Feeding a Roman town

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Environmental evidence from excavations in Winchester, 1972–1985

by M Maltby

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Front cover: Design by Mark Barden showing a reconstruction of cattle being led through the gate of *Venta Belgarum*

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Summary

This volume is part of an integrated series of studies of Winchester's archaeology. It provides a record and analysis of Roman environmental evidence from the less well-known extra-mural areas of Winchester and assesses what these new discoveries add to the understanding of the city's past. It is one of the most comprehensive accounts of animal remains from a Roman town published up until this time. The study is based on excavations from the 1970s and early 1980s, which, by examining sites on the defences and in the historic suburbs, has enlarged the scope of previous extensive investigations within the city walls.

The volume consists of four parts, of which the first provides an overall introduction, covering the nature of the samples and how they were retrieved. The locations of the sites themselves and an outline of the structural sequences within them are linked to the changing history and archaeology of the city as a whole. In subsequent sections, the volume draws together a series of specialist reports, arranged partly according to the location of the sites from which the environmental evidence was obtained, and partly based on the kind of evidence recovered. Part 2 incorporates three reports on a large sample of faunal remains – including fish from the northern suburb of the Roman town, and a smaller sample from sites on the defences. Part 3 concerns faunal and molluscan remains from the western suburb, whilst the evidence of plant remains from all of those defences and suburbs sites is dealt with in Part 4.

Part 2 has benefited particularly from the main author's direct experience of the relationship between this suburban assemblage and those from local rural sites, as well as other urban assemblages. It includes a detailed examination of inter- and intra-site variability and a species-by-species discussion that incorporates observations about carcass processing methods and animal husbandry in general. The section also offers a substantial synthesis of how towns were provisioned with meat and other animal products throughout Roman Britain, and considers how this evidence has implications for our understanding of the Romano-British economy and society. It also includes a thoughtful discussion of the role and significance of deposits of partial and complete animal skeletons in the archaeological record.

The reports included in Parts 3 and 4 consider smaller samples, which may be less representative of the town as a whole, but which nevertheless offer fascinating snapshots of particular times and places. The specialist treatment of cattle, however, is the linking theme of all the bone reports, as these animals were brought to town in large numbers for slaughter, and processed systematically by professional butchers. Everything was used, including splitting and splintering substantial quantities of limb bones for marrow and bone working. Throughout the volume, description and discussion are backed up by illustrations and the presentation of quantified data, in the form of tables and charts, in the text, and within appendices.

Thus, this volume will be essential reading for all those interested in the study of the animals, plants, and environment of a Roman town, as well as being of value to urban archaeologists and to those with a general interest in the history and archaeology of Hampshire. It sheds new light on the management of animal and plant resources in and around one of the most well-known *civitas* capitals, as well as providing glimpses of everyday life in Winchester through this comprehensive study of the supply, consumption and disposal of mammals, birds, fish, and plants over a period of almost four hundred years.

Résumé

Ce volume fait partie d'une série intégrante d'études sur l'archéologie de Winchester. Il fournit un registre et une analyse des indices environnementaux romains provenant des quartiers extra-muraux moins bien connus de Winchester, et il évalue ce qu'apportent ces nouvelles découvertes à nos connaissances concernant le passé de la ville. C'est l'un des comptes-rendus les plus complets concernant les restes animaux provenant d'une ville romaine publiés jusqu'à ce jour. L'étude est basée sur les fouilles des années 1970 et du début des années 1980; ces fouilles, qui avaient examiné des sites situés sur les défenses et dans les faubourgs historiques, ont étendu la portée d'enquêtes antérieures approfondies à l'intérieur des murs de la ville.

Ce volume est en quatre parties, dont la première fournit une introduction générale, couvrant la nature des échantillons et la manière dont ils avaient été prélevés. Les emplacements des sites eux-mêmes et une esquisse des séquences structurelles à l'intérieur des sites sont liés à l'évolution de l'histoire et de l'archéologie de la ville dans son ensemble. Dans les parties suivantes, ce volume regroupe une série de rapports spécialisés, arrangés en partie selon l'emplacement des sites où avaient été obtenus les indices environnementaux, et en partie basés sur le type d'indices découverts. Dans la deuxième partie se trouvent trois rapports sur un grand échantillon de restes de faune – y compris de poissons, provenant du faubourg Nord de la ville romaine, et un plus petit échantillon provenant des sites situés sur les défenses. La troisième partie s'occupe des restes de faune et de mollusques provenant du faubourg Ouest ; et la quatrième partie s'occupe des indices de restes de plantes provenant de tous ces sites situés dans les faubourgs et les défenses.

La deuxième partie a bénéficié tout particulièrement de l'expérience directe que possède l'auteur principal concernant les rapports entre cet ensemble provenant des faubourgs et ceux qui provenaient de sites ruraux locaux, aussi bien que d'autres ensembles urbains. Elle contient un examen détaillé de la variabilité inter-site et intra-site, ainsi qu'une discussion espèce par espèce, laquelle intègre des remarques sur les méthodes de traitement des carcasses et sur l'élevage en général. Cette partie offre également une importante synthèse de la manière dont les villes étaient approvisionnées en viande et autres produits d'origine animale dans toute la Grande-Bretagne romaine, et elle prend en considération les implications suggérées par ces indices au niveau de nos connaissances concernant la société et l'économie romano-britannique. Elle comprend également une discussion bien pensée du rôle et de la signification des dépôts de squelettes d'animaux, partiels et complets, dans le registre archéologique.

Les rapports inclus dans la troisième partie et la quatrième partie prennent en considération de plus petits échantillons, lesquels pourraient moins bien représenter la ville dans son ensemble mais brossent néanmoins des tableaux fascinants de certaines époques et de certains lieux précis. Par ailleurs, le traitement spécialisé du bétail est le thème qui relie tous les rapports sur les os car ces animaux étaient amenés à la ville en grand nombre, pour y être abattus et y faire l'objet d'un traitement systématique par des bouchers de métier. Tout était utilisé, y compris les os des membres, qui étaient fendus ou brisés en éclats pour leur moelle et le façonnage d'objets en os. Dans tout le volume, la description et la discussion sont appuyées par des illustrations et par la présentation de données quantifiées, sous la forme de tableaux et de chartes, à la fois dans le texte et dans les annexes.

La lecture de ce volume sera donc essentielle pour tous ceux dont le travail porte sur les animaux, les plantes et l'environnement d'une ville romaine, et sera également fort importante pour les archéologues urbains ainsi que pour tous ceux qui s'intéressent à l'histoire et à l'archéologie du Hampshire en général. Il porte un nouveau regard sur la gestion des ressources animales et végétales dans l'une des villes capitales les mieux connues ainsi qu'aux alentours, et il fournit également un aperçu de la vie quotidienne à Winchester à travers cette étude très approfondie de l'offre, de la consommation et de la mise au rebut des mammifères, des oiseaux, des poissons et des plantes, pendant une période de près de quatre cents ans.

Zusammenfassung

Dieser Band ist Teil einer integrierten Serie von archäologischen Studien in der Stadt Winchester. Er besteht aus einem Inventar von Umweltfunden aus der Römerzeit, die aus den weniger bekannten Gebieten ausserhalb der Stadtmauern stammen, und bewertet, was diese neuen Ermittlungen zum Verständnis der Geschichte dieser Stadt beisteuern. Dieser Bericht umfasst die umfangreichste Untersuchung von tierischen Überresten, die bisher von einer römischen Stadt veröffentlicht wurde. Diese Studie basiert auf Ausgrabungsfunden aus den 70er und 80er Jahren, die vor allem aus den Verteidigungsanlagen und den historischen Stadträndern stammten, und somit das bisherige Untersuchungsareal innerhalb der Stadtmauern erheblich erweitert konnten.

Der Band besteht aus vier Teilen. Das einleitende, erste Kapitel befasst sich mit den Fundtypen und Ausgrabungsmethoden. Die räumliche Verteilung der Fundorte und der Schichtenablauf werden mit der Geschichte und Archäologie der gesamten Stadt verknüpft. Die folgenden Abschnitte dieses Bandes besteht aus einer Reihe von Expertenberichten, die zum Teil nach dem Areal der Umweltfunde, und teilweise nach Fundarten arrangiert sind.

Der zweite Teil umfasst drei Berichte über einen großen Fundsatz von Tierüberrresten – unter anderem bestehend aus Fischen aus dem nördlichen Rand der römischen Stadt, und aus einem kleineren Fundsatz aus den Verteidigungtsanlagen. Der dritte Teil befasst sich mit den Tierüberresten und Molluska aus den westlichen Stadträndern und im vierten Teil werden die Pflanzenüberreste aus den Verteidigungsanlagen und Stadträndern behandelt.

Der zweite Teil hat besonders von der praktischen Erfahrung des Hauptautors profitiert, vor allem was die Beziehung zwischen den Fundsätzen aus den Stadträndern und Fundsätzen aus dem nahegelegenen Umland, sowie anderen Stadtarchäologischen Funden angeht. Er enthält eine detaillierte Untersuchung der Variabilität innerhalb eines Fundorts und zwischen verschiedenen Fundorten und eine Artenspezifische Diskussion, die Beobachtungen über die Bearbeitung von Tierkadavern und Tierhaltung im allgemeinen miteinbezieht. In diesem Teil wird eine umfangreiche Synthese präsentiert, die sich mit dem Prozess befasst, wie Städte im gesamten römischen Britannien mit Fleisch und anderen Tierprodukten versorgt wurden. Es wird erwogen was diese neuen Erkenntnisse zu unserem Verständnis der romano-britischen Wirtschaft und Gesellschaft beitragen. Er beinhaltet auch eine tiefgreifende Diskussion über die Rolle und Bedeutung von Teil- und Gesamtskelletten im archäologischen Fundbestand.

Im dritten und vierten Teil dieses Berichtes werden kleinere Fundsätze behandelt, die eventuell weniger repräsentativ für die Stadt im allgemeinen sind, aber trotzdem faszinierende Schnappschüsse über bestimmte Zeitabschnitte und Lokalitäten vermitteln. Die Aufbereitung von Rindern ist ein verbindendes Thema in allen Knochenberichten, da diese Tiere in großer Anzahl zur Schlachtung in die Stadt gebracht wurden und systematisch von professionellen Fleischern bearbeitet wurden. Alle Teile der Tiere wurden genutzt, unter anderem wurden Beinknochen zur Verwertung von Knochenmark und anderer Knochenverarbeitung gespalten und zersplittert. Berichte und Diskussionen werden in diesem Band durchgehend mit Illustrationen und quantitativen Daten unterstützt, in Form von Tabellen, Grafiken innerhalb des Textes und in den Anhängen.

Dieser Band ist daher eine unentbehrliche Lektüre für alle, die an der Studie von Tieren, Pflanzen und der Umwelt in einer römischen Stadt interessiert sind. Er ist auch für Stadtarchäologen von Nutzen und all denen, die an der Geschichte und Archäologie der Grafschaft Hampshire interessiert sind. Er gibt Aufschluß über das Management von Tier- und Pflanzenressourcen innerhalb und um die best-bekanntesten römischen Civitas (Verwaltungseinheiten), und liefert einen Einblick in das Alltagsleben von Winchester, anhand einer Untersuchung von Versorgung und Verzehr von Säugetieren, Vögeln, Fischen und Pflanzen über einen Zeitraum von fast vierhundert Jahren.

PART 1: Introduction

1 Background *by K E Qualmann*

This volume is one in a series of publications reporting on aspects of archaeological investigations carried out in Winchester, mainly since 1972. In the previous year, the large-scale programme of excavations directed by Martin Biddle for the Winchester Excavations Committee was completed, and the efforts of the committee through the work of its Research Unit, became fully concentrated on preparing reports for publication.

The continuing destruction of the buried remains of the city's past was, however, recognised to be a serious problem, and a Rescue Archaeologist – one of the first such posts in the country – was appointed on the establishment of Winchester City Museums, but seconded to the Research Unit Director. This arrangement enabled a full-time response to rescue threats to be maintained within the framework of existing knowledge and advancing research.

Despite core support from the District Council, substantial excavation grants from the Department of the Environment, Ancient Monuments Inspectorate, and help-in-kind from Hampshire County Council, mainly on road schemes, it soon became clear that resources were not available to respond to every development threat. Watching briefs were maintained on many sites, but controlled excavation had to be much more selective. After 1973, a policy for the selection of sites for excavation was developed.

This was strongly influenced by the plans then being put forward for a partial ring-road, affecting important sites to the north and west of the city's defences, and housing schemes for the eastern suburb and the Hyde area. At the same time, conservation was the watchword in the city centre: such new development as did receive consent was quite small in scale.

Practical considerations were thus a major determinant of the policy that stressed suburban excavation in the period 1973–1980 at Winchester. But so too was the academic need to 'balance the sample' of previous work, which had focused largely on key sites within the city, and the feeling that certain types of new information might more cost-effectively be gained from extra-mural areas at this stage of our understanding.

Martin Biddle summarised the results of this policy in 1983: whereas 80% of the 1961–1971 programme was undertaken within the city walls, more than 90% of excavation between 1974 and 1980 was carried out in the suburbs (Biddle 1983, 103).

Changes in the organisation of local government, implemented in April 1974, further modified the base from which Winchester archaeology operated. The new District Council agreed to provide an archaeological service for its largely rural 64,350 hectare area (159,000 acres), in addition to that already provided for the ancient city at its core. An initial survey of the potential of Winchester District (Schadla-Hall 1977) led to the establishment of a sites and monuments record for the area, investigation of key sites threatened by development, and a continuing commitment to the management of the archaeological resources of the district.

2 Publication programme *by K E Qualmann*

Initial publication proposals reflected the pattern of the work described above, with volumes planned to gather together new information on each of the extra-mural areas of the city, or from district projects. Neither of the two publication series already established for Winchester seemed a particularly appropriate vehicle for these new reports. *Winchester Excavations 1949–60* was clearly designed to describe the work of a particular era, though a continuation of the title to cover later work was, at one stage, proposed (Collis 1978, 1). Similarly, *Winchester Studies* takes as its basis Martin Biddle's excavations of 1961–1971. The thorough research planned as part of this project, and its finite time scale, also made significant new additions difficult to accommodate.

The Ancient Monuments Inspectorate of the DoE funded much initial post-excavation work, which was organised on the basis of western suburb and northern suburb sites. In 1986 their successor body, English Heritage, sought to develop with the (then) Archaeology Section of Winchester Museums, a firm programme for all post-1971 Winchester sites funded from government sources. The first phase involved completion of site archives, assessment of the potential for analysis, and the drafting of proposals for publication. As this work progressed, it was agreed that some developer-funded sites should be included in the project because of their relevance to the interpretation of the 'core' sites.

In 1989, nine publication proposals, in addition to the nearly completed 'Western Suburb' project, were submitted to English Heritage and agreed. A tenth, on late Roman pottery from Winchester, was deferred for a final decision at a later date. Early in 1990, English Heritage recommended that the prehistoric sections of the 'Western Suburb' draft text, which included most of the recent evidence for the Oram's Arbour Iron Age enclosure on the western side of Winchester, be formed into a separate publication. The remainder of the 'Western Suburb' sections were to be integrated with the other nine proposed publications (including this one) as appropriate.

Developments and restructuring of the programme since the early 1990s have allowed for a decision on the fate of the pottery reports: these are now all collected into one volume (forthcoming). It was also realised that the thematic basis of the proposed volumes meant that complete sequences for multi-period sites would be split up between them. It has therefore been proposed that additional archive summaries be published, but because most of this information is now available on the Winchester Urban Archaeological Database, this work has since taken a low priority. At the time of writing, P6, P9, P10, and P11 have been published (Rees *et al* 2008; Gomersall and Whinney 2007, Serjeantson and Rees 2009; Qualmann *et al* 2004).

Table 1.1 List of proposed publications

1	The cemeteries of Roman Winchester: excavations in the suburbs 1982–1986
2	The town defences of Winchester
3	The suburbs of Roman Winchester: the non-funerary archaeology from excavations 1982–1986
4	Feeding a Roman town: environmental evidence from excavations in Winchester, 1972–1985 (this volume)
5	1500 years of pottery from Winchester: evidence from excavations 1972–1986
6	Artefacts and society in Roman and medieval Winchester: small finds from the suburbs and defences, 1971–1986 (Rees *et al* 2008)
7	The Saxon and medieval suburbs of Winchester
8	Hyde Abbey, Winchester
9	The hospital of St John the Baptist, Winchester (Gomersall and Whinney 2007)
10	Food, craft, and status in medieval Winchester. The plant and animal remains from the suburbs and city defences (Serjeantson and Rees 2009)
11	Oram's Arbour: the Iron Age enclosure at Winchester, volume 1: Investigations 1950–1999 (Qualmann *et al* 2004)
12	Archaeological archive summary 1

A proposal to recombine P1 and P3 into one volume covering all aspects of Winchester's Roman suburbs has been accepted.

Brief details of the proposed publications are shown in Table 1.1. The scope of the work represented by the titles varies quite significantly, from substantial volumes that integrate results from a number of sites, to short articles describing much more limited fieldwork projects. There are also substantial differences in the post-excavation research designs adopted for each. The broadly thematic approach means that some excavation sites are partially reported in more than one publication and that, as here, some classes of finds are published independently from the excavation sites from which they were recovered. Most of the reports are now complete at least in draft, and where not yet published, can be consulted by appointment. References throughout the text prefixed 'P' refer to this table.

It is hoped that the projects not included within the scope of this series of publications, including several major excavations carried out within the city area, can be published as part of a subsequent series.

3 Introduction to Roman Winchester

by K E Qualmann, H Rees, and G D Scobie

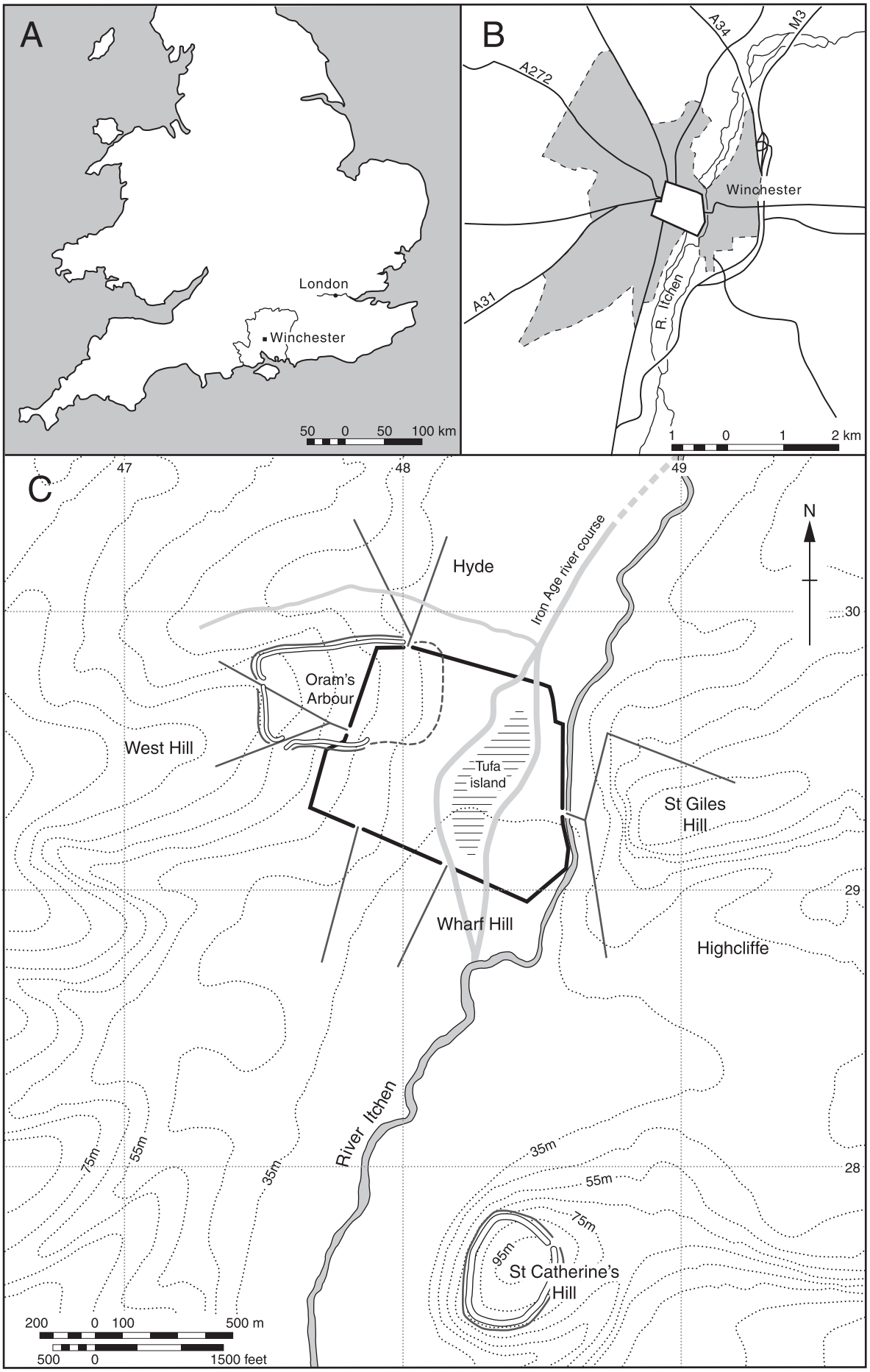
Winchester is located at the point in central Hampshire where the River Itchen cuts through an east–west ridge of chalk downland (Fig 1). This is the lowest point where the River Itchen can easily be crossed, and perhaps the highest to which the river is navigable at least by smaller craft. The accumulation of large amounts of alluvial chalk 'tufa' forming an area of slightly higher ground in the middle of the flood-plain enhances the advantages of the site as a crossing point and favoured location for settlement. The area which was first enclosed by the city defences in the Roman period consists of two zones, a low-lying, wetter, eastern zone in which the ford and the tufa island are found, and a higher, dryer western zone.

Though there is growing evidence for human settlement in Winchester from the Bronze Age or even earlier, the first defended centre was situated on the western side of the Itchen valley in the first or second century BC (Qualmann *et al* 2004; Fig 1). Known as the Oram's Arbour enclosure from the large open space which today occupies its western side, this settlement is somewhat unusual in central southern England both for its size, perhaps up to 20ha in extent – and for its location on steeply sloping ground.

Relatively little has been found to characterise the prehistoric occupation within this large, well-defended centre, especially in the period just prior to the Roman invasion of AD 43. There is little doubt, though, that Roman attention was soon drawn here, because of the site's ideal strategic location. A little pre-Flavian settlement within the enclosure is suggested by the recovery of pottery and other finds of this date (but probably residual) from the fill of the southern arm of the enclosure ditch (Biddle 1970, 279–80; 1975a, 98–100; Qualmann *et al* 2004), and by the timber buildings found overlying the possible remains of the enclosure bank in the south-eastern corner (Cunliffe 1964, 21–3).

Outside the enclosure and east towards the river, ditches possibly of pre-Flavian date have been recorded on the tufa island in the flood-plain (Bennet-Clark 1954; Biddle 1975b, 296; Winchester Museums History File SLH). That all of these locations are ranged west

Figure 1 (opposite) Location plans: (A) southern Britain: (B) the Winchester area; (C) general topography showing the lines of the Roman defences and roads, and the Oram's Arbour enclosure


A
London
Winchester
50 0 50 100 km
B
A272
A34
M3
Winchester
A31
R. Itchen
1 0 1 2 km
C
47
48
49
N
30
29
28
Hyde
Iron Age river course
Oram's Arbour
West Hill
Tufa island
St Giles Hill
Wharf Hill
Highcliffe
River Itchen
75m
55m
35m
35m
55m
75m
95m
St Catherine's Hill
200 0 100 500 m
500 0 1500 feet

to east roughly along the present High Street and the approach to the river crossing suggests that this was the main focus of settlement at the time. The whereabouts of the expected early fort have so far remained elusive. One possibility, that it was located near the valley bottom and close to the ford (Biddle 1975b, 296), looks less likely in the light of excavations carried out at The Brooks in the late 1980s (Zant 1993, 50). The most plausible known site is that in the south-eastern corner of the Iron Age enclosure, which is strategically better placed in being some way up the western slope.

The prehistoric routeways to the west seem to have been incorporated into the long-distance Roman road network, whilst the northern approach outlasted the conquest for a little while. There is also evidence that the surviving Iron Age bank and ditch continued to play a defensive role in the earlier Roman period, and they formed a significant boundary in the landscape until as late as the 12th century.

Venta Belgarum – the market place of the Belgae – was the fifth largest town in Roman Britain and *civitas* capital of an area covering perhaps the greater part of central southern England (Wacher 1995, 293). When the defences were built around AD 70 (Biddle 1975a, 110–12), they were sited partly over and partly downhill from the Iron Age enclosure; hence the eastern side of the Roman town extended into the flood-plain, taking the (present) western bank of the River Itchen as its border, whilst the boundary of the town on its western side left part of the earlier enclosure intact (Figs 1 and 2). There is quite good evidence from excavations in the eastern part of the town that at that time the river flowed somewhat to the west of its present course (Qualmann 1993, 75). This barrier and the wet, low-lying character of the terrain seems to have made for sufficient security in the east and the defensive circuit was not completed until the late 2nd century (Figs 2 and 3). In the early 3rd century these earthen defences were strengthened by a masonry wall, and there is some evidence that further reinforcement of the rampart was carried out in the late 3rd century, although this may have been on a more piecemeal basis (P2).

The late 1st and early 2nd centuries witnessed the establishment of a street grid, the construction of simple timber buildings and the earliest attempts to drain low-lying areas (*cf.* Zant 1993, 45–53). Little is known of the location of public buildings, apart from the forum and the temple, which were both on the tufa island (Fig 2). These seem to have been in existence by around AD 100. From the mid- to late 2nd century onwards, coinciding with the completion of the drainage system, which allowed some areas to be occupied for the first time, buildings were often larger and more pretentious, masonry-built and provided with tesselated floors and hypocausts (*cf.* Zant 1993; Scobie 1995).

Wacher (1995, 293) has argued that the initiation during the Flavian period of these major construction and reclamation projects was due to a change in arrangements brought about by the death of Cogidubnus, and the break-up of his kingdom into smaller administrative units. Others have envisaged that a long span of urban planning followed (*cf.* Todd 1989), which seems to have been the case here, since the drainage system was not completed until the mid- to late 2nd century.

Immediately to the north of the defended area, the land drops fairly steeply into a valley of the Fulflood, an intermittent stream or winterbourne which takes its name from the Old English *ful flod* (foul or dirty stream), and which is first mentioned in AD 961 (Biddle 1976, 237). This valley and the spur of downland which rises beyond it to the north are the major natural features of the area of the northern suburb. The top of the eastern spur, St Giles Hill, is relatively level and ends as a steep bluff to the west, now accentuated by a railway cutting. To the south, the hill drops steeply into Chilcomb Vale, while to the north, it slopes more gently to Winnall Moor. The western spur of chalk downland, St Paul's Hill, slopes gently eastwards down to the valley floor and northwards into the Fulflood valley. To the south, the land drops more steeply into Sparkford Combe (Fig 1).

There are real differences in settlement and chronology between suburbs, which seem to have been dictated by topography: in the eastern suburb, the steepness of the chalk slope below St Giles Hill set a limit on expansion. In the west, the chalk slopes are not quite so precipitous, but still lend a rural character to those sites not immediately adjacent to the gates and the defences, except at times of maximum expansion of the inhabited areas. Bisection of the northern suburb by the Fulflood stream makes for a wider area of ground, but one which was subject to minor seasonal flooding.

As in the Iron Age, the Roman town was situated at an important junction of long-distance routes: at least five roads met at *Venta Belgarum*. The area outside the North Gate was a more specific focus of routes from the north. A heavily used pre-Roman trackway was here replaced by Roman roads leading north-east to Silchester (*Calleva Atrebatum*) and north-west to Mildenhall (*Cunetio*) and Cirencester (*Corinium*) (Margary 1973, Routes 42a and 43; Fig 2). From the East Gate, the east-bearing road turned sharply southwards, heading for Wickham, where it branched towards Chichester in one direction and in the other, Bitterne (Margary 1973, Route 420; Fig 2). It has also been suggested that the modern Alresford Road marks part of a route to London *via* Neatham: Millett and Graham (1986, fig 10) refer to this as the Winchester–London Roman road (Fig 2). Leading from the West Gate, the route of the Roman road to Old Sarum survives as the Romsey Road (Margary 1973, Route 45a; Fig 2).

Isolated 1st- and early 2nd-century burials are found outside the defences to the north (Collis 1978, 149–55), and also to the east and south (Biddle 1967; Jones 1978), but these are likely to be the graves of wealthy individuals from independent settlements in the countryside, rather than of town dwellers (Collis 1978, 40, 109; Millett 1986; P1 and P3). The best-known and most extensive cemetery was situated outside the North Gate in a wide strip to the east of the Cirencester road.

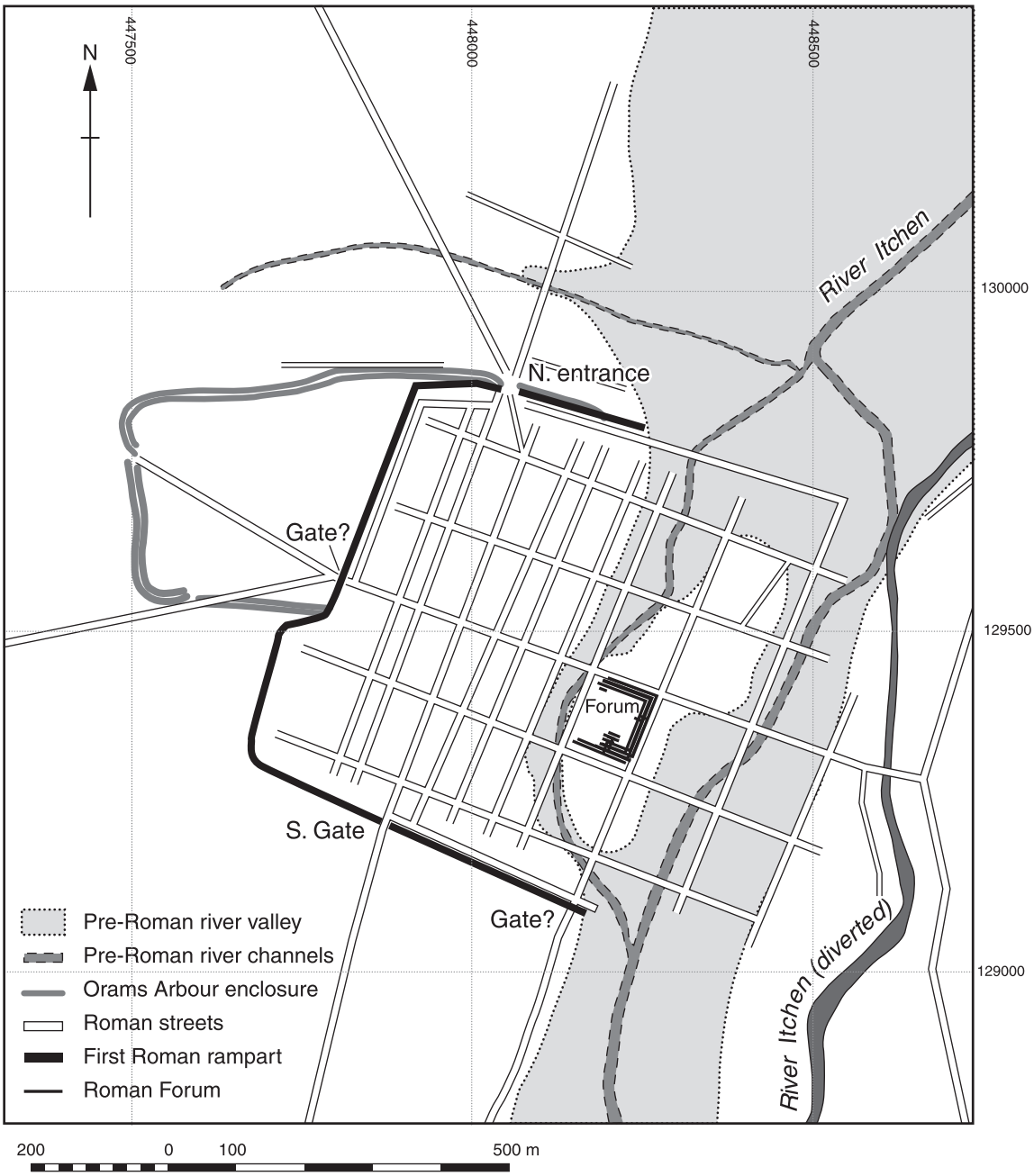


Figure 2 Settlement pattern in Winchester in the earlier Roman period

This graveyard was first used in the Neronian period, and by the 4th century, human burial had extended as far as Lankhills (Clarke 1979), some 500m from the North Gate (P1). In the late 3rd century, a new area was established to the west of the Cirencester road. This departure coincided with a gradual change in burial rite, from cremation to inhumation. Similarly, the areas outside the eastern and western walls of the city did not come into regular use as burial grounds until the late 3rd century. In the west, interments were made in the Oram's Arbour ditch and at West Hill, outside the enclosure (P1). Another, apparently smaller cemetery is known to the south-west, along St James Lane (Bradfield 1840). Outside the East Gate, the late Roman cemetery developed northwards following the natural contours of the steep hill slope (P1).

Suburban occupation began to grow adjacent to both the Silchester and Cirencester roads in the northern area in the mid- to late 2nd century. By the later Roman period, this was a flourishing suburb, apparently with its own extra-mural street system (Figs 2 and 3), although the buildings were much less grand than their counterparts within the walls. By contrast, in the west and close to the town there may have been an extra-mural street respecting the line of the western defences, but no occupation has been recorded alongside this, or the hollow way which appears to be heading towards modern Stockbridge (Figs 2 and 3). Indeed, there are few known signs of occupation within the entire circuit of the Iron Age enclosure; a masonry building possibly of the late 1st to late 2nd centuries, recorded in the south-west corner when the

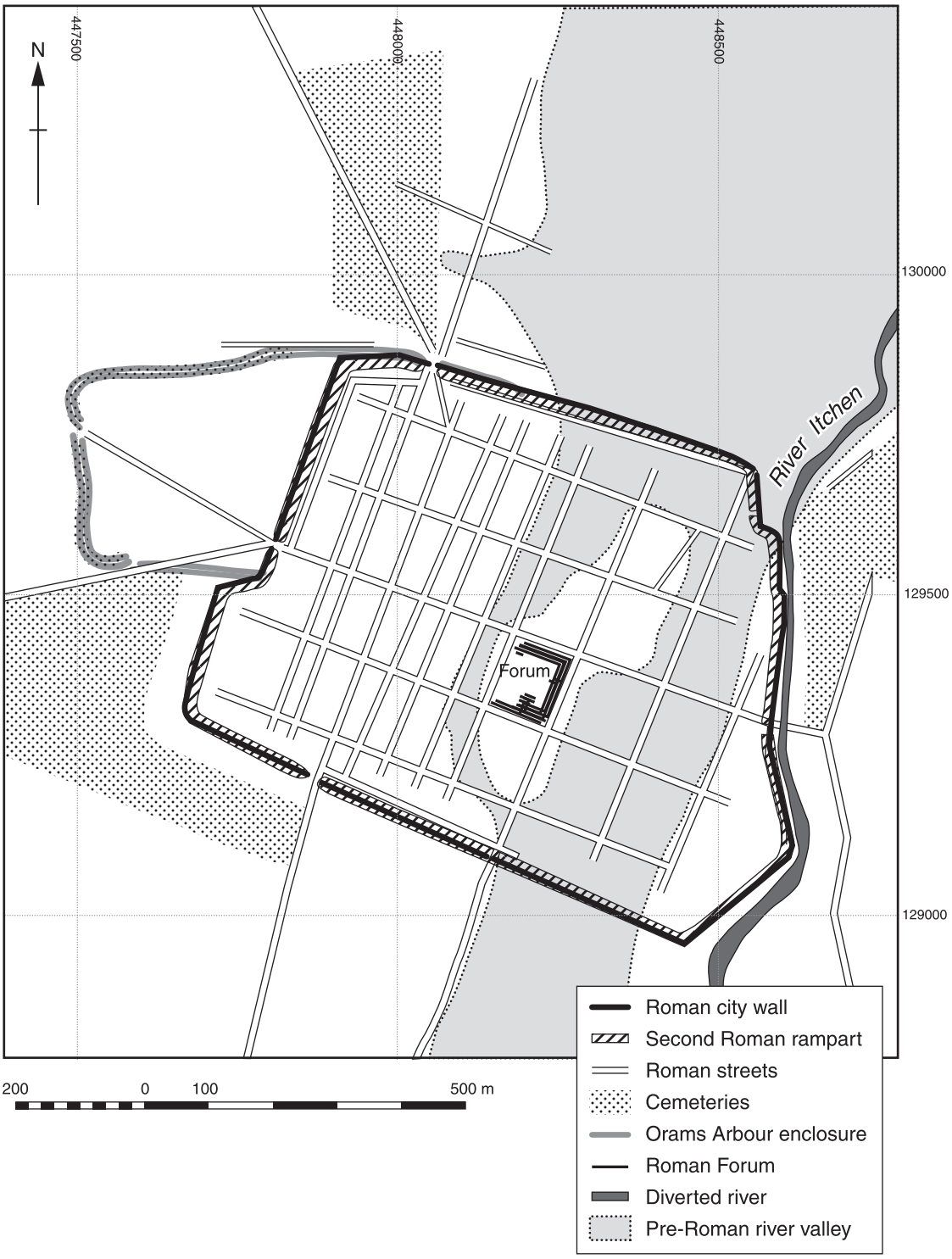


Figure 3 Settlement pattern in Winchester in the later Roman period

railway cutting of 1838–39 was excavated may have been religious in function (Haverfield 1900; and see also Esmonde Cleary 1987, 151). Outside the enclosure, there is a little evidence for independent rural settlement. The eastern suburb too seems to have been little-occupied by living townspeople (Collis 1978, 40); there was perhaps some suburban development close to the East Gate and adjacent to the east-bearing roads. A stone-lined tank or plunge bath was used during the late 3rd to mid-4th centuries on the site at Water Lane (Collis 1978, 48–51), but there was no trace of a building to which it might have been attached.

The decline of the town as a recognisably urban place began in the third quarter of the 4th century. No new town houses were constructed after *c* AD 350, and although the existing stock continued to be maintained and modified, it gradually fell into disrepair. By the 5th century, these houses were squats or shanties, rather than the well-appointed residential accommodation of previous centuries (*cf.* Zant 1993, 149–56). In

Table 1.2 Sites included in this volume

Area of the town	Site	Code	Area opened (m²)
Northern suburb	Hyde Abbey	HA 72	395
		HA 74	600
	Victoria Road	VR 72–80	2214
Western suburb	Crowder Terrace	CT 74	506
	New Road	NR 74–77	1891
	Sussex Street	SXS 76	180
		SXS 77	14
		SXS 79	248
City defences	Henly's Garage	HG 84/85	300
	27 Jewry Street	27JS 84	151
	Jewry Street, Crown Hotel	JCH 84	70

the mid-4th century too, the street grid, although still in use, had begun to decay and the formation of dark earth was under way (Scobie 1994; 1995, 7). During the late 4th and early 5th centuries, there may have been some attempt to maintain the main elements of the street grid in the core of the town on the tufa island (Scobie 1994, 2–3), and perhaps on the defences: excavation has uncovered evidence of several phases of metalling post-dating the 360s or 370s from the street south of the forum (Biddle 1970, 312–13). A similar sequence was found on the street leading through the South Gate (Biddle 1975a, 116–18). Ultimately, these attempts at maintenance failed, however, as the gate was blocked at some point before the 7th century.

In the countryside, the main arterial routes probably survived the collapse of the Roman town: indeed, stretches persist in use as roads to this day. Nearer the town, in the northern and eastern suburbs, however, the road infrastructure began to crumble, with dating evidence from the northern suburb suggesting that this downturn again occurred in the mid- to late 4th century. In the northern suburb, deposits of dark earths and waterborne soils began to form as buildings gradually went out of use. It seems, then, that the decline that began in the mid- 4th century was terminal, and by the turn of the 5th century, *Venta Belgarum* as a town (rather than a collection of decaying buildings) had disappeared.

The cemeteries close to the East Gate seem, from the evidence of coins, to have continued in use until the end of the 4th century or even into the early 5th. Likewise, only a few of the graves in the Oram's Arbour ditch were later than silting deposits containing coins dated up to AD 402 (P1). In the northern cemetery, however, both to the east and the west of the Cirencester road, a new phase of burial was initiated apparently around AD 390 (Clarke 1979; P1). Finds are usually late Roman in type (but see Clarke 1979, 377–403) and it is difficult from this evidence to suggest an end date for the phase. It is conceivable, though, that burial continued here into the 5th century (P1). Graves at the most north-easterly edge of the eastern cemetery and furthest from the East Gate have similarities in burial practice with late (post-Roman) graves from cemetery sites further west such as Poundbury and Cannington. This has led to the suggestion that this area also continued in use during the 5th century, although firm dating evidence is lacking.

4 The scope of the report

by M Gomersall, P J Ottaway, K E Qualmann, and H Rees

With the growth of Rescue Archaeology since the Second World War, and thanks to the efforts of Winchester City Council and the Winchester Excavations Committee, the character of the occupation both within the walls and in the suburban areas has been illuminated by numerous excavations. To date, however, there has been very little excavation to the south of the city wall in the southern suburb. Almost all of the sites considered as part of this particular publication programme were recorded within the period 1972–86. The full gamut comprises diverse kinds of archaeological intervention: survey, including building survey, surface collection, observation, watching brief and salvage recording, and trial and full excavation.

Topographically, the sites are broadly divided into two: those in the suburbs and those on the defences. Within this, each of the northern, eastern, and western suburbs has a distinctive character of its own, and the grouping of individual excavations according to the area in which they were located is not merely a convenience for the purposes of publication. The city defences sites are a more disparate group than the suburban ones; the excavated areas not only took in the defences themselves, but often produced evidence of activity just inside the walls. In addition, the sites were dispersed around the circuit of the defences to

Table 1.3 Northern suburb, city defences and western suburb: summary of bone groups

Northern suburb						
Victoria Road East and West: early Roman (late 1st to mid-2nd century)						
Site	**Group No**	**Archaeology**	**Trenches**	**No of frags**	**Period**	**Phases**
VRE	1	Cemetery	X–XV	847	5	Selected from 46–253
VRE	2	Deposits with butchery waste	X, XII, XIII	3126	5	105–06, 113, 181–6
VRE	3	Other deposits	X–XV	3883	5	Selected from 126–223
VRW	4	Ditch and path SW of Cirencester road	V	3374	2	902–16, 935
Victoria Road East: mid- to late Roman (except Period 5, late 2nd to 4th century)						
	Group No	**Archaeology**	**Trenches**	**No of frags**	**Period**	**Phases**
	1	Structure adjacent to Cirencester road – 2nd phase	X	162	5	155–67
	2	Site-wide accumulation 2	X	1070	5	195, 260–2, 266–9
	3	Oven (F846) and related deposits	XIII	191	6	293–9
	4	Oven (F846) and related deposits	XIII	1741	6	310–27
	5	Deposits contemporary with oven (F846)	XIII	1297	6	303–08
	6	Flint and silt deposits: NE part of site	XII	10	7	375–6
	7	Flint surface: NE part of site	XII	176	7	378
	8	Silt deposits: NE part of site	XII	642	7	379–81
	9	Silt deposits: NE part of site	XII	124	7	382–3
	10	Building 1: NE part of site	XII	735	7	385–6
	11	Silt deposits: NE part of site	XII	829	7	387–9
	12	Building 2nd phase: NE part of site	XII	1379	7	393
	13	Silt deposits: NE part of site	XII	1068	7	394–9
	14	Building 2: NE part of site	XII	224	7	402–10
	15	Structure adjacent to Cirencester road: 4th phase	X	153	7	328–38
	16	Structure adjacent to Cirencester road: 5th phase	X	72	7	468–9
	17	Building 3	XV	100	7	341–6
	18	Building 4	XV	186	7	426–41, 445–7
	19	Well F1096	XV	1612	7	348
	20	Well F1093	XV	1993	7	442
	21	Pit F168	X	183	7	479
	22	Pit F814	XIII	2132	7	480
	23	Pit F981	XIV	320	7	450
	24	Pit F1098	XV	92	7	471
	25	Ditch F122/F1202	X/XVI	194	7	465
	26	Site-wide accumulation 3	X, XI, XII, XIV, XV	990	7	276, 287–92
	27	Deposits contemporary with site-wide accumulation 3	XIII	110	7	369–73
	28	Deposits post-dating Building 3	XIII, XV	540	7	349–57, 361–2
	29	Deposits in W part of Tr X	X	271	7	358–60
	30	Late Roman – post-Roman deposits	XV	542	7	461–4, 472–5

Table 1.3 (*cont.*) Northern suburb, city defences and western suburb: summary of bone groups

Victoria Road West: mid- to late Roman (mid-2nd to 4th century)

Group No	Archaeology	Trenches	No of frags	Period	Phases
1	Possible structural features	V	360	3	917
2	Building 1	V	31	3	918, 922
3	Building 2	V	585	3	919, 923, 925, 929
4	Building 3	V	460	3	920, 926, 930
5	Building 4	V	238	3	921, 927–8
6	Pit F64/70	V	205	3	932
7	Metalled yard surface, occupation deposits and silts	V	742	3	924, 931
8	Features in the western area of Trench V and earliest silts in Trenches IV and VI	IV–VI	71	3	933–5
9	Deposits contemporary with the earliest graves	IV–V	369	3	938–9
10	Bank of the ditch F12	V	197	3	951–4
11	Fill of ditch F12	IV - V	1604	4	941–4, 946–8, 950
12	Well F46	V	907	4	945
13	Well F18	V	170	4	949
14	Well F43	V	1959	4	956
15	Bones from Roman graves	IV - V	174	4	
16	Deposits and features over the cemetery	V	813	4	965, 968
17	Late features	V	492	4	969

Hyde Abbey 1972 (late 3rd to 4th century)

Group No	Archaeology	Trenches	No of frags	Period	Phases
1	Street	I–IV	549	1	1–4, 8
2	Buildings 1–3	I–IV	378	2	5–6, 9–11
3	Ditch F37	II	196	2	7

Hyde Abbey 1974 (all Trench XI)

Group No	Archaeology	No of frags	Period	Phases	Date
1	Roadside (?) ditch	13	2	52–3	Early Roman
2	Structural remains Groups 1–3	51	3	55–9	Later 2nd? – late 3rd/4th century
3	Structural remains Group 4	170	3	76	Later 2nd? – late 3rd/4th century
4	Structural remains Group 5	302	3	60–1	Later 2nd? – late 3rd/4th century
5	Structural remains Groups 6–7	860	3	64–7	Late 3rd – 4th century
6	Silt and loam deposits	839	3	68	Late 3rd – 4th century
7	Structural remains Group 8	385	3	69–71	Late 3rd – 4th century
8	Latest Roman – post-Roman deposits	991	3	74–5	4th century and ? later

Table 1.3 (*cont.*) Northern suburb, city defences and western suburb: summary of bone groups

City defences

Jewry Street, Crown Hotel (JCH)

Group No	Archaeology	No of frags	Trenches	Phases	Date
1	Developed soils and assoc features	61	II	707–10	Late 1st – early 2nd century
2	Developed soils	42	III	323–4	Late 1st – early 2nd century
3	Developed soils & building remains F87	105	III	320–2	Late 1st – early 2nd century
4	Soil layers	359	III	317–19	2nd century
5	Pit F72 and post-holes	187	III	315	Late 2nd – 3rd century
6	Town rampart	219	III	311–14	Late 2nd century

27 Jewry Street (27JS)

Group No	Archaeology	No of frags	Trenches	Phases	Date
1	Roman street and gully F76	82	I	3–4	Late 1st – early 2nd century
2	Roman street 2nd phase and assoc. conts	261	I	5–7	Mid-/late 2nd century
3	Buildings over Roman street	197	I	8–9	Late 2nd – 4th century
4	Soil over Roman street	59	III	32	Late 2nd century and later

Henly's Garage

Group No	Archaeology	No of frags	Phases	Date
1	Developed soils and early features of occupation	43	1–3	Late 1st – 2nd century
2	Disuse of early properties	34	4–7	Late 2nd century
3	Occupation	92	9–11	Late 2nd – 3rd century
4	Well F38 – upper layers	339	32	Late 2nd – 3rd century
5	Hill wash over rampart	150	15	Late 3rd – 4th century
6	Masonry town house	384	23–5	Late 2nd – 4th century
7	Late Roman pits and wells	706	16	Late 3rd – 4th century

Western suburb

Site	Group No	Archaeology	No of frags	Period	Phases	Date
Crowder Terrace	1	Ditch fill	8817	-	10	Early 2nd century
Sussex Street Tr XIV/New Road	2	Iron Age enclosure ditch fill	415	SXS–NR 3	SXS4–10 NR 6	Early Roman
New Road	3	Late Roman cemetery	340	4	12–22	Late 3rd – 4th century
New Road	4	Deposits over cemetery	222	5	23–26	Late 4th – 5th century
Crowder Terrace	5	Pit fill	240	-	13	4th century

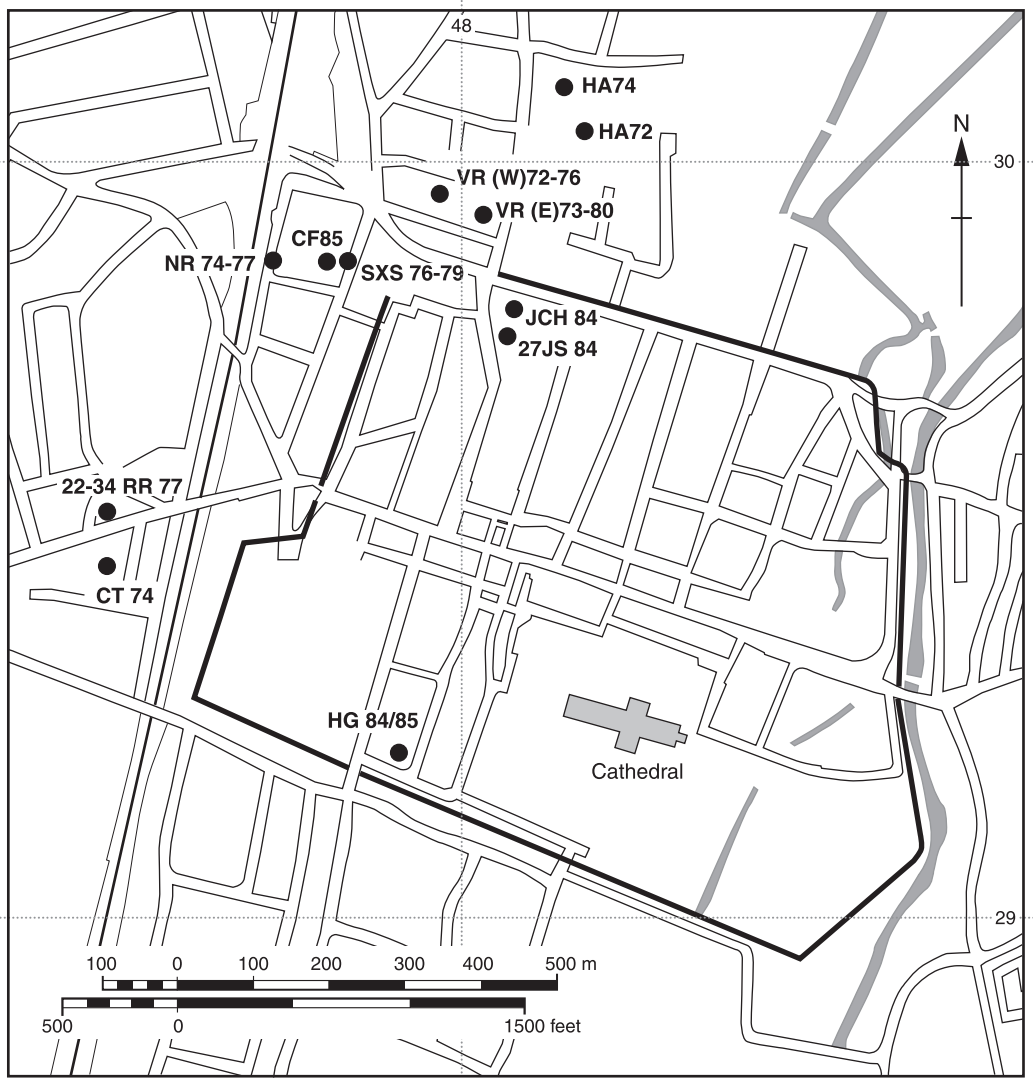


Figure 4 Sites location plans

the north, east, and south. Thus, although the term has been retained here, the sites can just as usefully be viewed individually.

The evidence for animal bones, plant remains, and mollusca presented here comes from a subset of the complete 1972–86 list of excavated sites and contexts, selected after post-excavation assessment (Fig 4). A full description of the prehistoric, Roman, and post-Roman archaeology of the suburbs and defences of Winchester is contained in other volumes in this series (Qualmann *et al* 2004; P1, P2, P3, P7, and P8). A summary account of the sites from which the material in this volume derives follows below. The sizes of the areas opened up for excavation at each site are given in Table 1.2, but it should be emphasised that not all trenches contained archaeologically significant deposits, that some trenches were not excavated fully to natural, and that some areas were rapidly salvage recorded.

In addition, the report on each group of animal bones (Parts 2 and 3) is accompanied by a brief description of their provenance. A list of the groups of animal bones in the order in which they are described in Parts 2 and 3 appears in Table 1.3.

In Mark Maltby's analysis of the faunal remains from mid to later Roman contexts at sites in the northern suburb and defences (Section 2.2), the groups were amalgamated into thirteen assemblage groups to enable general comparisons between sites and between context types. These assemblage groups, with individual groups from which they are made up, are listed in Table 1.4

Finally, the provenance of the botanical material selected for consideration in Part 4 may be summarised as follows:

1. Buried soils at Sussex Street, Victoria Road East (Periods 4–5) and Henly's Garage;
2. The Roman (*c* AD 70–250) cemetery at Victoria Road East (Periods 5–6);
3. An oven (F846) used during the late 2nd and early 3rd centuries at Victoria Road East (Period 6);
4. A later Roman cess pit and a late 4th-century feature of occupation at Henly's Garage.

Table 1.4 Assemblage groups of faunal remains

Assemblage group name	Bone groups
Victoria Road East wells and pits	VRE19–24
Victoria Road ditches	VRE25, VRW10–11
Victoria Road East buildings - and other structures	VRE1, 3–4, 14–18
Victoria Road East north-east corner	VRE6–13
Victoria Road East other	VRE2, 5, 26–30
Victoria Road West pits	VRW6, 12–14
Victoria Road West buildings	VRW1–5
Victoria Road West other	VRW7–9, 15–17
Hyde Abbey buildings (and structural remains)	HA72.2, HA74.2–5, 7
Hyde Abbey other	HA72.1 and 3, HA74.1, 6, 8
Jewry Street Crown Hotel	JCH1–6
27 Jewry Street	27JS1–4
Henly's Garage	HG1–7

It should be noted that some reinterpretation of the archaeology of the Roman northern suburb has taken place since the publication of the volume dealing with finds from the same sites (Rees *et al* 2008). For more detailed information and concordance of the environmental evidence with the artefact assemblages, the reader is referred to Appendix 2.

The structure of the report

Part 2 is a detailed analysis of the mammal and bird bones from Roman contexts. Sites in the northern suburb of the Roman town are considered first; the two Victoria Road sites (East and West) produced the largest sample of bones of any of the sites in this volume, but there is also a smaller group from Hyde Abbey. The report on the northern suburb is followed by that on sites within the city defences: 27 Jewry Street; Crown Hotel, Jewry Street; and Henly's Garage.

At the beginning of the northern suburb report is the analysis (Section 2.1) of bone from mid-1st-century to mid-2nd-century contexts at Victoria Road East and West by Julie Pfeiffer. This was prepared during the mid-1980s, before Mark Maltby had undertaken analysis of the mid-2nd-century to late 4th/early 5th-century material. Included at the appropriate point in Maltby's report is a contribution by Andrea Bullock on fish from mid-2nd- to late 4th/early 5th-century deposits at Victoria Road East (pp 238–245). Maltby's discussion (Sections 2.2, pp 245–304 and Section 2.3) takes into account both Pfeiffer's and Bullock's work.

Part 3 is concerned with the western suburb of Roman Winchester and presents reports on selected faunal remains (Coy and Bradfield , Section 3.1) and mollusca (Thomas, Section 3.2). The faunal remains comprise a much smaller amount of material than comes from the northern suburb, as might be expected given the kinds of contexts excavated. Nevertheless, the analysis is published so that comparisons between suburbs may be made. This report was compled in the mid-1980s, as in the case of Section 2.1, before Maltby's report on the northern suburb.

Part 4 is a report by Francis Green on botanical remains from all of the sites considered in this volume.

The northern suburb: Victoria Road and Hyde Abbey

The two sites in the northern suburb included in this volume are Victoria Road (VR) and Hyde Abbey (HA).

Figure 5 gives a schematic representation of the main results from the excavation of the two sites.

Victoria Road (Plates 1–2; Fig 6)

This site name and the VR code (VR 72–80) was given to two large areas of excavation (centre at NGR SU480300), referred to below as Victoria Road East and Victoria Road West (VRE and VRW), and to a trench linking them. They were seen as a single response to the proposed construction of a major new road. Nearly 2500 square metres were hand excavated by the Winchester Archaeology Office between 1972 and 1980, comprising one of the largest archaeological investigations to have taken place in Winchester.

Victoria Road West (Trenches I–VI) was immediately south of Victoria Road itself and to the north of Swan Lane, and Victoria Road East (Trenches X–XV) was adjacent to Hyde Street (by which name the site has sometimes been known). A trench (XVI), *c* 30m long, was largely machine dug across the line of the Roman

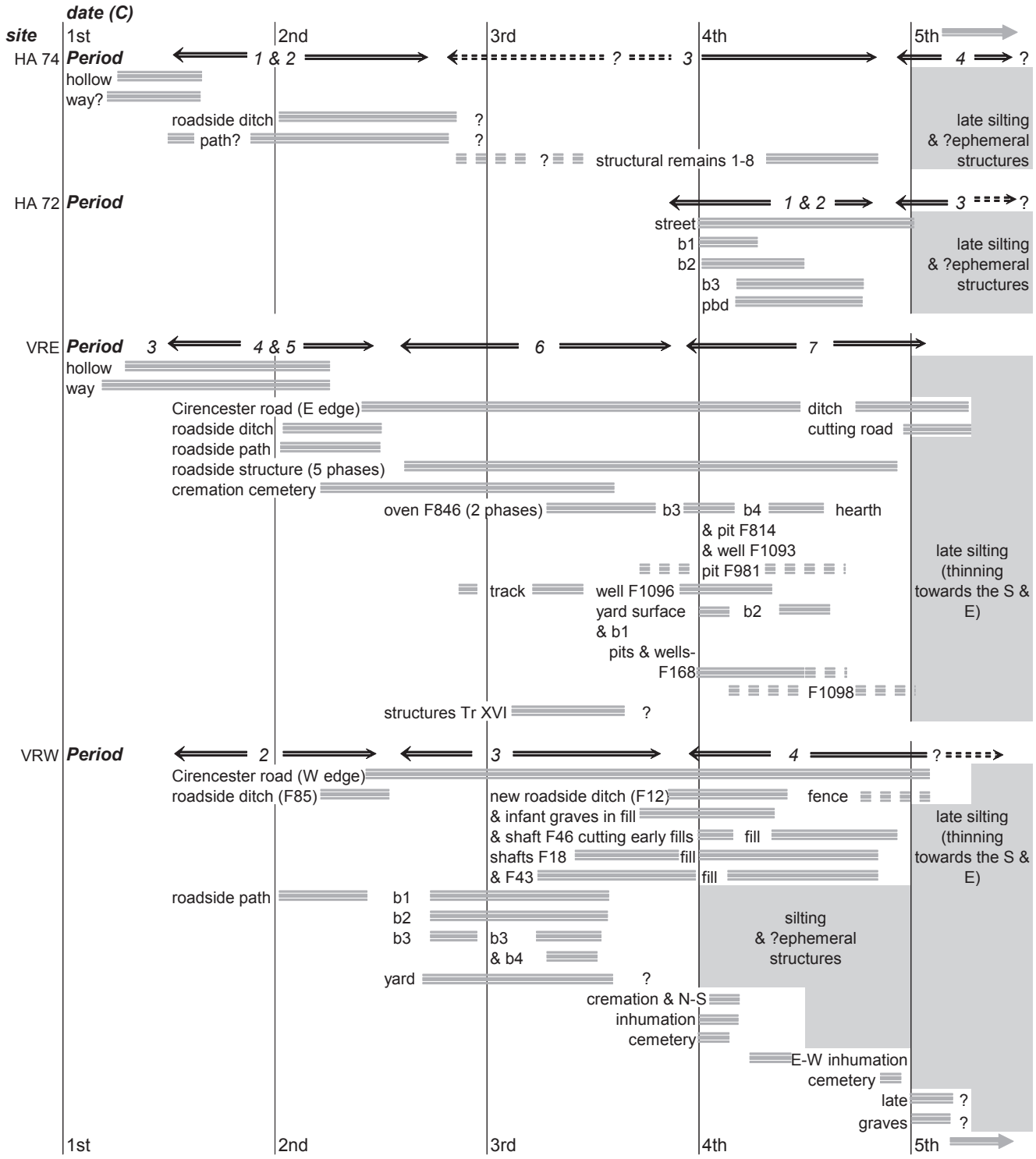


Figure 5 Roman northern suburb: summary of excavations

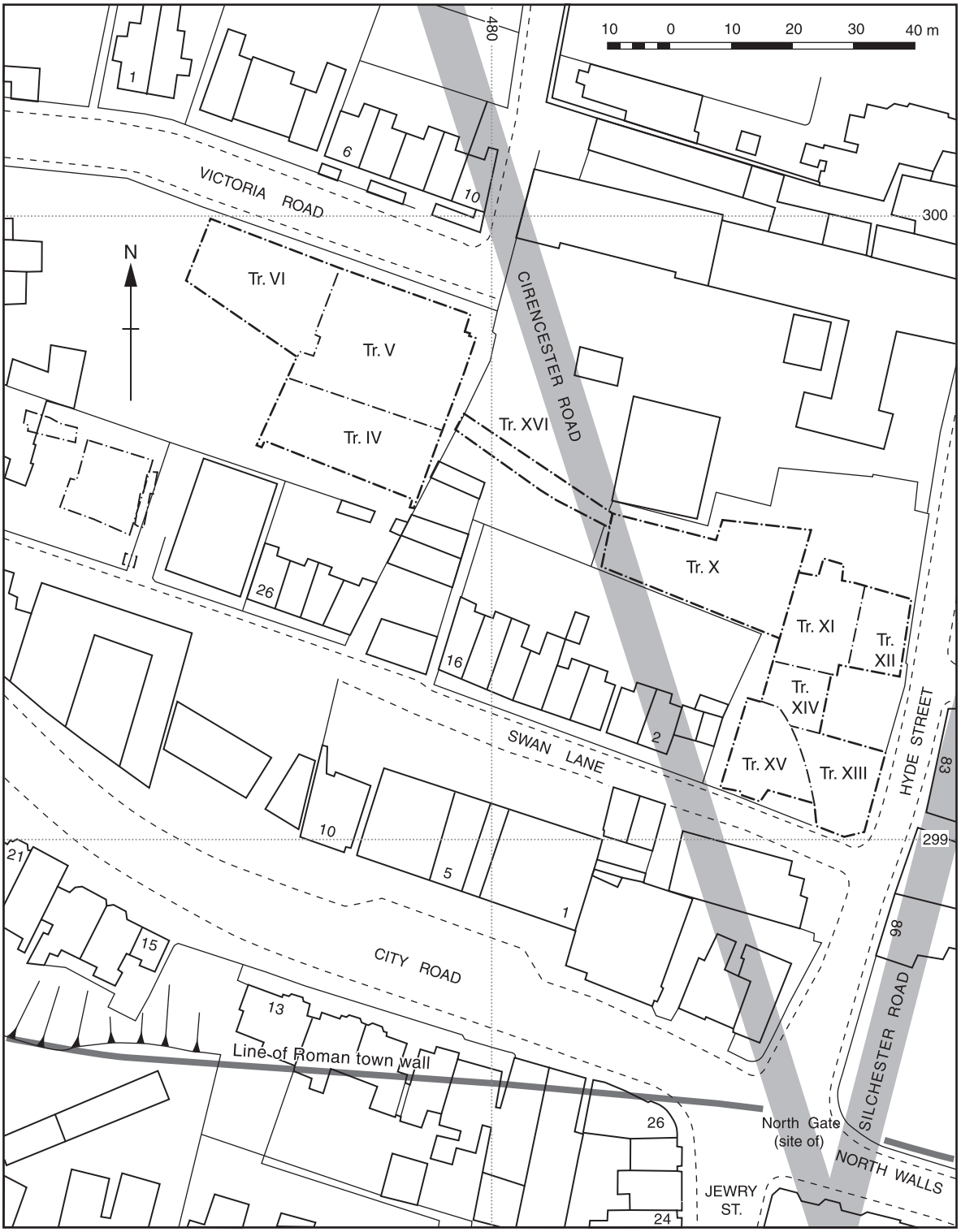
b: building; pbd: property boundary ditch

road to Mildenhall and Cirencester in order to create a stratigraphic link between the eastern and western sites, although it did not quite reach as far as Victoria Road West. This trench is considered to belong to Victoria Road East.

Substantial deposits dating from the prehistoric through to the post-medieval period have been recovered from these excavations. The prehistoric archaeology is described in Qualmann *et al* 2004, the Roman archaeology in P1 and P3 and the Saxon, medieval, and post-medieval archaeology in P7.

The sequences and period dating of the two parts of the Victoria Road site may be correlated by reference to Table 1.5.

The earliest Roman period on Victoria Road East (Period 4) was marked by the continuing use of a late Iron Age hollow way on a north–south alignment which originally led to an entrance in the Oram's



Excavation area

Line of Roman road

Roman defences

Figure 6 Location plan of the Victoria Road trenches, also showing the Cirencester and Silchester roads

Plate 1 General view of Victoria Road East. From the east, showing (from west to east), the eastern edge of the Cirencester road, the roadside path and ditch, and some of the features associated with the earlier cemetery

Table 1.5 Correlation of periods at Victoria Road East and West

Date	West – periods	East – periods
Bronze Age	–	1
Early Iron Age	1	2
Middle Iron Age – early Roman	–	3
Mid-1st – early 2nd century	2	4
Late 1st – mid-2nd century	–	5
Mid-2nd – late 3rd century	3	–
Late 2nd – mid-3rd century	–	6
Late 3rd – late 4th century	4	7

Arbour enclosure. Cut roughly parallel to this and *c* 10m to the west, either at the end of the Iron Age or early in the Roman period, was a substantial ditch. Encountered on the west side of the site was the main Roman road to Cirencester (F105) laid out on a north-west/south-east line which probably originated in the mid-1st century. It was flanked by a path and ditch (F258). Between the road and the ditch there were a number of post-holes which suggest a structure or structures of some sort, but not in such a regular pattern as to be a building; a further four phases of this structure were identified, the last two belonging to the late 3rd – 4th centuries (Period 7).

The main road leading from Winchester to Silchester located at 82 Hyde Street (Collis 1978, 119–42; Birbeck and Moore 2004) probably had a contemporary origin. In the roughly triangular area between the two roads a cemetery developed. 204 graves were recorded of which 184 were of late 1st-century to mid-2nd-century date (Period 5). The earliest can be dated to the third quarter of the 1st century, although cremation burials thought to date *c* AD 55–65 were found at 82 Hyde

Plate 2 General view of Victoria Road West. View from the south, showing (from north-east to south-west), the later cemetery area partially excavated, the cemetery boundary ditch, the roadside boundary ditch and path, and the western edge of the Cirencester road

Street (Birbeck and Moore 2004) immediately east of the site. On stratigraphic grounds the Victoria Road graves were divided into two phases, apparently separated in some parts of the site by an accumulation of clayey material ('site-wide accumulation 1'). As it was not always easy to establish the stratigraphic position of grave cuts, the distinction between the two phases is not clear cut and there is unlikely to have been a break in the use of the cemetery until the mid-2nd century. After a further accumulation of clayey material ('site-wide accumulation 2'), another twelve graves formed a distinctly later phase and probably belong to the early to mid-3rd century (Period 6). A few infant burials are not closely datable. The graves produced *c* 130 cremation burials and 80 inhumations, mostly of infants. Originally, there may have been as many as twice the number of graves but the site was heavily disturbed by post-Roman pits and other features.

A small number of the cremation graves contained animal bones – either deliberately buried skeletal components or fragments – probably included accidentally in the grave fill (Section 2.1, Group 1, pp 32–35). There were also a few deliberate animal burials. By the beginning of the 2nd century, the cemetery had received a boundary ditch (F911/F915) on its east side which, for most of its length ran north-west/south-east parallel to the Cirencester road. This was recut (F525/F704) in the mid-2nd century and remains of an inner bank have survived. Within the bank was the burial of an almost complete horse skeleton (Plate 5), one of the more remarkable discoveries from the excavation.

By the mid-2nd century, the hollow way had ceased to be a feature of the landscape. During this period, there was a quantity of butchery waste (Section 2.1, Group 2) deposited in material accumulating over the southern end of the feature (in Trench XIII). Some similar material was also found in the fill of the recut cemetery boundary ditch and the fill of the roadside ditch (F258). Fragments of bone recognisable as unfinished artefacts (mainly hairpins) were also included in these deposits. These fragments have been catalogued and discussed elsewhere (Rees *et al* 2008, 187–92).

Whilst the cemetery area remained largely unused in the late 2nd – mid-3rd century (Period 6), in the south-eastern part of the site (Trench XIII) a clay oven, perhaps for malting and/or drying grain (see Part 4), was constructed and two phases were identified. A relatively large assemblage of bone came from deposits in and around the structure.

At Victoria Road West, the earliest Roman feature was the ditch running along the south-west side of the Cirencester road (Period 2). This was recut on several occasions. Otherwise there was little evidence for activity on the site until the mid- to late 2nd century (VRW Period 3) when Buildings 1–4 were constructed along the south-west side of the Cirencester road. These buildings probably had walls with upright posts resting on timber sill beams and in places it seems likely the uprights were placed directly on, or sunk into, the ground surface. The walls were probably constructed of wattle and clay and the roofs were probably thatched. There was little uniformity in their size and ground plan. It is likely that these buildings served travellers, perhaps with food, drink, and other commodities. The buildings had probably ceased to exist by the middle of the 3rd century. Dug on a north-west/south-east line behind the buildings was a ditch (F12), which served as the boundary of a cemetery established in the late 3rd century.

Intensive use of Victoria Road East appears to have lasted from the late 3rd to mid-4th centuries (Period 7), following a third episode of accumulation across the site ('site-wide accumulation 3'). In the north-eastern part of the site, there was a sequence of flint surfaces, one at least for a post-built structure (Building 1). This surface was interleaved with silty deposits before the construction of a timber building with a chalk floor (Building 2) took place. In the south-western part of the site (Trench XV), located close to the line of the Cirencester road, there were two buildings (Buildings 3–4) similar in construction to those on Victoria Road West, also having chalk-filled trenches or chalk spreads as the base for a timber superstructure. More or less contemporary with these buildings were two deep wells (F1093 and F1096) and four pits (F168, F814, F981, F1098), which contained some very large assemblages of animal bone.

From the late 3rd century onwards, Victoria Road West was the site of a cemetery that contained some 120 inhumation graves and six cremations. There were three principal burial phases, the first dating to *c* AD 270–320, the second beginning *c* AD 340–50, and the third probably beginning in *c* AD 390. Cut into the infill of the ditch (F12) were two deep wells (F18 and F46), with a third (F43) lying just to the south of the ditch.

On Victoria Road East, a decline in level of activity probably began in the middle of the 4th century. The Cirencester road is likely to have been out of use by this time, the buildings had ceased to stand, and the wells and large pits were largely filled in.

Hyde Abbey (Fig 7)

North-east of Victoria Road, excavations at Hyde Abbey in 1972 (HA 72) and 1974 (HA 74) also produced samples of animal bone that have been included in this report.

It was hoped to encounter the Winchester to Silchester Roman road on the site but no certain trace was found. There were few remains of the early Roman period, but evidence for suburban growth dating from the late 3rd – 4th century was found in the 1972 excavations. This took the form of a street running south-east from the Silchester road and the remains of three timber buildings (Period 2). In 1974, a sequence of what appeared to be structural remains comprising chalk and flint surfaces interleaved with other deposits was revealed (Period 3). These remains may

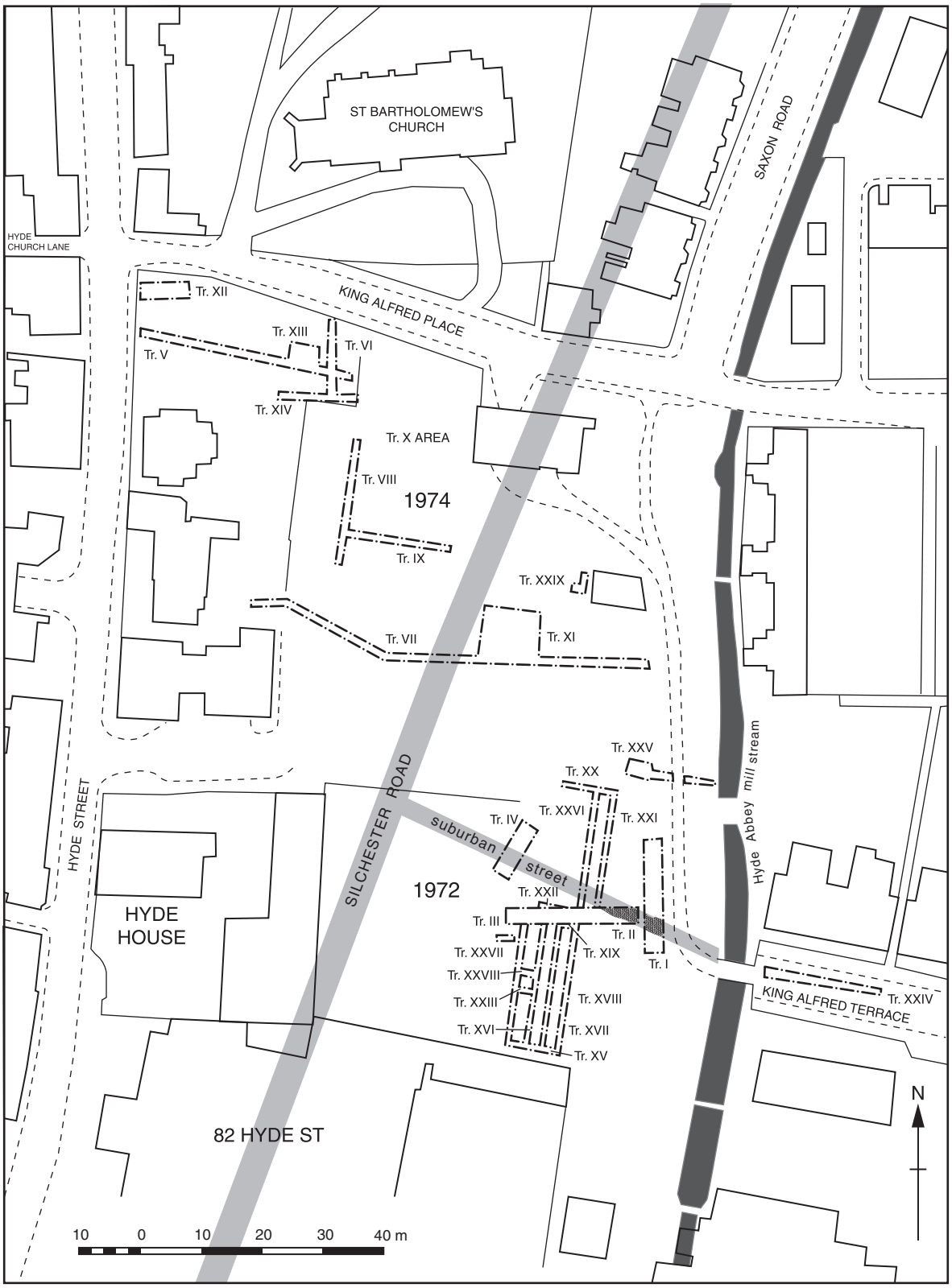


Figure 7 Location plan of the Hyde Abbey trenches, also showing the Silchester road and the suburban street

have represented buildings, but no coherent plans or parts of plans could be identified and they may have been, at least in part, exterior yards or ground consolidation material. Dating of this sequence was uncertain as the earlier structures produced pottery overwhelmingly of the later 2nd and 3rd centuries with tiny amounts of material dated post–AD 270, as well as coins of the 2nd and earlier 3rd centuries. The later structures were more certainly of the late 3rd and 4th centuries.

The western suburb within the Iron Age enclosure: New Road and Sussex Street

The landscape of the western suburb in the Roman period was dominated by what remained of the Oram's Arbour Iron Age enclosure located on the lower terrace of the western slope of St. Paul's Hill. A ditch of V-shaped cross-section, 3.5m– 4m deep and 7m–7.5m wide, once fronted by a rampart possibly about 8.5m wide, defined the northern, western, and southern sides of the enclosure, but no certain trace of the eastern side has been identified. The flood-plain may have been a sufficient barrier to negate the need for a ditch, but deposits thought to represent the slighted rampart have been identified in various parts of the presumed eastern circuit (*cf* Cunliffe 1964). As reconstructed, an area covering about 20ha was enclosed (Qualmann *et al* 2004), but its eastern half was obliterated by the construction of the new town from *c* AD 70 (Figs 1 and 2). The present sample includes material from two excavations located on the northern side of the circuit, to the west of and close to the main city defences. Figure 8 shows the location of these sites, along with others in the same part of the enclosure.

Like the Victoria Road site, substantial deposits of the prehistoric, Roman, and post-Roman periods were recorded from both excavations. At Sussex Street (SXS 76–79) a section excavated through the enclosure ditch (in Trench XIV) showed that, although erosion and silting had taken place within the ditch from middle Iron Age times, it still formed a significant (and deep) feature of the landscape at the beginning of the Roman period. Episodes of erosion and silting interspersed with deposits interpreted as representing periods of stable vegetation followed. At New Road (now Station Road, NR 74–77) to the west of Sussex Street (Figs 4 and 8), parts of the sequence were similar, but an episode of cleaning was also identified, suggesting that the ditch was actively maintained during the Roman period. Later, from around the third or fourth quarter of the 3rd century, the gradually silting ditch was used as a cemetery.

The contrast between the two sequences suggests that the part of the circuit which was closest to the north-western defences (sampled at SXS) went out of use at some time before the establishment of the cemetery. Corroborative evidence of this came from Carfax which was sited between the SXS and NR excavations (Figs 4 and 8). There, the bank(s) of upcast resulting from the episode(s) of ditch cleaning survived *in situ* on the northern lip of the ditch. Subsequently, the ditch to the east had been fully filled with material which may have supported an upstanding earthwork, whereas the cemetery began to develop in the by then butt-ended ditch to the west. The infilling of the ditch and the possible earthwork have been interpreted as marking the construction of a new entrance to the enclosure at the point where it abutted the Roman defences (Fig 3).

The area within the enclosure at SXS was devoid of Roman features of occupation up to 115m to the south of the enclosure ditch. Layers of dark brown soil observed in some trenches, and excavated in others (notably Trench VIII, 1976 and Trench XVII, 1979) and up to around 0.5m thick are interpreted as plough-soils. At NR, the only evidence of Roman activity was a small shallow feature located about 30m to the north of the line of the enclosure ditch.

Figure 10 summarises the results of the excavations.

The western suburb outside the Iron Age enclosure: Crowder Terrace (Fig 9)

The excavated trenches at Crowder Terrace (CT 74) were located around 125m south of the south-western corner of the Oram's Arbour enclosure (Figs 4 and 9). The earliest Roman deposits were soil accumulations up to 0.45m thick which have been interpreted (Part 3.2) as associated largely with stable grassland used for pasture. Cutting these deposits was a north–south ditch, probably a field boundary, which seems to have been extant between the mid- to late 1st century and the mid- to late 2nd. A large assemblage of bone-working waste was recovered from the latest fills of the ditch. Subsequently, several pits were dug on the site, the most significant of which (F10) produced a quantity of domestic debris of the late 3rd and 4th centuries, implying the presence of settlement nearby.

Figure 10 shows the excavated stratigraphic sequence for Crowder Terrace in diagrammatic form.

The northern city defences: 27 Jewry Street and Crown Hotel, Jewry Street (Fig 11)

Crown Hotel, Jewry Street (JCH 84) and 27 Jewry Street (27JS 84), are located at the corner of Jewry Street and North Walls and lie just within the line of the northern city defences, immediately south of the site of the Northgate. The site at 27JS lay well to the south of the line of the defences and therefore produced no evidence of their character and chronology, but it was included in this publication programme on account of its proximity to JCH (Figs 4 and 11). The results of the excavations are summarised in Figure 13.

At 27JS up to 0.15m of buried soil sealed natural and was cut by the post-holes of a timber building. This was deliberately dismantled prior to the creation of a series of enclosures, marked by lines of stake-holes, with an informal trackway between them. The trackway was later formalised as a flint-metalled street, 3.0m wide, with a shallow gully on the downhill side. The alignment was north-west to south-east, at variance with that of the earlier building and the main Roman street grid. A timber building of beam-slot construction, and with a hearth in one corner, fronted the street. These early phases can only be tentatively dated from limited ceramic evidence to the late 1st to mid-2nd centuries.

The street was resurfaced on two occasions, and

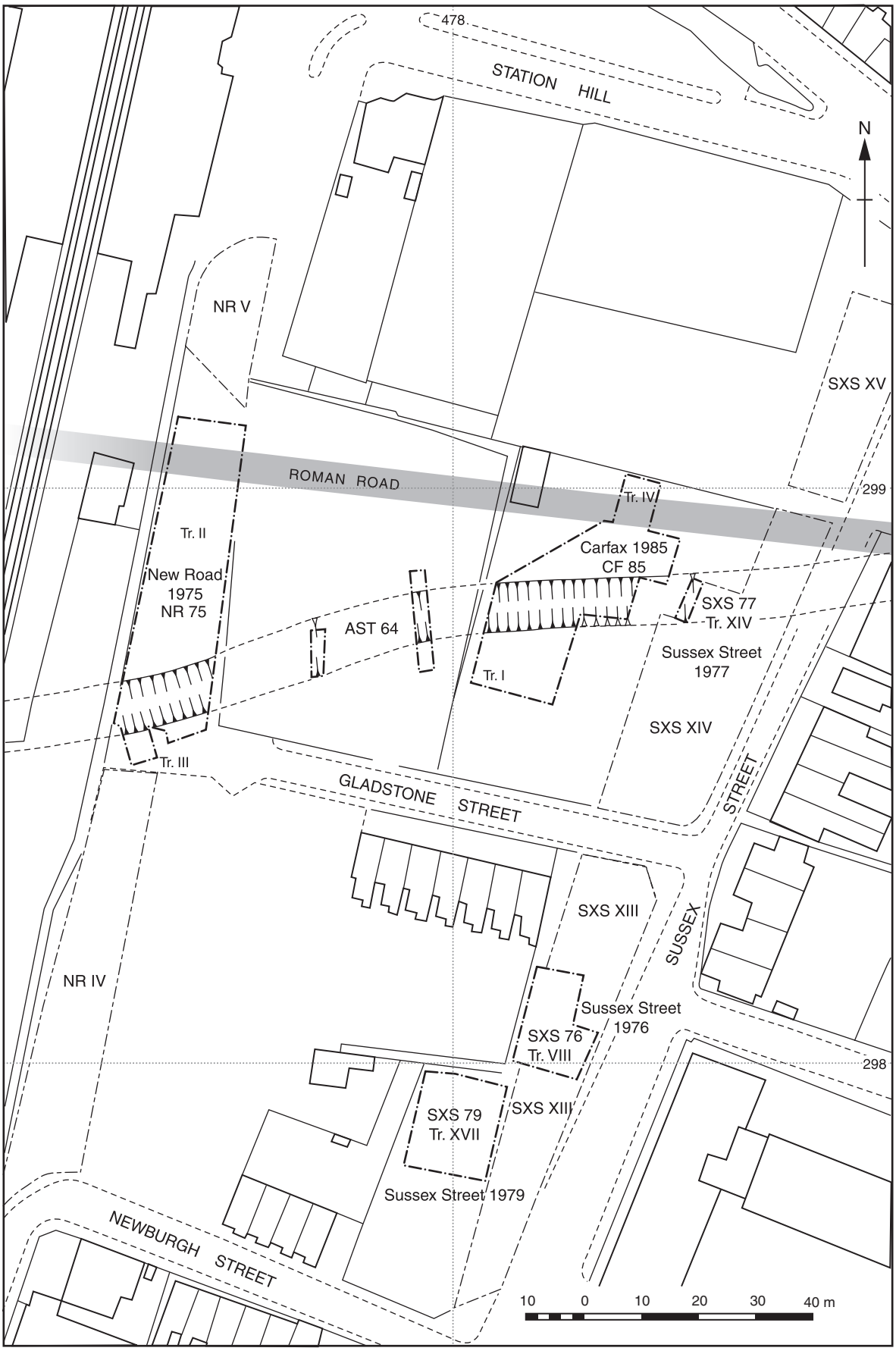


Figure 8 Location plan of the New Road and Sussex Street trenches in relation to other sites on the northern part of the circuit of the Oram's Arbour enclosure

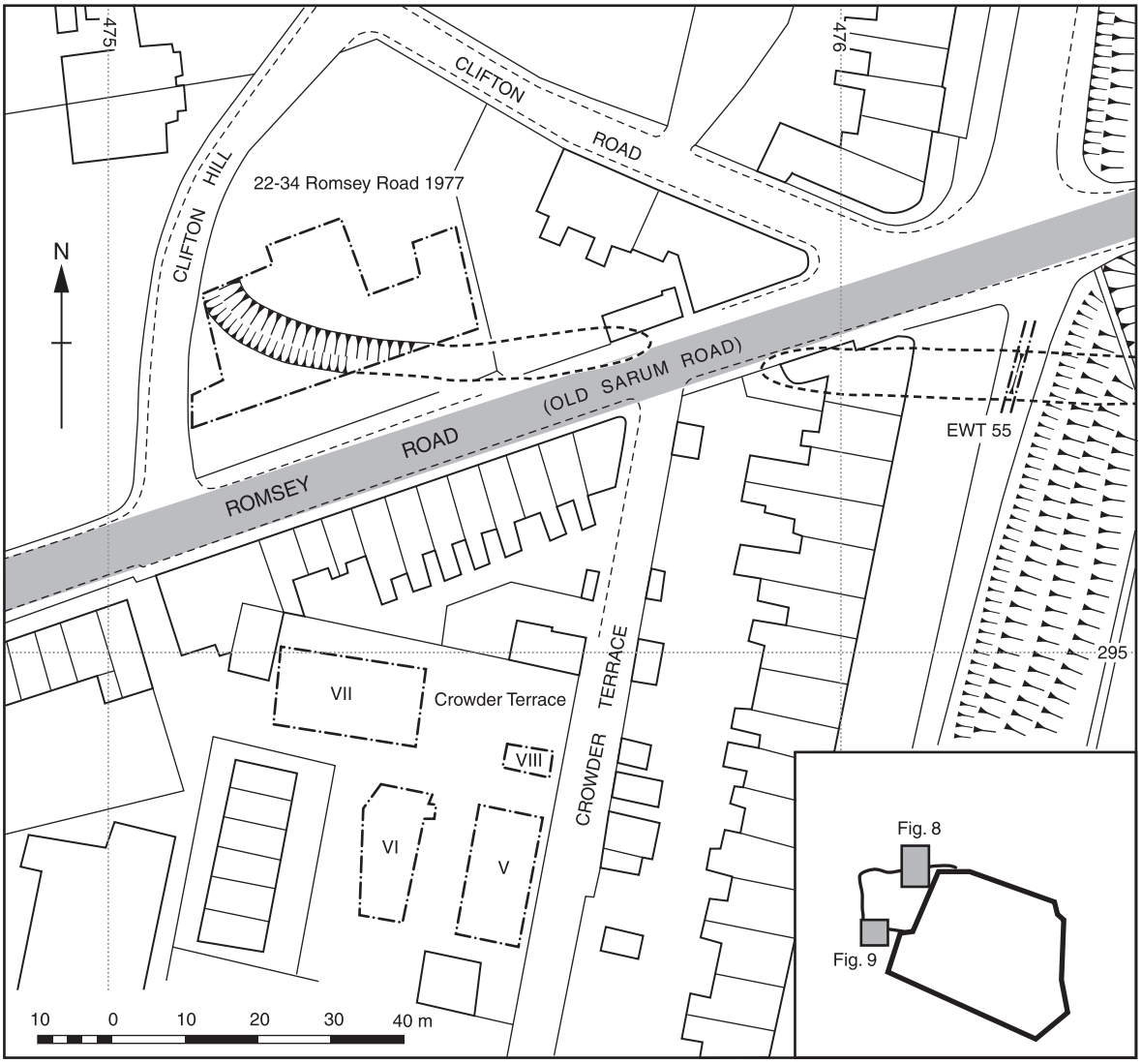


Figure 9 Location plan of the Crowder Terrace trenches in relation to the south-west corner of the Oram's Arbour enclosure recorded at 22–34 Romsey Road

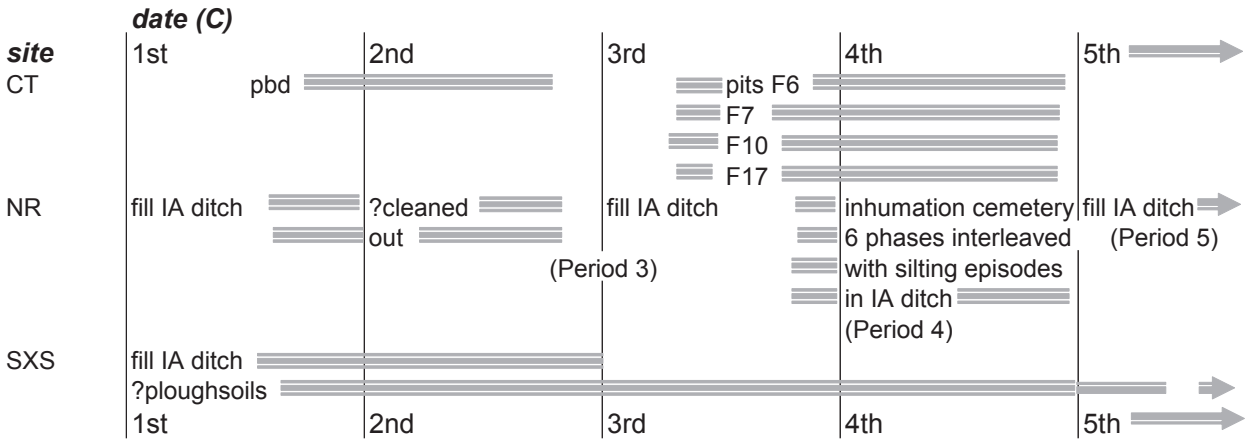


Figure 10 Roman western suburb: summary of excavations

pbd: property boundary ditch

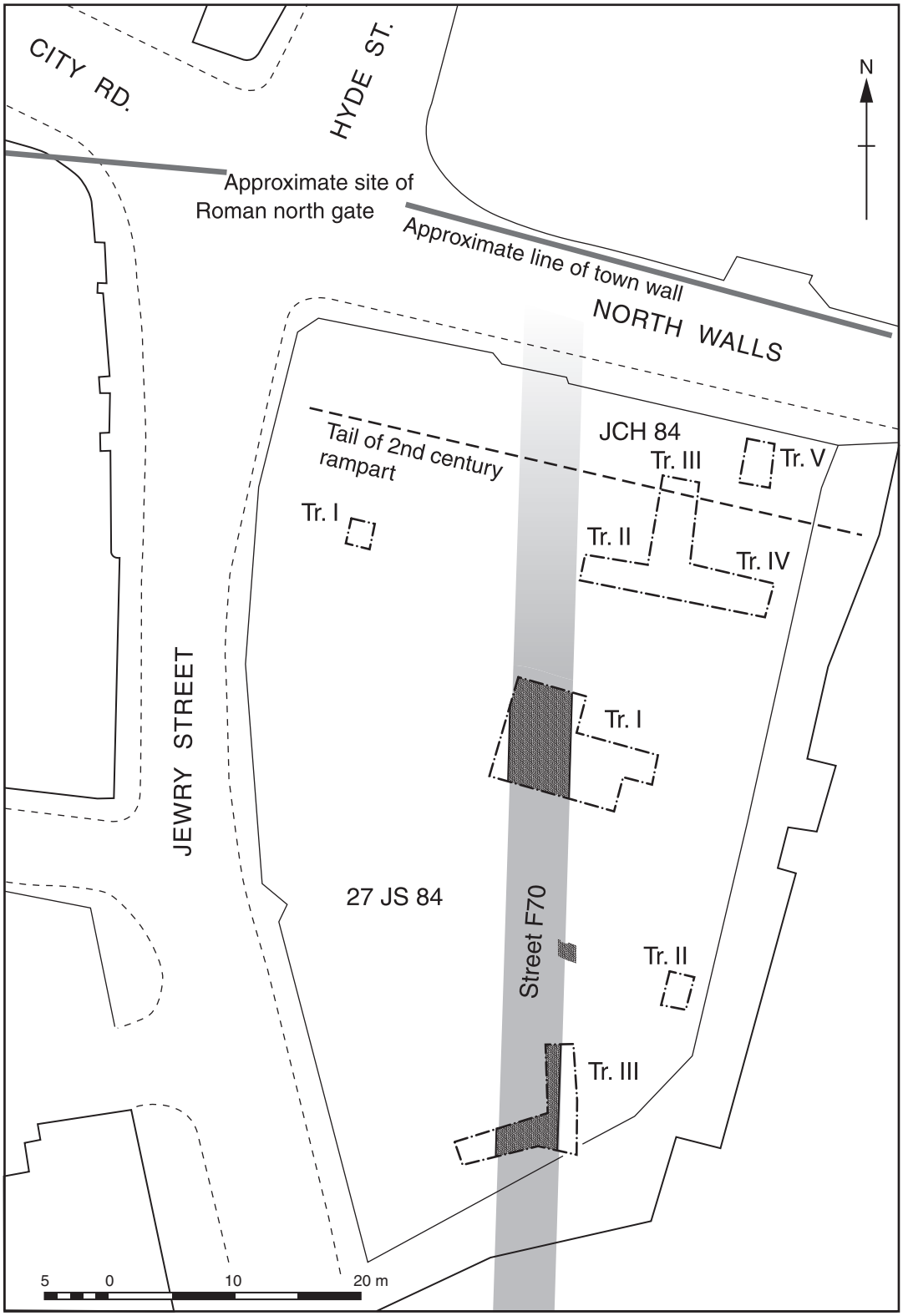


Figure 11 Location of the 27 Jewry Street and Crown Hotel, Jewry Street trenches

was widened to 4.5m. The building to the east was dismantled and a substantial fence built, separating the street from land now used for agricultural activity. Much domestic refuse of later 2nd-century date was incorporated in the cultivated soil. The street was abandoned in about AD 200 and overlaid by two timber buildings aligned on the main Roman north–south street located about 20m to the west. One of these was poorly preserved; the other combined ground beams and shallow flint foundations in its construction. These were in turn replaced in the late 3rd or early 4th century by a more substantial timber

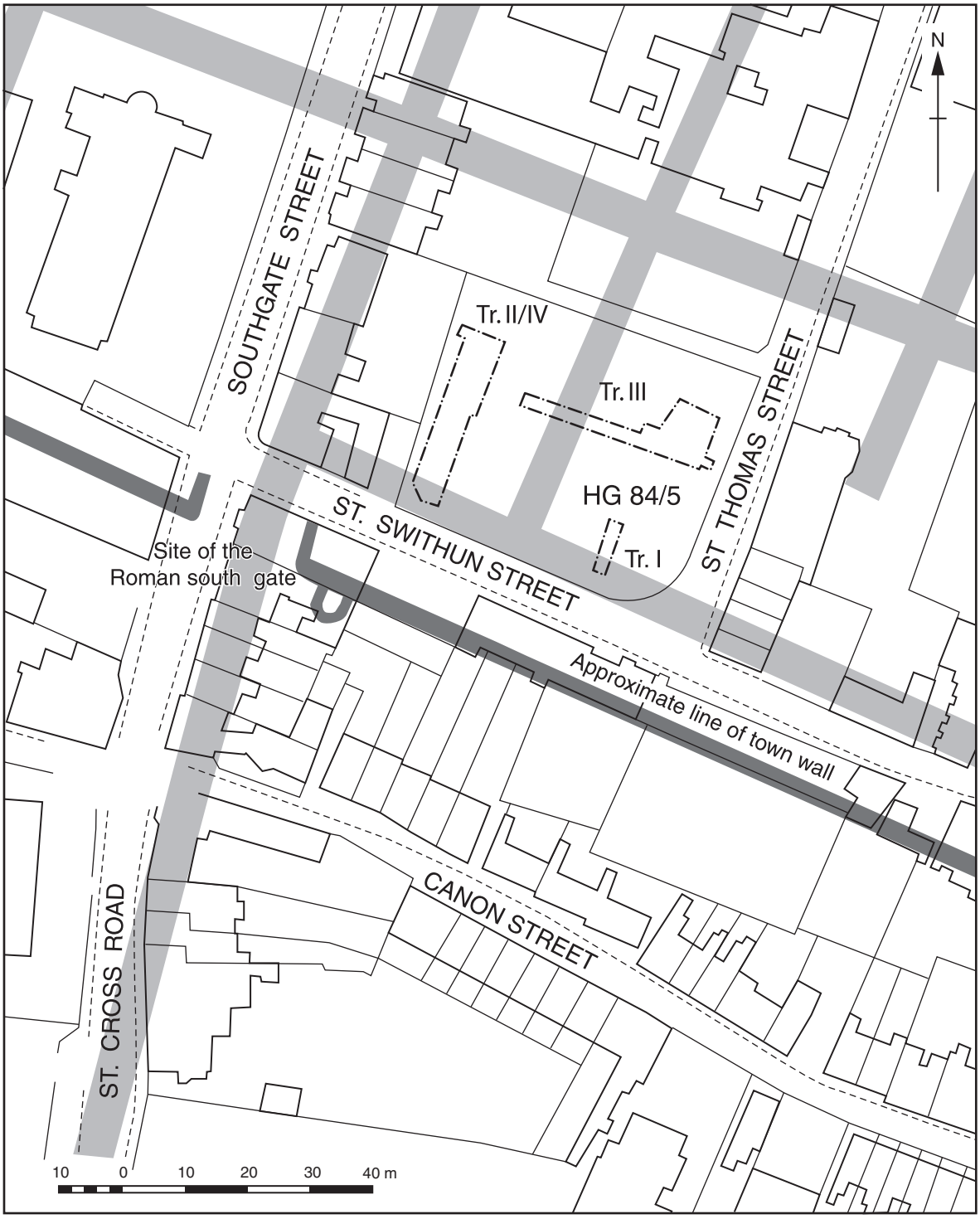


Figure 12 Location of the Henly's Garage trenches

building with rammed chalk floors. The uppermost part of the Roman sequence was represented by the collapsed roof of this building, including a number of diamond-shaped limestone roof slates, but no diagnostic dating evidence for this event was obtained.

At JCH, natural was once again sealed by a developed soil containing large quantities of late 1st-century to early 2nd-century pottery. Beam slots of a timber building cut this soil, and were sealed by a 0.75m thick dump of orange-brown clay loam, representing the extended town defensive rampart. A line of three post-holes marked the rear (south) of the rampart and may represent a timber revetment. Perhaps contemporary was a small pit cut into the rampart and containing a deposit of disarticulated immature sheep bones, overlaid by a deposit of charcoal with many bones of frogs and toads. At a later date, a human cremation burial in a necked greyware jar was cut into

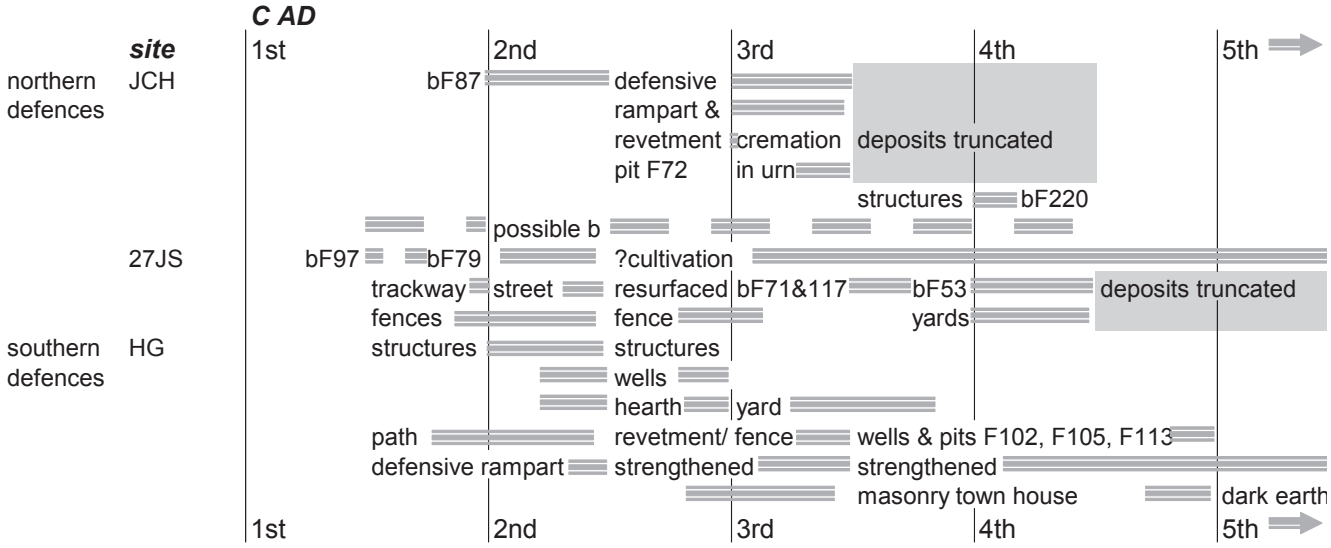


Figure 13 Roman city defences: summary of excavations

b: building

the rampart. Evidence for late Roman activity was confined due to truncation to the eastern part of the site where remnants of perhaps three separate phases of timber buildings were recovered.

The southern city defences: Henly's Garage (Fig 12)

The site (HG 84/85) lay just inside the southern defences, about 40m north-east of the South Gate (Figs 4 and 12). The earliest significant evidence of activity was a late 1st-century intra-mural track or street running parallel to the southern town defences. To the north were a series of shallow gullies, defining four narrow strip properties. Each property included a well, while a timber building, only partly excavated, extended to the east. During the 2nd century, soil eroded from the town rampart just to the south began to affect these properties.

In the last quarter of the 2nd century, the defensive ramparts were widened to the north, causing a new intra-mural track to be constructed and intra-mural property boundaries to be redefined. The infilling of one of the earlier wells included a rich assemblage of pottery dated to the late 2nd or early 3rd century. A metalled surface was laid north–south across the central area of the site at about this time, and to the west a substantial town house was built. This building continued in use until the end of the Roman period.

In the late 3rd or early 4th century, the town defensive rampart was again widened. Due to severe later truncation, only cut features survived from this period. These included four large pits, two wells, post-holes, possibly indicating revetment of the rampart defences, and a chalk-lined cess pit. This last feature was cut into the ramparts and was filled with material including a ceramic assemblage with a high proportion of colour coats and nine irregular barbarous radiates of AD 270–284.

Figure 13 summarises the stratigraphic sequences from the site.

5 Methodology and terminology

by M Gomersall, F J Green, and H Rees

Excavation and recording

The period since 1972 has witnessed the evolution of archaeological techniques in Winchester, as elsewhere, so practices carried out in 1972 had completely changed by the 1980s. There were also a number of problems in allocating time and resources to all of the various opportunities for investigation that became available during the period. This early problem of prioritisation did not disappear, but rather grew worse over time, as the dramatic rise in rescue archaeology throughout the country during the 1970s and 1980s was reflected in Winchester's experience. Thus, a number of the sites in this volume, especially after 1975, were excavated under rescue conditions.

It should be stressed at the outset, then, that within a broad framework of best practice, the quality of the data recovered sometimes varies from site to site in a way that may now be difficult to quantify. Nevertheless, it will be clear from subsequent pages that, where excavation under controlled conditions was possible, the principle of careful hand recovery of animal bones has been adhered to in the vast majority of cases. Moreover, the soil sampling policy, although it could not always be followed entirely consistently, has produced a useful complement of the smaller bones and some information from botanical remains.

Sampling and processing

Prior to 1974, soil samples were taken in order to augment the archaeological interpretation of particular deposits and also to recover environmental and economic data. It was realised that significant information could be retrieved from well-preserved waterlogged deposits. A system of sampling for biological materials was devised by the Winchester Excavations Committee, directed by Martin Biddle. Soil samples were removed on a judgemental basis, and the collection of botanical items such as nuts and fruit stones, readily identifiable botanical items, were also recovered by the excavators. Before 1974, these items were retained in separate organic finds sequences in a similar way to 'small' or other 'recorded' finds.

Processing of material from these earlier excavations by one of the present writers (FJG) was undertaken at the same time as the suburban excavations of the 1970s and 1980s were being carried out. This allowed the policy for sampling to be reorganised to include an enlarged range of deposit types, especially those that had the potential to inform the understanding of the wider environment and the economy of the suburban sites.

The sample sizes from the earlier period of excavation in Winchester had varied depending on the volume of the context excavated and the preservation conditions encountered. In practice, the average and normal soil sample size was approximately five litres. In an attempt to ensure a degree of consistency, so that comparisons could be made between the predominantly intra-mural excavations prior to 1974 and those from the suburbs discussed here, a sample volume of five litres was chosen.

The proviso was that deposits of greater than 300mm thickness or those that were in excess of 1m in surface area were to be routinely further sampled. Thus for every 100mm of depth and 100mm^2 of surface area, or both, it was recommended that further samples were to be taken by the excavators. The aim was to recover enough botanical material for reliable identification through aggregating the results from the individual samples. This was to ensure maximum retrieval of the range of species and at the same time allow worthwhile assessment of any variation in density of botanical components within a single deposit.

Further, the sampling programme allowed for removal of 100 per cent of specific deposits, for example large charred grain accumulations, again using five litres as the basic sample unit. The objective was that the distribution of plant material through deposits might lead to a better understanding of the processes that had originally contributed to their formation (Green 1979a, 17–38). Even in the early 1970s it was already clear that the principal range of cereal species was relatively well understood for the major periods in southern Hampshire and that more detailed questions of the evidence could and should be explored.

At the time when this process was implemented, it was then quite normal, especially on the larger prehistoric and Roman sites then being excavated, to remove very large individual soil samples, frequently to be processed in variations of the 'Siraf' seed machine. The formative work at Winchester experimented with such devices (Green 1979a, 307–09). This rapidly demonstrated the limitations of using such mechanical recovery devices to process the heavy clay-based and alluvial soils frequently encountered capping the chalk bedrock at Winchester (Green 1979a, 54). The five-litre sample units were an ideal size for rapid laboratory and highly controlled processing. This involved 100ml of 100 vols solution of hydrogen peroxide per 2500ml of water, and 2500ml of sample.

Flots were collected in a 250-micron sieve and the resulting plant assemblages identified using a low-powered binocular microscope. Also sorted for analysis were the bones collected in both the flots and the residues trapped in the 1mm-mesh sieves. The volumes of soil processed, the methods employed throughout each stage of processing, and the weights of the various organic and non-organic components of the processed sample were recorded on index cards, which now form part of the site archives.

It should be noted that this author (FJG) did not monitor, and thus further influence the sampling of the Henly's Garage site. On the other sites, daily or weekly monitoring visits were undertaken, so that changes to the quantities of samples taken were specifically influenced by prompt processing. The importance of rapid processing of samples, whilst deposits were still available for further sampling was significant. Of equal importance was the capability to determine that some contexts were not worthy of further sampling.

Further details of the contexts that could be sampled in this way are given in the individual reports in Parts 2 and 3. The sampling strategy for snails was designed to answer specific questions about the archaeology and environment of the western suburb and this is also described in more detail in Section 3.2.

Phasing and nomenclature

It has been the policy of the Winchester Museums Archaeology Section to regard the fieldwork stage of any project as incomplete until the stratigraphic analysis has been carried out (Qualmann and Scobie 1985–6). This has normally been achieved in a way similar to that described by Biddle (1990, 14–18), by grouping contexts or features or both, when they can be shown to be stratigraphically contemporary. These groups, known as phases, are the blocks from which is built the understanding of the development of the site through time and on which the wider interpretations of the site are based. Each phase is allocated a number, in the same way as contexts and features are during excavation.

This system has been of value in dealing with bulk finds such as the animal bones discussed in this volume, as it provides a means of grouping contexts, and thus enlarging the size of the sample to be studied, in a way that has an independent basis in the stratigraphic

evidence. Phase numbers are therefore used freely in the following chapters to refer to parts of sites and groups of contexts. Trench (Roman numerals), context (in italics), and feature (F) numbers are also quoted for the same reason (it should be noted that different trenches on the same site may have been allocated the same run of context numbers). At Victoria Road, where a number of phases could be interpreted with reasonable certainty as belonging to a larger structure or building, they have been allocated building numbers. Also in respect of Victoria Road and some, but not all sites, the phases have been subjected to a higher order grouping to create what are known as periods. For full details of contexts, phases, and periods the reader is referred to the site archives.

Dating

The stratigraphic phasing has been linked to real time mainly by taking into account the dating of the finds. In theory, when dating the deposits by reference to the finds, there are two extremes: in the first (well stratified), a *terminus post quem* (*tpq*) from the finds holds good for several successive phases of occupation and gives a relatively tightly defined dating based also on the assessment of the rapidity of structural change; in the second (poorly stratified), a *tpq* from the finds is the sole dating evidence, as comprehensive structural change has been lost to truncation, or was never present because the site was not intensively used.

In practice, the nature of the stratigraphy means that all shades in between the two extremes are encountered. On many of the major sites continual disturbance of the ground took place from the Roman period to the present day, and the potential for residuality is high, if difficult to quantify. Added to this, negative features may take a long time to silt up fully and deep features, such as pits and wells, may be subject to sinkage after infilling. In these cases, the date of use of the feature may bear little relationship to the date of the finds from its fill.

There are also a number of instances in which finds are apparently later in date than the deposits from which they came. In some cases, the site records pinpoint the reason, for example, that the context was much disturbed by tree roots. It is also possible for poorly sealed deposits to be reworked in a way which is difficult to define as a separate context; for example, in areas where occupation was not intensive, by ploughing or horticulture. In other cases, it is more difficult to judge whether the apparent contamination is real, or whether the date of the deposit should be reassessed. Human error during finds processing is probably a factor. Given also that the largest, best-preserved, and most reliably dated finds assemblages are almost never in the most useful contexts, it has to be admitted that dating is a complex and inexact business. Whilst that quoted here is probably broadly accurate, the reader may wish to allow for some revision in the future.

Bone working waste

There were substantial deposits of bone working waste from Crowder Terrace in the western suburb and from Victoria Road in the northern suburb. As described in detail in Section 2.1 (Group 2), this material represents the last stages in a process of specialist exploitation of animal carcases, mainly of cattle, which involved splitting and smashing bones for marrow extraction and grease production. Finds that were distinguished as unfinished artefacts, that is hairpins and counters from Victoria Road and spoons and pegs (*cf.* Crummy 1983, 162–3) from both sites have been described in another volume in this series (Rees *et al* 2008). The mass of the material, consisting of split and smashed fragments of unrecognisable artefact form, is discussed here with appropriate cross-referencing. Precisely which anatomical elements were used for which artefact type is often unclear, as the closer the object became to being a finished artefact, the more its anatomically diagnostic features were obscured by heavy working.

Although several different artefact types were produced, methods of manufacture have been noted as very similar throughout all types, suggesting that a limited group, or 'school' of bone workers was involved. There is no real evidence that any of the waste was found *in situ*: the faunal and artefact specialists agreed independently that it could well have been dumped each time new development was planned in order to consolidate wet ground. Therefore, it seems that bone workers obtained raw material from specialist butchers, but it is uncertain whether these activities spanned the entire Roman period or were carried out within a limited date range.

PART 2: Faunal remains from the northern suburb and the city defences

1 Faunal remains from early Roman contexts at Victoria Road *by J S Pfeiffer*

Introduction

This report is concerned with a total of 11,231 bones recovered from more or less contemporary Period 5 contexts at Victoria Road East and Period 2 contexts at Victoria Road West. During these periods (mid-1st – early 2nd century), a cemetery occupied most of the Victoria Road East site whilst there was little evidence for activity on Victoria Road West except for the ditch running alongside the south-west side of the Cirencester road.

The bone largely derived from hand collection, but there were also some small mammal and amphibian bones recovered from sieving of soil samples taken primarily to recover plant remains.

The bones were considered in four groups as follows:

Group 1. Material from the graves in the cemetery (Victoria Road East, Period 5).

Group 2. Specialised butchery waste from outside the cemetery, recovered from the cemetery boundary ditch and bank at its north-eastern edge, from the hollow way at its eastern edge, and from the first phase of the Cirencester roadside ditch at its western edge (Victoria Road East, Period 5).

Group 3. Material from other contexts on the eastern side of the Cirencester road (Victoria Road East, Period 5).

Group 4. Material from the first phase ditch and path on the south-western side of the road (Victoria Road West, Period 2).

The contrasting character of the four groups can be seen in Figures 14 and 15, which shows percentages of

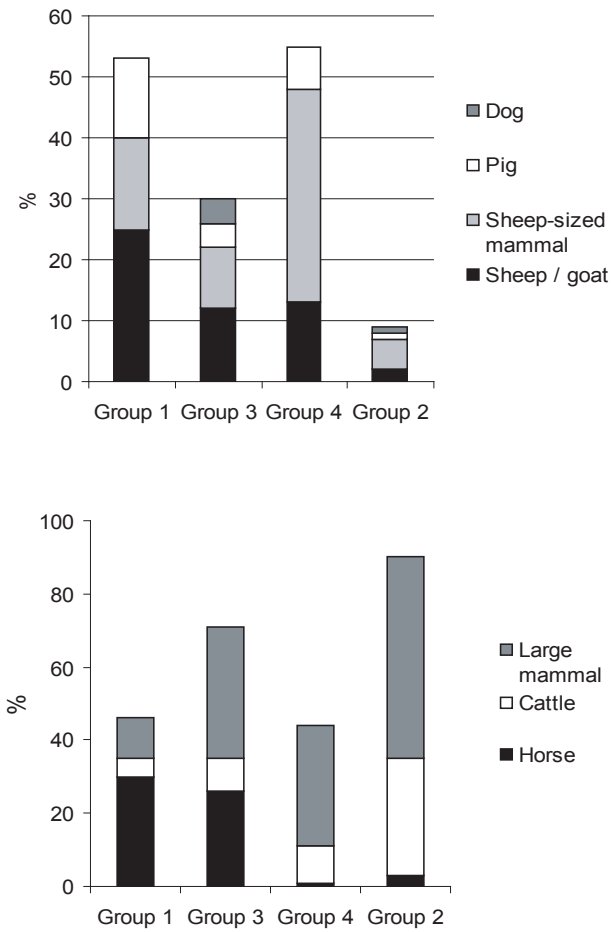


Figure 14 Victoria Road, early Roman contexts, major domesticated animals by group (NISP)

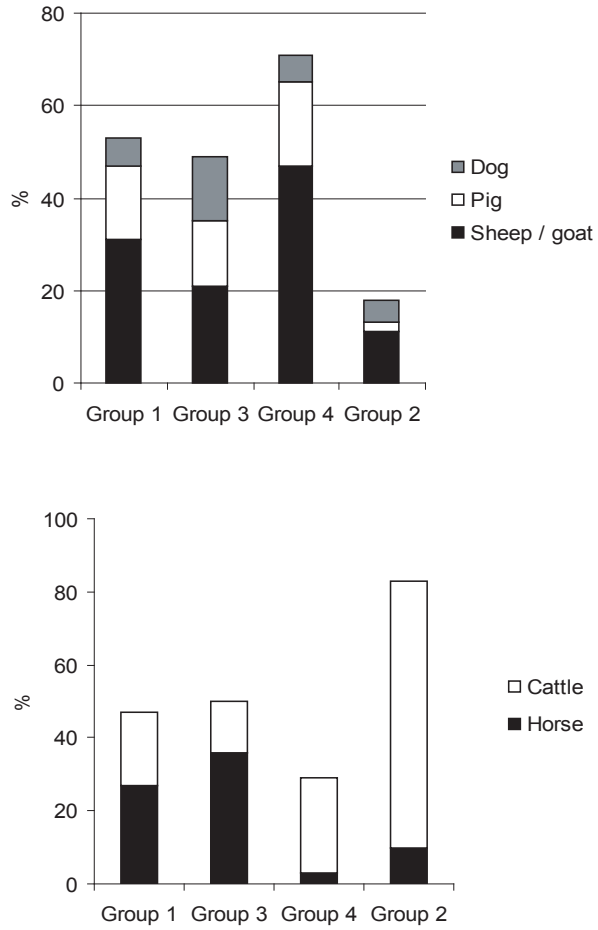


Figure 15 Victoria Road, early Roman contexts, major domesticated animals by group (MNI)

smaller (upper) and larger domestic mammals (lower), using Number of Individual Specimens counts (NISP) and Minimum Number of Individuals counts (MNI) respectively.

The preservation of bone varied from context to context. However, evidence of staining and canid gnawing was found in most contexts, indicating that the bones were exposed to various taphonomic processes before final burial. The exception to this is material from the graves (Group 1), which was often introduced as part of the primary deposits.

Metrical data were collected for all contexts. Although the sample proved too small to be significant in isolation, these are given in Tables 2.11–2.15, so that comparisons can be made between this sample and the larger one from the contexts of later periods reported on in Section 2.2 and in Appendix 1.

Faunal remains from the cemetery

Group 1: overview

Animal remains were found in sixteen graves and in a further six cut features, at least four of which contained deliberate animal burials (catalogued below). They included parts of four horses in two separate burials (F1148 and G594), a domestic fowl (G464), and a sheep (F859). Some of the partial skeletons and other articulated bones from Victoria Road East (Group 3) may also be associated with the use of the cemetery.

The cemetery group as a whole contained 847 bones, with 570 identified to species. The species present were horse, sheep, pig, cattle, sheep/goat, cat, dog, domestic fowl, frog, hare, shrew, and goose (in that order of frequency by fragment count; see Table 2.1). MNI counts are shown in Table 2.2. Much of the bone was in the form of immature partial skeletons. As immature animal bones do not survive well in any circumstances, the material was comparatively poorly preserved.

Altogether, partial or nearly complete skeletons of at least five horses were deliberately buried in the cemetery area. Partial skeletons of other animals found in graves include those of at least three sheep or goats. In addition, there were two pig skulls and one partial pig skeleton and most of the skeleton of a domestic fowl.

Although there was no butchery on the horse bones, other bones of domestic species showed signs of it. On the sheep/goat bones, butchery appears on the distal tibia, the proximal metapodial, the distal femur, and the astragalus. Such marks are indicative of the separation of bones and the removal of meat. The sheep from F859 had a severed cervical vertebra. Butchery on cattle was mainly found on the meat bearing bones – femur, humerus, and scapula. In addition, knife marks were frequently present on the first two phalanges – usually a sign of skinning (Binford 1981 and see Section 2.2). Butchery on pig was limited to one humerus.

Ageing was determined using epiphysial union (Silver 1969) and toothwear (Grant 1975, 1982). The majority of the partial skeletons present in the graves belonged to immature animals, the pigs between under two years to two and a half years, the sheep under one year.

The part skeletons may well represent feasts for the dead or offerings to the gods to ensure a safe arrival in the afterlife. The skulls and some of the disarticulated bones probably had the same role. The small animals such as the frog and shrew are no doubt inci-

Table 2.1 Species representation in the cemetery, Group 1 (by NISP)

Species	N	%
Horse	224	26
Sheep	168	20
Small artiodactyl	115	13
Pig	96	11
Large mammal	85	10
Unidentified mammal	76	9
Cattle	37	4
Sheep/goat	21	4
Small mammal	8	1
Cat	4	
Dog	3	
Domestic fowl	4	
Frog	2	
Hare	2	
Goose	1	
Shrew	1	
Total	847	

Table 2.2 Species representation in the cemetery, Group 1 (by MNI)

Species	MNI	%
Horse	13	19
Cattle	10	15
Pig	8	12
Sheep/goat	8	12
Sheep	7	10
Cat	5	7
Domestic fowl	4	6
Dog	3	4
Frog	2	3
Small mammal	2	3
Hare	2	3
Shrew	2	3
Goose	1	1
Total	67	

Note: MNI was determined by grouping bones by phase and grave

dental inclusions. Further discussion of associated bone groups can be found in Sections 2.2 and 2.3; an overview of the significance of animal bones in burials is covered in P1 and P3.

Catalogue

Prefix 'S' refers to 'small' or itemised find number.

Graves

G411 The remains of a cattle mandible and rib; the tibia of a sheep or goat.
G431 A hare rib; a cattle carpal.
G433 The remains of a small artiodactyl, probably sheep or goat; a large mammal rib. The former bones were very fragmentary but a tibia, a scapula, and ribs were identified.
G465 Rib and tooth fragment of a horse; fragment of sheep/goat pelvis; and large mammal long bone fragments.
G466 Pig – juvenile skull; sheep – skull fragments, mandible (under six months), two left and two right pelves, femur, tibia, calcaneum, astragalus, and ribs; sheep/goat – tibia. These at least were deliberately placed (recorded as S5711/5723 and S5710); cattle – sacrum, humerus, proximal tibia epiphyses, fibula, calcaneum, and astragalus; dog – first phalanx; horse – tooth fragments, caudal vertebrae, and ilium.
G480 The remains of the hindquarters of a horse. Present were the sacrum, pelvis, left femur, and some lumbar vertebrae. An age of four to five years is suggested on epiphysial union. As the bones were scattered and disarticulated, it is possible that more than one individual was present. G480 also contained the disarticulated bones of at least two adults – one male, one female.
G515 A total of 62.8g of very fragmented unidentified bone from a samian bowl S7106.
G517 Fragmented pig skull, from a male less than ten months of age; cattle mandible.
G543 A cattle mandible; mammal long bone fragments.
G565 A pig scapula; small unidentified fragments.
G566 Articulated ulna and radius of a sheep (S7330); the furcula of a domestic fowl (S7329) – placed as grave goods. The lack of epiphysial union on the sheep radius suggests an age of less than six months.
G578B (Plate 3) The right half of a pig skull (S7340); a sheep scapula. The skull rested on two ceramic bowls (S7341, S7342) and its mandible had a wear value of 14 (Grant 1982).
G588 A sheep metatarsal.
G589 A sheep/goat thoracic vertebra and rib; a pig occipital; and a goose rib.
G597 Cattle lumbar vertebra.
G598 Frog humerus. This is no doubt an incidental inclusion.

Features associated with the cemetery

F229 (possible post-hole) Fragment of a pig canine.
F256 (fragment of walling possibly related to a grave) First phalanx of horse; first phalanx of hare.
G464 (burial of a domestic fowl, now missing: with pot S5486) Domestic fowl bones; and a cat phalanx. The bird was carefully laid out with its head resting on the pot (Plate 4). A maxilla and nasal bone of a common shrew (*Sorex araneus*) were found in the pot, presumably later intrusions.
G594 (horse burial cut into the bank F912/F924 associated with ditch F709/F711/F936 which formed the north-east boundary of the cemetery) The nearly complete articulated skeleton of a horse (Horse 4 – Table 2.14, Plate 5). Present are: skull (badly fragmented), mandible, the complete vertebral

Plate 3 Victoria Road East G578B

Plate 4 Victoria Road East G464

Plate 5 Victoria Road East horse burial G594

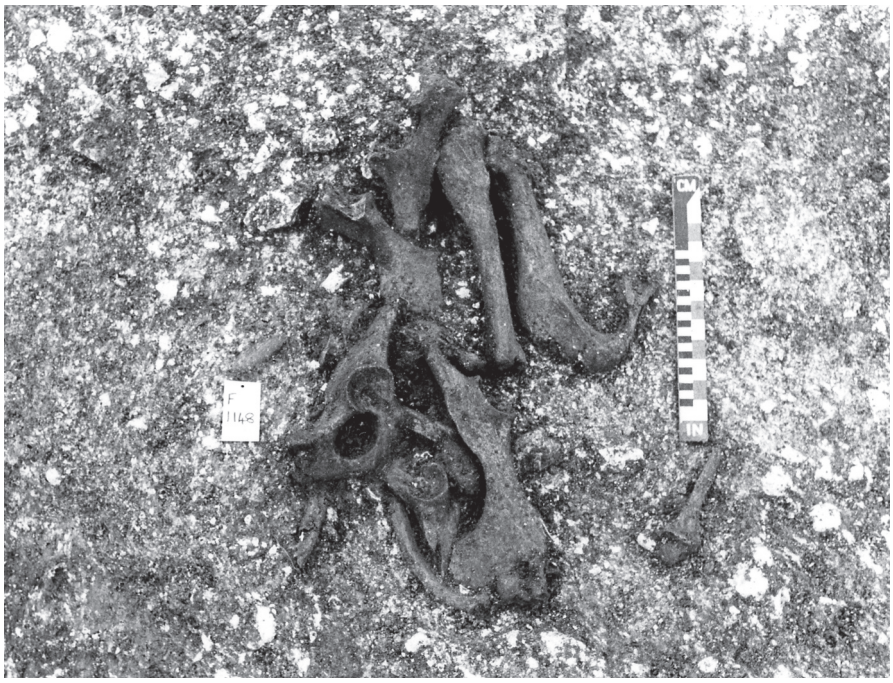


Plate 6 Victoria Road East horse burial F1148

column, scapulae, humeri, radii, ulnae, third metacarpals, all front phalanges, pelves, complete right femur, and proximal left femur. The missing elements are the hindquarters from the tibiae down. Horse 4 was pony-sized, 11.91 hands (1209mm) at the withers (Kiesewalter 1888). It was male and aged between four and five years. There was no sign of butchery. The remains of at least one other horse (Horse 5) were represented by a mandible and an atlas. The sternum, costal cartilage, sacrum, skull, and vertebral fragments which were also present could belong to either horse. In addition to the horses, there were: cattle – humerus, right and left radii, ulna, femur, tibia, and ribs; pig – humerus; cat – metapodial; dog – mandible.

F859 (sheep burial) Skeleton of an immature sheep, nearly complete. It includes the vertebral column, ribs, scapulae, humeri, left ulna, metacarpals, left pelvis, femora, tibiae, fibula, calcaneum, right astragalus and sternum. The skull and cervical vertebrae 1-5 are missing. The animal was aged one and a half to two years. The sixth vertebra was severed on the caudal end and the seventh shows damage to the cranial surface. Binford (1981) has suggested that such marks would have been caused by beheading the animal.

F1148 (horse burial, at the south-eastern margin of the cemetery; Plate 6) The remains of at least two horses (Horses 2 and 3 – Table 2.14), represented by two left and two right pelves, one right femur and one left femur, an axis, and some fragmentary vertebrae and ribs. The epiphysial union of the

Table 2.3 Species representation in the deposit of butchery waste, Group 2 (by NISP and MNI)

NISP	F258		F914/704/525, F912		F856			
Species	**N**	**%**	**N**	**%**	**N**	**%**	**Total**	**%**
Large mammal	606	50	554	62	497	48	1657	53
Cattle	345	29	158	18	486	47	989	32
Small artiodactyl	96	8	42	5			138	4
Sheep/goat	49	4	8	1	2	1	59	2
Dog	36	3	6	<1	1	<1	43	1
Pig	29	2	3	<1			32	1
Horse	18	1	48	5	37	3	103	3
Unidentified mammal	11	1	74	8			85	3
Sheep	9	1	5	1			14	<1
Domestic fowl	1	<1			4	1	5	<1
Crow	1	<1					1	<1
Total	1201		898		1027		3126	

Species	**MNI**	**%**	**MNI**	**%**	**MNI**	**%**	**Total**	**%**
Cattle	44	69	6	33	53	83	103	71
Sheep/goat	9	14	2	11	1	2	12	8
Dog	3	5	3	17	1	2	7	5
Pig	2	3	1	6			3	2
Sheep	2	3	1	6			3	2
Horse	2	3	5	28	7	11	14	10
Domestic fowl	1	2			1	2	2	1
Crow	1	2					1	1
Total	64		18		63		145	

Note: MNI was determined by counting the most frequent bone element for each species and halving it

bones suggests that the horses were over five years of age. The withers heights determined on the femora were both approximately 11 hands (Kiesewalter 1888).

Faunal remains from non-funerary contexts

Group 2. Cemetery boundaries and roadside ditch

Deposits of bone in this group all have in common a similar distribution of species, bone element and butchery patterns. Table 2.3 illustrates the predominance of cattle and large mammal in the assemblages and Table 2.4 shows the prevalence of their upper limb bones. The majority came from adult animals and the relatively small number of measurable bones indicate that the cattle were small but within the normal range for this period. The bones from Victoria Road East are primarily the meat-bearing ones, and the lack of primary butchery waste – skulls, mandibles, and metapodials – suggests that the initial dismembering of the carcass and the final preparation of the meat for cooking took place in separate locations. The lack of toes and horn cores may indicate that the animals were also skinned and had their horns removed for working elsewhere.

The butchery patterns, which were consistent throughout, both in the method of butchery and the bones involved, are these:

1. Several characteristic patterns were found on the humeri. The trochlea was chopped into thin slices. The coronoid fosse exhibited repeated chop marks on a medial-lateral plane. The region of the olecranon fosse was found separated from the rest of the bone.
2. The ulnae were fragmented and did not exhibit any regular pattern.
3. The radii were split and splintered axially. Some radii showed knife and chop marks along the length of the bone.
4. The femora were badly splintered. Femoral butchery is characterised by scooped chop marks along the length of the bone. Knife marks are found around the joints and the head of the femur was often missing because it had been removed at the same time as the pelvis.

Table 2.4 Anatomical distribution in the deposit of butchery waste, Group 2

	F258									F915/704/525, F912									F856							
	C	LM	S	S/G	P	H	SA	D	T	C	LM	S	S/G	P	H	SA	D	T	C	LM	S/G	H	D	T	OT	%
Jaw	29	2		20	1	1	1	4	58	6			3	1	1	2		13	6					6	77	3
Scapula	1			4		1			6	4	2	1			1	1	1	10				1		1	17	1
Humerus	85	1		3	7				96	7	3				2			12	127			3	1	131	239	8
Radius	50		1	1		1			53	21	14	1			7			43	81			3		84	180	6
Ulna	28	4					1		33	24	8							32	25			3		28	93	3
Carpal	5								5	3					2			5							10	
Metacarpal	4		3	4	1				12	6		1			1		1	9	1			1		2	23	1
1st Phalanx	2					1			3	4					1			5							8	
2nd Phalanx	1			1					2	1								1	1					1	4	
3rd Phalanx	1				1	1			3						1			1				2		2	6	
Os coxae	3	2		3		1		5	14	1	1		1		1			4	3			6		9	27	1
Femur	36	3						1	40	9	7				1		3	20	66		1			67	127	4
Tibia	46	6		4	4		2		62	37	23	1	1		5			67	148			6		154	283	9
Patella																			2					2	2	
Fibula					2				2																2	
Calcaneus	5					3			8	1								1	2			1		3	12	
Astragalus	16			1	1				18	4					1			5	8					8	31	1
Navicular cuboid	1			1					2	2								2							4	
Metatarsal	1		4	3	3	1			12	9		1			11			21							33	1
Occipital				2					2	1								1							3	
Sphenoid	1								1																1	
Basisphenoid	1								1																1	
Frontal	7		1	1	4				13				2	1				3							16	1

	F258									F915/704/525, F912									F856							
	C	LM	S	S/G	P	H	SA	D	T	C	LM	S	S/G	P	H	SA	D	T	C	LM	S/G	H	D	T	OT	%
Petrus	1								1																1	
Maxilla	1			2		1			4	1	1							2							6	
Zygomatic	1				1				2																2	
Horn core	1								1																1	
Ribs		45					17	11	73		31					5		36	2					2	111	4
Cervical vertebrae	3	4					1		8		4						1	5	6		1	9		16	29	1
Atlas								1	1																1	
Axis	3			1			1	1	6	1					1			2				2		2	10	
3rd Cervical vertebra								1	1																1	
Thoracic vertebrae		13					1	8	22	1	3							4							28	1
Lumbar vertebrae		5						5	10	1	4		1					6							16	1
Unidentified vertebrae		8					1		9		2							2							11	
Loose teeth	5				2	3			10	8				1	4			13	5					5	28	1
Frags		73					2		75		4							4		94				94	173	6
Longbone frags	2	436					51		489		439					27		466		403				403	1358	45
Skull frags	4	2					18		24		7					7		14	1					1	39	1
Metapodial				1	1	1			3	6	1				3			10							13	
Tooth frags		2							2																2	
Tarsals	1								1						5			5	2					2	8	
Total	345	606	9	52	28	15	96	37	1188	158	554	5	8	3	48	42	6	824	486	497	2	37	1	1023	3037	

Key:

C = cattle
LM = large mammal
S = sheep
S/G = sheep/goat
P = pig
H = horse
SA = small artiodactyl
D = dog
T = total
OT = overall total

Table 2.5 Butchery characterised by superficial chopping recorded in the deposit of butchery waste, Group 2

	F258			F915/704/525, F912			F856	
Element	**C**	**LM**	**H**	**C**	**LM**	**H**	**C**	**LM**
Humerus	16			2			17	
Radius	2			7	1		9	
Ulna	3			3	1		4	
Femur	17			8	3		15	
Tibia	15			3			18	
Astragalus	2			3	3			
Metatarsal			1	1		2		
Longbone frags	1	78			42			82
Total	56	78	1	27	50	2	63	82

Key: as Table 2.14

5. The tibiae exhibited the same scooped chop marks as the rest of the bone, but no other butchery patterns were noted.
6. The astragalus was consistently chopped in half lengthways.

All of the upper limb bones exhibited the superficial scooping marks made whilst systematically stripping meat from the bone prior to butchering it further (Table 2.5). They had been split or fragmented for the removal of marrow and grease, as described in Section 2.2.

Such large-scale accumulations of specific bone elements are often found in extra-mural areas of Romano-British towns and are the result of organised butchery of cattle (see also Section 2.2, pp 106–120 and Section 2.3, pp 283–287). Contemporary contexts at Rack Street, Exeter, Silchester, and Aldgate (London) produced a predominance of primary butchery waste, whilst a distribution of elements similar to that at Victoria Road was found in 4th-century contexts at Cirencester (Maltby 1984a). Parallels for the butchery methods seen at Victoria Road are also found in Zwammerdam in Holland, and Xanten (*Colonia Ulpia Traiana*) in the Rhineland (van Mensch 1974). Here, it is suggested, the slaughter and stripping of the animals for meat took place separately from the use of the bones to produce broth. Production on a large scale and for mass consumption is also implied by the Winchester material, but Maltby (below) argues that the large-scale processing was sometimes done to obtain grease from the bones, as well as marrow.

Table 2.6 Species representation in other contexts to the east of the Cirencester road, Group 3 (by NISP)

	N	%
Frog, F952	3315	85
Unidentified mammal	152	4
Large mammal	124	3
Horse	87	2
Frog, other contexts	61	2
Sheep/goat	41	1
Small artiodactyl	35	1
Cattle	30	
Pig	12	
Dog	12	
Domestic fowl	6	
Small mammal	5	
Cat	1	
Roe deer	1	
Apodemus sp	1	
Total	3883	

Table 2.7 Species representation in other contexts to the east of the Cirencester road, Group 3 (by MNI)

MNI	%	
Frog, F952	110	86
Horse	5	4
Sheep/goat	3	2
Frog, other contexts	2	2
Cattle	2	2
Pig	2	2
Dog	2	2
Domestic fowl	1	1
Cat	1	1
Roe deer	1	1
Apodemus sp	1	1
Total	130	

Note: MNI was determined by counting the most frequent bone element for each species and halving it

Table 2.8 Anatomical distribution in other contexts to the east of the Cirencester road, Group 3

	C	LM	S/G	P	H	SA	D	T
Jaw	1	3	7	1	1			13
Scapula	1		1	1	1	1		5
Humerus	3	3				1		7
Radius		3	1			1	2	7
Ulna	5	1	1	2			1	10
Carpal					1		3	4
Metacarpal	2		6	1			2	11
1st Phalanx	5		1		2		1	9
2nd Phalanx	2		1		1		1	5
3rd Phalanx	1						1	2
Os coxae		2	1		3			6
Femur	1	1	1		4		1	8
Tibia		2	2	2	3	2		11
Patella						1		1
Calcaneus					1			1
Astragalus	1				1			2
Navicular cuboid				1	1			2
Metatarsal	1	1	5		5	1		13
Occipital	1	1	3					5
Frontal		2						2
Maxilla	1							1
Zygomatic					1			1
Ribs		11	2		22	9		44
Cervical vertebrae		2	1		8			11
Atlas		1			1			2
Thoracic vertebrae	3				20			23
Lumbar vertebrae		1			3	1		5
Unidentified vertebrae		1		1	1			3
Sacrum					3			3
Loose teeth	1	1	4	1	1			8
Frags		13	2			2		17
Longbone frags		71			1	14		86
Skull frags	1	1	1			2		5
Metapodial			1	1				2
Tarsals					2			2
Totals	30	121	41	11	87	35	12	337

Key: as Table 2.14

Group 3. Other contexts on the eastern side of the road

This group consisted of 3883 bones, of which 3551 were identified to species examined from other contexts. The species list comprised frog, horse, sheep/goat, cattle, dog, domestic fowl, pig, roe deer, cat, and wood-mouse in that order of frequency by fragment count (Table 2.6). Table 2.7 gives the frequency by MNI. One bone of fallow deer was identified, but it is possible that it is intrusive.

The vast majority of the material (3315 fragments) was accounted for by frog bones from a single sieved context (3791) in the late Iron Age/early Roman north-south ditch (F952) running parallel to the hollow way. The animals may have been trapped in the ditch, or

Table 2.9 Species representation in the ditch and path to the west of the Cirencester road, Group 4 (by NISP and MNI)

NISP	Ditch F85		Path F102 and associated contexts			
Species	**N**	**%**	**N**	**%**	**Total**	**%**
Small artiodactyl	803	33	337	34	1140	34
Large mammal	761	30	315	33	1076	32
Sheep/goat	277	12	126	12	403	12
Cattle	225	8	87	10	312	9
Pig	153	8	79	7	232	7
Unidentified mammal	44	4	40	2	84	2
Domestic fowl	20	1	11	1	31	1
Sheep	11	2	17	<1	28	1
Horse	20	1	6	1	26	1
Dog	12	<1	4	1	16	
Crow	6	<1			6	
Domestic duck/mallard		1	6		6	
Red deer	2	<1	1	<1	3	
Redshank			3	<1	3	
Hare	2	<1			2	
Fallow deer	1	<1			1	
Pigeon	1	<1			1	
Roe deer	1	<1			1	
Thrush			1	<1	1	
Unidentified bird	1	<1			1	
Unidentified fish	1	<1			1	
Total	2341		1033		3374	

	MNI	**%**	**MNI**	**%**	**Total**	**%**
Sheep/goat	18	40	11	31	29	36
Cattle	11	24	7	19	18	22
Pig	5	11	7	19	12	15
Dog	2	4	2	6	4	5
Sheep	1	2	2	6	3	4
Horse	1	2	1	3	2	2
Domestic duck/mallard			2	6	2	2
Red deer	1	2	1	3	2	2
Domestic fowl	1	2	1	3	2	2
Hare	1	2			1	1
Roe deer	1	2			1	1
Fallow deer	1	2			1	1
Pigeon	1	2			1	1
Crow	1	2			1	1
Redshank			1	3	1	1
Thrush			1	3	1	1
Total	45		36		81	

Note: MNI was determined by counting the most frequent bone element for each species and halving it

might have hibernated in mud that dried out. Two femora and one tibio-fibula exhibited healed fractures caused by a contraction of the leg muscles that exceeded the tensile strength of the bone in its force. Such breaks, which take place during leaping, typically heal quite quickly, allowing the frog to survive (Buckland-Wright pers comm). A woodmouse, another incidental find, was a single specimen.

Amongst the material which originated from human use and which was discarded at the site, the condition of the large mammal bone suggests that most of it was not immediately buried. Much was fragmentary and stained, and there was evidence of canid gnawing, suggesting a deposit of general rubbish rather than anything more specialised. The distribution of species and anatomical element was also very different from the specialist butchery waste (pp 35–38 above) and there was no predominant bone type (Table 2.8). Although the butchery methods were similar, there was very little butchery at all.

Another contrast with the butchery waste was in the presence of partial animal skeletons in the silting over the hollow way (F856) and in the late Iron Age/early Roman north-south ditch F952 running parallel to it. The articulated bones included portions of dog, horse, and sheep/goat. It is possible that these were the physical remains of ceremonies related to the use of the cemetery, which are difficult to recognise because of the contexts in which they occurred (see also pp 32–34, on the distribution of associated bones).

The dog was represented by the right front limb from the radius downwards. It was mid-sized but detailed measurements were not taken as the animal was immature. One horse comprised nearly the entire vertebral column, the ribs, and left limb from the metatarsal down. This animal was approximately five years old at the time of death. A second horse consisted of the thoracic vertebrae and ribs. The skull and feet of a lamb were also present, although the bone was in a poor state of preservation. The lamb was aged under a year, judging from epiphysial union (Silver 1969). No butchery was noted on any of the animals, although in the case of the lamb this may have been due to the poor condition of the bone.

Group 4. Path and ditch to the west of the Cirencester road

A total of 2342 bones was recovered from F85, the first phase of the ditch to the south-west of the Cirencester road. However, only 731 were identifiable to species, due to the very fragmentary nature of the assemblage. In the total fragment count unidentified large mammal and small artiodactyl bones overwhelm the identified fragments, which are from sheep/goat, cattle, pig, and domestic fowl: these are represented by one or more per cent of the assemblage in that order of proportion (Table 2.9). Although the quantity of unidentifiable material is characteristic of specialist butchery elsewhere on the site (see p 35), here, however, sheep/goat is predominant rather than cattle. The distribution of anatomical elements (Table 2.10) shows a higher proportion of jaws and feet than elsewhere on the site, and is comparable to the assemblage from the Iron Age/Roman site at Owslebury, Hants (Maltby 1987a).

There was little evidence of butchery, as only 32 bones (3%) had any marks at all. However, the state of fragmentation suggests that some were split for marrow and the butchery methods observed were similar to those from other deposits in the northern suburb (see also Section 2.2). The majority of the animals were adult.

In addition to the material from the ditch, 1033 bones were recovered from contexts associated with the path (F102) to the east of the ditch. Of these, only 339 were identifiable to species. The distribution of species and bone elements was similar to that from F85. There was very little butchery present, although bone fragmentation suggests that some were also split for marrow removal.

Conclusions

The animal bones from early Roman deposits at Victoria Road East (Period 4) and West (Period 2) fall into three slightly overlapping groups: firstly, special offerings in graves and possibly in some associated features; secondly, waste from specialist butchery of cattle; and thirdly, less specialised waste from the preparation and consumption of meat and other animal products (Figs 14 and 15). The second group represents a large-scale, specialised butchery, the distinctive techniques of which are found on other urban sites both in Britain and on the continent. Whether its products were reserved for particular groups in the population, or whether waste was merely generated and dumped in particular areas remains an open question.

Table 2.10 Anatomical distribution in the ditch and path to the west of the Cirencester road

Anatomy	C	LM	S	S/G	P	H	SA	D	T	C	LM	S	S/G	P	H	SA	D	T	OT	%
Jaw	35	10		53	15	1	2		116	7	8		28	12		2	3	60	176	5
Scapula	3	4		8	14	3	7		39	1	1	3	6	1	1	2		15	54	2
Humerus	4	3		8	7		4		26	2	2		3	6		3	1	17	43	1
Radius	6	4	4	11	2	1	4	2	34	3	9	3	9	3		7		34	68	2
Ulna	3	4		6	5		2		20	4	5		1	7				17	37	1
Carpal	4			1					5				2		1			3	8	
Metacarpal	13		1	30	12		1	2	59	12		6	3	5				26	85	3
1st Phalanx	11	1		10	5	2			29	5			9		1			15	44	1
2nd Phalanx	10			1					11	2			1					3	14	
3rd Phalanx	2								2	1		1	2					4	6	
Os coxae	15	5		12	6	2	6		46	3	5	1	8	6		5		28	74	2
Femur	13	2		2	3	1	3	1	25	6	6			2		2		16	41	1
Tibia	13	11	2	12	12		10		60	2	9		3	11		11		36	96	3
Fibula					3				3					3				3	6	
Calcaneus	7	3	1	2	3	1	1		18	1			3	1	1			6	24	1
Astragalus	5			1	2	1			9	5					1			6	15	
Navicular cuboid	1								1	3								3	4	
Metatarsal	14		3	35	7		3		62	12		2	11	10		2		37	99	3
Occipital		1			9			1	11					2				2	13	
Sphenoid		1							1										1	
Temporal	1				2				3										3	
Parietal					1				1										1	
Petrus	1								1										1	
Frontal	5	8		1	10		6		30		4		3	1		3		11	41	1
Maxilla	1	2		3	4		1	2	13	1			1					2	15	

Anatomy	C	LM	S	S/G	P	H	SA	D	T	C	LM	S	S/G	P	H	SA	D	T	OT	%
Incisive	1			1	1				3				1					1	4	
Nasals		1							1										1	
Zygomatic	3	1			5		4		13										13	
Horn core	6	3					1		10	1	1		3			1		6	16	
Ribs		299					272		571		113					96		209	780	24
Cervical vertebrae	1	15		1		1	1	1	20		6					1		7	27	1
Atlas	1	1			1	2	2		7	1								1	8	
Axis	3	3		2			1	1	10				1					1	11	
Thoracic vertebrae	3	19		2			10		34		2		1			5		8	42	1
Lumbar vertebrae	3	13		2	1		3		22		14		1			5		20	42	1
Caudal vertebrae										1								1	1	
Sacrum	2	1							3										3	
Unidentified vertebrae		7					6		13		2					7		9	22	1
Hyoid				1					1		2							2	3	
Loose teeth	31			69	17	3		2	122	10			22	8	1			41	163	5
Frags		142					20		162		2							2	164	5
Longbone frags		153					332		485		108					152		260	745	23
Skull frags		40			3		96		139		11					23		34	173	5
Tooth frags		2		2					4	2			1	2		7		12	16	
Metapodial	1			1	2	2	5		11	2	2		3			3		10	21	1
Costal cartilage		2							2		3							3	5	
Tarsals	3				1				4										4	
Totals	225	761	11	277	153	20	803	12	2262	87	315	16	126	80	6	337	4	971	3233	

Key: as Table 2.14

Table 2.11 Summary of metrical data in cattle

Anatomy	Measurement	N	Mean	SD
Scapula	SLC	1	56	
	GLP	1	53	
	BG	3	41	4
	LG	3	50	6
Humerus	Bd	1	66	
	BT	1	65	
Radius	Bp	1	80	
	PB	1	40	
	BFp	1	71	
Metacarpal	GL	1	108	
	Bp	15	51	4
	Dp	14	31	3
	SD	1	28	
	Bd	9	57	10
	DFB	11	51	8
	DFD	11	27	5
Tibia	Bd	13	66	4
Calcaneus	GL	1	142	
Astragalus	GLl	7	66	7
	Glmid	8	50	5
	GLm	9	59	6
	PB	7	43	4
	Bd	9	41	5
	Dl	6	37	5
Metatarsal	Bp	7	41	4
	Dp	6	41	3
	Bd	10	52	7
	DFB	9	46	4
	DFD	8	25	

Note: Measurements are coded after von den Driesch (1976) and are in millimetres

Table 2.12 Summary of metrical data in sheep and sheep/goat

	Anatomy	Measurement	N	Mean	SD
Sheep	Radius	Bp	6	29	1
		PB	6	15	1
		BFp	1	25	
	Metacarpal	Bp	6	20	1
		Dp	6	14	2
		Bd	1	23	
	Os coxae	LAR	2	20	
	Tibia	Bd	4	24	1
	Calcaneus	GL	2	57	6
		GB	2	22	2
	Metatarsal	GL	3	136	11
		Bp	11	19	1
		Dp	10	19	1
		SD	7	11	
		Bd	3	22	2
		DFB	3	22	1
		DFD	3	12	1
Sheep/goat	Mandible	PML	5	22	1
		ML	9	47	2
	Scapula	SLC	3	17	1
		GLP	4	29	2
		BG	4	19	2
		LG	4	22	1
	Metacarpal	GL	1	131	
		Bp	3	20	1
		Dp	3	15	1
		SD	1	13	
		Bd	4	24	1
		DFB	4	24	
		DFD	4	13	
	Os coxae	LA	1	23	
		LAR	1	20	
	Tibia	SD	1	10	
		Bd	4	25	1
		Dd	1	19	
	Astragalus	GLl	1	30	
		Glmid	1	24	
		GLm	1	29	
		PB	1	20	
		Dl	1	17	
	Metatarsal	Bp	1	21	
		Dp	1	20	
		Bd	3	22	1
		DFB	3	21	2
		DFD	3	13	1

Note: Measurements are coded after von den Driesch (1976) and are in millimetres

Table 2.13 Summary of metrical data in horse

Anatomy	Measurement	N	Mean	SD
Mandible	PML	2	92	5
Scapula	SLC	1	50	
	GLP	1	77	
	BG	1	41	
	LG	1	47	
Humerus	Bp	1	100	
	SD	1	37	
	BT	1	74	
	Bd	1	80	
Radius	GL	1	340	
	Bp	1	86	
	Bd	2	72	11
	Dd	1	38	
	BFd	1	56	
Os coxae	SH	1	2644	
	LA	1	61	
	LAR	2	58	4
Metacarpal	GL	1	228	
	Bp	1	53	
	SD	1	34	
	Bd	1	52	
Femur	DC	2	55	5
	SD	2	45	3
	Bd	1	95	
Tibia	GL	3	333	15
	Bp	1	77	
	SD	3	38	2
	Bd	5	68	4
	Dd	5	42	2
Calcaneus	GL	2	95	
Astragalus	LmT	2	54	6
	GB	2	59	9
	GH	2	55	6
	BFd	2	46	7
Metatarsal	GL	1	224	
	Bp	3	47	3
	Dp	2	35	1
	Bd	1	42	

Note: Measurements are coded after von den Driesch (1976) and are in millimetres

Table 2.14 Measurements from horses in the cemetery, Group 1

Anatomy	Measurement		
Horse 2	Femur	DC	51.4
		SD	43.1
		GL	331
	Tibia	SD	37.6
		Bd	67.7
		Dd	42
Horse 4	Maxilla toothrow		182
	Maxilla premolar row		95
	Maxilla molar row		80.6
	Mandible cheek teeth		180
	Mandible premolar row		95.3
	Mandible molar row		84.3
	Mandible diastema length		82
	Humerus	Bp	100.5 (just fused)
		SD	37.5
		Bt	73.8
		Bd	80
	Radius/ulna	GL	340
		Bp	86.1
		BFp	75.2
		Bd	80
	Metacarpal	GL	228
		Bp	52.9
		SD	34.4
		Bd	52.4
	Os coxae	SH	2644
		LAR	61.1
	Femur	GL	405
		DC	58.1 (just fused)
		SD	47.9
		Bd	95

Note: Measurements are coded after von den Driesch (1976) and are in millimetres

Table 2.15 Summary of metrical data in dog

Anatomy	Measurement	N	Mean	SD
Mandible	M1L	3	21	2
Scapula	SLC	1	17	
	GLP	1	20	
	BG	1	12	
	LG	1	18	
Femur	DC	2	16	
	Bp	2	30	3

Note: Measurements are coded after von den Driesch (1976) and are in millimetres

2 Faunal remains from contexts of the mid-2nd to late 4th/early 5th centuries in the northern suburb and on the city defences *by M Maltby*

Introduction

Animal bone studies in Romano-British towns

Until relatively recently, surprisingly few studies have been carried out on animal bone assemblages from the major Roman towns in Britain. King (1984) was able to list only four towns where analyses of assemblages of over 1000 identified fragments had been published. These included sites in Exeter (Maltby 1979a), Colchester (Luff 1982), and London (Armitage 1980). Since then the situation has improved, as assemblages collected during the growth of rescue excavations in historic towns in the last twenty years have been analysed. In addition to further sites from the towns listed above, for example Colchester (Luff 1993), substantial samples have been analysed from Cirencester (Maltby 1998), Dorchester (Maltby 1993), Gloucester (Maltby 1983), Lincoln (Dobney *et al* 1996), and York (O'Connor 1988) amongst others. The work on the faunal remains from Winchester can now be added to this list.

The analyses of bones from Romano-British urban sites have already produced some very interesting results, which have informed us about meat diet, butchery and rubbish disposal practices, animal exploitation, the redistribution of meat and other animal produce, and the size and health of the domestic animals eaten. A number of the sites have now produced clear evidence of specialisation in butchery practices (Maltby 1989a; 1994). In some towns, there have been major variations between the faunal assemblages of different sites, often caused by the disposal of substantial dumps of cattle carcass processing waste (Maltby 1979a; 1984a; 1998; Luff 1982; 1993; O'Connor 1988; Dobney *et al* 1996; Dobney 2001).

The potential of animal bone analyses to contribute to general studies of the economy of Roman Britain has also been discussed (Maltby 1984a; 1994; van der Veen and O'Connor 1998; Dobney *et al* 1998; Hamshaw-Thomas 2000; Dobney 2001). It has been argued that the role and importance of towns in regional pastoral farming strategies can be monitored by comparisons between urban and rural animal bone assemblages. Studies of mortality and sex profiles, species representation, carcass processing techniques, metrical and pathology data can all provide information about the regional exploitation of domestic stock and the redistribution of meat and other produce. Unfortunately, there have been few comparative studies of assemblages from towns and those of rural sites in their hinterland. This is indicative of the constraints imposed by the needs of rescue archaeology. It has rarely been possible to produce a coherent inter-settlement research strategy. Urban faunal samples to date have too often been studied in isolation. In addition, we are handicapped by the limited areas excavated in the towns themselves. The full range of variability in faunal assemblages has probably not yet been encountered in any major Romano-British town.

Despite these problems, sufficient faunal samples from Romano-British sites have been analysed to allow King (1978; 1984; 1999) to review the evidence of species representation from a wide range of sites of different periods and regions. King (1999) observed that cattle and pig elements tended to be most abundant in Roman military assemblages and that these species were also well represented in samples from Romano-British major towns. In contrast, sheep/goat tended to be better represented in contemporary rural settlements, although in general pigs and cattle were better represented at villas than in non-villa settlements. King suggested that marketing practices and dietary preferences resulted in differences in the meat diet of townspeople and inhabitants of rural settlements and linked the preference for pork, in particular, with Romanisation, status, and wealth, an observation also made by Grant (2002). King also noted that cattle and pig both tended to be better represented in later Roman settlements of all types than in early Roman settlements.

Similar comparisons between sites from the same settlement and between different settlements have begun to be made for other aspects of faunal assemblages. For example, butchery marks on cattle carcasses have been compared on various Iron Age and Romano-British sites in Hampshire (Maltby 1989a), including some of the material from the Winchester northern suburb. Variations in the size of stock from different sites in the Roman period have been examined by several authors (eg Maltby 1981; Noddle 1987; Levitan 1989). Inter-site comparisons of ageing and sexing data have also been made in order to investigate possible variations in mortality rates and the effects of urban demands for meat (eg Noddle 1987; Luff 1993; Maltby 1994).

The faunal assemblages from Winchester represent an important addition to the material available for studies in these and other aspects of archaeozoological studies. In addition to the study of variations within the assemblages to be investigated in detail here, the results from these analyses can be compared not only with those from samples from major Romano-British towns but also with a number of sites within Hampshire. Towns of any period should not usually be studied in isolation. Their role in the regional economy forms an important recurrent theme in many

studies of archaeological data and the need to understand how an adequate meat supply was obtained is clearly one question which should be addressed by archaeozoologists. Comparisons between urban and rural sites in their hinterland are also needed to investigate the ways in which towns may have influenced regional exploitation patterns.

Of particular importance in this respect, therefore, is the large assemblage from the Iron Age and Romano-British rural settlement at Owslebury. This settlement is situated about 7km to the south-east of Winchester (Collis 1970) and was occupied continuously between the 4th century BC until the later Romano-British period. Excavations produced over 80,000 animal bone fragments of Romano-British date (Maltby 1987a). Numerous comparisons will be made between the results from this site and Winchester.

Other smaller late Iron Age and Romano-British samples from the region are also available for comparison. The best of these comes from the multi-period Winnall Down/Easton Lane complex, which lies less than two kilometres from Winchester. Late Iron Age and early Romano-British phases produced over 2300 animal bone fragments and again can be used in comparisons with the Winchester assemblages (Maltby 1985b; 1989b).

The deposits and their faunal assemblages

Identification, recording and analysis of the mammal and bird bones were carried out by site in phase order. The fish bones from Victoria Road are discussed on pp 238–245. This enabled material from broadly contemporary contexts to be examined together. The material from excavations in the northern suburb of Roman Winchester was initially subdivided into three main groups. The first two come from the Victoria Road (VR) site which was divided into two parts – East and West. Victoria Road East (Trenches X–XV) produced occupation evidence on the east side of the Cirencester road. Victoria Road West (Trenches IV–VI) contained deposits on and to the west of the Cirencester road. Trenches VII/XVI ran across the line of the road and linked the eastern and western parts of the site. The third group comes from Hyde Abbey (HA). This site produced Roman occupation deposits from the area around the Silchester road. In addition, material from three sites just inside the Roman city defences was examined separately. Summaries of the excavations producing these assemblages have been provided in Section 1.4.

Table 2.16 shows the size of the assemblages recorded from these sites. From all the sites combined, a sample of almost 50,000 animal bone fragments was obtained. Of these, over 40,000 were obtained from hand excavation on site. The rest were extracted from sieved soil samples subsequently processed at the Winchester Archaeology Office (then part of Winchester Museums Service). The term 'fragment' is used here and subsequently to refer to the number of individual specimens recorded (NISP). Specimens that showed evidence of recent breakage into two or more pieces were recorded as one fragment.

The majority of the bones were obtained from Victoria Road East. Analysis of nearly 25,000 hand-collected unsieved bones from these trenches was originally carried out in 1987 and the preliminary results and conclusions were the subject of a report to the Ancient Monuments Laboratory (Maltby 1987b). Over 5000 fragments were recovered from sieved samples.

The evidence presented in this discussion therefore relies heavily on the data obtained from the deposits from the northern suburb that lay in the area to the east of the Cirencester road. However, this information can be supplemented by the assemblages obtained from the other sites in the vicinity. A sample of over 9000 fragments was obtained from Victoria Road West and this provides evidence for animal bone deposition in the area of occupation to the west of the Cirencester road. Unfortunately soil samples were taken from only a few Roman contexts during the excavation in this area, so the sieved sample forms only a small proportion of the assemblage from here.

Roman deposits from the Hyde Abbey site produced over 5000 fragments, of which only 279 came from sieved samples. The assemblage is valuable in that it provides information about animal bones deposited in another part of the northern suburb, near the Silchester road and situated further away from the centre of the town than Victoria Road. This provides opportunities for intra-site comparisons to investigate whether the evidence for animal exploitation and bone disposal is consistent or variable in different parts of the suburb.

The samples from the sites on the defences are smaller but again valuable for the purpose of making inter-site comparisons of animal bones from different parts of Roman Winchester. Of the two sites near the North Walls, the Crown Hotel site on Jewry Street (JCH) produced the larger sample of over 1100 fragments, of which over 900 were hand collected. Roman deposits from 27 Jewry Street (27JS) produced only 599 fragments, all of which were unsieved. The Henly's Garage (HG) site near the Southgate produced over 2500 fragments, including over 800 from sieved samples.

Table 2.16 also divides the assemblages from the sites described above into groups classified by broad deposit categories. Comparatively few wells and large rubbish pits were discovered on any of the sites. However, where they were found they tended to produce well-preserved assemblages of bone which could usually be more reliably dated than assemblages in other feature types. They also produced most of the complete or partial animal skeletons and other associated groups of bone. Bones from pits and wells contributed over 13,500 fragments, of which over 2700 were from sieved samples. The unsieved material included 1889 bones from associated groups.

Substantial assemblages from ditch deposits were even more restricted than those from pits and wells. Just over 2000 fragments were recovered from such features, the majority from the roadside ditch F12

Table 2.16 Faunal remains from later Roman contexts in the northern suburb and all contexts on the city defences

		Assoc bones	Other ident	Unid	Unsieved total	Sieved samples	Overall total
Victoria Road, East	Pits/wells	1495	2670	2167	6332	2307	8639
	Ditches		90	104	194	26	220
	Buildings	29	1146	1492	2667	893	3578
	NE corner	39	5129	5497	10665	115	10780
	Other	28	2154	2495	4667	1908	6585
	Total	1591	11189	11755	24851	5249	29784
Victoria Road, West	Pits/wells	214	2100	927	3241	155	3396
	Ditches		750	854	1604		1604
	Buildings	135	470	709	1314	84	1398
	Other		1134	2084	3218	78	3296
	Total	349	4454	4574	9377	317	9694
Hyde Abbey	Ditches		97	112	209		209
	Buildings	83	883	1180	2146	235	2381
	Other	96	820	1463	2379	44	2423
	Total	179	1800	2755	4734	279	5013
Jewry Street, Crown Hotel	Pits/wells	125	25	37	187	165	352
	Other		328	458	786		786
	Total	125	353	495	973	165	1138
27 Jewry Street	Buildings		110	87	197		197
	Other		246	156	402		402
	Total		356	243	599		599
Henly's Garage	Pits/wells	55	745	245	1045	138	1183
	Buildings		169	215	384	98	482
	Other		179	140	319	580	899
	Total	55	1093	600	1748	816	2564
All sites	Pits/wells	1889	5540	3376	10805	2765	13570
	Ditches		937	1070	2007	26	2033
	Buildings	247	2778	3683	6708	1310	8018
	Other	163	9990	12293	22446	2725	25171
	Total	2299	19245	20422	41966	6826	48792

Key:
Assoc bones = bones in associated groups
Other ident = other identified fragments
Unid = unidentified fragments

found at Victoria Road West. No substantial linear features were found on the city defences sites.

Traces of timber buildings were recovered from all the northern suburb and city defences sites. Animal bones were found in a wide range of context types associated with these buildings, including floor levels, post-holes, beam slots and ovens. However, it is doubtful that many of the animal bones were deposited during the active life of the buildings. Some of the material, for example, would have become incorporated in the fills of the slots and post-holes during the decay of the timber buildings. In addition, much of the material from the layers within the buildings is likely to have accumulated after their abandonment. Therefore, bones from buildings do not form very cohesive groups. They are likely to be of mixed origin and date and variable in preservation. The assemblages are more likely to reflect disposal activity subsequent to rather than during the use of the buildings. Bones from such deposits did, however, form quite a high proportion of the total assemblages from the sites in question. Overall, over 8000 fragments came from building contexts, of which some 1300 were obtained from sieved samples (Table 2.16). Features from several buildings produced partial skeletons, particularly of sheep. Most of these can probably be regarded as foundation deposits.

A distinctive sequence of deposits was excavated

in the north-east corner of Trench XII at Victoria Road East, which is treated separately in the analyses below. It consisted of flint surfaces, one at least for a post-built structure (Building 1), interleaved with silty deposits and concluded with the construction of a timber building with a chalk floor (Building 2). In the analyses by context type below these buildings are not considered under the building heading.

Soil layers were another main type of context which produced large numbers of animal bones. Such layers often contain a lot of residual material and the faunal assemblages cannot usually be closely dated. Preservation of bones in such layers is also often not of a high quality. Nevertheless, they can still be of some value in interpreting rubbish disposal practices. Over one third of the bones recorded for this study were from groups that came principally from soil layers. Over 10,000 of these were from two episodes of so-called 'site-wide accumulation' from Victoria Road East, but soil layers produced bones on all the sites (Table 2.16). Bones from an earlier episode are considered in Section 2.1.

Other groups came from road surfaces or other feature types that were not commonly encountered. Finally, some groups came from contexts of no dominant type. Often these produced bones from a variety of small features and layers. Just under 3000 fragments came from such groups (Table 2.16).

The assemblages represent one of the largest faunal samples to be examined from a Romano-British town. The range of contexts offers an opportunity to examine variations in disposal practices within the areas under investigation. Similar intra-site comparisons from the Dorchester Greyhound Yard excavations revealed significant variations in assemblages from different parts of an *Insula* (Maltby 1993). It was expected that analysis of the Winchester sample would determine whether similar variations may be encountered in suburban areas of a Roman town.

Dating the assemblages

Dating of the stratigraphic sequences at Victoria Road and Hyde Abbey relies primarily on pottery (P5) and to a lesser extent other artefacts (Rees *et al* 2008). The material discussed below from Victoria Road East comes from Periods 5–7 (see also Table 1.5). In the case of those from Period 5 the deposits are of mid-2nd-century date – post-dating the main cemetery episode. Period 6 deposits, including those associated with an oven (F846), belong to the late 2nd – mid-3rd centuries. Period 7 deposits (late 3rd – late 4th centuries) were the most productive. From Victoria Road West the material comes from Period 3 (mid-2nd – late 3rd centuries) and Period 4 (late 3rd – late 4th centuries). The material from Hyde Abbey 1972 is from Periods 1–2 (late 3rd–4th centuries) and that from Hyde Abbey 1974 is largely from Period 3. The dating of this latter period is ambiguous: it may have begun in the later 2nd century, but this would involve treating the very small quantities of late 3rd- to 4th-century pottery from the earlier parts of the HA 74 sequence as intrusive.

Indeed, accurate dating of all parts of the sequences is difficult partly because of the character of the pottery assemblages and partly because post-Roman disturbance and truncation have separated blocks of stratigraphy, in some cases cutting down to natural bedrock. As a result, there were few features that produced well-sealed, closely dated assemblages. By their nature certain types of context, including general soil layers, which may have been reworked by gardening or ploughing, and those from building-related features such as post-holes and trenches, usually contain residual material. These kinds of contexts in the northern suburb and on the city defences sometimes contained significant amounts of early Roman and occasionally Iron Age pottery. It must be assumed, although it cannot be proven, that significant amounts of bone were also residual. In addition, the occasional presence of species that were introduced in medieval times, notably rabbit, shows that intrusion and contamination could take place in unsealed contexts. Some layers also were contaminated by the presence of later pottery of various dates, although the proportion of residual and intrusive pottery was relatively small in most contexts.

To conclude, it is difficult to be confident that bones from contexts assigned to particular periods at Victoria Road and Hyde Abbey form mutually exclusive groups, because of the problems of residuality and the vagaries of pottery dating. The animal bones from the northern suburb have been mainly treated as a single assemblage dating between the later 2nd and the later 4th centuries. However, the assemblages could in many contexts contain some material from earlier times and earlier phases. Although, some comparisons will be made between the assemblages from earlier and later contexts where appropriate, it will be more valuable subsequently to select some of the more closely dated assemblages from this broadly later Roman sample for comparison with similarly reliably dated assemblages from other sites in Winchester, in order to investigate any changes in diet, animal exploitation, and disposal practices within this period.

Similar caution must be applied to the material from the defences sites. Both early and later Roman deposits are included in this analysis. Most of the bones were, however, obtained from later contexts, although some residual material was often encountered.

Methods of analysis

The animal bones from every context were identified and recorded individually using the comparative skeleton collections at the Faunal Remains Unit, Department of Archaeology, University of Southampton. In addition to bones that could be identified to species, unidentified fragments were placed where possible into the categories of large mammal (cattle, horse, or red deer); sheep-sized mammal (sheep/goat, pig, roe deer, or dog); or unidentified bird. Where possible, sheep and goat elements were identified to species based on diagnostic morphological criteria (Boessneck

1969; Payne 1985; Prummel and Frisch 1986). All counts of sheep/goat include all specimens specifically identified as sheep or goat as well as undifferentiated fragments of ovicaprid. Totals of horse may possibly include small numbers of other equid species (mule and donkey), as no attempt to differentiate between these species was made at the time of recording.

Data were recorded onto a microcomputer using the English Heritage, Ancient Monuments Laboratory AML programs (Jones *et al* 1980). This system enables a large amount of information to be recorded and stored for each fragment. In addition to recording context, species, and anatomy details, descriptive fields were available to record fragmentation, tooth eruption and wear, epiphysial fusion, sex, butchery marks, gnawing damage, the surface condition of the bones, and pathological alterations of the bones or teeth. Measurements were also recorded using vernier callipers or a measuring board. Nearly all of the measurements taken followed those recommended by von den Driesch (1976). Recording of the eruption and wear of the mandibular cheek teeth of cattle, sheep/goat, and pig followed the method of Grant (1982).

All contexts from each site had been assigned to a stratigraphic phase prior to the bones being recorded. All the bones could therefore be assigned to individual phases. For the purposes of archiving and subsequent analysis of intra-site variability, the assemblages were placed in phases (and in the case of the northern suburb sites, into groups of phases known as periods). For the purpose of analysis of the bones, phases were used as the basis for the creation of groups within the assemblage; in some instances such groups consisted of bones from contexts of a single feature, such as a pit or a well. More often the bones from a number of phases were grouped together. For example, bones from phases associated with a building, would usually be considered together. Altogether, over 900 bone-bearing contexts were divided into 79 groups (see Table 1.4).

Data from each of the groups were placed in separate files for archive purposes and stored on disc. Data from unsieved and sieved samples were stored separately. Computer-generated paper archives of the raw data are stored at Winchester.

For each phase or phase group, this archive consists of the following information:

1. a summary context-ordered catalogue of each fragment recorded;
2. a species list;
3. species/anatomy tables;
4. tables listing the numbers of gnawed, eroded, ivoried (see pp 88–89 for a definition of the term), burnt, split, splintered, and skimmed fragments for each species and anatomy.

More general site archives were also created for the following information:

1. metrical archive arranged by species and site;
2. butchery archives arranged by species;
3. mandibular tooth ageing archives for cattle, sheep/goat and pig, using the system of Grant (1982).

All the above information was generated either by AML or dBASE programs. In addition, the following summary archives were created for each group:

1. a list of contexts producing bones in each group and the number of fragments involved;
2. summary species/anatomy tables for cattle, sheep/goat, pig, horse, and dog;
3. tables of summary statistics including relative species representation and the percentages of eroded, butchered, gnawed fragments etc represented in each phase group.

Copies of these archives are stored at Winchester and the bones themselves are now housed in the stores of the Winchester Museum.

The structure of the report

The next section (pp 53–84) briefly describes the faunal assemblages from hand-collected samples from each of the 79 groups. For the Victoria Road and Hyde Abbey sites the site periods are used to give an overall structure to the description of the material.

The following section (pp 84–105) is concerned with the analysis of intra-site variability of the assemblages described in the previous sections. The analysis will include comparisons of species representation and preservation of bones in different areas and in different context types. The possible causes of intra-site variability are also discussed. There follows (pp 105–218) an examination in more detail of the assemblages of each of the major domestic species – cattle; sheep/goat; pig; horse; and dog in turn. Relevant data are discussed with regard to determining their relative importance in the meat diet, body part representation, carcass usage, age, sex, and size. The assemblages of the less common mammals and amphibians are then considered (pp 218–221) followed by discussion of bird bones from unsieved samples (pp 221–227). The next section (pp 227–238) is concerned with the results of the analysis of the sieved samples. A section by Andrea Bullock then deals with fish from Victoria Road East (pp 238–245). Finally, the last part of Section 2.2 (pp 245–254) offers conclusions of the analysis. Section 2.3 discusses the results in the context of other contemporary towns (pp 255–304).

The faunal assemblages

Introduction

Both the hand-collected and sieved faunal assemblages were subdivided into 79 groups for initial recording and analysis. The creation of these groups took into account stratigraphic and other phasing information, and the type and location of the

Table 2.17 Summary of animal bone data from Group VRE1

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	41	9	4		1			107	162	13	7			26
%	(75	16	7		2)			66		8	(13)			(49)

Key:
C cattle, S sheep/goat, P pig, H horse, D dog, OM other mammals, B bird, U unidentified, E eroded, G gnawed, I ivoried, Bt burnt, Bu butchered

sheep 1, goat 0, large mammal 94, sheep-sized mammal 6

See key to Table 2.91 for methods of calculating preservation percentages

% in ( ), calculation based on <50 fragments, % in ( ), calculation based on <100 fragments

Table 2.18 Summary of animal bone data from Group VRE2

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	317	134	55	16	9	3	14	522	1070	179	98	47	9	123
%	60	25	10	3	2			49		21	29	14	1	36

Key as Table 2.17
sheep 15, goat 0, large mammal 342, sheep-sized mammal 116
other mammals: red deer 2, hare 1
birds: domestic fowl 8, duck species 2, woodcock 3, raven 1

feature(s). This section describes the unsieved assemblages in these groups.

In each case, a brief description of the location, phasing, and type of contexts contained in the group is given. This information has been derived from the detailed stratigraphic reports of the excavations (P1 and 3). This section is followed by a short decription of the faunal assemblage. This includes the size of the assemblage; its distribution within the contexts involved; the general state of preservation of the bones; brief details of species representation; and descriptions of any articulated or associated bones encountered. Generally, detailed discussions of anatomical representation, butchery, ageing, and metrical data are not discussed in this section, although any significant concentrations of bones of particular types are noted, as these may reflect specific dumping episodes. The descriptions are supported by summary tables (Tables 2.17–2.90). Detailed individual records of bones from each context are stored in the computer archives.

Description of the 79 groups corresponds as closely as possible with the description of the stratigraphic and structural sequences in P1–P3, but it should be noted that the present text of P2 may be revised before publication, although the phasing and dating of the sites will not change (see also Table 1.4).

Northern suburb

Victoria Road East (Trenches X–XVI)

Period 5 (mid-2nd century)

Structures

VRE1 Trench X: Phases 155–67 – contexts associated with a structure adjacent to the Cirencester road (2nd Phase)
The remains of post-built structures stood immediately adjacent to the eastern side of the Cirencester road throughout most of the Roman period. Five phases have been identified dating from the mid-2nd century (possibly earlier) to the late 4th century.

This group from the second phase of the structure consists of eleven assorted contexts, apparently of mid- to late 2nd-century date, which provided a sample of 162 fragments. Most of the bones came from two chalky spreads adjacent to a group of post-holes: Context *594* produced 111 fragments; *593* contained 29 fragments. Both were dominated by splintered unidentified large mammal longbone fragments, probably representing bone working waste. Several split cattle radius and tibia fragments were recorded. Cattle (75%) dominated the small identified assemblage. Preservation was quite good with only 8% eroded fragments and 13% gnawed fragments (Table 2.17).

Other deposits

VRE2 Trench X: Phases 195, 260–2 and 266–9 – Site-wide accumulation 2 (deposits post-dating the Period 5 cemetery)
These contexts appear to have accumulated in the mid- to late 2nd century. From Phase 195 five layers produced 784 fragments, mainly from *540* and *494*, which contributed 455 and 274 fragments respectively. The assemblage from *540* was again dominated by heavily butchered cattle upper limb bones and unidentified large mammal splintered longbone fragments. At least four cattle were represented. *494* produced a more balanced assemblage, with other types of bones and species better represented. Overall, cattle provided 63% of the identified domestic mammal fragments, sheep/goat 23%, pig 10%, horse 3%, and dog 1%. In addition, a few bones of red deer, domestic fowl, woodcock, and raven were identified. Preservation of the bones was moderate.

Phases 260–2 and 266–9 produced 286 fragments, of which 205 came from a layer of flints F172, *508* in Phase 262. Silts from Phases 266–9 contributed 45 fragments. Preservation was generally quite poor with 27% eroded fragments and 26% gnawed fragments. Cattle (50%), sheep/goat (32%), pig (12%), horse (3%), and dog (3%) were identified together with a few bones of domestic fowl, duck, woodcock, and hare. No large groups of butchery or bone working waste were recovered, although several split and splintered large

Table 2.19 Summary of animal bone data from Group VRE3 (oven F846, 1st phase)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	35	16	8	1	2	1		128	191	6	10	12	4	13
%	(56	26	13	2	3)			67		3	(18)	6	2	(23)

Key: as Table 2.17

sheep 3, goat 0, large mammal 74, sheep-sized mammal 32
other mammals: hare 1

Table 2.20 Summary of animal bone data from Group VRE4 (oven F846, 2nd phase)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated				5					5					
Other frags	343	248	87	59	10	2	11	976	1736	160	15 5	56	35	134
Total frags	343	248	87	64	10	2	11	976	1741					
% (excluding associated)	46	33	12	9	1			57		10	23	3	2	20

Key: as Table 2.17
sheep 28, goat 0, large mammal 582, sheep-sized mammal 232
other mammals: red deer 1, cat 1
birds: domestic fowl 10, teal 1

Plate 7 Victoria Road East oven F846

mammal bones were recorded. The combined totals from all the phases are provided in Table 2.18.

Period 6 (late 2nd to mid-3rd centuries)

Oven

VRE3–4 Trench XIII: Phases 293–9 and 310–27– oven (F846) and related deposits

A clay oven (F846; Plate 7) was situated about 10m from the Cirencester road. Its function is uncertain, but it may have been used for malting and/or drying crops (See Section 4.2, p 336). It was probably constructed in the mid- to late 2nd century.

The animal bones are contained in two groups corresponding to what were thought to be two episodes of use. The first (Group VRE3), Phases 293–9, produced 191 fragments from ten contexts, most of which were amongst debris from the oven (this total excludes material from F850–1 – Phase 298 – two adjacent small features of unknown significance). No associated bones were noted. The material was quite fragmentary, as indicated by the high percentage of unidentified fragments (Table 2.19). Only bones from the five main domestic mammal species and hare were identified. Cattle fragments (56%) were the most common and contained a relatively high proportion of butchered upper limb bone fragments. Preservation of the bones was quite good.

The second group (VRE4), Phases 310–27, contained bones from the oven (Phases 310–23) and from deposits overlying it (Phases 324–7). A total of 32 contexts produced a large sample of 1741 fragments (Table 2.20). Of these, 873 came from contexts directly associated with the oven. Flint metalling (F841 and *3358*) produced 398 fragments. The fill of a post-hole (F848) contained 131 fragments including five associated vertebrae of an adult horse. This was the only group of associated bones.

Several contexts produced split and splintered cattle and horse bones. A deposit associated with the flint metalling (*3358*) produced an assemblage of 112 fragments dominated by radius, femur, tibia, and scapula fragments of both species. This was clearly waste from a specialised industrial process, probably bone working. The post-hole (F848) included a smaller concentration of similar waste. Several other groups from Victoria Road East produced similar evidence for processing waste. It is likely that the bones were redeposited from earlier dumping episodes (see Section 2.1).

Similar concentrations of bones were not found in the deposits of Phases 324–7. *3281* produced 621 fragments but there was no clear bias towards bones of particular elements, which could not be explained by taphonomic processes or retrieval bias.

Taken together, in the two groups considered here, cattle provided 46% of the identified fragments of the major domestic species. Sheep/goat (33%), pig (12%), horse (9%), and dog (1%) were also represented. The unusually high percentage of horse is due to the dumping from bone working activities in which horse bones were sometimes used as raw

Table 2.21 Summary of animal bone data from Group VRE5

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated				11					11					
Other frags	242	185	40	33	6		7	773	1286	97	120	15	36	94
Total frags	242	185	40	44	6		7	773	1297					
% (excluding associated)	48	37	8	7	1			60		8	27	15	3	21

Key: as Table 2.17
sheep 21, goat 0, large mammal 538, sheep-sized mammal 160
birds: domestic fowl 4, duck species 2, woodcock 1

Table 2.22 Summary of animal bone data from Group VRE7

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	24	6	6	13				127	176	104	15	2		4
%	(49	12	12	27)				72		62	(36)	1		(10)

Key: as Table 2.17
large mammal 111, sheep-sized mammal 6

material. Domestic fowl, teal, red deer, and cat were also represented in small numbers.

Preservation of the bones was mixed but about 10% of the bones were eroded and 23% of the bones of the major species bore evidence of gnawing.

VRE5 Trenches XIII and XV: Phases 303–08 – deposits contemporary with the oven (F846)

These deposits consisted of ten contexts which produced 1297 fragments. Deposits *3233* and *3343* were the most productive with 500 and 341 fragments respectively. Several layers produced evidence for the disposal of quantities of split and splintered large mammal longbone fragments. Such fragments were common in *3233*, *3343* and *4231*. Upper limb bones of cattle and horse bearing similar longitudinal splits were also found in some numbers. It is likely that this represents further evidence for the disposal of bone working and other craft waste. This material was mixed with other rubbish and the bias towards cattle (48%) and horse fragments (7%) was not exceptional. These figures exclude two small associated groups of horse bones: the first from *3343* consisted of five thoracic vertebrae, a lumbar vertebra and a rib (two further vertebrae of this adult animal were found in a sieved sample – Table 2.203); the second from *4231* consisted of four further thoracic vertebrae.

Other species recovered included sheep/goat (37%), pig (8%), dog (1%), domestic fowl, duck and woodcock. Preservation of the bones was quite good with relatively low numbers (8%) of eroded fragments. Burnt fragments (3%) were more common than in most phase groups (Table 2.21).

Period 7 (late 3rd to 4th centuries)

The sequence in the north-east corner of Victoria Road East – Trench XII: Phases 375–410

Post-dating the second cemetery boundary ditch (F709/F711/F936) on the north-east side of the cemetery was a sequence of deposits and structural remains probably dating from the late 3rd century to the early 4th century. It consisted of three flint surfaces and finally a chalk surface, all on a north-west/south-east alignment, which were interleaved with silty deposits which produced quantities of domestic refuse and craft waste including much from iron smithing (Rees *et al* 2008).

Interpretation of the flint surfaces is difficult; they may all have been the floors of buildings, for which the walls were based on beams laid directly on the ground. However, the first surface (F702) is regarded as that of an open yard, although it might also have been a minor street, but the second surface (F682), albeit somewhat uneven, was associated with a chalk-filled trench and some post-holes on its south-west side suggesting that this was a building floor. These features are therefore referred to as Building 1 with the third flint surface (F665, F670, F939) seen as a re-flooring. The chalk surface can be confidently identified as belonging to a building referred to as Building 2. The yard and buildings are probably to be associated with properties extending beyond the limits of the excavation which perhaps faced the Silchester road to the east.

VRE6 Phases 375–376 – flint and silt layers

Two contexts produced just ten fragments, five of which were unidentified large mammal fragments. Three pig and two cattle fragments completed the assemblage. Five of the fragments were eroded and one was butchered.

VRE7 Phase 378 – flint surface

Three contexts produced 176 fragments, mainly from F702 (*2618*). Preservation was very poor with high percentages of eroded and gnawed fragments and a high percentage of unidentified fragments. Fragmentation was partly the result of poor preservation but the sample included a large number (72) of large mammal longbone fragments, at least fourteen of which had been deliberately splintered. This was probably waste from earlier bone working activities dumped in the area and redeposited. Cattle and horse were the most common species identified, with sheep/goat and pig very poorly represented in the small sample (Table 2.22). No other species were identified.

VRE8 Phases 379–81 – silts

These silts contained much organic material, particularly animal bone. Six layers produced 642 fragments, 389 of these from *2551*. Preservation was quite poor, with high percentages of eroded and gnawed fragments. Cattle fragments (60%) dominated the identified material ahead of sheep/goat (19%) and pig (10%). Horse (8%) was relatively well represented. Six bones of dog and a single bone each of red deer, hare, and rabbit were recorded. The last from *2556* was

Table 2.23 Summary of animal bone data from Group VRE8

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	192	61	33	27	6	3		320	642	194	86	24	2	57
%	60	19	10	8	2			50		31	29	4	<1	19

Key: as Table 2.17
sheep 8, goat 0, large mammal 241, sheep-sized mammal 51
other mammals: red deer 1, hare 1, rabbit 1 (intrusive)

Table 2.24 Summary of animal bone data from Group VRE9

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	66	9	3	8				38	124	11	31	3	1	35
%	(77	10	3	9)				31		9	(37)	2	<1	(42)

Key: as Table 2.17
large mammal 26, sheep-sized mammal 5

Table 2.25 Summary of animal bone data from Group VRE10 (Building 1)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated	6								6					
Other frags	258	77	27	43	2	6	6	310	729	155	126	22	2	56
Total frags	264	77	27	43	2	6	6	310	735					
% (excluding associated)	63	19	7	11	<1			42		23	37	3	<1	16

Key: as Table 2.17
sheep 8, goat 0, large mammal 226, sheep-sized mammal 52
other mammals: red deer 5, rabbit 1 (intrusive)
birds: domestic fowl 5, rook/crow

probably a medieval intrusion. No articulated groups were noted (Table 2.23).

Cattle mandible and scapula fragments were well represented in *2551* and *2547*. The former layer also contained several split and splintered upper limb bones, similar to those found in the earlier flint metalling layers. There is therefore an indication of the disposal of cattle butchery and bone working waste in some quantities but the material is probably of a mixed origin representing a number of dumping episodes.

VRE9 Phases 382–3 – silt deposits

A further five silt layers produced 124 animal bone fragments, mainly from *2562*. The assemblage was dominated by large bones, particularly of cattle, which contributed 77% of the identified fragments. Horse (9%) was also comparatively well represented but smaller domestic species such as sheep/goat (10%) and pig (3%) were poorly represented. Comparatively few small unidentified fragments were recovered. There must be a suspicion that this assemblage was poorly retrieved resulting in a heavy bias towards large mammal bones. Alternatively, collections of large bones may have been disposed of in these layers. Mandible and scapula fragments were again well represented in the cattle assemblage and a large proportion of the cattle bones bore butchery marks. The surface condition of the bones that were recovered was generally better than in the silts from Phases 379–81, but gnawed fragments were common (Table 2.24).

VRE10 Phase 385–6 – Building 1 (Plate 8)

As noted above, the second layer of flint metalling in the sequence (F682) is considered to have been a building floor. On its south-west side was a small slot packed with chalk to hold a line of posts.

Thirteen post-holes produced 159 animal bone fragments, of which only 48 were identified. The fill *2503* of F675 produced 91 fragments, of which 73 were unidentified large mammal longbone fragments. Nearly all of these were split or splintered and some bore evidence of further shaving. These fragments represent a dump of bone working waste. From F672, *2499* produced six similar fragments, presumably from the same dump.

The material making up the metalled surface produced 576 fragments including a small group of six cattle cervical and lumbar vertebrae of an immature animal. Cattle and horse bones and teeth were again well represented. A minimum of eight cattle was represented by skull fragments and seven by scapulae and tibiae. A few of the bones from this layer are likely to be intrusive. A rabbit bone almost certainly is of post-Roman date and butchery marks on one or two of the sheep/goat vertebrae also look suspiciously to be of medieval or later origin. Red deer was represented by five worked antler fragments.

Overall, cattle (63%) again were easily the most commonly represented species, followed by sheep/goat (19%), horse (11%), and pig (7%). Only two fragments of dog were identified. Domestic fowl and rook/crow bones were found in small numbers. Preservation was moderate with high percentages of gnawed and eroded fragments (Table 2.25).

VRE11 Phases 387–9 – silt deposits

The metalled surface (F682) silted over with a deposit similarly organic in nature to the earlier silts. Eight contexts produced 829 fragments, 486 of which came from *2508*. Preservation of the bones was moderate. In the sample as a whole, cattle fragments (49%) again predominated with a fairly even representation of skeletal parts. Although

Table 2.26 Summary of animal bone data from Group VRE11

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	237	170	52	17	5	3	5	340	829	139	138	23		67
%	49	35	11	4	1			41		18	32	3		16

Key: as Table 2.17
sheep 20, goat 0, large mammal 234, sheep-sized mammal 87
other mammals: red deer 3
birds: domestic fowl 4, rook/crow 1

Table 2.27 Summary of animal bone data from Group VRE12 (Building 1, 2nd phase)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	472	222	66	30	3	7	4	575	1379	177	225	93	1	126
%	60	28	8	4	<1			42		14	32	7	<1	18

Key: as Table 2.17
sheep 18, goat 0, large mammal 408, sheep-sized mammal 106
other mammals: red deer 5, roe deer 2
birds: domestic fowl 4

Table 2.28 Summary of animal bone data from Group VRE13

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	222	185	50	11	1	2	4	593	1068	172	150	72	2	70
%	47	39	11	2	<1			56		17	37	7	<1	17

Key: as Table 2.17
sheep 17, goat 1, large mammal 377, sheep-sized mammal 161
other mammals: red deer 2
birds: domestic fowl 3, duck species 1

sheep/goat fragments (35%) were less commonly identified, a minimum of eight animals were represented in *2508* compared with a minimum of four cattle in the same context. The rest of the identified assemblage was completed by pig (11%), horse (4%), dog (1%), three red deer antler fragments, four domestic fowl bones, and one from a rook or crow (Table 2.26). The horse assemblage included three associated cervical vertebrae from *2517* and a radius from a foetal or neonatal foal from *2548*.

VRE12 Phase 393 – Building 1, 2nd phase
This metalling (F665, F670, F939) was more substantial than F682, being 0.3m thick in places. It contained a lot of domestic refuse as well as flint. Two contexts produced 1379 fragments, 1265 of these from *2486*. The assemblage was moderately preserved. Cattle (60%) dominated the identified fragments but sheep/goat (despite contributing only (28%) of the fragments) were represented by as many, if not more, individuals (at least 11). Pig (8%), horse (4%), and dog (0.4%) completed the list of domestic mammals. Red deer was represented by three bones and two antler fragments; roe deer by two bone fragments. Domestic fowl was the only avian species identified (Table 2.27). The assemblage from *2486* was not dominated by concentrations of particular types of bones but probably represents bones from a series of dumping episodes, which may have been subsequently redeposited amongst this metalling. The other context, *2495*, however, was more heavily biased towards cattle and included 18 mandible fragments from at least four animals.

Plate 8 Victoria Road East, north-east corner, Building 1

VRE13 Phases 394–9 – mainly silts
These deposits produced 1068 fragments from eleven contexts. From *2470* and *2471* came 505 and 309 fragments respectively. The assemblage was very similar in its moderate preservation and species representation to the one from the earlier silts from Phases 387–9 (VRE11). Cattle (47%), sheep/goat (39%), pig (11%), horse (2%), and dog (0.2%) were recorded. Two fragments of red deer antler, three domestic fowl, and one duck bone completed the identified assemblage (Table 2.28). The cattle assemblage showed no major biases towards specific bones.

VRE14 Phases 402–10, Building 2
Overlying the silty deposits was what appeared to be a reconstruction of Building 1 defined by a hard-packed chalk surface (*2455, 2458*). A second phase of the surface was represented by *2413* and *2417* and a possible beaten earth floor (*2392, 2397, 2414, 2459*). Further patching of the surface was represented

Table 2.29 Summary of animal bone data from Group VRE14 (Building 2)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	37	47	11	1		1	3	124	224	33	18	10	2	11
%	(39	49	11	1)				56		16	(24)	5	<1	(14)

Key: as Table 2.17
sheep 4, goat 0, large mammal 66, sheep-sized mammal 36
other mammals: cat 1
birds: domestic fowl 3

Table 2.30 Summary of animal bone data from Group VRE15

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	28	18	11	1	1	1	4	89	153	14	24	16		6
%	(47	31	19	2	2)			67		9	(42)	11		(11)

Key: as Table 2.17
sheep 5, goat 0, large mammal 50, sheep-sized mammal 25
other mammals: red deer 1
birds: domestic fowl 2, domestic duck/mallard 1, woodcock 1

Table 2.31 Summary of animal bone data from Group VRE16

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated		24							24					
Other frags	6	4	2	1	1			34	48	7	3	2		3
Total frags	6	28	2	1	1			34	72					

Key: as Table 2.17
sheep 25 (24 associated), goat 0, large mammal 21, sheep-sized mammal 7

by chalk and mortar layers *2393* and *2411*. As the latest part of the Roman sequence in this area, the date of Building 2 is uncertain but an early to mid-4th-century construction and use is the most likely.

Ten contexts produced 224 fragments, mainly from the silts that separated the floor layers. No associated groups of bones were observed. Sheep/goat fragments (49%) were the most commonly identified, followed by cattle (39%), pig (11%), and horse (1%). Cat and domestic fowl were also represented. Preservation was moderate with relatively high percentages of eroded fragments, gnawed bones, and loose teeth (Table 2.29).

Other buildings

VRE15 Trench X: Phases 328–38 – 4th phase of structure adjacent to the Cirencester road

Bones from Phases 331–8 were from contexts associated with the fourth phase of a structure (see Group VRE1 for bones from second phase) adjacent to the Cirencester road. They are considered here along with bones from broadly contemporary adjacent deposits (Phases 328–9) and a layer of cobbles (Phase 330). All these phases are thought to date to the later 3rd century.

Eleven contexts produced animal bones, of which 78 came from contexts directly associated with the structure and 75 from other layers. Sixty-two fragments were found in Deposit *432* (Phase 328). Most of the bones from the building came from compacted chalk layers.

The assemblage was too small and mixed for detailed analysis. No associated bones were recovered. Cattle (47%), sheep/goat (31%), pig (19%), horse (2%), and dog (2%) were identified. Red deer, domestic fowl, domestic duck/mallard, and woodcock bones were also recorded. Preservation was mixed but high percentages of gnawed fragments were observed in most deposits. Eroded and ivoried fragments were recorded in roughly equal numbers (Table 2.30).

VRE16 Trench X: Phases 468–9 – 5th phase of structure adjacent to the Cirencester road

Twelve post-holes of the structure produced 72 fragments from their fills. The compacted chalk fill of F58 (*129*) produced 24 bones from a skeleton of an immature sheep. The animal was represented by several cervical and thoracic vertebrae, ribs, sacrum, and right femur and tibia. There was no evidence of butchery on any of these bones. Apart from this burial, the remaining post-holes produced only a handful of bones, with only the major domestic mammals being identified. Dog was represented by a tibia of a short bow-legged type (Table 2.31).

VRE17 Trench XV: Phases 341–6 – Building 3

Stratigraphically later than the oven (Period 6) in the south-western part of the site was Building 3, which would have been *c* 7m from the Cirencester road. Only a part of the building's plan could be recovered, as the north and east walls did not survive and its dimensions are therefore uncertain. The surviving footings which supported the southern and western walls existed as slots 0.3m wide and 0.1m deep, filled with compacted chalk and would have acted as bases for sill beams. Coins and limited pottery evidence suggest a construction date in the late 3rd – early 4th centuries. A lack of related occupation deposits suggests that this was a store house or roadside shop.

Only 100 fragments were recovered from ten contexts, with cattle (51%), sheep/goat (34%), pig (11%), and dog (4%) the only species identified. Apart from the usual high incidence of gnawed bones, preservation of the bones was generally good (Table 2.32). Many of the bones may have been deposited after the building was abandoned.

Table 2.32 Summary of animal bone data from Group VRE17 (Building 3)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	27	18	6		2			47	100	2	13	14	6	5
%	(51	34	11		4)			47		(2	27	15	6	23)

Key: as Table 2.17
sheep 1, goat 0, large mammal 24, sheep-sized mammal 18

Table 2.33 Summary of animal bone data from Group VRE18 (Building 4)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	29	54	6		2		1	94	186	8	27	4	5	16
%	(32	59	7		2)			51		4	(32)	2	3	(19)

Key: as Table 2.17
sheep 5, goat 0, large mammal 56, sheep-sized mammal 29
birds: domestic fowl 1

Table 2.34 Summary of animal bone data from Group VRE19 (well F1096)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated	8		72		352	98	35		565					
Other frags	349	140	53	13	13	25	20	434	1047	106	83	72	3	204
Total frags	357	140	125	13	365	123	55	434	1612	106	83	72	3	204
% (excluding associated)	61	25	9	2	2			43		11	16	7	<1	38

Key as Table 2.17
sheep 26, goat 1, large mammal 335, sheep-sized mammal 67
other mammals: hare 2, short-tailed vole 1, rodent 3
amphibians: frog 117 (98 associated)
birds: domestic fowl 47 (29 associated), domestic/greylag goose 6 (associated), domestic duck/mallard 2

VRE18 Trench XV: Phases 426–41, 445–7 – Building 4
Overlying the deposits over Building 3 in the south-western part of the site were the remains of another timber building – Building 4. It was not possible to recover a complete ground plan as part of it lay south of the site boundary and the remainder was disturbed by later features. It is probable that the walls were constructed on timber sill beams laid directly on to the ground which was prepared with chalky spreads and patches. The principal feature within the building was an oven (F1100) found at the southern trench edge. The building is likely to be of 4th-century date and may have been contemporary with the later use of the wells F1093 and F1096, and pit F814 (below).

Ten contexts produced 186 fragments, of which 99 came from *4144*, a silty loam. A few fragments were obtained from contexts associated with the chalky spreads and patches, and possible mortar floor of the building.

Sheep/goat fragments (59%) were the most frequently identified, followed by cattle (32%), pig (7%), and dog (2%). Domestic fowl was represented by one bone. No associated groups were recorded. A lot of the bones were gnawed, although erosion damage was slight (Table 2.33). The sheep/goat assemblage included 19 metapodial fragments but there is no clear indication that this represented the dumping of waste from large-scale processing.

Wells

VRE19 Trench XV: Phase 348 – F1096 *(Fig 16)*
This well was situated in the southern part of the site about 4m north-east of the Cirencester road. It was excavated to a depth of 7.3m, at which point the modern water table was reached.

The earliest deposit (*4382–3*) was probably a natural, probably primary, silting layer. It was succeeded by a chalky deposit (*4381*), perhaps deliberate backfill. Subsequently there was another silt deposit (*4380*) and a second chalky layer (*4379*). Deposits *4376–8* may represent a mixture of silting and deliberate infill. There then seems to have been an episode when chalk eroded from the sides of the shaft (*4211*). Later deposits may represent a mix of deliberate backfilling and natural silting (*4106*, *4112*, *4119*, *4152–3*, *4209*, *4211*).

The feature was probably filling up during and after the time Building 3 stood on the site, but accurate dating for it is difficult, partly because the complete depth could not be excavated. Material from the excavated infill deposits seems to be largely of the late 3rd – early 4th centuries.

The well produced one of the largest bone assemblages from the northern suburb sites. Fourteen contexts produced 1612 fragments, of which 565 were recorded as eighteen associated groups (Tables 2.34–2.35). Most of these subgroups were from skeletons from the primary silting layers or the infilling layers and presumably represent carcasses that were thrown into the well after it fell into disuse.

Nine of the groups belonged to dogs. The most complete skeleton belonged to an adult bitch of a miniature type from infill layer *4209*. Skeletons of three other adult dogs were found in varying states of completeness. Other groups of dog bones in the well included partial skeletons of a subadult from *4383* and an immature animal from *4376* and bones from three groups of neonatal mortalities.

A juvenile pig skeleton was represented by 72 bones from infilling layers *4377* and *4378*. Four groups of domestic fowl bones were recovered, three from *4382*. The foot of a domestic/greylag goose was found in *4383*. Two small groups of cattle bones were found in *4376*. Both included butchered bones and probably represent processing waste.

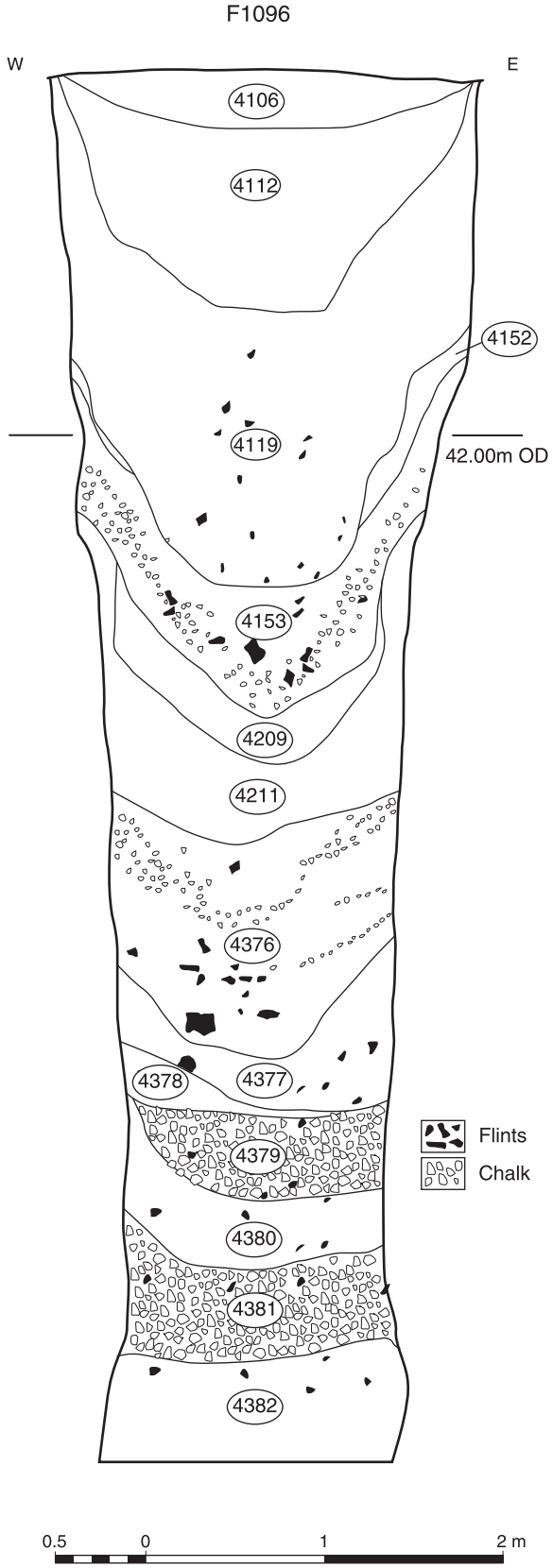


Figure 16 Victoria Road East, section through well F1096

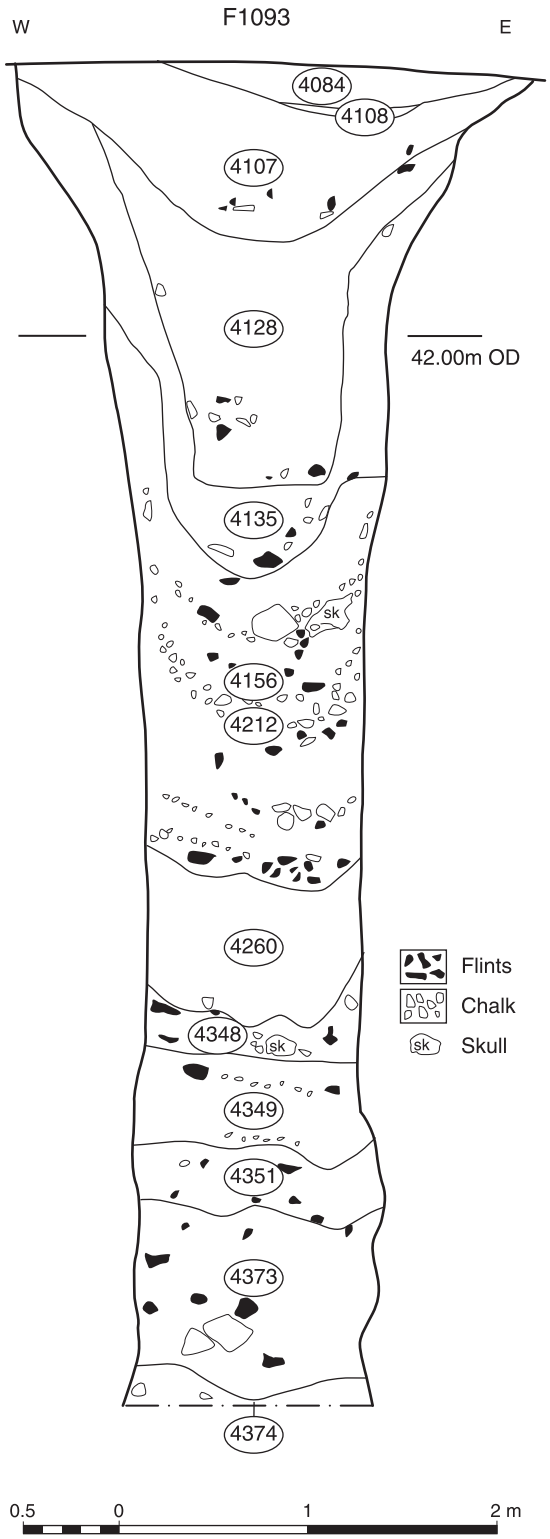


Figure 17 Victoria Road East, section through well F1093

Table 2.35 Summary of associated groups of bone in well F1096

Species	Bones	Context	Zone	Comments
Dog	9	4119	A	Ribs only of an adult
Fowl	8	4152	A	Adult hen not in lay
Dog	81	4209	B	Adult ?female miniature type
Cattle	3	4376	B	Skull and mandibles – butchered
Cattle	5	4376	B	Cervical vertebrae – atlas butchered
Dog	63	4376	B	Immature male
Dog	39	4376	B	Adult – deformed sacro-iliac joint
Dog	6	4376	B	Neonatal
Frog	98	4376	B	Fall victims?
Pig	72	4377/4378	B	Juvenile
Dog	11	4382	C	Bones from minimum two neonatals
Fowl	12	4382	C	Hen in lay
Fowl	6	4382	C	Adult wing bones
Fowl	3	4382	C	Immature leg bones
Dog	62	4383	C	Adult female – bow-legged (evidence for osteoarthritis of trunk and legs)
Dog	62	4383	C	Subadult – larger than above
Goose	6	4383	C	Tarsometatarsus and phalanges

Zones: A = upper backfills, B = infilling/refuse layers, C = primary silts

There is no evidence for butchery on any of the bones of the other associated groups and in most cases it is likely that complete carcasses were deposited. At least three frogs were represented by 98 bones in *4376*. These may have been victims of falls.

Excluding the associated bones, the rest of the assemblage was dominated by cattle fragments (61% of the major species), particularly in the upper backfills. The largest assemblage came from *4119*, with nearly 700 fragments. The cattle assemblage from this layer (236 fragments) consisted principally of upper limb bone shaft fragments (174 fragments from a minimum of nine animals), many of which had been systematically split or splintered. Over 100 unidentified large mammal longbone fragments were found in the same layer, many of them also splintered and representing evidence for the same intensive butchery or bone working processing. Assemblages dominated by similar concentrations of cattle upper limb bones were found in a number of layers and earlier features in this part of the northern suburb. It is probable that the final backfilling of the well resulted in the redeposition of bones from earlier deposits, although relatively few fragments showed evidence for weathering. A minimum of five cattle were represented by scapulae in *4376*, where mandible and skull fragments were also found in some numbers. Cattle fragments (43 out of 59 fragments identified) also dominated the unassociated bones in this layer.

Other domestic mammals were relatively poorly represented in this feature (Table 2.34). Sheep, pig, horse, dog, and goat were recorded. Bird bones were were quite well represented in the deposits. Domestic fowl dominated but goose and duck bones were also present. The identified component also included relatively large numbers of associated frog bones and a few bones of hare and short-tailed vole.

Preservation of the bones was very good, particularly in the lower fills, where ivoried bones were quite commonly recorded. The unassociated bones did, however, include eroded and gnawed fragments, indicating that some of the material was probably redeposited.

VRE20 Trench XV: Phase 442, F1093 (Fig 17)
This well was situated about 9m north-east of the Cirencester road, and north of F1096; its infilling was probably contemporary with Building 4. It was excavated to the level of the modern water table at a depth of *c* 7.2m, although this was not the bottom of the feature.

The earliest excavated layer was a silt (*4374*), which was sealed by a thick chalk plug (4373), probably deliberately deposited. This was succeeded by a series of deposits that were probably a mixture of deliberate dumping and natural silting (*4156, 4212, 4260, 4348–9, 4351*). There then developed an inverted 'cone' characteristic of wells which have been left to silt up naturally. During this period, a silty deposit (*4135*) accumulated. This produced 47 coins, of which the vast majority were dated to AD 350–60 and none was later than AD 364 (Davies 2008, 135). Above *4135*, the feature appears to have been deliberately backfilled (*4084, 4107–08, 4128*). Coin evidence suggested that backfilling was not completed until the last decade or so of the 4th century.

Thirteen contexts produced 1993 animal bone fragments (excluding sieved samples). Again a substantial proportion (542) of these belonged to associated groups belonging to carcasses that were thrown down the well after it became disused. All of these groups were in the lower layers of the fills. A summary of the associated groups (Table 2.36) shows that substantial parts of skeletons of eight dogs were recovered. Three of these belonged to puppies all of about the same size and age (about three months old). They were all found in *4212* and could have been members of the same litter. The main parts of a large immature dog skeleton were found in *4260*, with a few of its bones in the adjacent *4348*. An adult male dog was found in *4212*. As in the case of one of the dogs in F1096, this skeleton also had deformities of the sacro-iliac joint and the lumbar vertebrae. A minimum

Table 2.36 Summary of associated groups of bone in well F1093

Species	Bones	Context	Zone	Comments
Pig	17	4212	B	Immature – bones from three feet
Dog	105	4212	B	Adult male – deformed sacro-iliac joint
Dog	194	4212	B	Three juvenile skeletons
Dog	82	4260/4348	B	Immature – large
Horse	115	4260/4348	B	Adult – deformed thoracic vertebrae
Dog	29	4373	B	Bones from minimum three neonatals

Zone: B = infilling/silting layers

Table 2.37 Summary of animal bone data from Group VRE20 (well F1093)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated			17	115	410				542					
Other frags	179	402	68	25	11	9	16	741	1451	5	177	635	3	75
Total frags	179	402	85	140	421	9	16	741	1993	5	177	635	3	75
% (excluding associated)	26	59	10	4	2			52		<1	28	33	<1	12

Key: as Table 2.17
sheep 46, goat 3, large mammal 262, sheep-sized mammal 419
other mammals: red deer 1
amphibians: frog 1, toad 4, frog/toad 3
birds: domestic fowl 11, domestic duck/mallard 2, duck sp 1, buzzard 2

of three neonatal puppies were found in *4373*. It is also worth noting here that sieved samples produced a large number of puppy bones from the adjacent deposit, *4351* (Table 2.203). A total of 115 horse bones from *4260* and *4348* formed associated groups and these all probably belonged to a single skeleton of an adult animal, which bore evidence of osteophytes and fusion of two of its thoracic vertebrae. Seventeen bones of pig from *4212* were from three of the trotters of an immature pig. These may have been butchery waste.

In contrast, no large associated groups of bones were recorded in the upper fills, which produced 1134 fragments. A total of 721 of these came from *4135*. Several groups of two or three bones belonging to the same cattle, sheep, or pig skeleton were noted in these fills, but butchery marks and fragmentation patterns suggest that these can best be regarded as butchery waste. This would accord with an interpretation of the secondary usage of the well as a rubbish pit. Amongst the identified material, sheep/goat dominated (59%), whereas cattle representation (26%) was one of the lowest recorded in any of the large assemblages from the northern suburb. No large concentrations of butchery waste were observed, although the unusually high percentages of sheep/goat fragments in *4135* in particular (70%) does indicate that several sheep carcasses may have been processed together.

Other species represented included pig (10%), goat, and horse (4%). It is possible that several of the horse bones belonged to the adult skeleton discussed above. The only other mammal bone identified in the unsieved samples was a red deer scapula from *4135*. Only a few amphibian bones were recovered by normal excavation but hundreds were obtained from sieved samples together with a number of small mammal bones (Table 2.196). Only sixteen bird bones were identified, mainly belonging to domestic fowl, although two species of duck and common buzzard were also represented (Table 2.37).

Surface preservation of the bones was superb. Only five fragments were eroded and over 600 were ivoried. Gnawing damage was, however, observed on 28% of the domestic mammal fragments, indicating that many were accessible to dogs prior to deposition.

Pits

VRE21 Trench X: Phase 479 – F168 (Fig 18)
This pit was situated in the northern part of the site, about 13m north-east of the Cirencester road. It had a depth of about 2.9m.

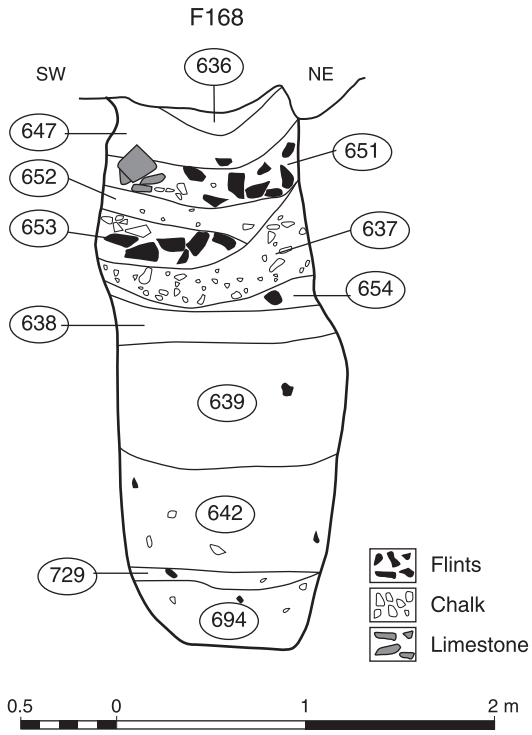


Figure 18 Victoria Road East, section through pit F168

Table 2.38 Summary of animal bone data from Group VRE21 (pit F168)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated			4						4					
Other frags	53	21	23	6		13	8	55	179	3	30	43		29
Total frags	53	21	27	6		13	8	55	183					
% (excluding associated)	51	20	22	6				35		2	(31)	27		(30)

Key: as Table 2.17
sheep 1, goat 0, large mammal 26, sheep-sized mammal 18
other mammals: rodent 1
amphibians: frog 11, frog/toad 1
birds: domestic fowl 7, domestic/greylag goose 1

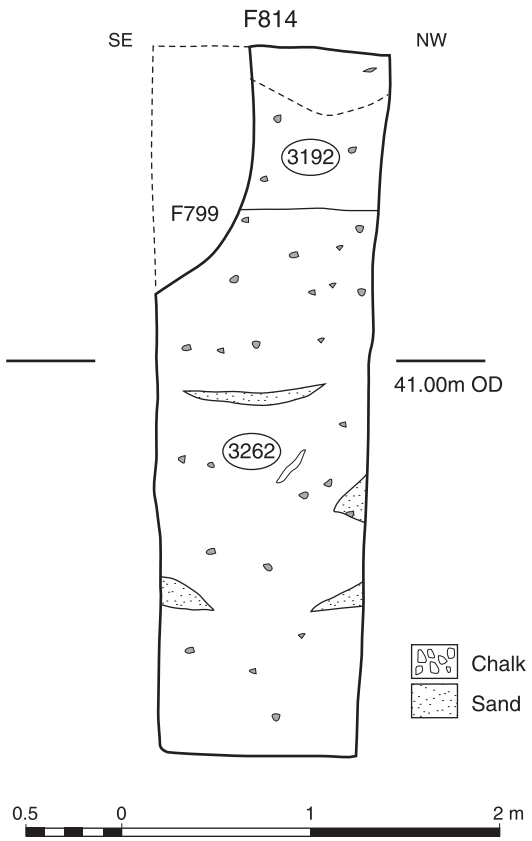


Figure 19 Victoria Road East, section through pit F814

Deposit *639* contained a number of complete or near-complete vessels, perhaps material from the removal of earlier graves or perhaps deliberately deposited as some form of ritual activity. The corpse of an infant (G416) was deposited in the second to uppermost deposit (*647*). The fill layers can be dated to the first half of the 4th century.

The animal bone assemblage was unspectacular. Fourteen contexts produced just 183 fragments, about half of which (90) were recovered from *642*, a dumping layer. The only group of associated bones were four toe bones of an immature pig in *639*. It is impossible to determine whether these were directly associated with the burial or any other ritual activity.

The rest of the faunal assemblage consisted of typical butchery and cooking waste dumped into the pit (Table 2.38). In a relatively small sample, cattle fragments (51%) were dominant amongst the identified domestic mammals, followed by pig (22%), which was unusually well-represented. Sheep/goat were only ranked third (20%), and horse (6%) was a poor fourth. A minimum of three cattle were represented by scapulae in the small sample of fourteen identified bones from *638* but there was no evidence of large-scale dumping.

Eight bird bones were identified but only domestic fowl and goose were represented. The presence of amphibian bones indicates that the pit was left open at some stage.

Surface preservation of the bones was very good with high percentages of ivoried bones and only two eroded fragments. As in other pits, however, evidence of gnawed bones was common.

VRE22 Trench XIII: Phase 480 – F814 (Fig 19)
This pit was situated in the south-eastern part of the site, *c* 15m from the Cirencester road. It was about 3.8m deep. Much of the pit, to within 0.7m of the top, was filled with a homogeneous deposit of silty clay (*3262*). A very large sample of 2132 animal bone fragments was recovered by hand, of which nearly 1900 came from *3262*. This deposit not only contained a large sample of animal bones but also ten complete or near complete colour-coated beakers (P5). In light of these finds, this feature has perhaps the best evidence from the site for the sort of 'structured deposit' of presumed ritual character described by Fulford (2001) in respect of pits and wells at Silchester and elsewhere.

One of the main features of the assemblage was the presence of several dog skeletons intermixed in *3262* (Plate 9). It was impossible to assign all the bones from the skeletons to individuals but the 330 bones belonged to at least eight dogs. Most of these were adult animals with all limb bone and vertebral epiphyses fused. However, at least one immature individual was represented. The dogs varied greatly in size. One was a small, stocky bow-legged individual, whilst several others were much larger. The variations in the sizes of dogs will be discussed below (pp 216–217). Several dog bones displayed deformities, including a skull of an old male with a healed depressed fracture (Plate 10).

Two cats were represented by small groups of associated bones in *3262*. Pairs of femora and tibiae from an immature animal formed the first group; seven ribs from an adult animal formed the second. A raven skeleton was represented by 26 bones in the same layer (Plate 38). Although no other large associated groups were recorded, at least five pairs of sheep metapodials and six pairs of domestic fowl bones were recorded (Plate 11).

Cattle dominated the remaining assemblage, contributing 64% of the fragments of the identified domestic mammals (Table 2.39). There is evidence for large-scale disposal of certain parts of cattle carcasses. A minimum of 24 cattle were represented by the area of the skull to which horn cores were attached and a number of horn cores were also found (Plate

Plate 9 Dog skulls from Victoria Road East pit F814

Plate 10 Dog skull with a depressed fracture above eye socket from Victoria Road East pit F814

Plate 11 Selection of domestic fowl bones from Victoria Road East pit F814, including several pairs

Table 2.39 Summary of animal bone data from Group VRE22 (pit F814)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated					330	11	26		367					
Other frags	658	273	73	17	4	2	37	701	1765	62	212	646	32	270
Total frags	658	273	73	17	334	13	63	701	2132					
% (excluding associated)	64	27	7	2	<1			40		4	23	38	2	29

Key: as Table 2.17
sheep 52, goat 0, large mammal 493, sheep-sized mammal 137
other mammals: cat 11 (associated), rodent 2
birds: domestic fowl 33, domestic duck/mallard 1, duck sp 2, raven 26 (associated), white tailed eagle 1

12). Butchery marks on several specimens indicated where the horns had been removed. It seems likely that most of these skulls were processed together to remove the horns. Other parts of the skeleton were less well-represented. Eleven cattle were represented by metatarsals, ten by tibiae fragments, and nine by metacarpals and mandibles.

Another unusual feature about the cattle assemblage was the large number (21) of complete metapodials present (Plates 13–14). Complete metapodials were rarely encountered elsewhere because of the practice of breaking open the bones for marrow extraction. It will be shown below (pp 147–148) that the metapodials from F814 included an unusually high proportion of male specimens, whereas metapodials of cows dominated in other deposits in the area. Since the morphology of the horn cores also indicated that steers were the most commonly represented in this material, it is feasible that these metapodials were associated with the skulls. Cattle phalanges were also quite well represented in *3262* and it is possible that cattle hides brought in with heads and feet attached were being processed in the vicinity. A substantial part of the assemblage could therefore be the waste from tanning and horn working processes. Raw material for these specialist activities may have relied on sources of stock not usually as well represented in the rest of the assemblages.

Sheep/goat (27%) were relatively poorly represented, with only sheep being positively identified. The presence

Plate 12 Selection of cattle horn cores from Victoria Road East pit F814

Plate 13 Selection of complete cattle metacarpals from Victoria Road East pit F814

of the pairs of complete metapodials may also indicate the presence of skinning waste, although small foot bones were grossly under-represented. A minimum of twelve sheep were represented by mandibles and radii. Pig (7%) and horse (2%) were very poorly represented (Table 2.39).

Domestic fowl was the most common species of bird identified. Two species of duck and the unusual find of a white-tailed eagle's humerus completed the avian assemblage (Plate 39).

Preservation of the bones was superb with large numbers

Plate 14 Selection of complete cattle metatarsals from Victoria Road East pit F814

Table 2.40 Summary of animal bone data from Group VRE23 (pit F981)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated		13	4						17					
Other frags	21	55	10			24	2	191	303	2	23	118	2	12
Total frags	21	68	14			24	2	191	320					
% (excluding associated)	(24	64	12)					63		<1	(29)	40	<1	(15)

Key: as Table 2.17
sheep 5, goat 4 (associated), large mammal 58, sheep-sized mammal 119
other mammals: hare 1
amphibians: frog 22, toad 1
birds: domestic duck/mallard 1, wader cf plover sp 1

of ivoried bones and low percentages of eroded fragments (Table 2.39). Gnawed bones were, however, found in large quantities, indicating that many of the bones were not dumped directly into the pit.

VRE23 Trench XIV: Phase 450 – F981

F981 was a pit rectangular in plan and 0.8m deep, situated near the centre of the site *c* 17m from the Cirencester road. The fill was a series of dark silty and chalky backfill deposits (*3831* and *3842–5*), which contained pottery and a coin of Carausius (AD 287–93) suggesting a late 3rd- or early 4th-century date. The pit may have been contemporary with either Building 3 or 4.

Eight contexts produced 320 animal bone fragments. Over half the fragments came from *3834*. Several small groups of associated bones were recovered. Four bones from the upper left hindlimb of a juvenile pig were found in *3834*. A pair of metacarpals in *3834* probably belonged to the same juvenile goat as the pair of metatarsals found in *3841*. Nine ribs of a young sheep or goat in *3842* could possibly have belonged to the same animal.

Apart from the associated bones, sheep/goat fragments (64%) dominated the rest of the identified assemblage, with cattle (24%) poorly represented. Pig (12%) was the only other domestic mammal identified. It is possible that several porous sheep/goat bones included amongst the unassociated bones belonged to the goat skeleton, inflating the percentage of sheep/goat in these counts (Table 2.39).

Hare was the only other mammal identified. Frog and toad bones were found in several layers. Only two bird bones were found: one belonged to a domestic duck/mallard; the other was a tarsometatarsus of a species of wader, possibly a plover.

Surface preservation of the bones was excellent, with only two eroded fragments and a high percentage of ivoried bones (Table 2.40). Gnawed bones, however, again formed a substantial proportion of the assemblage. Given the good preservation, there was an unusually high percentage of unidentified fragments (63% in this sample), with rib fragments particularly common.

VRE24 Trench XV: Phase 471 – F1098

This pit was subrectangular in plan and situated on the south-western side of the site *c* 1m from the Cirencester road. It was excavated to a depth of 2m, but was probably deeper. The fills therefore consisted only of the upper backfill deposits broadly dated between AD 270–400 (although there was one late Anglo-Saxon sherd amongst 100 of Roman date).

Only 92 animal bone fragments were recovered from four of the upper fills of this pit, mainly from *4113*. No

Table 2.41 Summary of animal bone data from Group VRE24 (pit F1098)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	20	21	2	2	2			45	92	15	8		1	9
%	(43	45	4	4	4)			(49)		(19			1)	

Key as Table 2.17
large mammal 30, sheep-sized mammal 10

Table 2.42 Summary of animal bone data from Group VRE25 (ditch F122/F1202)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	51	24	9	4	2			104	194	51	20	1		11
%	(57	27	10	4	2)			54		28	(26)	<1		(14)

Key as Table 2.17
sheep 2, goat 0, large mammal 66, sheep-sized mammal 25

articulated groups were recorded. Only bones of the major domestic mammals were identified, with cattle and sheep/goat fragments occurring in roughly equal numbers (Table 2.41). A pair of dog mandibles were found in *4113* and *4147*. A horse lumbar vertebra bore evidence of osteophytes. The preservation of the bones was not exceptional with much of the material likely to have been redeposited, but again this is to be expected in the upper layers of a pit.

Ditch

VRE25 Trench X/XVI: Phase 465 – F122/F1202
A ditch 1.5–2m wide and 0.7m deep was cut through deposits overlying the Cirencester road. Although the road had fallen into disuse, its alignment was still observed in later activities. The fill layers were a series of silts (*31, 290, 294, 297, 1813–17*) probably dating to the last two decades of the 4th century or to the early 5th century, although an even later date is possible.

Six contexts produced 194 animal bone fragments, of which 90 were recovered from *31*. No associated groups were recorded nor was there any evidence for large-scale dumping of butchery waste. Cattle (57%) were the most commonly identified species, followed by sheep/goat, pig, horse, and dog. No other species was identified. Preservation was moderate with evidence of erosion on the surface of 28% of the bones and almost no ivoried fragments. Gnawed bones were also common (Table 2.42).

Other deposits from Victoria Road East
Much of the faunal assemblage from Victoria Road East was retrieved from numerous silts (usually representing phases of disuse) and soil layers generated by the digging of features such as pits, graves, and construction trenches. Although these are difficult to date and pose problems particularly through residuality and, to a lesser extent, later contamination, they can provide indications of disposal practices in areas where pits were rare.

VRE26 Trenches X, XI, XII, XIV, and XVI: Phases 276, 287–92 – Site-wide accumulation 3.
The contexts in these phases formed part of the third, and final, general accumulation of material across the site and probably date largely to the late 3rd century.

In Phase 276, nine contexts in the western part of Trench X produced 636 fragments. The three most productive layers were *416*, *433*, and *415*, which produced 254, 167, and 139 fragments respectively. *415* and *416* again contained high percentages of large mammal split and splintered fragments with cattle radius, femur, tibia, and metatarsal being well represented. These layers therefore provide further evidence for the disposal of waste from a large-scale processing activity involving these bones, probably bone working, perhaps preceded by marrow extraction and grease production. The identified species list consisted of cattle (61%), sheep/goat (18%), pig (14%), horse (6%), dog (0.4%), and domestic fowl. Preservation was moderate. The high percentage of butchered fragments reflected the abundance of bone working waste and several horse bones had been split and trimmed in a similar way to the cattle.

In Phases 287–92 (from the eastern part of Trench X, Trenches XI, XII, and XIV), eight contexts produced 354 fragments. Preservation was moderate (17% eroded; 25% gnawed). Cattle (51%) provided most of the identified fragments. Unusually, cervical vertebrae were the most commonly identified elements (17 out of 80 fragments). It is possible that several of these found in layers *1616* and *2583* were from the necks of the same animals. Other species represented were sheep/goat (28%), pig (9%), horse (8%), dog (4%), hare (3%), and domestic fowl. The combined totals from these phases are provided in Table 2.43.

VRE27 Trench XIII: Phases 369–73
This group is from phases in Trench XIII thought to be contemporary with Site-wide accumulation 3 (see above). It consists of bones from fifteen contexts from a variety of deposit types – slots, post-holes, cobbling, and areas of burnt material in the area formerly occupied by the oven F846. These only produced 110 fragments, 51 of which were from the fills of slot F843 (Phase 373). Preservation was quite poor and only 37 fragments were identified. Species identified were cattle, sheep/goat, pig, horse, dog, and domestic fowl (Table 2.44).

VRE28 Trenches XIII and XV: Phases 349–57, 361–2 – deposits post-dating Building 3
In Phases 349–57 (Trench XIII) and 361–2 (Trench XV), nineteen contexts produced 540 fragments, including 299 from four layers from Phase 355. Preservation was moderate (14% eroded; 32% gnawed). There was a fairly even representation of cattle (43%) and sheep/goat (39%) fragments. A few split and splintered large mammal fragments were recorded, but there were no large concentrations of these in any of these layers. The species list was completed by pig (14%), horse (2%), dog (2%), red deer, roe deer, rodent, domestic fowl, and domestic duck/mallard (Table 2.45).

VRE29 Trenches X and XVI: Phases 358–60 – western part of Trench X and Trench XVI
In Phases 358–60 seven layers produced 271 fragments

Table 2.43 Summary of animal bone data from Group VRE26

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	244	94	51	28	8	1	4	560	990	134	80	26	9	133
%	57	22	12	7	2			57		14	20	2	<1	34

Key as Table 2.17
sheep 15, goat 0, large mammal 416, sheep-sized mammal 96
other mammals: hare 1
birds: domestic fowl 4

Table 2.44 Summary of animal bone data from Group VRE27

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	12	13	8	1	1		2	73	110	28	6	6	2	3
%								68		27		6	2	

Key: as Table 2.17
sheep 6, goat 0, large mammal 24, sheep-sized mammal 31
birds: domestic fowl 2

Table 2.45 Summary of animal bone data from Group VRE28

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	119	107	38	6	5	5	5	255	540	71	77	5	5	33
%	43	39	14	2	2			48		14	32	1	<1	14

Key: as Table 2.17
sheep 15, goat 1, large mammal 155, sheep-sized mammal 76
other mammals: red deer 2, roe deer 2, rodent 1
birds: domestic fowl 4, domestic duck/mallard 1

Table 2.46 Summary of animal bone data from Group VRE29

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	50	43	14	2		2	2	158	271	70	20	4		7
%	46	39	13	2				59		28	(22)	2		(8)

Key: as Table 2.17
sheep 2, goat 0, large mammal 95, sheep-sized mammal 44
other mammals: red deer 1, hare 1
birds: domestic fowl 1, woodcock 1

including 123 from *340*. Preservation of the bones was quite poor (28% eroded; 22% gnawed). No large accumulations of butchery or bone working waste were encountered. The identified fragments were cattle (46%), sheep/goat (39%), pig (13%), horse (2%), and a single bone each of red deer, hare, domestic fowl, and woodcock (Table 2.46).

VRE30 Trench XV: Phases 461–4 and 472–5 – Late Roman to post-Roman deposits

The final group of bones from Victoria Road East came from sixteen contexts which were the latest in the Trench XV sequence. They are likely to be Roman, although this is not entirely certain and some contexts may be late Anglo-Saxon.

Most of the contexts were silty deposits, but those in Phases 473–4 represented chalk spreads of unknown significance. These contexts produced 542 fragments. All but 34 fragments came from silts. The most fragments (165) came from the silt layer *4064* (Phase 461). The only associated group came from the post-hole F1151 (Phase 472). This consisted of 17 bones from a buzzard skeleton. Sheep/goat fragments (42%) were the most commonly identified, followed by cattle (39%), pig (16%), dog (2%), and horse (0.4%). Three bones of domestic fowl and one each of roe deer and hare completed the identifications. Preservation was quite good, with only 5% being eroded fragments, although 25% of the identified domestic mammal fragments were gnawed (Table 2.47).

Victoria Road West (Trenches IV–VI)

Period 3 (mid-2nd to late 3rd centuries)

Structural remains

From the mid-2nd until perhaps the mid-to late 3rd century, the area adjacent to the Cirencester road was occupied by timber buildings roughly aligned on it. The remains consisted of flint and chalk surfaces and a number of post-holes and other cut features. Although more or less contemporary, a sequence of construction has been identified and the groups of bones described follow that sequence. It is likely that it was during the life of these buildings that a ditch (F12) was dug along their south-west side that may have served to mark out the boundary of a cemetery further to the south-west. Although the primary silt in the ditch should probably be assigned to this period, all animal bone from the ditch fill layers has been considered under the Period 4 heading below.

Table 2.47 Summary of animal bone data from Group VRE30

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated							17		17					
Other frags	88	94	36	1	4	2	3	297	525	24	47	3	7	19
Total frags	88	94	36	1	4	2	20	297	542					
% (excluding associated)	39	42	16	<1	2			57		5	25	<1	1	10

Key: as Table 2.17
sheep 12, goat 1, large mammal 154, sheep-sized mammal 109
other mammals: roe deer 1, hare 1
birds: domestic fowl 3, buzzard 17 (associated)

Table 2.48 Summary of animal bone data from Group VRW1

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	20	78	20	5	1	1		235	360	24	26	5	6	10
%	16	63	16	4	<1			65		7	26	1	2	10

Key: as Table 2.17
sheep 7, goat 0, large mammal 95, sheep -sized mammal 113
other mammals: hare 1

Table 2.49 Summary of animal bone data from Group VRW3 (Building 2)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated		128		7					135					23
Other frags	53	101	17	9	2	1	3	264	450	28	28	3	5	18
Total frags	53	229	17	16	2	1	3	264	585					
% (excluding associated)	29	55	9	5	1			59		7	22	1	1	14

Key: as Table 2.17
sheep 130 (128 associated), goat 1, large mammal 107, sheep sized mammal 115
other mammals: rodent 1
birds: domestic fowl 1, duck sp 1, woodcock 1

VRW1 Trench V: Phase 917 – possible structural features
This phase comprised possible remains of structural features pre-dating the buildings. Thirteen contexts produced 360 fragments, of which only 125 were identifiable, indicating the fragmentary nature of the material recovered. The identified material was dominated by sheep/goat fragments (63%), followed by cattle and pig (both 16%), horse (4%), dog (0.8%), and hare (Table 2.48).

VRW2 Trench V: Phases 918 and 922 – Building 1
The earliest of the four roadside buildings discovered in Trench V was the most northerly of them. Seven contexts associated with this building produced just 31 animal bone fragments. Only sheep/goat (7) and cattle (4) were identified. The unidentified fragments included 13 from sheep-sized mammals and 3 from large mammals. Two fragments were burnt and one each was eroded, gnawed or ivoried.

VRW3 Trench V: Phases 919, 923, 925 and 929 – Building 2
This was located about 1.5m to the south of Building 1. Several phases of floor deposits were represented. Bones were recovered mainly from floor and associated silt deposits. Altogether, 585 fragments were recovered from sixteen contexts.

Two partial skeletons of sheep were recovered. The first, from the fill of post-hole F9, consisted of 67 bones of a hornless sub-adult ewe. Most of the major bones of the skeleton were represented (Plate 28). Some of the vertebrae and both astragali and calcanei bore knife cuts indicating that the carcass had undergone some initial processing before burial (Plate 29). A femur and a tibia of a foetal lamb were found in the same context and it is possible that these belonged to the ewe. The floor *405* produced 61 bones of an immature sheep. The skull was not recovered but other parts of the skeleton were reasonably well represented. Both these burials could be foundation deposits for the building. The silt *91* produced fragments of the left humerus, radius, and ulna of an adult horse and the three right metatarsals and adjoining tarsal of the same or different animal.

Sheep/goat fragments (55%) dominated the remainder of the identified material, with cattle (29%), pig (9%), horse (5%), and dog (1%) relatively poorly represented. Both the sheep/goat and cattle assemblages included a lot of loose teeth, indicative of moderate and fragmentary preservation. Relatively few fragments (7%), however, were eroded. Other species identified were rodent, domestic fowl, duck, and woodcock (Table 2.49).

VRW4 Trench V: Phases 920, 926, and 930 – Building 3
This was the largest of the roadside timber buildings and was subsequently subdivided. Several phases of floor deposits were recorded. The original structure was built in the mid-2nd century and the subdivision took place in the late 2nd

Table 2.50 Summary of animal bone data from Group VRW4 (Building 3)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	63	68	47	6	1	1	5	269	460	53	30	9	3	23
%	34	37	25	3	<1			58		13	20	2	<1	15

Key: as Table 2.17
sheep 9, goat 0, large mammal 122, sheep-sized mammal 109
other mammals: red deer 1
birds: domestic fowl 5

Table 2.51 Summary of animal bone data from Group VRW5 (Building 4)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	18	35	18	2	4	2	3	156	238	24	12	6	3	3
%	(23	45	23	3	5)			66		11	(21)	3	1	(5)

Key: as Table 2.17
sheep 4, goat 0, large mammal 65, sheep-sized mammal 59
other mammals: hare 1, cat 1
birds: domestic fowl 2, domestic duck/mallard 1

Table 2.52 Summary of animal bone data from Group VRW6 (pit F64/70)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	42	28	16	6	2		1	110	205	8	30	4	10	17
%	(45	30	16	6	2)			54		4	(33)	2	5	(19)

Key: as Table 2.17
sheep 4, goat 0, large mammal 45, sheep-sized mammal 54
birds: domestic fowl 1

or early 3rd century. A total of nineteen layers produced 460 animal bone fragments. Preservation was moderate and much of the material was quite fragmentary. The species list consisted of sheep/goat (37%), cattle (34%), pig (25%), horse (3%), dog (0.5%), red deer, and domestic fowl (Table 2.50). No associated bones or concentrations of particular bones were noted and the assemblage appears to have been of a mixed origin.

VRW5 Trench V: Phases 921, 927, and 928 – Building 4
Building 4 was formed by the subdivision of Building 3. The associated phases date from the late 2nd or early 3rd century to the late 3rd century. Most of the 238 animal bone fragments came from floor layers. Again many of these were fragmentary and were probably derived from a number of sources. Only 82 fragments were identified to species, with sheep/goat (45%) again the most common, followed by pig and cattle both (23%), dog (5%), horse (3%), domestic fowl, duck, cat, and hare (Table 2.51).

Pit

VRW6 Trench V: Phase 932 – F64/70
F64/F70 was a small pit subrectangular in plan (depth not accurately recorded) located to the west of Building 4. It seems to have been filled during the 3rd century and to have been in use at the same time as the roadside buildings. Hand collection produced animal bones from two backfill deposits, *386* and *387*. Out of a total of 205 fragments, 193 were collected from *387*. No associated groups were encountered nor were there any amphibian bones. Less than 100 fragments could be identified to species (Table 2.52). The list consisted of cattle (45%), sheep/goat (30%), pig (16%), horse (6%), dog (2%), and domestic fowl. Surface preservation of the bones was good, although a third of the identified mammal fragments were gnawed. Five percent of the fragments were burnt and the presence of further burnt bones was noted in sieved samples from *376* and *387*. Eleven of the 42 cattle fragments belonged to scapulae, perhaps indicating the presence of some specialist butchery waste associated with the processing (perhaps preserving) of shoulder meat.

Other deposits

VRW7 Trench V: Phase 931- metalled yard surface, occupation deposits, and silts
Fourteen contexts in Phase 931 produced 742 fragments, including 245 from *27* and 132 from *11*. The majority (70%) of the bones could not be identified to species but in this case this is partly due to the presence of substantial numbers of split and splintered large mammal longbone fragments, particularly from *27*. Several shafts of unfinished bone pins were found in the same layer, which is a clear indication that these were offcuts from bone working. Several split cattle radius and tibia fragments were an indication of the major source of the material that was worked. Worked horse bones and red deer antler fragments were found in *63*. Splintered longbone fragments were also found in *11* and *62*, but in less dense concentrations than in *27*.

Although cattle fragments (44%) were the most frequently identified, sheep/goat (33%) and pig (17%) are both fairly well represented, suggesting butchery or cooking waste still formed a substantial part of the assemblage, which was clearly of mixed origin. Bones of horse (5%), dog (0.9%), domestic fowl, goose, duck, and woodcock were also identified in small numbers. Preservation of the bones was quite good (Table 2.53).

VRW8 Trenches IV, V and VI: Phases 933–5 – small features in the western area of Trench V and earliest silts in Trenches IV and VI
The deposits and features in Phases 933–5 were probably contemporary with the use of the buildings described above.

Table 2.53 Summary of animal bone data from Group VRW7

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	93	70	37	10	2	6	6	518	742	39	36	2	3	45
%	44	33	17	5	<1			70		5	20	<1	<1	25

Key: as Table 2.17
sheep 5, goat 0, large mammal 361, sheep-sized mammal 115
other mammals: red deer 6
birds: domestic fowl 2, domestic/greylag goose 2, domestic duck/mallard 1, woodcock 1

Table 2.54 Summary of animal bone data from Group VRW8

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	8	10	5	1		1		46	71	9	3		2	3

Key: as Table 2.17
sheep 1, goat 0, large mammal 21, sheep-sized mammal 14
other mammals: red deer 1

Table 2.55 Summary of animal bone data from Group VRW9

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	45	42	18	2	1		1	260	369	41	20		4	10
%	42	39	17	2	<1			70		12	25		1	12

Key: as Table 2.17
sheep 3, goat 0, large mammal 80, sheep-sized mammal 154
birds: domestic fowl 1

Table 2.56 Summary of animal bone data from Group VRW10

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	32	32	14	2	1			116	197	20	12	1	1	13
%	(40	40	17	2	1)			59		11	(17)	<1	<1	(19)

Key: as Table 2.17
sheep 6, goat 1, large mammal 70, sheep-sized mammal 38

Ten contexts produced just 71 fragments, only 35 of which were identified. Species identified were sheep/goat, cattle, pig, horse, and red deer (Table 2.54).

VRW9 Trenches IV–V: Phases 938–9 – deposits contemporary with the earliest graves and probably post-dating the buildings

Eleven contexts produced 369 fragments. Most of the moderately preserved assemblage was very fragmentary, accounting for the high percentage (70%) of unidentified fragments. No associated bones or concentrations of particular butchery or bone working waste were noted. The material is likely to have had a mixed origin. The species list consisted of cattle (42%), sheep/goat (39%), pig (17%), horse (2%), dog (0.9%), and domestic fowl (Table 2.55).

VRW10 Trench V: Phases 951–4 – bank of the roadside ditch F12

Seven deposits from a low bank of material formed from upcast in digging the ditch (F12) produced 197 fragments, of which only 81 were identified. The species involved were cattle and sheep/goat (both 40%), pig (17%), horse (2%), and dog (1%). The assemblage was moderately preserved (Table 2.56). The presence of late Anglo-Saxon pottery could indicate that some of the bones were intrusive too. The presence of a goat horn core and several large sheep bones may reflect this contamination.

Period 4 (late 3rd to late 4th centuries)

Cemetery boundary ditch

In this period an inhumation cemetery developed south-west of the ditch F12. There were three principal phases of burial dated to *c* AD 270–320, 340/350 – late 4th century, and *c AD* 390 – early 5th century. The ditch was re-cut on three occasions and was probably completely infilled by the mid- to late 4th century. There were also a number of graves and features dug into the ditch during its life including the large pits or wells F18 and F46.

VRW11 Trenches IV–V: Phases 941–4, 946–8, 950 – infilling of F12 and its re-cuts

A total of 24 contexts associated with primary silts of the ditch produced only 413 animal bone fragments. On the other hand, 1191 fragments were obtained from 40 contexts of the later fills, reflecting the presence of layers of deliberate dumping. *153*, *355*, *83*, and *136* all produced over 100 fragments. There were, however, no groups of associated bones nor was there any evidence for the disposal of large-scale butchery or bone working waste.

A total of 750 fragments were identified, of which cattle (40%) were the most common, followed by sheep/goat (27%), pig (23%), horse (7%), and dog (3%). Five other mammals were represented by one or two bones – red and roe deer, cat, hare, and rabbit. The rabbit bone was found in

Table 2.57 Summary of animal bone data from Group VRW11 (ditch F12)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	294	195	165	54	21	6	15	854	1604	137	161	18	3	97
%	40	27	23	7	3			53		18	26	2	<1	16

Key: as Table 2.17
sheep 14, goat 6, large mammal 421, sheep-sized mammal 307
other mammals: red deer 1, roe deer 2, cat 1, hare 1, rabbit 1 (intrusive)
birds: domestic fowl 11, domestic duck/mallard 1, duck sp 1, heron 1, woodcock 1

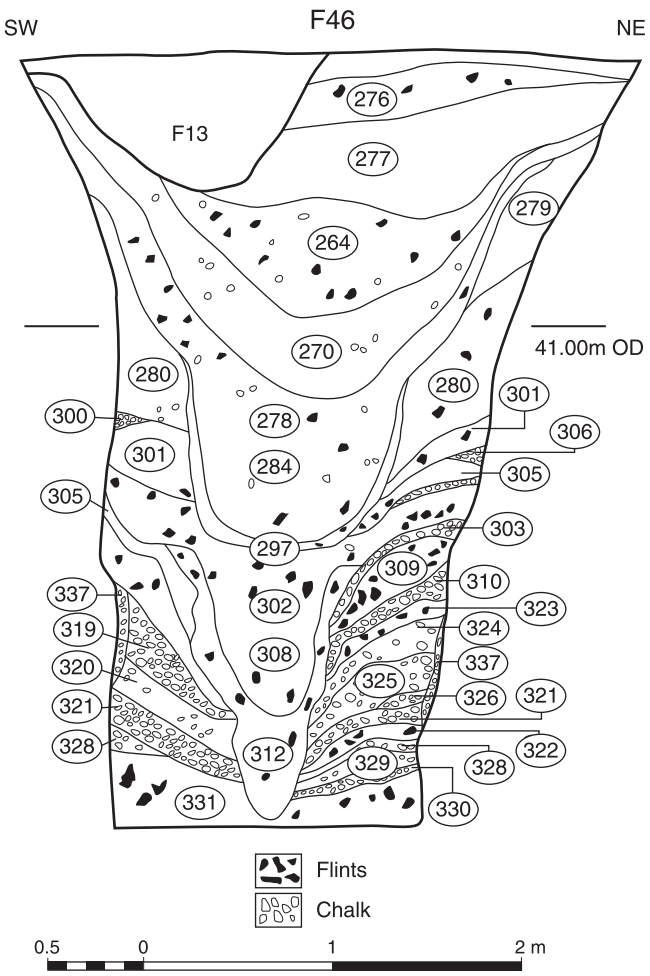


Figure 20 Victoria Road West, section through well F46

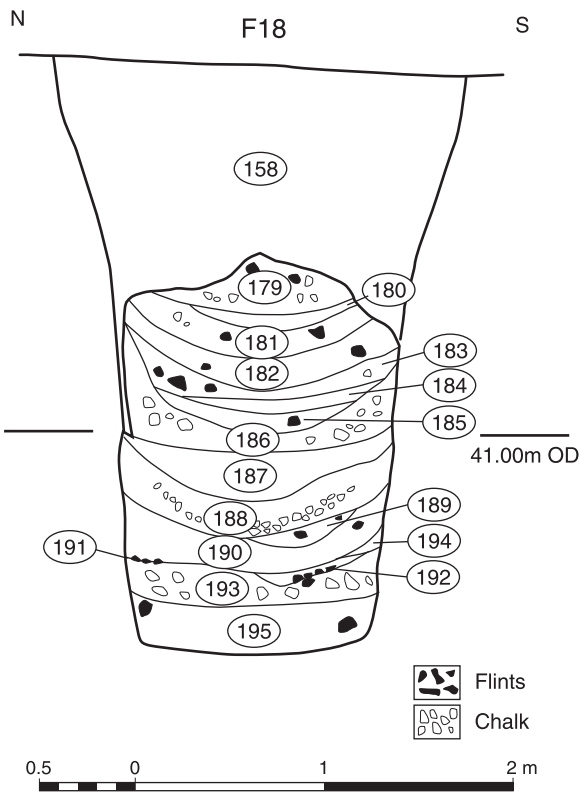


Figure 21 Victoria Road West, section through well F18

153 (Phase 946) and it must be assumed that this layer has been contaminated by later material. Eleven domestic fowl bones were recorded and there was a single identification of bones from two species of duck, heron, and woodcock. Preservation of the bones was mixed with some layers producing relatively high percentages of eroded fragments, while others produced much better preserved assemblages. Gnawed bones were found much more consistently throughout the ditch fills (Table 2.57).

Pits or wells

There were three large pits or wells found cut through (F46 and F18) or adjacent (F43) to F12. On stratigraphic grounds F18 and F46 were probably cut in the late 3rd century. Although F43 could not be tied into these two stratigraphically, the pottery in its later infill deposits was late 3rd- – early 4th-century and its cutting was probably more or less contemporary with the other two.

VRW12 Trench V: Phase 945 – F46 (Fig 20)

F46 reached a depth of 4m. Nineteen contexts produced 907 fragments. The most commonly occurring bones even amongst hand-collected material belonged to amphibians, particularly frogs. A total of 188 frog and toad bones were recovered, mainly from *280*, *302*, *308*, *309*, and *311*. Their presence indicates gradual accumulation of fills as the feature remained open.

There was a fairly even distribution of bones of the major domestic mammals, with cattle contributing 33% of the identified fragments, sheep/goat 30%, and pig unusually well represented with 29%. Horse (7%), dog (1%), red deer, hare, and rodent completed the list of mammals identified. The few identified bird bones belonged to domestic fowl, goose, and duck. The surface condition of the bones was generally good but relatively few fragments were ivoried and 29% of the domestic mammal fragments bore gnawing marks, indicating secondary disposal (Table 2.58). No associated groups were noted and there were no large concentrations of bones of particular types, although sheep/goat mandibles were well represented in several contexts.

VRW13 Trench V: Phase 949 – F18 (Fig 21)

Nine contexts produced 170 fragments. As in the case of F46,

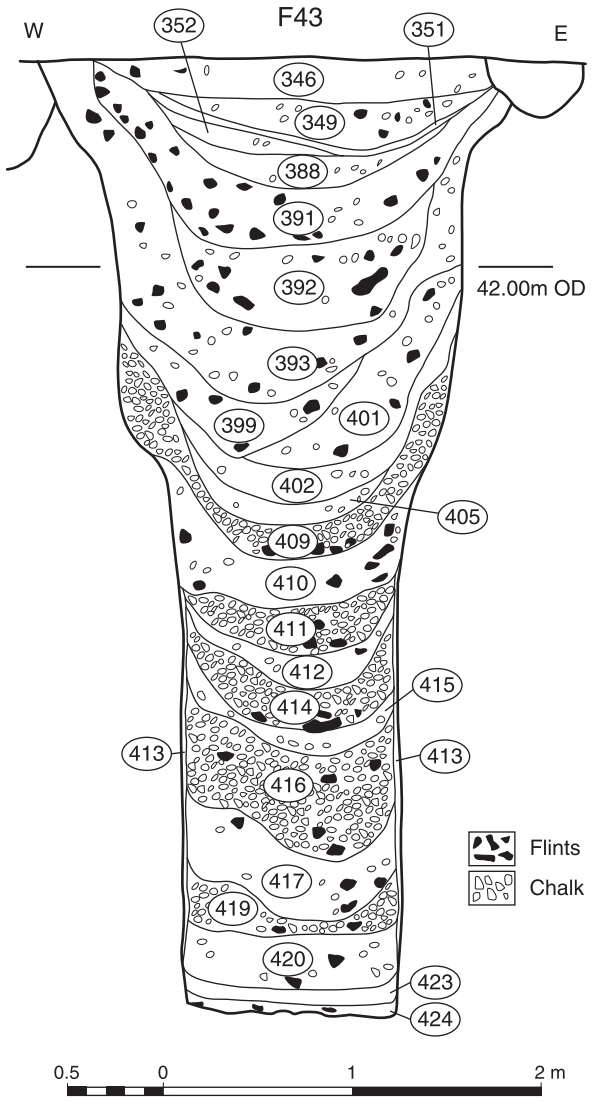


Figure 22 Victoria Road West, section through well F43

the faunal assemblage was dominated by amphibian bones. A total of 89 frog and toad bones were recovered by hand excavation from silt deposits *187* and *190* in the lower part of the feature. Most of the bones that were identified to species belonged to frogs. Only a charcoal deposit, *191*, produced any quantity of bones of other species. These included a rabbit femur, which was probably intrusive. Other species identified were sheep/goat, cattle, pig, horse, red deer antler, rodent, and domestic fowl (Table 2.59).

VRW14 Trench IV: Phase 956 – F43 (Fig 22)
F43 reached a depth of 5.1m. This produced a large faunal assemblage of 1959 fragments from 23 layers. Once again the most common find was frogs and, to a lesser extent, toads – in total contributing 1046 bones. They were retrieved mainly from *410*, *412*, and *413* amongst the lower silts.

Several groups of associated bones were recovered from the feature, mainly from *410*. The largest group consisted of 86 bones of an adult male dog skeleton, which had a healed depressed skull fracture. Eighty-three bones of an adult cat skeleton were found in the same layer. Twenty-six bones of the head and feet of a juvenile sheep were also recovered. Knife cuts on a calcaneus and astragalus indicated the point where the hind feet had been severed. The head and feet may have been attached to the hide of animal when removed from the rest of the carcass.

Three small associated groups of cattle bones were noted. Context *346* contained all seven cervical vertebrae of an adult animal. The atlas and axis both bore butchery marks. Four lumbar vertebrae also of an adult animal were retrieved from *392*. Context *492* produced eight bones from the left forelimb of another fully grown animal.

Excluding associated groups, cattle fragments (52%) were the most commonly identified, followed by sheep/goat (32%), pig (11%), horse (4%), and dog (2%). A few bones of rodent, domestic fowl, domestic duck/mallard, teal, and a wader *cf* golden plover were also recorded. Preservation was good, although gnawed fragments accounted for 41% of the identified mammal bones (Table 2.60). This would suggest that many of the bones amongst the upper backfills were derived from other dumps or middens.

Table 2.58 Summary of animal bone data from Group VRW12 (well F46)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	96	87	82	19	3	191	8	421	907	44	73	19	7	45
%	33	30	29	7	1			59		6	29	3	1	18

Key: as Table 2.17
sheep 9, goat 0, large mammal 218, sheep-sized mammal 146
other mammals: red deer 1, hare 1, rodent 1
amphibians: frog 180, toad 4, frog/toad 4
birds: domestic fowl 6, domestic/greylag goose 1, domestic duck/mallard 1

Table 2.59 Summary of animal bone data from Group VRW13 (well F18)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	8	13	6	2		93	2	46	170	4	5	2		1
%								(61)		(5)		(3)		

Key: as Table 2.17
sheep 4, goat 0, large mammal 18, sheep -sized mammal 18
other mammals: red deer 1, rabbit 1 (intrusive), rodent 2
amphibians: frog 42, toad 1, frog/toad 46
birds: domestic fowl 2

Table 2.60 Summary of animal bone data from Group VRW14 (well F43)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated	19	26			86	83			214					
Other frags	174	108	36	13	6	1051	7	350	1745	24	133	29	9	55
Total	193	134	36	13	92	1134	7	350	1959					
% (excluding associated)	52	32	11	4	2			50		4	41	4	1	18

Key: as Table 2.17
sheep 33 (26 associated), goat 1, large mammal 173, sheep-sized mammal 136
other mammals: cat 83 (associated), rodent 5
amphibians: frog 588, toad 40, frog/toad 418
birds: domestic fowl 3, domestic duck/mallard 2, teal 1, wader (cf plover) 1

Table 2.61 Summary of animal bone data from Group VRW15 (late 3rd- and 4th-century graves)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	44	23	12	8		2		55	174	18	23	1	2	13
%	(51	26	14	9)				49		11	(29)	<1	1	(16)

Key: as Table 2.17
sheep 3, goat 0, large mammal 54, sheep-sized mammal 19
amphibians: toad 2

Table 2.62 Summary of animal bone data from Group VRW16

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	114	111	45	8	6	3	3	523	813	85	48	5	2	28
%	39	38	16	3	2			64		12	25	<1	<1	15

Key: as Table 2.17
sheep 5, goat 0, large mammal 238, sheep-sized mammal 230
other: hare 3
birds: domestic duck/mallard 1, duck sp 1, wader (cf common snipe) 1

Other deposits

VRW15 Trenches IV and V: animal bones from Roman graves
The backfills of twelve graves produced a total of 174 animal bones, although those that were likely to have been directly associated with the burials are noted in another volume in this series (P1). The generally moderate preservation of the assemblages was similar to the bones from other soil layers and most of the bones are likely to have been redeposited during the filling of the graves. Cattle (51%), sheep/goat (26%), pig (14%), horse (9%), and toad were identified (Table 2.61).

VRW16 Trench V: Phases 965 and 968 – deposits and features over the cemetery
Altogether, 813 animal bones were recovered from twelve later Roman contexts associated with possible pits, silts, and metalling. Of these, 452 fragments were from silt *344*. The assemblage was fragmentary and moderately preserved. Sixty-four percent of the sample was unidentified. The metalling *30* included a small group of splinters from bone working waste. No other concentrations of specific butchery or bone working waste were recorded. Species identified were cattle (39%), sheep/goat (38%), pig (16%), horse (3%), (dog 2%), hare, two species of duck, and a species of wader – possibly common snipe (Table 2.62).

VRW17 Trench V: Phase 969 – late features
Several late Roman contexts, possibly representing occupation on the site after the cemetery had gone out of use, produced 492 fragments from seven contexts. Again, much of the bone was only moderately preserved, fragmentary, and included a lot (67%) of unidentified fragments. The usual range of species was identified, which consisted of cattle (41%), sheep/goat (33%), pig (17%), horse (8%), dog (0.6%), red deer, hare, and domestic fowl (Table 2.63).

Hyde Abbey (see Fig 7)

Excavations in 1972 (Trenches I–IV)

Suburban street, buildings, and ditch (late 3rd to 4th centuries)

HA72.1 Phases 1–4 and 8 – street (Period 1)
Deposits related to a metalled street on an east-south-east/west-north-west alignment produced 549 animal bone fragments from twelve contexts. Phase 8 (metalling and silts) produced 350 of the fragments. Preservation was poor with 64% eroded fragments and a highly fragmented assemblage. The sample was dominated by unidentified large mammal fragments. Cattle (55%) were the most frequently identified of the domestic mammal fragments. Upper limb bones, particularly humeri and radii were well represented. Several of these had been split longitudinally and the assemblage may have included waste from specialist butchery processes. Other species identified were sheep/goat (23%), horse (13%), pig (9%), and domestic fowl (Table 2.64).

Table 2.63 Summary of animal bone data from Group VRW17

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	64	51	27	12	1	3	3	331	492	64	25	6	2	15
%	41	33	17	8	<1			67		14	22	1	<1	13

Key: as Table 12.17
sheep 5, goat 1, large mammal 188, sheep-sized mammal 106
other mammals: red deer 2, hare 1
birds: domestic fowl 3

Table 2.64 Summary of animal bone data from Group HA72.1

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	107	45	17	25			1	354	549	331	32	10	1	23
%	55	23	9	13				64		64	19	2	<1	14

Key: as Table 2.17
sheep 4, goat 0, large mammal 307, sheep-sized mammal 34
birds: domestic fowl 1

Table 2.65 Summary of animal bone data from Group HA72.2 (Buildings 1–3)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	81	52	36	19	2		1	187	378	155	29	2	2	12
%	43	27	19	10	<1			49		45	18	2	<1	7

Key: as Table 2.17
sheep 2, goat 0, large mammal 120, sheep-sized mammal 50
birds: duck sp 1

Table 2.66 Summary of animal bone data from Group HA72.3 (ditch F37)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	37	29	15	6	4	2	1	102	196	23	26	9		6
%	(41	32	16	7	4)			52		13	(33)	5		(8)

Key: as Table 2.17
sheep 3, goat 0, large mammal 68, sheep-sized mammal 23
other mammals: cat 2
birds: domestic fowl 1

HA72.2 Phases 5–6, 9–11 – Buildings 1–3 (Period 2)
Traces of three Roman timber buildings alongside the street produced 107 fragments from thirteen contexts. The assemblage was poorly preserved with 41% eroded fragments. Only 54 bones of domestic mammals were identified.

Building debris (Phase 10) and ditch infill produced 271 fragments from eight contexts. The assemblage was again poorly preserved including 47% eroded fragments. Cattle fragments (44%) were the most frequently identified with sheep/goat (29%), pig (19%), horse (7%), dog (0.8%), and duck also represented. Table 2.65 summarises the count from all phases in this group.

HA72.3 Trench II: Phase 7 – ditch F37 (Period 2)
During the life of Building 1, there was a ditch (F37) cut, probably marking a property boundary to the west of the structure on a north-north-west/south-south-east alignment at right angles to the street. A total of 135 of the 196 fragments recovered came from Context *96*. Relatively fewer eroded fragments were recorded than in the previous two groups, although a third of the identified domestic mammal fragments had been gnawed. Only 94 fragments were identified, which consisted of cattle (41%), sheep/goat (32%), pig (16%), horse (7%), dog (4%), cat, and domestic fowl (Table 2.66).

Excavations in 1974 (Trenches VII–XI)

Trenches VII and XI were excavated on the projected line of the Roman road to Silchester. The road was not found. At the time of the excavation it was believed that it had once existed but had been destroyed by later truncation, but it is now thought that the road line lay on slightly higher ground immediately to the west of Trench XI (although it was not found in Trench VII). In Period 2 (undated, but probably early Roman) there was a ditch aligned north-north-east/south-south-west, parallel with and perhaps associated with the Silchester road.

Features and deposits of Period 3 (?later 2nd – late 3rd/4th century) recorded in Trench XI may represent a sequence of later Roman buildings erected alongside the road and encroaching on the infilled roadside ditch as at Victoria Road. The strata were composed, for the most part, of chalk and flint surfaces cut by possible post-holes and other features and interleaved with silty deposits. However, individual buildings could not be clearly defined and the strata may have a different significance. In light of this, they have been divided into what are referred to as 'structural remains', of which there are eight separate groups (1–8). The earlier groups of remains contained much later 2nd- to 3rd-century pottery

Table 2.67 Summary of animal bone data from Group HA74.2

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	7	14	4	5				21	51	2	6	4	1	7

Key: as Table 2.17
sheep 3, goat 0, large mammal 10, sheep-sized mammal 8

Table 2.68 Summary of animal bone data from Group HA74.3

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated				4					4					
Other frags	24	33	16	5		1	2	85	166	5	14	17		7
Total frags	24	33	16	9		1	2	85	170					
% (excluding associated)	(31	42	21	6)				51		3	(23)	11		(11)

Key: as Table 2.17
sheep 2, goat 0, large mammal 27, sheep-sized mammal 44
other mammals: roe deer 1
birds: domestic fowl 2

Table 2.69 Summary of animal bone data from Group HA74.4

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated		72							72					12
Other frags	32	66	15	5			2	110	230	14	42	19	1	11
Total frags	32	138	15	5			2	110	302					
% (excluding associated)	27	56	13	4				48		6	39	9	<1	10

Key: as Table 2.17
sheep 81 (72 associated), goat 1, large mammal 52, sheep-sized mammal 49
birds: domestic fowl 2

with a little late Roman material, and it is difficult to judge if the latter is intrusive. Similarly, the latest groups of remains (7–8) contained a little late Anglo-Saxon pottery.

Roadside ditch (Period 1)

HA74.1 Trench XI: Phases 52–3 – roadside ditch
The ditch produced just thirteen fragments (2 cattle; 1 sheep/goat; 4 large mammal; 5 sheep-sized mammal; 1 unidentified mammal). Three fragments were ivoried.

Structural remains (Period 2)

HA74.2 Trench XI: Phases 55–9 – structural remains Groups 1–3
Nine contexts produced just 51 fragments. Sheep/goat, cattle, horse and pig were identified (Table 2.67).

HA74.3 Trench XI: Phase 76 – structural remains Group 4
The deposits were situated in the south-east corner of the trench. Eighteen contexts produced 170 fragments, of which 90 were found in the silt *373*. Four of these were from the foot of a horse. Only 78 other domestic mammal fragments were identified, of which sheep/goat formed 42%, cattle 31%, pig 21%, and horse 6%. A fragment of roe deer antler and two domestic fowl bones were also found. Surface preservation of the bones was good (Table 2.68)

HA74.4 Trench XI: Phases 60–1 – structural remains Group 5
Twelve contexts provided 302 fragments. These included 72 bones of a butchered sheep skeleton from post-hole F202. Most parts of the carcass were represented (Plate 31), although some small bones from the feet and a few vertebrae were not retrieved by hand (a further 27 bones were recovered from sieved samples – Table 2.203). Twelve of the hand-collected bones bore butchery marks (Plate 32). These indicated that one of the flanks of the sheep had been removed and that the feet had been detached from the upper limbs. The animal was horned and probably killed in its second year. The remains may represent a building foundation deposit.

Sheep/goat fragments (56%) also dominated the remainder of the identified domestic mammal assemblage, with cattle (27%), pig (13%), horse (4%), and domestic fowl also represented. There were few eroded fragments but a large percentage of gnawed bones (Table 2.69).

HA74.5 Trench XI: Phases 64–7 – structural remains Groups 6–7
Altogether, 860 fragments were obtained from 30 contexts. Three hundred and seventy-four were associated with structural remains Group 6, including seven bones from a skeleton of a hen in lay from *303*. From contexts in structural remains Group 7 there were 478 fragments. Surface preservation of the bones was good, although many bones were gnawed and fragmentary. Sheep/goat fragments (49%) dominated the identified sample, with cattle (31%), pig (17%), horse (3%), dog (0.6%), domestic fowl and woodcock also represented (Table 2.70).

HA74.6 Trench XI: Phase 68
Eight contexts, silt and loam-based deposits interposed

Table 2.70 Summary of animal bone data from Group HA74.5

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated							7		7					
Other frags	101	159	54	10	2		6	521	853	36	89	111	4	44
Total frags	101	159	54	10	2		13	521	860					
% (excluding associated)	31	49	17	3	<1			61		4	31	14	<1	15

Key: as Table 2.17
sheep 14, goat 0, large mammal 172, sheep-sized mammal 287
birds: domestic fowl 11 (7 associated), woodcock 2

Table 2.71 Summary of animal bone data from Group HA74.6

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated							12		12					
Other frags	87	157	56	2	1	2	11	511	827	18	59	78	5	37
Total frags	87	157	56	2	1	2	23	511	839					
% (excluding associated)	29	52	18	<1	<1			62		2	23	10	<1	15

Key as Table 2.17
sheep 15, goat 0, large mammal 195, sheep-sized mammal 255
other mammals: hare 1, rodent 1
birds: domestic fowl 4, domestic/greylag goose 2, domestic duck/mallard 3, teal 1, wader (cf plover) 1, raven 12 (associated)

Table 2.72 Summary of animal bone data from Group HA74.7

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	47	59	17	3			3	256	385	12	22	31	2	11
%	37	47	13	2				66		3	21	9	<1	10

Key as Table 2.17
sheep 7, goat 0, large mammal 101, sheep-sized mammal 111
birds: domestic fowl 1, domestic duck/mallard 1, duck sp 1

between structural remains Groups 7 and 8 produced 839 fragments, including 510 from *278*. These included twelve bones of a raven skeleton. The remaining assemblage was again dominated by sheep/goat fragments (52%), with cattle (29%), pig (18%), horse (0.7%), and dog (0.3%) completing the list of domestic mammals. The list of rarer species identified was longer than in most groups. In addition to the raven, bones of hare, rodent, domestic fowl, duck and goose, teal, and a species of wader (*cf* plover) were found in small numbers. Surface preservation was good but there was again a fairly high degree of fragmentation (Table 2.71).

HA74.7 Trench XI: Phases 69–71 – structural remains Group 8

A total of 23 contexts produced 385 fragments. Species ranking was similar to several of the other groups on the Hyde Abbey site, with sheep/goat fragments (47%) most commonly identified, followed by cattle (37%), pig (13%), and horse (2%). Bones of two species of duck and domestic fowl were also found. Preservation was good but the bones again were often fragmentary (Table 2.72).

Latest Roman to post-Roman contexts (Period 3)

HA74.8 Trench XI: Phases 74–5

A series of silty deposits was cut into by chalk-filled slots, probably serving as a base for a timber structure. Twenty-one contexts produced 991 bones. These included 71 bones from a burial of an immature pig in F156. Most parts of the body were represented apart from the hind legs. Seven bones of the forefoot of another pig were found in *264*. Six bones from a raven's wing were recorded from *260*. The possibility that at least some of this material is of post-Roman date is increased by the presence of a fallow deer humerus in *233*. However, bone preservation and species representation was similar to that encountered in several other phase groups on the site, with sheep/goat fragments dominant (55%), followed by cattle (26%), pig (18%), and with horse (0.7%) and dog (0.3%) poorly represented (Table 2.73).

City Defences

Jewry Street, Crown Hotel

Five trenches were excavated at the Crown Hotel site. Roman activity was recorded in all five trenches, but the Roman sequence was poorly preserved due to truncation in all but Trench III. The excavation was not sited in such a way as to recover evidence of the defensive rampart of *c* AD 70, but when the rampart was widened in the late 2nd century, it encroached on to what was later to become Trench III. Groups 1–3, dated to the later 1st and early 2nd century, comprised some of the earliest faunal material discussed in this report.

Table 2.73 Summary of animal bone data from Group HA74.8

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated			78				6		84					
Other frags	77	161	54	2	1	3	11	598	907	30	60	70	1	19
Total	77	161	132	2	1	3	17	598	991					
% (excluding associated)	26	55	18	<1	<1			66		4	25	8	<1	8

Key as Table 2.17
sheep 14, goat 0, large mammal 200, sheep-sized mammal 289
other mamals: hare 1, red deer 1, fallow deer 1 (?intrusive)
birds: domestic fowl 8, domestic/greylag goose 1, domestic duck/mallard 2, raven 6 (associated)

Table 2.74 Summary of animal bone data from Group JCH1

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	15	14	2	2				28	61	1	9	4		5

Key as Table 2.17
sheep 3, goat 0, large mammal 13, sheep-sized mammal 13

Table 2.75 Summary of animal bone data from Group JCH2

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	5	15	3					19	42	1	2	6		3

Key as Table 2.17
sheep 3, goat 0, large mammal 14, sheep-sized mammal 4

Table 2.76 Summary of animal bone data from Group JCH3

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	21	14	6	5				59	105	1	4	4	2	12

Key as Table 2.17
sheep 4, goat 0, large mammal 36, sheep-sized mammal 20

Phases 707–10, Trench II; Phases 317, 319–24, Trench III (late 1st to early 2nd centuries)

Early soil layers and associated features

JCH1 Trench II: Phases 707–10
In Trench II, the natural was sealed by developed soils which had been cut by a single circular scoop or post-hole, in turn overlaid by a compact layer of flint gravel that only survived in a small area on the northern edge of the trench. Over this and covering the entire trench area was a further accumulation of clean brown loam soils.

Nine early Roman contexts, mostly the soil layers, produced 61 fragments, of which just 33 were identified. Cattle, sheep/goat, pig, and horse were represented (Table 2.74).

JCH2 Trench III : Phases 323–4
These early Roman developed soils produced just 42 fragments from eight contexts. Only sheep/goat, cattle, and pig were identified (Table 2.75).

JCH3 Trench III : Phases 320–2
Phase 321 consisted of developed soils contemporary with those of Phase 323. Seventy-two animal bone fragments were recovered from four contexts. Phase 322 defined the fragmentary remains of a building (F87) at the northern edge of the trench. Three contexts produced just 22 fragments. The remains were sealed by further silts (Phase 320), which produced just eleven fragments from two contexts. This phase group therefore contributed only 105 fragments, of which 46 were identified (cattle, sheep/goat, pig, and horse). Preservation of the bones was good (Table 2.76).

JCH4 Trench III: Phases 317 and 319
These late 1st- and early 2nd-century soils produced 359 fragments from three contexts, including 284 from 225 (Phase 317). Despite the usual prevalence of gnawed bones, surface preservation was good with high percentages of ivoried fragments and few eroded bones. Sheep/goat fragments (54%) were the most commonly identified, followed by cattle (34%), pig (11%), domestic fowl, horse, and dog (Table 2.77).

Phases 311–15, Trench III (late 2nd to early 3rd centuries)

Rampart and associated features

JCH5 Trench III: Phase 315 (Figs 23 and 24)
Four post-holes seemingly forming a revetment at the heel of the late 2nd-century rampart, and a nearby pit produced 187 fragments. The pit F72 produced 142, of which 125 came from at least two skeletons of immature sheep (Plate 33). This was

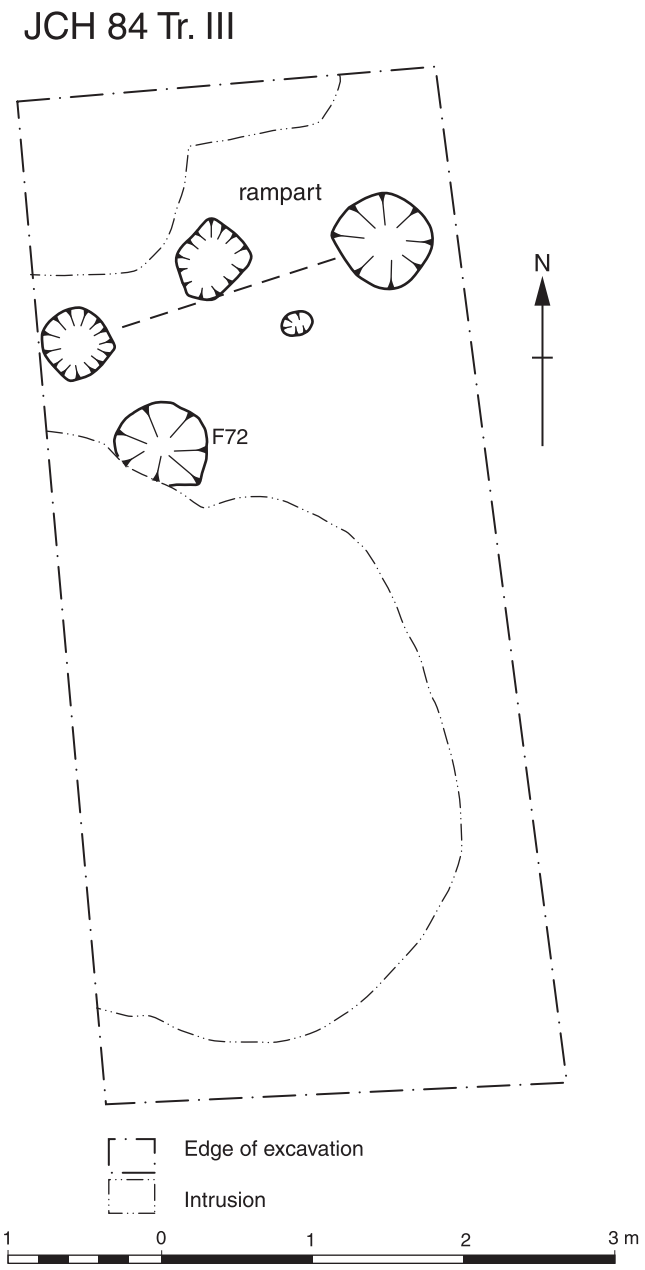


Figure 23 Trench III at JCH, showing the revetment for the 2nd-century rampart and the position of F72

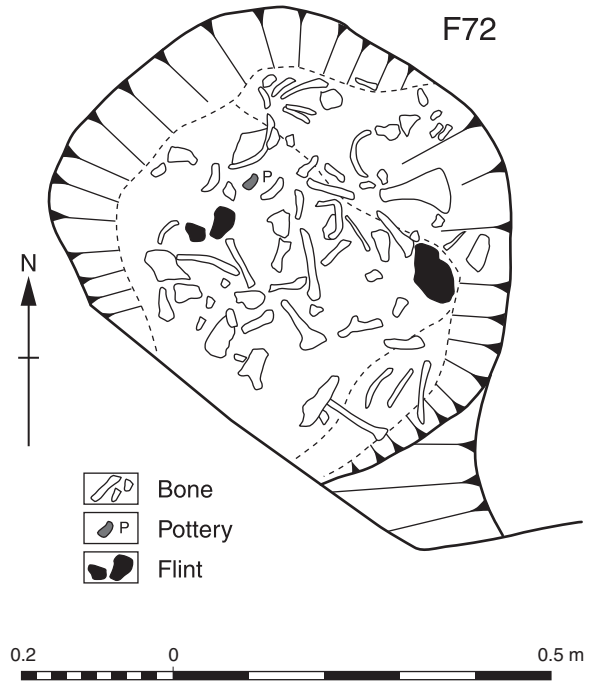


Figure 24 Detailed plan of JCH F72 showing the sheep bones during excavation

a curious group recovered mainly from *244* (the lower fill of the pit) but some bones were also found in *239* and *240* (the upper and middle fills respectively). Because of mixing and the fragmentation of some of the bones, it was not possible to separate the skeletons completely. The younger sheep was probably a male under six months old and horned. Several of its bones, particularly those of the lower hindlimbs, were charred. The second sheep was older, hornless, and probably killed in its second year.

Both skeletons produced abundant evidence of carcass processing. Nine bones of the younger animal bore butchery marks. These consisted of a humerus and a femur which had been chopped in two; superficial chopmarks on both pelves; knife cuts on two lumbar vertebrae and the atlas; a thoracic vertebra that had been chopped through transversely; and one which had been chopped along the line of the backbone. The second skeleton included at least twelve butchered bones (Plate 34): a radius had been chopped in two; there were chop marks on both humeri and pelves, a femur, a cervical vertebra, and a lumbar vertebra; knife cuts were observed on the top of the skull and on a cervical vertebra; three rib heads bore butchery marks. These marks clearly indicate the segmentation of the carcasses, filletting and probably the removal of marrow. The processed disarticulated skeletons were deposited in the bottom of the pit.

Only 25 other fragments were identified (cattle, sheep/goat and pig – Table 2.78), although sieved samples from *240* produced large numbers of frog bones (Table 2.202).

JCH6 Trench III: Phases 311–14

Layers associated with the construction of the earthern defensive rampart and its weathering dated to the late 2nd and early 3rd centuries. Altogether, 219 fragments were obtained from nine contexts, of which 113 came from *151* (Phase 313, material weathered from the rampart). Preservation was good but the assemblage included a high proportion (66%) of unidentified fragments. These included several splintered large mammal longbone fragments. Cattle (45%), sheep/goat (34%), pig (18%), horse (4%), and cat were identified (Table 2.79).

27 Jewry Street

Roman deposits were recorded in all three trenches excavated at the site of 27 Jewry Street, but truncation had destroyed all but the developed soil overlying natural in Trench II. All excavated deposits on this site were within the defended area of the Roman town.

Phases 3–7, Trench I (late 1st to late 2nd centuries)

Early street and streetside features

27JS1 Trench I: Phases 3–4

Twelve contexts representing a street and streetside drainage gully all probably dating to the late 1st and early

Table 2.77 Summary of animal bone data from Group JCH4

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	51	80	16	1	1		2	208	359	5	32	70	11	31
%	34	54	11	<1	<1			58		1	24	20	3	23

Key as Table 2.17
sheep 15, goat 0, large mammal 107, sheep-sized mammal 83
birds: domestic fowl 2

Table 2.78 Summary of animal bone data from Group JCH5

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated		125							125				14	22
Other frags	12	11	2					37	62	1	3	5	3	3
Total frags	12	137	2					37	187	1	3	5	17	25

Key as Table 2.17
sheep 125 (associated), goat 0, large mammal 15, sheep-sized mammal 16

Table 2.79 Summary of animal bone data from Group JCH6

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	33	25	13	3		1		144	219	7	15	21	7	16
%	(45	34	18	4)				66		3	(23)	10	3	(25)

Key as Table 2.17
sheep 1, goat 0, large mammal 72, sheep-sized mammal 51
other mammals: cat 1

2nd centuries produced 82 animal bone fragments. Only sheep/goat, cattle, and pig were identified. Preservation was good including a high proportion of ivoried fragments (Table 2.80).

27JS2 Trench I: Phases 5–7
These contexts are from the accumulation of soil over the street, its resurfacing and final disuse, and post-holes forming fencelines alongside it. These mid- to late 2nd-century deposits produced 261 fragments from fifteen contexts. The silt *339* yielded 107. Cattle mandible fragments were well represented in this context and metapodials were found fairly commonly in other contexts. Upper limb bones were relatively less well represented than usual. Overall cattle (61%) were very well represented; sheep/goat (27%), pig (10%), and horse (3%) were the only other species identified. Preservation was good with low levels of eroded fragments. A high percentage of the assemblage was identifiable (Table 2.81).

Phases 8–9, Trench I; Phase 32, Trench III (later Roman)

Buildings

27JS3 Trench I: Phases 8–9
Traces of successive buildings that were constructed over the abandoned street produced 197 animal bone fragments from eighteen contexts dating from the late 2nd (Phase 8) to the 4th century (Phase 9). Cattle (43%), sheep/goat (38%), pig (14%), horse (4%), and domestic fowl bones were identified. Preservation was good, apart from the usual presence of gnawed fragments (Table 2.82).

Soil accumulation over street

27JS4 Trench III: Phase 32
718 consisted of soil that sealed the remains of the street in this trench and accumulated during the later Roman period. The context produced 59 fragments, of which only 35 were identified to sheep/goat, cattle, pig, and horse (Table 2.83).

Henly's Garage

Four trenches were excavated at Henly's Garage. They were sited in such a way as to recover evidence of both the defensive rampart and properties within the walls to the north.

Phases 1–7, Trench IV (late 1st to late 2nd centuries)

Early properties and associated features

HG1 Phases 1–3
Eight early Roman contexts representing developed soils (Phase 1), gullies defining a series of properties fronting the road passing through the South Gate (Phase 2), and a track giving access to the back of the defensive rampart (Phase 3) produced 43 fragments. Twenty-eight were from Phase 1 (*1276*), 11 from Phase 2 gullies, and four from the gravel surfaces (Phase 3). Cattle, sheep/goat, pig, horse, and woodcock were identified (Table 2.84).

HG2 Phases 4–7
Only 34 fragments were recovered from six contexts (mainly silts marking the disuse of properties fronting the street) of later 2nd-century date. Sheep/goat, cattle,

Table 2.80 Summary of animal bone data from Group 27JS1

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	13	25	8					36	82	2	9	17		7

Key as Table 2.17
sheep 5, goat 0, large mammal 12, sheep-sized mammal 21

Table 2.81 Summary of animal bone data from Group 27JS2

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	100	44	16	5				96	261	4	19	26		27
%	61	27	10	3				37		2	13	11		18

Key as Table 2.17
sheep 9, goat 0, large mammal 67, sheep-sized mammal 23

Table 2.82 Summary of animal bone data from Group 27JS3

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	45	40	15	4			6	87	197	5	18	16		17
%	43	38	14	4				44		3	(19)	9		(18)

Key as Table 2.17
sheep 7, goat 0, large mammal 43, sheep-sized mammal 32
birds: domestic fowl 6

Table 2.83 Summary of animal bone data from Group 27JS4

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	13	14	6	2				24	59		10	5		6

Key as Table 2.17
sheep 3, goat 0, large mammal 13, sheep-sized mammal 8

Table 2.84 Summary of animal bone data from HG1

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	10	3	3	1			1	25	43	1	3	1		5

Key as Table 2.17
sheep 1, goat 0, large mammal 8, sheep-sized mammal 10
birds: woodcock 1

pig, horse, and roe deer bones were identified (Table 2.85). A horse radius from *1068* had been split and a fragment of cattle radius from *1258* had been split and sawn, perhaps indicating the presence of offcuts from bone working.

Phases 9–11 and 15, Trench IV; Phase 32, Trench I (late 2nd to early 3rd centuries)

Deposits and features associated with rampart

HG3 Phases 9–11

This group comprised bones from post-holes marking new boundaries following the widening of the rampart in the late 2nd century, and from yard surfaces to the north of those boundaries. The deposits were dated to the late 2nd and 3rd centuries. Altogether, 92 fragments were recovered by normal excavation methods. Sheep/goat fragments were the most commonly identified followed by cattle, pig, horse, dog, hare, domestic fowl, and domestic duck/mallard (Table 2.86).

The sieved samples from post-hole F152 (Phase 10), which included a butchered skeleton of a sheep (Table 2.203), will be discussed in a following section of this report (see pp 232–234).

HG4 Phase 32

The upper layers of a well, which was sited within one of the properties to the north of the rampart and which was filled in the late 2nd to early 3rd centuries, produced 339 fragments from eight contexts. *1162* and *1165* produced 91 and 116 fragments respectively. Cattle, pig, sheep/goat (relatively poorly represented), horse, dog, and domestic fowl were identified. Preservation was quite good apart from the high incidence of gnawed fragments (Table 2.87). Fewer ivoried bones were encountered than from the features of Phase 15.

HG5 Phase 15

Eight layers of hillwash sealing the tail of the rampart and the occupation to the north dating to the late 3rd or 4th centuries provided 150 fragments, a high percentage of which had suffered gnawing damage, although surface condition of the bones was quite good. Cattle fragments (43%) were the most

Table 2.85 Summary of animal bone data from HG2

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	5	9	3	1		1		15	34		5	2		4

Key as Table 2.17
sheep 2, goat 0, large mammal 7, sheep-sized mammal 3
other mammals: roe deer 1

Table 2.86 Summary of animal bone data from HG3

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	11	26	8	2	1	1	2	41	92	1	9	6		8

Key as Table 2.17
sheep 3, goat 0, large mammal 21, sheep-sized mammal 12
other mammals: hare 1
birds: domestic fowl 1, domestic duck/mallard 1

Table 2.87 Summary of animal bone data from HG4 (well F38)

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	73	46	54	9	2		2	153	339	2	43	27		36
%	40	25	29	5	1			45		<1	24	8		20

Key as Table 2.17
sheep 5, goat 1, large mammal 102, sheep-sized mammal 36
birds: domestic fowl 2

Table 2.88 Summary of animal bone data from HG5

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	38	32	15	3	1	1	1	59	150	2	35	7		17
%	(43	36	17	3	1)			39		1	(43)	5		(21)

Key as Table 2.17
sheep 3, goat 0, large mammal 40, sheep-sized mammal 16
other mammals: hare 1
birds: domestic fowl 1

frequently identified, followed by sheep/goat (36%), pig (17%), horse (3%), dog (1%), hare, and domestic fowl (Table 2.88).

Phases 23–5, Trench III (late 2nd to 4th centuries)

The masonry town house

HG6 Phases 23–5 (Plate 43)
These phases are related to deposits associated with the construction, use, and disuse of a town house built in the late 2nd – 3rd century and in use until the 4th century (see also Fig 61). A total of 22 contexts produced 384 fragments. Most (201) of these were from demolition deposits (Phase 25), including 150 from a rubble deposit (*811*).

Cattle fragments were the most frequently identified, followed by sheep/goat, pig, and dog. Two dog bones from a silt (*817)* bore evidence of butchery. Red deer (antler only) and domestic fowl were also represented (Table 2.89).

Phase 16, Trench IV (late 3rd to 4th centuries)

Wells and pits

HG7 Phase 16 ***(see Plate 42)***
This group consisted of three features dated to the late 3rd and 4th centuries (see also Fig 60). They provided the largest assemblage from the site contributing 706 fragments recovered by hand. Most (536) of these were found in a large, rectangular pit (F102), particularly in layers of deliberate backfill which marked the latest filling of the feature after its disuse as a cess pit. *1004* produced 352 fragments, of which 345 were amphibian bones, and of which 156 were identified as frog. The remainder probably also belonged to the same species, although the presence of a few bones of toad cannot be ruled out. This death assemblage either represented pitfall victims or the remains of frogs that inhabited the pit during a period when it was filled with water.

Species diversity was high in pit F102. In addition to the major domestic species, of which cattle fragments were the most commonly recovered, small numbers of bones of domestic fowl, raven, jackdaw, red deer, and roe deer were also identified. Eight dog bones from *1008* probably belonged to the same large adult animal.

Only 30 fragments from two contexts were recovered from well F105. These consisted mainly of large bones of cattle and horse. Red deer was represented by an antler fragment and other domestic mammal bones were found in small numbers.

A second well (F113) produced 140 fragments from two contexts. These included 47 bones of a small adult dog found in *1093*. Cattle, sheep/goat, pig, horse, red deer, domestic fowl, and goose were also represented.

The bones from all these features were well preserved with high percentages of ivoried fragments and very few

Table 2.89 Summary of animal bone data from HG6

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Total frags	79	58	24		6	1	1	215	384	11	25	19	2	42
%	47	35	14		4			56		3	16	5	<1	27

Key as Table 2.17
sheep 7, goat 2, large mammal 133, sheep-sized mammal 62
other mammals: red deer 1
birds: domestic fowl 1

Table 2.90 Summary of animal bone data from HG7

	C	S	P	H	D	OM	B	U	Total	E	G	I	Bt	Bu
Associated					55				55					
Other frags	98	56	34	8	2	350	11	92	651	3	53	92		30
Total frags	98	56	34	8	57	350	11	92	706					
% (excluding associated)	49	28	17	4	1			31		1	28	32		16

Key as Table 2.17
sheep 16, goat 1, large mammal 63, sheep-sized mammal 18
other mammals: red deer 3, roe deer 1
amphibians: frog156, frog/toad 190
birds: domestic fowl 4, domestic/greylag goose 1, raven 4, jackdaw 2

eroded fragments. Gnawed bones, however, were common indicating the secondary deposition of many of the bones into these features after their disuse (Table 2.90).

Preservation, retrieval, and species representation

Preservation of the animal bone assemblages

Animal bones are very susceptible to damage and destruction subsequent to their disposal (Lyman 1994). Bones lying on or close to the ground surface will become weathered and eventually disintegrate. They can also be damaged by trampling and they are particularly vulnerable to the activities of scavenging animals. In Winchester, dogs are likely to have been the principal agents of scavenging. Deeply buried bones have a much better chance of survival provided the conditions in which they rest are not too acidic. Bones can also be subjected to damage by burning either before or after final deposition.

Many bones will be totally destroyed by such taphonomic processes. Unfortunately, not all bones or parts of the same bone are equally susceptible to damage and this creates biases in the surviving assemblages towards less fragile elements. Denser bones or parts of bones of all species have a better chance of survival. For example, in many species the less dense proximal end of the tibia is less likely to survive than the denser distal end (Binford 1981; Brain 1981; Maltby 1985a; Lyman 1994). Many bones of smaller species and of younger animals of all species are less likely to be preserved. Dogs also tend to destroy ends of limb bones before the shaft.

By recording the damage caused by erosion, gnawing, and burning on surviving fragments, an indication of the frequency and severity of these various destructive agencies can be gained. There are also ways to assess the damage by comparing, for example, counts of fragile and robust elements.

The percentages of eroded, gnawed, burnt, and ivoried fragments are given for all groups containing over 100 fragments in Table 2.91. All calculations exclude bones from associated groups.

Eroded bones

The incidence of surface erosion and weathering was variable, ranging from less than 1% to 64% of the assemblages. Percentages of less than 5%, indicating very good preservation, were recorded in nearly all the wells and pits. This largely reflects the relatively deep burial of bones soon after disposal and their subsequent lack of disturbance. The well F1096 from Victoria Road East (Group VRE19) included more (11%) eroded fragments than the others. Most of the eroded bones from this feature were found in the upper fills, which seems to have included a significant amount of less well preserved redeposited material.

Very low percentages of eroded bones were recorded from all the sites in the city defences . Assemblages from the silts and other layers from the Victoria Road sites were less well preserved, usually with over 10% eroded bones. This moderate preservation probably reflects the fact that the bones were only shallowly buried for a considerable period. Assemblages from buildings were variably preserved, partly reflecting the wide range of feature types that were included in this category (post-holes, slots, floor layers etc).

Plate 15 Pig humeri. The distal ends of the specimens on the left and right have been destroyed by gnawing

Generally, they produced slightly lower percentages of eroded fragments than the layers.

Ditch contexts tended to include relatively high percentages of eroded fragments, again reflecting the shallowness of deposition and the relatively slow silting of these features. The most poorly preserved assemblages were those from hollow ways or metalling, where in some cases over 60% of the bones were eroded. Here the effects of shallow deposition are likely to have been made more severe by trampling.

Similar variations in the incidence of erosion were encountered in Roman deposits in Dorchester (Maltby 1993), where pits and wells also preserved bones better than soil layers. However, although the assemblages from Winchester were generally not as well preserved as those from Dorchester, the effects of erosion were much less severe than in many Iron Age and Romano-British rural samples from chalkland sites.

Gnawed bones

Damage resulting from gnawing was found commonly in assemblages from all types of features. Most of the damage was probably caused by dogs, although gnawing by pigs and other animals cannot be ruled out. Pigs, in particular, can do significant damage to bones (Greenfield 1988). There were also some observations of bones that had been gnawed by cats or rodents. The frequency of gnawing observations ranged between 13% and 43% of the bones identified to the major domestic mammals excluding associated bones and loose teeth (Table 2.91). The average frequency of gnawed fragments in the 57 assemblages was 26% (sd = 7.1). There were no clear trends in the variations of these frequencies between sites or context types.

The results demonstrate that all the assemblages have been significantly modified by scavenging activity (Plate 15). The figures can only record observations of damage on surviving bones. Many other bones will have been destroyed totally or have been rendered unidentifiable. The effects of scavenging can be monitored by an analysis of the relative abundance of articular surfaces and shaft fragments of major limb bones of the domestic species (Table 2.92). Late-fusing ends of diaphyses, such as the proximal humerus and femur and distal radius and femur survive less well than the earlier fusing distal humerus and proximal radius, for example. Distal ends of metapodials can be expected to survive less well than their proximal ends in all these species.

These expectations were borne out in the analysis of the survival of the relative number of shaft fragments

Table 2.91 Preservation data

Site	Group	Period	Phase	Deposit type/ interpretation	Feature/ building	%U	%G	%E	%I	%B	Total
VR East Wells and pits	VRE19	7	348	Well	F1096	43	16	11	7	<1	1047
	VRE20	7	442	Well	F1093	52	28	<1	33	<1	1451
	VRE21	7	479	Pit	F168	35	31	2	27	0	179
	VRE22	7	480	Pit	F814	40	23	4	38	2	1765
	VRE23	7	450	Pit	F981	63	29	<1	40	<1	303
VR All trenches, ditches	VRE25	7	465	Ditch	F122/1202	54	26	28	<1	0	194
	VRW11	4	941–4, 946, 948, 950	Ditch	F12	53	26	18	2	<1	1604
VR East Buildings	VRE1	5	155–67	Roadside structure 2nd phase		66	13	8	0	0	162
	VRE3	6	293–9	Building	Oven F846	67	18	3	6	2	191
	VRE4	6	310–27	Building	Oven F846	57	23	10	3	2	1736
	VRE14	7	402–11	Building	2	56	24	16	5	<1	224
	VRE15	7	328–38	Roadside structure 4th phase		67	42	9	11	0	153
	VRE17	7	341–6	Building	3	47	27	2	15	6	100
	VRE18	7	426–41, 445–7	Building	4	51	32	4	2	3	186
VR East NE corner	VRE7	7	378	Metalling		72	36	62	1	0	176
	VRE8	7	379–81	Silts		50	29	31	4	<1	642
	VRE9	7	382–3	Silts		31	37	9	2	<1	124
	VRE10	7	385–6	Building	1	42	37	23	3	<1	729
	VRE11	7	387–9	Silts		41	32	18	3	0	829
	VRE12	7	393	Building	1 – Phase 2	42	32	14	7	<1	1379
	VRE13	7	394–9	Silts		56	37	17	7	<1	1068
VR East Layers/ other	VRE2	5	195, 260–2, 266–9	Site-wide accumula-tion: 2		49	29	21	14	1	1070
	VRE5	6	303–08	Deposits contemp. with oven F846		60	27	8	15	3	1286
	VRE26	7	276, 287–92	Site-wide accumula-tion: 3		57	20	14	2	<1	990
	VRE28	7	349–57, 361–2	Deposits post-dating Building 3		40	32	14	1	<1	540
	VRE29	7	358–60	Silts		59	22	28	2	0	271
	VRE30	7	461–4, 472–5	Late – post-Roman deposits		57	25	5	<1	1	525
VR West Wells and pits	VRW6	3	932	Pit	F64/70	54	33	4	2	5	205
	VRW12	4	945	Well	F46	59	29	6	3	1	907
	VRW14	4	956	Well	F43	50	41	4	4	1	1745
VR West Buildings	VRW3	3	919, 923, 925, 929	Building	2	59	22	7	1	1	450
	VRW4	3	920, 926, 930	Building	3	58	20	13	2	<1	460
	VRW5	3	921, 927, 928	Building	4	66	21	11	3	1	238

Site	Group	Period	Phase	Deposit type/ interpretation	Feature/ building	%U	%G	%E	%I	%B	Total
VR West Other deposits	VRW1	3	917	Structural features		65	26	7	1	2	360
	VRW7	3	924, 931	Various – metalling, occupation & silts		70	20	5	<1	<1	742
	VRW9	3	938–9	Silts – contemporary with cemetery		70	25	12	0	1	369
	VRW10	3	951–4	Silts – ?remains of roadside bank		59	17	11	<1	<1	197
	VRW15	4	Various	Graves		49	29	11	<1	1	174
	VRW16	4	965–8	Various – contexts over cemetery		64	25	12	<1	<1	813
	VRW17	4	969	Silts – disuse of site		67	22	14	1	<1	492
Hyde Abbey Buildings	HA72.2	1	5–6, 9–11	Buildings	1, 2, 3	49	18	45	2	<1	378
	HA74.3	3	76	Structural	4	51	23	3	11	0	166
	HA74.4	3	60–1	Structural	5	48	39	6	9	<1	230
	HA74.5	3	64–7	Structural	6, 7	61	31	4	14	<1	853
	HA74.7	3	69–71	Structural	8	66	21	3	9	<1	385
Hyde Abbey Other deposits	HA72.1	1	1–4,8	Hollow way/street		64	19	64	2	<1	549
	HA72.3	2	7	Ditch	F37	52	33	13	5	0	196
	HA74.6	3	68	Silts		62	23	2	10	<1	827
	HA74.8	3	74–5	Silts		66	25	4	8	<1	907
Jewry Street,	JCH4		317–19	Soil layers		58	24	1	20	3	359
Crown Hotel	JCH6		311–14	Rampart		66	23	3	10	3	219
27 Jewry Street	27JS2		5–7	Various – associated with street		37	13	2	11	0	261
	27JS3		8–9	Buildings		44	19	3	9	0	197
Henly's Garage	HG5		15	Hillwash		39	43	1	5	0	150
	HG7		16	Pits/wells		31	28	1	32	0	651
	HG6		23–5	Building – masonry town house		56	16	3	5	<1	384
	HG4		32	Well	F38	45	24	<1	8	0	339

Key:
%U = % unidentified fragments excluding associated bones, birds, and wild mammals
%G = % gnawed fragments – major identified species excluding associated bones and loose teeth
%E = % eroded fragments excluding loose teeth
%I = % ivoried fragments excluding loose teeth
%B = % burnt fragments
Note: Totals exclude associated bones. Phase groups with <100 fragments omitted

Table 2.92 Survival of limb bones of cattle, sheep/goat, and pig

		P+D	P	D	Shaft	Total	%Shaft	%P	%D
Cattle	Humerus	1	20	127	326	474	69	4	27
	Radius	13	191	48	219	471	46	43	13
	Femur	1	49	53	292	395	74	13	14
	Tibia	2	38	133	342	515	66	8	33
	Metacar-pal	19	107	66	79	271	29	46	31
	Metatarsal	22	143	80	156	401	39	41	25
Sheep/ goat	Humerus	7	8	58	130	203	64	7	32
	Radius	6	87	25	312	430	73	22	7
	Femur	5	18	9	132	164	80	14	9
	Tibia	4	10	104	345	463	74	3	23
	Metacar-pal	22	91	17	339	469	72	22	8
	Metatarsal	16	112	17	399	544	73	24	6
Pig	Humerus	2	7	30	124	163	76	6	20
	Radius	4	33	9	28	74	38	50	18
	Femur	1	6	13	109	129	84	5	11
	Tibia	9	12	34	145	200	73	11	23

Key: P+D proximal and distal ends present, P proximal end present, D distal end present, %Shaft percentage of shaft fragments, %P percentage of bones with proximal ends (P+D & P), %D percentage of bones with distal ends (P+D & D)

Note: Totals exclude loose epiphyses & associated bones
Counts in these and subsequent tables and figures include a small number of bones from a few contexts from VRE which were not included in the final group study because of rephasing of contexts subsequent to the original stratigraphic analysis. Since it is highly likely that most of the bones in these contexts are residual Roman material, it is not considered that the overall results are compromised.

and articular ends of cattle, sheep/goat, and pig humeri, radii, femora, tibiae, and metapodials (Table 2.92). In every case, the later fusing articular end of the bone was represented by fewer specimens than the earlier fusing end. Proximal humeri and tibiae of all these species rarely survived and distal radii and both ends of femora fared only slightly better. Sheep/goat distal metapodials were also poorly represented.

In nearly all cases, limb bones were represented mainly by shafts only. Between 64% and 80% of the selected sheep/goat elements were shafts (Table 2.92). It seems unlikely that butchery techniques on sheep/goat carcasses would have created many shaft fragments. Therefore the lack of articular surfaces indicates that these have not survived various taphonomic processes, whereas the denser shafts had a better chance of preservation.

Pig humeri, tibiae, and femora also included high percentages of shaft fragments, indicating similar rates of destruction to sheep/goat. However, only 38% of pig radii consisted only of shafts and 50% of the specimens possessed the proximal end. This anomaly is not fully understood. It is again not thought that differences in the butchery of these bones would be an important factor. The radius may not have fragmented to the same extent as the other three larger elements when subjected to canid gnawing.

It is to be expected that the larger cattle limb bones will usually be broken into more fragments than those of sheep/goat and pig. Carcass processing methods, particularly segmentation, marrow and grease extraction and, in some cases, bone working, would tend to produce greater fragmentation and a higher percentage of shaft fragments. Consequently, it is not surprising that cattle upper limb bones included large percentages of shaft fragments. However, these percentages were rarely higher than those of sheep/goat and given the greater degree of deliberate breakage by humans, the results suggest that cattle limb bones survived better than those of sheep/goat and pig.

This is most marked in the comparison of cattle and sheep/goat metapodials. Cattle metapodials tended to be less fragmented than their upper limb bones (Table 2.113). Only 29% of the metacarpals and 39% of the metatarsals were represented by shaft fragments only. This contrasts sharply with sheep/goat where the corresponding percentages were 72% and 73% (Table 2.92). This is probably a better reflection of the difference in the survival rates of the bones of these species.

Ivoried bones

A small number of bones possessed surfaces of an unusually hard and shiny texture, a condition

which has been described as ivoried (Coy 1975). This condition tends to occur more commonly on smaller bones of medium-sized mammals and particularly on bird bones. The reasons for this condition are not fully understood, although they must be associated with post-depositional diagenetic changes to the bone. In assemblages from Iron Age chalkland sites in Wessex, more ivoried bones have tended to come from the lower fills of pits than upper fills, suggesting that depth of burial has some bearing on these changes. The presence of higher numbers of ivoried bones also tends to indicate good preservation of the bones, although many may have been damaged previously by gnawing.

Frequencies of ivoried bones varied significantly in the groups from Winchester (Table 2.91). The highest percentages (>25%) of ivoried fragments were recorded in several of the wells and pits, particularly from Victoria Road East and Henly's Garage Phase 16 (Group HG7). These calculations exclude associated bones found in abundance in some of these features, many of which were also ivoried. It appears that conditions in these sub-surface features were often more conducive to these changes. There were, however, some interesting exceptions including the well F1096 from Victoria Road East (Group VRE 19) at 7%, the pits or wells from Victoria Road West (Groups VRW 12–14; 2–4%), and Henly's Garage well F38 (Group HG4). In the case of F1096 at Victoria Road East, most of the unassociated bones had been redeposited in the rapidly infilled upper layers and this may partially explain the lower percentage of ivoried bones. Most of the bones from the other shafts with comparatively low percentages of ivoried fragments were also located in the upper fills. Depth of burial may therefore have been a significant factor.

Most other groups from the Victoria Road sites produced only small numbers of ivoried fragments. The silt layers in particular contained low percentages. Most groups included less than 10% ivoried fragments. The Hyde Abbey and city defences assemblages tended to include slightly higher percentages, perhaps suggesting slightly better preservation of bones on those sites. On all sites, groups which included low percentages of eroded fragments tended to contain higher percentages of ivoried bones.

Burnt bones

Fragments of burnt bone were recorded infrequently. In most of the groups they accounted for less than 1% of the fragments (Table 2.91). There is therefore little evidence that the bones were burnt subsequent to their final deposition. Slightly higher percentages of burnt bones were found in several of the buildings from Victoria Road East, deposits from Jewry Street, Crown Hotel and Victoria Road West Pit F64/70 (Group VRW6). These might represent the inclusion of some material previously burnt in hearths or bonfires and subsequently redeposited amongst other waste.

Retrieval rates

Phalanges (toe bones) of most mammals have low densities (Lyman 1994). In addition, most are small bones, which are more likely to be overlooked by archaeologists using normal retrieval methods. The combination of these factors leads to the expectation that these bones will be poorly represented in most archaeological samples.

Analysis of the Winchester assemblage did confirm that phalanges were recovered in low numbers. Comparisons were made between the numbers of distal metapodials and first phalanges (Table 2.93). Horses and pigs have equal numbers of these adjacent elements, whereas the cloven feet of cattle and sheep/goat include twice as many first phalanges. For all these species fewer than expected first phalanges were represented. The percentage loss of first phalanges was lower in cattle (28%) and horse (32%) than for pig (39%) and sheep/goat (45%). This suggests that the phalanges of the smaller species suffered greater loss from preservation and retrieval biases. This loss is all the greater, as it has already been demonstrated that a large percentage of distal metapodials of sheep/goat in particular did not survive (Table 2.92).

There is some butchery evidence to suggest that first phalanges, particularly of cattle, were sometimes separated from the distal metapodials. It could be argued that some of the first phalanges were removed with the skins and deposited elsewhere, thus accounting for some of the losses. It is less likely, however that the first and second phalanges would be separated in the same way. They ought to be found in equal numbers. However, this is not the case. Less than half of the expected number of second phalanges of cattle, pig, and horse were recorded and the loss of sheep/goat second phalanges was as high as 86% (Table 2.93). Densities of second phalanges are a little lower than first phalanges (Lyman 1994), which could explain some of the losses. However, differential retrieval is more likely to have been the principal factor for the discrepancy (in the sheep/goat assemblage in particular).

Similar results were obtained when the frequencies of other small bones were studied. Equal numbers of astragali and distal tibiae should be expected. The astragalus is also quite a dense element (Lyman 1994). Losses of only 18% for cattle therefore are not surprising, particularly as the common practice of splitting tibiae may have inflated the counts of distal tibiae. Complete cattle astragali were usually over 50mm long and over 30mm in width (Table 2.134) and, provided they were substantially complete, it would be expected that most would be recovered by normal retrieval methods. However, the loss of pig (51%) and especially sheep/goat astragali (88%) was much greater. The smallest sheep/goat astragali measured about 26mm in length and 15mm in width (Table 2.156), a size it seems that was perhaps below the threshold for consistent retrieval of bones.

Losses of carpals of sheep/goat were even greater.

Table 2.93 Indicators of loss of small bones of major species through retrieval and preservation biases

	Cattle	Sheep/goat	Pig	Horse
Metapodials, distal*	187	72	31	37
1st Phalanges*	271	79	19	25
Expected no of 1st phalanges	374	144	31	37
% loss of 1st phalanges	28	45	39	32
1st Phalanges*	271	79	19	25
2nd Phalanges*	126	11	9	10
Expected no of 2nd phalanges	271	79	19	25
% loss of 2nd phalanges	54	86	53	60
Tibia, distal	135	108	43	
Astragalus	111	13	21	
Expected no of astragalus	135	108	43	
% loss of astragalus	18	88	51	
Metacarpal, proximal	126	103		
Carpals	46	0		
Expected no of carpals	756	618		
% loss of carpals	94	100		
Radius, distal	61	31		
Carpals	46	0		
Expected no of carpals	366	186		
% loss of carpals	87	100		

Note: * excludes abaxial (lateral) phalanges and metapodials (pig)

Totals exclude associated bones

Not a single one was recovered by normal excavation methods apart from in associated skeletons. Given perfect preservation and retrieval conditions, hundreds of these bones would have been recovered (Table 2.93). In this case, preservation as well as retrieval factors are likely to have been involved. Even the larger cattle carpals were very poorly represented.

It has therefore been established that preservation and retrieval factors have resulted in a high percentage of bone loss and that sheep/goat and pig have suffered greater losses than cattle and horse. This clearly has implications for the interpretation of species representation and body part frequencies. Variations in bone loss between different species can be demonstrated by comparing the frequencies of different skeletal elements.

Figures 25–28 compare the frequencies of most of the limb bones and mandibles of cattle, sheep/goat, pig and horse respectively. In the case of the major limb bones, only bones with surviving joint surfaces were counted. Proximal and distal ends were treated separately. Only mandibles with surviving molars were counted. Counts of phalanges of cattle, sheep/goat, and pig were divided by four and those of horse divided by two to eradicate problems created by the presence of greater numbers of these bones in the skeleton. Similarly, the totals of pig metapodials were halved. Lateral metapodials and phalanges of pig were not counted in this exercise. Because of difficulties of identification, not all the distal ends of pig and horse metacarpals and metatarsals could be distinguished. Counts of the distal ends of all these metapodials were amalgamated and divided by four in the case of pig and by two in the case of horse.

Counts were obtained for twenty different elements in this way. Counts of each element were expressed as a percentage of the most represented element (MRE). In the case of cattle for example, this was the proximal radius, which was represented by a minimum of 204 specimens. This figure was converted to 100%. The counts of other cattle elements were each expressed as a percentage of 204 (Fig 25). If there are no major biases in anatomical representation, equal numbers of these elements should be found and percentages should lie close to 100%. This is clearly not the case

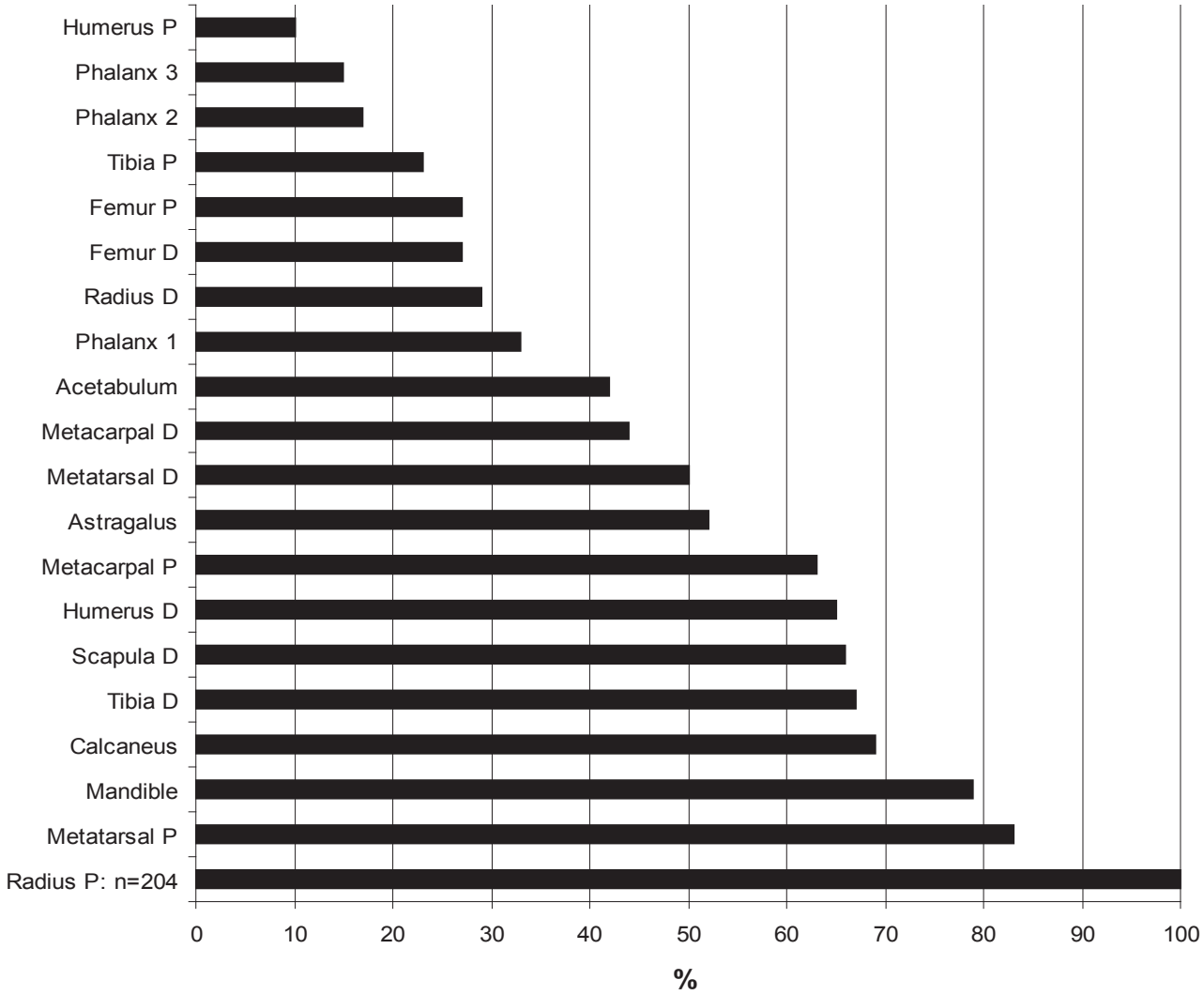


Figure 25 Percentage survival of cattle bones (MRE)

Key: P = proximal, D = distal

for any of the species (Figs 25–28). Many elements were poorly represented and the graphs show that generally late- fusing and small elements suffered the greatest losses.

Comparisons between the species also show that such losses were greater in sheep/goat and pig (Figs 26–27) than for cattle and horse (Figs 25 and 28). Mandibles dominated the sheep/goat and pig assemblages, greatly outnumbering any other element. Their mandibles are dense elements and suffer less from attrition by dog gnawing than limb bone articular surfaces. The cattle and horse assemblages had a more even representation with fewer losses. The relative abundance of different elements for all these species will be further discussed below.

The effects of canid gnawing will also have adversely affected the epiphysial fusion data, since it is likely that the more fragile unfused bones of younger animals will have suffered greater losses. Gnawing will also have destroyed evidence of butchery marks and decreased significantly the number of bones available for metrical analysis.

The relative abundance of domestic mammals

There are a number of problems in trying to quantify the relative importance of different species to the meat diet and variations in this between and within sites. Differential retrieval and preservation of bones of different species are factors that have already been discussed. In addition, differential treatment of the carcasses also complicates the picture. For example, cattle carcasses are more likely to be broken into a larger number of fragments per animal than those of the smaller sheep and pigs. Because there are inherent biases in all methods of species quantification commonly employed in zooarchaeology, four different methods were employed to investigate the relative abundance of the major domesticates. The methods and their results are discussed below.

Fragment counts (NISP)

Counts of the number of all fragments (or number of

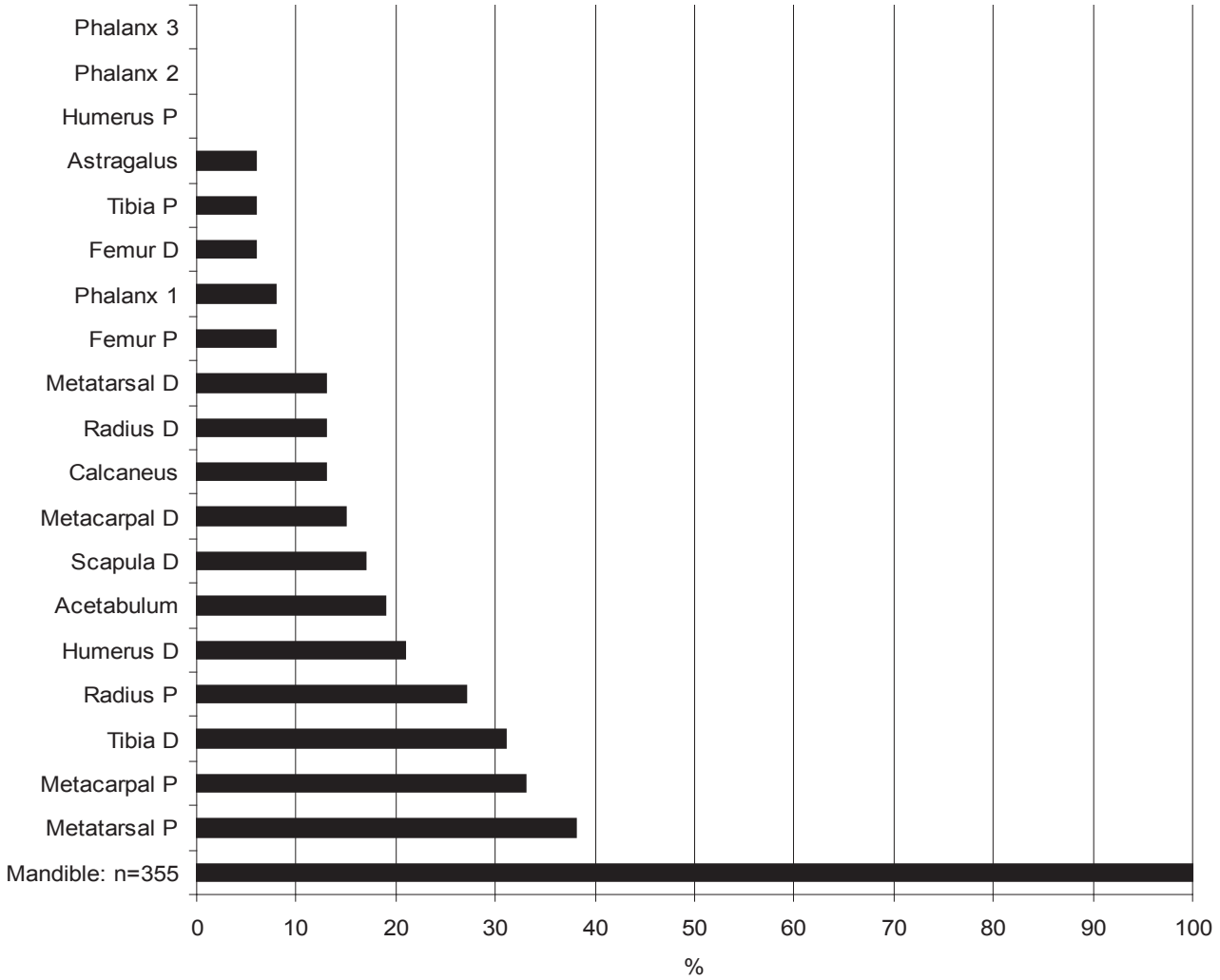


Figure 26 Percentage survival of sheep/goat bones (MRE)

Key: P = proximal, D = distal

individual specimens – NISP) of cattle, sheep/goat, pig, horse, and dog were made for all the groups discussed above (Tables 2.17–2.90). Excluding associated bones, 14,675 fragments of these species were identified from all sites. Such counts are particularly susceptible to the biases discussed above. For example, it is possible that several fragments of the same element, particularly skulls and the larger limb bones, could be counted. However, this method of quantification has the advantage of supplying larger samples than others commonly employed. Comparisons with samples from other sites have also to be considered and results from most analyses have often been restricted to fragment counts (King 1978; 1984; 1999).

Percentages were calculated for all groups which produced over 50 fragments identified to the major domestic mammals (Table 2.94). Cattle fragments were the most frequently identified in 39 of 55 of these, with percentages ranging between 16% and 77%. This gives a good indication of the large amount of variation in the assemblages, although most of the lowest and highest percentages were derived from small groups, which were not very reliable. From all groups, cattle provided 46% of the fragments identified to the major domestic species from these Roman deposits (Table 2.95).

As noted elsewhere, counts from the groups were amalgamated into thirteen assemblage groups to enable more general comparisons between sites and between context types (Table 1.4). This reduced the amount of variation, with cattle contributing between 30% and 56% of the assemblages (Table 2.95). Cattle tended to be best represented at Victoria Road East, irrespective of context type (42–56%). They were also comparatively well represented in the 27 Jewry Street deposits. However, cattle fragments were usually outnumbered by those of sheep/goat in groups and amalgamated assemblage groups from Victoria Road West and Hyde Abbey (30–43%). Forty-three percent of the identified domestic mammal fragments from the Henly's Garage site belonged to cattle (Table 2.95), which was the best represented species in all the largest groups from that site (Table 2.94). Reasons for

Table 2.94 Percentages of animal bone fragments of the major species

Site/trench	Group	Period	Phase	Deposit type/ interpretation	Feature/ building	N	C	S	P	H	D	C:H	C:SP	S:P	LM: SM
VR East	VRE19	7	348	Well	F1096	568	61	25	9	2	2	96	64	73	83
Wells	VRE20	7	442	Well	F1093	685	26	59	10	4	2	88	28	86	38
and pits	VRE24	7	471	Pit	F1098	47									
	VRE21	7	479	Pit	F168	103	51	20	22	6	0	90	55	48	59
	VRE22	7	480	Pit	F814	1025	64	27	7	2	<1	97	66	79	78
	VRE23	7	450	Pit	F981	86	24	64	12	0	0	100	25	85	33
Total						2514	51	36	9	3	1	95	53	80	61
VR All trenches, ditches	VRE25	7	465	Ditch		90	57	27	10	4	2	93	61	73	73
	VRW11	4	941–4, 946, 948, 950	Ditch	F12	729	40	27	23	7	3	84	45	54	58
Total						819	42	27	21	7	3	86	47	56	59
VR East Buildings	VRE3–4	6	293–9, 310–27	Oven	F846	809	47	33	12	7	1	86	51	74	71
	VRE14	7	402–11	Building	2	96	39	49	11	1	0	97	39	81	65
	VRE15–16	7	328–38	Roadside structure	4th phase	73	47	30	17	3	3	95	50	63	69
	VRE17	7	341–6	Building	3	53	51	34	11	0	4	100	53	75	57
	VRE18	7	426–41, 445–7	Building	4	91	32	59	7	0	2	100	50	90	66
Total						1122	45	36	12	6	2	89	49	76	70
VR East NE corner	VRE6	7	375–6	Metalling		5									
	VRE7	7	378	Metalling		49									
	VRE8	7	379–81	Silts		319	60	19	10	8	2	88	67	65	83
	VRE9	7	382–3	Silts		86	77	10	3	9	0	89	85	75	84
	VRE10	7	385–6	Building 1		407	63	19	7	11	<1	86	71	74	81
	VRE11	7	387–9	Silts		481	59	35	11	4	1	93	52	77	73
	VRE12	7	393	Building 1, Phase 2		793	60	28	8	4	<1	94	62	77	79
	VRE13	7	394–9	Silts		469	47	39	11	2	<1	95	49	79	70
Total						2609	56	28	9	6	1	91	60	75	78
VR East Layers/ other	VRE1	5	155–67	Assoc. w/roadside Structure 2		55	75	16	7	0	2	100	76	69	94
	VRE2	5	195, 260–2, 266–9	Site-wide accumula-tion 2		531	60	25	10	3	2	94	63	71	75
	VRE5	6	303–08	Contempo-rary with F846		506	48	37	8	7	1	88	52	82	77
	VRE26	7	276, 287–92	Site-wide accumula-tion 3		425	57	22	12	7	2	90	63	65	81
	VRE27	7	369–73	Contemp. with site-wide acc. 3		36									
	VRE28	7	349–57, 361–2	Deposits post-dating Building 3		275	43	39	14	2	2	95	45	74	67
	VRE29	7	358–60	Silts		109	46	39	13	2	0	96	47	75	68
	VRE30	7	461–4, 472–5	Late – post-Roman deposits		223	39	42	16	<1	2	99	40	72	59
Total						2159	52	31	11	4	2	93	55	73	74

Table 2.94 (*cont.*) Percentages of animal bone fragments of the major species

Site/trench	Group	Period	Phase	Deposit type/ interpretation	Feature/ building	N	C	S	P	H	D	C:H	C:SP	S:P	LM: SM
VR West Pit and wells	VRW6	3	932	Pit	F64/70	94	45	30	16	6	2	88	49	64	45
	VRW12	4	945	Well	F46	287	33	30	29	7	1	83	36	51	60
	VRW13	4	949	Well	F18	29									
	VRW14	4	956	Well	F43	337	52	32	11	4	2	93	55	75	56
Total						747	43	32	19	5	1	89	46	63	56
VR West Buildings	VRW2	3	918, 922	Building	1	11									
	VRW3	3	919, 923, 925, 929	Building	2	182	29	55	9	5	1	85	31	86	48
	VRW4	3	920, 926, 930	Building	3	185	34	37	25	3	<1	91	35	59	53
	VRW5	3	921, 927, 928	Building	4	77	23	45	23	3	5	90	25	66	52
Total						455	30	46	18	4	2	89	32	72	50
VR West Other deposits	VRW1	3	917	Possible structures		124	16	63	16	4	<1	80	17	80	46
	VRW7	3	924, 931	Various – metalling, occupation & silts		212	44	33	17	5	<1	90	47	65	76
	VRW8	3	933–5	Various – small features		24									
	VRW9	3	938–9	Silts – contem-porary with cemetery		108	42	39	17	2	<1	96	43	70	34
	VRW10	3	951-4	Silts – ?remains of roadside bank		81	40	40	17	2	1	94	41	70	65
	VRW16	4	965–8	Various – contexts over cemetery		284	39	38	16	3	2	93	42	71	51
	VRW17	4	969	Silts – disuse of site		155	41	33	17	8	<1	84	45	65	64
	VRW15	4	Various	Graves		87	51	26	14	9	0	85	56	66	74
Total						1075	39	39	17	4	1	90	41	70	58
Hyde Abbey '72	HA72.2	1	5–6, 9–11	Buildings	1, 2, 3	190	43	27	19	10	<1	81	48	59	71
Hyde Abbey '74	HA74.2	3	55–9	Struc. remains	1, 2, 3	30									
	HA74.4	3	60–1	Struc. remains	5	118	27	56	13	4	0	86	28	81	51
	HA74.5	3	64–7	Struc. remains	6, 7	326	32	48	17	3	1	91	33	74	37
	HA74.7	3	69–71	Struc. remains	8	126	39	48	11	2	0	94	39	82	48
	HA74.3	3	76	Struc. remains	4	78	31	42	21	6	0	83	33	67	38
Total						868	34	44	16	5	<1	86	36	73	47
Hyde Abbey '72	HA72.1	1	1–4,8	Hollow way/street		194	55	23	9	12	0	82	63	73	90
Other deposits	HA72.3	2	7	Ditch	F37	91	41	32	16	7	4	86	46	66	75
Hyde Abbey '74	HA74.1	3	52–3	Ditch	F107/ 199	3									

Table 2.94 (*cont.*) Percentages of animal bone fragments of the major species

Site/trench	Group	Period	Phase	Deposit type/ interpretation	Feature/ building	N	C	S	P	H	D	C:H	C:SP	S:P	LM: SM
Other deposits	HA74.6	3	68	Silts – disuse		303	29	52	18	1	0	98	29	74	43
	HA74.8	4	74–5	Silts – disuse		295	26	55	18	1	0	97	26	75	41
Total						886	35	44	16	4	1	90	37	73	56
Jewry Street, Crown Hotel	JCH1		707–10	Silts – developed soils		33									
	JCH2		323–4	Silts – developed soils		23									
	JCH3		320–2	Silts – developed soils & building		46									
	JCH4		317–19	Soil layers		149	34	54	11	1	1	98	35	83	56
	JCH5		315	Pit & post-holes		25									
	JCH6		311–14	Rampart		74	45	34	18	4	0	92	46	66	59
Total						350	39	45	12	3	<1	93	41	79	58
27 Jewry Street	27JS1		3–4	Street & gully		46									
	27JS2		5–7	Various – associated with street		165	61	27	10	3	0	95	63	73	74
	27JS3		8–9	Buildings		104	43	38	14	4	0	92	45	73	57
	27JS4		32	Silts – disuse		35									
Total						350	49	35	13	3	0	94	50	73	62
Henly's Garage	HG1		1–3	Various – developed soils & occupation		17									
	HG2		4–7	Silts – disuse		18									
	HG3		9–11	Various – structural features		48									
	HG5		15	Hillwash		89	43	36	17	3	1	93	45	68	71
	HG7		16	Pits/wells		198	49	28	17	4	1	92	52	62	78
	HG6		23–5	Building – masonry town house		167	45	36	15	0	4	100	47	71	68
	HG4		32	Well	F38	184	40	25	29	5	1	89	42	46	74
Total						721	43	32	20	3	2	93	45	62	70

Key:

N = total number of fragments of major domestic mammals excluding associated bones, C = cattle, S = sheep/goat, P = pig, H = horse, D = dog, C:H = cattle fragments as a percentage of total cattle and horse fragments, C:SP = cattle fragments as a percentage of the total cattle, sheep/ goat and pig fragments, S:P = sheep/goat fragments as a percentage of the total sheep/goat and pig fragments, LM:SM = unidentified large mammal fragments as a percentage of the total unidentified large- and sheep-sized mammal fragments

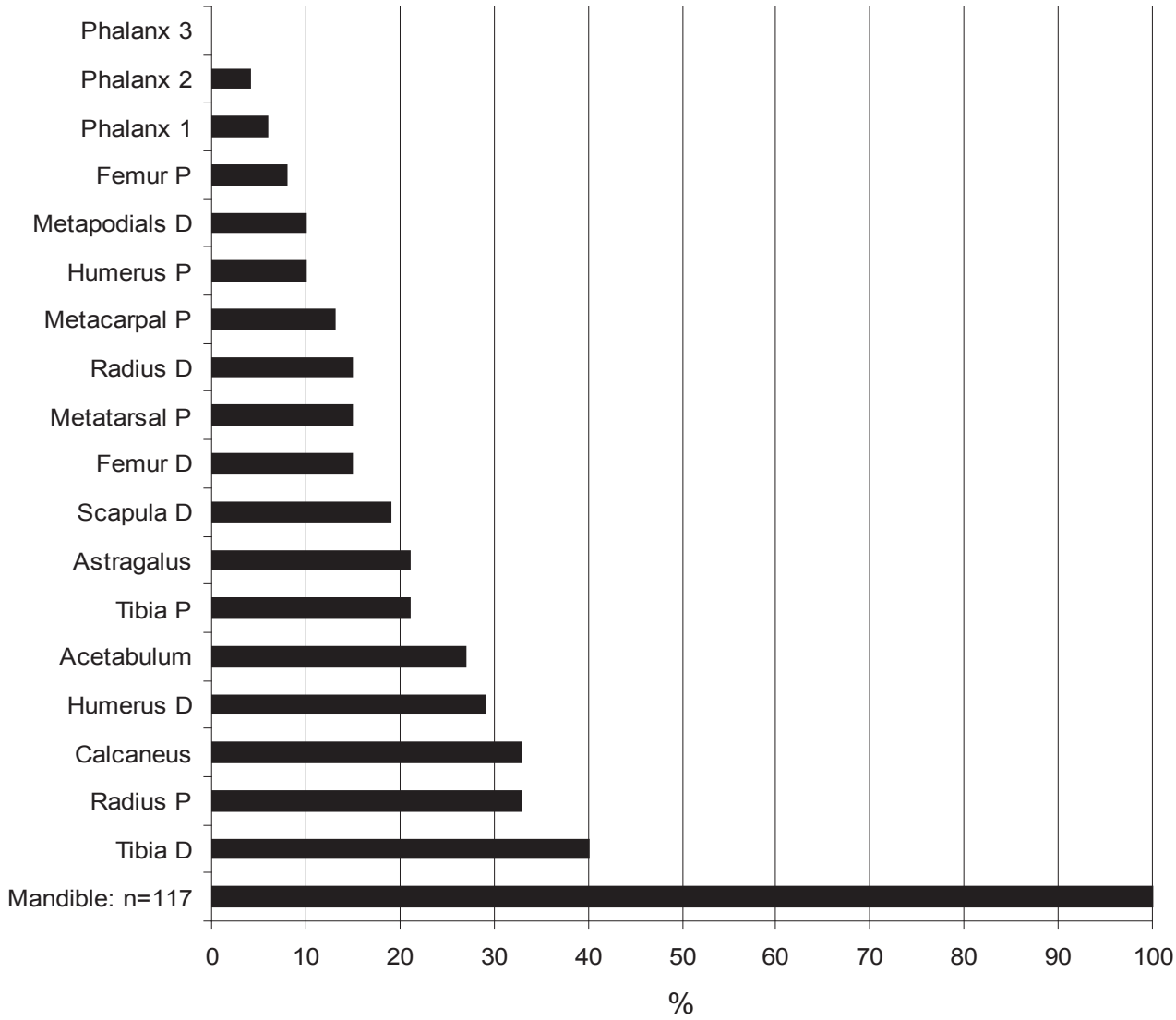


Figure 27 Percentage survival of pig bones (MRE)

Key: P = proximal, D = distal

the variations in cattle frequencies will be examined in more detail below (pp 106–109).

Sheep/goat fragments were the second most commonly recorded category. They were the best represented species in 16 of the 55 largest groups and ranked second in all but one of the others. Their percentage varied between 10% and 64% (Table 2.94). Overall, they contributed 35% of the identified fragments of the major domestic species. This varied between 27% and 46% in the major assemblage groups (Table 2.95). Not surprisingly, their lowest percentages tended to occur in assemblages where cattle were best represented. Consequently, sheep/goat fragments were generally less well represented at Victoria Road East, and in the 27 Jewry Street and Henly's Garage assemblages (27–36%) than elsewhere (32–46%). Further discussion of the relative frequency of sheep/goat fragments can be found below (pp 159–160).

Pig fragments were comparatively poorly represented. They usually ranked third behind sheep/goat and cattle. They outnumbered sheep/goat in only one of the 55 largest groups. They never outnumbered cattle fragments although they were found in equal numbers in two groups. Pig fragments were even outnumbered by those of horse in three of the groups, all of which included some bone working waste. Percentages of pig fragments varied between 3% and 29% (Table 2.94).

Overall, 13% of the identified major domestic mammal fragments belonged to pig. In the major assemblage groups, percentages ranged between 9% and 21% (Table 2.95). Pigs were less well represented at Victoria Road East than elsewhere in the northern suburb. This probably reflects the presence of more deposits of large-scale industrial bone waste derived from cattle and, to a lesser extent, horse on that site, which has depressed the relative percentage of pig bones. Further discussion of the possible importance of pork and bacon in Winchester on the basis of fragment counts can be found below (pp 184–186).

Horse bones provided only a small proportion of

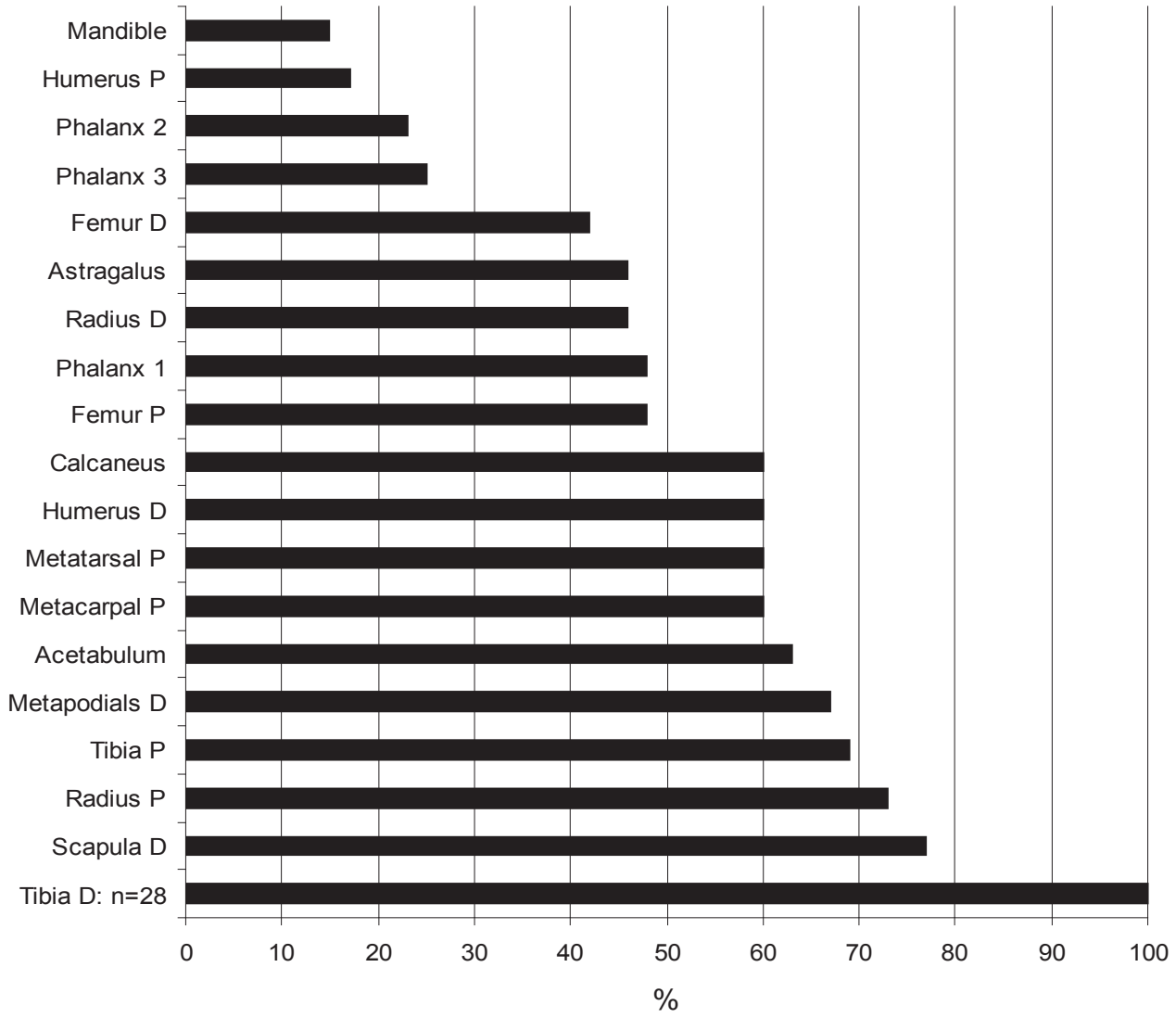


Figure 28 Percentage survival of horse bones (MRE)

Key: P = proximal, D = distal

the faunal assemblages. Percentages of fragments in the groups ranged between 0% and 17% but only in three cases did the percentage rise above 10% (Table 2.94). Horse fragments only provided 4% of the total fragments identified to the major domestic mammals. This frequency ranged between 3% and 7% in the thirteen assemblage groups (Table 2.95). Higher percentages of horse bones tended to be associated with deposits containing possible bone working waste. There is therefore little evidence that they provided a regular addition to the meat diet.

Dog bones were the least common of the major species in most groups. Excluding associated bones, they never provided more than 5% of the fragments in any group and in 27 groups they formed less than 1% of the identified domestic mammal fragments (Table 2.94). Overall they provided just 1% of the identified fragments and never formed more than 3% of the sample from any of the assemblage groups (Table 2.95). They were best represented in ditches at Victoria Road. These features tended to contain a slightly greater diversity of species than other assemblages.

Selected Bone Counts (SBC)

Counts of fragments (NISP) suffer from a number of problems as discussed above. Therefore, three other methods of quantifying the relative abundance of the major domestic species have been employed, in order to compare these results with the NISP method. The first of these methods involves counts of diagnostic zones of a relatively small number of elements only.

By the selection of elements, problems of differential fragmentation can be largely eliminated. The method has been developed to enable faunal samples to be recorded and analysed more quickly and efficiently. Selection of bones for recording is designed to concentrate time and resources on those elements which will provide the most information, whereas small pieces

Table 2.95 Major domestic mammals – frequencies in assemblage groups (NISP)

	Cattle	Sheep/goat	Pig	Horse	Dog	Total
VRE wells and pits	1280	912	229	63	30	2514
%	51	36	9	3	1	
VR all trenches, ditches	345	219	174	58	23	819
%	42	27	21	7	3	
VRE buildings	505	405	131	63	18	1122
%	45	36	12	6	2	
VRE NE corner	1473	730	240	149	17	2609
%	56	28	9	6	1	
VRE layers/other	1113	679	246	87	34	2159
%	52	31	11	4	2	
VRW shafts and pits	320	236	140	40	11	747
%	43	32	19	5	1	
VRW buildings	138	211	82	17	7	455
%	30	46	18	4	2	
VRW other deposits	420	417	178	48	12	1075
%	39	39	17	4	1	
Hyde Abbey buildings	292	383	142	47	4	868
%	34	44	16	5	1	
Hyde Abbey other deposits	310	393	142	35	6	886
%	35	44	16	4	1	
Jewry Street, Crown Hotel	137	159	42	11	1	350
%	39	45	12	3	<1	
27 Jewry Street	171	123	45	11	0	350
%	49	35	13	3	0	
Henly's Garage	314	230	141	24	12	721
%	43	32	20	3	2	
Total	6818	5097	1932	653	175	14675
%	46	35	13	4	1	

of bones (for example, shaft fragments) which do not contain much information are not considered in quantitative analysis (Davis 1992). Bones of different sizes can be chosen to monitor retrieval rates and the choice of mandibles and a selection of early-fusing and late-fusing epiphyses can also allow ageing analysis to be carried out. Recording of the articular ends of limb bones ensures that metrical data can be obtained. The recording system has now been applied to a number of British assemblages, for example, from Launceston Castle (Albarella and Davis 1996).

The fourteen elements selected for this exercise on the Winchester samples follow those recommended by Davis (1992) with minor modifications. The elements involved were:

mandibles with one or more of the cheek teeth surviving;
distal scapula (glenoid cavity);
distal humerus;
distal radius;
distal femur;
distal tibia;
distal metacarpals;
distal metatarsals;
acetabulum with part of the ischium attached;
carpals;
calcaneus;
astragalus;
first phalanx;
third phalanx.

Table 2.96 Major domestic mammals – frequencies in assemblage groups (by Selected Bone Counts)

	Cattle	Sheep/goat	Pig	Horse	Dog	Total
VRE wells and pits	275.75	164	43.75	18	7.13	508.63
%	54	32	9	4	1	
VR all trenches, ditches	61	29.5	40	22	8	160.5
%	38	18	25	14	5	
VRE buildings	114.33	46.25	16.95	19.67	2.13	199.33
%	57	23	9	10	1	
VRE NE corner	257.08	109	39.5	28	8	441.58
%	58	25	9	6	2	
VRE layers/other	214.17	127.25	53.75	18	11.13	424.3
%	50	30	13	4	3	
VRW shafts and pits	82.33	36.5	35.92	15.17	3	172.92
%	48	21	21	9	2	
VRW buildings	22.25	33.25	12.5	2.17	0	70.17
%	32	47	18	3	0	
VRW other deposits	68.17	48.25	29.75	15.83	3	165
%	41	29	18	10	2	
Hyde Abbey buildings	40.67	69.5	21.42	16.33	1	148.92
%	27	47	14	11	<1	
Hyde Abbey other deposits	45.92	55	11	11	1	123.92
%	37	44	9	9	<1	
Jewry Street, Crown Hotel	19.25	37.5	3	2	1	62.75
%	31	60	5	3	2	
27 Jewry Street	22.5	28.25	4.5	2	0	57.25
%	39	49	8	3	0	
Henly's Garage	66.25	42.25	28.25	4.5	4	145.25
%	46	29	19	3	3	
Total	1289.67	826.5	340.29	174.67	49.39	2680.52
%	48	31	13	7	2	

Note: Selected bones = mandible with one or more cheek teeth present, distal scapula, humerus, radius, femur, tibia, metapodials, acetabulum (os coxae), carpals, calcaneus, astragalus, 1st phalanx, 3rd phalanx. Counts are standardised by anatomical part

Counts of carpals, metapodials, and phalanges were amended where necessary to allow for variations between the number of occurrences of these elements in the skeletons of different species. Lateral metapodials and phalanges were not included. Also, unfused epiphyses and loose teeth were not counted.

The results of this analysis of Selected Bone Counts (SBC) are shown in Table 2.96. Cattle were again the best represented species, contributing 48% of the elements overall. Counts varied between 27% and 58% in the thirteen assemblage groups. The range in percentages and their average compare fairly closely with the results from the NISP method, although there were greater variations between the same assemblage groups (Table 2.95). For example, cattle provided 57% of the Selected Bone Counts from the Victoria Road East buildings compared with 45% of the total number of fragments. Conversely, they provided only 39% of the selected bones from 27 Jewry Street compared with 49% of the fragments. However, in eight of the thirteen assemblage groups differences in cattle percentages between these two methods of calculation were of the order of 5% or less.

Sheep/goat provided 31% of the selected elements, slightly less than the total number of fragments (35% – Tables 2.95–2.96). However, variations between assem-

blages groups were greater, ranging between 18% and 60%. Discrepancies between results from the same assemblage group were also greater. In five cases, results from the methods of calculation varied by over 10%. Sheep/goat provided only 23% of the Selected Bone Counts from the Victoria Road East buildings compared with 36% of the total number of fragments. On the other hand, they provided 60% of the selected bones from Jewry Street, Crown Hotel, compared with 45% of the fragments. A similar increase was observed in the assemblage group from 27 Jewry Street corresponding with the lower percentage of cattle selected elements.

Pig provided 13% of the selected elements, the same as that obtained by the NISP method. Once again there was greater variability in this figure between assemblage groups (5–25%). The greatest discrepancy between the results of the two methods of calculation in the same assemblage group was 7%, encountered at Hyde Abbey in contexts other than buildings and at Jewry Street, Crown Hotel. In both cases the selected elements methods produced lower pig percentages. This method of quantification indicated that pigs were best represented in the Victoria Road East assemblage groups.

Selected Bone Counts produced an overall percentage of horse of 7% compared with 4% from NISP counts (Tables 2.95–2.96). This increase probably reflects the fact that horse bones were less fragmentary than cattle. The percentage of horse ranged between 3% and 14% in the assemblage groups and this figure usually was equal or higher than the corresponding calculation derived from fragment counts. The greatest increases were encountered in the Hyde Abbey and some of the Victoria Road West assemblage groups.

Dogs were again the least well represented species contributing just 2% of the selected bones compared with 1% of the total fragments (Tables 2.95–2.96). Percentages ranged between 0% and 5% in the thirteen assemblage groups.

Counts of selected bones therefore gave broadly similar results to those obtained from fragment counts, although they tended to produce more variability between assemblage groups. Species ranking was the same with cattle being the best represented, followed by sheep/goat, pig, horse, and dog respectively.

One drawback of the selected element method, however, concerns the selection of articular surfaces only for counts of limb bones. It has been demonstrated that such elements suffered severely from attrition by dogs and that bones of sheep/goat and pig were more severely affected than those of cattle and horse (Table 2.92). It has also been shown that carpals and phalanges of sheep/goat and pig were less likely to be retrieved than those of cattle and horse (Table 2.93). Consequently, one source of bias towards large mammals (greater fragmentation) may have been replaced with others by the use of this method of counting.

Whole Bone Equivalents (WBE)

An alternative method of removing some of the problems of differential fragmentation is to weight counts according to the proportion of the bone recovered. In this method, small bones such as the phalanges are not included in the counts because of the problems of differential retrieval. Vertebrae, ribs, skull, and pelvis are also omitted because of problems of identification and recording. The following bones were therefore selected for this analysis:

mandible;
scapula;
humerus;
radius;
femur;
tibia;
metapodials.

Again, adjustments were made in the counts of metapodials to allow for variations in the number of these bones in different species. Details of the completeness of each of the selected bones were recorded. They were classified initially into five size categories:

less than 0.25 of a complete bone;
over 0.25 but less than 0.50 of a complete bone;
more than 0.50 but less than 0.75 of a complete bone;
more than 0.75 of a bone but not a complete bone;
a complete bone.

Bones were scored at 0.10; 0.25; 0.50; 0.75; and 1.00 respectively for the five categories. The totals for each bone were added together to produce the whole bone equivalents (WBE) and the combined totals of the bones were then listed by assemblage group for each species in Table 2.97. Unfused epiphyses were not counted and counts excluded associated bones.

As expected, this method of counting drastically changed the results of the relative abundance of the major domestic species. Cattle were ranked only second in all but one of the assemblage groups. The exception was that from the north-east corner of the Victoria Road East site (Groups 6–14) which also produced the highest percentage of cattle WBEs (44%). Their lowest percentage was 21% in the assemblage group from the Victoria Road West buildings. The overall percentage of cattle was only 33% (Table 2.97). The assemblage groups from Victoria Road East and 27 Jewry Street still tended to produce higher cattle percentages than other assemblage groups, but all calculations of cattle abundance were significantly lower than those obtained by the previous methods of quantification.

Sheep/goat emerged as the most numerous species using the WBE method of counting. They were the best represented species in twelve of the thirteen assemblage groups with percentages ranging between 35% and 66% and an overall percentage of 48% (Table 2.97). Their lowest percentage frequency was encountered in the assemblage from the Victoria Road ditches, although they were still the best represented species amongst a more diverse assemblage. Otherwise, as usual sheep/goat were better repre-

Table 2.97 Major domestic mammals – frequencies in assemblage groups (by Whole Bone Equivalents)

	Cattle	Sheep/goat	Pig	Horse	Dog	Total
VRE wells and pits	159.4	207.9	37.2	15.7	7.36	427.56
%	37	49	9	4	2	
VR all trenches, ditches	32.55	39.45	23.95	10.2	6.03	112.18
%	29	35	21	9	5	
VRE buildings	58	89.2	20.35	8.15	5.63	181.33
%	32	49	11	4	3	
VRE NE corner	169	154.5	33.3	17.35	6.5	380.65
%	44	41	9	5	2	
VRE layers/other	103.7	168.3	45.35	6	14.56	337.91
%	31	50	13	2	4	
VRW shafts and pits	39	46.45	16	9.95	2	113.4
%	34	41	14	9	2	
VRW buildings	11.2	30.4	9.03	1.9	0	52.53
%	21	58	17	4	0	
VRW other deposits	31.35	57.6	20.4	4.95	2	116.3
%	27	50	18	4	2	
Hyde Abbey buildings	33.9	78.1	18.8	8.05	0.1	138.95
%	24	56	14	6	<1	
Hyde Abbey other deposits	30	76.3	15.2	4.15	0.75	126.4
%	24	60	12	3	<1	
Jewry Street, Crown Hotel	12	33.65	3.1	1.15	1	50.9
%	24	66	6	2	2	
27 Jewry Street	18.75	32.2	7.35	1.95	0	60.25
%	31	53	12	3	0	
Henly's Garage	25.5	54.55	23.08	2.8	5	110.93
%	23	49	21	3	5	
Total	724.35	1068.6	273.11	92.3	50.93	2209.29
%	33	48	12	4	2	

Note: Whole Bone Equivalent counts are summations of WBEs of: mandible, scapula, humerus, radius, femur, tibia, metapodials

sented in assemblages where cattle were less well represented.

Pigs again ranked third using WBE counts. Overall, they formed 12% of the total assemblage, with percentages ranging between 6% and 21% in the thirteen assemblage groups (Table 2.97). Although their overall relative frequency did not increase, pigs were better represented in relation to cattle using this method than in counts derived from the NISP and SBC methods.

Horse and dog continued to be poorly represented, providing only 4% and 2% of the WBE counts respectively (Table 2.97). Horse percentages ranged between 2% and 9%; dogs between 0% and 5%.

The WBE method therefore favoured counts of sheep/goat in comparison with the NISP and SBC methods. This reflects the fact that their identified major limb bones and mandibles survived in a more complete state than those of cattle. Comparisons of the mean fragment sizes of the bones of cattle, sheep/goat, pig, and horse are compared in Figure 35. This shows that the limb bones of cattle were much more fragmentary than those of sheep/goat, pig, and horse. The pattern is different for the mandible, but sheep/goat mandibles tended to survive in a much more complete state than those of the other three species. The weighting employed in this method of counting therefore favoured sheep/goat in particular and also horse and pig in comparison with cattle.

Most Represented Element (MRE)

The WBE method does not make any assumptions about which parts of the bones are represented. Also, by combining counts from different bones, it cannot be used to estimate minimum numbers of animals represented. The Most Represented Element method (MRE) goes some way towards this goal. Counts were

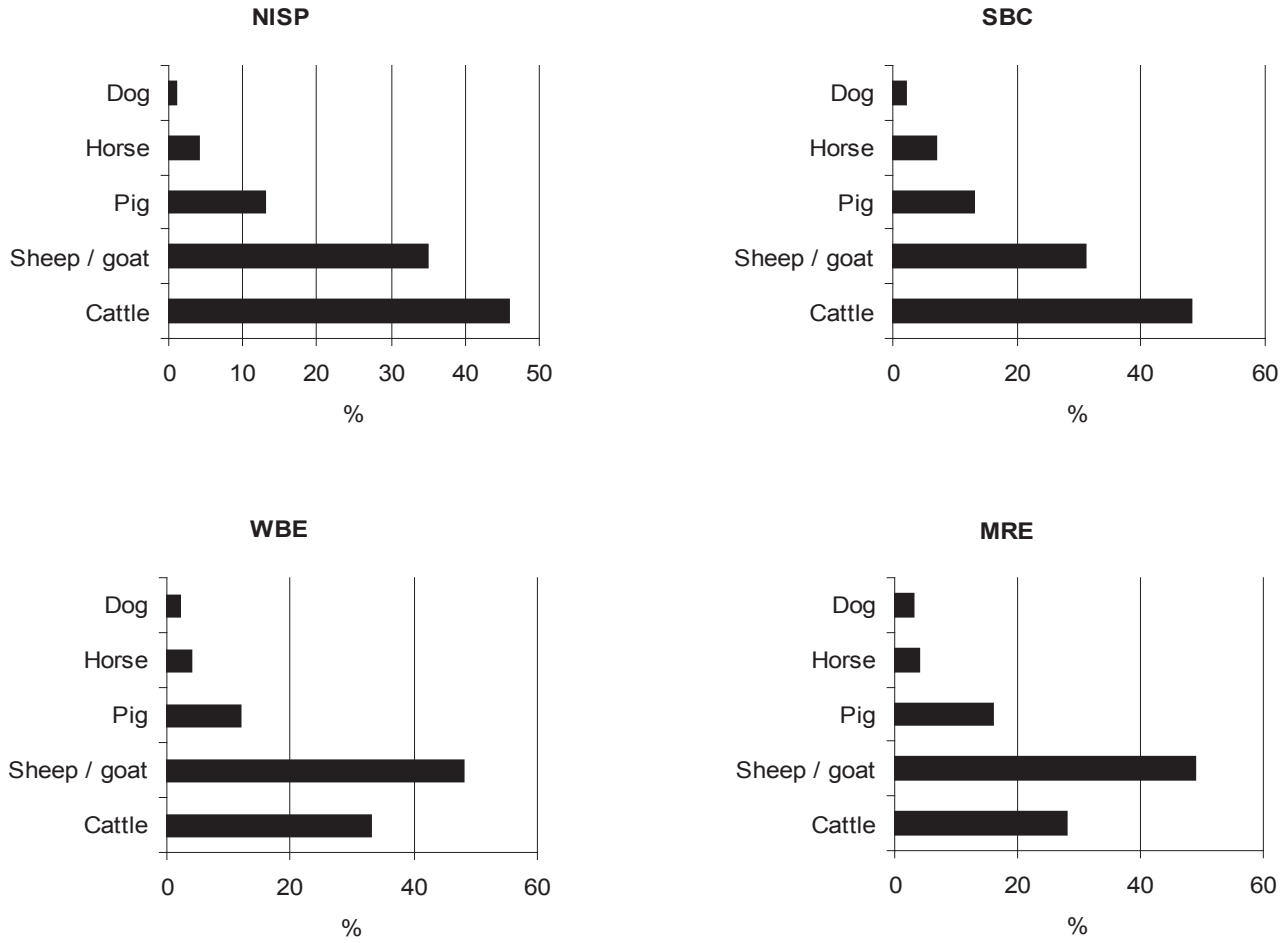


Figure 29 Overall percentages of major domestic animals

restricted to the element of each species, which was found in the greatest numbers. Figures 25–28 show that, overall, mandibles were the MRE of sheep/goat and pig, whereas proximal radius and distal tibia were the MREs for cattle and horse respectively. Mandibles were the MRE of dogs. However, in a few of the assemblage groups other elements of some of these species were better represented and counts were derived from these. Table 2.98 gives the totals of the MREs for the major domestic species by assemblage group. Two overall totals are given. The first is derived by the summation of the MREs from each assemblage group. This assumes that no animal was represented in more than one assemblage group. The second calculation does not make this assumption and the total is therefore derived from the MRE from all deposits irrespective of its primacy in a particular assemblage group. It should be emphasised that neither total represents an estimate of the minimum number of animals since the side of the body has not been taken into account. An approximation to the minimum number of individuals (MNI) represented would involve halving the MRE total.

Comparisons of the frequencies of the major domestic species employing this method of counting showed that cattle were the best represented in only two of the assemblage groups and equal with sheep/goat in a third. In the other ten assemblage groups they ranked second to sheep/goat. Percentages varied between 20% and 39%. Overall, the percentage of cattle lay between 28% and 31% depending on the method of calculation (Table 2.98). This was the lowest figure obtained for cattle in any of the methods of quantification (Fig 29).

Sheep/goat were the best represented species in every case where cattle was ranked second. Their percentage of the MREs in the assemblage groups varied widely between 30% and 64%, with an average of 45–49%. Pig MREs varied between 8% and 31% with an overall average of 15–16%, slightly higher than the figures obtained by other methods of calculation. Pigs were best represented in the Henly's Garage assemblage, where they were ranked second behind sheep/goat. Pigs were less well represented than sheep/goat and cattle in all the other assemblage groups (Table 2.98).

Horse and dog continued to be poorly represented in comparison with the main food species. Horse MREs ranged between 2% and 12%, with an overall average of 4–6%. Dog percentages ranged between 0% and 13%, with an average of 3%. Both species were best represented in the Victoria Road ditches (Table 2.98).

By limiting counts to the most represented element, problems of differential fragmentation, preservation,

Table 2.98 Major domestic mammals – frequencies in assemblage groups (by Most Represented Element)

	Cattle	Sheep/goat	Pig	Horse	Dog	Total
VRE wells and pits	40	67	16	3	4	130
%	31	52	12	2	3	
VR all trenches, ditches	10	13	8	4	5	40
%	25	33	20	10	13	
VRE buildings	14	22	7	6	1	50
%	28	44	14	12	2	
VRE NE corner	41	62	21	9	3	136
%	30	45	15	7	2	
VRE layers/other	58	58	21	6	4	147
%	39	39	14	4	3	
VRW shafts and pits	13	11	6	3	2	35
%	37	31	17	9	6	
VRW buildings	5	8	4	1	1	19
%	26	42	21	5	5	
VRW other deposits	15	14	11	4	2	46
%	33	30	24	9	4	
Hyde Abbey buildings	14	29	5	4	1	53
%	26	55	9	8	2	
Hyde Abbey other deposits	10	28	6	3	1	48
%	21	58	13	6	2	
Jewry Street, Crown Hotel	5	16	2	1	1	25
%	20	64	8	4	4	
27 Jewry Street	10	13	3	1	0	27
%	37	48	11	4	0	
Henly's Garage	10	14	12	1	2	39
%	26	36	31	3	5	
Total by group	245	355	122	46	27	795
%	31	45	15	6	3	
Total by bone	204	355	117	28	20	724
%	28	49	16	4	3	

Note: Highest total MRE is mandible for all species except cattle (proximal radius) & horse (distal tibia)

and retrieval should be lessened because the bones involved for each species would be expected to be amongst the largest, densest, and least fragmented. However, there are several problems with this method that need to be recognised. The first problem is that it cannot guarantee that the most represented elements of each species had an equal chance of survival and recovery. A second problem is that counts are susceptible to bias by the presence of any large accumulations of particular bones, derived perhaps from large-scale butchery or bone working waste. A third problem is that by limiting counts to individual bones, sample sizes are decreased significantly. This probably accounts for the greater variability in percentages observed between the assemblage groups.

Discussion

It is not claimed that any of the four methods of quantification discussed above have provided an accurate reflection of the relative contribution of the different domestic species to Winchester's meat supply in the Roman period. There are too many unknown variables which could have influenced the formation of the assemblage studied. The results, however, do again demonstrate that different methods of quantification can produce quite different results. Comparisons of the overall percentages using the four different methods of quantification (Fig 29) show that the relative abundance of cattle and sheep/goat varied enormously. Fragment counts and Selected

Bone Counts favoured cattle; counts of Whole Bone Equivalents (WBE) and Most Represented Elements (MRE) produced much higher percentages of sheep/goat. There was much less variation in the relative frequencies of pig and dog. Horses were never well represented but SBC and WBE counts favoured them.

All the methods have merits and problems, some of which have been discussed above. None of them are ideally suited to deal with a complex set of assemblages such as those in Winchester. Fragment counts (NISP) produce the largest samples and can, with care, be compared with results from a large number of other sites. However, it must be recognised that this method favours cattle in assemblages displaying intensive deliberate breakage of cattle bones, significant levels of canid gnawing, and differential retrieval rates. This does not necessarily invalidate inter-site comparisons of fragment counts, if one accepts that such biases will be similar on all the sites. This is, of course, debatable.

The Selected Bone Counts (Fig 29) gave similar results to the NISP counts. It can be argued that this justifies the adoption of this method instead of the more time consuming NISP method. Fewer bones need to be examined in detail to produce these results. It must be conceded, however, that in an assemblage which has suffered quite heavy attrition from dogs, most of the selected articular ends of limb bones of cattle and horse have a better chance of survival than those of sheep/goat and pig. Results are therefore likely to be biased towards the former species and the results from Winchester certainly appear to suggest this.

The Whole Bone Equivalents method gave quite different results, suggesting that sheep/goat were more important numerically than cattle. The method, however, also has its problems. The recording of proportions of the bone in the manner described above is subjective. For example, fragments smaller than 0.25 of a complete bone were arbitrarily given a score of 0.10. This is no more than an approximation of the average amount of bone present and the accuracy of this was not tested. Given the large number of bones in this category, particularly of cattle, changes in this figure could have significant effects on the relative frequencies. The method does, however, allow for counts of shaft fragments, which were the most common parts of the bones of all species to survive. It therefore may provide a more realistic estimate of the relative number of animals represented. Unfortunately, inter-site comparisons employing this method are restricted because of the lack of comparable data.

Counts of the Most Represented Element (MRE) can theoretically be compared with minimum number (MNI) estimates obtained from other sites, as the method is based on similar principles. Unfortunately, there are several methods by which such MNI estimates have been obtained, which can create minor discrepancies when using the data for comparisons. Estimates are more likely to be biased by unusually large accumulations of the most represented bone. On the other hand, the relatively low number of cattle may be a consequence of not finding large accumulations of primary butchery waste dominated by mandibles and metapodials on these sites. Such discoveries could have significantly increased their relative abundance estimated by any of the methods of quantification, including the MRE method.

Figure 30 illustrates the ranges in frequencies of the major domestic species in the assemblage groups and the mean overall percentages using the four methods of quantification. This diagram clearly demonstrates several of the observations made above. The MRE method produced greater variation in the percentages of pig and dog. It also provided the highest percentages of sheep/goat, pig, and dog. The MRE and WBE methods both produced much higher frequencies of sheep/goat and correspondingly lower frequencies of cattle. Percentages of the minor species varied much less and their relative ranking was the same in all four methods.

Which of the methods most accurately reflects the relative number of animals exploited? On balance, probably the MRE and WBE methods are less susceptible to biases created by taphonomic processes. If this is accepted, the results indicate that sheep were the most commonly slaughtered for their meat, although as discussed below (pp 109), cattle would have provided the most meat. Pigs were also an important food resource, although it appears that they were not as commonly exploited as sheep and cattle. Even if all the horse and dog bones belonged to animals exploited for meat, which is extremely unlikely (pp 208–209 and pp 212–213 below), they were not an important source of food. Further discussion about the relative frequency of the major domestic species and comparisons with other Romano-British towns can be found in Part 3 (pp 255–269).

Figures 31–34 compare the relative representation of cattle, sheep/goat, pig, and horse respectively in the thirteen assemblage groups. These show that, irrespective of the method of quantification, there were variations in species abundance. Cattle were best represented in the assemblages from Victoria Road East and 27 Jewry Street. They were less well represented in the deposits from Victoria Road West, Hyde Abbey, and Jewry Street, Crown Hotel. They were probably also less well represented on the Henly's Garage site, if greater credence is given to results from the WBE and MRE methods (Fig 31).

Variations of sheep/goat frequencies in assemblages groups were less clearly patterned (Fig 32). The assemblages from Hyde Abbey and Jewry Street, Crown Hotel contained the highest percentages of sheep/goat, but there was a lot of variation in their representation in assemblages from Victoria Road.

However, pig representation showed quite distinct variations. They were best represented in the groups from Henly's Garage and Victoria Road West. All other assemblages contained consistently lower percentages of pig bones (Fig 33). Horse bones were consistently poorly represented on the city defences sites. They

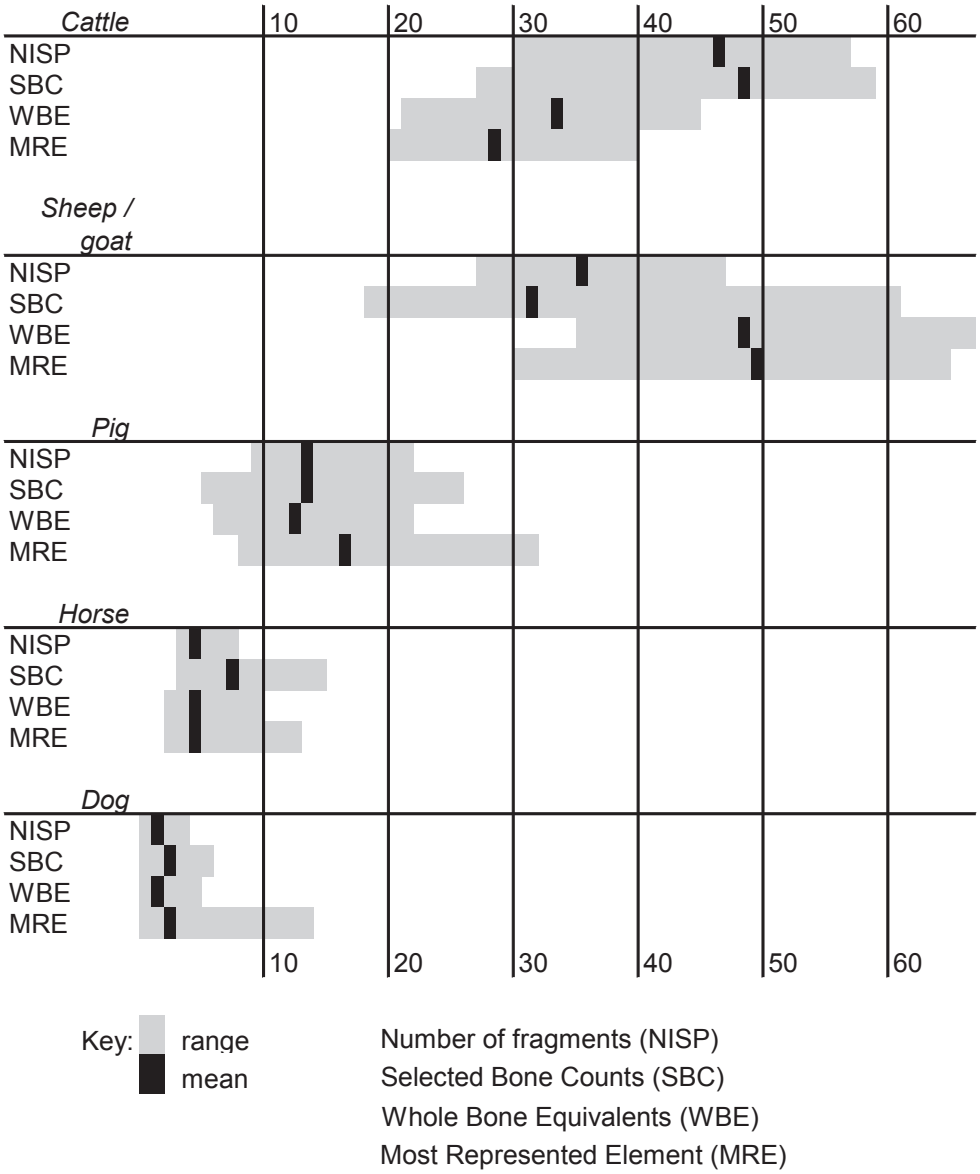


Figure 30 Ranges in percentages of major domestic species in assemblage groups

were best represented in the Victoria Road ditches (Fig 34).

The analysis therefore shows that there was a fair amount of variability in the relative abundance of major domestic mammals between the assemblage groups. Some of this variability appears to be related to the location of the sites from which they derived. Future analyses of Roman assemblages from Winchester, including deposits from within the city, will undoubtedly produce further evidence for differences in the spatial distribution of bones. Certainly, more material from the central area of the town needs to be studied for comparison with the suburbs material. Such comparisons should provide further information about the disposal of bones in different parts of the town and perhaps also variations in the meat diet of its inhabitants. These assemblages were unfortunately not sufficiently closely dated to investigate possible chronological variations and the investigation of this should be regarded as a priority for future analyses of animal bones from the town.

The exploitation of cattle

Associated groups

Only three features produced associated groups of cattle bones. Victoria Road East well, F1096, (Group VRE19) included the skull and mandibles of an adult animal and five cervical vertebrae (Table 2.99). Bones in both groups were butchered. Two of the three associated groups in Victoria Road West, F43, (Group VRW14) also included butchered specimens. All these groups can be regarded as butchery waste thrown into the shafts. Lack of disturbance by dogs after primary deposition kept the bones together as integral units. No butchery marks were found on any of the eight left

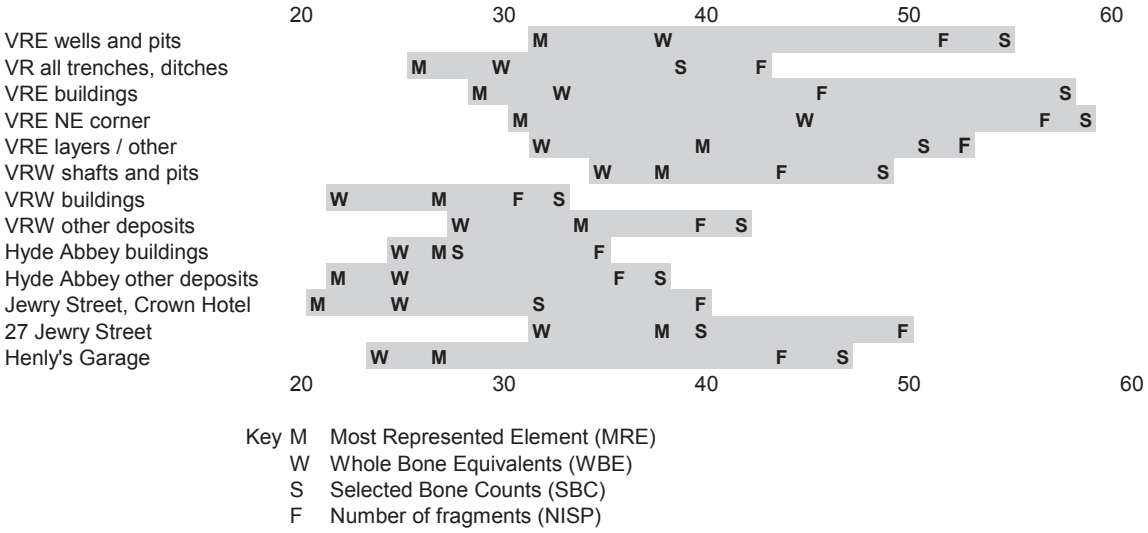


Figure 31 Ranges in percentages of cattle by assemblage group

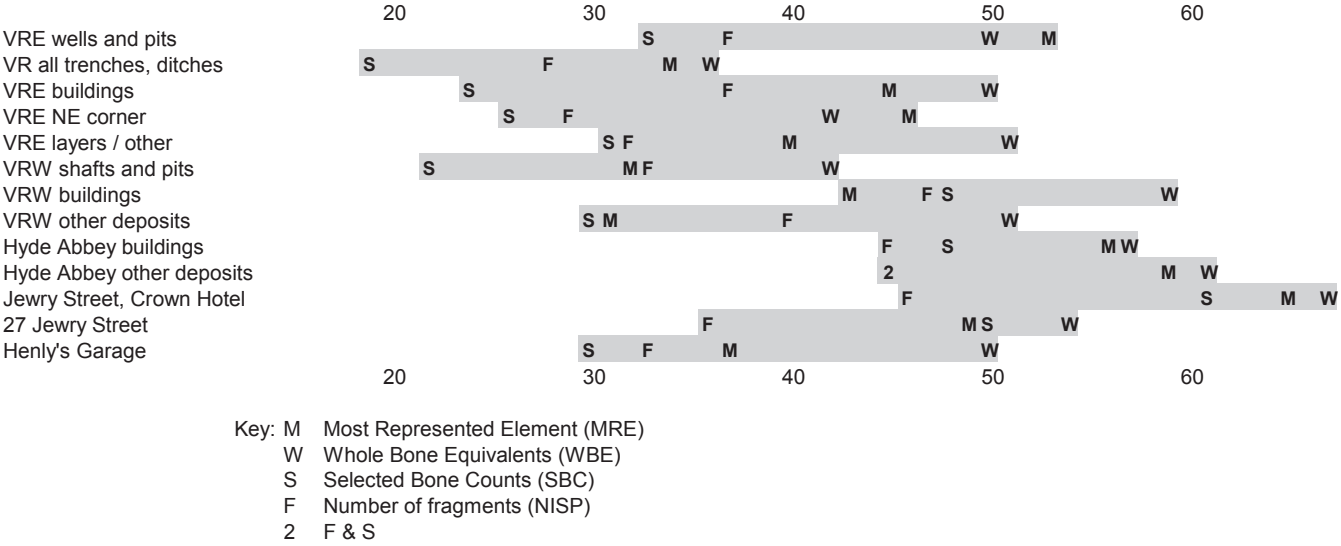


Figure 32 Ranges in percentages of sheep/goat by assemblage group

forelimb bones from Context *412* in F43, including a complete humerus and radius. However, whether all eight bones can be regarded as a single unit is questionable since no metacarpal was discovered. The carpals and phalanges could have belonged to different animals (Table 2.104). The final associated group consisted of four cervical and two thoracic vertebrae from the metalled surface of Building 1 in the north-east corner of Victoria Road East (F682, VRE10). The thoracic vertebrae bore evidence of butchery, again indicating that this group represents a well-preserved segment of butchery waste (Table 2.102).

Only 33 cattle bones were recorded in associated groups, representing only 0.5% of the total cattle assemblage. The lack of associated bones is indicative of the intensive exploitation of cattle carcasses, supporting the fragmentation and butchery evidence discussed later in this section. The value of beef, grease, and marrow in the town was such that the carcasses of cattle slaughtered there were nearly always fully disarticulated to enable further processing to take place.

Relative abundance of cattle bones

Excluding bones in associated groups, nearly 7000 cattle fragments were identified from normal excavation. In addition, a very high proportion of the

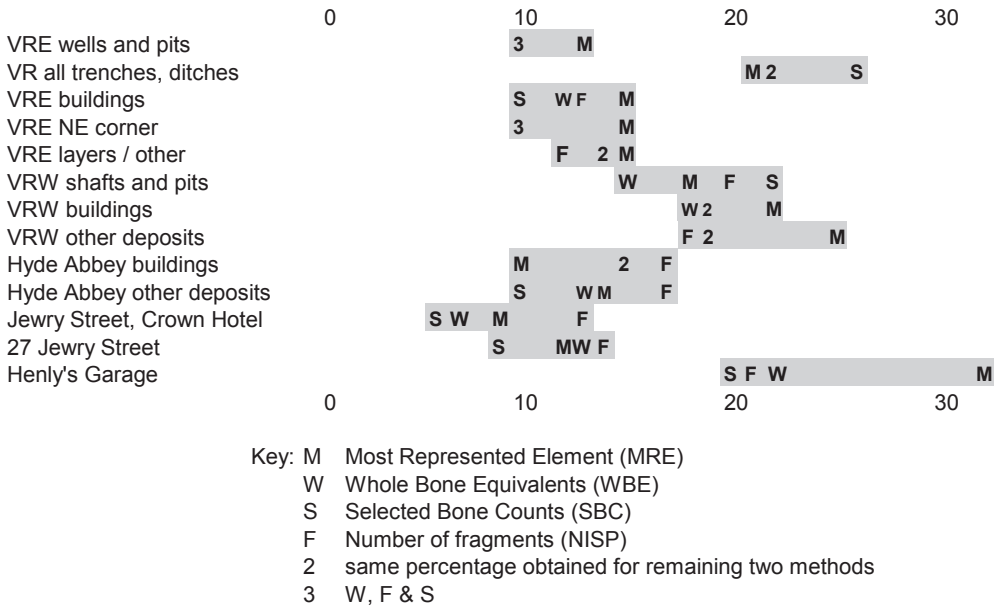


Figure 33 Ranges in percentages of pig by assemblage group

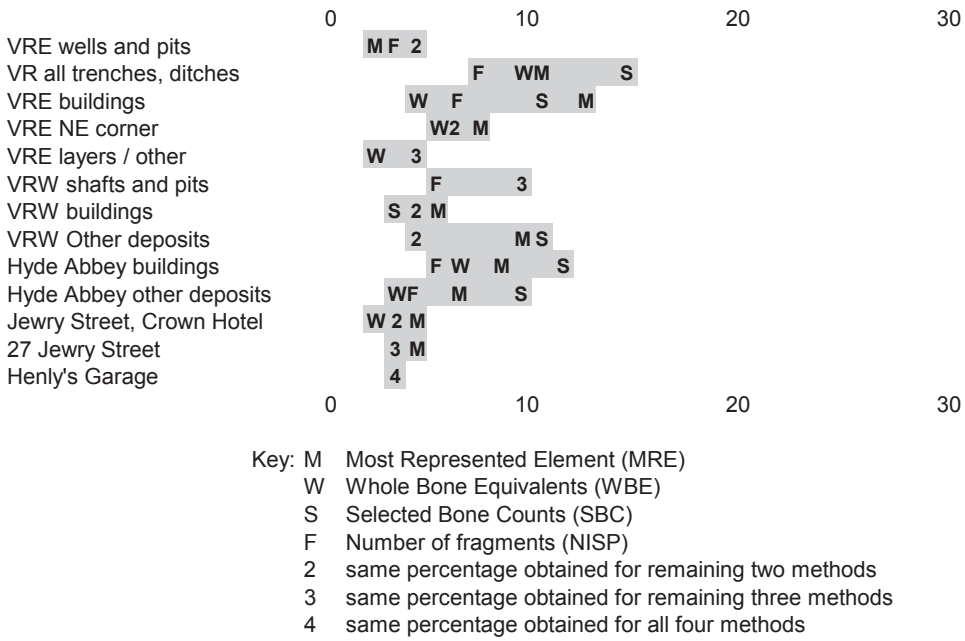


Figure 34 Ranges in percentages of horse by assemblage group

unidentified large mammal fragments recorded also would have belonged to cattle.

Cattle fragments were the most frequently identified in 39 of 55 groups large enough for percentage calculations to be made. From all deposits, cattle provided 46% of the fragments of cattle, sheep/goat, pig, horse, and dog (Table 2.95). Cattle are usually the best represented species on Romano-British urban sites (King 1978; 1984; 1999; see also Section 2.3). They also tend to be better represented in later Romano-British deposits and on urban as opposed to rural sites. The assemblages from these sites in Winchester fit into that general trend. They form, for example, a higher proportion of the assemblage than the large later Romano-British sample from the nearby rural site of Owslebury (37% – Maltby 1994). The percentage of cattle from the Staple Gardens Roman deposits in Winchester was greater (54% – Maltby 1986a).

A common feature of Romano-British assemblages, particularly but not exclusively from urban sites, is the variability in species representation. Analysis of the Romano-British deposits at Greyhound Yard, Dorchester, for example, showed marked variability between assemblages from different parts of the same

Insula (Maltby 1993). Open areas in the centre of the *Insula* tended to have higher percentages of cattle in the assemblages than the pits located at the rear of roadside properties. The central area often produced evidence for the dumping of groups of specific cattle bones. In some cases upper limb bones predominated; in others scapulae and mandibles had been deposited in fairly large numbers. The disposal of such accumulations increased the percentage of cattle bones recovered in that area.

All large Romano-British towns where a substantial amount of excavation has been carried out have produced some assemblages biased by the large scale dumping of specific parts of cattle carcasses (Maltby 1984; Table 2.226). Winchester is no exception. As has been discussed in Section 2.1, it was observed, for example, that a number of assemblages included high percentages of heavily butchered cattle upper limb bones. These dumps usually resulted in cattle fragments providing a relatively high percentage of the assemblage.

The amount of variability in species representation has been discussed in general terms above (Table 2.94 and pp 91–105). Much of this variability was caused by the differential disposal of cattle bones and this will now be examined in more detail. Overall, cattle fragments formed 51% of the identified domestic mammal sample from Victoria Road East. However, in 24 groups of over 50 identified fragments, this percentage varied between 24% and 77%. Assemblages with the highest percentages of cattle usually contained concentrations of specific body parts. Well F1096 (61% cattle) included a high proportion of heavily butchered upper limb bones in the upper backfills. Pit F814 (64%) included probable horn working waste and larger than usual percentages of metapodials and phalanges, perhaps indicative of skinning waste.

A number of silt layers and metalled surfaces in the north-east corner of the site (Groups VRE6–13) also produced high percentages of cattle fragments (56% from all contexts). Concentrations of scapulae, mandibles, and upper limb bones were noted in various deposits.

Percentages of cattle fragments were lower in contexts associated with buildings in Victoria Road East (45%) but this figure is still substantially higher than those obtained from similar buildings located elsewhere in the northern suburb. Dumps of upper limb bones were found in several deposits associated with these buildings.

Concentrations of split and splintered upper limb bones were also noted in a number of other layers from Victoria Road East. High percentages of cattle were usually associated with these layers (for example, Groups VRE1, VRE2, and VRE26 – Table 2.94).

Cattle fragments were less dominant at Victoria Road West. Overall, they contributed 39% of the fragments of the major domestic mammals compared with 51% from Victoria Road East. Although a few deposits contained concentrations of specific types of cattle butchery or bone working waste (for example, Group VRW7; Phase 931), these were not as extensive as many of those found at Victoria Road East and were usually mixed with other more typical assemblages. The disposal of large-scale butchery and bone working waste from cattle carcasses therefore appears to have been less extensive west of the Cirencester road.

Although lower percentages of cattle were generally obtained from Victoria Road West, they showed almost as much variability as those from Victoria Road East, ranging between 23% and 52% (Table 2.94). They outnumbered sheep/goat in all deposits apart from those associated with Buildings 1–4 and the structures and associated surfaces in Group VRW1 (Phase 917).

The Hyde Abbey site produced more sheep/goat than cattle fragments in both buildings and other deposits. Cattle provided only 34% of the fragments overall. Again, there was a good deal of variation between deposits with cattle contributing between 26% and 55% of the identified domestic mammal fragments (Table 2.94). The highest percentage was obtained from a hollow way and subsequent road (Group HA72.1). The metalling in this group (Phase 8) included a bias towards cattle upper limb bones representing the redeposited remains of large-scale butchery waste subsequently incorporated into the foundation of the road. Apart from this, no large-scale butchery waste was encountered on this site.

The Jewry Street, Crown Hotel site also produced more sheep/goat fragments (45%) than cattle (39%). Only two of the assemblages contained over 50 domestic mammal fragments. Group JCH4 of early 2nd-century date produced only 34% cattle. Later 2nd- and 3rd-century assemblages associated with the earthen rampart (Group JCH6) produced 45% cattle.

Cattle were better represented at the neighbouring 27 Jewry Street site, contributing 49% overall and being particularly well represented in Group 27JS2 (61%). It seems that head and feet bones of cattle were dumped in these 1st- to 2nd-century deposits in greater numbers than usually encountered on other sites, perhaps indicating the deposition of more primary butchery waste.

Most deposits on the Henly's Garage site produced more cattle than sheep/goat fragments with 43% cattle fragments identified overall. There was less variation in species representation within this site, with the four largest groups producing between 40% and 49% cattle. There were no significant concentrations of specific bones of cattle in any of the deposits from this site.

The analysis indicates that there was a substantial variation in the relative number of fragments of cattle in relation to the other major species represented both within and between sites. These variations cannot be ascribed solely to chronological changes in deposition practices, since such variations occur both in earlier and later deposits spanning the 2nd to 4th centuries, including well sealed deposits in which residuality should not be a major problem. However, the area covered by Victoria Road East was used to dump

refuse from large-scale processing of cattle upper limb bones during the early Roman period as discussed in Section 2.1 above and although it seems that this practice probably continued throughout the 2nd and 3rd centuries at least, such refuse was often mixed with bones deposited from other sources. There was probably a lot of disturbance due to scavenging animals and secondary deposition as the site developed. This creates the problem of residuality particularly in the silt deposits and it may be that the main period of deposition of the heavily butchered upper limb bones was concentrated in the earlier Roman period rather than in the later 3rd and 4th centuries.

Table 2.94 also records the percentage of cattle of the total cattle, sheep/goat, and pig fragments. The same variations were found as discussed above. The removal of horse and dog from the calculations did not have a great effect upon the overall figures because of their low frequencies. The percentage of cattle in the assemblages can also be compared with the relative frequency of unidentified large mammal fragments expressed as a percentage of the total of unidentified large mammal and sheep-sized mammal fragments (Table 2.94). In general, the percentage of unidentified large mammal fragments was higher in assemblages which also contained high percentages of cattle.

The differential disposal of cattle bones associated with large-scale processing makes it difficult to assess in an accurate manner their importance to the meat diet. However, it is clear that cattle were by far the most important providers of meat. Although minimum number calculations may indicate that more sheep were eaten, cattle provide much more meat per carcass. If one allows that, on average, adult cattle carcasses provided eight times more meat than sheep and five times more than fully grown pigs, minimum number calculations derived from the most represented elements of these species (Table 2.98) can be translated into meat weight percentages. These would suggest that cattle provided 49% of the meat from these three species, with pig providing 27%, and sheep/goat 24%. This is possibly an underestimate for the importance of beef, since a large proportion of the pigs, in particular, were not fully grown and these calculations are based on fully grown animals. In addition, as discussed above (pp 101–104), the most represented bone method may underestimate the number of cattle in comparison with the other species.

Cattle, therefore, were the most important suppliers of meat. It is not surprising to find that there is evidence for large-scale organised processing of their carcasses, which sometimes resulted in the disposal of large numbers of waste bones in some deposits. Parts of the northern suburb became dumping areas for some of this material.

Representation of different skeletal elements

The numbers of fragments of different skeletal elements of cattle are listed by assemblage group in Tables 2.99–2.111. Bones from associated groups are listed separately from other fragments. More general summaries of some of these data are presented in Table 2.112. Figure 25 compares the frequencies of major elements based mainly on the survival of the articular ends. The following review of this information is presented by area of the body.

The amalgamation of elements into these different groups is based on a number of premises. Head elements can represent primary butchery, skinning or horn working waste, although marrow can be obtained from the mandibular ramus and the tongue, brain and cheek meat also have food value.

The scapulae and os coxae represent areas with high meat values that link the trunk with the limbs. They have little marrow content whereas the upper limb bones (particularly the femur and humerus) have high meat and marrow utility values (Binford 1981). Scapulae may, however, have been subject to specialist processing and preserving.

The carpals and tarsals are small bones in areas of little meat value. The metapodials contain relatively high quantities of marrow but have little meat associated with them. They are often deposited as primary butchery waste. Phalanges and sesamoids are also likely to be discarded at an early stage of processing and may also be attached to skins. They are small bones that have greater chances of being overlooked during excavation than the metapodials or upper limb bones.

Bones of the trunk can be associated with meat joints, although this depends on butchery methods. They have little marrow value and are among the bones most susceptible to damage and destruction by scavengers.

Head

Cattle skulls are usually highly fragmented in archaeological samples and fragment counts tend to overestimate their importance. Percentages of skull fragments ranged between 4% and 13% in the different assemblage groups. They formed over 10% of the fragments in five of these. They were usually well represented in wells and pits at Victoria Road and Henly's Garage (Group HG4; Tables 2.99, 2.104, and 2.111). This may reflect better preservation conditions in these deep sub-surface features, which allowed for the recovery of more identifiable skull fragments. In the case of Victoria Road East pit F814 (Group VRE22), it also reflects the disposal of a relatively large number of horn cores, probably representing waste from horn working (Table 2.99, Plate 12). Contexts in the north-east corner of the Victoria Road East site (Groups VRE6–13) also included slightly higher percentages of skull fragments than elsewhere (Table 2.102).

Mandibles were also well represented as is normally the case in archaeological samples. Counts included both specimens with and without teeth. They are dense bones and are easily recognis-

Table 2.99 Anatomical elements of cattle from Victoria Road East wells and pits

Wells and pits	VRE19		VRE20	VRE24	VRE23	VRE22	VRE21		
	F1096		F1093	F1098	F981	F814	F168	Total	%
	A	O							
Skull frags	1	13	29		2	118	4	167	13
Mandible	2	27	15	4	1	37	8	94	7
Hyoid			1			2	1	4	0,3
Loose teeth		13	16	2	2	37	2	72	6
Scapula		23	11		1	22	7	64	5
Humerus		53	7	3	1	32	4	100	8
Radius		40	13	2		27	2	84	7
Ulna		14	5		1	19	1	40	3
Os coxae		12	17	3	4	21		57	4
Femur		54	5	1		34	2	96	8
Patella		1				1		2	0,2
Tibia		45	5		1	54	4	109	9
Carpals		2	1			9		12	0,9
Calcaneus		6	2			11	1	20	2
Astragalus		4	1			13	1	19	1
Centroquartal						7		7	0,5
Other tarsals						3		3	0,2
Metacarpal		4	3			21	2	30	2
Metatarsal		5	7	2	2	23	2	41	3
Metapodial			3			1		4	0,3
Lateral metapodial						1		1	0,1
1st Phalanx		4	8			35	4	51	4
2nd Phalanx		3	2			22	1	28	2
3rd Phalanx		1	1	1	1	21	1	26	2
Sesamoids						5		5	0,4
Ribs		2	8		1	7	2	20	2
Cervical vertebrae	5	14	12	1	4	46		82	6
Thoracic vertebrae		5	3	1		13	2	24	2
Lumbar vertebrae		3	4			10	2	19	1
Sacrum		1				6		7	0,5
Total	8	349	179	20	21	658	53	1288	

Key: A = associated bones, O = other bones

Note: % excludes associated bones

able even in fragmentary condition. They formed between 3% and 20% of the fragments of the assemblage groups. In most cases this figure fell between 7% and 10% of the total cattle fragments. Their lowest frequency was in the relatively small sample from the Jewry Street, Crown Hotel site. This sample also included a low percentage of skull fragments in an assemblage dominated by upper limb bone fragments (Tables 2.109 and 2.112). The highest percentage of mandibles was recorded from the 27 Jewry Street site. Here, bones of the head and feet were well represented suggesting that the deposits contained a higher proportion of primary butchery waste than encountered in other assemblage groups (Table 2.110). Similarly, mandible fragments were also well represented (14%) in the deposits associated with the Victoria Road West buildings (Table 2.105). Additionally, this assemblage contained relatively large numbers of metapodials, which may also indicate the presence of relatively more primary butchery waste amongst the rubbish. However, the sample is quite small and may be unreliable.

Table 2.100 Anatomical elements of cattle in Victoria Road ditches

Ditches	VRE25 F122/1202		VRW11 F12	
	Total	%	Total	%
Skull frags	6	12	21	7
Mandible	8	16	17	6
Hyoid			1	0,3
Loose teeth	6	12	31	11
Scapula	7	14	15	5
Humerus	3	6	18	6
Radius	3	6	21	7
Ulna			9	3
Os coxae			31	11
Femur	2	4	18	6
Tibia	1	2	16	5
Calcaneus	1	2	9	3
Astragalus	1	2	2	0,7
Centroquartal			1	0,3
Metacarpal	2	4	14	5
Metatarsal	4	8	17	6
Metapodial			3	1
1st Phalanx	4	8	8	3
2nd Phalanx			7	2
3rd Phalanx	1	2	4	1
Ribs			5	2
Cervical vertebrae	1	2	13	4
Thoracic vertebrae	1	2	1	0,3
Lumbar vertebrae			7	2
Sacrum			4	1
Caudal vertebrae			1	0,3
Total	51		294	

Mandible fragments were usually recorded in greater numbers than cattle skull fragments.

Mandibles with surviving teeth were the third best represented cattle element when compared with counts of articular ends of limb bones (Fig 25). Only the proximal ends of radii and metatarsals survived in greater quantities. Most of the exceptions were those assemblages discussed above which contained the highest percentages of skull fragments (Table 2.112).

Loose teeth are dense elements which sometimes survive well even in conditions where bones are poorly preserved. High percentages of loose teeth can be indicative of poor preservation, although the small size of incisors and premolars in particular causes retrieval problems and makes such analyses more difficult. Loose teeth formed between 3% and 20% of the assemblage groups with an average of about 10%. This is quite a low percentage compared with some samples, for example, those from ditches and quarries at the Iron Age site at Winnall Down (Maltby 1985b). This indicates that despite the high levels of fragmentation, cattle bones survived quite well in these assemblages.

Hyoids were found only in small numbers and these small bones from the throat never formed a significant part of any assemblage.

Scapula and os coxae

These bones have similar properties in that they are large elements which incorporate substantial areas of relatively flat bone. Anatomically, they serve similar

Table 2.101 Anatomical elements of cattle from Victoria Road East buildings, oven F846, and associated deposits

Groups	VRE15–16	VRE3–4	VRE14	VRE17	VRE18		
Buildings	**Roadside Structure 2**	**Oven F846**	**2**	**3**	**4**	**Total**	**%**
Skull frags	5	33	1	1	3	43	9
Mandible	1	35	5	4		45	9
Loose teeth	1	32	4	4		41	8
Scapula	2	36	3		1	42	8
Humerus	1	18	2	1	2	24	5
Radius	4	20	1	1	2	28	6
Ulna	2	16	1		3	22	4
Os coxae	1	21	3	6	2	32	6
Femur	4	23	2	3	2	34	7
Tibia	4	30	1	1	2	38	7
Carpals		1			1	2	0,4
Calcaneus	2	7	1		1	11	2
Astragalus	2	8	1	1		12	2
Centroquartal		5			1	6	1
Other tarsals		2				2	0,4
Metacarpal		17	3	1	2	23	5
Metatarsal	1	15	3	1	3	23	5
Metapodial		5				5	1
1st Phalanx		9	2	1	1	13	3
2nd Phalanx		7				7	1
3rd Phalanx	2	4	2			8	2
Ribs		5	1			6	1
Cervical vertebrae		16		1	3	20	4
Thoracic vertebrae		7				7	1
Lumbar vertebrae	2	2	1	1		6	1
Sacrum		2				2	0,4
Caudal vertebrae		1				1	0,2
Vertebra		1				1	0,2
Total	34	378	37	27	29	505	

functions linking the trunk with the limbs and are located in areas of the body which possess substantial amounts of meat. They commonly display butchery marks. They can become very fragmented because of butchery practices and through subsequent breakage.

Scapulae formed between 3% and 9% of the cattle fragments in the assemblage groups. The lowest percentage was obtained from the Victoria Road West buildings, in which the assemblage was dominated by bones of the head and feet (Table 2.105). A similar pattern was also noted in the 27 Jewry Street sample, where scapulae formed only 4% of the cattle fragments (Tables 2.110 and 2.112). Generally, there was less variation in the relative frequencies of cattle scapulae and upper limb bones (Table 2.112), although scapulae were less well represented in assemblages that contained a lot of heavily processed limb bones, for example, Jewry Street, Crown Hotel (Table 2.109). The highest percentage of scapulae fragments (9%) was recorded in the groups from the Victoria Road East buildings (Table 2.101) but this figure was only slightly higher than in some other assemblage groups.

Table 2.102 Anatomical elements of cattle from the north-east corner of the Victoria Road East site

Groups	VRE6	VRE7	VRE8	VRE9	VRE10	VRE11	VRE12	VRE13		
Phases	**375–6**	**378**	**379–81**	**382–3**	**385–6**	**387–9**	**393**	**394–9**	**Total**	**%**
Skull frags		1	22	3	44	18	81	16	185	13
Mandible		3	34	13	18	26	35	22	151	10
Hyoid							1		1	0,1
Loose teeth		1	15	2	26	17	45	17	123	8
Scapula	1	2	22	10	24	20	28	14	121	8
Humerus		3	12	9	9	17	36	13	99	7
Radius		1	12	6	20	19	26	10	94	6
Ulna		1	3	1	10	9	22	9	55	4
Os coxae		2	4	6	16	23	27	13	91	6
Femur		2	9	1	7	14	20	12	65	4
Tibia	1		9	1	27	14	25	22	99	7
Carpals			1		1			3	5	0,3
Calcaneus			4	1	4	9	6	1	25	2
Astragalus		1	1	1	5	5	7	2	22	1
Centroquartal			1	1	1	1	2		6	0,4
Other tarsals								1	1	0,1
Metacarpal		1	7	2	8	5	15	7	45	3
Metatarsal		5	15	3	19	11	37	23	113	8
Metapodial			1	1	1	1	1	2	7	0,5
1st Phalanx		1	5		4	13	29	12	64	4
2nd Phalanx			2		2	5	9	8	26	2
3rd Phalanx			3		1	4	5	4	17	1
Ribs			2		2	1	4		9	0,6
Cervical vertebrae			5	2	8+	5	6	5	31	2
Thoracic vertebrae			3	1	4*		2	3	13	0,8
Lumbar vertebrae				2	2		1	1	6	0,4
Sacrum					1		2	2	5	0,4
Total	2	24	192	66	264	237	472	222	1479	

Note: +includes four associated bones, * includes two associated bones, % excludes associated bones

Considering fragments with articular surfaces only, scapulae were quite well represented, lying sixth in the ranking of elements (Fig 25).

Os coxae fragments were slightly less well represented than scapulae, usually forming between 4% and 6% of the cattle assemblage. Higher percentages (11%) were recorded in Victoria Road West ditch F12 (Group VRW11) and at Jewry Street, Crown Hotel (Tables 2.100 and 2.109).

Upper limb bones

This category includes the humerus, radius, ulna, femur, patella, and tibia. They were generally well represented in most of these assemblage groups and represent evidence for the disposal of bones which bear quite a lot of meat (particularly the femur and humerus). In many cases these bones had also been processed for marrow and sometimes had provided raw material for bone working (particularly the radius and tibia).

Humeri usually provided between 5% and 8% of the cattle assemblage. Exceptions to this included the 27 Jewry Street sample (2%), where upper limb bones were in general poorly represented (Tables 2.110 and 2.112) and deposits other than those associated with buildings and structural remains at Hyde Abbey (11%), where humeri were unusually well represented in the road metalling in a poorly preserved assemblage (Group HA72.1) dominated by upper limb bones (Table 2.108).

Distal ends of humeri were well represented but proximal ends survived the least well of all the selected

Table 2.103 Anatomical elements of cattle from Victoria Road East silts and other deposits

Group	VRE1	VRE2	VRE5	VRE26	VRE27	VRE28	VRE29	VRE30		
Phases	**155–67**	**195, 260–2, 266–9**	**303–08**	**276, 287–92**	**369–73**	**349–57, 361–2**	**358–60**	**461–4, 473–5**	**Total**	**%**
Skull frags	1	25	5	11	1	7	5	12	67	6
Mandible	4	28	22	15	1	14	1	4	89	8
Hyoid		2	2	1					5	0,5
Loose teeth	2	23	22	14	2	11	7	13	94	8
Scapula	2	7	24	15		2	3	3	56	5
Humerus	1	28	28	14		10	1	1	83	8
Radius	8	26	21	19		13	4	5	96	9
Ulna	1	18	9	9	2	5	4	1	49	4
Os coxae		10	6	3		7	4	6	36	3
Femur	1	19	24	26		7	2	4	83	8
Patella			1						1	0,1
Tibia	12	42	25	22	2	7	7	4	121	11
Carpals		6	2	3		2		1	14	1
Calcaneus	1	7	7	4		4		1	24	2
Astragalus	1	4	5	3	1	1	1	2	18	2
Centroquartal		3	2	2					7	0,6
Other tarsals		2							2	0,2
Metacarpal		4	4	11	1	5		4	29	3
Metatarsal	3	14	5	20	1	8	2	3	56	5
Metapodial		8		9			2	1	20	2
Lateral metapodial		1							1	0,1
1st Phalanx		12	4	4		3	2	2	27	2
2nd Phalanx	1	3	1	2		1		2	10	0,9
3rd Phalanx		5	1	4		2	2	3	17	2
Ribs		4	2	5		2		1	14	1
Sternebrae				1					1	0,1
Cervical vertebrae	1	10	14	20		2	3	6	56	5
Thoracic vertebrae	1	3	3	4	1	4		7	23	2
Lumbar vertebrae		2							2	0,2
Sacrum	1	1	2	3		1		1	9	0,8
Caudal vertebrae			1			1		1	3	0,3
Total	41	317	242	244	12	119	50	88	1113	

elements (Fig 25). This reflects their late fusion age and low density.

Radii were found in consistent frequencies in the northern suburb assemblage groups with percentages ranging between 5% and 8% of the cattle fragments. The samples from the defences sites were more variable ranging between 4%, in the 27 Jewry Street sample (Table 2.110), and 12% in the Jewry Street, Crown Hotel assemblage (Table 2.109). Similar variations were observed with other upper limb bones in these assemblages.

Proximal ends of radii were the best represented of all the selected elements but distal radii were recorded much less frequently (Fig 25). This again reflects differences in fusion age and density between the two ends of the bone, with the distal end being much more susceptible to destruction by canid gnawing.

Cattle ulnae are much more slender and fragile bones than the adjacent radii and are usually recovered in much smaller numbers. The samples from Winchester fitted the expected pattern. They usually formed between 3% and 5% of the cattle fragments. Excep-

Table 2.104 Anatomical elements of cattle from Victoria Road East wells, shafts, and pits

Groups	VRW12	VRW13	VRW14		VRW6		
Shafts/pits	F46	F18	F43		F64/70	Total	%
			A	O			
Skull frags	4	1		26	4	35	11
Mandible	8	1		14	3	26	8
Hyoid	1			1		2	0,6
Loose teeth	2			8		10	3
Scapula	6			4	11	21	7
Humerus	7	1	1	5	2	16	5
Radius	4	1	1	10	2	18	5
Ulna	4			5		9	3
Os coxae	11			4		15	5
Femur	5			10	3	18	6
Tibia	9	1		8	2	20	6
Carpals	2		3			5	0,6
Calcaneus	4			6	2	12	4
Astragalus	2	1		8	2	13	4
Centroquartal	2			1		3	0,9
Other tarsals				1		1	0,3
Metacarpal	2			8	5	15	5
Metatarsal	7	1		12	1	21	7
Metapodial	1			1		2	0,6
1st Phalanx	6		2	9	1	18	5
2nd Phalanx	2		1	1	1	5	1
3rd Phalanx		1		3		4	1
Ribs				2		2	0,6
Cervical vertebrae	2		7	13		22	5
Thoracic vertebrae	2			6	1	9	3
Lumbar vertebrae	1		4	6		11	2
Sacrum	2			2	2	6	2
Total	96	8	19	174	42	339	

Key: A: associated bones, O: Other bones

Note: % excludes associated bones

tions were the assemblages from Victoria Road West buildings (0%) and 27 Jewry Street (1%), where in both cases upper limb bones were poorly represented in comparison with bones of the head and feet (Tables 2.105 and 2.110). In contrast, the samples from Hyde Abbey deposits not associated with buildings or structural remains (Groups HA72.1, HA72.7, HA74.1, HA74.6, HA74.8) and Jewry Street, Crown Hotel, produced slightly higher percentages of ulnae fragments (6% and 8% respectively). In both cases, other upper forelimb bones were also well represented (Tables 2.108–109).

Femora usually formed between 4% and 8% of the cattle fragments. They were, however, unusually well represented in the Jewry Street, Crown Hotel assemblage (14%) along with os coxae fragments (Table 2.109). No femora fragments were identified in the sample from Victoria Road West buildings (Table 2.105).

Cattle femora were usually very fragmented (Table 2.113) and neither of their late fusing articular ends survived well (Fig 25).

Tibiae were quite well represented throughout the assemblages, usually forming between 5% and 9% of the cattle fragments. They were best represented in several of the layers from Victoria Road East (Table 2.103), where their numbers were enhanced by the presence of some bone working waste.

Distal ends of tibia survived well but the late fusing proximal ends were relatively poorly represented in comparison with other major elements (Fig 25).

The relatively small patellae also are not usually

Table 2.105 Anatomical elements of cattle from Victoria Road West buildings and associated deposits

Groups	VRW2	VRW3	VRW4	VRW5		
Buildings	**1**	**2**	**3**	**4**	**Total**	**%**
Skull frags		4	5		9	7
Mandible	1	8	7	4	20	14
Loose teeth	1	12	9	6	28	20
Scapula		1	3		4	3
Humerus		1	5		6	4
Radius		4	2	1	7	5
Os coxae		2	5		7	5
Tibia		4	5	1	10	7
Calcaneus		1			1	0.7
Centroquartal		1			1	0.7
Metacarpal	1	4	7	1	13	9
Metatarsal		1	7	2	10	7
Metapodial		1			1	0.7
1st Phalanx	1		3	1	5	4
2nd Phalanx		1	2		3	2
Ribs		1		1	2	1
Cervical vertebrae		2	3	1	6	4
Thoracic vertebrae		2			2	1
Lumbar vertebrae		2			2	1
Sacrum		1			1	0.7
Total	4	53	63	18	138	

heavily fragmented by butchery practices and are not very dense bones. They are not expected to be well represented in fragment counts. Indeed, they were absent from the samples in most assemblage groups and never formed more than 0.3% of any assemblage. Retrieval and taphonomic factors probably mainly account for their poor representation.

Carpals and tarsals

As was discussed above, cattle carpals were under-represented in the Winchester samples compared with the adjacent distal radii and proximal metacarpals (Table 2.93). Although there are six carpals on each limb, they are quite small bones and can be overlooked using hand excavation methods. They never provided more than 1% of the cattle fragments in any assemblage group.

On the other hand, the major tarsals were well represented. They are always likely to be less well represented than the major limb bones in fragment counts because they are not commonly heavily fragmented. Calcanei usually provided 2–3% of the cattle assemblage and astragali 1–2%. Calcanei were fourth and astragali ninth in the ranking of best surviving elements (Fig 25).

The slightly smaller centroquartals (navicular cuboids) were less well represented and never formed more than 1% of any cattle assemblage group. Other small tarsals were retrieved very rarely.

Metapodials

These bones were generally found in a less fragmented state than the upper limb bones (Table 2.113). Fragment counts therefore tended to favour the latter. However, metapodials are dense elements and survived in good numbers. In some assemblage groups, there is evidence for their deposition in significantly higher numbers than other deposits.

Metacarpals formed between 2% and 9% of the cattle fragments. Most assemblages contained 3%. The highest percentages were found in assemblages from the Victoria Road West buildings (Groups VRW2–5; – 9%), Henly's Garage (8%), particularly in the Phase 16 pits and wells (Group HG7), and 27 Jewry Street (7% – Tables 2.105, 2.110, and 2.111).

Proximal ends of metacarpals survived in slightly

Table 2.106 Anatomical elements of cattle from Victoria Road West other deposits

Groups	**VRW1**	**VRW7**	**VRW8**	**VRW9**	**VRW10**	**VRW16**	**VRW17**	**VRW15**		
Phases	**917, 924**	**931**	**933–5**	**938–9**	**951–4**	**965, 968**	**969**	**Graves**	**Total**	**%**
Skull frags	2	11				7	5	3	28	7
Mandible	3	12	1	4	4	12	3	4	43	10
Hyoid							1		1	0.2
Loose teeth	2	6	1	8	5	27	4	4	57	14
Scapula	1	13			1	3	6	3	27	6
Humerus	1	1	1	6	2	5	3	3	22	5
Radius		11		4	1	10	6	3	35	8
Ulna	1	6		4	1	2	4	2	20	5
Os coxae	1	3	2			7	5	3	21	5
Femur		3		2		3	4	1	13	3
Tibia		8	1	1	2	9	2	2	25	6
Carpals		2		1				1	4	1
Calcaneus		1		4	1	3	2		11	3
Astragalus		3		2			4		9	2
Centroquartal		1		1	1		2		5	1
Metacarpal	2	1		3	7	2	2	5	22	5
Metatarsal	2	3	1	1	1	3	3	4	18	4
Metapodial		2							2	0.5
1st Phalanx		3		1	2	10	1	2	19	5
2nd Phalanx	1				2	4	3	1	11	3
3rd Phalanx		1				1	2		4	1
Ribs	1	1					1		3	0.7
Cervical vertebrae		1	1	1		3		2	8	2
Thoracic vertebrae				1	1	2			4	1
Lumbar vertebrae	2			1	1				4	1
Sacrum	1					1		1	3	0.7
Caudal vertebrae							1		1	0.2
Total	20	93	8	45	32	114	64	44	420	

greater numbers than distal ends, although they were both outnumbered by several upper limb bone elements and mandibles (Fig 25).

Metatarsal fragments were usually better represented than metacarpals. Most assemblage groups produced 6–8% metatarsal fragments. Their lowest percentage (3%) was in the Victoria Road East wells and pits, which also produced the lowest percentage of metacarpals (Table 2.99). Generally, assemblage groups with higher percentages of metacarpals also produced higher percentages of metatarsals, for example, the sample from 27 Jewry Street (12% – Table 2.110).

Proximal metatarsals were the second best surviving element but the later fusing distal metatarsals were recovered much less frequently (Fig 25).

In most assemblage groups, a few small metapodial fragments, usually from the distal end, could not be identified to a specific bone. Totals of such fragments are listed in Tables 2.99–2.111. They never formed a significant part of the cattle assemblage.

Phalanges and sesamoids

All phalanges were poorly represented (Fig 25). The relative abundance of first and second phalanges has been discussed above (Table 2.93 and p 89). The former were better represented than the latter. Both were found in greater numbers than third phalanges. Variations in abundance reflect both differences in size and density.

First phalanges usually formed between 3% and 5% of the cattle assemblage groups, second phalanges 1–2%, and third phalanges less than 2% (Tables 2.99–2.111).

Table 2.107 Anatomical elements of cattle from Hyde Abbey structural remains and associated deposits

Groups	HA72.2	HA74.2	HA74.4	HA74.5	HA74.7	HA74.3		
Phases	**5–6, 9–11**	**55–9**	**60–1**	**64–7**	**69–71**	**76**	**Total**	**%**
Skull frags	4		6	11	4	1	26	9
Mandible	3	1	4	12	6	7	33	11
Hyoid	1			2			3	1
Loose teeth	18	2	1	6	4	4	35	12
Scapula	5	1	2	9	2	2	21	7
Humerus	8		1	6	9		24	8
Radius	7	1		8	3		19	7
Ulna	4		1	4			9	3
Os coxae	3	1	5	7	1		17	6
Femur	2	1	1	8	1	1	14	5
Patella	1						1	0.3
Tibia	9		1	7	3		20	7
Carpals						1	1	0.3
Calcaneus	1		1		1	1	4	1
Astragalus	1				1	1	3	1
Centroquartal	1			1			2	0.7
Other tarsals						1	1	0.3
Metacarpal	3		1	1		3	8	3
Metatarsal	5		2	4	4		15	5
Metapodial	1		2	2	2		7	2
1st Phalanx	2			5	5	1	13	4
2nd Phalanx			1	3		1	5	2
3rd Phalanx			1	2			3	1
Cervical vertebrae	1		1	2	1		5	2
Thoracic vertebrae	1		1				2	0.7
Caudal vertebrae				1			1	0.3
Total	81	7	32	101	47	24	292	

Sesamoids are very small bones and are not usually recovered by hand excavation. They were found in only two assemblage groups and only six were retrieved.

Bones of the trunk

Generally, trunk bones are not very dense, contain a high proportion of cancellous bone, and are very susceptible to destruction by gnawing. Fragmentary shafts of rib were not identified to species. Counts were restricted to dorsal ends. Similarly, only vertebrae with surviving cranial or caudal joint surfaces were counted.

Ribs never formed more than 3% of the cattle fragments in any of the assemblage groups. They were best represented in the sample from Henly's Garage (Table 2.111). In several cases this figure was 1% or less. Considering the large number of ribs in cattle skeletons, these figures show that the ends of these bones survived very poorly. Rib shaft fragments, however, formed a significant proportion of the unidentified large mammal counts.

Cervical vertebrae were the most frequently recorded vertebrae and formed between 2% and 6% of the cattle assemblages. They tended to be relatively more frequent in the Victoria Road groups than in those from Hyde Abbey and the city defences.

Thoracic vertebrae should be the best represented of the vertebrae because there are approximately twice as many of them in the skeleton as cervical or lumbar vertebrae. However, they never formed more than 3% of the cattle fragments and formed less than 2% of the total of most assemblage groups. They appear to survive less well than cervical vertebrae.

Lumbar vertebrae formed less than 2% of the cattle fragments in all assemblage groups and less than 1% in more than half of these. As with other vertebrae, they tended to be less well represented in the Hyde Abbey and city defences groups.

Table 2.108 Anatomical elements of cattle from Hyde Abbey other deposits

Groups	HA72.1	HA72.3	HA74.1	HA74.6	HA74.8		
Phases	**1–4, 8**	**7**	**52–3**	**68**	**74–5**	**Total**	**%**
Skull frags	8	3		3	9	23	7
Mandible	8	4		6	9	27	9
Loose teeth	4	3		8	7	22	7
Scapula	9	4		5	5	23	7
Humerus	26	4		4	1	35	11
Radius	13	1		7	5	26	8
Ulna	8	2		4	5	19	6
Os coxae	1	1		5	4	11	4
Femur	6	1		5	3	15	5
Tibia	7	1	1	9	6	24	8
Carpals	1	1		1	1	4	1
Calcaneus	1			1	1	3	1
Astragalus	2	1		1		4	1
Centroquartal		1		1		2	0.6
Metacarpal	2	3		3	2	10	3
Metatarsal	5	2	1	5	6	19	6
Lateral metapodial					1	1	0.3
Metapodial	1			5	3	9	3
1st Phalanx				4	3	7	2
2nd Phalanx	2	1		3	3	9	3
3rd Phalanx		2		4	1	7	2
Ribs					1	1	0.3
Cervical vertebrae	2	1		2	1	6	2
Thoracic vertebrae	1	1		1		3	1
Total	107	37	2	87	77	310	

Fragments of sacral vertebrae were found in all assemblage groups apart from those from Hyde Abbey and 27 Jewry Street. They usually formed less than 1% of the cattle assemblages. The small caudal vertebrae were very poorly represented. They were identified in only six assemblage groups and only eight were recorded.

Overview of anatomical representation

All assemblage groups produced bones from all parts of the cattle skeleton. There is no evidence that some cattle were slaughtered and butchered elsewhere and joints of meat brought to the town. Much of the uneven representation of cattle bones can be explained by factors such as differential survival, fragmentation, and retrieval. Although there were no very large discrete accumulations dominated by a few elements, such as have been encountered in some Romano-British towns, there is evidence that bones from different parts of cattle carcasses were commonly separated and sometimes thrown away in different locations. The clarity of such spatial variations has been blurred by subsequent mixing and redeposition of bones and the large degree of residuality evident in some deposits. Nevertheless there is evidence, for example, that upper limb bones were often collected for further processing together after initial butchery, whereas metapodials and head bones were often dumped together after primary butchery. Subsequent disposal resulted in variations in the relative abundance of these bones in different assemblage groups.

Table 2.112 compares the relative percentages of groups of cattle bones from the assemblage groups. Upper limb bones were particularly well represented in the samples from Victoria Road East wells and pits (Groups VRE19–24), Jewry Street, Crown Hotel, and Hyde Abbey non-building or structural deposits (Groups HA72.1, HA72.7, HA74.1, HA74.6, HA74.8). Metapodials and mandibles were both best represented in the Victoria Road West buildings (Groups VRW2–5) and the 27 Jewry Street assemblages, in which upper limb bones were much less frequent.

Table 2.109 Anatomical elements of cattle from Jewry Street, Crown Hotel

Groups	JCH1	JCH2	JCH3	JCH4	JCH5	JCH6		
Phases	**707–10**	**323–4**	**320–2**	**317–19**	**315**	**311–14**	**Total**	**%**
Skull frags	1		1	2		1	5	4
Mandible	1		1	1		1	4	3
Hyoid				1		1	2	1
Loose teeth				3	1		4	3
Scapula			1	3		4	8	6
Humerus			1	3	1	5	10	7
Radius	2	2	5	5	1	2	17	12
Ulna	3			4	1	3	11	8
Os coxae	1		2	5	2	5	15	11
Femur	4	1	2	6	2	4	19	14
Tibia	1	1	6	4		1	13	9
Calcaneus		1		1	1		3	2
Metacarpal				3		1	4	3
Metatarsal	1		1	2		2	6	4
Metapodial				1		1	2	1
1st Phalanx				2	1		3	2
2nd Phalanx				1		1	2	1
3rd Phalanx					2		2	1
Ribs			1	1			2	1
Cervical vertebrae				2		1	3	2
Thoracic vertebrae	1						1	0.7
Sacrum				1			1	0.7
Total	15	5	21	51	12	33	137	

The results show that there were variations in the processing and disposal of different cattle bones. Further analysis of Roman deposits elsewhere in Winchester is likely to provide more evidence for this. As has been discussed above, such variations can have a significant effect on the relative abundance of cattle bones in the assemblages.

Fragmentation of cattle bones

The major cattle bones from Winchester were heavily fragmented. As discussed above (pp 100–101) in relation to the calculation of whole bone equivalents, these bones were divided into five size categories based on the proportion of the bone that survived. The fragmentation data for the mandible, scapula, humerus, radius, femur, tibia, metacarpal, and metatarsal are presented in Table 2.113 for each assemblage group. The mean size of the fragments can be approximated by dividing the WBEs by the total number of fragments. Most of these bones were more fragmented in cattle than the other major domestic species (Fig 35).

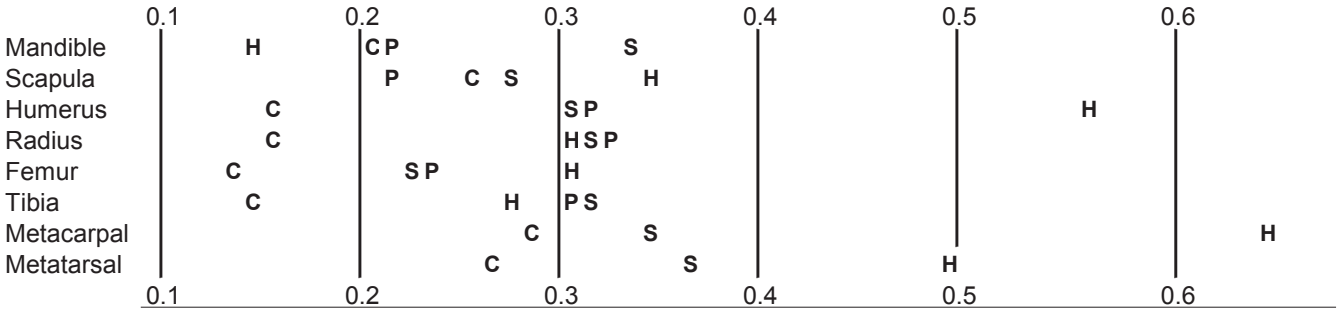
Of the 647 mandibles considered in this analysis, 66% fell into the smallest size category (0.10) and a further 20% in the second smallest (0.25). Only 17 complete mandibles were recovered, over half of which were found in the Victoria Road East wells and pits. The mean size of mandibles was much higher in those features (0.33) than in any other assemblage group. Assemblages from Henly's Garage and the Hyde Abbey buildings and structural remains (Groups HA72.2, HA74.2–5, and HA74.7) also had relatively high mean sizes. Most of the other assemblage groups produced mean sizes of less than 0.20 and the mean for all assemblages was 0.21 (Table 2.113).

None of the 465 scapulae were complete and 54% were recorded as 0.10 of a bone. A further 23% fell into the 0.25 category. The least fragmented assemblage (mean = 0.43) came from the Victoria Road East wells and pits (Groups VRE19–24), where 38% belonged to the 0.75 category. Pits or wells from Victoria Road West also produced a relatively high mean size for scapula (0.37). Assemblages from Henly's Garage and the Hyde Abbey buildings again had relatively high mean sizes. The overall average was, however, only 0.26.

All the upper limb elements were in general

Table 2.110 Anatomical elements of cattle from 27Jewry Street

Groups	**27JS1**	**27JS2**	**27JS3**	**27JS4**		
Phases	**1–4**	**5–7**	**8–9**	**32**	**Total**	**%**
Skull frags	1	8	6		15	9
Mandible	2	20	9	3	34	20
Loose teeth		12	3		15	9
Scapula		4	1	1	6	4
Humerus		3			3	2
Radius		4	1	1	6	4
Ulna		1		1	2	1
Os coxae		5	5	1	11	6
Femur		4	1	2	7	4
Tibia		3	3		6	4
Calcaneus	1		1		2	1
Astragalus		2			2	1
Centroquartal			2		2	1
Other tarsals		1	1		2	1
Metacarpal	2	8	1	1	12	7
Metatarsal	5	12	2	1	20	12
Metapodial			3		3	2
1st Phalanx	1	4	3		8	5
2nd Phalanx		3	1		4	2
3rd Phalanx			2		2	1
Ribs		1			1	0.6
Cervical vertebrae	1	2			3	2
Thoracic vertebrae		1		1	2	1
Lumbar vertebrae		1		1	2	1
Caudal vertebrae		1			1	0.6
Total	13	100	45	13	171	



Key: C cattle
S sheep / goat
P pig
H horse

Figure 35 Comparison of mean fragment sizes

Table 2.111 Anatomical elements of cattle from Henly's Garage

Groups	HG1	HG2	HG3	HG5	HG7	HG6	HG4		
Phases	**1–3**	**4–7**	**9–11**	**15**	**16**	**23–5**	**32**	**Total**	**%**
Skull frags			2	4	9	9	14	38	12
Mandible	1	1		2	8	9	8	29	9
Loose teeth			2		2	10	1	15	5
Scapula	2		1		10	2	6	21	7
Humerus	1		1	5	5	4	5	21	7
Radius	3	1	1	5	7	1	2	20	6
Ulna	1				2	3	4	10	3
Os coxae			1	2	9	2	7	21	7
Femur				3	2	6	6	17	5
Tibia	1	1	1	4	2	1	7	17	5
Calcaneus		1		1	1	2	2	7	2
Astragalus				1		2	1	4	1
Centroquartal						1		1	0.3
Metacarpal				4	15	6	1	26	8
Metatarsal	1			2	8	8	2	21	7
1st Phalanx					6	3	2	11	4
2nd Phalanx					2	2	1	5	2
3rd Phalanx					1			1	0.3
Ribs		1	1	1	2	4	1	10	3
Cervical vertebrae				3	1	2	3	9	3
Thoracic vertebrae			1	1	2	2		6	2
Lumbar vertebrae					3			3	1
Sacrum					1			1	0.3
Total	10	5	11	38	98	79	73	314	

Table 2.112 Relative percentages of selected cattle bones (fragments)

Site/contexts	Mp:UL	PT:UL	M:UL	Sc:Mp	Sc:UL	Sk:M	Sk:UL
VR East wells and pits	15	28	18	46	13	63	28
VR all trenches, ditches	33	32	24	35	21	51	25
VR East buildings	29	31	25	46	26	46	22
VR East NE corner	29	29	27	42	23	55	31
VR East layers/other	22	24	20	36	13	43	16
VR West shafts and pits	33	41	26	36	21	56	31
VR West buildings	51	30	47	14	15	31	28
VR West other deposits	27	35	28	39	19	39	20
Hyde Abbey buildings	26	27	29	41	19	42	23
Hyde Abbey other deposits	25	23	18	37	16	46	16
Jewry Street, Crown Hotel	15	13	8	40	10	45	7
27 Jewry Street	59	48	59	15	20	31	38
Henly's Garage	36	25	25	31	20	57	31

Key:

Mp: metapodials, UL: upper limb bones (humerus, radius, ulna, femur, patella, tibia), PT: phalanges, sesamoids, tarsals carpals, M: mandible, hyoid, Sc: scapula, Sk: skull fragments

Note: Figures represent percentages of the first group of bones listed, for example Sk:M is % skull of total skull and mandible fragments

Table 2.113 Fragmentation of major cattle bones

Site/contexts	0.1	0.25	0.5	0.75	1	N	WBE	Mean
Mandible								
VR East wells and pits	42	25	5	11	9	92	30.2	0.33
VR all trenches, ditches	18	4	1	1	1	25	5.05	0.20
VR East buildings	40	9	4	3		56	10.5	0.19
VR East NE corner	87	40	13	7	4	151	34.45	0.23
VR East layers/other	84	18	4	4		110	17.9	0.16
VR West shafts and pits	18	3	3	2		26	5.5	0.21
VR West buildings	16	4				20	2.6	0.13
VR West other deposits	37	5	1			43	5.45	0.13
Hyde Abbey buildings	20	7	1	3	2	33	8.5	0.26
Hyde Abbey other deposits	22	2		3		27	4.95	0.18
Jewry Street, Crown Hotel	2	2				4	0.6	
27 Jewry Street	27	4	2	1		34	5.45	0.16
Henly's Garage	15	6		4	1	26	7	0.27
Total	428	129	34	39	17	647	138.15	0.21
Scapula								
VR East wells and pits	18	12	10	24		64	27.8	0.43
VR all trenches, ditches	14	6		2		22	4.4	0.20
VR East buildings	37	17	2	4		60	11.95	0.20
VR East NE corner	62	32	10	17		121	31.95	0.26
VR East layers/other	52	13	6	1		72	12.2	0.17
VR West shafts and pits	8	4	3	6		21	7.8	0.37
VR West buildings	3		1			4	0.8	
VR West other deposits	17	7	1	2		27	5.45	0.20
Hyde Abbey buildings	10	5		6		21	6.75	0.32
Hyde Abbey other deposits	16	3	2	2		23	4.85	0.21
Jewry Street, Crown Hotel	4	3	1			8	1.65	0.21
27 Jewry Street	3	2		1		6	1.55	
Henly's Garage	9	2	2	3		16	4.65	0.29
Total	253	106	38	68		465	121.8	0.26
Humerus								
VR East wells and pits	73	23		4		100	16.05	0.16
VR all trenches, ditches	14	5		2		21	4.15	0.20
VR East buildings	24	6	1	1		32	5.15	0.16
VR East NE corner	72	16	3	8		99	18.7	0.19
VR East layers/other	69	17	3	1		90	13.4	0.15
VR West shafts and pits	8	5	2			15	3.05	0.20
VR West buildings	4	2				6	0.9	
VR West other deposits	21	1				22	2.35	0.11
Hyde Abbey buildings	18	2	1	3		24	5.05	0.21
Hyde Abbey other deposits	33		1	1		35	4.55	0.13
Jewry Street, Crown Hotel	9	1				10	1.15	0.12
27 Jewry Street	2	1				3	0.45	
Henly's Garage	14	6			1	21	3.9	0.19
Total	361	85	11	20	1	478	78.85	0.16

Table 2.113 (*cont.*) Fragmentation of major cattle bones

Site/contexts	0.1	0.25	0.5	0.75	1	N	WBE	Mean
Radius								
VR East wells and pits	61	12	3	2	6	84	18.1	0.22
VR all trenches, ditches	21	1		1	1	24	4.1	0.17
VR East buildings	27	4				31	3.7	0.12
VR East NE corner	65	22	3	2	2	94	17	0.18
VR East layers/other	96	8				104	11.6	0.11
VR West shafts and pits	12	3	1	1		17	3.2	0.19
VR West buildings	6	1				7	0.85	
VR West other deposits	27	7		1		35	5.2	0.15
Hyde Abbey buildings	15	3	1			19	2.75	0.14
Hyde Abbey other deposits	21	3		1	1	26	4.6	0.18
Jewry Street, Crown Hotel	13	4				17	2.3	0.14
27 Jewry Street	4	2				6	0.9	
Henly's Garage	10	6		2		18	4	0.22
Total	378	76	8	10	10	482	78.3	0.16
Femur								
VR East wells and pits	79	13	2	2		96	13.65	0.14
VR all trenches, ditches	17	2		1		20	2.95	0.15
VR East buildings	32	5		1		38	5.2	0.14
VR East NE corner	51	12	1	1		65	9.35	0.14
VR East layers/other	81	9				90	10.35	0.12
VR West shafts and pits	12	5		1		18	3.2	0.18
VR West buildings				(none)				
VR West other deposits	11	2				13	1.6	0.12
Hyde Abbey buildings	9	4	1			14	2.4	0.17
Hyde Abbey other deposits	13	1		1		15	2.3	0.15
Jewry Street, Crown Hotel	16	3				19	2.35	0.12
27 Jewry Street	6	1				7	0.85	
Henly's Garage	10	3		2		15	3.25	0.21
Total	337	60	4	9		410	57.45	0.14
Tibia								
VR East wells and pits	82	20	2	4	1	109	18.2	0.17
VR all trenches, ditches	14	2		1		17	2.65	0.16
VR East buildings	37	6			1	44	6.2	0.14
VR East NE corner	69	27	1	2		99	15.65	0.16
VR East layers/other	105	22	1			128	16.5	0.13
VR West shafts and pits	12	5		3		20	4.7	0.24
VR West buildings	8	2				10	1.3	0.13
VR West other deposits	21	3				24	2.85	0.12
Hyde Abbey buildings	15	2	2	1		20	3.75	0.19
Hyde Abbey other deposits	21	3				24	2.85	0.12
Jewry Street, Crown Hotel	12	1				13	1.45	0.11
27 Jewry Street	3	3				6	1.05	
Henly's Garage	12	3		1		16	2.7	0.17
Total	411	99	6	12	2	530	79.85	0.15

Table 2.113 (*cont.*) Fragmentation of major cattle bones

Site/contexts	0.1	0.25	0.5	0.75	1	N	WBE	Mean
Metacarpal								
VR East wells and pits	5	10	1	3	11	30	16.75	0.56
VR all trenches, ditches	10	5		1		16	3	0.19
VR East buildings	8	16	1		3	28	8.3	0.30
VR East NE corner	16	22	3	3	1	45	11.85	0.26
VR East layers/other	16	17	4	1		38	8.6	0.23
VR West shafts and pits	6	7	1		1	15	3.85	0.26
VR West buildings	6	6	1			13	2.6	0.20
VR West other deposits	11	9	1		1	22	4.6	0.21
Hyde Abbey buildings	3	4	1			8	1.8	0.23
Hyde Abbey other deposits	5	3		2		10	2.75	0.28
Jewry Street, Crown Hotel	2	1		1		4	1.2	
27 Jewry Street	3	4	5			12	3.8	0.32
Henly's Garage	4	13	2		2	21	6.65	0.32
Total	95	117	20	11	19	262	75.75	0.29
Metatarsal								
VR East wells and pits	14	11	3		13	41	18.65	0.45
VR all trenches, ditches	10	5	3	2	1	21	6.25	0.30
VR East buildings	20	10	5			35	7	0.20
VR East NE corner	53	37	11	8	4	113	30.05	0.27
VR East layers/other	44	13	8	2		67	13.15	0.20
VR West shafts and pits	7	7	1	5	1	21	7.7	0.39
VR West buildings	4	5	1			10	2.15	0.22
VR West other deposits	11	5	1		1	18	3.85	0.21
Hyde Abbey buildings	9	4	2			15	2.9	0.19
Hyde Abbey other deposits	14	3	2			19	3.15	0.17
Jewry Street, Crown Hotel	3	2	1			6	1.3	
27 Jewry Street	7	10	3			20	4.7	0.24
Henly's Garage	4	6	1	3	2	16	6.65	0.42
Total	200	118	42	20	22	402	107.5	0.27

Key: N: Number of fragments,WBE: Whole Bone Equivalents, Mean: Mean size of fragments (WBE/N)

dominated by small fragments. The mean size of humeri fragments was only 0.16 and was not higher than 0.21 in any assemblage group. In a sample of 478 specimens, only one complete bone was recorded, whereas 76% fell into the 0.10 category.

Very similar results were obtained for the radius, which also had an overall mean size of 0.16 and the largest mean was only 0.22. Ten complete bones (out of 482) were recorded, most of them again found in the Victoria Road East wells and pits. Seventy-eight per cent belonged to the 0.10 size category.

Cattle femora were even more fragmentary. The overall mean was only 0.14 and only the sample from Henly's Garage had a mean of over 0.20. No complete bones were retrieved and 82% fell into the 0.10 category.

Similarly, the mean size of tibiae fragments was only 0.15. The highest mean size (0.24) was obtained from Victoria Road West shafts and pits. None of the other assemblage groups produced means of over 0.19. Only two complete tibiae were found in a sample of 531 bones, whereas 77% were recorded in the 0.10 category.

Metapodials were generally less fragmented than upper limb bones. The overall mean size of metacarpals and metatarsals was 0.29 and 0.27 respectively. Forty-one complete metapodials were recorded. Most of these were recovered from Victoria Road East pit F814 (Group VRE22, Plates 13 and 14), which accounts for the much higher mean sizes (metacarpal = 0.56; metatarsal = 0.45) of these bones in Victoria Road East wells and pits than elsewhere. The Henly's Garage site

also produced a higher proportion of complete or 0.75 metapodial fragments than other assemblage groups. Only 36% of the metacarpals and 50% of the metatarsals fell into the smallest size category.

Fragmentation can result from a wide range of factors. Carnivore scavenging, weathering, and trampling can all produce breakage in bones. High levels of fragmentation do not necessarily imply intensive deliberate breakage by humans during carcass processing. They can imply poor preservation. It has already been demonstrated that canid gnawing was a significant taphonomic factor in the complete destruction of many bones and the partial destruction of many others. Many of the deposits were layers, in which weathering effects would have further damaged bones. Several hollow ways and metalling produced clear evidence for trampling.

Although these taphonomic processes were important, there is also much evidence to support the contention that a lot of the fragmentation was deliberate and was a consequence of various stages in carcass processing. As discussed below, there were a lot of butchery marks associated with the splitting of bone for marrow. Further fragmentation resulted from processing some bones for their grease content, whilst others were worked.

Comparisons with fragmentation of cattle bones from other sites are limited because of differences in recording methods and the lack of quantification in published reports. However, there is evidence that fragmentation levels were greater on Romano-British urban sites than on Iron Age sites. For example, although the metapodials from Winchester were generally the least fragmented of the limb bones (Table 2.113), many were clearly broken either across the shaft, or sometimes split longitudinally to release the marrow. Most metapodials survived as less than 0.50 of a bone. This contrasts with the metapodials from the Iron Age and Romano-British deposits at Winnall Down, where bones of over 0.50 were much more frequent and fragmentation was generally much lower (Maltby 1985a).

All the major limb bones from the Winchester deposits were generally more fragmented than those from the later Roman deposits at Owslebury (humerus 0.29; radius 0.26; femur 0.31; tibia 0.35; metacarpal 0.39; metatarsal 0.36 – calculations adapted from Maltby 1987a). Since the preservation of bones from many of the ditch deposits at Owslebury was poorer than in Winchester, the differences do appear to be a genuine reflection of the much greater intensity of deliberate bone breakage in Winchester.

High levels of fragmentation of cattle bones have also been noted at Silchester (Maltby 1985a) and Dorchester (Maltby 1993), although the average size of fragment was generally larger in the Greyhound Yard deposits in Dorchester than in the Winchester assemblages. This may reflect the better preservation of bones in Dorchester, as many more were recovered from pits than was the case in Winchester. On both sites bones deposited in pits and wells tended to be less fragmented.

The Winchester assemblages therefore indicate there was a high level of deliberate fragmentation of cattle bones. This is typical of Roman urban assemblages and shows that products such as marrow and grease were extracted systematically and more intensively than seems to have been the case on Iron Age and Romano-British rural settlements in the area.

Butchery of cattle bones

One of the major avenues of research in this project was to analyse in detail the evidence for the processing of cattle carcasses and, in particular, to compare the evidence from Winchester with that from rural sites in its hinterland. Preliminary results, comparing data from urban deposits from Victoria Road East and Silchester with the rural sites of Owslebury and Winnall Down have already been published (Maltby 1989a). This section will extend that analysis to other urban sites in Winchester and update the discussion about butchery practices in the light of more recent research.

Nearly 2000 observations of butchery marks on cattle bones were recorded, representing 31% of the assemblage excluding loose teeth and bones in associated groups (Table 2.114). The frequency of observations was slightly higher in the Victoria Road East assemblage (32%) than elsewhere, particularly with regard to the upper limb bones and tarsals. This may reflect that more of the bones deposited there had been processed intensively for marrow and in the early stages of bone working. The lowest frequency of butchery was recorded in the Hyde Abbey assemblage (22%).

Bones in areas of the body associated with the most meat – for example the upper limb bones, scapula, os coxae, and vertebrae – tended to have the highest frequencies of butchery marks. Bones of the head and limb extremities displayed fewer marks (Table 2.114).

The frequency of butchery observed should be regarded very much as a minimum. Dogs will have destroyed evidence for butchery marks on parts of the bones they gnawed heavily. Indeed, bones that had been split open to reveal the marrow cavity would have enabled dogs to gnaw those bones more effectively.

Comparisons of butchery frequencies between different sites are difficult because of problems of taphonomy and recording. In addition, butchery carried out by implements such as cleavers are more likely to leave evidence in the form of chop marks on the bones than butchery performed with knives. This may largely explain the much lower percentages of butchered cattle bones recorded at Owslebury, where in no period did the percentage of butchery observations exceed 10% (Maltby 1989a). Higher levels of surface erosion on the bones will have destroyed some butchery evidence there and, as is evident from Tables 2.115–2.126, carcass processing involved greater use of knives than in Winchester. In addition, many of the observations of butchery in the Winchester assemblage

Table 2.114 Observations of butchery marks on cattle bones

	VR East		VR West		HA		Defences		Total	
	B	%	B	%	B	%	B	%	B	%
Skull frags	79	16	19	20	5	10	9	16	112	16
Mandible	72	17	15	14	7	12	18	28	112	17
Hyoid	1	8	0	0	0	0	1	50	2	10
Scapula	93	29	29	43	11	25	12	40	145	31
Humerus	175	54	29	48	22	37	20	59	246	51
Radius	149	47	30	38	18	40	17	41	214	44
Ulna	47	27	12	32	2	7	6	26	67	25
Os coxae	101	44	32	43	12	43	20	43	165	44
Femur	163	66	21	43	12	41	17	41	213	52
Tibia	160	42	21	30	13	30	10	29	204	38
Carpals	2	35	1	17	0	0	0	0	3	7
Calcaneus	40	46	6	18	2	29	3	25	51	34
Astragalus	37	50	3	13	1	14	2	33	43	39
Centroquartal	13	48	1	10	1	25	1	33	16	36
Metacarpal	15	10	6	9	0	0	1	2	22	8
Metatarsal	50	19	11	17	3	9	9	42	73	18
Metapodial	18	36	3	38	0	0	0	0	21	27
1st Phalanx	47	26	8	17	2	10	5	22	62	23
Ribs	18	32	3	25	0	0	3	23	24	26
Sternebrae	1	100	0	0	0	0	0	0	1	100
Cervical vertebrae	82	42	10	26	7	64	7	45	106	41
Thoracic vertebrae	37	53	8	50	1	20	3	33	49	40
Lumbar vertebrae	20	53	6	30	0	0	1	20	27	43
Sacrum	8	18	4	29	0	0	0	0	12	20
Caudal vertebrae	1	25	1	50	0	0	0	0	2	25
Total	1429	32	279	27	119	22	165	28	1992	31

Key: B: number of butchered fragments, %: percentage of all identified fragments
Defences = JCH, 27JS, and HG

Note: Counts exclude groups of associated bones and loose teeth

involved splitting of the limb bones, a practice rarely carried out at Owslebury. Other rural Romano-British assemblages from Hampshire have also produced low percentages of butchery observations (Maltby 1989a).

However, it is interesting to note that 34% of cattle bones from the Staple Gardens site in Winchester were recorded as butchered (Maltby 1989a), 29% of the sample from Greyhound Yard in Dorchester (Maltby 1993), and 35% of a late Roman sample of specialist butchery waste from Chester Street in Cirencester (Maltby 1998). These figures are closely comparable with the levels of observations in the northern suburb and city defences sites in Winchester. Romano-British urban samples therefore tend to produce more evidence for butchery, which at least in part can be explained by differences in the methods and intensity of carcass processing.

Analysis of the butchery observed in the Winchester assemblage will be discussed by area of the body. The original records are stored in the archive. Tables 2.115–2.128 provide a summary of the main types of butchery marks observed on a number of the elements. The different types of butchery were defined according to their location, the implement used, and the direction in which the marks were running. Some bones had more than one type of butchery observation. The frequency of observations of each type are recorded by site and comparisons of the frequencies of the different types of butchery marks are made with samples from Staple Gardens, Owslebury, and Winnall Down. Data from those sites were extracted from the respective site archives and published in an earlier discussion of butchery methods (Maltby 1989a).

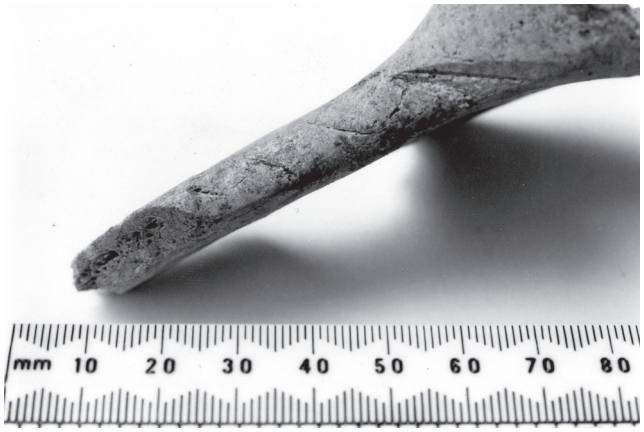


Plate 16 Cattle mandible showing cleaver marks on the posterior of the ramus (J12)

Head

Observations of butchery on skull fragments have not been quantified in detail. The highly fragmented nature of cattle skulls reduced the percentage of butchery observations (Table 2.114), since many small fragments of the skull came from areas which rarely bore marks. Much of the fragmentation can be explained by other taphonomic factors but some of it must also have been the result of breaking open the skulls to extract the brains. Evidence for the splitting of the back of the skulls was observed on several ventral portions of the occipital and basioccipital.

Observations of the use of knives in the processing of skulls were very limited. They included a few fragments of maxilla which bore knife cuts associated with the removal of the cheek meat. However, the vast majority of butchery marks on skulls were chops. Skulls were usually detached from the mandibles by the use of a cleaver, which sometimes left marks on the temporal and zygomatic but more commonly damaged

Table 2.115 Butchery marks on cattle mandibles from Winchester, Owslebury, and Winnall Down

	K	K	K	K	C	C	C	K	K	K	C	C	C	K	C	
Sample	**J1**	**J2**	**J3**	**J4**	**J5**	**J6**	**J7**	**J8**	**J9**	**J10**	**J11**	**J12**	**J13**	**J14**	**J15**	**N**
VR East	1				5	5	7	2		2	9	39	7		2	417
VR West	1				2		1	1				9	1	1		106
HA					1			2			2	3	1			60
Defences					1			1			2	4		1	1	64
Total	2				9	5	8	6		2	13	55	9	2	3	
% Butchery	2				8	4	8	4		2	11	48	8	2	3	(114)
Staple Gardens		2			3						3	2			1	46
Owslebury	53	5	3		2			45	16	10	21	5	3	12	1	1764
Winnall Down	2							1	1		2			1		83

Key:

K = knife cut(s)
C = predominantly chop mark(s)
N = total number of mandible fragments examined
% Butchery = percentage of observed butchery marks assigned to that category (total in brackets)
J1 = dorso-ventral (or oblique) knife cuts - lateral diastema
J2 = dorso-ventral (or oblique) knife cuts - medial diastema
J3 = cranio-caudal knife cuts – lateral diastema
J4 = cranio-caudal knife cuts – medial diastema
J5 = dorsal-ventral (or oblique) chop marks – lateral diastema
J6 = dorsal-ventral (or oblique) chop marks - medial diastema
J7 = dorsal-ventral/cranial-caudal chop through medial diastema
J8 = cranio-caudal knife cuts – lateral ramus near condyle
J9 = other knife cuts – caudal part of ramus near condyle
J10 = knife cuts – other parts of ramus
J11 = cranio-caudal chop marks – lateral ramus near condyle
J12 = chop/saw marks – caudal ramus on and below condyle
J13 = chop/saw marks – other parts of ramus
J14 = knife cuts below cheek teeth (mostly on lateral)
J15 = superficial chop marks below cheek teeth

Note: Data adapted and expanded from Maltby (1989a)
For Staple Gardens (Winchester) Roman deposits see Maltby 1986a
For Owslebury Roman deposits see Maltby 1987a
For Winnall Down/ Easton Lane late Iron Age and early Roman deposits see Maltby 1985b; 1989b

the mandibular ramus. Separation from the neck was commonly achieved by chopping through the occipital condyles. Horns were detached from the frontal usually using a cleaver. Several of the accumulation of horn cores in Victoria Road East pit F814 (Group VRE22) had evidence for saw marks around the base where the horn sheath had been removed, indicating the presence of waste from specialist processing (Plate 12). Similar accumulations of horn cores have been found in late Iron Age or very early Roman deposits at Brighton Hill South (Maltby 1995a), possibly indicating that specialist processing was not restricted to urban sites in the area – although the earlier date of the Brighton Hill South material may mean that the two samples are not directly comparable.

Observations of butchery marks on cattle mandibles from Romano-British sites in Hampshire were grouped into fifteen categories (Maltby 1989a). Examples of eleven of these types were recorded in the Winchester northern suburb and city defences samples (Table 2.115). By far the most frequent type (55 examples) were cleaver marks located on the caudal aspect of the ramus near to the condylar process (J12 – Plate 16). These were made during the removal of the lower jaws from the skull. The angle of the marks on the caudal surface either ran horizontally or obliquely. Less commonly, such marks were located more laterally again, usually situated just below the condylar surface (J11). The Owslebury assemblage included mandibular rami with similar chop marks but in different proportions. There, it appears that mandibles were much more likely to receive blows on the lateral surface. Variations in the locations of these marks may reflect the position of the head (eg upright on a table or the ground; on its side; suspended) when it was butchered and possibly whether it had already been beheaded. The Owslebury data also showed that knives were more often employed for this task than cleavers, whereas such marks were encountered very rarely on specimens from Winchester.

There were also contrasts in the butchery marks located towards the front of the mandible on the diastema. At Owslebury, there were many examples of knife cuts on the lateral surface mainly running vertically (J1). Only two examples have been recorded from Winchester, where superficial chop marks in this area were more common (J5–6) and at least eight specimens had been chopped completely through (J7). Most of the marks on the diastema were probably associated with the separation of the two halves of the mandible. Such a separation would have facilitated the removal of the tongue. Knife cuts on the body of the mandible, usually on the lateral surface (J14) were more commonly observed at Owslebury. Only two specimens bore similar marks in the Winchester samples (Table 2.115).

Scapula and pelvis

These bones had high frequencies of butchery observations (Table 2.114). Twelve categories of butchery were recorded on cattle scapulae from the Winchester assemblages but two types were much more common than others (Table 2.116). As in the case of the mandibles, most of the butchery was carried out with cleavers or implements with heavy blades, in contrast to Owslebury where knife cuts continued to be much more frequent. In Winchester it was common for the glenoid (scapula joint surface) to have been completely chopped through axially (S1). Usually this resulted in the chopping off of the superglenoid tuberosity and the cranial part of the glenoid from the rest of the scapula. Sometimes such marks were also located on the caudal part of the glenoid. Only two specimens from Owslebury had similar marks. There, horizontal knife cuts near the rim of the glenoid were more common (S8) and showed that different techniques were used for the segmenting of the shoulder joint.

The most frequently observed butchery marks observed on scapulae from Winchester consisted of axial marks that damaged the lateral spine (S4 – Plate 17). Most of these marks were located at the base of the protruding spine of the scapula on the neck of the bone above the glenoid. Sometimes substantial portions along the length of the spine had been sliced off. Usually these marks were made with a cleaver or heavy blade. Occasionally a saw seems to have been employed. This may be evidence for subsequent preparation of the bone for bone working. Blade and superficial chop marks on other parts of the scapulae blade were observed less frequently (S5–7) but were probably made during filleting. Dobney (2001) has suggested that the trimming of glenoid cavities (S1) and the removal of the spine (S4) could both be associated with curing the meat on the bone, although there are no clear examples of damage to the blade caused by hanging the joints on hooks, as observed, for example, in Lincoln (Dobney *et al 1996).*

This technique was one of the few that was also common at Owslebury. However, at that site there were many other specimens that bore axial knife marks on the lateral aspect of the scapula blade (S9) and knife cuts on other aspects (S10–13), which were also most likely to have been made during the removal of meat. Scapulae with knife cuts decreased in later Roman levels at Owslebury (Maltby 1989a), which may suggest that filleting techniques changed from traditional methods.

A diverse range of butchery marks was found on os coxae. Marks were divided into sixteen categories. However, in a total of 190 butchery observations in the Winchester assemblages, only seven consisted of knife cuts (P12–16 – Table 2.117). The most common type of chop marks was associated with the separation of the pelvis from the femur at the acetabulum. This often resulted either in the complete severance of the acetabulum (P5 – Plate 18) or in the presence of superficial marks around the joint surface (P6).

Other common observations of butchery included shafts of the ilium that had been chopped through vertically (P2), allowing the caudal part of the pelvis together with the femur, if still attached, to be separated from the vertebral column. Other superficial chop

Plate 17 Cattle scapula showing blade marks on the spine (S4)

Plate 18 Cattle pelvis showing cleaver mark through the acetabulum (P5)

Table 2.116 Butchery marks on cattle scapulae from Winchester, Owslebury, and Winnall Down

	C	C	C	B	B	B	C	K	K	K	K	K	K	
Sample	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**	**S10**	**S11**	**S12**	**S13**	**N**
VR East	40	4	2	54	3	4	5		2		1			324
VR West	8	1		15	4	2	1	2	1	1	2	1		67
HA	4			5			3				1			44
Defences	5		1	2			1	1	1	1	1			30
Total	57	5	3	76	7	6	10	3	4	2	5	1		
% Butchery	32	3	2	42	4	3	6	2	2	1	3	<1		(179)
Staple Gardens	6		1	6	1	1	2							48
Owslebury	2		2	36	6	5		13	20	3	9	12	3	486
Winnall Down				2	1			3	1		1			42

Key:
B = predominantly heavy blade mark(s)
S1 = axial/oblique chop through glenoid cavity running in medio-lateral direction
S2 = repeated axial/oblique chops through glenoid cavity running in medio-lateral direction
S3 = horizontal superficial chop marks around glenoid cavity
S4 = axial blade/chop/saw marks – lateral spine
S5 = other axial blade/chop/saw marks – lateral aspect of blade
S6 = superficial blade/chop/saw marks – medial/caudal aspects of blade
S7 = other chop/blade/saw marks – lateral aspect of blade
S8 = horizontal knife cuts around glenoid cavity
S9 = axial knife cuts – lateral aspect of blade (including spine)
S10 = axial knife cuts – medial/caudal aspects of blade
S11 = other knife cuts – lateral/cranial aspects of blade
S12 = other knife cuts – medial/caudal aspects of blade
S13 = knife cuts near proximal end of blade

Note: Other codes and data sources as Table 2.115

marks were also found quite commonly on the shaft of the ilium (P3–4). Chop marks on the iliac tuberosity would have been made during the separation of the pelvis from the backbone at the sacrum (P1). Superficial chop marks on the shafts of the pubis and ischium were also quite common (P8, P10), some of which may have been made during filleting. So too were scoop marks made on the shafts of the ilium and ischium made by running a heavy blade along them. However, such butchery was only observed in the Victoria Road East sample (P11).

In contrast to Winchester, observations of knife cuts outnumbered chop marks in the Owslebury sample. Although most types of chop mark were present, they were much less frequent. Traditional methods of butchery seems to have continued to be practised.

Upper limb bones

Upper limb bones were, in general, the bones which displayed the greatest evidence of butchery (Table 2.114). Some of the butchery methods employed are very distinctive and have parallels on other Roman sites.

Over half the humeri fragments had butchery marks observed on them (Table 2.114). These were divided into fourteen types, several of which were not found in the Owslebury assemblage (Table 2.118). For example, many humeri from Winchester had been chopped axially through the distal articulation in a posterio-anterior direction (H1 – Plate 19). Some of these marks, particularly those located close to the lateral side may have been the result simply of disarticulation of the elbow joint. However, the position of the marks very often resulted in the splitting of the shaft, suggesting that marrow extraction was also intended. Evidence for splitting was also frequently observed on proximal and shaft fragments (H3, H5). Some specimens, particularly from Victoria Road East, had more than one axial chop through the bone (H4, H6). A few had been split open through the medial or lateral aspects (H9). In some cases such chopping appears to have been too intensive simply for marrow extraction. Ends of bone split into small pieces may have been boiled to extract grease. In some cases the splintering of the bone shaft may have been made during the preparation of raw material for bone working, although the shape of the humerus is not ideal for such purposes.

Another distinctive type of butchery mark encountered on Winchester humeri consisted of specimens in which the most distal part of the medial epicondyle had been chopped off obliquely or horizontally (H2 – Plate 20). This would have separated the humerus from the radius and ulna prior to splitting.

The most commonly recorded type of butchery on humeri in the Winchester samples consisted of the removal of small scoops or slices of bone from the

Table 2.117 Butchery marks on cattle os coxae from Winchester, Owslebury, and Winnall Down

	C	C	C	C	C	C	C	C	C	C	B	K	K	K	K	K	
Sample	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**	**P13**	**P14**	**P15**	**P16**	**N**
VR East	10	13	8	8	24	14	5	7		13	11	1		1	1	1	229
VR West	2	3	3	3	8	6		6	1	6							74
HA	1		1	2	2	1	1	1		3					1		28
Defences	2	2	2	1	2	4		3	2	2			1	1			47
Total	15	18	14	14	36	25	6	17	3	24	11	1	1	2	2	1	
% Butchery	8	8	7	7	19	13	3	9	2	13	6	<1	<1	1	1	<1	(187)
Staple Gardens	2	4	1	1	5	2		1	2			1		2	2		34
Owslebury	1	4		2	5	1		3				7	4	4	5	7	406
Winnall Down					1					1			1	1		1	32

Key:
P1 = chop/saw marks – iliac tuberosity (articular surface with sacrum)
P2 = dorso-ventral/latero-medial chop through shaft of ilium
P3 = superficial dorso-ventral/latero-medial chop marks – shaft of ilium
P4 = other superficial chop marks – shaft of ilium
P5 = chop through acetabulum
P6 = superficial chop/saw marks in and around acetabulum
P7 = cranio-caudal/oblique chop through shaft of pubis
P8 = superficial chop/saw marks – shaft of pubis
P9 = chop through shaft of ischium
P10 = superficial chop/saw marks – shaft of ischium
P11 = superficial blade/chop/saw marks – shafts of ilium and ischium
P12 = knife cuts – lateral aspect of shaft of ilium
P13 = other knife cuts – ilium
P14 = knife cuts in and around acetabulum
P15 = knife cuts – pubis
P16 = knife cuts – ischium

Note: Other codes and data sources as Table 2.115

shaft running a cleaver blade axially along the shaft (H11). This would have removed meat and soft tissue from the bone. The marks occurred mainly in areas where protuberances of the bone blocked the progress of the blade.

None of the humeri from Owslebury had evidence for similar blade marks nor was there evidence for axial splitting of the bones in a posterio-anterior direction. Disarticulation marks consisted almost entirely of knife cuts (H10, H14) and knife cuts probably associated with filleting were commonly observed on the shafts (H13). Such marks have been found frequently in British Iron Age assemblages. Although similar knife cuts were found in

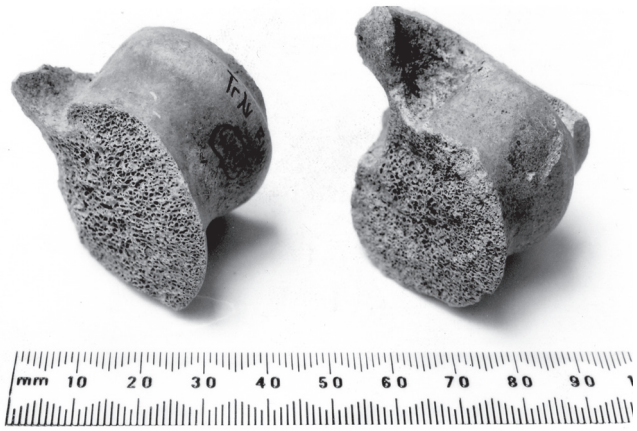


Plate 19 Cattle humeri showing axial chops through distal end (H1)

Plate 20 Cattle humerus showing chop through medial epicondyle (H2)

Table 2.118 Butchery marks on cattle humeri from Winchester, Owslebury, and Winnall Down

	C	C	C	C	C	C	C	C	C	K	B	C	K	K	
Sample	**H1**	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**	**H10**	**H11**	**H12**	**H13**	**H14**	**N**
VR East	52	39	12	21	20	2	3		4	7	63	4			324
VR West	8	8	1		3		1		1	2	13	1	2	1	61
HA	4		2	2	1			1	1	2	12	1			59
Defences	2	1			1					3	13	1	2		34
Total	66	48	15	23	25	2	4	1	6	14	101	7	4	1	
% Butchery	21	15	5	7	8	<1	1	<1	2	4	32	2	1	<1	(317)
Staple Gardens	7	5			2		2	1			10	3	1		48
Owslebury		2					1	1	1	34		3	20	7	486
Winnall Down										5					42

Key:
H1 = axial chop through distal articulation (trochlea) running in anterio-posterior direction
H2 = horizontal/oblique chop through distal surface of medial epicondyle
H3 = axial/oblique chop through proximal articulation
H4 = repeated axial chops through distal articulation running in anterio-posterior direction
H5 = axial/oblique chop through shaft running in anterio-posterior direction
H6 = repeated axial/oblique chops through shaft
H7 = oblique/anterio-posterior superficial chop marks – medial aspect of distal end
H8 = superficial chop marks – proximal end
H9 = axial/oblique chop through medial or lateral aspects of distal end
H10 = knife cuts – distal end (mostly on medial aspect)
H11 = superficial axial blade/chop/saw marks on shaft
H12 = other superficial chop marks on shaft
H13 = knife cuts on shaft
H14 = knife cuts – proximal end

Note: Other codes and data sources as Table 2.115

the Winchester samples, they formed an insignificant proportion of the assemblage.

Butchery marks were also frequently observed on cattle radii (Table 2.114). Eleven types of butchery mark were recorded in the Winchester samples (Table 2.119). By far the most common type consisted of axial chops through the proximal end in an anterio-posterior direction (R1 – Plate 21). In some cases only the lateral part of the articulation was removed. Such butchery marks correspond with those on the adjoining lateral part of the distal trochlea of the humerus and would have been made during segmentation. In other cases the chopping also opened up the marrow cavity. In many cases in the Victoria Road samples, proximal radii had been repeatedly chopped through (R3–4). There is also evidence of axial splitting at the distal end of the bone (R5) and on shaft fragments (R7). Marrow appears to have been removed systematically from these bones. As in the case of humeri, some radii had been chopped repeatedly into small fragments possibly for grease extraction. However, many of the splintered shafts of radii found in a number of deposits are bone working offcuts.

Plate 21 Cattle radius showing axial chop through proximal end (R1)

Axial blade marks made during filleting (R14) were recorded less frequently than on the humerus. This reflects the fact that there are fewer protuberances on cattle radii. It does seem likely that this was the main method of filleting.

No radii with blade butchery or axial splits were found in the large assemblage from Owslebury. Nearly all butchery marks consisted of knife cuts (R11–13), which were not recorded at all in the Winchester samples. There could scarcely be a greater contrast in butchery techniques practised at the two settlements.

Butchery marks on ulnae fragments were not quantified in detail but observations produced further evidence of filleting by the use of a cleaver blade and the chopping axially of the proximal end associated both with dismemberment and marrow extraction.

Over half of the cattle femora fragments from Win-

Table 2.119 Butchery marks on cattle radii from Winchester, Owslebury, and Winnall Down

Sample	C R1	C R2	C R3	C R4	C R5	C R6	C R7	C R8	C R9	C R10	K R11	K R12	K R13	B R14	C R15	N
VR East	73	4	23	8	22		9	1	5	4				19		316
VR West	10	1	4	1	6		2	1						5	4	80
HA	12		1		2				1					1	1	45
Defences	8		1		4		2		1					2	1	41
Total	103	5	29	9	34		13	2	7	4				27	6	
% Butchery	43	2	12	4	14		5	<1	3	2				11	3	(239)
Staple Gardens	6		5	1		1				1				11		51
Owslebury									1	1	26	3	12			414
Winnall Down									1		1	1				34

Key:
R1 = axial chop through proximal articulation running in anterio-posterior direction
R2 = axial chop through proximal articulation running in medio-lateral direction
R3 = repeated axial chops through proximal articulation running in anterio-posterior direction
R4 = axial chops through proximal articulation running in medio-lateral and anterio-posterior directions
R5 = axial chop through distal articulation running in anterio-posterior direction
R6 = superficial chop/saw marks on shaft
R7 = axial chop through shaft running in anterio-posterior direction
R8 = repeated axial chops through shaft running in anterio-posterior direction
R9 superficial horizontal chop marks – medial aspect of proximal end
R10 = horizontal chop marks (mostly superficial) – distal end
R11 = knife cuts – proximal end (mostly on medial aspect)
R12 = knife cuts – distal end
R13 = knife cuts on shaft
R14 = superficial axial blade/chop/saw marks on shaft
R15 = other superficial axial chop marks – proximal end

Note: Other codes and data sources as Table 2.115

chester were recorded as butchered (Table 2.114). All but one of the observations were of chop or blade marks (Table 2.120). In many respects the butchery was similar to that observed on the humerus. Axial blade marks on the shaft were present on a large number of bones leaving marks on the major protuberances of the shaft (F9).

Axial splitting was also commonly observed on femora from Victoria Road East but infrequently on other sites (F3–6). The few very splintered specimens were always associated with assemblages containing evidence of bone working waste.

Many of the proximal articular surfaces were chopped through (F1). This corresponds to the chops through the acetabulum (P7) made during the severing of the hip joint. Less frequently, the distal end of the femur had been chopped through horizontally (F8) and in a few cases the distal condyles had been chopped through axially (F14). Both types would have been made during disarticulation of the knee joint.

Once again, the butchery techniques at Owslebury were quite different. The majority of observations were of knife cuts. Only one possible example of blade butchery was recorded and none of the femora had been axially split.

Tibiae bore fewer butchery marks than femora but there is still evidence that they were systematically processed (Table 2.114). Thirteen types of butchery on tibiae were recorded in the Winchester samples (Table 2.121). By far the most common were axial blade marks made during filleting (T12 – Plate 22). Two similar examples were observed in the Owslebury samples but generally finer knives were used for filleting the shin meat (T10).

In Winchester, axial chops through the tibia usually ran in a posterio-anterior direction (T2, T4, T6 – Plate 23) and were commonly recorded. Victoria Road East additionally produced repeatedly split bones (T3, T5, T7). Some of these may have been used for the production of grease, but most appear to have been associated with bone working. No axially split tibiae were found at Owslebury, where nearly all the butchery marks consisted of knife cuts. Knife cuts are almost absent in the Winchester tibiae samples.

Axially chopped cattle upper limb bones were recorded more commonly at Victoria Road East than in the assemblages from the other sites in Winchester (Fig 36). It supports the view that more specialist waste derived from marrow processing and bone working was deposited there.

Axially chopped upper limb bones have been encountered on a number of Romano-British urban sites (Table 2.225). This method of exposing the marrow

Plate 22 Cattle tibia showing blade marks on distal portion of shaft (T12)

cavity was probably introduced by the Romans, directly or indirectly. Evidence for split bones has been found on military sites, such as the early phases at Cirencester (Thawley 1982). Later Roman deposits in Cirencester produced cattle bones split in an identical manner to those in Winchester (Maltby 1998). Other examples have been noted in Colchester (Luff 1993); York (O'Connor 1988); Silchester (Maltby 1984b); Dorchester (Maltby 1993); and Lincoln (Dobney *et al* 1996; other examples are listed in Table 2.225). In the cases of York and Colchester, deposits containing small, heavily split fragments were also recorded. Frequencies of split limb bones varied and not every urban deposit contained them, but it is striking how

Table 2.120 Butchery marks on cattle femora from Winchester, Owslebury, and Winnall Down

	C	C	C	C	C	C	C	C	B	K	K	K	K	C	C	
Sample	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**	**F13**	**F14**	**F15**	**N**
VR East	21	1	5	13	22	5		6	100					4		291
VR West	2		1	1	1			1	17			1			1	49
HA	4	1		1					8						1	29
Defences		3			1		1	1	10						1	41
Total	27	5	6	15	24	5	1	8	135			1		4	3	
% Butchery	12	2	3	6	10	2	<1	3	58			<1		2	1	(234)
Staple Gardens	2								16							18
Owslebury	1	1					1		1	5	1	11	5			418
Winnall Down										1		2	1			36

Key:
F1 = chop through proximal articular surface (head and neck)
F2 = superficial chop marks on and around proximal head and neck
F3 = axial chop through proximal running in anterio-posterior direction
F4 = axial/oblique chop through shaft running in anterio-posterior direction
F5 = axial/oblique chop through distal running in anterio-posterior direction
F6 = repeated axial/oblique chops through distal and shaft running in anterio-posterior direction
F7 = superficial horizontal chop/saw marks – distal end
F8 = horizontal chop through distal articular surface
F9 = superficial axial blade/chop/saw marks on shaft
F10 = knife cuts – medial aspect of proximal end
F11 = other knife cuts – proximal end
F12 = knife cuts on shaft
F13 = knife cuts – distal end
F14 = axial chop through distal lateral and medial condyles running in medio-lateral direction
F15 = superficial horizontal/oblique chop/saw marks on shaft

Note: Other codes and data sources as Table 2.115

Plate 23 Cattle tibia showing axial chop through distal end (T6)

Table 2.121 Butchery marks on cattle tibiae from Winchester, Owslebury, and Winnall Down

Sample	C T1	C T2	C T3	C T4	C T5	C T6	C T7	C T8	K T9	K T10	K T11	B T12	C T13	C T14	C T15	N
VR East	1	19	3	22	5	34	10			1		81	3			381
VR West		1		5		3		1				11	1	1		70
HA						3						8	1		1	44
Defences	2	1		2		2						7				35
Total	3	21	3	29	5	42	10	1		1		107	5	1	1	
% Butchery	1	9	1	13	2	18	4	<1		<1		47	2	<1	<1	(229)
Staple Gardens	1	1		1		3	1			1		13	3			61
Owslebury									1	16	2	2	2			465
Winnall Down						(none)										31

Key:T1 = superficial horizontal/oblique chop marks – proximal end
T2 = axial chop through proximal usually running in a anterio-posterior direction
T3 = repeated axial chops through proximal
T4 = axial chop through shaft
T5 = repeated axial chops through shaft
T6 = axial chop through distal usually running in a anterio-posterior direction
T7 = repeated axial chops through distal
T8 = superficial horizontal chop/saw marks – distal end
T9 = knife cuts – proximal end
T10 = knife cuts on shaft
T11 = knife cuts – distal end
T12 = superficial axial blade/chop/saw marks on shaft
T13 = other superficial chop/saw marks on shaft
T14 = horizontal/oblique chop through distal
T15 = horizontal/oblique chop through proximal

Note: Other codes and data sources as Table 2.115

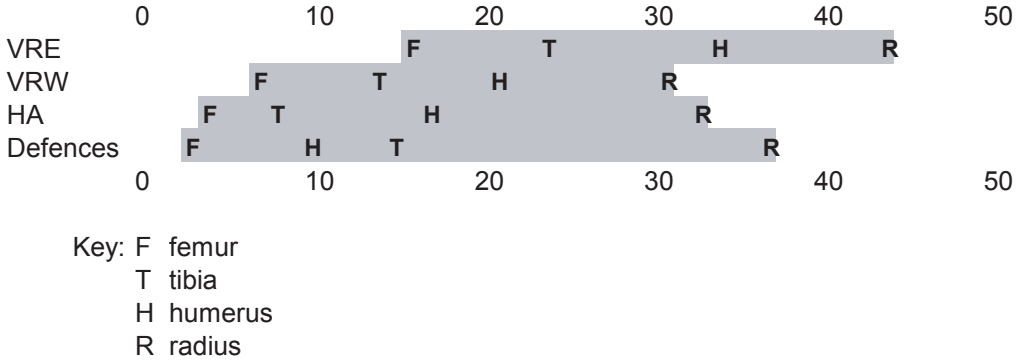


Figure 36 Percentages of axially split cattle upper limb bones

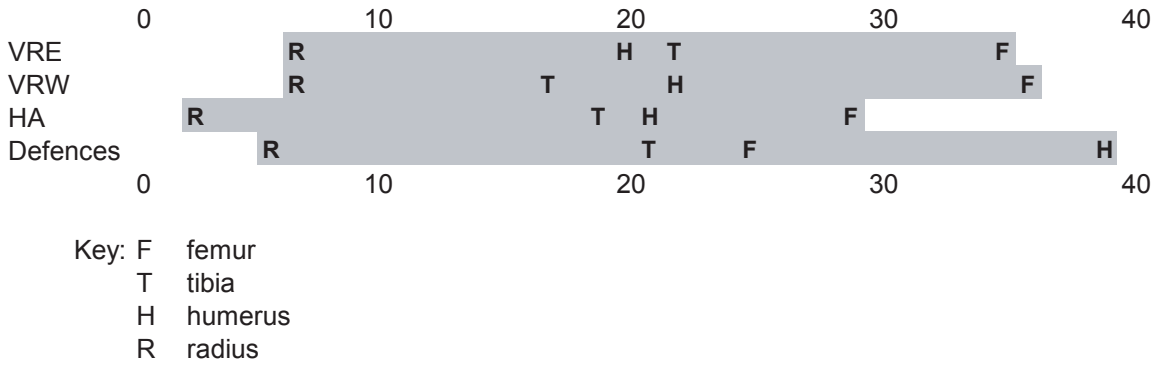


Figure 37 Percentages of cattle upper limb bones with blade marks

frequently they have been found in major urban centres, whereas they are virtually absent from rural samples such as Owslebury and Winnall Down. Specialist processing of cattle carcasses for their marrow and sometimes other products is clearly evident in such towns, as will be discussed more fully in Section 2.3. Small towns such as Neatham, Hampshire, have also produced axially split upper limb bones (Done 1986). Inspection of the bones from Neatham in the Hampshire Museum stores in preparation of this report confirms that the methods of splitting of the bones was very similar to Winchester.

There was less variation in the frequency of superficial axial blade marks in the Winchester samples. They were a little less frequently recorded in the Hyde Abbey assemblage than in the samples from other sites but were commonly observed on all of them. They were observed most commonly on femora and humeri and least commonly on radii (Fig 37). This consistency suggests that specialist butchers were usually filleting meat from these bones using a cleaver rather than a knife, some of which were further processed for marrow and other products.

Once again similar butchery techniques have been observed in a number of Romano-British urban assemblages (Table 2.225), for example in Dorchester (Maltby 1993), Cirencester (Maltby 1998), and Lincoln (Aird 1985). Identical marks have also been noted by the author in the collections from the small town at Neatham and in military deposits from the fort at South Shields. They have rarely been observed on rural sites such as Owslebury, Winnall Down and several other rural settlements in Hampshire (Maltby 1989a). Their presence may indicate the presence of specialist butchers in a settlement. The implications of this will be discussed further in Section 2.3.

Carpals and tarsals

Butchery marks were recorded on only three carpals but they were observed more commonly on the major tarsal bones, particularly in the Victoria Road East sample (Table 2.114). Astragali displayed a variety of chop marks, mainly made during the disarticulation of the feet at the ankle joint (Table 2.122). Sometimes this resulted in the astragali being completely severed horizontally usually from the anterior (A1, A3, A5). A few of the astragali had blade marks (A11 – Plate 24) or had been split axially (A7–8). This may imply that they were still attached to the tibiae at the time. Alternatively, some of the split specimens may have been broken to facilitate grease extraction.

Only one astragalus bore knife cuts in contrast to the sample from Owslebury, in which many astragali bore knife cuts made during disjointing (A9–10).

Nearly all of the butchered calcanei in the Winchester assemblages had been chopped (Table 2.123). Such marks were frequently observed on the calcaneal tuberosity, particularly on the medial aspect (C1–2).

Table 2.122 Butchery marks on cattle astragali from Winchester, Owslebury, and Winnall Down

Sample	C A1	C A2	C A3	C A4	C A5	C A6	C A7	C A8	K A9	K A10	B A11	C A12	N
VR East	4	14	10	6	5	2	4	1			3		74
VR West	1	1					1					1	24
HA										1			7
Defences							2						6
Total	5	15	10	6	5	2	7	1		1	3	1	
% Butchery	9	27	18	11	9	4	13	2		2	5	2	(56)
Staple Gardens	2	2	2	3	1		1				2		12
Owslebury	1			3	1				19	10			170
Winnall Down			1						3				22

Key:
A1 = oblique/horizontal chop through proximal usually running in an anterio-posterior direction
A2 = superficial chop/saw marks – proximal end
A3 = oblique/horizontal chop through centre of bone usually running in an anterio-posterior direction
A4 = superficial medio-lateral chop/saw marks – anterior aspect of central part of the bone
A5 = oblique/horizontal chop through distal usually running in an anterio-posterior direction
A6 = superficial chop/saw marks – distal
A7 = axial/oblique split through bone
A8 = repeated axial/oblique splits through bone
A9 = knife cuts – anterior aspect of central part of bone
A10 = knife cuts – anterior aspect distal end
A11 = superficial axial blade/chop/saw marks
A12 = superficial chop marks – posterior aspect of central part of bone running medio-laterally

Note: Other codes and data sources as Table 2.115

Chop marks were also found on other parts of the bone and quite a few had been chopped through the centre of the bone (C5). Most of these chop marks were probably made during the disarticulation of the tibia from the foot, although a few may have been broken for further processing. Only two bones with knife cuts were recorded from Winchester, whereas such cuts were the only type observed on calcanei from Owslebury and Winnall Down (C7–8).

The centroquartal (navicular cuboid) lies between the astragalus and the metatarsal. Most butchery marks observed on these bones were associated with their separation from the metatarsal. Most of the butchery marks in the Winchester samples consisted of superficial chop marks on the posterior aspect (Q2 – Table 2.124). Three specimens had been split axially (Q1), probably when still attached to the metatarsals. Three bones had knife cuts on the anterior surface (Q4), a method of disarticulation much more prevalent at Owslebury.

Plate 24 Cattle astragalus showing blade mark along posterior aspect (A11)

Metapodials and phalanges

The frequency of butchery observations on bones of the limb extremities was lower than for bones of the upper limbs (Table 2.114). In the case of the metapodials, this was largely because axial chop marks and blade marks, although present, were not found in great numbers (M1–4, M14 – Tables 2.125–2.126). Axially split bones had a restricted distribution and may have been mainly associated with bone working activities. It was quite common in the Victoria Road deposits to discover small portions of the distal ends of metapodials that had been chopped through obliquely (M3). These may have been required for grease production. Most metapodials had been broken across the shaft presumably to extract marrow. Chop marks were rarely associated with these breaks.

Axial blade marks associated with filleting were

Table 2.123 Butchery marks on cattle calcanei from Winchester, Owslebury, and Winnall Down

Sample	C C1	C C2	C C3	C C4	C C5	C C6	K C7	K C8	N
VR East	23	4	2	1	11	3	1		87
VR West	4				1		1		33
HA	1					1			7
Defences					1	2			12
Total	28	4	2	1	13	6	2		
% Butchery	50	7	4	2	23	11	4		(56)
Staple Gardens			2		1				13
Owslebury							2	9	182
Winnall Down								2	16

Key:
C1 = oblique/medio-lateral chop through calcaneal tuber
C2 = superficial chop/saw marks – calcaneal tuber
C3 = oblique/horizontal chops through distal end
C4 = superficial chop/saw marks – distal end
C5 = oblique horizontal chop through central part of bone
C6 = superficial chop/saw marks – central part of bone
C7 = knife cuts – central part of bone
C8 = knife cuts – distal end

Note: Other codes and data sources as Table 2.115

Table 2.124 Butchery marks on cattle centroquartals from Winchester, Owslebury, and Winnall Down

Sample	C Q1	C Q2	C Q3	K Q4	K Q5	N
VR East	3	9		1		27
VR West		1				10
HA				1		4
Defences				1		3
Total	3	10		3		
Staple Gardens			(none)			
Owslebury				18	1	99
Winnall Down				2		11

Key:
Q1 = axial chop through bone usually in an anterio-posterior direction
Q2 = superficial chop/saw marks – posterior/lateral aspects
Q3 = superficial chop/saw marks – anterior aspect
Q4 = knife cuts – anterior aspect (+ lateral and medial)
Q5 = knife cuts – posterior aspect

Note: Other codes and data sources as Table 2.115

found on only five metatarsals (M14). There is comparatively little meat on these bones and they were not processed for meat as intensively as the upper limb bones.

Superficial chop marks on the medial and lateral borders of the posterior aspect of the proximal end of metatarsals were commonly recorded (M5 – Plate 25). They correspond to the chop marks recorded on the posterior of several centroquartals (Q2 – Table 2.124). These disarticulation marks again contrast with those found at Owslebury, where the anterior aspects of the proximal ends of metatarsals often bore knife cuts (M10 – Table 2.126). As usual, knife cuts were rarely observed on the Winchester metapodials. None of the metacarpals from Winchester bore evidence of butchery associated with disjointing at the proximal

Table 2.125 Butchery marks on cattle metacarpals from Winchester, Owslebury, and Winnall Down

Sample	C M1	C M2	C M3	C M4	C M5	C M6	C M7	C M8	C M9	K M10	K M11	K M12	K M13	B M14	C M15	N
VR East	6	2	4	2			1		1				1			143
VR West	2	1		1			1					1				64
HA						(none)										18
Defences		1														39
Total	8	4	4	3			2		1			1	1			
Staple Gardens	4		4						1			2				39
Owslebury	1	1							5	1	3	6	3			380
Winnall Down	2															30

Key:
M1 = axial chop through proximal end
M2 = axial chop through shaft
M3 = axial/oblique chop through distal end
M4 = repeated axial chops through proximal or shaft
M5 = superficial medio-lateral chop marks – posterior aspect of proximal end
M6 = superficial medio-lateral chop marks – anterior aspect of proximal end
M7 = superficial horizontal chop/saw marks on shaft
M8 = horizontal chop through shaft
M9 = superficial horizontal chop/saw marks – distal end
M10 = medio-lateral knife cuts – anterior aspect proximal end
M11 = medio-lateral knife cuts – posterior aspect proximal end
M12= knife cuts on shaft
M13 = knife cuts – distal end
M14 = superficial axial blade/chop/saw marks on shaft
M15 = superficial chop/saw marks – medial/lateral aspects of proximal end

Note: Other codes and data sources as Table 2.115

Table 2.126 Butchery marks on cattle metatarsals from Winchester, Owslebury, and Winnall Down

Sample	C M1	C M2	C M3	C M4	C M5	C M6	C M7	C M8	C M9	K M10	K M11	K M12	K M13	B M14	C M15	N
VR East	9	2	11	8	13		2	2	1		1	1	1	4		260
VR West					1		1	1	4	2		1		1	1	66
HA	1	1			1										1	34
Defences					3	1		1			1	1	1		2	42
Total	10	3	11	8	18	1	3	4	5	2	2	3	2	5	4	
% Butchery	12	4	14	10	22	1	4	5	6	2	2	4	2	6	5	(81)
Staple Gardens	1	1	1	1	1				2							30
Owslebury							1		2	11	1	1	6			509
Winnall Down												1	3			49

Note: Codes and data sources as Tables 2.115 & 2.125

end. The point of separation from the upper limbs may often have been slightly higher up the leg.

Butchery marks were only found on the first of the phalanges (Plate 26). These consisted more often of knife cuts than chop marks (Table 2.127). Many of these knife cuts (Ph4–6) were probably associated with skinning. Initial incisions around the toes would have enabled the skin to be freed. Knife cuts on the posterior aspect of the proximal end (Ph2) may have either been associated with skinning or the disarticulation of the toes from the distal metapodials. Superficial chop marks in the same location are almost certainly associated with the latter practice (Ph8). Superficial chop marks were quite common

Plate 25 Cattle metatarsal showing superficial chop marks on the posterior aspect of the proximal end (M5)

Plate 27 Cattle thoracic vertebrae showing superficial chop marks on the lateral aspect of body (V3)

in the Winchester samples but almost absent from Owslebury (Ph8–10).

Bones of the trunk

Analysis of these bones is less detailed. Rib shafts were not identified to species, although butchery was

Plate 26 Cattle first phalanx showing knife cuts around the proximal end

recorded. They commonly displayed both chop marks and knife cuts. There is evidence that the rib cage was commonly segmented. The dorsal ends of the ribs were also frequently butchered and there is evidence that cleavers were commonly used to separate the rib heads from the thoracic vertebrae.

Butchery marks recorded on cattle vertebrae are quantified in Table 2.114. In addition to these, many small vertebral fragments not identified to species also displayed evidence for butchery. Butchery marks were placed in six broad categories (Table 2.128). The vast majority of butchery records consisted of chop marks. Most were associated with the division of the trunk into two halves. Axial chops running along the midline were comparatively rare (V1) but chops located slightly off centre or on the lateral parts of the vertebral body were common (V2–3 – Plate 27). There is also evidence that the trunk was usually segmented transversely (C4). Such marks were particularly common on the cervical vertebrae, showing where the neck had been divided and also in some cases where the skull had been detached.

Discussion

The butchery analysis has demonstrated that cattle carcasses were butchered systematically in Winchester. As the most important meat source for the town, it is to be expected that their carcasses would be heavily exploited to maximise their food value. Consequently, specialist butchers practised highly intensive techniques of carcass processing that were introduced by the Romans and followed standard procedures that have been encountered on other urban and military sites in Britain and elsewhere in the Roman Empire. These were professional tradesmen, who presumably worked full-time and dealt with many animals. Although some of

Table 2.127 Butchery marks on cattle first phalanges from Winchester, Owslebury, and Winnall Down

Sample	K Ph1	K Ph2	K Ph3	K Ph4	K Ph5	K Ph6	K Ph7	C Ph8	C Ph9	C Ph10	N
VR East		10	1	10	7	15	1	7	2	5	181
VR West		1	1		2		1	2		1	48
HA					1	1					20
Defences	1	2		1	2			1			22
Total	1	13	2	11	12	16	2	10	2	6	
% Butchery	1	17	3	15	16	21	3	13	3	8	(75)
Staple Gardens		3						1			15
Owslebury	3	3	2	17	4	23	3	1			319
Winnall Down				2		2					18

Key:
Ph1 = medio-lateral knife cuts – anterior aspect of proximal end
Ph2 = medio-lateral knife cuts – posterior aspect of proximal end
Ph3 = anterio-posterior knife cuts – peripheral aspect of proximal end
Ph4 = medio-lateral knife cuts – anterior aspect of shaft
Ph5 = medio-lateral knife cuts – posterior aspect of shaft
Ph6 = anterio-posterior knife cuts – peripheral aspect of shaft
Ph7 = knife cuts – distal end
Ph8 = superficial medio-lateral chop/saw marks – posterior aspect of proximal end
Ph9 = superficial medio-lateral chop/saw marks – anterior aspect of proximal end
Ph10 = superficial chop/saw marks – posterior aspect of shaft

Note: Other codes and data sources as Table 2.115

Table 2.128 Butchery marks on cattle vertebrae from Winchester

	C V1	C V2	C V3	C V4	C V5	K V6
Atlas	1	10	10	4	11	1
Axis	2	11	13	2	4	4
Other cervical vertebrae	6	15	18	11	8	1
Thoracic vertebrae		29	12	5	3	
Lumbar vertebrae	3	19	1	5	8	2
Sacrum	3	3	2	2	4	
Total	15	87	56	29	38	8
% Butchery	6	37	24	12	16	3

Key:
V1 = axial chop through centre of body in cranio-caudal direction
V2 = axial chop through lateral part of body in cranio-caudal direction
V3 = superficial axial chops on lateral
V4 = axial chop through body in medio-lateral direction
V5 = other chop marks
V6 = knife cuts

their methods would appear to lack finesse, it is probable that they were well suited to processing large numbers of animals quickly. In addition to the routine processing of cattle carcasses for meat, bulk processing facilitated the collection of specific bones as raw material for further processing for marrow and bone objects.

It is less likely that carcass processing was a specialist activity outside towns. New methods of butchery were generally not taken up in settlements like Owslebury. There, traditional methods of butchery continued which mainly used knives rather than cleavers. Carcasses were less heavily processed for marrow and grease.

Table 2.129 Summary of cattle mandibular tooth eruption data

	Eruption stage											
Site/group	**1**	**1–2**	**2**	**2–3**	**3**	**3–4**	**4**	**4–5**	**5**	**5–6**	**6**	**Total**
VR East wells & pits	1	1					3	1	2		28	36
VR East other					1		5	5	8		50	69
VR West	2			1	1				1	1	16	22
HA						1	1				13	15
Defences						1	1		2		13	17
Total	3	1	0	1	2	2	10	6	13	1	120	159
%	2	<1	0	<1	1	1	6	4	8	<1	75	

Key:
Stage 1 = deciduous 4th premolar (d4) not in wear
Stage 2 = d4 in wear; 1st molar (M1) not in wear
Stage 3 = M1 in wear; 2nd molar (M2) not in wear
Stage 4 = M2 in wear; 3rd molar (M3) not in wear
Stage 5 = M3 in wear; permanent 4th premolar (P4) not in wear
Stage 6 = P4 in wear

Ageing data

Two main methods were used to study the mortality data of cattle represented in the Winchester deposits. Epiphysial fusion data will be discussed later. The first method involved the analysis of the eruption and surface wear of the mandibular cheek teeth. Mandibles possessing premolars and/or molars were recorded using the system of Grant (1982). These were assigned where possible into one of six wear stages which have been defined in Table 2.129. Wear on isolated loose teeth was not analysed.

Analysis of toothwear patterns employed the method of calculating numerical values to the molars devised by Grant (1982). The method works on the principle that the higher the numerical value, the greater the wear on the teeth and, by implication, the greater the age of the animal to which the mandible belongs. The translation of these values into absolute ages is, however, still rather subjective, particularly for the older specimens. It should also be noted that the values do not represent equal age spans. Mandibles possessing only premolars could not be analysed by this method. Missing molars meant that a lot of values could only be estimated. It was, however, possible to place 149 mandibles into arbitrary groups covering five numerical values (1–5, 6–10 … 36–40, 41–5, 46+). Further limitations of this method have been discussed by O'Connor (2003).

Epiphysial fusion data are less reliable than tooth eruption data because of the problems of canid scavenging. Many fusion surfaces of cattle limb bones were destroyed completely, particularly those with later fusing epiphyses (Table 2.92; Fig 35). It must be assumed that the unfused specimens of younger animals suffered more severely from this attrition than the denser, fused epiphyses. There are also many problems of determining the ages of epiphysial fusion (Grigson 1982). A fused epiphysis also only indicates that it belonged to an animal that died later than the age of fusion of that particular epiphysis. If the line of fusion is still visible, it shows that the animal survived only for a short time after fusion. However, in cases where this line has completely disappeared, it cannot be determined how long after fusion the animal lived. For example, a cattle tibia with a fused proximal epiphysis probably belonged to an animal over 42–48 months old (Silver 1969), but it is impossible to be certain whether the animal died at five, ten, or fifteen years old. Nevertheless, epiphysial fusion data can be used with care to supplement the toothwear evidence.

The results from cattle mandibular tooth eruption showed that 75% of the sample of 159 mandibles from all sites had reached Stage 6, in which all the permanent cheek teeth were erupted and in wear. These represent cattle of over three years of age and probably substantially older in many cases. There was comparatively little variation in this high percentage of adult cattle between different sites, although 87% of the mandibles in the small sample from Hyde Abbey were at Stage 6 (Table 2.129).

A maximum of only 9% of the cattle mandibles belonged to animals that died prior to the second molar coming into wear. There is little evidence therefore for the slaughter of immature cattle under two years of age. Only four mandibles of young calves were recorded (Stages 1–2).

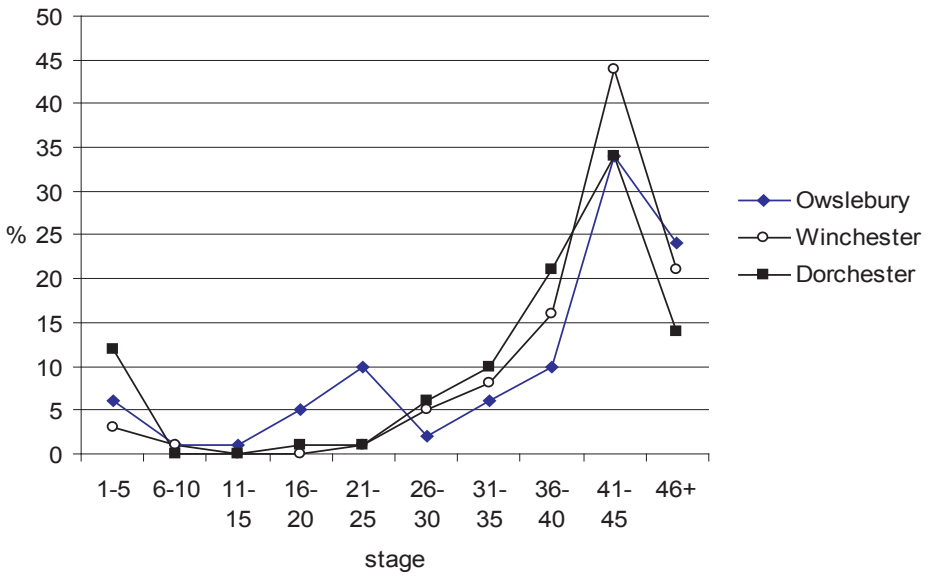
The mandibles at Wear Stages 1–2 had numerical values of 1–5 (Table 2.130). Calves were therefore only represented by 3% of the mandibles. Further, only 11% of the mandibles had values of less than 30, clearly suggesting that there was no great demand for the slaughter of immature cattle in the town.

The mandibles with all molar teeth in wear could be assigned to the three highest groups of numerical values (36–40, 41–45, 46+). Twenty-one per cent of the mandibles had values of 46 and above and always had

Table 2.130 Summary of wear stages of cattle mandibles

	Numerical value of wear										
Site/group	**1–5**	**6–10**	**11–15**	**16–20**	**21–5**	**26–30**	**31–5**	**36–40**	**41–5**	**46+**	**Total**
VR East wells & pits	2					2	2	5	16	8	35
VR East other				1	1	3	8	10	25	15	63
VR West	2	2					1	2	11	3	21
HA					1			3	7	3	14
Defences						2	1	4	6	3	16
Total	4	2	0	1	2	7	12	24	65	32	149
%	3	1	0	<1	1	5	8	16	44	21	

Note: Method adapted from Grant (1982)
Totals include estimated numerical values



Totals include estimated values
Dorchester: Dorchester Greyhound Yard
Owslebury: 3rd- and 4th-century deposits at Owslebury

Figure 38 Cattle mandible wear stages

heavy wear on the first molar and sometimes on the second and third molars too. These are likely to have belonged to quite old animals.

Mandibles were most abundant in the 41–45 group, representing 44% of the total sample. This is a marked peak of slaughter of cattle that were fully grown adult animals, but which had not attained very old age. Absolute ageing is difficult because of likely variability in eruption and toothwear rates, but many of these cattle were possibly aged between four and seven years at death. There was also a substantial percentage of mandibles in the 36–40 group (16%), representing slightly younger cattle. The mortality profile suggests that there was a tendency to select animals that had reached full size but were not kept for a long period thereafter for breeding, milking, or working.

Figure 38 compares the percentage of mandibles in the various numerical values groups from Winchester with Roman samples from Owslebury and Dorchester. In all three assemblages, most of the mandibles belonged to adult animals with fully erupted tooth rows.

There are, however, some differences between the samples. Relatively more mandibles with values

Table 2.131 Summary of cattle epiphysial fusion data

		U	J	F	%F
Early fusing epiphyses	Radius, proximal	3	-	207	99
	Scapula, glenoid process	3	-	127	98
	Acetabulum	2	-	82	98
	Humerus, distal	1	1	128	98
	Phalanx 1, proximal	5	-	245	98
	Phalanx 2, proximal	4	-	118	97
Later fusing epiphyses	Tibia, distal	7	4	128	92
	Metacarpal, distal	5	2	78	92
	Metatarsal, distal	10	2	92	88
Late fusing epiphyses	Femur, distal	3	2	48	91
	Radius, distal	9	4	54	81
	Humerus, proximal	3	1	17	81
	Femur, proximal	6	4	40	80
	Calcaneus, proximal	8	1	20	69
	Tibia, proximal	20	4	17	41

Key:
U = unfused
J = fusing
F = fused
%F = percentage fused

Note: For discussion of fusion ages, see Grigson (1982)

of 46+, belonging to old cattle, were present in the sample from the rural settlement at Owslebury than in the samples from the urban sites. There were also slightly higher percentages of immature cattle in the Owslebury sample. There is therefore slightly more variability in the ages of cattle there than in Winchester, in particular. This may suggest a greater degree of selectivity in the ages of cattle chosen for slaughter in the town, with fewer very old animals and fewer animals culled prior to the main peak of slaughter. This pattern supports the notion that Winchester was largely a consumer site importing cattle, whereas Owslebury was a producer site, perhaps exporting some cattle to the urban butchers.

Other Romano-British urban and military assemblages have produced similar mortality profiles to Winchester, with marked peaks of cattle slaughter at similar stages of toothwear. Examples include samples from Portchester Castle (Grant 1975), Exeter (Maltby 1979a), and Cirencester (Maltby 1998). Results from some other urban samples are shown in Table 2.227.

Mandibles of calves were rarely found in the Winchester samples. They were more common in the Dorchester sample, where they provided 12% of the mandibles (Table 2.227). Several different reasons can be given to explain this discrepancy. The first factor is that of differential preservation. Most of the calf mandibles in Dorchester were found in cess pits with excellent bone preservation. Contemporary soil layers produced much fewer calf mandibles (Maltby 1993). Very few similar deposits were excavated in the Winchester sites and it is worth noting that three of the four mandibles from neonatal mortalities were found in pits or wells. Mandibles of young ungulates generally survive less well amongst scavenged material than those of older animals and are likely to be under-represented (Munson and Garniewicz 2003).

Secondly, many of the calf mandibles from Dorchester were found in pits within domestic properties. Those households may often have acquired calves and butchered them themselves. The Winchester cattle assemblages were dominated by bones of adult animals which had been butchered by specialists. Carcasses of calves may not have been processed in the same way as adult cattle and their bones may have been dumped in different locations. Excavations of properties nearer the centre of Winchester may produce more evidence for the consumption of veal.

However, at the moment, there is no evidence that veal production was an important component of cattle husbandry in the Winchester area. Veal calves are often a by-product of dairy cattle and therefore there is also no strong evidence that milk production was very important.

Table 2.131 presents the epiphysial fusion data from all the sites in Winchester. Fused specimens dominated all the fusion groups. Very few unfused early-fusing epiphyses were recovered indicating that cattle under approximately a year old are very poorly represented. In addition, 88–92% of the distal tibiae and metapodials were fused, indicating that only about 10% of the cattle represented were younger than about 30 months

Table 2.132 Cattle withers heights estimates

Context	Bone	Estimated heights (cm)
VR East pit F814	Radius	109.2, 116.1
	Metacarpal	113.7, 118.7, 119.1, 119.1, 119.6, 121.6
	Metatarsal	111.7, 115.5, 115.5, 116.6, 119.9, 120.4, 122.6, 123.2, 123.2, 127.5
Other contexts	Radius	110.9, 111.8, 114.4, 124.5, 133.7
	Metacarpal	105.0, 107.6, 109.0, 110.6, 114.5, 115.2, 116.7, 120.6, 121.6, 127.7
	Metatarsal	108.5, 108.9, 110.6, 111.2, 113.6, 115.2, 116.5, 116.6, 122.0

	N	Min	Max	Mean	SD	CV
Pit F814	18	109.2	127.5	118.5	4.5	3.8
Other contexts	24	105.0	133.7	115.3	6.9	6
Total	42	105.0	133.7	116.7	6.1	5.2
Owslebury LR	40	104.4	130.9	115.8	6.7	5.8
Dorchester LR	40	100.7	121.4	111.3	5.5	4.9

Note:
Data for Owslebury and Dorchester late Roman adapted from Maltby (1987a; 1993)

Estimates calculated by multiplying greatest lengths by factor devised by Matolsci (1970) for the radius (4.3) and Fock (1966) for the metacarpal (6.125) and metatarsal (5.45).

old at death. These results broadly support the findings of the toothwear analysis.

Most of the late fusing limb bone epiphyses were also fused. Over 80% of the distal radii and femora and proximal humeri and femora were fused, indicating that most of the cattle were over four years old. However, the difficulties of interpreting fusion data are demonstrated here by the fact that only 41% of the proximal tibiae, which are usually believed to fuse at approximately the same time as the other late fusing epiphyses, were fused. It is possible that the proximal tibia in fact fuses rather later than the others. Alternatively, it is equally possible that unfused proximal tibiae simply survived better than the unfused specimens of the other bones.

Metrical data

The high levels of fragmentation of cattle bones restricted the number of measurements that could be taken. The practice of splitting the limb bones axially severely limited the number of upper limb bones that could be measured. Gnawing damage was also detrimental to metrical studies. Details of the most common measurements taken are listed in Appendix 1.

Withers heights were estimated from the greatest lengths of complete bones using the conversion factors of Fock (1966) for the metapodials and Matolsci (1970) for the radii. Only 42 bones could be measured in this way. Eighteen of these were found in one feature, pit F814 at Victoria Road East (Group VRE22). This unusual group was treated separately (Table 2.132).

Estimates of withers height ranged between 105.0cm and 133.7cm. The mean from all contexts was 116.7cm. However, the bones from pit F814, were on average from larger cattle (mean = 118.5cm) than those from other contexts (mean = 115.3cm). Standard deviation calculations (Table 2.132) showed that there was less variation in the size of the bones from that feature, which may well have derived from one source.

The average and range in size of the cattle were similar to the animals found in Romano-British deposits at Owslebury (Table 2.132) but cattle from both sites were on average about 4cm taller than those from contemporary deposits in Dorchester. Cattle in the west of Britain were generally smaller than those in south-east England and the Midlands in this period (Maltby 1981, 1993). This may reflect the introduction of more new, larger stock in the latter regions in the Roman period. Alternatively, or in addition, it may indicate the development of improved husbandry practices in the more Romanised areas. Improvements in the size of cattle in these areas were not evident on the outskirts of the province.

Unfortunately, the nature of the Winchester sample meant that no investigation of possible diachronic changes in the sizes of cattle was possible. Victoria Road East pit F814 (Group VRE22) contained a good early to mid-4th-century group of bones and it is possible that the larger size of animals represents improvements in the size of cattle in the late Roman period. However, this is just a single assemblage, which has a number of unusual features. The metapodials were associated with horn cores and could represent skinning waste brought in from a single source. To extrapolate from this that there were general changes in the quality of cattle at this time is premature.

The breadths of cattle limb bones tend to be greater in males than females. In addition, it is known that the

Table 2.133 Length and breadth measurements of complete cattle metacarpals

Site/context	GL	Bp	SD	Bd	Bd/GL	Possible Sex
VR East F814	185.6	55.0	31.3	54.8	0.30	Female?
	185.6	61.6	35.5	-	-	Male?
	193.8	58.7	32.1	59.0	0.30	Female?
	194.4	54.7	29.8	-	-	Female?
	194.4	60.7	33.5	60.1	0.31	Male?
	195.2	59.8	34.7	62.9	0.32	Male
	196.7	65.1	36.9	66.4	0.34	Male
	198.5	61.6	35.9	62.8	0.32	Male
VR East Other	175.6	48.6	27.6	52.0	0.30	Female?
	177.9	54.2	28.4	55.3	0.31	Male?
	196.9	58.5	34.8	65.3	0.33	Male
	198.5	64.4	38.7	63.4	0.32	Male
	208.5	57.2	33.1	61.0	0.29	Female
VR West	188.0	53.8	32.4	55.5	0.30	Female?
Henly's Garage	171.5	48.4	28.3	50.6	0.30	Female?
	180.5	-	27.3	52.0	0.29	Female
	187.0	51.3	30.6	53.4	0.29	Female
	190.5	52.3	28.0	55.0	0.29	Female

Key:
GL = greatest length
Bp = maximum proximal breadth
SD = minimum shaft breadth
Bd = maximum distal breadth

Note: All measurements in millimetres

lengths of metacarpals also display sexual dimorphism (Grigson 1982). For complete bones, Howard (1963) devised indices that she claimed could separate male from female specimens. For example, metacarpals with distal breadth: greatest length indices of 0.30 and below were classified as cows; those with indices above 0.30 as castrates or bulls, the latter having the highest indices because of their greater stockiness. However, Albarella (2002) has argued that several other factors, particularly differences in breed, can also influence these indices and interpretation of sexual dimorphism must be carefully considered. There is also the possibility that expansion of the distal ends of metacarpals could in some cases be caused by occupational stresses such as ploughing (Bartosiewicz *et al* 1997).

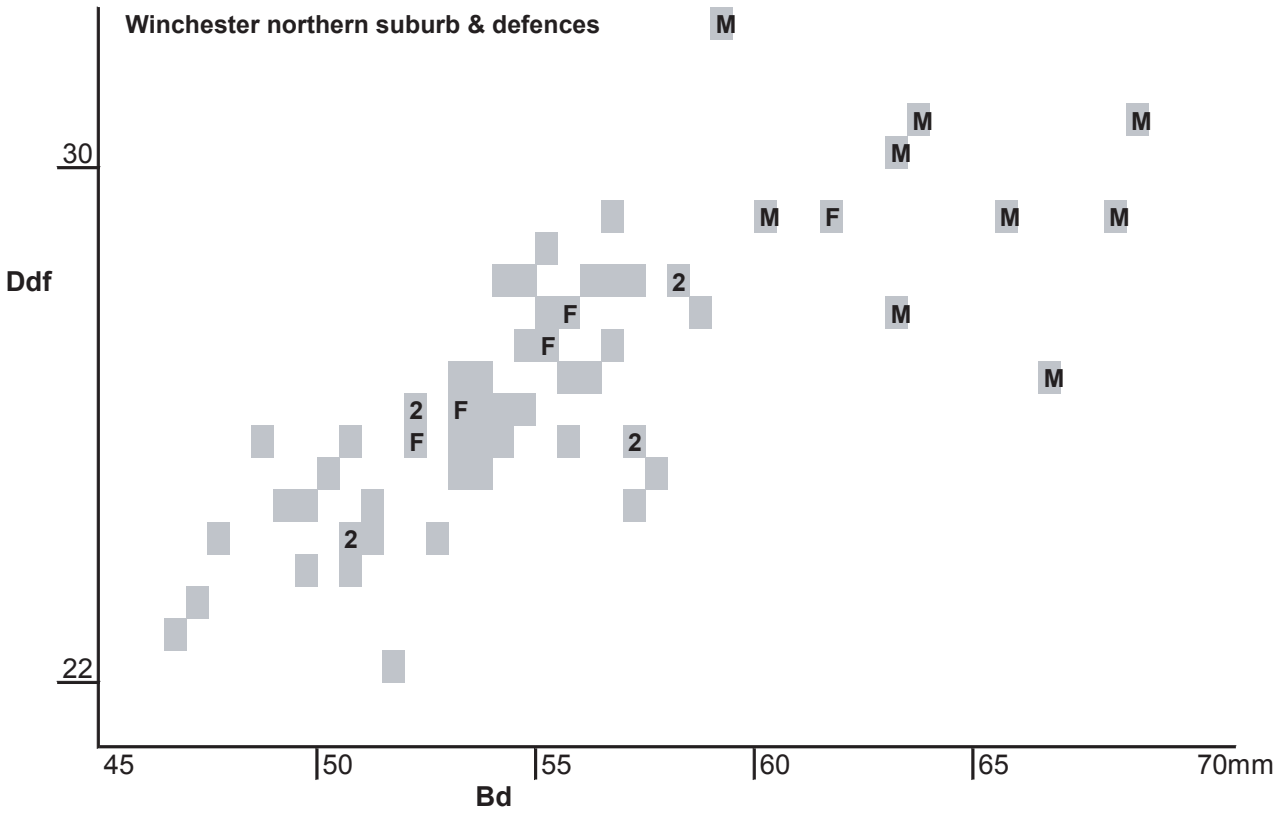
Metrical data from all the complete fused metacarpals are presented in Table 2.133. They show interesting variations in metacarpal dimensions from different sites. Most of those from Pit F814 appear to have probably been from males. They were associated with horn cores most of which had morphological characteristics typical of steers (Armitage 1982a).

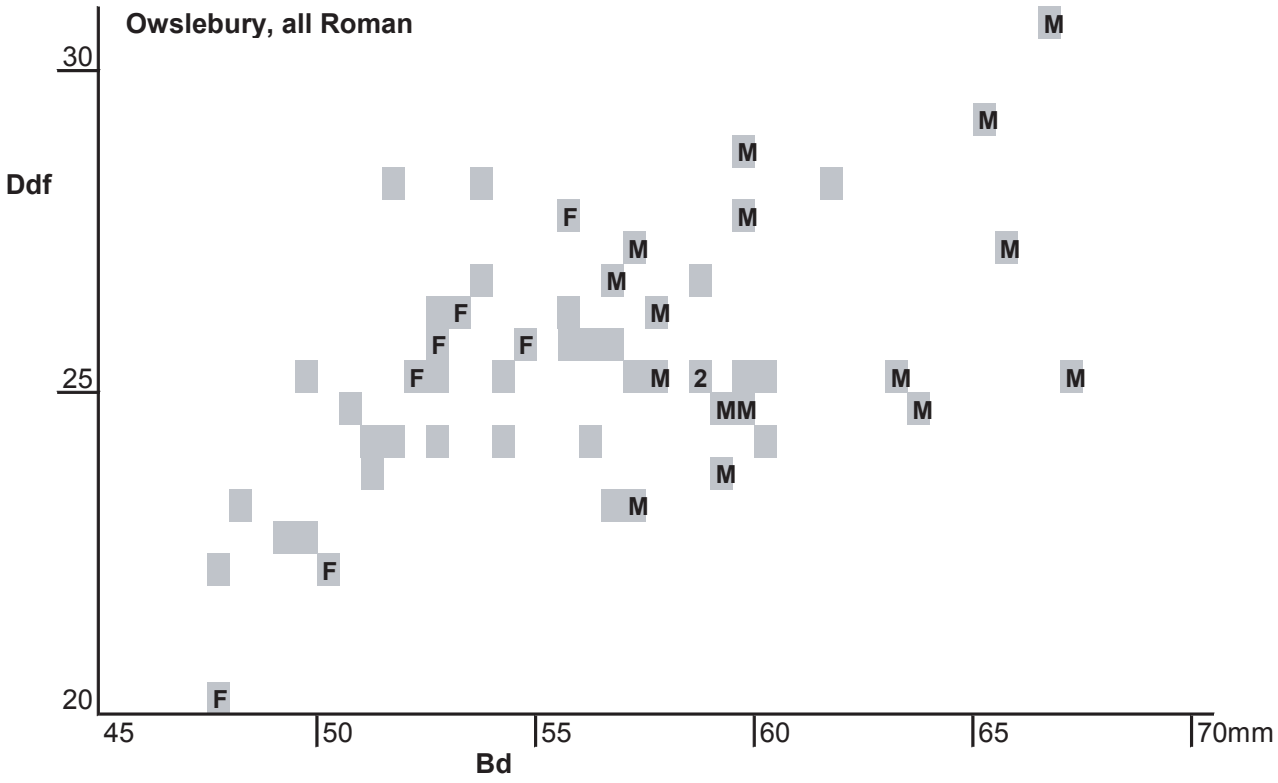
Three of the five complete metacarpals from other Victoria Road East deposits fell into the putative male range. However, the five complete specimens from other sites had dimensions more typical of cows. Overall, including some very marginal cases, ten females to eight males were represented by complete bones.

The relative numbers of adult male and female cattle can be further investigated by adding the measurements of the distal ends of incomplete bones to the sample of complete specimens. Distal breadth measurements were plotted against measurements of the depth at the distal fusion point (Fig 39). Complete specimens provisionally assigned as male or female are indicated in this diagram. The results show that the great majority of broken specimens had dimensions similar to the complete specimens assigned as females.

If the interpretation that the variations are caused primarily by sexual dimorphism is correct, these results suggest that relatively few metacarpals of male cattle over three years of age were represented. The bias towards the smaller (female) specimens would have been greater if the bones from Pit F814 were excluded. It is also possible, however, that the cattle in this pit belonged to members of a larger and stockier type (possibly also used as plough animals) brought to Winchester in the late Roman period. This may in turn suggest that there were different supply networks involved in bringing cattle to Winchester.

The distribution of measurements from Winchester contrasts with the results from the Romano-British assemblage from Owslebury (Fig 39). There, a much greater proportion of metacarpals were in the upper end of the range. Many of these were complete and





Key: Ddf depth distal fusion point
F complete, probably female
Bd maximum distal breadth
M complete, probably male
2 two specimens, same measurements

Figure 39 Measurements of distal ends of cattle metacarpals

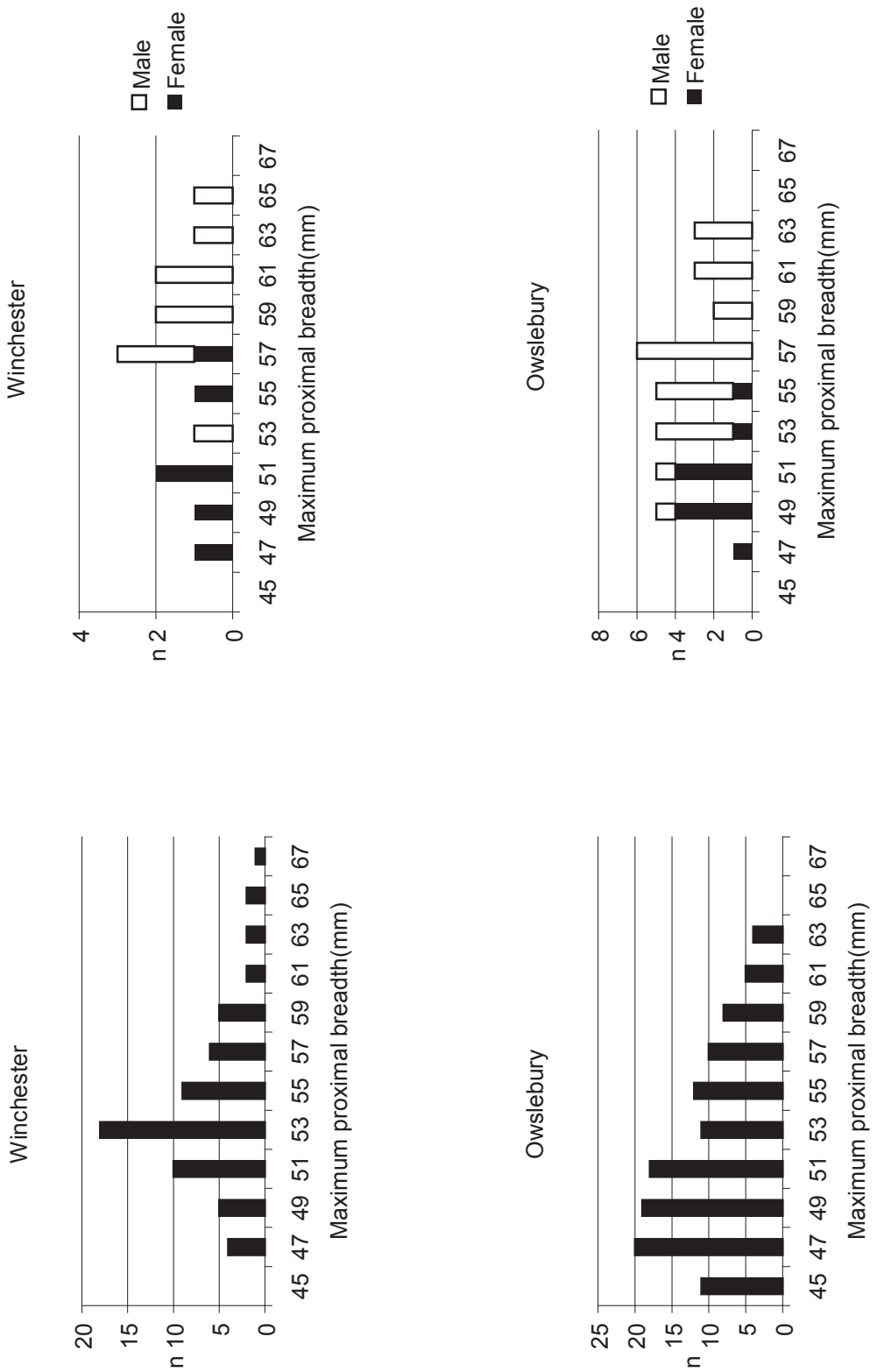


Figure 40 Maximum proximal breadth measurements of cattle metacarpals

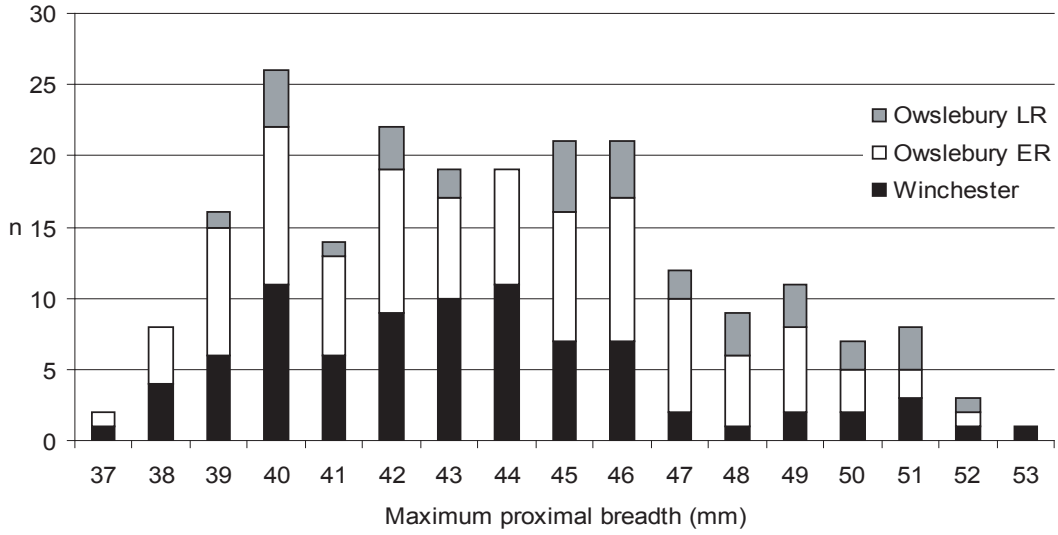


Figure 41 Maximum proximal breadth measurements of cattle metatarsals

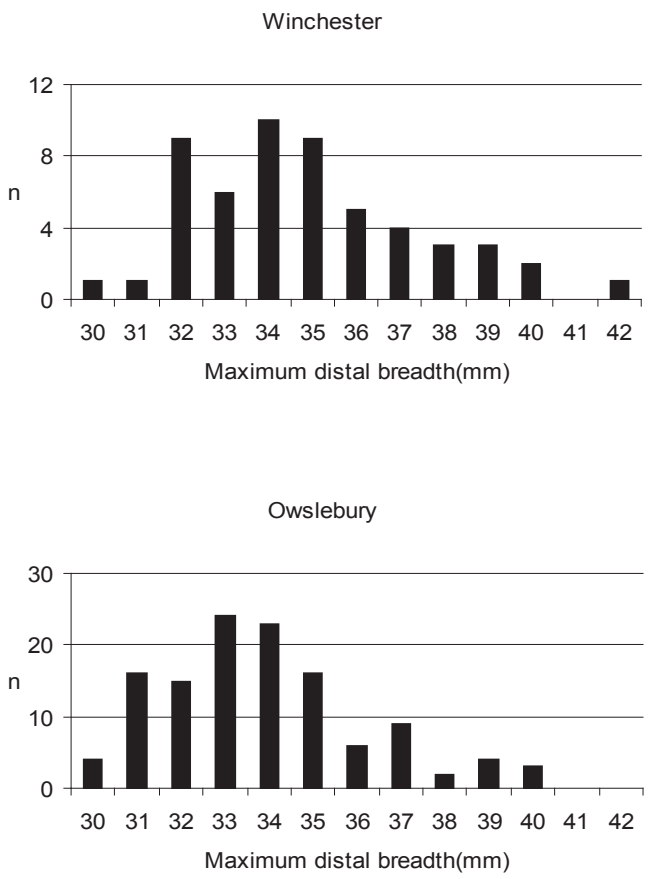


Figure 42 Maximum distal breadth measurements of cattle astragali

were placed in the male category using Howard's indices (Maltby 1987a). If the interpretation is correct, the inhabitants of Owslebury slaughtered much more even numbers of male and female cattle. Inhabitants of Winchester were usually provided with meat from cows. There is no clear evidence that cattle at Owslebury generally belonged to larger and stockier types than those found in Winchester. It appears that relatively more male cattle could have been utilised as plough animals at the producer site of Owslebury. Surplus cows from here and similar farms and villas could have been sent to Winchester.

Comparisons of breadth measurements of proximal metacarpals from Winchester and Owslebury tended to support this conclusion, although the results were harder to interpret (Fig 40). Probable overlap between the largest female and the smallest male specimens made it impossible to assign all the metacarpals as male or female. A few specimens may have belonged to immature cattle. Both distributions were positively skewed, containing more smaller, arguably mainly female specimens. However, the Owslebury sample contained a higher proportion of complete 'male' metacarpals and relatively more broken specimens of similar breadths. The metacarpals of both male and female cattle in the Winchester sample tended to be slightly broader than those at Owslebury and a higher proportion of broken bones were in the range of the complete metacarpals assigned as females.

Measurements of the maximum proximal breadth of metatarsals from Winchester produced similar contrasts to samples from Owslebury. The Winchester sample was positively skewed with a lot of smaller specimens, signifying a bias towards females. The Owslebury samples had a different distribution, the 3rd- to 4th-century sample, in particular, being negatively skewed towards larger specimens (Fig 41).

Comparisons of the distal breadths of astragali from Winchester and Owslebury are more difficult to interpret (Fig 42). The degree of overlap between males and females is not known. The Winchester distribution, however, was strongly positively skewed, which again could imply that females were represented in greater numbers.

The samples of upper limb bones which provided

Table 2.134 Summary of other cattle measurements

Anatomy	Measurement	N	Min	Max	Mean	SD	CV
Horn core	Max Base	64	34.0	82.1	50.4	9.8	19.5
	Min Base	62	26.5	57.1	38.2	7.3	19.2
	LOC	29	85.0	240.0	148.9	28.4	19.1
Humerus	BT	10	63.8	80.1	69.9	5.4	7.8
	HT	50	34.5	53.1	42.0	3.4	8.0
Radius	GL	11	240.0	311.0	268.3	22.3	8.3
	BFp	9	65.6	83.0	71.5	6.1	8.5
	Dp	39	35.4	49.6	40.0	3.6	9.1
Femur	DC	9	35.2	49.6	43.2	4.9	11.4
Tibia	Bd	31	50.5	66.1	57.0	3.9	6.9
	Dd	35	34.5	50.1	43.2	3.6	8.4
Calcaneus	GL	7	112.0	133.8	124.5	8.5	6.8
Astragalus	GLl	57	49.7	73.3	63.5	4.4	6.9
	GLm	54	51.6	66.7	57.7	3.5	6.0
	Bd	55	30.9	42.0	35.4	2.5	7.2
Metacarpal	GL	18	171.5	208.5	190	9.4	4.9
	Bp	63	47.0	68.6	55.0	4.5	8.3
	Dp	58	28.5	50.1	34.1	3.7	10.8
	Bd	62	46.7	63.4	54.2	3.7	6.9
	Bdf	67	43.6	60.4	50.6	4.4	8.6
	Ddf	67	22.1	32.5	26.5	2.1	8.1
Metatarsal	GL	19	199.0	234.0	214.3	9.9	4.6
	Bp	84	37.9	53.2	43.8	3.6	8.1
	Dp	49	36.2	49.3	41.9	3.2	7.5
	Bd	63	43.6	60.6	50.5	3.6	7.1
	Bdf	63	39.1	55.6	46.9	3.2	6.9
	Ddf	52	23.6	33.5	27.6	2.2	7.8

Key:
Max Base = maximum diameter horn core base
Min Base = minimum diameter horn core base
LOC = length of outer curvature of horn core
BT = breadth distal trochlea
Bd = maximum distal breadth
HT = greatest height of distal trochlea
Bp = maximum proximal breadth
BFp = breadth of proximal articular surface
DC = depth of proximal caput of femur
CV = coefficient of variation
Dp = maximum proximal depth
Dd = maximum distal depth
GL = greatest length
GLl = greatest length lateral half
GLm = greatest length medial half
Bdf = breadth distal fusion point
Ddf = depth distal fusion point
N = number of measured bones
SD = standard deviation

All measurements in millimetres

breadth measurements were restricted by the practice of axial splitting. However, as can be deduced from the summary of the ranges and means of breadth measurements of some of these bones (Table 2.134), the distributions of the distal humeri, proximal radii, and distal tibiae were also positively skewed.

The metrical data appear to suggest that the majority of the cattle represented in Winchester were female. Rural settlements such as Owslebury could have supplied cows for slaughter by the urban butchers. Such a trend could explain why relatively more male specimens were represented in the Owslebury sample. The higher incidence of steers in the Owslebury sample could also indicate their importance as working animals on that farming settlement.

This assumes that the inhabitants of Winchester were supplied with meat solely from outside sources. Some of them may have owned their own stock and some cattle may have been kept in or close to the town. The absence of large numbers of calf bones suggests that dairying was not very important, although this theory needs to be reviewed after better preserved

assemblages from other parts of the town have been investigated.

Variations in the size of measurements of most bones were fairly similar with coefficients of variation usually between 6% and 9% (Table 2.134). The variability of horn core measurements, however, was much greater, with coefficients of variation of about 19%. Most of the horn cores were the size of short horn specimens as defined by Armitage (1982a). A horn core with maximum and minimum basal diameters of 45.7mm and 34.5mm was the only measurable specimen in the cattle assemblage from the sieved samples. This specimen fell within the lower end of the range encountered in the rest of the assemblage (Table 2.134).

The stature of cattle in comparison with those from other Romano-British urban sites is discussed in Section 2.3 (pp 292–293).

The sheep/goat assemblage

Associated groups of bones

Associated groups of sheep and goat bones were found in six assemblage groups. They have already been described briefly above in the discussion of the contexts where they were found. These groups are, however, worthy of more detailed consideration.

Pit F981 at Victoria Road East (Group VRE23) included thirteen bones possibly from the same skeleton (Table 2.136). A pair of metacarpals in *3834* and a pair of metatarsals in *3841* were both identified as goat. Both pairs of bones had unfused distal epiphyses and were porous. These could have belonged to the same kid, which was probably substantially under six months old when it died. Nine sheep/goat ribs in *3842* could not be identified to species but the porosity of these associated bones indicated that they also belonged to a juvenile animal, probably the same one as the metapodials. Several other more fragmentary sheep/goat porous bones recovered from the pit could also have belonged to the same skeleton. No evidence of butchery was found on any of the associated bones. The foot bones may have been associated with the skin.

A post-hole (F58) associated with the possible structure adjacent to Cirencester road (Group VRE16) produced 24 bones of an immature animal represented mainly by vertebrae and probably also by the right femur and tibia (Table 2.138). The femur was identified as belonging to a sheep on the basis of the morphology of its proximal end (Prummel and Frisch 1986). All epiphyses were unfused and the animal was probably under two years old. None of the bones were porous and the size of the limb bones suggests that the animal was over one year old. Butchery was noted on three vertebrae. The atlas had knife cuts across the cranial part of the ventral surface made when the head was removed from the neck; the axis had knife cuts running vertically on the lateral aspect of the body near the cranial end.

The pit or well F43 from Victoria Road West (Group VRW14) included associated bones from several species. Amongst these were 26 bones of the head and feet of a juvenile lamb (Table 2.141). All its bones were porous and the first molars had just erupted, indicating that the animal was about 2–4 months old (Jones 2006). Knife cuts were observed on the anterior aspects of the left calcaneus and astragalus made when the feet were separated from the upper hindlimb at the ankle joint. The head and feet were probably discarded during the primary stages of butchery and perhaps remained attached to the skin when this was removed.

The final three deposits contained larger groups of associated bones. Building 2 at Victoria Road West (Group VRW3) produced two groups of bones (Table 2.142). The first, from the fill of post-hole F9, contained 67 bones of a ewe with a hornless skull. The morphology of the skull and several of the limb bones confirmed that the skeleton belonged to a sheep. Most parts of the body were represented, although some small bones were missing and most of the vertebrae and some of the hindlimbs survived only as fragments (Plate 28).

All the mandibular molars were in wear but the first molar was not in heavy wear. This corresponds to Stage 5 of the tooth eruption sequence and indicates that the sheep probably died between 30 and 48 months old. This was the most common stage of slaughter of sheep represented on the Winchester sites (Table 2.153). Epiphysial fusion data gave broad support for this estimate. All early fusing limb bone epiphyses had fused, as had the distal tibia and distal metapodials. Of the late fusing epiphyses, the calcaneal tuber had fused, the epiphyses of the distal femur and proximal tibia were fusing but the proximal humerus was unfused. Ageing of sheep by epiphysial fusion is fairly unreliable but taken in conjunction with the toothwear data, the evidence suggests that the sheep skeleton belonged to an animal of about three years old. A femur and tibia of a foetal lamb were found in the same context and may have belonged to the same animal.

Butchery marks were observed on seven bones of this skeleton (Plate 29). Both calcanei bore knife cuts on their lateral and anterior aspects and an astragalus and a centroquartal had corresponding knife cuts on their anterior surface. These are marks typically made when the feet are removed from the hindlimbs (Binford 1981). Further evidence for dismemberment is provided by an oblique chop through the lateral aspect of the shaft of a tibia towards the proximal end. Both tibiae had been broken into two or three pieces. The pelvis bore oblique knife cuts on the ventral aspect of the shaft of the ischium. These may have been made during filleting of meat at the top of the leg joint. Finally, a lumbar vertebra bore knife cuts that ran vertically along the side of the body of the vertebra. These were possibly made when the flanks were detached from the vertebral column.

One of the centroquartals bore slight evidence of burning. This carcass had therefore been at least partially dismembered and possibly filleted. The scorched bone may also infer that parts of the carcass

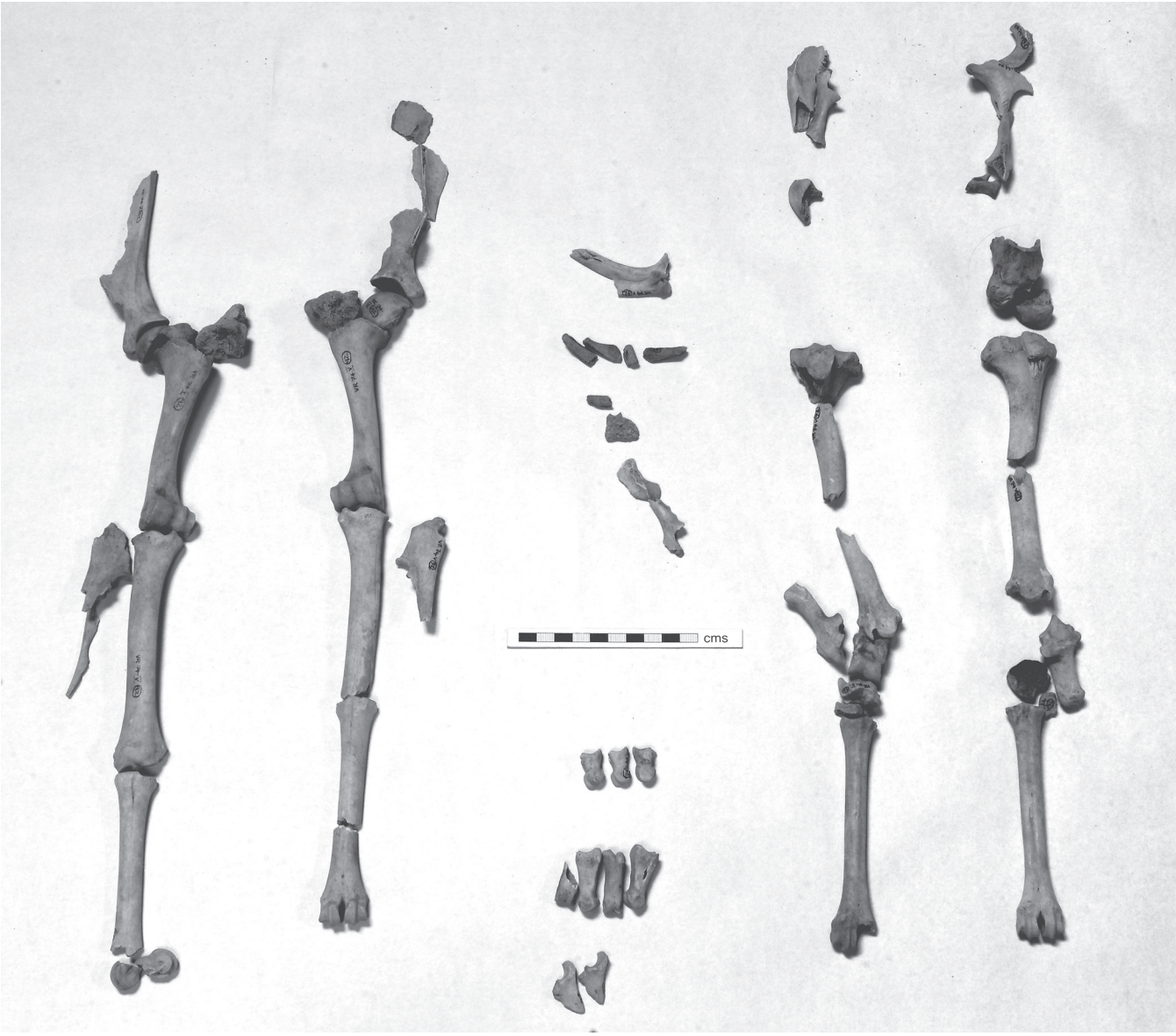


Plate 28 Bones of sheep skeleton in Victoria Road West Building 2 (post-hole F9)

were roasted. However, it seems that the dismembered bones were subsequently collected and deposited together.

The second group of sheep bones from Building 2 (Group VRW3) was found in the floor layer (405). The maximum total of associated bones in this group amounted to 61 bones, all of which could have belonged to the same animal. Bones from most parts of the body were found but a number of them survived only as fragments because of ancient breakage and butchery. Most of the major limb bones were represented, although the femora, tibiae, and one of the radii were incomplete. The posterior projection of the distal joint surface of one of the femora had been chopped off axially, probably during separation from the tibia. There was also evidence that the front and hind feet had been disarticulated from the upper limbs. A carpal bore a knife cut on its posterior surface and an astragalus and centroquartal had been cut on their anterior surfaces at the point where the feet were detached. Both halves of the pelvis had also been butchered: in one case the caudal part of the ischium had been chopped off; the other had been chopped through the acetabulum at the junction of the pubis and ilium. This would have separated the femur from the os coxae.

Epiphysial fusion data from the limb bones showed that all the early fusing epiphyses had fused but the distal tibia was only just fusing and the distal metapodials and all late fusing epiphyses were unfused. This indicates that the sheep probably died between one and two years old, possibly in the latter part of that range. The morphology of the metapodials and some other limb bones were typical of sheep rather than goat.

Five ribs and seventeen vertebrae probably belonged to the same skeleton. All vertebral epiphyses

Plate 29 Examples of butchered bones from sheep skeleton in Victoria Road West Building 2 (post-hole F9). From left to right: lumbar vertebra, astragalus, centroquartal

were unfused and belonged to an immature animal. Only two of the vertebrae (both cervical) survived complete and butchery was noted on eleven specimens. The axis (2nd cervical vertebra) had been chopped through axially across its cranial end. This would have detached the skull and atlas (1st cervical vertebra) from the remaining vertebral column. The bodies of five thoracic and three lumbar vertebrae had been chopped through axially in a cranio-caudal direction. Some of these had been chopped close to the centre of the vertebral body but in other cases the chops were offset towards the lateral aspect. The evidence suggests that the trunk of the body had been split into roughly equal sides. At least one thoracic vertebra had been chopped across axially where the vertebral column was segmented. Most of the other vertebrae had also probably been butchered but no clear evidence of chopping was observed on the surviving fragments. The cranial half of the sacrum was recovered and this had been chopped through the sacro-iliac joint where it had been separated from the pelvis (Plate 30).

A pair of mandibles and a small fragment of skull from the same context could also have belonged to the butchered skeleton. The mandibular first and second molars were in wear but the third molar had not erupted. Toothwear evidence indicated that they belonged to an animal of about 18–22 months of age (Hambleton 1999). This is compatible with the age range indicated by the state of fusion of the limb bones.

The sheep appears to have been segmented into several joints. There is no clear evidence of filleting meat from the bone, however, and it seems that most parts of the body were subsequently deposited together on or under the floor.

Another sheep skeleton was found in a post-hole F202 on the Hyde Abbey site (Group HA74.4). Recovered by hand were 72 bones with all areas of the body represented (Plate 31). All the major limb bones were recovered but some of the vertebrae and many of the bones of the limb extremities were not retrieved by normal recovery methods (Table 2.144). However, 27 of these were found in a sieved sample (Table 2.203) and it is clear that a complete carcass was deposited. However, it was again clear that this carcass had been at least partially butchered. Twelve hand-collected bones bore evidence of butchery, including seven vertebrae (Plate 32). The atlas bore knife cuts on the ventral aspect near its articulation with the skull. The marks indicate that the head had been carefully detached. The axis had superficial chop marks also running across the ventral surface, possibly made during an earlier part of the same process of separating the skull from the neck. One cervical and two lumbar vertebrae had been chopped through axially towards the lateral parts of their bodies, indicating that the trunk had been split roughly into two equal halves. Seven thoracic vertebrae from the sieved sample showed similar marks. A knife cut was found on the ventral aspect of another thoracic vertebra. This may have been

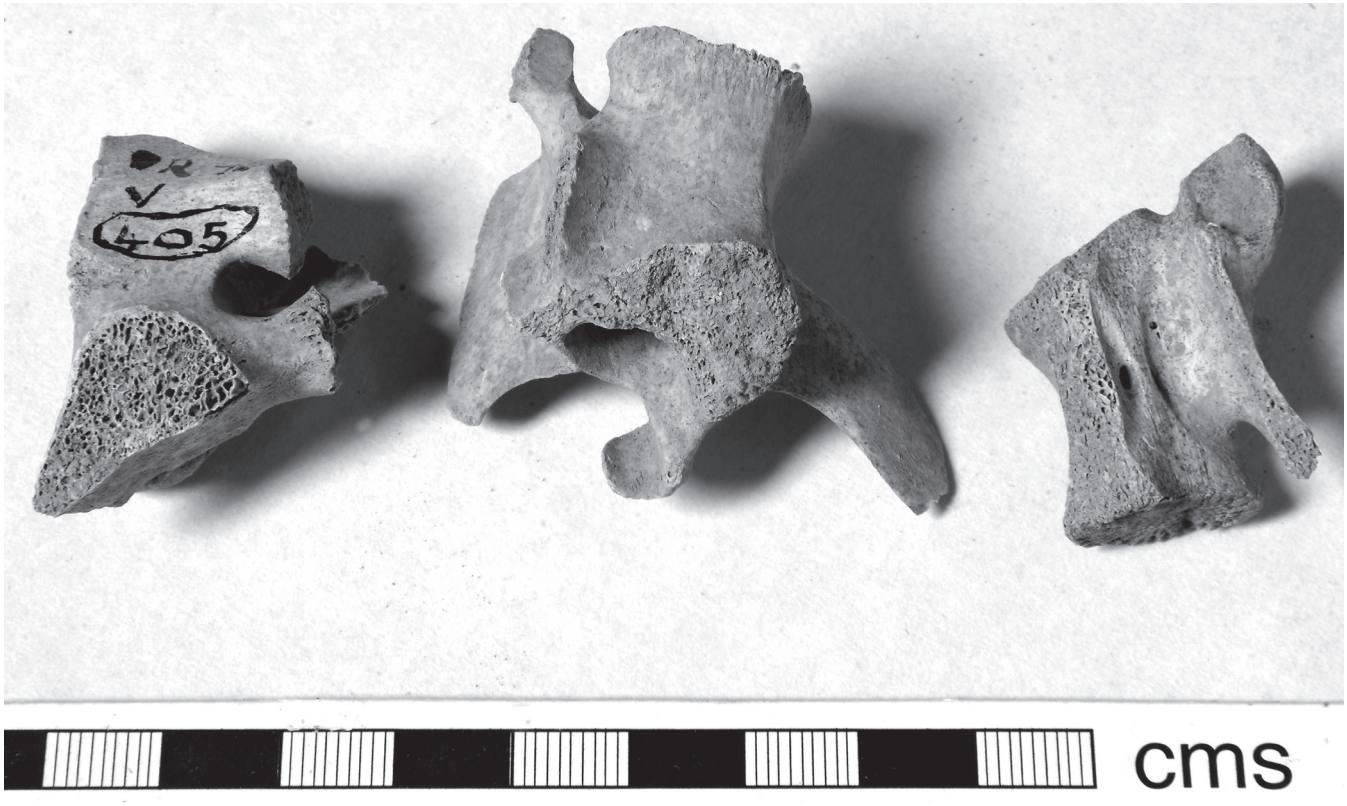


Plate 30 Examples of butchered bones from sheep skeleton in Victoria Road West Building 2 (floor layer 405). From left to right: sacrum, two lumbar vertebrae

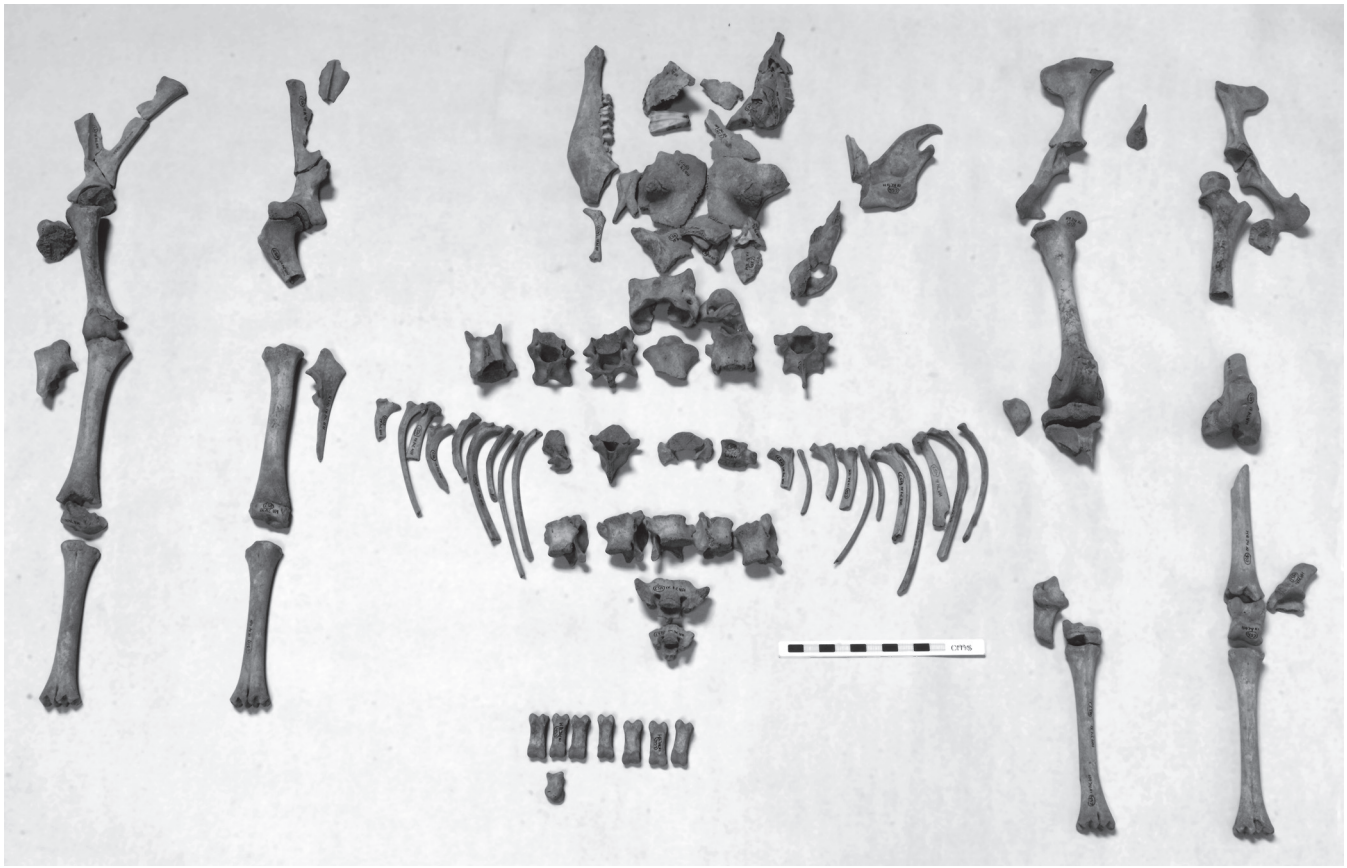


Plate 31 Bones of sheep skeleton in Hyde Abbey Group HA74.4 (post-hole F202)

Plate 32 Examples of butchered bones from sheep skeleton in Hyde Abbey Group HA74.4 (post-hole F202). From left to right: centroquartal, astragalus, cervical vertebra

the result of filleting or perhaps was made during the cleaning out of the internal organs. A knife cut was also observed on the dorsal articular surface of one of the ribs, made during its detachment from the vertebral column.

No butchery marks were observed on the upper limb or girdle bones but a knife cut was observed on the anterior of the proximal end of a metacarpal made during the detachment of the front foot. Similar cuts were observed on the anterior of an astragalus and on both the anterior and posterior aspects of a centroquartal (Plate 32). These marks on the tarsals were also made during the removal of the feet and skins. The other astragalus, found in the sieved sample, had evidence of slight burning.

The morphologies of the skull, scapula, and several of the limb bones were characteristic of sheep rather than goat. The skull was horned. The recording of mandibular ageing data revealed that only the first of the molars was in wear; the second molar had erupted through the bone but was unworn. The acetabulum, scapula, and proximal radius had fused but all other epiphyses, including the quite early fusing distal humerus, were unfused. The ageing evidence suggested that the sheep was about six to 12 months old (Jones 2006).

The final group of associated bones was found in a pit F72 on the Jewry Street, Crown Hotel site (Group JCH5) and consisted of 125 bones from two intermixed skeletons deposited in it (Table 2.146). The first skeleton belonged to a lamb represented by bones from all parts of the body. Some of its bones were still porous and all early fusing epiphyses were unfused. Mandibular tooth eruption data showed that the deciduous premolars were in wear but the first molar, although erupted, was unworn. The lamb, identified to species by the morphology of its skull, deciduous premolars, and several limb bones, would have been about 3–5 months old at death. The skull had horns and their shape suggested that the lamb was male.

Despite its small size, the carcass had been processed with at least nine bones bearing butchery marks. The shafts of a humerus and femur had been chopped in two; both halves of the pelvis had superficial chop marks near the acetabulum; a cervical vertebra bore a knife cut that ran across its dorsal aspect; the lateral part of a thoracic vertebra had been chopped through when separated from the ribs; another thoracic vertebra had been chopped across axially where the vertebral column was segmented; two lumbar vertebrae had been cut through at the junction of the body and the lateral wing during the removal of the flank

Both tibiae had been broken into two and the distal halves were charred completely black; an astragalus, centroquartal, both metatarsals, and a first phalanx had also been damaged by fire.

The second skeleton belonged to an older sheep that was also represented by bones from all areas of the skeleton. Tooth ageing data showed that the first molar was at Wear Stage g (Grant 1982) but the second molar had only just come into wear and the third molar had not erupted. The animal was possibly about 15–18 months old. This is supported by the fusion data. The early fusing epiphyses had fused but the distal tibia

Plate 33 Tibia from the older sheep skeleton from Crown Hotel, Jewry Street, pit F72, showing the recently fused distal epiphysis

was just fusing (Plate 33) and the distal metapodials were unfused. This sheep was at a similar stage of skeletal development to that of the second animal described from Building 2 at Victoria Road West (Group VRW3). This sheep had no horns.

Butchery marks were observed on ten bones assigned to this skeleton (Plate 34): the skull bore a knife cut on its frontal bone; chop marks were found on both humeri, in one case the proximal end having been chopped through at its junction with the scapula; one radius had been broken in two and bore superficial chop marks adjacent to the break; the shaft of a pubis bore superficial chop marks; an ilium had knife cuts on the ventral aspect of its shaft near the acetabulum; both femora had been deliberately broken open, one also having knife cuts around its proximal articular surface corresponding with the marks on the ilium made during the disarticulation of the hip joint; the distal half of the same femur bore superficial chop marks running horizontally along its posterior and medial surfaces, presumably made when it was detached from the tibia; a cervical vertebra had been chopped across when the vertebral column was segmented; the atlas had knife cuts on its ventral surface made when the animal was beheaded; and a lumbar vertebra bore superficial chop marks on the lateral part of its body. Three rib heads, probably from this second skeleton, had knife cuts or superficial chop marks on their lateral surfaces made when the ribcage was separated from the vertebrae.

Plate 34 Examples of butchered bones from the older sheep skeleton from Crown Hotel, Jewry Street, pit F72. From left to right: frontal atlas, radius

Table 2.135 Sheep and goat bones identified

Site/contexts	Sheep	Goat	% Goat
VR East wells and pits	104	7	6
VR all trenches, ditches	16	6	27
VR East buildings	7	0	0
VR East NE corner	71	0	0
VR East layers/other	179	3	2
VR West shafts and pits	25	1	4
VR West buildings	22	1	4
VR West other deposits	28	2	7
Hyde Abbey buildings	63	1	2
Hyde Abbey other deposits	11	0	0
Jewry Street, Crown Hotel	23	0	0
27 Jewry Street	24	0	0
Henly's Garage	34	4	11
Total	607	25	4

Note: Totals exclude groups of associated bones

There is no evidence that the feet were disarticulated from this skeleton. However, both tibiae had been broken in two and the distal end of one of them was burnt.

The assemblage therefore consists of the remains of two complete skeletons, which had been at least partially butchered. Parts of the lower hind limbs had been in contact with fire prior to the surviving bones being gathered together and deposited in the pit.

Most of the associated groups of sheep/goat bones bore evidence of carcass processing. Three deposits in particular produced remains of at least five fairly complete sheep skeletons, all of which had been subjected to a substantial amount of processing. All showed evidence of disarticulation and segmentation of the carcass; some also bore convincing evidence of filleting and marrow extraction. In four cases there was evidence of burning on bones of the lower hind limbs. Such burning may indicate that parts of the carcasses were roasted. These bones may have been exposed to fire perhaps at the end of a spit.

In each case the butchered carcass had been gathered together and dumped as a discrete group – within buildings in three cases and in a shallow pit in another. It is possible to argue that the remains simply represent exceptionally well preserved evidence of the remains from the processing, cooking, and consumption of sheep. However, the apparently careful subsequent disposal of the bones suggests some sort of ritual deposition, associated perhaps with the foundation of a building or with other small ceremonial feasts. In these areas of Winchester, such deposits seem only to be associated with sheep, which were mostly immature and of a size suitable for spit roasting.

Goat bones

Morphologically, sheep and goat skeletons are quite similar but it is possible to differentiate between the species from a number of bones. In this analysis, sheep and goat bones were identified to species on the following parts of the anatomy, where they had survived in a good state of preservation: mandibular fourth deciduous premolar (Payne 1985); horn core; frontal; parietal; distal scapula; distal humerus; proximal femur; proximal and distal radius; proximal and distal metapodial; calcaneus; third phalanx (Boessneck 1969; Prummel and Frisch 1986).

Excluding associated bones, 632 bones were identified to species, of which only 25 (4%) belonged to goat (Table 2.135). It can therefore be assumed that the vast majority of the indeterminate sheep/goat fragments belonged to sheep. Percentages of goat varied a little between assemblage groups. They were unusually well represented in ditch F12 at Victoria Road West (Group VRW11). This ditch produced a more diverse species assemblage than most other deposits (Table 2.57).

The discovery of the metapodials of the goat from Victoria Road East pit F981 (Group 23) indicated that they were sometimes skinned and dismembered. However, no butchery marks were found on any of the limb bones identified as goat. Chop marks were found, however, at the base of three horn cores, showing where horns had been removed from the skull. Goat horns would have been valued as a raw material for the manufacture of objects. Goat meat may well have been eaten occasionally but it was not an important part of the diet and there is no evidence to suggest that goats were kept in large numbers in this area of the town.

The low number of goat bones in comparison to sheep in Winchester is similar to other contemporary Romano-British sites. The percentage of goat ranged between 0.4% and 7% in Roman phases from Dorchester Greyhound Yard, with the later Roman deposits tending to include the higher percentages (Maltby 1993). Later Roman deposits from Owslebury produced 3% goat amongst the bones specifically identified as sheep or goat (Maltby 1987a). Such figures are typical of many Iron Age and Romano-British sites in Wessex (Maltby 1981). The relative numbers of sheep and goat identified in Romano-British towns is further discussed in Section 2.3 (Table 2.209).

Abundance of sheep/goat bones

The relative abundance of sheep/goat bones has been discussed above (pp 91–105). To summarise, sheep/goat suffered from a much greater loss of bones than cattle through taphonomic and retrieval biases. (Tables 2.92–2.93; Fig 26). Counts of fragments and selected bone elements appear to provide under-estimates of the relative number of sheep/goat represented in the assemblages (Fig 32). They provided the highest number of fragments in only sixteen of the 55 sub-samples with an average frequency of 35% (Tables 2.94–2.95). Minimum number counts and whole bone equivalents calculations provided higher estimates of the relative abundance of sheep/goat (Tables 2.97–2.98). However, as discussed above (p 109), sheep may not have provided any greater quantities of meat than pigs and provided much less than cattle.

Sheep/goat bones were best represented on the Hyde Abbey and Jewry Street, Crown Hotel sites (Fig 32). Variations in their frequencies, however, were probably largely dependent upon the degree to which cattle bones discarded from specialist processing activities were present in the assemblage, rather than marked variations in the disposal of sheep/goat bones themselves.

As discussed above (p 91), there are a lot of problems of comparing cattle frequencies with those of sheep/goat and other smaller species. Variations in fragmentation, preservation, retrieval rates, and disposal practices between these species can be demonstrated and all these are factors that affect relative proportions.

Comparison of fragment counts of sheep/goat and pig only has the advantage of removing many of the biases created by the inclusion of the cattle assemblage. The species are closer in size. Although fully grown pigs (and most of their bones) are larger than sheep, more of their bones were from immature animals reducing the likelihood of bias in retrieval rates. Pigs have more teeth and foot bones than sheep/goat, which should bias the counts towards them. However, most of these extra elements are small and few were recovered by normal retrieval methods. Their carcasses appear to have been processed in similar ways. Analysis of the survival of upper limb bone articular surfaces indicates that those of pig have a slightly better chance of survival than those of sheep/goat (Table 2.92) but there was little difference in the average fragment sizes of these bones, although pig mandibles were more fragmentary than those of sheep/goat (Tables 2.150 and 2.173).

Although there are still problems of comparing fragment counts of these species, the biases involved should be less than if counts of cattle and horse are included. Accordingly, appropriate calculations were made and Table 2.94 includes frequencies of sheep/goat expressed as a percentage of the total sheep/goat and pig fragments for all of the largest sub-samples.

Sheep/goat outnumbered pig fragments in all but one of the sub-samples. Sheep/goat provided 70–80% of the fragments in all of the assemblage groups apart from the samples from the Victoria Road ditches (56%), the Victoria Road West wells and pits (63%) and Henly's Garage (62%) (Table 2.94).

Comparisons of the relative abundance of sheep/goat and pig can be made with a large number of other samples, where NISP counts have been employed. King (1978; 1984; 1999) carried out similar surveys but included cattle in the calculations. This analysis has provided an opportunity to compare a large number of samples but to exclude cattle from the calculations.

Counts of sheep/goat, pig, and domestic fowl have been obtained from over 100 Romano-British samples (Maltby 1997). Although that analysis concentrated on the abundance of domestic fowl bones (see below, p 223), the data collected also originally provided an opportunity to compare the relative abundance of sheep/goat and pig. Thirty-nine samples from urban sites, including Winchester, were analysed. If counts from all these samples are pooled, sheep/goat have formed 60% of the total sheep/goat and pig bones from these sites. The assemblages from Winchester therefore have a higher percentage of sheep/goat than the average from Roman towns. As discussed more fully below (pp 268–269, this may partly be due to the location of the sites within the town. Samples from peripheral areas of some towns have tended to produce higher percentages of sheep/goat than samples from nearer the centres. Table 2.215 includes an updated dataset from major towns, and the results will be discussed further in Section 2.3.

The survey generally supported King's conclusions that there were variations in the relative percentages of sheep/goat and pig on different types of settlement in Roman Britain. Sheep/goat frequencies tended to be higher on native rural settlements (78%) and smaller nucleated settlements (77%) than they were on more Romanised settlements such as villas (67%), military sites (62%), and towns (60%). The contrast between rural and urban assemblages will be discussed further in relation to pig frequencies (p 185) but analysis of sites in Wessex generally support these wider trends (Table 2.158).

Although sheep/goat fragments from these sites in Winchester were better represented than in most contemporary urban samples (Table 2.215), they were not as well represented as in most rural settlements. This may indicate that although they were the most

Table 2.136 Anatomical elements of sheep/goat from Victoria Road East wells and pits

Groups	VRE19	VRE20	VRE24	VRE23		VRE22	VRE21		
Wells & pits	F1096	F1093	F1098	F981		F814	F168	Total	%
				A	O				
Skull frags	20	50	1		5	28	3	107	12
Mandible	21	42	1		10	37	4	115	13
Hyoid		4				2		6	0.7
Loose teeth	15	29	9		5	35	2	95	10
Scapula	12	28			7	10	1	58	6
Humerus	8	12	2		4	15	1	42	5
Radius	13	30			1	27	1	72	8
Ulna	1	12			2	3		18	2
Os coxae	2	27	1		2	9		41	4
Femur	3	15	1		2	11		32	4
Tibia	10	20	4		2	27	3	66	7
Calcaneus	1	2						3	0.3
Astragalus		1			1	1		3	0.3
Metacarpal	8	32		2	4	23	3	72	8
Metatarsal	11	24	2	2	3	32	2	76	8
Metapodial	2	1						3	0.3
1st Phalanx	3	7			1	2		13	1
2nd Phalanx		1						1	0.1
Ribs	5	44		9	6	3	1	68	6
Cervical vertebrae	3	4				2		9	1
Thoracic vertebrae	1	6						7	0.8
Lumbar vertebrae	1	10				5		16	2
Sacrum		1				1		2	0.2
Total	140	402	21	13	55	273	21	925	

Key:
A = associated bones
O = other bones

% excludes associated bones

commonly exploited species, inhabitants of Winchester relied less on lamb and mutton than those living on rural sites in the area. This may partly reflect dietary preferences of the inhabitants as King (1984) has suggested. It may also reflect that the higher demand for meat in towns was such that species that could supply more meat (cattle and pig) were more heavily exploited than on rural sites.

Representation of different skeletal elements

Counts of both associated and unassociated sheep/goat bones found in each sub-sample are listed by assemblage group in Tables 2.136–2.148. Percentages of the total sheep/goat fragments excluding associated bones are given for each assemblage group. The rationale behind the grouping of elements into areas of the body is the same as described for cattle. The relative frequencies of mandible, acetabulum, calcaneus, astragalus, phalanges, and the ends of the major limb bones are set out in Figure 26.

Head

Skull fragments usually formed between 4% and 8% of the sheep/goat assemblage groups. Two groups had substantially higher percentages: skull fragments accounted for 12% of the samples from the Victoria Road East wells and pits (Groups VRE19–24; Table 2.136) and from Jewry Street, Crown Hotel (Table 2.146).

Table 2.137 Anatomical elements of sheep/goat from Victoria Road ditches

Groups	VRE25	VRW11	
Ditches	F122/1202	F12	
	Total	Total	%
Skull frags		7	4
Mandible	5	29	15
Loose teeth	5	50	26
Scapula		3	2
Humerus	1	6	3
Radius		10	5
Ulna		8	4
Os coxae		10	5
Femur		9	5
Tibia	4	19	10
Calcaneus	1		
Metacarpal	3	12	6
Metatarsal	5	18	9
1st Phalanx		3	2
2nd Phalanx		2	1
3rd Phalanx		1	0.5
Ribs		3	2
Cervical vertebrae		2	1
Lumbar vertebrae		3	2
Total	24	195	

In the former case, this probably reflects better preservation conditions in those deep features; in the latter assemblage group, nearly half of the skull fragments came from contexts in Group JCH4, deposits which also contained notably well preserved bones.

Even in the best preserved assemblages, skull fragments were outnumbered by those of mandibles (Table 2.149), which were the most abundant element in the sheep/goat sample. They formed between 9% and 18% of the assemblage groups. Mandibles with surviving cheek teeth were by far the best represented element when compared with other bones (Fig 26). No large accumulations of mandibles were noted but they were consistently the best surviving element on every site.

Loose teeth indicate the destruction of mandibles and maxillae. The poorer the preservation of those bones, the higher the percentage of loose teeth should be, provided they have been retrieved. Although loose teeth formed a larger proportion of the sheep/goat assemblage than cattle, percentages were still not very high. These did vary enormously, however, ranging between 6% and 34% of the assemblage groups. Percentages tended to be lower on the city defences sites than in the northern suburb, where the lowest percentage (10%) was associated with the Victoria Road East wells and pits (Table 2.136), again indicative of the good preservation conditions in those features. The highest percentages of sheep/goat loose teeth were found in the Victoria Road West samples. They were not particularly high in the wells and pits (15%), but formed 26%–34% of the total fragments in the other assemblage groups (Tables 2.141–2.143). The reasons for these higher percentages could be a combination of better retrieval rates and poorer preservation of the bones.

Scapula and os coxae

Scapulae consistently formed between 2% and 7% of the sheep/goat fragments. The highest percentage was associated with the 27 Jewry Street assemblage, which was a relatively small and possibly atypical sample (Table 2.147). Distal scapulae were the eighth best represented element (Fig 26). They were the least well represented of the early fusing bones but were found more frequently than all of the elements with later fusing epiphyses apart from the distal tibia.

Os coxae fragments were also found consistently throughout the deposits. They formed between 3% and 7% of the sheep/goat assemblages. They were best represented in the sample from the Henly's Garage site (Table 2.148), but there was relatively little variability in their frequency between sites. The acetabulum was

Table 2.138 Anatomical elements of sheep/goat from Victoria Road East buildings, oven F846, and associated deposits

Group	VRE15–16		VRE3–4	VRE14	VRE17	VRE18		
Buildings	Roadside Structure 2		Oven F846	2	3	4	Total	%
	A	O						
Skull frags		5	21		1	6	33	8
Mandible		3	46	7	1	6	63	16
Hyoid			1				1	0.2
Loose teeth		2	42	13	1	6	64	16
Scapula		1	5	1		2	9	2
Humerus		3	5	3		1	12	0.7
Radius		1	17	2	3	3	26	6
Ulna		1	9	1			11	3
Os coxae			8	2	1	3	14	3
Femur	1		13	1	1	2	18	4
Tibia	1	1	18	3		4	27	6
Calcaneus			1				1	0.2
Astragalus				1			1	0.2
Metacarpal		1	35	2	1	12	51	13
Metatarsal		1	25	9	7	6	48	12
Metapodial		1	1			1	3	0.7
1st Phalanx			6	1	1	1	9	2
3rd Phalanx		1					1	0.2
Ribs	5		6			1	12	2
Cervical vertebrae	6		2		1		9	0.7
Thoracic vertebrae	10	1		1			12	0.5
Lumbar vertebrae			2				2	0.5
Sacrum	1		1				2	0.2
Total	24	22	264	47	18	54	429	

Key:
A = associated bones
O = other bones

% excludes associated bones

slightly better represented than the distal scapula (Fig. 26).

Upper limb bones

Sheep/goat humeri fragments were found in similar quantities to those of scapulae in most assemblage groups. Percentages ranged between 1% and 6% and most lay between 3% and 5%. Most survived as shaft fragments only (Table 2.92) and proximal ends in particular were poorly preserved. Distal ends were the sixth best represented element (Fig 26). The variability reflects differences in bone density and epiphysial fusion ages.

Radii were more frequently identified, although they survived mainly as shaft fragments (Table 2.92). They formed between 5% and 13% of the sheep/goat assemblage groups, usually in the middle of that range. The highest percentages were obtained from the 27 Jewry Street and Henly's Garage sites (Tables 2.147–2.148). Proximal radii survived in greater frequencies than the later fusing distal ends (Fig 26; Table 2.92).

Ulnae were less well represented forming no more than 4% of any assemblage group and usually only 2–3%. Both their small size and fragility resulted in this poor representation.

Femora were also relatively poorly represented forming between 2% and 5% of the assemblage groups. Very high proportions of shaft fragments were recovered (Table 2.92) and both the late fusing proximal and distal ends were low in the element rankings (Fig 26).

Table 2.139 Anatomical elements of sheep/goat from the north-east corner of the Victoria Road site

Groups	VRE7	VRE8	VRE9	VRE10	VRE11	VRE12	VRE13		
Phases	**378**	**379–81**	**382–3**	**385–6**	**387–9**	**393**	**394–9**	**Total**	**%**
Skull frags		1	1	4	7	14	10	37	5
Mandible	1	19	4	20	24	42	23	133	18
Loose teeth	1	5	1	14	25	30	31	107	15
Scapula		1	1	3	10	13	9	37	5
Humerus		6		3	1	9	7	26	4
Radius	1	3		4	18	29	16	71	10
Ulna		1			3	1	5	10	1
Os coxae		2		1	3	9	5	20	3
Femur		1		2	5	2	6	16	2
Tibia	2	3		8	14	25	18	70	10
Calcaneus					3	1	1	5	0.7
Astragalus						1		1	0.1
Metacarpal		2	1	8	18	13	15	57	8
Metatarsal	1	13	1	5	25	20	24	89	12
Metapodial		2						2	0.3
1st Phalanx		1			1	1	5	8	1
Ribs		1		1	6	7	4	19	3
Sternebrae				1	1			2	0.3
Cervical vertebrae					2	2	2	6	0.8
Thoracic vertebrae				1	4	3	2	10	1
Lumbar vertebrae				1			2	3	0.4
Sacrum				1				1	0.1
Total	6	61	9	77	170	222	185	730	

Tibiae, particularly their relatively dense shaft fragments, form a substantial part of most sheep/goat assemblages and these were no exception. Apart from the anomalous 27 Jewry Street sample (2%) they formed between 6% and 11% of the assemblage groups and were the best represented of the upper limb bones. Distal ends survived much better than the late fusing proximal ends (Fig 26; Table 2.92).

Metapodials

Metapodials are relatively dense, easily identifiable elements and formed a substantial proportion of all the sheep/goat assemblages (14–23%). Metatarsal fragments were usually slightly more common forming between 8% and 13% of the assemblages. The percentage of metacarpals was more variable (6–15%) but they outnumbered metatarsal fragments only in three of the assemblage groups. Proximal ends of both bones were well represented but the distal ends had suffered more severely from the effects of canid scavenging (Fig 26; Table 2.92).

Carpals, tarsals, and phalanges

As discussed above (pp 89–90), these small bones were extremely poorly represented, with their poor survival resulting from retrieval biases exacerbated by taphonomic factors (Table 2.93). The largest of these bones, the calcaneus, astragalus, and first phalanges were found in small numbers in most assemblage groups. However, the smaller second and third phalanges, carpals, and other tarsals were rarely recovered apart from in associated groups. Even adding together the totals of all these bones, they never formed more than 5% of any assemblage group and contributed less than 1% to the Henly's Garage sample (Table 2.148). Slightly higher percentages were found in assemblages which also contained higher percentages of loose teeth – suggesting that differential recovery was a factor in variations in the frequency of loose teeth.

Bones of the trunk

Although ribs and vertebrae formed between 3%

Table 2.140 Anatomical elements of sheep/goat from Victoria Road East silts and other deposits

Groups	VRE1	VRE2	VRE5	VRE26	VRE27	VRE28	VRE29	VRE30		
Phases	**155–67**	**195, 260–2, 266–9**	**303–08**	**276, 287–92**	**363–74**	**349–57, 361–2**	**358–60**	**461–4, 473–5**	**Total**	**%**
Skull frags	3	3	24	5	3	3	2	11	54	8
Mandible	1	27	24	15	3	9	7	8	94	14
Loose teeth		16	35	13		17	5	17	103	15
Scapula		4	4	1		2			11	2
Humerus	2	6	5	2		8	1	5	29	4
Radius		12	14	8		11	4	9	58	9
Ulna		5	6	1		1		2	15	2
Os coxae		2	5	4		4	2	1	18	3
Femur		4	7	5	2	4	1	6	29	4
Tibia	1	13	16	10	1	16	6	9	72	11
Calcaneus		1	2	1		2			6	0.9
Metacarpal	2	10	15	15	3	13	3	8	69	10
Metatarsal		22	19	11	1	8	4	13	78	11
Metapodial			1				1		2	0.3
1st Phalanx		4	3			3		1	11	2
2nd Phalanx							1	1	2	0.3
3rd Phalanx		1							1	0.1
Ribs		3	3	2		3	1	1	13	2
Cervical vertebrae		1	1	1			2		5	0.7
Thoracic vertebrae						1			1	0.1
Lumbar vertebrae						1	2	1	4	0.6
Sacrum			1			1	1	1	4	0.6
Total	9	134	185	94	13	107	43	94	679	

and 10% of the assemblage groups, these bones were under-represented with respect to the numbers of these elements in the skeleton. Most assemblages contained only 4%–6% ribs and vertebrae. Only ribs with surviving dorsal ends were identified to species and this partly explains the low percentages of rib fragments. Shaft fragments were well represented in the unidentified sheep-sized mammal category. However, taphonomic factors also played a large part in the low numbers of trunk bones recovered. The highest percentages of these bones were found in the Victoria Road East wells and pits and Henly's Garage assemblages (Tables 2.136 and 2.148). These assemblages were relatively well preserved.

Overview of anatomical representation

The variations in the numbers of different sheep/goat elements represented can be best explained by factors of differential recovery and preservation. There is little evidence for large-scale deposition of particular parts of the carcasses. The assemblages were consistently biased towards denser and larger elements. There were some minor variations between assemblage groups which suggest some differences in retrieval and survival rates but the degree of variability between the samples was much less than for cattle.

Comparisons of groups of bones from different parts of the body demonstrate this variability in recovery and preservation (Table 2.149). The numbers of metapodial fragments were usually slightly less than the combined counts of radius, ulna, and tibia. Two exceptions were the relatively small sample from 27 Jewry Street and the larger sample from the Victoria Road East buildings. The reasons for this are not clear.

Metapodial counts were also compared with the combined totals of humeri and femora. These should be present in equal numbers but metapodial fragments always outnumbered the upper limb bones, usually contributing over 70% of the combined totals (Table 2.149). This reflects the relative density and fragility of the bones rather than necessarily the disposal of more bones of little meat value. The only assemblage groups which contained less than 70% metapodials

Table 2.141 Anatomical elements of sheep/goat from Victoria Road West wells, shafts, and pits

Groups	VRW12	VRW13	VRW14		VRW6		
Shafts/pits	F46	F18	F43		F64/70	Total	%
			A	O			
Skull frags	3	4	1	3		11	4
Mandible	14	3	2	8	3	30	11
Hyoid		1			1	2	0.8
Loose teeth	23			13	2	38	15
Scapula	3			4	5	12	5
Humerus	4	2		7	2	15	6
Radius	6		1	7	2	16	6
Ulna	5	1			2	8	3
Os coxae	3			6	1	10	4
Femur	5			4	1	10	4
Tibia	6	1	1	17	3	28	11
Calcaneus	1		2	1		4	2
Astragalus			2	1		3	1
Centroquartal			1	1		2	0.8
Metacarpal	7		1	13	3	24	9
Metatarsal	4		2	13	1	20	8
1st Phalanx	2		5	1		8	3
2nd Phalanx			5			5	2
3rd Phalanx			3			3	1
Ribs				3	2	5	2
Sternebrae				1		1	0.4
Cervical vertebrae	1	1		3		5	2
Thoracic vertebrae				1		1	0.4
Lumbar vertebrae				1		1	0.4
Total	87	13	26	108	28	262	

Key:
A = associated bones
O = other bones

Note: % excludes associated bones

were those from the Victoria Road East wells and pits and Henly's Garage, which also included a number of such features. Better preservation of upper limb bones in such features could largely account for their better representation.

Similar factors would account for minor variations in the relative counts of humeri and femora compared with radii, tibiae, and ulnae. The latter were in the majority in all assemblage groups due mainly to the better survival of radii and tibiae (Table 2.149).

Comparisons of sheep/goat anatomical representation with results from Dorchester Greyhound Yard (Maltby 1993) showed that metapodials and mandibles were generally better represented in the Winchester deposits than in Dorchester, where upper limb bones tended to form a higher proportion of the assemblages. This may again reflect different preservation conditions, with more sub-surface features producing more better-preserved assemblages at the latter site.

Fragmentation and butchery of sheep/goat bones

The smaller carcasses of sheep require less segmentation than cattle bones and less marrow and grease are available from their bones. Fragmentation is more likely to have been caused by the activities of scavengers than butchery practices.

Fragmentation of sheep/goat bones was not as severe as for cattle. Mean sizes for most of the major limb bones and mandibles lay between 0.31 and 0.37 of a complete bone. Scapulae and femora fragments were generally more fragmented (0.30 and 0.23 respectively), reflecting the more fragile nature of their shafts (Table 2.150).

Table 2.142 Anatomical elements of sheep/goat from Victoria Road West buildings and associated deposits

Groups	VRW2	VRW3		VRW4	VRW5		
Buildings	**1**	**2**		**3**	**4**	**Total**	**%**
		A	**O**				
Skull frags		2	5	4		11	4
Mandible	1	4	16	9	3	33	14
Hyoid		1				1	
Loose teeth	1		38	16	10	65	31
Scapula	1	4		4	2	11	3
Humerus		4	3	3		10	3
Radius		4	6	4	1	15	5
Ulna		3	2	3		8	2
Os coxae		4	2	5	3	14	5
Femur		4	2		2	8	2
Patella		1				1	
Tibia	2	4	8	3	2	19	7
Carpals		3				3	
Calcaneus		4	2	2	1	9	2
Astragalus		2		1		3	0.5
Centroquartal		3				3	
Other tarsals		2				2	
Metacarpal	2	4	5	4	2	17	6
Metatarsal		3	5	7	5	20	8
1st Phalanx		10	3	2		15	2
2nd Phalanx		6				6	
3rd Phalanx		5					5
Ribs		10			1	11	0.5
Costal cartilages		5				5	
Sternebrae		2				2	
Cervical vertebrae		8	2	1	1	12	2
Thoracic vertebrae		15	2			17	0.9
Lumbar vertebrae		9			1	10	0.5
Sacrum		2			1	3	0.5
Total	7	128	101	68	35	339	

Key:
A = associated bones
O = other bones

Note: % excludes associated bones

There was some variation between assemblage groups. Mandibles tended to survive in a more complete state in the Victoria Road East pits and wells and in the Hyde Abbey and city defences samples than elsewhere. Their higher fragmentation in the Victoria Road deposits reflects the greater prevalence of layers in those assemblages and probably greater disturbance and redeposition of the assemblages.

Fragmentation of radii, tibiae, and metapodials showed comparatively little variation between assemblage groups. Bones from Victoria Road East wells and pits and Henly's Garage tended to be less fragmentary, although there were exceptions. Sample sizes for other bones tended to be too small to allow detailed analysis.

Detailed examples of how some of the sheep and goat carcasses were processed have been described in the discussion of the associated groups of bones (pp152–158). In many respects those examples are typical of the methods employed on carcasses found throughout the assemblages.

Table 2.143 Anatomical elements of sheep/goat from Victoria Road West other deposits

Groups	VRW1	VRW7	VRW8	VRW9	VRW10	VRW16	VRW17	VRW15		
Phases	**917, 924**	**931**	**933–5**	**938–9**	**951–4**	**965, 968**	**969**	**Graves**	**Total**	**%**
Skull frags	3	5	2	1	3	4	1	5	24	6
Mandible	9	6		7	3	6	5	1	37	9
Loose teeth	21	15	4	15	4	52	27	2	140	34
Scapula	2			1	1	4	2	1	11	3
Humerus	3	6			3	2	1		15	4
Radius	7	8	2	2	3	4	2	5	33	8
Ulna	1	1		1	1	3	1		8	2
Os coxae	1	4		2		3	1	2	13	3
Femur	2	1		2	2		2		9	2
Tibia	5	8	1	2	1	13	1	2	33	8
Calcaneus	1			1					2	0.5
Astragalus						2			2	0.5
Metacarpal	4	4		2	1	7	3	3	24	6
Metatarsal	12	6		3	4	5	3	2	35	8
Metapodial						1			1	0.2
1st Phalanx	2	3	1	2		1			9	2
2nd Phalanx	1			1					2	0.5
3rd Phalanx	1								1	0.2
Ribs	1	1			3	1	1		7	2
Cervical vertebrae		1			2	1			4	1
Thoracic vertebrae	1								1	0.2
Lumbar vertebrae	1				1	2			4	1
Sacrum		1					1		2	0.5
Total	78	70	10	42	32	111	51	23	417	

Excluding associated bones, observations of butchery were made on only 282 sheep/goat fragments, representing only 6% of the total assemblage. The destruction of so many articular surfaces by canid scavenging partially accounts for this low figure. These sites were commonly where segmentation took place but any butchery marks will have been subsequently destroyed in many cases. Slightly higher percentages of observations (10%) were recorded in the defences assemblages than on other sites (Table 2.151). Bones bearing chop marks were found in the majority of cases but a higher percentage of bones bearing knife cuts were noted in the Hyde Abbey and city defences samples. As the analysis of the associated bones has shown, it was not unusual for both cleavers and knives to have been employed on the processing of the same carcass.

Butchery marks were recorded on 32 skull fragments, all but four of which consisted of chop marks. Most of these consisted of cases where the top and back of the skull had been split open with a cleaver blow to gain access to the brain, which was clearly commonly used for food. There were two examples where the base of sheep horn cores had been chopped through to remove the horn. Knife cuts were observed running along two maxillae, presumably made during removal of cheek meat or skinning. Knife cuts were also found on the top of two frontal bones probably made during skinning.

A very small percentage of mandible fragments bore butchery marks. Only 16 examples were recorded from all the sites. Most marks were observed on the diastema at the front of the jaw. In six cases chop marks on the medial aspect appear to have been made when the two halves of the mandibles were separated. Knife cuts in the same area were found on three other specimens and were probably associated with the same process. Knife cuts were also found on the lateral surface of four other diastemae. These may have been associated with skinning. Only three observations were made of knife cuts close to the condyle of the mandibular ramus. Separation of the jaws from the skull appears not to have left evidence of butchery marks in the vast majority of cases.

Fifteen scapulae fragments were recorded as butchered. Very few observations were made on

Table 2.144 Anatomical elements of sheep/goat from Hyde Abbey structural remains and associated deposits

Groups	HA72.2	HA74.2	HA74.4		HA74.5	HA74.7	HA74.3		
Phases	5–6, 9–11	55–9	60–1		64–7	69–71	76	Total	%
			A	O					
Skull frags	3		1	3	10	5	3	25	6
Mandible	5		2	1	22	6	5	41	10
Hyoid		1			1		2	4	0.8
Loose teeth	9		1	9	22	9	4	54	14
Scapula	2	1	2	2	6	2	1	16	4
Humerus	3		2	2	11	4		22	5
Radius	8	1	2	6	10	5	2	34	8
Ulna	1		2	1	5	2	1	12	3
Os coxae	2		2	4	6	2	2	18	4
Femur			2	1	3	1	1	8	2
Patella			1					1	
Tibia	8	1	2	6	13	5	1	36	9
Calcaneus			2	2	2	1		7	1
Astragalus			1	1	1			3	0.5
Centroquartal			1			1		2	0.3
Metacarpal	6	2	2	11	13	5	2	41	10
Metatarsal	4	4	2	11	24	2	6	53	13
1st Phalanx			7		2			9	0.5
2nd Phalanx			1		1	1		3	0.5
Ribs		4	19	5	4	4	1	37	5
Sternebrae			1					1	
Cervical vertebrae	1		7		3	2	1	14	2
Thoracic vertebrae			2			1	1	4	0.5
Lumbar vertebrae			7	1		1		9	0.5
Sacrum			1					1	
Total	52	14	72	66	159	59	33	455	

Key:
A = associated bones
O = other bones

Note: % excludes associated bones

specimens from Victoria Road East, although this site produced the largest sample. As in the case of the mandible, slightly more examples of knife cuts than chop marks were recorded (Table 2.151). Six specimens had knife cuts or superficial chop marks on the neck of the scapula, probably mainly associated with disjointing. Most of the other knife cuts and superficial chop marks were located on various parts of the scapula blade and seem mainly to have been associated with filleting. Different implements were therefore used to perform the same tasks on different specimens.

Similar observations were made on humeri fragments, although again the sample of butchered bones was small with butchery recorded only on fourteen specimens. Most humeri bearing chop marks were found at Victoria Road East. These included two specimens which had been chopped horizontally through the distal joint surface to separate the bone from the radius and ulna. A third specimen had a superficial chop on the medial aspect of the distal end, also made during disarticulation. Superficial horizontal chop marks were found on the shafts of four other humeri from various sites. The purpose of these is not clear. Most of the knife cuts were located on the distal part of the shaft, perhaps associated with disarticulation, although filleting cannot be ruled out. One specimen had knife cuts on the medial aspect of the distal end that were definitely caused during segmentation. Similarly, one specimen had knife cuts around the proximal end made during separation from the scapula.

Butchery marks were observed on 27 radii and chop

Table 2.145 Anatomical elements of sheep/goat from Hyde Abbey other deposits

Groups	HA72.1	HA72.3	HA74.1	HA74.6	HA74.8		
Phases	**1–4, 8**	**7**	**52–3**	**68**	**74–5**	**Total**	**%**
Skull frags	1	3		9	10	23	6
Mandible	5	5	1	28	19	58	15
Hyoid					1	1	0.3
Loose teeth	11	4		26	32	73	19
Scapula	1	2		2	7	12	3
Humerus	2			4	5	11	3
Radius	5	2		12	13	32	8
Ulna				6	4	10	3
Os coxae	2	1		10	9	22	6
Femur	2			3	6	11	3
Tibia	3	4		16	17	40	10
Calcaneus				1	2	3	0.8
Metacarpal	5	3		10	11	29	7
Metatarsal	6	1		18	15	40	10
Metapodial	1				1	2	0.5
1st Phalanx		2		5	1	8	2
2nd Phalanx		1				1	0.3
Ribs	1	1		4	5	11	3
Sternebrae					1	1	0.3
Cervical vertebrae				2	2	4	1
Caudal vertebrae				1		1	0.3
Total	45	29	1	157	161	393	

marks were more common than knife cuts on all the sites. Chop marks were mainly located on the shaft and in seven cases the shaft had been severed. Superficial chop marks in the same areas were found on fourteen specimens. Most of these marks were associated with segmentation of the carcass separating the upper limb from the feet. Only two specimens had evidence of chopping around the proximal articulation. Perhaps the elbow joint was commonly kept as a unit, although gnawing may have destroyed a lot of evidence for butchery in that area. Two specimens had knife cuts around the proximal articular surface where radii had been separated from the humeri. Similar marks were found around the distal end of another specimen. Knife cuts were found on the posterior aspects of two shafts.

Butchery marks were observed on only two ulnae. In both cases these consisted of chop marks around the proximal articulation with the humerus and radius and were made during disarticulation of this joint.

Os coxae were the bones with the highest incidence of recorded butchery. A total of 37 observations were made, of which 28 were chop marks (Table 2.151). Most of the butchery marks were located on the ilium, particularly on the shaft. Some had been chopped through but most had superficial chop marks. Most of the marks were located near the acetabulum and were probably associated with the removal of the hindlimbs. At least six specimens had been chopped through the acetabulum itself. Most of the ilia with knife cuts were from the Henly's Garage sample and were found both on the shaft and near the articular surface. A few specimens had been chopped on and around the sacro-iliac joint.

Butchery marks were observed on the shafts of only four ischia and these usually consisted of knife cuts. Chop marks were found on two shafts of the pubis.

Only seventeen femora were recorded as butchered. Four specimens had chop marks around the proximal articulation made during separation from the pelvis. One of these also had blade marks on the lateral aspect similar to filleting marks usually found on cattle bones. There was only one specimen that had evidence for being chopped through the distal articular surface. Chop marks were observed on five shaft fragments, but only in one case had the shaft been completely severed. Knife cuts were recorded on the shafts of six specimens, probably made during filleting. One of these also had knife cuts near the proximal articulation made during disjointing from the pelvis.

Tibiae appear to have been butchered in a similar way as radii. Most of the 27 butchery observations

Table 2.146 Anatomical elements of sheep/goat from Jewry Street, Crown Hotel

Groups	JCH1	JCH2	JCH3	JCH4	JCH5		JCH6		
Phases	707–10	323–4	320–2	317–19	315		311–14	Total	%
					A	O			
Skull frags	3	1	2	10	3	2	1	22	12
Mandible	4	5	4	8	6	1	3	31	16
Hyoid					1		1	2	0.6
Loose teeth		2	2	9			8	21	13
Scapula			1	4	4	4	1	10	4
Humerus		1		1	4			6	1
Radius	1			6	4	3	3	17	8
Ulna	1		1	4	4			10	4
Os coxae				5	4	2	2	13	6
Femur			1	5	4			10	4
Patella					2			2	
Tibia		2	1	9	6		3	21	9
Carpals					2			2	
Calcaneus				1	3			4	0.6
Astragalus				2	2			4	1
Centroquartal					1			1	
Metacarpal	2	2	1	6	3	1	3	18	9
Metatarsal	3	2		6	4			15	7
Metapodial					1			1	
1st Phalanx				1	9	1		11	1
2nd Phalanx					4			4	
3rd Phalanx					4			4	
Ribs			1	1	10			12	1
Sternebrae					1			1	
Cervical vertebrae				2	12	1		15	2
Thoracic vertebrae					15			15	
Lumbar vertebrae					10			10	
Sacrum					2			2	
Total	14	15	14	80	125	15	25	284	

Key:
A = associated bones
O = other bones

Note: % excludes associated bones

consisted of chop marks on various parts of the shaft made during segmenting of the hindlimb. In ten cases the shaft had been severed in the same way as described for some of the partial skeletons discussed earlier in this section. In nine cases the chop was superficial but often close to a break in the bone where the lower limb had been separated. Only one specimen bore chop marks at the proximal end, although this part of the bone rarely survived. None of the distal ends, however, had been chopped through, but two specimens bore knife cuts made during disarticulation. Four other tibiae had knife cuts on the shaft probably made during filleting.

The paucity of carpals and tarsals severely limited analysis of possible butchery of them. Two astragali and one calcaneus bore knife cuts on their anterior surfaces associated with separation of the upper hindlimb from the feet (and possibly the skins) at the ankle joint.

Butchery marks were recorded on sixteen metapodials, ten of which were knife cuts. Proximal ends of three metatarsals and a metacarpal had knife cuts on the anterior, lateral, or medial aspects typical of disarticulation marks. Horizontal knife cuts were found on the shafts of three metacarpals and two metatarsals, usually towards the proximal end. The purpose of these is unclear, although initial cutting of the skins

Table 2.147 Anatomical elements of sheep/goat from 27 Jewry Street

Groups	**27JS1**	**27JS2**	**27JS3**	**27JS4**		
Phases	**1–4**	**5–7**	**8–9**	**32**	**Total**	**%**
Skull frags	4	2	3		9	7
Mandible	3	12	3	3	21	17
Loose teeth		1	4	4	9	7
Scapula	1	4	3		8	7
Humerus	2	2	3		7	6
Radius	2	4	8	2	16	13
Ulna		1	1		2	2
Os coxae	1	1	2	1	5	4
Femur			1	1	2	2
Tibia	1		2		3	2
Calcaneus		1			1	0.8
Metacarpal	5	5	7	2	19	15
Metatarsal	3	4	2	1	10	8
1st Phalanx	1				1	0.8
Ribs	2	3			5	4
Cervical vertebrae		2			2	2
Thoracic vertebrae		1			1	0.8
Lumbar vertebrae		1	1		2	2
Total	25	44	40	14	123	

Table 2.148 Anatomical elements of sheep/goat from Henly's Garage

Groups	**HG1**	**HG2**	**HG3**	**HG5**	**HG7**	**HG6**	**HG4**		
Phases	**1–3**	**4–7**	**9–11**	**15**	**16**	**23–5**	**32**	**Total**	**%**
Skull frags		1	1	1	6	4	5	18	8
Mandible	1		1	7	3	3	13	28	12
Loose teeth			4	3	1	4	1	13	6
Scapula			2	2	3	2	1	10	4
Humerus			1	3	1	4	2	11	5
Radius		2	3	4	8	5	6	28	12
Ulna					2		1	3	1
Os coxae			4	3	1	4	3	15	7
Femur			2	1	3	5	1	12	5
Tibia		3	5	1	8	6	2	25	11
Metacarpal	1	2	1	1	9	4	3	21	9
Metatarsal	1	1		5	6	7	5	25	11
1st Phalanx						1		1	0.4
Ribs			1		2	4	2	9	4
Cervical vertebrae			1		1	4	1	7	3
Thoracic vertebrae					1	1		2	0.9
Lumbar vertebrae				1	1			2	0.9
Total	3	9	26	32	56	58	46	230	

Table 2.149 Relative percentages of selected sheep/goat bones (fragments)

Site/contexts	Mp:RUT	Mp:HF	HF:RUT	M:RUT	Sk:M	SOC:HF	M:Mp
VR East wells and pits	48	67	32	42	48	57	44
VR all trenches, ditches	48	78	28	45	17	45	47
VR East buildings	62	79	30	41	33	48	37
VR East NE corner	49	78	22	49	22	58	47
VR East layers/other	51	72	29	39	36	33	39
VR West shafts and pits	45	62	33	35	26	47	41
VR West buildings	49	75	24	48	24	63	49
VR West other deposits	45	71	24	33	39	50	38
Hyde Abbey buildings	54	78	25	34	38	54	30
Hyde Abbey other deposits	46	76	21	41	28	61	45
Jewry Street, Crown Hotel	43	76	19	42	43	TS	49
27 Jewry Street	58	76	30	50	30	TS	42
Henly's Garage	45	67	29	33	39	52	38

Key:
Mp = metapodials
RUT = radius, ulna, tibia
HF = humerus, femur
M = mandible
Sk = skull fragments
SOC = scapula, os coxae
TS = sample too small for calculations (<30 fragments)

Note: Figures represent percentages of the first group of bones listed, for example Sk:M is % skull of total skull and mandible fragments

is a possibility given the lack of evidence for skinning marks on any of the sheep/goat first phalanges.

One metatarsal had been split axially from the proximal end and another largely complete specimen had been chopped through obliquely at the distal end. Superficial horizontal chop marks were found on the shafts of two metacarpals and two metatarsals.

Butchery marks were found rather more frequently on sheep/goat ribs and vertebrae and provide evidence of how the trunk of the carcasses were segmented. Many of these marks were similar to those observed on the butchered carcasses discussed above. Chop marks were recorded much more frequently than knife cuts (Table 2.151). For example, chop marks around the dorsal articulation were recorded on ten ribs. These were made when they were separated from the thoracic vertebrae. Four other ribs had chop marks on the shaft. Only two ribs had knife cuts recorded around the dorsal end, although six specimens had knife cuts on various parts of the shaft. Additionally, there were many more rib shaft fragments of sheep-sized mammals which bore butchery marks. These fragments were not assigned to species but many would have belonged to sheep. They provide evidence that the rib cage was segmented and filleted.

Butchery marks were observed on 21 cervical vertebrae. Three atlases bore knife cuts where the skull had been detached. The only other knife cut was recorded on the ventral aspect of an axis. Twelve cervical vertebrae had been chopped axially along the line of the spine. These sometimes split the vertebrae into two equal halves but more often the chop was offset towards the lateral. Six specimens had been chopped through transversely where the spine was segmented into sections.

Most of the butchery recorded on other types of vertebrae was associated with the axial division of the trunk into two sides. Examples were found on thoracic, lumbar, and sacral vertebrae, as well as on sternebrae. In twelve cases the splitting was down the midline of the vertebrae; fourteen specimens had butchery marks on the lateral part of the bone where the flanks had been removed and seven specimens had been chopped through in the zone between the midline and the lateral extremity. Transverse chops through the vertebrae were recorded on only two bones.

Comparisons with butchery evidence from Owslebury and Dorchester Greyhound Yard (Maltby 1987a;1993) showed more similarities with the latter. Chop marks accounted for up to 75% of the butchery observations in the Dorchester sample where there was some evidence for an increase in the use of cleavers for butchery in the later Roman period. The types of butchery marks were also similar, particularly those resulting from the segmentation of the carcass. Chops through shafts of radii and tibiae were quite common and vertebrae often showed evidence of the trunk being roughly divided into sides. Knife cuts were more common on lower limb bones. At Owslebury, on the other hand, very few chop marks were recorded on limb bones. There were no examples of these bones being chopped through and segmentation of the limbs

Table 2.150 Fragmentation of major sheep/ goat bones

Site/contexts	0.1	0.25	0.5	0.75	1	N	WBE	Mean
Mandible								
VR East wells and pits	35	22	14	25	19	115	53.75	0.47
VR all trenches, ditches	17	8	5	3	1	34	9.45	0.28
VR East buildings	38	11	13	7	3	72	21.30	0.30
VR East NE corner	58	36	18	15	6	133	41.05	0.31
VR East layers/other	45	35	19	15	4	118	38.00	0.32
VR West shafts and pits	14	7	3	4		28	7.65	0.27
VR West buildings	16	7	2	3	1	29	7.60	0.26
VR West other deposits	20	30	5	2		57	13.50	0.24
Hyde Abbey buildings	8	13	8	8	2	39	16.05	0.41
Hyde Abbey other deposits	21	17	8	5	7	58	21.10	0.36
Jewry Street, Crown Hotel	6	7	4	5	3	25	11.10	0.44
27 Jewry Street	3	7	8	1	2	21	8.80	0.42
Henly's Garage	6	8	5	5	2	26	10.85	0.42
Total	287	208	112	98	50	755	260.20	0.34
Scapula								
VR East wells and pits	15	23	10	8	2	58	20.25	0.35
VR all trenches, ditches	2	1				3	0.45	
VR East buildings	3	6	5			14	4.30	0.31
VR East NE corner	11	16	6	4		37	11.10	0.30
VR East layers/other	7	6	2	2		17	4.70	0.28
VR West shafts and pits	4	4	3	1		12	3.65	0.30
VR West buildings	4	2	1			7	1.40	
VR West other deposits	3	7	1			11	2.55	0.23
Hyde Abbey buildings	7	5	2			14	2.95	0.21
Hyde Abbey other deposits	6	4	2			12	2.60	0.22
Jewry Street, Crown Hotel	2	3	1			6	1.45	
27 Jewry Street	7			1		8	2.50	0.31
Henly's Garage	1	4	3		1	9	3.60	0.40
Total	72	81	36	16	3	208	61.50	0.30
Humerus								
VR East wells and pits	12	14	8	5	3	42	15.45	0.37
VR all trenches, ditches	1	4		1	1	7	2.85	
VR East buildings	6	5	2	1		14	3.60	0.26
VR East NE corner	11	10	4	1		26	6.35	0.24
VR East layers/other	15	9	5	5		34	10.00	0.29
VR West shafts and pits	5	6	3		1	15	4.50	0.30
VR West buildings	1	2	1	1	1	6	2.85	
VR West other deposits	6	7	1	1		15	3.60	0.24
Hyde Abbey buildings	9	4	4	1		18	4.65	0.26
Hyde Abbey other deposits	4	2	3	1	1	11	4.15	0.38

Table 2.150 (*cont.*) Fragmentation of major sheep/ goat bones

Site/contexts	0.1	0.25	0.5	0.75	1	N	WBE	Mean
Jewry Street, Crown Hotel	1			1		2	0.60	
27 Jewry Street	3	2	1	1		7	2.05	
Henly's Garage	3	4	3	1		11	3.55	0.32
Total	77	69	35	20	7	208	64.20	0.31
Radius								
VR East wells and pits	17	29	17	6	3	72	24.95	0.35
VR all trenches, ditches	1	5		4		10	4.35	0.44
VR East buildings	8	14	8	1	1	32	10.05	0.31
VR East NE corner	28	24	14	4	1	71	19.80	0.28
VR East layers/other	15	28	14	7		64	20.75	0.32
VR West shafts and pits	3	8	3	2		16	5.30	0.33
VR West buildings	2	2	6	1		11	4.45	0.40
VR West other deposits	11	12	9	1		33	9.35	0.28
Hyde Abbey buildings	10	16	3	3		32	8.75	0.27
Hyde Abbey other deposits	10	9	8	5		32	11.00	0.34
Jewry Street, Crown Hotel	4	5	3	1		13	3.90	0.30
27 Jewry Street	5	6	2	3		16	5.25	0.33
Henly's Garage	5	12	5	2	1	25	8.50	0.34
Total	119	170	92	40	6	427	136.40	0.32
Femur								
VR East wells and pits	16	11	3		2	32	7.85	0.25
VR all trenches, ditches	4	3	1	1		9.00	2.40	
VR East buildings	10	6	2			18	3.50	0.19
VR East NE corner	10	5	1			16	2.75	0.17
VR East layers/other	25	5	2		1	33	5.75	0.17
VR West shafts and pits	5	4	1			10	2.00	0.20
VR West buildings		4				4	1.00	
VR West other deposits	4	5				9	1.65	0.18
Hyde Abbey buildings	3	2			1	6	1.80	
Hyde Abbey other deposits	4	4	3			11	2.90	0.26
Jewry Street, Crown Hotel	2	2	1	1		6	1.95	
27 Jewry Street		2				2	0.50	
Henly's Garage	3	3	3		1	10	3.55	0.36
Total	86	56	17	2	5	166	37.60	0.23
Tibia								
VR East wells and pits	14	25	16	10	1	66	24.15	0.37
VR all trenches, ditches	6	10	7			23	6.60	0.29
VR East buildings	6	13	9	3		31	10.60	0.34
VR East NE corner	18	34	16	2		70	19.80	0.28
VR East layers/other	22	37	17	7	2	85	27.20	0.32

Table 2.150 (*cont.*) Fragmentation of major sheep/ goat bones

Site/contexts	0.1	0.25	0.5	0.75	1	N	WBE	Mean
VR West shafts and pits	5	12	6	4		27	9.50	0.35
VR West buildings	6	6	2		1	15	4.10	0.27
VR West other deposits	8	22	3			33	7.80	0.24
Hyde Abbey buildings	9	16	4	5		34	10.65	0.31
Hyde Abbey other deposits	7	22	7	4		40	12.70	0.32
Jewry Street, Crown Hotel	1	7	6	1		15	5.60	0.37
27 Jewry Street	1	1	1			3	0.85	
Henly's Garage	7	11	4	3		25	7.70	0.31
Total	110	216	98	39	4	467	147.25	0.32
Metacarpal								
VR East wells and pits	17	18	14	13	8	70	30.95	0.44
VR all trenches, ditches	5	2	3	2	3	15	7.00	0.47
VR East buildings	19	22	9	9	1	60	19.65	0.33
VR East NE corner	14	22	10	11		57	20.15	0.35
VR East layers/other	28	26	20	9	1	84	27.05	0.32
VR West shafts and pits	7	10	3	2	1	23	7.20	0.31
VR West buildings	7	1	2	1	2	13	4.70	0.36
VR West other deposits	12	6	2	3	1	24	6.95	0.29
Hyde Abbey buildings	13	13	8	4	1	39	12.55	0.32
Hyde Abbey other deposits	15	5	6	2	1	29	8.25	0.28
Jewry Street, Crown Hotel	4	7	1	2	1	15	5.15	0.34
27 Jewry Street	5	8	1	4	1	19	7.00	0.37
Henly's Garage	4	2	4	6		16	6.90	0.43
Total	150	142	83	68	21	464	163.50	0.35
Metatarsal								
VR East wells and pits	25	17	7	18	7	74	30.75	0.42
VR all trenches, ditches	11	6	4	1	1	23	6.35	0.28
VR East buildings	22	16	15	6		59	16.70	0.28
VR East NE corner	25	22	24	18		89	33.50	0.38
VR East layers/other	26	25	19	22		92	34.85	0.38
VR West shafts and pits	9	1	3	4	1	18	6.65	0.27
VR West buildings	8	6	1	2		17	4.30	0.25
VR West other deposits	17	6	2	8	2	35	12.20	0.35
Hyde Abbey buildings	17	10	7	16	1	51	20.70	0.41
Hyde Abbey other deposits	16	11	3	9	1	40	13.60	0.34
Jewry Street, Crown Hotel	4	3	1	3		11	3.90	0.35
27 Jewry Street	-	3	4	2	1	10	5.25	0.53
Henly's Garage	4	5	5	5	2	21	9.90	0.47
Total	184	131	95	114	16	540	198.65	0.37

Key: as Table 2.113

Table 2.151 Observations of butchery marks on sheep/goat bones

	VR East			VR West			HA		Defences			
	K	C	B	K	C	B	K	C	K	C	B	Total
Skull frags	3	16			3		1	4		5		32
Mandible	7	5		1		1			1	1		16
Scapula	2	1		3	1		2	2	2	2		15
Humerus	2	5					1	1	3	1	1	14
Radius	3	10		1	4			5		3	1	27
Ulna					2							2
Os coxae	2	15		2	8			4	5	1		37
Femur	3	5		1	3		2		1	2		17
Tibia	3	13			3		2	2	1	3		27
Calcaneus	1											1
Astragalus	1		1									2
Metacarpal	3	1						1	1			6
Metatarsal	1	2		1	1		4			1		10
Ribs	2	8			2		3		2	3		20
Atlas	1			1	1				1			4
Axis		2		1				1				4
Cervical vertebrae		6			3			2		2		13
Thoracic vertebrae		11			1				1			13
Lumbar vertebrae	1	8		2	4					1		16
Sacrum		3			1							4
Sternebrae		1						1				2
Total	35	112	1	13	37	1	15	23	18	25	2	282
%	24	76	<1	25	73	2	39	61	40	56	4	
Butchered		148			51		38			45		282
Total sheep/goat (excluding teeth)		2579			766		649			469		4463
% butchered		6			7		6			10		6

Key:
K = knife cuts
C = chop marks
B = knife & chop marks

Note: Counts exclude groups of associated bones

appears to have relied on the use of knives, continuing the practice common in the Iron Age. Cleavers were used sometimes to split open the skull and the vertebrae, but such butchery was not carried out as consistently as on the urban sites.

It is not clear what proportion of sheep carcasses were processed by professional butchers in Winchester. Techniques of segmentation not encountered in Owslebury were observed and these were very similar to those found in Dorchester. This may imply that specialists were often processing sheep carcasses. However, investigation of possible chronological variations in butchery have not been carried out in Winchester. It is possible that the use of the cleaver for butchery gradually became more widespread amongst the inhabitants of the town during the Roman period. There were also variations between assemblages from different sites. Relatively more knife cuts were found on bones from the Hyde Abbey and Henly's Garage sites, for example. Several reasons for this can be postulated. Perhaps the refuse from these sites included more bones that had been filleted during food preparation and consumption. Alternatively, fewer bones of sheep processed by specialist butchers may have been deposited on those sites. It is likely that more sheep than cattle would have been butchered by households and they may have relied more on knives. Chronological variation and differential preservation are also factors that have to be considered when comparing relative frequencies of different types of butchery mark.

Table 2.152 Summary of sheep/goat mandibular tooth eruption data

	Eruption stage												
Site/group	**1**	**2**	**2–3**	**3**	**3–4**	**4**	**4–5**	**5**	**5–6**	**6**	**6–7**	**7**	**Total**
VR East wells & pits		6		1	2	23	1	20	1	10	1	2	67
VR East other	1	1		1	6	22	7	49	7	26	9	11	140
VR West		1		1	1	9	2	19		4	5	4	46
HA			1	1		9	1	23	2	10	6	1	54
JCH		1			1	6		6	1	3			18
27JS				1				5	2	3	1	1	13
HG		1				3		7	1	1			13
Total	1	10	1	5	10	72	11	129	14	57	22	19	351
%	0.3	3	0.3	1	3	21	3	37	4	16	6	5	

Key:
Stage 1 = deciduous 4th premolar (d4) not in wear
Stage 2 = d4 in wear; 1st molar (M1) not in wear
Stage 3 = M1 in wear; 2nd molar (M2) not in wear
Stage 4 = M2 in wear; 3rd molar (M3) not in wear
Stage 5 = M3 in wear; M1 not in heavy wear (< Grant stage h)
Stage 6 = M1 in heavy wear; M2 not in heavy wear
Stage 7 = M1 and M2 in heavy wear

Ageing data

Both tooth eruption and epiphysial fusion data were recorded. Recording of the eruption and wear of mandibular cheek teeth initially followed the method of Grant (1982). Mandibles were then allotted, where possible, to one of seven stages of development. In some cases, the fragmentary nature of the jaw, resulting in the absence of some teeth, meant that mandibles could only be assigned to two adjacent stages. A total of 351 mandibles were complete enough for this assessment to be made. The numbers assigned to each stage are listed in Table 2.152.

Epiphysial fusion analysis was severely handicapped by the damage inflicted by gnawing. Only a small proportion of the limb bones survived with articular surfaces and there is a probability that unfused specimens were more prone to destruction. Younger animals are therefore likely to be under-represented. There are also problems of estimating the age of fusion.

Very few neonatal mortalities (Stage 1) and young lambs (Stage 2) were represented by mandibles. Only one specimen had unworn deciduous premolars (Stage 1) and only ten more (3%) did not have the first molar in wear, signifying that they died before about three to five months of age (Stage 2). This indicates that sheep were not bred in this area of the town and the slaughter of lambs and kids as a by-product of milk production was not a common practice. It should be noted, however, that the majority of deposits excavated were not conducive to the survival of the fragile mandibles of very young sheep and goats. It may be significant that the majority of mandibles of young sheep and goats were found in pits and wells where they had a better chance of survival. A similar pattern was observed on the Dorchester Greyhound Yard site (Maltby 1993).

Only 1% of the mandibles from Winchester were at Stage 3 of the toothwear sequence. They would have belonged to animals mostly aged between six and 12 months (Jones 2006). This was an age of death for sheep commonly encountered on Iron Age sites in Wessex (Hambleton 1999), for example at Danebury (Grant 1984; 1991) and Winnall Down (Maltby 1985b). Slaughtering of sheep at that age generally became less common in the Romano-British period (Maltby 1981). There is evidence that the slaughter of sheep of this age became less common in the later Roman period in the towns of Cirencester and Dorchester (Levitan 1990; Maltby 1993). The percentage of sheep killed at this age at Owslebury also gradually declined during the late Iron Age and Romano-British phases. However, even in the late Roman deposits, 8% of the sample were assigned to Stage 3, indicating a higher mortality of sheep under a year old than at Winchester (Maltby 1987a).

There was a substantial kill-off of sheep at Stage 4 of the tooth eruption sequence. Twenty-one per cent of the mandibles from Winchester were assigned to this stage and belonged to animals culled between one and two years of age, probably mostly in the upper part of that range. These were immature animals slaughtered for their meat. It was a common age of culling in the Romano-British period (Maltby 1981) and animals of this age were also commonly recorded at Dorchester and Owslebury (Maltby 1994). The increase in the number of animals killed at this age, particularly in towns, indicates the increased importance of meat production and possibly improvements in husbandry and fodder provision to allow a greater proportion of the flock to live longer prior to slaughter.

Table 2.153 Summary of wear stages of sheep/goat mandibles

	Numerical value of wear									
Site/group	**1–5**	**6–10**	**11–15**	**16–20**	**21–5**	**26–30**	**31–5**	**36–40**	**41+**	**Total**
VR East wells & pits	5	1		3	21	2	20	12	1	65
VR East other	2			3	19	15	37	36	10	122
VR West	1		1	1	6	4	15	5	5	38
HA	1			3	5	5	16	14	2	46
JCH	1			2	3	1	7	3		17
27JS		1				1	4	5	1	12
HG	1			2	1	1	7	1		13
Total	11	2	1	14	55	29	106	76	19	313
%	4	0.6	0.3	4	18	9	34	24	6	

Note: Method adapted from Grant (1982)
Totals include estimated numerical values

Table 2.154 Summary of sheep/goat epiphysial fusion data

		U	J	F	%F
Early fusing epiphyses	Acetabulum	5		53	91
	Radius, proximal	8	1	84	90
	Humerus, distal	11	1	55	82
	Scapula, glenoid process	10		39	80
Later fusing epiphyses	2nd Phalanx, proximal			10	100
	1st Phalanx, proximal	3	1	51	93
	Tibia, distal	11	3	95	87
	Metacarpal, distal	15		23	61
	Metatarsal, distal	17		16	48
Late fusing epiphyses	Calcaneus, proximal	7	2	21	70
	Femur, proximal	13		10	43
	Tibia, proximal	8		6	43
	Radius, distal	19	1	11	35
	Femur, distal	9	1	4	29
	Humerus, proximal	11	1	3	20

Key:
U = unfused
J = fusing
F = fused
%F = percentage fused

However, two-thirds of the sheep/goat mandibles from Winchester belonged to sheep/goat that had all their molars in wear (Stages 5–7) and belonged to animals over two years of age. Many of these (37% of the total sample), however, did not possess any heavily worn teeth (Stage 5) and mostly represent animals aged under six years old (Jones 2006). Animals culled between these ages may have provided some fleeces and offspring prior to slaughter but were killed before old age. Samples from Dorchester also included a high percentage of mandibles of animals of this age (Maltby 1993).

Mandibles of sheep over six years of years of age (Stages 6–7) provided 27% of the Winchester sample and represented animals kept for breeding, wool production, and possibly milk products prior to slaughter. The fact that they were represented in fairly substantial numbers even in the town where demands for meat would have been greater, suggests that some secondary products, probably wool, were of importance. The percentage of adult sheep represented was greater than in later Roman deposits in Dorchester, where Stage 5 mandibles dominated the sample (Maltby 1993), but the Winchester samples were similar to results from contemporary deposits at Owslebury (Maltby 1987a). However, comparatively few very old sheep represented by mandibles at Stage 7 were evident at Winchester (Table 2.152).

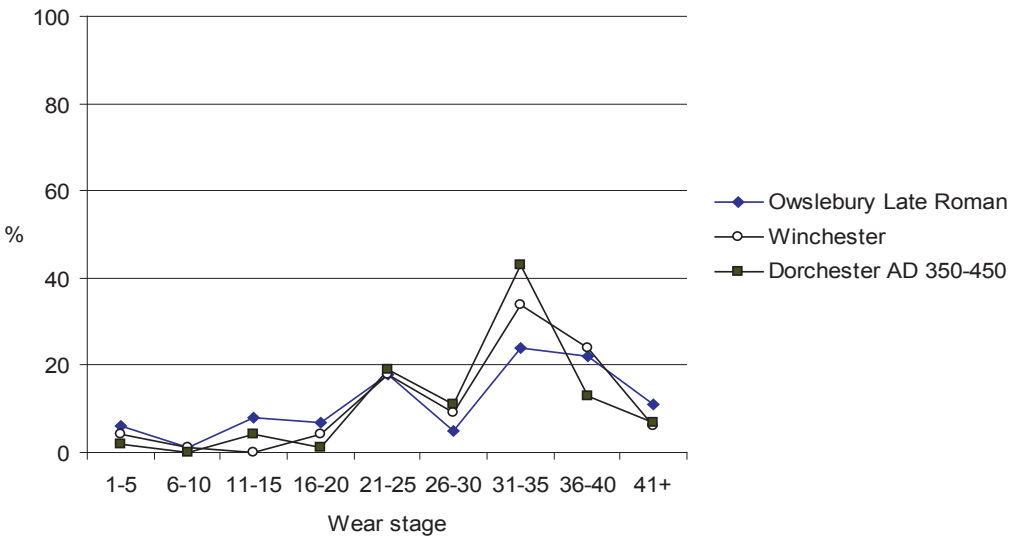


Figure 43 Sheep/goat mandible wear stages

Most (313) of the mandibles with surviving molars were complete enough to allow calculations of numerical values based on tooth eruption and crown attrition patterns following the system of Grant (1982). Estimated values were made in cases where one molar was absent. The results are summarised by site in Table 2.153. Mandibles with values of 1–5 are equivalent to Stages 1–2 in the above discussion. Those with values of 6–15 equate with Stage 3; 16–25 with Stage 4; 26–35 mainly with Stage 5; 36–40 mainly with Stage 6 and 41 and above with Stage 7. As in the case of cattle, the numerical values do not represent equal periods of time. The rate of change in numerical values tends to decrease in older specimens. Approximate ages for Grant wear stages are given by Hambleton (1999).

The results of the analysis confirm the trends noted above that there were very few young lambs represented but higher mortalities of animals above 18 months of age and particularly between two and six years. Comparisons of the results of this analysis with samples from Dorchester and Owslebury (Fig 43) show that the samples from Winchester and Dorchester have a lot of similarities, with high peaks of specimens with values of 31–5. This peak was more marked in the latter sample whereas the Winchester sample had higher percentages of slightly older animals with values of 36–40. The results from the Owslebury sample showed the same general pattern but the peaks were not as marked. There were relatively more specimens with values of under 20 and more old animals represented by specimens of values of over 41.

Table 2.154 summarises the epiphysial fusion data, which generally support the more reliable toothwear evidence. Between 80% and 91% of the early fusing epiphyses had fused and belonged to animals probably mainly over a year old. This implies a slightly higher rate of first year mortality than indicated by the mandibles. Of the later fusing epiphyses, results from the phalanges should be disregarded as they have probably been biased by less efficient retrieval of the smaller unfused specimens. Results from the distal tibia, metacarpals, and metatarsals differed quite widely, ranging from 87% fused for the tibia to 48% for the metatarsal. These epiphyses probably fused between 15 and 28 months, although a lot of variability should be expected. The large fluctuations probably reflect the fact that a lot of animals were slaughtered between these ages, an observation that again supports the tooth eruption data.

Late fusing epiphyses are the most susceptible to destruction and the sample sizes are consequently smaller and even less reliable. Results from the calcaneus should again probably be disregarded because of the small size of the unfused specimens. Other bones included between 20% and 43% fused specimens representing sheep mainly over three years of age. The results reflect that there was substantial further kill off of animals between two and four years old, as indicated by the mandibular ageing data.

The fact that the Dorchester and Winchester samples show less diversity in the ages of animals represented probably reflects the greater selectivity of animals acquired to supplement the urban meat supply. The inhabitants of the rural settlement of Owslebury were more likely to consume meat from younger casualties and from old stock not sent to the urban market.

Metrical data

Details of the most common measurements of sheep/goat are given in Appendix 1. Although their bones were less heavily butchered than cattle, the destruc-

Table 2.155 Sheep withers height estimates

Bone	Estimated heights (cm)
Radius	55.4, 55.9
Metacarpal	54.7, 57.3, 57.4, 58.9, 59.5, 60.6, 61.6, 61.9, 62.3
Metatarsal	55.0, 58.0, 58.1, 58.2, 61.8, 64.2

	N	Min	Max	Mean	SD	CV
All Bones	17	54.7	64.2	58.9	2.8	4.8
Owslebury LR	25	54.5	62.9	58.3	2.8	4.8
Dorchester LR	19	50.0	67.4	59.2	5.3	9.0
Exeter Roman	19	52.7	64.9	57.0	2.9	5.2

Key:
N = number of measured bones
SD = standard deviation
CV = coefficient of variation
Note:
Data for Exeter Roman, Owslebury, and Dorchester – late Roman adapted from Maltby (1979a; 1987a; 1993)

Estimates calculated by multiplying greatest lengths by Teichert's (1975) factors:
radius: 4.02
metacarpal: 4.89
metatarsal: 4.54

tion of so many articular surfaces of sheep bones severely limited the collection of metrical data. The greatest lengths of only seventeen complete limb bones, mostly metapodials, could be measured. These measurements were transformed into estimates of withers height using the conversion factors of Teichert (1975; Table 2.155). These estimates ranged between about 55cm and 64cm with a mean of 58.9cm and a relatively small standard deviation. These figures are fairly similar to those from Owslebury, although some taller sheep were represented in Winchester. The average height was slightly lower than those in the sample from later Roman deposits in Dorchester, where there was more variability. The sheep from all of these sites were on average larger than those from Exeter (Table 2.155). Sheep in western Britain tended to be on average smaller than those further to the east in the Romano-British period (Maltby 1981). Comparisons of sheep withers heights from other Romano-British towns will be made in Section 2.3 (Table 2.234).

Summaries of the most common sheep measurements are given in Table 2.156. The results from early fusing articulations such as the scapula, distal humerus, proximal radius, and the proximal metapodials (which fuse before birth), should be treated with some caution, since they may include specimens from immature animals that were not fully grown. These articular surfaces sometimes have considerable post-fusion growth and, although porous specimens were not measured, some bias in the results towards smaller specimens may be expected. Unfortunately, the number of measurable late fusing articular ends was limited. The mean breadth measurements tended to be slightly larger than those from the later Roman deposits in Dorchester (Maltby 1993). Whether this means that Winchester in general was provided with slightly larger stock than Dorchester, or whether the sample contained a greater proportion of male specimens, which tend to be broader, remains to be investigated further.

Table 2.157 compares the minimum shaft diameters and greatest distal breadth measurements against greatest lengths of complete metacarpals from Winchester. These indicate that the ratios of breadth to length of the bones was fairly consistent and similar to the metacarpals represented in the later Roman deposits at Dorchester, where the bones tended to be generally sturdier than in the early Roman deposits (Maltby 1993).

Nine sheep bones from the sieved samples were measured. These included a metacarpal with a greatest length of 127.8mm, a maximum proximal breadth of 19.5mm, a minimum shaft breadth of 11.8mm, and a maximum distal breadth of 22.6mm. This specimen was slightly longer than any of the complete metacarpals in the main assemblage (Table 2.157) and had an estimated withers height of 62.5cm, the second largest estimate obtained in the Winchester Roman samples (Table 2.155). The shaft breadth:greatest length ratio for this metacarpal was 0.09, indicating it was more slender than the other measured specimens (Table 2.157). Indeed the proximal breadth measurement was the smallest obtained in the whole sample (Table 2.156).

Other measurements obtained from sieved samples included a scapula with a greatest length of the glenoid and tuber scapulae of 29.8mm; a humerus with a maximum distal breadth of 32.4mm and a distal trochlea breadth of 30.9mm; a calcaneus with a greatest length of 51.7mm; two metacarpals with maximum proximal breadths of 20.2mm and 23.0mm; a metatarsal with a maximum proximal breadth of 19.8mm and a radius with a maximum

Table 2.156 Summary of sheep measurements

Anatomy	Measurement	N	Min	Max	Mean	SD	CV
Scapula	SLC	30	16.2	22.2	18.6	1.4	7.7
	GLP	23	28.8	35.4	31.3	1.8	5.7
	BG	21	18.1	23.2	19.7	1.4	6.9
Humerus	BT	37	24.4	31.1	27.8	1.6	5.7
	Bd	22	26.9	33.9	29.9	2.1	7.0
	HT	38	15.6	20.2	18.0	1.2	6.6
Radius	Bp	45	26.7	33.5	30.0	1.5	5.0
	BFp	45	24.0	30.6	27.4	1.4	5.1
	Dp	40	13.9	17.8	15.6	0.9	6.1
	Bd	8	24.9	31.5	27.5	2.2	8.1
Tibia*	Bd	85	21.8	28.1	25.2	1.3	5.2
	Dd	79	16.6	22.2	19.5	1.2	6.1
Calcaneus	GL	15	49.8	59.4	54.3	3.2	5.9
Astragalus	GLl	11	26.1	32.1	27.9	2.0	7.2
	GLm	9	25.1	29.9	27.0	1.7	6.3
	Bd	10	14.6	17.7	15.8	1.0	6.2
Metacarpal	GL	9	111.9	127.4	121.4	5.2	4.3
	Bp	54	19.7	25.7	22.3	1.4	6.1
	Dp	45	14.5	18.8	16.3	1.0	6.3
	Bd	12	22.1	26.3	24.4	1.4	5.6
	Bdf	17	21.6	26.5	24.2	1.5	6.2
	Ddf	15	11.9	14.6	13.0	0.7	5.1
Metatarsal	Bp	48	16.5	21.9	19.5	1.2	6.4
	Bd	12	21.1	27.1	23.6	1.7	7.1
	Bdf	12	19.7	26.9	22.9	1.9	8.3
	Ddf	13	11.4	14.6	13.0	1.0	7.5

Key:
SLC = smallest length of neck
GLP = greatest length of glenoid and tuber scapulae
BG = breadth of glenoid cavity
BT = breadth distal trochlea
Bd = maximum distal breadth
HT = greatest height of distal trochlea
Bp = maximum proximal breadth
BFp = breadth of proximal articular surface
Dp = maximum proximal depth
Dd = maximum distal depth
GL = greatest length
GLl = greatest length lateral half
GLm = greatest length medial half
Bdf = breadth distal fusion point
Ddf = depth distal fusion point

N = number of measured bones
SD = standard deviation
CV = coefficient of variation

* may include a few bones of goat
All measurements in millimetres

proximal breadth of 29.8 and a proximal articular surface breadth of 28.2mm. All these measurements fell within the ranges obtained from the unsieved assemblage (Table 2.156).

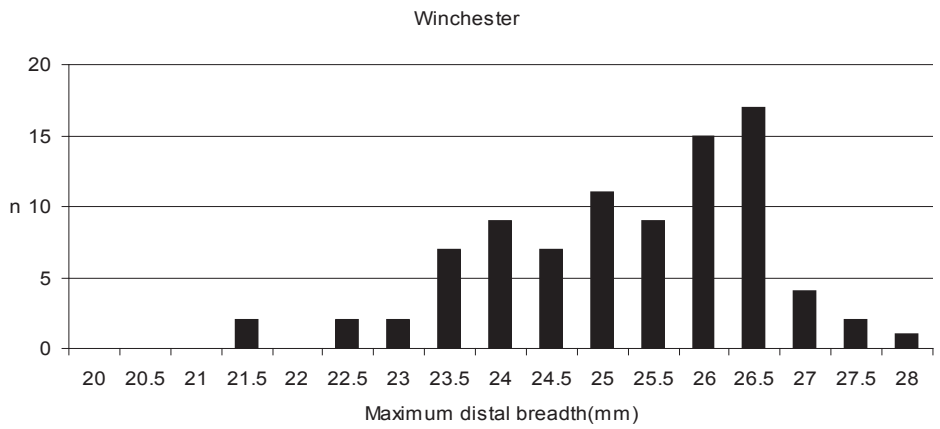
Comparisons of the type and size of sheep represented in and around Winchester have produced some interesting contrasts (Maltby 1994). Both horned and hornless sheep have been recorded in Winchester. Hornless specimens were found in early Roman deposits at Staple Gardens (Maltby 1986a) and in some numbers in the later Roman deposits in the northern suburb. Iron Age sheep in the area appear to have been horned. No hornless specimens were found in Iron Age deposits at Winnall Down (Maltby 1985b) and Owslebury (Maltby 1987a). They were found very rarely in the huge sample from Danebury (Grant 1984). At Owslebury, hornless specimens were found only in late Roman features, several hundred years later than their appearance in nearby Winchester. It would appear that the inhabitants there continued to exploit traditional native sheep, whereas the inhabitants of Winchester

Table 2.157 Sheep metacarpal measurements and indices

GL	Bp	SD	Bd	SD:GL	Bd:GL
111.9		12.5	22.1	0.11	0.20
117.1	20.9	11.3	22.4	0.10	0.19
117.3	20.9	13.2	22.8	0.11	0.19
120.5		11.7		0.10	
121.6	23.0	13.1	25.6	0.11	0.21
123.9	21.1	13.5	22.9	0.11	0.18
125.9		12.7	24.5	0.10	0.19
126.6	21.0	12.1	22.8	0.10	0.18
127.4	22.7	14.0	24.2	0.11	0.19

Key:
GL = greatest length
Bp = maximum proximal breadth
SD = minimum shaft breadth
Bd = maximum distal breadth

Note: all measurements in millimetres



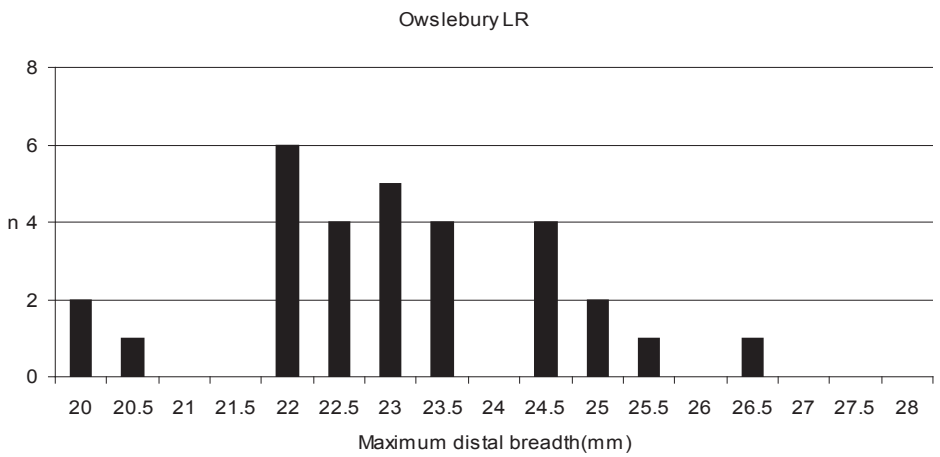
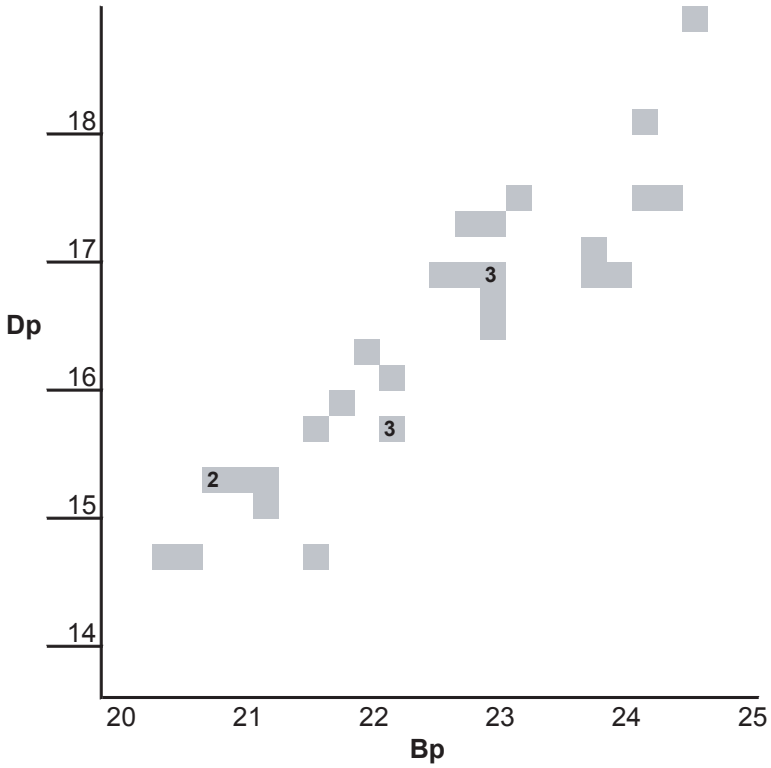


Figure 44 Maximum distal breadths of sheep/goat tibiae



Key: Bp maximum proximal breadth (mm)
Dp maximum proximal depth (mm)
2, 3 2 and 3 specimens measuring the same

Figure 45 Measurements of proximal ends of sheep metacarpals

Plate 35 Example of a hornless sheep skull

were supplied with sheep of both this type and of a hornless type (Plate 35).

Comparisons of the distal breadths of tibiae from Winchester and Owslebury (Fig 44) show a remarkable contrast in the sizes of the stock represented. The Winchester samples included many more larger specimens. Sixty-eight per cent of the specimens had breadths of over 25.0mm compared with only 13% in the late Roman sample from Owslebury.

At Owslebury, the late Roman pits which contained the hornless skulls also produced complete metapodials belonging to the same sheep. These remains perhaps represent bones brought to the site with skins. These metapodials were larger than nearly all the other specimens from the site (Maltby 1994) indicating that the hornless sheep were larger than the traditional type of sheep. Most of the metacarpals from these animals had proximal breadths of over 22mm. Metacarpals of that size were found much more commonly in the Winchester deposits (Fig 45), although some others were no larger than the smaller specimens from Owslebury. This and data presented for the proximal breadth of metatarsals in Figure 46 suggest that the majority of the sheep in Winchester were larger and possibly of a different type to the native breed and were perhaps derived from stock originally imported into Britain at the end of the Iron Age. It implies that the inhabitants of Winchester were supplied with lamb and mutton from a wide range of flocks.

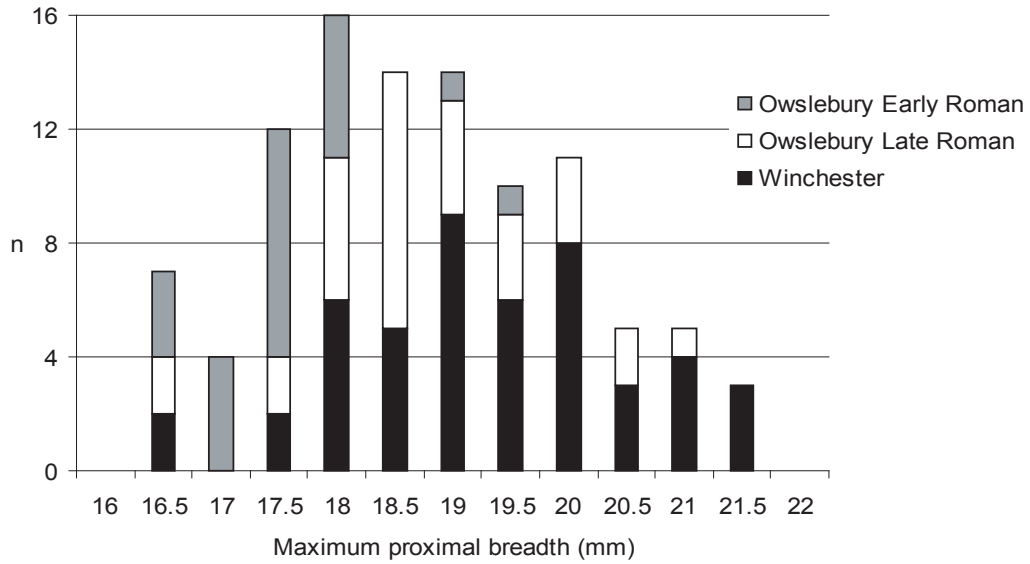


Figure 46 Maximum proximal breadths of sheep metatarsals

The exploitation of pigs

Associated bones

Six groups of associated bones were recorded totalling 175 bones, which represents 8% of the pig fragments identified from the hand-collected assemblages. The bones in the associated groups are listed in Tables 2.159 and 2.168. Four of the groups were found in pits and wells from Victoria Road East (Groups VRE19–24); the other two were found in late Roman deposits from the Hyde Abbey site (Group HA74.8). All the groups belonged to either juvenile or immature pigs. The most complete of the partial skeletons recovered consisted of 72 bones from a juvenile animal from Victoria Road East well F1096 (Group VRE19); 71 bones from an immature pig were found in F156 on the Hyde Abbey site (Group HA74.8). No evidence of butchery was found on these or any of the smaller associated groups of pig bones. Most of the groups were found in features where partial and complete skeletons of other species were also found and four toe bones from an immature pig were found in the same layer as an infant burial in Victoria Road East pit F168 (Group VRE21). However, there is no clear evidence from the bones themselves or from their contextual or artefactual associations that these groups represent ritual deposition. In particular, the groups of foot bones from Victoria Road East well F1093 and pit F168 could represent trotters discarded as butchery waste. The other groups may have been from natural mortalities of stock kept in the town or from joints of spoiled meat dumped into the pits and wells when they were disused.

Abundance of pig bones

The abundance of pig bones has already been discussed in general terms (pp 91–105) and in relation to sheep/goat in particular (p 159). It remains to consider the relative importance of pigs to the meat diet, particularly in comparison with other sites. Such comparisons again have to be largely restricted to fragment (NISP) counts because of the nature of previous studies.

The abundance of pig bones displayed quite a high degree of variability in the samples, although the general trends were quite consistent. Employing fragment counts, they ranked third behind cattle and sheep/goat in all thirteen major assemblage groups (Table 2.95) and only occasionally achieved a higher ranking employing the other quantification methods (Tables 2.96–2.98).

As discussed above (p 159), perhaps a more reliable indication of assessing the importance of pigs is to ignore the counts of larger mammals and to compare pig bone frequencies with sheep/goat counts only. In ten of the thirteen main groups, pig provided 20–30% of the total sheep/goat and pig fragments. The only exceptions were the samples from the Victoria Road ditches, Henly's Garage, and the Victoria Road West wells and pits, which produced 44%, 38%, and 37% pig fragments respectively. There does not appear to be any clear chronological pattern in these variations. Pigs were better represented in the assemblages from Victoria Road West and Henly's Garage (Fig 33), which may indicate variations in the importance of pork in different areas of the town.

However, a consideration of the results from sub-samples from the above sites (Fig 47) shows that

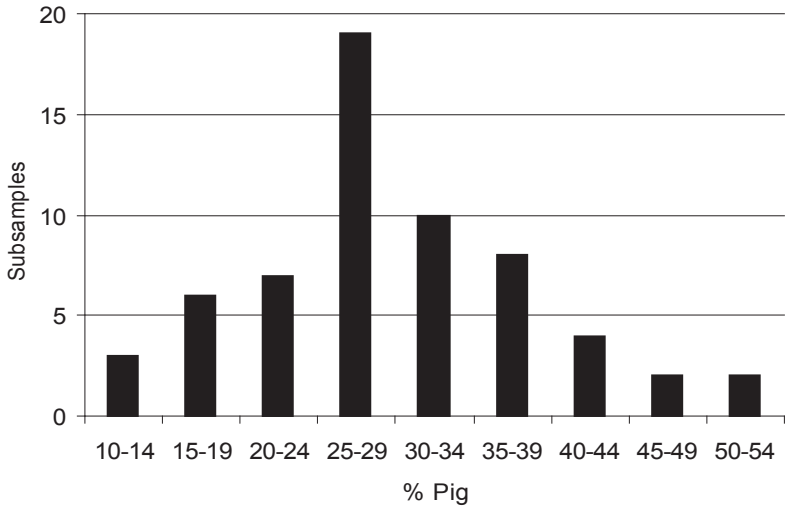


Figure 47 Pig bones as a percentage of total pig and sheep/goat bones

although the percentage of pig varied between 10% and 54% of the total sheep/goat and pig fragments, the distribution is clearly unimodal, with the mean (29%) and median (27%) lying within the main modal group (25–29%). The majority (70%) of the sub-samples produced percentages that lie within one standard deviation (9.3%) of the mean and the distribution is very similar to what one would expect from a statistically normal distribution. As such, statistically one can regard the overall sample to be representative of a single population, with the variations observed in the sub-samples being expected errors in the sampling of that population. Even so, the distributional variation does need to be investigated further, particularly in the light of variations in pig frequencies that have now been encountered within several Romano-British towns (see below, pp 268–269).

The percentages of pig bones recovered are similar to the results from other Romano-British towns, from where a number of samples have produced quite high percentages of pig (King 1984; Maltby 1998). King (1984) has argued that the consumption of pork and bacon was greater in towns than in other types of Romano-British civilian settlements because of the dietary preferences of the inhabitants. He has suggested that this demand was initially directly or indirectly influenced by army veterans accustomed to a higher consumption of beef and pork than lamb and mutton, both in the army and in their native lands.

The percentage of pig bones in the Winchester suburbs and city defences samples are compared with other sites in and around Winchester and Dorchester in Table 2.158. These show that most of the samples from the Winchester northern suburb have lower pig frequencies than those in the Staple Gardens samples from nearer the centre of the town (Maltby 1986a). They are also lower than most of those from the substantial intra-mural samples obtained from the Greyhound Yard excavations in Dorchester (Maltby 1993).

As Table 2.158 shows, rather lower percentages have been recorded on sites near the periphery of the two towns, notably on these sites in Winchester and the Dorchester County Hall site in Dorchester (Hamilton-Dyer 1993a). Sites on the outskirts of these towns have notably low levels of pig bones, for example the Winnall Down/Easton Lane site near Winchester (Maltby 1985b; 1989b) and the Alington Avenue site near Dorchester (Maltby 2002). Other contemporary rural sites in Wessex also generally have low pig frequencies. Owslebury (Maltby 1987a) is unusual in that its early Roman assemblages have quite high frequencies of pig (mostly 25–35%) but these figures decline in the later Roman deposits (generally 10–20% – Table 2.158) and are lower than most of the contemporary samples from Winchester.

To summarise, it seems that pork and bacon were consumed (or at least pig carcasses were processed and dumped) in relatively greater quantities in comparison with lamb and mutton in Roman Winchester and Dorchester than on contemporary sites in their hinterland. There is also some evidence to suggest that pig bones are better represented near the centre of these towns than on their peripheries. There is, of course, a need to examine further samples from different parts of these towns. Lower frequencies of pig bones on peripheral sites may simply reflect a chronological change, in which pigs became less important in the later Roman period, as seen at Owslebury. Excavation of suburban sites may produce a higher proportion of later Roman assemblages, for example, and perhaps relatively fewer pig bones because of this. However, there is as yet no convincing evidence to support this explanation. Both early and late Roman assemblages from the Greyhound Yard site in Dorchester produced higher levels of pig bones than peripheral sites.

If the results genuinely reflect the fact that pork consumption was greater in these towns, it raises the question of the origin of these supplies in areas where it appears that pigs were kept traditionally in small numbers (Maltby 1994). Sources for this increased demand could be villas but there are no good

Table 2.158 Percentages of pig among total sheep/goat, and pig fragments from samples in and around Winchester and Dorchester

% pig	Winchester, northern suburb & city defences, 2nd–4th C	Winchester, Staple Gardens, Roman	Winnall Down/Easton Lane, late Iron Age/ early Roman	Owslebury, early Roman	Owslebury, late Roman	Brighton Hill South, late Iron Age/early Roman	Abbotstone Down, late Iron Age/early Roman	Dorchester, Greyhound Yard, Roman	Dorchester, Alington Avenue, late Iron Age	Dorchester, Alington Avenue, Roman	Dorchester, County Hall, Roman
0–4						1					
5–9			1						1		
10–14	2		1		3	1				1	1
15–19	5		2	1	4	1					
20–4	8			3	1		1	1			
25–9	16			3				2			
30–4	5			6				7			
35–9	6	1		1				16			
40–4	2	1						17			
45–9	3							9			
50–4	1							2			
55–9				(none)							
60–4								1			
Total Samples	48	2	4	14	8	3	1	55	1	1	1

Note: Data adapted and expanded from Maltby (1994) and also taken from individual reports for:
Winchester, Staple Gardens (Maltby 1986a)
Winnall Down/ Easton Lane (Maltby 1985b, 1989b)
Owslebury (Maltby 1987a)
Brighton Hill South (Maltby 1995a)
Abbotstone Down (Maltby 1986b)
Dorchester, Greyhound Yard (Maltby 1993)
Dorchester, Alington Avenue (Maltby 2002)

Samples consist of groups from discrete features or feature groups containing at least 50 sheep/goat and pig fragments. Most contain over 100 fragments.

villa samples as yet available for comparison from Hampshire. It is also possible that meat preserved by salting or smoking could have been brought in from some distance. Again, there is to date no direct evidence for this.

Perhaps a more likely alternative is that a substantial number of pigs consumed in these towns were bred and kept within the central areas. The towns themselves could have been centres of pig production. Keeping of pigs in towns by households is well attested in the medieval period and this could have happened at an earlier date. The decrease in the frequency of pig bones in samples from the suburbs and even more markedly in those from nearby rural settlements, suggests that the inner urban parts of these towns acted as the focal point for the distribution of pork and possibly as production centres as well. Further discussion of pig abundance in major Romano-British towns can be found in Section 2.3.

Representation of different skeletal elements

Pig bones identified in all the sub-samples are listed by general assemblage group (Tables 2.159–2.171). However, because of the smaller sample sizes these data will not be examined in as much detail as those of cattle and sheep/goat. In many respects, the relative abundance of different elements is similar to that of sheep/goat with preservation and retrieval biases being major factors in the distribution. Gnawing damage, for example, resulted in a high loss of the major limb bone articular surfaces (Table 2.92) and approximately 85% of these and smaller bones of the appendicular skeleton had not survived in comparison with the best represented element – the mandible (Fig 27).

Pig mandibles seem to survive well in comparison with other pig bones in most faunal samples (Coy 1985). Skull fragments are also usually well represented and sometimes outnumber mandible fragments

Table 2.159 Anatomical elements of pig from Victoria Road East wells and pits

Groups	VRE19		VRE20		VRE24	VRE23		VRE22	VRE21			
Wells & pits	F1096		F1093		F1098	F981		F814	F168		Total	%
	A	O	A	O		A	O		A	O		
Skull frags	1	6		5			1	18			31	13
Mandible	1	8		7	1		2	9		3	31	13
Loose teeth		6		6			2	7		1	22	10
Scapula	2	1		4			2	2		1	12	3
Humerus	3	3		4				8		5	23	9
Radius	2	3		1				2			8	3
Ulna	1	1		4				1		3	10	4
Os coxae	2	3		5		1		3		4	18	7
Femur	2	5		6		1		5			19	7
Tibia	1	5		6		1	1	6		3	23	9
Fibula		2		4		1		1		1	9	4
Calcaneus	1			2				1			4	2
Astragalus		1		1				1			3	0.9
Other tarsals			3								3	
Metacarpal	2	1	3					1			7	0.9
Metatarsal		1	2	1				3		1	8	3
Lateral metapodials	1	3	2				1	2		1	10	3
1st Phalanx		1	5					2	1		9	0.9
2nd Phalanx	1		2						1		4	
Sesamoids									2		2	
Ribs	21	1		5			1				28	3
Sternebrae	1										1	
Cervical vertebrae	9										9	
Thoracic vertebrae	8			1							9	0.4
Lumbar vertebrae	11	2		6				1			20	4
Sacrum	1				1						2	0.4
Caudal vertebrae	1										1	
Total	72	53	17	68	2	4	10	73	4	23	326	

Key:
A = associated bones
O = other bones

Note: % excludes associated bones

in the major assemblage groups (Table 2.172). The Winchester assemblages that derived mainly from silts and other layers usually produced relatively fewer skull fragments than others, probably reflecting poorer preservation conditions. The combined totals of skull fragments, mandibles, and loose teeth contributed over 29% of the pig fragments in all the assemblage groups and over 40% in several of them (Tables 2.159–2.171).

Bones of the foot were generally poorly represented. Retrieval bias could largely account for the lack of phalanges (Fig 27). Pig calcanei and astragali were relatively better represented than in the sheep/goat assemblage (Fig 26). These bones are larger in the pig and may have suffered less from retrieval bias. Conversely, pig axial metapodials were under-represented and their proximal ends notably suffered much greater losses than the proximal metapodials of sheep/goat (Fig 26). Sheep/goat metapodials are larger than those of pig, provided they survive in a relatively complete state, and this may partially account for their higher numbers. There was no evidence for the disposal of large numbers of pigs' trotters, which has been observed on some Romano-British sites, for example Dorchester (Maltby 1993) and Exeter (Maltby 1979a). The abundance of pig foot bones was in general lower in relation to both head and upper limb bones in Winchester (Table 2.172) than at Dorches-

Table 2.160 Anatomical elements of pig from Victoria Road ditches

Groups	VRE25	VRW11	
Ditches	F122/1202	F12	
	Total	Total	%
Skull frags	2	15	9
Mandible		15	9
Loose teeth	1	21	13
Scapula	3	10	6
Humerus		17	10
Radius	2	10	6
Ulna		5	3
Os coxae		14	8
Femur		8	5
Tibia		14	8
Fibula		5	3
Calcaneus		5	3
Astragalus		3	2
Metacarpal		3	2
Metatarsal		4	2
Lateral metapodial		4	2
1st Phalanx		1	0.6
2nd Phalanx		1	0.6
3rd Phalanx		1	0.6
Ribs		4	2
Cervical vertebrae	1	3	2
Thoracic vertebrae		1	0.6
Caudal vertebrae		1	0.6
Total	9	165	

ter Greyhound Yard (Maltby 1993). It is possible that trotters were often removed at an early stage of processing and were not commonly associated with the joints of meat consumed and/or deposited in these areas of Winchester. It is also possible that some preserved (bacon) joints were imported. However, a wider range of samples is required to examine this theory adequately.

There were no large accumulations of particular types of pig bones in any of the deposits. There were variations in the relative abundance of different parts of the skeleton between major assemblage groups (Table 2.172) but there was no consistent pattern in these variations and in some cases the samples were too small to provide significant results.

Fragmentation and butchery of pig bones

Much of the fragmentation of pig bones probably resulted from taphonomic factors other than butchery, with canid scavenging probably being the most damaging agent of attrition (suggested by the high percentage of shaft fragments; Table 2.92). Analysis of fragment sizes showed that humeri, radii, and tibiae survived generally in a more complete state than mandibles, scapulae, and femora (Table 2.173). There were variations in mean fragmentation levels between assemblage groups but many samples were too small to merit detailed analysis. As in the case of cattle and sheep/goat, very few complete bones of the larger elements were recovered and in the large majority of cases, less than half the bone was present.

Observations of butchery were made on 218 pig bones representing 12% of the assemblage excluding loose teeth and associated groups of bones. The city defences sites, particularly Henly's Garage, produced higher percentages of butchery marks than elsewhere (Table 2.174). They also produced higher percentages of bones bearing knife cuts than the other sites, although on all sites marks made with a heavier implement were predominant. Overall, 18% of the bones with observa-

Table 2.161 Anatomical elements of pig from Victoria Road East buildings, oven F846, and associated deposits

Groups	VRE15–16	VRE3–4	VRE14	VRE17	VRE18		
Buildings	**Roadside Structure 2**	**Oven F846**	**2**	**3**	**4**	**Total**	**%**
Skull frags	3	18	2		2	25	19
Mandible	3	10	1	1	1	16	12
Loose teeth		10	4		1	15	11
Scapula	1	8				9	7
Humerus	1	8	1	2		12	9
Radius		3				3	2
Ulna		5	1			6	5
Os coxae		2				2	2
Femur		8				8	6
Patella		1				1	0.8
Tibia	2	10			2	14	11
Fibula		4				4	3
Calcaneus	1					1	0.8
Metacarpal			1			1	0.8
Metatarsal		2	1			3	2
Lateral metapodials	1	2		1		4	3
Metapodial		1				1	0.8
1st Phalanx				2		2	2
3rd Phalanx		1				1	0.8
Ribs	1	2				3	2
Total	13	95	11	6	6	131	

Table 2.162 Anatomical elements of pig from the north-east corner of the Victoria Road site

Groups	VRE6	VRE7	VRE8	VRE9	VRE10	VRE11	VRE12	VRE13		
Phases	**375–6**	**378**	**379–81**	**382–3**	**385–6**	**387–9**	**393**	**394–9**	**Total**	**%**
Skull frags	1		5		2	7	6	2	23	10
Mandible		2	6	1	6	10	10	8	43	18
Loose teeth	1	1			6	7	6	6	27	11
Scapula			1		2	2	3	5	13	5
Humerus			4	1	1	3	5	4	18	8
Radius			1		2	4	2	2	11	5
Ulna			1			4	6	4	15	6
Os coxae			3				2	2	7	3
Femur			2		1	4	6	1	14	6
Tibia	1		4		5	7	12	9	38	16
Fibula		1	3			2		3	9	4
Calcaneus					1	1	1	1	4	2
Astragalus			2				2		4	2
Metacarpal		1					1		2	0.8
Lateral metapodials		1				1	3	1	6	3
Metapodial			1						1	0.4
1st Phalanx								1	1	0.4
2nd Phalanx								1	1	0.4
Cervical vertebrae					1				1	0.4
Thoracic vertebrae				1			1		2	0.8
Total	3	6	33	3	27	52	66	50	240	

Table 2.163 Anatomical elements of pig from Victoria Road East silts and other deposits

Groups	VRE1	VRE2	VRE5	VRE26	VRE27	VRE28	VRE29	VRE30		
Phases	**155–67**	**195, 260–2, 266–9**	**303–08**	**276, 287–92**	**363–74**	**349–57, 361–2**	**358–60**	**461–4, 473–5**	**Total**	**%**
Skull frags		2	5	4	1	7	1	2	22	9
Mandible		5	10	6	2	4	1	4	32	13
Loose teeth		5	2	2	1	4	4	5	23	9
Scapula	1	2	4	6	2		1	1	17	7
Humerus		2	5	2		4		5	18	7
Radius	1	2				3			6	2
Ulna	1	5	1	2		2		1	12	5
Os coxae		4		1		2	1	3	11	4
Femur		7	3	8				2	20	8
Tibia		8	4	4	1	3	4	2	26	11
Fibula		5	2	3	1	1		2	14	6
Calcaneus			2	1		1			4	2
Astragalus				2				1	3	1
Other tarsals						1			1	0.4
Metacarpal		2		3		1		1	7	3
Metatarsals		1		2				1	4	2
Lateral metapodials		3	2	2		1	1	2	11	4
1st Phalanx		1				1		1	3	1
Ribs	1			2				1	4	2
Cervical vertebrae								2	2	0.8
Thoracic vertebrae				1		2			3	1
Lumbar vertebrae		1					1		2	0.8
Sacrum						1			1	0.4
Total	4	55	40	51	8	38	14	36	246	

tions of butchery on them had knife cuts, significantly lower than in the sheep/goat sample (31% – Table 2.151). The higher incidence of chop marks probably reflects the need for greater segmentation of the larger pig carcasses.

Most observations (41) of butchery were observed on mandibles, all but one of which consisted of chop marks. A total of 24 specimens bore chop marks on the medial aspect of the diastema where the front of the mandibles had been split open to separate them and provide easier access to the tongue. This method was also commonly observed on mandibles from Dorchester Greyhound Yard (Maltby 1993). Only five observations were made of superficial chop marks towards the back of the ramus probably made during disarticulation from the skull. The bodies of three mandibles had been chopped through the cheek tooth rows vertically, effectively breaking the mandibles into posterior and anterior segments. The purpose of this is not clear, although it would provide access to the tongue and at the same time separate the anterior half of the mandible from the skull, opening up the marrow cavity. Three mandibles had superficial chop marks running vertically in the same area. The only observation of knife cuts was made on the lingual aspect of the body of a mandible. These cuts ran vertically and perhaps were also associated with the removal of the tongue.

Butchery marks were observed relatively rarely on skull fragments (Table 2.174). In nine cases, however, there was evidence for the splitting of the back of the skull to remove the brain (Plate 36). One occipital bore superficial chop marks on its articular surface where the head had been detached from the neck. A zygomatic had vertical superficial chops marks perhaps made during the separation of the skull from the mandible. Knife cuts were observed on a temporal and a lacrimal, the latter perhaps associated with the removal of cheek meat.

All but two of the 27 butchery marks observed on pig scapulae were chops. This contrasts with the butchery of sheep/goat scapulae, where the majority

Table 2.164 Anatomical elements of pig from Victoria Road West wells, shafts, and pits

Groups	**VRW12**	**VRW13**	**VRW14**	**VRW6**		
Shafts/pits	**F46**	**F18**	**F43**	**F64/70**	**Total**	**%**
Skull frags	6	1	6		13	9
Mandible	8		2	3	13	9
Loose teeth	9		4	2	15	11
Scapula	4		2	2	8	6
Humerus	4	2	1	1	8	6
Radius	6		1		7	5
Ulna	8		4		12	9
Os coxae	6		1		7	5
Femur	8		1	1	10	7
Tibia	10		2	1	13	9
Fibula	3	1		3	7	5
Carpals	1				1	0.7
Calcaneus	1		3	1	5	4
Astragalus	3		2		5	4
Metacarpal	1		1		2	1
Metatarsal			1		1	0.7
Lateral metapodials	1		1		2	1
1st Phalanx	1		1		2	1
Ribs	1	1	1		3	2
Cervical vertebrae		1	1	1	3	2
Thoracic vertebrae	1				1	0.7
Lumbar vertebrae			1	1	2	1
Total	82	6	36	16	140	

Table 2.165 Anatomical elements of pig from Victoria Road West buildings and associated deposits

Groups	**VRW3**	**VRW4**	**VRW5**		
Buildings	**2**	**3**	**4**	**Total**	**%**
Skull frags		8	3	11	13
Mandible	2	7		9	11
Loose teeth	2	8	3	13	16
Scapula	1	3	2	6	7
Humerus	2	3	3	8	10
Ulna	1	2	1	4	5
Os coxae		1	1	2	2
Femur	1	5		6	7
Tibia	2	2	1	5	6
Fibula		1		1	1
Calcaneus	1	1		2	2
Metacarpal	2			2	2
Lateral metapodials	1	2	1	4	5
Metapodial	1		1	2	2
2nd Phalanx		1		1	1
Ribs	1	2	2	5	6
Cervical vertebrae		1		1	1
Total	17	47	18	82	

Table 2.166 Anatomical elements of pig from Victoria Road West other deposits

Groups	VRW1	VRW7	VRW8	VRW9	VRW10	VRW16	VRW17	VRW16		
Phases	**917, 924**	**931**	**933–5**	**938–9**	**951–4**	**965, 968**	**969**	**Graves**	**Total**	**%**
Skull frags	4	5		2	1	1	1	1	15	8
Mandible	3	8		5	1	3	1	1	22	12
Loose teeth	1	8	2	2	1	14	6	1	35	20
Scapula						2	1		3	2
Humerus	2					2	3		7	4
Radius	1	1	1	1	2	2	1		9	5
Ulna		2	1	1	1	2	1	2	10	6
Os coxae				1				1	2	1
Femur		2	1	2	1	3	3		12	7
Tibia	3	3		1	3	4	3	3	20	11
Carpal							1		1	0.6
Fibula	2	1		1		1			5	3
Calcaneus		2				3			5	3
Astragalus		1							1	0.6
Other tarsals						1			1	0.6
Metacarpal							2		2	1
Metatarsal	1	1						1	3	2
Lateral metapodials	3	1				3	1		8	4
Metapodial				1		1			2	1
1st Phalanx		1					1	1	3	2
2nd Phalanx				1		2			3	2
3rd Phalanx							2		2	1
Ribs		1			4	1		1	7	4
Total	20	37	5	18	14	45	27	12	178	

of specimens had knife cuts (Table 2.151). In thirteen cases the blade of the scapula had been chopped through medio-laterally. This would have enabled the distal part of the shoulder and the forelimbs to be detached from the trunk of the body. Four specimens had similar butchery marks located nearer to the glenoid cavity and these would have served the same purpose. Superficial chops near the glenoid cavity (three cases) may also have been made during disarticulation of the scapula from the humerus. Seven specimens had superficial chops on various parts of the blade. The two observations of knife cuts on scapulae were also located on the blade and are likely to have been made during filleting.

A total of nineteen os coxae bore butchery marks, seventeen of which were chop marks. Most observations were found on the ischium, usually quite close to the acetabulum made during the detachment of the hind limb at the pelvic joint. In six other cases, chop marks were located on the acetabulum itself. The shafts of three ilia had been chopped through vertically separating the posterior part of the pelvis from the sacrum. Knife cuts were observed on three specimens, one of which also had chop marks.

Butchery marks were observed on 22 pig humeri, including nine with knife cuts (Table 2.174). Eight of these were located on the shaft usually towards the distal end. Some of these may have been filleting marks but knives may also sometimes have been used to sever the ligaments around the elbow joint allowing the humerus to be separated from the radius and ulna. One specimen had knife cuts on the distal articular surface itself, which must have been made during disjointing. Three distal articular surfaces had been chopped through during segmentation and another had superficial chops in the same location made during the same process. Two humeri had been chopped through the shaft just above the distal end again during segmentation. Superficial chop marks were found in the same area of the shafts of six other specimens usually running horizontally. The purpose of these is not clear. Finally, one specimen had been chopped through its proximal articular surface where it had been separated from the scapula.

Only two radii bore butchery marks. One from the Henly's Garage site had been cut with a knife along the lateral aspect of the proximal end; the second had been chopped through the shaft near the distal end.

Table 2.167 Anatomical elements of pig from Hyde Abbey structural remains and associated deposits

Groups	HA72.2	HA74.2	HA74.4	HA74.5	HA74.7	HA74.3		
Phases	**5–6, 9–11**	**55–9**	**60–1**	**64–7**	**69–71**	**76**	**Total**	**%**
Skull frags	3		3	10	1	3	20	14
Mandible	5		5	4	1	4	19	13
Loose teeth	2		1	8	6	7	24	17
Scapula	2		1	4	1		8	6
Humerus	5	2	2	5	1		15	11
Radius	4			2			6	4
Ulna	2			2	1	2	7	5
Os coxae	2			3	1		6	4
Femur	6			5	1		12	8
Tibia	4	1	1	3	1		10	7
Fibula				1	1		2	1
Carpals		1					1	0.7
Calcaneus	1				1		2	1
Metacarpal				1			1	0.7
Metatarsal					1		1	0.7
Lateral metapodials				4			4	3
Metapodial				1			1	0.7
2nd Phalanx			1				1	0.7
Ribs			1				1	0.7
Thoracic vertebrae				1			1	0.7
Total	36	4	15	54	17	16	142	

Both marks represent aspects of segmentation of the forelimb.

Butchery marks were found more commonly on ulnae but only two, both from the Henly's Garage site, bore knife cuts, which were located near the proximal joint surface and made during disjointing from the humerus. Seventeen specimens bore chop marks, of which nine had been chopped through the proximal joint surface or just above it on the olecranon. Superficial chop marks in the same area were observed on six other specimens. These were all probably made during separation from the humerus. One ulna had been chopped through lower down the shaft.

Four of the eleven observations of butchery on femora consisted of knife cuts. These were all located on the shaft usually on the posterior surface and probably represent evidence for filleting. Three of these specimens were found on the defences sites (Table 2.174). Most of the chop marks were located on or near the distal articular surface and included four examples of the bone being chopped through during segmentation.

All but two of the 28 observations of butchery on pig tibiae were located on the shaft. Fourteen had been chopped (or occasionally sawn) through horizontally and there were twelve cases that had superficial horizontal chop marks. One specimen had been chopped through the proximal articular surface and one had a superficial chop mark on the posterior aspect of the distal end. Those which had been chopped through showed clear evidence of segmentation where the feet had been removed. It is possible that some of the superficial chop marks represent the same process. Only two specimens bore knife cuts located near the middle of the shaft.

Evidence for butchery around the ankle joint was found on four calcanei and seven astragali. They are all likely to have been made when the feet were removed from the upper hindlimb. It seems that both knives and heavier cleavers were used for this task and examples of such marks were found in roughly equal numbers (Table 2.174).

Evidence for butchery of the trotters was limited to two lateral metapodials, both of which bore knife cuts. The location of these marks on the anterior aspect of the shaft of one specimen may suggest that they were incisions made as a prelude to skinning. The other specimen had knife cuts on the lateral aspect of the proximal end, which could have been made during disarticulation.

Most of the butchery marks on vertebrae consisted of chops through the body running caudo-cranially,

Table 2.168 Anatomical elements of pig from Hyde Abbey other deposits

Groups	HA72.1	HA72.3	HA74.6	HA74.8			
Phases	1–4, 8	7	68	74–5		Total	%
				A	O		
Skull frags		2	9	1	10	22	15
Mandible	2		8	1	6	17	11
Hyoid			1	1		2	0.7
Loose teeth	2	2	15		13	32	23
Scapula	3	2		2	2	9	5
Humerus	2		1	2	7	12	7
Radius	1		3	3		7	3
Ulna		2	4	2	4	12	7
Os coxae	1	1		1		3	1
Femur	1	1	2		2	6	4
Tibia	3	1	4		2	10	7
Fibula		2	4		4	10	7
Calcaneus	1		1			2	1
Metacarpal				3		3	
Metatarsal	1					1	0.7
Lateral metapodials			3	3	2	8	4
Metapodial					1	1	0.7
1st Phalanx				2		2	
2nd Phalanx			1	1	1	3	1
3rd Phalanx				2		2	
Ribs		1		25		26	0.7
Sternebrae				1		1	
Cervical vertebrae		1		7		8	0.7
Thoracic vertebrae				13		13	
Lumbar vertebrae				7		7	
Sacrum				1		1	
Total	17	15	56	78	54	220	

Key:
A = associated bones
O = other bones

% excludes associated bones

sometimes through the centre of the bone but in other cases offset from the midline. The method was identical to that practised on cattle and sheep/goat and shows that the carcasses were often roughly split into two halves.

The types of butchery marks on pig bones were closely similar to those at Dorchester Greyhound Yard (Maltby 1993). It is not certain whether pigs were commonly processed by specialist butchers, although the consistency in the butchery of some bones such as the mandibles and vertebrae suggests that a lot of them were. The relatively high incidence of the use of cleavers to segment the carcasses may also reflect specialist activity, although such a conclusion is speculative. However, the use of the cleaver was much more common in Winchester than at Owslebury where the large majority of pig carcasses appear to have been processed with knives even in the later Roman phases (Maltby 1987a).

Ageing data

Tooth eruption data were recorded using the method of Grant (1982) but detailed analysis was restricted to an examination of the seven-stage toothwear sequence as set out in Table 2.175. Surface wear patterns on pig cheek teeth are more variable than on those of cattle

Table 2.169 Anatomical elements of pig from Jewry Street, Crown Hotel

Groups	JCH1	JCH2	JCH3	JCH4	JCH5	JCH6	
Phases	**707–10**	**323–4**	**320–2**	**317–19**	**315**	**311–14**	**Total**
Skull frags			1	4		3	8
Mandible			1	1	1	3	6
Loose teeth	1	1	2	4			8
Scapula				3		3	6
Humerus		1		1			2
Radius			1	1		1	3
Os coxae			1			1	2
Tibia		1				1	2
Fibula	1			1	1		3
Ribs				1		1	2
Total	2	3	6	16	2	13	42

or sheep/goat and it is more difficult to estimate toothwear stages in cases where one or more teeth are missing. Estimates of the ages of the seven-stage sequence are adapted from Bull and Payne (1982).

The main economic value of pigs lies in their meat and fat. This, combined with their high fertility rates, enables a high percentage to be culled immature. Of the 111 mandibles with tooth eruption evidence, only 30 (27%) had the third molar in wear (Stages 6 and 7) and belonged to animals older than about 30 months. Of these, seventeen (15%) had only slight wear on the third molar and were probably under 36 months old. Only about 11% of the specimens therefore belonged to pigs over three years old. This is not unusual in pig assemblages. For example, only 10% of the mandibles from the Roman deposits at Dorchester Greyhound Yard (Maltby 1993) and 13% of the 3rd- to 4th-century AD mandibles from Owslebury (Maltby 1987a) belonged to pigs that had reached the same approximate age.

The high rate of immature slaughter is supported by the epiphysial fusion evidence (Table 2.176). The large majority of late fusing epiphyses were unfused and belonged to pigs probably under 42 months old. Estimating the age of domestic pigs from fusion data is, however, an inexact science (Bull and Payne 1982) and there are not much reliable modern comparative data for ageing late fusing epiphyses.

The most common wear stage represented in the Winchester sample of pig mandibles was Stage 5 (32%). These represent pigs which died between the time that their permanent premolars came into wear and the time when the third molar had developed to a similar stage (Table 2.175). The age of death of most of these animals probably lay between 18 and 30 months. If one adds the specimens at Stages 5–6 and 6, about half the pigs represented appear to have been slaughtered between the ages of 18 and 36 months. Pigs of this age would not have been fully grown but would have developed relatively good carcass weights and were at a good age for culling for meat.

There was some inter-site variability in the relative abundance of pig mandibles at Stage 5. They formed 37% of the sample from Victoria Road East but only 13% from the Victoria Road West sample (Table 2.175). Reasons for the variability are not clear.

Only 7% of the mandibles were at Stage 4 (second molar in wear; permanent premolars not in wear). This, however, is likely to have been a short-lived stage and a relatively high percentage of the mandibles (14%) could not be assigned specifically to stages 4 or 5 because of their fragmentary state (Table 2.175). It would be best to include these with those from Stage 5, which would mean that 53% of the pigs represented by these mandibles were killed between about 12 and 30 months, possibly mostly in the middle and later parts of that range.

Pigs that died or were killed under 12 months old are represented by only 13% of the mandibles (Stages 1–3). Most of these had the first molar in wear and were over six months old (Stage 3). Neonatal and juvenile mortalities were therefore poorly represented. This is again supported by epiphysial fusion evidence that shows that the great majority of early fusing epiphyses had fused (Table 2.176). These results are similar to those from the rural settlement at Owslebury (Maltby 1987a) but are at variance with the results from several samples from other Romano-British towns. Thirty-seven percent of the Dorchester Greyhound Yard sample, for example, were at Stages 1–3, including 22% at Stages 1–2. Thirty-three percent of the mandibles in the sample from Tanner Row, York, did not have the second molar in wear (O'Connor 1988). Mandibles from juvenile pigs were also found in relatively greater numbers on some sites in Exeter (Maltby 1979a).

The presence of larger numbers of juvenile mortalities could suggest a greater interest in the exploitation of suckling pigs, which are known to have been popular in Roman cuisine and greater intensity in the exploitation of pigs for meat in general. This raises the question of why the assemblages from Winchester contain fewer mandibles of young pigs than other urban sites.

Table 2.170 Anatomical elements of pig from 27 Jewry Street

Groups	**27JS1**	**27JS2**	**27JS3**	**27JS4**	
Phases	**2–4**	**5–7**	**8–9**	**32**	**Total**
Skull frags		1			1
Mandible	1	7	1	1	10
Loose teeth		1	3		4
Scapula	1	1			2
Humerus		2	1		3
Ulna		1	1		2
Os coxae				1	1
Femur		1	3	1	5
Tibia	2	1	1	1	5
Fibula			1	1	2
Metacarpal		1		1	2
Metatarsal			1		1
Lateral metapodials	2		1		3
Ribs	2		1		3
Cervical vertebrae			1		1
Total	8	16	15	6	45

Table 2.171 Anatomical elements of pig from Henly's Garage

Groups	**HG1**	**HG2**	**HG3**	**HG5**	**HG7**	**HG6**	**HG4**		
Phases	**1–3**	**4–7**	**9–11**	**15**	**16**	**23–5**	**32**	**Total**	**%**
Skull frags	1	1			4	4	12	22	16
Mandible			2	3	8	3	20	36	26
Loose teeth				2	2		4	8	6
Scapula				2	4	2	1	9	6
Humerus		1	3	1	4	3	5	17	12
Radius	1			1	3	1		6	4
Ulna			1		2	1		4	3
Os coxae		1		1	1		1	4	3
Femur			1		2	1	3	7	5
Tibia			1	3	2	1	5	12	9
Fibula							2	2	1
Calcaneus						2		2	1
Astragalus						1		1	0.7
Metatarsal					1	1		2	1
Lateral metapodials	1			1	1	1		4	3
Metapodial				1			1	2	1
Ribs						2		2	1
Thoracic vertebrae						1		1	0.7
Total	3	3	8	15	34	24	54	141	

Table 2.172 Relative percentages of selected pig bones (fragments)

	OSHF:Feet	OSHF:RUTF	Sk:M	SkM:UL	SkM:Feet
VR East wells and pits	72	58	50	36	71
VR all trenches, ditches	70	59	53	27	59
VR East buildings	72	56	61	40	75
VR East NE corner	73	42	35	35	78
VR East Layers/other	62	51	45	33	62
VR West shafts and pits	65	46	TS	27	59
VR West buildings	67	67	TS	38	65
VR West other deposits	43	35	41	35	54
Hyde Abbey buildings	79	62	51	36	78
Hyde Abbey other deposits	69	42	57	39	77
Jewry Street, Crown Hotel	TS	TS	TS	44	TS
27 Jewry Street	TS	TS	TS	35	TS
Henly's Garage	77	61	38	49	84

Key:
OSHF = os coxae, scapula, humerus, femur
Feet = all carpals, tarsals, metapodials, and phalanges
RUTF = radius, ulna, tibia, fibula
M = mandible
Sk = skull fragments
UL = all upper limb bones (OSHF + RUTF)
TS = sample too small (<30 fragments) for calculations

Note: Figures represent percentages of the first group of bones listed, for example Sk:M is % skull of total skull and mandible fragments

Differential preservation has again to be considered and it is perhaps significant that four of the mandibles at Stage 3 were found in pits and wells from Victoria Road East. However, neonatal and juvenile mortalities were rare in even the best preserved of the Winchester assemblages, whereas they survived in numbers in Dorchester in all types of deposit (Maltby 1993), including those less well preserved than some of those from Winchester. It is unlikely, therefore, that the differences can be accounted for wholly by taphonomic factors.

The second possibility is that the consumption of meat from piglets was less important in Winchester than in towns such as Dorchester and York. This theory could be tested by examining samples from other areas of Roman Winchester.

Another possibility is that there were differences in the meat diet between the inhabitants resident in the centre of Roman towns compared with those who lived in the suburbs. Suckling pigs may perhaps have been more expensive and were more often consumed by richer residents or there may simply have been different dietary preference between parts of the town's population, perhaps based on traditional diets. Grant (2002) has suggested that high percentages of pigs, and particularly piglets, in assemblages near the centre of Silchester may be indicative of the high status of the consumers in the more Romanised part of the town.

The presence of relatively large percentages of neonatal mortalities in the centre of Dorchester but not in the Winchester suburbs adds support to the theory that pigs may have been kept as breeding animals in sties or larger enclosures within the towns, whose centres were the focal point for the consumption of pork and possibly the distribution and production of it as well. This will be further considered in Section 2.3 (Table 2.229).

Metrical data

The high incidence of immature mortalities severely limits the acquisition of metrical data from postcranial elements of pigs. Unfortunately, recording of the bones was carried out prior to the demonstration that measurements of pig lower molars could be more reliable indicators of pig size than their limb bones because of problems of post-fusion growth (Payne and Bull 1988; Albarella and Payne 2005). Details of the most common measurements are listed in Appendix 1.

Lengths of the lower third molars ranged between 29.3mm and 35.5mm (Table 2.177). These all fall below the range usually attributed to wild boar. Wild boar was not specifically identified, although a few bones (none measurable) were unusually large and perhaps indicate their presence in very small quantities.

Summaries of the most common measurements of scapula, humerus, radius, tibia, and astragalus are given in Table 2.177. However, no sample contained more than nineteen specimens. Most of the measurements were taken around articular surfaces with early

Table 2.173 Fragmentation of major pig bones

Site/contexts	0.1	0.25	0.5	0.75	1	N	WBE	Mean
Mandible								
VR East wells and pits	12	5	9	4		30	9.95	0.33
VR all trenches, ditches	8	5	1	1		15	3.30	0.22
VR East buildings	8	10				18	3.30	0.18
VR East NE corner	26	13	2	2		43	8.35	0.19
VR East layers/other	26	14	3	2		45	9.10	0.20
VR West shafts and pits	9	4				13	1.90	0.15
VR West buildings	6	3				9	1.35	0.15
VR West other deposits	12	7	3			22	4.45	0.20
Hyde Abbey buildings	12	4	1		2	19	4.70	0.25
Hyde Abbey other deposits	10	3	1		2	16	4.25	0.27
Jewry Street, Crown Hotel	3	3				6	1.05	
27 Jewry Street	5	3	2			10	1.75	0.18
Henly's Garage	17	10	4	1		32	6.95	0.22
Total	154	84	26	10	4	278	60.40	0.22
Scapula								
VR East wells and pits	4	5	1			10	2.15	0.22
VR all trenches, ditches	6	4	3			13	3.10	0.24
VR East buildings	7	3		1		11	2.20	0.20
VR East NE corner	8	3	2			13	2.55	0.20
VR East layers/other	12	10	1			23	4.20	0.18
VR West shafts and pits	4	3	1			8	1.65	0.21
VR West buildings	1	3	2			6	1.85	
VR West other deposits	2	1				3	0.45	
Hyde Abbey buildings	4	2	1	1		8	2.15	0.27
Hyde Abbey other deposits	5		1	1		7	1.75	
Jewry Street, Crown Hotel	4	2				6	0.90	
27 Jewry Street	1	1				2	0.35	
Henly's Garage	1	3	1	1		6	2.10	
Total	59	40	13	4		116	25.40	0.22
Humerus								
VR East wells and pits	4	6	5	4	1	20	8.40	0.42
VR all trenches, ditches	7	5	3	1	1	17	5.20	0.31
VR East buildings	5	6	1	4		16	5.50	0.34
VR East NE corner	4	5	6	3		18	6.90	0.38
VR East layers/other	4	11	4	3		22	7.40	0.34
VR West shafts and pits	2	2	2	2		8	3.20	0.40
VR West buildings	5	2	1			8	1.50	0.19
VR West other deposits	3	3	1			7	1.55	
Hyde Abbey buildings	4	10	1			15	3.40	0.23
Hyde Abbey other deposits	5	3	2			10	2.75	0.28
Jewry Street, Crown Hotel		2				2	0.50	
27 Jewry Street	1	1	1			3	0.85	
Henly's Garage	2	11		1		14	3.70	0.27
Total	46	67	27	18	2	160	50.85	0.32

Table 2.173 (*cont.*) Fragmentation of major pig bones

Site/contexts	0.1	0.25	0.5	0.75	1	N	WBE	Mean
Radius								
VR East wells and pits	1	2		1	2	6	3.35	
VR all trenches, ditches	4	6	2			12	2.90	0.24
VR East buildings		1	2			3	1.25	
VR East NE corner	3	3	4	1		11	3.80	0.35
VR East layers/other	2	4	1			7	1.70	
VR West shafts and pits	2	4		1		7	1.95	
VR West buildings				(none)				
VR West other deposits	1	4	3	1		9	3.35	0.37
Hyde Abbey buildings	3	3				6	1.05	
Hyde Abbey other deposits	3	1				4	0.55	
Jewry Street, Crown Hotel	2	1				3	0.45	
27 Jewry Street				(none)				
Henly's Garage		1	2		2	5	3.25	
Total	21	30	14	4	4	73	23.60	0.32
Femur								
VR East wells and pits	10	4	1		1	16	3.50	0.22
VR all trenches, ditches	6	1	1			8	1.35	0.17
VR East buildings	6	1	1	1		9	2.10	0.23
VR East NE corner	7	6	1			14	2.70	0.19
VR East layers/other	15	11		1		27	5.00	0.19
VR West shafts and pits	3	5	1	1		10	2.80	0.28
VR West buildings		3	1	2		6	2.75	
VR West other deposits	8	3	1			12	2.05	0.17
Hyde Abbey buildings	4	6	1	1		12	3.15	0.26
Hyde Abbey other deposits	3	3				6	1.05	
Jewry Street, Crown Hotel	2					2	0.20	
27 Jewry Street	2	1	1	1		5	1.70	
Henly's Garage	1	3	5		1	10	4.35	0.44
Total	67	47	14	7	2	137	32.70	0.24
Tibia								
VR East wells and pits	6	9	3	2	1	21	6.85	0.33
VR all trenches, ditches	6	4	1	1	2	14	4.85	0.35
VR East buildings	7	4	3	1		15	3.95	0.26
VR East NE corner	20	10	5	2		37	8.50	0.23
VR East layers other	9	17	9	2	1	38	12.15	0.32
VR West shafts and pits	5	6		2		13	3.50	0.27
VR West buildings	4	1				5	0.65	
VR West other deposits	7	6	5		2	20	6.70	0.34
Hyde Abbey buildings	5	2		1	2	10	3.75	0.38
Hyde Abbey other deposits	1	5	1	3		10	4.1	0.41
Jewry Street, Crown Hotel	2					2	0.20	
27 Jewry Street	2	1	1	1		5	1.70	
Henly's Garage	1	3	5		1	10	4.35	0.44
Total	75	68	33	15	9	200	61.25	0.31

Key: as Table 2.113

Table 2.174 Observations of butchery marks on pig bones

	VR East			VR West		HA		Defences		
	K	C	B	K	C	K	C	K	C	Total
Skull frags		9		1	2	1			1	14
Mandible	1	15			9		7		9	41
Hyoid						1				1
Scapula		11			6	1		1	8	27
Humerus	5	7		2	2		2	2	2	22
Radius		1						1		2
Ulna		6			7		2	2	1	18
Os coxae		9	1		4		1	2	2	19
Femur		2			3	1	1	3	1	11
Tibia		14		1	6		1	1	5	28
Fibula		2								2
Calcaneus		1		1	1		1			4
Astragalus	2	2	1	2						7
Lateral metapodials				1				1		2
Ribs	1	2		2			1		1	7
Thoracic vertebrae		5					1			6
Lumbar vertebrae		4			1					6
Sacrum		1								1
Total	9	91	3	10	41	4	17	13	30	218
%	9	88	3	20	80	19	81	30	70	
Butchered		103		51		21		43		218
Total pig (excluding teeth)		871		481		228		208		1788
% butchered		12		11		9		21		12

Key:
K = knife cuts
C = chop marks
B = knife & chop marks

Note: Counts exclude groups of associated bones

Table 2.175 Summary of pig mandibular tooth eruption data

	Eruption stage												
Site/group	1	2	2–3	3	3–4	4	4–5	5	5–6	6	6–7	7	Total
VR East				8	4	1	8	22	1	9		7	60
VR West		2		2	1	3	5	3	1	3	1	2	23
HA						2		5		2		2	11
JCH								1		1			2
27JS						1		1		1			3
HG		1		1		1	2	4	1	1		1	12
Total	0	3	0	11	5	8	15	36	3	17	1	12	111
%	0	3	0	10	5	7	14	32	3	15	1	11	

Key:
Stage 1 = deciduous 4th premolar (d4) not in wear
Stage 2 = d4 in wear; 1st molar (M1) not in wear
Stage 3 = M1 in wear; 2nd molar (M2) not in wear
Stage 4 = M2 in wear; permanent 4th premolar (P4) not in wear
Stage 5 = P4 in wear; 3rd molar (M3) not in wear
Stage 6 = M3 in early wear (Grant stages a-b)
Stage 7 = M3 in moderate or heavy wear (Grant stages c-k)

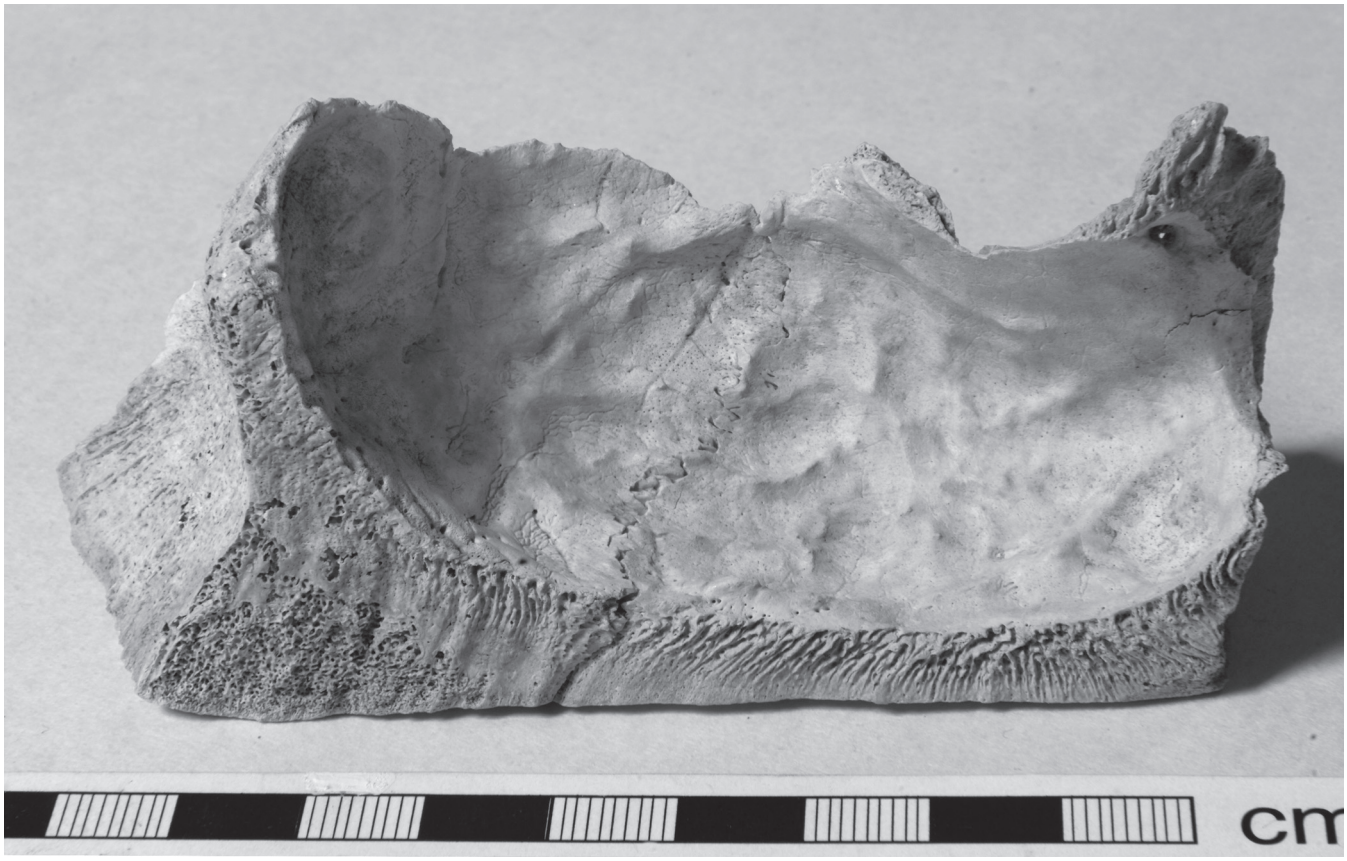


Plate 36 Pig skull fragment showing butchery through the parietal and occipital, exposing the brain cavity

Table 2.176 Summary of pig epiphysial fusion data

		U	J	F	%F
Early fusing epiphyses	Axial 2nd phalanges, proximal		1	7	88
	Scapula, glenoid process	2	1	14	82
	Acetabulum	5	1	25	81
	Radius, proximal	6	2	29	78
	Humerus, distal	10	1	21	66
Later fusing epiphyses	Axial 1st phalanges, proximal	8	2	6	38
	Tibia, distal	31	3	9	21
	Axial metapodials, distal	29		2	6
	Lateral metapodials, distal	41		2	5
Late fusing epiphyses	Ulna, proximal	17		4	19
	Femur, distal	12		2	14
	Radius, distal	12		1	8
	Humerus, proximal	8	1		0
	Calcaneus, proximal	15	1		0
	Femur, proximal	7			0
	Tibia, proximal	21			0

Key:
U = unfused
J = fusing
F = fused
%F = percentage fused

Note: See Bull and Payne (1982) for discussion of fusion ages

Table 2.177 Summary of pig measurements

Anatomy	Measurement	N	Min	Max	Mean	SD	CV
Mandible	M3L	17	29.3	35.5	32.9	1.9	5.8
	M3B	19	12.5	16.9	14.8	1.1	7.4
Scapula	SLC	5	21.5	26.8	23.8	2.0	8.6
	GLP	5	34.5	36.1	35.2	0.6	1.7
	BG	6	24.3	26.7	26.0	0.5	2.0
Humerus	BT	11	29.6	39.3	34.2	2.6	7.7
	Bd	8	37.2	45.9	41.4	2.9	7.1
	HT	8	24.7	31.6	28.1	2.4	8.7
Radius	Bp	19	25.9	34.2	29.7	2.1	7.1
	Dp	14	16.1	23.9	20.7	1.9	9.3
Tibia	Bd	10	27.5	32.2	30.2	1.4	4.7
	Dd	10	25.5	30.7	27.3	1.8	6.6
Astragalus	GLl	6	40.0	44.1	42.2	1.4	3.4
	Bd	7	21.1	24.2	23.2	1.1	4.7

Key:
M3L = length of third molar
M3B = breadth of third molar
SLC = smallest length of neck
GLP = greatest length of glenoid and tuber scapulae
BG = breadth of glenoid cavity
BT = breadth distal trochlea
Bd = maximum distal breadth
HT = greatest height of distal trochlea
Bp = maximum proximal breadth
Dp = maximum proximal depth
Dd = maximum distal depth
GLl = greatest length lateral half
N = number of measured fragments
SD = standard deviation
CV = coefficient of variation

Note: All measurements are in millimetres

fusing epiphyses, such as the proximal radius and distal humerus. These are particularly susceptible to post-fusion growth. Measurements of the later fusing distal tibiae may be more reliable, although few in number and perhaps still displaying some post-fusion growth. Comparisons of the maximum distal breadths of tibiae from Winchester have been compared with those from Owslebury and Dorchester Greyhound Yard (Maltby 1994) and the results are reproduced in Figure 48. The results show that most of the pig tibiae in Winchester and Dorchester were larger than those from Owslebury. All the Owslebury specimens measured less than 30mm, whereas specimens larger than this were found quite commonly at the other two sites. The mean sizes were also greater in Winchester and Dorchester. A pig tibia from the sieved samples had a maximum distal breadth of 31.9mm. This was one of the largest specimens recovered (Table 2.177) and adds further evidence to support the observation that pigs represented in Roman Winchester were generally larger than those from the rural settlement at Owslebury (Fig 48).

There are several possibilities which could account for these variations. The first is that there were more immature pigs represented at Owslebury and the largest specimens from the towns mainly represent older animals. This explanation is not supported by the ageing data discussed above.

It is possible that more larger males are represented in the urban samples. However, the Owslebury sample has a more restricted range than the other samples and one would have expected a few bones to attain the size of the largest from the other sites, if sexual dimorphism was the sole factor.

There was some evidence that pigs tended to become larger during the Roman period in Dorches-

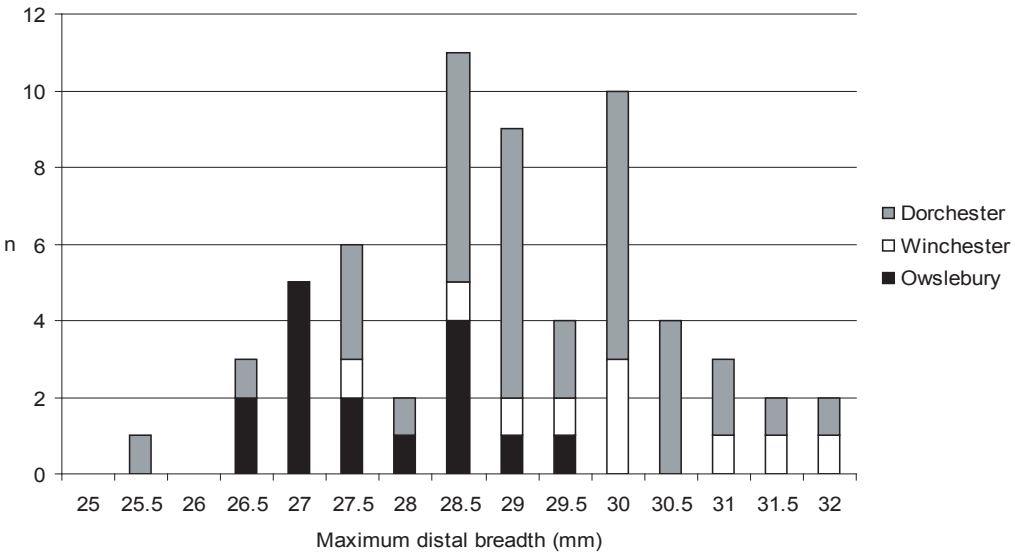


Figure 48 Maximum distal breadths of pig tibiae

ter (Maltby 1993) and chronological change could also have taken place further east in the Winchester area. The sample from Owslebury includes specimens of earlier date than those from Winchester and it could be argued that the differences are largely the result of chronological variation. However, some late Roman specimens are present in the Owslebury sample and none of these attain the size of the larger tibiae from Winchester.

It does appear likely, therefore, that many of the pigs exploited in Winchester were either of a larger type than those consumed at Owslebury or had better growth rates. The Romans may have introduced larger stock to meet demands from the army and from the towns. Pigs kept in urban sties may have enjoyed better nutrition than those raised on rural sites and fattened on woodland pannage. In Italy, comparisons of artistic, documentary, and archaeological data have suggested that at least two types of pigs were exploited during the Roman period (MacKinnon 2006). One type consisted of a larger, fatter, short-legged variety; the second type was smaller overall but with relatively longer legs. The former appears to have been exploited in smaller numbers but was probably stall-fed. A similar contrast in husbandry methods could account for the size variations observed at Winchester and Owslebury.

More samples from a range of settlement types and dates are needed to examine this question further. Such research will be assisted by the recent development of standardised measurements for domestic pigs, which will make comparisons between samples easier (Albarella and Payne 2005). There is currently, however, as in the case of sheep, some evidence to suggest that Winchester relied on a wider range of sources for its supply of pork. It remains to be investigated whether a substantial part of this supply came from within the town itself.

The horse assemblage

Identification of equid bones

No attempt was made during recording to differentiate equid bones into horse (*Equus caballus*), mule (*Equus caballus* x *Equus asinus*), or donkey (*Equus asinus*). It was assumed during identification and recording that all the bones belonged to horse. Examination of the metapodials and phalanges did not produce any evidence for the presence of small, slender bones morphologically similar to donkey. However, recent research has suggested that mules may have been present in larger numbers during the Roman period than previously considered and it may in some cases be possible to distinguish between horse and mule using metrical analysis (Johnstone 2005). It has been assumed that the majority, if not all, of the equid bones found in these excavations belonged to horse but it should be emphasised that it is only an assumption. The presence of some mule bones within the assemblage cannot be discounted.

Associated horse bones

At least 115 bones of a horse skeleton were recovered from Victoria Road East well F1093 (Group VRE20 – Table 2.36). This animal was represented by most parts of the body but its skull, mandibles, and some cervical vertebrae were not recovered and one of its forelimbs was missing. A number of bones from the limb extremities were also not found (Table 2.178). There was no evidence of butchery marks on any of the bones and it is probable that a complete carcass was originally deposited and was subsequently slightly disturbed prior to final deposition in the well. The skeleton belonged to an adult horse

Table 2.178 Groups of associated horse bones

Groups	VRE20 Well F1093	VRE3–4 Oven F846	VRE5 Phases 303–08	VRW3 Building 2	HA74.3 Phase 76
Scapula	1				
Humerus	1			1	
Radius	1			1	
Ulna	1			1	
Os coxae	2				
Femur	2				
Patella	2				
Tibia	2				
Fibula	1				
Carpals	2				
Calcaneus	2				
Astragalus	2			1	
Other tarsals	6			1	
Metacarpals	2				1
Metatarsals	3				
Lateral metapodial	4			2	1
1st Phalanx	2				1
2nd Phalanx	3				1
3rd Phalanx	1				
Sesamoids	2				
Ribs	21		1		
Costal cartilages	20				
Sternebrae	2				
Cervical vertebrae	4				
Thoracic vertebrae	14	3	9		
Lumbar vertebrae	6	2	1		
Sacrum	1				
Caudal vertebrae	5				
Total	115	5	11	7	4

with all epiphyses fused, including those of the vertebral bodies. It has been stated that the vertebral epiphyses fuse around five years of age (Silver 1969), so this animal lived for sometime longer than that. Further evidence that the animal was quite old is provided by the pathological fusing of two of the thoracic vertebrae and associated abnormal growth on adjacent bones. Such fusion has been noted in both wild and domestic horses (Baker and Brothwell 1980) and therefore need not be a condition brought about by riding.

Other associated groups of horse bones were much smaller (Table 2.178). Oven F846 (Groups VRE3–4) at Victoria Road East produced a group of five vertebrae from a post-hole fill. These were fused and belonged to a horse over five years of age. Two groups consisting of a total of ten vertebrae and a rib were found in silts in the vicinity of this building (VRE5). It is probable that both these groups and perhaps the one within the building belonged to the same animal.

Two small groups of horse limb bones were found in a silt layer associated with Building 2 at Victoria Road West (Group VRW3). All epiphyses were fused and both groups could have belonged to the same adult animal. Four bones of a front foot were found in another silt layer at Hyde Abbey (Group HA74.3).

These associated groups totalled 142 bones, representing 17% of the total horse assemblage. This contrasts with the cattle sample, which had a very low total of associated bones (0.5%) and no large groups. This is the first of a number of indications that horse carcasses were not butchered as consistently nor as intensively as those of cattle.

Abundance of horse bones

The abundance of horse bones has been discussed to some extent above (pp91–105). On all sites they were identified in relatively small numbers and clearly horses were less commonly exploited for meat and other carcass products than cattle, sheep/goat, and pig. This was supported by the results of all the quantification methods used (Tables 2.95–2.98; Fig 34).

The relative abundance of cattle and horse bones is, however, worthy of further attention, particularly in comparison with results from other sites. The cattle: horse fragment ratio is an useful one because the mature skeletons of the two species are of similar size and robustness and should suffer less from biases of differential recovery than comparisons with sheep/goat and pig.

Direct comparisons between cattle and horse assemblages still need to be treated with caution because their carcasses have not been treated in the same way. It is demonstrated elsewhere in this section that horses were less intensively exploited for meat than cattle and this might be reflected in processing, cooking, consumption, and disposal strategies. There is the possibility that there were different attitudes to the consumption of horse-flesh in different sectors of the Romano-British population. It should be emphasised that the cattle:horse ratio does not measure the relative abundance of these species kept in and around Winchester. It can, however, give an indication of the relative importance of their exploitation for meat and other carcass products on different settlements.

The percentage of cattle of the total cattle and horse fragments in each of the sub-samples is given in Table 2.94. The inverse ratios (percentage of horse) are summarised in Fig 49, in which sub-samples from Winchester, Owslebury, and Dorchester are compared.

From all the sites in Winchester, horse provided 9% of the total cattle and horse fragments. There was, however, quite a lot of variability within the sub-samples (Table 2.94). The highest percentage was 30% from the sample from Buildings 1–3 at Hyde Abbey (Group HA72.2). This was, however, a very small and probably unreliable sample and is not included in Figure 49. Apart from this, the percentage of horse varied between 0% and 20% of the total cattle and horse fragments. Most sub-samples included less than 10% horse (Fig 49), but most of the assemblage groups included one or more sub-sample with higher percentages (Table 2.94).

From Victoria Road East, samples where horses were particularly well represented (>10%) included well F1093 (Group VRE20); oven F846 (Groups VRE3–4); silts and other deposits in the north-east corner of the site (Groups VRE8–10), and deposits contemporary with the oven (Group VRE5) and from site-wide accumulation 3 (Group VRE26; Table 2.94). High percentages of horse fragments from Groups VRE3–5 are associated with waste connected with the possible industrial processing of upper limb bones of both cattle and horse. Well F1093 included unusually low percentages of cattle bones compared with all other major species. The high percentage of horse in this instance is a consequence of the paucity of cattle rather than especially high frequencies of horse. Groups VRE8–10 included evidence that a small amount of later material was admixed and the layers were not well sealed.

High percentages of horse bones from Victoria Road West were found in ditch F12 (Group VRW11), pit or well F46 (Group VRW12), pit F64/70 (Group VRW6), Building 2 (Group VRW3), metalling in Phase 931 (Group VRW7), silts in Phase 969 (Group VRW17), and grave fills (Group VRW15; Table 2.94).

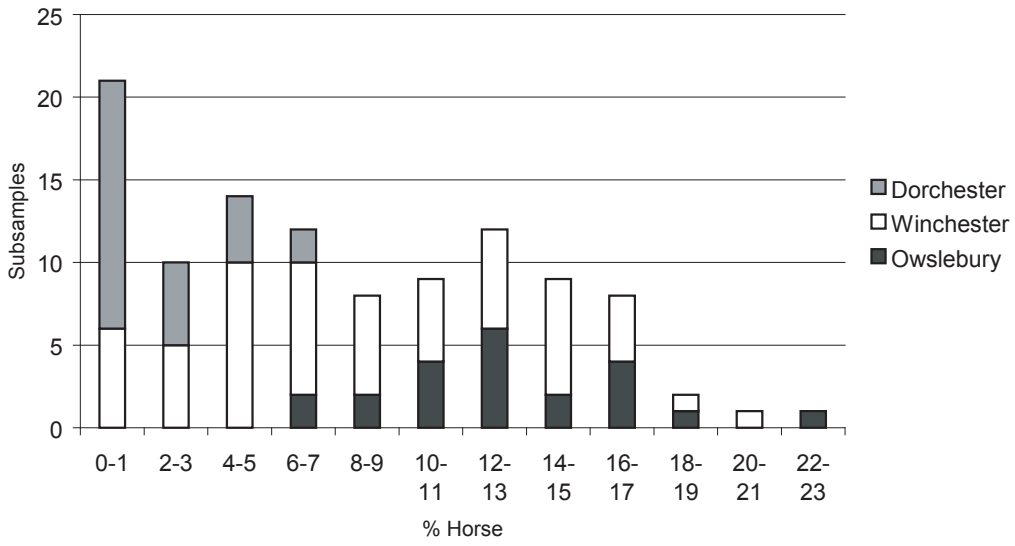
Samples from pit F64/70 and the grave fills are small and probably not very reliable. Cattle fragments were low in comparison with all major species in shaft F46. Ditch F12 provided a large sample and the high percentage of horse reflects the rather diffuse assemblage from the upper fills of this feature. This roadside ditch may have attracted a larger range of dumping episodes over a longer period of time than other features or abandoned buildings, to which there would have been more restricted access for rubbish disposal and fewer episodes of dumping.

Apart from late Roman silt layers in Phase 68 (Group HA74.6) and Phases 74–5 (Group HA74.8) and Structural Remains 6 and 8 (Groups HA74.5 and HA74.7), all the Hyde Abbey groups produced over 10% horse of the total cattle and horse bones (Table 2.94). The hollow way (Group HA72.1) produced evidence for some dumping of specialist industrial waste including horse upper limb bones. Ditch deposits (Group HA72.3) again produced relatively high horse percentages.

Percentages of horse bones tended to be slightly lower in deposits from the city defences sites, with only Henly's Garage well F38 (Group HG4) producing over 10% horse of the total cattle and horse fragments (Table 2.94).

To summarise these sub-sample variations, horse bones showed quite wide variations in their relative abundance in relation to cattle. Reasons for this could be due to a combination of factors relating to site location, specialist processing, preservation, and sampling. Horse bones tended to be well represented in sub-samples where fragmentation levels were high and where material may have been redeposited and trampled; in areas on or close to roads; and in association with dumps of waste from the specialist processing of upper limb bones of cattle and horse.

Comparing these results with those from Dorchester Greyhound Yard reveals that horse bones tended to be better represented in the Winchester samples (Fig 49). None of the Dorchester sub-samples contained more than 7% horse and 15 sub-samples (58%) produced less than 2%. Other Romano-British urban assemblages have tended to produce few horse bones. For example, horse bones contributed less than 1% of the cattle and horse totals from Tanner Row, York (O'Connor 1988). Thirteen of 20 sub-samples from Exeter produced less than 2% horse and none contained more than 10% (Maltby 1979a). It is possible that horses were slightly more important providers of meat and other carcass products in Winchester than on other urban sites.



All sub-samples contain >50 fragments of major domestic mammals

Figure 49 Horse bones as a percentage of cattle and horse bones

However, the observed differences may be the result of other factors.

The first factor concerns the possibility of chronological change. Late Roman sub-samples from Dorchester and Exeter tended to produce slightly higher percentages of horse bones. However, in neither case did this figure rise above 8% of the total cattle and horse fragments in any sub-sample and the average overall percentage of horse from late Roman deposits lay between 2% and 3%, well below the average from Winchester.

A second and more likely possibility relates once more to the location of the sites from where assemblages have been obtained. Most samples from York, Exeter, and Dorchester were obtained from intra-mural sites, in areas where there is clear evidence for the importance of cattle processing and consumption in the urban centres. Results from such sites show an obvious contrast to those from rural settlements such as Owslebury, where horse bones continued to be found in much higher frequencies in Romano-British deposits, usually between 10% and 20% (Fig 49). Other samples from contemporary rural sites from Wessex also contained horse percentages consistently over 10%, with over 20% at Winnall Down/Easton Lane (Maltby 1994). These figures are similar to those obtained from many Iron Age sites in Wessex (Maltby 1981; Grant 1984; 1991) and the traditional use of horses as a fairly regular source of meat seems to have continued into the Roman period on many native settlements.

In contrast, there appears to have been little demand for horse-flesh in the centre of towns such as Dorchester, Exeter, and York. Accordingly, the carcasses of the horses kept by their inhabitants are less likely to appear in deposits in those areas. Horses were not processed in large quantities by the specialist butchers who concentrated upon cattle carcasses in response to the demand for beef. Some horse carcasses were butchered but perhaps this was more commonly carried out on the outskirts of the towns than in their centres. This could partially explain the higher percentages of horse bones deposited in the Winchester suburbs.

The variations may also reflect dietary preferences of the inhabitants of the suburbs, more of whom may have continued to consume more horse meat as a supplement to their diet than the residents in the centre of the town. More samples need to be analysed from the central area of Winchester to test these ideas. The Staple Gardens excavations produced 7% horse bones (Maltby 1994), a figure that provides no clear indications of whether there were significant variations between inner and outer parts of the town. A broader comparison of horse abundance in Romano-British towns will be made in Section 2.3 (Table 2.218).

Representation of different anatomical elements of horse

Anatomical representation of horse bones by fragment counts is summarised in Table 2.179 by assemblage group for Victoria Road and by site for the smaller assemblages from the other sites. Loose teeth (20%) were the most commonly identified elements. They provided a higher percentage of the horse assemblage than in the case of cattle. This may indicate the poorer preservation of horse skull and mandibles. In addition, horse teeth are significantly larger than those of cattle and may have had a better chance of recovery.

Table 2.179 Anatomical elements of horse by sites/assemblage groups

	VR East				VR West			VR all trenches			Other sites				All sites	
	Wells & pits	Buildings	NE corner	Other	Shafts & pits	Buildings	Other	Ditches	Total	%	HA	JCH	27JS	HG	Total	%
Skull frags	3	2	18	1	1				25	5	4			3	32	5
Mandible	3	6	3	4	1	1			18	3	3	2	2	1	26	4
Loose teeth	4	9	49	17	4	5	6	2	96	17	24	3	3	7	133	20
Scapula	4	5	12	2	2	1	4		30	5	2	1		1	34	5
Humerus	5	3	1	1	4		1	5	20	4	4		1		25	4
Radius	1	10	3	6	3	1	3	3	30	5	2	1	1	2	36	5
Ulna		2	2	2	4		1	4	15	3	2			1	18	3
Os coxae	4	6	6	2	1			3	22	4	5			1	28	4
Femur	3	9	3	3	3	1	3	6	31	6	4				35	5
Patella	1			1					2	0.4					2	0.3
Tibia	3	8	9	14		1	2	5	42	8	5			1	48	7
Carpals	3	1			1	1	2		8	1	2				10	1
Calcaneus		1	1	1	2		4	3	12	2	2	1		1	16	2
Astragalus			2		2	1	3	2	10	2	2				12	2
Other tarsals	1		3	3			2	5	14	3	3				17	3
Metacarpals	3	1	6	2	2		2	4	20	4	1		1	1	23	3
Metatarsals	3	1	1	5	2	1	1		14	3	3	1	1		19	3
Lateral metapodials			7	5		1	3	3	19	3	3				22	3
Metapodials		2	2	3	3	1		2	13	2	2	1		1	17	2
1st Phalanx	1	2	5	5	1		3	2	19	3	5			1	25	4
2nd Phalanx	1			1	1		4	2	9	2		1			10	1
3rd Phalanx	5	1		2			1	2	11	2	1				12	2
Sesamoids	2								2	0.4					2	0.3
Ribs	5	1		8		1	1		16	3					16	2
Sternebrae	1								1	0.2					1	0.1
Cervical vertebrae	1	3	10	3	3		2	3	25	5	2		2		29	4
Thoracic vertebrae	3	7	2	5		1		2	20	4	1				21	3
Lumbar vertebrae	2	1	3	1					7	1				2	9	1
Sacrum			1						1	0.2				1	2	0.3
Caudal vertebrae	1								1	0.2					1	0.1
Total	63	81	149	97	40	17	48	58	553		82	11	11	24	681	

Table 2.180 Fragmentation of major horse bones

	0.1	0.25	0.5	0.75	1	N	WBE	Mean
Mandible	17	9				26	3.95	0.15
Scapula	14	7	4	9		34	11.90	0.35
Humerus	3	5	3	11	3	25	14.30	0.57
Radius	20	5	5	3	3	36	11.00	0.31
Femur	17	9	2	5	2	35	10.70	0.31
Tibia	26	12	3	2	5	48	13.60	0.28
Metacarpal	3	6		3	11	23	15.05	0.65
Metatarsal	7	3		4	5	19	9.45	0.50

Key:
N = Number of fragments
WBE = Whole Bone Equivalents
Mean = Mean size of fragments (WBE/N)

Superficially, fragment percentages would suggest that there was a fairly even representation of horse bones from different parts of the body (Table 2.179). However, such percentages do not take into account the fact that some elements such as vertebrae and ribs occur in greater quantities in the skeleton than the major limb bones, for example. Vertebrae and ribs were therefore under-represented as were some of the small bones such as the patella, carpals and phalanges. Bones of the upper limb, particularly the tibia, were better represented overall than the metapodials. This partially reflects the presence of several of these bones amongst the specialist industrial waste found in several deposits, particularly from Victoria Road East. Scapulae and skull fragments were better represented in deposits from the north-east corner of the Victoria Road site than in other assemblages.

Mandibles were poorly represented. They provided 4% of the total horse fragments (Table 2.179). This is a low percentage given the robustness and size of these bones. In comparison, mandibles provided 6% of the horse fragments from the Romano-British deposits at Owslebury and were the best represented element in a number of those assemblages (Maltby 1987a). All the mandibles identified in the Winchester deposits were very fragmentary (Table 2.180) and very few had teeth surviving with them. This is demonstrated in Figure 28, in which only mandibles with surviving cheek teeth are included in the counts. Mandibles were the most poorly represented of the elements compared in this analysis. This is in marked contrast with the results of identical analyses for the other major species (Figs 25–27). The presence of quite large numbers of loose teeth suggests that horse jaws were deposited on these sites but it seems that they had a surprisingly poor survival rate.

The horse assemblage therefore shows some bias towards upper limb and girdle bones and some evidence that certain bones were sometimes collected for specialist processing. Bones of the head, vertebrae, ribs, and some of the smaller bones of the lower limbs were also poorly represented.

Fragmentation and butchery of horse carcasses

Analysis of the fragment sizes of the major bones of horse (Table 2.180) showed that on average most were considerably less fragmentary than those of cattle (Table 2.113; Plate 37). The scapula and major limb bones all had significantly higher mean fragment sizes than the equivalent bones in the cattle skeleton. Only mandibles, as noted above, were found consistently as small fragments. The metapodials, humerus, and femur had particularly high mean fragment sizes in comparison with all major food species (Fig 35). The mean fragment sizes of radius and tibia would be significantly higher, if those associated with the specialist processing waste were omitted. These accounted for more than half of the radius and tibia fragments of less than 0.25 of a complete bone represented in the total assemblage.

Observations of butchery (and/or working) were made on 62 bones, representing 11% of the horse assemblage excluding loose teeth (Table 2.181). Relative frequencies varied between sites with the highest percentages (15%) being obtained from Victoria Road East and the city defences sites. In the former case, the high percentage was the result of the presence of concentrations of split and splintered horse bones amongst specialist processing waste. Sixteen butchered horse bones were recovered from deposits associated with oven F846 (Groups VRE3–4) and ten more from silt layers contemporary with them (Group VRE5). Nine butchered horse bones were found in silts of Phase 276 (Group VRE26). Only eleven other butchered horse bones were observed in the rest of the assemblage from this site, mainly from silt layers. Butchered horse bones were found only in Trenches X–XIII.

Most of the observed butchery consisted of limb bones that had been axially split, particularly the radii and tibiae and, to a lesser extent, the metapodials. All the split radii and all but one of the split tibiae from Victoria Road East were found in the three groups highlighted above associated with large numbers of cattle bones and unidentified large mammal longbone fragments split in the same manner. Only one isolated

Plate 37 Examples of horse bones: limb bones tended to be more complete than cattle

example of a split horse tibia was found in deposits from Victoria Road West and none were found on the Hyde Abbey site. Two split horse radii were found on city defences sites, in both cases associated with cattle bones processed in the same manner (Group JCH3; Group HG2).

Apart from the above, horse bones bore few butchery marks in comparison with cattle. Including all butchery marks from all sites, 30% of the cattle bones were butchered (Table 2.114) compared with 11% for horse. Excluding the split horse bones from Victoria Road East, this figure falls to 5%, a frequency closely comparable to that observed at Dorchester Greyhound Yard (Maltby 1993). In contrast to cattle, horse limb bones were rarely split axially for marrow in other deposits. Similarly, there were only three examples of horse limb bones which had marks associated with the filleting of the meat by running a heavy blade axially along the shaft.

Unlike cattle, most horse carcasses appear not to have been processed by specialist butchers. Horses were not an important source of meat and the use of their carcasses was much less intensive than that of cattle. Sometimes, however, selected horse limb bones were collected for processing and were split open into small fragments along with similar cattle bones. The selection of bones with relatively long and straight shafts and the breakage patterns suggests that they were required for purposes other than extraction of marrow. It is probable that they were selected for bone working by specialists, who subsequently deposited their waste amongst other rubbish. Much of the material described as butchered in this section probably should be described as bone working waste.

Horse ageing data

Very few horse jaws survived with teeth embedded in them. It was therefore not possible to carry out analysis of toothwear. Epiphysial fusion data were more abundant and analysis showed that nearly all the horses represented were adult (Table 2.182). Bones of neonatal mortalities were encountered extremely rarely and nearly all the early fusing limb bone

Table 2.181 Observations of butchery marks on horse bones

	VR East			VR West		HA		Defences		
	K	C	B	K	C	K	C	K	C	Total
Scapula		2			1					3
Humerus			2				1			3
Radius		11		1					2	14
Ulna		1								1
Femur		2								2
Tibia		13								13
Carpals					1					1
Calcaneus					1					1
Astragalus					1					1
Other tarsals		1			1					2
Metacarpal		2	1							3
Metatarsal		5			1				2	8
Metapodials		6			1				1	8
Total	0	43	3	1	7	0	1	0	5	60
%	0	93	7							
Butchered		46		8		1		5		60
Total horse (excluding teeth)		314		143		58		33		548
% butchered		15		6		2		15		11

Key: K = knife cuts, C = chop marks, B = knife & chop marks

Note: Counts exclude groups of associated bones

Table 2.182 Summary of horse epiphysial fusion data

		U	J	F	%F
Earlier fusing epiphyses	2nd Phalanx, proximal			12	100
	1st Phalanx, proximal			25	100
	Radius, proximal			21	100
	Humerus, distal	1		16	94
	Metacarpal, distal			17	100
	Metatarsal, distal	1		8	89
	Metapodials, distal			11	100
	Scapula, glenoid process			21	100
	Acetabulum			19	100
	Tibia, distal			28	100
Total		2		178	99
Later fusing epiphyses	Calcaneus, proximal			9	100
	Humerus, proximal	2		3	
	Femur, proximal	1	1	12	86
	Femur, distal			12	100
	Tibia, proximal		1	19	95
	Radius, distal			12	100
	Ulna, proximal			1	
Total		3	2	68	93

Key: U = unfused, J = fusing, F = fused, %F = percentage fused

Note: See Silver (1969) for discussion of fusion ages

Table 2.183 Summary of horse bone measurements

Anatomy	Measurement	N	Min	Max	Mean	SD	CV
Scapula	SLC	8	51.8	66.6	60.6	5.4	8.9
	GLP	9	72.2	95.7	87.6	7.2	8.2
	BG	10	38.3	48.6	44.4	3.8	8.6
	LG	9	46.6	60.2	55.6	4.7	8.4
Humerus	BT	14	65.1	77.4	72.4	3.9	5.3
	HT	14	47.1	55.9	51.0	2.8	5.5
Radius	BFp	8	66.2	75.8	70.9	3.6	5.1
Tibia	Bd	21	57.7	72.9	64.8	4.7	7.3
	Dd	22	35.0	46.6	40.8	2.9	7.2
Metacarpal	Bp	17	42.9	52.3	48.0	2.9	6.1
	Dp	14	27.6	35.3	32.1	2.5	7.7
	Bd	15	43.9	53.1	48.3	2.8	5.7
Metatarsal	Bp	9	41.8	50.4	46.8	3.2	6.8

Withers height estimates

Radius	117.6, 135.0, 136.7
Tibia	125.1, 129.9, 132.5, 134.2
Metacarpal	116.3, 123.1, 125.9, 127.2, 128.2, 128.2, 133.3, 136.6, 141.0, 141.1, 141.7, 142.9, 144.5, 150.0
Metatarsal	126.1, 126.3, 127.8, 129.0, 129.5, 137.5

Total withers heights

N	Min	Max	Mean	SD	CV
27	116.3	150	132.1	8.1	6.2

Key:
SLC = smallest length of neck
GLP = greatest length of glenoid and tuber scapulae
BG = breadth of glenoid cavity
LG = length of glenoid cavity
BT = breadth distal trochlea
HT = greatest height of distal trochlea
BFp = breadth of proximal articular surface
Bd = maximum distal breadth:
Dd = maximum distal depth
Bp = maximum proximal breadth
Dp = maximum proximal depth
N = number of measured bones
SD = standard deviation
CV = coefficient of variation

Withers heights estimated by multiplying lateral lengths by Kiesewalter's (1888) conversion factors: radius: 4.34, tibia: 4.36, metacarpal: 6.41, metatarsal: 5.33

Note: All measurements in millimetres; withers height estimates in centimetres

epiphyses had fused. Of the later fusing limb bone epiphyses, 93% had fused and belonged to animals at least 36–42 months old (Silver 1969). Most horses probably lived much longer than that. Measurements of the heights of a small sample of cheek teeth indicated that most of the horses were probably over ten years old, employing Levine's (1982) method of analysis.

There was little demand for horse meat and instead, horses (and perhaps mules) would have been valued as beasts of burden and as transport. Most would have lived as long as they were fit for work.

Horse metrical data

The low rate of immature horse mortalities and the relatively low fragmentation of their bones meant that a greater proportion of the horse bones were

measurable than those of cattle, sheep/goat, or pig. Lateral length measurements were taken on 27 limb bones and converted to estimates of withers height by employing Kiesewalter's (1888) conversion factors (Table 2.183). Estimates ranged between 116cm and 150cm, with a mean of 132.1cm. The horses represented therefore ranged between about 12 and 15 hands and had an average height of about 13.5 hands. The smallest horses were comparable in size to the ponies commonly found on Iron Age sites in Wessex. It is impossible to be certain from this evidence whether the largest equids represent animals imported by the Romans or improved native stock. The range in size is similar to that from later Roman deposits at Owslebury (Maltby 1987a) and the small sample from Roman Dorchester (Maltby 1993). From both those sites there was evidence that larger horses (and/or mules) with withers heights above 130cm began to appear in the early Roman period.

The largest samples of maximum breadth and depth measurements of limb bones from Winchester (Table 2.183) were not significantly different in range and mean size from those from contemporary deposits at Owslebury (Maltby 1987a).

The dog assemblage

Associated dog bones

At least 1233 of the dog bones were found in associated groups, representing 87% of the hand-collected assemblage (Table 2.184). All these groups were deposited in wells or pits.

The well F1096 from Victoria Road East (Group VRE19) produced nine associated groups totalling 352 bones . A summary of these groups is included in Table 2.35. Four adult, a sub-adult, a juvenile, and three neonatal dogs were represented, in most cases by substantial parts of the skeleton. Two of the adult animals bore skeletal deformities. The skeleton from *4376* had a deformed sacro-iliac joint and a bowlegged, probably female dog recovered from *4383*, had evidence for osteoarthritis on several vertebrae and limb bones.

Victoria Road East well F1093 (Group VRE20) included 410 bones from a minimum of eight dogs (Table 2.36). An adult, an immature, three juvenile, and three neonatal mortalities were represented and described above (see pp 61–62). A substantial number of bones from neonatal skeletons were also found in the sieved material from this well (Table 2.203).

Victoria Road East pit F814 (Group VRE22) produced 330 bones from a minimum of eight intermixed skeletons. One group belonged to an immature dog; the rest were from adult animals (Plate 9).

Victoria Road West pit or well F43 (Group VRW14) included 86 bones from a well-preserved skeleton of an adult dog, which had recovered from a depressed fracture of the skull, and Henly's Garage well F113 (Group HG7) contained 47 bones of another adult dog, and eight bones of a large adult were found in HG pit F102 (Group HG7).

Anatomical elements of associated groups of dog bones are given in Table 2.184. There is quite an even representation of bones from different parts of the skeleton, indicating good preservation of the skeletons and suggesting that most, if not all, these animals were buried as complete carcasses. Nearly all the bones survived complete and there is no evidence for butchery or skinning marks. Small bones, particularly of the limb extremities, were, however, under-represented even in the adult skeletons. This was probably the result of a combination of differential retrieval rates and preservation factors. Although ritual motives may have been a factor in the deposition of dogs in wells and other features, particularly in the case of multiple burials (Woodward and Woodward 2004), pragmatic considerations of population control and simply the burial of pets that had died of natural causes cannot be ruled out. The significance of dog burials will be discussed further below (pp 246–247).

Other dog bones

Only 185 unassociated dog bones were identified from all sites (Table 2.185). These formed a very low percentage of the major mammal bones in all sub-samples (Table 2.94). Dogs were unimportant as a food resource and very few, if any, appear to have been eaten. It is likely that the vast majority of the bones were derived from heavily disturbed burials.

The unassociated dog bone assemblage included relatively high percentages of ribs and vertebrae compared with other species (Table 2.185). This indicates that these bones were better preserved and again suggests that they were not processed. Skull fragments, mandibles, and loose teeth were also quite abundant and there was a fairly even representation of the upper limb and girdle bones, with the exception of the scapula, which was poorly represented. Foot bones were very rarely recovered as isolated bones.

Only two observations of butchery on dog bones were made. The bones were found in the same context (*817*) in the town house excavated on the Henly's Garage site (Phases 22–4, Group HG6). A femur had been sawn through the shaft, leaving just the proximal half of the bone. This is an unusual mark and the use of a saw suggests that it was perhaps associated with an early stage of bone working rather than food processing. The second butchered bone was a radius, which had knife cuts on the medial and lateral aspects of the proximal end made during disarticulation from the humerus. Similar knife cuts on all major species have been observed quite commonly on Iron Age specimens from southern England (Wilson 1978; Maltby 1987a; 1989a). However, there is no evidence that this technique was used on other species in any of these Roman Winchester assemblages. The two butchered dog bones provided evidence that on rare occasions dog carcasses were utilised in some way.

Unassociated bones of dog tended to survive in a more complete state than those of other species. The

Table 2.184 Anatomical elements of dog in associated groups

Group	VRE19 F1096	VRE20 F1093	VRE22 F814	VRW14 F43	HG7 Phase 16
Skull frags	8	6	14	1	1
Mandible	13	11	10	2	2
Hyoid	1		3		
Scapula	10	13	6	2	2
Humerus	14	14	13	2	3
Radius	13	10	9	2	2
Ulna	13	11	9	2	2
Os coxae	7	14	14	2	1
Femur	10	12	14	2	
Patella	2				
Tibia	10	12	12	2	1
Fibula	4	5	4	1	1
Carpals	2	1	4		
Calcaneus	3	6	1	2	
Astragalus	3	6	3	1	
Other tarsals	1	5	1		
Metacarpals	10	14	18	5	8
Metatarsals	19	10	21	2	2
Metapodials	2	9			
1st Phalanx	17	5	7	3	1
2nd Phalanx	6		4		
3rd Phalanx	4		1		
Ribs	62	96	69	21	22
Costal cartilages		7	4		
Sternebrae	1	2	1		1
Cervical vertebrae	25	40	25	7	3
Thoracic vertebrae	50	64	35	13	3
Lumbar vertebrae	31	27	18	6	
Sacrum	4	4	3	1	
Caudal vertebrae	5	3	5	6	
Unidentified vertebrae		2			
Baculum	2	1	2	1	
Total	352	410	330	86	55

mean fragment sizes of mandibles (.74), humeri (.70), radii (.58), femora (.51) and tibiae (.50) were all substantially greater than the equivalent bones in other species. What breakage there was is more likely to have been the result of taphonomic processes other than butchery. These results support the view that dog carcasses were rarely processed and most of the isolated bones belonged to animals originally deposited as complete carcasses, which became scattered and largely destroyed during subsequent disturbance and redeposition.

Dog ageing data

Epiphysial fusion and mandibular tooth eruption data from both associated and isolated bones from all sites are considered together in Table 2.186. Each of the major elements was considered separately and it was possible to assign the bones into five age categories (neonatal; juvenile; immature; sub-adult; adult) on the basis of a combination of observations of tooth eruption, epiphysial fusion, and porosity of the bones. By dividing the number of specimens assigned to each

Table 2.185 Anatomical elements of other dogs by sites/assemblage groups

	VR East				VR West			VR all trenches	Other sites			All sites	
	Wells & pits	Buildings	NE corner	Other	Shafts & pits	Buildings	Other	Ditches	HA	JCH	HG	Total	%
Skull frags	3	2	3		5		1	1	2		1	18	10
Mandible	5	1	1	4	2		2	6			2	23	12
Loose teeth	2	1		5	1	2	5	1	3			20	11
Scapula				1				1				2	1
Humerus	2	3	3	3	1			2	2	1	2	19	10
Radius			1	8			1	1			2	13	7
Ulna		1	1	3		3		2				10	5
Os coxae	1	1	3	2	1			2			1	11	6
Femur	5	1	1	3							1	11	6
Tibia	1	2	4	3					1		1	12	6
Calcaneus								1				1	0.5
Metacarpals	1							1				2	1
Metatarsals		1										1	0.5
Metapodials	1			1								2	1
Ribs	4	4		6		1	1	2			1	19	10
Cervical vertebrae	1	2		2	1	1	2	1	2		1	13	7
Thoracic vertebrae	2	1		1								4	2
Lumbar vertebrae	2							2				4	2
Total	30	20	17	42	11	7	12	23	10	1	12	185	

Table 2.186 Ageing Data and minimum number estimates of dog bones

		VPoU	PoU	U	J	F	%F	MNI
Acetabulum		3	3			34	85	21
Scapula	D	5	5			21	68	17
Phalanx 1	P				2	31	91	3
Phalanx 2	P					10	100	1
Humerus	D	14	5	2	2	32	56	28
Metapodials	D		9	7		104	87	9
Ulna	P	5	5	2		22	65	18
Radius	P	4	5	2		27	71	20
Radius	D	3	5	3		22	67	18
Tibia	D	3	3	2	2	23	70	18
Calcaneus	P		2		2	9	69	7
Humerus	P	14	4	6	1	23	48	25
Femur	P	2	2	3	2	23	72	17
Femur	D	7	3	4		17	54	17
Tibia	P	5	3	5	1	20	59	19
Mandible*		4	8			46	79	29

Key:
VPoU = very porous, epiphysis unfused (neonatal/foetal)
PoU = porous, epiphysis unfused (juvenile)
U = epiphysis unfused (immature)
J = epiphysis fusing
F = fused (adult)
P = proximal
D = distal

*Key for mandible
VPoU = very porous, deciduous teeth not fully erupted
PoU = porous, 1st molar not in wear
F = all permanant cheek teeth in wear

Approximate fusion ages in months (Sliver 1969)
acetabulum: 6
scapula: 6–7
phalanges: 7
distal humerus: 8–9
distal metapodials: 8–10
proximal ulna: 9–10
proximal & distal radius: 11–12
distal tibia, calcaneus: 13–16
proximal humerus: 15
proximal & distal femur, proximal tibia: 18

age category by the frequency that element appeared in a single skeleton, it was possible to derive a MNI estimate for each element. At least 29 dogs were represented by mandibles (Table 2.186). This analysis also confirmed that the major limb bones were quite well represented but many of the limb extremities were missing.

All age groups were represented. A minimum of seven neonatal puppies were represented. Nearly all of these bones were found in wells and pits. In some cases bones of several puppies were found together. These may have been from litters of newborn puppies that either died at birth or were deliberately destroyed in order to keep the dog population under control or deposited as sacrificial offerings. Similar concentrations of newborn puppies in pits and wells were recovered from Owslebury, Dorchester Greyhound Yard, and Oakridge (Maltby 1987a; 1993; 1995b). Such features were clearly regarded as a common depository for such animals.

A minimum of four juvenile dogs under six months of age were also recorded. At least four immature and/or sub-adult dogs that died between six and 18 months of age were present. At least 23 dogs of over six months of age were represented by mandibles with fully erupted tooth rows and at least twelve dogs of over 18 months of age were represented by the proximal humerus and femur.

The wide range in the age of dog mortalities was similar to that encountered in Dorchester (Maltby

Table 2.187 Shoulder height estimates for dog limb bones

Anatomy	Estimated shoulder heights
Humerus	27.8, 29.3, 30.8, 33.9, 39.8, 39.9, 44.3, 51.2, 53.3, 55.1
Radius	22.8, 27.1, 28.1, 30.8, 31.1, 33.8, 45.2, 53.1, 53.1, 53.6
Ulna	26.5, 27.3, 30.4, 30.8, 54.0
Femur	28.7, 30.7, 33.2, 44.1, 51.5, 52.7, 53.6, 54.9
Tibia	26.9, 27.5, 29.7, 30.9, 42.3, 45.0, 49.9, 53.2, 53.6, 53.6

	N	Min	Max	Mean	SD	CV
Humerus	10	27.8	55.1	40.5	10.2	25.2
Radius	10	22.8	53.6	37.9	12.1	31.9
Ulna	5	26.5	54.0	33.8	11.4	33.7
Femur	8	28.7	54.9	43.8	11.1	25.3
Tibia	10	26.9	53.6	41.3	11.4	27.6

Key:N = number of measured bones
SD = standard deviation
CV = coefficient of variation

Note: Heights are in centimetres

Shoulder heights estimated by multiplying greatest lengths by Harcourt's (1974) conversion factors:
humerus: x3.43-26.54
radius: x3.18+19.51
ulna: x2.78+6.21
femur: x3.14-12.96
tibia: x2.92+9.41

1993). Dogs would have been kept in towns for purposes similar to those one would expect in modern towns. These would include animals used as guard dogs or for shepherding other animals. Some may simply have been pets. It is also likely that there were stray animals attracted to rubbish deposits. The relatively high rate of immature mortalities may imply that attempts were made to keep the dog population under control. A number of dogs had suffered traumas including depressed fractures of the skull. All these showed signs of healing, however, and do not appear to have been the direct cause of death.

Dog metrical data

The large number of complete limb bones of adult dogs allowed estimates of shoulder heights to be calculated using Harcourt's (1974) conversion factors. The estimates for each bone are given in Table 2.187. In cases where pairs of bones were represented in the skeleton, only one measured bone was recorded. The results show a wide range in the heights of dogs, with coefficients of variation of over 25%. The smallest bones belonged to a lapdog of about 23cm; the largest dogs had shoulder heights of about 55cm. This range is similar to that found in Dorchester (Maltby 1993). Some of the smaller dogs had bowed legs. Neither urban assemblage has yet produced the slightly taller dogs of about 60cm found at the rural settlements at Owslebury and Oakridge (Maltby 1987a; 1995b) and larger dogs have also been found on some sites elsewhere in Roman Britain (Harcourt 1974; see also Table 2.242).

Small dogs of under 30cm were more commonly represented at Winchester than at Oakridge. Animals of this small size were probably introduced into southern England in the late Iron Age and thereafter became quite common on some Romano-British sites (Harcourt 1974). Most may simply have been pets. Some may have been specially bred, but it is difficult to assign bones to breeds from metrical analysis alone. The chances of the interbreeding of dogs within the town must have been high and many dogs were probably mongrels displaying characteristics of a number of types or breeds of dog.

Other dog measurements are summarised in Table 2.188. Breadth and depth measurements tended to be less variable than length measurements but all the most common measurements had coefficients of variation of over 10%. The bones of larger animals tended to have more slender shafts than smaller dogs and this is also reflected in the breadth measurements of the articular surfaces. A similar pattern was observed in Dorchester (Maltby 1993).

The evidence suggests that a substantial number of dogs were kept and bred in Winchester and their numbers may have had to be controlled. They varied greatly in size and may have had a wide range of uses. The evidence that some dogs had recovered from various traumas and had been kept alive despite suffering other severe skeletal pathological conditions indicates that some at least had been carefully looked after (Serpell and Paul 1994).

Table 2.188 Summary of other dog measurements

Anatomy	Measurement	N	Min	Max	Mean	SD	CV
Mandible	M1L	25	15.8	23.7	19.8	2.3	11.5
	M1B	25	6.2	9.7	8.0	1.0	12.9
Scapula	SLC	7	14.8	23.0	18.9	2.9	15.2
	GLP	13	18.1	31.9	26.5	4.1	15.6
	BG	13	10.5	20.9	16.3	3.1	19.3
	LG	8	16.7	27.4	24.3	3.7	15.1
Humerus	GLC	9	84.4	163.9	118.5	32.8	27.7
	Dp	11	24.0	42.6	34.9	5.9	16.9
	Bd	15	24.5	36.4	31.0	3.8	12.4
	HT	15	15.1	22.6	18.7	2.4	12.8
Radius	Bp	16	10.6	18.9	15.8	2.5	15.8
	Dp	15	7.2	12.8	13.2	1.7	12.6
	Bd	9	13.0	26.3	20.3	4.6	22.7
Femur	Bd	11	18.5	33.2	26.7	4.5	16.9
	DC	15	11.4	20.1	16.0	2.8	17.3
	Bp	14	22.8	38.3	32.0	4.7	14.8
Tibia	Bp	10	20.7	35.2	28.9	4.9	16.8
	Bd	14	13.8	23.9	19.2	3.0	15.4
	Dd	13	9.9	18.0	14.2	2.7	18.9
Calcaneus	GL	5	30.1	41.7	36.3	4.6	12.7

Key:
M1L = length of 1st molar
M1B = breadth of 1st molar
SLC = smallest length of neck
GLP = greatest length of glenoid and tuber scapulae
BG = breadth of glenoid cavity
LG = length of glenoid cavity
GLC = length from proximal caput
Dp = maximum proximal depth
Bd = maximum distal breadth
HT = greatest height of distal trochlea
Bp = maximum proximal breadth
DC = depth proximal caput
Dd = maximum distal depth
GL = greatest length
Note: All measurements in millimetres

N = number of measured bones
SD = standard deviation
CV = coefficient of variation

Other mammals and amphibians

Abundance of other mammals

This section will discuss the other mammal species and amphibians identified in the hand-collected sample. The species identified and the number of bones involved are listed in Table 2.189. Other mammals were poorly represented with only seven species identified and, including all rodent bones, only 203 bones were found in total. Excluding associated groups of bones, only 104 bones were recorded representing no more than 1% of the total mammal fragments in any of the assemblages listed and only 0.7% overall.

Cat

Bones of cat were the most commonly identified. However, 99 (93%) of their 106 bones were found in three associated groups. The largest of these consisted of 83 bones of an adult cat from the well F43 at Victoria Road West (Group VRW14). Most parts of the body were represented, although a lot of the small bones of the limb extremities were not recovered (Table 2.190). Two much smaller associated groups from two animals were found in the pit F814 at Victoria Road East (Group VRE22): the first consisted of eight ribs of an adult cat; the second consisted of a pair of tibiae and a femur. These limb bones were unfused and belonged to an immature individual.

Other cat bones were rarely recovered, although they were identified on all sites apart from Henly's Garage. These isolated finds consisted of major limb bones usually of adult cats (Tables 2.189–2.190). The high percentage of associated bones and the lack of evidence for skinning or butchery indicates that cat carcasses were probably not usually exploited. As today, they would have been kept as pets and would have helped to control vermin.

Table 2.189 Other mammals and amphibian species recovered by hand collection

	VR East						VR West		Other sites			All sites
	Wells & pits		Buildings	NE corner	Other		All contexts		HA	JCH	HG	Total
	A	O			A	O	A	O				
Cat	11		2		5		83	2	2	1		106
Red deer		1	2	16		5		13	1		4	42
Roe deer				2		3		2	1		2	10
Fallow deer									1			1
Hare		3	1	1		4		8	2		2	21
Rabbit				2		1		2				5
Short-tailed vole		1										1
Rodent species		6				1		9	1			17
Total mammals	11	11	5	21	5	14	83	36	8	1	8	203
% all mammals		0.4	0.4	0.8		0.5		1	0.5	0.3	1	0.7
Frog	151			1				810			156	1118
Toad	5							47				52
Frog/toad	4							418			190	612
Total amphibians	160			1				1275			346	1782
% identified bones		6	0	0.01		0		29	0	0	31	9

Key:
A = associated bones
O = other bones

Note: % excludes associated bones
(fallow deer and rabbit are probably intrusive)

Cats were introduced to some parts of Britain during the Iron Age. In the Winchester area, they were recorded in later Iron Age contexts at Owslebury (Maltby 1987a) but not at Winnall Down (Maltby 1985b). They have been found on a number of Romano-British sites, although not in large quantities. They appear to have been kept in much fewer numbers than dogs in towns, although the possibility that differential retrieval rates has led to their under-representation needs to be noted. However, no cat bones were found in any of the sieved samples from the Winchester sites, confirming their infrequency amongst the faunal assemblages. As in the case of dogs, the comparatively small number of pits and wells excavated may partially explain why cats were found in low numbers compared with Dorchester, Greyhound Yard, where cat skeletons dumped into these features survived well and were recovered more frequently (Maltby 1993).

Several of the bones from the skeleton of the adult cat from the well F43 (Group VRW14) were measured. Greatest lengths were obtained for the humerus (103.1mm), radius (101.2mm), ulna (120.1mm), femur (115.7mm), and tibia (122.3mm). These results indicate that the cat was quite large. It was slightly larger than two cat skeletons recovered from late Roman cess pits at Owslebury (Maltby 1987a) but smaller than the largest skeleton recovered from Dorchester (Maltby 1993). Most cats that have been recovered from Romano-British sites have been quite large animals and the skeleton from Winchester fits into this pattern. It is assumed that all the bones are from domestic cat, although the presence of wild cat is possible in this period.

Deer

Bones of three species of deer were identified but only in small quantities. Red deer (*Cervus elaphus*) were the most common and were represented by 42 fragments of bone and antler. The species was identified on all sites except Jewry Street, Crown Hotel.

Most of the evidence for red deer exploitation concerned the use of antler as a raw material for making artefacts. A total of 27 antler pieces was recorded. Although recorded from most sites, these finds were sometimes spatially clustered. Thirteen antler fragments were recovered from layers in the north-east corner of the Victoria Road East site (Groups VRE6–14). At least five of these showed evidence of working in the form of saw marks. Three of these worked antler fragments came from deposits from Group VRE8, some of which also contained notable amounts of splintered limb bones, indicating they may have been associated

Table 2.190 Anatomical elements of cat, deer, hare, and rabbit

	Cat		Red deer	Roe deer	Fallow deer	Hare	Rabbit
	A	O					
Antler			27	1			
Skull frags	2						
Mandible	3						
Scapula	1		1			1	
Humerus	3		2		1	1	1
Radius	3	1	4			6	1
Ulna	3	1					1
Os coxae	2	1		2		2	
Femur	3			2		4	1
Tibia	4	4	3			3	1
Fibula	1						
Calcaneus				1			
Other tarsals	1						
Metacarpal	7		2	2		1	
Metatarsal	4		2	2		2	
1st Phalanx	6		1				
2nd Phalanx	5						
Ribs	27					1	
Sternebrae	1						
Cervical vertebrae	5						
Thoracic vertebrae	10						
Lumbar vertebrae	7						
Sacrum	1						
Total	99	7	42	10	1	21	5

Key:
A = associated bones
O = other bones

with the same specialist processing. Six red deer antler fragments were found in Victoria Road West Period 3 Deposit *63* (Group VRW7), a layer also containing evidence for bone working and the splintered offcuts of cattle and horse limb bones. This group contained evidence for one naturally cast antler and one uncast specimen still attached to the skull. Antler would have been imported as raw material for working by specialists, especially into combs (Rees *et al* 2008, 64–6).

Only fifteen bones of red deer were identified (Table 2.190), which implies that their meat was only very rarely eaten in the town, although it should be noted that the bones of animals hunted and killed outside the town may not have been brought there, if all the filleting was carried out at the kill site. There is no evidence that deer bones were processed by specialist butchers. None of the limb bones bore axial blade marks nor had any been split axially.

From the very limited number of limb bone epiphyses present, there is no evidence for the presence of immature red deer. Measurements were taken on a small number of limb bones. A complete radius had a greatest length of 251mm; distal breadths of two radii measured 49.2mm and 54.1mm; a tibia had a distal breadth of 46.4mm and a metacarpal one of 38.3mm; the breadth of the distal trochlea of a humerus measured 55.0mm. These results indicate that the red deer represented in Winchester were of a similar size to those from Owslebury and Dorchester, which were generally large and typical of other Romano-British sites (Noddle 1982). The large size of the red deer probably indicates that they were from woodland herds. It has been suggested that size reduction has been the result of general displacement of the red deer populations to less favourable moorland habitats (Grant 1981; Staines 1991; Yalden 1999).

Roe deer (*Capreolus capreolus*) elements were found on all sites apart from Jewry Street, Crown Hotel. They were rare, however, with only ten elements identified (Table 2.189). Most of these were from the limbs, although an uncast antler was also recorded. Superficial chop marks at the base of the antler indicate that it was removed from the rest of the skull presumably as a preparation for working. Superficial chop

marks observed on a femur were the only evidence for carcass processing. Roe deer do not appear to have been commonly exploited, although it will be interesting to compare these results with other sites in Roman Winchester to see if this is typical. No evidence for the presence of immature animals was found in the very small sample of ageable bones.

Fallow deer (*Dama dama*) was represented by a humerus from Hyde Abbey context *233* (Group HA74.8). Fallow deer bones have occasionally been recorded on Romano-British sites but their identification and dating has often been questioned. This specimen is another example. It derives from the latest Roman phase from the site and may be associated with post-Roman activity. The layer was not well sealed and it is probable, therefore, that this bone was a medieval intrusion. Fallow deer have been found in small numbers on Roman sites in south-east England (Bendrey 2003; Sykes 2004; Sykes *et al* 2004). However, fallow deer do not appear to have been introduced in substantial numbers into Britain before the Norman period (Grant 1981; Chapman and Putnam 1991; Yalden 1999; Sykes 2004).

Hare and rabbit

Hare (*Lepus* sp) bones were recorded on all sites apart from Jewry Street, Crown Hotel. A total of only 21 bones were identified. Eight of these were recovered from Victoria Road West, which included a slightly higher proportion of this species than assemblages from other sites (Table 2.189). However, the contribution of hares towards the diet appears to have been minimal.

No associated groups of bone were recorded. The major upper limb bones were the best represented elements with bones of the front and back legs recovered in roughly equal numbers. The small bones of the feet, vertebrae, and head bones were not recorded (Table 2.190). Biases resulting from differential retrieval and preservation probably account for these discrepancies.

Recording of epiphysial fusion data indicated that both immature and adult hares were caught, although the latter were more common. Knife cuts were found on the shaft of one of the femora indicating that the bone was filleted and it is likely that all the hares represented were brought to the town to be eaten. There was only one complete bone – a radius – which provided a greatest length measurement of 115.5mm. This was quite a large specimen and it suggests that it belonged to a brown hare (*Lepus europaeus*) rather than the smaller mountain hare (*Lepus timidus*). There is no definite record of brown hare in Britain prior to the Romano-British period, so it is possible that the species was a Roman introduction (Tapper 1991; Yalden 1999).

Five bones of rabbit (*Oryctolagus cuniculus*) were recorded in five different contexts at Victoria Road (Table 2.189). Rabbits are also not thought to have been introduced into Britain in substantial numbers prior to the Norman invasion (Maltby 1979a; Tapper 1991; Yalden 1999). None of the contexts that produced rabbit bones was well sealed and it is likely that these bones are intrusive from later deposits.

Small mammals

Bones of small mammals are unlikely to be recovered by hand excavation. Only eighteen rodent bones were recorded from the northern suburb sites and none was found in the hand-retrieved bones from the city defences sites. All but three of these were found in pits and wells at Victoria Road, usually associated with layers containing a large number of amphibian bones, indicating that they were victims of falls when the features lay open. The only positive identification to species was a jaw of a short-tailed vole (*Microtus agrestis*) found in well F1096 (Group VRE19) at Victoria Road East. Discussion of the environmental interpretations derived from the presence of various species of small mammals will be discussed below (pp 237), in which the sieved samples are considered.

Amphibians

Bones of amphibians were retrieved in much greater numbers than small mammal bones. A total of 1782 were recorded from hand-excavated material, representing 9% of the bones identified to species. This high total is based on the discovery of very large numbers of amphibian bones in some of the wells. From the Victoria Road East assemblages, over 100 bones were found in well F1096, *4376* (Group VRE19 – Tables 2.33–2.34) and smaller numbers were also found in well F1093 (Group VRE20 – Table 2.35), pit F981 (Group VRE23 – Table 2.39) and pit F168 (Group VRE21 – Table 2.37). Amphibian bones formed 6% of the samples from wells and pits on this site but only one bone was found in any of the other deposits (Table 2.189).

Amphibian bones were abundant in the three wells on Victoria Road West, forming 29% of the total assemblage of identified bones from shafts and pits from that site (Table 2.189). Over 1000 amphibian bones were recovered by hand from well F43 (Group VRW14 – Table 2.60), nearly 200 from F46 (Group VRW12 – Table 2.58), and over 80 from F18 (Group VRW13 – Table 2.59). Apart from these large accumulations, only two bones of toad were recovered from this site, from one of the grave fills (Group VRW15 – Table 2.61).

All the amphibian bones from the Henly's Garage site came from cess pit F102, *1004* (Group HG7 – Table 2.88) and consisted of over 300 bones. This accumulation resulted in amphibians providing 31% of the identified bones from that site (Table 2.189).

The recovery of such a high percentage of amphibian bones by hand in some features is remarkable and must reflect the density of the accumulation in those layers. Most of the identified bones belonged to frogs (*Rana* sp) (Table 2.189) and it is possible that some of

Table 2.191 Bird bones recovered by hand collection

Site/contexts	Associated	Other	% major mammals
VR East wells and pits	61	83	3
VR all trenches, ditches		15	2
VR East buildings		22	2
VR East NE corner		19	0.7
VR East layers/other	17	63	2
VR West shafts and pits		18	2
VR West buildings		11	2
VR West other deposits		13	1
Hyde Abbey buildings	7	14	2
Hyde Abbey other deposits	18	24	3
Jewry Street, Crown Hotel		2	0.6
27 Jewry Street		6	2
Henly's Garage		18	2
Total	103	308	2

Note:Identified bird bones are expressed as a percentage of the bones of the major mammals (cattle, sheep/goat, pig, horse, & dog – Table 2.95)

Percentages exclude associated bones

the shafts were open long enough for water to accumulate in them and for frogs to colonise them. Toad (*Bufo* sp) bones were also identified in some features. Subsequent infilling may have created many of these death assemblages. Smaller accumulations of amphibian bones may signify pitfall victims. A fuller discussion of the significance of the amphibians will be made below (pp 237), where the sieved samples, some of which also produced large numbers of amphibian bones, are reviewed.

The exploitation of birds

Associated groups

Only 411 bird bones were identified in unsieved assemblages, of which 103 (25%) were bones associated with ten partial skeletons (Table 2.191). Five of the associated groups (none comprising of more than 12 bones) were found in well F1096 (Group VRE19). Four of these were from the primary silts (*4382*, *4383*),

Plate 38 Bones of raven skeleton from Victoria Road East pit F814

Table 2.192 Identified bird species

	VR East		VR West	HA		JCH	27JS	HG	Total	%
	A	O		A	O					
Domestic fowl	29	155	37	7	23	2	6	9	268	75
Domestic/greylag goose	6	1	3		3			1	14	3
Goose species		1							1	0.3
Domestic duck/mallard		8	7		6			1	22	7
Duck species		8	3		2				13	4
Teal		1	1		1				3	1
Heron			1						1	0.3
Woodcock		6	3		2			1	12	4
Wader cf plover		1	1		1				3	1
Wader cf snipe			1						1	0.3
Buzzard	17	2							19	0.6
Raven	26	1		18				4	49	2
Rook/crow		2							2	0.6
Jackdaw								2	2	0.6
White-tailed eagle		1							1	0.3
Total	78	187	57	25	38	2	6	18	411	

Key:
A = associated bones
O = other bones

Note:Goose species are smaller than domestic/greylag goose
Duck species are medium sized ducks, smaller than a mallard cf widgeon
Percentages exclude associated bones

which contained a number of other partial skeletons (Table 2.34). Three belonged to domestic fowl, consisting of bones of a hen in lay, wing bones from another adult bird, and leg bones from an immature chicken.

The fourth group in the primary fills consisted of foot bones from a domestic/greylag goose. Bones from an adult hen not in lay were found in the upper backfills of the well.

Other associated groups of bird bones from Victoria Road East belonged to a raven (26 bones) found in pit F814 (Group VRE22 – Plate 38), which was found with other associated groups (Table 2.38) and a buzzard (17 bones) from post-hole F1151 (Group VRE30; Phase 472 – Table 2.47).

A second partial raven skeleton (18 bones) was found in silt layers on the Hyde Abbey site (Group HA74.6 – Table 2.71) and seven bones from a hen in lay were found in Group HA74.5 on the same site (Table 2.70). No associated groups were recorded from the city defences sites.

No evidence of butchery was observed on any of the bones in the associated groups. However, butchery marks were rarely encountered on other bird bones and therefore this does not preclude the possibility that some of the partial skeletons could have been processed, particularly in the case of the smaller groups of bones of domestic fowl and goose. The more complete skeletons of raven and buzzard were less likely to have been processed. Possible explanations for the presence of skeletons of these species will be discussed below.

Abundance of bird bones

Inevitably, bird bones are likely to be under-represented in assemblages collected by hand because of retrieval factors. Excluding associated groups, only 308 bird bones were identified, representing just 2% of the total of identified major domestic mammal bones (Table 2.191). This figure was fairly consistent amongst the major assemblage groups, rising no higher than 3% in any of them and falling below 1% in two cases. Low percentages of bird bones are typical of Romano-British assemblages. The relative number of birds to mammal bones is slightly lower than the average recorded amongst the larger assemblages of this date (Albarella 2005).

Comparisons of the relative abundance of bird bones recovered from different excavations are difficult because of probable variations in retrieval standards and bone preservation. However, it is interesting to note that the relative abundance of bird bones in these assemblages is significantly lower than in those from Dorchester Greyhound Yard, where bird bone totals ranged between 11% and 21% of the total identified

mammal bones in different periods (Maltby 1993). Identification, quantification, and calculation methods were identical between the samples. Other possible reasons for this variation need to be considered.

The first possibility is that the preservation conditions were more conducive to the recovery of bird bones in Dorchester. Compared with Winchester, there were many more cess pits and other deep features excavated and these generally preserved bones extremely well. The relative abundance of bird bones was lower in soil layers from Dorchester but even in these, the percentage of bird bones never fell below 8%. This recovery rate was still significantly higher than any of the Winchester assemblages, even those from pits and wells, in which general preservation was very good. It is unlikely that the differences in relative abundance can be wholly attributed to taphonomic factors. Indeed some experiments have suggested that bird bones in some circumstances survive better than bones of mammals (Nicholson 1996).

A second possibility is that the retrieval of bird bones was consistently more efficient in Dorchester than in Winchester. Although there may be some variation, it again seems unlikely to be a primary factor. Sieved samples from Winchester produced only 6% bird bones (Tables 2.196–2.202), still below figures obtained from Dorchester. So, although some bird bones would undoubtedly have been overlooked during normal excavation, this alone cannot account for the discrepancy in the abundance of bird bones between the two assemblages.

A third and more interesting possibility is that birds were generally less frequently exploited in Winchester than in Dorchester. However, the abundance of bird bones in assemblages may also depend upon the location of the deposits within the towns. Birds may have been eaten more frequently by inhabitants of inner areas of towns such as around the Greyhound Yard site in Dorchester than by those residing in the suburbs. This may in turn be related to dietary preferences and perhaps social or economic status. In addition, the greater tendency to deposit larger amounts of processing waste of domestic mammals (particularly cattle) on the outskirts of towns must also be considered. This would have the effect of depressing the percentage of bird bones in the assemblages. The bones of birds exploited for meat are also likely to be associated mainly with domestic refuse. They may therefore be found less commonly in areas which were sparsely occupied or in properties that had been abandoned.

Further samples from other areas of Winchester are required for comparison. Bird bones were slightly better represented in assemblages from Staple Gardens (Maltby 1986a) than from the northern suburb sites but these percentages were still substantially lower than in Dorchester and some other urban samples (Maltby 1997). Analysis of Roman samples from The Brooks and other more central sites in Winchester would be valuable. It should be noted that, although the abundance of bird bones from these Winchester sites was quite low, it was still notably greater than in contemporary samples from Owslebury, where bird bones formed less than 1% of the total of the identified mammal bones (Maltby 1987a).

Domestic fowl

Domestic fowl (chickens) belong to the gallinaceous order of birds that also includes species such as guinea fowl (*Numida meleagris*), red grouse (*Lagopus scoticus*), black grouse (*Lyurus tetrix*), and pheasant (*Phasianus colchius*). Although it is possible that the assemblage included bones of other galliformes, none of the diagnostically distinctive bones such as the coracoid and tarsometatarsus (Cohen and Serjeantson 1996) had morphological traits of species other than domestic fowl. It is therefore assumed that the vast majority, if not all, of these bones belonged to domestic fowl.

Domestic fowl provided the highest percentage of bird bones from all the sites investigated. Excluding associated groups, they formed 75% of the avian assemblage. Such a high figure is comparable with some assemblages in Exeter (Maltby 1979a) and Dorchester (Maltby 1993). Domestic fowl seem to have been exploited for the first time in southern England in the Iron Age but are rare or absent from most Iron Age sites in Hampshire, for example at Danebury (Coy 1984; Serjeantson 1991). They seem to continue to have been rarely exploited on rural sites in the Romano-British period but are found regularly in towns throughout the Romano-British period.

Comparisons of the abundance of domestic fowl with sheep/goat and pig bones have been made for a large sample of Romano-British sites (Maltby 1997). Such comparisons are problematic because of variations in preservation, retrieval, and analytical methods between sites. Nevertheless, general trends can be observed. For example, the analysis indicated that domestic fowl and pigs were best represented on urban sites but more poorly represented on rural settlements. Domestic fowl were not recorded from a number of samples from such sites. Comparing the totals of sheep/goat and domestic fowl bones only, 71% of the samples from rural sites contained less than 1% domestic fowl and 89% had less than 2%. Results from urban samples were much more variable but many produced high percentages of domestic fowl. Seventy-nine per cent of the urban samples produced over 6% and in 53% of the samples domestic fowl contributed over 16% of the total fowl and sheep/goat bones. The Dorchester Greyhound Yard assemblages, for example, contained between 16% and 25% domestic fowl bones.

The Winchester samples produced some of the lowest percentages of domestic fowl from urban samples in this analysis ranging between 3% and 5% of the total sheep/goat and domestic fowl assemblages. This may indicate that domestic fowl were kept and exploited in smaller numbers in Winchester than was usually the case in similar settlements. This again may be a reflection that these samples come from deposits on the outskirts of the town, where the residents had

Table 2.193 Anatomical elements of domestic fowl by site

	VR East		VR West	HA		JCH	27JS	HG	Total	%
	A	O		A	O					
Skull		5	1						6	3
Mandible		3							3	1
Scapula	1	9	2		2				14	6
Coracoid	3	13	4		2				22	8
Furcula		6	1	1	2				10	3
Humerus	3	22	5		2		1		33	13
Radius	1	10	1	1	2	1	2		18	7
Ulna	3	13	3	1	1				21	7
Carpometacarpus	1	4			1				6	2
Os coxae	2	5		1					8	2
Femur	3	16	4	1	3		2	2	31	12
Tibiotarsus	5	26	8	1	3			3	46	17
Tarsometatarsus	5	16	8	1	4			3	37	13
Rib		1							1	0.4
Sternum	1	6			1	1	1	1	11	4
Vertebrae	1								1	
Total	29	155	37	7	23	2	6	9	268	

Key:
A = associated bones
O = other bones

Note:Percentages exclude associated bones

Table 2.194 Domestic fowl – ageing and other data

	N	%
Porous bones	39	23
Non-porous bones	131	77
Medullary bone	15	39
No medullary bone	23	61
Butchered	3	1

Note:Percentages exclude associated bones
Porous bones indicate immature birds
Medullary bone indicates hens in lay

a less varied diet or simply where bird bones were deposited relatively less frequently.

A study of the anatomical parts of domestic fowl represented (Table 2.193) clearly demonstrates that the larger and more robust bones had the best chance of recovery. On all sites, tibiotarsi, tarsometatarsi, femora, and humeri were well represented, whereas smaller bones, particularly of the wing, were under-represented. Skull, mandible, and os coxae were also poorly represented. Compared with the best represented element, the tibiotarsus, 56% of the the ten largest other leg and wing bones were missing. Most of this loss can be accounted for by differential retrieval rates. The percentage loss would be higher if one includes bones of the head, the fibula, and sternum in the calculations. Bird phalanges, ribs, and vertebrae were usually not identified to species unless in an associated group with identified elements.

Observations of butchery were made on only three domestic fowl bones. The distal end of a tibiotarsus and the proximal end of a tarsometatarsus bore marks made during the removal of the feet; the proximal end of a humerus had knife cuts associated with the disarticulation of the wing. Butchery of birds need not leave evidence of marks on the bones but it is curious that the incidence of observed butchery is so low. For example, over 11% of the domestic fowl tibiotarsi from Dorchester Greyhound Yard bore butchery marks compared with only 2% from the Winchester sites. The reasons for this discrepancy are not clear.

The age of birds can to some extent be indicated by the porosity of their bones. Porous bones belong to immature birds and so it is possible to estimate the proportion of these in an assemblage, although there are problems of identification of very porous bones to species. Thirty-nine porous bones identified as domestic fowl were recorded (excluding those in associated groups), representing 23% of the assemblage (Table 2.194). The presence of such a high percentage of immature birds suggests that domestic fowl were being kept and bred in the town.

Hens in lay deposit a granular deposit of medullary

Table 2.195 Summary of measurements of domestic fowl bones

Anatomy	Measurement	N	Min	Max	Mean	SD	CV
Coracoid	GL	9.0	47.0	55.7	50.3	2.9	5.9
	Lm	12.0	44.3	56.9	49.2	3.8	7.7
	Bb	9.0	9.7	13.0	10.8	1.1	9.8
Humerus	GL	10.0	58.2	81.3	65.2	7.3	11.2
	Bp	15.0	15.4	21.7	17.4	1.5	8.6
Carpometacarpus	GL	6.0	33.3	40.4	36.7	2.9	8.0
Femur	GL	13.0	69.3	83.2	72.7	4.3	6.0
	Bp	18.0	13.1	17.1	14.7	1.3	8.7
	Dp	13.0	5.9	7.4	6.3	0.4	6.3
	Bd	14.0	11.5	16.1	13.8	1.3	9.8
Tibiotarsus	GL	9.0	94.1	120.6	104.2	9.5	9.1
	Bd	13.0	9.7	11.8	10.7	0.7	6.6
	Dd	9.0	9.8	12.0	10.8	0.7	6.5
Tarsometatarsus	GL	9.0	64.5	81.7	69.0	5.1	7.3
	Bp	12.0	11.0	13.6	12.1	0.9	7.5
	Bd	13.0	10.8	14.1	11.8	1.2	10.1

Key:
GL = greatest length
Lm = medial length
Bb = basal breadth
Bp = maximum proximal breadth
Dp = maximum proximal depth
Bd = maximum distal breadth
Dd = maximum distal depth

N = number of measured bones
SD = standard deviation
CV = coefficient of variation

Note: All measurements in millimetres

bone within the shaft cavities of their bones, particularly in the femur and tibiotarsus (Driver 1982). The presence or absence of medullary bone was noted in 38 bones. Of these, fifteen (39%) had medullary bone and belonged to hens in lay (Table 2.194). This again indicates the presence of breeding birds and may also suggest that egg production for human consumption was a common practice, although the killing of hens whilst in lay may indicate that their meat was regarded as more important than eggs.

It was possible to measure a relatively high proportion of the domestic fowl bones because many of those recovered were complete. The standard deviations of some of the measurements showed a wide range of sizes (Table 2.195), although most of them fell within the ranges obtained from other contemporary assemblages. Sexual dimorphism is a major factor accounting for variations in size in domestic fowl, with bones of cocks and capons tending to be larger. However, other studies have indicated a large degree of overlap in size between sexes and there is also a great deal of variation within the sexes and several types of domestic fowl are likely to have been exploited.

Although the range in size of domestic fowl from the Winchester sites is generally similar to those from Dorchester Greyhound Yard, the mean sizes of the bones are consistently smaller. For example, the mean greatest length of the femur was 72.7mm compared with 77.1mm in the Dorchester sample (Maltby 1993). Three carpometacarpi from sieved samples had greatest lengths of 33.3mm, 40.0mm, and 40.4mm, which matched the range in size encountered in the small sample of measured bones from the unsieved assemblage (Table 2.195). A femur of a bird not in lay had a greatest length of 71.5mm, towards the lower end of the size range of that element. It is possible that fewer cocks and capons were represented in the Winchester sample. There may also have been a preference for the consumption of larger birds by the residents of the area of Dorchester excavated, who may have been of higher socio-econonic status to those who lived in suburban Winchester.

Ducks and geese

Duck species provided 12% of the identified bird bone assemblage excluding associated bones (Table 2.192). The most common species identified was domestic duck or mallard (*Anas platyrhynchos*). It is difficult to determine between the wild and domestic forms but most of the bones were no larger than specimens of wild mallard. Albarella (2005) has argued that there is no convincing evidence for duck breeding in Roman Britain. The bones found in Winchester are therefore likely to have been from wild or, at best, tamed ducks.

Plate 39 Sea eagle humerus from Victoria Road East pit F814

Other species of duck identified included teal (*Anas crecca*) and possibly wigeon (*Anas penelope*). The relative abundance of duck bones was significantly higher than at Owslebury (5% – Maltby 1987a) but lower than at Dorchester Greyhound Yard, where the percentage of duck bones increased from 11% in the earliest Roman deposits to over 35% in the latest phase (Maltby 1993).

Apart from the associated foot bones already described, domestic/greylag goose (*Anser anser*) was represented only by eight bones. It is again difficult to differentiate between wild and domestic forms of this species from their bones. Several Roman authors discussed the keeping of domestic geese in Italy and other parts of the Empire, but there is little documentary or zooarchaeological evidence to support the premise that domestic geese were reared in Roman Britain (Albarella 2005). This species has been recorded on a range of Romano-British sites (Parker 1988) but usually only in small numbers and it does not appear to have gained in importance until the Anglo-Saxon period in southern England (Maltby 1981; Albarella 2005). One bone of a smaller species of goose was also recovered.

Waders

Several species of waders were represented in small numbers. The most commonly identified was woodcock (*Scolopax rusticola*), which provided 4% of the avian assemblage (Table 2.192). This species seems to have been exploited on many settlements during the Romano-British period (Parker 1988) and appears to have been a relatively frequent supplement to the diet, albeit of little overall importance. Similar percentages of woodcock were recovered from Dorchester (Maltby 1993) and Exeter (Maltby 1979a). Butchery marks – a humerus from Henly's Garage bearing knife cuts – were observed on one bone.

Five other bones of waders were identified as heron (*Ardea cinerea*); possibly plover (*Pluvialis* sp) – the tarsometatarsus from VR F981 bore close similarities to a golden plover specimen in the modern reference collection consulted; and snipe (*Gallinago gallinago*). As in the case of ducks, geese, and woodcock, all these birds may have been brought to the town as catches from wildfowling expeditions but were only a rare addition to the diet.

Pigeons and doves

No columbine species were identified in the hand-collected material, though one bone was recovered from a sieved sample (see p 238). This contrasts with Dorchester where such species provided 5% of the avian assemblage in the earlier Roman phases, although their numbers decreased in the later Roman deposits (Maltby 1993). No bones of pigeons or doves were identified from Owslebury (Maltby 1987a). The higher incidence of pigeons in Dorchester may again reflect that residents in the centre of towns enjoyed a more varied diet.

Birds of prey

Bones of buzzard (*Buteo buteo*) were found only from Victoria Road East. Seventeen bones were from the partial skeleton discussed above and two isolated bones were identified from the same site. These birds may have been attracted to the areas as scavengers of rubbish deposited in the suburbs and they have been found on sites in other Roman towns (Parker 1988; Maltby 1993; Mulkeen and O'Connor 1997; see also Table 2.220).

A more unusual find was that of a humerus of a white-tailed eagle (*Haliaeetus albicilla*) in pit 814 at Victoria Road East (Group VRE22 – Plate 39). This species is now more commonly associated with coastal environments but its distribution may have changed and the species has been found on many sites inland. The possibility that the bird was attracted as a scavenger to the outskirts of Winchester is possible, although this does not explain why a single bone of this species was deposited in the pit itself.

Mulkeen and O'Connor (1997) have noted that sea eagles have broad ecological ranges in some parts of Europe and need not have been restricted to rocky coasts in Britain in the past. They scavenge on both fish and mammals and could be well adapted to urban habitats. Sea eagle bones have been found on several inland Romano-British sites including Droitwich and Leicester (Baxter 1993; Mulkeen and O'Connor 1997) and prehistoric sites such as Coneybury Henge, Wiltshire (Maltby 1990a), suggesting that their past distribution may have been more widespread than today.

The decapitated skull of an eagle found in a 3rd-century well at Leicester (Baxter 1993) provides an interesting parallel to the Winchester specimen. Articulated remains of piglets, kittens, young dogs, and partial skeletons of a crow and jackdaw were found in the same feature along with cattle and sheep/goat assemblages dominated by cranial elements. The presence of the white-tailed eagle with multiple burials of mammals and birds has clear similarities with the assemblage from pit 814. The possibility that this represents ritual deposition is discussed further below (p 247).

Corvids

Partial skeletons of two ravens (*Corvus corax*) have already been described. At least one of these (from pit 814 – Plate 38) could have been associated with ritual deposition. Five other bones of this species were also found. Ravens have been identified from a large number of Roman sites including towns (Parker 1988). Although it has been suggested that they were sometimes kept as pets (Maltby 1979a), a more likely explanation is that ravens were also scavengers of the town's rubbish and that the remains belong to birds of this resident population.

A similar explanation would account for the presence of rook or crow (*Corvus frugilegus*/ *Corvus corone corone*) and jackdaw (*Corvus monedula*). These species still occur commonly in modern towns.

Importance of birds

Although they are probably under-represented because of differential retrieval, birds would have formed only a small proportion of the meat diet. Domestic fowl was the only species of bird bred and exploited in any numbers and probably the only species that was a regular component in the diet of the inhabitants of the town. Evidence for wildfowling is limited and several of the wild species present in the samples probably were not exploited but were resident in the town and its outskirts.

Mammal, amphibian, and bird bones from sieved samples

Sampling methods

Whole earth samples were taken from as many contexts as possible (as set out in Part 1). In practice and from necessity, however, sampling strategies varied between sites. A systematic programme was carried out on the Victoria Road East site. A similar programme was carried out on Victoria Road West but on a more limited range of contexts. All of the sieving on the Hyde Abbey site was carried out during the excavations of 1974 and concentrated on deposits associated with buildings. Only a few contexts from wells and pits were sampled from the Jewry Street, Crown Hotel site (Group JCH5). No sieved sampling was carried out on the 27 Jewry Street excavations but a more extensive programme was undertaken on the Henly's Garage site.

On all sites, sampling tended to be more extensive – and more productive – on contexts from wells, pits, and buildings. A total of 218 samples produced bones – providing a sample of 6857 fragments of mammal, amphibian, and bird bones (Table 2.16). A total of 4372 bones (64%) were unidentified and 469 belonged to seven associated groups of bones of domestic species. Tables 2.196–2.202 summarise the numbers of bones identified to species or assigned to unidentified categories by site and, where appropriate, by assemblage group.

Thirty-nine contexts from six wells and pits at Victoria Road East produced 2307 fragments from at least thirteen species. Over 1000 were found in well F1093 (Group VRE20), including over 500 amphibian bones and over 200 bones from neonatal puppies. Amphibian bones were also abundant in well F1096 (Group VRE19) and pit F814 (Group VRE22). The latter also produced over 60 bones from a domestic fowl skeleton (Table 2.196).

Deposits from buildings and structures on the same site and in the same trenches were extensively sampled (Table 2.197). Forty-nine samples contained bones, producing an assemblage of 893 fragments. Nearly 700 of these were found in contexts associated with oven F846 (Group VRE3–4), producing bones from at least eleven species, although over 600 fragments were unidentified. Building 4 (Group VRE18) produced 164 fragments, most of the 36 identified bones belonging to amphibians.

Deposits from the north-east corner of the Victoria Road East site provided a sample of only 115 fragments from seven productive samples. Only eight bones were identified (Table 2.198). Samples from most other layers from this site also produced relatively few bones. The

Table 2.196 Species represented in sieved samples from Victoria Road East wells and pits

Groups	VRE19	VRE20	VRE24	VRE23	VRE22	VRE21	
Features	**F1096**	**F1093**	**F1098**	**F981**	**F814**	**F168**	**Total**
Cattle	1		1		3	3	8
Sheep/goat	4	10	2	3	7	2	28
Pig	2	3		2	2	1	10
Horse		1					1
Dog		220			1		221
Common shrew		1					1
Short-tailed vole	2	1					3
Mouse (Apodemus sp)		3					3
House mouse	1			1	2		4
Rodent species	3	30	2	1	2	1	39
Frog	91	101		11	201	2	406
Toad	8	20	1		10		39
Frog/toad	96	397	2	26	281	1	803
Domestic fowl		3	1		63		67
Duck species		1					1
Large mammal	6	17	8	1	13	1	46
Sheep-sized mammal	31	162	26	66	23	6	314
Unidentified mammal	66	90	41	84	19	5	305
Unidentified bird	3	2	1		1	1	8
Total	314	1062	85	195	628	23	2307

Note:Sheep/goat from F814 includes five associated bones
Dog from F1093 is all associated bones from neonatal puppies
Dog from F814 is from a group of associated bones recovered by hand collection
Domestic fowl from F814 includes 62 associated bones

exception was the assemblage from deposits above the oven F846 (Group VRE5), which produced a sample of 1731 fragments from at least ten species, although nearly 1600 fragments were unidentified. No more than 50 fragments were found in any of the other sub-samples. Altogether, over 1900 fragments were recorded from 42 contexts (Table 2.199).

Sieved samples from Victoria Road West produced over 300 fragments from the 29 samples that produced bones. The largest sample was obtained from shafts and pits, although extensive sampling only produced 155 bones from eighteen contexts. Most of the 41 identified fragments were amphibian bones (Table 2.200). Very large numbers of these were recorded in the unsieved samples (Table 2.189).

Nineteen of the 23 samples which produced bones from the Hyde Abbey site were from contexts associated with buildings. Altogether, 279 fragments were recorded, of which 48 were identified to at least six species. These included 27 bones from a sheep skeleton from Group HA74.4 (Phases 60–1 – Table 2.201).

Only two samples from Pit F72 (Group JCH5) were taken from the Jewry Street, Crown Hotel site. These produced 165 bones, most of which belonged to amphibians. The remainder consisted of associated bones of sheep (Table 2.202).

Bones were retrieved from 25 sieved samples from Henly's Garage. These produced a total of 816 fragments including 269 bones identified to at least ten species (Table 2.202). The largest sample of over 300 fragments was obtained from Group HG3. This included 135 bones from a sheep skeleton from posthole F152 (Phase 10). Amphibian and rodent bones were also present in some numbers in some of these deposits. Rodent bones were the most commonly identified in sieved samples from Group HG2, from

Table 2.197 Species represented in sieved samples from Victoria Road East buildings, oven F846, and associated deposits

Groups	**VRE15–16**	**VRE3–4**	**VRE17**	**VRE18**	
Buildings	**Roadside Structure 2**	**Oven F846**	**3**	**4**	**Total**
Cattle		13		1	14
Sheep/goat	2	23	1	4	30
Pig		6		1	7
					0
Red deer		1			1
Mouse (*Apodemus* sp)		2			2
House mouse		1			1
Rodent species		5	3	1	9
					0
Frog		6	1	11	18
Frog/toad		13	1	18	32
					0
Domestic fowl		3			3
Domestic duck/mallard		1			1
Pigeon/dove		1			1
					0
Large mammal	2	62		2	66
Sheep-sized mammal	4	279	8	61	352
Unidentified mammal	2	263	13	64	342
Unidentified bird		13		1	14
Total	10	692	27	164	893

Table 2.198 Species represented in sieved samples from the north-east corner of the Victoria Road East site

Groups	**VRE8**	**VRE10**	**VRE11**	**VRE13**	
Phases	**379–81**	**385–6**	**387–9**	**394–9**	**Total**
Sheep/goat	1		1	1	3
Pig	1				1
Mouse (*Apodemus* sp)		1			1
Rodent species		1			1
Frog		1			1
Frog/toad	1				1
Large mammal	2	1	4	5	12
Sheep-sized mammal	9	4	10	3	26
Unidentified mammal	17	4	32	14	67
Unidentified bird			2		2
Total	31	12	49	23	115

Table 2.199 Species represented in sieved samples from Victoria Road East silts and other deposits

Groups	VRE1	VRE2	VRE5	VRE26	VRE27	VRE28	VRE30	Total
Phases	**155–67**	**195, 260–2, 266–9**	**303–08**	**276**	**369–73**	**349–57, 361–2**	**461–4, 472–5**	
Cattle	3		20					23
Sheep/goat		2	61					63
Pig			8		1		1	10
Horse			7					7
Dog			2					2
Hare			1					1
Short-tailed vole			1					1
Rodent species		1	2		1			4
Frog	1		12		1		10	24
Frog/toad	1		22		3	1	1	28
Domestic fowl			4					4
Thrush species			1					1
Large mammal	3	4	138	2		6	1	154
Sheep-sized mammal	1	9	512		1	19	13	555
Unid mammal	12	27	934	1	6	24	20	1024
Unidentified bird			6		1			7
Total	21	43	1731	3	14	50	46	1908

Note: Horse from Phases 303–08 represents a group of associated bones

Table 2.200 Species represented in sieved samples from Victoria Road West

	Shafts & pits	Ditch	Buildings	Other	Total
Cattle	1				1
Sheep/goat	5		5	1	11
Pig	1				1
Cat	1				1
Rodent species	1			1	2
Frog	17			11	28
Frog/toad	15			15	30
Large mammal	4		2		6
Sheep-sized mammal	38	6	31	12	87
Unidentified mammal	70	20	45	35	170
Unidentified bird	2		1	3	6
Total	155	26	84	78	343

Table 2.201 Species represented in sieved samples from Hyde Abbey

	Buildings	Other	Total
Cattle	4		4
Sheep/goat	34	2	36
Pig	4		4
Rodent species	2		2
Frog/toad		1	1
Domestic fowl	1		1
Large mammal	7	3	10
Sheep-sized mammal	114	15	129
Unidentified mammal	68	21	89
Unidentified bird	1	2	3
Total	235	44	279

Note: Sheep/goat from buildings includes 27 associated bones

Table 2.202 Species represented in sieved samples from the city defences

Group	JCH5	HG1	HG2	HG3	HG7	HG6	HG
Phase	315	1–3	4–7	9–11	16	24	Total
Cattle			1	1		1	3
Sheep/goat	25			135	2	1	138
Pig			2	2	4	2	10
Dog						1	1
Common shrew				1			1
Pygmy shrew			1				1
Short-tailed vole			1				1
Bank vole			1				1
Rodent species			31	11		3	45
Frog	73			22			22
Toad	3						
Frog/toad	64	1	2	43			46
Large mammal			4	3		14	21
Sheep-sized mammal		2	58	22		13	95
Unidentified mammal		3	125	105	125	63	421
Unidentified bird			3		7		10
Total	165	6	229	345	138	98	816

Note: Sheep/goat from JCH5 comprises 25 associated bones
Sheep/goat from HG3 includes 122 associated bones

which over 200 fragments were recorded. Samples from other phases were less productive.

Associated bones

Groups of associated bones were found in six sieved samples. Two groups were found in pit F814 at Victoria Road East (Group VRE22); others were found in well F1093 (Group VRE20) and deposit *3343* (Group VRE5); Hyde Abbey post-hole F202 (Group HA74.4); Jewry Street, Crown Hotel pit F72 (Group JCH5); and Henly's Garage post-hole F152 (Group HG3). Four of the groups belonged to sheep and one each to horse, dog, and domestic fowl. The bones represented in each group are listed in Table 2.203.

The complete skull, mandibles, and hyoids of a hornless sheep were recovered in a sample from Victoria Road context *3262* in pit F814 (Group VRE22). All the cheek teeth were fully erupted and the wear patterns of the molars gave a numerical value of 33 using Grant's (1982) method of recording (Stage 5). The bones belonged to a sheep that was probably killed between the ages of three and four years. Several pairs of sheep metapodials were recovered from the same context. The presence of these in the same layer as the head bones perhaps indicates the presence of bones associated with sheepskins.

The 27 sheep bones in sieved samples from Hyde Abbey post-hole F202 all belonged to the skeleton of the horned immature sheep, the majority of which was recovered by normal retrieval methods and is described in detail above (pp 154–156; Table 2.144). The sieved samples retrieved many of the smaller bones of the limb extremities, sternebrae, and vertebrae – including four of the tail (caudal) vertebrae (Table 2.203). Although almost a complete carcass was deposited, abundant evidence for butchery was recorded on bones of this sheep, including the seven thoracic vertebrae recovered from the sieve. Discussion of the butchery of this animal can be found above (pp 154–156). The astragalus found in the sieved sample was completely charred.

The third group of associated sheep bones recovered from sieved samples was retrieved from Jewry Street, Crown Hotel pit F72. Normal excavation produced 125 bones from two partially processed immature sheep, which are again described in more detail above (pp 156–158). Sieving produced 25 further bones of these animals (Table 2.203). Nine of these belonged to the younger lamb and included fragments of a scapula and a metatarsal, a calcaneus, two second phalanges, part of the atlas, and three thoracic vertebrae. Other parts of the scapula, metatarsal, and atlas were found in the unsieved material. The metatarsal had an unfused distal end and was burnt. The proximal ends of the phalanges and calcaneus were unfused.

The other sixteen bones in the sieved samples all probably belonged to the older sheep and consisted of small bones of the limb extremities and some of the smaller vertebrae. They included a centroquartal which bore knife cuts on its anterior surface where the feet had been removed at the ankle joint. The sieved material added further evidence that two largely complete carcasses were present. These had been butchered and some of the bones had been burnt. The impression that these represented the remains of sheep carcasses that had been butchered and their meat cooked prior to deposition is strengthened by the analysis of the sieved remains.

The final associated group consisted of 122 sheep bones found in a sieved sample from Henly's Garage post-hole F152. These belonged to a virtually complete skeleton lacking only a few of the small bones of the limb extremities, vertebrae, and ribs (Table 2.203). It was deposited in a similar position in relation to the late 2nd-century rampart as the group at JCH (Fig 50).

Despite its completeness, there was abundant evidence for butchery of the carcass. No less than 33 of the bones bore butchery marks. Fourteen vertebrae had been chopped through axially towards the lateral side of the vertebral body where the trunk had been split into two halves. A corresponding chop mark was found on a rib head. Six other ribs bore knife cuts on various parts of the shaft made during filleting. A cervical and a thoracic vertebra had been chopped through transversely where the spine had been segmented. The atlas bore a knife cut on the lateral part of the dorsal aspect adjacent to the cranial articular surface where the skull had been separated. Both os coxae bore butchery marks. The left one had been chopped through the acetabulum where it had been separated from the hindlimb and it also bore a knife cut on the shaft of the ilium, which was probably made during filleting. The right os coxae had been chopped through the shaft of the ilium during segmentation from the hindlimb. The left femur bore a superficial chop mark on the proximal articular surface corresponding with the chop through the acetabulum. The shafts of both femora had been broken, the right femur being broken into four pieces. A superficial chop mark on the anterior surface of the distal end of the right tibia indicated where the feet were removed from that limb. Knife cuts were found on all four aspects of the left calcaneal tuber where the feet and the skin had been separated from the upper hindlimb. Corresponding marks were found on the anterior aspect of the astragalus. Finally, one of the carpals bore a knife cut on its anterior surface where the feet had been separated from the upper forelimb. Evidence of burning was found on a carpal and the sternum.

The sheep was immature. Examination of the cheek teeth showed that only the first molar was in wear. Of the limb bone epiphyses, only those of the proximal radii had fully fused; epiphyses of the distal humerus and scapula and the bones of the os coxae were just fusing. All other epiphyses were unfused. The evidence would indicate that the skeleton belonged to a lamb of about six months old. Sexing of such an immature skeleton is difficult, although the acetabulum and pubis had a morphology more characteristic of a female than a male. The skull was hornless.

The skeleton therefore bears many similarities

Table 2.203 Anatomical elements in groups of associated bones from sieved samples

Groups	**VRE22**	**HA74.4**	**JCH5**	**HG3**	**VRE5**	**VRE20**	**VRE22**
Features/phases	**F814**	**Phase 60–1**	**F72**	**Phases 9–11**	**Phases 303–08**	**F1093**	**F814**
	Sheep	**Sheep**	**Sheep**	**Sheep**	**Horse**	**Dog**	**Domestic Fowl**
Skull	1			1		39	1
Mandible	2			2		1	2
Hyoid	2			1			
Scapula			1	2		4	2
Coracoid							2
Furcula							1
Humerus				2		5	2
Radius				2		2	2
Ulna				2		3	2
Os coxae				2		12	
Femur				2		5	2
Patella				2			
Tibia				2		4	
Tibiotarsus							2
Fibula						3	
Carpals		7	5	12			
Calcaneus			1	1			
Astragalus		1		1			
Centroquartal		1	2	2			
Other tarsals			2	5			
Metacarpal				2			
Carpometacarpus							1
Metatarsal			1	2			
Tarsometatarsus							2
Metapodials						28	
1st Phalanx				8			
2nd Phalanx		2	3	7			
3rd Phalanx		3		6			
Wing phalanx							2
Foot phalanx							9
Sesamoids			1	7			
Ribs			1	22	1	51	14
Strenum		1		1			1
Cervical vertebrae			1	6			
Thoracic vertebrae		7	6	11	4		
Lumbar vertebrae		1		7	1		
Sacrum				1	1		
Caudal vertebrae		4	1	1			
Pygostyle							1
Unid vertebrae						63	14
Total	5	27	25	122	7	220	62

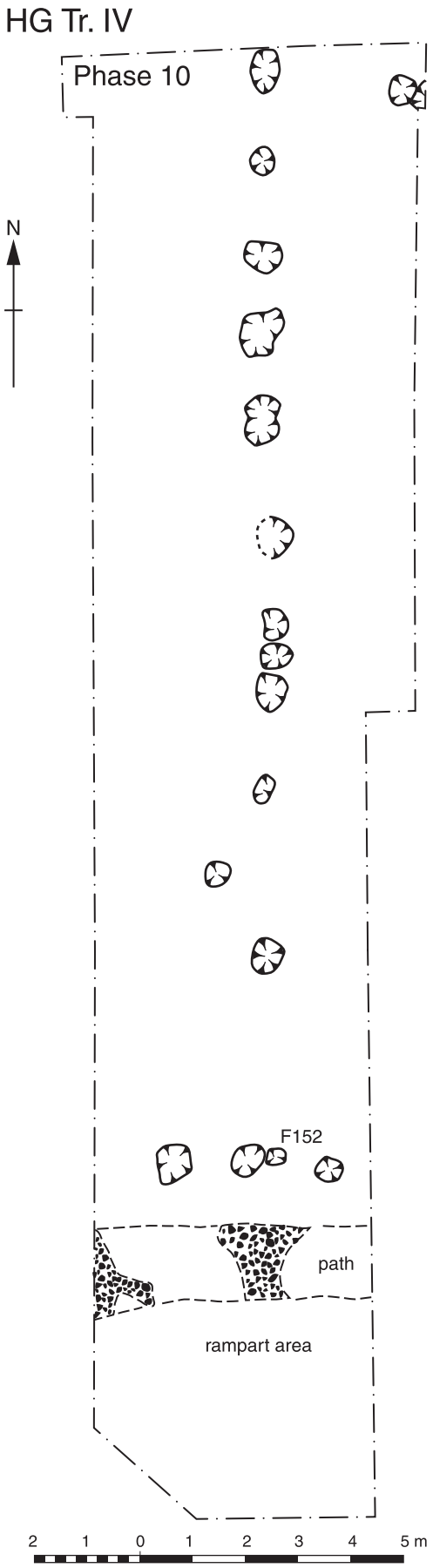


Figure 50 Plan of HG in Phase 10, showing property boundaries in relation to the 2nd-century rampart and the position of F152

with other large groups of associated sheep bones described above (pp 152–158). A complete carcass had been butchered and probably cooked leaving traces of burning on some bones. The bones had then been collected together and buried. Such careful deposition implies that the consumption and disposal of the sheep may have been associated with some special event.

Six associated horse vertebrae and a rib were found in a sieved sample from Victoria Road East *3343* (Group VRE5). All epiphyses were fused and the bones belonged to an adult animal. Other vertebrae of this animal were recovered from the unsieved sample (p 204 and Table 2.178). No evidence of butchery was observed on any of the bones.

A total of 220 bones of neonatal puppies was found in sieved samples from Victoria Road East well F1093 (Group VRE20). They were found in *4351* adjacent to layer *4373*, from which 29 bones from at least three neonatal puppies were recovered during normal excavation. Bones from the sieved sample included large numbers of skull bones, metapodials, ribs, and vertebral fragments (Table 2.203). A minimum of four puppies were represented by the femora. The puppies deposited in this well could all have belonged to the same litter. Their discovery increases the proportion of neonatal dogs as represented in Table 2.186, from which these bones are excluded. Further discussion of neonatal puppies can be found above (p 215).

Sixty-three bones of a domestic fowl skeleton were found in a sieved sample from Victoria Road East *3262* in pit F814. It was therefore found in the same layer as several dog skeletons, two partial cat skeletons, and a partial raven skeleton, as well as possible skinning waste of cattle and sheep (pp 62–67). All parts of the body of the domestic fowl were represented by the bones retrieved from the sample (Table 2.203). The skeleton belonged to quite a young bird. The ends of the limb bones were only just attaining their adult morphology and several bones were still slightly porous. No measurements were taken because of the immaturity of the skeleton. None of the bones bore evidence of butchery marks. The complete carcass appears to have been deposited in the pit along with other animals.

Other domestic mammal bones

Bones retrieved from the sieve and identified to one or more of the major domestic mammal species were recovered from 28 of the 36 sub-samples listed in Tables 2.196–2.202. Excluding associated bones, 254 fragments of cattle, sheep/goat, pig, horse, and dog were identified in sieved samples (Table 2.204). Sheep/goat bones were the most commonly identified. They were found in 24 of the sub-samples and were the best represented of the major domestic mammals in 20 of these. They provided 60% of the identified domestic mammal fragments (Table 2.204). This percentage is higher than in all but two of the sub-samples of unsieved bones (Table 2.94) and substantially higher than the average percentage (35%) of sheep/goat fragments in such samples (Table 2.95).

Table 2.204 Anatomical elements of major species in sieved samples excluding associated bones

	Cattle	Sheep/goat	Pig	Horse	Dog	Domestic fowl
Skull	5	12	3			
Mandible	6	17	2			
Loose teeth	9	45	11	1	2	
Scapula	3	2	1			1
Humerus	2	6	2			1
Radius	3	5				3
Ulna		5				1
Os coxae	3	6	1			1
Femur	1	2	2		1	1
Tibia	3	5	1			
Tibiotarsus						1
Fibula			5			1
Carpals		2	1			
Calcaneus	1	2				
Astragalus	2					
Centroquartal	1	3				
Other tarsals		1				
Metacarpal	1	5				
Carpometacarpus						3
Metatarsal	1	3				
Lateral metapodial			4			
Metapodial		1	2			
1st Phalanx	4	7				
2nd Phalanx	2	1	2		1	
3rd Phalanx	1	8	1			
Sesamoids	2	4	2			
Ribs		3				
Sternebrae		1				
Cervical vertebrae	1	4	1			
Thoracic vertebrae		2				
Lumbar vertebrae	2					
Sacrum			1			
Caudal vertebrae		1				
Inidentified vertebrae			1			
Sternum						
Total	53	153	43	1	4	13
% major mammals	21	60	17	0.4	2	

It supports the view, discussed above (pp 89–91), that normal excavation methods tended to be biased against the retrieval of sheep/goat bones in comparison with cattle. One caveat, however, is that most of the sieved samples were derived from features such as wells, pits, and buildings, that tended to produce higher percentages of sheep/goat than soil deposits and other layers. Further sampling of such layers might not have produced such high percentages of sheep/goat fragments.

The relative abundance of different types of sheep/goat bones identified in sieved samples was also markedly different from the unsieved assemblages (Table 2.204). Loose teeth formed 29% of the overall assemblage compared with an average of 17% in the unsieved assemblages. This suggests that sieving

resulted in the recovery of more teeth, particularly the smaller incisors and premolars. The other major contrast with unsieved material was the greater proportion of carpals, tarsals, and phalanges identified in the sieved samples. They formed 20% of the sieved assemblage compared with a maximum of 5% in any of the unsieved assemblage groups. Fragments of limb bones formed a correspondingly lower percentage of the sheep/goat sieved assemblages. Fragments of mandible and skull, however, continued to be quite well represented.

Five of the sheep/goat bones from sieved samples were recorded as butchered. A sternebra, a cervical, and a thoracic vertebra had been split axially when the trunk was divided into two halves. A rib head bore a knife cut on its lateral surface made during disarticulation. Knife cuts were observed on the anterior surface of a centroquartal where the feet had been separated from the upper hindlimb. All these types of butchery mark were also observed amongst the unsieved material.

The sieved assemblage provided little ageing data for sheep/goat. Two mandibles were at Stage 5 of the toothwear sequence, having numerical values of 32 and 33. This was the most common stage of eruption encountered in the unsieved sheep/goat assemblage (Table 2.152). Too few fusion points were recovered to merit analysis of epiphysial fusion data in the sieved samples.

The sieved samples included nine sheep bones that were measured. These are discussed further above (pp 180–181).

Cattle bones were comparatively poorly represented in sieved samples. They were identified in only thirteen of the sub-samples and were the best represented domestic mammal species in only two cases. They formed only 21% of the identified fragments of the major mammals (Table 2.204), a figure lower than in all but one of the unsieved samples (Table 2.94) and much lower than the overall cattle fragment percentage (46%) from the unsieved samples (Table 2.95).

The sieved sample of 53 cattle fragments was too small to carry out detailed comparisons of anatomical representation with the unsieved material (Table 2.204), although it should be noted that loose teeth and phalanges were better represented in the sieved samples.

Butchery marks were observed on eight cattle bones in the sieved samples. A superficial chop mark was noted on the lateral part of an occipital near the condyle. A distal humerus had been split repeatedly axially (Butchery Type H4) and had been chopped across the joint surface during segmentation (H2). Its shaft also bore blade marks associated with filleting (H11). Joint surfaces of a scapula and an acetabulum had been chopped through during dismemberment (Types S1 and P5 respectively). A distal tibia had been split open for marrow extraction (T6) and two astragali had been chopped through the proximal end during segmentation (A1). One of these specimens had also been chopped through near the centre of the bone (A3). Finally, a lumbar vertebra had been chopped axially through the lateral part of the vertebral body during the splitting of the trunk (V2). All these types of butchery marks were commonly encountered in the unsieved sample (Tables 2.115–2.128).

A single cattle horn core from the sieved samples was measured, and has been previously discussed (pp 152).

Pig bones were identified in seventeen of the sub-samples and were the best represented of the major domestic species in five of them (Tables 2.196–2.202). However, they provided only 17% of the fragments identified to these species (Table 2.204). They contributed 22% of the total sheep/goat and pig fragments, slightly lower than the equivalent figure (28%) obtained from the unsieved samples. The sample was too small for detailed analysis of anatomical elements represented (Table 2.204).

Two butchered pig bones were recorded: a humerus had been chopped through its proximal joint surface when separated from the scapula and an ilium had been chopped through the sacro-iliac joint when separated from the vertebral column. The former had one parallel in the unsieved sample; the latter was the only observation of this practice.

Two pig mandibles provided tooth eruption data: one had the first two molars in wear and the fourth premolar just coming into wear (Stage 5); the second belonged to a younger animal which still possessed its deciduous premolars (Stages 3–4 – Table 2.175). The limited epiphysial fusion data also confirmed that the majority of the pigs represented were immature but no bones of neonatal mortalities were recovered from the sieves.

A measured pig tibia from a large animal has been discussed above (p 202).

Apart from the associated bones, horse was represented in the sieved samples only by a very heavily worn deciduous premolar in well F1093. This is likely to have been a shed tooth rather than from an immature mortality. Horse provided less than 1% of fragments of major mammals in the sieved samples, confirming its poor representation in the unsieved assemblage.

Only four dog bones were recovered in the sieved samples apart from those from the neonatal mortalities discussed above (Table 2.204). These included a femur from pit F814, which belonged to one of the adult dog skeletons recorded in context *3262*.

Unidentified fragments from sieved samples were assigned where possible into large mammal and sheep-sized mammal categories, although many of the smallest unidentified fragments could not be assigned to either category (Tables 2.196–2.202). Altogether, 1887 fragments from large and sheep-sized mammal categories were recorded from the sieved samples, of which only 17% were assigned to the large mammal category. This was a much lower percentage than any of the unsieved sub-samples (Table 2.94), in which large mammal fragments tended to outnumber those of sheep-sized mammal. The vast majority of large mammal fragments are likely to have belonged to cattle and their low representation in the sieved samples confirms that bones of sheep/goat and pig

had a better chance of recovery in the sieved samples, although often in too fragmentary a state for identification to species.

Another significant difference between the sieved and unsieved assemblages was the relative percentage of burnt bone fragments recovered. Burnt bones rarely formed more than 2% of the unsieved sub-samples (Table 2.91). However, 697 burnt fragments were recorded in the sieved samples, representing 15% of the total sample excluding bones of other mammals, associated bones, and loose teeth. Burning often causes severe fragmentation of bones and it is therefore to be expected that more burnt fragments may have been overlooked during normal excavation. Bones of sheep-sized mammals also appear to have been more commonly burnt and these are much better represented in the sieved samples. Their bones appear to have been more likely to have been burnt either during cooking – perhaps indicating that roasting of sheep and pig carcasses was a common practice, or after disposal in domestic hearths or bonfires.

Other mammals

An antler tine of red deer found in a deposit associated with oven F846 at Victoria Road East (Group VRE3–4) was the only identification of any species of deer in the sieved samples. Similarly, only one tooth of hare was recorded. Cat was represented by a canine tooth from Victoria Road West F43 (Group VRW14) which probably belonged to the mandible of an adult cat skeleton found during normal excavation of the same feature (p 217 – Table 2.199).

Bones of small mammals were found more frequently. Altogether 122 bones were recorded from at least six species. Sieving therefore increased the number and diversity of small mammals represented. Only eighteen bones were recovered by hand and only short-tailed vole specifically identified. Not surprisingly, the sites upon which the most rigorous sampling programmes were carried out (Victoria Road East and Henly's Garage) produced the greatest number of these bones.

Identifications to species of small mammals was restricted to skulls and mandibles. Common shrew (*Sorex araneus*) was found in two samples and pygmy shrew (*Sorex minutus*) in one from Henly's Garage. Both species are tolerant of a wide range of conditions provided there is some ground cover. Their low numbers may indicate the lack of cover in built-up areas.

Short-tailed vole (*Microtus agrestis*) was found in five contexts and bank vole (*Clethrionomys glareolus*) in one. At least two species of mouse were present. Two bones of house mouse (*Mus musculus*) and six of wood mouse (*Apodemus* sp) were identified. The presence of voles and wood mice suggests there may have been some scrub or other cover in the vicinity of the northern suburb sites. However, they could have been caught by cats and carried a few hundred metres from the kill site. Their low numbers, however, suggest that the area was not an ideal habitat for these species. House mice would have been attracted to rubbish deposits, although again their low numbers suggest that they had not colonised the area in large numbers.

Limb bones of rodents were not identified to species. Most were of a size comparable to skeletons of mice and smaller voles. However, several from well F1093 were from a larger species the size of either water vole (*Arvicola terrestris*) or black rat (*Rattus rattus*). Black rat appears to have been introduced to Britain in the Roman period and has been identified in other Roman towns such as York (Rackham 1979; O'Connor 1988), London (Armitage *et al* 1984), and Dorchester (Maltby 1993). Its presence in contemporary deposits in Winchester could be expected. The species would have been attracted to areas where a lot of carcass waste was deposited. However, it should be emphasised that there is as yet no positive identification of this species from Winchester.

Amphibians

Amphibian bones were present in 23 of the sieved sub-samples. Altogether, 1619 bones were recorded. They were particularly common in some of the samples from lower fills of wells and pits, particularly Victoria Road East wells F1096 and F1093, pit F814, and pit F72 at Jewry Street, Crown Hotel. Amphibian bones were, however, also present in smaller numbers in samples from other types of context (Tables 2.196–2.202). Several other shafts and pits produced large numbers of amphibian bones during normal excavation (pp 220–221) and it appears that many of these features were left open for a period, which allowed amphibians either to colonise those which had accumulated water or trapped them as they moved across the site.

Of the 614 amphibian bones assigned to species, 93% belonged to frog (*Rana* sp) and only 7% to toad (*Bufo* sp). It is assumed that most or all of the frog bones belonged to common frog (*Rana temporaria*) and most or all of the toad bones to common toad (*Bufo bufo*), although their bones were not compared against skeletons of other species. Bones of toad were only found in sieved samples from four of the pits and wells from Victoria Road East and Jewry Street, Crown Hotel, pit F72. Lack of suitable cover may have restricted their numbers.

Frog bones, on the other hand, were found more widely and in much greater numbers in the deposits and frogs must have been present in some numbers in the vicinity of the sites involved. They may have taken advantage of standing water in wells and pits when they were available, but they must also have been colonising similar suitable habitats in the northern suburb area during the later Roman period.

Birds

Excluding the birds of the domestic fowl skeleton discussed above, only 50 bird bones were recovered

from sieved samples, of which only seventeen could be identified (Tables 2.196–2.202). Thirteen of the bones belonged to domestic fowl, confirming that this was the only species of bird exploited in any numbers in the town. Bones identified are listed in Table 2.204. The sample was too small for detailed analysis, although it should be noted that smaller bones such as the scapula, radius, fibula, and carpometacarpus were better represented than in the unsieved samples (Table 2.193). Measurable bones are described above (p 225). No butchery marks were observed on any of the bones.

A single bone each from four other species of bird was identified. A domestic duck or mallard (*Anas platyrhynchos*) os coxae was found in a sample from Victoria Road East oven F846 (Table 2.197). The tarsometatarsus of a smaller duck, the size of a wigeon (*Anas cf penelope*) was found in a sample from VRE well F1093 (Table 2.196). Both species of duck were found in small numbers in the unsieved assemblages. A tarsometatarsus of a pigeon or dove (*Columba* sp) was also found in oven F846 and is the only record of this species from the excavations. As discussed above (p 226), bones of pigeons were found quite commonly in some deposits from Dorchester Greyhound Yard (Maltby 1993). A tarsometatarsus of a member of the thrush genus (*Turdus* sp) was found in a Victoria Road East deposit *3233* (Phase 303, Group VRE5). Again, this is the only passerine specimen identified from the excavations.

Summary

Sieving also produced evidence for the exploitation of fish as discussed below. The sieving programme confirmed that normal retrieval methods tended to be biased towards large mammal bones. Sieved samples produced significantly larger numbers of the smaller bones of sheep-sized mammals. The exercise enabled the number of species of small mammals and birds to be expanded, although the indications were that none of these species were present in large numbers. The sieving programme also provided further evidence that most of the pits and wells had at some stage lain open long enough for large numbers of amphibians to accumulate in them.

Fish remains from the later Roman phases (Periods 6–7) at Victoria Road East *by A Bullock*

Introduction

The analysis of fish remains from archaeological deposits was largely neglected until the development of excavation techniques in the 1970s in which new methods for collecting organic material came into use. The adoption of sieving on a large scale in the excavations in the Winchester suburbs and elsewhere resulted in some cases with massive increases in the amount of fish remains recovered.

This report concerns the analysis of fish remains collected from sieved samples of later Roman deposits, from Victoria Road East. The aim of the analysis of material presented here is to provide information on fish consumption in Winchester. The deposits sampled consist of material dumped in buildings after they fell out of use, as well as material buried in some other features. The remains may be associated with food which was consumed close to the site or further afield in the town.

Methods

A comprehensive sampling policy was employed on Victoria Road East, and 5l samples were taken of most contexts. The samples were sieved using a 1mm mesh to recover fragments of micro-fauna and plant macro-fossils. The fish remains were removed from the sample residues during the identification of the bird and mammal remains. A record on paper was made of the species, anatomy, size, and condition of the remains. The data was entered into an IBM-compatible computer using the faunal analysis database management system, ANIMALS (Campana and Crabtree 1987) which has been modified by the author to store information concerning fish remains.

The identification of the remains was made by comparison to modern material housed at the Faunal Remains Unit in Southampton and the Environmental Archaeology Unit in York. The nomenclature and terminology used closely follow those of Wheeler (1969) and Wheeler and Jones (1989), respectively.

The significance of the remains is described in terms of their proportion of the total assemblage and of the frequency with which they were represented (O'Connor 1985). Developments on these ideas are presented in the form of tabulated results. The relative frequency of occurrence has been calculated for each species with respect to the number of anatomical divisions in which the species was represented, and to the number of phases from which the species was recovered.

Information from a variety of historical sources concerning the history of fishes and fishing has been used to interpret the assemblage. The remains have been compared with fish from Roman deposits at Dorchester (Hamilton-Dyer 1993b), Exeter (Wilkinson 1979), and Silchester (Hamilton-Dyer 2000). In addition, comparisons have been made with the results of analyses conducted on the fish remains from the Roman deposits at sites in York (Jones 1988b; O'Connor 1988).

Results

The assemblage of fish remains totalled 160 fragments collected from sixteen phases of later Roman date

Table 2.205 Summary by phase of the fish remains from Victoria Road East

Group	Period	Phase		I	Dog	Clu	Samd	Salmo	Eel	Gad	Mack	L	Flat	Total
VRE5	6	303	Contemporary with oven F846	10			1			1	1		4	17
VRE5	6	304	as 303	1										1
VRE5	6	305	as 303			1							3	4
VRE4	6	310	Oven F846 – 2nd phase	9		19			52				31	111
VRE15	7	337	Roadside structure – 4th phase	1										1
VRE19	7	348	Well F1096										1	1
VRE29	7	358	Deposits in Trench X		1	1								2
VRE11	7	387	Silt deposit in NE part of site	1					1					2
VRE18	7	440	Building 4			1								1
VRE20	7	442	Well F1093	3								1	1	5
VRE18	7	446	Building 4	1										1
VRE23	7	450	Pit F981	6					1					7
VRE25	7	465	Ditch F122			3			1					4
	7	476	Debris from mausoleum F272					1						1
	7	478	Graves						1					1
VRE21	7	479	Pit F168				1							1
				32	1	25	2	1	56	1	1	1	40	160

Key:

I	Indeterminate species	L	*Liza aurata*
Dog	*Scyliorhinus* sp	Flat	Pleuronectidae
Clu	*Clupea harengus*		
Samd	Salmonidae		
Salmo	*Salmo* salar		
Eel	*Anguilla anguilla*		
Gad	Gadidae		
Mack	*Scomber scombrus*		

Note: Other faunal remains from Phases 476 and 478 are included in Section 2.1

Table 2.206 Percentage composition of fish remains from the later Roman phases at Victoria Road East

	N	%	P	Fp
Anguilla anguilla	58	45	7	37
Pleuronectidae	40	31	5	28
Clupea harengus	25	19	5	28
Other	7	5		
	130		18*	

Key:
N = Number of fragments
P = Number of phases in which species is represented
Fp = Relative frequency of species occuring in later Roman phases

Note:* total number of phases containing fish remains
This tabulation excludes the 35 unidentified fragments
Other species: Scyliorhinus sp, Salmonidae, Salmo salar

Table 2.207 Condition of fish remains from the later Roman phases at Victoria Road East

	Unaffected	Charred	Butchered	Burnt black	Burnt white	Chewed	Crushed	Total
Indeterminate species	32	3						35
Scyliorhinus sp	1							1
Clupea harengus	22			1		2		25
Salmonidae	3							3
Anguilla anguilla	56				1	1		58
Gadidae	1							1
Scomber scombrus	1							1
Liza aurata	1							1
Pleuronectidae	29	5		2	1	1	2	40
	146	8	0	3	2	4	2	165

Note: None of the bones was both burnt and damaged

(Periods 6–7 – late 2nd century to late 4th century). The majority, 133 (83%), were recovered from Period 6: deposits contemporary with the oven, F846 (Phases 303–05) and from the fill of the oven in its second phase of use (Phase 310, Plate 7). The remaining 27 fragments (27%) were collected from Period 7 deposits. Table 2.205 presents the number of fragments for each of the eight taxa represented in these phases.

Table 2.205 shows that 32 fragments (20%) are bones of indeterminate species. Of the 128 fragments for which a family, genus, and/or species was determined, 58 (45%) were identified as eel, *Anguilla anguilla*, 40 (31%) as right-sided flatfish, Pleuronectidae, 25 (10%) as herring, *Clupea harengus*. The remaining seven fragments (5%) comprised bones from a species of dogfish, salmon, a small type of cod, mackerel, and mullet. This information is summarised in Table 2.206 which also shows the relative frequency with which the major species were represented. The dogfish was from a context that had some evidence of medieval contamination, and may not be Roman.

The condition of the bones recovered is presented in Table 2.207: nineteen fragments (12%) of the assemblage was either burnt or damaged. The majority of the bones showed no signs of these conditions and no evidence of butchery was recorded.

Size

The approximate size of the fish was estimated by comparison with modern specimens. The majority of the size estimates were made from elements of the vertebral column. They were assigned to size classes using criteria of Wheeler (1969) (Table 2.208). Size estimates were obtained from 130 fragments (79%) of the assemblage. The number of fragments in each size category is listed for each species in Table 2.209. The two tables in conjunction provide information concerning the size of the fishes represented in the assemblage. Table 2.209 shows that 83% of the bones belonged to medium-sized fishes and 7% to fishes of small size. There were no bones from large fishes.

Table 2.208 Size categories for the fish species present in the later Roman phases at Victoria Road East

	Size category (cm)			
	Small	**Medium**	**Large**	**Very large**
Scyliorhinus sp	<20	20-40	40-76	>76
Clupea harengus	<16	16-23	23-31	>31
Salmonidae	<20	20-35	35-50	>50
Salmo salar	<15	15-25	25-50	>50
Anguilla anguilla	<30	30-46	46-94	>94
Gadidae	<35	35-50	50-65	>65
Scomber scombrus	<13	13-30	30-46	>46
Liza aurata	<11	11-20	20-42	>42
Pleuronectidae	<15	15-27	27-40	>40

Note: This information is after Wheeler (1969)

Table 2.209 Estimated size of fishes represented in the later Roman phases at Victoria Road East

	Size estimate/number of fragments			
	Not Recorded	**Small**	**Medium**	**Total**
Indeterminate species	18	1	16	35
Scyliorhinus sp			1	1
Clupea harengus			25	25
Salmonidae			2	2
Salmo salar		1		1
Anguilla anguilla		2	56	58
Gadidae		1		1
Scomber scombrus			1	1
Liza aurata			1	1
Pleuronectidae		7	33	40
Total	18	12	135	165

Table 2.210 Numbers of fragments in each anatomical division for each species recovered from the sieved samples

	A	**B**	**D**	**I**	**N**	**V**	**Total**
Indeterminate species		1	24	3		7	35
Scyliorhinus sp						1	1
Clupea harengus					1	24	25
Salmonidae						3	3
Anguilla anguilla	1	3			3	51	58
Gadidae						1	1
Scomber scombrus						1	1
Liza aurata						1	1
Pleuronectidae	3	5	2		1	29	40
Total	4	9	26	3	5	118	165

Key:
A = Appendicular skeleton
B = Branchiocranium
D = Dermal skeleton
I = Indeterminate elements
N = Neurocranium
V = Vertebral elements

Note: Anatomical divisions after Wheeler and Jones (1989)

Table 2.211 Comparison of fish remains from later Roman phases at Winchester and York

	Winchester, Victoria Road		York, Tanner Row	
	N	%	N	%
Vertebral elements	111	85	288	42
Dermal elements	2	2	332	48
Other elements	17	13	72	10
Total number of frags	130		692	
Marine species	29	22	78	11
Freshwater species	0		486	70
Estuarine spieces	101	78	128	19
Total number of frags	130		692	
Marine species	5	63	4	36
Freshwater species	0		4	36
Estuarine species	3	37	3	28
Total number of species	8		11	

Table 2.212 Summary of fish remains for Roman sites in England: counts by numbers of taxa and by numbers of fragments

		Winchester, VR	York, Tanner Row	Dorchester, Greyhound Yard	Dorches-ter, Church Street	Silchester, Basilica	Exeter	Ower, Isle of Purbeck
Anguilla anguilla		1	1	1	1			1
Clupea harengus		1	1					
Conger conger				1				
Cyprinidae			4		1	1		
Dicentrarchus labrax				1		1	1	
Gadidae		1	1	1	1		3	
Labridae				1	1		1	
Mugilidae		1				1		
Pleuronectidae		1	1	1	1	1		
Salmonidae		1	1			1	1	
Scomber scombrus		1						
Scyliorhinus sp		1						
Sparidae			1	1	1	1	1	1
Trachurus trachurus			1	1	1			
Triglidae				1			1	
Total number of taxa		8	11	9	7	6	8	2
Total fragments	N	165	692	215		119	89	8
Unidentified	N	35	0	143		74	66	5
	%	21	0	67		62	74	63
Identified	N	130	692	72		-	23	3
	%	79	100	33		38	26	37

Note: See Locker (2007) for updated and more extensive comparisons of fish from Romano-British sites

Parts of the body

Table 2.210 presents the number of fragments in each of five anatomical divisions. With the exception of the three unidentified elements, the bones of indeterminate species could also be divided anatomically. Vertebral elements (73%) were predominant in the assemblage. Elements of the dermal skeleton (16%) were the next most frequently represented. Bones of the appendicular skeleton (2%), the branchiocranium (6%), and the neurocranium (3%) combined, represented the remaining 11% of the assemblage. Elements of the dermal skeleton included fin ray fragments and scale fragments which were not identified to species. Disregarding these fragments, the vertebral elements represent 86% of the identified fish remains. The branchiocranium (7%) and neurocranium (4%) represented 11%, and the remaining 3% is represented by elements of the appendicular skeleton.

Summary data concerning the fish remains from other Roman sites in Britain are presented in Tables 2.211 and 2.212 and Figure 51 (see also Section 2.3 and Tables 2.223–2.224).

Discussion

General

The fish remains from the later Roman phases of the suburban settlement at Victoria Road East represented just over 1% of the total identified animal bone from the site and 3% of the material recovered from sieving. These statistics emphasise the small size of the assemblage and corroborate observations, made by Wilkinson (1979), that fish were not much exploited by the inhabitants of Roman urban settlements in southern Britain.

The assemblage consists largely of the vertebrae of herring and eel. The absence of head bones is generally considered to indicate that the processing of fish has taken place elsewhere. In this case, the low recovery of head bones combined with the absence of butchery evidence, the size of the material recovered, and the location of the Victoria Road site – on the north-west side of the defended settlement and away from the river, could indicate that fish were brought to the site ready for consumption.

This lack of evidence of waste material from the processing of fish is also considered, in conjunction with the absence of remains of freshwater species, to indicate that the occupants of the Victoria Road site were not actively involved in obtaining fish for food. If they were involved in fishing as a subsistence activity, one would expect to find a wider range of species, including local coarse fishes, and a wider representation of skeletal elements. In this sense it is apparent that the users of the Victoria Road site were part of the urban community who were purchasing fish rather than catching them themselves. Maltby has shown in the analysis of the animal bones from Victoria Road, that the deposits were more like urban deposits than rural ones. The evidence from the fish remains corroborates this theory.

Ecological considerations

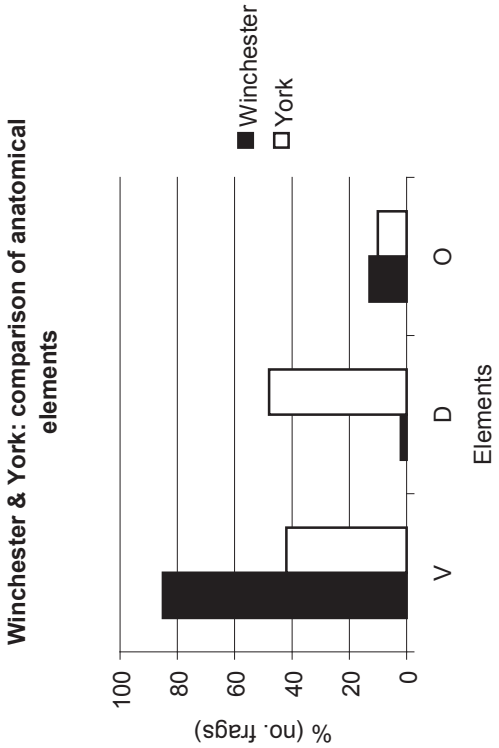
Clupea harengus

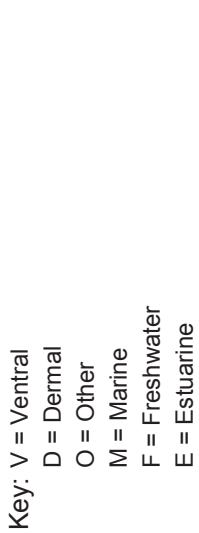
Herring is not as common a component of Roman bone assemblages as it is in later periods, but it has been identified on 44 of the 109 sites surveyed by Locker (2007). Its remains have been recovered from later Roman deposits in Winchester and York. In both cases the sites are located on the outskirts of the urban settlements, but the composition of the herring assemblages differs markedly. In Winchester, as has been shown, herring was represented by vertebrae, which if not an artefact of poor preservation, signifies the presence of pre-processed animals. At York (Jones 1988c) whole fish of smaller dimensions were represented in much greater numbers (Fig 51), perhaps associated with fish sauce production.

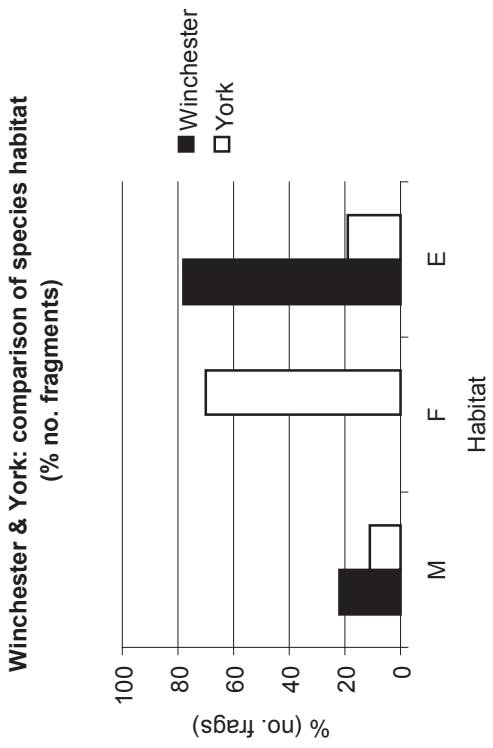
The absence of herring from many Roman fish bone assemblages, like that of the large gadoid fishes, has been interpreted to indicate a lack of deep sea fishing in Roman times (O'Connor 1988; Hamilton-Dyer 2000,). Although, it is possible that remains of herring have been missed on many occasions, since sieving is generally required to recover the bones of this fish, it can be stated, more probably, that the inhabitants of Roman Winchester did not eat herring regularly. The presence of herring here does not necessarily indicate deep sea fishing, for Couch (1864), Day (1880), and Yarrell (1836) make reference to the occurrence of large shoals of herring on the southern coast of Britain and the northern coast of continental Europe in ancient times. Others have described the capture of fishes related to herring in the Thames Estuary (Day 1880). In addition, Wheeler (1969) describes the spawning migration of herring from deep waters to the shallower inshore waters. Thus, deep sea fishing technology would not have been necessary to capture these herring.

Anguilla anguilla

Eel remains are frequently recovered from deposits of Roman and later date in Britain (Locker 2007). Their economic importance in Britain increased throughout the Roman period and at the height of the Anglo-Saxon period, they were considered one of two fisheries for which Britain was famous (Couch 1865). The species inhabits freshwater for most of its life, returning to the sea only to spawn. The fish are utilised at all stages of their life cycle and fishermen are engaged in their capture throughout the year. The greatest effort is expended, however, in capturing the mature eels (Burgess 1970) as they descend the rivers from July to November (Day 1880). This catadromous migration is dependent on the onset of sexual maturity and the decrease in water temperature (Bertin 1956). Wheeler (1969) describes the sexual maturity of eels in terms







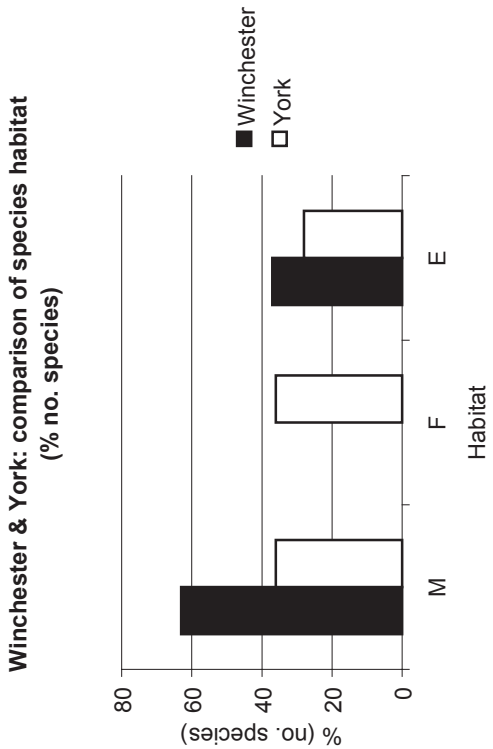


Figure 51 Fish remains from Winchester and York compared

of their length and reports that when male eels reach 40cm in length (females 54–60cm) they begin their migration to the sea. He also reports that mature eels are most abundant at river mouths in September and October.

Pleuronectidae

There are eight species of right-sided flatfish which inhabit British coastal waters (Wheeler 1969). Two of these, namely, flounder, *Platichthys flesus* and plaice, *Plueronectes platessa* have been identified from Roman deposits in Silchester (Hamilton-Dyer 2000). These two species are difficult to distinguish from their skeletal remains and specific identification relies on characteristic elements of the branchiocranium.

Their habits, however, are strikingly different, for the flounder can tolerate freshwater and individuals have been known to penetrate far inland. Day (1880) reported taking flounder in the Severn at Shrewsbury and in the Avon within three miles of Bath. Yarrell (1836) claimed that flounder was known in numbers in the Thames as high as Teddington and Sunbury. Plaice, although sometimes encountered in the brackish waters of estuaries, prefers a deeper marine habitat.

Apart from sites in Essex, flounder is more frequently identified from Roman deposits (Locker 2007) and it is thought that the occurrence of plaice coincides with the increase in fishing exploitation in later periods. It must be said, however, that plaice has been recovered from features at the Roman Basilica site in Silchester (Hamilton-Dyer 2000).

Of the nine elements of the skull and appendicular skeleton which were recovered from Phase 310, a dentary and a ceratohyal have been tentatively identified as flounder. These identifications and the lack of any characteristic elements of plaice, suggest that the pleuronectid remains from Victoria Road belong to flounder. It is conceivable that flounder were taken locally in the River Itchen, as individuals would surely have been available as far inland as Winchester. However, the species, as a population, spawns in salt water and is characterised by sometimes distant migrations (Wheeler 1969). Yarrell (1836) reported that the spawning season was typically from February to March and it is likely that they were regularly congregating at the mouths of the Itchen and Hamble prior to any seasonal migration to deeper waters.

Salmonidae

Remains of species of the salmon family have been recovered from Roman deposits at York, Silchester, and Exeter, and in many other Roman assemblages (Table 2.223; Locker 2007). Bones of salmon, *Salmo salar*, are most frequently recorded and it is most often identified on the basis of vertebral elements. This is the case with the remains from Victoria Road where a single vertebra was identified to this species and two others categorised as belonging to the Salmonidae family. Salmon live in salt water except when they return to fresh water to spawn.

Other species

A single vertebra from a species of dogfish (Scyliorhinidae) was recovered from Victoria Road. This, as discussed above, may have been intrusive.

Mackerel, *Scomber scombrus* is a pelagic marine species forming large surface shoals. These fish migrate throughout the summer to spawn in shallow waters. Their flesh is high in fat and this renders their remains pliable and easily broken. A single vertebra from the tail end of the column was recovered from Victoria Road.

Members of the cod family, Gadidae, have been well represented in medieval deposits throughout Britain but are generally uncommon in the Roman period, although they have been recorded on over twenty sites (Locker 2007). The gadid vertebra recovered from Victoria Road was of small size indicating that it represented a fish of up to 30cm in length. It was probably a species of the genus *Trisopterus* (poor cod), whose young enter estuaries, especially in summer.

The golden mullet (*Liza aurata*) is another species which inhabits the brackish waters of estuaries. It is not clear if the fish make a migration at spawning time, but they are often seen shoaling near the surface from September onwards.

Conclusion

It is clear from the remains that eel, flounder, and herring were all consumed in Roman Winchester, and all prepared for consumption elsewhere. It is likely that they were either pickled, salted, or smoked. There is no evidence that fishing was engaged in as a subsistence activity by the local community or that fish were processed in large numbers.

It is probable that the fish came from fishmongers who operated to serve the main urban community. Whether the fishermen who supplied the fishmongers were operating out of Winchester, it is not possible to determine. The town would certainly have had communication with the settlement at Bitterne (*Clausentum*), which was a more suitable location for catching and processing fish, especially of those species encountered at Victoria Road. The River Itchen could have been navigated by sizeable vessels as far upriver as Winchester, and it is possible that fish were arriving, via this route, or by road, already pickled, smoked, or salted.

Discussion *by M Maltby*

The excavations of the later Roman phases from sites in the northern suburb of Winchester produced a large faunal assemblage particularly from the Victoria Road

sites. Although the study was begun many years ago, this represents one of the largest and most important assemblages analysed in detail from a suburban area of a Romano-British town. These bones were supplemented by material obtained from sites located near the city defences. Altogether, 48,792 animal bone fragments were recorded, of which bones retrieved from sieved samples accounted for 6826 specimens (Table 2.16). These totals include 21,544 fragments identified to species from unsieved deposits and a further 2485 identified in sieved samples (Tables 2.196–2.202). The nature of the assemblages varied in different types of context excavated and, to a certain extent, they also varied between sites. The following discussion examines some of the general trends observed.

Wells and pits

The small number of wells and pits excavated limited the amount of closely dated material available. Nevertheless, they produced over 13,500 fragments and some contained important, well dated and extremely well preserved assemblages. Most of these features were found at Victoria Road (Groups VRE19–24, VRW6, VRW12–14).

Some aspects of the faunal assemblages from wells and pits were typical of those encountered in other types of deposit. They consisted largely of fragments of bones of cattle, sheep/goat, and pig. Many of these bore butchery marks indicating that they had been processed before disposal. Many also bore evidence of gnawing, indicating that they were accessible to dogs prior to secondary deposition in the wells and pits.

Preservation of bones tended to be better in wells and pits than in other types of feature. This was reflected in several ways. Fewer bones from wells and pits tended to be eroded and more were ivoried. Limb bones of cattle and sheep/goat were usually less fragmented and more of the fragile anatomical elements such as skull fragments tended to be represented. The deeper burial of the bones, particularly in the lower fills, accounts for their better survival.

Natural deaths

It is clear that several of the wells and pits were left open for a time, which resulted in the accumulation of bones from large numbers of amphibians, particularly frogs, in some of the lowest levels of these shafts. These animals were either the victims of falls or perhaps frogs, attracted by pools of standing water, colonised the shafts. In either case, their presence indicates that there were suitable breeding areas for frogs in the vicinity of the Victoria Road and Henly's Garage sites. On the other hand, sieved samples from wells and pits produced relatively few remains of small mammals such as shrews, voles, and wood mice. Their rarity would imply that there was little suitable vegetation cover in the vicinity and that this area of the northern suburb was heavily disturbed by human occupation and use in the later Roman period.

Deposition of carcasses

The subsequent infilling of these features produced the best preserved and the most spectacular of the faunal assemblages from the excavations. Some wells and pits contained complete carcasses or substantial parts of skeletons. In some cases, associated groups of bones were found in large numbers. VR well F1096 (Group VRE19) contained at least eighteen such groups and fourteen animals were represented by associated bones in VR well F1093 (Group VRE20). At least thirteen partial or complete animal burials were deposited in VR pit F814 (Group VRE22). VR well F43 (Group VRW14) produced six associated groups. Substantial parts of single dog skeletons were also found in wells F113 and F102 at Henly's Garage (Group HG7).

The number of bones in these associated groups varied. Some of the small groups from domestic species probably simply represented processing waste. Butchery marks were observed on some of the bones in these groups. There were cases where bones of the heads and feet of cattle, sheep and goat were found in association, particularly in pit F814. These groups again may represent discrete collections of primary butchery waste. A more likely explanation, however, particularly with the large numbers of cattle horn cores found in F814, is that these bones were attached to skins. The skins themselves may have been thrown into the wells and pits, although it is perhaps more likely that the bones had been removed from the skins during processing and subsequently deposited. The evidence further suggests that horn working waste may also have been dumped in F814.

Dog burials

Most of the largest groups of associated bones from wells and pits belonged to species whose carcasses were not usually processed for meat or other products. Bones representing complete burials of dogs were found in four wells and a pit. Wells F1093, F1096 and pit F814 at Victoria Road East contained the remains of several animals. Including associated bones from neonatal puppies found in sieved samples, the remains of at least 31 dog burials were found in wells and pits.

Similar depositions of dogs have been recorded in wells and deep pits on other Romano-British settlements. They have been found, for example, in several features in Dorchester (Maltby 1993; Woodward and Woodward 2004) and in a well at the rural settlement at Oakridge (Maltby 1995b). They have also been found in several similar features at Baldock, Hertfordshire (Hamilton-Dyer pers comm).

The reasons why dogs were commonly deposited in deep features need to be considered. Single skeletons can be explained as the burial of dogs, which died

either through natural causes or by accident and were deposited in a nearby available shaft. Deliberate killing cannot be ruled out, however, although none of the dog skeletons had evidence of wounds inflicted immediately prior to death. Larger groups need more careful consideration. Those found in the wells F1093 and F1096 were recorded in several layers within the lower fills and may again represent separate burials of animals deposited over a substantial period of time as the wells were infilled.

The deposits do imply something about the attitude of the inhabitants who buried them. These people did not regard dogs as a source of food. The discovery of several neonatal skeletons and associated bones of three slightly older puppies in F1093 could represent the disposal of dogs from the same litters. In these cases it is more likely, although not certain, that these animals were deliberately killed perhaps indicating that the dog population needed to be controlled. There is no reliable evidence that these burials had any ritual significance.

The dog skeletons from pit F814, however, were all found in one layer and could represent animals deposited together in context *3262*. The likelihood of eight dogs of different ages and types all dying of natural causes at about the same time and subsequently deposited in the same layer of the pit seems remote, although an epidemic of, for example, canine distemper could have caused large numbers of deaths. It is more likely that these dogs were deliberately killed, although for what purpose is unclear. There may have been a purge on stray dogs in an attempt to control their numbers. The abundance of gnawed bones in all deposits testifies that many dogs had access to butchery waste in the town and perhaps infers that dogs were present in large numbers and were considered to be a nuisance or a health hazard in areas where a lot of rubbish was dumped. Such an explanation could account for the presence of the bodies of two cats and a raven in the same deposit, perhaps victims of the same purge of scavenging animals.

In this instance there is also a case that there was a ritual significance to these burials. They were associated with a number of complete pottery vessels and one near-complete glass vessel. The faunal assemblage had several other unusual features. As discussed above, it included bones probably associated with cattle hides and sheepskins and a number of cattle horn cores. Metrical analysis indicated that many of the cattle represented by the horn cores and metapodials belonged to males, whereas bones of females were usually more abundant in the other assemblages from the northern suburb. The cattle represented also tended to be larger than cattle from other Roman assemblages in the town. The unusual find of a bone of a white-tailed eagle also occurred in this layer along with the partial skeleton of a raven. Found in isolation, such assemblages could be explained as well preserved examples of various butchery and industrial activities and the deposition of their waste products. However, the association of these with the large number of burials and other unbroken artefacts may have had more significance than simply that the carcasses and industrial waste were available nearby when it was decided to rapidly infill the pit. Ritual significance cannot be proven but the assemblage from this pit is the most likely candidate to meet the criteria of a 'special deposit' as defined by Grant (1984) of any of the faunal assemblages from wells or pits from the excavations. A similar assemblage from a shaft in Dorchester has been interpreted as being of ritual significance (Woodward and Woodward 2004).

Processing waste

There was evidence that some of these features were used as repositories for some large scale processing waste. The contents of pit F814 have already been discussed. One of the upper fills of well F1096 included an accumulation of butchered cattle upper limb bone fragments. Smaller concentrations of particular cattle bones formed significant component of other assemblages, for example, scapulae in pit F64/70 from Victoria Road West (Group VRW6). However, the incidence of such accumulations was certainly no greater than in other types of deposits and, arguably, less frequent. Other types of animal bone waste presumably derived from domestic sources as well as butchers formed an important part of all the well and pit assemblages.

Buildings and boundaries

Assemblages associated with buildings came from a variety of context types and mostly represented material of mixed origins, in many cases deposited after the buildings had fallen into disuse. It is not possible therefore to make inferences about the use of the buildings or the processing of animals within them from these deposits.

Sheep burials

One notable exception to this, however, concerns the discovery of a number of groups of associated sheep bones. As discussed in above (pp 152–158 and pp 232–234), these formed discrete groups of bones representing carcasses of one or sometimes two animals, ranging in age between six months and adult. Examples were found in contexts associated with structural remains at Hyde Abbey (Group HA74.4), Building 2 at Victoria Road West (Group VRW3), and at Victoria Road East a structure adjacent to the Cirencester road (Group VRE16). Similar groups were found in JCH pit F72 (Group JCH5) and HG post-hole F152 (Group HG3). At both of the latter sites, the features formed part of the boundary between the defensive rampart and properties within the walls; an urned human cremation burial (JCH) and a complete pot (HG) were placed in other features marking this boundary.

Nearly all the carcasses had been segmented and showed evidence of filleting. Several bones, usually

from the lower limbs, bore evidence of charring. Each group therefore probably represents complete carcasses of lambs or older sheep, which had been skinned, butchered, and the flesh of the dressed carcasses cooked probably by roasting.

As discussed above (p 158) it could be argued that these groups simply represent well preserved remains of waste from common butchery and cooking practice carried out by households in the areas excavated. Certainly other sheep bones found in isolation sometimes had identical butchery marks to those represented in the skeletons and other charred sheep/goat bones were discovered in both the sieved and unsieved samples. The methods of carcass processing were therefore not unusual. Similar butchery marks were found on the partial sheep skeletons found in graves in the early Roman cemetery described in Section 2.1.

However, the method of deposition was unusual. It appears that all bones of the carcass were gathered together after cooking (and presumably consumption of the flesh) and buried together as a discrete group under floors of buildings or in other sub-surface features. The apparently careful burial of the bones within some buildings may indicate that the consumption of the sheep was associated with some sort of ritual, perhaps linked with the foundation of the building. In the case of the city defences sites, the ritual could be related to the redefinition of property boundaries within the walls following the widening of the rampart in the late 2nd century. The fact that, on current evidence, this practice appears only to have been carried out with sheep carcasses may also be significant. Carcasses of pigs may often have been processed in the same manner but for some reason the bones of these were not on special occasions collected up and deposited as discrete groups. This may demonstrate a difference in the attitudes of the inhabitants to these species. There is evidence from a number of other late Iron Age and Romano-British sites for ritual deposition of sheep and goats – for example at the settlement at Elms Farm, Essex (Johnstone and Albarella 2002); and the temples at Harlow, Great Chesterford (Legge *et al* 2000) and Uley (Levitan 1993; King 2005).

Variations within and between sites

Disposal of specialist waste from cattle processing

Assemblages in and around oven F846 at Victoria Road East (Groups VRE3–5) were distinctive because they contained a large proportion of small fragments of cattle limb bones deposited as waste from marrow and grease production and particularly bone working activities. Smaller numbers of similarly processed limb bones of horse in the same deposits indicated that their bones were sometimes collected as raw material for bone working. However, although waste from these industrial activities was found in the vicinity of the building, there is no evidence that activities within the building itself were the source of such waste products. It is more likely that the bones were brought to the area prior to the construction of this building and dumped in a convenient open space and were subsequently redeposited when the plot was developed.

Similarly, assemblages from layers of metalling were generally poorly preserved but several areas did include deposits of specialist waste, for example from the north-east corner of the Victoria Road East site (Phases 378 and 393 – Groups VRRE7 and VRE12) and the suburban street at Hyde Abbey (Phase 8 – Group HA72.1). Large bone accumulations may have been considered to be a useful source of material to lay down as part of the make-up of such metalling.

A large proportion of the assemblage from Victoria Road East was obtained from silt layers. These assemblages were generally moderately preserved and most contained some residual material. However, several produced evidence of specialist processing waste, particularly accumulations of cattle upper limb fragments derived from marrow processing and bone working. These may be residual remnants of dumps of such material laid down to the east of the Cirencester road in the earlier Roman period (Section 2.1). It is also possible, however, that some of this area continued to be used as a dumping ground for such material into the later Roman period as well. However, all layers also included bones probably derived from other sources, including household refuse and small-scale butchery waste.

Accumulations of bones derived from large-scale specialist processing were less frequent in silt layers on Victoria Road West and from other sites, although a few contexts from Victoria Road West (Phase 931 – Group VRW7) did produce some bone working waste.

In general, evidence for the disposal of specialist processing waste was found more commonly in all types of feature from Victoria Road East than at any other site. This partially explains the better representation of cattle bones from this site than from any others investigated. However, even in assemblages not biased by such accumulations, it seems that the area to the east of the Cirencester road was generally the recipient of relatively more cattle bones than other areas.

Variation in the main domestic species

There were also intra-and inter-site variations in the relative abundance of other domestic species. Sheep/goat, for example were generally better represented on the Hyde Abbey site than at Victoria Road. Pigs were better represented in the deposits from Victoria Road West and Henly's Garage than elsewhere.

Most of the assemblages from buildings on the Victoria Road West and Hyde Abbey sites tended to produce lower percentages of cattle and correspondingly higher percentages of sheep/goat fragments, perhaps indicating that waste from the processing and consumption of sheep was more likely to be deposited in the vicinity of such buildings.

Only a small number of ditch sections were

excavated and consequently faunal assemblages from such features were limited. The only substantial sample was obtained from the ditch F12 at Victoria Road West (Group VRW11). This produced a slightly more diverse assemblage than others at Victoria Road, including comparatively high percentages of horse bones and several species of birds. No evidence for dumping of specialist butchery or bone working waste on a large scale was found in this or other ditches.

It is tempting to suggest that these intra-site variations reflect differences in the diets of inhabitants living in different parts of the town and its suburbs. However, this assumes of course that most of the bones on the sites were derived from the animals consumed by the local residents. This is an assumption that requires testing on further well dated samples before other possible factors such as diachronic variation and differential disposal of bones imported from other areas of the town can be discounted.

The meat supply in Roman Winchester

Although there were some variations between sites and analysis was complicated by retrieval and taphonomic biases, detailed examination of the relative abundance of species represented allowed positive conclusions to be made about the meat supply to Roman Winchester. The following discussion summarises the results.

Cattle

Cattle, by virtue of their large carcass size, were the most important source of meat in Roman Winchester, although they were not necessarily consumed in the greatest numbers. The present evidence suggests that beef probably formed at least half of the meat supplied to the town. The relatively high levels of cattle bones recovered is typical of many Romano-British urban assemblages (see also Section 2.3).

The importance in the supply of beef is reflected in the evidence that their carcasses were often processed by specialist butchers who dealt with large numbers of animals brought for slaughter. Evidence for large-scale processing of cattle carcasses on urban sites such as Winchester by specialists carrying out systematic and intensive butchery practices has been found in several Roman towns in Britain and elsewhere in the Roman Empire. Identical methods of butchery have been recorded on many of these settlements and the butchers must have been trained to process carcasses in a prescribed manner. The methods employed appear to have been designed to deal with large numbers of cattle efficiently and quickly. Disposal of their waste appears to have been a common problem and many Roman towns have evidence for the disposal of large amounts of cattle bones in undeveloped or abandoned areas within or on the outskirts of the towns. In the case of Winchester, parts of the northern suburb and the area around the northern defences at certain times received such material, although many of the bones in the former case had been selected for further processing for other products before disposal. It is certain that other areas of Winchester would also have been used for similar dumping where and when opportunities arose.

Analysis of the ageing and sexing data from Winchester showed a marked peak of cattle slaughtered as adults that had not attained very old age. Most of these cattle may have been females. Immature cattle were represented only in small numbers and there was little evidence for the slaughter of veal calves. The results demonstrate that there was a preference for the supply of cattle of particular ages and sex. The possible bias towards adult cows suggests deliberate selection of females for the urban meat market. It is likely that the specialist butchers were responsible directly or indirectly for such a selection policy. Whether this policy evolved naturally as the result of individual enterprise and experience or was regulated by civic authorities is uncertain. However, it would be likely that there was some central control to ensure adequate provision of such an important commodity. Again, the cattle mortality profiles were similar to some other samples from Romano-British towns. They differ somewhat from the sample from Dorchester Greyhound Yard (Maltby 1993), which contained a greater number of bones of calves but excavation of central areas of Roman Winchester may produce similar evidence for the exploitation of younger cattle.

Sheep and goats

The area around Winchester was well suited to the keeping of sheep and they were probably the most common species exploited for meat but the total amount of lamb and mutton eaten by inhabitants of Roman Winchester was probably significantly less than that of beef. Ageing analysis showed that few neonatal mortalities were represented and lambs of under a year old appear to have been rarely slaughtered in the town. Most of the sheep were slaughtered between two and six years of age. This peak is marked and suggests there was deliberate selection of prime animals for slaughter in the town.

It is less clear whether a large proportion of the sheep brought to the town were slaughtered and butchered by specialists. No large accumulations of primary butchery waste have been found. There was quite a lot of consistency in butchery marks and a greater use of the cleaver than encountered on Iron Age or contemporary Romano-British rural sites, which may suggest many sheep were butchered by specialists. However, the discovery on several sites of complete carcasses that were clearly processed individually suggests that many sheep may have been acquired by households who perhaps carried out their own slaughtering and butchering. The smaller size of the sheep carcass of course makes this more feasible than for cattle both in terms of cost and logistics. This interpretation is complicated by the evidence for possible subsequent ritual deposition of some of these butchered sheep carcasses.

They may have been animals especially acquired for feasts. On other occasions, lamb and mutton may have been obtained in smaller portions from other sources for more mundane household consumption.

The presence of both native horned and generally larger hornless types of sheep indicates that Winchester probably obtained animals from a wide range of flocks including perhaps stock imported to the area during the Roman period.

Pigs

Pigs were the third most common species exploited for meat and in terms of carcass weight may have been almost as important as sheep. Pigs appear to have been exploited more commonly in Winchester than on Iron Age and contemporary Romano-British rural sites in the area. There is also some evidence that their contribution to the diet varied in different parts of the town. Although pigs were quite commonly represented on Iron Age sites in the area, the increased demand for, and consumption of, pork and bacon in Winchester may have required the local herds to have been supplemented by new stock. Comparisons of metrical data showed that pigs consumed in Winchester were generally larger than those from Owslebury and this implies they came from a different source. Villas may have been one source, although no large samples are available for comparison. Another possibility is that pigs were kept in the town in some numbers by the inhabitants.

There was little evidence for the consumption of suckling pigs, although preservation conditions were not ideal in most deposits for the survival of the bones of such animals. Most pigs were slaughtered in their second or third year. Such high rates of immature slaughter are typical of other Roman sites. There were no large accumulations of pig bones indicative of large-scale processing. However, some of the butchery marks may have been inflicted by professional butchers using techniques not traditionally practised in the area.

Other species

The meat supply relied heavily on the three species already discussed. Other species supplemented the diet but did not form a significant part of it. The most common of these other species was horse. However, although it was represented by over 600 fragments, excluding groups of associated bones, many of these bones were associated with bone working rather than food refuse. Although other butchery marks indicated that horse-flesh was sometimes eaten, horse carcasses were not processed consistently or as intensively as cattle. Few, if any, appear to have been slaughtered in their prime for meat.

The next most common food species represented was domestic fowl. Although comparisons with other Romano-British urban samples revealed that domestic fowl bones were recovered less frequently in these Winchester suburban deposits than in most assemblages, they were nonetheless found in greater numbers than on rural settlements in the area. This implies that most of the domestic fowl represented may have been birds kept in the town. The recovery of several largely complete and apparently uneaten carcasses may also imply that these birds were kept in the town and also that not all of them provided meat. A more extensive sieving programme concentrating on well preserved assemblages may demonstrate that domestic fowl was a more common food resource than indicated in these assemblages. However, it does not seem likely that they were regarded as a major component of the diet.

Meat of other domestic species was only rarely consumed. No butchery marks associated with filleting of goat bones or segmenting the major meat bones were recorded, although the species may occasionally have provided meat. Only one dog bone bore such marks. The majority of dog bones came from associated groups, showing that their carcasses were rarely processed.

Bones of wild mammals were poorly represented. Red and roe deer bones formed only a very small component of the assemblage, implying that venison was only a very rare addition to the diet, if these assemblages are typical. There is some evidence that hares were occasionally caught and brought to the town in the Roman period.

Other species of birds that probably offered an occasional supplement to the diet included several species of ducks, geese, pigeon, woodcock, and possibly other species of waders such as heron, snipes, and plovers. However, the combined total of bones of these species numbered less than 100 in the unsieved samples. Sieving failed to produce much evidence that they were present in significantly greater numbers. It does not seem that these species of birds were of any importance in the diet.

Evidence for fish relies heavily on the samples from one building, which produced bones of several species, mainly belonging to herring, common eel, and flatfish. Eels could have been caught in the local river and all these species could have been fished in estuarine or inshore waters. Further sieving may also reveal that fish were more commonly exploited than the present evidence from Victoria Road East indicates. However, the findings to date do not suggest that fish were heavily exploited and brought to the town in great quantities.

The present evidence would suggest that Winchester's meat supply relied principally on cattle, sheep, and pigs sometimes supplemented by meat from horses and domestic fowl and only occasionally by flesh from anything else. The system of supply may have been different for each of the principal species. Acquisition of cattle and sheep may have been largely supplied by the importation of stock from rural settlements in the town's hinterland. Supplies of pork and chicken may have relied more heavily on animals kept in the town itself.

Other animal products

Most of the bones represented in Winchester derived from animals that were eventually processed for their meat and fat. However most of the species represented in the samples had the potential to provide other products and they may have been exploited for them. These include dairy products; power; hides, skins and fleeces; marrow and grease; horn, antler, and bone (for artefact production); and eggs. The following discussion will examine these commodities in turn.

Dairy products

The most likely species to have been exploited for milk were cattle, goats, and sheep. It is not possible to be certain whether any particular animal was exploited by humans for milk but mortality and sex profiles can provide indications as to whether milk production was an important element in a species' exploitation. The presence of high percentages of adult females combined with evidence for the culling of juvenile (usually male) animals would be indicative of dairy herds or flocks.

The cattle ageing and sexing data from Winchester only partly meet these criteria. Most of the cattle were adult and metrical analysis of the metapodials suggested that cows formed the majority of the adult population. However, few bones of calves were recovered. It is possible that these were under-represented because of the nature and the location of the deposits excavated but the current evidence suggests there was not a significant culling of veal calves. On the other hand, McCormick (1992) has argued that until quite recent times calves were needed to be present to enable the cows to let down milk and he has challenged the view that the slaughter of young calves was necessary in a dairy herd. If this is correct, the low numbers of calves does not negate the possibility that many of the cows were milked. A lot of these cows, however, must have been killed in their prime, since relatively few mandibles had very heavy wear on their teeth. This suggests that meat rather than milk was the more important commodity. The bias towards female animals could be the result of economic forces, in which meat from cows aged between four and six years old was in the greatest demand in the town. Cattle milk was not heavily exploited during the Roman period according to classical authors such as Pliny (White 1970).

Evidence that milk was an important component in sheep and goat husbandry practices is also elusive. There is no evidence for the slaughter of large numbers of young lambs or kids, which might indicate that dairy production was important. Many of the older female sheep and goats represented could have been exploited for milk but the mortality patterns suggest that meat production was of much greater importance.

Power

Both cattle and horses would have been used as working animals. Plough oxen and perhaps even bulls (Ferdière 1988) could have been important for agricultural production. The presence of a large proportion of adult steers in an assemblage could indicate that the maintenance of large numbers of oxen for plough teams was an important factor in cattle exploitation. However, the low numbers of bones of adult male cattle in most deposits in Winchester could again suggest that meat production was more important. On the other hand, the low numbers of immature mortalities represented in the urban assemblage leaves open the question of where the male cattle were slaughtered. As discussed below, it is possible that relatively more male cattle, particularly plough oxen, were kept for slaughter on rural settlements. Urban market forces may again have been an important factor. The meat from retired plough oxen may not have been in great demand in the town and the importance of cattle as working animals may not be fully reflected in the animals brought to the urban meat markets.

The emphasis in the exploitation of horses was quite different from cattle. Although some were eaten in Roman Winchester, very few seem to have been killed off at a relatively young age for meat. Ageing data are limited but the impression is that most horses would have lived until fairly old age. Their use as transport animals and as beasts of burden would have increased their life expectancy significantly. Horses probably would have been expensive animals to replace and there would most likely have been a reluctance to dispose of them unless it became necessary, particularly as their value as a meat-bearing animal was unlikely to have been as high as cattle.

Hides, skins, and fleeces

It is assumed that the hides and skins of the major domestic mammals were heavily utilised but direct evidence for this is limited. Some methods of skinning leave the feet and sometimes the heads attached to the skins (Serjeantson 1989) and therefore concentrations of bones from these parts of the body can sometimes be interpreted as waste produced by tanners who gathered together skins in large numbers for processing. The most likely candidate for such an assemblage was found in pit F814 at Victoria Road East, which included large numbers of skull fragments and metapodials of cattle, several pairs of sheep metapodials, and at least one complete sheep's head which may have been associated with the feet.

Other groups of associated head and foot bones were found in smaller numbers in other pits and wells from Victoria Road. Head bones of a cow were found in well F1096 (Group VRE19); pairs of metapodials of a kid were recovered from pit F981 (Group VRE23); bones of the head and feet of a lamb were found in well F43 (VRW14); groups of pig foot bones were found in well F1093 (VRE20) and pit F168 (Group

VRE21). The problem with such isolated groups is that although the remains could represent skinning waste, they could alternatively simply be bones discarded as primary butchery waste.

Knife cuts associated with skinning were observed on some bones, particularly cattle first phalanges. Some of the relatively rare knife cuts on the shafts of sheep metapodials may also have been caused by the initial incision prior to the removal of the skin. There was no evidence that any of the dogs and cats had been skinned. There is also no evidence that the pelts of wild mammals were processed in the town.

Flocks of sheep kept commercially for wool production do not usually have a high rate of immature slaughter. The emphasis on the culling of sheep aged between two and six years old in the samples from Winchester would suggest that wool production was of secondary importance to that of meat supply for the town. Of course, the samples may be biased towards younger animals because of this demand for meat. Some later Roman samples from rural sites have produced higher percentages of older sheep suggesting a greater emphasis on wool production. It should also be noted that most of the sheep killed for their meat in Winchester would have been able to supply two or more annual fleeces before they were killed.

Marrow and grease

Marrow extracted from the bones of domestic mammals would have been a common source of nourishment used in stocks and stews. Marrow processing of sheep and pig carcasses may often have been carried out by individual households. Several of the complete butchered sheep carcasses, for example, had evidence that the upper hind limbs had been deliberately broken open for this purpose.

Cattle bones may also have been commonly broken open for marrow in the course of domestic cooking. However, there is evidence to suggest that a lot of marrow extraction was carried out by the town's specialist butchers. The consistency and intensity of deliberate bone breakage was a major feature of the cattle assemblage. Most of the metapodials had been broken open transversely; many of the upper limb bones had been split axially. The consistency of both practices suggests that professional butchers were systematically processing most of the cattle carcasses for marrow. Some of the axial splitting of the limb bones may have also been to prepare the bones for subsequent bone working. However, the distribution of axially split bones was more widespread than bone working waste, which suggests that the process was carried out routinely on carcasses processed by the butchers. The techniques used were identical to those observed on other sites on urban and military sites in Britain and elsewhere in the Roman provinces (Lauwerier 1988; Maltby 1989a).

The ends of some limb bones were more highly fragmented than needed for marrow extraction. Groups of these bones were found in relatively large numbers in several deposits from Victoria Road East. It is possible that such breakage would have been the result of splintering of some of these limb bones in preparation for bone working. It is also possible, however, that such bones were often accumulated for special processing themselves. This process may have involved boiling the bones for extraction of grease. Parallels for these accumulations have been found in Colchester (Luff 1982), York (O'Connor 1988), and in Zwammerdam, The Netherlands (van Mensch 1974).

It is worth making the contrast again here between the cattle and horse assemblages. There is little evidence that horse bones were broken open for marrow as systematically or as often as those of cattle. Breakage patterns tended to be different and there was little axial splitting of horse bones except in circumstances in which they appear to have been used as raw material for bone working. The impression is gained that most horse carcasses were not processed by specialist butchers.

Horn, antler, and bone

Concentrations of offcuts of horn, antler, and bone working were found mainly at Victoria Road, particularly to the east of the Cirencester road. The main evidence for horn working waste was found in pit F814, in which the horn cores and adjacent parts of the skull of at least 24 cattle were deposited. Red deer antlers were brought to Winchester for working and although large numbers of offcuts were not found, evidence for the manufacture of antler objects was discovered in several deposits, which tended to be ones which also produced bone working waste.

Bone working waste consisted mostly of offcuts of limb bones of cattle and to a lesser extent horse. Metapodials were sometimes represented but offcuts from the radius and tibia were the most common. The finds represent the activity of specialist bone workers in the town who obtained much of their raw material either directly from the specialist butchers or from their rubbish dumps. Their own waste was sometimes dumped in the northern suburb. It is possible that much of the bone working waste may be residual from dumps deposited in the earlier Roman period at Victoria Road. However, such activities no doubt continued throughout the Roman occupation of the town.

Eggs

The presence of medullary bone within the shafts of domestic fowl limb bones testifies to the exploitation of some of the hens for eggs. It is difficult to comment further on the intensity of such exploitation until more contemporary samples have been analysed and compared.

Urban and rural contrasts

Analysis of the Romano-British assemblages from Winchester has had the major advantage that they can be compared with an important rural assemblage from a neighbouring settlement at Owslebury (Maltby 1987a). This has allowed comparisons to be made between assemblages from a rural settlement that had Iron Age origins and continued to be occupied until the late Romano-British period with those from a suburb of a major urban centre located a few kilometres distant.

There were differences in many aspects between the two assemblages, some of which were predicted but others were unexpected. The differences can be summarised under headings of species representation; mortality and sex profiles; carcass processing methods; horn, antler, and bone working; and type and quality of the stock.

Species representation

The meat diets of the inhabitants of Winchester and Owslebury both consisted mainly of beef substantially supplemented by lamb or mutton and pork. However, there do appear to have been differences in the relative contribution of these to the diet. The evidence would suggest that the inhabitants of Winchester ate a greater proportion of beef and pork and rather lower proportions of lamb and mutton than their contemporaries at Owslebury. This contrast is typical of general trends in Roman Britain and other provinces discussed by King (1984, 1999). It indicates that there may have been different dietary preferences between the inhabitants of the two settlements and probably also reflects that the demand for meat in Winchester necessitated the acquisition of more carcasses of the larger meat-bearing species.

The inhabitants of Winchester appear to have been more likely to supplement their diet with chicken than the inhabitants of Owslebury. They probably also ate more fish and duck and other species of birds. However, it seems these resources were only a rare addition to the diet in either settlement, although this needs to be confirmed by further sieving programmes. Similarly, neither set of inhabitants appears to have eaten venison or hare very often. The slightly more diverse diet of the Winchester inhabitants may reflect the higher economic status of some of the residents and also the greater availability of some of these species brought to the urban market and in some cases probably kept in the town itself.

In contrast, the inhabitants of Owslebury and similar rural sites may have been more likely to continue to consume horse-flesh more often than in Winchester.

Mortality and sex profiles

Ageing and sexing evidence of the major domestic species from Winchester and Owslebury again showed some contrasts. The mortality profiles of pigs were fairly similar, with the emphasis on the culling of second and third year animals for meat on both sites and relatively few older animals represented. It has been argued above (p 197) that excavations of more wells and pits towards the centre of Winchester may produce more evidence for the slaughter of pigs under a year old. However, the current state of the evidence does suggest little variation in the slaughtering patterns of pigs.

There was more variation in the mortality and sex profiles of cattle between the Winchester and Owslebury samples. The excavations at Owslebury produced relatively more mandibles of old cattle than those from the northern suburb and city defences sites in Winchester. They also contained slightly more immature specimens killed at an age prior to the peak age for slaughter of prime adults. There was a more pronounced peak of specimens of young adult cattle in the Winchester sample, implying that there was a greater amount of selectivity in the cattle chosen for slaughter in the town. Metrical data also indicate that relatively more large (male) cattle were slaughtered at Owslebury than in Winchester. As discussed above, this suggests that there was a deliberate selection of cows no longer required for breeding purposes to be slaughtered in Winchester. It also implies that inhabitants of rural settlements may have kept and slaughtered relatively more plough oxen.

Ageing data of sheep from the two sites similarly suggest that there was a greater degree of selectivity in the choice of the ages of sheep slaughtered in Winchester. There were fewer very young and very old animals represented. The urban consumer was provisioned with a greater proportion of sheep culled at the optimum age for slaughter for meat. Inhabitants of Owslebury running their own flocks would sometimes have had to cull more sheep at a younger age. Additionally, their oldest sheep kept for breeding and wool may not have been in much demand in the urban meat market.

Carcass processing methods

Detailed analysis of bone breakage patterns and butchery marks has been a major component of this work and the evidence has been discussed extensively in earlier sections of this report. It remains only to emphasise again that the intensive methods of carcass processing in Winchester, particularly of cattle, were in many ways quite different to those practised in Owslebury, where traditional butchery techniques continued for longer and where there was no need for professional butchers to process large numbers of animals quickly and systematically.

Horn, antler, and bone working

In contrast to Winchester, there were no large deposits of waste from these activities at Owslebury, although

evidence for small numbers of antler and bone offcuts was recorded. Bone workers would have had an excellent supply of raw material in Roman towns, although this does not necessarily mean they were permanently resident in places such as Winchester. No workshops have as yet been discovered in the town. Evidence of the accumulation of cattle horn cores at the rural settlement of Brighton Hill South (Maltby 1995a) suggests that horn workers were not necessarily restricted to urban sites. However, the very early date of the Brighton Hill South material (possibly entirely pre-Conquest) should be borne in mind.

Type and quality of stock

Variations in the type and quality of the stock represented in Winchester and Owslebury should be set against the background of evidence for greater diversity in stock types in the Romano-British period, particularly in the southern and eastern part of the province. There is evidence for the appearance of some larger cattle and sheep on many Roman sites in this area, including both these sites. There was also much greater diversity in the size of dogs kept on Roman settlements, particularly with the introduction of smaller breeds (Harcourt 1974; Clark 1995). In general, however, more of the new types of stock were represented in Winchester than at Owslebury.

For example, hornless sheep appear much earlier in the Winchester deposits than at Owslebury and more of the sheep in the assemblages from the town were from sheep larger than the average Iron Age type of horned sheep, which continued to be found in larger numbers at Owslebury well into the Romano-British period.

There appear to have been fewer variations in the size of cattle between the two sites but pigs consumed in Winchester were generally larger than those from Owslebury and smaller dogs were found in greater numbers in the town.

Two main factors can be put forward to explain most of the variations observed between the assemblages from Winchester and Owslebury. The first concerns the role of Winchester as a major consumer settlement. The population of the town needed supplies and their demands dictated the types of animals acquired. Settlements like Owslebury were the suppliers but where traditional local resources were insufficient, alternative commodities or sources of production were found.

The emergence of Winchester as an urban centre must have had an important impact on farmers in the hinterland including those resident at Owslebury. The supplies of animals to Winchester would have involved a complex network of redistribution, including barter, money, and taxation in kind. Many of these exchanges would have threatened traditional forms of exchange and redistribution of animals, which were embedded in the social system.

The second factor that can account for differences in the faunal assemblages from Winchester and Owslebury is not totally unrelated to the first. Many of the differences between the assemblages can be seen in terms of innovation. Centres of population such as Winchester were more likely to adopt new ideas and import new commodities than native settlements. Consequently, it is in Winchester that we find, for example, the greater numbers of domestic fowl, small dogs, larger pigs, and hornless sheep – all of which were probably introduced to the area through Roman influence and in some cases were kept in the town itself. Where these introductions came from requires further investigation. It is possible that some new stock were imported from the continent during the Roman period, although it is unlikely that such imported animals were brought directly to Winchester in large numbers. It is perhaps more likely that improved stock were initially obtained from other heavily Romanised areas in southern Britain.

3 Feeding Romano-British towns – a review of the zooarchaeological evidence *by M Maltby*

Although comparisons with other urban assemblages have been made at various points throughout this current discussion of the animal bones from Winchester, it seems opportune to draw together the current evidence for animal exploitation from major Romano-British conurbations. The assemblages chosen for this survey are drawn from *coloniae* and *civitas* capitals as defined and discussed by Wacher (1995). Analyses of large faunal assemblages have been published from (in alphabetical order) Caerwent, Canterbury, Chichester, Cirencester, Colchester, Dorchester (Dorset), Exeter, Gloucester, Leicester, Lincoln, London (including Southwark), Saint Albans, Silchester, Winchester, Wroxeter, and York. The major sources for this material are listed in Table 2.213. Some *civitas* capitals have not produced sufficiently large faunal assemblages to merit inclusion in this survey (Aldborough, Brough-on-Humber, Caistor, Carmarthen). The review also excludes material from Carlisle, Corbridge, Catterick, Ilchester, and Bath. Although these can be regarded as substantial urban settlements, there remain various ambiguities about their status and layout (Wacher 1995). Similarly, although some important analyses have been carried out on assemblages from smaller towns and vici, these have been omitted from this survey.

Mammal representation

NISP counts of the mammalian species identified from the larger assemblages obtained from a large selection of sites from the major urban centres are provided in Table 2.214. Where it has been possible to determine, counts exclude associated bone groups. It should be noted that elements counted in these NISP totals vary depending on the analyst. For example, some counts include loose teeth, some include more types of vertebrae than others, and some are based on restricted counts of elements. It is almost impossible to eradicate this problem based on published data. Work on the Winchester material has shown, however, that percentages derived from NISP and Selected Bone Counts are quite similar (Fig 29; Tables 2.95–2.96). King (1978; 1984; 1999) has demonstrated that Romano-British urban assemblages tend to have relatively high per-

Table 2.213 Sources for reports and discussions of animal bone assemblages from Romano-British major towns

Town	Sources
Caerwent	Hambleton and Maltby in prep
Canterbury	King 1982
Chichester	Hamilton-Dyer 2004; Levitan 1989
Cirencester	Levitan 1990; Maltby 1998; Thawley 1982
Colchester	Dobney et al 1999; Luff 1982, 1993; Locker 1992
Dorchester	Hamilton-Dyer 1993a; 1993b; Maltby 1990b, 1992, 1993, 1994; Woodward & Woodward 2004
Exeter	Maltby 1979a; Wilkinson 1979
Gloucester	Dobney *et al* 1999; Levine 1986; Maltby 1979b, 1983
Leicester	Baxter 1993, 1996, 2004, 2005; Brown 1985; Gidney 1991, 1993, 1999, 2000; Goudwell 1994; Nicholson 1999, 2004
Lincoln	Aird 1985; Dobney *et al* 1996, 1998, 1999; Scott 1999
London and	Ainsley 2002; Armitage 1980, 1982a, 1982b; Armitage *et al* 1984, 1987; Barber & Bowsher 2000; Clutton-Brock & Armitage 1977; Gask 1997; Jones 1988a;
Southwark	Locker 1980, 1988; Macready & Sidell 1998; Pipe 2002, 2003; Reilly 2000, 2001, 2002, 2005; Watson 1973; West 1993
St Albans	Fulford 2001; King 2005; Locker 1999; Marples 1984; Wilson 1984
Silchester	Fulford 2001; Grant 2000, 2002; Hamilton-Dyer 2000; Maltby 1984b; Serjeantson 2000
Winchester	Bullock this volume; Coy & Bradfield this volume; Maltby 1986a, 1989a, 1994, this volume; Pfeiffer this volume
Wroxeter	Armour-Chelu 1997; Hammon 2005; Locker 1997; Meddens 2000
York	Dobney *et al* 1999; Jones 1988c; O'Connor 1987, 1988

Table 2.214 Mammal bones recovered from Romano-British major towns

Town	Site	Period	Cow	S/G	Pig	Horse	Dog	Cat	Red	Roe	Fal	Hare	Bad	Fox	Bear	Otter	Source
Caerwent	Basilica	C1–4	7485	5133	6000	82	341	18	50	49		140	13				Hambleton/Maltby in prep
Canterbury	Castle	60–90	219	415	398	A	8		1			1					King 1982
		70–90	195	484	324	8	16		3								
		50–150	195	273	239	7	35			4		1					
		150–400	196	107	128	5	8	A	1	1							
Canterbury	Castle	Total	805	1279	1089	20	67	A	5	5		2					
Chichester	Cattlemarket	C1	326	122	52	6	11										Levitan 1989
		C1–2	1756	740	301	37	12	1	1	2		2					
		C2–3	797	368	153	23	28		1	1							
		C3–4	739	330	208	41	53		7			4					
		C4–5	2255	1262	499	70	383		11	6							
Chichester	Cattlemarket	Total	5873	2822	1213	177	487	1	20	9		6					
Chichester	Market Road	Total	47	20	12	9	11	2		1	1						Hamilton-Dyer 2004
Chichester	All	Total	5920	2842	1225	186	498	3	20	10	1	6					
Cirencester	33 Sheep St	C1–2	425	349	163	5	11		3			1					Maltby 1998
		C2–3	97	94	37	2	12		2								
		C3–4	170	107	75	8	27	2	3	4							
Cirencester	33 Sheep St	Total	692	550	275	15	50	2	8	4		1					
Cirencester	Cemetery	C2–3	787	129	59	8	2		2								Thawley 1982
		C3–4	381	31	30		6		1								
Cirencester	Cemetery	Total	1168	160	89	8	8		3								
Cirencester	Chester St	C1–2	152	105	95	2	3			1							Maltby 1998
		C3–4	2869	116	123	8	5			1		1					
Cirencester	Chester St	Total	3021	221	218	10	8			2		1					
Cirencester	Querns Road	C2	162	168	78	10	4		2	3		2					Maltby 1998
		C3–4	216	208	84	16	13		2	6		2					
Cirencester	Querns Road	Total	378	376	162	26	17		4	9		4					
Cirencester	St Michael's	C1–2	2262	361	335	10	12		2	1		3					Levitan 1990

Table 2.214 (*cont.*) Mammal bones recovered from Romano-British major towns

Town	Site	Period	Cow	S/G	Pig	Horse	Dog	Cat	Red	Roe	Fal	Hare	Bad	Fox	Bear	Otter	Source
		C3	1044	614	445	16	33		3	1		3					
		C4	1074	550	472	9	30		3	2		7					
Cirencester	St Michael's	Total	4380	1525	1252	35	75		8	4		13					
Cirencester	The Beeches	C4	771	335	277	35	23	1	12			8	2				Levitan 1990
Cirencester	All	Total	10410	3167	2273	129	181	3	35	19		27	2				
Colchester	Balkerne Lane	60–150	3488	1323	738	55	P	P	13	11		P					Luff 1993
		100–300	6813	692	438	29	P	P	8	2		P					
		150–400+	5100	1824	1291	47	P	P	38	14		P					
Colchester	Balkerne Lane	Total	15401	3839	2467	131	P	P	59	27		P					
Colchester	Butt Road	C2–320	63	48	101	14	P	P	2	1		P					Luff 1993
		C2–400+	66	47	88	7	P		1	6				P			
		320–400+	478	348	533	33	P	P	25	6					P		
Colchester	Butt Road	Total	607	443	722	54	P	P	28	13		P		P	P		
Colchester	Culver St	60–150	626	579	778	10	P		37	45		P					Luff 1993
		60–225	314	281	166	6	P	P	6	11		P					
		75–300	416	432	782		P		13	15		P					
		100–350	192	127	184	1	P		4	3		P					
		150–400+	781	567	734	17	P	P	39	53		P					
Colchester	Culver St	Total	2329	1986	2644	34	P	P	99	127		P					
Colchester	Gilberd School	50–110	21	45	28		P			3							Luff 1993
		60–275	500	445	451	5	P		18	49		P					
		110–350	142	96	138	3	P		10	5		P					
Colchester	Gilberd School	Total	663	586	617	8	P		28	57		P					
Colchester	Lion Walk	RB	784	497	458	15	97	2	9	3		4					Luff 1993

Table 2.214 (*cont.*) Mammal bones recovered from Romano-British major towns

Town	Site	Period	Cow	S/G	Pig	Horse	Dog	Cat	Red	Roe	Fal	Hare	Bad	Fox	Bear	Otter	Source
Colchester	Long Wyre St	C1	113	47	80	3	P		2	1		P					Luff 1993
Colchester	Middleborough	RB	113	86	87	9	P	P	6	2		P					Luff 1993
Colchester	All	Total	20010	7484	7075	254			231	230							
Dorchester	Charles St	C1–2	197	410	94	5	3			4							Maltby 1990b
		C3–4	450	646	243	11	14					10					
Dorchester	Wessex Court II	C1–2	281	434	227	5	26	1	3	3							Maltby 1992
		C3–4	120	108	71	5	12		2	1							
	Charles St/ WC II	Total	1048	1598	635	26	55	1	5	8		10					
Dorchester	Colliton Park	C1–2	224	557	36	3	4			2							Hamilton-Dyer 1993b
		C3–4	89	135	16	3	3										
		C4	182	144	48	14	12										
Dorchester	Colliton Park	Total	495	836	100	20	19			2							
Dorchester	Greyhound Yard	60–100	103	241	114	7	5		2			1	1				Maltby 1993
		75–120	2303	2498	1569	52	194	5	11	11		31	3				
		100–200	366	434	278	2	45	6		4		4					
		150–300	1035	1383	946	11	93	1	4	7		19	2				
		250–400	458	420	330	7	69	1	6	2		17	3				
		350–450	1855	1096	822	33	104	18	22	8		53	1				
		400+	565	382	287	19	12	4	10	1		15					
Dorchester	Greyhound Yard	Total	6685	6454	4346	131	522	35	55	33		140	10				
Dorchester	All	Total	8228	8888	5081	177	596	36	60	43		150	10				
Exeter	Goldsmith St	75–100	76	89	75	3	1		1	1		3					Maltby 1979
		100–200	245	311	236	5	7	1		1		13					
		300+	808	375	290	14	13	10	7	6		7	4				
		RB	249	157	67	3						5					
Exeter	Goldsmith St	Total	1378	932	668	25	21	11	8	8		28	4				

Table 2.214 (*cont.*) Mammal bones recovered from Romano-British major towns

Town	Site	Period	Cow	S/G	Pig	Horse	Dog	Cat	Red	Roe	Fal	Hare	Bad	Fox	Bear	Otter	Source
Exeter	Rack St	75–100	754	157	51	57	11		2	4							Maltby 1979
		100–200	31	24	5					1							
		100–300	44	13	7												
		200–300	25	8	3		1										
		300+	66	33	21							1					
Exeter	Rack St	Total	920	235	87	57	12		2	5		1					
Exeter	St Mary Major	75–100	143	172	124		7		11	3		4		2			Maltby 1979
		100–200	126	169	148	14	2		1	1		3					
		200–300	163	107	143		1	1	2	3		7	A				
		300+	140	43	85	8	12		1			3					
Exeter	St Mary Major	Total	572	491	500	22	22	1	15	7		17	A	2			
Exeter	Trickhay St	75–100	33	37	37					4							Maltby 1979
		75–150	11	6	14												
Exeter	Trickhay St cont'd	100–200	102	68	41		1		4	1							
		200–300	35	37	33				1			4					
		300+	589	97	138	17	4	1				1					
Exeter	Trickhay St	Total	770	245	263	17	5	1	5	5		5					
Exeter	All	Total	2870	1658	1255	104	55	12	25	20		46	4	2			
Gloucester	East Gate	C1–4	399	158	80	16	17										Maltby 1983
		C4	560	284	136	17	93	1		2							
Gloucester	East Gate	Total	959	442	216	33	110	1		2							
Gloucester	Eastgate St	C2	1094	1													Levine 1986
Gloucester	1 Westgate St	C3–4	217	30	16	4	1		1								Maltby 1979b
Gloucester	All	Total	2270	473	232	37	111	1	1	2							
Leicester	Bath Lane	C2–3	80	92	80	2	2					4					Brown 1985

Table 2.214 (*cont.*) Mammal bones recovered from Romano-British major towns

Town	Site	Period	Cow	S/G	Pig	Horse	Dog	Cat	Red	Roe	Fal	Hare	Bad	Fox	Bear	Otter	Source
Leicester	Blackfriars St	LC1–2	159	128	82	2	12	6				2					Brown 1985
Leicester	Bonners Lane	C2–4	160	58	13	19	5	4									Baxter 2004
Leicester	Causeway Lane	50–200	1983	1491	675	45	38	2	1	4		8					Gidney 1999
		200–400	1291	862	558	110	82	3	16	15		25					
Leicester	Causeway Lane	Total	3274	2353	1233	155	120	5	17	19		33					
Leicester	Newarke St	C2–4	154	81	39	8	7					1					Baxter 1996
Leicester	The Shires	C1–E2	80	56	27	3											Gidney 1991
		C2	669	469	333	8	43	1	5	1		7					
		C3–4	69	128	34	4	4	2				1					
Leicester	The Shires	Total	818	653	394	15	47	3	5	1		8					
Leicester	West Bridge	C1	134	164	73	10	1					1					Goudwell 1994
		C2	118	33	34	1	1		1	1		1		A			
		C4	89	96	55				1			1					
Leicester	West Bridge	Total	341	293	162	11	2		2	1		3					
Leicester	All	Total	4986	3658	2003	212	195	18	24	21		51		A			
Lincoln	Lower City Defences	C1–4	1849	382	175	65	140	5	7	2		4					Scott 1999
Lincoln	Waterfront +	C1	221	89	52	26	38										Dobney et al 1996
	Wigford +	C2	165	43	25	9	1		1								
	Lower Town +	C3	248	188	63	17	7	5		2		3					
	Upper Town	C4	4193	711	373	20	55	5	13			3	1				
Lincoln	Waterfront +	Total	4827	1031	513	72	101	10	14	2		6	1				
Lincoln	All	Total	6676	1413	688	137	241	15	21	4		10	1				
London	Aldgate (Pit 15)	L1–E2	175	7	7												Watson 1973
London	Baltic House	50–250	21	12	23	18	26		4	3							Reilly 2002
		250–400	186	24	74	58	7		3	3		3					

Table 2.214 (*cont.*) Mammal bones recovered from Romano-British major towns

Town	Site	Period	Cow	S/G	Pig	Horse	Dog	Cat	Red	Roe	Fal	Hare	Bad	Fox	Bear	Otter	Source
London	Baltic House	Total	207	36	97	76	33		7	6		3					
London	Billingsgate	C1–2	1272	316	636	24	39	1	8	14		9					Armitage 1980
London	Cannon St	C1–4	219	77	225		137	2	1	2							Pipe 2002
London	E Cemetery (D+F)	C1–4	498	85	66	276	28	3	2	1		1					Reilly 2000
London	Leadenhall Court	C1	P	P	P	P	P		P	P		P					West 1993
London	Mithraeum	C2–4	98	28	58		7	2	1			1					Macready & Sidell 1998
London	Walbrook	C2–4	896	51	21	4	7	5									C-Brock & Armitage 1977
London	All	Total	2867	515	1044	104	223	10	17	22	0	13					
Southwark	199 Borough H St	C1–4	1413	754	803	2	10	1	3	5		6					Locker 1988
Southwark	Borough H St	C1–2	2967	215	375	7	7		2	14							Ainsley 2002
Southwark	Fennings Wharf	C1–4	45	29	48					2							Rielly 2001
Southwark	London Bridge 95	C1–2	632	157	287	20	10	34	11	9		14					Ainsley 2002
Southwark	NW Suburb	C1–2	P	P	P	P	P	P	P	P	P	P	P		P?		Pipe 2003
Southwark	Winchester Palace	C1–2	81	63	206	2	28	1	18	16		30					Reilly 2005
		C3–4	77	12	59	2	120	2	2			5					
Southwark	Winchester Palace	Total	158	75	265	4	148	3	20	16		35					
Southwark	All	Total	5215	1230	1778	33	175	38	36	46	P	55	P		P?		
St Albans	1955–61	C1–4	118	37	36	14	15	11	5	1							Wilson 1984
St Albans	Folly Lane P3–7	C1-4	2201	603	209	285	262	1	14	5		1		1			Locker 1999
St Albans	All	Total	2319	640	245	299	277	12	19	6		1		1			

Table 2.214 (*cont.*) Mammal bones recovered from Romano-British major towns

Town	Site	Period	Cow	S/G	Pig	Horse	Dog	Cat	Red	Roe	Fal	Hare	Bad	Fox	Bear	Otter	Source
Silchester	Basilica	50–85	586	331	314	34	1		2								Grant 2000
		85–125/50	591	390	349	14	4		3	1							
		125–50	414	374	303	7	8	2	1	1		10		4			
		250–400	906	1479	805	21	15		3	2		27					
Silchester	Basilica	Total	2497	2574	1771	76	28	2	9	4		37		4			
Silchester	South Gate	50–85	273	109	32	1	3										Maltby 1984
		85–150	201	91	70	6	9		3	2							
		C4	164	73	91	6	2		7	1		1					
Silchester	South Gate	Total	638	273	193	13	14		10	3		1					
Silchester	Manor Farm	RB	109	66	38	2											Maltby 1984
Silchester	All	Total	3244	2913	2002	91	42	2	19	7		38		4			
Winchester	Crowder Terrace	C2	266	36	6	72	2			1							Coy/Bradfield
	Crowder Terrace	C3–4	20	80	8	7											this volume
	Oram's Arbour	C1–3	40	88	43	74	9										
	Oram's Arbour	C3–4	116	105	31	46	21			1							
Winchester	Western Suburb	Total	442	309	88	199	32			2							
Winchester	Staple Gardens	C1–2	92	84	60	4	7					1					Maltby 1986a
		C3–4	523	373	222	34	26		4	1						1	
Winchester	Staple Gardens	Total	615	457	282	38	33		4	1						1	
Winchester	Victoria Rd G2	C1–2	989	73	32	103	43										Pfeiffer this volume
	Victoria Rd G4	C1–2	312	431	232	26	16		3	1		2					
	Victoria Rd East	C2–4	4716	2945	1020	420	122	2	24	5		9					Maltby this volume
Winchester	Victoria Rd West	C2–4	878	864	400	105	30	2	13	2		8					
cont'd	Hyde Abbey	C2–4	602	776	284	82	10	2	1	1	1	2					
Winchester	Northern Suburb	Total	7497	5089	1968	736	221	6	41	9	1	21					
Winchester	JS Crown Hotel	C2–4	137	159	42	11	1	1									
	27 Jewry St	C2–4	171	123	45	11											
	Henly's Garage	C2–4	314	230	141	24	12		4	2		2					
Winchester	Defences	Total	622	512	228	46	13	1	4	2		2					

Table 2.214 (*cont.*) Mammal bones recovered from Romano-British major towns

Town	Site	Period	Cow	S/G	Pig	Horse	Dog	Cat	Red	Roe	Fal	Hare	Bad	Fox	Bear	Otter	Source
Winchester	All	Total	9176	6367	2566	1019	299	7	49	14	1	23				1	
Wroxeter	Basilica (Ph T-W)	C3–5	2729	918	684	7	65	13	15	7		19	3	1			Hammon 2005
Wroxeter	Baths	90–130	325	218	159	1	5		1			13					Meddens 2000
		130–70	474	224	221	1	33		3	2	1	1					
		C3	3428	798	706	5	211		5	4		6					
Wroxeter	Baths	Total	4227	1240	1086	7	249		9	6	1	20					
Wroxeter	All	Total	6956	2158	1770	14	314	13	24	13	1	39	3	1			
York	Tanner Row	C2	384	79	96	6	3		1	7		1					O'Connor 1988
		C2–3	4663	1160	938	27	49	2	9	6		15		6			
		C4	169	45	44	1	3	1									
York	Tanner Row	Total	5216	1284	1078	34	55	3	10	13		16		6			

Key:
Cow = cattle; S/G = sheep/goat; Red = red deer; Roe = roe deer; Bad = badger
P = species present but not quantified by NISP; A = species represented by associated bone groups only
Note: Counts are of NISP or selected bone elements (refer to reports for details) and usually exclude sieved samples

Table 2.215 Percentages of cattle, sheep/goat, and pig from Romano-British major towns

Town	Site	NISP	Cattle	Sheep/G	Pig	Cattle	S/G:P	S:P
Caerwent	Basilica	18618	40	28	32	45=	46	49
Canterbury	Castle	3173	22	40	29	59	54	38=
Chichester	Cattlemarket	9908	59	28	12	22=	70	11=
Cirencester	33 Sheep St	1517	46	36	18	34=	67	17=
Cirencester	Cemetery	1417	82	11	6	6	64	23=
Cirencester	Chester St	3460	87	6	6	3	50	43=
Cirencester	Querns Road	916	41	41	18	43=	70	11=
Cirencester	St Michael's	7157	61	21	17	19=	55	36=
Cirencester	The Beeches	1383	56	24	20	27=	55	36=
Colchester	Balkerne Lane	21707	71	18	11	12	61	28=
Colchester	Butt Road	1772	34	25	41	54	38	51
Colchester	Culver St	6959	33	29	38	55	43	50
Colchester	Gilberd School	1866	36	31	33	50=	49	46
Colchester	Lion Walk	1739	45	29	26	37=	52	42
Colchester	Long Wyre St	240	47	20	33	33	37	52
Colchester	Middleborough	286	40	30	30	45=	50	43=
Dorchester	Charles St/WC II	3281	32	49	19	56=	72	8=
Dorchester	Colliton Park	1431	35	58	7	53	89	1=
Dorchester	Greyhound Yard	17485	38	37	25	47	60	30=
Exeter	Goldsmith St	2978	46	31	22	34=	58	33=
Exeter	Rack St	1242	74	19	7	10	73	6=
Exeter	St Mary Major	1563	37	31	32	48=	50	43=
Exeter	Trickhay St	1278	60	19	21	21	48	47=
Gloucester	1 Westgate St	263	83	11	6	4=	65	22
Gloucester	East Gate	1617	59	27	13	22=	67	17=
Gloucester	Eastgate St	1095	100	0	0	1		
Leicester	Bath Lane	252	32	37	32	56=	53	40
Leicester	Blackfriars St	369	43	35	22	40=	61	28=
Leicester	Bonners Lane	231	69	25	6	13=	82	3
Leicester	Causeway Lane	6860	48	34	18	31=	66	20=
Leicester	Newarke St	274	56	30	14	27=	68	15=
Leicester	The Shires	1865	44	35	21	39	62	26=
Leicester	West Bridge	796	43	37	20	40=	64	23=
Lincoln	Defences	2406	77	16	7	7=	69	13=
Lincoln	Waterfront +	6371	76	16	8	9	67	17=
London	Baltic House	340	61	11	29	19=	27	56
London	Billingsgate	2224	57	14	29	26	33	55
London	Cannon St	521	42	15	43	42	25	57
London	Eastern Cemetery	649	77	13	10	7=	58	33=
London	Walbrook	968	93	5	2	2	71	10
Southwark	199 Borough High St	2970	48	25	27	31=	48	47=
Southwark	Borough High St	3557	83	6	11	4=	36	53
Southwark	London Bridge 95	1076	59	15	27	24	35	54
Southwark	Winchester Palace	498	32	15	53	56=	22	58
Silchester	Basilica	6842	36	38	26	50=	60	30=

Table 2.215 (*cont.*) Percentages of cattle, sheep/goat, and pig from Romano-British major towns

Town	Site	NISP	Cattle	Sheep/G	Pig	Cattle	S/G:P	S:P
Silchester	Manor Farm	213	51	31	18	30	63	25
Silchester	South Gate	1104	58	25	17	25	59	32
St Albans	Folly Lane	3013	73	20	7	11	74	4=
Winchester	Crowder Terrace	416	69	29	3	13=	89	1=
Winchester	Defences	1362	46	38	17	34=	69	13=
Winchester	Hyde Abbey	1662	36	47	17	50=	73	6=
Winchester	Oram's Arbour	423	37	46	17	48=	72	8=
Winchester	Staple Gardens	1354	45	34	21	37=	62	26=
Winchester	Victoria Rd G2–4	2069	63	24	13	17=	66	20=
Winchester	Victoria Rd West	2142	41	40	19	43=	68	15=
Winchester	Victoria Rd East	8681	54	34	12	29	74	4=
Wroxeter	Basilica	4331	63	21	16	17=	57	35
Wroxeter	Baths	6553	65	19	17	16	53	41
York	Tanner Row	7578	69	17	14	13=	54	38=

Key:
%S/G:P = percentage sheep/goat of total sheep/goat and pig
S:P = sheep/goat NISP expressed as a percentage of total sheep/goat and pig

Note: Data derived from Table 2.214; NISPs = total cattle, sheep/goat, and pig (<200 excluded)

centages of cattle and pig compared with other types of contemporary settlement. In a sample of 50 urban assemblages, the percentages of cattle, sheep/goat, and pig averaged 54%, 27%, and 20% respectively (King 1999). A high degree of variability is evident, however, as demonstrated in the standard deviations published by King. These convert into coefficients of variation of 34.6%, 52.0%, and 50.0% for cattle, sheep/goat, and pig respectively.

Table 2.215 provides supporting evidence for King's results. Counts have been amalgamated by sites within towns (thereby ignoring any chronological variations in this instance). From a sample of 59 sites from sixteen towns, cattle provided between 22% and 100% of the total of cattle, sheep/goat, and pig elements counted. The average percentage from the 59 samples is 54.4%, almost identical to King's (1999) results. However, it also confirms the high degree of variability (sd 17.7%; cv 32.5%) that can be found in species representation. Significantly, all but one (Goodman's Yard, London) of the reports of the fifteen assemblages with the highest percentages of cattle bones (69% and above) explicitly notes the presence of substantial deposits derived from specialist large-scale processing of cattle (see also Table 2.226). It is clear that cattle representation is affected significantly when excavations uncover areas where the waste from large-scale primary butchery or from subsequent marrow processing, horn working, or bone working has been deposited. It is therefore not surprising that the highest percentage of cattle (69%) recovered from sites in Winchester comes from Crowder Terrace in the western suburb where a substantial deposit of bone working waste was recovered (Section 3.1). Both the earlier Roman (Section 2.1) and later Roman assemblages from Victoria Road East also include some large dumps of specialist waste accounting for higher cattle percentages (63% and 54% respectively). Cattle percentages from other Winchester sites fall below 50%, with the lowest percentage obtained from Hyde Abbey (36%). The variation of cattle percentages evident in Winchester is typical of other Romano-British towns, for example in London, Silchester, Cirencester, Colchester, and Exeter (Table 2.215). If the assemblages are split further by phase, even more variation is evident (Table 2.216).

King (1984; 1999) has argued that beef consumption tended to become more important in the later Romano-British period. Although this may be true when one considers the whole range of military, urban, and rural sites, the evidence from the urban assemblages considered here does not show a very consistent pattern. Table 2.216 shows the percentages of cattle, sheep/goat, and pig from 28 sites in thirteen towns where assemblages from different periods have been compared. Although cattle percentages are at their highest in the latest phases of seventeen multi-period sites, this is not the case in eleven other urban assemblages. In several cases, the increase in the cattle percentage simply reflects the presence of large dumps of specialist waste rather than a consistent chronological trend.

Therefore, Winchester is typical of other Romano-British towns in that it has provided evidence for the high importance of beef production, which resulted in the deposition of large amounts of specialist waste in some areas of the town or its suburbs. There is no clear evidence that beef production became more important in the later Roman period. Percentages of cattle bones

Table 2.216 Percentages of cattle, sheep/goat, and pig from Romano-British major towns; diachronic comparisons by site

Town	Site	Period	NISP	Cattle	Sheep/G	Pig	S:P
Canterbury	Castle	60–90	1032	21	40	39	58
		70–90	1003	19	48	32	60
		50–150	707	28	39	34	53
		150–400	431	45	25	30	46
Chichester	Cattlemarket	C1	500	65	24	10	70
		C1–2	2797	63	26	11	71
		C2–3	1318	60	28	12	71
		C3–4	1277	58	26	16	61
		C4–5	4016	56	31	12	72
Cirencester	33 Sheep St	C1–2	937	45	37	17	68
		C2–3	228	43	41	16	72
		C3–4	352	48	30	21	59
Cirencester	Cemetery	C2–3	975	81	13	6	69
		C3–4	442	86	7	7	51
Cirencester	Chester St	C1–-2	352	43	30	27	53
		C3–4	3108	92	4	4	49
Cirencester	Querns Road	C2	408	40	41	19	68
		C3–4	508	43	41	17	71
Cirencester	St Michael's	C1–2	2958	76	12	11	52
		C3	2103	50	29	21	58
		C4	2096	51	26	23	54
Colchester	Balkerne Lane	60–150	5549	63	24	13	64
		100–300	7943	86	9	6	61
		150–400+	8215	62	2	16	59
Colchester	Butt Road	C2–320	212	30	23	48	32
		320–400+	1359	35	26	39	40
Colchester	Culver St	60–150	1983	32	29	39	43
		60–225	761	41	37	22	63
		75–300	1630	26	27	48	36
		100–350	503	38	25	37	41
		150–400+	2082	38	27	35	44
Colchester	Gilberd School	60–275	1396	36	32	32	50
		110–350	376	38	26	37	41
Dorchester	Charles St/WC II	C1–2	1642	29	51	20	72
		C3–4	1638	35	46	19	71
Dorchester	Colliton Park	C1–2	817	27	68	4	94
		C3–4	240	37	56	7	89
		C4	374	49	39	13	71
Dorchester	Greyhound Yard	60–100	458	22	53	25	78
		75–120	6370	36	39	25	61
		100–200	1078	34	40	26	61
		150–300	3364	31	41	28	59
		250–400	1208	38	35	27	56
		350–450	3773	49	29	22	57
		400+	1234	47	31	23	57

Table 2.216 (*cont.*) Percentages of cattle, sheep/goat, and pig from Romano-British major towns; diachronic comparisons by site

Town	Site	Period	NISP	Cattle	Sheep/G	Pig	S:P
Exeter	Goldsmith St	75–100	240	32	37	31	54
		100–200	792	31	39	30	57
		300+	1473	55	25	20	56
Exeter	St Mary Major	75–100	439	33	39	28	58
		100–200	443	28	38	33	53
		200–300	413	39	26	35	43
		300+	268	52	16	32	34
Exeter	Trickhay St	100–200	211	48	32	19	62
		300+	824	71	12	17	41
Gloucester	East Gate	C1–4	637	63	25	13	66
		C4	980	57	29	14	68
Leicester	Causeway Lane	50–200	4149	48	36	16	69
		200–400	2711	48	32	21	61
Leicester	West Bridge	C1	371	36	44	20	69
		C4	240	37	40	23	64
Lincoln	Waterfront +	C1	362	61	25	14	63
		C2	233	71	18	11	63
		C3	499	50	38	13	75
		C4	5277	79	13	7	66
Southwark	Winchester Palace	C1–2	350	23	18	59	23
		C3–4	148	52	8	40	17
Silchester	Basilica	50–85	1231	48	27	26	51
		85–125/50	1330	44	29	26	53
		125–50	1091	38	34	28	55
		250–400	3190	28	46	25	65
Silchester	South Gate	50–85	414	66	26	8	77
		85–150	362	56	25	19	57
		C4	328	50	22	28	45
Winchester	Staple Gardens	C1–2	236	39	36	25	58
		C3–4	1118	47	33	20	63
Winchester	Victoria Rd G2–G4	C1–2	2069	63	24	13	66
	Victoria Rd E and W	C2–4	10823	52	35	13	72
Wroxeter	Baths	90–130	702	46	31	23	58
		130–70	919	52	24	24	50
		C3	4932	70	16	14	53
York	Tanner Row	C2	559	69	14	17	45
		C2–3	6761	69	17	14	55
		C4	258	56	17	17	51

Key:
S:P = sheep/goat NISP expressed as a percentage of total sheep/goat and pig

Note: Excludes NISPs of <200 cattle, sheep/goat, and pig

Table 2.217 Specific identifications of sheep and goat from Romano-British major towns

Town	Site	NISP Sheep	NISP Goat	% Goat
Caerwent	Basilica	545	51	8.6
Chichester	Cattlemarket	455	23	4.8
Cirencester	Chester St	33	1	2.9
Cirencester	St Michael's	188	2	1.1
Colchester	All	60	6	9.1
Dorchester	Greyhound Yard	1269	34	2.6
Leicester	Causeway Lane	43	1	2.3
Leicester	The Shires	230	1	0.4
Lincoln	Waterfront +	167	5	2.9
London	Baltic House	9	0	0.0
London	Billingsgate	9	1	10.0
London	Cannon St	13	0	0.0
Southwark	Borough High St	33	0	0.0
Southwark	London Bridge 95	33	2	5.7
Southwark	Winchester Palace	13	1	7.1
Silchester	South Gate	34	1	2.9
Winchester	Defences	81	4	4.7
Winchester	Hyde Abbey	74	1	1.3
Winchester	Staple Gardens	87	10	10.3
Winchester	Victoria Rd West	75	4	5.1
Winchester	Victoria Rd East	377	16	4.1
Wroxeter	Basilica	291	16	5.2
Wroxeter	Baths	104	1	1.0

decrease in the later Roman Victoria Road deposits but increase in the intra-mural Staple Gardens area (Maltby 1986a). There is also significant intra-site variability in the northern suburb and city defences assemblages. Examination of further assemblages from Roman Winchester is likely to show further variability.

The relative importance of sheep and goat has been discussed by various authors, although species differentiation has been determined on different suites of bones. The low percentages of goat identified compared with sheep in the Winchester northern suburb and defences assemblages are within the range encountered in other towns where such quantification has been attempted (Table 2.217). Apart from samples containing groups of goat horn cores collected for processing, no assemblage in the survey produced more than 10% goat.

Sheep/goat provided an average of 26.2% (sd 11.9%; cd 45.4%) of the total of the cattle, sheep/goat, and pig elements in the 59 samples of more than 200 identified elements surveyed. Pig elements averaged 19.2% (sd 10.9%; cd 56.7%) in the same samples (Table 2.215). The average percentages also bear very close similarities to the results obtained by King (1999), although there is an even greater amount of variability, particularly in the pig percentages.

As discussed in Section 2.2 (p 159), the relative abundance of sheep/goat and pig elements is better compared directly rather than expressing them as percentages of the total cattle, sheep/goat, and pig remains, because of the biasing effects of the large dumps of cattle elements. Although these percentages are included in Tables 2.215–2.216, it is the percentage of sheep/goat from the total sheep/goat and pig in those tables that provides a better guide to their relative abundance. Most of the sites from Winchester have high percentages of sheep/goat compared with other urban assemblages. Indeed, the Crowder Terrace assemblage has the equal lowest percentage of pig to sheep/goat elements in any of the samples in the survey and their abundance in the Victoria Road East assemblage has the equal fourth lowest percentage. All the sites in Winchester are amongst the samples with the highest 26 percentages of sheep/goat (out of 58). This suggests that, despite the evidence for higher percentages of pig in Winchester than on rural Romano-British settlements in the vicinity (Table 2.158), pork consumption may

have been less marked than in many towns. There are certainly significant variations between towns. For example, sites in London and Southwark have consistently produced high percentages of pig elements, which outnumber sheep/goat in seven of the nine sites compared. Pig elements are also consistently well represented in sites from Colchester, whereas they are usually less well represented in sites from Leicester and Lincoln (Table 2.215).

The results suggest there may have been regional variations in the relative amounts of lamb, mutton, pork, and bacon processed and consumed in towns. Whether this reflects regional variations in the availability of sheep and pigs or differences in dietary preferences remains to be investigated further. However, it has been noted in Section 2.2 (p 185) that the abundance of pig tends to be higher in sites located near the centre of towns than on their periphery. Table 2.215 tends to support this, with quite high percentages of pig being found on sites adjacent to the Basilicas in Caerwent, Exeter, and Wroxeter, for example. Notable variations in the relative abundance of sheep/goat and pig have been found between sites from the same town. In a number of cases, including Cirencester, Colchester, Dorchester, Exeter, Leicester, and Winchester, peripheral sites (eg respectively The Cemetery site, Balkerne Lane, Colliton Park, Rack Street, Bonners Lane, and the various suburb and defences sites in Winchester) have lower percentages of pig elements than sites nearer the centre of the towns. There are exceptions to this pattern. High percentages of pig in late Roman deposits from the extra-mural site at Butt Road, Colchester may have been associated with ritual deposition in the cemetery area (Luff 1993). Overall, there is no significant difference between the relative percentages of sheep and pig in the three sites in Silchester compared here, although in the early Roman period, much higher percentages of pig were found near the Basilica than near the South Gate (Table 2.216). The Basilica assemblage in Silchester is also unusual in having a fairly large increase in the percentage of sheep/goat in the later Roman deposits (Grant 2000), although the same trend is seen to a lesser extent in the Victoria Road and Staple Gardens sites in Winchester. Sites in most other towns have tended either to have no significant chronological variations or a tendency to produce higher percentages of pig in later phases (Table 2.216).

The relative abundance of horse (equid) bones on sites in Winchester, Dorchester, Exeter, and York has already been discussed in Section 2.2 (p 205). The survey of 59 urban samples (Table 2.218) confirms that equid bones are often very poorly represented in comparison with cattle and that horseflesh did not make a significant contribution to the diet in these towns. On average, horse contributes 5.3% of the total cattle and horse elements. In only sixteen sites do horses provide more than 5% of the total horse and cattle elements. However, these include all the sites from Winchester, where the evidence for the deposition of horse bones is therefore greater than in most Romano-British urban assemblages. All the suburban Winchester sites described in this volume are ranked in the top eleven for the abundance of horse, with exceptionally high percentages from the western suburb sites (Section 3.1). The use of horse bones as raw material in artefact production accounts for high percentages of horse in the Crowder Terrace site (*ibid*) and in some of the northern suburb deposits (Section 2.2, p 205). The very high percentages of horse (43.5%) from the New Road and Sussex Street sites may reflect the deliberate deposition of horse carcasses in the disused Oram's Arbour ditch.

Elsewhere, high percentages of horse are also usually associated with suburban sites, such as at Rack Street, Exeter (Maltby 1979a); Bonners Lane, Leicester (Baxter 2004); and Butt Road and Middleborough, Colchester (Luff 1993). At Folly Lane, Saint Albans, the percentage of horse bones (11.5%) is perhaps additionally enhanced by ritual deposition of their bones in the vicinity of the temple (Locker 1999; King 2005). Most of the horse bones from the intra-mural site of Baltic House, London (26.9% horse) came from early Roman ditches, which may have been at the periphery of the town at that time (Reilly 2002). Deposition of horse carcasses in peripheral areas of the towns appears to have been common practice.

The numbers of dog bones found in Romano-British urban assemblages are included on Table 2.214, but because it is not always clear in reports whether associated bones have been included or excluded from the counts, no attempt at comparative analysis will be made here. The frequency of occurrence of associated dog bones is discussed below. Similarly, the numbers of cat bones are recorded in Table 2.214 but beyond reiterating the discussion in Section 2.2 (p 218) that they are much less abundant than dogs in most towns, no further analysis is undertaken here.

Red deer, roe deer, and hare bones have been recorded in all the major Romano-British towns apart from the sites in Gloucester where hare has not been identified in the sites compared in this survey (Table 2.214). However, on none of the sites were bones of these species found in large quantities. The highest percentage of red deer expressed as a percentage of the total cattle, sheep/goat, pig, and red deer elements (including antler) was 3.9% at the Winchester Palace site, Southwark, which was associated with a building of high status (Reilly 2005). The second highest percentage (2.1%) is from the Middleborough site in Colchester (Table 2.219). There is slightly more evidence for the exploitation of red deer in Colchester than in other towns (Luff 1993). Only seven of the 55 samples have over 1% red deer and four of these are from Colchester. None of the samples investigated from Winchester has produced more than 0.6% red deer.

Parallel calculations of roe deer percentages from the same sites have produced a very similar picture of low representation of their remains. No site has produced more than 3.1% roe deer (Winchester Palace, Southwark) and only four sites have produced more than 1% roe deer (Table 2.219). It is interesting to note that the Colchester assemblages again tend to produce

Table 2.218 Percentages of cattle and horse from Romano-British major towns

Town	Site	NISP Cow+Hor	% Horse	Rank Horse
Caerwent	Basilica	7567	1.1	47
Canterbury	Castle	825	2.4	29=
Chichester	Cattlemarket	6050	2.9	27
Cirencester	33 Sheep St	707	2.1	34=
Cirencester	Cemetery	1176	0.7	50
Cirencester	Chester St	3031	0.3	53=
Cirencester	Querns Road	404	6.4	14
Cirencester	St Michael's	4415	0.8	48=
Cirencester	The Beeches	806	4.3	19
Colchester	Balkerne Lane	15532	0.8	48=
Colchester	Butt Road	661	8.2	10=
Colchester	Culver St	2363	1.4	44
Colchester	Gilberd School	671	1.2	45=
Colchester	Lion Walk	799	1.9	37=
Colchester	Long Wyre St	116	2.6	28
Colchester	Middleborough	122	7.4	13
Dorchester	Charles St/WC II	1074	2.4	29=
Dorchester	Colliton Park	515	3.9	20
Dorchester	Greyhound Yard	7331	2.1	34=
Exeter	Goldsmith St	1403	1.8	39=
Exeter	Rack St	977	5.8	15=
Exeter	St Mary Major	594	3.7	21
Exeter	Trickhay St	787	2.2	33
Gloucester	1, Westgate St	221	1.8	39=
Gloucester	East Gate	992	3.3	23
Gloucester	Eastgate St	1094	0.0	58=
Leicester	Bath Lane	82	2.4	29=
Leicester	Blackfriars St	161	1.2	45=
Leicester	Bonners Lane	179	10.6	8
Leicester	Causeway Lane	3429	4.5	18
Leicester	Newarke St	162	4.9	17
Leicester	The Shires	833	1.8	39=
Leicester	West Bridge	352	3.1	24=
Lincoln	Defences	1914	3.4	22
Lincoln	Waterfront +	4899	1.5	43
London	Baltic House	283	26.9	3
London	Billingsgate	1296	1.9	37=
London	Cannon St	219	0.0	58=
London	Eastern Cemetery	774	35.6	2
London	Walbrook	900	0.4	52
Southwark	199 Borough High St	1415	0.1	57
Southwark	Borough High St	2974	0.2	55=
Southwark	London Bridge 95	652	3.1	24=
Southwark	Winchester Palce	162	2.4	29=
Silchester	Basilica	2573	3.0	26
Silchester	Manor Farm	111	1.8	39=
Silchester	South Gate	651	2.0	36
St Albans	Folly Lane	2486	11.5	6
Winchester	Crowder Terrace	365	21.6	4
Winchester	Defences	558	8.2	10=
Winchester	Hyde Abbey	684	12.0	5
Winchester	Oram's Arbour	276	43.5	1
Winchester	Staple Gardens	653	5.8	15=
Winchester	Victoria Rd G2–4	1430	9.0	9
Winchester	Victoria Rd West	983	10.7	7
Winchester	Victoria Rd East	5136	8.2	10=
Wroxeter	Basilica	2736	0.3	53=
Wroxeter	Baths	4234	0.2	55=
York	Tanner Row	5250	0.6	51

Note: Data derived from Table 2.214

Table 2.219 Percentages of red deer, roe deer, and hare from Romano-British major towns

Town	Site	NISP C+S/G+P	NISP Red	% Red	NISP Roe	% Roe	NISP Hare	% Hare
Caerwent	Basilica	18618	50	0.3	49	0.3	140	0.7
Canterbury	Castle	3173	5	0.2	5	0.2	2	0.1
Chichester	Cattlemarket	9908	20	0.2	9	0.1	6	0.1
Cirencester	33 Sheep St	1517	8	0.5	4	0.3	1	0.1
Cirencester	Cemetery	1417	3	0.2	0	0.0	0	0.0
Cirencester	Chester St	3460	0	0.0	2	0.1	1	0.0
Cirencester	Querns Road	916	4	0.4	9	1.0	4	0.4
Cirencester	St Michael's	7157	8	0.1	4	0.1	13	0.2
Cirencester	The Beeches	1383	12	0.9	0	0.0	8	0.6
Colchester	Balkerne Lane	21707	59	0.3	27	0.1	P	
Colchester	Butt Road	1772	28	1.6	13	0.7	P	
Colchester	Culver St	6959	99	1.4	127	1.8	P	
Colchester	Gilberd School	1866	28	1.5	57	3.0	P	
Colchester	Lion Walk	1739	9	0.5	3	0.2	4	0.2
Colchester	Long Wyre St	240	2	0.8	1	0.4	P	
Colchester	Middleborough	286	6	2.1	2	0.7	P	
Dorchester	Charles St/WC II	3281	5	0.2	8	0.2	10	0.3
Dorchester	Colliton Park	1431	0	0.0	2	0.1	0	0.0
Dorchester	Greyhound Yard	17485	55	0.3	33	0.2	140	0.8
Exeter	Goldsmith St	2978	8	0.3	8	0.3	28	0.9
Exeter	Rack St	1242	2	0.2	5	0.4	1	0.1
Exeter	St Mary Major	1563	15	1.0	7	0.4	17	1.1
Exeter	Trickhay St	1278	5	0.4	5	0.4	5	0.4
Gloucester	East Gate	1617	0	0.0	2	0.1	0	0.0
Gloucester	Eastgate St	1095	0	0.0	0	0.0	0	0.0
Gloucester	1, Westgate St	263	1	0.4	0	0.0	0	0.0
Leicester	Bath Lane	252	0	0.0	0	0.0	4	1.6
Leicester	Blackfriars St	369	0	0.0	0	0.0	2	0.5
Leicester	Bonners Lane	231	0	0.0	0	0.0	0	0.0
Leicester	Causeway Lane	6860	17	0.2	19	0.3	33	0.5
Leicester	Newarke St	274	0	0.0	0	0.0	1	0.4
Leicester	The Shires	1865	5	0.3	1	0.1	8	0.4
Leicester	West Bridge	796	2	0.3	1	0.1	3	0.4
Lincoln	Defences	2406	7	0.3	2	0.1	4	0.2
Lincoln	Waterfront +	6371	14	0.2	2	0.0	6	0.1
London	Baltic House	340	7	2.0	6	1.7	3	0.9
London	Billingsgate	2224	8	0.4	14	0.6	9	0.4
London	Cannon St	521	1	0.2	2	0.4	0	0.0
London	Eastern Cemetery	649	2	0.3	1	0.2	1	0.2
London	Walbrook	968	5	0.5	0	0.0	0	0.0
Southwark	199, Borough High St	2970	3	0.1	5	0.2	6	0.2
Southwark	Borough High St	3557	2	0.1	14	0.4	0	0.0
Southwark	London Bridge 95	1076	11	1.0	9	0.8	14	1.3
Southwark	Winchester Palace	498	20	3.9	16	3.1	35	6.6
St Albans	Folly Lane	3013	14	0.5	5	0.2	1	0.0
Silchester	Basilica	6842	9	0.1	4	0.1	37	0.5
Silchester	Manor Farm	213	0	0.0	0	0.0	0	0.0
Silchester	South Gate	1104	10	0.9	3	0.3	1	0.1
Winchester	Crowder Terrace	416	0	0.0	1	0.2	0	0.0
Winchester	Defences	1362	4	0.3	2	0.1	2	0.1
Winchester	Hyde Abbey	1662	1	0.1	1	0.1	2	0.1
Winchester	Oram's Arbour	423	0	0.0	1	0.2	0	0.0
Winchester	Staple Gardens	1354	4	0.3	1	0.1	0	0.0
Winchester	Victoria Rd G2-4	2069	3	0.1	1	0.0	2	0.1
Winchester	Victoria Rd West	2142	13	0.6	2	0.1	8	0.4
Winchester	Victoria Rd East	8681	24	0.3	5	0.1	9	0.1
Wroxeter	Basilica	4331	15	0.3	7	0.2	19	0.4
Wroxeter	Baths	6553	9	0.1	6	0.1	20	0.3
York	Tanner Row	7578	1	0.0	7	0.1	1	0.0

Key: % Roe = % of roe deer + cattle + sheep/goat + pig; % Red = % of red deer + cattle + sheep/goat + pig; % Hare = % of hare + cattle + sheep/goat + pig; P = present

slightly higher percentages of roe deer than those from other towns, indicating a slightly greater consumption of venison there. Similarly, the Winchester Palace and Baltic House sites in Southwark and London have high percentages of both red and roe deer, perhaps indicative of the high status of these sites. Roe deer is, on the other hand, consistently poorly represented in the Winchester assemblages, never rising above 0.2% in the eight sites sampled.

The rare occurrence of fallow deer on Romano-British sites has been discussed in Section 2.2 (p 220). Fallow deer bones have been identified only on three sites surveyed in Table 2.214. These are Market Road, Chichester (Hamilton-Dyer 2004); the NW Suburb, Southwark (Pipe 2003); and Hyde Abbey, Winchester. In addition, fallow deer has been identified in the Baths site at Wroxeter (Meddens 2000). As discussed above there is a possibility that the Hyde Abbey specimen is intrusive and the same may be true of the Chichester specimen (Hamilton-Dyer 2004). However, fallow deer securely dated to the early Roman period have now been identified at nearby Fishbourne (Sykes *et al* 2006).

Although the percentages of hare bones are likely to be affected by poor recovery in hand-collected samples, there is little evidence for extensive exploitation of this species in any Romano-British town. By far the highest percentage (6.6%) is again from Winchester Palace, Southwark, indicating the much greater species diversity there than in other urban assemblages (Reilly 2005). Unfortunately hare remains are not fully quantified in the Colchester publications, so it is difficult to determine whether the slightly higher percentages of deer bones there are also reflected in other wild species. In the 52 other samples, hare percentages of above 1% have been encountered only on three sites, the highest being 1.6% from Bath Lane, Leicester (Brown 1985). The highest percentage from any Winchester site (Victoria Road West) is only 0.4% (Table 2.219).

Other wild mammal species recorded in Romano-British towns are listed in Table 2.214. This list excludes small mammal species, as their presence is largely dependent upon whether sieving has been carried out. The list also does not include wild boar, as most reports do not distinguish between wild boar and domestic pig. The presence of a small number of wild boar bones has been claimed on a few sites including Caerwent (Hambleton and Maltby in prep); Exeter (Maltby 1979a); the Lower City Defences, Lincoln (Scott 1999); Wroxeter (Hammon 2005); and Tanner Row, York (O'Connor 1988). The survey shows the presence of badger bones in very small numbers in hand-collected assemblages on seven sites from six towns. Winchester is one of the towns where they have not been recorded as yet. Fox bones have been specifically identified in samples from Butt Road Colchester; St Mary Major, Exeter; West Bridge, Leicester; Folly Lane, St Albans; Tanner Row, York; and the Basilica sites in Silchester and Wroxeter. Brown bear has been identified at Butt Road, Colchester (Luff 1993) and tentatively in Southwark (Pipe 2003). Bear bones have been identified on a few other Romano-British sites (Yalden 1999; Stallibrass 2002). The Staple Gardens site in Winchester is the only urban site in this survey which has produced bones of otter, although it was also identified in military deposits in Exeter (Maltby 1979a). Not included in Table 2.214 are the occasional records of whale/dolphin bones, which have been recorded at The Shires, Leicester (Gidney 1991) and Winchester Palace, Southwark (Reilly 2005).

Generally, therefore, mammalian species representation in the Winchester assemblages has broad similarities to other large urban complexes in Roman Britain. Although, there is a high degree of intra- and inter-site variability in their relative percentages, all the assemblages are dominated by cattle, sheep/goat, and pig. Wild species are usually present only in small numbers. Species diversity is generally quite low. Calculations of the Simpson's Diversity Index (d) on some of the larger samples (based on counts given in Table 2.214) confirmed that the assemblage from Winchester Palace, Southwark was the most diverse (d = 2.05), reflecting higher percentages of wild game species. None of the other assemblages has diversity indices of over 1.77 (Caerwent). Diversity indices in the Winchester samples range between 1.67 (Victoria Road East) and 1.77 (Victoria Road West). Assemblages with very high levels of cattle have the lowest diversity indices. For example, the Borough High Street, Southwark assemblage has a diversity index of only 1.20.

Bird representation

Table 2.220 lists the categories of birds recorded in assemblages from sites in major Romano-British towns. Table 2.222 provides a list of urban sites where more detailed identifications to species have been made within particular avian groups. Galliformes, consisting primarily of domestic fowl, where specifically identified, dominate most of the samples. In 34 samples of >50 bird bones, the percentage of Galliformes ranged between 48% and 97%, with an average of 72%. The high percentage (96%) from the London Mithraeum probably reflects the ritual deposition of domestic fowl bones at the temple (Macready and Sidell 1998; King 2005). The lowest percentage was obtained from the Hyde Abbey site but the percentage of domestic fowl here was depressed by the inclusion of two partial raven skeletons. Generally, the high incidence of domestic fowl in the Winchester avian assemblages is typical of Romano-British urban samples.

Comparisons of the relative abundance of domestic fowl, sheep/goat, and pig elements have been used by Maltby (1997) to demonstrate that there are significant variations in the relative abundance of bones of these species in assemblages from different types of settlement in Roman Britain. As noted in Section 2.2 (p 223), the samples from the northern suburb produced some of the lowest percentages of domestic fowl encountered on urban sites surveyed in that previous study. The current survey has increased the sample to 48 sites

from fifteen major Romano-British towns (Table 2.221). In these samples, domestic fowl contribute 0.3% to 69% of the total domestic fowl, sheep/goat, and pig elements, with an average of 11.4%. The highest percentage is associated with the London Mithraeum, again reflecting the ritual deposition of domestic fowl bones at the temple. Relatively high percentages (>14%) of domestic fowl are represented in a number of samples from London, East Gate; Gloucester; the Defences sites in Lincoln; and Tanner Row, York. High percentages of domestic fowl also appear to have been found at Colchester, although not all species of bird have been fully quantified in the published report (Luff 1993), making direct comparisons with the other sites problematic. It is possible that the high incidence of domestic fowl bones in *colonia* may reflect a slightly greater consumption of chickens in these settlements. However, other factors, including greater retrieval efficiency and better preservation of bird bones on these sites, cannot be discounted at this stage. The survey also supports the observations noted in Section 2.2 (p 223), that intra-mural sites have tended to produce higher percentages of domestic fowl than sites located nearer the periphery of the major towns. None of the Winchester sites provided more than 5% domestic fowl and the survey confirms that the inhabitants may have exploited relatively fewer chickens than those in a number of other towns.

Other species of galliformes (pheasant and black grouse) have been positively identified only on a few urban sites (Table 2.222). Although not all analyses have attempted to differentiate these from domestic fowl, it seems unlikely that they were commonly exploited.

Albarella (2005) has noted that duck bones tend to be found more frequently than goose bones on Romano-British sites. This is confirmed by the current survey of major urban sites. Comparing the number of goose and large (mallard/domestic) duck bones in samples of over ten bones of these species, ducks outnumber geese in 19 out of 26 cases (Table 2.220), although the Tanner Street, York (O'Connor 1988) and Silchester Basilica assemblages (Serjeantson 2000) are notable exceptions. Albarella (2005) has also argued that there is no convincing evidence that domesticated ducks were present in Roman Britain. Percentages of large duck bones in 33 samples of over 50 bird bones, range between 2% and 27% with a mean of 8%. Several sites from Colchester (Luff 1993) and Lincoln (Dobney *et al* 1996) have produced relatively high percentages of duck bones, although the figures from Colchester are somewhat inflated because some wild species were not quantified. Percentages of duck in the larger samples from Winchester range between 3% and 12% of all the bird bones (including articulated remains) (Table 2.220).

Geese also may not have been domesticated in Roman Britain (Albarella 2005). In the same samples as noted above for large ducks, percentages of goose bones range between 0% and 33%, but with a lower average of 6%. The survey shows a lot of variation within towns, particularly from sites in London and Southwark. In addition to the high percentages of goose bones noted above in York and Silchester, some sites in Lincoln and Leicester have produced over 10% goose bones. On the other hand, goose bones are poorly represented in some of the sites further west such as Exeter, Caerwent, Wroxeter, and Dorchester. None of the assemblages in Winchester has included more than 5% goose bones (Table 2.220). Although most of the goose bones have either been identified as greylag (and/or domestic) goose, or assumed to be of that species, occasional identifications of other species of geese have been claimed on a few sites (Table 2.222).

Records of other duck species have been noted fairly frequently. Although handicapped by the problems of identification, ducks smaller than mallard but larger than teal have been specifically noted in seventeen of the large urban assemblages in this survey (Table 2.222). They have never formed more than 7% of an urban avian assemblage (Goodman's Yard, London – Locker 1980). They were present in small numbers on most of the Winchester sites investigated. Possible species represented in various sites are given in Table 2.222.

Bones of teal have been positively identified on a wide range of Romano-British sites (Parker 1988). They have been recorded in 21 of the urban assemblages in this survey (Table 2.220). At Caerwent, they outnumber mallard/domestic duck, forming 5% of the bird assemblage (Hambleton and Maltby in prep). Usually, however, as in the case of the Winchester sites, they are found only in small numbers.

Swan bones have been recorded in small numbers on at least eight of the urban sites in the survey (Table 2.220), but have as yet not been identified in any Romano-British deposit in Winchester. Three different species of swan have been identified on various sites (Table 2.204; Parker 1988). Crane bones have been identified on at least eight large urban sites but as yet not in Winchester (Table 2.220).

The most common species of wader recorded in assemblages from large Romano-British towns, both in terms of sites recorded and in numbers of bones identified, is the woodcock. At least 29 sites have woodcock bones and, apart from St Albans and Canterbury, they have been recorded in all of the towns included in the survey. The species formed 11% of the assemblage from the Baths site in Wroxeter (Meddens 2000) and was also quite well represented in Exeter (8% – Maltby 1979a). The average percentage of woodcock bones is 2% in 27 samples of over 50 bird bones (Table 2.220). The percentage of woodcock in sites from Winchester ranged between 0% and 5% and is therefore fairly typical of large urban sites.

Bones of plovers have been found in small numbers in at least seventeen sites (Table 2.220). The sites where more specific identifications have been made are listed in Table 2.222. To date, Crowder Terrace is the only site in Winchester where plover bones have been positively identified (Section 3.1), although a specimen from Victoria Road East was also probably from a plover (Section 2.2, p 226).

Table 2.220 NISP of birds from Romano-British major towns

Town	Site	NISP	Fowl	Goo	Mal	Teal	Duc	Swa	Cra	Wdk	Wad	Plv	Rai	Dov	Par	Cuc	Sea	Pry	Owl	Buz	Rav	Cor	Tur	Pas
Caerwent	Basilica	2561	1269	22	121	135	58		3	99	37	13	25	160			1		1	2	16	168	163	268
Chichester	Cattlemarket (CM)	190	132	10	18					4											10	16		
Chichester	Market Road	3	1	1	1																			
Cirencester	33 Sheep St	77	63		12					1											1			
Cirencester	Cemetery	30	24	3	2																1			
Cirencester	Chester St	49	35	1	1	7	1			3	1													
Cirencester	Querns Road	83	75	2	2					3												1		
Cirencester	St Michael's (SMF)	322	226	18	46	6				7		1	2	1						1	2	1	1	10
Cirencester	The Beeches	6	5	1																				
Colchester	Balkerne Lane	598	474	17	107				other species not quantified															
Colchester	Butt Road	718	697	5	16				other species not quantified															
Colchester	Culver St	1199	939	97	163				other species not quantified															
Colchester	Gilberd School	925	597	222	106				other species not quantified															
Colchester	Lion Walk	379	298	17	64				other species not quantified															
Colchester	Middleborough	70	37	14	19				other species not quantified															
Colchester	All					P	P	P	P	P	P	P	P	P	P			P		P	P	P	P	
Dorchester	Charles St/WC II	207	164	P	43		P			P	P										P	P		
Dorchester	Colliton Park (CP)	43	P		P	P				P				P										P
Dorchester	Greyhound Yard (GY)	2534	1447	30	282	14	139		2	94	4	2	1	83			1	4		11	269	147	3	1
Exeter	All	478	332	9	13	2			2	39	1			7	1	1					54	9	6	2
Gloucester	East Gate (EG)	79	49	6	5					4				1					8		2			4
Gloucester	North Gate	10	9		1																			
Gloucester	1, Westgate St	9	5		1	3																		
Leicester	Bonners Lane		P	P	P																			
Leicester	Causeway Lane (CL)	462	361	30	34	1				18		5		2							7	4		
Leicester	High Street (HS)			P														P				P		
Leicester	Newarke St	4	2	2																				
Leicester	The Shires (TS)	147	107	10	5			1			2	3		2				1			16			
Leicester	West Bridge	48	40	6	1									1										
Lincoln	Defences (D)	122	94	26	P			P		P		P							P		P			
Lincoln	Waterfront + (W+)	202	119	28	44		2		2		2		1								4			
London	Baltic House	33	20	7	6																			
London	Billingsgate (Bi)		P	P	P		P	P		P		P		P										

Town	Site	NISP	Fowl	Goo	Mal	Teal	Duc	Swa	Cra	Wdk	Wad	Plv	Rai	Dov	Par	Cuc	Sea	Pry	Owl	Buz	Rav	Cor	Tur	Pas
London	Cannon St	33	21		4																8			
London	Eastern Cemetery	40	33	3	2				1	1														
London	Goodman's Yard (GY)	55	32	18	1		4																	
London	Leadenhall		P	P	P									P										
London	Mithraeum	201	192	1	4		2			1											1			
London	Walbrook	6	4	1	1																			
Southwark	199 Borough High St	104	101	1	2																			
Southwark	Borough High St	60	36	2	3										1					1			1	16
Southwark	Fennings Wharf	33	27	2	3	1																		
Southwark	London Bridge 95	227	117		13	3		1		1	1			1									6	84
Southwark	NW Suburb (NW)		P	P	P	P	P		P	P		P	P	P				P			P			
Southwark	Winchester Palace (WP)	214	147	20	23	6	4	2	1	4					1					1	4	1		
St Albans	1955–1961	38	28	3	5									1								1		
St Albans	Folly Lane (FL)	44	31	1	3									1							1	6	1	
Silchester	Basilica (B)	893	706	103	27					28		1		11							2	6		9
Silchester	Manor Farm	2	2																					
Silchester	South Gate	26	18		4							1			1						2			
Winchester	Crowder Terrace (WS)	3	2									1												
Winchester	Defences (D)	26	17	1	1					1											4	2		
Winchester	Hyde Abbey (HA)	63	30	3	6	1	2			2		1									18			
Winchester	Oram's Arbour	3	1			1																1		
Winchester	Staple Gardens	26	19	3	1	1	2																	
Winchester	Victoria Rd G2–4	54	36		6						3			1								7	1	
Winchester	Victoria Rd West	57	37	3	7	1	3			3	2	1												
Winchester	Victoria Rd East	265	184	8	8	1	8			6		1						1		19	27	2		
Wroxeter	Basilica (1997) (Ba)		P	P				P	P	P	P	P	P								P	P		
Wroxeter	Basilica (2005) (Ba)	177	157		12	3			3						2									
Wroxeter	Baths (Bth)	200	155	2	4		1			22				2							14			
York	Tanner Row (H)	585	424	108	32	1	6	2	1	1		2		5								3		
York	Tanner Row (WS)	248	198	27	6	1				2		3		1								1		9

Key:
Fowl = galliformes (mainly domestic fowl); Goo = goose (mainly Anser sp); Mal = mallard/domestic duck (Anas platyrhynchos); Teal = teal (Anas crecca); Duc = duck (Anas sp);
Swa = swan (Cygnus sp); Cra = crane (Grus grus); Wdk = woodcock (Scolopax rusticola); Wad = other waders; Plv = plover family (Charadriidae);
Rai = rails (Rallidae); Dov = pigeon family (Columbidae); Par = partridge family; Cuc = cuckoo (Cuculus canorus); Sea = seabird; Pry = bird of prey;
Owl = owl (Strigiformes); Buz = buzzard (Buteo buteo); Rav = raven (Corvus corax); Cor = other corvid (Corvidae); Tur = thrush family (Turdidae); Pas = passerine
H = hand collection; S = sieved

Table 2.221 Percentages of domestic fowl, sheep/goat, and pig from Romano-British major towns

Town	Site	Fowl	S/G	Pig	NISP	% Fowl	%F:S/G	%F:Pig	%S/G:Pig
Caerwent	Basilica	1268	5133	6000	12401	10	20	17	46
Chichester	Cattlemarket	132	2822	1213	4167	3	4	10	70
Cirencester	33 Sheep St	63	550	275	888	7	10	19	67
Cirencester	Cemetery	24	160	89	273	9	13	21	64
Cirencester	Chester St	35	221	218	474	7	14	14	50
Cirencester	Querns Road	75	376	162	613	12	17	32	70
Cirencester	St Michael's	226	1525	1252	3003	8	13	15	55
Cirencester	The Beeches	5	335	277	617	1	1	2	55
Colchester	Balkerne Lane	474	3839	2467	6780	7	11	16	61
Colchester	Butt Road	697	443	722	1862	37	61	49	38
Colchester	Culver St	939	1986	2644	5569	17	32	26	43
Colchester	Gilberd School	597	586	617	1800	33	50	49	49
Colchester	Lion Walk	298	497	458	1253	24	37	39	52
Colchester	Middleborough	37	86	87	210	18	30	30	50
Dorchester	Charles St/WC II	164	1598	635	2397	7	9	21	72
Dorchester	Greyhound Yard	1447	6454	4346	12247	12	18	25	60
Exeter	All	332	1658	1255	3245	10	17	21	57
Gloucester	East Gate	49	158	80	287	17	24	38	66
Leicester	Causeway Lane	361	2353	1233	3947	9	13	23	66
Leicester	Newarke St	2	81	39	122	2	2	5	68
Leicester	The Shires	107	2592	1352	4051	3	4	7	66
Lincoln	Defences	94	382	175	651	14	20	35	69
Lincoln	Waterfront +	119	1031	513	1663	7	10	19	67
London	Baltic House	20	36	97	153	13	36	17	27
London	Cannon St	21	77	225	323	7	21	9	25
London	Eastern Cemetery	33	85	66	184	18	28	33	56
London	Goodman's Yard	32	51	109	192	17	39	23	32
London	Mithraeum	192	28	58	278	69	87	77	33
Southwark	199 Borough High St	101	754	803	1658	6	12	11	48
Southwark	Borough High St	36	215	375	626	6	14	9	36
Southwark	Fennings Wharf	27	29	48	104	26	48	36	38
Southwark	London Bridge 95	117	157	287	561	21	43	29	35
Southwark	Winchester Palace	147	186	335	668	22	44	30	36
St Albans	Folly Lane	31	603	209	843	4	5	13	74
Silchester	Basilica	706	2574	1771	5051	14	22	29	59
Silchester	Manor Farm	2	66	38	106	2	3	5	63
Silchester	South Gate	18	273	193	484	4	6	9	59
Winchester	Crowder Terrace	2	116	14	132	2	2	13	89
Winchester	Defences	17	512	228	757	2	3	7	69
Winchester	Hyde Abbey	30	776	284	1090	3	4	10	73
Winchester	Oram's Arbour	1	193	74	268	0	1	1	72
Winchester	Staple Gardens	19	457	282	758	3	4	6	62
Winchester	Victoria Rd G2-4	36	504	264	804	4	7	12	66
Winchester	Victoria Rd West	37	864	400	1301	3	4	8	68
Winchester	Victoria Rd East	184	2945	1020	4149	4	6	15	74
Wroxeter	Basilica	157	918	684	1759	9	15	19	57
Wroxeter	Baths	155	4727	2104	6986	2	3	7	69
York	Tanner Row	422	1284	1078	2784	15	25	28	54

Key: NISP = total domestic fowl (galliformes), sheep/goat, and pig; % Fowl = % of domestic fowl of total domestic fowl, sheep/goat, and pig; % F:S/G = % of domestic fowl of total domestic fowl and sheep/goat; % F:Pig = % of domestic fowl of total domestic fowl and pig; %S/G:Pig = % of sheep/goat of total sheep/goat and pig

Identification of wader bones to species is difficult because of close skeletal similarities between some species and the limitations of most comparative collections. Table 2.222 lists those sites where further identifications have been attempted. Winchester is one of only two large urban sites in the survey where heron has been identified, although it has also been recorded occasionally on other sites in Roman London (Parker 1988). The common snipe has been recorded in four major towns including Winchester (Table 2.222). The curlew is the most common wader species that has, as yet, not been identified in Roman Winchester. Similarly, no species of rail has been recorded from Winchester sites, although they have been found in small numbers on a number of other large urban sites (Tables 2.220 and 2.222).

The only bone of the pigeon family recovered by normal excavation methods in Winchester comes from early Roman deposits at Victoria Road (Section 2.1), although a bone was also recovered in a sieved sample (not listed in Table 2.220) from later Roman deposits from Victoria Road East. As discussed in Section 2.2 (p 226), pigeon bones were quite common in the assemblage from Greyhound Yard, Dorchester, where they provided 3% of the bird assemblage (Maltby 1993). In Caerwent, they formed 6% of the bird bone assemblage (Hambleton and Maltby in prep). They have been found in a number of other urban samples but only in small numbers (Table 2.220). More detailed identifications of species of pigeon and dove have been attempted at a few sites (Table 2.222).

Bones of the partridge family have been recorded on at least six sites in the survey of assemblages from large towns (Table 2.220). Only the common partridge has been specifically identified (Table 2.222). No bones of partridge have been recorded on any of the Winchester sites.

The absence of seabirds in the bird bone assemblages from Winchester is not unusual. They have been rarely recorded on Romano-British urban sites (Tables 2.220 and 2.222). Bones of birds of prey are also rare. The possible ritual significance of the sea eagle bones discovered in Winchester, Leicester, and Southwark has been discussed in previous sections of this volume (pp 227 and 247). Red kite and sparrowhawk have both been discovered on a single urban site (Table 2.222). Buzzard bones have been recorded more widely, occurring on at least seven sites including Winchester (Table 2.220). Bones of owl have been found on three sites, in two cases being specifically identified as barn owl (Tables 2.220 and 2.222).

Ravens have been identified in at least 26 samples from Romano-British major towns (Table 2.220) including three from Winchester. Their possible ritual significance in some deposits is discussed elsewhere in this section. Smaller species of corvid are also quite commonly recorded, having being noted in at least 21 assemblages (Table 2.220). Sites where more specific identifications have been made are listed in Table 2.222.

Bones of the thrush family are absent in Winchester apart from in sieved samples (Section 2.2, p 238). The low representation of thrushes and smaller passerines in Table 2.220 is to be expected in samples drawn mainly from hand-collected excavation. More detailed identifications of these species are again given in Table 2.222.

The Winchester bird assemblage is therefore again fairly typical of Romano-British major towns – being dominated by bones of domestic fowl. Several species of duck, goose, woodcock, and other waders appear also to have been consumed but, based on current evidence, not very frequently. Although there are some variations in the particular species present, this pattern seems typical of other urban sites.

Fish representation

As yet, no evidence for the production or import of fish sauces has been found in Roman deposits in Winchester. Evidence for these commodities has been recorded on several sites including London (Bateman and Locker 1982), York (Jones 1998c), Lincoln (Dobney *et al* 1996), and Dorchester (Hamilton-Dyer pers comm).

Detailed analysis of fish bones from Winchester has been restricted to a fairly limited range of samples from Victoria Road East (Section 2.2, pp 238–245). Comparisons can be made of species representation with 26 other urban assemblages, although not all have been retrieved by wet-sieving (Table 2.223). Further comparisons can be made with the data from a wide range of Roman sites surveyed by Locker (2007).

Bones of eel were the most commonly identified in the Victoria Road East sample. Eels have also been the most commonly recorded fish species in sieved samples from a number of other urban assemblages, including Colliton Park, Dorchester (Hamilton-Dyer 1993a); Causeway Lane, Leicester (Nicholson 1999); Fennings Wharf, Southwark (Reilly 2001); and Folly Lane, St Albans (Locker 1999). They were the second most common species represented in the samples from Tanner Row, York (O'Connor 1988); Culver Street, Colchester (Locker 1992); and the Waterfront sites in Lincoln (Dobney *et al* 1996). The abundance of eel in archaeological samples, however, appears to be greatly dependent upon whether sieving has taken place. There are notable absences of eel bones in substantial hand-collected samples from sites in Exeter (Wilkinson 1979) and Caerwent (Hambleton and Maltby in prep), for example. Only one eel bone was found in the hand-collected Greyhound Yard assemblage at Dorchester (Hamilton-Dyer 1993b).

Bones of small flatfish were the second most common species group represented in Winchester. Flatfish bones have also been found in fifteen other sites in the current survey (Table 2.223). They were the most commonly identified in the sample from Culver Street, Colchester (Locker 1992) and were also well represented in the samples from several of the London sites and the Basilica sites in Silchester (Hamilton-Dyer 2000) and Caerwent (Hambleton and Maltby in prep). Where more detailed identifications have been made (Table 2.224), plaice and flounder have been the

Table 2.222 Further identifications of bird species from Romano-British towns

Galliformes (in addition to domestic fowl)	Towns (sites
Pheasant (*Phasianus colchius*)	Caerwent Colchester
Black grouse (*Lyrurus tetrix*)	York (H)
Geese (in addition to domestic/grey lag (*Anser anser*))	
cf Barnacle (*Branta leucopsis*)	Leicester (HS) Lincoln (W+) York (H)
cf Brent (*Branta bernicla*)	Wroxeter (Bth)
cf Pink-footed (*Anser brachyrhynchus*)	York (H)
Ducks (in addition to mallard/domestic duck and teal)	
cf Shelduck (*Tadorna tadorna*)	Lincoln (W+)
cf Wigeon (*Anas penelope*)	Caerwent Cirencester (CS) Colchester York (H)
Wigeon/garganey	Caerwent
cf Gadwall (*Anas strepera*)	York (H)
cf Pochard (*Aythya ferina*)	Lincoln (W+)
cf Smew (*Mergus albellus*)	Lincoln (W+)
cf Goldeneye (*Bucephala clangula*)	London (GY)
cf Shoveler (*Anas clypeata*)	York (H)
Tufted (*Aythya fuligula*)	Colchester York (H)
Swans	
Mute (*Cygnus olor*)	York (H) Wroxeter (Ba)
Bewick's (*Cygnus columbianus*)	York (H)
Whooper (*Cygnus cygnus*)	Lincoln (D)
Plovers	
Golden plover (*Pluvialis apricaria*)	Caerwent Colchester Leicester (CL; TS) Lincoln (D; W+) Winchester (WS) York (H; WS)
Golden/grey plover (*P squatarola*)	Caerwent Colchester London (Bi) Silchester (B; SG) Winchester (HA)
Lapwing (*Vanellus vanellus*)	Caerwent Colchester Leicester (CL) Wroxeter (Ba)
Waders (in addition to crane, plovers, and woodcock)	
Grey heron (*Ardea cinerea*)	Lincoln (D) Winchester (VR West)
Curlew (*Numenius arquata*)	Caerwent Colchester Dorchester (GY) Exeter Wroxeter (Ba)
Whimbrel (*Numenius phaeopus*)	Colchester
Oystercatcher (*Haematopus ostralegus*)	Exeter
Dunlin (*Calidris alpina*)	Colchester
Redshank (*Tringa totanus*)	Caerwent
Bar-tailed godwit (*Limosa lapponica*)	Colchester
Black-tailed godwit (*Limosa limosa*)	Colchester
Godwit (*Limosa* sp)	Caerwent
Common snipe (*Capella gallinago*)	Caerwent Colchester Dorchester (GY) Winchester (NS)
Jack snipe (*Lymnocryptes minimus*)	Caerwent
Rails	
Water rail (*Rallus aquaticus*)	Caerwent Wroxeter (Ba)
Moorhen (*Gallinula chloropus*)	Caerwent Cirencester (SMF)
Coot (*Fulica atra*)	Southwark (NW)
Corncrake (*Crex crex*)	Colchester Dorchester (GY)

Table 2.222 (cont.) Further identifications of bird species from Romano-British towns

Galliformes (in addition to domestic fowl)	Towns (sites
Pigeons and Doves	
Woodpigeon (*Columba palumbus*)	Caerwent Dorchester (GY) Southwark (NW) York (H)
Rock dove/domestic (*Columba livia*)	Caerwent Dorchester (GY) Exeter Silchester (B)
Stock dove (*Columba oenas*)	Exeter Gloucester (EG) York (H)
Rock/stock dove	Colchester
Partridge family	
Partridge (*Perdix perdix*)	Colchester Exeter Southwark (WP) Silchester (SG)
Seabirds	
Auk family (Alcidae)	Caerwent
Shag (*Phalacrocorax aristotelis*)	Dorchester (GY)
Birds of Prey (in addition to buzzard)	
White-tailed eagle (*Haliaeetus albicilla*)	Leicester (HS) Southwark (NW) Winchester (NS)
Red kite (*Milvus milvus*)	Dorchester (GY)
Sparrowhawk (*Accipiter nisus*)	Colchester
Owls	
Barn owl (*Tyto alba*)	Caerwent Gloucester (EG)
Corvids (in addition to raven)	
Rook (*Corvus frugilegus*)	Chichester (CM) Colchester York (H)
Crow (*Corvus corone*)	Caerwent Chichester Colchester York (H)
Rook/crow	Caerwent Cirencester (QR; SMF) Dorchester (GY; WCII) Exeter Leicester (CL) St Albans (FL) Winchester (NS)
Chough (*Pyrrhocorax pyrrhocorax*)	Caerwent
Jay (*Garrulus glandarius*)	Chichester (CM)
Magpie (*Pica pica*)	Caerwent
Jackdaw (*Corvus monedula*)	Chichester (CM) Colchester Dorchester (GY) Exeter Silchester (B) Winchester (D) Wroxeter (Ba) York (WS)
Jackdaw/magpie/jay	Caerwent Dorchester (GY) Southwark (WP)
Thrushes	
Mistle thrush (*Turdus viscivorus*)	Colchester
Blackbird (*Turdus philomelos*)	Caerwent
Thrush (*Turdus merula*)	Caerwent
Redwing (*Turdus iliacus*)	Caerwent Cirencester (SMF) Colchester
Other Passerines and small species	
Starling (*Sturnus vulgaris*)	Caerwent Dorchester (GY) York (WS)
Swallow (*Hirundo rustica*)	Caerwent Cirencester (SMF)
Grey shrike (*Lanius excubitor*)	Colchester
Robin (*Erithacus rubecula*)	Dorchester (GY)
House sparrow (*Passer domesticus*)	York (WS)
Chaffinch (*Fringilla coelebs*)	York (WS)
Greenfinch (*Carduelis chloris*)	York (WS)

Key: York (H) = hand collected samples from Tanner Row
York (WS) = wet-sieved samples from Tanner Row
See Table 2.220 for key to other sites

Table 2.223 Fish bones recovered from Romano-British major towns

Town	Site	Ret	NISP	Car	Herr	Gry	Salm	Sme	Pike	Cyp	Eel	Con
Caerwent	Basilica	H	113		6		41					
Cirencester	St Michael's	H	1				1					
Colchester	Culver St	WS	352		58		2	4		58	58	
Dorchester	Colliton Park	WS	784	P						81	689	
Dorchester	Greyhound Yard	H	528				2				1	10
Exeter	All	H	23				4					1
Gloucester	East Gate	H	5				2					1
Leicester	Bonners Lane	WS	7						1	5		
Leicester	Causeway Lane	WS	484		113		7	1	6	57	224	
Lincoln	Waterfront	WS	329				4		8	150	66	
Lincoln	Waterfront "Garum"	WS			K							
London	Baltic House	WS	60	2	25			3		6	7	
London	Cannon St	WS	54		2					1	3	
London	Goodman's Yard	H	8							1		
London	Peninsular House	WS			K							
London	Leadenhall Court	WS									P	
Southwark	199 Borough HS	WS	54		4			6		10	16	
Southwark	Borough High St	H/WS	17				1			3		
Southwark	Fennings Wharf	WS	276	1	37			12		5	201	
Southwark	London Bridge 95	H/WS	2									
St Albans	Folly Lane	H/WS	121					6		18	94	
Silchester	Basilica	WS	44				1			2		
Silchester	Manor Farm	H	1									
Winchester	Victoria Rd East	WS	132	1	25		3				58	
Wroxeter	Basilica (1997)	DS	29				12		5	1		
York	St Mary Bishophill	WS	5756		5756							
York	Tanner Row	WS	700		27	14	28	56	10	349	105	

Key:
Ret = retrieval; H = hand-collected; WS = wet-seived; DS = dry-sieved
Car = cartilaginous (rays; sharks); Herr = herring family (Clupeidae); Gry = grayling (*Thymallus thymallus*);
Salm = Salmonidae (salmon family); Sme = smelt (*Osmerus eperlanus*); Pike = pike (*Esox lucius*); Cyp = Cyprinidae (carp family);
Eel = comon eel (*Anguilla anguilla*); Con = conger eel (*Conger conger*); Gad = Gadidae (cod family);
Hak = hake (*Merluccius merluccius*); Bur = burbot (*Lota lota*); Stic = three-spined stickleback (*Gasterosteus aculeatus*);
Per = percidae (perch family); Scd = scad (*Trachurus trachurus*); Brm = sea bream (Sparidae); Mul = mullet family (Muglidae);
Bass = bass (*Dicentrachus labrax*); Mac = mackerel (*Scomber scombrus*); Flat = flatfish;
Loa = stone loach (*Noemacheilus barbatulus*); Bul = bullhead (*Cottus gobio*); San = sand eel (Ammodytidae);
Stu = sturgeon (*Acipenser sturio*); Gur = gurnard (Triglidae); Wra = wrasse (Labridae); Drag = dragonet (Callionymiidae)
P = present
K = abundant

Note: Also see Locker (2007) for fish remains from Romano-British sites

Gad	Hak	Bur	Stic	Per	Scd	Brm	Mul	Bass	Mac	Flat	Loa	Bul	Snd	Stu	Gur	Wra	Drag
							6	41		19							
29			19				8		20	95					1		1
						9				3						2	
5					10	46	56	269		23					1	105	
4	5					2		4		1					1	1	
1										1							
				1													
1				23					9	41					2		
				41						13	6	1	40				
													K				
5									6	6							
31										17							
										7							
						P											
			18														
7								5	1								
15										5							
														2			
1										2							
						7	8	20		6							
						1											
1							1		1	42							
				8			1		2								
		3		68	1	6				33							

Table 2.224 Further identifications of fish species from Romano-British towns

Sharks and rays	
Thornback ray (*Raja clavata*)	London (BH)
Dogfish (Scyliorhinidae)	Winchester
Herring Family	
Shad (*Alosa* sp)	Caerwent York (TR)
Herring (*Clupea harengus*)	Colchester Leicester (CL) Lincoln London (PH)
Sprat (*Sprattus sprattus*)	London (PH) Southwark (FW) York (SM)
Salmon Family	
Salmon (*Salmo salar*)	Caerwent Exeter Leicester (CL) Gloucester (EG) Lincoln Silchester York (TR)
Trout (*Salmo trutta*)	Leicester (CL) York (TR)
Cyprinids	
Carp (*Cyprinus carpio*)	Lincoln
Tench (*Tinca tinca*)	Leicester (CL) Lincoln
Barbel (*Barbus barbus*)	London (BH) York (TR)
Common Bream (*Ambramis brama*)	Lincoln London (GY)
Roach (*Rutilus rutilus*)	Lincoln London (CS)
Gudgeon (*Gobio gobio*)	Leicester (CL)
Chub (*Leuciscus cephalus*)	Dorchester (CP) Leicester (CL) York (TR)
Dace (*Leuciscus leuciscus*)	St Albans; Southwark (FW)
Chub/dace (*Leuciscus* sp)	Lincoln York (TR)
Bitterling (*Rhodeus sericeus*)	Lincoln
Perch Family	
Perch (*Perca fluviatalis*)	Leicester (BL; CL) Lincoln Wroxeter York (TR)
Ruffe (*Gymnocephalus cernua*)	Lincoln
Gadoids	
Cod (*Gadus morhua*)	Colchester St Albans Southwark (BHS; FW)
Whiting (*Merlangius merlangus*)	Exeter Southwark (BHS; FW)
Haddock (*Melanogrammus aeglefinus*)	Colchester
Sea bream	
Couch's (*Sparus pagrus*)	Silchester
Mullet family	
Thin-lipped grey (*Liza ramada*)	Caerwent Colchester Wroxeter
Thick-lipped grey (*Chelon labrosus*)	Colchester
Golden grey (*Liza aurata*)	Dorchester (GY) Silchester Winchester
Flatfish	
Plaice (*Pleuronectes platessa*)	Caerwent Colchester London (CS) Silchester
Flounder (*Platichthys flesus*)	Colchester Leicester (CL) Winchester
Sole (*Solea solea*)	London (GY)
Brill (*Scophthalmus rhombus*)	St Albans
Turbot (*Scophthalmus maximus*)	Exeter
Wrasse	
Ballan (*Labrus bergylta*)	Dorchester (CP; GY)

See Table 2.223 for other species and families represented
see Locker (2007) for other Romano-British fish identifications

most commonly identified. Only the latter has been positively identified at Winchester (Section 2.2, p 245). Identifications of other species of flatfish (sole, brill, and turbot) have each only been made on few sites, so their absence from Winchester is not unusual (Table 2.224; Locker 2007).

Bones of the herring family were also quite commonly represented in the Winchester sieved samples. Their recovery again seems largely dependent on excavation techniques, although they were notably absent from both hand-collected and sieved deposits in Dorchester (Hamilton-Dyer 1993a; 1993b). On the other hand, they formed significant components of assemblages from Culver Street, Colchester (Locker 1992); Causeway Lane, Leicester (Nicholson 1999); Baltic House, London (Reilly 2002); and Fennings Wharf, Southwark (Reilly 2001). In addition thousands of their bones have been recovered in each of the probable fish sauce deposits noted above (Table 2.223). In most samples, including Winchester, where it has been possible to identify clupeid bones in more detail, herring has been the species represented. However, shad and sprat have also been identified on a few sites (Table 2.224; Locker 2007).

Turning to the species more infrequently encountered in the Victoria Road East samples (Table 2.223), dogfish has not been recorded on any other Roman urban site considered in this survey and it is possible that this is a medieval intrusion (Section 2.2, p 240). Salmonids are more common, occurring in thirteen samples and forming substantial proportions of the fish assemblages from towns such as Caerwent (Hambleton and Maltby in prep) and Wroxeter (Locker 1997). In most cases, salmon rather than trout have been identified (Table 2.224).

Bones of gadoids have been recorded in eleven of the samples, forming the most common species group identified in the small sample from Cannon Street, London (Pipe 2002). The samples from Fennings Wharf, Southwark (Reilly 2001) and Culver Street, Colchester (Locker 1992) are among others in south-east England where bones of the cod family have been found in significant numbers (Locker 2007). Specimens specifically identified as cod have been recorded on four sites and whiting on three. Colchester is the only town that has specific identifications of haddock bones in this survey (Table 2.224), but it has also been recovered from other sites in York and Southwark (Locker 2007).

Bones from various species of the mullet family have been found on several sites but only formed a substantial proportion of one assemblage collected by hand from Greyhound Yard, Dorchester (Hamilton-Dyer 1993b). The specimen from Winchester has been identified as a golden grey mullet (Section 2.2, p 245), a species also recorded in Dorchester and Silchester (Hamilton-Dyer 1993b, 2000). Thin-lipped grey mullet have been identified in three towns and thick-lipped grey mullet in one (Table 2.224). The appearance of mackerel in Winchester has parallels on five other sites surveyed here (Table 2.223).

Of fish species not recorded thus far in Winchester, perhaps the most notable absentees are the cyprinids. These freshwater species formed the most commonly identified group in the samples from Tanner Street, York (O'Connor 1988) and the Lincoln Waterfront site (Dobney *et al* 1996). They also formed significant proportions of samples from Culver Street, Colchester (Locker 1992); Colliton Park, Dorchester (Hamilton-Dyer 1993a); Folly Lane, St Albans (Locker 1999); and Causeway Lane, Leicester (Nicholson 1999). Altogether they have been recorded on fourteen of the sites surveyed. At least nine different species of this family have been identified on various sites (Table 2.224). Pike is another freshwater species absent from the Winchester assemblage, although it has been recorded on five of the other large urban sites (Table 2.223). Similarly, bones of the perch family have been recorded on five of the surveyed sites (Tables 2.223–2.224).

Other fish species have been recorded only on a few sites, although in some cases these species form substantial proportions of the assemblages from the sites where they have been found. For example, bass have only been recorded on five sites but their bones formed significant percentages of the identified fish bones in samples from Greyhound Yard, Dorchester; Caerwent; Exeter; and Silchester (Table 2.223). Sea bream have only been identified in samples from Exeter (Wilkinson 1979); Dorchester (Hamilton-Dyer 1993a; 1993b); Silchester (Maltby 1984b; Hamilton-Dyer 2000); Leadenhall Court, London (West 1993); and York (O'Connor 1988). Exeter and Colchester are the only towns where hake has been identified in Roman deposits (Wilkinson 1979; Locker 2007) and grayling have only been identified in York (O'Connor 1988). Bones of wrasses have been identified only in Exeter and Dorchester, although they formed a significant proportion of the Greyhound Yard assemblage in the latter town (Hamilton-Dyer 1993b).

A clearer picture of fish exploitation in Winchester must await further studies of sieved samples. However, in many ways the results fit a pattern that seems to demonstrate that apart from some evidence for the import and/or manufacture of fish-based sauces, exploitation of fish was not carried out intensively in Roman Britain. Most large towns have produced fairly limited ranges of species and there are clear regional variations on species representation, presumably reflecting variations in the availability of resources. For example, the inhabitants of York and Lincoln appear to have relied more on local freshwater species than others. Currently it appears that most of the fish eaten in Roman Winchester could have been obtained from the lower reaches of rivers and the Solent. There is little evidence for extensive offshore fishing in most towns.

Specialist processing of cattle carcasses

Detailed descriptions and analysis of cattle bone fragmentation and butchery marks have been set out in Section 2.2 (p 126–142). The prevalent use of the cleaver and the consistency of the butchery marks clearly show that specialist butchers were operating

Table 2.225 Romano-British urban sites with specialist butchery evidence

Town	Site	Split u limb	Blade u limb	Chop ramus	Trim scap	Holed scap	Chop cap	Source
Caerwent	Basilica	11%	18%	x	x	x	x	Hambleton/Maltby in prep
Chichester	Cattlemarket	x	x	x	x			Levitan 1989
Chichester	Market Road		x					Hamilton-Dyer 2004
Cirencester	Cemetery	x						Thawley 1982
Cirencester	Chester St	39%	20%	x	x	x		Maltby 1998a
Colchester	Various		x		x			Luff 1982, 1993
Dorchester	Colliton Park	x	x		x			Hamilton-Dyer 1993
Dorchester	Greyhound Yard	17%	21%	x	x	x	x	Maltby 1993
Exeter	Various	x	x	x	x			Maltby 1979a
Gloucester	East Gate						x	Maltby 1983
Gloucester	Eastgate St	78%	x					Levine 1986
Gloucester	1, Westgate St				x		x	Maltby 1979b
Leicester	Bonners Lane	x						Baxter 2004
Leicester	Clarence St	x						Baxter 2005
Leicester	The Shires				x			Gidney 1991
Lincoln	Waterfront	x		x	x	x	x	Dobney *et al* 1996
Lincoln	Wigford	x			x	x		Dobney *et al* 1996
London	Mithraeum						x	Macready/Sidell 1998
London	Walbrook	x					x	C-Brock/Armitage 1977
Southwark	NW Southwark	Low %	x					Pipe 2003
Southwark	199 Borough HS	x					x	Locker 1988
Southwark	Borough High St		x					Ainsley 2002
Southwark	Winchester Palace		x					Reilly 2005
St Albans	Folly Lane	x						Locker 1999
Silchester	South Gate		x					Maltby 1984b
Winchester	Crowder Terrace	x						Coy/Bradfield this vol
Winchester	Defences	17%	21%	x	x		x	
Winchester	Staple Gardens	15%	28%	x	x		x	Maltby 1986a
Winchester	Hyde Abbey	16%	16%	x	x		x	
Winchester	Victoria Rd G2-4	x	x				x	Pfeiffer this volume
Winchester	Victoria Rd West	18%	18%	x	x		x	
Winchester	Victoria Rd East	29%	20%	x	x		x	
Wroxeter	Basilica	21%	x	x	x	x	x	Hammon 2005
Wroxeter	Baths	x	x	x	x		x	Meddens 2000
York	Blake Street					x		O'Connor 1987
York	Tanner Row	x				x	x	O'Connor 1988

Key:
u limb = humerus, radius, femur, and tibia
Chop ramus = chop marks on or near mandibular condyle
Trim scap = blade marks on scapula spine or body
Chop cap = femur caput chopped through
x = present but not quantified

in Winchester. The use of the cleaver as a multipurpose tool for both the segmentation of the carcass and filletting would have allowed efficient and swift processing of carcasses (Seetah 2006). Comparisons with other urban assemblages are handicapped by inconsistencies in recording of butchery marks by different analysts and also by the lack of explicit descriptions of butchery in many published reports. There have been few attempts at detailed quantification of the frequency of occurrence of the different types of marks. However, Table 2.225 indicates the sites where some of the more common types of processing mark have been noted in published reports. It should be emphasised that the list includes only those cases where the butchery trait is specifically mentioned. It is extremely likely that further investigation would reveal that all the types of marks would be encountered in assemblages from major

towns. The consistency of the butchery marks and their widespread occurrence suggest that specialist butchers using new methods of carcass processing were operating in these towns.

In a few cases it has been possible to compare the frequency of particular butchery marks. Filletting marks on upper limb bones made with the blade of a cleaver are very distinctive specialist butchery marks (see Section 2.2, pp 131–137) that have been recorded on many Roman urban sites (Table 2.225). There are problems in quantifying blade marks, as they do not appear on all areas of the bones, even if they have been processed in this way. Therefore estimating percentages of fragments with such marks is a fairly crude measure. However, it is interesting to note that where frequencies of such marks have been noted, relatively consistent results have been obtained. In several assemblages around 20% of the total number of fragments of radius, humerus, femur, and tibia have been damaged with blade marks. These include assemblages consisting almost entirely of cattle processing waste – Eastgate Street, Gloucester (Levine 1986); Chester Street, Cirencester (Maltby 1998) – and those that include a much wider range of bones – Caerwent (Hambleton and Maltby in prep); Greyhound Yard, Dorchester (Maltby 1993); various Winchester sites. There are some variations in blade mark frequencies on different bones and between sites in Winchester (Fig 37). It is perhaps significant that there is a gradual decrease in the percentage of blade marks the further the assemblage was from the centre of the Roman town. The highest percentage (28%) was found in the Staple Gardens assemblage near the centre of the town. The lowest (16%) was obtained in the assemblage from the Hyde Abbey site, located some distance to the north of the town walls.

There is very little evidence for similar marks on Iron Age sites in Britain (Maltby 1989a). They have been recorded on other types of civilian Romano-British site but, where quantified, never to the same extent as in major urban sites. They are completely or almost entirely absent from some rural settlements. For example, only 3% of the cattle upper limb bones were recorded with blade marks on the native settlement of Alington Avenue on the outskirts of Dorchester (Maltby 2002) compared with 17% on the Greyhound Yard deposits in the Roman town (Table 2.225). Only 0.2% of the upper limb bones from Roman deposits at Owslebury were recorded with blade marks and none were observed in early Romano-British features at Winnall Down in the hinterland of Winchester (Maltby 1989a). They have been noted more frequently in villa and some larger roadside settlements and small towns but unfortunately very few samples have been quantified.

The consistency in the frequency of blade marks on cattle upper limb bones in urban assemblages suggests that perhaps most of the filletted beef consumed in the major towns was obtained from stock processed by specialist butchers. If so, this has implications on how a major proportion of the meat supply in Roman Britain was controlled and redistributed, as discussed by Grant (1989) and Maltby (1989a). Traditional means of beef procurement must have been superseded by the emergence of professional traders who acquired large numbers of animals for processing. The proportion of stock slaughtered and processed by non-specialists must have decreased markedly. Traditionally, the slaughter of large valuable animals and redistribution of their meat (either fresh or preserved by salting and/or smoking) must have been significant events for their owners and their families. The process may often have been associated with significant social or ceremonial occasions (for example, commemorations; marking rites of passage; celebrating seasonal events; gatherings of kin or trading partners etc). The emergence of urban centres with the increased demands for food from their inhabitants must have led not only to a change of emphasis towards wholesale procurement, slaughter, and redistribution by professional traders but also probably severely disrupted social and ritual practices associated with traditional means of meat redistribution. Once established, there is evidence that the processing methods continued throughout the Roman period.

The axial splitting of cattle upper limb bones both for the extraction of marrow and grease and in some cases for bone working has been noted as a frequent occurrence in some of the Winchester northern suburb deposits (Section 2.2, pp 131–137). Split upper limb bones occur commonly in many towns (Table 2.225). However, their relative frequency appears less consistent than for blade marks on the same elements. In the few quantified samples, the percentage of split humeri, radii, femora, and tibiae ranges between 11% and 78%. The highest percentage is derived from a discrete assemblage consisting almost entirely of upper limb bones retrieved from three adjacent pits in Eastgate Street, Gloucester (Levine 1986). This clearly shows that such bones were sometimes accumulated in large numbers for secondary processing. As discussed earlier in this section, there have been various interpretations put forward as to why the bones were split. The under-representation of epiphyses in accumulations from Gloucester and York would suggest that the bones were gathered to extract marrow as a discrete product rather than the bones being used in large-scale broth production (O'Connor 1988; Stokes 2000; Dobney 2001). Dobney (2001) has suggested several possible uses for marrow, including lamp oil, cosmetics, soaps, and medicines, in addition to its value in cooking. Others have suggested that some of the accumulations represent the preparation of quantities of glue.

It should be emphasised that although the vast majority of upper limb bones in urban sites have been broken, it is only a certain proportion that were split axially, indicating they were specially selected for processing. Similarly, groups of cattle mandibles, many with scorch marks, have been observed in Lincoln that were also probably processed for marrow (Dobney *et al* 1996). In some cases split limb bones were reduced further when they were used to produce bone artefacts, for example in Winchester. The lower percentages of split upper limb bones found in some assemblages, for example from the Basilica site in Caerwent (Hambleton and Maltby in prep), probably

Table 2.226 Romano-British urban sites with large accumulations of cattle processing waste

Town	Site	Upper limbs	Scap	Femur caput	Head/ feet	Feet	Head	Horn cores	
Chichester	Cattlemarket				x				Levitan 1989
Cirencester	Cemetery				x				Thawley 1982
Cirencester	Chester St				x				Maltby 1998a
Cirencester	St Michael's				x				Levitan 1990
Colchester	Balkerne Lane	x	x		x				Luff 1982, 1993
Colchester	Culver St				x				Luff 1993
Colchester	Gilberd School		x			x			Luff 1993
Colchester	Long Wyre St		x						Luff 1993
Dorchester	Colliton Park	x							Hamilton-Dyer 1993
Dorchester	Greyhound Yard	x							Maltby 1993
Exeter	Goldsmith St				x				Maltby 1979a
Exeter	Rack St				x				Maltby 1979a
Gloucester	East Gate				x		x		Maltby 1983
Gloucester	Eastgate St	x							Levine 1986
Gloucester	1 Westgate St		x	x					Maltby 1979b
Leicester	Bonners Lane	x							Baxter 2004
Leicester	Causeway Lane				x			x	Gidney 2000
Leicester	Clarence St							x	Baxter 2005
Leicester	Newarke St							x	Baxter 1996
Lincoln	Waterfront	x	x				x		Dobney *et al* 1996
Lincoln	Wigford	x							Dobney *et al* 1996
London	Aldgate				x				Watson 1973
London	Eastern Cemetery					x			Reilly 2000
London	Mithraeum							x	Macready/Sidell 1998
London	Sir John Cass				x				Armitage *et al* 1987
London	Walbrook				x			x	C-Brock/Armitage 1977
Southwark	Borough High St	x			x				Ainsley 2002
Southwark	Winchester Palace							x	Reilly 2005
St Albans	Folly Lane	x							Locker 1999
Silchester	Basilica				x				Grant 2000
Silchester	South Gate				x				Maltby 1984b
Silchester	Manor Farm		x						Maltby 1984b
Winchester	Crowder Terrace		x						Coy/Bradfield this vol
Winchester	Hyde Abbey	x							
Winchester	Victoria Rd G2	x							Pfeiffer this volume
Winchester	Victoria Rd East	x					x	x	
Wroxeter	Basilica		x				x	x	Hammon 2005
Wroxeter	Baths	x	x		x				Meddens 2000
York	Tanner Row	x	x						O'Connor 1988

Key:
Scap = scapulae
x = present

indicate that the waste from these specialist processes had been redeposited and become mixed with other material. The same explanation would account for the variations in assemblages from the Winchester northern suburb and defences (Fig 36; Table 2.225). The highest percentages of split bones were found in deposits of the Victoria Road site where bone working waste was dumped.

Again, provisional comparisons with non-urban assemblages indicate that split upper limb bones are much less likely to be encountered in sites other than in major towns. Such bones are encountered very rarely in Iron Age assemblages and are often absent from assemblages from Romano-British rural sites such as Winnall Down and Owslebury (Maltby 1989a). They have been found in some assemblages from nucleated settlements, but unfortunately none of these have been quantified. It is likely, however, that they will be encountered more rarely than in large urban complexes but further research is required to confirm that impression. They have, however, been observed on a few villa sites including Wortley, Gloucestershire. Here, although found in some numbers, axially split bones appear to be limited to one or two deposits, suggesting that the practice was restricted both in extent and time.

Marrow became more important in the Romano-British period in general, as indicated by the increased fragmentation of metapodials (Maltby 1985a). However, the intensity of marrow production appears to have been greater in large urban settlements, where it appears to have been common practice to accumulate upper limb bones to obtain larger quantities of marrow. This would suggest that most axial splitting was associated with specialist rather than routine carcass processing. This seems to have been carried out more frequently in large towns, where it would have been easier to acquire large numbers of suitable bones. There is some evidence for similar processing in other types of settlement, although noticeably not on non-villa rural settlements. Marrow or grease was therefore processed in bulk commonly in major towns and perhaps fairly frequently in small towns and some roadside settlements. The bones were processed either by specialist butchers themselves or by people who obtained filletted bones from them and processed them using cleavers.

Specialist butchery of cattle scapulae involving trimming of the glenoid area, the blade, and the spine has also been noted in a large number of Romano-British urban assemblages including all those from Winchester (Table 2.225). In several cases, it has been argued that perforations in the blades of these scapulae represent evidence for shoulder joints being hung during preservation by smoking or salting (O'Connor 1988; Dobney *et al* 1996; Dobney 2001). In contrast to most of the other butchery marks found in urban assemblages, trimmed scapulae appear more frequently in other types of settlements. At Owslebury, for example, the most common butchery marks on the cattle scapula consisted of blade marks on the edge of the spine particularly where it rises from neck of the glenoid cavity. A few specimens were also noted at Winnall Down (Table 2.116). This raises the possibility that settlements such as Owslebury were importing cured shoulders of beef on the bone from urban butchers. Longitudinal knife cuts found on the blades of a few of these scapulae at Owslebury suggest that traditional methods of butchery were subsequently carried out to fillet the meat from the bone. An alternative explanation to account for the presence of these distinctively butchered scapulae on rural settlements is that they were processed there in the same manner as in towns.

In addition to the widespread adoption of new carcass processing methods in towns, evidence for large-scale disposal of butchery waste continues to be a feature of many Romano-British urban assemblages. At least 39 of the sites in the current survey have evidence for discrete accumulations of cattle processing waste of some sort (Table 2.226). These dumps have been found both near the centre of towns (for example, Greyhound Yard, Dorchester (Maltby 1993) and Wroxeter (Meddens 2000)), in peripheral areas (for example, Chichester (Levitan 1989) and Winchester) or in both (for example, Colchester (Luff 1982; 1993); Exeter (Maltby 1979a); Cirencester (Maltby 1998); and Silchester (Maltby 1984b; Grant 2000)). There are a few assemblages that have produced large quantities of bones derived from more than one phase of carcass processing, for example at Chester Street, Cirencester (Maltby 1998). However, most consist of discrete accumulations derived from primary processing (heads and feet), joint preparation (femur caput, scapulae) marrow extraction (most of the upper limb bone deposits), bone working (including some of upper limb deposits in Victoria Road, Winchester and the scapulae deposits at Crowder Terrace, Winchester) or horn working. This suggests that discrete stages of processing were often undertaken separately, perhaps in different locations by different specialists.

Comparisons of mortality profiles of domestic animals in major Roman towns

Direct comparisons between mortality profiles of domestic animals are limited by variations in the methods employed by different analysts, the lack of detail in the descriptions within some published reports, and small sample sizes in other cases. This survey will be restricted to comparisons of tooth ageing data. Although many reports include epiphysial fusion data, there are problems of compatibility in the published analyses and in general the method is less reliable than tooth ageing analysis.

Cattle

Table 2.227 compares the Grant (1982) mandibular tooth wear stages from twelve samples from major Roman towns including the one from the Winchester northern suburb and city defences assemblage. In all cases there is a high percentage of adult animals represented. In

Table 2.227 Summary of wear stages of cattle mandibles from major Roman towns

		Mandible wear stages										
Town	**Site**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	
		1–5	**6–10**	**11–15**	**16–20**	**21–5**	**26–30**	**31–5**	**36–40**	**41–5**	**46+**	**Total**
Caerwent	Basilica	6	0	2	0	4	4	10	17	39	19	83
Chichester	Cattlemarket	0	4	0	8	4	6	7	16	41	15	101
Cirencester	Chester St	0	0	0	3	2	5	0	18	48	25	66
Cirencester	St Michael's Field	4	0	0	4	4	9	7	14	23	36	56
Dorchester	Greyhound Yard	12	0	0	1	1	6	11	20	35	15	173
Gloucester	East Gate	4	0	0	4	8	4	12	20	32	16	25
Leicester	Causeway Lane	0	3	1	13	4	6	10	13	26	24	70
London	Walbrook (Layer 9)	0	0	0	0	0	0	10	23	37	30	30
St Albans	Folly Lane	0	0	0	0	0	13	0	13	40	33	15
Silchester	Basilica	11	4	0	4	7	4	11	21	14	25	28
Winchester	N Suburb + defences	3	1	0	<1	1	5	8	16	44	21	149
York	Tanner Row	0	0	0	0	0	8	8	11	38	35	37

Note: Method adapted from Grant (1982)
1–5, 6–10 etc mandible wear stages; totals include estimated numerical values

the Winchester assemblage 65% of the mandibles possessed mandible wear stages of 41 or more. This is a little higher than the average of 59% from the twelve samples, which range between 38% and 73% (3 cases). The high peak of specimens (44%) with mandibular wear stages (MWS) of 41–45 in Winchester indicates a preference to slaughter prime beef adult cattle rather than very old animals. Similar peaks occur in most of the other samples. The mode in ten of the samples lies in the MWS 41–45 bracket. The St Michael's Field assemblage from Cirencester is unusual in having its highest peak (36%) in the oldest age category (Levitan 1990), although the samples from St Albans (Locker 1999) and York (O'Connor 1988) also have over 30% of mandibles with wear stages of over 45 (Table 2.227).

Slightly younger cattle represented by wear stages of 36–40 are also quite commonly represented in all the samples including Winchester, providing 11–23% of the mandibles. Again, this indicates a preference to slaughter prime beef cattle.

Only the samples from Greyhound Yard, Dorchester (Maltby 1993) and the Basilica site in Silchester (Grant 2000) have produced samples with significant percentages of calf mandibles, although they are present in small numbers in several other samples (Table 2.227). This implies that veal was not a particularly common commodity. Certainly in samples dominated by large-scale butchery waste – from sites such as Chester Street, Cirencester (Maltby 1998); Walbrook, London (Clutton-Brock and Armitage 1977); Rack Street, Exeter (Maltby 1979); and the Cattlemarket site, Chichester (Levitan 1989) – there is little evidence that calves were processed in large numbers by specialist butchers. As noted in Section 2.2 (p 145), although it is possible that the high percentages of calf bones in Dorchester and Silchester simply reflect excellent preservation of more fragile calf mandibles in deep shafts, similar concentrations were not found in shafts and wells in the Winchester northern suburb, although they were present in small numbers (Table 2.130). It is possible that veal was a commodity that was highly valued and calves were only processed on special occasions or featured in the diet of only some of the richer members of the urban community resident near the centre of such towns.

The slaughter of immature cattle was generally low. Less than 7% of the mandibles in the Winchester assemblage possess wear stages of 16–30. This is one of the smallest percentages recorded in the twelve samples, although no cattle of this age were represented in the Walbrook, London sample (Clutton-Brock and Armitage 1977). The sample from Causeway Lane, Leicester (Gidney 2000) is the main exception to this pattern with 23% of animals in this group (Table 2.227).

The Winchester cattle mortality profile can therefore be seen to be fairly typical of a pattern prevalent in other major Romano-British towns, showing a marked preference for the slaughter of adult animals with particular concentrations on the acquisition of mature but not elderly animals. The metrical analysis of cattle metacarpals from Winchester showed that most of these were small, gracile specimens. It has been argued cautiously in this volume that variations in size of cattle metacarpals may be indicative of sexual dimorphism and that the majority of the adult cattle represented in Winchester were cows, whilst recognising that other explanations cannot be ruled out (Albarella 2002).

Comparisons with similar analyses of cattle metacarpals from other samples from major Roman towns reveal a remarkably consistent pattern. The distribution of breadth measurements of both the proximal and distal ends of metacarpals are often very heavily skewed towards smaller specimens. Several samples have produced cattle assemblages that can be interpreted as comprising of more female than male animals. Examples include Chichester (Levitan 1989), Cirencester (Levitan 1990; Maltby 1998), Colchester

(Luff 1993), Dorchester (Maltby 1993), Exeter (Maltby 1979a), Leicester (Gidney 1999), Lincoln (Dobney *et al* 1996), Wroxeter (Meddens 2000), and York (O'Connor 1988). Similarities in the results of both the ageing and metrical data from these and other urban samples suggest that the mechanisms of how beef was supplied to these towns were similar. Supplies relied on the acquisition of adult, but not very old animals, possibly mostly cows, which were not further required as breeding or working animals. It is not clear if this supply relied mainly on market forces. It does seem, however, that the urban butchers had the power to acquire cattle of specific age and sex and the data do give the impression that the supply of cattle to the towns was carefully and systematically managed.

Sheep/goat

It has been possible to compare mandibular ageing data from nineteen samples from the major Roman towns employing O'Connor's (1988) age categories. These consist of neonatal, juvenile, immature, sub-adult, and adult. Sample sizes range between 19 and 350 and the Winchester data (Table 2.152) and some of the published data has been transformed into this format for this survey (Table 2.228). Comparisons using Grant's (1982) method are also shown, but it has been possible to use only ten samples.

As discussed in Section 2.2 (pp 177–179), most of the sheep represented in Winchester were aged between two and six years old, which incorporates the sub-adult and some of the younger adults. Using O'Connor's method, 73% of the sheep/goat survived until adulthood. Elsewhere, percentages of adults range widely between 18% at the Shires, Leicester (Gidney 1991; 2000) and 75% at Folly Lane, St Albans (Locker 1999). Therefore, the Winchester assemblage includes one of the highest percentages of adult sheep in the survey. Other samples with high adult percentages include assemblages in Lincoln (Dobney *et al* 1996; Scott 1999) and Chichester (Levitan 1989). The Staple Gardens assemblage (Maltby 1986a) also includes a relatively high percentage of adults (Table 2.228). As discussed earlier, this implies that secondary products, particularly wool, may have been of some importance in the Winchester area, delaying the slaughter of fully-grown sheep, although not until old age, as the Grant data confirm (Table 2.228). A similar explanation can be put forward for to explain the results from Chichester, Lincoln, and St Albans and, to a lesser extent perhaps, other assemblages with over 50% adult sheep/goat (Chester Street, Cirencester; Greyhound Yard, Dorchester; East Gate, Gloucester; and the Basilica sites at Caerwent, Silchester, and Wroxeter). The analysis does not take into account possible chronological variations in mortality rates but it should be noted that assemblages with high percentages of adult sheep/goat tend to include specimens mainly of later Roman date, perhaps indicating an increase in the importance of wool production. However, more detailed analysis is required to test this hypothesis.

Sub-adult animals aged between about one and two years form between 7% (St. Albans) and 34% (Causeway Lane, Leicester) of the selected assemblages. They comprise 22% of the Winchester northern suburb assemblage, which is also the average percentage of the nineteen samples compared. In most samples, most of these mandibles have MWS of 21–25 (Table 2.228), representing animals probably mainly culled for meat between 18 and 24 months of age as they neared full size and weight. There is good evidence therefore that a substantial proportion of sheep were raised for meat and brought to these towns for slaughter.

The immature category includes sheep and goats aged mainly between 6–12 months. Their relative numbers vary markedly between the samples with percentages ranging between 1% at the Basilica site, Silchester (Grant 2000) and 37% in the St Michael's, Cirencester assemblage (Levitan 1990). The Winchester samples are among those with very low percentages of immature sheep/goat (Table 2.228). Again this analysis may mask chronological variations but it currently seems that much fewer immature lambs were slaughtered in towns such as Winchester, Dorchester, and Lincoln than in Cirencester, Leicester, and possibly London. Further research is required to establish why this may have been the case.

The relative frequency of juvenile lambs and kids aged under six months of age also varies greatly. Percentages range from 0% in the small sample from Chester Street, Cirencester (Maltby 1998) to 36% in the sample drawn from the intra-mural sites in Colchester (Luff 1993). They are generally poorly represented in samples from sites on the outskirts of towns such as Winchester's northern suburb and city defences (3%); East Gate, Gloucester (3%); Causeway Lane, Leicester (4%); Cattlemarket, Chichester (3%); and the Defences sites in Lincoln (3%). They are extremely well represented in intra-mural sites of the coloniae of Colchester and York (31%), and, to a lesser extent in several of the central sites in other towns such as Silchester (18%), Wroxeter (14%), and Canterbury (13%) (Table 2.228). This may indicate that young lambs were more likely to form a greater component of the diet in more affluent areas of the towns. However, high percentages of juveniles have not been encountered in all intra-mural assemblages, forming only 7% of the well preserved assemblage from Dorchester (Maltby 1993) and 8% from Staple Gardens, Winchester (Maltby 1986a). Even lower percentages were present in the two Cirencester samples (Table 2.228).

No neonatal sheep/goat are represented in the Winchester northern suburb and city defences sample and they form very low percentages in most of the assemblages in this survey (Table 2.228). Although poor survival could at least partially explain their low representation (Hambleton 1999; Munson and Garniewicz 2003), the low representation probably also implies that few sheep were kept within or in the close vicinity of the major towns and that the great majority of the sheep were brought from further afield for slaughter. The sample from The Shires, Leicester (Gidney 1991) is a notable exception to the pattern, including 23%

Table 2.228 Summary of wear stages of sheep/goat mandibles from major Roman towns

Town	Site	N	J	I	S	A	
		%	%	%	%	%	Total
Caerwent	Basilica	1	10	6	27	56	201
Canterbury	Castle	6	13	14	28	39	69
Chichester	Cattlemarket	0	3	12	18	67	204
Cirencester	Chester St	0	0	26	21	53	19
Cirencester	St Michael's	0	4	37	18	41	105
Colchester	Intramural	0	36	25	10	29	288
Dorchester	Greyhound Yard	2	7	6	29	55	350
Gloucester	East Gate	3	3	6	28	59	32
Leicester	Causeway Lane	2	4	32	34	28	185
Leicester	The Shires	23	7	27	25	18	44
Lincoln	Defences	0	3	3	20	73	30
Lincoln	Waterfront +	0	7	2	20	71	87
London	Billingsgate	0	20	17	17	46	54
St Albans	Folly Lane	2	5	12	7	75	57
Silchester	Basilica	3	18	1	27	51	94
Winchester	N Suburb + defences	0	3	2	22	73	329
Winchester	Staple Gardens	3	8	3	26	61	38
Wroxeter	Basilica	4	14	6	23	53	132
York	Tanner Row	0	31	9	17	42	64

Key:
N = neonatal (dp4 not in wear)
J = juvenile (dp4 in wear; M1 not in wear)
I = immature (M1 in wear; M2 nor in wear)
S = subadult (M2 in wear; M3 nor in wear)
A = adult (M3 in wear)

Note: Method of analysis adapted from O'Connor (1988)

		Mandible wear stages									
Town	Site	%	%	%	%	%	%	%	%	%	
		1–5	6–10	11–15	16–20	21–5	26–30	31–5	36–40	41+	Total
Caerwent	Basilica	12	2	4	2	21	8	31	13	6	190
Chichester	Cattlemarket	3	6	6	1	15	6	30	22	10	204
Cirencester	Chester St	0	16	11	11	11	5	37	5	5	19
Cirencester	St Michael's	4	21	16	1	15	8	16	12	7	105
Dorchester	Greyhound Yard	9	0	4	4	24	9	27	14	9	336
Leicester	Causeway Lane	2	31	4	15	19	4	11	9	5	185
St Albans	Folly Lane	2	6	9	6	4	7	20	20	22	54
Silchester	Basilica	20	1	2	3	17	12	22	19	3	94
Winchester	N Suburb + defences	4	1	0	4	18	9	34	24	6	313
York	Tanner Row	28	2	7	0	18	7	10	12	0	60

Note: Method adapted from Grant (1982)
1–5, 6–10 etc = mandible wear stages; totals include estimated numerical values

Table 2.229 Summary of wear stages of pig mandibles from major Roman towns

Town	Site	N %	J %	I %	S %	A %	Total
Caerwent	Basilica	4	14	13	33	36	170
Chichester	Cattlemarket	0	2	16	57	25	49
Cirencester	St Michael's	0	2	27	49	22	41
Colchester	All	0	22	8	43	26	76
Dorchester	Greyhound Yard	10	15	18	33	24	165
Gloucester	East Gate	6	0	11	44	39	18
Leicester	Causeway Lane	17	15	27	37	5	41
Lincoln	Waterfront +	4	4	11	26	54	46
Silchester	Basilica	20	10	14	41	14	49
Winchester	N Suburb + defences	0	3	11	57	29	103
Wroxeter	Basilica	3	7	2	24	64	109
York	Tanner Row	0	12	20	32	35	65

Key:
N = neonatal (dp4 not in wear)
J = juvenile (dp4 in wear; M1 not in wear)
I = immature (M1 in wear; M2 nor in wear)
S = subadult (M2 in wear; M3 nor in wear)
A = adult (M3 in wear)

Note: Method of analysis adapted from O'Connor (1988)

neonatal mortalities. As Gidney (2000) has argued, this may represent the selection of young lambs for luxury and/or ritual consumption.

Pigs

Twelve samples from major towns could be compared using O'Connor's (1988) categories as described above (Table 2.229). As expected, percentages of adult pigs are generally smaller than for the other major domestic species. Pigs were raised principally for meat and lard and could tolerate high levels of kill-off of immature animals. Percentages of adults represented range between 5% from Causeway Lane, Leicester (Gidney 1999) and 64% at Wroxeter (Hammon 2005). These are both rather extreme figures; most samples include 20–40% adult pigs, with the percentage from the Winchester northern suburb and city defences (29%) lying close to average of 31% (Table 2.229). In most cases, including the samples with high percentages of adults at Wroxeter and Lincoln (Dobney *et al* 1996), few of the mandibles from adults had heavy wear on the third molars, indicating that there were not significant numbers of elderly animals represented.

Mandibles of subadult pigs form the most frequent age category in eight of the samples. The highest percentages (57%) are represented in the Winchester and Chichester samples (Levitan 1989). The average from the twelve samples is 40%, showing that pigs aged between one and two years were the most frequently targeted for culling for the provision of fresh and preserved pork products.

Pigs culled under about a year old are also quite common in all the samples, as indicated by the percentages of the neonatal, juvenile, and immature categories (Table 2.229). Combining these three categories, percentages range between 12% at Wroxeter (Hammon 2005) and 59% at Causeway Lane, Leicester (Gidney 1999). The Winchester northern suburb and defences sample (14%) has the second lowest percentage of young pigs, well below the average of 29%. Differential survival of the more fragile mandibles of piglets may explain some of the variations, but there may also have been real variations in the numbers of young pigs that were slaughtered within and between towns. It should also be noted that there are substantial variations in the relative frequencies of the juvenile and immature categories. The latter usually outnumber the former but the samples from Caerwent, Colchester and Wroxeter are exceptions (Table 2.229).

Neonatal pigs were present in at least seven of the twelve samples, sometimes, as in the samples from the Basilica, Silchester (Grant 2000), Leicester (Gidney 1999), and Dorchester (Maltby 1993) in significant numbers. These could represent the selection of suckling pigs for consumption. In addition, the greater prevalence of neonatal animals in the pig assemblages contrasts with nearly all of the cattle and sheep/goat assemblages from the same towns. The possibility that some of the neonatal pigs represent natural mortalities of pigs kept in the towns cannot be ruled out.

The stature of the domestic mammals

Tables 2.230–2.242 summarise the metrical data available in published or easily accessible archive form

Table 2.230 Summary of cattle withers heights from major Roman towns

Town	Site/date	No	Min	Max	Mean	s.d
Caerwent	Basilica C1–4	20	101.9	117.2	109.7	4.6
Chichester	Cattlemarket C1–4	14	106.6	132.9	113.4	
Cirencester	St Michael's Field C2–4	8	111.1	121.5	116.0	4.1
Colchester	Various C1–3		102.5	121.2	112.8	4.5
Colchester	Various C3–4		104.3	128.1	116.4	5.7
Dorchester	Greyhound Yd C1–4	40	100.7	121.4	111.3	5.5
Exeter	Various C1–4	41	97.4	119.3	108.4	
Leicester	Various C1–4	24	100	125.3	111.5	
Lincoln	Waterfront + C4	42	105.8	125.9	114.1	4.2
London	Various C1–4	18	101.8	136.3	112.5	
Winchester	NS + defences C2–4	42	105.0	133.7	116.7	6.1
Wroxeter	Basilica C4–5	13	98.6	117.6	108.9	5.1
York	Tanner Row C2–4	12			111.4	5.2

Note: All measurements in centimetres based on coversion factors by Fock (1966)

from major towns that can be directly compared with specific measurements taken on bones from the Winchester northern suburb and city defences. This is not intended to be a comprehensive review of the stature of domestic mammals of Roman Britain, which would necessarily incorporate assemblages from other types of site. However, many of the largest assemblages available are from these towns, so the comparisons should reveal some general regional patterns. Also, no comprehensive attempt has been made here to examine possible chronological changes. The review is also limited by the fact that different authors take (or at least publish) different measurements decreasing the samples that can be directly compared.

Cattle

Withers height estimates have been compared from thirteen sites from twelve towns. The heights of cattle recorded vary from 97.4cm to 136.3cm, demonstrating a substantial range in size. It is generally accepted that there was an overall increase in the average size of cattle in the Roman period both on the continent and in Britain, through the importation of new stock and/or by improvements in husbandry (Maltby 1981; Luff 1982; Albarella 2002). However, regional variations have been noted (Maltby 1979a, 1981) and these results tend to support previous observations. The average withers heights of cattle recorded in the western sites of Exeter, Caerwent, and Wroxeter are all below 110cm (Table 2.230) and no specimen of over 120cm has been recorded. The average size of cattle from Dorchester is only a little higher (111.3cm), although a few larger specimens were found (Maltby 1993). The average size of cattle from the other towns range between 111.4 (York) and 116.7cm (Winchester). The results continue to suggest that fewer, if any, improvements were made to cattle in the south-west of Britain, whereas modest overall improvements were made in several other areas.

Although the Winchester sample has the largest average size of cattle, they are not much larger than those from several other samples, such as those from Cirencester and Colchester. There is evidence for an increase in the average height of cattle in the later Roman period in Colchester (Luff 1993) and possibly in Dorchester (Maltby 1993). As discussed in Section 2.2 (pp 146), despite evidence that generally larger cattle were present in the 4th-century pit F814, it remains to be established whether similar trends occurred in Winchester.

The presence of generally relatively large cattle in Winchester is supported by most of the other measurements compared. The average maximum distal breadth of tibiae from Winchester (57.0mm) is the highest of the eight urban samples compared, although not significantly larger than several of these samples (Table 2.231). Comparisons of the lateral lengths of astragali from eight assemblages (Table 2.232) again show that the Winchester sample has the largest mean size (63.5mm). Once more, this survey demonstrates that the cattle from the western sites were generally slightly smaller than those from other areas. The average lateral lengths of astragali in the samples from Exeter, Caerwent, and Dorchester are all below 60cm. It is perhaps surprising to note that the cattle tibiae and astragali from Silchester are generally smaller than those from Winchester (Tables 2.231–2.232).

The distributions of the proximal breadths of metatarsals from the nine samples compared in Table 2.233 are all positively skewed, possibly reflecting a bias towards females, as discussed above. Again the western sites (Exeter, Caerwent, Wroxeter, Dorchester) have, on average, slightly smaller specimens with means ranging between 41.1mm and 42.8mm. Winchester (43.8mm) is amongst a group of assemblages from towns in the South and Midlands with higher means

Table 2.231 Summary of cattle tibia measurements from major Roman towns

			Tibia: maximum distal breadth			
Town	**Site/date**	**No**	**Min**	**Max**	**Mean**	**s.d**
Caerwent	Basilica C1–4	25	45.0	66.0	54.5	4.7
Chichester	Cattlemarket C1–4	14	47.6	68.9	56.2	6.3
Dorchester	Greyhound Yd C1–4	41	47.9	66.5	55.7	4.0
Exeter	Various C1–4	20	49.7	65.1	55.6	4.3
Lincoln	Various C4	105	40.8	67.7	56.1	3.7
Silchester	Basilica C1–4	15	48.1	61.4	52.6	3.4
Winchester	NS + defences C2–4	31	50.5	66.1	57.0	3.9
Wroxeter	Basilica C4–5	14	50.5	62.3	54.0	2.9

Note: All measurements in millimetres

Table 2.232 Summary of cattle astragalus measurements from major Roman towns

			Astragalus: greatest length lateral half			
Town	**Site/date**	**No**	**Min**	**Max**	**Mean**	**s.d**
Caerwent	Basilica C1–4	47	52.4	68.4	58.8	3.1
Cirencester	Chester St + SMF C2–4	29	52.9	67.9	60.5	3.7
Dorchester	Greyhound Yd RB	36	52.7	71.4	59.5	4.0
Exeter	Various C1–4	32	50.7	62.0	56.9	2.5
Lincoln	Various C4	157	53.0	70.8	61.5	2.8
Silchester	Basilica C1–4	25	54.6	67.0	60.0	3.6
Winchester	NS + defences C2–4	57	49.7	73.3	63.5	4.4
York	Tanner Row C2-4	10	60.5	62.7	61.9	1.3

Note: All measurements in millimetres

Table 2.233 Summary of cattle metatarsal measurements from major Roman towns

			Metatarsal: maximum proximal breadth			
Town	**Site/date**	**No**	**Min**	**Max**	**Mean**	**s.d**
Caerwent	Basilica C1–4	49	36.7	51.2	42.1	3.2
Chichester	Cattlemarket C1–4	83	36.8	54.2	43.4	3.8
Cirencester	Chester St + SMF C2–4	129	37.2	52.3	43.9	2.8
Dorchester	Greyhound Yd C1–4	75	35.5	53.9	42.8	3.8
Exeter	Various C1–4	62	36.0	48.2	41.1	2.4
Leicester	The Shires C1–4	17	38.5	57.0	44.3	5.0
Gloucester	East Gate C1–4	15	38.6	52.8	43.3	4.0
Winchester	NS + defences C2–4	84	37.9	53.2	43.8	3.6
Wroxeter	Basilica C4–5	60	37.5	52.0	41.8	2.7

Note: All measurements in millimetres

ranging between 43.4mm and 44.3mm. Interpretation of the metatarsal results must be tempered with caution because of the possible inclusion of specimens from immature cattle that had not attained full size, although porous specimens were excluded where known. If sexual dimorphism is a significant factor in breadth measurements, mean sizes may vary according to the relative number of males and females represented in the samples. However, the fact that there are fairly similar distributions in the various samples does suggest that there were regional variations in cattle sizes. Winchester, by the later Roman period at least, appears to be one of the towns that had access to generally larger cattle than in the later prehistoric period.

Table 2.234 Summary of sheep withers heights from major Roman towns

Town	Site/date	No	Min	Max	Mean	s.d
Caerwent	Basilica C1–4	16	50.9	64.5	58.9	3.8
Chichester	Cattlemarket C1–4	32	50.4	73.3	59.6	
Cirencester	Chester St + SMF C2–4	17	52.0	62.9	58.9	3.5
Colchester	Various C1–3		49.0	70.4	59.7	4.8
Colchester	Various C3–4		52.7	72.6	62.6	6.6
Dorchester	Greyhound Yd C1–4	61	50.0	67.4	58.1	4.0
Exeter	Various C1–4	19	52.7	64.9	57.0	2.9
Gloucester	East Gate C1–4	9	58.7	67.2	62.9	3.1
Leicester	Various C1–4	37	51.7	70.0	59.1	4.5
Lincoln	Various C4	60	54.9	71.7	62.8	3.8
London	Various C1–4	22	53.6	66.7	60.3	
Silchester	Basilica C1–4	13	51.3	69.5	61.3	
Winchester	NS + defences C2–4	17	54.7	64.2	58.9	2.8
York	Tanner Row C2–4	24	52.9	65.2	59.0	3.5

Note: All measurements in centimetres based on coversion factors by Teichert (1975)

Table 2.235 Summary of sheep radius measurements from major Roman towns

			Radius: breadth proximal articular surface			
Town	Site/date	No	Min	Max	Mean	s.d
Caerwent	Basilica C1–4	40	21.9	28.7	25.9	1.8
Cirencester	St Michael's Field C2–4	10	23.0	26.4	24.7	1.3
Dorchester	Greyhound Yd C1–4	66	21.4	29.8	25.7	1.6
Leicester	The Shires	12	24.3	27.8	25.7	1.3
Lincoln	Various C4	14	25.2	32.7	28.4	2.1
Silchester	Basilica C1–4	10	23.7	30.8	27.1	2.0
Winchester	NS + defences C2–4	45	24.0	30.6	27.4	1.4
Wroxeter	Basilica C4–5	14	23.4	29.5	25.9	1.9

Note: All measurements in millimetres

Sheep

Sheep withers height estimates from fourteen samples have been compared. As in the case of cattle, a large variation in heights has been recorded, ranging between 49.0cm and 72.6cm. Mean withers heights range between 57.0cm (Exeter) and 62.9cm (Gloucester) with an average of 59.9cm (Table 2.234). The average height of sheep from Winchester (mean 58.9cm) is therefore slightly smaller than in many towns. As in the case of cattle, sheep from the western towns appear generally to be slightly smaller than those brought to towns in the Midlands and eastern England.

In contrast, comparison of measurements of the articular proximal breadth of sheep radii from eight sites shows that the sample from Winchester has the second highest mean (27.4mm), surpassed only by the Lincoln sample (28.4mm). These and the sample from Silchester (27.1mm) produced significantly larger means than the other sites, most of which are located in the West (Table 2.235). Caution should be exercised with the interpretation if this measurement, as it has been shown that significant post-fusion growth occurs around this area.

However, a similar pattern emerges when the distal breadth measurements of tibiae are compared (Table 2.236). In a sample of ten assemblages, the mean size obtained from Winchester (25.2mm) lies second only to the sample from Lincoln (25.6mm). Nearly all the remaining samples produced means between 23mm and 24mm. It is less likely that post-fusion growth is a significant factor in this case as the distal tibia fuses later than the proximal radius.

Comparisons of proximal breadth measurements of metatarsals from nine sites show less variation in mean size (Table 2.237). However, the three smallest means are again from the western sites of Exeter, Caerwent, and Dorchester (18.2–18.5mm), whereas the mean from the Winchester sample is the second highest at 19.4mm. However, the possibility that post-fusion growth has

Table 2.236 Summary of sheep tibia measurements from major Roman towns

			Tibia: maximum distal breadth			
Town	**Site/date**	**No**	**Min**	**Max**	**Mean**	**s.d**
Caerwent	Basilica C1–4	109	20.3	29.2	23.4	1.6
Cirencester	St Michael's Field C2–4	12			23.2	1.4
Dorchester	Greyhound Yd C1–4	166	20.0	27.8	23.8	1.3
Exeter	Various C1–4	66	21.3	29.2	23.4	1.3
Gloucester	East Gate C1–4	7	23.1	26.3	24.5	1.2
Leicester	The Shires	18	21.1	27.3	23.6	1.7
Lincoln 4th C	Various C4	54	20.0	28.8	25.6	1.8
Silchester	Basilica C1–4	34	18.9	27.6	23.4	1.9
Winchester	NS + defences C2–4	85	21.8	28.1	25.2	1.3
York	Tanner Row C2–4	20	21.2	28.0	24.0	1.6

Note: All measurements in millimetres

Table 2.237 Summary of sheep metatarsal measurements from Major Roman towns

			Metatarsal: maximum proximal breadth			
Town	**Site/date**	**No**	**Min**	**Max**	**Mean**	**s.d**
Caerwent	Basilica C1–4	41	16.1	21.6	18.3	1.2
Chichester	Cattlemarket C1–4	51	15.7	22.4	18.9	1.5
Cirencester	St Michael's Field C2–4	18	16.5	21.6	19.1	1.6
Dorchester	Greyhound Yd C1–4	81	15.6	22.2	18.5	1.3
Exeter	Various C1–4	25	16.0	20.0	18.2	1.1
Gloucester	East Gate C1–4	13	18.2	22.6	19.9	1.4
Leicester	The Shires	12	16.7	22.4	19.0	1.7
Silchester	Basilica C1–4	32	15.8	23.0	19.4	1.4
Winchester	NS + defences C2–4	48	16.5	21.9	19.5	1.2

Note: All measurements in millimetres

played some part in the variability in size of this measurement has not been taken into account.

The metrical analyses would suggest that the sheep in Winchester were, on average, not particularly tall but were relatively stocky compared with sheep brought to some other towns, particularly those in western Roman Britain. However, as was discussed in Section 2.2 (pp 183), it is plausible that at least two types of sheep were present in Winchester – a smaller, horned type similar to those found on Iron Age settlements in the area and a larger hornless type that was present from the early Roman period. Unfortunately, there has been little quantification of the relative abundance of horned and hornless sheep, so it is difficult to gauge whether relative numbers varied significantly between sites or through time. Nor has it been established to what extent hybridisation between the two types took place. Sexual dimorphism has also to be considered.

Pig

It was suggested in Section 2.2 (pp 202–203) that pigs brought to and/or kept in Winchester tended to be larger than those found on the nearby rural settlement of Owslebury. Limited comparisons show that the average breadth measurements of proximal radii and distal tibiae and the lateral lengths of astragali in the Winchester sample are generally similar to those from other major urban sites (Tables 2.238–2.240). In all three cases, the smallest means are found in the Exeter assemblage, again suggesting that any improvements in domestic stock were less marked in the peripheral area of the province. However, in general, sample sizes are limited and it would repay carrying out more comprehensive studies of pig metrical data along the lines recommended by Albarella and Payne (2005).

Horse

As discussed in Section 2.2 (p 203), no attempt was made during identification and recording to distinguish between horses and mules. It is assumed that the majority of the equid bones belong to horse but

Table 2.238 Summary of pig radius measurements from major Roman towns

			Radius: maximum proximal breadth			
Town	**Site/date**	**No**	**Min**	**Max**	**Mean**	**s.d**
Caerwent	Basilica C1–4	31	25.4	31.4	28.0	1.5
Chichester	Cattlemarket C1–4	5	29.1	33.0	30.5	1.5
Cirencester	St Michael's Field C2–4	4	27.7	31.8	29.9	2.2
Dorchester	Greyhound Yd C1–4	48	25.6	32.3	28.4	1.7
Exeter	Various C1–4	25	22.9	30.1	27.1	1.6
Lincoln 4th C	Various C4	9	25.7	28.8	27.0	0.9
Silchester	Basilica C1–4	12	25.2	35.4	28.6	2.2
Winchester	NS + defences C2–4	19	25.9	34.2	29.7	2.1

Note: All measurements in millimetres

Table 2.239 Summary of pig tibia measurements from major Roman towns

			Tibia: maximum distal breadth			
Town	**Site/date**	**No**	**Min**	**Max**	**Mean**	**s.d**
Caerwent	Basilica C1–4	39	25.0	36.0	28.6	2.0
Chichester	Cattlemarket C1–4	6	27.1	31.8	29.8	2.0
Cirencester	St Michael's Field C2–4	6	25.6	35.2	31.0	3.3
Dorchester	Greyhound Yd C1–4	37	25.8	32.7	29.6	1.6
Exeter	Various C1–4	12	24.8	30.0	27.7	1.5
Lincoln	Various C4	7	25.7	36.6	29.2	4.0
Winchester	NS + defences C2–4	10	27.5	32.2	30.2	1.4
York	Tanner Row C2–4	11	26.3	34.7	28.9	2.4

Note: All measurements in millimetres

Table 2.240 Summary of pig astragalus measurements from major Roman towns

			Astragalus: greatest length lateral half			
Town	**Site/date**	**No**	**Min**	**Max**	**Mean**	**s.d**
Caerwent	Basilica C1–4	28	36.4	43.2	39.6	1.8
Cirencester	St Michael's Field C2–4	9	38.7	46.7	42.0	2.8
Exeter	Various C1–4	14	31.0	50.7	37.7	4.1
Lincoln	Various C4	5	35.7	42.3	40.3	2.8
Winchester	NS + defences C2–4	6	40.0	44.1	42.2	1.4

Note: All measurements in millimetres

the presence of some mules cannot be ruled out. The Winchester sample has produced the largest sample of equid metrical data published from any Roman town. However, the paucity of horse bones in most assemblages from major towns inevitably restricts any detailed comparative analysis. The Winchester assemblage produced the smallest mean withers height (132.1cm) in a comparison of five assemblages (Table 2.241). However, a more comprehensive analysis would need to incorporate the evidence from rural and military sites as well as towns.

Dog

The diversity in size of dogs from Winchester as reflected in their shoulder heights has been discussed in Section 2.2 (p 216). This high degree of variability in Romano-British dogs was originally synthesised by Harcourt (1974) and subsequent analyses have tended to support his observations (eg Clark 1995). Comparisons of the estimated shoulder heights in samples from seven towns all show high standard deviations indicating significant variations in size, although mean

Table 2.241 Summary of equid withers heights from major Roman towns

Town	Site/date	No	Min	Max	Mean	s.d
Dorchester	Greyhound Yd C1–4	8	122.0	156.2	133.0	12.7
Lincoln	All C4	9	123.3	153.6	140.9	
London	Various C1–4	7	120.9	143.4	135.7	9.9
St Albans	Folly Lane C1–4	10	108.8	146.1	133.3	12.3
Winchester	NS + defences C2–4	27	116.3	150.0	132.1	8.1

Note: All measurements in centimetres based on conversion factors by Kiesewalter (1888)

Table 2.242 Summary of dog shoulder heights from major Roman towns

Town	Site/date	No	Min	Max	Mean	s.d
Caerwent	Basilica C1–4	11	29.2	60.6	39.4	11.3
Colchester	Various C4	101	21.0	61.0	38.9	10.5
Dorchester	Greyhound Yd C1–4	41	26.2	53.8	37.7	9.5 (tibia)
Exeter	Various C1–4	3	30.7	56.7	40.6	
Lincoln	Various C4	13	14.9	63.8	35.0	13.8
London	Various C1–4	17	30.7	73.0	45.0	13.7
Winchester	NS + defences C1–2	6	34.6	53.2	42.8	6.6
Winchester	NS + defences C2–4	43	22.8	55.1	39.9	11.1

Note: All measurements in centimetres based on conversion factors by Harcourt (1974)

heights are surprisingly consistent ranging between 35.0cm and 45.0cm (Table 2.242). The presence of significant numbers of small dogs in Winchester also reflects the pattern observed in other major Romano-British towns and can be regarded as another facet of 'Romanisation'.

Associated bone groups in major Roman towns

Associated bone groups recovered from the Winchester northern suburb and city defences have been described in previous sections. There is evidence that dogs and, more rarely, other species of mammal and bird were sometimes deposited in disused wells or other shafts and butchered sheep carcasses were sometimes deposited in association with buildings. As discussed at the beginning of this section, the motives behind such depositions are not always clear and interpretation ideally needs to take into consideration detailed contextual information and a more holistic analysis of the associated finds. Although it is tempting to interpret all associated groups as evidence for ritual deposition, particularly in cases where there are multiple burials within a feature, it has been argued previously that other interpretations should also be considered. Although brief comparisons with other assemblages have been made in previous sections, it is perhaps worthwhile to review the evidence for associated bone groups reported from other major Romano-British towns in order to establish how frequently associated animal remains have been recorded. The following discussion will describe the evidence from the various reports and discussions listed in Table 2.213.

Caerwent

Although a large sample of animal bones from the Basilica site has been examined (Table 2.214), the number of associated bone groups recorded is small (Hambleton and Maltby in prep.). Only 22 groups were noted, half of which consisted of fewer than ten bones. In contrast to the Winchester northern suburb sites, no large wells or shafts were found and, although some large bone assemblages were excavated in pits and other features on and near to the road to the east of the Basilica, much of the material in these was redeposited. Twelve associated bone groups were found in the Basilica itself, although again some of these were probably redeposited during various building works. Seven were found in the *tribunalia* but whether this represents a focus of structured deposition is debatable given the detailed contextual evidence.

Most (twelve) of the associated groups belonged to dogs including the only multiple deposition of two adult dogs within a pit on the East Road. A fairly complete skeleton of a male dog was found in the robbed out wall footings of a building in the same area. All the remaining dog groups consisted of less than 20 bones, including only one from a juvenile. No evidence for butchery was found and, as at Winchester, it seems likely that these all represent the redeposited and comminuted remains of animals originally deposited as

whole carcasses. The same explanation would account for the partial cat skeleton found in another pit on the East Road.

The only associated groups of sheep (two), cattle, and pig consisted of small numbers of bones from the foot or ankle, with some of the bones showing evidence of butchery in the case of pig and cattle. These probably all represent processing waste, as possibly do the remains of a salmon found in a scoop within the nave of the Basilica, although a ritual deposition cannot be ruled out in that case.

Four partial bird skeletons were also found. The remains of an immature jackdaw from a roadside gutter probably represent a natural mortality of a resident fledgling, as probably do the bones of a young pigeon found in a pit within the *tribunalia*. Several bones of a passerine species, possibly a sparrow, were found in the same context. Finally, twelve bones of an adult domestic fowl were recovered from the lower fill of a robber pit in another room of the Basilica. No butchery marks were recorded on bones in this group but whether this represents a ritual deposition is open to question.

Canterbury

There are no quantified results given in the published report from the Canterbury Castle site (King 1982). Numbers of associated bone groups appear to have been small, however. No groups of cattle, sheep/goat, and pig bones were explicitly noted. A fairly substantial group of horse bones was found in a ditch deposit associated with human remains dated to the late 1st century. Small associated groups of limb bones and vertebrae of dog and cat were also noted. King (1982) argued that these bones were remains of complete carcasses that had been left above ground to be partly destroyed and scattered by scavengers prior to burial.

Chichester

Levitan (1989) drew attention to the surprising number of associated bones found in the excavations of the Cattlemarket site. The report includes an excellent summary of these remains. A total of 45 groups were recorded, about half being from fairly complete skeletons whereas eleven consisted of fewer than twenty bones. Multiple burials were found in several pits and wells.

Dogs provided 32 of the groups, of which 23 were found in nine pits, three were from Well 1 and six were from layers. Five perinatal, eight immature, and nineteen adult dogs were represented. No evidence of butchery was found on any of the bones.

Bones of two calves of about six months of age were found in Wells 1 and 3. The former was fairly complete; the latter was more fragmented but included bones from most parts of the body. No butchery marks were observed. Well 1 also produced a substantially complete unbutchered skeleton of a horse of about five years of age. All four partial skeletons of pigs were found in pits. Three were from animals of under a month old and one was about six months of age. Again, no evidence of butchery was observed.

An unbutchered adult female goat skeleton was found in Well 3. Five associated groups of sheep bones were recovered. In contrast with the other species, most of these were not found in pits or wells. Only one skeleton of an immature ewe was found in a pit. Three were found in post-holes. Two belonged to immature lambs with no convincing evidence for butchery. The third group, which belonged to an adult ewe, has evidence of processing. Bones from all parts of the skeleton were recovered, although only the left side of the body appears to be present. Evidence for charring was observed on the atlas, a calcaneum, and a first phalanx. Butchery marks were found on a lumbar vertebra, which had been chopped through transversely, and a femur that bore knife cuts on the lateral part of the proximal end. Levitan (1982) was sceptical as to whether the marks on the femur represented successful disarticulation, as there were no marks on the pelvis. However, this group has many similarities with several of the butchered groups of sheep bones in Winchester. Butchery marks on the vertebra could indicate segmentation as indeed could the marks on the femur. If not, they could be argued to be filletting marks. Evidence of burning on the neck and limb extremities also indicates that the carcass could have been roasted on a spit before (some of) the bones were collected and deposited in the post-hole.

In addition to the provenance and nature of the butchered sheep skeleton, the associated bone groups from Chichester have general similarities with those from the Winchester northern suburb and city defences sites. Most groups consist of dogs and most (apart from sheep) were recovered from pits and wells. Some of these features contained multiple depositions. Levitan (1982) considered that most of the groups represent evidence for the disposal of natural mortalities or diseased animals, the site in his view being a convenient location on the outskirts of the town for disposing of dead animals alongside other waste. Multiple burials, he argued, could represent evidence for organised disposal or perhaps collection in some cases of 'semi-feral scavengers'. The possibility of ritual deposition was considered briefly but tended to be dismissed as a credible explanation for the presence of the skeletons.

No clearly associated bones were reported in the small assemblage from the excavations of the River Lavant culvert (Hamilton-Dyer 2004).

Cirencester

The Chester Street excavations produced few wells and large pits and this probably explains the lack of associated bone groups. Much of the later Roman material was derived from accumulations of specialist cattle butchery waste that contained few bones of other species. Three dog bones may have been from the same individual but that was the only possible group recorded. A partial skeleton of a dog was found on the Querns Road site (Maltby 1998).

Only two sheep skeletons from the same context were observed in the sample from the St Michael's Field site (Levitan 1990). However, one of these skeletons again has similarities with some of the Winchester associated groups. Sixty-five bones of a hornless adult ewe were found associated with a 3rd-century building. Most parts of the body appear to have been represented although small bones, particularly from the feet, may not have been present or were overlooked during excavation. Butchery marks associated with the removal of the ribs were observed on some thoracic vertebrae and knife cuts were also observed on the calcaneus. No mention of burnt bones is made but again it seems possible that parts (or all) of a processed sheep carcass had been gathered together and deposited in the building, perhaps implying some ritual motivation. A second sheep was represented by eight bones of a foetal or perinatal lamb.

Colchester

Research into of the large animal bone assemblages available from several sites in Colchester was clearly constrained by time limits imposed for analysis, which resulted in the lack of full recording and quantification of some species including dogs and cats (Luff 1993). There are therefore no details published of any individual groups. Sadly, within what is in other respects a very comprehensive analysis of the bones, there is very little discussion of associated bones. It is stated that dogs and cats were usually represented as complete or partial burials and a few examples (all from the Balkerne Lane site) are given. One late 1st-century feature included complete skeletons of eight dogs of different sizes, a collection comparable in numbers to the remains from wells F1093 and F1096, and pit F814 from Victoria Road East, Winchester. A 3rd-century 'rubbish pit' from the same site included associated bones of two adult cats and a kitten. A contemporary pit produced two dog skeletons and a piglet skeleton 'together with the remains of a bear and a cat'. An adult cat was associated with a child burial in another 3rd-century deposit.

No mention was made of any other associated groups in the published report but this does not necessarily mean they were absent. No interpretation of the possible significance of the skeletons was made. However, this is another example of a suburban site that has produced multiple burials, particularly of dogs, in one case associated with a rare wild mammal species, and, in another, within a context clearly linked with the deposition of human remains. It is possible that ritual deposition can account for at least some of these groups, although it would be interesting to know more about the contexts and associated finds.

Dorchester

Detailed summaries of the numerous associated bone groups from Greyhound Yard are available (Maltby 1993). Numerous partial and complete dog skeletons were found. The presence of multiple groups made it difficult to estimate exact numbers but at least 4050 of the 4572 dog bones were assigned to 104 associated groups from a minimum of 93 animals, indicating that dogs were usually deposited as complete carcasses. A large number of these were found in deep pits, which often also contained cess and a lot of other animal bones and artefacts. Multiple burials were more common than individual depositions. Four pits contained associated bone groups of more than ten dogs. All ages were represented including at least nine perinatal, 21 juvenile, 19 immature, 34 adult and ten immature/adult animals. No evidence for carcass processing was noted in any of the groups.

Cats, although fewer in number, were generally deposited in a similar way to dogs. Ten associated bone groups provided 244 of the 280 cat bones identified. They belonged to one adult, one juvenile, and eight immature animals. All seven of the associated groups of pig bones were found in the lower fills of cess pits and consisted of partial skeletons of neonatal or juvenile animals.

Thirteen associated bone groups belonged to sheep/goat, including seven from one pit (2310). Three of these consisted of substantially complete neonatal lamb skeletons and a partial skeleton of a juvenile lamb. They were accompanied by the head, feet, and tail of a goat with several bones bearing butchery marks indicative of skinning and dismemberment. The split skulls and mandibles of two older sheep were also recovered from this pit. Three other small groups of sheep heads or feet were found in other pits.

The closest parallel to the larger groups of butchered associated sheep bones in Winchester was found in a shallow pit located close to a late 1st- to early 2nd-century timber building. The group consisted of 44 bones, mainly comprised of ribs and vertebrae but also including the skull, mandibles, and some foot bones. Butchery marks were recorded on the skull, axis, and a thoracic vertebra. The upper limb bones were not recovered. This therefore belonged to a carcass that had at least been segmented prior to deposition.

Elsewhere in Dorchester, a pit from the Colliton Park excavations produced a substantial part of an immature lamb and the head, neck, and foot bones of an adult sheep (Hamilton-Dyer 1993a). Assessment of bones from the Charles Street excavations (Maltby 1990b) showed the presence of 56 bones from two immature sheep skeletons in an occupation layer. These included an astragalus with knife cuts, indicating that one of these sheep had been at least partially processed.

Although fifteen groups of associated cattle bones were recorded from Greyhound Yard, Dorchester (Maltby 1993), none consisted of more than nine bones. The groups consisted of vertebrae, or bones from the foot, ankle, or upper forelimb. Butchery marks were found on bones of five of these groups. One fairly complete skeleton of a perinatal foal was found at the bottom of pit 4161. Two small groups of hare bones were recorded in late Roman pits. Three bones of a badger were found in an earlier pit.

Associated groups of bird bones were also identified. The most common species represented by associated bones was raven, with eleven groups, all from cess pits or wells. Four associated groups of jackdaw (two from the same pit) and two of rook/crow were also recorded in various pits. Small groups of domestic fowl (two), pigeon/doves (three), buzzard, red kite and ducks (two) were also recorded.

Several bones from the same individuals were probably represented amongst the bass, wrasse, and mullet bones recovered from pit 4161 (Hamilton-Dyer 1993b).

Interpretation of these groups (Maltby 1993) inclined towards explanations based on carcass processing for the cattle and sheep/goat partial skeletons. The large numbers of dogs (and cats) were considered to represent the disposal of animals that had either died of natural causes or had perhaps sometimes been rounded up and killed to control the population. Similarly, the corvid, buzzard, and kite remains were seen as the disposal of birds present as scavengers in the town. The horse was interpreted possibly as a foaling mortality and the pigs were considered to be natural mortalities from herds bred in the town. The possibility that at least some of the groups were of ritual significance was not discussed. The disused wells and shafts were considered to be merely suitable receptacles for the accumulation of unwanted rubbish, whether it be cess, specialist butchery waste, kitchen waste, dead pets, or scavengers killed as pests.

Woodward and Woodward (2004) have reinterpreted the assemblages from some of the large pits from Greyhound Yard. By considering artefacts such as coins and complete pots as well as animal bone groups, they argued that sequences of structured deposition could be seen. By interpreting some of these shafts as ritual pits associated with the laying out of the town's major road system, the animal and other depositions were seen as 'related to the possible enactment of urban foundation rituals, and their continuing celebration'. Their interpretation certainly merits serious consideration, particularly as it demonstrates the advantages of a more integrated approach to the finds. However, they do ignore the presence of large amounts of other faunal and artefactual material and the presence of cess in the deposits.

Exeter

No systematic analysis or detailed discussion of associated groups was attempted, although the numbers of bone involved were noted. (Maltby 1979a). Parts of three piglet skeletons were found in late 1st-century deposits on the St Mary Major/Cathedral Close site and interpreted as evidence for the keeping of pigs in towns. Third-century deposits from the same site produced partial skeletons of a dog and a badger. Contemporary assemblages from the Trickhay Street site included a partial skeleton of a hare. Late 1st-century deposits from Goldsmith Street included eight bones of an adult fox. No associated groups of bird bones were recorded from the Roman town, although a partial raven skeleton was found in the earlier military deposits. No multiple burials were recorded, perhaps because few large pits were excavated.

Gloucester

The only associated bone group recorded from the North Gate site consisted of 33 cattle bones from all four feet of one adult animal buried within a building. Two small groups of dog bones were found in Roman deposits on the East Gate site and eight bones of a barn owl were found in a late Roman deposit (Maltby 1979b).

Leicester

With a few notable exceptions, the various excavations in Leicester have not produced much evidence for associated bone groups. Analysis of the assemblage from The Shires excavation (Gidney 1991) produced evidence for large accumulations of bones of 2nd-century date from a disused cellar of a timber house. These included partial remains of at least two dogs, which were thought to have been redeposited. The cellar also produced the skeleton of a raven scattered between four contexts, again indicative of redeposition. A partial raven skeleton also of 2nd-century date was found in a pit. The cellar also contained significant numbers of complete pots including tazzae, perhaps indicating a ritual connection (Gidney 2000). This is the same feature that produced the high percentage of infant lamb mandibles discussed above (pp 289–291).

As discussed in Section 2.2 (p 227), the faunal assemblage from the 3rd-century infill of shaft F300 from the High Street excavations (Baxter 1993) has similarities with the material from F1093 and F1096 (Groups VRE19–20), and, particularly with pit F814 (Group VRE22) from Victoria Road East, Winchester, and some of the pits in Greyhound Yard, Dorchester. Although only the upper fills were excavated, the shaft produced partial skeletons of two perinatal pigs, two kittens, two immature dogs, a crow and a jackdaw, along with butchery waste dominated by cattle head bones, an eagle skull, and a barnacle goose tibiotarsus. No detailed counts were published and there is no discussion of associated finds. It would have been interesting to discover whether similar depositions were present in the unexcavated lower fills of the shaft. However, it is possible to argue that some of these groups were ritual depositions.

Lincoln

There are no descriptions of any associated bone groups in the assemblages examined by Dobney *et al* (1996). Indeed, it was noted in relation to dog that all the well-dated remains were disarticulated with no evidence for the disposal of complete carcasses. The lack of wells and deep pits in the sites excavated could

explain the absence of such groups. At least three complete dogs were recovered from the excavations of the defences of the lower city (Scott 1999) but no details of these have been published, although they are available in the archive.

London and Southwark

Not all the published reports discuss whether associated bone groups were recovered, although in the case of more recent analyses, data are available in archive. Unsurprisingly, the best evidence for such groups and the most detailed discussion of them comes from the report of the excavations of the Eastern Cemetery (Barber and Bowsher 2000). Complete or partial burnt skeletons of pigs and chickens were found associated with five and nine cremations respectively. All the chickens are described as complete (although fragmented) whereas the pigs, apart from one partial skeleton, were represented only by forelimb bones from either the left- or right-hand side.

Several pits that probably predated the cemetery also included animal bone groups (Barber and Bowsher 2000; Reilly 2000; Fulford 2001). A 2nd-century pit produced a wide range of finds in the primary fill, including a partial skeleton of a heron and several broken flagons. Another early Roman pit contained skeletons of an adult horse, a dog, and a juvenile red deer – which had apparently been carefully arranged. A third deep pit or well included an articulated dog skeleton alongside some burnt animal bones, possibly redeposited from a cremation, a large amount of building stone, burnt wheat chaff and some fish bones.

Elsewhere in the Eastern Cemetery area, at least eight groups of associated adult horse bones were recovered from a variety of feature types. Only one, from a quarry pit, was complete and articulated. Several were disarticulated and interpreted as redeposited carcasses; others were partially articulated skeletons, which Reilly (2000) argues may have been secondary burials interred during a hiatus in the use of the cemetery and subsequently disturbed by further grave digging. No evidence for butchery was found on any of the bones. Reilly (2000) also suggests that the presence of relatively large numbers of both associated and individual horse bones on sites on the outskirts of towns represented the casual dumping of (originally complete) horse carcasses in peripheral areas of the towns, which subsequently commonly were disturbed, redistributed, and partially destroyed.

Other associated bone groups noted from excavations in London include the discovery of the skull, mandible, and some cervical vertebrae of a horse from Goodman's Yard (Locker 1980). The skeletons of a minimum of nine adult dogs were deposited in 3rd-century deposits within a turret on the Central Criminal Court site (Armitage *et al* 1987).

Several associated bone groups have been noted in the assemblages from sites excavated in Southwark. Four partial articulated dog skeletons were recovered from Winchester Palace (Reilly 2005). The partial skeletons of three dogs were found in the backfill of a well shaft on the Redcross Way site and described by Ainsley (2002). They consisted of the skeleton of a large elderly dog, mostly complete but missing most of the foot bones and some of the vertebrae; eight bones from a juvenile, and a pair of femora of a second adult. The femora were found in different contexts and Ainsley argues that all three skeletons were redeposited remains rather than primary burials in the well. Dog skeletons have also been recorded in earlier excavations (1974) in Southwark. Two 2nd-century timber-lined pits and a well included at least twenty dog skeletons in deposits that also contained a large number of complete pots and glass vessels (Fulford 2001). These accumulations therefore have similarities with some of those from shafts in Dorchester (Woodward and Woodward 2004) and Winchester.

Three partial skeletons of kittens were retrieved from London Bridge sites and a small number of bones from a lamb were recovered from a make-up layer associated with the construction of a building (Ainsley 2002). The group included a mandible, scapula, metapodials, and one vertebra. Despite the lack of butchery marks, it was argued that the carcass had probably been processed. Once again the presence of a partial sheep skeleton associated within a building bears similarities to several of the Winchester groups and it is possible that this was a foundation deposit.

St Albans

Despite the clear association with a temple complex and associated features, relatively few associated animal bone groups were recovered from the Folly Lane excavations (Locker 1999). A pit cut into the terminal of the ceremonial enclosure ditch produced a partial skeleton of an adult horse. Fragmentary remains of the skull and mandible and limb bones were recovered. Associated bones of two further horses were found in the upper silts. Individual horse bones were also relatively common in the upper fills of the ditch and their abundance is reminiscent of peripheral urban cemetery sites such as the Eastern Cemetery in London (Barber and Bowsher 2000) and, to a lesser extent, Victoria Road, Winchester.

The assemblage from Shaft AET again deserves to be described in some detail because of similarities with some features in Winchester. The bone assemblage is dominated by over 1000 split upper limb bones from dozens of cattle (Locker 1999). The presence of large accumulations of specialist processing waste probably associated with marrow production is, as discussed above, not unusual on large urban sites, although not often found as such a large discrete accumulation (Table 2.226). However, a human skull had previously been placed at the bottom of the pit. The lower fills also included a partial skeleton of a puppy represented by ribs and some limb bones. Forty-nine bones of a second puppy skeleton were recovered from another layer, consisting mainly of ribs, vertebrae, and forelimb bones. The dogs were interpreted as votive

offerings because of their proximity to the human skull, although possible reasons as to why they were incomplete were not discussed.

Features described by the excavators as ritual shafts on the basis of other finds including complete pottery vessels (Fulford 2001) contained various amounts of bone. Most of the bones came from three shafts and included high percentages of horse bones, although only one associated group consisting of a left hind leg was found. This appears to have been redeposited judging by the presence of gnawing on the calcaneus. However, high percentages of horse bones in assemblages from this site were interpreted in general to be indicative of ritual deposition (Locker 1999). Two partial dog skeletons were recovered from the sinkage at the top of another shaft.

A shallow pit cut into the back of the military rampart and dated to AD 61–75 contained two sets of articulated vertebrae of sheep/goat (Marples 1984). No ribs and only a few limb bones and a mandible fragment were recovered. There is no statement as to whether any of the bones bore butchery marks but it was noted that many of the unidentified bones in the deposit were burnt. This may therefore represent a deposit of perhaps three sheep/goat carcasses, which may have been processed. The nature of the remains and its location bear similarities with the butchered sheep remains found in JCH pit F72 and HG post-hole F152 in Winchester, both situated on the boundary of the defences.

Silchester

No associated groups of bones were found in the excavations of the South Gate and other areas of the defences (Maltby 1984b). There also appears to have been no associated groups in the large assemblage recorded from Roman deposits on the Basilica site (Grant 2000). However many associated groups have been recorded – particularly from well shafts and pits in other excavations from the town. Some of these have been noted by Fulford (2001). Recent excavations in *Insula* IX have produced complete pottery vessels and other unusual finds in various later Roman shafts. One example included two complete New Forest vessels and an articulated cattle ankle joint. Another included a complete skeleton of a dog, apparently carefully placed against the side of the pit.

Fulford also noted the probable presence of associated bone groups recovered from pits and wells from much earlier excavations in Silchester, although the descriptions of bones recorded in the annual reports of the excavations are usually brief and selective. Dog skeletons, however, appear to have been frequently recovered. One was found, for example, in a pit from *Insula* II. Silchester Museum houses many complete dog skulls from the excavations but it is not clear whether they were isolated finds or associated with other parts of the skeletons, which were not kept.

In addition to the material from the shafts, Fulford (2001) has also drawn attention to groups of animal bones from House 1 in *Insula* XXVII. Deposits of bird bones were found in one room while in another there was a deposit of a very young lamb seemingly associated with three pots. Again, this is reminiscent of some of the finds of sheep from the buildings in the northern suburb of Winchester. Finally, an articulated section of a fish complete with scales, originally described as a small carp, but perhaps more likely to be another type of cyprinid, was found in a pot in an unprovenanced feature.

Winchester

In addition to the material from assemblages described in detail in this volume, the presence of some associated groups of bone was also noted in the Roman deposits from Staple Gardens (Maltby 1986a). Twenty-three bones of a juvenile lamb were discovered in a post-hole of a fence line along the edge of a bank and ditch. Six bones from the forefoot of a dog were found from the bank itself.

Wroxeter

The only associated bones described by Meddens (2000) from the baths and macellum excavations belonged to two adult dog skeletons found in 3rd-century pits. It was argued that their incompleteness was due to poor retrieval rather than from disturbance and redeposition. Two other smaller groups of dog bones were found in earlier deposits from the site.

York

The only associated group of bones explicitly noted from the Tanner Row site belonged to a partial dog skeleton (O'Connor 1988). The nature of the deposits, which lacked deep pits and wells, probably accounted for the lack of associated groups on this site.

Discussion

This survey of sites from major Romano-British towns has shown that associated bone groups have been recorded from all of them. Their frequency varies between sites for a number of reasons. The first concerns the types of features excavated. Associated groups are more likely to be recovered from pits and wells than other types of deposit, although they have also been found in graves, buildings, and ditches. However, assemblages that have largely been derived from occupation layers are much less likely to produce such material. The Winchester excavations provide a good example of this variability. A second reason for variations in frequency lies in the detail published in the animal bone reports. Some authors have provided

detailed discussions of associated groups but others include few details and some make no reference to the presence or absence of such groups.

Dogs are by far the most common species represented by associated groups. Multiple depositions of dogs within the same feature have been recorded on several sites in addition to Winchester, including the neighbouring *civitas* capitals of Chichester, Dorchester, and Silchester. If one adds the presence of such depositions from other sites such as the small town of Neatham (Done 1986; Fulford 2001) and the rural site of Oakridge II (Maltby 1995b), it is clear that this was common practice in the region. There is little evidence that dog carcasses were processed. Very few examples of skinning or other butchery marks have been found even on isolated bones. As several specialists have pointed out, many of the partial skeletons could represent parts of complete carcasses that have been redeposited. It seems likely that cats were treated and deposited in the same way as dogs.

Horse carcasses too seem generally not to have been routinely processed for food or other products, although a few bones from several towns do have evidence for butchery or bone working. Fairly complete skeletons of horses have been found in wells or deep shafts in four different towns including Winchester. In all four cases they are from features that contained multiple burials of different species and in some cases substantial amounts of complete pottery vessels. They also tend to be located in the lower fills, all of which could support arguments in favour of ritual deposition. Smaller groups of horse bones have been found in Winchester, St Albans, and several sites in London. The fact that several of these groups are from sites located near cemeteries or ritual buildings could also be used to support a ritual interpretation. However, as discussed above, these are also in peripheral areas of the towns, which tend to produce higher percentages of horse. It is therefore possible that the partial skeletons and indeed many of the isolated horse bones represent disturbed and partially destroyed carcasses deposited in areas away from the main occupation areas of the towns.

Associated groups of cattle bones are uncommon from the sites in this survey. It can be argued that all of the small groups from sites in Winchester, Caerwent, Silchester, and Dorchester are butchery waste. The foot bones from North Gate, Gloucester may have been skinning waste, although given its provenance, the possibility that it was a foundation deposit is worth considering. The calf skeletons in the two wells at Chichester are the only others where ritual deposition could be strongly supported, although at least one of these may have been redeposited.

Associated groups of pig bones have been recorded in at least eight towns including Winchester. Apart from the burnt joints accompanying burials in the Eastern Cemetery, London, nearly all the other groups of pig bones considered in this survey came from perinatal or juvenile pigs recovered usually as partial skeletons that showed no evidence of butchery. Most have been found in wells and deep pits and are usually found with burials of other species. These may conceivably have been sacrificial animals but it could also be argued that they were natural mortalities from stock reared in the town and not considered fit to eat, particularly if they had been left to rot prior to deposition.

Partial and complete skeletons of (usually juvenile) sheep and goats have been found, sometimes with other associated groups in shafts and wells in several towns. Some of the remains, however, probably represent processing waste. However, in contrast with all other species, associated groups of sheep bones in Winchester were more commonly found in association with buildings or on the boundaries of defences. All the groups include butchered bones and sometimes burnt bones, which had been gathered together after processing and cooking and carefully deposited. This survey has revealed that similar groups have been found in similar deposits in several other towns including Chichester, Cirencester, Dorchester, London, and possibly St Albans and Silchester. These arguably represent more convincing evidence for ritual deposition than many of the associated groups found in pits. The practice may have been associated with the dedication of buildings or the marking of boundaries.

Depositions of associated groups of wild mammal species have been rarely discovered. The most significant is probably the red deer skeleton found in close association with a dog and a horse from the Eastern Cemetery site in London (Reilly 2000), which may represent a ritual deposition associated in some way with hunting.

Associated groups of bird bones have also been found in some towns. Those of domestic fowl may include some which were ritual depositions, as they clearly were in the graves in the Eastern Cemetery in London, and, indeed in the Alington Avenue cemetery, Dorchester (Maltby 2002) and elsewhere. However, the case for ritual deposition of domestic fowl in many instances is unclear.

Associated groups of ravens have been found in Leicester, Dorchester, Winchester and, judging by the large numbers recovered in 19th-century excavations, probably in Silchester (Maltby 1979a). Woodward and Woodward (2004) have plausibly argued for a ritual interpretation for the deposition of the Dorchester ravens and the same could be argued for the remains from the other towns, as usually they are associated with multiple burials. Raven skeletons have also been found on Iron Age sites such as Owslebury (Maltby 1987a) and Danebury (Coy 1984), which could imply some sort of continuity in belief systems associated with these birds. This contrasts with interpretations that emphasise the probable presence of ravens and other corvids as scavengers in the towns and the need to control their numbers.

The survey has demonstrated that the provenance and nature of most of the associated bones groups found in Winchester have parallels in other towns and presumably the same motivations were involved in their deposition. There has been a range of interpretations put forward to explain their presence. What is becoming increasingly apparent is that no single

explanation can satisfactorily account for all of the groups. To take the Dorchester shafts as an example, it is just as naïve to interpret all associated bone groups as identical ritual depositions (Woodward and Woodward 2004) as it is to assume that they all represent discarded carcasses (re)deposited with other rubbish (Maltby 1993). It is clear that interpretations have to take into account the nature of associated finds and detailed contextual information. In many cases, for example, it is unknown whether bone groups are articulated or scattered within a context in a disarticulated state. Clearly, this could have a bearing on any interpretation. It is apparent that there are some very interesting repetitive patterns of carcass disposal in these Roman towns. It now remains to improve excavation and recording techniques, and provide better communication between excavators and specialists, in order to make more holistic and robust interpretations of these remains.

Recommendations for future research

The analysis has revealed a great deal about animal exploitation in the northern suburb of Winchester in the Roman period. The data can be used as a basis for further work on Roman material in the town and its hinterland. The following priorities are recommended.

1. In Winchester, future research on animal bones needs to concentrate on well-dated assemblages. It has been impossible to investigate diachronic change with much confidence in these samples and this needs to be rectified. Good diachronic resolution will assist in establishing whether there were significant changes in the diet, or in the quality of the stock, or in the distribution systems, or in ritual practices. The best closely dated material is likely to come from pits and wells, which will also preserve bones better than most other deposits. Although such features may sometimes produce assemblages that are atypical because of deposition of complete carcasses, they have many other advantages and the history of deposition in these features is an important topic in itself. It is important, where safe to do so, for these features to be completely excavated, for it is usually the lower fills that produce the most useful faunal data.
2. Detailed examination of suitably large Roman assemblages from other parts of Winchester is required. This analysis has demonstrated that there was significant spatial variation in the nature of faunal assemblages within and between sites. The full range of this variability is unlikely to have been encountered. In particular, good assemblages from more central parts of the town are needed to compare with these assemblages from the suburbs.
3. Any excavations of well-dated Roman features in the town need to incorporate further sieved sampling programmes to increase the database of such material. This could clarify the importance of the exploitation of birds and fish in the town, as well as recovering bones of small mammals, amphibians, and birds in order to obtain a better idea of environmental conditions in different parts of the town.
4. To date, excavations in Winchester have produced only the residues of industrial activities involving the processing of animal carcasses. The butchers in particular are likely to have had permanent facilities in the town. The discovery and excavation of such premises would be extremely interesting for archaeozoologists.
5. Outside of the town, further investigations of contemporary rural settlements would be valuable to confirm whether the contrasts between Owslebury and Winchester are replicated on other sites. It would be extremely informative if a suitably large assemblage from a villa settlement could be obtained from the area. Data from such sites are sadly lacking and it is important that a better understanding is obtained concerning their relationship with the town in terms of its meat supply. It may also be expected that owners of villas would be more likely to introduce new types of stock than native farmers and this theory could be tested on suitable material.

This analysis of animal bones has completed the first stage of detailed research of the faunal data from the later Roman period in Winchester. This extensive discussion has been necessary to produce a published archive of information that can be used as a basis for future comparisons with contemporary material from the town and its environs. It is also an important assemblage in its own right for archaeozoological studies of Roman Britain and it is hoped that the data will provide useful reference material for analyses of other urban assemblages in particular. Many of the conclusions of this analysis require such comparisons so that they can be supported or refuted.

It is also hoped that the issues raised in this report are of interest to other archaeologists. Inferences have been made about a wide range of themes relevant to Romano-British studies in general. These include examination of the relationship between town and countryside; acculturation; ritual practices; industry; technology; civic administration; trade and markets; and the social and economic status of inhabitants of towns. It is hoped that the information derived from the examination of the Winchester animal bones has added to the understanding of how the residents of the Roman town lived and provided some insights into their attitudes to other animals.

PART 3: Environmental evidence from the western suburb

1 Faunal remains from Roman deposits

by J Coy and J Bradfield

Introduction

Five groups were selected for presentation in this report: one consists of a deposit of specialised waste from the (?mid- to late) 2nd-century fill of the north–south field boundary ditch at Crowder Terrace; the four other smaller assemblages are – earlier Roman (up to *c* AD 250/270) deposits in the Oram's Arbour ditch at New Road and Sussex Street, two groups of later Roman material in the ditch at New Road (one group from the cemetery and one post-dating it), and material from later Roman pits at Crowder Terrace. The latter four groups are described only briefly. A few measurements were taken and these are tabulated, so that they may be compared with material from the northern suburb (Tables 2.11–2.15 and Appendix 1). The small amount of information concerning ageing and pathologies is available in the archive.

Crowder Terrace: the waste deposit

Most of the bone came from the later fills (*21* and *30*) of a north–south field boundary ditch F14/ 15/ 21/ 95, at Crowder Terrace (Phase 10) which appears to have been in use from the late Iron Age or very early Roman period until the mid- to late 2nd century. (Figs 52 and 53).

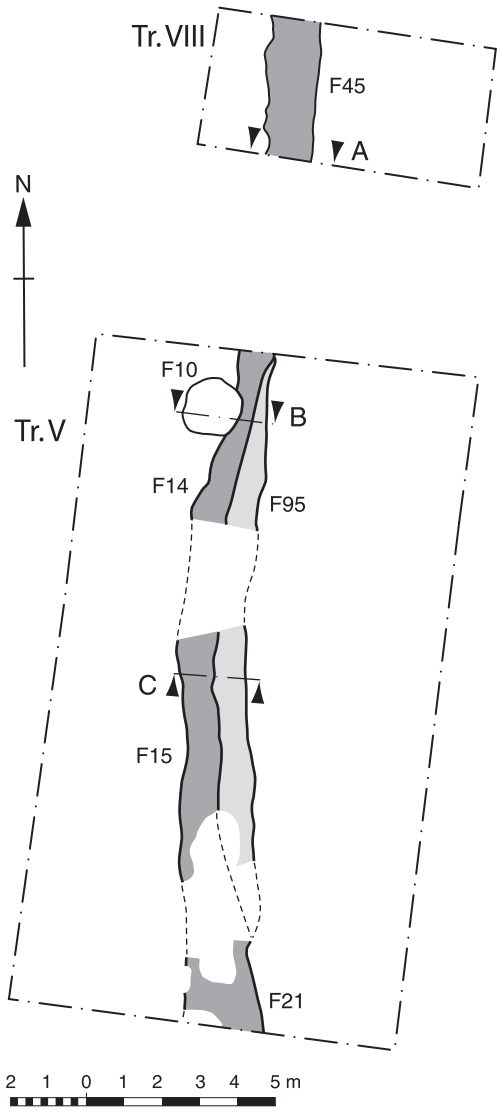


Figure 52 Plan of the north–south field ditch at Crowder Terrace, also showing one of the later Roman pits, F10

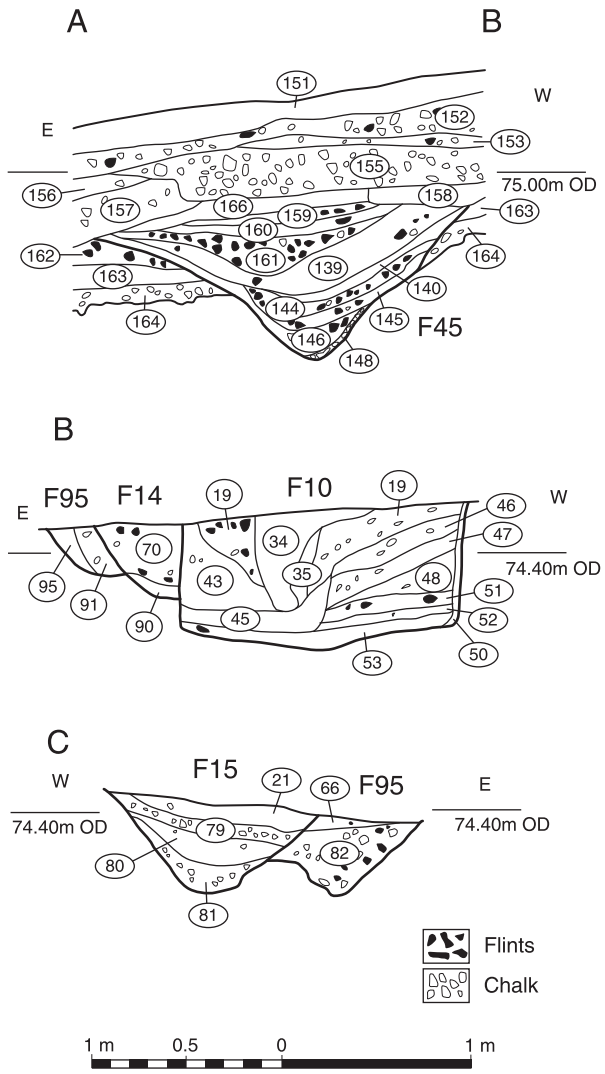


Figure 53 Sections through the north–south field ditch at Crowder Terrace, also showing one of the later Roman pits, F10

Table 3.1 Animal bones from the waste deposit at Crowder Terrace (Phase 10)

	Horse	Cattle	Sheep/ goat	Pig	Cattle-sized	Sheep-sized	Totals
Horn core			1			1	2
Cranium						3	3
Mandible		3	13	2	11		29
Vertebra			2		2	2	6
Rib				1	15		16
Scapula		119		2	1100		1221
Humerus	1	2			6		9
Radius	21	45			37	1	104
Ulna	11	3			8		22
Pelvis		3	2				5
Femur	2		1	1	2		6
Patella		1					1
Tibia	11	32	3		46		92
Carpal/tarsal	6	10	2		4		22
Metapodial	20	47	4		34	1	106
Phalanges		1					1
Loose teeth			8				8
Longbone frags					2043	5	2048
Frags					5113		5113
Totals	72	266	36	6	8421	13	8814

Note: There were also two fragments from domestic dog and a metapodial of roe deer (*Capreolus capreolus*)

Table 3.2 Percentage of fragments from the waste deposit at Crowder Terrace that were worked

	Identified to species				Large ungulate	
	% Horse	(n)	% Cattle	(n)	%	(n)
Scapula			77	119	100	1100
Radius	0	21	11	45	51	37
Ulna	27	11	33	3	12	8
Tibia	18	11	16	32	35	46
Metapodial	85	20	81	47	94	34
Frags					100	7161

Some 8800 fragments were examined (Table 3.1). The majority could only be identified as being from bones with a thick wall, probably mostly longbones. These were classified as cattle-sized longbone fragments, or, where the fragments were of a very small size, as cattle-sized fragments. In *21*, 97% of the fragments were chopped or worked, and in *30*, 87% (shown together in Table 3.2). These two contexts also accounted for around 230 fragments which were recognisable as objects, mostly spoons, which had been blundered in the final stages of manufacture, and these are catalogued as artefacts in a separate publication within the series (Rees *et al* 2008).

The identified bones are almost exclusively from cattle and horse (Table 3.1) and from a narrow range of anatomical elements: mainly the scapula, metapodials, tibia, and radius. A minimum of three horses and six cattle were represented by the proximal radii; six horses and eleven cattle by the distal tibiae; and 25 cattle by the scapulae. There were some bones of other species present (sheep, pig, dog, and roe deer), but none of these were worked, and presumably their presence was not related to the bone working process.

The deposit was clearly specialised and of almost completely unmixed origin. It obviously included material that had been deliberately selected for working.

Cattle scapula was highly favoured, judging by its

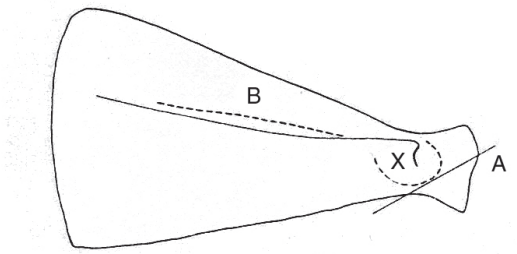


Figure 54 Cattle scapula and area of maximum working

high frequency but it must be remembered that the shoulder blade is a large and flat bone which will produce a large number of recognisable fragments. Horse scapulae were absent in the deposit, perhaps because the bone is not so broad and smooth as that of cattle and may have fragmented in an unsatisfactory manner. The working on the cattle scapula aimed at isolating the thickest part of the outer surface of this bone – that at the base of the acromion and lower part of the spine (area X in Fig 54). The scapulae had been sliced obliquely in the region of the scapula neck and also some 100–150mm above it (A & B in Fig 54). There was also a concentration of fine chiselling or knife whittling in the neck region, both at the point where the spine originates at the neck and half way towards the acromion. The archive contains maximum dimensions for all worked fragments recorded under the categories of scapula, longbone, and unidentifiable fragment. There was a great variety of size and thickness in the scapulae and presumably they would have varied very much in their suitability for working.

It is puzzling, therefore, that there were no artefacts in the deposit which could have been made from cattle scapulae. The only unfinished artefacts that were certainly present were bone spoons. Experimental butchery of modern cattle scapulae which was carried out at the Ancient Monuments Laboratory showed that cattle scapulae are too thin to have produced these spoons. Other artefacts known to have been made from cattle scapulae elsewhere in Roman Britain are rare, but include weaving tablets. This type, however, was poorly represented in the Roman suburbs and defences (Rees *et al* 2008, 76, no 363, 185).

It is difficult to ascertain which, after the scapula, were the most favoured bones, partly because the most heavily and consistently worked fragments have lost any of the features on the bone which would allow them to be identified. The next most frequently identified fragments are metapodials of both cattle and horse. Virtually every piece found had been worked. There was also some working of the radius and tibia, but to what extent they were worked compared with the other elements is uncertain. Only a very few pieces of humerus and femur were recognised. There were no signs of real working on the large, identifiable fragments of proximal radius and distal tibia, but there were often jagged areas which could be the result of splitting the articulation from the rest of the shaft. The shafts of the tibiae, radii, and metapodials had been split longitudinally. Sometimes the splitting was continued through the articular end of the bone. Although some of the initial splitting may have been carried out using a heavier implement, most of the working shows characteristic marks made by contact with a very sharp thin blade. Evidence for the use of knives is confirmed by the wavy nature of some of the cut surfaces, indicating the use of a slightly flexible blade. There was no evidence for the use of saws. The longbone fragments were of two main types. Some were only slightly longer than they are wide in relation to the axis of the longbone, and these often had ends coming to a point. This was probably caused by the method of shattering the bone rather than working. The second type were narrower, longitudinal strips. Many fragments were too small or too whittled to be identifiable even as longbone; some of these were roughly square in section and sometimes whittled on more than one side.

The majority of articular ends were fused. There was an apparent absence of distal radius and proximal tibia, and this could be accounted for if it was cattle of between four and six years that were selected for slaughter. At this age the distal radius and proximal tibia would have been unfused (Table 3.3), and these may have been discarded elsewhere at an earlier stage in the working process.

As well as containing waste from bone working, the deposit may include some from specialist butchery. However, there are deposits in the northern suburb that produced typical Roman butchery waste, which

Table 3.3 Ages of fusion in modern horse and cattle

	Scapula	Radius	Tibia	Metacarpus	Metatarsus	
Horse proximal			***15–18 months***	3–3.5 years		
Cattle proximal			***12–18 months***	3.5–4 years		
Horse distal		1 year	3.5 years	***20–24 months***	15–18 months	16–20 months
Cattle distal		***7–10 months***	3.5–4 years	***2–2.5 years***	2–2.5 years	2–2.5 years

Note: After Silver 1969
Epiphyses italicised and emboldened are those most commonly represented at Crowder Terrace

Table 3.4 Animal bones from earlier Roman phases of the Oram's Arbour ditch

	Horse	Cattle	Sheep/ goat	Pig	Cattle-sized	Sheep-sized	Dog	Totals
Horn core			4					4
Cranium	3	3	10	10	9	11		46
Maxilla			2	2				4
Mandible	1		10	3			4	18
Vertebra		9		1	2	4		16
Rib					7	6		13
Sternum			2					2
Scapula	3	2		1	4	6		16
Humerus	2	4	11	7	6			30
Radius	5	4	5	4	6		3	27
Ulna	5			4				9
Pelvis			3		6			9
Femur	3		2				1	6
Patella					1			1
Tibia	17	7	10	6				40
Carpal/tarsal	5		7	1				13
Metapodial	9	6	7		2		1	25
Phalanges			5	1				6
Loose teeth	21	5	10	3				39
Longbone frags					33	18		51
Frags					15	25		40
Totals	74	40	88	43	91	70	9	415

Note: Phases cover Sussex Street Phases 4–10 and New Road Phase 6

are described in Part 2.1 and in these the quantitative balance of anatomical elements is somewhat different from that in Crowder Terrace.

The smaller assemblages

Material from the Oram's Arbour ditch at New Road and Sussex Street

Sussex Street Trench XIV (Phases 4–10); New Road, Period 3 (Phase 6): late 1st – early 3rd century (Plates 40 and 41)

The Iron Age enclosure ditch at Sussex Street (Trench XIV) silted up or was filled during the earlier Roman period, and may have more or less vanished as a feature of the landscape before the mid- to late 3rd century. By contrast, at New Road, it appears that the ditch was cleaned out, and only one phase of erosion and silting was recorded predating the establishment of the later Roman cemetery.

Although they are unlikely to be precisely contemporary, then, the bones from the earlier Roman ditch fills at New Road and Sussex Street (represented by *557* in Fig 55 and by *513*, *512*, *511*, *508*, *504*, *500*, *492*, *577*, *487*, *490*, *491*, and *493* in Fig 56) have been summarised (by NISP) in Table 3.4 in order to give some picture of the species and anatomical elements. Overall sheep/goat was most common, followed by horse, pig, cattle, and dog in that order.

The 242 fragments from the silting of the Oram's Arbour ditch at Sussex Street were mainly from *592* (Phase 4) and *494* (Phase 10) with 105 and 64 fragments respectively. A fragment of a large boar canine had been worked. This could have been from a domestic pig. Unlike the bones from the waste deposit at Crowder Terrace, the tibiae from the ditch showed no evidence of bone working, although, like some of the other horse bones, one showed knife cuts. Some of the horse teeth suggested animals with an age of at least twenty years.The size of the animals from the earlier Roman deposits at Sussex Street and New Road fit into the overall ranges for the Wessex Iron Age and the bones were generally typical of Iron Age occupation debris. There was one exception: remains of a large horse were recovered from Sussex Street. Overall, three sizes of horse were represented, respectively, smaller than a 13 hand New Forest pony, the same size (Table 3.5), and as stocky as the modern racehorse skeleton in the FRU reference collection. As no withers heights were calculable, it is impossible to tell whether the last individual was as tall as the racehorse (which has a withers height of 16 hands), but bone widths for this horse were above the normal Iron Age range and suggest that the horse is more typical of the improved stock sometimes found in the Roman period.

Plate 40 East-facing section across the Oram's Arbour enclosure ditch at New Road

Plate 41 East-facing section across the Oram's Arbour enclosure ditch at Sussex Street

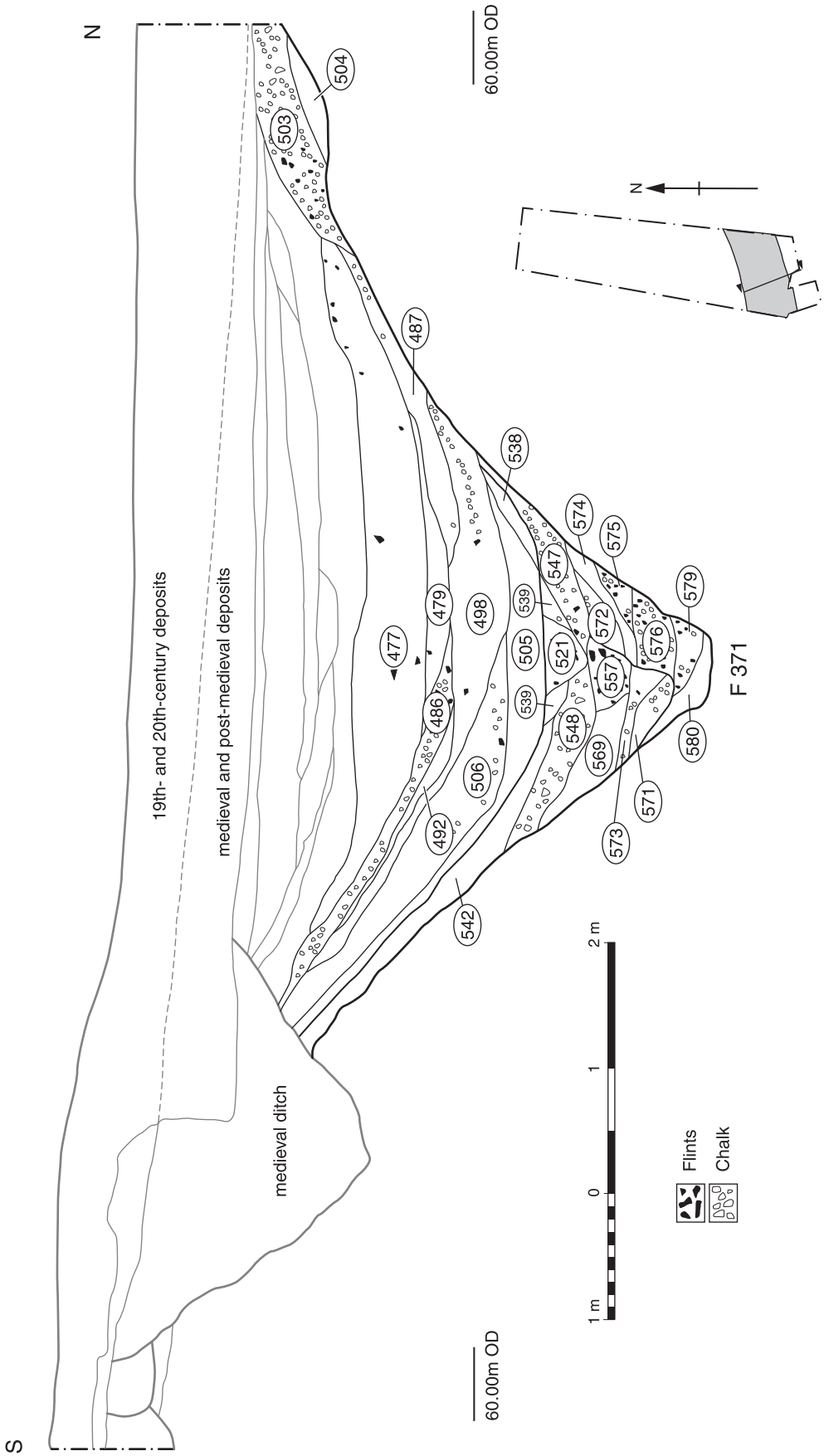


Figure 55 Section across the Oram's Arbour enclosure ditch at New Road

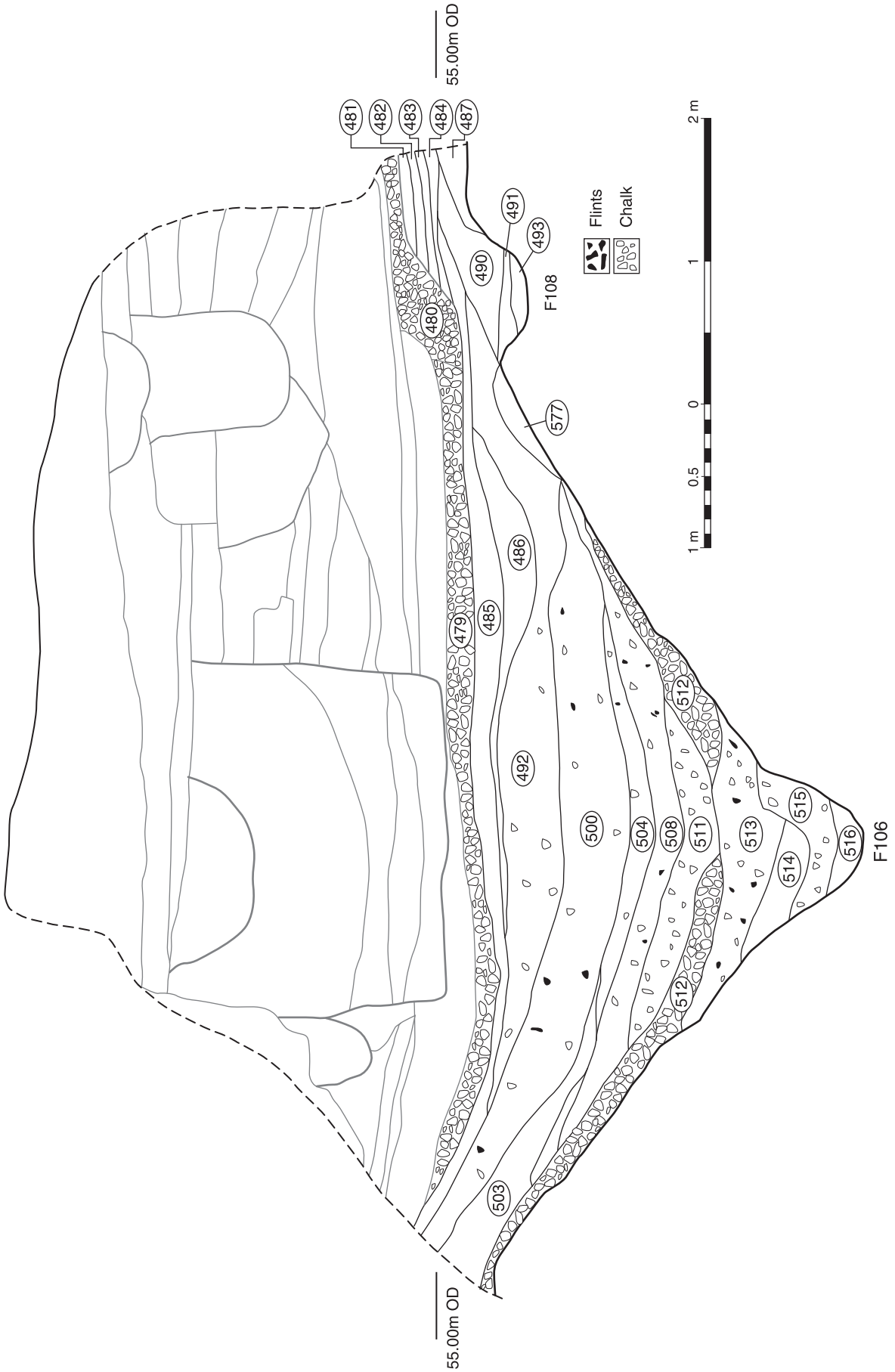


Figure 56 Section across the Oram's Arbour enclosure ditch at Sussex Street

Table 3.5 Summary of metrical data from the western suburb

Species	Anatomy	Measurement	N	Min	Max	Mean	SD	CV
Cattle	Scapula	SLC	14	40.8	51.4	46.7	3.8	8
		GLP	7	52.7	72	60.4		
		LG	5	41.6	62	51.6		
		BG	19	37.7	51.5	44.1	4	9.1
	Metacarpus	Bd	7	49.6	65.4	58		
		DFB	6	45.2	58	52.3		
		Dd	7	29.5	35	31.8		
	Tibia	Bd	15	54.4	68.5	62.2	4.6	7.4
		Dd	19	37.8	54.5	46.1	4.2	9.2
Sheep/goat	Humerus	SD	5	11.9	17.4	14.3		
		BT	7	24	28.3	25.7		
		Bd	11	25	29.7	26.9	1.7	6.3
	Mandible	PM Row	12	20.1	27.1	23.5	2.7	11.5
		M Row	13	39.3	51.1	46.7	3.2	6.9
		Before P2	13	12.5	19.5	16	2.1	13.3
		Before M1	14	14.7	22.7	19.5	2.4	12.4
		Length M3	12	18.1	24.1	21	1.7	8.1
		Tooth Row	10	59.8	77	68.5	5.1	7.5
Horse	Radius	Dp	7	34.3	40.3	37.7		
	Tibia	Bd	14	62.2	72.5	66.7	3.6	5.5
		Dd	14	36.8	44.6	41.2	2.5	6.2

Measurements & estimated withers heights

Species	Anatomy		Measurement	Withers Height
Cattle	Metacarpus	GL	192	118
Horse	Tibia	GL	319.9	-
			334.9	-
			342.9	-
		LI	301	131
			311	136

Key:
N = number of measured bones
SD = standard deviation
CV = coefficient of variation
See Appendix 1 for key to measurements. Withers height in cm; all other measurements in mm.

Material from the enclosure ditch was not well preserved on the whole, the least well preserved assemblages coming from the latest phases, as might be expected. The fragments from the ditch at Oram's Arbour were mostly hard and well preserved, although only thirteen of them were measurable. About 5% of the fragments were eroded and 8% canid-gnawed. At New Road, 3.5% of the assemblage was eroded, 12% was gnawed, and only 16% could be measured.

New Road, Periods 4–5: late 3rd – early 5th century

The earlier (Period 4) material was from silting deposits successively sealing and cut by several phases of later Roman graves. There are some indications that intrusive medieval material may be present in the upper layers. Large amounts of soil were sieved from the cemetery area at New Road, but sieved material did not make a significant contribution for these phases, presumably because the bones arrived in the ditch siltings as a result of secondary deposition. No fish or amphibian bones were retrieved from sieved samples.

Period 4 (Phases 12–23): late 3rd – 4th century

Contexts of Period 4 are represented in Figure 55 by *547*, *548*, *539*, *521*, *542*, *505*, *506*, *492*, *498*, *486*, *487*, *503*, and *504*. Among the 340 fragments from Phases 12–23 (Table 3.6) were a fair number of loose teeth and mandibular fragments, typical of secondary deposits: 3% of the assemblage had been gnawed by dogs. Eroded bones formed 1%, with 43% of the total only being identifiable as small or large ungulate. Species present

Table 3.6 Animal bones from the Oram's Arbour ditch – silting layers in the later Roman cemetery

	Horse	Cattle	Sheep/ goat	Pig	Cattle-sized	Sheep-sized	Dog	Totals
Horn core		1						1
Cranium		3	6	1	1	3	2	16
Maxilla		3	2				4	9
Mandible	3	7	6	8			2	26
Vertebra	9	6	2	1	5	1		24
Rib	1		3		9	7	1	21
Scapula	1	2	2	1	2			8
Humerus		3	3	2	3		1	12
Radius		1	5		4		2	12
Ulna		2	1					3
Pelvis		2	1				1	4
Femur		1	2	2	2	2		9
Patella		1						1
Tibia	1		8		3	3	2	17
Fibula				3				3
Carpal/tarsal		2	2	1	1	1	1	8
Metapodial		3	5				2	10
Phalanges		4	1	2				7
Loose teeth	2	17	22	4			2	47
Longbone frags					25	38		63
Frags					2	34		36
Totals	17	58	71	25	57	89	20	337

Note: A teal and a domestic fowl metacarpus and a fragment of roe deer antler were also present
Phases cover New Road Phases 12–23

were sheep/goat, cattle, pig, dog, and horse in that order (NISP). In *492*, a similar silting deposit, there was a carpometacarpus of teal (*Anas crecca*). In *560*, the fill of a Phase 12 grave, there was a fragment of roe deer antler.

A sheep cranial fragment in the silting over the cemetery *478* (Phase 23) was from a four-horned animal. As these were unknown in the Roman period, it is more likely to have been of medieval date.

Period 5 (Phases 24–26): late 4th–early 5th century

Period 5 contexts are represented in Figure 55 by *479* and *477*. There were 222 fragments from soil and possible turf layers overlying the cemetery (Table 3.7). At least 6% of the bones were eroded and there was also a high incidence of dog gnawing (9%). As in the material from the earlier layers, loose teeth and mandibular fragments were well represented. Again, over 40% of the fragments could only be identified as being from small or large ungulates and could not be identified to species. The main difference was the lack of dog remains in the later deposits. The similarity in the origin and history of the deposit may be the reason that it is similar to that from Phases 12–23.

The assemblage contrasts with that from the late Roman pit at Crowder Terrace (F10) which is described below. This may reflect not only the unspecialised nature of the material from the ditch but also the probability that these phases represent silting over a long period of time.

Crowder Terrace

Pit F10 (Phase 13): late 3rd and 4th centuries

There were 237 bones from pit F10. The bones present are shown below (Table 3.8) as an example of typical pit contents from the western suburb. Bones from F10 and the few other pits of Phase 13 were generally well preserved: the bone was very crisp and hard with a slightly mineralised appearance and a ginger-brown colour. However, it should be noted that the pit contents were not as well preserved as the best preserved groups from pits and wells in the northern suburb discussed by Maltby in Section 2.2

The usual selection of common domestic mammals was present – sheep/goat, cattle, pig, and horse in that order of ranking by NISP. This pattern is quite different from the earlier Roman ditch samples from New Road and Sussex Street, where horse predominated. Several sheep crania were represented, one rather Soay-like and another of the hornless variety. The larger size of Roman hornless sheep compared to the smaller Iron Age horned variety has been discussed in Part 2 (pp 181–183). There were also four bird bones – a femur of a golden plover (*Pluvialis apricaria*); a femur and tibiotarsus of domestic fowl, the former from a laying hen as shown by the presence of the medullary bone (Coy 1983); and one unidentifiable fragment. The pit provided twice as

Table 3.7 Animal bones from the fill of the Oram's Arbour ditch – final silting over the cemetery

	Horse	Cattle	Sheep/ goat	Pig	Cattle-sized	Sheep-sized	Dog	Totals
Horn core		1						1
Cranium	3	3	5	1	2	9		23
Maxilla	2		1					3
Mandible	4	5	8					17
Vertebra	4	6	4	1	3	2		20
Rib					5			5
Scapula	3	2	1		4			10
Humerus	2	1		2	2	1		8
Radius	1	5	2					8
Ulna		3			1			4
Pelvis	2	3			1			6
Femur		1		1				2
Tibia	2	2	4					8
Carpal/tarsal		4						4
Metapodial	1	8	1					10
Phalanges	2	4						6
Loose teeth	3	10	8	1			1	23
Longbone frags					25	26		51
Frags					8	4		12
Totals	29	58	34	6	51	42	1	221

Note: There was also a humerus of a crow (*Corvus corone* sp)
Phases cover New Road Phases 24–26

Table 3.8 Animal bones from Crowder Terrace pit F10 (Phase 13)

	Horse	Cattle	Sheep/goat	Pig	Cattle-sized	Sheep-sized	Bird	Totals
Cranium		2	11	1	1			15
Maxilla		1	6	1				8
Mandible		2	9			1		12
Vertebra	1	1	7	1	4	1		15
Rib		2	7		9	10		28
Scapula	1	7	3		15	2		28
Humerus	1	2	4	2	3			12
Radius	1	1	4			1	1	8
Ulna			1					1
Pelvis			2					2
Femur	1		1	1		1	2	6
Tibia			4				1	5
Carpal/tarsal		1	1		1			3
Metapodial		1	11					12
Loose teeth	2		9	2				13
Longbone frags					10	27		37
Frags					11	21		32
Totals	7	20	80	8	54	64	4	237

Note: Bird includes golden plover (femur); domestic fowl (femur, tibia), and unidentified (radius)

many small ungulate as large ungulate fragments. As there were very few identified bones of pig and horse and none of goat, it is likely that these bones were mostly from sheep and cattle.

In both *19* and *34*, there was evidence of bone working, probably using a saw, on cattle scapulae and two wide flat cattle rib fragments. These probably aimed at a rectangular, flat slab of bone.

Conclusions

The small assemblages from pits and layers described above are typical of the varied deposits found in and around Roman towns, and in many ways are similar to those analysed by Maltby in Section 2.2. The earlier suburban deposits here are notable for having a rather higher percentage of horse than is usually found. In the sample as a whole, horse is less common than on rural sites in Wessex, but is more common than on sites within the defended areas of other towns such as York, Exeter, and Dorchester. This may be because the sites were located in the suburbs rather than the centre of the town. The higher percentage of horse amongst bone working waste in the northern suburb suggests that horse bones may often have been selected for this purpose, although in smaller quantities than cattle.

The specialised assemblage of worked bone and offcuts, however, has no parallels as far as is known. The bone has been worked to a much greater degree than in a typical deposit of specialised Roman butchery, but the full range of artefacts that were the intended end product remains unclear. The worked bone is discussed further in P6 (Rees *et al* 2008, 182–7) but the deposit remains enigmatic.

2 Environment and land-use in Winchester's western suburb in the Roman period: evidence from the land mollusca *by K D Thomas*

Note: This report is presented more or less as written in the early 1980s as it stands alone and is site-specific.

Introduction

A large number of soil samples collected from both earlier and later Roman contexts in Winchester's western suburb have yielded assemblages of land snails. The molluscs cast some light both on contemporary environments and probable patterns of land use during the period.

Sites and samples

The various sites, phases, and samples discussed are listed in Table 3.9. In every case columns of samples are numbered from the bottom (lowermost, or stratigraphically earliest sample) upwards, except for sample CT73 (Table 3.12), which is younger than CT74.

New Road

A series of samples from the Oram's Arbour ditch (Plate 40) was collected by Mrs Carole Keepax (hence the *CK* prefix to the sample numbers). One group from the late Roman period – samples CK7 to CK14 (*547*, *505*, *498*, *479,* and *477* in Fig 55) is considered in the sections below; another group from middle Iron Age contexts is published elsewhere (Thomas 2004). Each sample occupied a volume of approximately 1l. Further details of the samples are given in Table 3.10 (the samples were taken and the snails extracted before the present author became involved with the project, so the data differ somewhat from the other sites examined, where 1kg samples of soil were extracted for molluscs).

Sussex Street

Columns of soil samples were collected from six different locations (A to F) amongst contexts of Phases 3 and 11, which have been interpreted archaeologically as ploughsoils, located within the area enclosed by the circuit of the ditch and accumulating throughout the Roman period. Samples weighing 1kg were taken at a sampling interval of 10cm. Details are given in Table 3.11.

Crowder Terrace

Here, as at Sussex Street, a possible ploughsoil (Phase 5) was cut by an early Roman north–south field boundary ditch (Phases 6–11). Samples weighing 1kg were taken at a sampling interval of 10cm both from the soil and from the fill of the ditch (specifically Phase 7 – *140* and *145;* Phase 8 – *161*). Table 3.12 gives further details.

Methods and results

The land snails were extracted according to the method outlined by Evans (1972). All recognisable fragments of shell were recovered, identified as far as possible, and then quantified. The results for each series of samples are given in Tables 3.13–3.16. The various species identified were classified into various ecological groups (open country, catholic, and shade-loving categories were used) and the percentage frequencies of each group were given – the results are shown in Tables 3.17–3.20 and Figures 57–59.

Attempts were also made to calculate 'absolute' frequencies for each species by weighting abundances according to both the sampling interval (which varied for the New Road series: see Table 3.10) and the proportion of fine material in the soils or sediments (that is, particles of less than 2mm diameter for CT and SXS and of 0.3–2mm for NR, where the total sample weights were not available). These weighted estimates did not yield results which differed significantly in their ecological implications from the unadjusted raw data, so they will not be considered further here. Such an outcome is not always to be expected; in some circumstances (Thomas 1985) calculation of adjusted abundances can lead to different, and possibly more secure, interpretations.

Samples from the enclosure ditch at New Road (Fig 57)

These were all of later Roman date and associated with the use of the cemetery from *c* AD 250/270 onwards. It has been suggested that the inferred open landscape around this site had a marked influence on the rates of colonisation of the ditch by shade-loving snails during the middle Iron Age period (Thomas 2004). The low frequencies of such types persist in the late Roman samples CK7 and CK8 (Table 3.17 – *547* and *505*), which have yielded assemblages dominated by open country species. However, there are some differences in the abundance of various species of snails here, which,

Table 3.9 The contexts sampled for molluscs

Area	Site	Phase	Sample	Archaeological Interpretation
Enclosure ditch	New Road	13	CK7	Successive phases of silting in ditch
		19	CK8	each cut by graves, c 250/70–400
			CK9	
		21	CK10	
			CK11	
		24/26	CK12	Silting over cemetery
		26	CK13	
			CK14	
Within the circuit of the enclosure	Sussex Street	3	A1	Earlier Roman ploughsoils/colluvium
			A2	
			B1	
			B2	
			C1	
			D1	
			E1	
			E2	
			F1	
			F2	
		11	A3	Later Roman ploughsoils/colluvium
			B3	
			C3	
			D3	
			E3	
			F3	
Outside the circuit of the enclosure	Crowder Terrace	5	CT69	Early Roman ploughsoils/colluvium
		7	CT70	Fill of 1st–2nd-C field boundary ditch
			CT74	
		8	CT73	

Table 3.10 Mollusc samples from New Road

Sample	Sample interval (m OD)	Sample thickness (cm)	Weight (gm) of particles >2 <0.3mm	Phase
CK7	59.27–59.35	8	55.2	13
CK8	59.50–59.57	7	26.8	19
CK9	59.65–59.71	6	31.4	19
CK10	59.80–59.90	10	15.5	21
CK11	60.05–60.15	10	13.7	21
CK12	60.27–60.39	12	14.2	24/26
CK13	60.47–60.57	10	18	26
CK14	60.67–60.77	10	24.6	26

Table 3.11 Mollusc samples from Sussex Street

Sample	Sample interval (m OD)	Weight (gm) of particles <2mm	Phase
A1	61.30–61.40	841.8	3
A2	61.40–61.50	780.8	3
A3	61-50–61.60	753.3	11
B1	61.37–61.47	934.5	3
B2	61.47–61.57	860.2	3
B3	61.57–61.67	876	11
C1	61.52–61.62	877.2	3
C3	61.72–61.82	711.7	11
D1	61.60–61.70	908.5	3
D3	61.80–61.90	814.9	11
E1	61.15–61.25	905.5	3
E2	61.25–61.35	749.3	3
E3	61.35–61.45	821.7	11
F1	61.67–61.77	964.1	3
F2	61.77–61.87	927	3
F3	61.87–61.97	872	11

Table 3.12 Mollusc samples from Crowder Terrace

Sample	Weight (gm) of particles <2mm	Phase
CT69	840.5	5
CT70	628.4	7
CT74	450	7
CT73	473.2	8

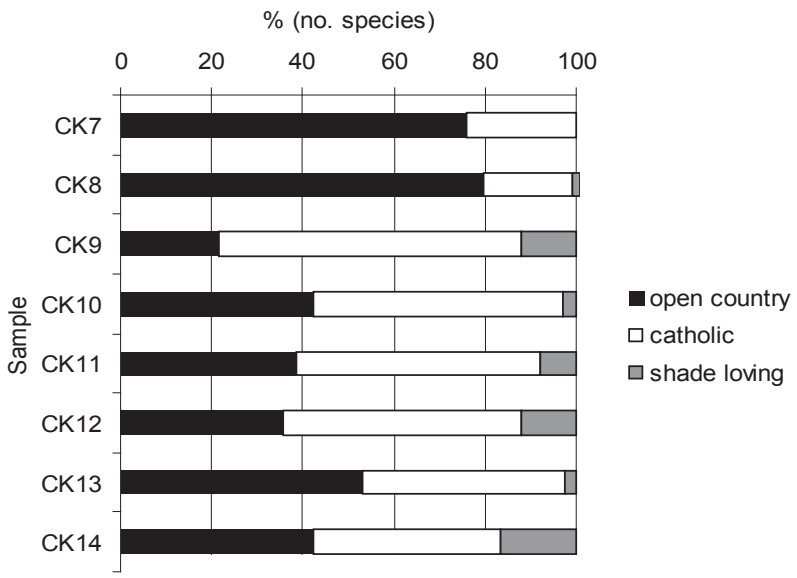


Figure 57 Ecological groupings, New Road

Table 3.13 Mollusc species from New Road

	CK7	CK8	CK9	CK10	CK11	CK12	CK13	CK14
Pomatias elegans (Müller)		+	1					
Carychium tridentatum (Risso)								12
Carychium sp						1	1	
Cochlicopa sp		7	7	5	3	6	14	13
Vertigo pygmaea (Draparnaud)		1						2
Pupilla muscorum (Linnaeus)	21	17	3	5	5	4	6	9
Vallonia costata (Müller)	9	21				1	45	22
Vallonia excentrica (Sterki)	8	55	3	7	4	24	68	41
Vallonia sp	2							
Punctum pygmaeum (Draparnaud)		1	2	1	1	1		
Discus rotundatus (Müller)							1	2
Vitria contracta (Westerlund)		1					1	4
Nesovitria hammonis (Ström)						1		2
Aegopinella pura (Alder)						2		
Aegopinella nitidula (Draparnaud)			3			5		7
Aegopinella sp							2	
Oxychilus sp					1		1	4
Limacidae		2			1		1	1
Cecilioides acicula (Müller)		1		2		1	23	21
Clausilia bidentata (Ström)								1
Helicella itala (Linnaeus)	1	11	3	2	1	1	2	7
Trichia striolata (C Pfeiffer)							3	30
Trichia hispida (Linnaeus)	13	16	17	12	10	37	73	32
Arianta arbustorum (Linnaeus)								1
Cepaea/ Arianta			3	1				
Cepaea sp						1	10	2
Totals excluding *Ceciloides acicula*	54	132	42	33	26	84	228	192
Numbers of taxa excluding *Ceciloides acicula*	5	11	9	7	8	12	14	18

Table 3.14 Mollusc species from Sussex Street, earlier Roman (Phase 3)

	A1	A2	B1	B2	C1	D1	E1	E2	F1	F2
Vertigo pygmaea (Draparnaud)								1		
Pupilla muscorum (Linnaeus)		1					1	+	1	
Vallonia costata (Müller)	4	6	1	5	2		2	5		3
Vallonia excentrica (Sterki)	4	24	3	26	19	6	13	22		21
Vallonia sp			1	4						3
Cecilioides acicula (Müller)	1	4			2					1
Helicella itala (Linnaeus)		4		7	3		5	2		6
Trichia striolata (C Pfeiffer)			1	2						3
Trichia hispida (Linnaeus)	2	5		4		+		2		2
Cepaea/ Arianta		+								
Totals excluding *Cecilioides acicula*	10	40	6	48	24	6	21	32	1	38
Numbers of taxa excluding *Cecilioides acicula*	3	6	3	5	3	1	4	6	1	5

Table 3.15 Mollusc species from Sussex Street, later Roman (Phase 11)

	A3	B3	C3	D3	E3	F3
Cochlicopa sp			1			
Pupilla muscorum (Linnaeus)	7	3	5	2		4
Vallonia costata (Müller)	6	7	2	3	1	6
Vallonia excentrica (Sterki)	38	29	23	33	7	28
Cecilioides acicula (Müller)			4	1		
Helicella itala (Linnaeus)	3	9	6	1	1	4
Trichia striolata (C Pfeiffer)	5	4		2		2
Trichia hispida (Linnaeus)	7	1	4	4	1	3
Totals excluding *Cecilioides acicula*	66	53	41	45	10	47
Numbers of taxa excluding *Cecilioides acicula*	6	6	6	6	4	6

Table 3.16 Mollusc species from Crowder Terrace

	CT69	CT70	CT74	CT73
Pomatias elegans (Müller)	+			
Cochlicopa lubrica ((Müller)	1			
Cochlicopa lubricella (Pollo)	2			
Cochlicopa spp	2	1		
Vertigo pygmaea (Draparnaud)	1			
Pupilla muscorum (Linnaeus)	43	71	38	
Vallonia costata (Müller)	18	57	70	2
Vallonia excentrica (Sterki)	70	114	83	3
Discus rotundatus (Müller)	+			2
Cecilioides acicula (Müller)	17	2	16	9
Cernuella virgata (Da Costa)	2			
Helicella itala (Linnaeus)	12	4	4	
Trichia striolata (C Pfeiffer)		43	15	1
Trichia hispida (Linnaeus)	7	6	16	
Cepaea sp		+		
Totals excluding *Cecilioides acicula*	158	296	226	8
Numbers of taxa excluding *Cecilioides acicula*	11	8	6	4

Table 3.17 Frequencies of ecological groups at New Road

	open country		catholic		shade loving	
Sample	**%**	**n**	**%**	**n**	**%**	**n**
CK7	75.9	4	24.1	1		
CK8	79.5	5	19.8	4	1.5	2
CK9	21.4	3	66.7	4	11.9	2
CK10	42.4	3	54.5	3	3	1
CK11	38.5	3	53.8	3	7.7	2
CK12	35.7	4	52.4	3	11.9	5
CK13	53.1	4	44.3	5	2.6	5
CK14	42.2	5	41.1	6	16.7	7

Key: n = numbers of taxa

Table 3.18 Frequencies of ecological groups at Sussex Street, earlier Roman

	open country		catholic		shade loving	
Sample	**%**	**n**	**%**	**n**	**%**	**n**
A1	80	2	20	1		
A2	87.5	4	12.5	2		
B1	83.3	2	16.7	1		
B2	87.5	3	12.5	2		
C1	100	3				
D1						
E1	100	4				
E2	93.7	5	6.3	1		
F1	100	1				
F2	86.8	3	13.2	2		

Key: n = numbers of taxa

Table 3.19 Frequencies of ecological groups at Sussex Street, later Roman

	open country		catholic		shade loving	
Sample	**%**	**n**	**%**	**n**	**%**	**n**
A3	81.8	4	18.2	2		
B3	90.6	4	9.4	2		
C3	87.8	4	12.2	2		
D3	86.7	4	13.3	2		
E3	90	3	10	1		
F3	89.4	4	10.6	2		

Key: n = numbers of taxa

Table 3.20 Frequencies of ecological groups at Crowder Terrace

	open country		catholic		shade loving	
Sample	**%**	**n**	**%**	**n**	**%**	**n**
CT69	92.4	6	7.6	4		1
CT70	83.1	4	16.9	4		
CT74	86.3	4	13.7	2		
CT73	62.5	2	12.5	1	25	1

Key: n = numbers of taxa

if not the result of sampling errors, may represent a shift in environment or land use around the site (Table 3.13).

The assemblage of molluscs from CK7 probably indicates a continuation of grassland habitats, but the sample from CK8 resembles some of the assemblages from the ploughsoils at Crowder Terrace and Sussex Street (below). Particularly marked is the increase in the abundance both of *Vallonia excentrica* and *Helicella itala* here, compared with CK7.

From sample CK9 upwards (*505*, *498*, *479*, *477*), catholic species become much more numerous, and shade-loving species also increase in abundance, although they are never predominant. The proportion of open country species initially falls but then remains fairly constant at around 40%. These assemblages are almost certainly mixed, containing components from the mollusc faunas in the general catchment around the ditch as well as from the faunas living in the ditch microhabitat.

The environment around the ditch was probably always open, but otherwise the pattern of land use is difficult to infer from these data. The environment within the ditch is also difficult to interpret. The high abundances of catholic species and the increased representation of shade-loving species suggests that the ditch was overgrown with dense vegetation, although the fluctuations in the frequencies of shade-loving species might indicate the periodic cleaning out of the ditch perhaps in preparation for episodes of grave digging.

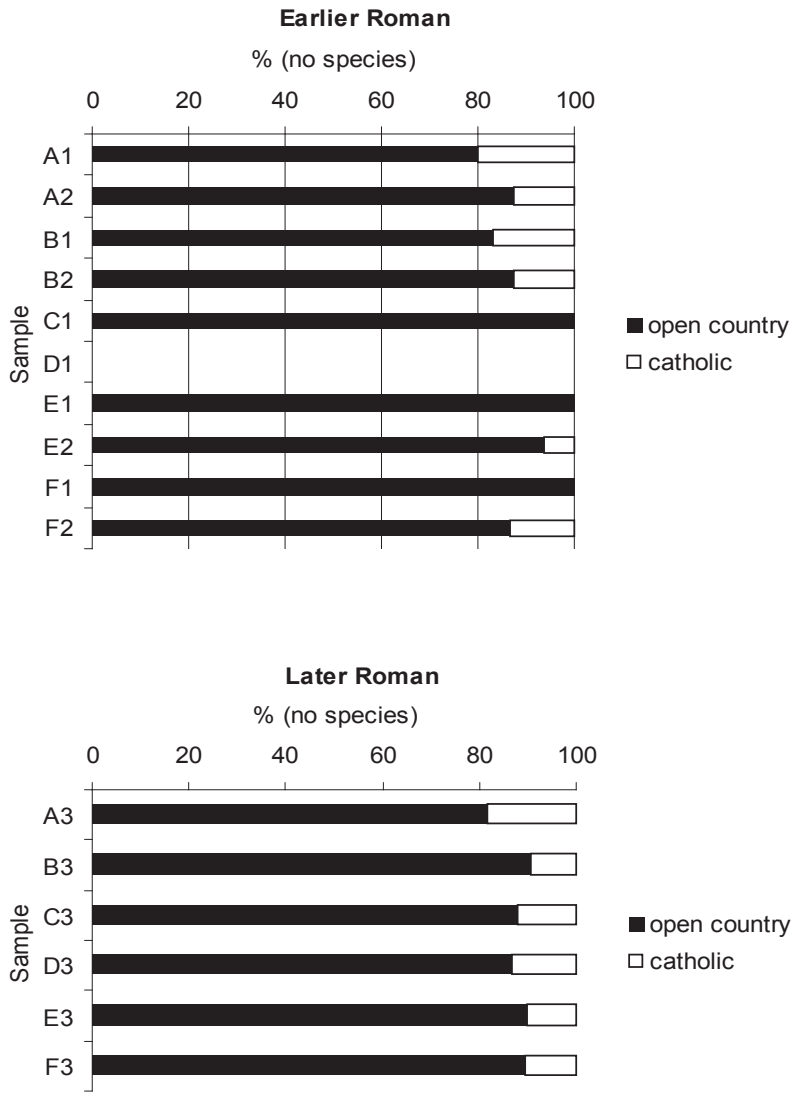


Figure 58 Ecological groupings, Sussex Street

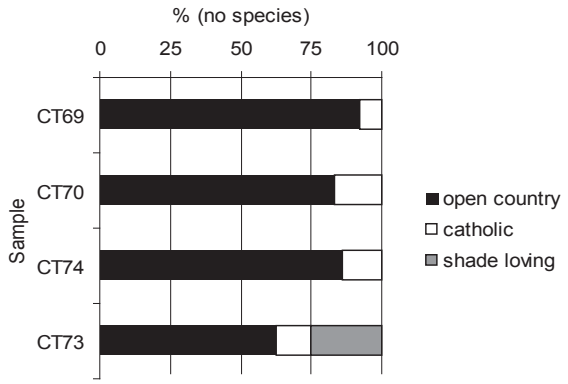


Figure 59 Ecological groupings, Crowder Terrace

The progressive increase, from sample CK7 to CK14, in the taxonomical diversity of the shade-loving species represents the gradual colonisation of the ditch by such species. This is not, however, true for all of the species involved: *Oxychilus*, *Nesovitrea,* and *Discus* had all successfully colonised the ditch in the middle Iron Age (Thomas 2004), but only reappear belatedly in the late Roman sequence of deposits. Whether such disjunctions are the result of sampling error or due to local extinction followed by recolonisation is unclear. The possibility that the ditch was actively cleaned out and maintained during the earlier Roman period might suggest the latter.

Late newcomers to the ditch include *Carychium*, *Aegopinella pura,* and *Clausilia bidentata*: all of these species have been described as occurring in long grassland habitats on the chalk (Cameron and Morgan-Huws 1975) and their late arrival in the ditch suggests that such habitats were not common in the vicinity of the site. This would indicate that land-use patterns continued to be fairly intensive, involving grazing (thereby preventing successions to long dense sward) or ploughing or both.

Samples from within the Oram's Arbour enclosure at Sussex Street (Fig 58)

Overall, the earlier Roman (Phase 3) samples contain a rather restricted assemblage of species (Table 3.14). The assemblages are overwhelmingly dominated by open country and ecologically compatible catholic species (Table 3.18). *Vallonia excentrica* is the dominant species in most of the assemblages, indicating open and very dry conditions. *Pupilla muscorum* is rare.

These assemblages consistently indicate open, disturbed ground. *V. excentrica* can thrive in ploughed soils and *Helicella itala* was probably more often associated with such soils than is the case today. The presence at low frequencies of *Vertigo pygmaea* and *Vallonia costata* might indicate some phases of stability in the soil, perhaps short fallow periods within a predominantly arable land-use cycle.

Later Roman assemblages from Sussex Street (Phase 11) are remarkably homogenous compared with those rather variable ones from samples of earlier date. Open country species indicative of ploughsoil conditions predominate (Table 3.19). These later Roman assemblages tend to be relatively large, they contain more species, and seem to have higher frequencies of *Pupilla muscorum* (Table 3.15). These differences might indicate some subtle shift in land-use at SXS, perhaps moving towards an increased emphasis on phases of fallow or pasture in an otherwise predominantly arable land-use pattern.

Samples from outside the enclosure at Crowder Terrace (Fig 59)

The assemblage of molluscs from the early Roman plough soil (sample CT69 – Phase 5) is dominated by open country species (Table 3.20). In contrast with the assemblage from the Sussex Street site, the assemblage is both larger and more taxonomically diverse (Table 3.16). Both *Pupilla muscorum* and *Vallonia costata* are relatively abundant, although the assemblage is dominated by *V. excentrica*.

If this assemblage can be interpreted in terms of patterns of land-use, a greater proportion of fallow or grassland would be indicated, compared with the more intensively arable soils at SXS. It cannot be asserted with certainty that the Crowder Terrace assemblage indicates stable short-turfed grassland conditions, but such conditions could have existed for some time at this site. Occasional periods of ploughing and arable probably occurred, but a predominantly pastoral land-use pattern is suggested. This is in keeping with the steeply sloping topography of the area.

The occurrence of *Cernuella virgata* may be of some interest, as this species is believed to have been introduced to Britain in the Roman, or more likely, medieval period. However, the horizon from which the sample came cannot be regarded as particularly well-sealed stratigraphically.

Samples CT70 and CT74 are from the fill of the second phase of the north–south boundary ditch (F45, Phases 7 and 8 – *145*, *140*, and *161* in Fig 45) cut into the ploughsoil. Both of the assemblages of molluscs from these samples are dominated by open country species (Table 3.20) and closely resemble the assemblage from the earlier phase (CT69). *Vallonia costata* is, however, relatively more abundant in these samples (Table 3.16). Possibly this is related to the local microhabitat of the ditch. *Trichia striolata* is also strongly represented; this is a synanthropic species that is often found in abundance in moist or slightly shaded habitats associated with human activity.

Conclusions

Although a large number of samples have been processed and analysed, they were derived from a small number of sites spanning quite a long period of time. Furthermore, some contexts, especially the ditch at New Road, present particular problems of interpretation regarding the appropriate scales of environmental reconstruction. It is not easy, therefore, to assess how representative the analysis is of the general environments that existed in pre-medieval Winchester.

The middle Iron Age landscape appears to have been fully open and, at least in the vicinity of the New Road site, of short turfed (probably grazed) grassland (Thomas 2004). No doubt arable activities were occurring elsewhere during this period.

The evidence for environments in the early Roman period is interesting in that it reveals spatial and topographically related variation in patterns of land-use. The molluscs from the ploughsoil within the Iron Age enclosure at Sussex Street indicate a predominantly arable land-use pattern with short-lived phases of fallow or pasture. Crowder Terrace, located on steeply sloping ground and outside the circuit of the enclosure,

yielded assemblages of molluscs indicating predominantly pastoral land-use, possibly with intermittent phases of ploughing and arable.

In the late Roman period at Sussex Street there appears to have been a slight shift in land-use towards increased pastoral activities but still within a mainly agrarian framework. At New Road, the environment remained open throughout the Roman period; there was some evidence for a shift from grassland with probably pastoral land-use to increased arable activity near this site. The ditch itself appears to have become overgrown and subsequently cleared out at various times.

In general, the assemblage of molluscs from the supposed ploughsoils are similar to those from lynchet deposits, for example Overton Down and Fyfield Down in Wiltshire (Evans 1972) and Bishopstone in Sussex (Thomas 1977). *Vallonia excentrica* is the dominant species, greatly outnumbering *V. costata*. *Pupilla muscorum* is generally low in abundance but *Helicella itala* and *Trichia hispida* are either abundant or consistently represented in the samples. Slugs, especially the Limacidae were often encountered in the lynchet samples but they are rare in the samples from Winchester, occurring only in the late Roman samples from the ditch at New Road.

PART 4: Roman plant remains from Winchester: evidence from the suburbs and defences *by F J Green*

Note: The analyses of plant remains from the sites in the suburbs and on the defences were completed at around the same time as Section 2.2. The report on the plant remains partly represents research that was first begun in the 1970s, and the methodologies employed reflect this. For a more detailed discussion of the sampling, the reader is referred to Green 1979a, 17–21, and to Part 1.

1 Introduction

Soil samples were collected on archaeological or deposit-specific criteria (from particular classes of context and where there were obvious accumulations of organic material), as well as being examined more systematically, in order to amass data about the wider environment. Further details are given in Part 1 (Section 1.5).

Because all of the soils were aerobic, no waterlogged or anaerobically preserved plant materials were recovered. Charring preserved the bulk of the plant remains. However, in some cases mineralised plant remains were located, although this type of preservation was in the main confined to deposits of post-Roman date. Similarly, preservation by impregnation of iron oxides or other metallic salts was confined to material from post-Roman deposits. All the carbonised plant remains were very poorly preserved, with characteristic tarred and distorted appearance.

Contamination of samples cannot be ruled out because of the shallow aerobic nature of many of the deposits examined, the lack of evidence from most features, and the limited range of species recovered. There is always the considerable risk on shallow chalkland sites of more recent carbonised material contaminating older deposits (Keepax 1977; Green 1985; 1996, 118): this was particularly a consideration in the western suburb.

For the purpose of confirming identifications, a personal herbarium and seed collection were used. These are now deposited with and form part of the English Heritage reference collection held by the Centre for Archaeology at Fort Cumberland in Portsmouth. Duplicate material collected at the same time as the creation of this reference collection forms the basis of part of the collection now held by the Department of Archaeology, University of Southampton.

Clapham, Tutin, and Warberg (1962) has been used as the basis for nomenclature throughout this discussion. However, the cultivated cereals, whilst being recorded under *Gramineae* have been included in tables at the end of the taxonomic sequence. The identifications of wheat grains to species were based on the early 1970s standards current at the time that the majority of the work was carried out, advised by Hillman (pers comm). However, these need to be reviewed in the light of Hillman *et al* (1995). The identifications provided in the site archive at that time indicated the morphological characteristics of the grain, and not *per se* the species. In the absence of detailed botanical descriptions and measurements of grain morphology, it is of course necessary to provide an indication of shape and size, as this may itself furnish a class of information about site-specific and regional patterning that could be significant to future research.

It is also important to note that the ethnobotanical studies of modern cereal species from the Near East and eastern Europe – those areas closest to the genetic 'epicentre' and the origin of wheat species – may not be indicative, or readily inform a north-western European context. Wheat species close to the area of origin would be expected to demonstrate considerable morphological and genetic variation, indicative of hybrid vigour, with populations exhibiting a wide range of characteristics. The potentially more isolated populations in north-western Europe, where external contact with changing genetic populations was unlikely, could result in a stable morphology of the species involved.

2 The evidence

As outlined above, Roman contexts were sampled for two basic reasons:

1. Buried soil horizons that were often poorly understood during excavation might (it was perceived) provide information about the wider local environment, and possibly about phases of abandonment and land-use on the periphery of the Roman town.
2. Cut features and structures of occupation might have value in respect of understanding the cultural and economic activities in the settlement.

It has to be said at the outset that few Roman contexts were thought likely to produce significant information about cultural activities. However, if samples had not been removed there would have been no archival base from which to work. Since it was then a formative period of analysis, it was important to establish the criteria adopted for more systematic sampling of the archaeological contexts.This period of learning by trial and error was fundamental to all future research and analysis of plant remains from the city.

Samples were taken from hundreds of contexts on many excavations. Many either failed to produce any plant remains or produced quantities of plant remains that were not considered to be worthwhile studying further (this information is contained within the relevant site archives). This preliminary assessment led to the selection of samples that are outlined below, which were considered to be amongst the more informative from Roman Winchester:

1. From buried soils at Sussex Street, Victoria Road, and Henly's Garage;
2. From the Roman (*c* AD 70–250) cemetery at Victoria Road East;
3. From an oven (F846) used during the late 2nd and early 3rd centuries (Period 6) at Victoria Road East (Plate 7);

Table 4.1 Plant species from ploughsoils at Sussex Street

Taxa	Synonym	Context	1201	301
		Phase	7	11
		Sample	236	103
RANUNCULACEAE				
Ranunculus sp indet	Buttercup		1c	
RUBIACEAE				
Galium sp	Goosegrass		2c	
GRAMINEAE				
(Cereals)				
Triticum cf spelta L	Spelt wheat (glume base)		1c	
Hordeum vulgare L	Barley (hulled 6 row)		2c	
Hordeum sp indet	Barley			1c
Cereal sp indet			6c f	
Gramineae sp indet	small seeded grases		1c	

Key:
c = carbonised
f = fragments

Table 4.2 Plant species from soil layers at Victoria Road

Taxa	Synonym	Context	595	660	655	665	700	845	1273	3420	3462
		Sample	858	600	859	604	634	728	65	1267	1359
		Period	5	4	5	5	5	4	4	5	5
PAPILIONACEAE											
Pisum cf sativum							1c				
Vicia sp	Vetch										
CORYLACEAE											
Corylus avellana L	Hazelnut		1c f								
GRAMINEAE											
(Cereals)											
Triticum cf compactum	Club wheat				3c						
Triticum cf spelta	Spelt wheat						1c				
Hordeum vulgare L	Barley (hulled 6 row)			1c		1c					
Hordeum sp indet	Barley									1c	
Avena cf sativa	Oat										2c
Cereal sp								3c	1c		
(Wild grasses)											
Bromus secalinus/mollis L	Brome grass										1c

Key: as Table 4.1

4. From a later Roman cess pit and a late 4th-century feature of occupation at Henly's Garage (Plates 42 and 43).

The absence of evidence from the cemetery regarding plant remains within food offerings in graves is also considered to be worth discussing here.

Buried soils

Buried soils located during the 1976–1979 excavations on Sussex Street (western suburb) were interpreted as ploughsoils. Two sets of column samples were removed during the 1976 excavations (Section 3.2) but these failed to produce any botanical evidence. Other

Table 4.3 Plant species from disuse phase at Henly's Garage

Taxa	Synonym	Context	1250
		Phase	7
		Sample	10
RANUNCULACEAE			
Ranunculus acris/repens	Buttercup		1c
PAPILIONACEAE			
cf Pisum	cf Pea		4c f
Vicia sp	Vetch		1c
LABIATAE			
Labiatae sp indet			2c
PLANTAGINACEAE			
Plantago lanceolata L	Ribwort/plantain		1c
CHENOPODIACEAE			
Chenopodium album L	Fat hen		1c
POLYGONACEAE			
Polygnum cf persicaria	Redshank		1c f
Rumex sp indet	Dock		3c
CYPERACEAE			
Carex sp indet	Sedge		2c
Cyperaceae sp indet	Sedge		1c
GRAMINEAE			
(Cereals)			
Triticum spelta L	Spelt wheat		1c
(Wild grasses)			
Bromus secalinus/mollis	Brome grass		8c
Gramineae sp indet	small seeded grasses		2c
Unidentified taxa			2c

Key: as Table 4.1

samples taken independently of the column sampling strategy yielded, from the earlier Roman period, a limited range of plant materials including a glume base of spelt wheat (*Triticum spelta*), two caryopses of barley (*Hordeum vulgare*), and a quantity of cereal grains, that were so badly eroded that identification to species was impossible, along with buttercup and goosegrass (SXS Phase 7, 1201). From a later Roman context a single grain of barley was recovered (SXS Phase 11, 301 – Table 4.1).

Early Roman (Period 4–5) soil deposits in Trenches X, XI, and XIII at Victoria Road East (northern suburb) produced a total of eight cereal grains from thirteen samples. As can be seen in Table 4.2, these consisted in the main of unidentifiable cereal fragments, barley (*Hordeum* sp) and oats (*Avena* sp indet.), and a single specimen of brome grass (*Bromus secalinus/mollis*). Clearance over 2nd-century buried soils representing a phase of disuse at Henly's Garage on the southern city defences (Phase 7, F153) produced only a single charred cereal grain morphologically suggesting spelt (*Triticum cf spelta*), four charred fragments possibly of *Pisum,* and quite an extensive range of wild and ruderal species (Table 4.3).

The cemetery

Samples were taken from the cremation graves at Victoria Road East. Almost all the plant remains recovered from these contexts were preserved by charring. No waterlogged deposits were located and there was a near-absence of calcium phosphate replaced material which suggests lack of domestic and other activities involving the deposition of human and other faecal material: a fact in keeping with the nature of the Victoria Road site at that time.

All the botanical evidence has been presented in Tables 4.4 – 4.5. Multiple samples were recovered from graves and included the contents of vessels placed within the burials. Of 87 samples, 17 produced plant remains. The charred plant remains were confined

Table 4.4 Plant Species from the 1st- to 3rd-century cemetery – Phase 1

Taxa	Synonym	Context	650	741	1002	1219	1280	1280	1306	1312	1312	1312	1312	1582	1582	1583	1593	4336
		Grave	417	431	477	515	517A	517B	546	550	550	550	550	578B	578B	577	582	624
		Sample	591	647	9	RF7103	RF7095	47	90	94	95	97	98	154	RF7343	139	140	1759
PAPILIONACEAE																		
Vicia sp	Vetch					1c												
RUBIACEAE																		
Galium sp	Goosegrass										1c					1c		
CHENOPODIACEAE																		
Chenopodium cf album	Fat hen		1c															
CORYLACEAE																		
Corylus avellana L	Hazelnut												1c f					
GRAMINEAE																		
(Cereals)																		
Triticum cf aestivum	Bread wheat								1c									
Triticum cf aestivum/ compactum	Bread/club wheat																1c	
Triticum cf diccocum	Emmer wheat												2c					
Triticum cf spelta	Spelt wheat														1c			
Triticum sp indet					4c			1c		1c				1c				
Hordeum vulgare L	Barley				1c		1c				1c							
Avena cf sativa	Oat										1c	2c						
Cereal sp indet				3c		2c						1c						3c

Key: as table 4.1
Note: RF 7095, 7103 & 7343 are cremation urns

Table 4.5 Plant species from the 1st- to 3rd-century cemetery – Phases 2 and 3

		Context	830	1015	1017	1249	1261	1261	1262	1553	606	609
		Grave	443	483	483	502	507/510	507/510	507/510	554	415	415
Taxa	**Synonym**	Sample	707	11	13	12	20	23	28	100	571	567
CAPRIFOLIACEAE												
Sambucus nigra L	Elder							5m				
PLANTAGINACEAE												
Plantago lanceolata L	Ribwort plantain									1c		
CORYLACEAE												
Corylus avellana L	Hazelnut									1c		
GRAMINEAE												
(Cereals)												
Triticum cf aestivum/compactum	Bread/club wheat				1c						1c	
Triticum cf spelta	Spelt wheat									2c		
Hordeum vulgare L	Barley		1c	1c								
Cereal sp indet						1c	1c	2c				2c
Cereal (culm frags)	straw								xx			

Key:
c = carbonised
m = semi-mineralised- ?intrusive

Table 4.6 Plant species from silting/soils over oven F846, 1st phase

		Context	**3343**					
		Phase	**303**					
Taxa	**Synonym**	**Sample**	**1199**	**1200**	**1212**	**1218**	**1220**	**1225**
RANUNCULACEAE								
Ranunculus acris/repens	Buttercup			1c f	1c			
MALVACEAE								
Malva sp	Mallow				1c f			
PAPILIONACEAE								
Vicia sp (small seeded)	Vetch				3c			
CAPRIFOLIACEAE								
Sambucus nigra L	Elder				1c f			
RUBIACEAE								
Galium aparine L	Goosegrass cleavers			1c				
Galium sp					1c			
COMPOSITAE								
COMPOSITAE sp indet					1c			
PLANTAGINACEAE								
Plantago lanceolata L	Ribwort/plantain			1c	5c			
POLYGONACEAE								
Rumex sp	Dock				3c			
CHENOPODIACEAE								
Beta sp (capsule frag)	Beet				1c f			
CORYLACEAE								
Coryllus avellana L	Hazel			3c f	3c f		2c f	
CYPERACEAE								
Cyperacea sp	Sedge				3c			
GRAMINEAE								
(Cereals)								
Triticum cf aestivo-compactum/ durum			1c					
Triticum spelta L	Spelt wheat		1c		2c		4c	
Triticum spelta L (glume bases)	Spelt wheat				2c			
Triticum cf spelta	Spelt wheat			8c f				
Triticum sp				3c f			1c	
Hordeum vulgare L	Barley			2c f	3c			
Hordeum sp	Barley		2c f				3c	
Cereal sp			7c f			3c f	1c	2c f
Cereals sp indet					8c f			
(Wild grasses)								
Bromus secalinus/mollis	Brome grass				3c			
cf Bromus secalinus/mollis	Brome grass					1c		
cf Lolium sp					1c			
Graminea sp	grass				4c	1c		1c
Taxa indet								1c

Key:
c = carbonised
f = fragments

Table 4.7 Plant species from fill of oven F846, 2nd phase

		Context	**3353**	**3366**
		Phase	**312**	**310**
Taxa	**Synonym**	**Sample**	**1191**	**1196a**
PAPILIONACEAE				
Vicia sp (large seeded)	Vetch			2c
Vicia sp (small seeded)	Vetch		2c	1c
ROSACEAE				
Potentilla sp			1c	
UNBELLIFERAE				
Umbelliferae sp indet				3c
CAPRIFOLIACEAE				
Sambucus nigra L	Elder		1c	
MENYANTHACEAE				
cf Mentha sp	Mint		1c	
LABIATAE				
Labiatae sp indet			1c	
PLANTAGINACEAE				
Plantago lanceolata L	Ribwort/plantain		4c	6c
CHENOPODIACEAE				
Chenopodium cf album	Fat hen		4c	
cf. Chenopodium album	Fat hen			2c
POLYGONACEAE				
Polygonum persicaria L	Redshank		1c	
Polgonum sp indet				1c
Rumex obtusifolius L	Broad-leaved dock			1c
Rumex sp indet	Dock		3c	
CYPERACEAE				
Cyperaceae sp indet	Sedge		2c	
GRAMINEAE				
(Cereals)				
cf Triticum aestivum/compactum/durum				1c
cf Triticum dicoccum	Emmer wheat			3c
Triticum spelta L (glume base)	Spelt wheat		1c	
cf Triticum spelta	Spelt wheat			7c
Hordeum vulgare L	Barley		4c	
cf Hordeum vulgare	Barley			4c
Cereal sp (immature grain caryopsis)			1c	
Cereals sp indet				25 f
Cereal (culm)	Straw		4c f	
Bromus secalinus/mollis	Brome grass		2c	
(Wild grasses)				
cf Bromus				1c f
Gramineae sp indet				3c
Gramineae sp indet (small seeded)	Grasses		2c f	
Unidentified taxa			1c	1c

Key: as Table 4.1

Plate 42 Lined cess pit F102 at Henly's Garage, facing east

mostly to cereal species, *Triticum cf spelta*, (spelt wheat), *Triticum cf compactum*, (bread or club wheat), and *Hordeum* sp (barley). Some weedy species were also recorded including *Chenopodium cf album* (fat hen) and *Galium* sp (cleavers or goosegrass).

41 samples were taken from graves in the second phase and eight produced plant remains. The range of finds and quantities can be seen in Table 4.5. From this, it is possible to see that the remains are similar to the material recovered from the first burial phase. Botanically, there seem to be no noticeable differences between these phases, and the activities or mechanisms that caused the deposition of such materials in the earliest phase seem not to have changed.

At least one cremation burial (G442) had revealed weedy species during processing that must have been scraped up from the location where the cremation had taken place. (However, this information only exists in the author's initial laboratory notes, the plant materials having been misplaced in storage). The evidence suggested that in this particular case the cremation had most likely taken place on the bank adjacent to a local stream, since the sample also contained burnt river pebbles that were not naturally occurring on the Victoria Road East site.

One grave (415) from the third phase (Period 6) of the cemetery produced two grains of barley and cereal grain of uncertain species (Table 4.5)

The oven (see Plate 7)

This material was removed from layers of silt (Phase 303) contemporary with the use of the oven (F846) and from the second phase fill of the oven (Phases 310 and 312) in Period 6 at Victoria Road East. The plant remains are summarised in Tables 4.6–4.7. The occurrence of low quantities of charred cereal remains, coupled with some wild or ruderal species is similar to the buried soils described above. The absence from this oven of sprouted cereal remains clearly suggests that it was in no way associated with malting. The absence of small fragments of charred bread could also possibly rule out its being the surviving remains of a bread oven.

However, there need be no direct connection between the fire or stoke-hole of such a structure and the oven itself – as with most ovens, the heat for cooking would most probably be indirect. Fragments of burnt food would therefore be unlikely to accidentally enter the fire at the oven's base unless oven sweepings were deliberately placed there. The same would almost certainly be true of a malting kiln. However, malting and cereal drying kilns certainly do normally produce greater quantities of waste, for which there is absolutely no evidence from this feature.

Thus, there is no clear evidence of the precise use to which the oven may have been put. In all probability it simply represents the base of a bread or similar baking oven and the plant remains represent tinder used to fuel the fire. It is possible that the single charred *Beta* (beet) capsule fragment located in the soil over the oven originated from the burning of horticultural rubbish. Whilst maritime beet is to be found growing along the gravel beaches along the Solent shores, its presence during the Roman period in Winchester must reflect a cultivated form. It probably consisted of a chard-like species usually used as a leaf vegetable rather than as a root vegetable.

Henly's Garage

Phase 16 – cess pit F102 (Plate 42; Fig 60)

The late 3rd- to early 4th-century cess pit (F102) from this site had two samples removed from contexts *1302* and *1074*, the cessy basal fills. The plant remains from both these contexts were preserved by mineralisation

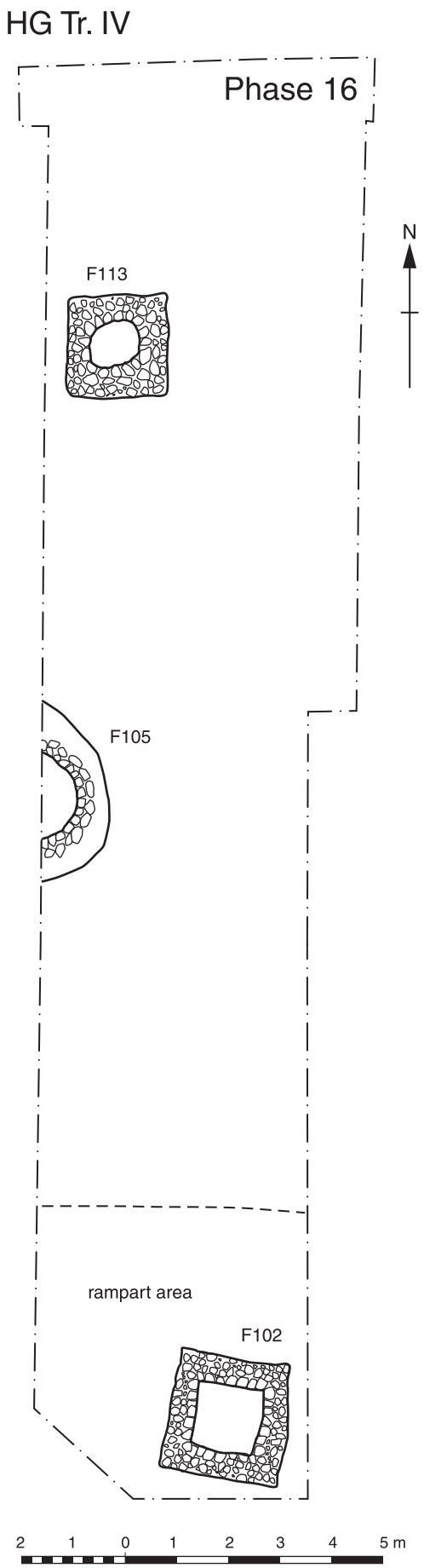


Figure 60 Location of Phase 16 features at Henly's Garage

(calcium phosphate replacement). This is entirely consistent with the archaeological interpretation of the pit's primary function (Green 1979b). A somewhat wider range of plant materials was identified from this feature, because of the mineralised preservation conditions, than has been recorded from the other Roman contexts discussed here (Table 4.8). However, the bulk of this mineralised material was in fact poorly preserved when compared with the evidence recovered from similar contexts of medieval date from the city. Many of the plant fragments were only partially mineralised.

The most significant component of these samples consisted of the kernels of a Prunus species probably, based on size, of cherry (*Prunus avium*) rather than any plum species. The actual fruit stones had not themselves been preserved by mineralisation. Other fruit species represented included blackberry (*Rubus fruticosus)* – a species commonly recorded in cess pits and latrines of all periods; and fig (*Ficus carica*), which was recovered from both the upper and lower cessy fills in this pit. The very small quantities of fig hardly suggest the major consumption of this species. However, once again differential preservation of the mineralised materials may be biasing the observed data.

Cereal bran fragments, most likely from human faecal deposits, were also recovered from the lower fill, indicating the consumption of bread or porridge. An extensive range of straw and grass fragments were also recovered. It is possible that this hay-like material may be the equivalent of modern toilet paper. The presence of seeds of herbs of the genus *Labiatae* may simply represent wild rather than culinary species. It is possible that they originated from culinary herbs, although such herbs are not normally harvested for drying with their seeds, as the seeds readily disarticulate. It is more likely that the *Labiatae* originated along with the other wild plant or ruderal species and these seeds originated with the hay-like material.

The lack of grape (*Vitis*) from this context needs to be commented on. The only exotic species recorded was fig, and yet it is very rare at any period not to find other exotic or imported species in association. Grape pips are frequently recorded on Roman and later sites, particularly where mineralised preservation conditions are located. It is possible that the preservation conditions on this site were not good enough, but this seems unlikely in respect of the preservation of the more robust seeds. It seems that if grape pips had been present, some evidence should have survived (Green 1979b). It is possible that exotic species were rarely consumed or that they may have been put to different uses even possibly being discarded in different contexts by the users of this particular cess pit.

Phase 24 – late phase of masonry town house (Plate 43; Fig 61)

The botanical material was from a silt layer (*817*), part of a build-up of soils and silts associated with the use of a hearth in Room 4 (the location is shown as

Table 4.8 Plant species from cess pit F102, Henly's Garage

		Context	1074	1302
		Phase	16	16
Taxa	**Synonym**	**Sample**	**40**	**44**
RANUNCULACEAE				
Ranunculus acris/repens	Buttercup			1m
PAPILIONACEAE				
Vicia sp	Vetch			16m
ROSACEAE				
Prunus sp indet	Cherry/plum (probably cherry)		76m	63
Rubus fruticosus	Blackberry		20m	3m
UMBELLIFERAE				
Umbellifera sp				2m
CAPRIFOLIACEAE				
Sambucus nigra L	Elder		1m	2m f
VALARIANACEAE				
Valarianella dentata L	Lamb's lettuce		1m	2m
LABIATAE				
Labiatae sp indet			1m	1m
POLYGONACEAE				
Polygonum sp				1m
MORACEAE				
Ficus sp	Fig			12m
cf Ficus	Fig		3m	
GRAMINEAE				
(Cereals)				
Avena sp (glume)	Oat		1m	
Cereal bran				xx f
(Wild grasses)				
Gramineae sp indet	Grasses			2m
Gramineae (culm frags)	Straw/hay		xx f	xx f

Key:
c = carbonised
m = mineralised
f = fragments

cut by a later feature, F193 in Figure 61). This represents continued occupation of the town house after its partial collapse and robbing in the last quarter of the 4th century or later. There was an extensive range of charred cereals of which *Triticum dicoccum* (emmer) was the major component, with a small admixture of spelt wheat and barley (Table 4.9 and Fig 62). Brome grass was also recovered from this context.

A substantial amount of the cereal remains was impossible to identify to species and appeared to have become abraded prior to being incorporated into the soil or silt horizon. It can be suggested that the deposit may therefore represent a substantially reworked parent material. The charred plant remains contained in this deposit may represent the remains of a quite considerable quantity of cereals destroyed by fire. It is not easily conceivable that the material slowly accumulated through a repeated activity. The lack of glume and other waste fragments normally associated with crop cleaning (with the exception of *Bromus*) indicates that this material is unlikely to have originated from this activity, though the charred material may reflect differential preservation through the process of charring (Boardman and Jones 1990). A specific accident within a domestic context could also be considered.

3 Discussion

The evidence from Sussex Street is consistent with other buried soils of this and later periods, and clearly

Table 4.9 Percentages of plant species from the masonry building, Henly's Garage

		Context	**817**	
		Phase	**24**	
		Sample	**55**	
Taxa	**Synonym**		**n**	**%**
GRAMINEAE				
(Cereals)				
Triticum dicoccum Shübl	Emmer wheat		43c	56
Triticum cf spelta	Spelt wheat		3c	4
Triticum sp			16c	21
Hordeum vulgare L	Barley		3c	4
(Grasses)				
Bromus secalinus/mollis	Brome grass		11c	14

Key:
c: carbonised

Plate 43 Remains of the masonry building at Henly's Garage

may be interpreted as 'background noise', that is residual material from earlier phases of activity. Of course manuring of fields during this period cannot be ruled out and therefore it is possible that charred plant remains may have become incorporated into soil structures during such phases of agricultural activity. In other more recent studies (Green and Lockyer 1992; 1994) more detailed sampling of buried soils has provided specific information about such activities.

The evidence from buried soils on widely distributed sites is broadly comparable. All the contexts contain small quantities of charred plant remains including spelt wheat (*Triticum spelta*) and barley (*Hordeum vulgare*). Whilst oat (*Avena* sp) was present, it could not

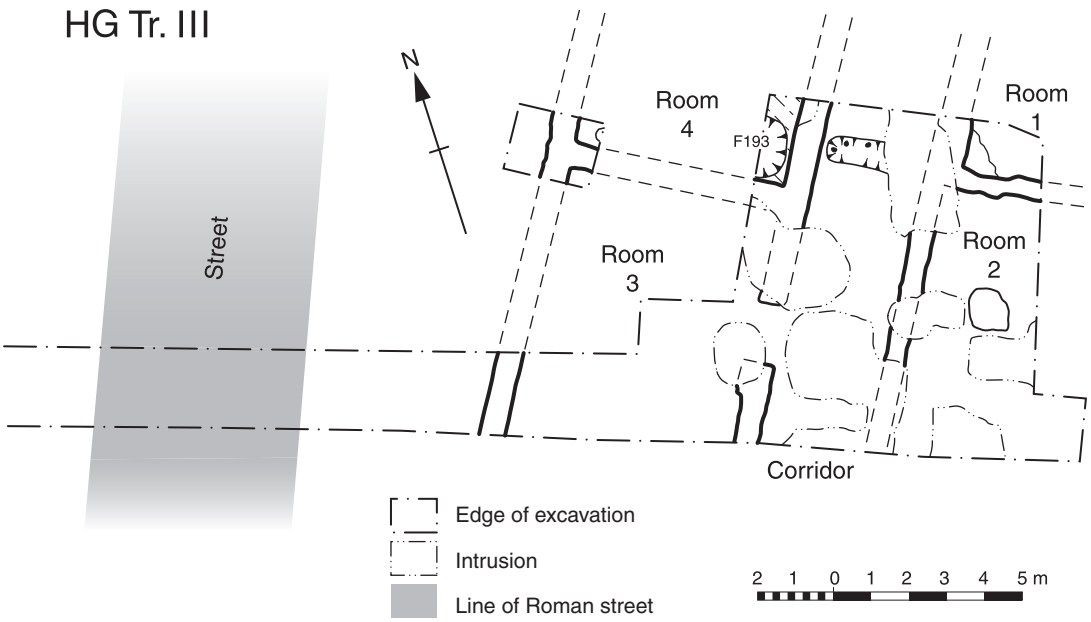


Figure 61 Plan of the masonry building at Henly's Garage

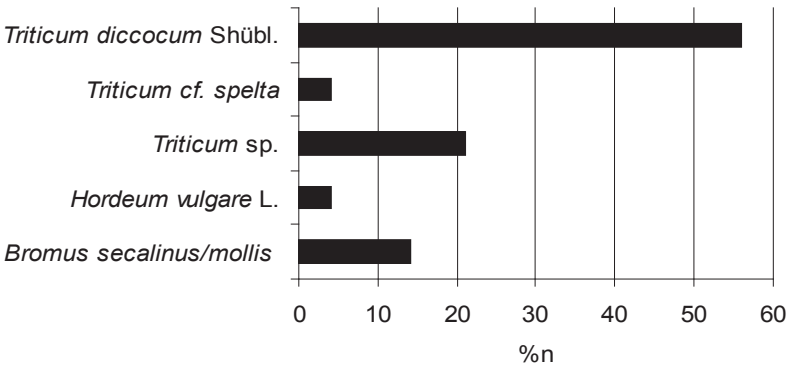


Figure 62 Percentages of plant species from the masonry building at Henly's Garage

be identified as a cultivated form. Rye (*Secale cereale*) was absent from these contexts. However, brome grass (*Bromus secalinus/mollis*), a common weed associated with cereal crops in the Iron Age and Roman periods, was recovered from nearly all these buried soil horizons.

The wild plant or ruderal flora also demonstrates close similarities. Unfortunately, none of the species recorded are specific to any one habitat or environment. The species concerned are commonly those recovered from a wide range of anthropogenic habitats and are not indicative of any specific environment. Nearly all the species recorded can be found on broken disturbed ground in association with settlement sites or for that matter in association with arable crops.

The sparse nature of the charred plant remains from these buried soils makes interpretation difficult, with the possible exception of the evidence from VR. In this particular case, a more extensive range of samples was removed at the author's instigation from buried soils associated with what was interpreted as an oven. Comparison of the evidence recovered from the buried soils with that from within the fill of the oven (Tables 4.6 – 4.7) reveals considerable similarities.

There are a number of possibilities: that the contents of the oven do not represent its primary use but a secondary fill, or that the activities associated with this oven resulted in the charred accumulations in the surrounding developing soil structure. If the latter is the correct assumption, then it is possible to suggest that the charred plant remains recovered from the Roman buried soils in Winchester result from the waste products of daily activities associated with the firing of domestic ovens. It is possible that dried vegetation, culled from the local environment, was specifically used as tinder. This repeated process on a daily basis would within a relatively short period have made a major contribution to the charred plant component

of the soils developing within and on the edge of the settlement. The archaeobotanical evidence suggests waste from the domestic processing of cereals and other foods. The assemblage from the vicinity of the oven would appear to represent a more dispersed form of this type of rubbish.

Other possibilities cannot be ruled out. It is of course quite conceivable that vegetation was simply cleared by burning, though this is hardly likely to make a major contribution to the quantities of charred ruderal seeds observed within general soils accumulations. The possibility of material being contributed by manuring seems unlikely and waste products of crop processing can be ruled out. Few rachis, spikelet forks, or glume bases, or for that matter any other chaff or waste fragments including silica skeleton material from grasses or cereal crops have been located. Such components would be expected if crop waste were being consumed as fuel, or simply burnt and discarded.

However, it is conceivable that the range of species, as represented largely by fruits and seeds, may represent a much earlier phase of crop cleaning, since most of them could easily be sieved from crops prior to threshing or separation of the grains from the glumes, for example spelt or emmer. However, this also seems most unlikely. The question would then have to be posed as to why the waste products of this latter process do not occur within these buried soils, since this is a much more valuable commodity for use as tinder or fuel than a very fine-sieved crop weed component.

The balance of the evidence therefore suggests that this charred material is not related to any crop processing activity, but simply represents material from the local environment collected and used, possibly as tinder or fuel for perhaps the initial firing of domestic ovens. In order to understand site formation processes in relation to these buried soils, it is necessary for the information produced by other specialists to be used to assess the economic and other activities. It is possible that botanical material originated from manuring and refuse disposal of soils, rather than domestic activities in the vicinity of the deposits.

Notable in the faunal remains from both the first phase of disuse and the second phase fill of the oven is waste from specialist industrial processes, probably marrow production and bone working (Section 2.2). The bone working component of the assemblage is confirmed by the presence of blundered objects discarded in the last stages of manufacture (and catalogued in another volume in this series, Rees *et al* 2008, 188–93). Also present was domestic debris including much pottery (P5) and some small objects, and a broken steelyard with weights (Rees *et al* 2008, 118, no 617). There was also a slight concentration of building ironwork in the first phase of disuse and a larger one in the second phase fill. This may suggest that both sets of contexts were partially formed by dumping from a range of sources, but that they included some material from the superstructure of the building itself. The recovery of a relatively large concentration of small and fragile fish remains in the first phase of disuse (Section 2.2, p 239), and its archaeological interpretation as a silting layer may indicate that some of the material that formed this context was from sources not too distant from its place of final deposition.

There was a notable absence of plant remains from the early cremation cemetery. Overall, the sparseness of botanical finds is quite consistent with what one might expect from such contexts at any period and what little material there was may be regarded as background noise. A little further interpretation is offered here, although it must be stressed that where such small accumulations of charred plant materials are located, then a considerable degree of caution needs to be exercised.

It is, however, strange that any charred plant materials should be recovered at all, and it may imply the reworking of earlier, prehistoric, deposits that contained such material. Against this theory is the fact that few prehistoric plant remains were recovered *in situ* from the Victoria Road site, but this is countered in turn by evidence of residual pottery from most phases. In this scenario, the plant remains tell us nothing about any religious or ceremonial activities that might have taken place, associated with the major burial phases.

At the same time, it is possible that the lack of environmental data from these cremation burials is the result of plant food offerings being burnt on the funeral pyre but not scraped up for deposition in the grave. In the eastern cemetery of Roman London, there was evidence for the deliberate deposition of cultivated pulses, but these were much more common in pyre deposits than in graves (Davis 2000). The recovery here of weed species and river pebbles in a sample from one grave is a reminder that burial of the remains was only one part of the whole complex funerary ritual.

It can be seen that the sparse botanical material discussed above provided little useful knowledge about the site. However, whilst the evidence is minimal, it was important at the time to try and establish quite what a cemetery of this period might produce. In the author's experience, there is little to be gained from examining soil samples for charred plant remains from Roman graves, with of course some rare exceptions. The exceptions are where charred evidence is obvious and charred cereal or other plant remains abound. At the very least, the effort put into examining samples from the above phases on this site can justify a more rational approach on similar burial sites in the city where only aerobic preservation conditions might be encountered.

4 Conclusion

Whilst it can be seen that the range of plant species recovered from the Roman extra-mural or suburban sites has failed to define any specific activity or provided any significant quantitative or for that matter any qualitative data, certain common features have emerged. All the sites have produced small quantities of charred cereals and this has predominantly consisted of spelt and barley with some possible free-

threshing wheat species. Little or no evidence for oat and certainly no conclusive evidence for cultivated oats was recovered, there also being an absence of rye. Brome grass, a common weed associated with Iron Age and Roman cereal crop processing waste, has been located on all the sites discussed here.

The evidence strongly suggests that activities throughout the Roman suburbs of Winchester, in respect of the deposition or presence of plant species, had a uniformity to them which are not directly comparable with evidence from the same sites in later periods. What this might indicate about how these areas functioned may only realistically be deduced from other classes of evidence. The animal bones, particularly, have provided a somewhat different picture with a greater ability to isolate specific activities within the suburban landscape and on the periphery of the walled area.

The range of cereal crops is very much what should be expected from 2nd- to 4th-century Roman urban sites. The assemblage of emmer grains from the masonry building at the Henley's Garage site appears to fit the pattern of this species becoming more important following the Roman Conquest (Campbell pers comm and forthcoming).

Regional variation in the range of wheat species may also be reflected in the consistent presence of the remains of what appears morphologically to be a free threshing wheat from contexts where there is an absence of chaff, rachis fragments, and spikelet forks. The absence of such material would be consistant with a free threshing species. This evidence has previously been noted from later Roman contexts within the Roman walled city on The Brooks site (Green in preparation). The evidence discussed in the present study (some in archive) is a further indication that a free threshing wheat was probably beginning to replace the brittle rachis-hulled wheats before the end of the Roman period.

Peas were clearly available in Roman Winchester. The absence from the deposits examined here of *Vicia faba* L. (broad or celtic bean) is difficult to explain, except that this species seems to be more readily preserved and identifiable from hilum fragments; preserved in waterlogged deposits (certainly from medieval contexts in the city) rather than as charred or mineralised specimens. This and the absence of many other species commonly recovered on other Roman sites may therefore be simply accounted for by the lack of waterlogged deposits.

However, some regional patterns of exploitation are emerging (Campbell pers comm and forthcoming) that suggests peas (*Pisum sativum*) are more frequently encountered on Hampshire sites, whereas sites in Oxfordshire tend to produce more evidence of beans (*Vicia faba*). There is also the possibility that there may be cultural or social preferences for the different species. It might well be expected that the inhabitants of Roman Winchester and its suburbs may have enjoyed different diets to their rural neighbours. They may well have utilised the legume products in different ways that easily could result in under- or even over-representation.

It is perhaps clear from this discussion that if, in future, Roman contexts in Winchester and its suburbs are to be sampled for plant remains, contexts and locations that have not been extensively sampled in the past should be targeted for maximum data retrieval. The study of Roman deposits presented here has indicated that to obtain worthwhile data, extensive programmes of sampling for the retrieval of plant remains are necessary. Where waterlogged mineralised and large charred grain deposits are located during excavation there should always be a presumption of extensive sampling to be undertaken by the archaeobotanist responsible for reporting on the material.

The evidence presented here should also ideally be viewed in conjunction with the unpublished waterlogged and other Roman botanical evidence from the city centre sites excavated in the 1970s and 1980s. Comparisons would also be worthwhile with material excavated in the 1960s by the Winchester Excavations Committee (Murphy 1977; Winchester Museums Archive).

Appendix 1: Mammal and bird bone metrical data from later Roman deposits in the northern suburb and on the city defences *compiled by M Maltby and V Ford*

Key to Measurements

All measurements in millimetres. Most as defined by von den Driesch (1976)

Bb	Basal breadth of bird coracoid
Bd	(Greatest) breadth distal end
Bdf	Breadth at distal fusion point
BF	Breadth of basal articular surface of bird coracoid
BFd	Breadth distal articular surface
BFp	Breadth proximal articular surface
BG	Breadth glenoid cavity
BMax	Maximum basal breadth of horn core
BMin	Minimum basal breadth of horn core
BM1	Breadth of first molar
BM3	Breadth of third molar
Bp	(Greatest) breadth proximal end
BPC	Greatest breadth of proximal articular surface of ulna
BP4	Breadth (minimum) of P4
BT	(Greatest) breadth distal trochlea
DC	Depth of femoral caput
Dd	(Greatest) depth distal end
Ddf	Depth at distal fusion point
Dic	cranial diagonal of bird scapula
Did	Diagonal distal breadth
Dl	Depth of lateral side
Dp	(Greatest) depth distal end
GB	Greatest breadth
BP4	Greatest breadth of P4
GH	Greatest height
GL	Greatest length
GLC	Greatest length to caput
GLl	Greatest length lateral side
GLm	Greatest length medial side
GLP	Greatest length glenoid process
HT	(Greatest) height distal trochlea
La	Articular length
LG	Length glenoid cavity
LL	Lateral length
LN	length of neck between glenoid cavity and spine
LO	Length of olecranon (ulna)
LOC	Length of outer curvature of horn core
L1	Length between proximal calcaneal tuber and distal articular face of lateral proximal facet
L2	Length between proximal calcaneal tuber and face of distal-most facet
L3	Length along centre of astragalus
LM1	Length of first molar
LM3	Length of third molar
LP4	length of fourth premolar
SD	Minimum shaft breadth
SDO	Smallest depth of the olecranon (ulna)
SLC	minimum length scapula neck
vdD1	Total length of skull (dog)
vdD7	Upper braincase length (dog)
vdD8	Viscerocranium length (dog)
vdD16	length of molar row (dog)
vdD17	length of premolar row (dog)
vdD23	Greatest mastoid breadth (dog)
vdD25	greatest breadth of occipital condyles (dog)
vdD29	Greatest braincase breadth
vdD30	Zygomatic breadth (dog)
vdD34	Greatest palatal breadth (dog)
vdD36	Breadth at the canine alveoli (dog)
vdD38	Skull height (basioccipital - sagittal crest of dog)
VR IV, VR V	Victoria Road West (Trenches IV and V)
VR X, VR XI, VR XII, VR XIII, VR XIV, VR XV	Victoria Road East (Trenches X-XV)

Cattle Measurements

Horn Core: Cattle

Site	Context	LOC	BMax	BMin
VR IV	392	120	53.0	32.0
VR IV	393		41.8	32.8
VR IV	393	145	48.8	
VR IV	410		40.6	28.4
VR V	51		39.7	32.5
VR V	85		51.2	40.0
VR V	207		50.1	33.3
VR V	236		58.5	41.5
VR V	258		50.1	35.8
VR V	263		42.8	30.8
VR V	264		65.3	54.8
VR X	144	165		38.4
VR X	144		39.0	30.3
VR X	200		51.6	38.6
VR X	508		46.0	35.0
VR XII	2453		61.3	41.4
VR XII	2486		44.3	35.8
VR XII	2495		52.9	36.8
VR XII	2508		42.5	33.9
VR XII	2508	140	48.2	34.7
VR XII	2517	140	44.2	33.2
VR XII	2517		82.1	57.0
VR XII	2538	148	45.0	39.2
VR XII	2551		45.7	37.1
VR XIII	3262	85	34.0	26.5
VR XIII	3262	135	44.3	38.5
VR XIII	3262	240		
VR XIII	3262		63.3	57.1
VR XIII	3262	116	41.2	27.8
VR XIII	3262	125	44.5	32.2
VR XIII	3262	135	45.2	34.6
VR XIII	3262	175	59.0	44.4
VR XIII	3262		72.4	51.1
VR XIII	3262		62.9	47.0
VR XIII	3262	160	45.8	39.4
VR XIII	3262	140	39.0	34.5
VR XIII	3262		58.7	51.6
VR XIII	3262		65.9	47.5
VR XIII	3262	192	56.3	46.0
VR XIII	3262		46.4	35.8
VR XIII	3262	145	48.9	34.9
VR XIII	3262	128	44.4	33.6
VR XIII	3262		35.5	28.0
VR XIII	3262		52.5	42.3
VR XIII	3262	145	39.8	35.4
VR XIII	3262		52.3	41.3
VR XIII	3262		50.9	33.3
VR XV	4098		46.7	34.0
VR XV	4135		38.6	30.2
VR XV	4135	170	50.8	37.0
VR XV	4212		43.5	37.6
VR XV	4212	135	45.0	30.6
VR XV	4348	160	51.1	38.7
VR XV	4351		50.3	36.7
VR XV	4376		72.6	51.7
VR XV	4382	180	75.8	49.5
VR XV	4382	140	43.9	33.6
HA 72	75		55.5	
HA 74	337		60.3	50.9
HG	815	175	55.5	42.6
HG	815		50.6	39.2
HG	1165	120	48.2	34.3
HG	1165	165		
HG	1165		42.2	30.3
HG	1165		44.1	36.5
HG	1223	138	47.0	36.5
HG	1223	155	57.7	

Scapula: Cattle

Site	Context	GLP	LG	BG	SLC
VR IV	346	57.5	48.7	42.0	46.0
VR IV	392	61.0	51.2		42.8
VR V	314	63.4		45.3	50.3
VR V	387	75.0	61.1		57.4
VR V	387			43.3	
VR V	387			44.9	
VR V	387	73.0	60.4		57.1
VR X	540			49.2	
VR X	642	58.2	49.5	39.1	46.0
VR XII	2478	73.0	62.7		58.4
VR XII	2486	56.4		39.4	
VR XII	2486			47.9	55.4
VR XII	2486	62.2		37.6	
VR XII	2508	62.7	54.3	46.5	
VR XII	2538			44.2	
VR XII	2538			47.9	52.9
VR XII	2538			41.8	
VR XII	2538			46.6	47.4
VR XII	2538			46.7	48.4
VR XII	2538			50.8	
VR XII	2547			43.3	
VR XII	2548		55.0	49.5	
VR XII	2555				50.3
VR XII	2562			43.1	
VR XIII	3233			44.8	
VR XIII	3262				63.5
VR XIII	3262	76.1	65.4		54.0
VR XIII	3281	82.3	69.4		61.4
VR XIII	3281	64.1	52.9	42.3	46.3
VR XIII	3343			50.8	
VR XV	4119			38.3	
VR XV	4382	62.1			45.2
HA 74	285	62.7	53.0	45.5	
HA 74	372	61.5	50.9	44.1	44.9
HA 74	416				48.0
HA 74	416	60.2	52.1		48.1
27JS	405	64.0	55.6		
HG	1165				45.5
HG	1165				41.3

Humerus: Cattle

Site	Context	BT	HT
VR IV	392		44.3
VR IV	401		38.2
VR IV	412	67.0	42.0
VR V	37		39.5
VR V	51		40.3
VR V	202		42.3
VR V	230		38.0
VR V	264		53.1
VR V	270		40.0
VR V	368		42.3
VR V	384		40.6
VR X	144		47.2
VR X	144		44.9
VR X	336		44.6
VR X	416		38.4
VR X	433		41.1
VR X	494		38.0
VR X	508		41.5
VR XII	2397		41.0
VR XII	2470		34.5
VR XII	2486		40.3
VR XII	2486		40.2
VR XII	2495		41.6
VR XII	2538	64.2	40.1
VR XII	2551		44.2
VR XII	2558		45.1
VR XII	2558		38.2
VR XII	2562		44.8
VR XII	2562		44.1
VR XII	2618	80.1	46.9
VR XIII	3233		43.6
VR XIII	3233		46.5
VR XIII	3262		48.5
VR XIII	3262	73.4	46.3
VR XIII	3262		38.5
VR XIII	3262		39.7
VR XIII	3318		40.2
VR XV	4119	63.8	
VR XV	4119		38.5
VR XV	4119		41.1
VR XV	4167		39.8
VR XV	4169		41.7
VR XV	4169		38.3
VR XV	4231	67.0	39.9
VR XV	4237		43.3
VR XV	4351	76.0	43.0
VR XVI	1815		43.8
HA 72	99		40.0
JCH	154	67.2	40.7
HG	1093	73.2	46.0
HG	1093	67.0	

Radius: Cattle

Site	Context	GL	Bp	Dp	BFp	SD	Bd
VR IV	352	240		36.6		33.7	61.7
VR IV	392			38.8			
VR IV	412	252	73.6	40.4	66.9		62.3
VR V	60			38.3			
VR V	96			40.1			
VR V	261	252		38.1			61.7
VR V	344			35.8			
VR X	415			37.1			
VR X	594			43.5			
VR XII	2451			43.2	75.1		
VR XII	2471		72.6	37.8	65.9		
VR XII	2503			40.3			
VR XII	2538			37.4			
VR XII	2562	311	90.2	47.3	83.0	45.0	
VR XII	2562			37.6			
VR XII	2562	260		36.8		36.0	
VR XII	2583			41.1			
VR XIII	3038			44.7			
VR XIII	3192	266			67.5	35.6	64.2
VR XIII	3262	270	81.7	40.0	72.8	39.1	71.3
VR XIII	3262	254		36.6		33.1	
VR XIII	3262			37.9			
VR XIII	3262			39.0			
VR XIII	3262			38.7			
VR XIII	3343			49.6			
VR XV	4118			40.5			
VR XV	4119			48.9			
VR XV	4119			44.0			
VR XV	4119			35.4			
VR XV	4119			40.6			
VR XV	4119			37.5			
VR XV	4125	258		37.7		32.6	
VR XV	4145			42.6			
VR XV	4348			37.3			
VR XVI	1815			37.7			
HA 72	79			41.2			
HA 72	96		71.8		65.6		
HA 74	269	299	82.8	44.7	77.6	42.0	74.9
HG	1004	290		44.4		42.7	
HG	1093		73.7	36.8	68.9		
HG	1093						67.0
HG	1276			35.5			

Ulna: Cattle

Site	Context	LO	BPC	SDO
VR XIII	3262	82.8	40.6	46.7
VR XIII	3262	96.1	47.8	48.4

Femur: Cattle

Site	Context	DC
VR V	30	49.2
VR X	416	49.6
VR X	508	37.3
VR XIII	3262	44.6
VR XV	4119	44.1
VR XV	4351	35.2
HA 72	83	40.0
HG	820	45.0
HG	982	43.9

Calcaneus: Cattle

Site	Context	GL	L1	L2	GB
VR X	540	134	86.7	98.3	41.0
VR XII	2486	127	82.6	93.2	36.6
VR XII	2551	128	85.9	95.8	
VRXIII	3262	114	73.0	85.4	31.0
HG	113	132			37.0
HG	811	112			
HG	861	125			33.0

Tibia: Cattle

Site	Context	Bd	Dd
VR IV	392	55.1	44.2
VR IV	392	58.7	
VR IV	410	51.8	39.5
VR V	130	65.4	50.1
VR V	151	59.1	46.6
VR V	236	66.1	48.8
VR V	344	56.2	41.9
VR V	405	51.7	37.6
VRX	290	58.0	42.2
VRX	340	56.9	46.6
VRX	594	56.7	43.3
VRXII	2036	53.7	
VRXII	2471	50.8	
VRXII	2517		45.9
VRXII	2538	60.4	48.0
VRXII	2538	57.0	45.6
VRXII	2538	56.4	43.3
VRXII	2551	60.9	45.1
VRXII	2556	61.7	47.9
VRXII	2558	57.8	45.8
VRXIII	3262		41.4
VRXIII	3262	59.9	44.4
VRXIII	3262		34.5
VRXIII	3281	54.8	
VRXIII	3319	50.5	35.6
VRXIII	3343	53.6	40.4
VRXIII	3345	62.2	48.2
VR XV	4092	57.1	41.9
VR XV	4119		42.5
VR XV	4119		40.3
VR XV	4167	57.8	44.8
VR XV	4212	57.9	42.2
VR XV	4232		42.1
VR XV	4352	58.8	42.6
VR XV	4376		42.8
HA 72	83	56.0	41.7
HG	1076	53.7	40.2
HG	1162		44.8
HG	1166	51.0	37.6

Astragalus: Cattle

Site	Context	GLl	L3	GLm	Bp	Bd	Dl
VR IV	194	59.6	47.1	55.9	40.3	36.3	
VR IV	346					39.0	
VR IV	392				40.4		
VR IV	392				43.9		
VR IV	393	58.1	45.9	54.3		36.5	32.1
VR IV	393	67.1	52.1	59.6	46.1	45.5	37.4
VR IV	393	58.2	44.3	52.5	39.8	36.4	32.4
VR IV	410	65.8	52.6				37.7
VR IV	414	64.9	51.5	60.5	44.6	41.4	42.0
VR IV	21			59.4			
VR IV	33	49.7	46.6	54.8	43.6	40.5	32.4
VR IV	191	63.6	47.7			38.6	34.7
VR IV	297			54.0			
VR IV	341	73.1		66.7	48.1	43.3	40.5
VR IV	384	67.4	52.2	61.5	47.5	43.0	36.8
VR IV	387	68.7	54.7			44.0	38.8
VR IV	387	68.7	54.4			44.0	38.7
VR X	31	63.2	48.1	56.4	41.2	41.3	34.0
VR X	144	62.7	47.5	56.9	43.9	40.6	35.3
VR X	415		48.7	57.6		42.7	35.3
VR X	415	63.9	49.1	59.2	45.0	43.3	35.9
VR X	494					40.7	
VR X	560	67.7	51.4	60.7	44.8	45.2	37.7
VR X	540		47.2	56.4	43.0		34.3
VR X	540				39.1		
VR X	603	64.4	49.3	58.6	42.5	38.5	35.4
VR X	637	62.9	47.0	55.5	40.8	37.4	35.6
VR XII	2036	61.4	46.6	57.0	40.7	39.0	33.8
VR XII	2486	62.9	49.6	58.2	41.0	39.0	34.3
VR XII	2486	61.8	46.7	56.3	42.3	41.1	35.6
VR XII	2486	61.4	48.0	57.0	41.4	38.9	35.4
VR XII	2495	60.9	47.0	54.2	41.0	39.6	33.9
VR XII	2498			57.7			
VR XII	2508	65.5	51.5				
VR XII	2508	61.5	47.4	56.5	42.4	38.2	33.7
VR XII	2517					40.4	
VR XII	2538	72.0	53.5	64.1	46.1	42.3	40.5
VR XII	2538	62.0	48.4		40.7	40.3	35.0
VR XII	2538	62.5	48.3	57.2	43.4	38.2	35.3
VR XII	2541	72.2	56.2			44.9	39.9
VR XII	2551	59.3					32.7
VR XII	2562	60.3	46.9	54.8	42.4	41.7	34.1
VR XII	2658	58.7	45.0	54.2	40.2	39.3	32.9
VR XIII	3192			60.7		40.5	
VR XIII	3262	66.9	50.3	59.7	45.4	42.0	36.4

Site	Context	GLl	L3	GLm	Bp	Bd	Dl
VR XIII	3262	60.9	46.6	56.3	43.4	39.7	34.5
VR XIII	3262	61.2	48.4	58.2	41.3	36.8	32.9
VR XIII	3262	63.7	50.6	59.3	43.6	40.0	32.5
VR XIII	3262	73.3	54.6	65.5	48.9	44.2	38.4
VR XIII	3262	60.9	45.2	55.1	38.8	37.1	32.2
VR XIII	3262	60.6	46.0	54.8	40.1	38.7	33.9
VR XIII	3262	64.4	50.7	59.8	44.0	41.6	34.8
VR XIII	3262	58.3	44.4	52.7	37.4	35.0	30.9
VR XIII	3262	59.5	45.4	55.3		39.4	
VR XIII	3262	59.2	45.9	53.7	39.5	38.9	32.2
VR XIII	3281	70.4	53.8	63.6	50.1	47.5	39.1
VR XIII	3281	57.8	43.7	51.8	39.2		31.5
VR XIII	3292				41.5		
VR XIII	3318	61.9					33.8
VR XIII	3319	60.1	45.6	55.6	42.8		
VR XIII	3320	63.5	49.1			38.4	34.9
VR XIII	3343	66.5	49.5	59.8			36.6
VR XIII	3343	67.4	53.0	62.7	47.5	44.0	37.7
VR XV	4092	60.7	47.5	56.1	41.4	39.2	33.6
VR XV	4114		49.0	58.4	41.1		36.1
VR XV	4212	65.5					
VR XV	4232	66.8	50.8	60.3	43.7	41.0	37.4
VR XV	4376	68.1	54.7	64.4	47.1	42.6	39.5
HA 72	78	62.3	47.6	56.7	41.4	38.4	34.3
HA 72	96	60.6	47.1	55.7	40.7	37.7	34.1
HA 74	373			62.9		43.0	
27JS	339					38.8	
HG	811			51.6			
HG	863	65.3					36.1

Metacarpal: Cattle

Site	Context	GL	Bp	Dp	SD	Bd	Bdf	Ddf
VR IV	196					54.7	50.6	25.9
VR IV	254		49.1	29.4				
VR IV	392	188	53.8	32.4	30.5	55.5	49.1	27.7
VR IV	393		63.1	41.1				
VR IV	401					53.0.	49.0	26.6
VR IV	402					57.8	52.7	27.8
VR IV	29		47.0	28.5				
VR IV	38					67.2	60.4	
VR IV	60					49.1	44.5	24.3
VR V	62					50.7	45.4	23.5
VR V	83					57.1	51.2	27.8
VR V	85					66.2		
VR V	136					54.7	51.0	28.0
VR V	136			31.2				
VR V	209					53.4	48.0	26.7
VR V	258		68.8	40.4				
VR V	264		53.8	31.2				
VR V	285		47.7					
VR V	361		56.0					
VR V	384			32.7				
VR V	387					46.7	43.6	22.6
VR V	387					46.8		43.1
VR V	405		51.5					
VR V	406					55.1	50.2	25.9
VR X	144					58.5	53.3	27.5
VR X	144					68.1	59.1	29.1
VR X	431					56.6	52.2	27.9
VR X	433		51.5	32.0				
VR X	433		51.9	31.6				
VR X	433					56.3	52.8	29.1
VR X	729		53.0	31.3				
VR X	928		55.8					
VR XI	1691		53.4	33.5				
VR XII	2392					53.4	49.7	25.6
VR XII	2397		54.5	33.7				
VR XII	2399	197	58.5	33.9	34.8	65.3	60.1	28.8
VR XII	2455	178	54.2	32.3	28.4	55.3	49.4	25.4
VR XII	2467					53.6	48.5	25.2
VR XII	2486		56.1	35.0				
VR XII	2486		55.0	33.9				
VR XII	2486		50.5	29.6				
VR XII	2486					56.9	51.3	24.5
VR XII	2486					49.9	45.9	
VR XII	2486					56.8	53.0	
VR XII	2486					52.7	48.7	27.3
VR XII	2486	199	64.4		38.7	63.4	58.2	30.3
VR XII	2495		54.1	36.1				
VR XII	2495		51.5	28.6				
VR XII	2508					51.7	44.3	22.1
VR XII	2508					54.4	51.5	27.0
VR XII	2508					51.2	44.5	24.0
VR XII	2538					53.0	49.7	24.9
VR XII	2538		54.8	33.1				
VR XII	2538		49.0	30.5				
VR XII	2538					52.8	48.1	25.3
VR XII	2541							32.0
VR XII	2551					54.9	53.6	28.5
VR XII	2556		59.0	37.6				
VR XII	2562		49.3	30.4				
VR XII	2562		51.6					

Site	Context	GL	Bp	Dp	SD	Bd	Bdf	Ddf
VR XII	2583		53.7					
VR XIII	3233					54.1	49.3	25.9
VR XIII	3262		56.4	33.6				
VR XIII	3262					68.3	60.1	30.6
VR XIII	3262					53.9	49.7	27.8
VR XIII	3262	194	58.7	34.7	32.1	59.0	58.8	32.5
VR XIII	3262	195	59.8	36.8	34.7	62.9	57.9	30.1
VR XIII	3262	199	61.6	39.7	35.9	62.8	56.9	27.3
VR XIII	3262	186	55.0	33.6	31.3	54.8	51.2	26.7
VR XIII	3262	194	54.7	33.4	29.8		52.3	27.0
VR XIII	3262		54.5	33.7				
VR XIII	3262	194	60.7	38.2	33.5	60.1	55.1	29.1
VR XIII	3262	186	61.6	35.4	35.5		55.5	26.5
VR XIII	3262	197	65.1	39.5	36.9	66.4	57.0	26.3
VR XIII	3281					47.7	43.9	24.0
VR XIII	3281			34.1				
VR XIII	3281					56.3	52.8	26.8
VR XIII	3281					53.7		28.1
VR XIII	3292					49.7	45.4	24.6
VR XIII	3318					50.6	45.6	23.9
VR XIII	3319		53.0	34.2				
VR XIII	3350	176	48.5	28.8	27.6	52.0	47.3	25.6
VR XIII	3375		50.2					
VR XV	4098		51.6					
VR XV	4119					50.4	46.5	25.4
VR XV	4144		57.7	37.3				
VR XV	4199					49.6	44.9	23.5
VR XV	4212	209	57.2	34.5	33.1	61.0	56.9	29.2
VR XV	4220					56.8	48.5	25.4
VR XV	4237		60.7	38.7				
VR XV	4376					52.6	45.8	47.7
VR XV	4382					54.1	49.9	25.5
HA 72	96		56.5	33.9				
HA 74	261		56.0					
HA 74	269		51.7	32.4				
HA 74	304		53.4	34.2				
HA 74	383					56.0	49.6	26.3
HA 74	391		55.9	34.3				
JCH	151		53.0	32.0				
27JS	311					58.3	52.2	28.0
27JS	312		57.5	36.8				
27JS	339		54.0	32.9				
27JS	339		54.2	33.7				
27JS	419		52.2	32.6				
27JS	419		65.0	41.7				
27JS	426		54.1	33.0				
27JS	461		53.0	34.0				
27JS	718					56.7	49.7	25.5
HG	113					51.1	47.5	24.5
HG	116					56.0	51.8	28.1
HG	116					48.4	47.4	25.5
HG	811			50.1	31.1			
HG	820					52.2	47.4	25.6
HG	861					49.9	45.4	25.0
HG	1008		57.1	35.0				
HG	1076	187	51.3	32.4	30.6	53.4	48.7	26.2
HG	1076					55.4	51.4	26.3
HG	1093	172	48.4	32.0	28.3	50.6	45.2	24.0
HG	1165					57.4	51.5	25.1
HG	1223	191	52.3	32.3	28.0	55.0	49.6	26.9
HG	1223	181		33.1	27.3	52.0	46.9	26.1

Metatarsal: Cattle

Site	Context	GL	Bp	SD	Bd	Bdf	Ddf
VR IV	392				50.4	45.8	30.2
VR IV	392		51.1				
VR IV	393	214		25.0	56.4	51.0	29.1
VR IV	393				49.4	45.6	
VR IV	393				52.0	49.0	30.2
VR IV	393		45.1				
VR IV	401				50.3	47.5	29.3
VR V	31				47.2	43.3	26.4
VR V	51		38.6				
VR V	57				52.2	48.2	
VR V	98				48.6	44.8	25.9
VR V	103				49.5	47.5	
VR V	106				50.8	46.2	28.0
VR V	136	203	37.9	22.7	44.9	44.3	26.9
VR V	153		40.6				
VR V	189		46.1				
VR V	228		45.1				
VR V	258				48.7	46.1	26.8
VR V	270					46.5	29.4
VR V	284				52.5	47.8	28.7
VR V	344		42.8				
VR V	346		40.1				
VR V	355		46.0				
VR V	387				57.5		
VR V	395		43.8				
VR V	466		40.8				
VR X	144		43.2				
VR X	144		53.2				
VR X	290				48.7	46.0	27.8
VR X	415		38.6				
VR X	416		46.6				
VR X	431				54.1	50.8	29.6
VR X	433		44.7				
VR X	433		45.5				
VR X	494		42.3				
VR X	508		44.5				
VR X	536				52.7	49.8	29.0
VR X	540				55.8	49.7	
VR X	540				52.6	51.0	29.4
VR XI	1223		45.1				
VR XI	1691		43.3				
VR XII	2036		40.5				
VR XII	2036				48.9	46.4	28.3
VR XII	2036				60.6		
VR XII	2036				46.9	45.6	27.6
VR XII	2036		42.8				

Site	Context	GL	Bp	SD	Bd	Bdf	Ddf
VR XII	2464		40.2				
VR XII	2467		41.5				
VR XII	2470				48.7	46.7	27.1
VR XII	2470		46.8				
VR XII	2470		43.6				
VR XII	2471		44.7				
VR XII	2471		44.7				
VR XII	2471				50.4	47.9	27.3
VR XII	2471		39.2				
VR XII	2486		39.8				
VR XII	2486		45.0				
VR XII	2486		44.9				
VR XII	2486				54.3	51.3	
VR XII	2486				46.1	43.2	
VR XII	2486			29.9			
VR XII	2495				52.3	51.8	
VR XII	2499				53.5	49.5	29.4
VR XII	2508	224	40.4	23.9	51.9	50.7	30.1
VR XII	2517		41.9				
VR XII	2538		44.9				
VR XII	2538		40.1				
VR XII	2538		42.7				
VR XII	2538		45.6				
VR XII	2538	214	43.3	23.6	47.2	43.6	26.7
VR XII	2538				50.6	49.4	
VR XII	2538				48.7	45.6	
VR XII	2551		49.6				
VR XII	2551					55.4	33.3
VR XII	2551				47.6	43.9	
VR XII	2562				50.2	49.2	29.4
VR XII	2562				48.0	44.5	26.3
VR XII	2618		42.6				
VR XII	2618		44.7				
VR XIII	3038	211	43.5	24.8			
VR XIII	3262	214	39.0	20.7	43.6	41.9	24.6
VR XIII	3262		38.9				
VR XIII	3262		40.5				
VR XIII	3262	226	47.1	28.0	56.1	50.3	27.2
VR XIII	3262	220		24.4	49.9	46.1	28.1
VR XIII	3262	226	41.4	23.1	49.1		
VR XIII	3262	225	41.4	22.2	49.2	45.4	26.3
VR XIII	3262	205		18.8		39.1	23.6
VR XIII	3262	212	44.3	22.9		46.5	26.8
VR XIII	3262	212	44.5	23.4	47.8	45.1	25.3
VR XIII	3262				47.6	44.4	23.8
VR XIII	3262				44.8	40.1	24.3
VR XIII	3262	221		23.1	49.3	46.5	26.3
VR XIII	3262	234	52.5	31.9	60.5	55.0	31.7

Site	Context	GL	Bp	SD	Bd	Bdf	Ddf
VR XIII	3262				47.8	44.6	24.1
VR XIII	3281		38.2				
VR XIII	3292		48.4				
VR XIII	3318				50.4		
VR XIII	3337				49.9	46.2	26.6
VR XIII	3350				51.3	48.5	28.7
VR XV	2544		43.1				
VR XV	4112		40.5				
VR XV	4113				49.9	47.5	28.6
VR XV	4119				56.7		
VR XV	4125		50.9				
VR XV	4135		44.3				
VR XV	4144		51.8				
VR XV	4212		39.3				
VR XV	4212		43.9				
VR XV	4237				50.4	47.0	29.4
VR XV	4374	200	40.2	25.4		47.5	
HA 72	48		42.2				
HA72	48		43.3				
HA72	75				52.0	47.6	
HA72	79		50.7				
HA72	82		44.1				
HA72	96		46.1				
HA 74	264				49.4	44.8	27.3
HA74	274				48.0	43.3	25.9
HA74	301		43.8				
HA74	401		42.9				
JCH	11		46.6				
JCH	154				51.0	47.0	27.7
27JS	311		49.9				
27JS	339		45.8				
27JS	345		41.3				
27JS	392		41.1				
27JS	419		39.4				
27JS	419		47.2				
27JS	419				48.5	45.2	26.8
27JS	419		41.1				
27JS	422						28.0
HG	113				49.3	46.7	25.0
HG	171		51.2				
HG	811	209	42.0	23.8	47.5	44.2	25.8
HG	846	204		22.1	45.6	42.6	24.9
HG	1074				58.1	55.6	33.5
HG	1093				51.1	48.2	26.9
HG	1129	199	40.2	23.6	47.6	45.0	26.7
HG	1166		42.5				
HG	1223		46.6				

Sheep and Goat Measurements

Scapula: Sheep/Goat

Site	Context	GLP	BG	SLC	LN	Species
VR IV	295	28.8	18.4	16.2	15.9	Sheep
VR V	92	32.3		20.2	19.7	Sheep
VR V	108	32.6	21.6	21.0		Sheep
VR V	405	30.7		17.1	18.1	Sheep
VR X	144	30.6	18.6	18.8		Sheep
VR X	144			18.5		Sheep
VR X	328	31.3	19.8	18.7		Sheep
VR X	540		18.5	16.6		Sheep
VR XII	2397	29.3	19.0	18.5		Sheep
VR XII	2486	32.3		19.4		Sheep
VR XII	2517	30.5	19.1	18.4		Sheep
VR XII	2538		19.1	19.8		Sheep
VR XII	2538	31.7	21.0	20.4		Sheep
VR XII	2548	29.2	19.0	18.1		Sheep
VR XIII	3192	31.6	19.1	18.2		Sheep
VR XIII	3262		19.3	18.5		Sheep
VR XV	4135	34.0		20.0		Sheep
VR XV	4376			17.9		Sheep
VR XV	4382	32.0	20.2	19.5		Sheep
HA 72	96	30.6	19.6	18.0	20.2	Sheep
HA 74	403	35.4	20.5	22.2	22.2	Sheep
HA 74	415		23.2			Sheep
HA 74	457	31.8	18.2	16.9	17.7	Sheep
JCH	244	29.3		16.2	19.0	Sheep
JCH	257	28.9	19.2	17.6		Sheep
27JS	312		21.6	19.5	20.6	Sheep
27JS	405		18.1	16.7	17.8	Sheep
27JS	419		21.6	18.1		Sheep
HG	116	34.2		18.7	22.8	Sheep
HG	117	33.0		19.7	23.6	Sheep
HG	1093	30.8		17.9	19.7	Sheep

Humerus: Sheep/Goat

Site	Context	Bd	BT	HT	Species
VR IV	410		27.6		Sheep
VR V	32			18.6	Sheep
VR V	33		29.0	18.6	Sheep
VR V	81	33.3	30.3	20.0	Sheep
VR V	92	30.3	27.6	18.0	Sheep
VR V	191	27.8	26.0	15.6	Sheep
VR V	209		26.2		Sheep
VR V	297			18.0	Sheep
VR V	304	31.7	29.2	18.2	Sheep
VR V	405	29.1	27.7	18.2	Sheep
VR X	337	27.9	26.6	17.1	Sheep
VR X	340	32.5	29.6	19.6	Sheep
VR X	526	28.6	27.6	17.3	Sheep
VR XII	2486		28.5	17.1	Sheep
VR XII	2487	33.3	29.9	18.6	Goat
VR XII	2556	28.4	26.3	16.0	Sheep
VR XIII	3010		26.6	16.8	Sheep
VR XIII	3262	30.4	28.1	20.1	Sheep
VR XIII	3262			18.8	Sheep
VR XIII	3343	26.9	25.6	16.8	Sheep
VR XV	4102	30.6	29.4	18.0	Sheep
VR XV	4119			18.8	Sheep
VR XV	4119		29.3	19.3	Sheep
VR XV	4141		28.3		Sheep
VR XV	4209	33.4	31.0	20.2	Sheep
VR XV	4348		27.8	18.1	Sheep
VR XV	4348	29.6	27.8	17.7	Sheep
VR XV	4382		27.9	17.8	Sheep
HA 72	55	29.6	26.8	16.2	Sheep
HA 74	269	33.9	31.1	20.1	Sheep
HA 74	269	27.3	25.6	16.7	Sheep
HA 74	274		28.8	18.9	Sheep
HA 74	326		30.3	19.0	Sheep
HA 74	377	29.2	28.0	17.3	Sheep
HA 74	403	32.2	30.4	19.6	Goat
JCH	244		26.1	16.8	Sheep
27JS	405		27.0	17.3	Sheep
27JS	419		27.9	16.9	Sheep
27JS	474	29.5	27.1	17.8	Sheep
HG	811	29.2	27.6	18.8	Sheep
HG	813	26.9	25.2	16.9	Sheep
HG	846	30.8	28.1	18.3	Sheep
HG	1216		24.4	17.4	Sheep

Radius: Sheep/Goat

Site	Context	GL	Bp	Dp	BFp	SD	Bd	Dd	Species
VR IV	401		31.4	16.4	28.3				Sheep
VR V	92	139	29.0	15.3	26.7	16.6		19.4	Sheep
VR V	191		26.7	13.9	24.0				Sheep
VR V	209		28.5		26.5				Sheep
VR V	258		27.9		25.9				Goat
VR V	297						27.5	18.1	Sheep
VR V	405		28.4	15.3	26.9				Sheep
VR X	212		28.7	14.1	25.8				Sheep
VR X	494		29.6	14.5	26.6				Sheep
VR XI	1223		28.1	14.9	26.3				Sheep
VR XII	2457	137.7	28.5	14.9	24.9	15.5	24.9	17.6	Sheep
VR XII	2470			16.6	28.9				Sheep
VR XII	2470		32.1	15.7	29.2				Sheep
VR XII	2471		29.0	15.6	26.6				Sheep
VR XII	2486		30.0						Sheep
VR XII	2508		30.7		27.5				Sheep
VR XII	2508		30.1	15.1	29.0				Sheep
VR XII	2508		30.4	16.2	26.4				Sheep
VR XIII	3192		32.7	16.1	29.5				Sheep
VR XIII	3233		29.0	14.8					Sheep
VR XIII	3233		29.6	15.0	27.6				Sheep
VR XIII	3262		29.9	16.8	27.9				Sheep
VR XIII	3318		29.2	15.0	25.9				Sheep
VR XIII	3319		29.6	15.6	26.1				Sheep
VR XIII	3322			16.6	28.7				Sheep
VR XV	4084						25.7	16.4	Sheep
VR XV	4102		31.8	16.2	29.9				Sheep
VR XV	4107			16.9	27.8				Sheep
VR XV	4119						27.3		Sheep
VR XV	4128		31.2	15.4	27.5				Sheep
VR XV	4129		31.1	16.2	27.8				Sheep
VR XV	4135		29.1						Sheep
VR XV	4135		30.0	14.3	28.0				Sheep
VR XV	4148		31.8	17.4	28.7				Sheep
VR XV	4206						28.8	20.2	Sheep
VR XV	4348						28.8	19.5	Sheep
VR XV	4376		30.7	15.9	27.2				Sheep
VR XV	4382		33.1	17.3	30.1				Sheep
VR XV	4382							17.9	Sheep
HA 72	21		30.2	15.0	27.0				Sheep
HA 72	96		31.4		28.3				Sheep
HA 74	257		29.6	15.9	26.6				Sheep
HA 74	257		33.5	17.8	30.6				Sheep
HA 74	264		29.3	15.4	25.9				Sheep
HA 74	278		30.2		27.3				Sheep
HA 74	403		29.8	15.3	27.3				Sheep
HA 74	406		30.7		28.1				Sheep
HA 74	457		29.3	16.7	27.6				Sheep
JCH	187						31.5		Sheep/Goat
JCH	244		27.6	14.6	25.9				Sheep
JCH	250		31.9	15.3	27.5				Sheep
27JS	405		28.2		25.4				Sheep
HG	817						25.2	17.2	Sheep/Goat
HG	1049		27.1	14.0	26.1				Sheep
HG	1093		29.2	16.0	25.9				Sheep
HG	1093		30.6	16.2	28.4				Sheep
HG	1165		30.3	15.3	26.9				Sheep

Ulna: Sheep/Goat

Site	Context	LO	BPC	SDO	Species
VR V	92		17.3		Sheep
VR X	144	44.1			Sheep
VR XII	2486	38.6	15.7	21.0	Sheep
VR XIII	3318	37.9	16.6	20.9	Sheep
VR XIII	3343	36.1	15.0	19.0	Sheep
HA 74	264	35.8		20.3	Sheep
HA 74	269	47.3	18.3	24.9	Sheep

Femur: Sheep/Goat

Site	Context	Bp	DC	Species
VR V	58	39.5	18.9	Sheep
VR XIII	3331		18.4	Sheep
HG	813	44.8		Sheep

Tibia: Sheep/Goat

Site	Context	Bd	Dd	Species
VR IV	393	24.6	19.4	Sheep/Goat
VR IV	393	24.2	19.1	Sheep/Goat
VR V	22	21.8	16.6	Sheep/Goat
VR V	58	24.5		Sheep/Goat
VR V	60	26.5	20.1	Sheep/Goat
VR V	63	23.9	17.6	Sheep/Goat
VR V	92	26.7	20.5	Sheep
VR V	139	25.7		Sheep/Goat
VR V	175	25.9	19.3	Sheep/Goat
VR V	209	26.1	20.0	Sheep/Goat
VR V	264	28.1	21.0	Sheep/Goat
VR V	304	25.8	19.4	Sheep/Goat
VR V	316	23.5	16.9	Sheep/Goat
VR V	335	26.3	21.6	Sheep/Goat
VR V	355	25.6	20.6	Sheep/Goat
VR V	386	27.0	20.1	Sheep/Goat
VR V	387	24.1	19.1	Sheep/Goat
VR V	405	25.2	20.5	Sheep
VR V	405	23.5	18.7	Sheep/Goat
VR V	406	23.4	18.1	Sheep/Goat
VR X	144	25.9	21.1	Sheep/Goat
VR X	144	23.9	18.1	Sheep/Goat
VR X	144	25.0	19.8	Sheep/Goat
VR X	200	25.8	19.6	Sheep/Goat
VR X	349	25.4	22.2	Sheep/Goat
VR X	349	24.8	21.3	Sheep/Goat
VR X	416	24.3	19.4	Sheep/Goat
VR X	494	24.8	18.9	Sheep/Goat
VR X	508	26.3	19.6	Sheep/Goat
VR X	626	25.8	21.0	Sheep/Goat
VR XII	2453	26.2	20.6	Sheep/Goat
VR XII	2477	25.2	19.7	Sheep/Goat

Site	Context	Bd	Dd	Species
VR XII	2486	26.3	20.0	Sheep/Goat
VR XII	2486	27.0		Sheep/Goat
VR XII	2486	27.2	20.9	Sheep/Goat
VR XII	2486	26.1	20.0	Sheep/Goat
VR XII	2487	24.9	18.7	Sheep/Goat
VR XII	2498	27.2	20.7	Sheep/Goat
VR XII	2508	26.0	19.8	Sheep/Goat
VR XII	2508	26.1	18.4	Sheep/Goat
VR XII	2538	24.5	19.2	Sheep/Goat
VR XIII	3192	26.0	19.4	Sheep/Goat
VR XIII	3233	26.6	20.9	Sheep/Goat
VR XIII	3233	26.2	20.6	Sheep/Goat
VR XIII	3233	27.5	19.5	Sheep/Goat
VR XIII	3262	24.2	17.6	Sheep/Goat
VR XIII	3262	25.1	19.8	Sheep/Goat
VR XIII	3262	23.9	18.2	Sheep/Goat
VR XIII	3292	25.1	19.3	Sheep/Goat
VR XIII	3322	21.9	17.1	Sheep/Goat
VR XIII	3343	22.6	16.8	Sheep/Goat
VR XV	4065	27.6	21.3	Sheep/Goat
VR XV	4084	25.2	19.9	Sheep/Goat
VR XV	4119	25.0	18.8	Sheep/Goat
VR XV	4119	25.3	20.0	Sheep/Goat
VR XV	4119	26.1	20.2	Sheep/Goat
VR XV	4128	25.2		Sheep/Goat
VR XV	4128	23.9	18.8	Sheep/Goat
VR XV	4135	25.6	19.8	Sheep/Goat
VR XV	4135	25.3	19.2	Sheep/Goat
VR XV	4151	23.1	17.9	Sheep/Goat
VR XV	4209	26.4	20.5	Sheep/Goat
VR XV	4231	25.7	19.1	Sheep/Goat
VR XV	4348	25.3	20.0	Sheep/Goat
HA 72	82	24.1	18.2	Sheep/Goat
HA 72	90	24.4	20.2	Sheep/Goat
HA 74	214	26.5	18.7	Sheep/Goat
HA 74	240	24.0	17.4	Sheep/Goat
HA 74	257	26.5	18.8	Sheep/Goat
HA 74	260	24.3	18.3	Sheep/Goat
HA 74	264	24.7	17.3	Sheep/Goat
HA 74	269	26.3	20.5	Sheep/Goat
HA 74	278	23.5	19.5	Sheep/Goat
HA 74	278	26.5	19.5	Sheep/Goat
HA 74	278	26.5	20.6	Sheep/Goat
HA 74	278	26.4	19.6	Sheep/Goat
HA 74	282	22.8		Sheep/Goat
HA 74	297	26.8	20.4	Sheep/Goat
HA 74	340	26.2	18.9	Sheep/Goat
HA 74	406	24.5	20.1	Sheep/Goat
JCH	244	24.6	19.0	Sheep
JCH	250	24.3		Sheep/Goat
27JS	405	25.7	21.3	Sheep/Goat
HG	817	24.6	19.2	Sheep/Goat

Calcaneus: Sheep/Goat

Site	Context	GL	L1	L2	Dp	GB	Species
VR IV	392	50.8			12.5	14.8	Sheep
VR V	53	52.3			11.8	13.0	Sheep
VR V	53	49.8			12.0	14.5	Sheep
VR V	92	53.9			13.5	15.2	Sheep
VR V	105	58.3					Goat
VR V	405	60.6			15.3	16.2	Sheep
VR X	31		35.5	39.1			Sheep
VR X	187	57.2	37.2	42.3			Sheep
VR X	508	53.9	34.9	39.2	13.2	16.2	Sheep
VR XII	2508	54.5	35.1	39.3			Sheep
VR XII	2517	59.4	38.6	43.7			Sheep
VR XIII	3365	56.6	38.4	42.1	13.5	15.8	Sheep
VR XV	4128	51.0	34.3	37.7	12.5		Sheep
VR XV	4151	58.7	41.0	44.2	13.9	16.3	Sheep
HA 74	215	55.7	36.3	40.1			Sheep
HA 74	406	52.2	33.8	39.2	12.7	13.1	Sheep
27JS	419	50.5	33.7	37.6		14.6	

Astragalus: Sheep/Goat

Site	Context	GLl	L3	Glm	Bp	Bd	Dl	Species
VR V	92	27.4	21.3			18.2	15.7	Sheep
VR V	344	26.6					15.8	Sheep/Goat
VR V	405	27.6		26.5	19.0	17.9		Sheep
VR XII	2486	27.1	21.4	25.9	19.2	18.2	15.6	Sheep/Goat
VR XV	4128	26.3	21.2	25.1	19.6	17.7	15.1	Sheep
HA 74	296	32.1	25.6	29.9		20.6	17.7	Sheep/Goat
HA 74	406	26.1	21.5	26.0	18.5	17.6	14.6	Sheep/Goat
HA 74	457	31.2	25.2	29.4	21.8	20.2	17.2	Sheep
JCH	225	28.9		28.1	21.2	19.1	16.2	Sheep/Goat
JCH	225	26.9		26.1	19.0	17.8	15.3	Sheep/Goat
JCH	244	26.6	21.5	26.0	19.7	17.0	14.9	Sheep

Metacarpal: Sheep/Goat

Site	Context	GL	Bp	Dp	SD	Bd	Bdf	Ddf	Species
VR V	60					25.8	25.0	13.3	Sheep
VR V	92	122	23.0	16.5	13.1	25.6	25.7	13.4	Sheep
VR V	121	126			12.7	24.5	24.7	12.9	Sheep
VR V	136		22.2	15.7					Sheep
VR V	153	112	24.6	17.8	16.7	27.1	27.3	13.0	Goat
VR V	209	112			12.5	22.1	21.6	12.0	Sheep
VR V	226		24.9						Goat
VR V	228		24.0	16.8					Sheep
VR V	229	117	20.9	15.3	13.2	22.8	24.0	12.7	Sheep
VR V	235		21.7	15.4					Goat
VR V	270	127	22.7	16.8	14.0	24.2	25.5	13.2	Sheep
VR V	344		23.3	17.4					Sheep
VR V	395		22.8	16.9					Sheep
VR V	405		21.7	15.7					Sheep
VR X	144		24.7	18.8					Sheep
VR X	144					23.3	21.9	12.7	Sheep
VR X	144					25.2	24.4		Sheep
VR X	416		20.9						Sheep
VR X	416		24.3	18.0					Sheep
VR X	432		21.8	15.9					Sheep
VR X	642		20.6						Sheep
VR X	968		23.1	17.2					Sheep
VR X	968		23.1	16.7					Sheep
VR XII	2036		21.3	15.2					Sheep
VR XII	2036		20.8	15.2					Sheep
VR XII	2036		22.2						Sheep
VR XII	2453		20.0						Sheep
VR XII	2470		22.1	16.2					Sheep
VR XII	2470		22.4						Sheep
VR XII	2471		20.8						Sheep
VR XII	2486		22.3	15.6					Sheep
VR XII	2517		24.4	17.4					Sheep
VR XIII	3262		21.6	14.7					Sheep
VR XIII	3262		23.0	16.8					Sheep
VR XIII	3281		23.1	16.9					Sheep
VR XIII	3315		22.7	17.3					Sheep
VR XIII	3318		24.1	16.9					Sheep
VR XIII	3318					26.3	26.3	13.5	Sheep
VR XIII	3319		23.8	17.1					Sheep
VR XIII	3322						24.6	12.6	Sheep
VR XIII	3323		21.2	16.0					Sheep
VR XIII	3365		19.7	14.6					Sheep
VR XV	4092		23.7						Sheep
VR XV	4125		22.2	15.7					Sheep
VR XV	4135		21.3	15.0					Sheep

Metacarpal: Sheep/Goat (*cont.*)

Site	Context	GL	Bp	Dp	SD	Bd	Bdf	Ddf	Species
VR XV	4151			16.5					Sheep
VR XV	4155					25.7	24.8	13.3	Sheep
VR XV	4167					24.8	24.3	12.9	Sheep
VR XV	4212		23.8	16.8					Sheep
HA 72	19	127	21.0	15.2	12.1	22.8	22.8		Sheep
HA 72	99		20.5	14.7					Sheep
HA 74	278					24.2	23.9	12.4	Sheep
HA 74	300		20.5						Sheep
HA 74	440					26.5	26.5	14.6	Sheep
HA 74	457		24.3	17.5					Sheep
JCH	151	124	21.1	15.7	13.5	22.9	23.9	13.1	Sheep
JCH	225	121			11.7				Sheep
JCH	244		20.2	14.5					Sheep
JCH	256		20.8	15.4					Sheep
JCH	270		21.9	16.2					Sheep
27JS	298		22.2	15.8					Sheep
27JS	393		23.8						Sheep
27JS	474		25.7	18.8					Sheep
27JS	544	117	20.9		11.3	22.4	21.7	11.9	Sheep
27JS	718		21.9	15.7					Sheep
27JS	718		21.4	15.6					Sheep
HG	1076		23.5	17.2					Sheep
HG	1093		22.5	16.3					Sheep
HG	1093		22.2	16.5					Sheep
HG	1223		22.7	16.6					Sheep

Metatarsal: Sheep/Goat

Site	Context	GL	Bp	SD	Bd	Bdf	Ddf	Species
VR V	37		19.1					Sheep
VR V	42		20.5					Sheep
VR V	51		16.5					Sheep
VR V	51				21.1	19.7	11.5	Sheep
VR V	92	128	20.2	12.0	24.5	23.6	14.0	Sheep
VR V	209		19.3					Sheep
VR V	209	121	21.9	12.6	24.2		13.8	Sheep
VR V	344		19.0					Sheep
VR V	405		20.0					Sheep
VR X	144		21.4					Sheep
VR X	144		19.2					Sheep
VR X	433		19.5					Sheep
VR XI	1223		21.8					Sheep
VR XII	2392				24.1	23.2	12.1	Sheep
VR XII	2486		16.9					Sheep
VR XII	2538		21.4					Sheep
VR XII	2548				23.7	23.7	14.3	Sheep

Metatarsal: Sheep/Goat (*cont.*)

Site	Context	GL	Bp	SD	Bd	Bdf	Ddf	Species
VR XII	2548					22.7	13.5	Sheep
VR XII	2551		19.1					Sheep
VR XIII	3262		18.4					Sheep
VR XIII	3318		18.4					Sheep
VR XIII	3318		20.3					Sheep
VR XIII	3331		18.4					Sheep
VR XIV	3847		18.7					Sheep
VR XV	4099		18.6					Sheep
VR XV	4102		20.3					Sheep
VR XV	4102		19.2					Sheep
VR XV	4114		21.2					Sheep
VR XV	4119				24.6	24.2	14.6	Sheep
VR XV	4119	136	20.2	10.8				Sheep
VR XV	4125		18.5					Sheep
VR XV	4135				21.4	21.0	11.7	Sheep
HA 74	215		21.1					Sheep
HA 74	253		18.4					Sheep
HA 74	259		20.2					Sheep
HA 74	269		20.9					Sheep
HA 74	278		19.5					Sheep
HA 74	285		19.8					Sheep
HA 74	297		19.5					Sheep
HA 74	303		18.7					Sheep
HA 74	343		20.4					Sheep
HA 74	370						12.8	Sheep
HA 74	408		19.8					Sheep
HA 74	437	142	20.4	12.3	23.6	22.8	12.5	Sheep
HA 74	457		21.8					Sheep
JCH	224		20.5					Sheep
JCH	225				27.1	26.9		Sheep
JCH	244		18.2					Sheep
27JS	339	128	18.3	9.9	21.4	20.5	12.8	Sheep
27JS	419		19.0					Sheep
27JS	474		19.4					Sheep
HG	194	128.0		12.1	23.4	22.8	12.7	Sheep
HG	811		17.8					Sheep
HG	811		17.6					Sheep
HG	1007		19.3					Sheep
HG	1074		18.7					Sheep
HG	1093		19.6					Sheep
HG	1129				24.1	24.0	13.3	Sheep

Pig Measurements

Mandible: Pig

Site	Context	LM3	BM3
VR V	83	35.3	14.7
VR V	229		14.3
VR V	248	34.1	16.1
VR V	258	31.7	15.8
VR V	278	32.0	
VR V	364	31.7	15.3
VR X	144	35.5	16.9
VR X	540	33.7	15.2
VR XII	2470	29.8	13.8
VR XII	2618	31.9	13.5
VR XIII	3233	30.9	15.3
VR XIII	3331	31.6	14.8
VR XV	4212	29.3	12.5
HA 72	11		14.8
HA 74	260	34.1	14.5
HA 74	274	35.8	15.7
HA 74	406	33.6	16.7
JCH	151	35.5	14.9
HG	1093	30.8	15.0
HG	1165		14.1
HG	1223	30.9	13.5

Maxilla: Pig

Site	Context	M3L	M3B
VR V	136	33.8	18.9
VR V	202	30.1	17.1
VR XIII	3262	39.0	22.5
VR XV	4135	31.7	16.5
HA 74	233	32.6	19.1
HG	1166		18.2
HG	1223	29.6	17.9

Scapula: Pig

Site	Context	GLP	BG	SLC
VR V	38	35.1	24.3	
VR V	71			24.7
VR V	284	36.1	25.4	26.8
VR V	365	34.5		22.7
VR XII	2486	38.5	26.7	
VR XII	2508	34.9		21.5
VR XIV	3841	35.5	26.0	
HA 72	96		25.6	23.2
HA 74	257		26.3	

Humerus: Pig

Site	Context	Bd	BT	HT
VR V	38		34.0	
VR V	194	41.3	33.4	28.2
VR V	304	38.9		28.5
VR V	355			30.4
VR X	508	39.5	31.8	24.7
VR XII	2399	45.9	39.3	31.6
VR XII	2481	40.8	32.1	27.4
VR XII	2562	44.2	37.2	
VR XIII	3262	43.5	35.6	29.4
VR XIII	3281		34.8	
VR XV	4102	37.2	29.6	24.9
VR XV	4169		33.9	
HG	1162		34.5	

Radius: Pig

Site	Context	Bp	Dp	Bd
VR V	83	31.0	22.2	
VR V	264	31.9	22.2	
VR V	284	30.3		
VR V	270	31.9	20.1	
VR V	316	25.9	16.1	
VR V	344	31.2	22.3	
VR V	361	28.5	18.7	
VR V	395	34.2		
VR X	294	28.6	21.1	
VR X	508			38.3
VR XII	2471	30.6		
VR XII	2486	29.7	21.5	
VR XII	2498	33.2	23.9	
VR XII	2517	29.3	19.2	
VR XII	2538	30.0	21.7	
VR XII	2548	28.6	20.6	
VR XII	2551	27.3		
VR XIII	3262	27.8	19.7	
JCH	225	28.5		
HG	171	28.9		
HG	1093	27.2	20.1	

Tibia: Pig

Site	Context	Bd	Dd
VR V	284	30.2	26.4
VR X	340	30.4	28.1
VR X	384	30.4	29.9
VR X	540	28.9	25.8
VR XII	2538	31.9	25.8
VR XIII	3262	27.5	25.5
HA 72	99	31.1	26.0
HA 74	296	29.1	27.7
HG	1049	29.9	26.9
HG	1162	32.2	30.7

Astragalus: Pig

Site	Context	GLl	L3	Glm	Bp	Bd	Dl
VR IV	333	43.2	38.3	42.5	20.3	25.6	24.2
VR IV	405				22.1		
VR V	264	41.9		39.7		28	22.7
VR V	356	41.6		38.0		27.1	21.1
VR X	200	42.6	37.1	41.2	22.6		23.4
VR X	433	44.1	38.2	43.5	22.7	26.9	24.0
VR X	433		37.5		23.8		24.0
VR XII	2453				24.6		
VR XII	2486				23.0		
HG	868	40.0		39.0	23.1	25.6	22.7

Third Metacarpal: Pig

Site	Context	GL
VR V	153	83.0
VR V	361	82.6

Equid Measurements

Scapula: Equid

Site	Context	GLP	LG	BG	SLC
VR V	265	90.8			
VR XII	2495		51.3		
VR XII	2508	92.2	58.8		60.7
VR XII	2558	93.4	59.4	48.5	62.6
VR XII	2562	81.3	52.5	41.4	53.9
VR XII	2562	72.2	46.6	38.3	51.8
VR XII	2562	88.7	57.2	48.5	66.5
VR XII	2618			44.2	
VR XIII	3262			48.2	
VR XV	4151			43.2	
VR XV	4260	87.6	55.0	40.2	62.5
VR XV	4351	95.7	60.2	48.6	66.6
HA 74	303	86.6	59.6	43.3	59.8

Humerus: Equid

Site	Context	GL	LL	GLC	SD	Bd	BT	HT
VR IV	382					72.1	68.3	47.7
VR V	136						65.1	
VR V	904						75.8	51.3
VR X	433							48.2
VR XII	2495						73.0	51.5
VR XIII	3262						69.8	48.9
VR XIII	3262						77.1	53.0
VR XV	4348	282	271	260	31.0	73.0	70.6	47.1
VR XVI	1815						75.6	54.9
HA 72	21					74.6	69.2	48.7
HA 74	437					78.0	75.5	54.9
27JS	297					79.5	77.4	55.9

Radius: Equid

Site	Context	GL	LL	Bp	Dp	BFp	SD	Bd	Dd	BFd
VR V	151			78.6		72.1				
VR V	264							74.5	45.5	63.7
VR V	270	292	271	70.9	38.9	66.2	33.9	65.1	37.1	56.2
VR V	346							70.7		
VR V	355							76.4	47.0	64.7
VR V	387				41.6					
VR X	215	342			47.6		34.3		47.6	65.3
VR XII	2504					75.1				
VR XIII	3343			75.9	43.1	70.3				
VR XIII	3343				46.6					
VR XIII	3358							63.2	37.2	58.0
VR XV	4260	319	311	75.5		68.2		70.4	44.5	36.9
VR XV	4376				43.7	72.4				
HA 72	20			74.5	41.3	66.9				
27JS	339							64.5	36.7	54.3
HG	194	332	315	83.6	47.7	75.8	39.1	77.5	47.0	64.5

Femur: Equid

Site	Context	GL	GLC	Bp	DC	SD	Bd	Dd
VR V	387			116				
VR X	508			106	56.0			
VR XII	2547				54.5			
VR XIII	3345						80.3	
VR XIII	3358			113				
VR XV	4135	400	362	111	55.7	40.1		
VR XV	4348	371	339	108	51.2	35.5		113

Tibia: Equid

Site	Context	GL	LL	SD	Bd	Dd
VR V	83				61.8	42.0
VR V	85				60.6	37.5
VR V	96				68.4	43.5
VR X	415				67.1	45.1
VR X	416				69.2	43.8
VR X	638	336	308	40.4	70.0	43.9
VR XII	2036				57.7	35.0
VR XII	2486				72.9	46.6
VR XII	2538				64.2	40.7
VR XII	2538				58.1	36.6
VR XIII	3262	316	287	35.9	65.6	39.9
VR XIII	3281				64.4	38.8
VR XIII	3281				65.6	42.3
VR XIII	3281				69.3	43.1
VR XIII	3343				62.1	39.5
VR XIII	3358				57.9	37.5
VR XV	4260	327	304	38.4	71.2	43.0
VR XV	4376	306		32.6	61.3	40.5
HA 72	75				71.0	40.9
HA 74	416	324	298	34.0		39.6
HA 74	437				60.6	38.4
HG	1049				61.3	39.1

Calcaneus: Equid

Site	Context	GL	L1	L2	GB
VR V	33	106			48.2
VR V	83	98			
VR XV	4348	104	73.9	90.7	29.4
HA 74	373	99			
JCH	225	103			

Astragulus: Equid

Site	Context	GH	LMT	L3	Glm	Bp	Bd	BFd	GB
VR IV	392		54.6		54.4	49.9			55.1
VR V	27		51.4		48.2		46.9	43.1	49.4
VR V	37		54.4		52.0	44.7		46.8	53.8
VR V	91		55.2						
VR V	228		61.2						
VR V	236				51.2		51.9	48.6	52.1
VR V	270		56.9				55.0	48.0	56.7
VR V	361		59.8						
VR V	405		52.6		50.1		46.3	45.5	51.4
VR XI	1691	60.2	53.1				53.1	47.9	56.1
VR XII	2495	58.6	50.9	33.2	52.5		51.1	47.4	52.4
VR XV	4348	49.6	56.1	33.3	50.4	48.5		47.3	53.4
HA 72	11		58.2					52.0	57.1
HA 74	406		51.0		50.8	44.2		46.3	49.6

Metacarpal: Equid

Site	Context	GL	LL	Bp	Dp	SD	Bd	Bdf
VR IV	352						53.1	50.6
VR V	153	214	208	47.4		30.1	46.0	43.9
VR V	154						49.8	48.1
VR V	225	206	199	42.9	27.6	28.0		39.0
VR V	228	228	223	49.3	33.6	31.7	48.9	44.0
VR V	229	234	226			36.7		
VR V	264	189	182	44.0	29.0	29.0	43.9	39.7
VR V	395			52.1				
VR XI	1696	221	213	48.9	35.3	32.9	50.9	47.0
VR XII	2508	228	220	51.0	35.0	33.1	48.6	48.2
VR XII	2551	229	221	52.3		32.7	51.1	44.3
VR XII	2618			45.4	31.8			
VR XIII	3262			50.7	34.7			
VR XIII	3262	204	196	46.2	32.0	29.9	45.9	42.5
VR XIII	3343						48.6	45.3
VR XV	4260	209	200	46.5	30.0	31.1	46.5	42.6
VR XV	4260	240	234	50.6	34.8	32.8	52.0	47.8
HA 72	21	200	192	43.6	28.9	28.7	44.2	40.6
HA 74	373	209	200	48.6	31.9	32.0	46.8	44.5
27JS	311			47.4	33.0			
HG	1076	228	220	48.5	32.3	31.5	48.3	45.8

Metatarsal: Equid

Site	Context	GL	LI	Bp	SD	Bd	Bdf
VR V	80	254		48.7			
VR V	270	244	237		29.2		
VR XII	2470	246	240	41.8	27.1		43.2
VR XIII	3262	248	243	47.2	28.0	47.2	43.9
VR XIII	3343					44.8	41.5
VR XIII	3343			49.0			
VR XV	4112			48.2			
VR XV	4260	249	242	43.6	28.3	46.1	42.8
HA 72	83			50.4			
HA 74	257	265	258	49.2	28.0	47.4	45.3
HA 74	373	241	237	42.8	26.5	43.7	42.2

Dog Measurements

Skull: Dog

Site	Context	vdD1	vdD7	vdD8	vdD16	vdD17	vdD23	vdD25	vdD29	vdD30	vdD34	vdD36	vdD38	LP4	BP4	GBP4
VR IV	410	181.5	89.5	100.8	17.7	46.6	65.3	38.3	55.1		68.7	40.1		19.2		
VR V	387							35.0								
VR XII	2548						67.7	37.6	56.2				55.9			
VR XIII	3262		73.0		16.2	46.0			52.8					16.2	8.3	9.1
VR XV	4209					35.0			50.6					14.5	6.2	7.8
VR XV	4212				15.3	42.1				90.6	57.5	31.1		16.0	7.5	9.2
VR XV	4260				22.0	49.8								19.1	7.3	11.1
VR XV	4376													16.9	6.8	8.7
VR XV	4376				15.7	26.3								17.1	8.0	9.6
VR XV	4383				17.2									18.0	6.7	8.4
VR XV	4383				20.9	50.9								20.7	8.4	11.3
HG	1093			68.5	15.5				49.2		52.8	26.1		15.8		8.4

Mandible: Dog

Site	Context	GL	LM1	BM1
VR IV	392	111.5	21.0	8.4
VR IV	410	134.0	21.5	9.5
VR V	136		21.5	8.4
VR V	202	87.6	16.0	6.2
VR V	226		20.2	
VR V	270		22.2	9.0
VR V	344		19.5	7.8
VR V	364	128.4		
VR X	200	146.1	22.6	9.6
VR X	347	98.0	15.8	6.4
VR X	504		21.7	8.7
VR XII	2517	126.3	19.2	7.5
VR XIII	3262	103.4	16.7	6.6
VR XIII	3262		21.2	8.5
VR XIII	3262	141.5	19.9	9.1
VR XIII	3262		16.4	6.7
VR XIII	3281	113.3	18.7	8.0
VR XV	4113		19.9	8.8
VR XV	4119	124.5	19.5	7.9
VR XV	4209		16.0	6.7
VR XV	4212	118.0	19.2	8.6
VR XV	4260		23.7	9.7
VR XV	4376		19.9	7.5
VR XV	4376		19.4	7.7
VR XV	4383	110.8	18.7	7.4
VR XV	4383		23.2	8.9
HG	1093	101.2		7.1

Scapula: Dog

Site	Context	GLP	LG	BG	SLC
VR IV	410	28.7	26.0	17.8	23.0
VR X	31	25.6	25.6	15.4	19.6
VR XIII	3262	28.8	27.4	18.5	
VR XIII	3262	28.8	27.0	18.4	
VR XIII	3262	23.8	21.5	13.0	19.8
VR XIII	3262	26.4		16.1	
VR XV	4209	18.1	16.7	10.5	14.8
VR XV	4212	24.1		15.3	19.6
VR XV	4260	31.6		20.9	
VR XV	4260	31.9		20.3	
VR XV	4376	25.6	23.5	15.0	20.2
VR XV	4383	30.4	26.9	18.2	
HG	1093	20.7		12.1	15.4

Humerus: Dog

Site	Context	GL	GLC	Dp	SD	Bd	BT	HT
VR IV	410	157.0	153.0	39.6	12.5	33.6	24.8	20.0
VR V	137					22.9	17.9	
VR XII	2508						28.5	22.6
VR XII	2508	124.0	120.1	28.5	10.0	23.4		15.1
VR XIII	3262	168.4	163.9	42.6	13.0	36.4	27.5	20.8
VR XIII	3262	93.3	85.8	33.2	12.4	27.7	20.4	15.4
VR XIII	3262					28.8	20.2	17.2
VR XIII	3262	163.1	157.6	40.0	13.0	32.3	24.0	19.4
VR XIII	3262			38.2				
VR XV	4084					32.3	25.1	20.0
VR XV	4128	123.8	120.8	29.0	8.8	23.4	18.1	13.4
VR XV	4209	88.9	84.4	24.0	7.9	20.2	15.5	11.6
VR XV	4212	137.0		34.7	10.7	26.7	20.6	14.9
VR XV	4260					36.3	28.2	21.0
VR XV	4260					35.8	26.3	21.5
VR XV	4376					28.8	21.8	16.3
VR XV	4376			33.4		25.6	20.1	14.8
VR XV	4383			40.4		32.8	25.6	18.6
VR XV	4383	106.7			9.7	24.5		15.2
HA 72	83					31.3	23.6	
HG	180					32.5	25.8	18.7
HG	817		86.5		8.5	23.4	18.3	14.0
HG	1008					31.3	23.4	18.6
HG	1093	97.6	94.7		8.5	22.7	17.3	13.7

Radius: Dog

Site	Context	GL	Bp	Dp	SD	Bd	Dd
VR IV	410	162.5	18.4	12.1	13.8	23.7	13.1
VR X	114	100.2	15.1	10.3	10.3	18.8	12.5
VR XIII	3233	65.7	10.6	7.2	8.4	13.0	
VR XIII	3233		13.0				
VR XIII	3262	160.8	18.8	12.8	12.3	26.3	15.9
VR XIII	3262	161.0	18.0	11.7	13.0	23.6	15.0
VR XIII	3262		16.1	10.7			
VR XIII	3262	79.0	15.3	9.9	13.4	19.0	10.9
VR XIII	3278		16.2	10.1			
VR XV	4209	82.3			7.5	14.1	
VR XV	4212	136.0	15.4	10.1	10.0	20.2	11.7
VR XV	4376		15.2	10.2			
VR XV	4376						10.6
VR XV	4383	154.5	18.9	12.6	11.0	24.0	13.3
VR XV	4383	91.6	14.2	9.5	10.3	18.5	10.3
HG	817		17.2	11.0			
HG	1093	90.8	11.8	7.3		16.4	9.9
HG	1165		18.3	11.8			

Ulna: Dog

Site	Context	GL	LO	BPC	SDO
VR IV	410		29.2	17.7	
VR V	57		23.0	13.0	
VR V	98		31.5	17.9	21.7
VR XIII	3262		29.3	19.1	21.2
VR XIII	3262	192.0	29.8	18.0	22.6
VR XIII	3262	93.1	25.1	12.3	
VR XV	4209	96.1	18.4		12.3
VR XV	4212		24.3	13.0	17
VR XV	4383	108.4	24.2	12.0	14.7
HG	1093	107.1	21.1	11.0	13.9

Femur: Dog

Site	Context	GL	GLC	Bp	DC	SD	Bd	Dd
VR IV	410	172.0		38.3	18.4	13.0	31.6	35.1
VR XII	2504			31.6	15.3			
VR XIII	3262	168.0	168.0	34.6	17.7	12.1	28.4	32.5
VR XIII	3262	101.8	95.7	30.2	14.9	12.8	26.5	29.8
VR XIII	3262	174.9	174.9	37.3	19.1	14.3	31.2	34.0
VR XIII	3262						26.8	
VR XIII	3262				20.1			
VR XIII	3262			31.2	15.5			
VR XIII	3262	178.9	178.9	37.4	20.1	13.3	33.2	37.0
VR XIII	3262	109.8	109.8	25.0	11.8	9.3	20.7	22.2
VR XV	4209	95.5	93.4	22.8	11.4	8.4	18.5	
VR XV	4212	144.5		34.5	15.2	11.2	27.7	28.1
VR XV	4376			28.8	13.6		24.0	
VR XV	4382			29.4	14.7			
VR XV	4383						25.1	
VR XV	4383			30.1	14.5			
HG	817				18.2			

Tibia: Dog

Site	Context	GL	Bp	Dp	SD	Bd	Dd
VR IV	410	179.0	33.9	35.6	12.7	21.9	17.3
VR X	165					17.9	13.4
VR XII	2551					15.2	11.9
VR XII	2583					19.1	13.9
VR XIII	3262	88.8	29.3		13.2	19.5	14.7
VR XIII	3262	167.5	31.8	33.9	11.3	21.9	15.3
VR XIII	3262	180.5	33.9	34.7	12.1	21.9	16.6
VR XIII	3262	180.5	35.2	38.3	13.3	23.9	18.0
VR XV	4209	91.0	20.7	20.9	7.9	13.8	9.9
VR XV	4212	151.0	28.8	30.5	10.0	18.7	13.2
VR XV	4376					19.5	
VR XV	4376	141.6	25.4		9.8	17.4	11.5
VR XV	4383	98.4	26.8		9.8		
HA 74	301					22.2	17.7
HG	1093	102.7	23.4	23.0	8.7	15.9	11.1

Calcaneus: Dog

Site	Context	GL	L1	L2	GB
VR IV	410	41.7			
VR V	153	30.1			
VR XV	4212	34.6	24.3	27.2	
VR XV	4212	40.2	27.1	30.6	13.0
VR XV	4376	35.0	24.4	27.6	10.0

Red Deer Measurements

Scapula: Red Deer

Site	Context	LG	BG	SLC
VR XV	4135	41.9	35.4	29.7

Humerus: Red Deer

Site	Context	BT	HT
HG	1129	55.0	43.0

Radius: Red Deer

Site	Context	GL	Dp	SD	Bd	Dd
VR V	51				49.2	39.4
VR XII	2486				54.1	33.2
VR XV	4151	251	37.3	34.8		37.9

Tibia: Red Deer

Site	Context	Bd	Dd
VR XII	2486	46.4	36.0

Metacarpal: Red Deer

Site	Context	Bd	Bdf
VR V	465	38.3	37.3

Cat Measurements

Scapula: Cat

Site	Context	GLP	LG	BG	SLC
VR IV	410	14.4	12.2	9.2	12.5

Humerus: Cat

Site	Context	GL	Dp	SD	Bd	BT	HT
VR IV	410	103	22.6	6.9	20.3	14.1	10.4

Radius: Cat

Site	Context	GL	Bp	Dp	Bd
VR IV	410	101	9.0	6.4	13.4
HA 72	96				13.0

Ulna: Cat

Site	Context	GL	LO	BPC
VR IV	410	120	14.4	9.7

Femur: Cat

Site	Context	GL	Bp	DC	SD	Bd	Dd
VR IV	410	116	21.1	9.8	8.5	20.3	20.2

Tibia: Cat

Site	Context	GL	Bp	Dp	SD	Bd	Dd
VR IV	410	122	21.6	20.2	7.0	16.0	10.9
VR V	151					12.2	7.9

Hare Measurements

Humerus: Hare

Site	Context	Bd	BT
HA 74	269	12.1	10.7

Radius: Hare

Site	Context	GL	Bd
VR XV	4119	115.5	10.6

Femur: Hare

Site	Context	Bp	Bd
VR V	86	19.3	
VR X	1027	19.5	19.6

Galliform (Domestic Fowl) Measurements

Coracoid: Fowl

Site	Context	GL	LM	Bb	BF
VR IV	346	55.7	53.5		13.0
VR V	387	54.0	51.4	13.9	11.3
VR X	144	48.6	45.6		10.1
VR X	144	51.7	49.8		11.3
VR X	531		56.9		
VR XII	2414		51.5		
VR XIII	3262	47.0	44.3		10.2
VR XIII	3262	50.4	48.5		9.8
VR XIII	3262	47.7	45.7		9.7
VR XV	4098		51.1		
VR XV	4152	48.7	45.8		11.5
VR XV	4382	49.0	46.8	12.7	10.5

Scapula: Fowl

Site	Context	Dic
VR V	86	12.8
VR V	299	12.1
VR X	144	10.8
VR XII	2470	13.4
VR XIII	3262	11.1
VR XIII	3281	10.5
VR XIII	3345	13.1
VR XV	4382	10.9
HA 74	269	13.3
HA 74	373	13.0

Humerus: Fowl

Site	Context	GL	Bp	SD	Bd
VR IV	392	63.0	16.9	6.3	13.3
VR V	169		16.6		
VR V	411				15.0
VR X	144				14.0
VR X	144	81.3	21.7	7.8	
VR X	144	60.2	16.8	5.9	13.3
VR X	639	75.3	19.8	7.3	15.5
VR XII	2486				13.4
VR XII	2508			6.7	13.8
VR XIII	3262		16.8		
VR XIII	3262	65.2	17.5	6.4	13.6
VR XIII	3262	59.9	17.1	6.1	13.1
VR XIII	3262		16.9		
VR XIII	3325				13.7
VR XV	4119				14.1
VR XV	4119	58.2	15.4	5.8	12.5
VR XV	4135		17.7		
VR XV	4135	63.0	16.7	6.0	13.0
VR XV	4382	64.0	16.8	6.2	13.7
VR XV	4382	62.1	16.8	6.5	13.5
HA 74	223				15.4
HA 74	285		17.5		
27JS	297				16.0

Radius: Fowl

Site	Context	GL	SD	Bd
VR XV	4382	55.6	3.4	6.0
HA 74	303	56.7		6.1
HA 74	340	65.7		7.3
27JS	405	63.8		6.7
27JS	405	67.6		7.7

Ulna: Fowl

Site	Context	GL	Bp	SD	Did
VR V	54				9.0
VR X	144	59.7	5.2	3.8	8.4
VR X	433	73.8	5.9	6.0	9.1
VR XII	2538				7.9
VR XIII	3262	64.2	5.3	4.2	7.5
VR XV	4382	61.4	5.1	3.8	8.2
VR XV	4382	63.0	4.9	3.7	7.9
HA 74	278				8.0
HA 74	303	62.8		4.4	8.1

Carpometacarpus: Fowl

Site	Context	GL	Bp
VR X	144	39.1	11.9
VR XII	2414	38.2	11.3
VR XV	4119		12.4
VR XV	4135	33.3	9.6
VR XV	4374	40.4	12.1
VR XV	4382	34.6	9.7
HA 74	269	34.3	

Femur: Fowl

Site	Context	GL	GLm	Bp	SD	Bd
VR V	32					15.5
VR V	191			17.1		
VR X	144			14.5		
VR X	144			16.8		
VR X	603	71.5	67.1	13.1	6.0	13.1
VR XII	2399		61.6	13.6		12.2
VR XII	2486	70.7	65.7	14.2	6.0	13.5
VR XII	2486	71.6	67.1	14.7	6.3	13.4
VR XII	2498	69.3		14.4	6.1	
VR XIII	3262	72.4	67.3	14.5	6.6	13.7
VR XIII	3262			13.8		
VR XV	4102					16.1
VR XV	4135	70.8	65.9	13.8	6.3	13.3
VR XV	4152	71.6		15.2	6.4	
VR XV	4382	70.1	65.5	13.7	5.9	13.2
HA 72	96	69.3	64.4	13.2	6.0	13.0
HA 74	303	71.4	66.3	14.4	6.5	13.6
27JS	405	83.2	78.3	16.8	7.7	16.6
HG	1004	71.7	67.0	14.1	6.0	14.9
HG	1223	81.2	75.8	16.6	7.4	15.9

Tibiotarsus: Fowl

Site	Context	GL	La	Dip	SD	Bd
VR V	33					11.2
VR V	83					11.2
VR V	85			20.5		
VR X	639	120.6	116.4	20.9	6.4	11.5
VR X	684	120.4	116.1		6.3	11.7
VR XIII	3233			18.2		
VR XIII	3262	94.1	91.5	17.3	5.4	10.3
VR XIII	3262	98.4	94.9	17.5	5.6	9.8
VR XIII	3262	102.1	98.6	18.5		10.6
VR XIII	3262					10.4
VR XIII	3329			16.8		
VR XV	4152	100.8		19.4	5.7	10.7
VR XV	4382	99.1	96.7	17.6	5.4	9.7
HA 74	260	101.5		17.1		
HA 74	303	101.2	97.4	17.7	5.7	10.2
HG	1093		94.5			10.1
HG	1162					11.8

Tarsometatarsus: Fowl

Site	Context	GL	Bp	SD	Bd
VR V	21				13.3
VR V	98	67.3	11.4	5.6	11.3
VR V	264				11.5
VR V	278		13.6		
VR V	361				18.1
VR X	144	64.5	11.0	5.8	11.1
VR X	536		13.5		
VR X	540	69.9	12.7	6.4	
VR X	540			5.8	11.1
VR X	698	65.6	11.4	5.7	10.8
VR XIII	3262	69.2	11.4		11.2
VR XIII	3281	81.7	13.0	6.8	14.1
VR XV	4152	66.8	12.0	5.6	12.0
VR XV	4153	67.2	11.8	6.3	11.6
VR XV	4382		11.3		
VR XV	4382				10.8
HA 74	303	68.5	11.7		11.1
HG	811				14.1

Domestic Duck/Mallard Measurements

Coracoid: Domestic Duck/Mallard

Site	Context	Lm
VR XV	4212	54.4

Scapula: Domestic Duck/Mallard

Site	Context	Dic
VR XV	4135	12.5

Radius: Domestic Duck/Mallard

Site	Context	GL
VR XIV	3834	67.6

Carpometacarpus: Domestic Duck/Mallard

Site	Context	GL	Bp
VR V	59	57.8	13.1
VR V	344		14.0

Femur: Domestic Duck/Mallard

Site	Context	GL	Lm	Bp	SD	Bd
VR V	264			11.1		
VR XV	4119	54.4	52.0	11.7	4.4	12.1

Tibiotarsus: Domestic Duck/Mallard

Site	Context	Bd
VR XV	4063	9.3

Tarsometatarsus: Domestic Duck/Mallard

Site	Context	GL	Bp	SD	Bd
VR XV	4119	44.8	9.0	4.3	8.9

Duck Species Measurements (cf Wigeon; Pochard; Garganey etc)

Coracoid: Duck Species

Site	Context	Lm	BF
VR X	508	43.4	18.1
HA 74	274		18.2

Humerus: Duck Species

Site	Context	GL	Bp	SD	Bd
VR X	508		18.5		
VR XV	4231	76.9	17.1	5.9	12.0

Carpometacarpus: Duck Species

Site	Context	GL	Bp
VR XII	2470	47.6	
HA 72	51	50.4	12.6

Femur: Duck Species

Site	Context	Lm	Bp	SD
VR XV	4135	40.2	9.6	3.6

Tibiotarsus: Duck Species

Site	Context	GL	SD	Bd
VR XIII	3262	69.1	3.4	7.5

Other Bird Measurements

Carpometacarpus: Goose (cf domestic)

Site	Context	GL	Bp
HG	1093	91.8	22.7

Tibiotarsus: Goose (cf domestic)

Site	Context	Bd
HA 74	269	17.3

Tarsometatarsus: Goose (cf domestic)

Site	Context	GL	SD	Bd
VR XV	4383	81.3	8.2	17.5

Tarsometatarsus: Heron

Site	Context	Bd
VR V	304	14.2

Femur: Woodcock

Site	Context	Bp
HA 74	328	8.7

Tarsometatarsus: *cf* Plover

Site	Context	GL
VR XIV	3834	41.9

Coracoid: Buzzard

Site	Context	GL	Lm	Bb	BF
VR XV	4352	43.6	38.7	18.8	16.1
VR XV	4373	63.8		14.5	9.1

Humerus: Buzzard

Site	Context	Bd
VR XV	4352	18.1

Radius: Buzzard

Site	Context	GL	Bp
VR XV	4352	122.3	8.0

Ulna: Buzzard

Site	Context	GL	Bp	SD	Bd
VR XV	4352	130	6.5	6.5	12.0

Femur: Buzzard

Site	Context	GL	Lm	Bp	SD
VR XV	4352	78.3	75.6	15.1	7.3

Tibiotarsus: Buzzard

Site	Context	GL	La	SD	Bd
VR XV	4352	107.9	105.5	6.8	12.9

Tarsometatarsus: Buzzard

Site	Context	Bp
VR XV	4352	13.6

Coracoid: Raven

Site	Context	GL	LM	BF
VR XIII	3262		55.3	
HA 74	260	56.5		16.5
HA 74	278	55.9		

Scapula: Raven

Site	Context	Dic
VR XIII	3262	18.2

Humerus: Raven

Site	Context	GL	Bp	SD	Bd
VR XIII	3262	93.4	25.4	8.7	21.8
HA 74	260	90.2		8.2	21.0

Radius: Raven

Site	Context	GL	Bp
VR XIII	3262	104.9	9.1

Ulna: Raven

Site	Context	GL	SD	Did
VR XIII	3262	117.5		15.1
HA 74	260	108.5	6.2	13.9

Carpometacarpus: Raven

Site	Context	GL	Bp
VR XIII	3262	69.3	15.1
HA 74	260	66.1	15.4

Femur: Raven

Site	Context	GL	Lm	Bp	SD	Bd
VR XIII	3262	67.8	64.5	15.0	6.5	15.5
HA 74	278	67.2		14.3	5.9	14.5

Tibiotarsus: Raven

Site	Context	GL	Dip	SD	Bd
VR XIII	3262	115.6	19.5	6.2	13.0
HA 74	278	110.7	18.9	5.6	12.2

Tarsometatarsus: Raven

Site	Context	GL	Bp	SD	Bd
VR XIII	3262	68.3	14.7	5.5	9.7
HA 74	278	65.8	13.3	5.0	9.3

Ulna: Rook/Crow

Site	Context	GL	Did
VR XII	2538	81.9	9.8

Humerus: White-tailed Eagle

Site	Context	Bd
VR XIII	3262	38.3

Appendix 2: Site concordance

Since the finds volume was published (Rees *et al* 2008), further work on the Roman archaeology particularly of the northern suburb has resulted in changes to the interpretation of some deposits, and their renaming. Readers wishing to compare the contexts of the environmental evidence with those of the finds will therefore require the following summary, and the Concordance Table A2.1.

Victoria Road East (VRE, Trenches X–XV; Trench VII/XVI)

In general, structural remains that were interpreted as buildings in the initial analysis, but not certainly, have had their building numbers removed and are referred to in a different way (see Table A2.1 and Fig 5). Conversely, one structure initially thought to be a yard surface with a fence line beside it has been reinterpreted as a building (now, VRE, Building 1).

Another building (originally Building 1.21) has been redated to the post-Roman period, although, as most of the pottery from it was residual Roman, it is likely that many of the other bulk finds were also Roman. The faunal remains from this building have been removed from the counts in Tables 2.16–2.91, however. Only one object catalogued as Roman in P6 came from this structure (**1147**, a piece of lead of unknown function; Rees *et al* 2008, 199).

This process has left only three buildings from the original interpretation, which have been renumbered VRE Buildings 2–4.

Victoria Road West (VRW, Trenches I–VI)

The four structures flanking the west side of the Roman road to Cirencester at Victoria Road are more certainly interpreted as buildings and they have merely been renumbered, VRW Buildings 1–4. Otherwise the description of the Roman archaeology in these trenches has remained unchanged (Fig 5).

Hyde Abbey 1972 (HA 72 Trenches I–IV)

The buildings have been renumbered (1–3) as shown in Table A2.1, but otherwise the interpretation of the Roman archaeology from these trenches has remained the same (Fig 5).

Hyde Abbey 1974 (HA 74 Trench VII/XI, Fig 5)

Initial interpretation had suggested the (very truncated) existence of the road to Silchester in these trenches, but further examination suggests that its line would have passed beyond the limit of the excavations. The roadside ditch is more certainly identified, along with the possible remains of a path.

Structural remains along the edge of these features were originally analysed as buildings, and some most likely were. However, as ground plans and individual building phases were unclear, and as some deposits probably represent intermittent attempts to level up the slope into the floodplain of the Itchen, the sequence has been renumbered as Units 1–8. The dating of this sequence is also unclear. The later units certainly belong to the late 3rd and 4th centuries, but the earlier units produced a quantity of late 2nd- and 3rd-century pottery with only a tiny amount of diagnostically later material.

Other sites

It may be noted that the Oram's Arbour Enclosure ditch at New Road (NR 74–77) has been assigned stratigraphic Periods 1–3, deposits predating the cemetery, cemetery deposits, and deposits post-dating the cemetery respectively (see Fig 10).

Site	Code	Trench(es)	Site/ period	Bone Group in Part 2.2	Original description	New description
Hyde Abbey 1972	HA 72	I–IV	2	HA72.2	Building 1.1	Building 1
					Building 1.2	Building 2
					Building 1.3	Building 3
Hyde Abbey 1974	HA 74	VII/XI	3	HA74.2	Building 1.4	Structural remains, Unit 1
					Building 1.5	Structural remains, Unit 2
					Building 1.6	Structural remains, Unit 3
				HA74.3	Building 1.7	Structural remains, Unit 4
				HA74.4	Building 1.8	Structural remains, Unit 5
				HA74.5	Building 1.9	Structural remains, Unit 6
					Building 1.10	Structural remains, Unit 7
				HA74.7	Building 1.11	Structural remains, Unit 8
Victoria Road (West)	VR(W)	I–VI	3	VRW2	Building 1.12	Building 1
				VRW3	Building 1.13	Building 2
				VRW4	Building 1.14	Building 3
				VRW5	Building 1.15	Building 4
Victoria Road (East)	VR(E)	X–XV	4	-	Building 1.23, Phase 1	Possible structure adjacent to Cirencester road, Phase 1
			5	VRE1	Building 1.23, Phase 2	Possible structure adjacent to Cirencester road, Phase 2
			6	VRE3-5	Building 1.24	Oven F846
			7	VRE10	?Yard surface F682	Building 1, Phase 1
				VRE12	?Yard surface 665/670/939	Building 1, Phase 2
				VRE14	Building 1.20	Building 2
				-	Building 1.23, Phase 3	Possible structure adjacent to Cirencester road, Phase 3
				VRE15	Building 1.23, Phase 4	Possible structure adjacent to Cirencester road, Phase 4
				VRE16	Building 1.23, Phase 5	Possible structure adjacent to Cirencester road, Phase 5
				VRE17	Building 1.19	Building 3
				VRE18	Building 1.22	Building 4
				-	Building 1.21	post-Roman structure (P7)
				-	Building 1.25	Patches of chalk and burnt material in Trench XIII
				-	Building 1.26	Hearth post-dating Building 2 in Trench XV
				-	Building 1.27	Chalk spreads in Trench XV

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