* from the Trou de Chaleux. OxA-4192 12860 ± 140 BP. Scale in mm. Photo by Gwil Owen.

into direct contact with humans. In a similar pattern to that already described for the horses, the butchery marks indicate an intensive processing of lower limbs. BPR data is presented in Table 3.8. The sample size is relatively small (the NISP count of 78) and there seems to be little point in discussing these percentages in great detail. However the overall patterning confirms the selective concentration on lower limbs (in total 9 bones are cut). The butchery evidence documents the removal of tendons attached to the phalanges at their point of contact. In this particular aspect the butchery of the musk oxen bears a striking resemblance to the horses.

Saiga tatarica - Saiga antelope

Saiga antelope resemble short-haired sheep in their general body form, but have a lighter build, with longer, more gracile legs. They have distinctive large protruding eyes and an extended muzzle. They are plains animals which avoid uneven or broken ground wherever possible. Their diets vary with the seasons; among the most notable elements are *Gramineae* (grasses), *Kochia* (summer cypress), *Salsola* (Russian thistle or saltwort), *Ephedra* and *Artemisia* (wormwoods). Only the males bear horns; individual males may gather harems of up to 40 females, although 10 to 15 is more usual. They will mate in winter, after which the harems disperse in the search for snow free areas. The young are born in spring. During calving they tend to cluster in single sex groups, although during the rest of the year they form mixed sex goups. They are herd animals, and may move in groups of tens of thousands on their migrations. There does not appear to be a consistent pattern for these migrations, which instead seem to be dictated by the availability of food, water and the local environmental conditions (Currant 1987).

Today they are confined to the drier steppe-regions of the old USSR. However, during the Bölling phase of the Lateglacial they are found in numerous faunal assemblages in western Europe. Even so, they are an extremely rare species, and the presence of a sole specimen within the Chaleux assemblage reflects this. The horn core (Plate 3.13), although partial, is highly distinctive and consequently there can be no question of the accuracy of Dupont's identification, it is the only specimen of *Saiga tatarica* to be identified in the Chaleux collection.

Plate 3.13: Horn core of *Saiga tatarica* from the Trou de Chaleux. Scale in mm.

No butchery marks were observed on this specimen, and its conservation with an organic based preservative (one of the few specimens in the collection so treated) precluded its selection as a potential radiocarbon sample. The radiocarbon dates we have from elsewhere for the presence of this species in north-western Europe are few. Two are known: the first comes from Gough's Cave, and is taken from a calcaneum. The date is 12380 ± 160 BP (OxA-463). The other also comes from Cheddar, this time from Soldier's Hole, and is a proximal left metacarpal from spit 8 dated to 12100 ± 140 BP (OxA-1464). Delpech (cited in Currant 1987) suggests that the incursion of saiga into western Europe may have been extremely limited, possibly a single episode. If correct, this might indicate that fauna was still being accumulated within the Trou de Chaleux later in the Bölling Interstadial phase than the radiocarbon dates currently suggest. However, the precise means by which the specimen came to be within the cave are by no means clear, and it cannot be directly linked to human activity, neither are there any traces of carnivore activity on the specimen.

Capra sp. and *Ovis aries* - ibex, chamois, goat, & domestic sheep

A range of ovi-caprids have been reported from Lateglacial caves in the Meuse basin including Chaleux, Trou des Nutons, Furfooz (chapter 4), Trou du Frontal, Furfooz (chapter 5) and Coléoptère (chapter 6). Both ibex (*Capra ibex*) and chamois (*Rupicapra rupicapra*) are found in the Lateglacial faunas from the Neuwied basin (Turner 1991), and are relatively common occurrences in the Lateglacial faunas of south-western Europe (*cf.* Bahn 1983; Bailey 1983; Boyle 1990; Clark & Straus 1983). However, in Britain there are as yet no clear instances of Lateglacial caprids. There are a few claimed specimens, although none without major problems of identification and context - see for example comments in Charles & Jacobi (1994, 6), in which the identification of *Capra ibex* from the Robin Hood Cave at Creswell Crags is based solely on a left upper M1 which could not be distinguished from that of domestic sheep or goat (*Ovis/Capra* sp.). In many cases the skeletal remains of *Capra ibex*, *Rupicapra rupicapra*, *Capra aegagrus* and *Capra hircus* are morphologically so similar that a combination of size and context are usually used to differentiate the four. It is likely that many past researchers did not consider fully the potential problems of stratigraphic integrity when examining some components of Belgian Lateglacial faunas.

In general, the caprid material from Chaleux combines specimens which are in a similar preservation state to the bulk of the Pleistocene fauna, with a component which is in a distinctively different condition: on these latter specimens the anatomical features are more sharply defined, carnivore damage is lacking, and in some cases the bone surface is 'greasy' to the touch. It seems likely therefore that at least part of this material is more recent than the Lateglacial. I have already discussed many of the problems with the caprid identifications from the Lesse valley in the preceding section on seasonality in this chapter, as well as in chapter 2. Given the problems posed by these specimens, it seems best to consider this material to be later prehistoric/historic in age, and as such not relevant to the questions in hand relating to Magdalenian butchery practices. It has already been suggested that further radiocarbon dating of the caprids might go some way towards testing this suggestion. It is clear that further work is needed on the caprids from Chaleux, a re-evaluation of the species identifications would seem to be one crucial area which urgently needs to be addressed, although my feelings are that it will be difficult to pinpoint many of the identifications beyond the unsatisfactory designation *Capra* sp.

Another piece of evidence suggesting later prehistoric/historic contamination of the Lateglacial fauna was the presence of one clearly identified specimen of domestic sheep's horn core (*Ovis aries*). It will not be considered further as the discussion here is centred on the Lateglacial fauna.

Although no further details of this part of the assemblage will be discussed, the breakdown of the BPR information for all the ovi-caprids has been combined, and is presented in Table 3.9 at the end of this chapter. It will be noted that there is a discrepancy between the total NISP count in this table and the combined totals for *Caprs* sp., *Rupicapra rupicapra* and *Ovis aries* (Table 3.2 above). This is because the specimens described by Stutz have been included in Table 3.9 to give a full overview of the ovi-caprid assemblage.

Family Suidae

Sus scrofa - wild boar/pig

Wild boar and domestic pig have striking osteological resemblances, and are only differentiated at the sub species level, domestic pig being *Sus scrofa domesticus* and wild boar *Sus scrofa scrofa.* The two groups can be identified metrically when compared with each other, the domestic variant being significantly smaller than the wild variety in general. However, size may also vary considerably between populations and through time, and consequently the overall picture is very blurred when dealing with material of potentially different ages. In theory it should be possible to establish whether multiple populations of pigs/wild boar are present within the Chaleux assemblage, using the technique developed by Bull and Payne (1982). However, the sample of pig bones is so small (55 specimens) and covers such a wide range of anatomical elements that any attempted calculation of a coefficient of variation is meaningless, as there are too few data points for any individual element.

Modern wild boars range in weight between 120 to 200 kg, with relatively low population densities. The timing of the rut is variable and depends on a range of factors including the intensity of available sun light, temperature and food supply (Boyle 1990, 94). These animals need a large calorific intake and are generalised feeders. Main foodstuffs include fruits, nuts, roots, rhizomes, fungi, vegetables and carrion, and their preferred habitat is deciduous woodland.

It is possible that wild boar is present within the Chaleux Lateglacial assemblage, but this has yet to be confirmed. Wild boar is clearly part of the Late Pleistocene megafauna in more southerly regions, such as the Dordogne region of France (see, for example Boyle, 1990). However, it is still unclear whether this species was locally present in Belgium during the Lateglacial: only negative evidence was produced by the AMS dating of a cut distal humerus of *Sus scrofa*, provenanced to the *1er niveau ossifère*, the results of which clearly indicate this particular specimen to be later prehistoric (OxA-4193 3060 ± 85 BP; Plate 3.4).

The *Suidae* in the Chaleux collection were in a similar preservation state to the vast majority of the fauna from the site, and there seemed to be no clear method of differentiating Lateglacial components from those more recent in age. Many of the bones show clear butchery traces relating to meat removal, although some of these are more consistent with the use of metal rather than flint blades (the 'V'-shaped cuts, whilst retaining the same general morphology of stone cuts, are relatively narrower, and may leave a 'lip' of bone where they have penetrated the bone surface). Many of the bones which show butchery traces, have also been "hacked" as if by a cleaver. This type of damage has not been observed on any of the clearly Lateglacial parts of the assemblage, and is quite different from the longitudinal splitting and shearing noted on the horse bones.

Adults males and juveniles were included (it is not clear whether females are also represented) in the small assemblage of 55 bones. BPR data (Table 3.10) indicates that parts of at least three adults (based on the distal humeri), and a more fragmentary juvenile were present.

Unlike material from the two Furfooz caves, there was very little evidence for seasonality or age structure from these remains. One partial left mandible had the dm3 in situ with M3 erupting. Correlating this with data published by Bull & Payne (1982) taken from a modern population of Turkish wild boar, this places the specimen in question between Bull & Payne's group 1 (where the M3 may not even be visible) and group 2 (where the M3 has erupted and is coming into wear, and the dm3 has already been lost). Overall this gives an age estimation lying within the range 11-19 months. Epiphysial fusion on some of the post-cranial elements gives further hints. The glenoid surface is unfused and missing on one right scapula (part of Acc. N° 2598), indicating that this juvenile was under one year old. Similarly all the vertebrae excluding the atlas were unfused and may well have been part of the same vertebral column; unfortunately Bull & Payne give no information for the age at fusion of the vertebrae, although this clearly takes place before 35 months is reached (the age at which all bones reach fusion; *ibid.*, 70) and could well be at broadly the same timing as the scapula.

Order Carnivora

Family Ursidae

Ursus arctos - brown bear

Brown bear dens are usually selected for their remoteness from centres of human population, and may be in long term use by successive generations of bears. Depending on environmental conditions, bears will begin hibernation between September and early November and continue until the April of the following year. Cubs may den with their mothers for up to two winters, and this may well be what happened with the two individuals from Chaleux - a hibernating adult and its cub were encountered by chance by the Magdalenian group which subsequently used Chaleux on one or more of its visits. The taking of these animals might therefore indicate winter seasonality for this particular 'event' at the site, and it will be interesting to see whether further seasonality work on other species confirms this suggestion. Before hibernation commences, bears lay down an immense amount of fat to see them through the winter months. Both Domico (1988) and Partridge (1992) give the figure of 90 lb (41 kg) as an upper limit for food consumption within a 24 hour period. From a human view point, bears have many uses. Their fat may well have been a valuable resource for the human residents of the cave. Their skins are tough and hard wearing, and their stored fat is known to make good fuel for lamps, has a high calorific value and may also be extremely useful in the waterproofing of skins. Coles (1991, 136) commented in passing that bear grease was a good adhesive agent for the pigments used in prehistoric art (although there is no evidence for cave painting at Chaleux or any of the Belgian caves).

Although the bulk of their food is vegetable based, bears are skilled hunters and fishers and, as with the other carnivores within the assemblage (discussed below), they may well have been responsible for the accumulation of parts of the mammal, fish and mollusc assemblages from Chaleux. Brown bears have been observed to take a wide range of mammals, and parts of large carcasses may be also be buried for future use (Partridge 1992, 27).

In general it is uncommon to find cut marked bear bones from Late Pleistocene contexts; bears tend to avoid direct contact with humans, unless they pose some form of threat, and choose their dens in relatively secluded areas. The hunting of bears is a highly dangerous pastime, even with modern guns and rifles. Handguns have to be of a large calibre, and often a number of shots are necessary to kill an adult (Domico 1988, 170), a luxury rarely available whilst being charged by a bear.

As with the rest of the fauna, I observed no clear evidence of projectile damage on any of the bear specimens. The hunting and killing of a bear would have almost certainly involved the use of projectile technology, whether the bear was first trapped or not. It seems likely therefore that the adult bear at least was taken unawares or found dead.

The NISP figure for brown bear at Chaleux is again low (65; 1.78% of the assemblage), and the BPR data (Table 3.11) indicates that only selected parts of three bear caracaases were recovered. The MNI count of 3 was obtained by combining the two adult left mandibles with the known presence of a juvenile based on metapodia, this gave an overall picture of two adults and a juvenile, all of these specimens contained within the bulk accession number 2601. In the case of the juvenile, only three metapodia with missing (unfused) proximal ends were present, indicating only the presence of a paw rather than the entire skeleton. Dupont's labels fixed to the specimens identify the bear as *Ursus ferox*. However, in the associated label (Appendix I) they are identified as *Ursus arctos* which is correct. Both adult bears are represented by parts of the skull (mandibles, a maxilla and loose teeth), three vertebrae, an innominate, sacrum, part of the forelimb, the lower portion of the hind limb and the phalanges. Butchery marks were observed on the bones of at least two of the three individuals (one adult and the juvenile; Figure 3.15). With the exception of a left mandible (Plate 3.14), all the butchery marks were confined to the paws and for the most part correspond with skinning, although marks across two tarsals and three phalanges are indicative of disarticulation. Amongst these are three metatarsals belonging to the adult (all cut) which were originally part of the same limb. They re-articulate well, and the cuts running across them follow a continuous trajectory.

Plate 3.14: Cut and gnawed left mandible of *Ursus arctos* from the Trou de Chaleux. Scale in mm. Arrow indicates cut marks.

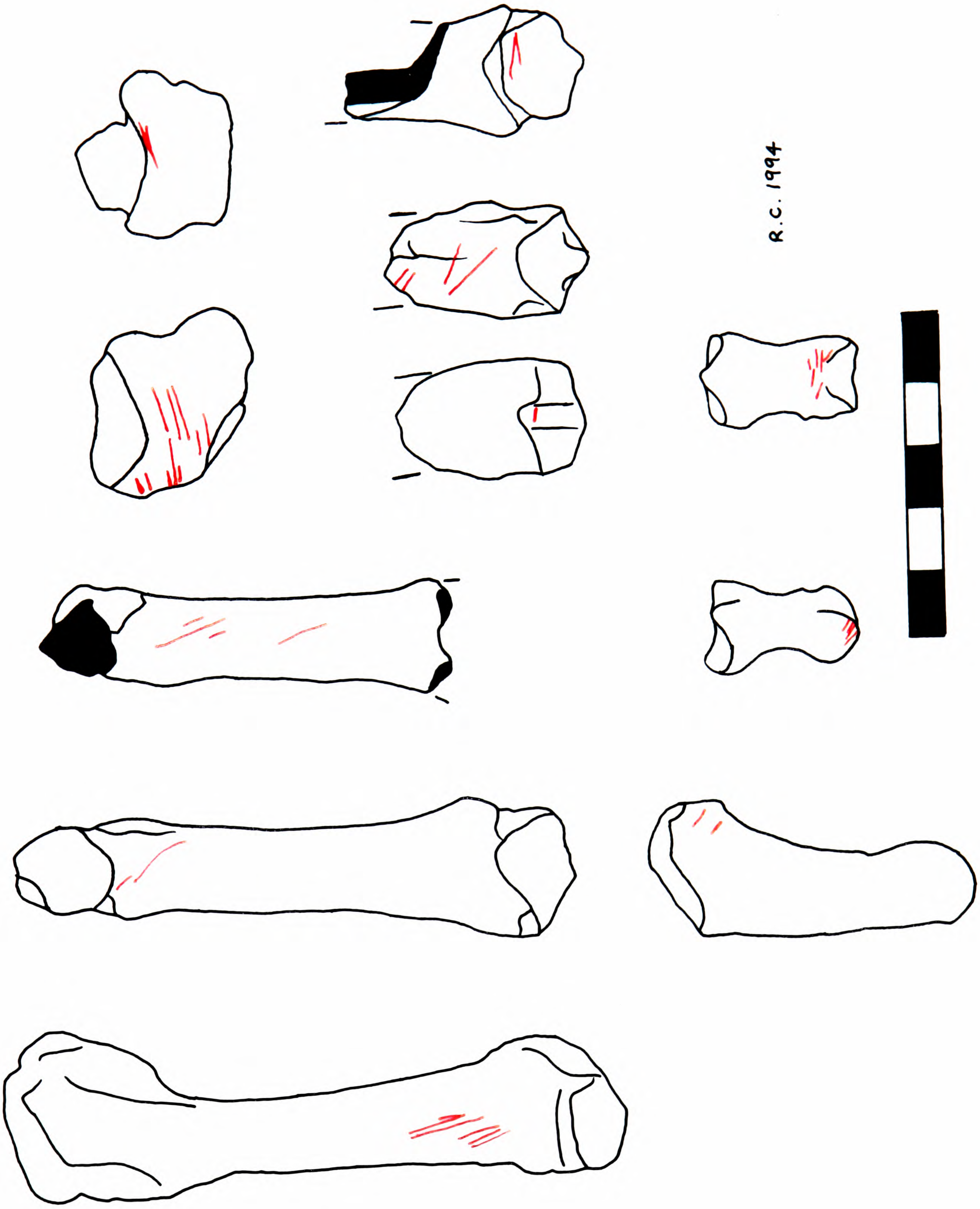

Figure 3.15: Cut bones of *Ursus arctos*. Scale in cm.

Given the highly intermittent nature of human presence in Belgium during the Lateglacial, alongside the evidence that there have been numerous residents in the Trou de Chaleux, it seems probable that the late Magdalenian hunter-gatherers may have encountered one (if not two) hibernating bears within the cave during one of their visits.

There are few convincing accounts of the human exploitation of bears in the archaeological literature. Suggestions that Middle Palaeolithic sites such as Istállósko and Szeleta belonged to a 'cave bear cult' in south-eastern Europe are dubious. Instead it seems most probable that the bears from these caves were hibernating and that bear was probably among the main residents of the sites for much of the Middle Palaeolithic (Allsworth-Jones, 1986) rather than there having been any true link between humans and bears. Re-examination of these so called 'cave-bear cult' faunas for direct butchery evidence might prove to be a useful exercise. Evidence for Mesolithic human hunting of brown bears is equally rare, but does exist. At Medvedia Cave near Ruzín in Slovakia, the skeletons of at least one bear was found associated with composite arrowheads (bone points with imbedded microliths) (Bárta 1989). For the time being, the two bears from Chaleux are one of the few clear examples of the Pleistocene human exploitation of bear carcasses.

Family Canidae

Canis sp. - wolf/dog

Although the presence of semi-feral dogs during the northern European Upper Palaeolithic has been suggested by Benecke (1987), it is unclear whether any of the 29 bones identified as *Canis* sp. from the Dupont excavations at the Trou de Chaleux came from a domestic dog or a wolf as these specimens were too fragmentary to make a full identification. Patou-Mathis (1994, 177) identified only wolf (*Canis lupus*) within the fauna excavated by the University of Liège. All of the bones and teeth were from adults, an MNI of 2 was obtained from the distal tibiae. None of the canid bones were modified, and so there is no direct evidence for a link between these and human activity. Full BPR details are given in Table 3.12.

Vulpes sp. - fox

As discussed above, it is currently unclear whether one or two species of fox are present. Clutton-Brock *et al.* (1976) identified various point of difference between different members of the *Canidae*, but few of these are applicable to post-cranial elements or incomplete crania. In general, arctic foxes are smaller than red foxes today, one of the most distinctive differences being that their muzzles are relatively shorter and broader than their red counterparts. It is possible to differentiate these two species osteologically, but, it would have proved too time consuming, given the limited time available for research visits to Brussels, especially as the faunal material from the *1^er^ niveau ossifère* contains elements of significantly different ages (and consequently examples of the same species may vary considerably in size). Another deciding factor in this decision was the fact that only 5 out of the 473 fox bones showed any traces of human modification.

Both red and arctic foxes live in dens with complex burrow systems (Ginsberg & MacDonald 1990). These are used primarily for shelter and rearing young. In the case of arctic foxes there is evidence to suggest that these dens may be in long term use by succeeding generations. The average life span of a fox is a few years (11 is given as a maximum: *op. cit.*, 34) but 300 years is given as an estimate of the use life of a den.

The arctic fox (*Alopex lagopus*) occurs in two colour morphs ("white" and "blue") both of which change seasonally. Its habitat is today distributed in circumpolar regions, especially arctic tundra and most arctic islands. It is an opportunistic scavenger and predator, and has been observed hunting ptarmigan (*Lagopus mutus*) and migrant waders. Arctic foxes have also been known to scavenge meat from seal carcasses (*op.cit.*, 34) and to take seabird eggs.

The colouring of the red fox is quite variable but not seasonal. Animals have been observed to have pelts in a range of shades from grey to bright red, although the most common is reddish-brown. Red foxes are distributed throughout the northern hemisphere and much of southern Australia. Their natural habitat is a dry, mixed landscape, although they are also found in uplands, mountains, deserts and sand dunes. In short, they are a highly flexible and adaptable species. Their diet is varied, including beetles, earthworms, small mammals (including lagomorphs), birds, fruit and carrion. They are often blamed for the death of juvenile livestock (e.g. lambs), although it is unclear whether they actively hunt these or take them as carrion. They are also known to cache food surpluses (MacDonald 1979, cited in Ginsberg & MacDonald 1990). Both species are currently trapped for their pelts in various parts of the world.

The foxes are the second most abundant species found at Chaleux (NISP = 473, 12.93% of the assemblage). Consequently their potential significance within the Lateglacial hunting/trapping economy should not be underestimated. Of the five fox bones that show butchery marks, one of these - a left scapula (part of IRScNB N° 2623) - is clearly very recent in origin. The remaining four specimens (2 femurs, a humerus and a scapula, again all part of IRScNB N° 2623) show longitudinal marks consistent with meat removal. The trapping of arctic foxes for their pelts is a relatively well documented activity during the Upper Palaeolithic of other regions (see, for example Klein 1973, 56). The evidence which Klein cites, from the Russian sites of Mezin and Avdeevo, consists of complete (or virtually complete) skeletons excluding paws, which he suggests were removed with the skins and notes that articulated paws had been found separately. The skinning of animals, without meat removal, leaves very few traces in the archaeological record. Cut marks may be present at key points of severance - in the region of the snout, and perhaps on the lower limbs, where the skin has been 'ringed' to remove it from the body. The precise location of both points of severance will vary. This variation may relate to a wide range of factors, including the particular butchery 'tradition' and techniques involved, as well as personal 'style' on the part of the butcher/furrier. Given this, it is clearly difficult to establish whether the foxes in general were present at Chaleux due solely to human agency, or to a range of predators of which humans were just one. As the fox bones lack any spatial information (as indeed does all the faunal material from Chaleux) and Dupont made no detailed comment on them in his labels, it is impossible to know whether the fox bones were recovered in articulated units or complete skeletons.

Mandibles are the most common elements within the assemblage. The left mandibles give an MNI count of 17 (Binford MNI of 15), which is much higher than the

MNI counts on other bones. Examination of the BPR tables and diagrams (Table 3.13, Figure 3.16) does not clearly show whether complete or almost complete carcasses were present at the site (if they had been, then the %MNI diagram would show many of the anatomical elements on very similar percentages). No juvenile bones were recorded, and although this suggests that the cave may not have been a den, this possibility cannot be fully ruled out. It is interesting that the first cervical vertebrae (atlas and axis) are present in identical numbers (8), although the %MNI figures for the other vertebrae are much reduced. Innominates appear in almost the same proportions to the first two cervical vertebrae. Complete long bones are relatively rare, although they are present. Proximal and distal ends occur in significantly different quantities, although this seems to be linked more with their relative robustness than to the human selection of different body parts given the small size of even the Pleistocene foxes. Fibulae are totally absent which given the fragile nature of this bone, may again be taken as an indication that bones were fragmented beyond recognition (or recovery) whilst buried.

Of perhaps greatest note is the relative lack of metapodia and phalanges. The metapodia occur only in very low frequencies, as do the 1st phalanges, whilst the 2nd and 3rd are totally absent. There are three possible explanations for this: first, that these elements were not recovered on site due to poor excavation techniques; second, that these elements were not identified after recovery; and finally that they were not originally present at the site. The first two possibilities do not seem to be particularly likely. As has been discussed in some detail above, Dupont's recovery techniques appear to have been excellent. Not only did he recover and preserve fish and micro-mammal bones, but these were sorted and identified. Similarly, a vast quantity of unidentifiable bone fragments were preserved in the Institut stores, all of which were provenanced to the *1er niveau ossifère*.

It seems clear that to recover these bones and bone fragments Dupont must have sieved at least part of the sediments, and given the quantity of material preserved in the collections, it seems extremely likely that sieving was employed throughout the excavations. If this was the case, then fox phalanges and metapodia would have been retrieved from these, even if missed in primary context. Given the consistently high level

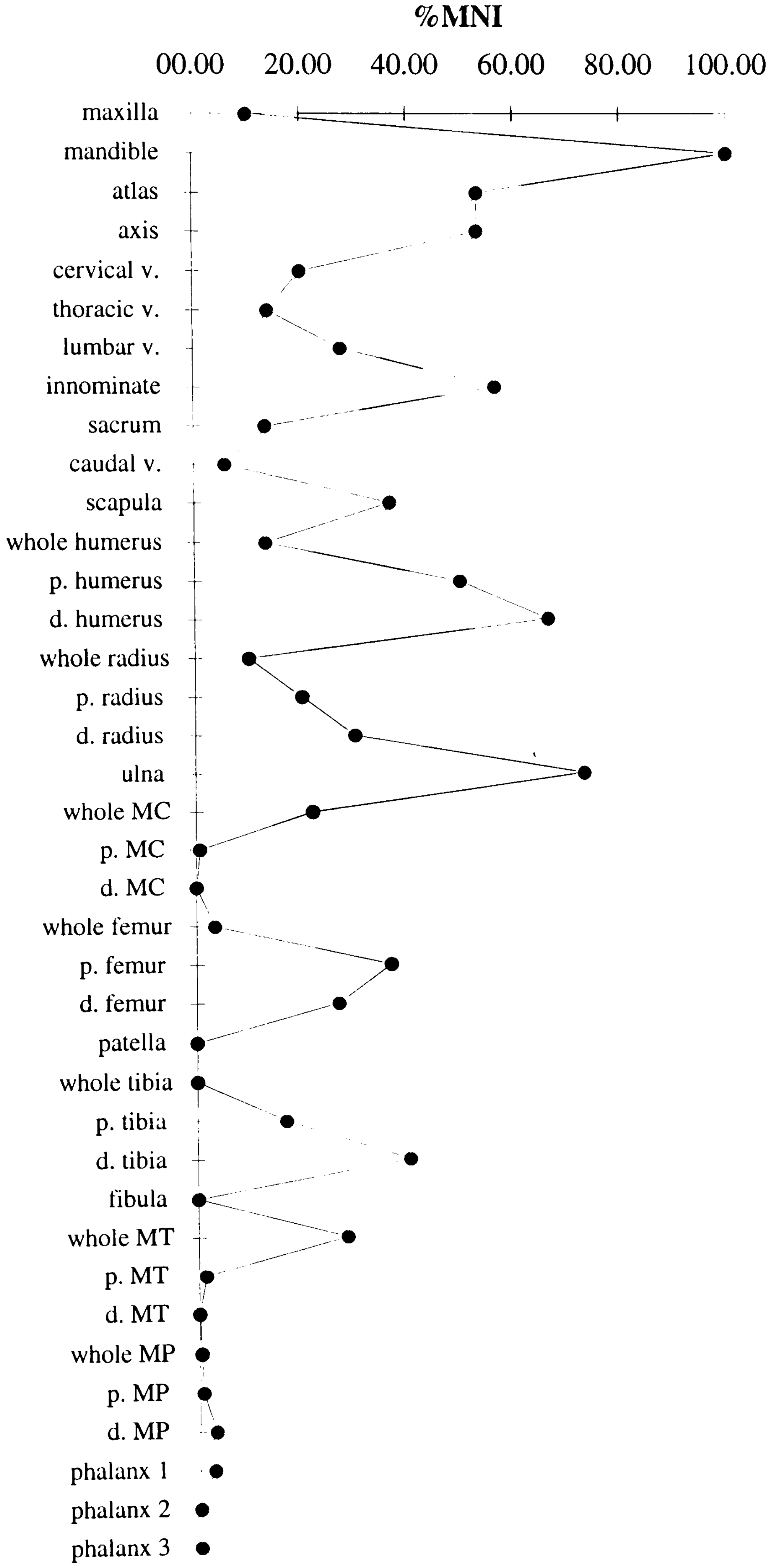

Figure 3.16: %MNI data for *Vulpes* sp. from the Trou de Chaleux.

and quality of Dupont's faunal identifications, it seems very unlikely that he would have failed to recognise some of the fox bones for what they are. Fox metapodia are quite distinctive. During the time spent quantifying the unidentifiable bone fragments, no fox bones were encountered, yet this would surely have been their final resting place had they been passed over by Dupont. This leads to the conclusion that these particular elements were not encountered during the 1865 excavations. Klein's (1973) account of fox skinning from Russian sites seems to give a strong hint as the the fate of at least some of the Chaleux foxes. Like their Russian counterparts, the Chaleux foxes have lost their paws, a fact which Klein records as being highly suggestive of skinning taking place. It is also worth noting that only one fox cranium and three maxillae were present in the collections, in very noticable contrast with the number of fox mandibles. This seems suggestive that fox skinning (and by implication trapping) was an activity at Chaleux. It would be interesting to know what anatomical elements of fox were recovered by Otte's excavations in the 1980s, as this might well confirm the observations made on the Dupont collection. Unfortunately full BPR information for *Vulpes vulpes* and *Alopex lagopus* was not included in Patou-Mathis' published report (1994) of this material. Alternatively, the presence of metapodia and phalanges within Otte's collection might give an indication as to spatial organisation and discard patterns amongst the Lateglacial hunter-gatherers-trappers of Chaleux.

Despite the circumstantial evidence for skinning and trapping activities at or near Chaleux, very few of the fox bones show any direct butchery marks. The marks on the 5 cut bones do not indicate skinning, but rather meat removal (humerus and femora) and disarticulation (scapula). It is unclear whether fox (arctic or red) would have made 'good eating' for the Lateglacial inhabitants, although given the very low number of bones indicating meat removal it seems unlikely. Today foxes are considered *vermin*, and as both *vermin* and carnivores are not generally thought of as a viable food resource in the way that rabbit or hares are (Jeremy Dennis pers. comm.). Whether any such cultural distinction was made during the Pleistocene is unclear, although it is worth noting that within Klein's sites in Russia the foxes do not appear to have been used for food, but instead discarded as complete carcasses.

It seems quite possible that, as well as being the prey of humans, one or both species of fox were resident in the Trou de Chaleux during the late Pleistocene and Holocene. We have seen that their dens may be used over relatively long time periods (perhaps 300 years), and in this time it is likely that a range of vertebrates, invertebrates and other food substances will have been brought by them to the cave, accounting for part of the faunal collection. Similarly at various times the foxes themselves may have been the prey of other carnivores living in and around Chaleux.

Family Mustelidae

Gulo gulo - Wolverine/Glutton

Wolverines are today mainly restricted to the taiga and southern tundra zones of Eurasia, including parts of the old Soviet Union, Norway, Sweden, Finland, Mongolia, northern China, and also extend into the new world in much of Canada, Alaska and possibly the Rocky mountains. However, this is by no means a reflection of their past distribution. They appear to be highly adaptable animals, and records from the earlier parts of this century, as well as the last, suggest that they were found in more southerly regions in the recent past (Schreiber *et al.* 1989, 22-23). They have extremely large home ranges, approx. 800-900 km^2 in summer, and perhaps even larger in winter (*op. cit.*, 22). In general, wolverines tend to avoid human settlements, and to date there is little research available on their ecology and behaviour patterns.

In many, if not all of the regions it is found in today the wolverine is traditionally hunted for its fur. This is deemed (R. Jacobi pers. comm.) to be especially useful in extremely cold environments, as it does not freeze when damp, and consequently makes a fine edging for hoods amongst other uses. The pelt of the wolverine may also have held symbolic significance, although this can only be guessed at. It seems unlikely that wolverines came into frequent contact with humans during the Palaeolithic, and their vicious reputation no doubt preceded them. Consequently the possession of a wolverine pelt may have contained levels of symbolic significance which we can only now guess at. It is difficult to reconstruct with any certainty human Lateglacial gourmet preferences. A small number of *Mustelidae* from Chaleux bear marks which may well correspond with meat removal rather than any other butchery activities but, given the questionable nature of the butchery mark from the single Chaleux specimen, it is unclear whether the wolverine formed a component in any Lateglacial meal at Chaleux.

The wolverine is also a predator, capable of taking large mammals, although in general it is mainly a scavenger of herbivore carcasses up to the size of reindeer and red deer. Characteristic damage patterns on bones accumulated by wolverines include intensive bone breakage and fragmentation alongside gnawing. Little trace of this type of modification can be seen within the Chaleux fauna. However, so little is currently known about wolverine behaviour that it seems rash to completely rule out wolverines as one of the potential bone accumulating carnivores in action at Chaleux.

As mentioned above, a single specimen of wolverine was identified by Dupont. A left scapula with possible cuts was confirmed as *Gulo gulo* by Mr. A.P. Currant at the Natural History Museum in London. Subsequent examination of the specimen by Ms J. Cook of the British Museum indicated that the marks observed on the specimen were ambiguous; the most prominent closely matched 'natural' marks found on the remains of a cow from Draycott (Cook pers. comm.; Cook & Andrews 1985). Others, less prominent, were only possible cuts. On the basis of these findings, it was decided to withdraw the specimen as a potential accelerator sample.

It thus remains unclear whether this specimen was introduced to the cave as the result of human agency. Wolverines were certainly known to Magdalenian hunter-gatherers; one is engraved on a perforated *bâton* from La Madeleine (Cremades 1992) and a similar piece is present within the British Museum collections (J. Cook pers. comm.). They have been identified from other Lateglacial contexts in north-western Europe such as Chelms Combe at Cheddar (Currant pers. comm.) and Petersfels (Albrecht *et al.* 1983, 78). Wolverines have also been recorded within the fauna from the Trou des Nutons at Furfooz (Chapter 4) and are also thought to be present in north-western Europe during the early Postglacial. Consequently it is unclear as to whether this specimen is part of the Bölling age fauna, or a more recent addition.

Meles meles - Badger.

As has already been mentioned, knowledge is extremely patchy about the temporal distribution of badgers through the Holocene and Pleistocene. Their presence in a Lateglacial assemblage is usually taken as evidence for more recent contamination, and a mixing of faunas is clearly present in the *1^er niveau ossifère*. However, this does not automatically make all or part of the badger specimens from the *1^er niveau ossifère* at Chaleux intrusive. Badger fossils have been recorded from other Lateglacial contexts in north-western Europe, including Petersfels (Albrecht *et al.* 1983, 80) although their contextual relationship with the archaeological assemblage is ambiguous.

Badgers are denning animals and live in sets; the morphology of these is highly variable, but they may be extremely large (totalling many cubic metres). The tunnels tend to be linked, and there are many chambers, often with bedding of vegetation. Badgers also 'like' using caves (Hans Kruuk pers. comm.). Sets are often shared with other carnivores, including foxes, otters and wild cats. These sets are thought to be in long term use, and some are thought to be used over centuries. Indeed, one near Kirkhead Cavern in Cumbria is mentioned in the Domesday Book, and is still in use. It is unclear whether these sets are used continuously, or episodically by different badger clans. Although in general badgers prefer hilly districts, especially well wooded ones (Neal 1948, 122), they are highly adaptable, and can survive in a range of habitats and soils. The Trou de Chaleux, with its steep talus cone, surrounding slopes and proximity to water, would have proved an ideal location for badgers.

It is possible that badgers may have been in played some part in the accumulation of the faunal assemblage found in the *1^er niveau ossifère*. Although their diet is primarily made up of earthworms (Kruuk 1989, 39), they are known occasionally to eat a variety of foodstuffs including salmon, frogs and toads, wood pigeon, Passerines, a variety of small mammals including rabbits and hares and carrion up to the size of sheep and deer. They have even been observed to kill lambs (Kruuk 1989, Plate 11) and to take chunks of food including carrion, back to cubs in the sets. In recent times they have been noticed to be omnivorous in areas away from extensive agriculture, taking carrion, small mammals and vegetable matter. The cubs themselves are prone to high mortality rates within the sets, but this varies with local ecological conditions (Hans Kruuk pers. comm.). Kruuk has observed corpses of very young badgers well away from sets, which must have been taken there by adults, but thinks that most will be either left inside the set or eaten by adults. Similarly Kruuk has noted that "small mammal remains can be passed relatively undamaged in the faeces, and their latrines inside the set or, in the cave-based sets as an 'entrance hall'" (Hans Kruuk pers. comm.). One particularly interesting feature is that they do not chew or gnaw bones, so it is difficult actually to demonstrate a direct link between badger activity and the accumulation of faunal remains. Given what has been outlined above, badgers may well have been responsible for at least part of the accumulation of small mammals and fish bones and even some of the larger mammal bones found within Chaleux. It seems likely indicate that a set had been located within Chaleux at some point in the past.

An MNI of 4 was calculated for the Chaleux badgers based on the innominates, scapulae and femora. No juvenile bones were recorded. Overall 66 badger bones were identified (1.8% of the assemblage). BPR information for *Meles meles* is presented in Table 3.14, although once again the sample size is considered too small to base any discussion of significant trends. It is, however, interesting to note in passing that as with the foxes, the lower portion of the badger limbs are totally absent. Similar arguments to those used in relation to the fox limbs (above) might be applied to argue a case for the skinning of badgers (and consequently that these too might have been trapped for their pelts).

Five of the badger femurs show clear butchery marks. These were the only butchery marks observed on any badger bones. Longitudinal groups of cuts were the only ones observed, almost all of which were located towards the proximal ends (in one instance, part of bulk Acc. N° 2623, a single longitudinal cut was situated at the distal end). These correspond with meat removal, suggesting that whilst badgers might well have been hunted/trapped for their distinctive pelt, their meat was also of some interest. Indeed meat removal is the only activity for which there is any direct evidence at Chaleux, so far as the badger bones are concerned.

It would have been an interesting exercise to test whether this exploitation of badgers could be linked to the Lateglacial or a more recent period. As with many of the other questions raised within the framework of this thesis, accelerator dating of the modified badger bones would have opened an interesting avenue for research. However, discussions with Rupert Housley at the Research laboratory for Archaeology and the History of Art at Oxford indicated that an application for date(s) on human exploitation of badgers, which would also yielding biostratigraphic information about this species was unlikely to be successful when viewed within the context of the number of dates already obtained from Chaleux. I therefore did not proceed with this enquiry, although it will be pursued should private funding for this project become available at a later date.

***Mustela* sp.**

Today there are approximately 53 seperate species of mustelid which are found primarily in the northern temperate zones of north America and Eurasia (Schreiber *et al.* 1989). These include the badger and the wolverine (both discussed above) as well as martens, mink, stoats and weasels. Each member of the *Mustelidae* has its own particular set of environmental preferences and behaviour. I do not intend to discuss these in detail here. Within the Chaleux assemblage 6 specimens which could only be identified to *Mustela* sp. were present (0.25% of the assemblage). Only two of these were mandibles, and unfortunately time was not available at the end of my research visits to verify the identifications made by Dupont. He identified three sperate species within this group (*Mustela vulgaris* (now *Mustela nivalis*, the weasel), *Mustela erminaea* (stoat), and *Mustela foina* (beech marten)). Many of these were postcranial elements and it was felt that these identifications could not be verified solely on the basis of the specimens available.

Mustelids rarely occur in Lateglacial contexts in north-western Europe. None were reported by Currant (1986, 1991) at Cheddar, neither were any observed by Turner (1991) in the Neuwied basin. In Mesolithic contexts, however, mustelids do appear to figure significantly within the economy. At Star Carr the remains of a polecat show butchery marks consistent with skinning (authors observation); the remains of at least 13 complete pine martens, a polecat, and4 otters (wild cat was also included in the list of animals skinned and butchered) have been reported from the late Mesolithic (Ertebølle) site of Tybrind Vig in Denmark (Trolle-Larson 1987). None of the Chaleux bones showed any sign of cuts, and the BPR information did not suggest that a complete mustelid carcasses were present (which would be expected had skinning taken place), although the sample size was too small to draw any detailed conclusions. Whilst it is possible that these mustelids were introduced to the cave as the end result of fur trapping, it is equally likley that they found their way to the cave through some other agency, perhaps via another predator and could also be more recent than the Lateglacial. There is no direct link between these 9 specimens and human activity.

Family Felidae

Felis sp. - Lynx & Wild Cat

The presence of lynx (*Lynx lynx*) within north-western European Bölling phase faunas has been suspected for some time, and has been confirmed as an integral part of the Lateglacial fauna from Gough's Cave, Cheddar (Currant 1991) by AMS dating (OxA-3411 12650 ± 120 BP taken from a lynx tibia), and so the possibility that lynx was also present in the Chaleux fauna cannot be completely excluded.

Dupont's identification of *Felis chaus* has already been discussed, and discarded. Thirty four individual felid bones were recorded, and my notes indicate that a number of these 'appeared recent', being greasy to the touch. An MNI of 4 was obtained from the left innominates. None of the specimens identified as *Felis* sp. had any trace of human modification, and so they will not be discussed in detail here. It seems likely as some of the bones 'appeared recent' at least some of the felid bones were not Lateglacial in age.

Order Rodentia

Family Castoridae

Castor fiber - Beaver

The Chaleux collection contains one solitary beaver bone, a distal left femur with no butchery marks (part of 2602). It is unclear whether this specimen is part of the Lateglacial fauna from Chaleux or a more recent component. It seems probable that, rather than being incorporated into the *1^{er} niveau ossifère* by human agency, this specimen was introduced into the cave by one of the many predators which appear to have made Chaleux their home at some point during the Holocene.

Beaver has been recognised in a number of European Lateglacial assemblages, although attempts at confirming it as an integral part of European Lateglacial faunas has so far been unsuccessful. An early Postglacial date on an unmodified right mandibular ramus of *Castor fiber* (OxA-1119 9320 ± 120 BP) from Gough's Cave, Cheddar, is the oldest beaver currently dated, and came from an apparently Lateglacial archaeological context. Similarly Bratlund's dates on beavers from Stellmoor in Northern Germany, which were expected to be linked to the Lateglacial Ahrensburgian occupation are also proved to be early Pre-Boreal (OxA-2873 7830 ± 80 BP; OxA-2874 9220 ± 90 BP). OxA-2873 is incidentally important as it comes from a "mandibular artefact of *Castor fiber*" (Bratlund's comments in Hedges *et al.* 1993), the only evidence indicating human activity at Stellmoor after the end of the Pleistocene.

As there were no butchery marks present, no link can be made between this specimen (and species) and the Magdalenian occupants of Chaleux. The proximity of the site to the river Lesse suggests that the beaver may have found its way into the faunal assemblage by purely natural means, though no marks of carnivore modification are present on it. There are no compelling reasons why this specimen should be thought to be a part of the Lateglacial fauna rather than of more recent age, and given that a part of the Chaleux fauna has already been argued to date to the Holocene rather than the Pleistocene I find no problem with this view.

Order Lagomorpha

Family Leporidae

Lepus sp.- hares

Lepus timidus occurs in many Late Pleistocene assemblages in western Europe. It is larger than its counterpart *Lepus europeus* - the brown hare, which is common in much of Europe today. In recent years its significance for Upper Palaeolithic economies has begun to be reconsidered. In south-western France Boyle (1990) has documented a rise in the abundance of hare bones during the Upper Palaeolithic, culminating in the Lateglacial. In Britain, recent work by myself and R.M. Jacobi (Charles & Jacobi 1994) has highlighted the economic value to humans of this species at the Robin Hood Cave, Creswell Crags. Arctic hare is frequently found in many British Lateglacial sites and appears to have been both a food source and a useful fur bearing mammal to local hunter-gatherer groups.

At the Trou de Chaleux *Lepus timidus* occurs in relatively low numbers. 50 specimens in total were identified, 1.37% of the total NISP counts. MNI calculations indicate only 2 individuals. As only 3 of the hare bones show clear cut marks, hares cannot be considered to have been of major economic significance within the site. Although, as has been suggested with the foxes, they might have been trapped for their pelts.

Order Primates

Family Hominidae

Homo sapiens - human

In addition to the large mammal assemblage described above, Dupont also identified a small number of human remains, which he provenanced to the *1er niveau ossifère*. Although I was able to locate the original plaster tray and label in the IRScNB stores, the human bones had been removed from this part of the store. Further enquiries did not locate the material. Dupont listed Van Beneden's identifications as well as his own (1865a, 830) which will be reproduced here for reference: a parietal (part of the skull), some loose teeth, an axis vertebra, a cervical vertebra, some lumbar vertebrae (adult), 2 lumbar vertebrae (juvenile), 3 scapulae, two radii, a tibia, two fibulae, rib fragments and several phalanges. Dupont suggested that this material came from a single individual, although he or she would have to have been quite remarkable with three scapulae and both adult and juvenile lumbar vertebrae. The majority of these came from a crevice at the side of the cave, mixed amongst fox and horse bones (*op. cit.* 830-831). Because the human long bones were complete, Dupont ruled out the possibility of cannibalism in relation to this particular material.

The possibility of canibalism is a recurring theme within Lateglacial archaeology, and clear evidence for this practice is particularly difficult to find. Once again, Gough's Cave at Cheddar has been at the centre of just this type of interpretative problem (Cook 1986, 1991; Currant *et al.* 1989). In the case of the Chaleux hominid, it is obviously difficult to comment. I have not seen the specimens, and in my own mind there is a question as to whether this human material was truly of Palaeolithic age. A number of the caves in the Dinant region have at various points in the past had a sepulchural use (Cauwe 1989; Cauwe *et al.* 1993).

THE AVIAN, SMALL MAMMAL AND FISH FAUNAS

Alongside the vast large mammal collection from Chaleux, Dupont also recovered a wealth of avian small mammal and fish remains. The study of these did not fall within the direct remit of my research, but I felt it worthwhile to record as much of this material in the briefest possible manner that time would permit. The avian fauna was inspected for butchery evidence; it did not seem appropriate to look for this type of information on the small mammal bones, as it was unlikely that any cut marks would be visible on such small bones. No attempts were made to verify Dupont's identifications as these collections were vast, research time was limited and comparative material was not immediately available.

Time did not permit a detailed study of the small mammal collection, and the sheer quantity of material made it impracticable to make any attempt at noting in detail its components. It is potentially an excellent data set upon which to base research into

Lateglacial small mammals; however, all of the material is glued to plaster and board backings, and great care will be necessary when extracting specimens for study.

Similarly, the fish vertebrae within the collection were not noted in detail, although their presence, combined with that of the small mammal fauna confirms in my mind that Dupont must have sieved the residues of his excavation through a relatively fine mesh. A detailed study of the fish remains has the potential to give relatively rare information about Palaeolithic human exploitation of this resource. This has only been briefly considered in relation to the western European Upper Palaeolithic (Bahn 1983; Jochim 1983).

Dupont's identifications of the avian fauna are presented in Table 3.3 below, in which I have also attempted to give the modern equivalents to the identifications; in some cases only a general family or group translation was possible. However, it should be stressed that the information within this table has been drawn direct from Dupont's records, and not from re-study with the use of comparative material. Dupont's degree of expertise in identifying small mammals, birds and fish remains is currently unknown. Although it is interesting to note in passing that his list contains a high proportion of game birds, which could have made good eating, alongside the potential value of their feathers.

Dupont's identification	**Modern equivalent/translation**	**Cut ?**
Lagopus albus	*Lagopus mutus* (ptarmigan)	yes
Tetrao tetrix	*Lyrurus tetrix* (black grouse)	-
Strix nivea	*Strix* sp. (owl family)	
Strix otus	*Asio otus* (long eared owl)	
Turdus pilaris	*Turdus pilaris* (fieldfare)	
Falco tinnunculus	*Falco tinnunculus* (kestrel)	-
Corbeau coicre	*Corvus* sp. (crow family)	-
Geai	*Garrulus glandarius* (jay)	-
Grand coq de bruyères	*Tetrao urogallus* (capercaillie)	-
Canard sauvages	*Anas platyrhynchos* (mallard)	-
Faucon cresserelle	*Falco* sp. (Falcon)	-
Aigle pygargue	*Haliaeetus albicilla* (white-tailed eagle)	-

Table 3.3: Avian species identified by Dupont from the Trou de Chaleux.

It is clear that parts of the avian fauna were exploited by the Magdalenian hunter-gatherers, presumably both as game and for feathers. Feathers may have been valued during the Lateglacial; as well as offering good potential for display and symbolic purposes, they also make ideal flights for projectile technology (although the use of such has yet to be demonstrated at Chaleux). As with the small mammal collection these bones were firmly affixed to plaster trays, which made inspection of the bone surface for butchery marks extremely problematic; therefore the identification of cut marks on a few of these specimens can only be provisional. Dewez (1987, Figure 51a N°s 381A &B, 382A & B, 383A & B, 384A & B, 385A &B) illustrates a number of these bones, which have all been 'ringed', and some of which show traces of groove and splinter technique, indicating that they were probably used as needle cores. Unfortunately he does not provide any species designation for them.

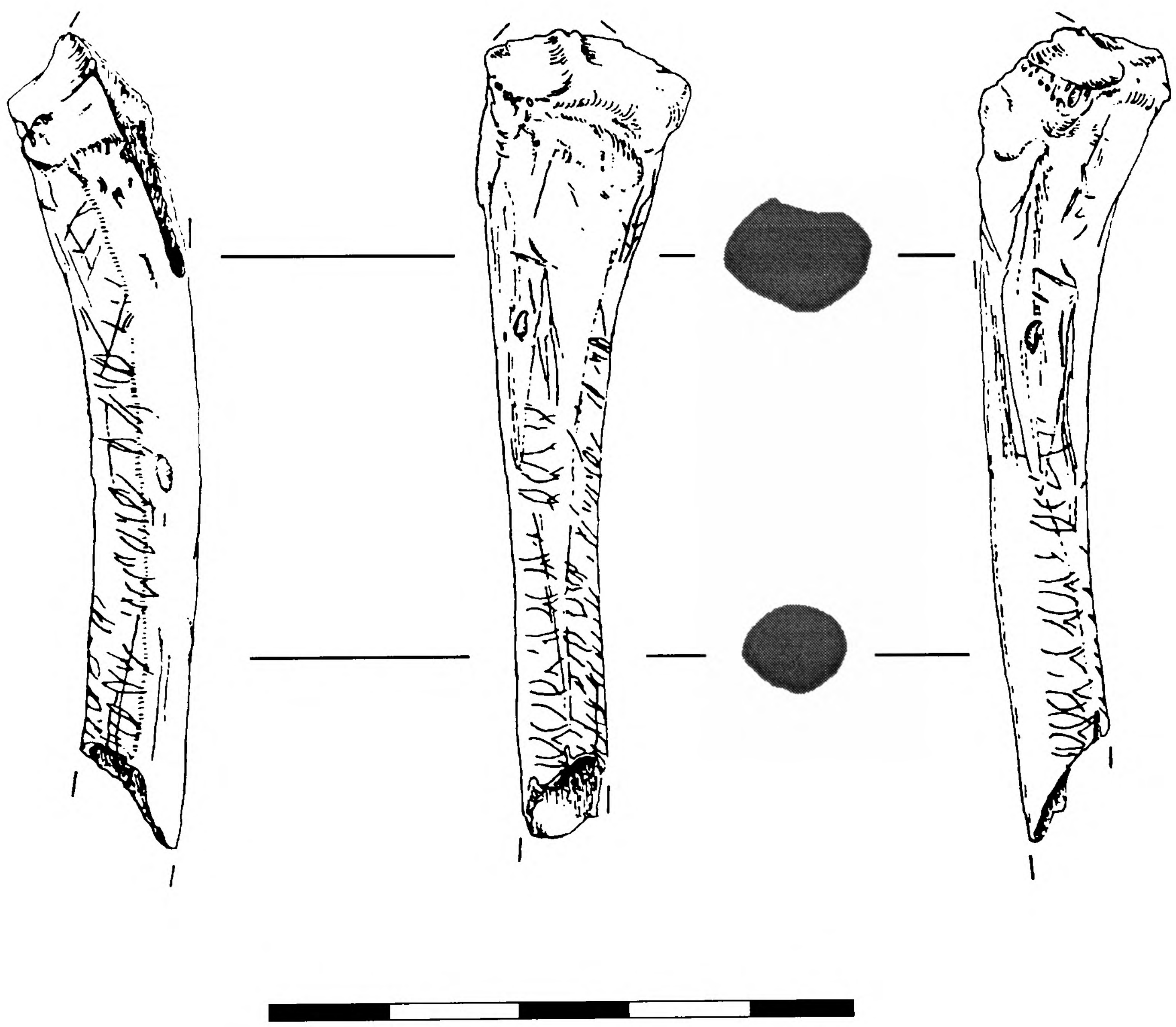

Figure 3.17: Engraved ulna of *Anser fabilis* from the Trou de Chaleux. Scale in centimeters. Drawing by P.Z. Dransart.

An unexpected addition to the Dupont collection was noted whilst examining the avian fauna for butchery marks. One ulna, which was subseqently identified as *Anser* *fabilis* (Bean goose, fide Colin Harrisson), showed abundant fine cut marks which under close examination did not appear to be the direct result of butchery, but instead a repeated design. This specimen is illustrated in Figure 3.17.

There are three rows running down the shaft of the bone which show a repeated U-shaped abstract design. Often the individual lines making the design have been scored on a number of occassions, indicating that these were intentional markings, rather than accidental butchery marks. Parallels for this particular piece are not immediatly apparent. It is perhaps most reminiscent of some of the most highly stylised of the Gönnersdorf so-called "female figurines" (Bosinski & Fischer 1974, Abbildungen 8 & 9), although I see no reason to interpret this particular piece as anything other than an abstract design.

CONCLUSIONS

Analysis of the large mammal assemblage from the Trou de Chaleux indicates that a wide range of large mammal species were exploited by the Lateglacial human population. The most abundant species exploited was the wild horse (*Equus ferus*). There is also clear evidence for the activities of a number of other bone accumulating agents (wolverine, wolf, badger, and fox), some of which were themselves the eventual prey of Late Palaeolithic hunters.

Radiocarbon determinations from a selection of modified bones indicate a late Dryas I/early Bölling age for the bulk of the assemblage, although more recent elements are also present. It has been suggested that the majority, if not all, of the *Suidae* and *Capridae* are among these intrusive elements. A Bölling age date is supported by the presence of *Saiga tatarica* within the collection. The presence of *Ovibos moschatus*, *Castor fiber* and *Gulo gulo* within the assemblage has been confirmed. No specimens of *Crocuta crocuta* have been identified from the Dupont collection.

Body Part representation suggests that portions of the horse carcasses were brought to the site having already been preliminarily butchered, and cut marks on a variety of bones document that these butchery units were subjected to further processing after arrival. Butchery marks corresponding with disarticulation are found in relation to virtually all of the joints in horse limbs and on sections of the vertebrae. The forelimbs (including the scapula) appear to have been imported as one such 'butchery unit', and butchery marks which can only correspond with the severance of the respective joint capsules can be found on many of the specimens in the collection. A similar pattern is apparent for the hind limbs. The lower portions of both the fore and hind limbs of horse are virtually devoid of any meat. Instead, below the humerus and femur, there is an extremely intricate network of bones, tendons and ligaments (*cf.* Figure 3.13). One might suppose that these are hardly areas of interest for hunters. However it is actually these that bear are the most abundant traces of human activity. The butchery marks found in this region bear witness to the systematic disarticulation of the individual bones. Carpals and tarsals were prized apart, as were 1st, 2nd and 3rd phalanges. Part of this at least can be explained by the subsequent longitudinal smashing of metapodials and first phalanges for their marrow content.

An interesting contrast can also be drawn between the Chaleux collection and the faunal material from Gough's Cave, Cheddar, Somerset. This collection also dates to the Bölling Interstadial, and is associated with a Creswellian archaeological assemblage; the faunal assemblage includes a high proportion of horse. Many of the horse phalanges from this site show traces of butchery marks, and it has been suggested that these correlate with the extraction of tendons for human use (Parkin *et al.* 1986). Butchery marks in the Chaleux assemblage are positioned in similar locations and it is assumed that they relate to the same objectives; however, no part of the Gough's Cave large mammal assemblage mirrors the bone breakage pattern noted at Chaleux. Whilst it is apparent that the bones in both assemblages were extensively smashed for marrow, there are distinct differences in the techniques employed between both sites. A further parallel has been drawn between the observed longitudinal splitting of the 1st phalanges at Chaleux and that reported by Bouvier from the Magdalenian IV layers at La Madèleine. Consequently it is suggested that marrow extraction via the longitudinal splitting of bones (particularly the 1st phalanges) may be a distinctive feature of Magdalenian butchery.

The extraction of tendons has also been noted from other species within the Chaleux collection including *Ovibos moschatus*. In chapter 1 I commented that there is an inbuilt bias in the study of butchery evidence towards an *apparent* pattern of intensive exploitation on mammalian lower limbs, and that at least in part this is what we have seen in the case of Chaleux. Whilst the evidence for tendon extraction is found in abundance at Chaleux, it should be remembered that other butchery activities, especially meat removal, disarticulation and marrow smashing have also been noted and discussed.

PROSPECTS FOR FURTHER RESEARCH

The study of the faunal remains from the Trou de Chaleux indicates the intensive exploitation of wild horses (*Equus ferus*) during the Lateglacial by the Magdalenian occupants of the site. Work on the absolute dating of the assemblage has also led to finer definition of the Magdalenian occupation of this region of Europe (see chapter 2, Charles 1993b & 1994a). Similarly, radiocarbon dating has been used as an aid to identifying the presence of intrusive elements in the assemblage. This work on the faunal identifications has contributed information enhancing our understanding of the structure of Lateglacial animal communities in Belgium.

There is still much scope for further work on the assemblage. More detailed seasonality data would be invaluable, as would information relating to the age structure of various parts of the large mammal assemblage. Both of these should certainly now be possible with further work on the re-located horse teeth. Similarly, there is scope for further work on the species identifications. The problems surrounding the caprids and suids have yet to be fully resolved: further taxonomic and radiocarbon work could help to clarify the situation. For the time being I have taken the cautious line of treating these specimens as later intrusions into the Palaeolithic assemblage. However, it has yet to be fully resolved.

I have suggested - admittedly on the basis of negative evidence - that the faunal assemblage from Chaleux was not accumulated as a result solely of hunting, but that to some extent trapping may also have played a significant part in Lateglacial animal exploitation strategies (see above; Charles & Jacobi 1994). The idea of 'hunting' during the Palaeolithic period automatically encapsulates concepts of active participants, tracking and intercepting their prey. The lack of projectile damage on the assemblage suggests that this may not have been the case at Chaleux. The use of traps, and the socioeconomic implications that a significant use of such equipment may have, has not been discussed in detail in the archaeological literature relating to Palaeolithic and Mesolithic subsistence strategies. Until more positive evidence for the use of trapping rather than direct encounter hunting is forthcoming it is hardly appropriate to speculate here on what techniques might have been used. However, this may be a profitable field of enquiry for further research.

Element	Left	Right	Indet	Adult	Juv	Cut	Total	MNI	Bin MNI	% MNI
cranial			129	129	00	25	129			
maxilla	11	15	31	56	01	20	57	15	28.50	46.34
mandible	42	54	27	122	01	49	123	54	61.50	100.00
teeth			500			00	500			
hyoid			21	21	00	01	21	21	21.00	34.15
atlas			00	00	00	00	00	00	00.00	00.00
axis			01	01	00	00	01	01	01.00	01.63
cervical v.			13	13	00	03	13		02.60	04.23
thoracic v.			22	22	00	04	22		01.83	02.98
lumbar v.			02	02	00	01	02		00.29	00.46
innominate	12	01	04	16	01	05	17	12	08.50	13.82
sacrum			13	13	00	08	13	13	13.00	21.14
caudal v.			160	159	01	09	160		10.67	17.34
scapula	22	36	03	56	05	30	61	36	30.50	49.59
whole humerus	00	02	01	01	02	01	03	02	01.50	02.44
p. humerus	07	04	09	18	02	04	20	07	10.00	16.26
humerus shaft	12	07	07	25	01	14	26			
d. humerus	13	11	02	26	00	11	26	13	13.00	21.14
radius	00	00	00	00	00	00	00	00	00.00	00.00
p. radius	13	17	01	30	01	12	31	17	15.50	25.20
radius shaft	10	09	00	19	00	04	19			
d. radius	15	05	00	16	04	07	20	15	10.00	16.26
ulna	16	19	01	30	06	11	36	19	18.00	29.27
carpals	61	79	00	140	00	30	140		10.00	16.26
whole MC	00	00	00	00	00	00	00	00	00.00	00.00
p. MC	21	17	04	42	00	12	42	21	21.00	34.15
d. MC			28	28	00	12	28		14.00	22.76
acc. MC	28	15	02	45	00	12	45		11.25	18.29
whole femur	00	00	00	00	00	00	00	00	00.00	00.00
p. femur	16	17	06	26	13	02	39	17	19.50	31.71
femur shaft	24	17	04	45	00	19	45			
d. femur	19	13	03	35	00	02	35	19	17.50	28.46
patella	09	07	00	16	00	01	16	09	08.00	13.01
whole tibia	00	00	00	00	00	00	00	00	00.00	00.00
p. tibia	07	10	05	22	00	04	22	10	11.00	17.89
tibia shaft	09	08	01	18	00	01	18			
d. tibia	24	19	02	39	06	08	45	24	22.50	36.59
fibula	02	03	00	05	00	00	05	03	02.50	04.07
tarsals	41	37	01	77	02	32	79		06.58	10.70
whole MT	00	00	00	00	00	00	00	00	00.00	00.00
p. MT	09	15	00	24	00	12	24	15	12.00	19.51
d. MT			04	04	00	01	04		02.00	03.25
acc. MT	20	12	01	33	00	07	33		08.25	13.41
p. MP	00	00	02	02	00	00	02		00.50	00.81
d. MP			49	42	07	09	49		12.25	19.92
acc. MP			03	03	00	01	03		00.38	00.61
p. sesamoid			91	91	00	16	91		11.38	18.50
whole phalanx 1			77	67	10	44	77		19.25	31.30
p. phalanx 1			33	33	00	07	33		08.25	13.41
phalanx 1 shaft			01	01	00	00	01			
d. phalanx 1			43	43	00	14	43		10.75	17.48
whole phalanx 2			97	80	17	56	97		24.25	39.43
p. phalanx 2			02	01	01	00	02		00.50	00.81
d. phalanx 2			00	00	00	00	00		00.00	00.00
d. sesamoid			64	64	00	05	64		16.00	26.02
phalanx 3			75	65	10	29	75		18.75	30.49
Total	**463**	**449**	**1416**	**1737**	**91**	**530**	**2457**			

Table 3.4: Body Part Representation for *Equus ferus* from the Trou de Chaleux.

Element	Left	Right	Indet	Adult	Juv	Cut	Total	MNI	Bin MNI	% MNI
antler			82	82	0	4	82			
cranial			0	0	0	0	0			
maxilla	0	0	0	0	0	0	0	0	0.00	00.00
mandible	1	0	0	1	0	1	1	1	0.50	20.00
teeth			4	4	0	0	4			
hyoid			0	0	0	0	0	0	0.00	00.00
atlas			0	0	0	0	0	0	0.00	00.00
axis			0	0	0	0	0	0	0.00	00.00
cervical v.			0	0	0	0	0		0.00	00.00
thoracic v.			6	6	0	2	6		0.43	17.14
lumbar v.			0	0	0	0	0		0.00	00.00
innominate	0	0	0	0	0	0	0	0	0.00	00.00
sacrum			0	0	0	0	0	0	0.00	00.00
caudal v.			0	0	0	0	0		0.00	00.00
scapula	2	1	0	3	0	0	3	2	1.50	60.00
humerus	1	0	0	1	0	1	1	1	0.50	20.00
p. humerus	0	0	0	0	0	0	0	0	0.00	00.00
d. humerus	0	0	0	0	0	0	0	0	0.00	00.00
p. radius	2	1	0	3	0	0	3	2	1.50	60.00
radius shaft	0	0	0	0	0	0	0			
d. radius	0	1	0	1	0	0	1	1	0.50	20.00
ulna	1	0	0	1	0	0	1	1	0.50	20.00
carpals	0	2	0	2	0	0	2			
p. MC	0	1	0	1	0	0	1	1	0.50	20.00
d. MC	0	0	0	0	0	0	0	0	0.00	00.00
acc. MC	0	0	0	0	0	0	0	0	0.00	00.00
p. femur	0	0	0	0	0	0	0	0	0.00	00.00
femur shaft	1	0	0	1	0	1	1			
d. femur	0	0	0	0	0	0	0	0	0.00	00.00
patella	1	0	1	2	0	0	2	1	1.00	40.00
p. tibia	0	0	0	0	0	0	0	0	0.00	00.00
d. tibia	0	1	0	1	0	1	1	1	0.50	20.00
fibula	0	0	0	0	0	0	0	0	0.00	00.00
tarsals	2	2	0	4	0	1	4			
p. MT	4	0	0	4	0	1	4	4	2.00	80.00
d. MT	0	0	0	0	0	0	0	0	0.00	00.00
acc. MT	0	0	0	0	0	0	0	0	0.00	00.00
MP			0	0	0	0	0	0	0.00	00.00
p. MP			9	9	0	2	9		2.25	90.00
MP shaft			7	7	0	4	7		1.75	70.00
d. MP			10	10	0	1	10		2.50	100.00
acc. MP			2	2	0	0	2		0.50	20.00
p. sesamoid			0	0	0	0	0		0.00	00.00
phalanx 1			1	1	0	0	1		0.25	10.00
p. phalanx 1			2	2	0	0	2		0.50	20.00
phalanx 1 shaft			0	0	0	0	0		0.00	00.00
d. phalanx 1			0	0	0	0	0		0.00	00.00
phalanx 2			1	1	0	0	1		0.25	10.00
phalanx 3			0	0	0	0	0		0.00	00.00
Total	**15**	**9**	**125**	**149**	**0**	**19**	**149**			

Table 3.5: BPR for *Rangifer tarandus* from the Trou de Chaleux.

Element	Left	Right	Indet	Adult	Juv	Cut	Total	MNI	Bin MNI	% MNI
cranial			0	0	0	0	0			
maxilla	0	0	0	0	0	0	0	0	0.00	00.00
mandible	0	0	0	0	0	0	0	0	0.00	00.00
teeth			0	0	0	0	0			
atlas			1	1	0	1	1	1	1.00	100.00
axis			0	0	0	0	0	0	0.00	00.00
cervical v.			0	0	0	0	0		0.00	00.00
thoracic v.			0	0	0	0	0		0.00	00.00
lumbar v.			0	0	0	0	0		0.00	00.00
innominate	0	0	0	0	0	0	0	0	0.00	00.00
sacrum			0	0	0	0	0	0	0.00	00.00
caudal v.			0	0	0	0	0			
scapula	0	0	0	0	0	0	0	0	0.00	00.00
whole humerus	0	0	0	0	0	0	0	0	0.00	00.00
p. humerus	0	0	0	0	0	0	0	0	0.00	00.00
humerus shaft	1	0	0	1	0	1	1	1	0.50	50.00
d. humerus	0	1	0	1	0	0	1	0	0.50	50.00
whole radius	0	0	0	0	0	0	0	0	0.00	00.00
p. radius	0	0	0	0	0	0	0	0	0.00	00.00
d. radius	0	0	0	0	0	0	0	0	0.00	00.00
ulna	0	0	0	0	0	0	0	0	0.00	00.00
carpals	0	0	1	1	0	0	1			
MC	0	0	0	0	0	0	0	0	0.00	00.00
p. MC	0	0	0	0	0	0	0	0	0.00	00.00
d. MC	0	0	0	0	0	0	0	0	0.00	00.00
whole femur	0	0	0	0	0	0	0	0	0.00	00.00
p. femur	0	0	0	0	0	0	0	0	0.00	00.00
d. femur	1	1	0	2	0	0	2	1	1.00	100.00
patella	0	0	1	1	0	0	1	1	0.50	50.00
whole tibia	0	0	0	0	0	0	0	0	0.00	00.00
p. tibia	0	0	0	0	0	0	0	0	0.00	00.00
d. tibia	0	1	0	1	0	0	1	1	0.50	50.00
fibula	0	0	0	0	0	0	0	0	0.00	00.00
tarsals	1	2	1	4	0	1	4			
MT	0	0	0	0	0	0	0	0	0.00	00.00
p. MT	0	0	0	0	0	0	0	0	0.00	00.00
MT shaft	0	0	1	1	0	0	1	1	0.50	50.00
d. MT	0	0	0	0	0	0	0	0	0.00	00.00
acc. MP			3	3	0	0	3		0.38	37.50
sesamoid			1	1	0	0	1			
phalanx 1			3	3	0	0	3		0.75	75.00
phalanx 2			2	2	0	1	2		0.50	50.00
phalanx 3			0	0	0	0	0		0.00	00.00
Total	**3**	**5**	**14**	**22**	**0**	**4**	**22**			

Table 3.6: BPR for *Cervus elaphus* from the Trou de Chaleux.

Element	**Left**	**Right**	**Indet**	**Adult**	**Juv**	**Cut**	**Total**	**MNI**	**Bin MNI**	**% MNI**
horn core			0	0	0	0	0			
cranial frag.			0	0	0	0	0			
maxilla	0	0	0	0	0	0	0	0	00.00	00.00
mandible	0	0	0	0	0	0	0	0	00.00	00.00
teeth			8	8	0	0	8			
atlas			1	1	0	0	1	1	01.00	50.00
axis			1	1	0	0	1	1	01.00	50.00
cervical v.			2	2	0	0	2		00.40	20.00
sternum			1	1	0	1	1		01.00	50.00
thoracic v.			0	0	0	0	0		00.00	00.00
lumbar v.			0	0	0	0	0		00.00	00.00
innominate	0	0	0	0	0	0	0	0	00.00	00.00
sacrum			1	1	0	0	1	1	01.00	50.00
caudal v.			2	2	0	0	2		00.11	05.26
scapula	1	0	0	1	0	0	1	1	00.50	25.00
humerus	0	0	0	0	0	0	0	0	00.00	00.00
p. humerus	0	0	0	0	0	0	0	0	00.00	00.00
d. humerus	0	0	0	0	0	0	0	0	00.00	00.00
radius	1	0	0	1	0	0	1	1	00.50	25.00
p. radius	0	0	0	0	0	0	0	0	00.00	00.00
d. radius	0	0	0	0	0	0	0	0	00.00	00.00
ulna	1	0	0	1	0	0	1	1	00.50	25.00
carpals	0	0	1	1	0	0	1			
MC	0	0	0	0	0	0	0	0	00.00	00.00
p. MC	2	2	0	4	0	1	4	2	02.00	100.00
MC shaft	0	1	0	1	0	1	1			
d. MC	0	0	0	0	0	0	0	0	00.00	00.00
femur	0	0	0	0	0	0	0	0	00.00	00.00
p. femur	1	1	0	2	0	1	2	1	01.00	50.00
d. femur	1	0	0	1	0	0	1	1	00.50	25.00
patella	0	0	0	0	0	0	0	0	00.00	00.00
tibia	0	0	0	0	0	0	0	0	00.00	00.00
p. tibia	0	0	0	0	0	0	0	0	00.00	00.00
d. tibia	0	0	0	0	0	0	0	0	00.00	00.00
fibula	0	0	0	0	0	0	0	0	00.00	00.00
tarsals	0	1	0	1	0	1	1			
MT	0	0	0	0	0	0	0	0	00.00	00.00
p. MT	3	0	0	3	0	0	3	3	01.50	75.00
MT shaft	1	0	0	1	0	1	1			
d. MT	0	0	0	0	0	0	0	0	00.00	00.00
MP			0	0	0	0	0		00.00	00.00
p. MP			0	0	0	0	0		00.00	00.00
MP shaft			0	0	0	0	0		00.00	00.00
d. MP			2	2	0	0	2		00.50	25.00
sesamoid			8	8	0	0	8		00.33	16.67
phalanx 1			2	2	0	1	2		00.25	12.50
phalanx 2			9	9	0	4	9		01.13	56.25
phalanx 3			4	4	0	1	4		00.50	25.00
Total	**11**	**5**	**42**	**58**	**0**	**12**	**58**			

Table 3.7: BPR for *Bos* sp. from the Trou de Chaleux.

Element	**Left**	**Right**	**Indet**	**Adult**	**Juv**	**Cut**	**Total**	**MNI**	**Bin MNI**	**% MNI**
horn	00	00	00	00	00	00	00	00	0.00	00.00
cranial	00	00	00	00	00	00	00	00	0.00	00.00
maxilla	00	00	00	00	00	00	00	00	0.00	00.00
mandible	00	00	00	00	00	00	00	00	0.00	00.00
teeth			00	00	00	00	00			
hyoid			00	00	00	00	00	00	0.00	00.00
atlas			00	00	00	00	00	00	0.00	00.00
axis			00	00	00	00	00	00	0.00	00.00
cervical v.			00	00	00	00	00		0.00	00.00
thoracic v.			02	02	00	00	02		0.15	06.48
lumbar v.			00	00	00	00	00		0.00	00.00
indet. vertebra			01	01	00	01	01			
innominate	00	00	00	00	00	00	00	00	0.00	00.00
sacrum			00	00	00	00	00	00	0.00	00.00
caudal v.			01	01	00	00	01		0.06	02.34
scapula	00	00	00	00	00	00	00	00	0.00	00.00
humerus	00	00	00	00	00	00	00	00	0.00	00.00
p. humerus	00	00	00	00	00	00	00	00	0.00	00.00
d. humerus	00	00	00	00	00	00	00	00	0.00	00.00
p. radius	00	00	00	00	00	00	00	00	0.00	00.00
d. radius	02	00	00	02	00	00	02	02	1.00	42.11
whole ulna	00	00	01	01	00	00	01	01	0.50	21.05
carpals	06	00	00	06	00	00	06	02	0.50	21.05
whole	00	00	00	00	00	00	00	00	0.00	00.00
p. MC	00	00	00	00	00	00	00	00	0.00	00.00
d. MC	00	00	00	00	00	00	00	00	0.00	00.00
femur	00	00	00	00	00	00	00	00	0.00	00.00
p. femur	01	00	01	02	00	00	02	01	1.00	42.11
d. femur	00	00	00	00	00	00	00	00	0.00	00.00
patella	01	00	00	01	00	00	01	01	0.50	21.05
p. tibia	00	01	00	01	00	00	01	01	0.50	21.05
d. tibia	01	01	00	02	00	00	02	01	1.00	42.11
fibula	00	00	00	00	00	00	00	00	0.00	00.00
tarsals	09	11	00	19	01	01	20	06	2.00	84.21
MT	00	00	01	00	01	01	01	01	0.50	21.05
p. MT	00	00	01	01	00	00	01	01	0.50	21.05
d. MT	00	00	00	00	00	00	00	00	0.00	00.00
p. MP	00	00	00	00	00	00	00	00	0.00	00.00
d. MP	00	00	06	06	00	01	06		1.50	63.16
sesamoid			12	12	00	00	12		0.50	21.05
phalanx 1			19	19	00	05	19		2.38	100.00
phalanx 2			00	00	00	00	00		0.00	00.00
phalanx 3			00	00	00	00	00		0.00	00.00
Total	**20**	**13**	**45**	**76**	**02**	**09**	**78**			

Table 3.8: BPR for *Ovibos moschatus* from the Trou de Chaleux.

Element	**Left**	**Right**	**Indet**	**Adult**	**Juv**	**Total**	**MNI**	**Bin MNI**	**% MNI**
horn core			4	4	0	4			
cranial			0	0	0	0			
maxilla	0	0	0	0	0	0	0	0.00	00.00
mandible	7	8	0	13	2	15	8	7.50	100.00
teeth			23	22	1	23			
atlas			0	0	0	0	0	0.00	00.00
axis			1	1	0	1	1	1.00	13.33
cervical v.			0	0	0	0		0.00	00.00
thoracic v.			0	0	0	0		0.00	00.00
lumbar v.			0	0	0	0		0.00	00.00
innominate	2	0	0	2	0	2	2	1.00	13.33
sacrum			0	0	0	0	0	0.00	00.00
caudal v.			0	0	0	0		0.00	00.00
scapula	4	3	0	7	0	7	4	3.50	46.67
humerus	3	1	0	4	0	4	3	2.00	26.67
p. humerus	0	0	0	0	0	0	0	0.00	00.00
d. humerus	1	1	0	2	0	2	1	1.00	13.33
radius	0	0	0	0	0	0	0	0.00	00.00
p. radius	2	4	0	6	0	6	4	3.00	40.00
d. radius	2	1	0	3	0	3	2	1.50	20.00
ulna	3	1	0	4	0	4	3	2.00	26.67
carpals	2	0	0	2	0	2			
MC	3	1	0	4	0	4	3	2.00	26.67
p. MC	0	1	0	1	0	1	1	0.50	06.67
d. MC	1	1	0	2	0	2	1	1.00	13.33
femur	0	0	0	0	0	0	0	0.00	00.00
p. femur	0	1	0	1	0	1	1	0.50	06.67
d. femur	1	1	0	2	0	2	1	1.00	13.33
patella	0	2	0	1	0	2	2	1.00	13.33
tibia	1	0	0	1	0	1	1	0.50	06.67
p. tibia	0	0	0	0	0	0	0	0.00	00.00
d. tibia	1	1	0	2	0	2	1	1.00	13.33
fibula	0	0	0	0	0	0	0	0.00	00.00
tarsals	6	1	0	7	0	7			
MT	0	1	1	2	0	2	1	1.00	13.33
p. MT	0	0	0	0	0	0	0	0.00	00.00
d. MT	0	0	0	0	0	0	0	0.00	00.00
MP			2	2	0	2		0.50	06.67
p. MP			0	0	0	0		0.00	00.00
MP shaft			1	1	0	1			
d. MP			2	2	0	2		0.50	06.67
phalanx 1			7	7	0	7		1.75	23.33
phalanx 2			2	2	0	2		0.50	06.67
phalanx 3			1	1	0	1		0.25	03.33
Total	**39**	**29**	**44**	**108**	**3**	**112**			

Table 3.9: BPR for Ovi-Caprids from the Trou de Chaleux.

Element	**Left**	**Right**	**Indet**	**Adult**	**Juv**	**Cut**	**Total**	**MNI**	**Bin. MNI**	**% MNI**
cranial			0	0	0	0	0			
maxilla	0	0	0	0	0	0	0	0	00.00	00.00
mandible	1	1	0	1	1	0	2	2	01.00	40.00
teeth			9	7	2	0	9			
atlas			1	1	0	0	1	1	01.00	40.00
axis			0	0	0	0	0	0	00.00	00.00
cervical v.			0	0	0	0	0		00.00	00.00
thoracic v.			1	0	1	0	1		00.07	02.86
lumbar v.			5	2	3	0	5		00.83	33.33
vertebra			1	1	0	0	1			
innominate	0	1	0	1	0	0	1	1	00.50	20.00
sacrum			0	0	0	0	0	0	00.00	00.00
caudal v.			0	0	0	0	0	0	00.00	00.00
scapula	0	2	0	0	2	0	2	2	01.00	40.00
humerus	0	0	0	0	0	0	0	3	00.00	00.00
p. humerus	1	0	0	1	0	0	1	1	00.50	20.00
d. humerus	2	3	0	5	0	1	5	3	02.50	100.00
radius	0	0	0	0	0	0	0	1	00.00	00.00
p. radius	1	0	0	1	0	0	1	1	00.50	20.00
d. radius	0	1	0	1	0	0	1	1	00.50	20.00
ulna	1	1	2	4	0	0	4	2	02.00	80.00
carpals	0	0	0	0	0	0	0	0	00.00	00.00
MC	0	0	0	0	0	0	0		00.00	00.00
p. MC	0	0	0	0	0	0	0		00.00	00.00
d. MC	0	0	0	0	0	0	0		00.00	00.00
femur	0	1	0	1	0	0	1	1	00.50	20.00
p. femur	0	0	0	0	0	0	0	1	00.00	00.00
d. femur	0	0	0	0	0	0	0	1	00.00	00.00
patella	0	0	0	0	0	0	0	0	00.00	00.00
tibia	0	0	0	0	0	0	0	1	00.00	00.00
p. tibia	0	0	0	0	0	0	0	0	00.00	00.00
tibia shaft	1	0	0	0	1	0	1			
d. tibia	0	1	0	1	0	0	1	1	00.50	20.00
fibula	0	2	0	2	0	0	2	2	01.00	40.00
tarsals	0	2	0	2	0	1	2		00.14	05.71
MT	0	1	0	1	0	0	1		00.13	05.00
p. MT	0	1	0	1	0	0	1		00.13	05.00
MT shaft	0	0	0	0	0	0	0			
d. MT	0	0	0	0	0	0	0	0	00.00	00.00
MP			0	0	0	0	0		00.00	00.00
p. MP			0	0	0	0	0		00.00	00.00
d. MP			1	1	0	0	1		00.06	02.50
phalanx 1			4	4	0	0	4		00.25	10.00
phalanx 2			5	4	1	0	5		00.31	12.50
phalanx 3			2	2	0	0	2		00.13	05.00
Total	**7**	**17**	**31**	**44**	**11**	**2**	**55**			

Table 3.10: BPR for *Sus scrofa* from the Trou de Chaleux.

Element	**Left**	**Right**	**Indet**	**Adult**	**Juv**	**Cut**	**Total**	**MNI**	**Bin MNI**	**% MNI**
cranial			0	0	0	0	0			
maxilla	0	1	0	1	0	0	1	1	0.50	50.00
mandible	2	0	0	2	0	1	2	2	1.00	100.00
teeth			11	11	0	1	11			
atlas			0	0	0	0	0	0	0.00	00.00
axis			0	0	0	0	0	0	0.00	00.00
cervical v.			0	0	0	0	0		0.00	00.00
thoracic v.			2	2	0	0	2		0.14	14.29
lumbar v.			0	0	0	0	0		0.00	00.00
vertebra indet			1	1	0	0	1			
innominate	0	1	0	1	0	0	1	1	0.50	50.00
sacrum	0	0	0	0	0	0	0	0	0.00	00.00
scapula	0	0	0	0	0	0	0	0	0.00	00.00
humerus	0	0	0	0	0	0	0	0	0.00	00.00
p. humerus	0	0	0	0	0	0	0	0	0.00	00.00
d. humerus	1	1	0	2	0	0	2	1	1.00	100.00
radius	1	0	0	1	0	0	1	1	0.50	50.00
p. radius	0	0	1	1	0	0	1	1	0.50	50.00
d. radius	0	0	0	0	0	0	0	0	0.00	00.00
ulna	1	0	0	1	0	0	1	1	0.50	50.00
carpals	3	2	1	6	0	2	6			
MC	2	0	0	2	0	0	2		0.20	20.00
p. MC	0	0	0	0	0	0	0		0.00	00.00
d. MC	0	0	0	0	0	0	0		0.00	00.00
femur	0	0	0	0	0	0	0	0	0.00	00.00
p. femur	0	0	0	0	0	0	0	0	0.00	00.00
d. femur	0	0	0	0	0	0	0	0	0.00	00.00
patella	1	0	0	1	0	0	1	1	0.50	50.00
tibia	0	0	0	0	0	0	0	0	0.00	00.00
p. tibia	0	0	0	0	0	0	0	0	0.00	00.00
d. tibia	0	0	0	0	0	0	0	0	0.00	00.00
fibula	0	0	0	0	0	0	0	0	0.00	00.00
tarsals	2	0	0	2	0	0	2			
MT	4	1	0	5	0	2	5		0.50	50.00
p. MT	0	1	0	1	0	0	1		0.10	10.00
d. MT	0	0	0	0	0	0	0		0.00	00.00
MP			1	0	1	1	1		0.05	05.00
p. MP			0	0	0	0	0		0.00	00.00
MP shaft			2	1	1	0	2			
d. MP			2	2	0	2	2		0.10	10.00
phalanx 1			7	7	0	1	7		0.35	35.00
phalanx 2			5	5	0	2	5		0.25	25.00
phalanx 3			7	7	0	0	7		0.35	35.00
Total	**17**	**7**	**40**	**62**	**2**	**12**	**64**			

Table 3.11: BPR for *Ursus arctos* from the Trou de Chaleux.

Element	Left	Right	Indet	Adult	Juv	Total	MNI	Bin MNI	% MNI
cranial			2	2	0	2			
maxilla	0	0	0	0	0	0	0	00.00	00.00
mandible	1	0	0	1	0	1	1	00.50	25.00
teeth			5	5	0	5			
atlas			0	0	0	0	0	00.00	00.00
axis			0	0	0	0	0	00.00	00.00
cervical v.			0	0	0	0		00.00	00.00
thoracic v.			1	1	0	1		00.08	03.85
lumbar v.			0	0	0	0		00.00	00.00
innominate	0	0	0	0	0	0	0	00.00	00.00
sacrum			0	0	0	0	0	00.00	00.00
caudal v.			1	1	0	1		00.05	02.38
scapula	0	0	0	0	0	0	0	00.00	00.00
humerus	0	0	0	0	0	0	0	00.00	00.00
p. humerus	0	0	0	0	0	0	0	00.00	00.00
d. humerus	0	0	0	0	0	0	0	00.00	00.00
radius	0	0	0	0	0	0	0	00.00	00.00
p. radius	0	0	0	0	0	0	0	00.00	00.00
d. radius	0	0	0	0	0	0	0	00.00	00.00
ulna	0	0	0	0	0	0	0	00.00	00.00
carpals	0	0	0	0	0	0			
MC	0	0	0	0	0	0		00.00	00.00
p. MC	0	0	0	0	0	0		00.00	00.00
d. MC	0	0	0	0	0	0		00.00	00.00
femur	0	0	0	0	0	0	0	00.00	00.00
p. femur	0	0	0	0	0	0	0	00.00	00.00
d. femur	0	0	0	0	0	0	0	00.00	00.00
patella	0	0	0	0	0	0	0	00.00	00.00
tibia	0	0	0	0	0	0	0	00.00	00.00
p. tibia	0	0	0	0	0	0	0	00.00	00.00
d. tibia	0	2	2	4	0	4	2	02.00	100.00
fibula	0	0	0	0	0	0	0	00.00	00.00
tarsals	0	0	0	0	0	0			
MT	0	0	0	0	0	0		00.00	00.00
p. MT	0	0	0	0	0	0		00.00	00.00
d. MT	0	0	0	0	0	0		00.00	00.00
whole MP			3	3	0	3		00.19	09.38
p. MP			3	3	0	3		00.19	09.38
d. MP			0	0	0	0		00.00	00.00
phalanx 1			3	3	0	3		00.19	09.38
phalanx 2			6	6	0	6		00.38	18.75
phalanx 3			0	0	0	0		00.00	00.00
Total	**1**	**2**	**26**	**29**	**0**	**29**			

Table 3.12: BPR for *Canis* sp. from the Trou de Chaleux.

Element	**Left**	**Right**	**Indet**	**Adult**	**Juv**	**Cut**	**Total**	**MNI**	**Bin MNI**	**% MNI**
cranial			01	01	0	0	1			
maxilla	00	03	00	03	0	0	03	03	01.50	10.00
mandible	17	13	00	30	0	0	30	17	15.00	100.00
teeth			73	73	0	0	73			
atlas			08	08	0	0	08	08	08.00	53.33
axis			08	08	0	0	08	08	08.00	53.33
cervical v.			15	15	0	0	15		03.00	20.00
thoracic v.			27	27	0	0	27		02.08	13.85
lumbar v.			29	29	0	0	29		04.14	27.62
vertebra (indet.)			01	01	0	0	01			
innominate	09	08	00	17	0	0	17	09	08.50	56.67
sacrum			02	02	0	0	02	02	02.00	13.33
caudal v.			18	18	0	0	18		00.86	05.71
scapula	04	06	01	11	0	2	11	06	05.50	36.67
humerus	02	02	00	04	0	1	04	02	02.00	13.33
p. humerus	08	07	00	15	0	0	15	08	07.50	50.00
d. humerus	10	10	00	20	0	0	20	10	10.00	66.67
radius	02	01	00	03	0	0	03	02	01.50	10.00
p. radius	01	05	00	06	0	0	06	05	03.00	20.00
d. radius	06	03	00	09	0	0	09	06	04.50	30.00
ulna	13	09	00	22	0	0	22	13	11.00	73.33
carpals	00	00	00	00	0	0	00			
MC	20	13	00	33	0	0	33		04.13	27.50
p. MC	00	01	00	01	0	0	01		00.13	00.83
d. MC	00	00	00	00	0	0	00		00.00	00.00
femur	01	00	00	01	0	0	01	01	00.50	03.33
p. femur	02	09	00	11	0	2	11	09	05.50	36.67
d. femur	04	04	00	08	0	0	08	04	04.00	26.67
patella	00	00	00	00	0	0	00	00	00.00	00.00
tibia	00	00	00	00	0	0	00	00	00.00	00.00
p. tibia	01	04	00	05	0	0	05	04	02.50	16.67
d. tibia	01	11	00	12	0	0	12	11	06.00	40.00
fibula	00	00	00	00	0	0	00	00	00.00	00.00
tarsals	06	06	04	16	0	0	16			
MT	20	22	00	42	0	0	42		05.25	35.00
p. MT	02	00	00	02	0	0	02		00.25	01.67
d. MT	00	00	00	00	0	0	00		00.00	00.00
MP	01	00	00	01	0	0	01		00.06	00.42
p. MP	00	01	01	02	0	0	02		00.13	00.83
d. MP	00	00	09	09	0	0	09		00.56	03.75
phalanx 1			08	08	0	0	08		00.50	03.33
phalanx 2			00	00	0	0	00		00.00	00.00
phalanx 3			00	00	0	0	00		00.00	00.00
Total	**130**	**138**	**205**	**473**	**0**	**5**	**473**			

Table 3.13: BPR for *Vulpes* sp. from the Trou de Chaleux.

Element	Left	Right	Indet	Adult	Juv	Cut	Total	MNI	Bin MNI	% MNI
cranial			3	3	0	0	3			
maxilla	1	1	0	2	0	0	2	1	1.00	28.57
mandible	1	0	1	2	0	0	2	1	1.00	28.57
teeth			0	0	0	0	0			
atlas			1	1	0	0	1	1	1.00	28.57
axis			3	3	0	0	3		3.00	85.71
cervical v.			2	2	0	0	2		0.40	11.43
thoracic v.			10	10	0	0	10		0.67	19.05
lumbar v.			4	4	0	0	4		0.80	22.86
innominate	3	4	0	7	0	0	7	4	3.50	100.00
sacrum			1	1	0	0	1		1.00	28.57
caudal v.			1	1	0	0	1		0.06	01.59
scapula	1	4	0	5	0	0	5	4	2.50	71.43
humerus	2	0	0	1	1	0	2	2	1.00	28.57
p. humerus	1	0	0	1	0	0	1	1	0.50	14.29
d. humerus	0	1	0	1	0	0	1	1	0.50	14.29
radius	1	1	0	2	0	0	2	1	1.00	28.57
p. radius	1	0	0	1	0	0	1	1	0.50	14.29
d. radius	0	0	0	0	0	0	0	0	0.00	00.00
ulna	2	2	0	3	1	0	4	2	2.00	57.14
carpals	0	0	0	0	0	0	0			
MC	0	0	0	0	0	0	0		0.00	00.00
p. MC	0	0	0	0	0	0	0		0.00	00.00
d. MC	0	0	0	0	0	0	0		0.00	00.00
femur	4	3	0	5	2	4	7	4	3.50	100.00
p. femur	0	1	0	1	0	1	1	1	0.50	14.29
d. femur	0	0	0	0	0	0	0	0	0.00	00.00
patella	0	0	0	0	0	0	0	0	0.00	00.00
tibia	1	0	0	1	0	0	1	1	0.50	14.29
p. tibia	0	0	0	0	0	0	0	0	0.00	00.00
tibia shaft	0	2	0	0	2	0	2			
d. tibia	0	0	0	0	0	0	0	0	0.00	00.00
fibula	0	0	0	0	0	0	0	0	0.00	00.00
tarsals	0	1	0	1	0	0	1			
MT	2	0	0	2	0	0	2		0.20	05.71
p. MT	0	0	0	0	0	0	0		0.00	00.00
d. MT	0	0	0	0	0	0	0		0.00	00.00
MP			0	0	0	0	0		0.00	00.00
p. MP			0	0	0	0	0		0.00	00.00
d. MP			0	0	0	0	0		0.00	00.00
phalanx 1			0	0	0	0	0		0.00	00.00
phalanx 2			0	0	0	0	0		0.00	00.00
phalanx 3			0	0	0	0	0		0.00	00.00
Total	**20**	**20**	**26**	**60**	**6**		**66**			

Table 3.14: BPR for *Meles meles* from the Trou de Chaleux.