Proc. Univ. Bristol Spelaeol. Soc., 1986, 17 (3), 311-330.

LATE PALAEOLITHIC EXPLOITATION OF HORSE AND RED DEER AT GOUGH'S CAVE, CHEDDAR, SOMERSET

by

R. A. PARKIN, P. ROWLEY-CONWY and DALE SERJEANTSON

ABSTRACT

This contribution studies the body part representation of the horse and red deer bones, the season of occupation of the cave as indicated by the bones, and the cut marks on the bones.

Samples from different areas of the cave show very different body part representation, only some aspects of which can be put down to differential recovery and post-excavation discard. A theory is put forward to explain differences in terms of human and carnivore activity.

The red deer jaws suggest that the cave was used in the winter.

The very clear cut marks indicate normal skinning, dismemberment and filleting of the animals, and also the removal of tendons and ligaments from the lower limbs, presumably for industrial purposes.

INTRODUCTION

This report discusses the cut marks and butchery evidence on the animal bones from Gough's Cave. The project was initially suggested by R. M. Jacobi, E. B. Jacobi and A. P. Currant, who first noticed the cut marks and who established which bones from the many excavations in the cave could be reliably ascribed to the Late Palaeolithic occupation levels. A study of the cut marks was carried out by one of us (Parkin, 1984), and this work forms the basis of the section on cut marks below.

Body part representation has also been studied. It consists largely of a comparison between the bones from two different excavations at the front and back of the cave. The excavations of R. F. Parry from 1927-1931 were carried out in the main inside the cave mouth (Parry, 1931), while those by the cave management from 1949-1952 took place further back inside the cave (Fig. 1). The cave management also excavated some deposits on the north side of the cave along the rim of the Cheddar Man fissure in 1959, and a sediment remnant in the area of excavation C (1949-50) was cleared by the cave management probably in 1959. It produced further bones, some of which are in the Cheddar Caves Museum. The surviving bones from the Parry excavations are now in various museums. Most are in the British Museum (Natural History), but we also examined bones in the possession of Cheddar Caves Museum, Wells Museum, Taunton Castle Museum and Dr N. C. Cooper, one of Parry's colleagues. Most of the bones from the 1949-52 excavations are in the British Museum (Natural History) but some of the more complete bones from this excavation have been returned to the Cheddar Caves Museum. The bones from the Cheddar Man fissure excavation were given to the University of Bristol Spelaeological Society (UBSS).

In the comparison of body parts from the front and back of the cave we have used the sample of bones from the 1927-31 excavations in the BM(NH) and the complete assemblage from the 1949-52 excavations. For the study of the cut marks we have discussed all the bones with cuts which we have seen.

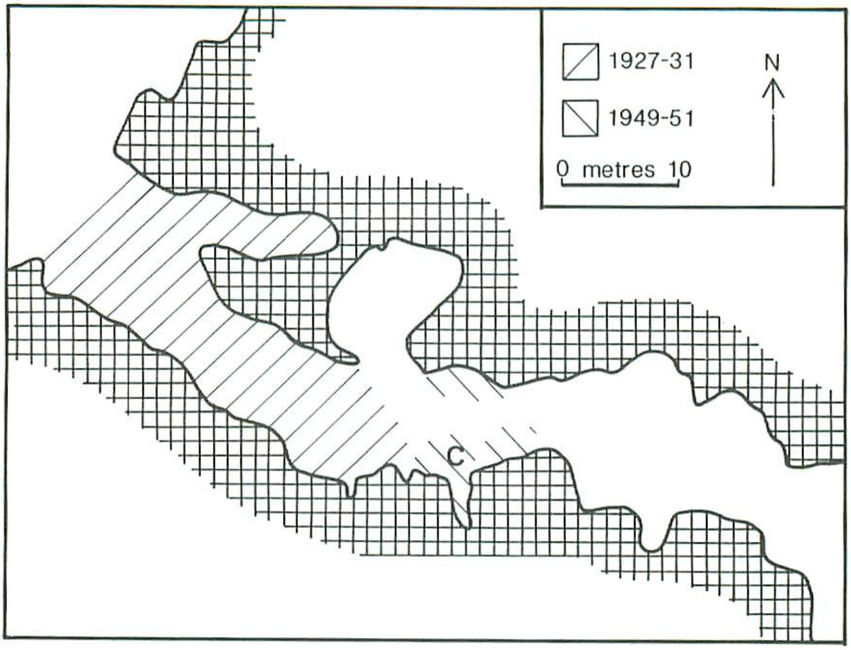


FIG. 1 — PLAN OF GOUGH'S CAVE, SHOWING LOCATIONS OF THE EXCAVATED AREAS PRODUCING THE TWO SAMPLES OF BONES
C denotes the area excavated in 1949-50

The bones from the Parry excavations consist of teeth and jaw fragments, a few pieces of vertebra and pelvis, complete epiphyses of long bones and numerous phalanges. There are also complete bones, such as tarsals and accessory metapodials, but no bone flakes or small articular fragments in the collection. As fragments of this type are unlikely to have been totally lacking in the deposits excavated, we deduced that undiagnostic fragments must have been discarded. This deduction was subsequently confirmed by the discovery of a copy of a letter to Parry which was found among the papers of Miss D. M. A. Bate who originally examined the bones. She wrote: 'I have made a small selection of specimens for you ... I shall be glad to know if they are suitable for your purposes & if so I would then keep a few of the better specimens for our collection as you kindly suggest & I suppose the remaining fragments need not be kept'. However, the 1949-52 sample is very different. It consists of many small long bone flakes, rib fragments, etc., with very few fragments of articular ends.

BODY PART REPRESENTATION

It is clear that the samples from the two areas of the cave display considerable differences, only partly explicable in terms of differential retention of the bones from the two excavations. The skeletal elements of horse and red deer bones from the Parry excavations inside the cave mouth are plotted in FIG. 2, which shows that the animals are represented almost entirely by heads and limb extremities. The bones are heavily marked by cuts (see below) and so definitely derive from human activity.

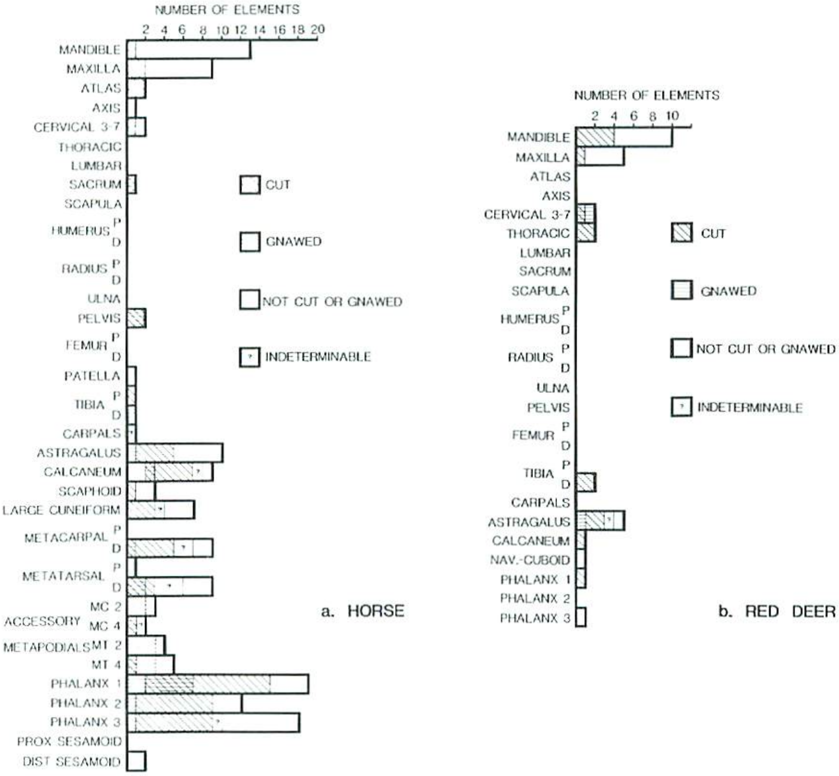


FIG. 2 — BODY PART REPRESENTATION OF (a) HORSE AND (b) RED DEER BONES FROM PARRY'S EXCAVATIONS (1927 TO 1931) IN THE FRONT OF THE CAVE (BM(NH) BONES ONLY). NUMBERS OF MANDIBLES AND MAXILLAE ARE BASED ON JAWS AND LOOSE TEETH. THE HISTOGRAMS PRESENT THE UNADJUSTED TOTALS: TO PRODUCE TOTALS CORRECTED FOR SKELETAL ELEMENT, NUMBERS OF HORSE PHALANGES SHOULD BE HALVED AND RED DEER PHALANGES QUARTERED. CUT AND GNAWED BONES ARE ALSO SHOWN. TRACES OF CUTTING OR GNAWING WERE NOT DETERMINED ON BONES SENT FOR DATING NOR ON BONES EMBEDDED IN MATRIX.

Evidence of carnivore gnawing was also visible, and the proportion of bones with tooth marks is shown. The bones which were used for carbon 14 dating have not been examined. Of the 121 horse bones, excluding mandibles and maxillae, evidence of gnawing was found on 29, 24% of the total assemblage. Of the 22 red deer bones (not including mandibles and maxillae), three (14%) were gnawed. The effect of gnawing was usually little more than scoring the bones with tooth marks, but destroying little of them (PLATE 1). There are one or two exceptions, including a horse calcaneum (M.50029) with the epiphysis gnawed off across the fusion line (PLATE 2) and a horse distal tibia (M.49770) where the shaft has been gnawed (PLATE 3).

Bone fragments of horse and red deer size from the cave management excavations at the back of the cave are listed in TABLE I. A few bones of man and bear were also found (Stringer, 1986), so a small proportion of the bone listed may belong to these species rather than to horse or red deer. Most fragments are small and undiagnostic, but a few could be identified; these are listed at the foot of the table. There are no complete bones, and virtually no limb bone articulations. Of the 336 fragments studied, 69 are still embedded in hardened matrix and could not be closely examined. Of the remaining 267, 38 were certainly gnawed by carnivores, and 11 more were possibly gnawed, a total of 18%. The further back in the caves the excavators worked the less evidence there was for human activity there. In a letter to Bate of 16 December 1928, Parry wrote 'Our finds are getting much scarcer as we go deeper into the cave'. The innermost area of the cave reached by Parry in his excavations was the bank of deposit on the left of the path beyond the Cheddar Man Fissure, which he excavated in 1928. His report makes it clear that the excavation was not 'producing any sign of occupation' (Parry, 1931, p. 47) even in this area of the cave.

These bones were thus not associated with much other evidence of human activity. Nevertheless, many of them have cut marks and so they too derive at least in part from human activity.

There is little likelihood that differences between the two assemblages were created purely by differential recovery and retention. If the excavators had discarded the bone flakes recovered in the 1949-52 excavations at the rear of the cave, the result would not have been an assemblage like that from the front. There were no complete bones, and virtually no complete limb bone articulations from the back of the cave. The shaft fragments which could be identified (TABLE I) are largely from the upper limb bones, those parts of the skeleton absent from the front of the cave. The two assemblages are essentially complementary, with the bones at the back of the cave being the elements missing from the front area, but in a much more highly comminuted state than those from the front.

In attempting to understand the differences between the two assemblages, it is significant that the inner sample comes from 25 m or more inside the cave, round a corner from the entrance (FIG. 1). This area was not in the daylight zone, and little regular human activity is likely to have taken place so far inside the cave. Few archaeological traces were found here (see above). We must therefore consider the possibility that some agency other than man was responsible for taking the bones to the back parts of the cave. The evidence of gnawing shows that carnivores also played a part in the taphonomy of the bones and the highly comminuted state of the material at the back of the cave is characteristic of a carnivore assemblage. If it is the case that the human users of the cave

TABLE I – *Bone fragments from the Cave Management excavations in the rear of the cave, 1949-52.*

	limb	*rib*	*vertebra*	*skull*	*total*
cut only	20	7	—	1	28
(?)cut	1	1	—	—	2
cut and (?)gnawed	—	2	—	—	2
gnawed only	11	21	2	1	35
(?)gnawed	3	6	—	—	9
neither cut nor gnawed	99	87	8	1	195
embedded in matrix	30	33	3	3	69
total	164	157	13	6	340

The above contains the following identified fragments of horse and red deer:

In British Museum (Natural History):

spit 11	horse ilium
spit 12	red deer first phalanx
spit 12	horse ulna
spit 13	red deer symphysis
spit 14	horse lower molar
spit 16	horse distal humerus (cut)
spit 16	horse femur shaft
spit 16	horse humerus shaft
spit 17	red deer proximal radius

In Cheddar Caves Museum

302	spit 12	horse acetabulum
204 + 1.2/68	spit 13 and 14	two pieces of red deer jaw (PLATE 19)
200	spit 13	horse radius shaft (cut)
201	spit 13	horse proximal femur fragment
205	spit 13	red deer radius (burned)
202	spit 14	red deer distal humerus
300	spit 16	horse radius/ulna (cut)
203	spit 17	radius/ulna fragment. (?)horse (cut)
304	spit 14	horse scapula

had no domestic dogs, then the carnivores in question must have been the wild species using the cave, perhaps during seasonal absences of the humans. Bones of wolves and foxes are present (Currant, this vol.) and there are tooth marks on the bones compatible with both these species. The hypothesis favoured here is that carnivores transported the main meat- and marrow-bearing bones to the back of the cave from areas nearer the front where they were originally discarded by the human occupants, there to be gnawed at leisure. The jaws and teeth and also the extremities of the leg were left near the cave entrance. It will be argued below that the tendons were stripped from the lower legs of the horses and deer, and so there would be little on these bones to attract the carnivores.

A description of the bones in a carnivore den in the Amboseli National Park, Kenya, is pertinent here though it deals with hyenas rather than wolf or fox and also with animals killed or scavenged by the hyenas themselves:

> The bones appear to be distributed non-randomly around the den. Around the main entrance there are few bones of any kind. From there along the trench for about 7 m are many relatively large and recognisable pieces. At the far end of the den the majority are small fragments of limb bones, very few with articular ends or distinctive features. (Hill, 1983, p. 89).

From Hill's description it is clear that the material at the back of the Amboseli den is very similar to that at the back of Gough's Cave.

One final point must be discussed regarding body part representation of the horses at the front of the cave: there is a singular lack of proximal ends of metapodials. There are no proximal metacarpals, while the two proximal metatarsals are both parts of complete bones, the only complete long bones present. This is striking in view of the numerous distal ends of the bones, of the many tarsals (which articulate with the proximal end of the metatarsal), and of numerous accessory metacarpals and metatarsals (which lie alongside the proximal end of the metapodials).

There is no obvious reason why the carnivores should have taken these articulations to the back of the cave. After the bones had been disarticulated and the tendons removed (see below), the metapodial proximal ends would hardly be more attractive than the tarsals of the distal ends. Possibly they were made into tools, as such bones often were in later periods, although no such evidence is available for the Upper Palaeolithic in Britain. Another possible explanation arises from Bate's statement that fragments were discarded. Binford (1984 and pers. comm.) has described a method of marrow removal involving heating the proximal end of the complete metapodial, smashing it with a stone, and peeling off the shaft fragments. This method produces fragmentary proximal ends, flakes of the shaft and complete distal ends. If the proximal ends were fragments, they would presumably have been thrown away by Bate after her earlier study. The horse and red deer metapodials show evidence of deliberate breakage (cf. Plate 14); the form in which the bone shafts were broken is best explained as marrow extraction.

UNANSWERED QUESTIONS

The nature of the excavations and the history of the bone samples mean that some questions cannot be answered. It is not possible to investigate activity areas at the front of the cave, nor the question of whether different parts of the carcase were brought to the site from elsewhere or removed from the site.

Activity areas

No spatial information is available except the division between the two areas of excavation. The concentration of bones showing tendon removal at the front of the cave does not necessarily indicate a special purpose area here. As the range of bones which was discarded is unknown, and, as it has been argued, some bone elements were selectively transported to the rear of the cave by carnivores, we have no way of knowing whether the bone debris from tendon removal was spatially distinct from other types of bones there before carnivore transport and post-excavation discard took place.

Introduction of elements to the site

The bones from only the front part of the cave might have led to the suggestion that virtually only sinew yielding bones had been brought to the site. Against this is the fact that many teeth and some vertebral and pelvic fragments were also found at the front of the cave, indicating the presence of at least some other body parts. In addition the evidence of gnawing on the lower limb bones would have suggested carnivore attrition, even had the rear of the cave not been excavated. The sample from the rear of the cave shows that many more elements must originally have been present at the front.

Removal of elements from the site

Once again, analysis of the bones from the front part of the cave might had led to the belief that the missing elements (the meat-bearing parts of the carcase) could have been removed from the site by man for consumption elsewhere; the samples from the rear of the cave show that at least some of the meat-bearing elements remained in the cave. Whether differential discard and/or the sample from the rear of the cave could account for all the meat-bearing elements missing from the front of the cave is unknown.

SEASONAL USE OF THE SITE

Some indications of seasonality can be obtained from the dentition of the red deer. There are five fragments from four different animals killed before dental maturity which give an indication of season of death. The provenance of all but one of the fragments is uncertain but, such as they are, they give a consistent picture.

The only fragment which is well-provenanced is a left maxilla from the cave management excavations of 1959 (M23.2/1) which has the three deciduous teeth *in situ*, as well as a permanent first molar. The permanent molar has light wear on the anterior cusp, and just a touch of wear on the anterior lingual section of the rear cusp. The maxilla is broken just behind M1. From the surviving bone, however, it appears that M2 is quite well formed, and would probably have been visible in the crypt, but not erupted so far that the tooth points would have been level with the jaw. A second left maxilla in the Cheddar Caves Museum with no excavation history, except that it is marked in a similar fashion to the provenanced specimens with a layer number (14), is identical to the previous specimen except that light wear has just touched the anterior parts of the rear cusp of M1. M2 is also missing, but would appear to have been in a similar stage of development to the UBSS specimen.

The other three specimens are mandibles. A left and a right hand jaw in the Cheddar Caves Museum (1.2/25) and 1.2/26), identified originally as reindeer (Balch, 1935, plate 10, 2), are so similar that they are probably a pair. One has been noted as coming from above the Cheddar Man, so it is not necessarily Palaeolithic (Oakley *et al.*, 1971). Another jaw in the Cheddar Caves Museum (1.2/69) is also only provenanced from the pencilled layer number 13 on the bone. These three mandibles have M1 in early wear, with M2 visible in crypt with the tooth points well below the level of the jaw. All five specimens are thus closely similar, with deciduous dentition in wear, M1 in early wear, and M2 definitely or probably unerupted. They must all have been killed in a relatively restricted part of the year.

A large collection of modern red deer mandibles has been collected in connection with another study (Legge and Rowley-Conwy, in press). The kill dates of most of these are known, and show that there is little variation between populations in age or eruption of particular teeth. The modern specimens are from populations in which births take place in late May or early June. The climate at the time of occupation of Gough's Cave was of course considerably different from that of today, but in the more extreme late glacial climate it is likely that there would have been even greater pressure on the deer to give birth at the time of year optimal for availability of grazing for the lactating females.

In the modern populations, animals with similar dental development to the Gough's Cave specimens are those killed in their first winter, between November and February. This is the period when M1 is in early wear, and M2 has not yet reached the level of the jaw. Of the specimens in the comparative collection which died in March three out of four had M2 erupted level with the jaw. The Gough's Cave specimens therefore most probably came from animals killed in the period from November to February.

The evidence from deer, therefore, suggests that occupation took place in the winter. The sample is small, and material may have been discarded which might tell another story. We cannot therefore rule out the possibility that the cave might also have been occupied in other seasons. In the relatively extreme climate of the late glacial, however, year-round occupation would be unlikely in most areas. Among recent high-latitude hunter-gatherers winter camps are frequently characterized by activities such as tool manufacture and curation, and primarily winter occupation would fit with the evidence discussed below that procurement of sinew was a major activity at Gough's Cave.

ANALYSIS OF THE CUT MARKS

The animal bones from Gough's Cave exhibit what is arguably the finest series of cut marks from the British Upper Palaeolithic. The major conclusion from the study of these cut marks is that many of them result from the deliberate removal of tendons from the lower legs of horses and perhaps red deer. This conclusion was reached by Parkin (1984) in her original study of the bones, and is followed here.

Where the bones are free of adhering matrix the surfaces are well preserved, and cut marks are clearly visible with the naked eye. Examination under x10 magnification was only occasionally necessary to confirm whether or not a cut was man-made, and markings on the bones which could have resulted from geological modification, rodents or carnivores were rejected.

Marks resulting from skinning, dismemberment, filleting and tendon removal were identified. Many dismemberment and filleting cuts correspond closely to Binford's (1981) descriptions of cut marks made by the Nunamiut Eskimo when butchering caribou and Dall sheep, and the cut marks seen on the Gough's Cave bones have been related to his designations of the various types of cuts, as set out in his table 4.04 (*op. cit.* p. 136). Martin (1907-10, pp. 217-292) illustrates several of the bones with cut marks from the Mousterian excavation at La Quina, and many are directly comparable with the cuts seen on the bones from Gough's Cave.

(*a*) *Cut Marks Made by Skinning and Dismemberment*

Two red deer mandibles have cuts on the external surface. Those on the BM(NH) specimen (M.49733) are repeated long cuts below the molar teeth diagonal to the bone. Similar cuts are illustrated by Martin (*op. cit.,* plate XLIII, 6 and 7) on reindeer mandibles. Another (M.49821) has many repeated short cuts below the diastema and the second premolar (PLATE 4). These cuts are made when skinning out the head. A red deer maxilla in two pieces (M.49980 and M.49981) has similar cuts above the premolars and molars, but the traces on two horse premaxillae (M.49777 and M.49849) are repeated shorter cuts. Martin describes skinning cuts in this location on bovid skulls (*op. cit.*, p. 223).

A horse ulna found in the 1959 excavations (M23.2/10) has short parallel transverse cuts across the cranial edge of the olecranon. Marks in this region are illustrated by Martin (*op. cit.,* plate XLIX:7) on a horse ulna from the Mousterian site of La Quina. Cuts here on the caribou ulna are made when dismembering the joint when stiff (Binford, 1981, p. 124). The external and internal faces of the olecranon also have a series of cuts resulting from dismembering the joint. A fragment of distal humerus from the same excavation (M23.2/11) has cuts on the ventral edge of the trochlea, Binford's Hd-4, attributable to dismemberment. Both of the horse pelves have short cut marks on the ilium near the acetabulum (PS-7) which result from dismembering the femur from the pelvis.

A complete red deer left ankle joint, consisting of a distal tibia, astragalus and calcaneum (M.50017, M.49914 and M.49920), has been reassembled by A. P. Currant (PLATES 5 to 9) and shows clearly how this joint was disarticulated. On the anterior face of the tibia are some short cuts (Td-4). Below this are transverse cuts at the edge of the articulation (Td-3). On both sides of the anterior face, these carry over on to the astragalus (TA-1) (PLATE 5). Round on the external side of the joint there are cuts on the lateral side of the calcaneum (PLATE 6). On the rear of the joint are transverse cuts across both the proximal crests of the astragalus (PLATE 7). On the medial side, there are cuts (type Td-3) which carry over on to the astragalus to form TA-2; there is also a cut along the edge of the sustentaculum of the calcaneum (PLATES 8 and 9). These cuts must have been inflicted when the joint was fully flexed, with the tibia and calcaneum nearly at right angles to one another. The cuts on the anterior and medial faces of the tibia and astragalus only line up when the joint is in this position (PLATES 5 and 8), and the cuts on the rear crests of the astragalus (PLATE 7) could not have been made unless the joint was flexed to uncover this part of the bone. The joint was evidently dismembered between the distal tibia and the astragalus.

The horse proximal tibia (M.49856) has a cut mark on the intercondylar tubercule (Tp-1). Of the two horse distal tibias, the BM(NH) specimen is uncut, while the UBSS tibia (M.23.2/11) (PLATE 10) has many small nicks on the anterior and lateral faces (Td-1 and Td-3). Such cuts are made when the tibia is disarticulated from the rest of the tarsal joint.

Five of the 10 equid astragali have cut marks (M.49743, M.49843, M.49930, M.49936 and M.50035). Three have cuts at the site of the insertion of the internal lateral ligament (PLATE 11), and one has similar cuts on the external face. Martin (*op. cit.,* plate LVII, 5) illustrates a horse bone similarly cut from La Quina. Three have cuts on the trochlea. The second red deer astragalus (M.49837) has cuts on the anterior face (TA-1).

Of the eight horse calcanea, one was destroyed for ^{14}C dating and one was embedded in hardened matrix. Four of the remaining six have cut marks (M.49842, M.49924, M.49949, M.50029). Three displayed cuts between the tuber calcis and the articulating facet (TC-3) and two of these have similar cuts along the underside of the bone as well. The fourth specimen has small cuts on the sustentaculum just below the lip of the articulation with the astragalus. One of the two horse naviculars (M.49931) and three of the seven lateral cuneiforms (M.50070, M.49819, M.49946) have cuts on the anterior face (PLATE 12), the equid equivalent of TNC-1 and TE-1. These cuts too are attributable to dismemberment. Two equid lateral metapodials have cut marks on the external surface at the proximal end (PLATE 13).

Finally, some of the horse and red deer metapodials have cuts around the distal condyles (McD-2). They are present on one of the red deer metacarpals (M.50018), on two of the horse metacarpals (M.49953 and M.50024) (PLATE 14), and on one horse metatarsal (M.50043). Four of the five red deer distal metatarsals (M.49831, M.49847, M.49948, and M.50026) have transverse marks on the posterior face of the condyles (MtD-1). Cuts in this location are inflicted by dismemberment. Other marks on the shafts of red deer and horse metapodials will be discussed below.

It is not only on the bones of the larger mammals that cut marks can be seen. Cuts have been described on the bird bones (Harrison, this vol.) and two hare bones have traces of disarticulation. A series of cuts can be seen on the shaft of a distal femur (Plate 15) and there is a nick less than 2 mm long across the lateral crest of the trochlea of a distal humerus (Plate 16).

(*b*) *Cut Marks Made by Filleting*

Several of the horse and red deer mandibles have cut marks on the medial surface of the bone. One of the red deer jaws (M.49733) has a long diagonal cut mark on the medial surface below the molar tooth row (type M-3). Two horse mandibles (M.49848 and 1.2/14 from the Cheddar Caves Museum) have cuts inside the mandibular symphysis at the point where the tongue muscle attaches to the symphysis. One of these also has a series of diagonal cuts on the medial side of the bone immediately below the second premolar and the posterior part of the diastema (Plate 17). The other also has cuts on the symphysis (Plate 18). These cut marks were made in severing the muscles of the tongue to remove it. A red deer jaw in two pieces in Cheddar Caves Museum (204 and 1.2/68) has extensive cuts on the inside of the ascending ramus where the pterygoid muscle attaches (Plate 19); a reindeer jaw from La Quina has a similar series of cuts (Martin, plate XLVIII, 6).

On the dorsal spines of two horse cervical vertebrae (M.50068 and 1.5/67) are several diagonal cuts, and on two thoracic vertebrae of red deer (M.49731 and M.49771) short cut marks across the spine correspond with similar cuts illustrated on Dall sheep and caribou vertebrae (Binford, 1981, fig. 4.21), though they are located rather higher on the spine than those illustrated. A horse thoracic vertebra (1.2/85) has cuts on the lateral side of the vertebral body. Two horse sacra (M.50032 and 1.2/84) have cut marks, one on the dorsal spine and one on the vertebral body, and a red deer sacrum (M.23.2/8) has multiple cut marks on the lateral border of the spine. These are all attributable to filleting the muscle. Three horse pelvis fragments (M.50027/31, M.50028, and M.23.2/15) have a series of long cuts similar to those described by Binford (1981, fig. 4.36) as resulting from filleting. One long bone fragment, part of a radius shaft in Cheddar Caves Museum, has long cuts on the posterior surface of the bone, resulting from filleting the muscle.

(*c*) *Other Cut Marks: the Case for Tendon Removal*

The foregoing descriptions of cut marks have emphasized the degree to which they fit within the patterns put forward by Binford on the basis of his studies with the Nunamiut Eskimo and Martin's study of the cut marks on the bones from La Quina. Despite the differences in species and the great difference in time, space and cultural context, the cut marks so far described from Gough's Cave can all be attributed to specific activities with a fair degree of certainty.

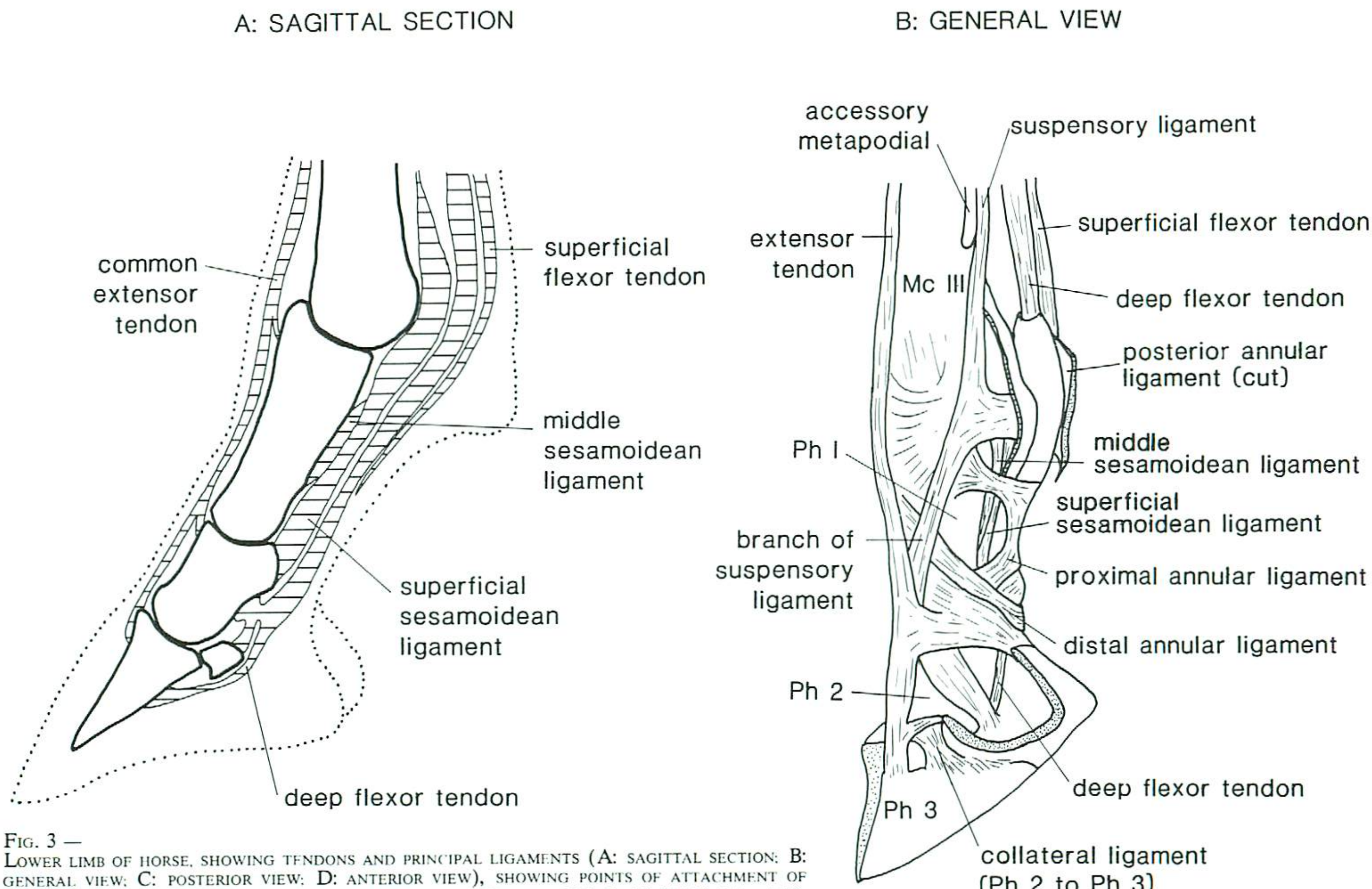
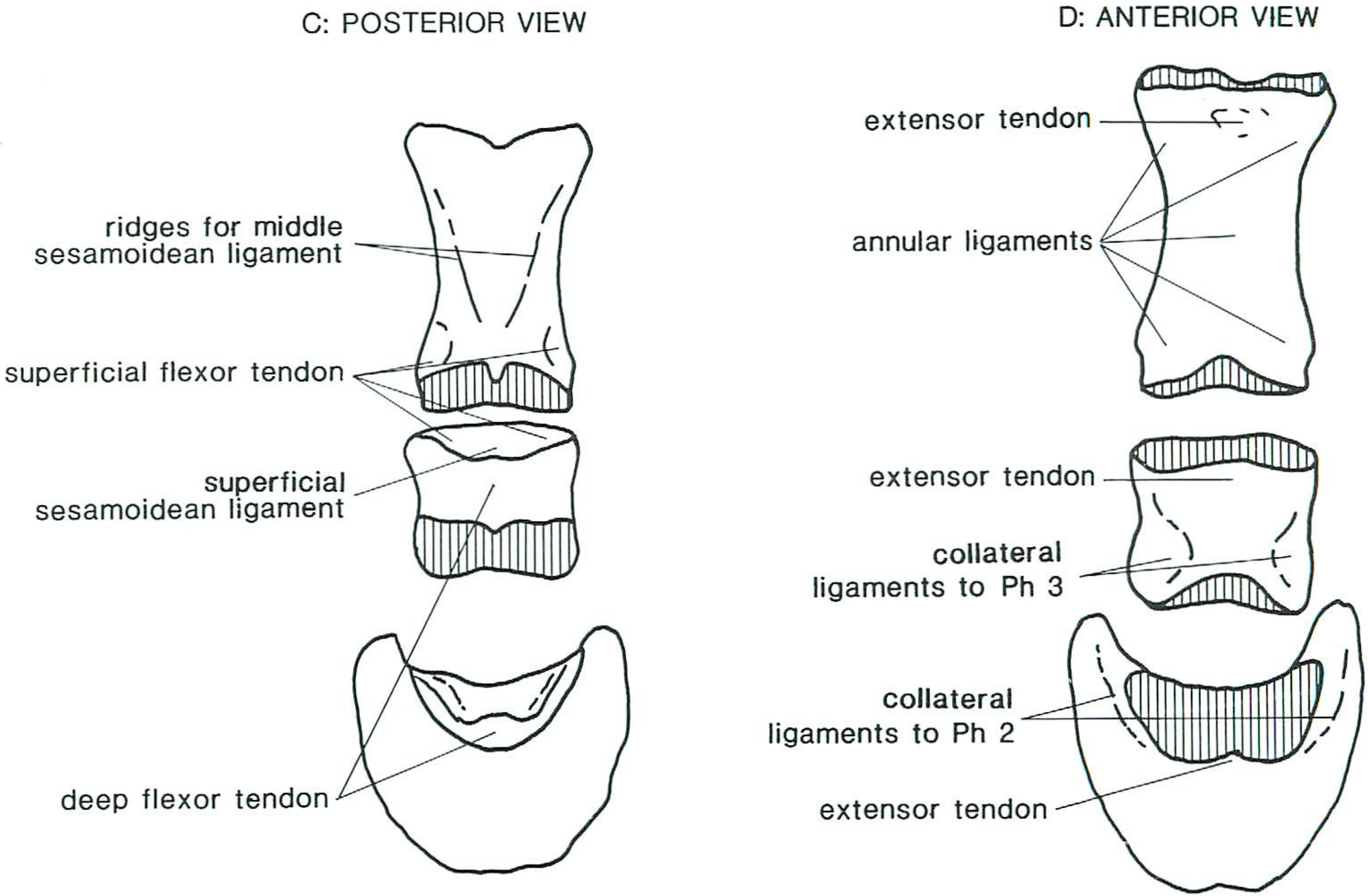


Fig. 3 —
Lower limb of horse, showing tendons and principal ligaments (A: sagittal section; B: general view; C: posterior view; D: anterior view), showing points of attachment of tendons and ligaments. Modified from Sisson and Grossman, 1953, figs. 79, 80, 240, 242 and 286.


C: POSTERIOR VIEW
ridges for middle sesamoidean ligament
superficial flexor tendon
superficial sesamoidean ligament
deep flexor tendon
D: ANTERIOR VIEW
extensor tendon
annular ligaments
extensor tendon
collateral ligaments to Ph 3
collateral ligaments to Ph 2
extensor tendon

It is all the more striking, therefore, that the most consistent and frequent cut marks occur on bones hardly discussed by Binford, namely the phalanges. Among the Nunamiut some encircling cuts from skinning may appear on phalanges, but that these are 'relatively rare' (Binford, 1981, p. 103). Some cuts encircling the phalanges are illustrated among the La Quina bones (Martin, *op. cit.,* p. 227-8). The cuts on the Gough's Cave horse and red deer do not encircle the phalanges, however, nor are they rare. Thirteen of the 19 first phalanges in the BM(NH) and two specimens in other museums have cut marks. Eight second phalanges out of 12 in the BM(NH) are cut and there are two in other museums. Cut marks could be seen on eight of the third phalanges out of a total of 18 in the BM(NH), but of those six are too damaged or embedded in matrix for any cuts to be visible. There are three terminal phalanges with cuts in other museums (see Appendix).

On the first and second phalanges the cuts are numerous, and are frequently arranged in rows of short, parallel marks along the shaft of the bone. A characteristic example can be seen in Plate 20, where the cuts on the medial border of an equid first phalanx are shown.

These cut marks can most logically be explained as tendon removal. There are several tendons in the lower leg of the horse (Figs. 3A and B) that could be used by men; the account of them here is based on Sisson and Grossman (1953). On the forward aspect of the lower limb are the extensor tendons. The common extensor tendon (on the hind leg the long digital extensor) originates from the digital extensor muscle around the distal third of the radius (on the hind leg the tibia). It runs down to insert on to the eminence on the proximal anterior point of the third phalanx; there are also insertion points on the dorsal surfaces of the proximal ends of the first and second phalanges. The fibrous ends of the tendon also adhere to the coronary corium, the soft tissue which covers the terminal phalanx, so the corium too needs to be cut to free the tendon. The lateral extensor tendon originates from the lateral digital extensor muscle, and runs down to the same point on the third phalanx.

Running down the back of the lower limb is the suspensory ligament, a highly modified muscle, which originates from the proximal ends of the metapodials. Though technically a ligament, as it originates from a bone rather than from a muscle, it otherwise shares the same qualities of strength and elasticity as the tendons. The suspensory ligament divides towards the bottom of the metapodial, part joining on to the proximal sesamoids, and part running round to join the extensor tendons at the front. Outside the suspensory ligament run the flexor tendons. The deep flexor tendon runs down to the third phalanx where it inserts in the flexor surface and the corium of the sole, the soft tissue which covers the sole of the terminal phalanx. The superficial flexor tendon inserts into the posterior face of the distal ends of the first phalanx and into the proximal and of the second phalanx.

Many of the cut marks on the phalanges fall on the points of tendon insertion (Figs. 3C and 3D). Three of the first phalanges have cuts where the extensor tendon inserts, and five where the superficial flexor tendon inserts. Of the second phalanges, two have cuts where the extensor tendon inserts (PLATES 21 and 22) and eight where the superficial flexor tendon inserts. An example of a phalanx with cuts at the point of insertion of the deep flexor tendon is shown in PLATE 23. Four of the third phalanges have cuts on the flexor surface where the flexor tendon inserts. (PLATES 24 and 25) and eight have cut marks on the sole where the bone is covered by the corium of the sole (PLATE 26). Similar cut marks were noted on 21 out of 103 equine third phalanges from La Madeleine (Garrod, 1925). Two terminal phalanges have cuts at the proximal end at the point where the extensor tendon inserts, and five have faint cuts on the dorsal surface where the bone is covered with the coronary corium (PLATE 27 and FIG. 4).

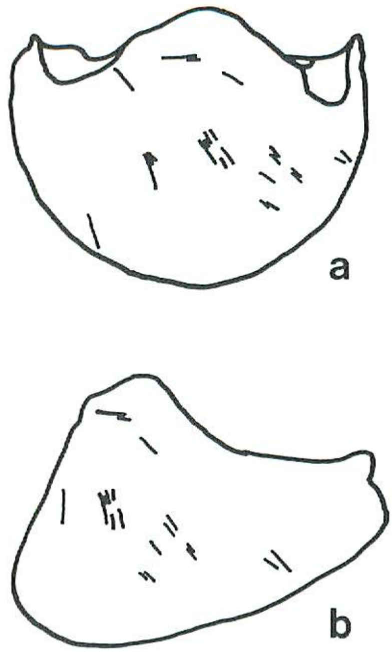


FIG. 4 — CUT MARKS ON THE DORSAL SURFACE OF A HORSE TERMINAL PHALANX, CHEDDAR CAVES MUSEUM 1.2/5: (a) FROM ABOVE; (b) FROM THE SIDE (SEE ALSO PLATE 27)

Other cuts on the first and second phalanges cannot be directly linked to removal of the tendons, as they are distributed over a greater area of the bone than the immediate area of the tendon insertions. The bones of the lower limb are connected by short ligaments, very much shorter than the suspensory ligament described above. In themselves these ligaments would probably have been of little use to the human inhabitants of Gough's Cave. However, the cuts over the surfaces of the first and second phalanges indicate that these too were being cut free from the bones. This is probably because no fewer than eight separate distal sesamoidean ligaments join the first and second phalanges to the proximal sesamoid bones. As the suspensory ligament also attaches to the proximal sesamoids and these bones are contained within the sesamoidean ligaments, they must be freed if the suspensory ligament is to be removed.

Apart from the sesamoidean ligaments, three annular ligaments encircle or join on to the flexor tendons and hold them close to the rear of the phalanges. The proximal and distal annular ligaments insert on to the first phalanx about its middle, while the volar/plantar annular ligament runs transversely from one sesamoid bone to the other (FIGS. 3C and D). It is necessary to cut these free to remove the flexor tendons. Four first phalanges have cut marks on the ridges for the attachment of the middle distal sesamoid ligament (PLATES 1, 29 and 30) where the annular ligaments attach. Seven of the second phalanges have cuts on the dorsal surface (PLATES 21 and 22) and eight on the posterior surface where the collateral ligaments insert.

The first and second phalanges thus testify to the removal of the entire tendon and ligament group from the lower limb. Interestingly there are no signs of cut marks on the third phalanges in the area either side of the insertion point for the extensor tendon; these are the points of attachment for the short collateral ligaments which connect the second and third phalanx. They do not connect to the proximal sesamoids, so it was not necessary to sever these ligaments in order to obtain the suspensory ligament. The inhabitants of Gough's Cave were evidently not severing the phalanges unless it was necessary to free a useful tendon or ligament.

Cuts on the distal metapodials support this argument. Two of the seven horse metacarpals examined and two of the six metatarsals have cut marks defined by Binford (1981, table 4.04) as 'short chevron marks on lateral and medial crests of the anterior face' (MCd-4 and MTd-4). These may result from severing the short ligaments which unite the metapodials with the proximal sesamoids, also (as with the attachments to the phalanges) in order to free the sesamoids and the suspensory ligament. Binford ascribes these marks to filleting (*op. cit.,* table 4.04), but does not discuss them further. In a sense filleting is a correct description, as tissue is being removed from the bone, but it was ligaments and tendons, rather than muscle, that was being removed.

What little evidence is available for the red deer suggests a similar picture. One of the two first phalanges has many cuts on the medial, lateral and dorsal sides, including some on the insertion point of the extensor tendon; the single second phalanx is similar. One of the five distal metatarsals and one of the two metacarpals have chevrons on the distal part of the shaft similar to those described for the horse metapodia. They are repeated short parallel cuts at a single point on the bone, and are distinct from those cuts which are produced by skinning, which are longer cuts around the shaft. The single bovine phalanx in the assemblage has cut marks on the medial surface of the bone and the distal articulation at points corresponding to detachment of ligaments (PLATES 31 and 32).

Among the other Upper Palaeolithic faunas which have been described, none, with the exception of the horse third phalanges from La Madeleine described by Garrod, have evidence of cuts on the phalanges similar to those present on the Gough's Cave bones. Cuts on the phalanges illustrated by Martin (*op. cit.,* pp. 227-8) are of a different type. The faunal remains from the Magdalenian levels at Petersfels were mostly of reindeer and horse (Albrecht *et al.,* 1983). No cuts were recorded on the horse phalanges, and only three out of the 77 first and second phalanges of reindeer have cut marks.

UTILIZATION OF SINEW

It has generally been accepted that sinew (tendons and the longer ligaments), together with gut and rawhide, was an important source of thread and rope for prehistoric man. In the open grassland conditions prevailing at Gough's Cave at this time there would have been few plants suitable for the manufacture of fibre.

Many uses of sinew are documented ethnographically. In his pioneering work, Clark (1952) wrote that the line to which the antler harpoons of late Magdalenian times were attached was 'presumably of reindeer sinew' (p. 28), and that snares and nooses for trapping small game and birds 'could well have been made of reindeer sinew' (p. 31). This usage was hypothesized by analogy with Eskimo practice as described by Birket-Smith (1929). Other technologies for which the Eskimo formerly used sinew are cited by Nelson (1969). When braided, it was used as the string on a bolas used to bring down ducks in flight (p. 158); the nets used for trapping low-flying ducks were also made of sinew (p. 160). The numerous bones of hare in the deposits (Currant, this vol.) are likely to be from animals obtained by trapping, either with snares or nets. Whichever of the two technologies was used, sinew would probably have been employed. The cuts on the sole and the dorsal surface of the horse terminal phalanges (PLATES 26, 27 and FIG. 4) are sufficiently extensive as to suggest that the hoof was being detached from the hoofcore, perhaps for the extraction of glue.

Sinew was also valuable for sewing boots, especially the *ugurulik,* the waterproof boot made with a sealskin sole and a caribou upper. Among the Nunamiut, Binford (1981, pp. 103-4) notes that the feet of caribou were skinned complete for use as *mukluk* boots which were sewn with sinew. The nomadic Tuvainian pastoralists made a distinction between the thinner tendons, which were used as thread for sewing coats and hats, and the thicker ones which were used for sewing footwear (Vainshtein, 1980, p. 212). In this connection, it is relevant that the humerus of a Whooper Swan from Gough's Cave has been worked for the production of bone needles (Harrison, this volume).

One of the major uses of sinew was in composite bows. Birket-Smith (1959, p. 87) describes their use by the Eskimo: 'Simple driftwood or antler bows lack power. Driftwood is not elastic enough; antler is no doubt much better, but can be much improved. The whole of the back of the bow is therefore covered with tightly stretched, plaited sinew cord, sometimes in the east, with only one layer, most frequently with two layers, the uppermost covering only the middle of the bow.' Kluckhohn *et al.* (1971, pp. 23-29) describe the manufacture of composite bows by the Navaho. Of particular relevance to Gough's Cave is the statement that the sinew came from 'the back or legs of a deer, and in later times horses'. Three or four layers of sinew would be attached, using glue made from horn and hoof. This was the most highly prized type of bow, and was made with the most care. Bowstrings were also made of sinew, from 'deer, cow or horse' (*ibid.*). The Altai Kalmuk of Central Asia, too, formerly made composite bows with sinew and horn (Forde, 1934, p.

350). If the possible fragment of a composite bow from Gough's Cave (Thomas, 1965, p. 40 and plate 12) really was from such a weapon, then sinew would probably have been employed.

In view of the range of uses for sinew, and the meagre hints in the material from Gough's Cave for more than one possible use, we have been able to do no more than suggest some of the possible reasons for the intensive exploitation of sinew indicated by the bone remains from Gough's Cave. It would be interesting to know whether other Palaeolithic assemblages would show similar evidence if re-examined.

ACKNOWLEDGEMENTS

We are very grateful to Roger Jacobi and Andrew Currant for their assistance. We also thank Tony Legge for references to the use of sinew, Tony Waldron for helpful comments on the anatomy of the leg and foot, and Kate Scott who helped Ruth Parkin with initial identification of the bones. We are especially grateful to John Downs, British Museum (Natural History), and Gwil Owen, University of Cambridge, for their superb photographs.

APPENDIX – HORSE PHALANGES WITH CUT MARKS

FIRST PHALANX	*SECOND PHALANX*
British Museum (Natural History)	*British Museum (Natural History)*
M.49737 M.48797 M.49835 M.49840 M.49912 M.49913 M.49922 M.49933 M.49945 M.49958 M.49969 M.49975 M.50030	M.49730 M.49774 M.49841 M.49855 M.49955 M.49956 M.49999 M.50034 M.50075 *Somerset County Museum, Taunton Castle* T1
Cheddar Caves Museum Spit 12 (no accession no.)	*Dr N. C. Cooper* (no reference no.)
Somerset County Museum, Taunton Castle T2	

TERMINAL PHALANX
British Museum (Natural History)
M. 49772 M.49773 M.49784 M.49846 M.49951 M.49954 M.49960 M.50067
Wells Museum
(no accession no.)
Cheddar Caves Museum
1.2/1 1.2/5

REFERENCES

ALBRECHT, G., BERKE, H. and POPLIN, F. 1983. Restes des mammifères du Petersfels 1 et Petersfels 3. pp. 63-127 in *Recherches Scientifiques sur les inventoires Magdaleniens du Petersfels, fouilles 1974-1976,* ed. G. ALBRECHT *et al.* (Tübinger Monographien zur Urgeschichte, **8**).

BALCH, H. E. 1935. *Mendip – Cheddar, its gorge and caves.* Wells, Clare.

BINFORD, L. R. 1981. *Bones: ancient men and modern myths.* New York: Academic Press.

BINFORD, L. R. 1984. *Faunal remains from Klasies River Mouth.* New York: Academic Press.

BIRKET-SMITH, K. 1929. *The Caribou Eskimos.* Vols. I & II. Copenhagen.

CLARK, J. G. D. 1952. *Prehistoric Europe: the economic basis.* London: Methuen.

FORDE, C. D. 1934. *Habitat, economy & society.* London: Methuen.

GARROD, D. A. E. 1925. Traits de silex sur phalanges de cheval paléolithiques. *Bull. Soc. Préhist. Fr.* **22**, 295-296.

HILL, A. 1983. 'Hyaenas and early hominids'. pp. 87-92 in *Animals and archaeology: 1. Hunters and their prey,* ed. J. CLUTTON-BROCK & C. GRIGSON. Oxford (British Archaeological Reports Int. Ser. **163**).

KLUKHOHN, C., HILL, W. W. and KLUKHOHN, L. W. 1971. *Navaho material culture.* Harvard: Belknap Press.

LEGGE, A. J. and ROWLEY-CONWY, P. A. in press. *Star Carr revisited. A re-analysis of the large mammals.*

MARTIN, H. 1907-10. Recherches sur l'évolution du Mousterien dans le Gisement de la Quina (Charente). Vol. 1, industrie osseuse. Paris: Schleicher Frères.

NELSON, R. K. 1969. *Hunters of the northern ice.* Chicago University Press.

OAKLEY, K. P., CAMPBELL, B. G., and MOLLESON, T. I. 1971. *Catalogue of fossil hominids. Vol. 2, Europe.* London, British Museum (Natural History).

PARKIN, R. A. 1984. A study of marks on bones caused by natural, animal and human agencies; with particular reference to material from Gough's Cave, Cheddar. Unpublished dissertation for B.A. Degree at University of Lancaster.

PARRY, R. F. 1931. Excavations at Cheddar. *Proc. Somerset. Archaeol. Nat. Hist. Soc.,* **76** for 1930, 46-62.

SISSON, S. and GROSSMAN, J. D. 1953. *The anatomy of the domestic animals.* 4th edn revised. Philadelphia, Saunders.

STRINGER, C. B. 1986. The hominid remains from Gough's Cave. *Proc. Univ. Bristol Spelaeol. Soc.*, **17** (2) for 1985, 145-152.

THOMAS, S. 1965. *Pre-Roman Britain.* Edinburgh, Clark.

VAINSHTEIN, S. 1980. *Nomads of south Siberia.* Cambridge University Press. (Cambridge Studies in Social Anthropology, **25**)

R. A. PARKIN, 218 Barrier Bank, Cowbit, Spalding,
Lincs. PE12 6AL, U.K.

Dr P. ROWLEY-CONWY, Department of Extra-mural Studies,
University of London, 26 Russell Square, London
WC1B 5DQ, U.K.

DALE SERJEANTSON, Department of Extra-mural Studies,
University of London, 26 Russell Square, London
WC1B 5DQ, U.K.

PLATE 1 – FIRST PHALANX OF HORSE (SOMERSET COUNTY MUSEUM, T2), ANTERIOR VIEW, SCORED BY CARNIVORE TEETH. CUT MARKS ARE ALSO PRESENT.

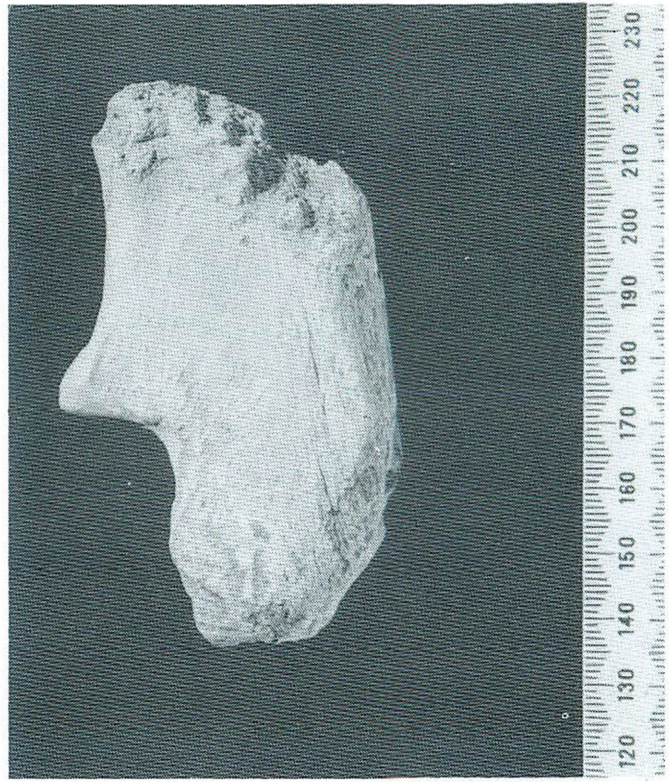


PLATE 2 – HORSE CALCANEUM, M.50029, GNAWED PROXIMALLY AND DISTALLY

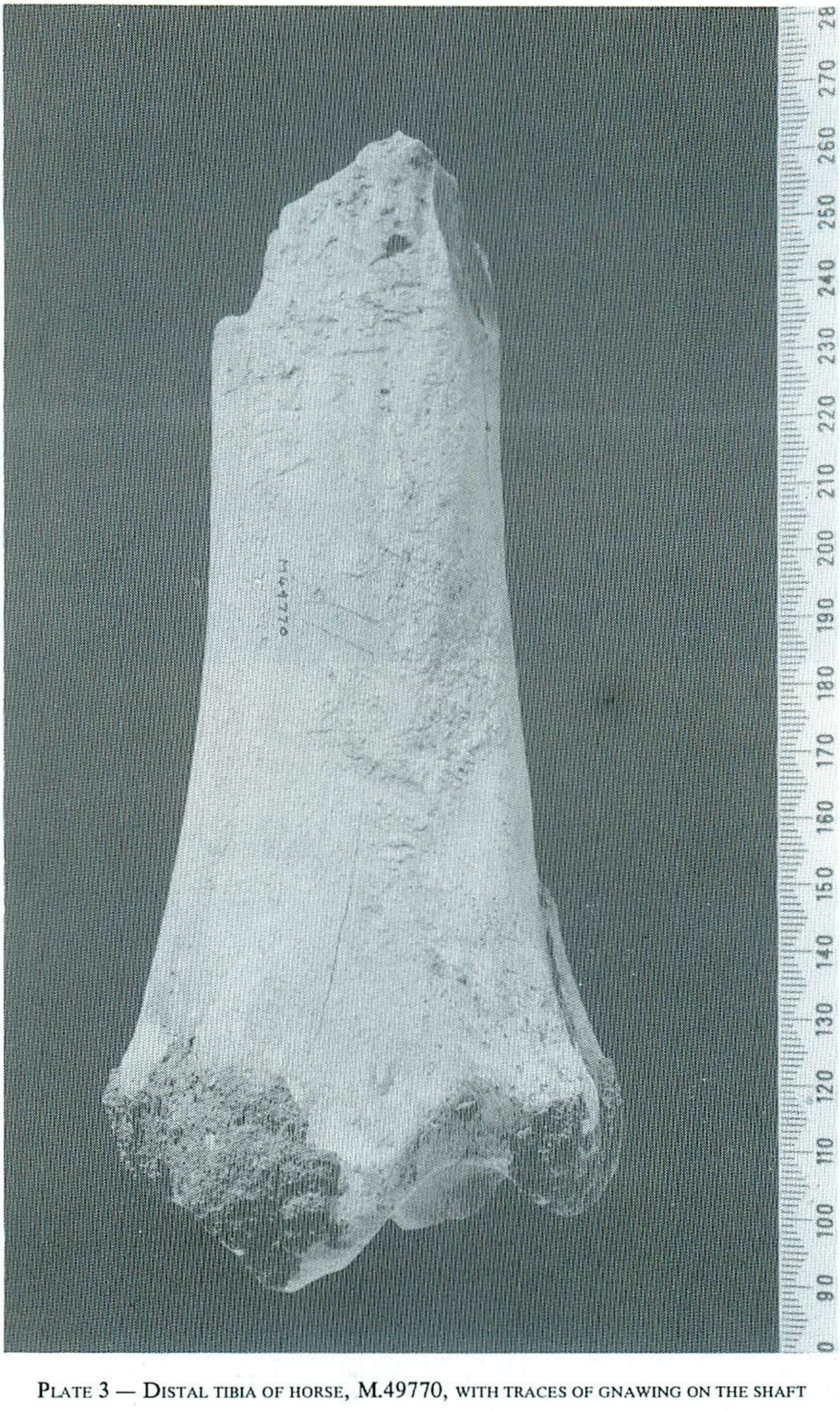


PLATE 3 — DISTAL TIBIA OF HORSE, M.49770, WITH TRACES OF GNAWING ON THE SHAFT

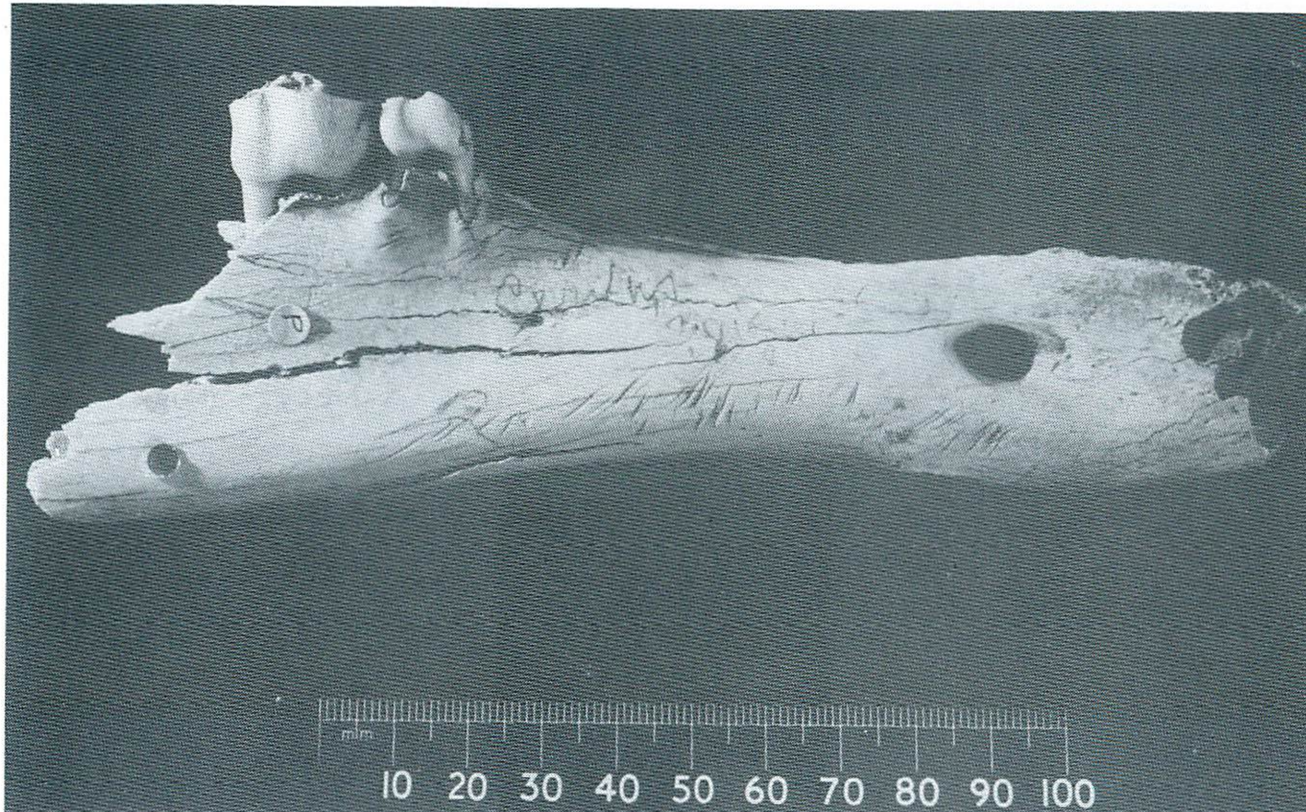


PLATE 4 — RIGHT JAW OF RED DEER, M.49821, EXTERNAL VIEW, SHOWING CUT MARKS ON THE EXTERNAL RAMUS AND BELOW P2, ATTRIBUTED TO SKINNING

Plate 5 — Ankle joint of red deer, M.50017, M.49914 and M.49920, anterior view, showing cuts on the distal tibia, astragalus and calcaneum

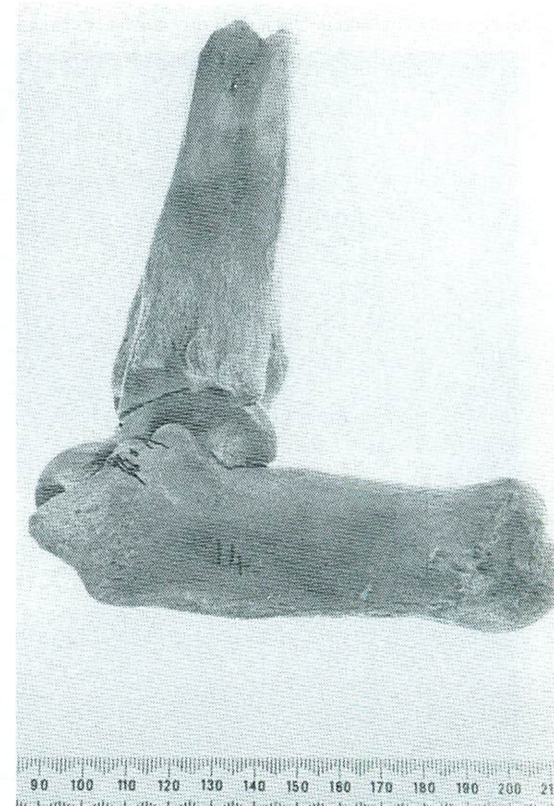


Plate 6 — Lateral view of red deer ankle joint, showing where cuts on the calcaneum and astragalus were made with the joint in the fully flexed position in which it is reassembled for the photograph

PLATE 7 — POSTERIOR VIEW OF SAME, SHOWING CUTS ON THE PROXIMAL CRESTS OF THE TROCHLEAS OF THE ASTRAGALUS WHICH MUST HAVE BEEN MADE WITH THE JOINT FULLY FLEXED IN THE POSITION SHOWN

PLATE 8 — MEDIAL VIEW OF SAME, SHOWING HOW CUTS ON THE MEDIAL FACE OF THE TIBIA AND ASTRAGALUS ARE ALIGNED, SO THEY MUST HAVE BEEN MADE WITH THE JOINT IN THE POSITION SHOWN

PLATE 9 — MEDIAL VIEW, ENLARGED, AS PLATE 8

PLATE 10 — DISTAL TIBIA OF HORSE, M.23.2/11, SHOWING CUTS ON THE ANTERIOR SURFACE

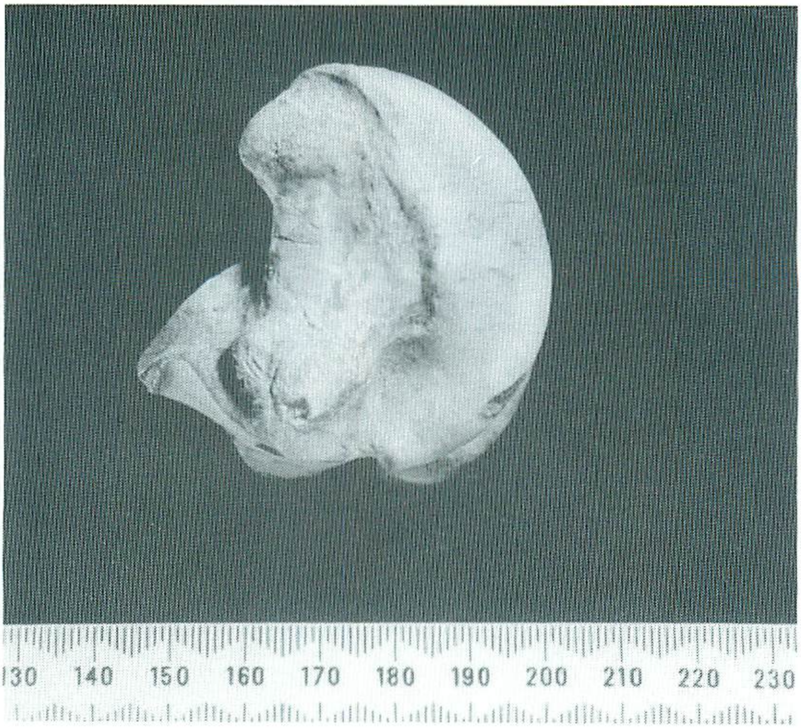


PLATE 11 — HORSE ASTRAGALUS, M.49843: VIEW OF MEDIAL SURFACE SHOWING CUT-MARKS

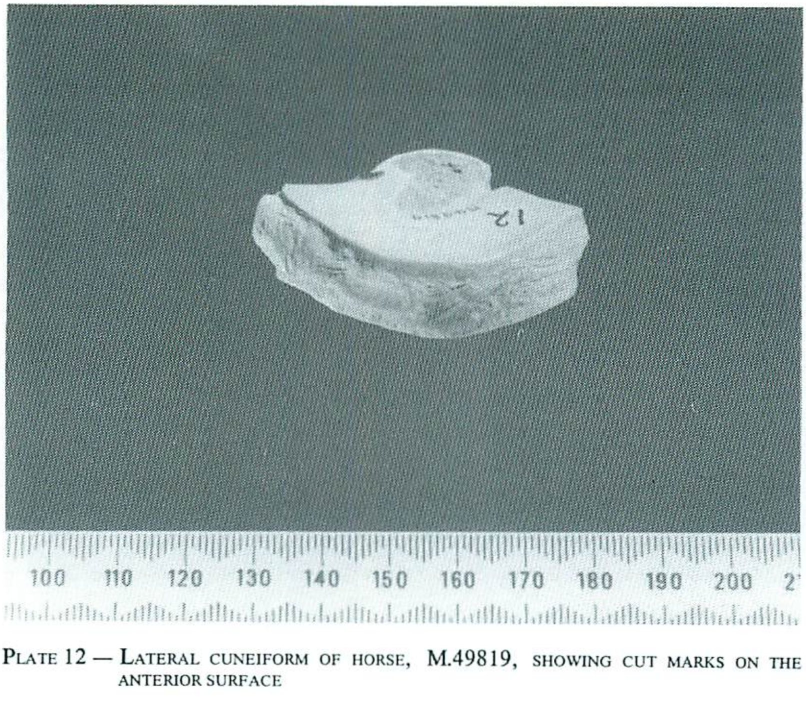


PLATE 12 — LATERAL CUNEIFORM OF HORSE, M.49819, SHOWING CUT MARKS ON THE ANTERIOR SURFACE

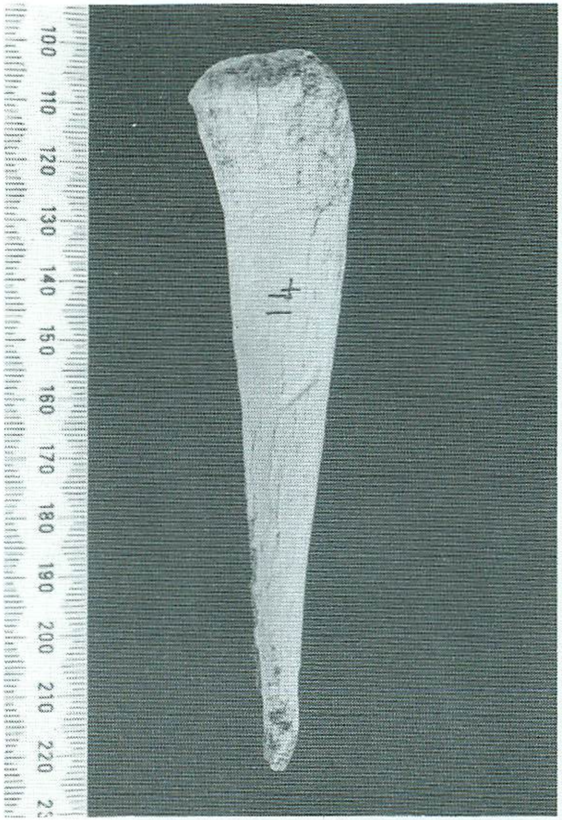


PLATE 13 — LATERAL METAPODIAL OF HORSE, M.49947, WITH A HORIZONTAL CUT AT THE PROXIMAL END

PLATE 14 — METACARPAL OF HORSE, M.50024, WITH CUTS ON THE TROCHLEA. THE PERCUSSION POINT WHERE THE BONE WAS SMASHED CAN ALSO BE SEEN.

PLATE 15 — HARE DISTAL FEMUR, M.13806, WITH CUT MARKS

PLATE 16 — HARE DISTAL HUMERUS, M.13802, WITH A SINGLE SHORT CUT MARK ON THE TROCHLEA

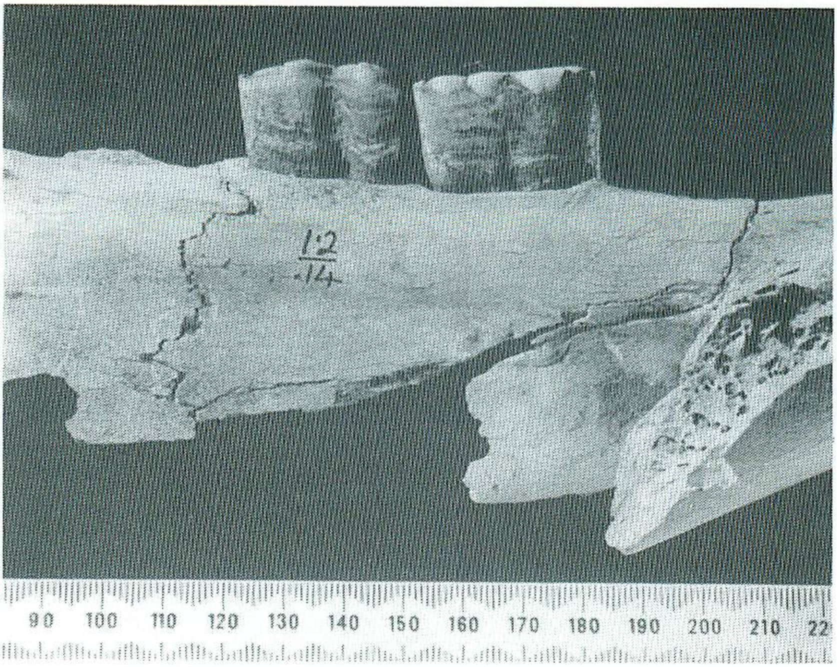


PLATE 17 — HORSE MANDIBLE FROM CHEDDAR CAVES MUSEUM, 1.2/4, SHOWING CUT MARKS ON THE MEDIAL SURFACE OF THE JAW BELOW P2 AND THE DIASTEMA

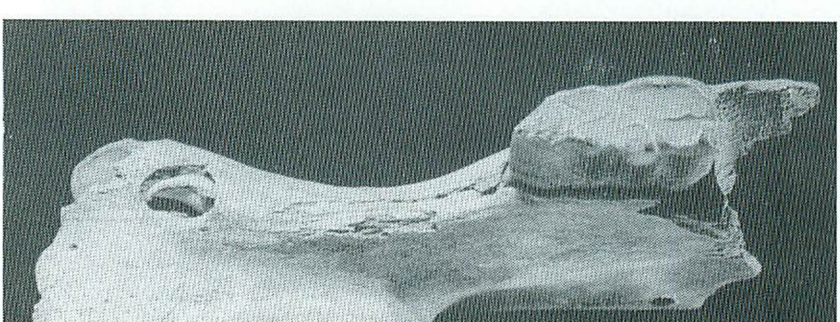


PLATE 18 — HORSE MANDIBLE, M.49848, WITH CUTS ON THE SYMPHYSIS. THE PERMANENT CANINES AND THIRD INCISORS ARE ERUPTING.

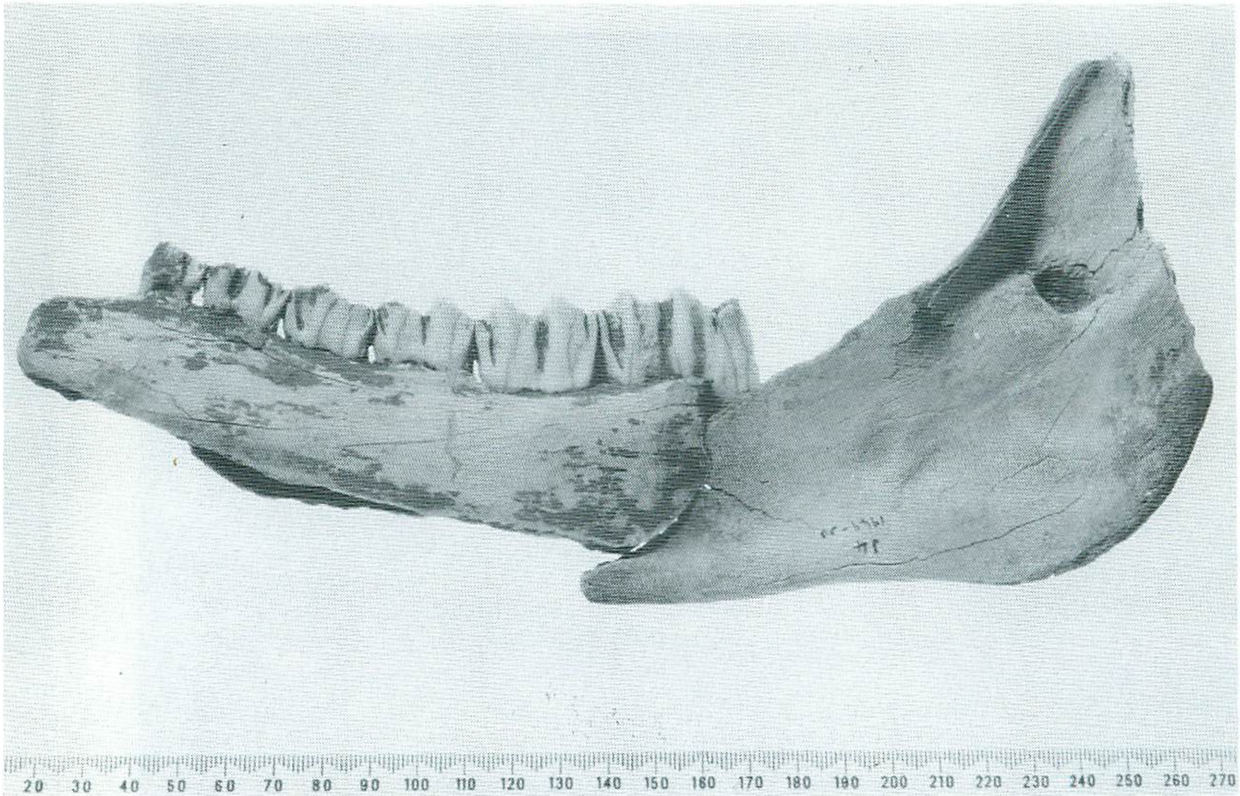


PLATE 19 — RED DEER MANDIBLE FROM CHEDDAR CAVES MUSEUM, FOUND IN TWO PIECES, 1.2/68 AND 204. THERE ARE FILLETING CUTS OVER MUCH OF THE MEDIAL SURFACE OF THE ASCENDING RAMUS WHICH EXTEND AS FAR FORWARD AS M3. THE STRIATIONS WHICH ARE VISIBLE ON THE FRONT PART OF THE BONE ARE POST-DEPOSITIONAL CRACKS.

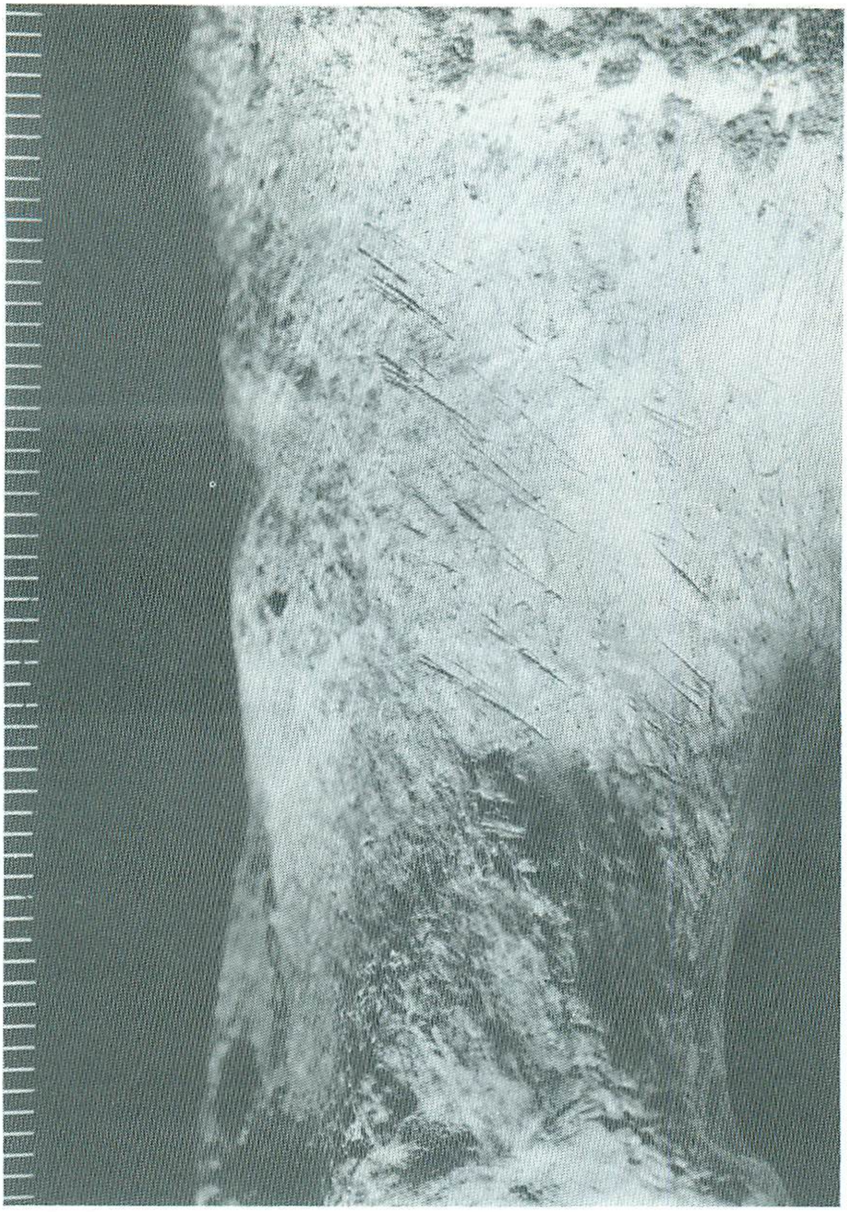


PLATE 20 — FIRST PHALANX OF HORSE, M.50030, SHOWING CUTS ON THE MEDIAL BORDER

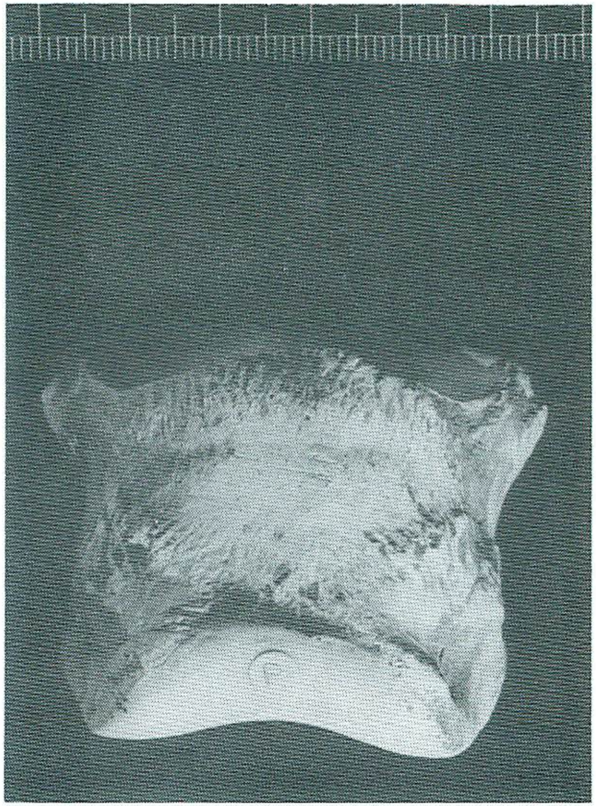


PLATE 21 — SECOND PHALANX OF HORSE, DORSAL VIEW, M.49730. THE CUTS AT THE PROXIMAL END ARE IN THE AREA OF INSERTION OF THE EXTENSOR TENDON. THERE ARE ALSO CUTS AT THE DISTAL END AROUND THE EMINENCES FOR ATTACHMENT OF THE COLLATERAL LIGAMENTS.

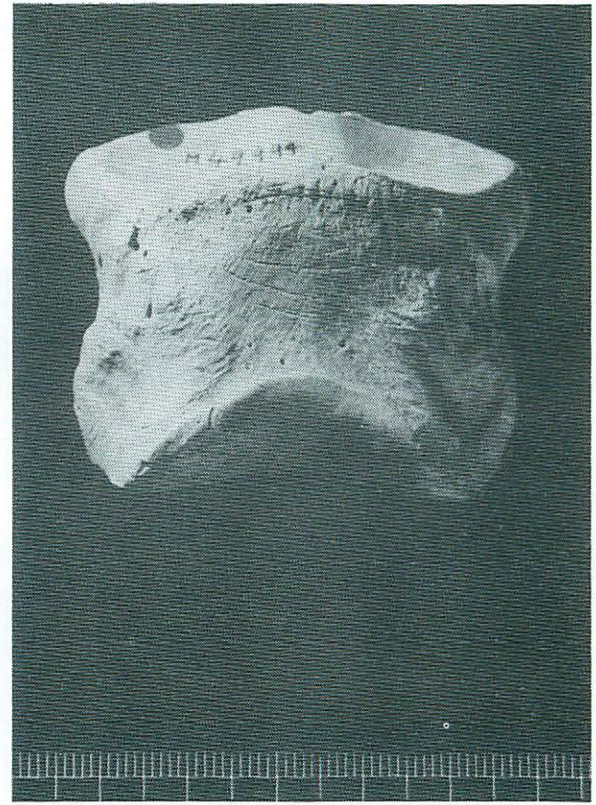


PLATE 22 — SECOND PHALANX OF HORSE, M.49999: CUTS LOCATED IN SIMILAR POSITIONS TO THOSE IN PLATE 21

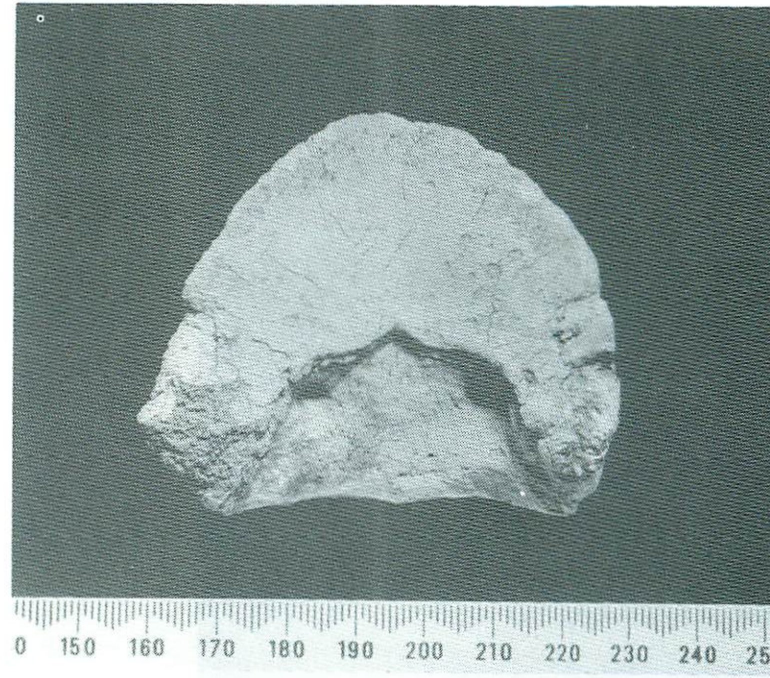


PLATE 24 (ABOVE) — TERMINAL PHALANX OF HORSE, M.49954, WITH CUTS ON THE FLEXOR SURFACE WHERE THE FLEXOR TENDON INSERTS. THE RADIAL STRIATIONS ON THE SOLE ARE POST-DEPOSITIONAL CRACKS IN THE BONE.

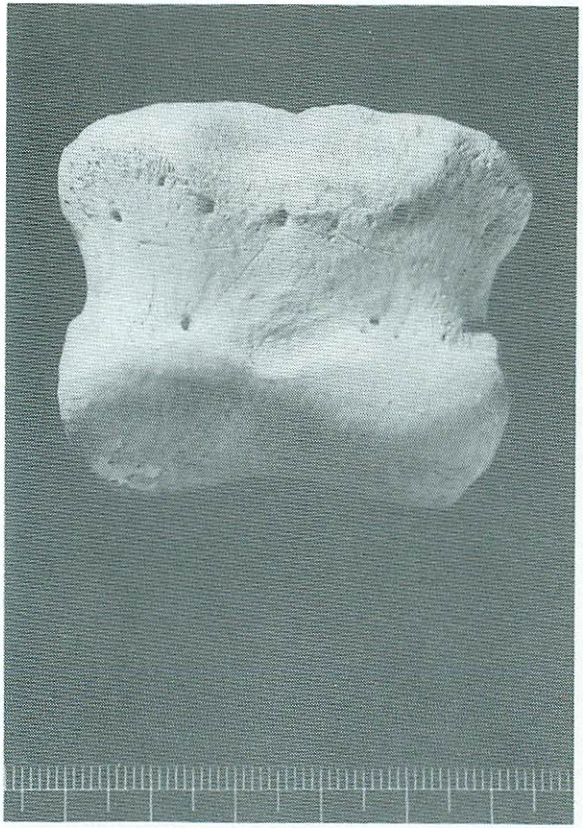


PLATE 23 (LEFT) — SECOND PHALANX OF HORSE, M.49999: CUTS ON POSTERIOR SURFACE

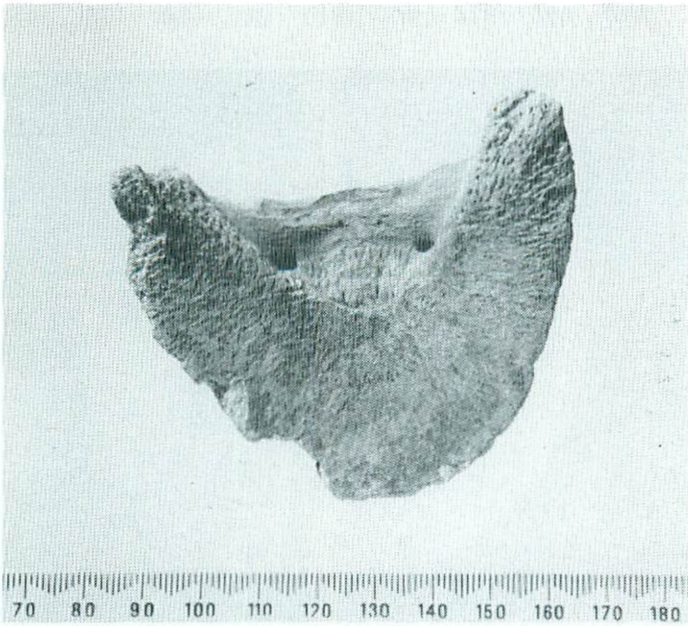


PLATE 25 — TERMINAL PHALANX OF HORSE, M.49846, WITH CUTS IN THE SAME PLACE AS IN PLATE 24

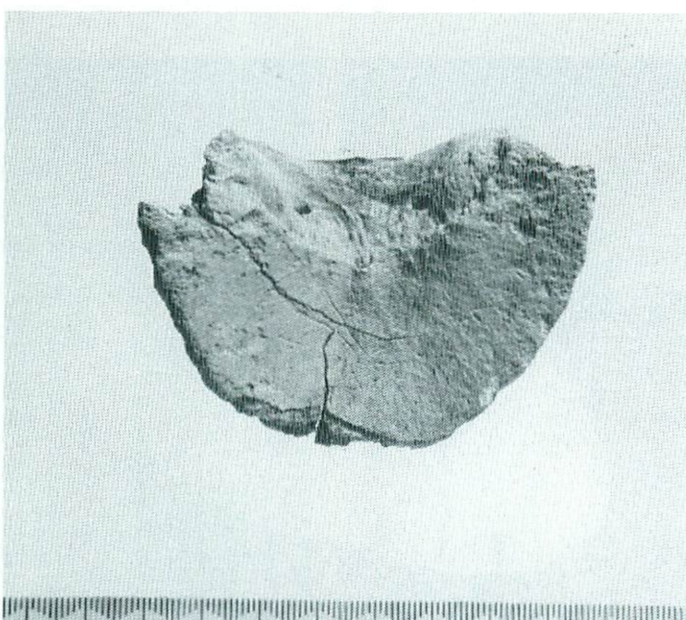


PLATE 26 — TERMINAL PHALANX OF HORSE, M.49773, WITH CUT MARKS ON THE SOLE

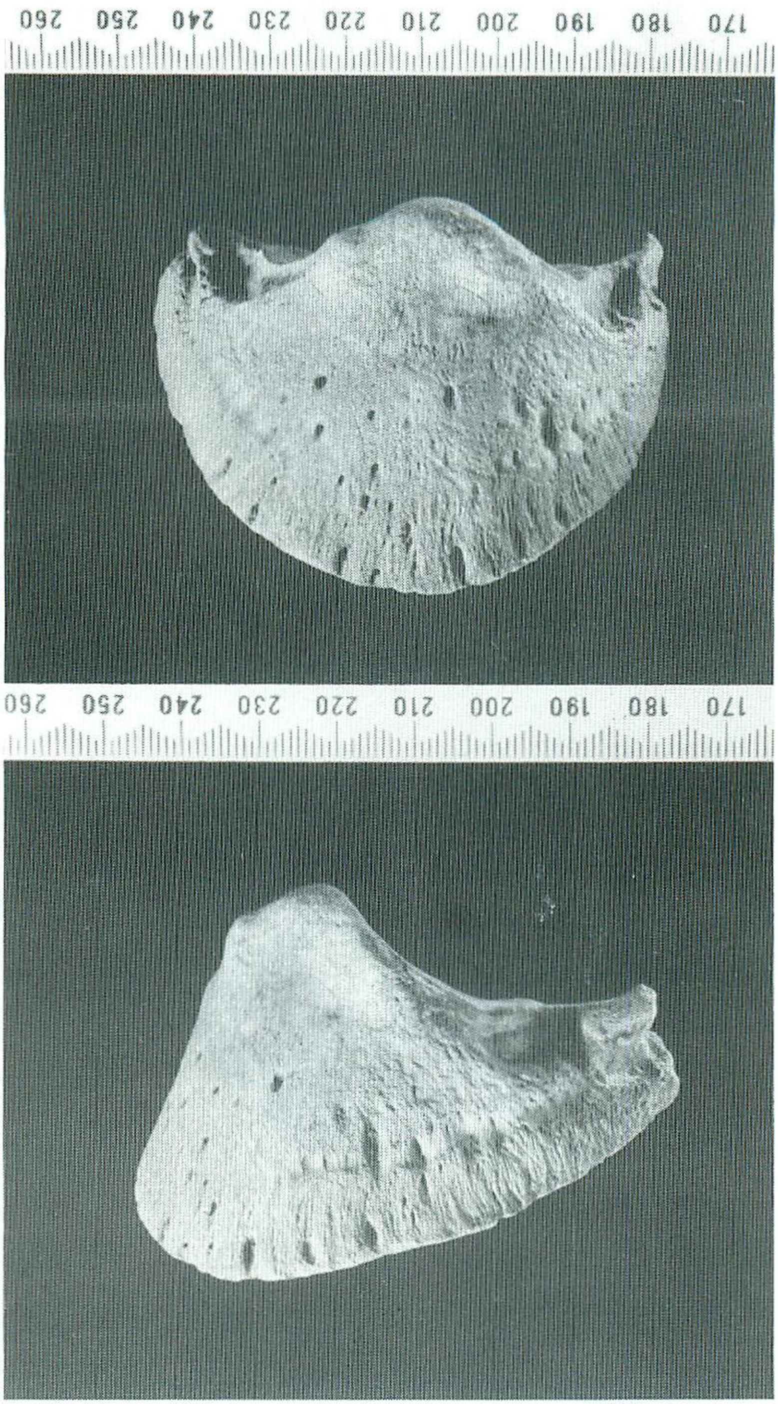


PLATE 27 — TERMINAL PHALANX OF HORSE FROM CHEDDAR CAVES MUSEUM, 1.2/5, WITH CUT MARKS ON THE DORSAL SURFACE: (a) FROM ABOVE; (b) FROM THE SIDE (SEE ALSO FIG. 4)

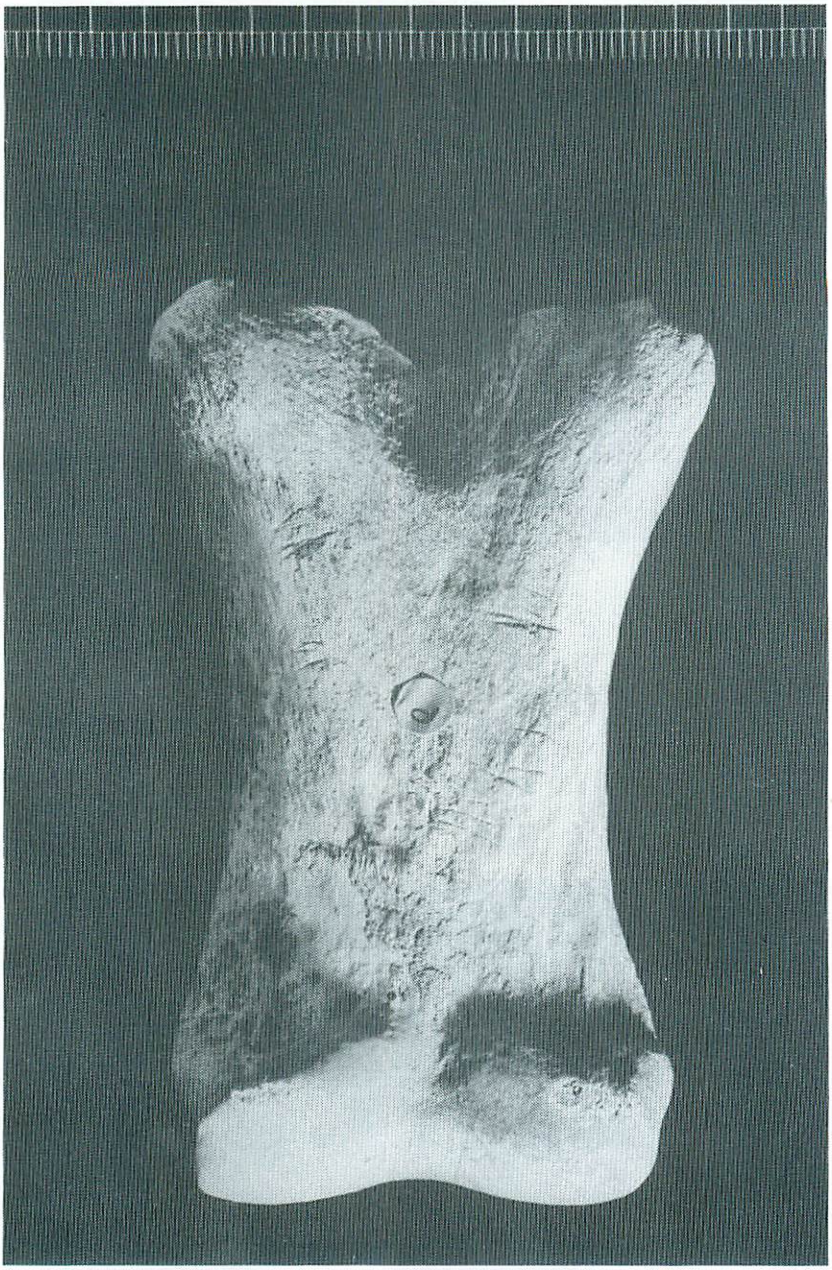


PLATE 28 — FIRST PHALANX OF HORSE, M.49840, WITH CUTS ON THE POSTERIOR SURFACE ON THE RIDGES FOR THE ATTACHMENT OF THE MIDDLE DISTAL SESAMOID LIGAMENT

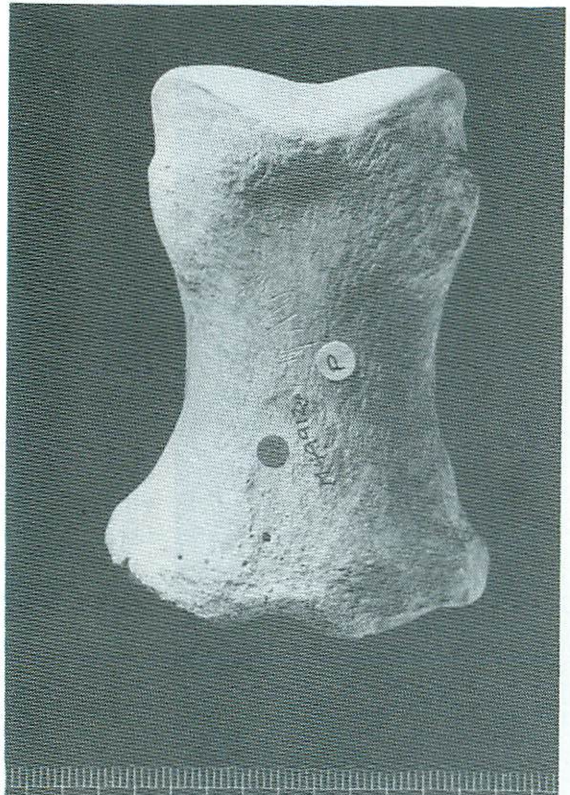


PLATE 29 — FIRST PHALANX OF HORSE, M.49912, WITH CUTS ON THE DORSAL SURFACE IN THE AREAS OF ATTACHMENT OF THE ANNULAR LIGAMENTS

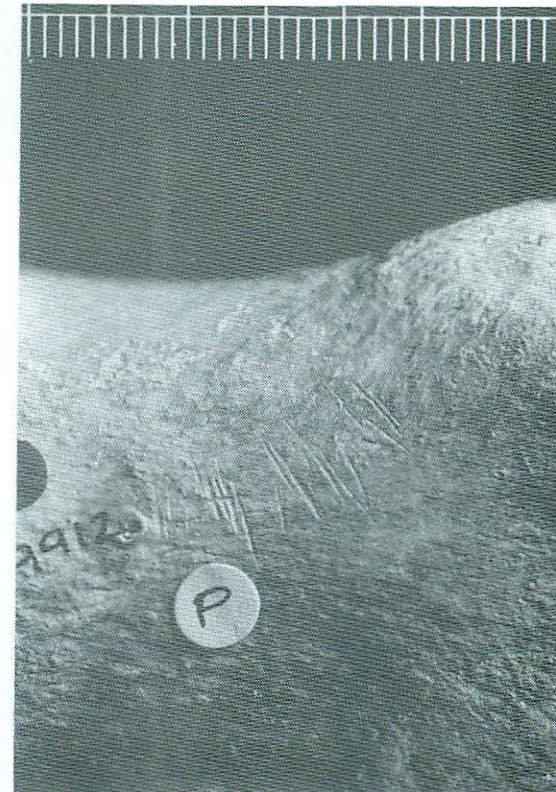


PLATE 30 — ENLARGED VIEW OF PLATE 29

PLATE 31 — SECOND PHALANX OF AUROCHS, M.49758, SHOWING CUTS ON DISTAL ARTICULATION AND ON DORSAL CREST.

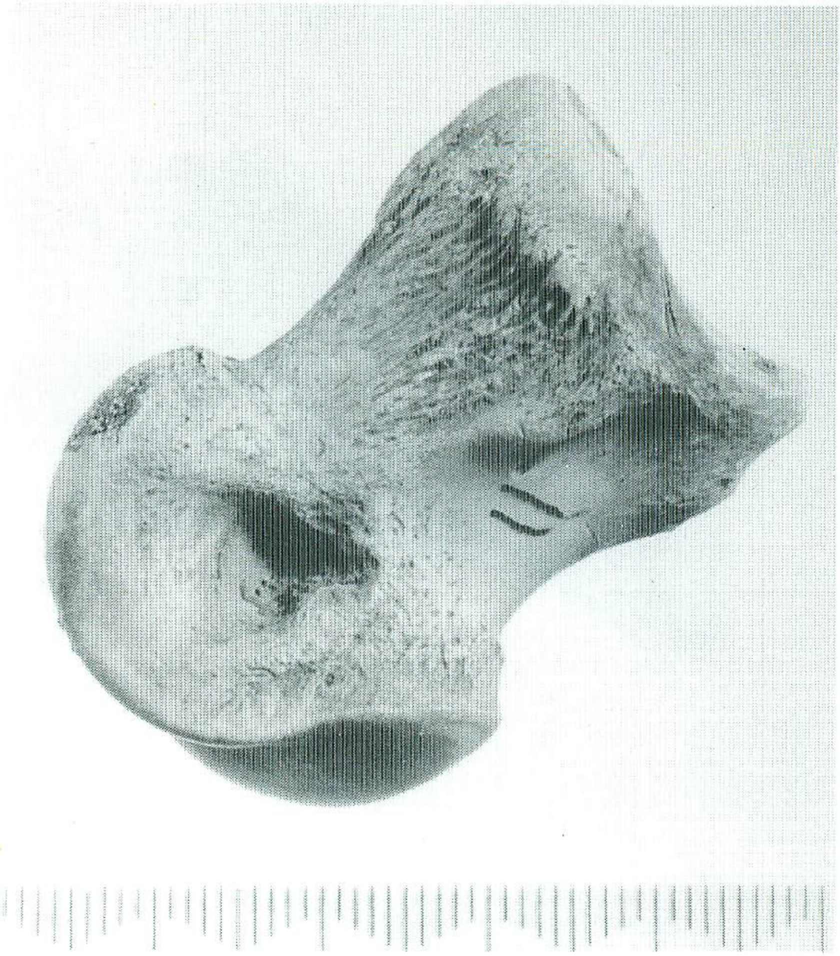


PLATE 32 — SAME AS IN PLATE 31, SHOWING CUTS ON MEDIAL SURFACE