

# An Archaeological Approach to the Study of Prehistoric Butchery: The Lateglacial Exploitation of *Equus ferus* at the Trou de Chaleux (Belgium)

Ruth CHARLES

## Abstract

This paper sets out to review one particular approach to the interpretation of prehistoric faunal assemblages—the study of butchery evidence. Different techniques used in the identification and interpretation of humanly accumulated faunal assemblages are outlined and then discussed. One particular approach to butchery evidence is advocated—the recognition and interpretation of cut marks on animal bones. This is illustrated by a case study drawn from a Late Magdalenian site, the Trou de Chaleux, Province of Namur, Belgium.

At Chaleux, abundant evidence for the human modification of animal bones has been recognised. This paper focuses on the butchery evidence observed on the remains of one species, the wild horse—*Equus ferus*—by far the most abundant large mammal species present at the site. It is argued that this species was systematically exploited for a large range of resources.

## Résumé

*Un problème spécifique dans l'interprétation des assemblages fauniques préhistoriques est abordé dans cet article, celui de l'étude et de la mise en évidence des stigmates de boucherie. Différentes techniques utilisées pour l'identification et la compréhension des assemblages fauniques formés par accumulation anthropique sont exposées et discutées. Une approche plus particulière de mise en évidence de pratiques bouchères est préconisée : la reconnaissance et l'interprétation des traces de découpe sur les ossements animaux. Cette approche est illustrée par une étude de cas, réalisée à partir d'un site magdalénien récent de Belgique, le Trou de Chaleux (Province de Namur).*

*À Chaleux, des modifications anthropiques sur ossements animaux ont été reconnues en abondance. Cet article se focalise sur les traces de boucherie observées sur les restes d'une espèce en particulier, le cheval sauvage — *Equus ferus* —, de très loin la mieux représentée sur le site parmi la grande faune mammalienne. On a pu démontrer que cette espèce a été systématiquement exploitée pour les ressources variées qu'elle offrait.*

## 1. INTRODUCTION

This paper sets out to discuss a range of approaches used in the re-construction of past faunal butchery practice. This will be done with specific reference to evidence from a Late Magdalenian context in the Ardennes region of north-western Europe, although the techniques outlined are more widely applicable. The many caves and rock shelters in the Ardennes have yielded abundant archaeological and palaeontological material since excavations began during the latter part of the last century. Much of the material recovered by the pioneers of prehistoric archaeology in this area survives today in museum collections. Whilst in many cases these collections lack precise contextual and stratigraphic information, by utilising a combination of the original publications, museum archives and original museum displays constructed by the excavators, the potential exists to extract sufficient information about these collections to make them a valuable research resource during the latter part of the 20th Century.

The Upper Palaeolithic, and more specifically the Magdalenian, was initially termed the *Age*

*du Renne* by Lartet & Christy (1875); in many peoples' minds it is synonymous with reindeer hunters. 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). As far as the Belgian Late Magdalenian is concerned reindeer are present in most archaeological sites, but in relatively low frequencies; instead, the wild horse (*Equus ferus*) is by far the most abundant species present. The traces of human modification on the remains of wild horses from a series of sites in the Ardennes bear witness to the importance of this particular wild mammal to the Lateglacial subsistence economy. For the purposes of this paper discussion will be confined to a range of analytical techniques currently used in assessing butchery evidence, taking one particular site, the Trou de Chaleux (Province of Namur, Belgium) as a central case study, and concentrating within this site on the evidence for the exploitation of wild horse. A more detailed account of the entire fauna from Chaleux, and the surrounding

Late Magdalenian caves in the north-western Ardennes may be found in Charles (1994).

## 2. ANALYTICAL TECHNIQUES — OVERVIEW

The range of analytical techniques available to the archaeozoologist are highly varied (see Grayson, 1984; Lyman, 1994a and b). To a great extent there has also been a lack of consistency between individual researchers' methodology and terminology (Lyman, 1994b). This paper will concentrate solely on the ways in which archaeozoologists have attempted to look at butchery evidence and to quantify it within a Palaeolithic framework, rather than embarking on a more general account.

The main form of Palaeolithic butchery evidence usually encountered 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. Ideally, butchery marks should be verified by the use of a scanning electron microscope (SEM). There are also 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 any form of movement and/or disturbance after initial deposition may accidentally have had contact with stones (and indeed with worked stone artefacts) leaving behind the distinctive 'cuts' without the direct intervention of humans. Consequently it is not simply the presence of a mark or series of marks which can be unambiguously identified as being caused by contact with a stone or metal edge which provides incontrovertible evidence of human activity; instead the location, orientation and in many cases the frequency of the marks also needs to be taken into consideration.

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). These criteria, rather than, simply the 'V'-shaped morphology should be used to define butchery marks, and to distinguish them from similar marks caused by natural processes. It should be remembered that cut marks are

generally unintentional, even when they 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. Consequently, the bones with butchery marks considered here are a conscious 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. Thus, there are in-built biases to any discussions of prehistoric butchery practices but these do not present an analytical problem as long as they are acknowledged at the outset.

Once specimens have been identified to anatomical element, species and side, they should be catalogued and drawn with all butchery marks visible (preferably on a scale of 1:1). Although it should be possible to use *proforma* recording sheets, the sheer number and range of different record sheets required due to the morphological variability of different elements between different species makes this prohibitive. Instead, it proved more effective to draw each specimen individually; although it is anticipated that the rapid expansion of computer technology, read-write CD-ROMs, databases and graphics programmes will make computerised recording of butchery evidence (alongside other archaeological and palaeontological features) far more widespread within the next decade. At the time the study reported here was undertaken, appropriate computer resources were not available. Accordingly the written catalogue was transferred into a spreadsheet, and then imported into a database. The database was then sorted to provide Number of Identifiable Specimens Present (NISP) counts, and more detailed Body Part Representation (BPR) data. BPR tables were then compiled for individual species from the different sites to give a detailed picture of assemblage composition.

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.

### 3. MNIs, BINFORD MNIs & % MNIs

In addition to using the basic NISP counts as an indicator of sample size and frequency of different species within a faunal assemblage, Minimum Number of Individual (MNI) counts and % MNI counts give a somewhat more sophisticated picture. There are two methods in common usage within archaeozoology for calculating MNI information. Simple MNI figures are calculated by taking the greatest of the left or right counts for each anatomical element (or part thereof) for each species. The alternative method, which I term the "Binford MNI" contains MNI counts calculated using L. R. Binford's method (1978: 69–72) of dividing the total number of a particular element by the number of that element present in a skeleton. Édouard Dupont (1841–1911), whose pioneering research will be discussed below, used a very similar technique (1872: 182–183) to determine an MNI of 56 for the horse remains found at the Belgian cave site of the Trou de Chaleux, 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. In this paper, when discussing MNI counts for different species I will use the basic MNI rather than the Binford MNI technique.

A further basic technique is the calculation of % MNIs, which are derived from the Binford MNIs. 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), species by species. 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 are often brought to a site as 'butchery units' (partially dismembered components of carcasses), which are then subjected to further processing. Since the study of butchery practice is concerned with the entire range of butchery activities, it is 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 has much to offer. The idea itself is not particularly new: the use of this technique is frequently found in the works of Binford (1978, 1981, 1984) and Brain (1981) among others, and is now widespread, while a less formalised version of it can even be found in the writings of Dupont (1872) and many other workers during the current and last centuries. 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 suggest that the calculation and interpretation of % MNIs is only a valid exercise when sample size is relatively high. In my own research (Charles, 1994), I have argued that it is appropriate when a significant proportion of the totals for each of the Body Part categories exceeded 30. In any case, BPR data based on % MNI calculations can really only be meaningfully discussed when sample sizes are relatively high.

However, before any inferences can be confidently drawn about human behaviour from the apparent patterning in the proportion of mammalian anatomical elements present at an archaeological site, one has to consider whether there is adequate evidence to suggest that humans were the main (or indeed only) bone accumulating agency at a given site. One of the major problems encountered when looking at Pleistocene and early Holocene faunal assemblages is identification and differentiation of humanly accumulated animal bone from that of bones collected by other carnivores. The recognition of butchery marks is a vital stage in this.

### 4. QUANTIFICATION OF BUTCHERY MARKS

Various authors have claimed that the frequency with which butchery marks occur is a significant factor (*cf.* Delpech & Villa, 1993; Lyman, 1994a: 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 humans who processed that particular carcass

Species	NISP	MNI	NISP cut	% of ident. fauna
LAGOMORPHA				
<i>Lepus</i> sp.	50	2	3	1.37
RODENTIA				
<i>Castor fiber</i>	1	1	0	0.03
CARNIVORA				
<i>Canis lupus</i>	29	1	1	0.79
<i>Vulpes</i> sp.	473	17	5	12.92
<i>Ursus arctos</i>	65	2	12	1.77
<i>Mustela</i> sp.	9	2	0	0.25
<i>Gulo gulo</i>	1	1	0	0.03
<i>Meles meles</i>	66	5	5	1.80
<i>Felis</i> sp.	34	4	0	0.93
PROBOSCIDEA				
<i>Mammuthus primigenius</i>	2	1	0	0.05
PERISSODACTYLA				
<i>Equus ferus</i>	2,457	54	530	67.12
ARTIODACTYLA				
<i>Sus scrofa</i>	55	3	2	1.50
<i>Ceruus elaphus</i>	22	1	4	0.60
<i>Capreolus capreolus</i>	4	1	0	0.11
<i>Rangifer tarandus</i>	149	4	19	4.07
<i>Capreolus capreolus</i>	4	1	0	0.11
<i>Rupicapra rupicapra</i>	29	3	3	0.79
<i>Ovis aries</i>	1	1	0	0.03
<i>Capra</i> sp.	77	8	3	2.10
<i>Ovibos moschatus</i>	78	2	9	2.10
<i>Bos</i> sp.	58	2	12	1.58
<i>Saiga tatarica</i>	1	1	0	0.03
<b>Sub total</b>	<b>3,661</b>		<b>608</b>	<b>100.08</b>
Unidentified bones & bone fragments	24,574			
<b>Total</b>	<b>28,235</b>			

**Table 1:** NISP counts for individual species recovered from the 1<sup>er</sup> niveau ossifère at the Trou de Chaleux by Éd. Dupont in 1865.

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. Lyman (*ibid.*) gives the example of discussions centring on the evidence from Olduvai Gorge: 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's (1986) counter-argument was 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 I would suggest that 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 (the largest faunal collection studied from the Belgian Ardennes to date, NISP = 3661; table 1) approximately 17.35 % of the identifiable bones show butchery traces and a relatively high proportion of these occur on the lower limbs of various large mammals, most notably the equids (table 2; 44.72 % of all cut marked *Equus ferus* specimens are lower limbs—metapodia, accessory metapodia, phalanges and sesamoids). Detailed examination of both the location and orientation of these marks suggests an *apparent* emphasis at this site 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), 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, one which 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 any rules or laws for correlating marks located on a particular bone or region of that bone with particular activities such as skinning or dismemberment *per se* (*pace* Binford, 1981). Instead, I contend that one can identify specific butchery activities only after a variety of other factors have been taken into account, each case being taken on its own merits. 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 examples discussed in the following pages, the precise butchery activities will be ambiguous. In such instances, the likely options will be discussed.

## 5. 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 and 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. Haynes (1983: 140) 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". 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, including Palaeontological collections dating to the Miocene in North America.

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 argue that certain aspects of the bone breakage observed at a Belgian Late Magdalenian site, the Trou de Chaleux, do not match any published descriptions of carnivore damage, nor any of the damage patterns observed in carnivore accumulated faunal assemblages known to the author.

Element	Left	Right	Indet.	Adult	Juv.	Cut	Total	MNI	Bin. MNI	% MNI
cranial	–	–	129	129	0	25	129	–	–	–
maxilla	11	15	31	56	1	20	57	15	28.50	46.34
mandible	42	54	27	122	1	49	123	54	61.50	100.00
hyoid	–	–	21	21	0	1	21	21	21.00	34.15
atlas	–	–	0	0	0	0	0	0	0.00	0.00
axis	–	–	1	1	0	0	1	1	1.00	1.63
cervical v.	–	–	13	13	0	3	13	–	2.60	4.23
thoracic v.	–	–	22	22	0	4	22	–	1.22	1.99
lumbar v.	–	–	2	2	0	1	2	–	0.33	0.54
innominate	12	1	4	16	1	5	17	12	8.50	13.82
sacrum	–	–	13	13	0	8	13	13	13.00	21.14
caudal v.	–	–	160	159	1	9	160	–	10.67	17.34
scapula	22	36	3	56	5	30	61	36	30.50	49.59
humerus	0	2	1	1	2	1	3	2	1.50	2.44
P. humerus	7	4	9	18	2	4	20	7	10.00	16.26
humerus shaft	12	7	7	25	1	14	26	12	13.00	21.14
D. humerus	13	11	2	26	0	11	26	13	13.00	21.14
radius	0	0	0	0	0	0	0	0	0.00	0.00
P. radius	13	17	1	30	1	12	31	17	15.50	25.20
radius shaft	10	9	0	19	0	4	19	10	9.50	15.45
D. radius	15	5	0	16	4	7	20	15	10.00	16.26
ulna	16	19	1	30	6	11	36	19	18.00	29.27
P. MC	21	17	4	42	0	12	42	21	21.00	34.15
D. MC	–	–	27	27	0	12	27	–	13.50	21.95
Acc. MC	28	15	2	45	0	12	45	–	11.25	18.29
P. femur	16	17	6	26	13	2	39	17	19.50	31.71
femur shaft	29	17	4	50	0	19	50	29	25.00	40.65
D. femur	19	13	3	35	0	2	35	19	17.50	28.46
patella	9	7	0	16	0	1	16	9	8.00	13.01
P. tibia	7	10	5	22	0	4	22	10	11.00	17.89
tibia shaft	9	8	1	18	0	1	18	9	9.00	14.63
D. tibia	24	19	2	39	6	8	45	24	22.50	36.59
Fibula	2	3	0	5	0	0	5	3	2.50	4.07
P. MT	9	15	0	24	0	12	24	15	12.00	19.51
D. MT	–	–	4	4	0	1	4	–	2.00	3.25
Acc. MT	20	12	1	33	0	7	33	–	8.25	13.41
P. sesamoid	–	–	91	91	0	16	91	–	45.50	73.98
phalanx 1	–	–	77	67	10	44	77	–	19.25	31.30
P. phalanx 1	–	–	33	33	0	7	33	–	8.25	13.41
phalanx 1 shaft	–	–	1	1	0	0	1	–	0.25	0.41
D. phalanx 1	–	–	43	43	0	14	43	–	10.75	17.48
phalanx 2	–	–	97	80	17	56	97	–	24.25	39.43
P. phalanx 2	–	–	2	1	1	0	2	–	0.50	0.81
D. phalanx 2	–	–	0	0	0	0	0	–	0.00	0.00
D. sesamoid	–	–	64	64	0	5	64	–	16.00	26.02
phalanx 3	–	–	75	65	10	29	75	–	18.75	30.49
<b>Total</b>	<b>366</b>	<b>333</b>	<b>989</b>	<b>1,606</b>	<b>82</b>	<b>483</b>	<b>1,688</b>			

Table 2: BPR information for *Equus ferus* from the Trou de Chaleux.

An example of this is 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; table 2) compared with gnawed bones in the same assemblage (0.30 % of the NISP), it seems justified to discuss the breakage patterns observed as being the result of human action, as they do not parallel any form of predator or 'natural' damage encountered before.

## 6. OTHER TYPES OF BUTCHERY EVIDENCE FREQUENTLY USED

Whilst this paper takes as its focus interpretation of butchery marks observed on individual bones, a range of other techniques aimed at interpreting animal carcass exploitation strategies should be noted. Perhaps the most commonly found techniques are the series of utility indices developed by Binford (1978, 1981, 1984). These are claimed to be a quantitative assessment of each

anatomical element, for each species, in terms of meat, marrow and grease. These three aspects can be combined to give a General Utility Index (GUI). In their purest form these utility indices are suggested to be significant in terms of assessing the desirability of different animal body parts to contemporary, as well as past, hunter-gatherer societies. As elements of low utility may form a part of the same butchery unit as those of high utility, Binford (*ibid.*) has also put forward a Modified General Utility Index (MGUI).

Such utility indices have found varying degrees of acceptance amongst archaeozoologists. Although they appear to have become established analytical units within archaeozoological literature (see, for example, Legge & Rowley-Conwy, 1988; Boyle, 1994), they should not be accepted and applied unquestioningly. The implication is that information derived from these indices is a 'universal' guide to the utility of each anatomical element. However, all butchery practice is situated within cultural attitudes to different animals at its most basic level. Whilst a westernised perspective will usually divide animals into self-contained Linnean species designation (potentially divisible by biological sex and age data), this perspective does not necessarily have a universal application (*cf.* Bulmer, 1964). This being the case, we do not know whether prehistoric hunters and butchers looked at (and classified) animals in such a way, and so we cannot say with any level of confidence that utility indices tell us much about prehistoric butchery objectives and practice. Similarly, rather than being independent measures of the potential for exploitation of particular body parts, the utility indices themselves are likely to reflect particular cultural needs of the individual butchers (in Binford's case the Nunamiut), which may well extend beyond the purely functional.

Consequently one should be cautious of the unquestioning use of such utility indices in the archaeozoological literature, and they will not be considered in further detail here.

## 7. INTRODUCTION TO THE FAUNAL COLLECTION FROM THE TROU DE CHALEUX

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 1833 study *Recherches sur les ossements fossiles découverts dans les cavernes de la Province*

*de Liège*. Dupont's work began under the auspices of the Belgian government on the proposal of the *Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique*. During the initial stages of his research, he published detailed accounts of these excavations and preliminary results in the *Bulletin de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique* (Dupont, 1865a and b; 1868a and b). Results were also presented in a series of published letters to the minister of the Interior, M. Alphonse Vandenpeereboom (Dupont, 1865c; 1865d; 1867), 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*. The archaeological and palaeontological collections from these sites are the original founding collections of the *Institut royal des Sciences naturelles de Belgique* (IRScNB) in Brussels.

Unfortunately, precise descriptions of the faunal collection from Chaleux and the Furfooz caves, where Dupont also worked, have remained largely unpublished, and consequently are unknown in detail to many archaeologists and palaeontologists. The results of Dupont's final analyses are thus largely unknown, although it became 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 of Dupont's excavations during the 1860s remain at the IRScNB: Dupont is believed to have removed all his papers when he left the Institute, and these were probably destroyed during the latter part of his life.

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 from Chaleux are all initialed by Dupont himself, dated *avril 1907* and held in the reserve collections of the IRScNB. These labels outline the stratigraphy of the site and discuss the archaeology and associated faunal assemblages. It is interesting to note that MNI counts are included for the different species present (usually based on the most frequent anatomical element); details of the presence and location of butchery evidence on the animal bones are provided, bone breakage patterns are described and brief discussions of how these may relate to human behaviour are included. Sadly, although these observations relate to a large number of specimens, they are extremely brief; in effect they are a series of notes and the only indication we have for the

path of Dupont's innovative later research on this material.

Few subsequent excavations have taken place at the Trou de Chaleux. In 1914, Edmond 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) had covered much of the cave floor of the central chamber. None of Rahir's material was located during the course of research reported here, and consequently it cannot be included in this study.

More recent excavations at the site were undertaken by the *Service de Préhistoire, Université de Liège* during the 1980s, with the aim of clarifying many of the problems left unresolved by Dupont (Otte & Teheux, 1986; Otte & Cabboi, 1988; Otte *et al.*, 1994), these publications deal primarily with material recovered during these excavations. The objective of the present paper is to discuss in some detail the evidence for Lateglacial faunal exploitation at the Trou de Chaleux recovered by Dupont during the last Century.

## 8. ARCHAEOLOGY

The archaeological material from the Trou de Chaleux is undoubtedly 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. Although lacking the 'harpoons' (barbed bone and antler points) frequently found in many later Magdalenian assemblages across Europe and indeed found elsewhere within Belgium (e.g. 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 and bladelets (some denticulated), long end scrapers, *becs*, and *perçoirs doubles type de*

*Chaleux*). A detailed discussion of the archaeological material recovered from this site is not within the direct remit of this paper, and the reader is referred to Dewez (1987) and Otte *et al.* (1994) for a fuller account of this aspect of the Chaleux collection.

## 9. FAUNA

The faunal collection from Chaleux made by Dupont is quite remarkable given the date of recovery. Over 3,000 identifiable specimens are preserved in the IRScNB stores, alongside a further 24,000 (approx.) unidentifiable bone fragments from the Magdalenian layer at this site (termed the *1<sup>er</sup> niveau ossifère*). 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.

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; these are stored 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).

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

**Table 3:** NISP counts of *species indeterminate* (*Sp. indet.*) bone and *Rangifer tarandus* antler fragments 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 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.

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 discussion of the fauna.

## 10. DATING EVIDENCE

The radiocarbon evidence for human presence at the Trou de Chaleux has recently been enhanced by the use of the Accelerator Mass Spectrometry technique on a series of humanly modified animal bones. In total 7 radiocarbon dates are currently available for the site. These are presented in uncalibrated radiocarbon years before present (BP) in table 4. Three of these are conventional age estimates, and fall within the Bölling chronozone of the Lateglacial, after Mangerud *et al.* (1974). A further four accelerator dates were obtained as part of the current research project, all of which were on single modified and identifiable bones provenanced to the 1<sup>er</sup> niveau ossifère. 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 a few later prehistoric elements within the assemblage. Both the radiocarbon evidence and the range of species present, 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<sup>er</sup> 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 (Poplin, 1976) in Germany, Gough's

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

Table 4: Radiocarbon dates from the Trou de Chaleux.

Lab Code	Date	Sample details	Site
OxA-4199	12240 ± 130 BP	Worked antler artefact	Trou da Somme
OxA-4195	12630 ± 140 BP	Cut 2nd phalanx of <i>Equus ferus</i>	Trou des Nutons, Furfooz
OxA-4198	12660 ± 140 BP	Bevelled sagaie base	Trou Burnot (Bois Laiterie)
OxA-3632	12790 ± 100 BP	Cut 3rd left cuneiform of <i>Equus ferus</i>	Trou de Chaleux
OxA-4197	12800 ± 130 BP	Cut partial left metacarpal of <i>Equus ferus</i>	Trou du Frontal, Furfooz
OxA-4192	12860 ± 140 BP	Cut 1st phalanx of <i>Ovibos moschatus</i>	Trou de Chaleux
OxA-3635	12870 ± 95 BP	Cut proximal 1st phalanx of <i>Equus ferus</i>	Grotte du Coléoptère
OxA-3633	12880 ± 100 BP	Cut 3rd left cuneiform of <i>Equus ferus</i>	Trou de Chaleux

Table 5: Radiocarbon dates with clear contextual links with human presence for the Late Magdalenian in Belgium.



Cave (Carrant, 1986) and Robin Hood's Cave (Charles & Jacobi, 1994) in Britain.

The associated archaeology, as we have seen, is clearly late Magdalenian: although the site lacks some of the distinctive *fossiles directeurs* of the 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 AMS dates from a number of Belgian late Magdalenian sites (table 5). In short, if we are looking at evidence for a particular 'tradition' of animal carcass butchery,

that 'tradition' belongs to the Late Magdalenian of north-western Europe.

## 11. 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 (Plate 1). 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

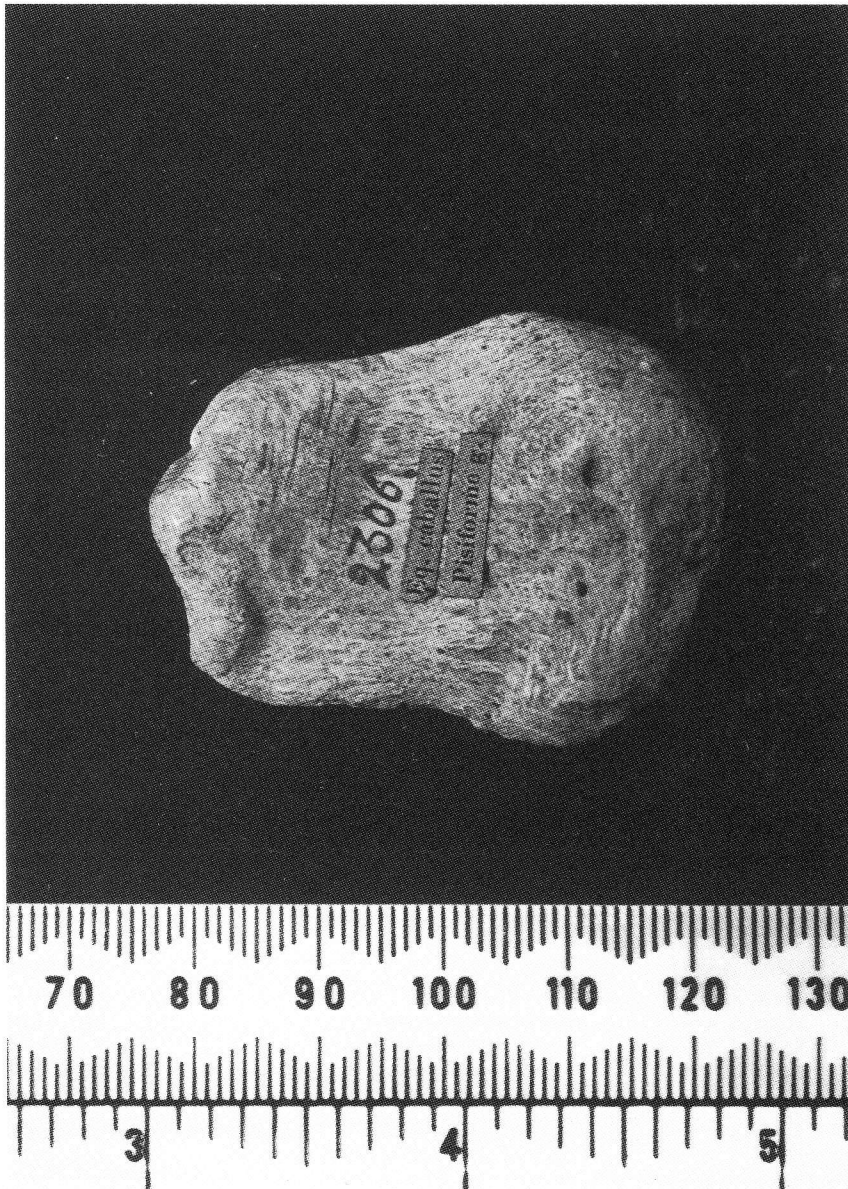


Plate 1: Cut left pisiform of *Equus ferus*, Trou de Chaleux. IRScNB reserve collection.

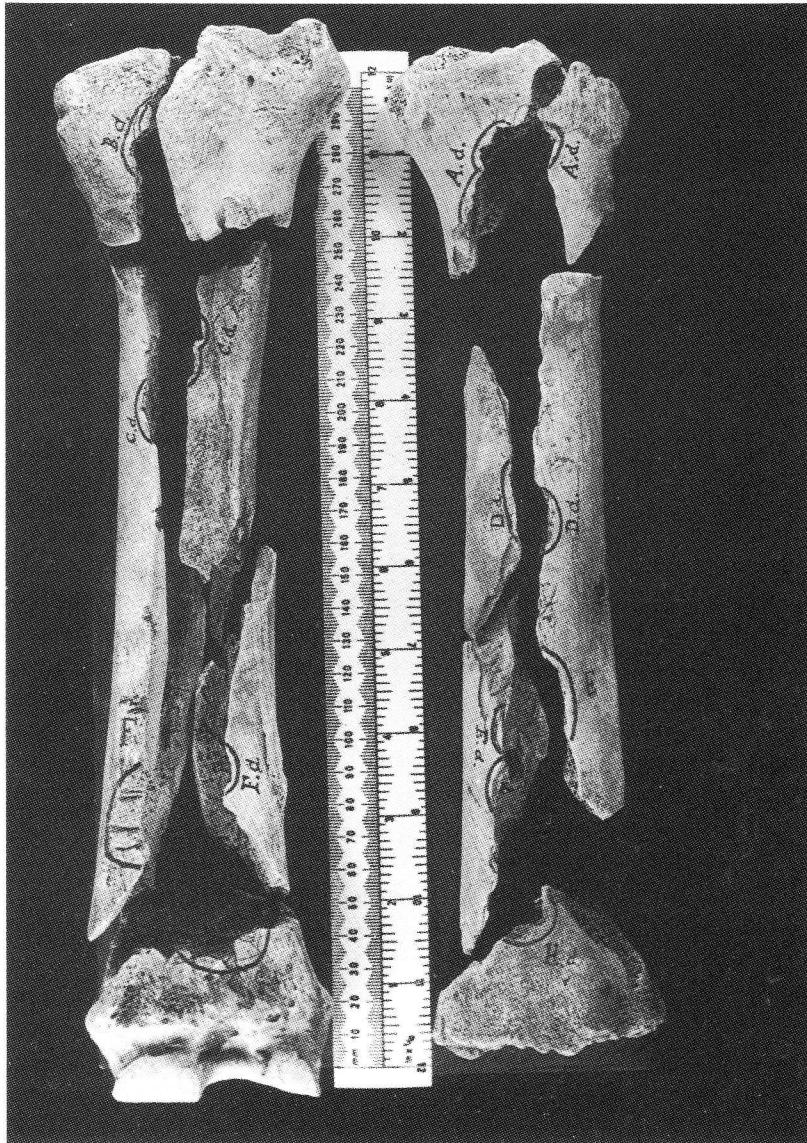


Plate 2: Montage of *Equus ferus* radii fragments (anterior and posterior views) showing Dupont's suggested points of percussion. IRScNB reserve collection.

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* indicating these impact points, graphically illustrate the ideas he developed over a century ago about systematic carcass processing (Plate 2).

It appears to have become part of popular archaeological mythology that Lewis R. Binford "discovered" cut marks and their archaeological potential. Binford himself 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 & Christy, 1875: Pl. B.XVII Nos. 2 and 4; Martin, 1921).

The evidence of cut marks clearly indicates that a significant proportion of the large and small animals 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. As with the Creswellian fauna from 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-gatherers, 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 anywhere in the Belgian Magdalenian), thread and snares.

It is also probable that skins were removed, and used, 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 fascia (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 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 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 (P.Z. Dransart pers. comm.). In such cases, skinning marks will not have been produced.

## 12. 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 percussion caused as the accidental side effect of 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 equid bones have been longitudinally split, including the tibiae, metapodials and 1st phalanges. It is possible, though unlikely that such breakage patterns could be caused by 'natural' agencies: however, no such trends have been observed in faunal assemblages accumulated by non-human agencies. In all cases it occurs on a high proportion of the anatomical elements present. Indeed, with reference to the phalanges (fig. 1), it appears extremely unlikely that this type of damage could be due to natural factors alone; *Equus* 1st 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.

Instead it is possible to draw a striking parallel between this and the breakage patterns found on *Equus* 1st phalanges at other Late Magdalenian faunal assemblage in north-western Europe, including La Madeleine (Bouvier, 1979), Gönnersdorf (Poplin, 1976), and Étioilles (Poplin, 1994) although it should be noted that the large mammal fauna from Étioilles is too poorly preserved to permit accurate identification of butchery marks. An apparently similar breakage pattern has also been alluded to at Monruz (Affolter *et al.*, 1994) although this information has yet to be fully published. In the cases of La Madeleine, Gönnersdorf 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 follows this pattern, but the bones are not completely split. Presumably, this splitting was done to provide access to the marrow in the 1st phalanges. 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 Marsha Levine (pers. comm.) is that the potential marrow reserves in the phalanges are minimal; she notes that these bones were often used as cores for bone needles in other Upper Palaeolithic assemblages. In the case of

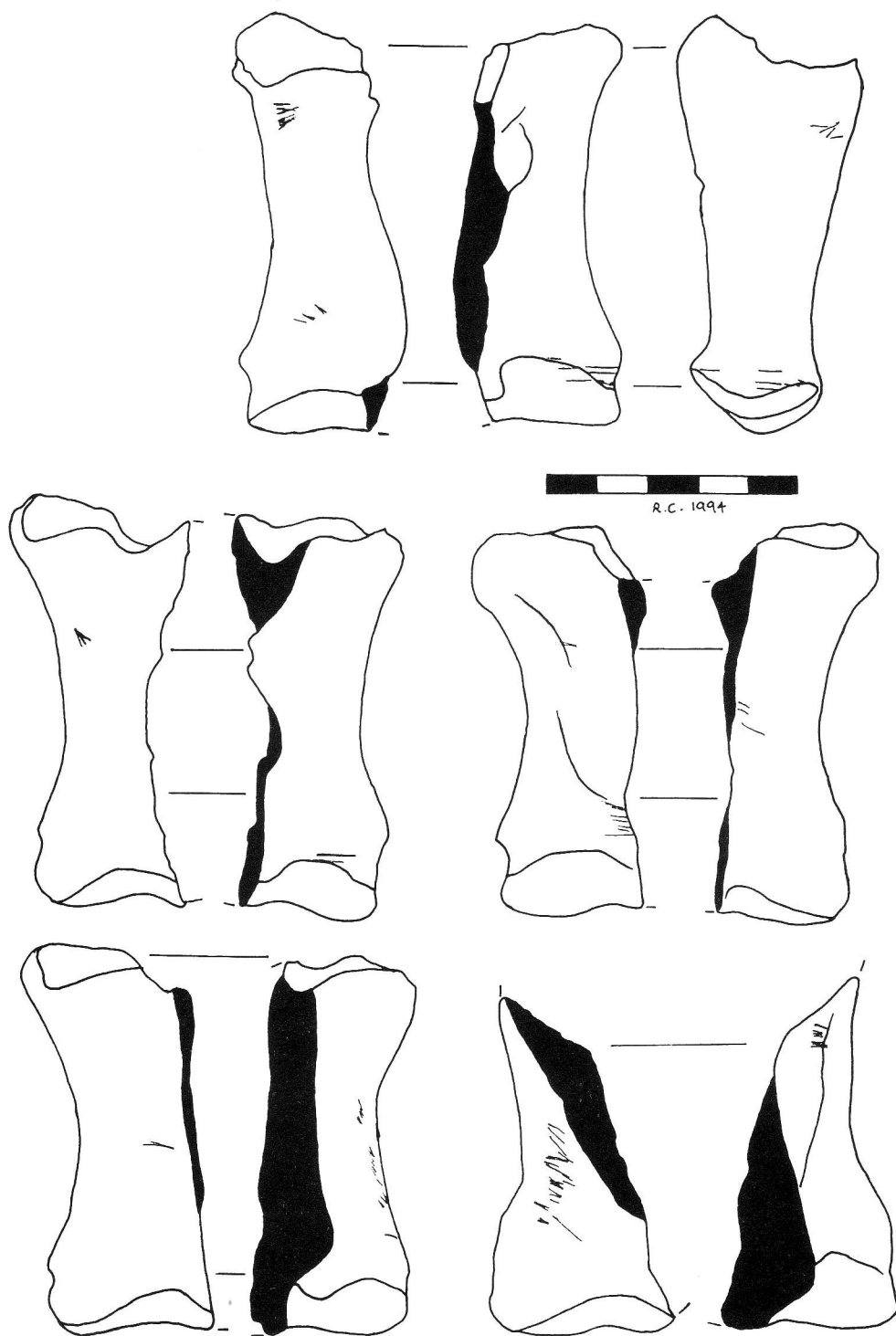


Fig. 1: Longitudinally split 1st phalanges of *Equus ferus* from the Trou de Chaleux. IRScNB reserve collection.

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. The splitting of these phalanges and the extraction of such minimal marrow reserves may well relate to the season of human occupation at the site

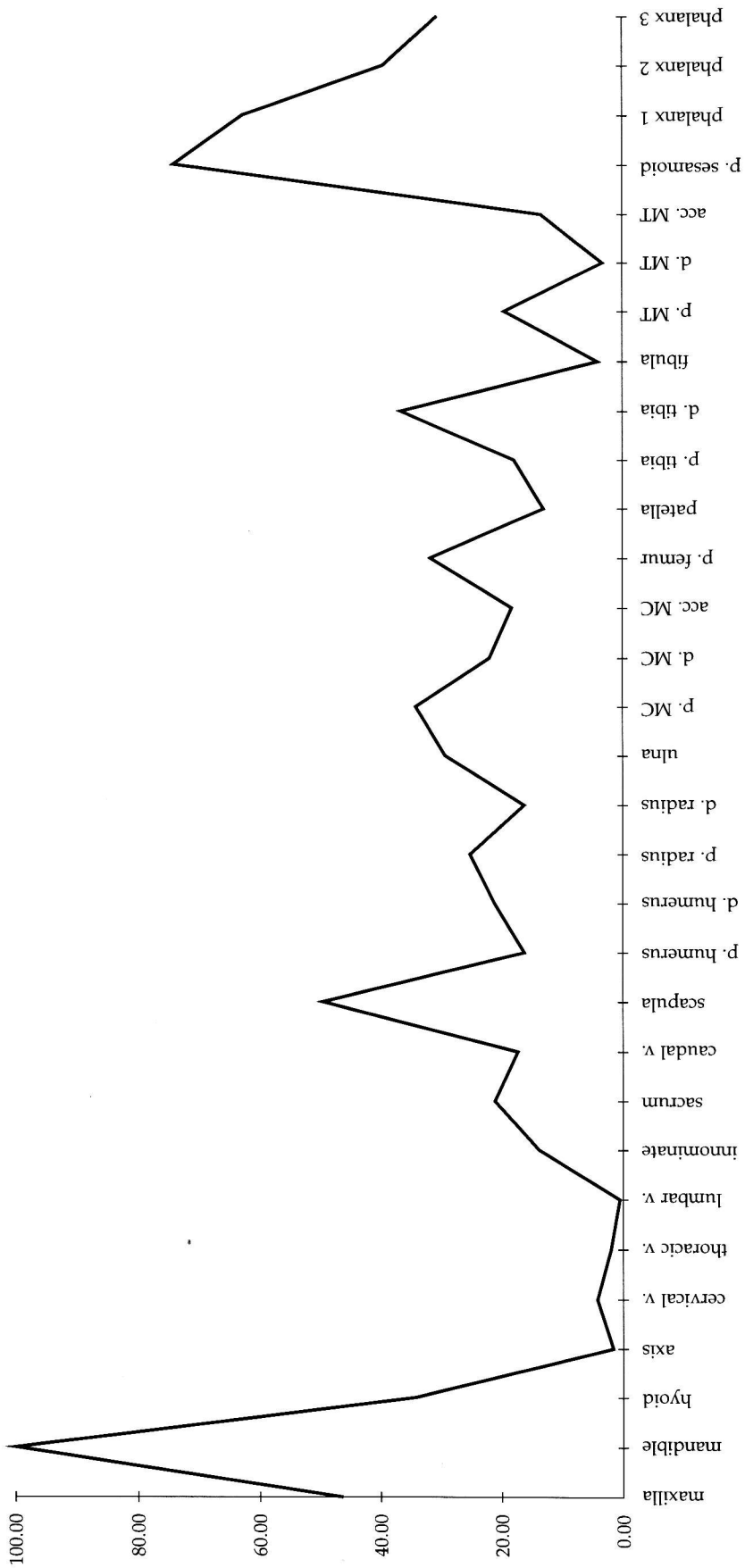


Fig. 2: Trou de Chaleux, BPR data for *Equus ferus*.



(M. Germonpré, pers. comm.), however, without any primary evidence for the season(s) of human presence at Chaleux during the Lateglacial this suggestion cannot be confirmed.

### 13. BPR FOR *EQUUS FERUS*

The Body Part Representation data for *Equus ferus* is presented in table 4. A BPR diagram using the % MNI calculations is presented as figure 2. 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, 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 being broken. The only long bones which have completely avoided any breakage are the ulnae, although these are frequently detached from the radii. 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 horse 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 (Plate 2). These points were also illustrated on accompanying illustrations of the long bones; it appears that Dupont felt that the bone breakage was so regular that systematically selected 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 (merely hinted at within these displays) to fall far more in line with my own thinking than they ever did in reality. However, the level of bone breakage was certainly extremely high.

The difficulty of distinguishing bone breakage caused by humans from that induced by natural agencies has already been commented upon. What can be remarked upon in the case of Chaleux is the high degree of bone 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. Some aspects of the bone breakage patterning which I believe to have been humanly induced have already been discussed, and I will go on to discuss other breakage patterns below.

This high degree of fragmentation may also be reflected in some of the peaks visible on figure 2. 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 vulnerable to breakage by 'natural' agencies).

### 14. BUTCHERY EVIDENCE FOR *EQUUS FERUS*

Meat removal is documented by filleting marks found on virtually all long bones, innominate and vertebral spines. Filleting 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, however, 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 help humans avoid scurvy (*ibid.*: 148–149). Although it is extremely difficult to identify humanly induced bone breakage from that caused by other predators, or 'natural' factors, it is suggested here 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, considered below, human activity is proposed 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 in hunter-gatherers communities (*cf.* Binford, 1984), although similar damage has also been noted to be caused by other predators (Brain, 1981). In general, the cuts on the mandibles at Chaleux 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 2). One hundred and twenty nine of these are identifiable to species, the remainder being included in the counts for sp. indet. bone fragments (see table 3). 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 may 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 the thinner bones at the base of the cranium, which are to a great extent protected from accidental damage by their articulation with robust elements such as the atlas vertebra and the mandible.

The brain itself has a particularly high dietary value, and so it is hardly surprising 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 suffering 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 vertebrae. However, it should also be noted that evidence for extraction of the brain and other fatty tissues from the cranium does not in itself provide evidence for dietary stress. It is equally possible that these resources were highly prized for their flavour and/or held symbolic significance amongst the Lateglacial hunter-gatherers of north-western Europe.

There are some notable absences within the Chaleux collection. Components of the vertebral column are either absent, or present in relatively low frequencies. 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 parts of the carcass were either subsequently removed or never originally present.

It seems unlikely that 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; 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 immediately 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—for none of which we have direct evidence in the palaeolithic), ornamentation and decoration on clothes and other items of material culture. A final possible use was noted from ethnographic collections from Southern Africa, where horse tails have been used as the basic component for Zulu ceremonial whisks. The potential uses of equid tails are numerous, and the above list is by no means exhaustive. It is extremely 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, 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 filleting 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 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 scapula from that used in disarticulating the right. 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. 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.

The former explanation seems less likely, as the proximal ends of humeri occur 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 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 longitudinal shearing of the proximal humeri is a part of this process is preferred here. 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 is 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. 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.

A similar pattern is found in the hind limbs. Cut marks surrounding the acetabulum region of the innomates correlate with disarticulation activities and meat filleting marks are also present. The femora are highly fragmented (none is 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: 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. 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 and no *lames machurées* (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 stone 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. Such items are present at Chaleux; see Dewez (1987: fig. 45).

To achieve 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 aspects 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. Is it likely 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. 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 access to individual bones with adequate marrow reserves, and, perhaps, secondly to 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; 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).

## 15. CONCLUSIONS

The preceding pages have argued for a more 'holistic' approach to the interpretation of Palaeolithic faunal remains. In the case of the European Palaeolithic record, it is certainly necessary to demonstrate a direct contextual link between faunal material found on archaeological sites and human activity. Many (but not all) faunal assemblages are also relatively small; this has its own attendant problems and in-built biases. Consequently, the applicability of Body Part Representation data should be carefully considered before undertaking any such analysis. A strong contextual link has to be demonstrated between the faunal sample in question and human activity, and the sample has to be sufficiently large before detailed statistical appraisal (and statistical transformations) are undertaken.

The case study presented here on the wild horse remains from the Trou de Chaleux indicates the ways in which butchery evidence may be utilised to draw inferences about past human butchery practice.

## Acknowledgements

I thank the staff of the IRScNB in Brussels for their help and patience during numerous research visits. The staff of the Oxford Accelerator Unit for the AMS work on the Chaleux fauna. Derek Roe for his many helpful comments on earlier drafts of this text, as well as for his steadfast supervision of my D. Phil. thesis, a part of which formed the basis for this paper. The research presented here was made possible by funding from the British Academy, Christ Church (Oxford) and the Meyerstein Fund of Oxford University.

## References

- AFFOLTER, J., CATTIN, M.-I., LEESCH, D., MOREL, P., PLUMETTAZ, N., THEW, N. & WENDLING, G., 1994. Monruz — Une nouvelle station magdalénienne au bord du lac de Neuchâtel. *Archéologie Suisse*, **17** (3): 94–104.
- BINFORD, L. R., 1978. *Nunamiut Ethnoarchaeology*. New York, Academic Press, 509 p.
- BINFORD, L. R., 1981. *Bones: Ancient men and modern myths*. New York, Academic Press, 320 p.
- BINFORD, L. R., 1984. *Faunal Remains from Klasies River Mouth*. New York, Academic Press, 283 p.
- BINFORD, L. R., 1986. Comment on Bunn and Kroll 1986. *Current Anthropology*, **27**: 444–446.
- BOUVIER, J.-M., 1979. Le mystère des fendeurs de phalanges ou Contribution à la connaissance du travail de l'os au Magdalénien IV. *Bulletin de la Société Préhistorique Française*, **76** (4): 105–109.
- BRAIN, C. K., 1981. *The Hunters or the Hunted? An Introduction to African Cave Taphonomy*. Chicago, University of Chicago Press, 365 p.
- BOYLE, K. V., 1994. La Madeleine (Tursac, Dordogne) une étude paléoéconomique du Paléolithique Supérieur. *Paleo*, **6**: 55–77.
- BULMER, R., 1964. Why is the Cassowary not a bird? A problem of zoological taxonomy amongst the Karam of the New Guinea Highlands. *Man (N. S.)*, **2**: 5–25.
- BUNN, H. T. & KROLL, E. M., 1986. Systematic butchery by Plio-Pleistocene hominids at Olduvai Gorge, Tanzania. *Current Anthropology*, **27**: 431–452.
- CHARLES, R., 1994. *Food for Thought: Late Magdalenian chronology and faunal exploitation in the north-western Ardennes*. Unpublished D. Phil. Dissertation. Oxford University.
- CHARLES, R. & JACOBI, R. M., 1994. The Late-glacial fauna from the Robin Hood Cave, Creswell Crags: a re-assessment. *Oxford Journal of Archaeology*, **13** (1): 1–32.
- CURRENT, A. P., 1986. The Lateglacial mammal fauna of Gough's Cave, Cheddar, Somerset. *Proceedings of the University of Bristol Speleological Society*, **17** (3): 286–304.
- DART, R., 1957. The Makapansgat Australopithecine Osteodontokeratic Culture. *Proceedings of the Third Pan African Congress on Prehistory (Livingstone 1955)*. London, Chatto & Windus.



- DAWKINS, W. B., 1874. *Cave Hunting: Researches on the evidence of caves respecting the early inhabitants of Europe*. London, Macmillan & Co, 455 p.
- DELPECH, F. & VILLA, P., 1993. Activités de chasse et de boucherie dans la Grotte des Églises. *Exploitation des animaux sauvages à travers le temps*. Juan-les-Pins, Éditions APDCA. : 79–102.
- DEWEZ, M., 1987. *Le Paléolithique Supérieur Récent dans les Grottes de Belgique*. Louvain-la-Neuve, Publications d'Histoire de l'Art et d'Archéologie de l'Université Catholique de Louvain, LVII.
- DUPONT, Éd., 1865a. Étude sur les cavernes des bords de la Lesse et de la Meuse, explorées jusqu'au mois d'octobre 1865. *Bulletin de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique*, XX, 2<sup>e</sup> Série : 824–850.
- DUPONT, Éd., 1865b. Sur l'analogie d'un dépôt de pierres et de boue produit par un orage et du dépôt à fragments de roches anguleux des cavernes de la Lesse. *Bulletin de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique*, XX, 2<sup>e</sup> Série : 250–253.
- DUPONT, Éd., 1865c. *Rapport adressé à M. le Ministre de l'Intérieur sur les fouilles scientifiques exécutées dans la Province de Namur pendant l'année 1864*. Bruxelles, Deltombe.
- DUPONT, Éd., 1865d. *Rapport adressé à M. le Ministre de l'Intérieur sur les fouilles scientifiques exécutées dans les cavernes des bords de la Lesse, jusqu'au mois de Novembre 1865*. Bruxelles, Deltombe.
- DUPONT, Éd., 1867. *Rapport adressé à M. le Ministre de l'Intérieur sur les résultats des travaux scientifiques exécutés dans les cavernes des environs de Dinant, jusqu'au mois de janvier 1867*. Bruxelles, Deltombe.
- DUPONT, Éd., 1868a. Étude sur les cavernes du Bois de Foy à Montaigle. *Bulletin de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique*, 25, 2<sup>e</sup> Série : 199–224.
- DUPONT, Éd., 1868b. Sur la succession des temps quaternaires, d'après les modifications observées dans la taille du silex. *Bulletin de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique*, 25, 2<sup>e</sup> Série : 38–41.
- DUPONT, Éd., 1872. *Les temps antéhistoriques en Belgique. L'homme pendant les âges de la Pierre dans les environs de Dinant-Sur-Meuse*. Bruxelles, Éd. Macquart et Cie, et Paris, J. B. Baillière, 154 p.
- GETTY, R. (Ed.), 1975. *Sisson and Grossman's The Anatomy of the Domestic Animals*. Philadelphia and London, W. B. Saunders Company, 2 vol.
- GRAYSON, D. K., 1984. *Quantitative Zooarchaeology: topics in the analysis of archaeological faunas*. New York, Academic Press.
- GORDON, B. C., 1988. *Of Men and Reindeer Herds in French Magdalenian Prehistory*. British Archaeological Reports International Series, 390. Oxford.
- HAYNES, G., 1983. Frequencies of spiral fracture and green bone fracture on ungulate limb bones in modern surface assemblages. *American Antiquity*, 48 (1): 102–114.
- LARTET, E. & CHRISTY, H., 1875. *Reliquae Aquitanicae: being contributions to the archaeology of Périgord and adjoining provinces of southern France*. London, Williams & Norgate.
- LEGGE, A. J. & ROWLEY-CONWY, P. A., 1988. *Star Carr revisited*. London, Dept. of Extra Mural Studies, University of London, 145 p.
- LYMAN, R. L., 1994a. *Vertebrate Taphonomy*. Cambridge Manuals in Archaeology. Cambridge, Cambridge University Press, 524 p.
- LYMAN, R. L., 1994b. Quantitative units and terminology in zooarchaeology. *American Antiquity*, 59 (1): 36–71.
- MANGERUD, J., ANDERSEN, S. T., BERGLUND, B. E. & DONNER, J. J., 1974. Quaternary stratigraphy of Norden, a proposal for terminology and classification. *Boreas*, 3: 109–128.
- MARTIN, H., 1921. *Le gisement de la Quina*. Extracts from "Bulletin de la Société Préhistorique Française". 1906–1921. Paris.
- MYERS, T. P., VOORHIES, M. R. & CORNER, G. R., 1980. Spiral fractures and bone pseudotools at palaeontological sites. *American Antiquity*, 45 (3): 483–490.
- OTTE, M. et TEHEUX, E., 1986. Fouilles 1986 à Chaleux. *Notae Praehistoricae*, 6: 63–77.
- OTTE, M. et CABBOI, S., 1988. La Grotte de Chaleux, résultats préliminaires de la fouille 1988. *Notae Praehistoricae*, 8: 25–37.
- OTTE, M. (dir.) with the collaboration of BADEN-POWELL, D., CABBOI, S., CHARLES, R., CORDY, J.-M., GILOT, E., LEJEUNE, M., LÉOTARD, J.-M., NOIREL-SCHUTZ, C., PATOU-MATHIS, M. & SCHOCH, W., 1994. *Le Magdalénien du Trou de Chaleux (Hulsonniaux — Belgique)*. Études et Recherches Archéologiques de l'Université de Liège, 60, Liège, 255 p.

- PARKIN, R. A., ROWLEY-CONWY, P. & SERJEANTSON, D., 1986. Late Palaeolithic exploitation of horse and red deer at Gough's Cave, Cheddar, Somerset. *Proceedings of the University of Bristol Spelaeological Society*, **17** (3): 311–330.
- PERKINS, D. & DALY, P., 1968. A hunter's village in neolithic Turkey. *Scientific American*, **219**: 577–580.
- POPLIN, F., 1976. *Les grands vertébrés de Gönnersdorf. Fouilles 1968*. In: G. Bosinski (Ed.), *Der Magdalénien-Fundplatz Gönnersdorf*, **2**. Wiesbaden, Franz Steiner Verlag GmbH, 212 p.
- POPLIN, F., 1994. La faune d'Étiolles : milieu animal, milieu taphonomique, milieu humain. In : Y. Taborin (Ed.), *Environnements et habitats magdaléniens dans le centre du Bassin parisien*. Documents d'Archéologie Française, **43**, Paris : 94–104.
- POTTS, R. & SHIPMAN, P., 1981. Cutmarks made by stone tools on bone from Olduvai Gorge, Tanzania. *Nature*, **291**: 577–580.
- RUTOT, A., 1903. Le préhistorique dans l'Europe centrale. *Mémoires du 21<sup>e</sup> Congrès de la Fédération archéologique et historique de Belgique*. Dinant.
- SCHMERLING, P.-C., 1833. *Recherches sur les ossements fossiles découverts dans les cavernes de la province de Liège*. Liège, P.-J. Collardin.
- SPETH, J. D., 1983. *Bison Kills and Bone Counts*. Chicago and London, University of Chicago Press, 237 p.
- STINER, M. C., 1991. Food procurement and transport by human and non-human predators. *Journal of Archaeological Science*, **18**: 455–482.

Author's address:

R. CHARLES

The Queen's College

Oxford OX1 4AW (Grande-Bretagne)