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A Review of Animal Bone Evidence from Central England

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SUMMARY

The evolution of human–animal relationships in central England is reviewed. In the Mesolithic, the main focus was on the hunting of large game. The earliest phase of a productive economy is poorly documented but the more mature Neolithic sees a strong focus on husbandry, with hunting playing a subsidiary role. Although milk was already consumed in the early Neolithic, other secondary products and services, such as wool and traction, only began to be used in later prehistory. The early Bronze Age also witnessed the introduction of the horse, transforming human mobility. In the late Iron Age, the influence of the Roman Empire becomes apparent through animal improvement and the importation of exotic species. More substantial changes occur within the Roman period, characterised by an emphasis on cattle husbandry and the introduction of new butchery styles. Abrupt changes occurred at the end of the Roman period, such as a return to a more rural, small-scale animal economy and a greater predominance of sheep. Towards the end of the Saxon period, fisheries come to rely heavily on marine species. After the Norman invasion, high-status sites assume greater predominance and wild game becomes an ever more powerful symbol of rank. The medieval period also sees the increased use of different animal parts in industry, with tanning gradually gaining importance, while horning declines. Improvement in meat yield is apparent towards the end of the medieval and in the post-medieval periods. The size of domestic animals gradually increases, to approach that of contemporary breeds.

COVER

Reconstruction artwork of ploughing at Old Oswestry Hillfort. © Historic England Archive

CONTRIBUTORS

Umberto Albarella

ARCHIVE LOCATION

The database for this report is available online via the ADS website at the following address:
https://archaeologydataservice.ac.uk/archives/view/animalbone_eh_2007/

DATE OF RESEARCH

2006–2019

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This project, with its many starts and stops, has occupied an inordinate period of my life. When Tessa Pirnie worked with me in 2006, the idea was that this would be a joint project. Her personal circumstances meant, however, that she had to redraw from the project. Nevertheless, Tessa's contribution was important as she revised and completed the database, carried out a substantial part of the analysis and also drafted part of the Bronze Age chapter. During the time when she worked as my research assistant, we met regularly to discuss the analysis and decide the next steps. This was by far the most productive and enjoyable part of this project and it is a matter of great sadness to me that that collaboration could not be continued. I am, however, grateful to Tessa for all the work she did. After a painful delay because of my many other commitments, I completed a first draft in 2011. I received several sets of peer review comments, which helped me to improve it. In 2015, with the help of Sarah Viner-Daniels, I carried out some editing of the original draft, but the final version did not become available until 2018. In 2019, with the fundamental contribution of Eva Fairnell, we carried out the final copy-edit. I need to emphasise here, Eva's immense patience, thoroughness and dedication. I am hugely grateful for all you have done in these last few months.

This project has been funded by English Heritage – now Historic England. I am sorry it took so long to complete. Most of all thanks to Gill Campbell, who, for many years, and on behalf of Historic England, stuck to the task to see this project completed. By relieving me of some of my teaching commitments, the mid-career British Academy fellowship, which I was awarded in 2014–15, helped me to carry out some of the editing. I am also grateful to Sharon Souter (Historic England) for her help in constructing the maps.

This review has been subjected to rigorous external review, and I am grateful to the reviewers for their helpful comments. Please note that this work can be referred to without any need to check first with the author. It is not preliminary and the evidence presented here has been thoroughly researched.

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1 INTRODUCTION

1.1 Aims

Archaeology is a popular subject, but some of the evidence that it produces is often embedded in a plethora of technical articles and reports, and frequently inaccessible. This is not just a problem for the occasional reader, but also for professional researchers, who often need an easily reached source of data in order to carry out their own work. The problem is particularly acute for the studies of animals and plants from archaeological sites, as these have for many years been confined to microfiches, appendices and unpublished archive reports. A common strategy in tackling this problem, particularly in recent years, has been the production of popular versions of this evidence, aimed at making it easily digestible to the general public. Although this is in theory a commendable exercise, it has often, but by no means always, led to a watered down, simplistic, sometimes pedestrian and occasionally even plainly wrong presentation of the archaeological record and its interpretation. There therefore seems to be an urgent need to produce academic syntheses of the evidence, which can be understood by the intelligent general reader, but that can also be a guide for professionals involved in the planning of archaeology and its presentation to the public. This publication intends to contribute in addressing this problem by trying to be a potentially useful source of information for the professional archaeologist as well as the keen amateur. It also aims to represent a potential link between the technical and the popular literature.

My basic aim is to collate, synthesise and interpret the present knowledge concerning the way humans and animals interacted in the past in central England. This will be achieved through a review of the available archaeological evidence, more specifically that deriving from the physical remains of the animals found on archaeological sites. The sub-field of archaeology that studies such remains is called zooarchaeology, but this review more specifically deals with the zooarchaeology of vertebrates, namely animals with a spinal cord and generally a brain case and an internal skeleton. Vertebrates include the classes of mammals, birds, reptiles, amphibian and fish, rather than animals with an external skeleton such as some molluscs and insects. Invertebrates also have an important potential in archaeology, but they are normally dealt with by different specialists. The remains that vertebrates leave on archaeological sites are almost exclusively represented by bones and teeth, other body parts being only preserved in exceptional circumstances.

Like any other archaeological project this review is inevitably led by, and perhaps biased towards, the research interests of the author. Every effort has, however, been made to let the data guide me towards new insights into the archaeological record and its interpretation. Research questions that I had not conceived at the onset of the project gradually emerged as the evidence was analysed.

Some of the issues that I had originally thought of tackling included:

- introductions and extinctions
- the beginning of domestication
- ceremonial and domestic settlements

- feasting and consumption
- agricultural intensification
- the impact of the Romanisation of Britain
- villages and towns
- regional comparison (particularly east–west)
- diet, trade and status
- late medieval agricultural innovations.

We will see that the available data have been more successful in illuminating some of these questions than others, and that other interesting themes also emerged.

Although the review provides important summary evidence, comprising a database of the collected information (*see* http://archaeologydataservice.ac.uk/archives/view/animalbone_eh_2007/), a gazetteer of the sites and an extensive bibliography, which I believe can be of great use to other researchers, its aim is not solely to present, but also to interpret the data. I am not interested in providing a long and detailed description of what had been found at each individual site, but I rather prefer to identify geographical patterns and chronological trends, which may be difficult to recognise at the site or micro-regional level. My work therefore operates mainly at the large scale and relies heavily on generalisations, an almost taboo subject for many archaeologists (cf Hodder 1986). This of course does not mean that local, detailed information, which is unique or of particular interest, will be ignored.

1.2 History of the project

The work on which this publication is based was commissioned by English Heritage in the mid-1990s. It was part of a more general programme of regional reviews in so-called 'environmental archaeology', an awkward concept frequently used (mainly) in British archaeology, which combines bioarchaeological and geoarchaeological studies (Luff and Rowley-Conwy 1994; Albarella 2001a). Some of these reviews have now been completed and published (eg Hambleton 2008; Serjeantson 2011; Holmes 2017). A review of vertebrate zooarchaeology for the whole of England was regarded to be, and rightly so, too large a task for any individual, and the region was therefore split into three areas: southern, central and northern. These neatly reflected the location and the regional competence of the university-based English Heritage animal bone specialists, spread, at the time, between the universities of Southampton, Birmingham, York and Durham. Towards the end of the 1990s and the beginning of the 2000s, however, English Heritage was subject to a substantial re-organisation, which led to a partial withdrawal of the financial support for the university-based English Heritage specialists. With the disappearance of most of these positions, many of the reviews were left incomplete. The idea of a review of the vertebrate zooarchaeology of central England resurfaced, however, in 2003, and, after a long negotiation, English Heritage funding for the resumption of the project, now based at the University of Sheffield, was approved in 2005. Work started again in January 2006, with Tessa Pirnie employed as a research assistant to Umberto Albarella in the undertaking of this project. The circumstances around why the project dragged on for many years and is only now brought to fruition are explained in the Acknowledgements.

Although this is the first time that a zooarchaeology review of such chronological scale has been attempted for central England, other regional, multi-period, precedents do exist. The best known is arguably represented by the synthesis of animal bone evidence for the north of England, carried out by Sue Stallibrass, and published in a monograph that also includes a parallel archaeobotanical study (Huntley and Stallibrass 1995). Concerning central England, we must mention a very useful review of the environmental archaeology evidence for the East Midlands (Monckton 2006). Back in the 1980s English Heritage had commissioned its earliest environmental archaeology reviews. Perhaps reflecting the thinking of the period, the reviews were primarily based on geographical units and then on the type of material analysed (ie bones, plants, soils, etc). These resulted in two publications (Keeley 1984, 1987), whose various geographical chapters were covered by scholars who dealt with a wide range of evidence loosely associated with the 'environment'. Although the publications were competently written and synthesise much useful information, the project did not prove to be particularly successful, as over the years these reviews have had surprisingly little exposure and have infrequently been quoted. We must, however, also consider that at that time the body of available data was much more restricted.

In addition to these diachronic reviews, a number of more specific period-based reviews have been undertaken. These have represented an important source of information and ideas for the present work and will be referred to in the relevant chapters.

1.3 Materials and methods

1.3.1 Geography

This review deals with a region defined here as central England. In English Heritage terminology this is often defined as 'the Midlands', a term that I find somewhat misleading and which will therefore not be used in this publication. The region is defined as including the areas known as the West Midlands, East Midlands and East Anglia, namely the following counties: Bedfordshire, Buckinghamshire, Cambridgeshire, Derbyshire, Essex, Hereford and Worcester (now the separate counties of Herefordshire and Worcestershire), Hertfordshire, Leicestershire, Lincolnshire, Northamptonshire, Norfolk, Nottinghamshire, Shropshire, Staffordshire, Suffolk, Warwickshire and the West Midlands. The county boundaries shown on Fig 1.1 are those described by the 1996 Ordnance Survey. A small number of sites technically falling outside the region was retained from an earlier phase in the history of this project. These are Brigg and Dragonby, currently in North Lincolnshire, formerly Humberside. In addition, Barking Abbey and Rainham Moor Hall Farm, listed as being in Essex, strictly speaking fall within Greater London.

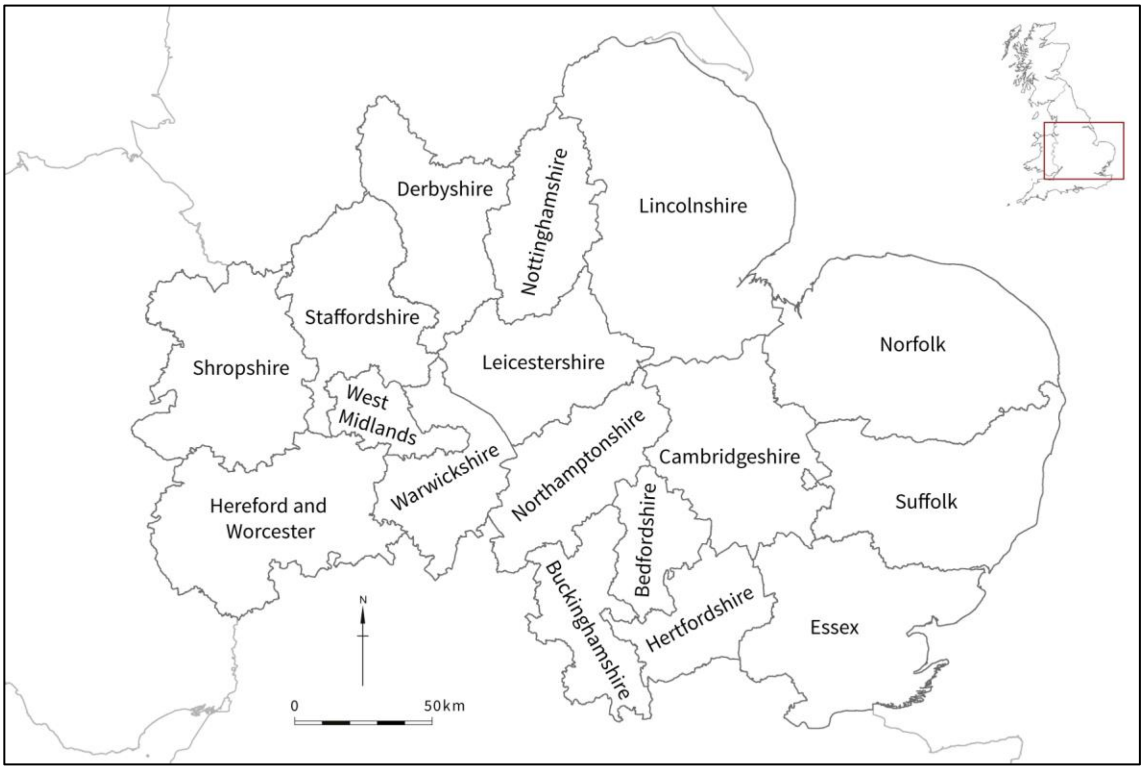

Fig 1.1 Location of the central England region, showing county boundaries as defined by the 1996 Ordnance Survey.

The region of central England is not divided from the rest of England by any well-defined geographical boundaries and it does not have any specific geological, environmental or cultural characteristics that clearly distinguish it from the rest of the country. Its definition is purely arbitrary and based on convenience. This does not exclude the possibility that some of its characteristics may be peculiar or unique or that, in turn, some of the features of the south and north of England may not be represented in this area.

Geologically the area is highly diversified. A broad band of chalk runs from the north-eastern coast of Lincolnshire and the northern coast of Norfolk to beyond the Chiltern Hills. This is topped with 'clay-with-flints' in the south, and elsewhere is largely obscured (except at its western edge) with boulder clay, morainic drift, and glacial sands and gravels. East of the chalk the drift geology largely comprises boulder clay (producing heavy soils), except in river valleys defined by alluvium and gravel terraces. Loess is also present in northern Norfolk, parts of Suffolk and Essex, and in Hertfordshire, providing more easily worked soils (Catt 1978). The Lincolnshire coast and the areas surrounding The Wash are alluvial, while the adjacent Fenlands are composed of peat. West of the chalk are bands of sedimentary rocks of increasing age. In summary, these comprise greensands and clays in central Lincolnshire and Cambridgeshire, oolites and Lias formations, which predominate in Northamptonshire and east Leicestershire, and Permian or Triassic mudstones and sandstones in the west of the region, with Devonian Old Red Sandstone west of Worcester. Northern parts of Derbyshire, Nottinghamshire and Staffordshire also contain Carboniferous limestone, Namurian 'millstone grit', and Westphalian coal measures. The latter are also present in parts of the West Midlands (British Geological Survey 1977, 2001).

In general terms this geology causes less acidic soils in East Anglia than in the Midlands, with a consequent better preservation of bones in the east than the west. As a result of the sedimentological and geomorphological complexity and diversity of the area, there are of course many exceptions to this general rule. Urban sites also tend to generate their own microenvironments and may not follow the general preservation conditions of the regions in which they are located.

Geographically the whole area is characterised by low altitude with no proper mountains. There are low hills, particularly in the centre and the west, but the only altitudes worthy of mention [*c* 300–600m above sea level (asl)] are probably those located in the southern part of the Peak District in Derbyshire, in Shropshire and to a lesser extent in Herefordshire. In East Anglia the altitude is constantly below 150m asl. Rivers abound, notably the Great Ouse and the Nene in the east, the Avon in the south, and the Wye and Severn in the west. There are also important alluvial plains, with the Fenlands, located between Lincolnshire, Cambridgeshire and Norfolk, and the northern part of the Thames estuary, in Essex, falling inside central England.

Geography and geomorphology are of course dynamic, and we must not assume current conditions can strictly be applied to the past. For instance, the shorelines of Lincolnshire and the Walsh have been significantly different to what they are now. The Fenlands have been subjected to several drainage episodes in the course of the history of human occupation.

1.3.2 Chronology

The timescale for inclusion spans the prehistoric and historic past, from the Mesolithic to modern times. Three Palaeolithic sites recorded before 1998 are retained in the database, but have played no further part in this analysis and do not appear in the gazetteer (*see* Appendix 1). It was decided to exclude the Palaeolithic from this work, as a synthesis of the zooarchaeological record for this earlier period requires a different approach, mainly because the discrimination between human-made and natural assemblages is difficult to ascertain for the period and requires an in-depth analysis of each site. Evidence from the Palaeolithic is therefore not particularly amenable to the kind of inter-site analysis that has been carried out for the later periods. In addition, a general examination of Pleistocene fauna in Britain already exists (Yalden 1999).

1.3.2.1 A note on radiocarbon dating and calendar years

The timescale of this review deals with all periods from the Mesolithic to modern times. This time span is conventionally considered to begin *c* 8000 BC, as expressed in radiocarbon years. In calendar years, this is equivalent to *c* 10,000 calibrated (cal) BC. Individual radiocarbon determinations are commonly cited in the literature as raw uncalibrated values. However, when dates are referred to in the body of a document, it often happens that the dating convention remains unspecified. Usage of radiocarbon ages or absolute dates may well vary according to the subject, style, discipline and date of the publication in question. This may lead to confusion as to whether radiocarbon years or calendar years are being reported.

For the purposes of this publication, it was decided that the most useful and consistent strategy would be to present radiocarbon dates throughout the text in calendar years (ie calibrated dates), with further comment where appropriate.

With regard to earlier periods, radiocarbon dating has the potential in some circumstances to provide a more precise indicator of date than material culture. In any case, comparison of absolute and relative dates may indicate incongruities such as the presence of intrusive or residual material. It is therefore particularly important that these dates should be readily comparable. In each of the earlier chapters, we compare relevant dates from central England sites with each other and with dates from key sites outside the region. Probability plots have been provided alongside the tabulated data, so that these relationships can be visualised more easily. It is hoped that this strategy will help alleviate the confusion caused by the sometimes haphazard reporting of dates elsewhere in the literature.

Radiocarbon determinations, where available, have been taken from site reports, or sourced from the Archaeological Site Index to Radiocarbon Dates from Great Britain and Ireland, hosted by the Archaeology Data Service (ADS) at http://ads.ahds.ac.uk/catalogue/specColl/c14_cba/index.cfm. The lists of dates used here is not exhaustive, but has been selected for its relevance. Useful dates include those taken on animal bone or antler, or where a clear stratigraphic relationship between faunal remains and dated material can be demonstrated. Comment is made where this is not possible. Calibration of the dates was achieved using the software OxCal Version 3.10 (© C Bronk Ramsay 2005; https://c14.arch.ox.ac.uk/oxcal.html), using atmospheric data from Reimer *et al* (2004). Dates used in the text are calibrated (cal BC or AD), while both the measurements and the calibrated date ranges are given in table form where appropriate, along with their corresponding probability plots (*eg see* Fig 2.2). Date ranges have been given at a 95% confidence level (2 sigma). As an example, the radiocarbon age 9960±140 BP (the measurement, and its error) becomes the range 10,090–9210 cal BC. Values have been rounded as follows: for those dates with an error ≥25 years, dates are rounded to 10 years; where the error is <25 years, they are rounded to 5 years.

1.3.3 Data collection

Data for this regional review were collected in a relational database, originally using Paradox software, but existing records were later transferred into Microsoft Access 2000 (by Manuela Lopez at English Heritage, February 2006). The database was originally designed by Umberto Albarella and Keith Dobney to serve as a medium for data collection for reviews of animal bones in both central and northern England. The data for this review are now available as a searchable database hosted by ADS at http://archaeologydataservice.ac.uk/archives/view/animalbone_eh_2007.

This database summarises information from 503 animal bone reports (many dealing with several phases of occupation) and 431 sites. A larger number of reports was actually consulted but some of them were not deemed to be informative for the purpose of the review and were therefore excluded from the database. Reports were included if they were analytical reports of archaeological sites (or syntheses) with reasonably securely dated phasing, even where dating was broad. Non-anthropogenic sites were included only when they contained information of direct relevance to archaeological questions.

Not every single zooarchaeological report that has ever been published about a central England site has been consulted, but I am confident that the evidence covers a substantial and highly significant part of the available information. All major works published before 2006 have been included in the database. In cases where a site has been published more recently than the latest phase of data collection, no new data have been added to the database (though this may happen in the future), but the findings have been incorporated in the text where appropriate.

Assessment reports and evaluations were excluded with few exceptions, for which the information was in any case recorded selectively. The reason for using such an approach was that evaluation reports were regarded to be based on preliminary and therefore often unreliable dating. On the other hand, assessment reports were interpreted to be just that, ie assessments rather than full, albeit preliminary, analyses. In choosing this approach, the interpretation of assessments given in the document *Management of Archaeological Projects* (MAP2; English Heritage 1991) was adopted, although I am aware that some colleagues take a different view of the work required at the assessment stage. This is, however, rarely spelled out in assessment reports and therefore the safest approach was to exclude them routinely from this review. While the bulk of the literature was from published sources, reports that were widely available, such as those from Historic England's Research Report series (https://historicengland.org.uk/research/research-results/research-reports/), were included, as were selected unpublished and 'forthcoming' manuscripts.

No lower limit was applied to the size of an assemblage, on the basis that even a single bone has the potential to provide useful information. However, small assemblages that provided no reliable quantitative information and supplied little more than a list of taxa commonly found at contemporary sites were excluded.

Information that was not presented in a site-report format and therefore was not necessarily amenable to being included in the database and the gazetteer was considered, and details of these sources are referenced where appropriate. The data entry was concluded at the end of April 2006, but any information that became available after that date was taken into account, particularly if it was regarded as important. However, this newly available evidence was not included in the database, the gazetteer and various outputs of the data analysis (tables, diagrams, maps): to carry on updating the database after the deadline would have created a never-ending process, as new faunal reports are continually being published.

1.3.4 Structure of the database

Data were entered into a Microsoft Access database via a form called Site, from which further nested forms are accessible. Figure 1.2 illustrates the structure of the tables within the database. There are four levels to the database, each corresponding to information at a different scale. The intentions behind each of these will be described in turn.

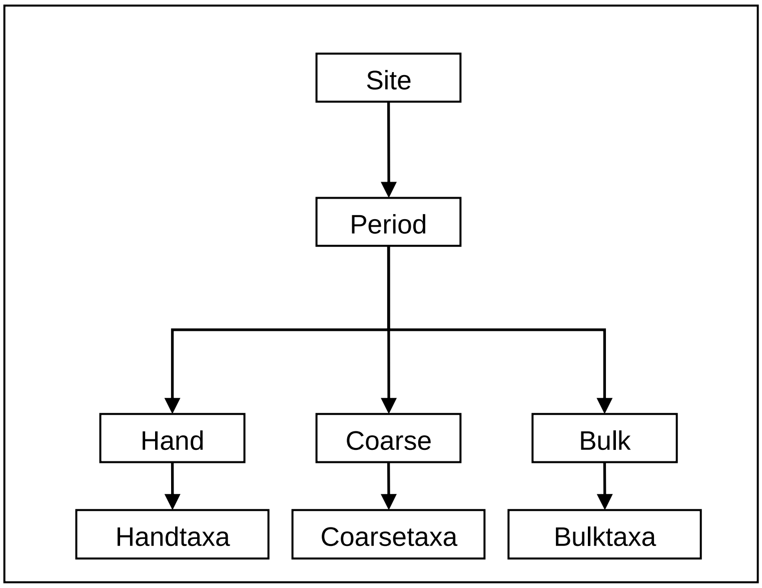

Fig 1.2 The structure of tables within the database for the central England review (see also *http://archaeologydataservice.ac.uk/archives/view/animalbone_eh_2007*).

1.3.4.1 Site

The basic unit of the database is the site report or specialist report. Each record in the top-level table (Site) therefore corresponds to a single bibliographic reference. Thus, one excavation may have several Site records, eg when mammals and birds are reported separately or by different authors.

Bibliographic information is structured in order to be compatible with the Environmental Archaeology Bibliography (EAB) (http://ads.ahds.ac.uk/catalogue/specColl/eab_eh_2004), and the same site names have been used where these were already present in the EAB, for ease of cross-referencing.

A gazetteer is provided in Appendix 1 that lists the sites (ie excavations) alphabetically, with details of the bibliographic references, site types and time periods associated with each. The sites have been given reference numbers, which are referred to in the text and plotted on maps where appropriate.

1.3.4.2 Period

This level of the database records information about phasing, stratigraphy and site types. As several phases of activity may apply to a single Site record, several Period records may exist for each. Each of these units is referred to as a 'periodsite'.

A set of pre-defined codes was used for the dating of each phase/periodsite, which allowed both specific date ranges and named periods to be used (eg late Neolithic–early Bronze Age, as well as late 1st to early 2nd century AD). The intention was to allow phases from sites across the region to be grouped by date, therefore a compromise was made between precision and usability. Phases with very specific date ranges (eg 1610–1685) were allocated to broader categories (eg 17th century). Where phases were short or overlapping, they were sometimes combined in the database to create larger assemblages with broader chronological resolution. This strategy was used particularly where comments in the text did not distinguish between phases. Large overlapping phases were sometimes retained as entities when they were discussed separately or belonged to discrete parts of the site.

Each periodsite or phase was also given a pre-defined code corresponding to its site type. As with period details, it was intended that this code would facilitate grouping periodsites together for comparison. The definition could refer to specific deposits, eg midden, or be used more broadly, eg monastic, depending on the level of information provided in the site report. Of course, an assemblage may derive from both a midden and a monastic site: a decision was made in each case as to which scale of information was most appropriate. Many sites were attributed to broad categories, such as enclosure, urban or rural, which, of course, may include many different sub-categories. Some site reports provided little or no information, which was also noted.

1.3.4.3 Hand/bulk/coarse

At this level of the database, the hand-collected, coarse-sieved and bulk-sieved fractions of each periodsite are separated out. Hand-collected refers to bones that were spotted during the excavation and collected without the aid of any additional process. Coarse-sieved and bulk-sieved assemblages may overlap but usually can be distinguished as follows.

- Coarse-sieved bones are those that are collected using a mesh size normally of 4mm or more. The sieving can be dry or wet, but is normally carried out on-site. The samples taken for sieving are generally not ‘bulk’, meaning that the more visible, large bones from those samples are collected by hand before sieving. Samples taken for coarse sieving are normally large, typically ranging from 20L to 100L.
- Bulk-sieved assemblages are generally recovered using a mesh size of 0.5–3mm. The sieving is generally wet and can be carried out in conjunction with flotation, often in a laboratory or in an *ad hoc* station organised on-site or in its vicinity. If flotation is also undertaken most bones will be collected from the flotation residues, which are sometimes sieved into different size fractions. A much smaller amount of bone, generally light elements such as fish scales, may end up in the flots. The fine-sieved assemblages are generally ‘bulk’, in the sense that no material is removed from the samples prior to sieving. Samples taken for bulk-sieving are generally 20L or smaller.

In practice it was not always possible to understand from a report whether the material was derived from hand-collection or sieving and/or from which type of sieving. Decisions about how to deal with such ambiguous assemblages were made on a case by case basis, noting in a comments field that, for instance, a small amount of sieved material may have been present in a hand-collected assemblage or, conversely, that the quantity of fish remains deriving from hand-collection is unknown. Another problem encountered was that in some cases the material or data from hand-collection and sieving, or from coarse-sieving and bulk-sieving, had been combined. In such cases, if the totality of the soil had been sieved, the assemblages were recorded according to the finest level of recovery (coarse-sieving or fine-sieving). If only a small amount of soil had been sieved, and the material from sieving had been combined with the hand-collected assemblage, this was recorded as 'hand-collected', specifying in notes that it included some material from sieving.

Each sub-assemblage is quantified according to the weight and quantity of identified and unidentified material, and the number of identified specimens (NISP) is given for each of the different categories (ie large+medium mammal, small mammal, bird, fish, amphibian and reptile).

1.3.4.4 Handtaxa/bulktaxa/coarsetaxa

This lowest level of the database contains records of each taxon present per periodsite (with the hand-collected and sieved fractions kept separate) together with quantitative and descriptive information about that taxon.

For the purposes of the database, taxa are generally given their common English names. Where a taxon has not been identified to species, a generic or family name might be used instead. In this case, an English or Latin name would be used according to circumstances. Thus, for example, 'caprine', 'gadid', 'passerine', 'deer', 'Columbidae' and 'vole sp.' are all acceptable terms.

Uncertain taxonomic identifications can be indicated with '?' (eg '?merlin') but specimens attributed only to size classes (eg 'sheep-sized') are not recorded. Categories such as 'fallow/red deer' are also permitted and, in such a case, any positively identified 'fallow' and 'red deer' specimens are also allocated a record.

Domestic animals and their wild progenitors are recorded separately where possible. In practice it is always difficult to achieve consistency. For instance, a record labelled 'pig' may also potentially include specimens of wild boar, which have not been identified as such, and vice versa. To some extent, this is dependent on the particular site report and the degree of caution exercised by its author. For example, where some might confidently assign specimens to the category 'horse', others might decide 'equid' is more strictly appropriate. The criteria used for a positive identification of a wild or domestic specimen have been noted where possible. These might include measurements, or the presence of distinctive morphological characters. Equally, absence of such criteria has also been deemed worth noting.

One instance where a slightly different procedure is followed is in the recording of sheep and goat. It was recognised that an enormous variability exists in the reporting of sheep and goat specimens in site reports. Indeed, some (particularly older) reports present all sheep/goat specimens as 'sheep', with no criteria for identification given. To make the sheep/goat content of assemblages comparable, all 'sheep', 'goat' and indeterminate/unspecified specimens are summed and recorded as 'sheep/goat' (taxonomically 'caprine'). Additionally, where 'sheep' and 'goat' were positively identified, the NISP for each is recorded separately, even though this in effect produces 'double-counting'. Presence and number of horncores (where given) is noted in the comments field, as sheep and goats can often be distinguished on this element, and it is sometimes omitted from the NISP.

English names have been used in the text for simplicity. However, the corresponding Linnaean Latin names can be found in Appendix 2, which comprises a list of all the taxa present in the database, indicating in which periods each may be found. In the case of those animals that are found in both wild and domestic forms, naming follows Gentry *et al* (2004). Thus, wild boar is named *Sus scrofa*, while the domestic pig is named *Sus domesticus*.

One major intention of compiling the database was to produce comparable datasets recorded in a consistent manner, so that regional patterns could be highlighted. It was recognised that the variability of quantification methods used within site reports rendered this problematic. A small number of reports contained only presence/absence data for taxa, or did not record NISP [eg using instead only percentage values for NISP, or minimum numbers of individuals (MNI)], which was regarded as less than ideal in terms of comparability. Indeed, NISP counts themselves are not unproblematic, as one worker may record all fragments while another is more selective. In order to allow for this, notes were taken where possible, for instance to state where partial skeletons had been included or excluded from total counts, or where antler had been included/excluded.

Complex categories of information (such as mortality profiles, biometry and butchery) are summarised and recorded by keyword. Some quantitative data, where given, could be included in the accompanying notes fields (eg a range of withers heights, or the percentage occurrence of a particular pathology).

1.4 The nature of the evidence

1.4.1 Inter-site comparison

Any review of zooarchaeological evidence inevitably relies on a comparison of individual assemblages, which are likely to have been excavated, recovered and analysed in different ways. The agents that have affected the preservation of the bones are also likely to have acted differentially at different sites. Inter-site comparison in zooarchaeology is problematic (Lawrence 1973; Albarella 1995b; Amorosi *et al* 1996) and should be approached cautiously. When assemblages from two sites are compared it is important that the differential factors that contributed to the generation of the zooarchaeological record are taken into account.

Taphonomic and recovery biases can contribute substantially to apparent differences between assemblages, and should therefore be considered. Recovery in particular can substantially affect the occurrence and proportion of taxa represented on a site. Even when only hand-collected assemblages are compared it is possible that the efficiency of hand-recovery may have been different between sites, and even between different excavation campaigns, areas and/or phases of the same site.

An equally, if not more, important factor is the counting and quantification systems adopted by each individual researcher. The most widespread quantification system, NISP, is particularly prone to generating different results between analysts, as the interpretation of an 'identified specimen' is extremely subjective. Other quantification systems, such as MNI and the weight of the bones, are more easily comparable between assemblages (but see Grayson 1984; Lyman 2008) but they are also less commonly adopted.

Different assemblages are also affected substantially by the range of human activities occurring at a particular site. On-site and off-site breeding, removal and introduction of animals and/or parts of animals from/to a site, butchery, cooking and disposal practices will all affect the formation of the assemblage. These factors are likely to have a differential influence at different sites and must therefore also be considered when assemblages are compared.

When the zooarchaeological record from two sites is compared, it is therefore necessary to consider thoroughly all factors that may have biased the animal bone record before conclusions regarding differences in the nature of the animal exploitation at the two sites are reached. We can define such an approach to inter-site comparison in zooarchaeology as ‘intensive’.

When a large number of sites are considered, this intensive approach is much more difficult to undertake, as the complexity of the differential bias will increase exponentially as more sites are taken into account. A different approach, which relies on large numbers, rather than on an in-depth site-by-site analysis, is required. A regional analysis therefore calls for an ‘extensive’ rather than intensive approach to inter-site comparison.

As this approach is cruder, it is only helpful in attempting to identify general patterns rather than looking at detailed differences between small numbers of sites. The larger the number of sites considered, the more reliable any detected differences between site groups (eg from different periods or regions) will be. In turn, large differences between site groups may be significant even when the sample of assemblages is not particularly large.

Although the extensive approach is not designed to identify differences between individual sites, it can be helpful with the identification of outliers: assemblages that have characteristics that are clearly at odds with the general trends exhibited by other assemblages in the same group. Once outliers are identified it is necessary to revert to the intensive approach to check whether their peculiar characteristics may be the consequence of taphonomic/recovery/quantification biases or are more likely to have been generated by differences in human activities.

A good medium for this extensive approach to inter-site comparison is the tripolar diagram, as this allows three different variables to be plotted. It is therefore particularly suited for comparing proportions of the three most common domesticates, cattle, sheep/goat and pig, between different site groups. However, interpreting a tripolar diagram may not be as intuitive as interpreting a bar chart or a simple scatter plot. As tripolar diagrams are used extensively in this publication, Fig 1.3 provides a quick guide to using them. By following these simple guidelines, the distribution of points within the triangle should be readily understood.

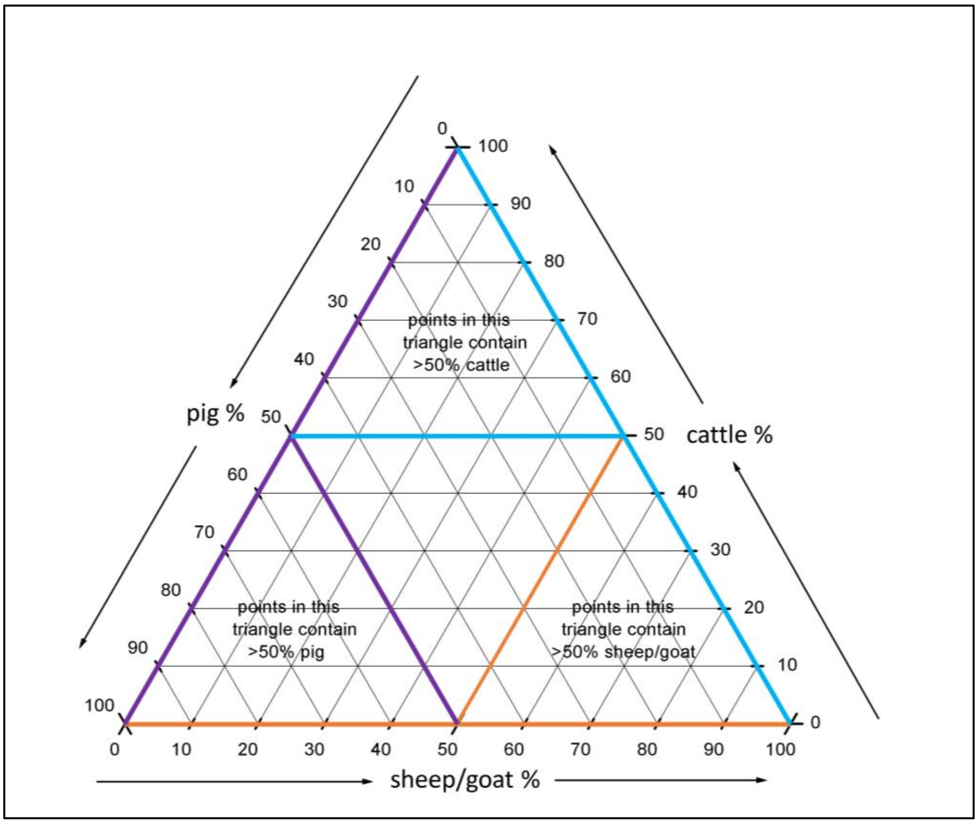

Fig 1.3 How to read a tripolar diagram: the percentage of sheep/goat in an assemblage, for instance, is 0% if plotted at the bottom left, and 100% at the bottom right. A point that falls in the exact centre of the diagram will represent 33.3% sheep/goat, 33.3% cattle and 33.3% pig.

1.4.2 Unevenness of the evidence

All regional studies are affected to some extent by an uneven coverage of evidence, and the zooarchaeological record for central England represents no exception. As will be seen in Chapters 2–9, the chronological coverage in particular is very uneven, with insufficient evidence in prehistory, even though there is an increasingly more abundant record from the Mesolithic to the late Iron Age, and the post-medieval (ie early modern) period. Even within the historic periods there are clear differences in the amount of coverage, for example the late Saxon period is much better represented than the early Saxon period.

Geographically the evidence is also unevenly distributed, as can be seen in Fig 1.4, which shows the county distribution of the sites included in the database. There is a gradual decrease in the number of sites from east to west, and from south to north. There are many factors affecting such distributions, but the over-riding one is probably differential preservation, with the acidic soils of the north-west producing the poorest zooarchaeological record in the region. The reduction in the number of sites when moving from south to north also reflects a countrywide trend, so it could therefore also be associated with past population density. The best represented county in the database is Essex, in the south-east, which has more than 50 recorded sites, whereas Staffordshire and Shropshire in the north-west are represented by fewer than 10 sites. A variable intensity of archaeological activity in different areas almost certainly represents another contributing factor.

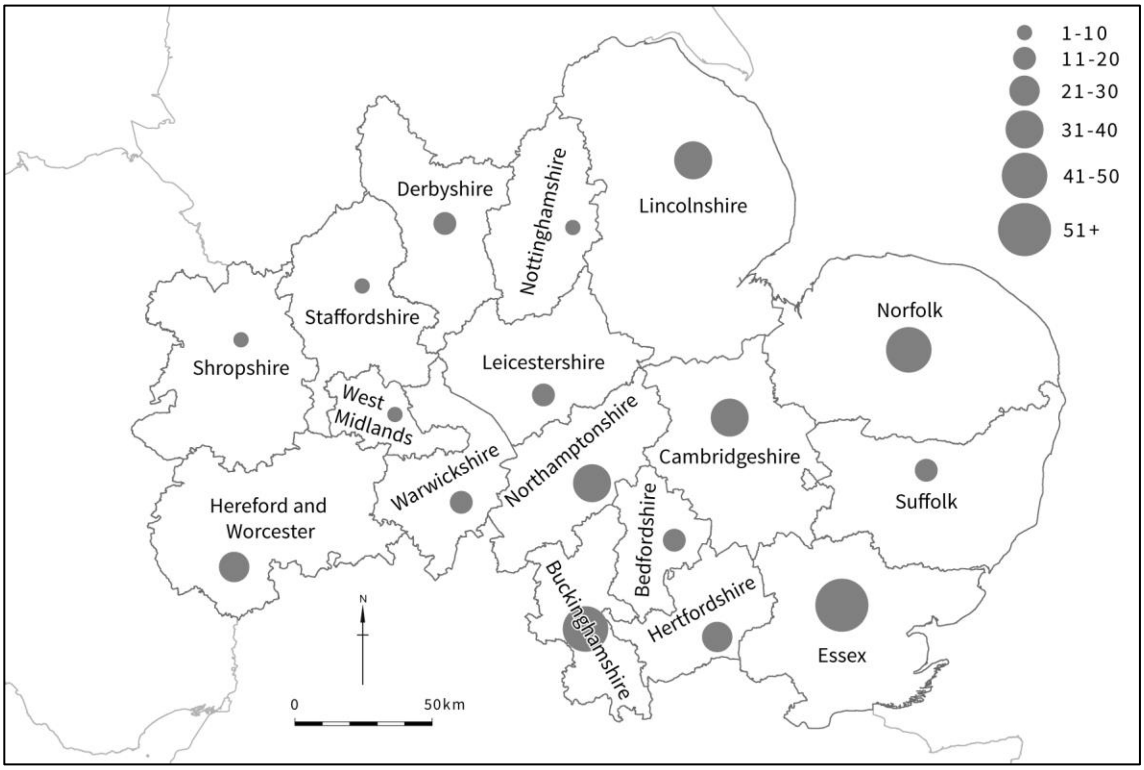

*Fig 1.4 The number of sites included in the database for central England (*see *http://archaeologydataservice.ac.uk/archives/view/animalbone_eh_2007), per county. A 'site' here refers to a single entry in the gazetteer (Appendix 1), which will have produced one or more site reports.*

An approximately similar pattern can be seen when looking at the density of sites per county area (Fig 1.5), although this emphasises even more the contribution of the southern counties, with Buckinghamshire providing the highest density of available zooarchaeological information. Suffolk, with its relatively small number of published animal bone assemblages, contrasts with other counties located in the south-east.

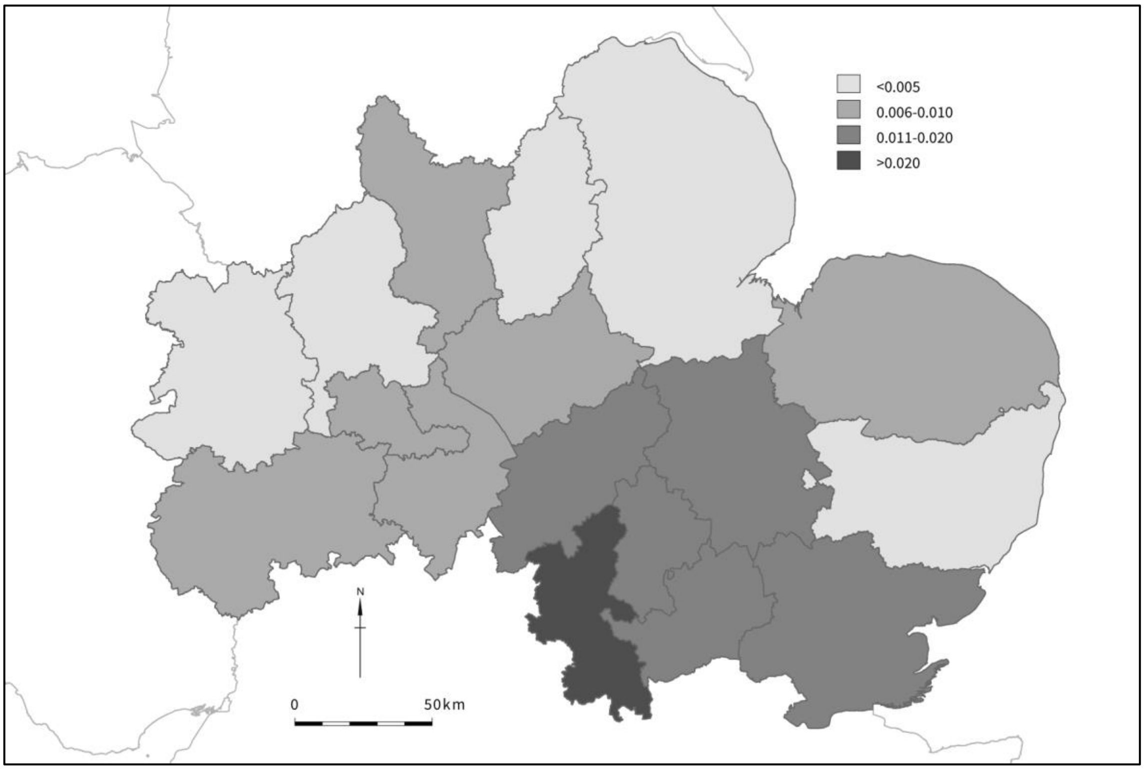

*Fig 1.5 The density of sites included in the database for central England (*see *http://archaeologydataservice.ac.uk/archives/view/animalbone_eh_2007), per county, expressed as sites per km*^{2}*. A 'site' here refers to a single entry in the gazetteer (Appendix 1), which will have produced one or more site reports.*

1.4.3 Recovery and quantification biases

As mentioned in section 1.4.1, the evidence will mainly be analysed extensively rather than intensively. In other words, we will investigate whether patterns of similarity or difference occur between different periods, regions and/or site types *despite* all the biases existing in the zooarchaeological record. There are, however, some biases that can affect sites *en masse*, not just individual sites. These should be borne in mind as they have an important methodological value and, if understood, can help us interpret the evidence more correctly.

Of these biases, the one that can be more easily identified as a general trend that goes beyond the individual site, is recovery bias. Unfortunately, there are very few cases in the database where material from both hand-collection and sieving was available (and not mixed with each other), but those that do exist are very useful in making the more general point about how different types of bone collection can affect the animal bone evidence. In Fig 1.6, the relative NISP frequency of the three main taxa (cattle, sheep/goat, pig) is shown for sites that have both hand-collected and sieved (coarse and/or bulk) assemblages available. Only assemblages where the total NISP of hand-collected bones and of sieved bones was greater than 100 were selected. It is quite clear that the points representing the sieved assemblages tend to plot lower down in the diagram, namely they have a lower proportion of cattle bones. As cattle bones are on average substantially larger than sheep/goat and pig bones, it is not surprising that in hand-collected assemblages they are somewhat *over*-represented. As in many of the sieved samples some of the largest bones may have been removed by hand prior to sieving, it is possible that, conversely, in these assemblages cattle bone are *under*-represented.

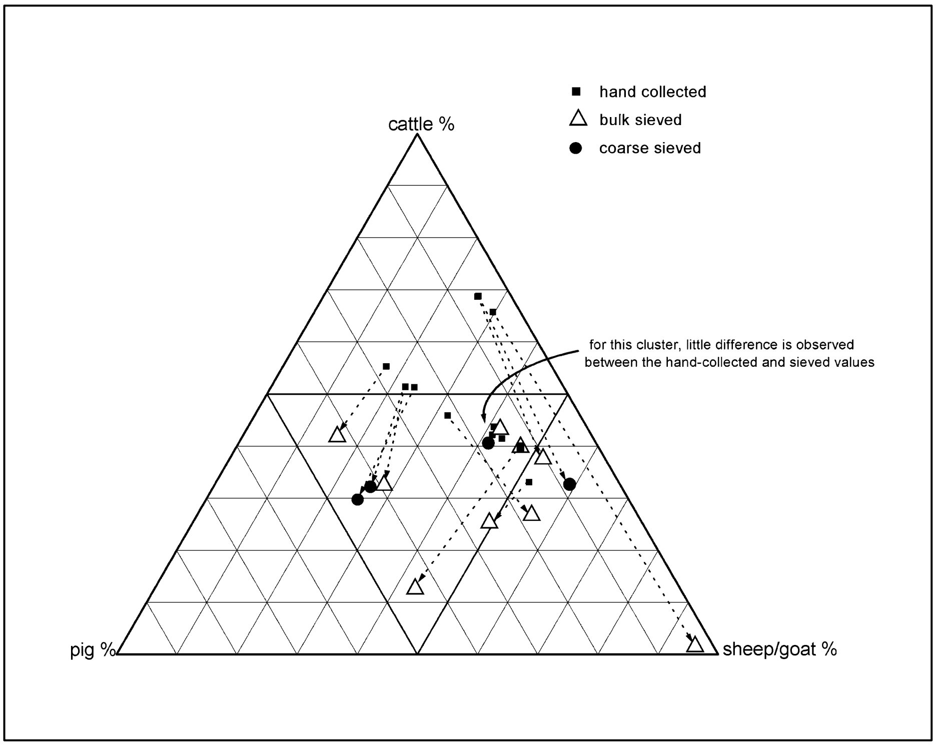

*Fig 1.6 Relative proportions of cattle, sheep/goat and pig in sieved and hand-collected assemblages from sites across central England. Assemblages were included only if the combined number of identified specimens (NISP) of cattle, sheep/goat and pig was >100 for the hand-collected and sieved material (*for details see *Table 1.1).*

As there are insufficient sieved assemblages to carry out a synthetic review of the evidence, this regional analysis will rely mostly on hand-collected assemblages. Consequently, we will have to bear in mind that on average cattle frequencies will be inflated and that any statistics based on the proportion of the main taxa should not be taken at face value. However, this is not as serious a problem as it may appear, as zooarchaeology works best when it investigates relative rather than absolute differences. The recovery bias will affect all hand-collected assemblages, although, admittedly, some more than others, and therefore, in relative terms, significant differences between sites or groups of sites can still be observed. Nevertheless, it would have been far more desirable to have a complete set of fully sieved assemblages, as not only would these have provided a fairer reflection of the frequency of species, but more importantly they would have provided a quantifiable account of what was recovered and what was lost. This is because the mesh size provides us with a clear indication of the level of loss and recovery, whereas hand-collection is more variable and impossible to quantify with any level of precision.

The effect of the recovery bias can also be observed when different quantification systems are compared. In Fig 1.7 the NISP and MNI frequencies of the three main taxa are plotted using a tripolar diagram. Only assemblages where the total NISP of the three species was greater than 400 and that provided counts for both NISP and MNI were plotted. On average, NISP values tend to favour cattle frequencies, while sheep/goat and pig tend to be better represented by MNI values. The difference between the two quantification systems is statistically significant according to a paired *t*-test for all three taxa (Table 1.1). It can be more easily (if somewhat more crudely) observed in a bar chart that plots, according to both NISP and MNI, the number of assemblages in which one of the three taxa is represented in more than 50% of the counts (Fig 1.8). The difference is particularly remarkable for cattle, as it represents more than 50% of the assemblages in 35 cases according to NISP, but only eight cases according to MNI.

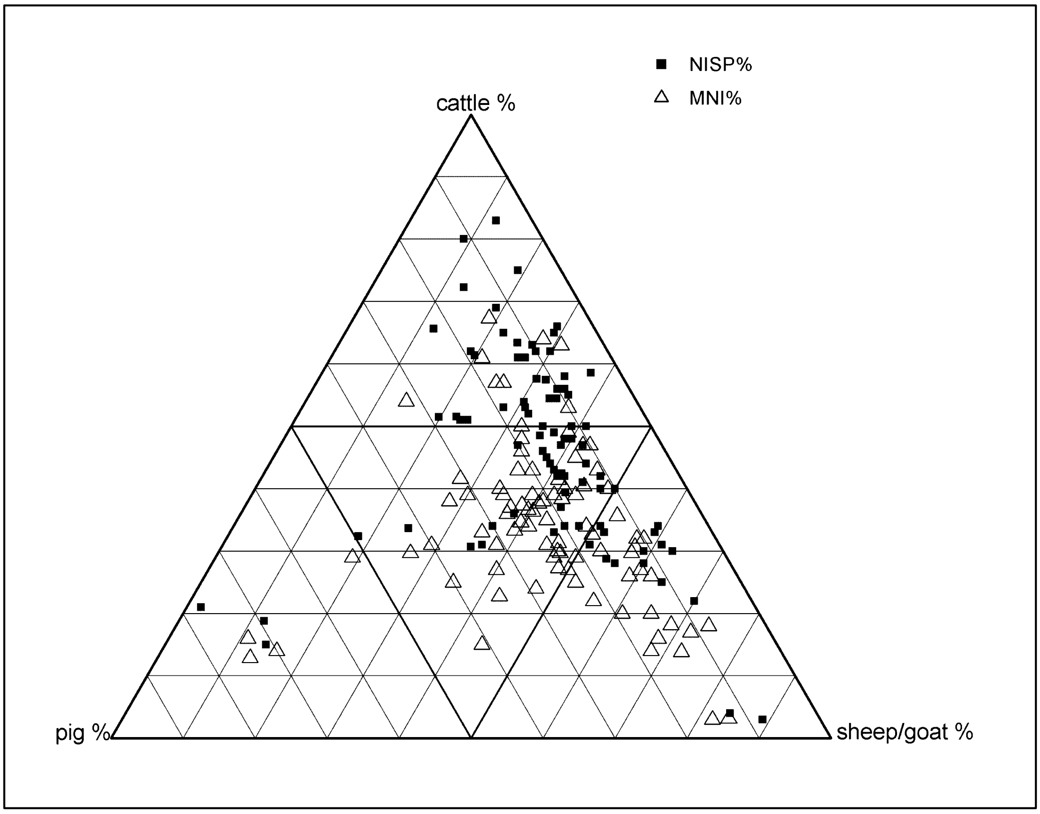

Fig 1.7 Relative proportions of cattle, sheep/goat and pig in hand-collected assemblages from sites across central England, as a percentage of number of identified specimens (NISP) and minimum number of individuals (MNI). Assemblages were only included if an MNI was reported and the combined cattle+sheep/goat+pig NISP >400.

Table 1.1 The results of a paired t*-test comparing the percentages of number of identified specimen (NISP%) and minimum number of individual (MNI%) values of cattle, sheep/goat and pig shown in Fig 1.7, using only the 86 hand-collected assemblages where cattle+sheep/goat+pig NISP >400, and where MNI was also reported.*

Hand-collected species	Mean NISP%	Mean MNI%	*t*	Significance	Comments
Sheep/goat	37.08	43.47	−7.453	0.000**	Significantly better represented by MNI
Cattle	45.99	33.95	13.988	0.000**	Significantly better represented by NISP
Pig	17.26	22.58	−6.441	0.000**	Significantly better represented by MNI

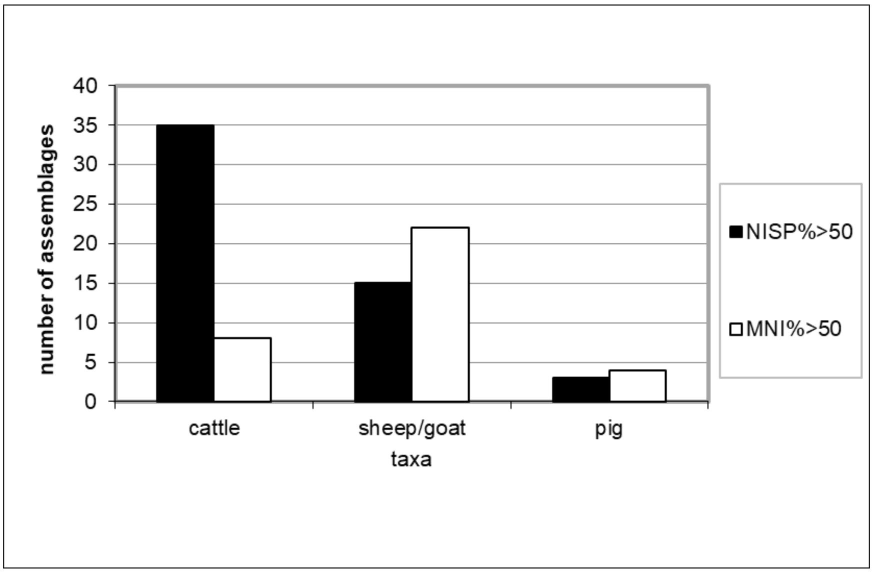

Fig 1.8 Comparison of number of identified specimens (NISP) and minimum number of individuals (MNI). Bars refer to the number of assemblages for each taxon (as shown in Fig 1.7) that represents greater than 50% of the cattle+sheep/goat+pig counts for NISP and MNI.

The main reason underpinning the different results between quantification systems is that NISP is more susceptible to recovery bias than MNI, as the latter relies only on the most commonly represented anatomical element. Consequently, MNI values tend to reduce the effect that small bones, such as phalanges, tarsals, carpals and isolated teeth, can have on pig and particularly sheep/goat NISP values. For this reason, MNI values tend to approach more closely the results obtained through the study of sieved assemblages. There are other problems with MNIs, as with any quantification system, that will not be elaborated here, as they have been discussed widely in the literature (eg Casteel 1977; Chaplin 1977; Gilbert and Singer 1982; Grayson 1984; Lyman 2008), but I believe that overall MNI represents a better quantification system for inter-site comparisons, particularly when, like in this review, many sites are considered. Nevertheless, the bulk of the quantification analysis of taxon representation presented in this publication relies on NISP, because MNIs are more rarely provided in bone reports. Using only MNIs would have led to a substantial decrease of the sample size.

2 MESOLITHIC

2.1 The context

Our chronological account of past human–animal relationships in central England starts with the Mesolithic, the cultural period immediately following the end of the last glaciation. Conventionally, the Mesolithic is regarded to have started, throughout Europe, about 10,000 cal BC, when the glaciers had melted away and the temperature had increased (Bell and Walker 1992). The end of the Mesolithic was demarcated by, among other innovations, the emergence of farming and subsequent abandonment of the hunter-gatherer style of life. In chronological terms such events vary enormously between different European regions, with the south-east of Europe witnessing the end of the Mesolithic and the consequent emergence of the Neolithic as early as the 7th millennium cal BC. In England, the Mesolithic survived until at least the mid-5th millennium cal BC, and the emergence of a productive economy was even later in European areas located further north, such as Scandinavia (Price 1987).

Radiocarbon determinations for sites in central England, and other sites mentioned in the text, can be found in Table 2.1 and Fig 2.2. The dates have been given as both radiocarbon ages (ie the measurement and the error, eg 9960±140 BP) and as calibrated dates (eg 10,090–9210 cal BC). The former values are commonly cited in the literature. However, radiocarbon dates are more properly expressed as calibrated date ranges, and are more readily and accurately comparable in this form.

Climatically the Mesolithic was not so different from today, although environmentally it preceded the intense human-driven deforestation of the following millennia. England was at that time mostly covered by deciduous woodland, which had gradually replaced the tundra environments (and, in places, the ice) typical of the glacial period (Bell and Walker 1992; Price 1987). The density of the forest canopy was, however, variable (Rackham 2000) and the existence of continuous forest coverage has been questioned (Vera 2000).

Because it represents the last stage of a fully hunter-gatherer way of life, the Mesolithic has often been seen purely in terms of its eventual conversion to a productive economy. But, however important the social and economic changes brought about by farming, they should not overshadow the fact that the Mesolithic period is interesting in its own right (Price 1987). The period has its own important specificities, which should not be considered simply as a number of steps taken towards the eventual domestication of plants and animals. In parts of Europe, including Britain, it was a long-lasting way of life, covering several millennia. In terms of animal economy, we know that Mesolithic people extended the range of resources that they exploited, and in coastal areas made extensive use of marine resources such as fish and molluscs. Accumulations of remains of mollusc preparation and consumption, fish and shell middens, are indeed typical of the period (Price 1983), although we do not have examples from central England (where any coastal sites are presumably now submerged). A broader range of terrestrial animals was also hunted, probably taking advantage of the greater biodiversity generated by the more forested environment.

During the earliest part of the Mesolithic, Britain was still connected to continental Europe, but the rise in sea level, as a result of the melting of the glaciers further north, led to its eventual separation from the rest of continental Europe and consequently to its island status. The timing of this separation has conventionally been taken as *c* 7500 cal BC, based on hypothetical reconstructions of the former coastline undertaken by Jelgersma (1979). More recent work suggests that this date may be much too early. Coles (in her 1998 synthesis) notes that fully marine conditions in the southern North Sea basin could have been established some time between 5800 and 3800 cal BC. Ward *et al* (2006), who opt for a date of around 4500 cal BC, acknowledge that our understanding is still hampered by chronological uncertainties, limited datasets, and the difficulties of modelling sea level change. However, this loss of land over time, and eventual insulation of Britain, has implications for cultural continuity with Europe during the later Mesolithic and beyond, creating the opportunity for distinctive development. It also has a bearing on the movement of animals in that period, including, crucially, the mechanisms of both introductions and eventual extinctions of species.

It is unfortunate that the zooarchaeological evidence for the British Mesolithic is very sparse, reflecting perhaps at the same time a relatively low density of population and the ephemeral nature of the archaeological record. If such scarcity of data characterises Britain, and England in particular, as a whole, the central part of England is the worst represented in terms of animal bone evidence. Some of the best-known Mesolithic sites with fauna, such as Star Carr and Seamer Carr (North Yorkshire) and Thatcham (Berkshire), are located outside central England. This unfortunately means that the Mesolithic zooarchaeological record for central England is limited to just four sites (Fig 2.1), of which one, Stebbingford, Felsted (site code 349, Essex; Wade 1996), is only represented by a stray find. This not only compares badly with the south of England, which is typically wealthier in archaeological evidence, but also the north, where Stallibrass (1995) counted as many as 15 Mesolithic sites with fauna, although most of these are also merely represented by stray finds (only five can be regarded as proper archaeological sites).

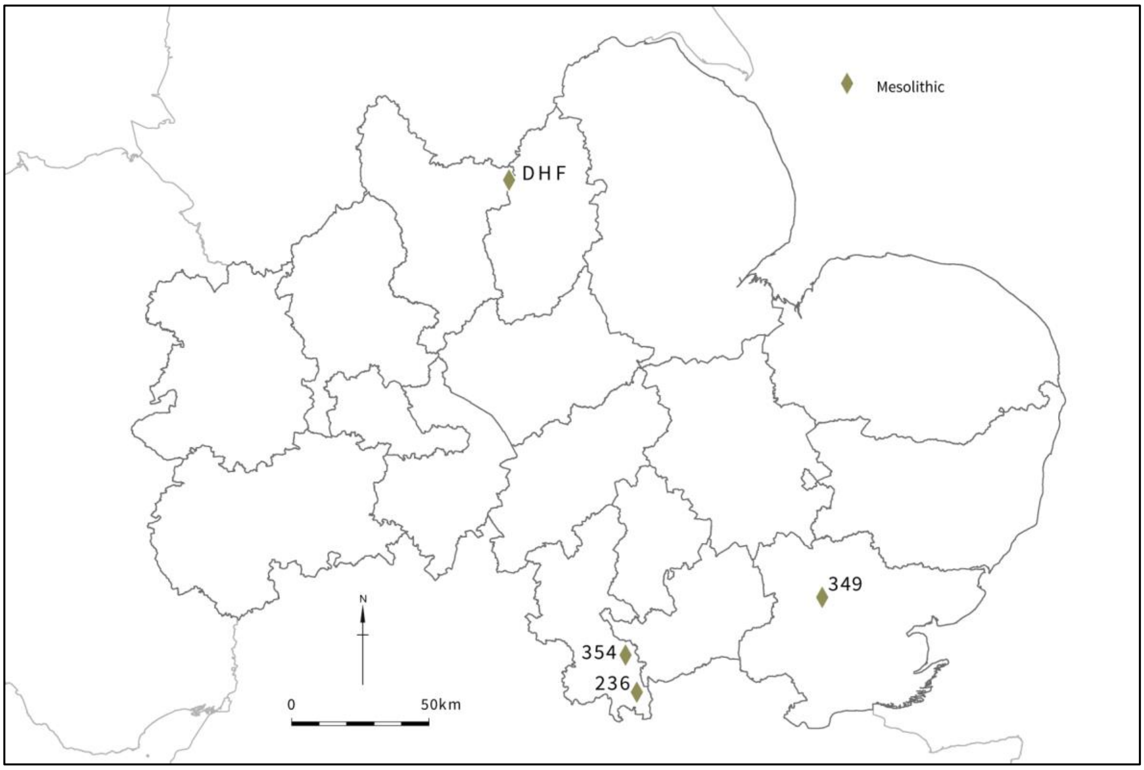

Fig 2.1 The distribution of Mesolithic sites across central England. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text. DHF=Dog Hole Fissure, Nottinghamshire; 236=Misbourne Viaduct, Buckinghamshire; 349=Stebbingford, Essex; 354=Stratford's Yard, Buckinghamshire.

Table 2.1 Radiocarbon dates from Mesolithic sites within central England, and other English Mesolithic sites mentioned in the text. All radiocarbon determinations and contextual information, unless asterisked, derive from the Archaeological Site Index to Radiocarbon Dates from Great Britain and Ireland, hosted on Archaeology Data Service (ADS) at http://ads.ahds.ac.uk/catalogue/specColl/c14_cba/index.cfm (consulted 10.11.06).

Calibrated dates were obtained from OxCal Version 3.10, © C Bronk Ramsay (2005; https://c14.arch.ox.ac.uk/oxcal.html), using atmospheric data from Reimer et al *(2004). All calibrated dates with an error ≥25 years have been rounded to 10 years.*

CBA=Council for British Archaeology; PVA=polyvinyl acetate.

**Radiocarbon age from Jenkinson and Gilbertson (1984) (Dog Hole Fissure)*

***Radiocarbon age from Ellis* et al *(2003) (Faraday Rd)*

Site and laboratory number	Material	Comments	Radiocarbon age, BP	Calibrated date range (95% confidence), cal BC
Sites within central England				
Dog Hole Fissure HAR 4309*	Bone	Bulk bone from wolf, red deer and pig: date thought to be too old: not reported on CBA/ADS	9960±140	10 090–9210
Stratford's Yard BM-2404	Bone	Bone collagen from aurochs, from 5 bones associated with Mesolithic flints	5890±100	5000–4510

Site and laboratory number	Material	Comments	Radiocarbon age, BP	Calibrated date range (95% confidence), cal BC
Misbourne Viaduct OxA-621	Bone	?Red deer vertebra: early presence of red deer cannot be ruled out (cf Gough's Cave)	12 530±200	13 340–12 030
Misbourne Viaduct OxA-601	Bone	Cattle distal metatarsal from tufa	6190±90	5330–4850
Misbourne Viaduct OxA-619	Bone	Cattle magnum	6100±120	5320–4720
Misbourne Viaduct OxA-618	Bone	Cattle vertebra	5970±100	5210–4610
Misbourne Viaduct OxA-603	Bone	Cattle 3rd phalanx	4070±100	2900–2340
Misbourne Viaduct OxA-602	Bone	Cattle cuboid from tufa	3730±90	2470–1890
Misbourne Viaduct OxA-620	Bone	Cattle phalanx 3: expected to be contemporary with OxA-601/619 but could be downward intrusion as a result of rabbit activity	2500±150	970–200
Sites outside central England				
Star Carr CAR-928	Antler	Worked red deer antler	9670±120	9320–8720
Star Carr CAR-930	Charcoal	From occupation horizon	9660±110	9310–8730
Star Carr OxA-1176	Charcoal	From occupation horizon	9700±160	9650–8630
Star Carr OxA-3345	Charcoal	Reed charcoal from palynology monolith	9580±70	9240–8730
Star Carr Q-14	Wood	From platform	9557±210	9450–8290
Star Carr OxA-1154	Antler	Red deer antler, from frontlet no 130	9500±120	9250–8480
Star Carr C-353	Wood	From platform	9488±350	10 020–7820
Star Carr OxA-2343	Resin	Resin 'cake' mastic not adhering to artefact (those from artefacts were contaminated with PVA)	9350±90	8820–8310
Thatcham IV OxA-732	Antler	Worked beam of red deer	9760±120	9450–8790
Thatcham IV OxA-894	Antler	Burnt elk antler	9490±110	9230–8490
Thatcham V Q-651	Wood	In association with artefacts	9840±160	9880–8790
Thatcham V Q-652	Wood	Pine	9840±160	9880–8790
Thatcham V Q-677	Wood	From same level as Q-650	9780±160	9800–8750
Thatcham V Q-650	Wood	From level that contained birch bark roll	9670±160	9450–8620
Thatcham V OxA-5191	Bone	Red deer phalanx 1 from lowest layer of site (earlier than main settlement)	9510±90	9230–8600
Thatcham V OxA-5190	Bone	Roe deer calcaneum from lowest layer of site (earlier than main settlement)	9430±100	9150–8450

Site and laboratory number	Material	Comments	Radiocarbon age, BP	Calibrated date range (95% confidence), cal BC
Thatcham V OxA-5192	Charred hazelnut	Charred hazelnut from layer 2: suggests rapid accumulation of deposit	9400±80	9120–8460
Thatcham Sewage Treatment Works BM-2744	Charred hazelnuts		9100±80	8550–8220
Thatcham III Q-659	Charcoal		10 365±170	10 850–9450
Thatcham III Q-658	Charcoal and nut shells		10 030±170	10 280–9220
Thatcham III OxA-2848	Resin	Resin mastic adhering to unretouched flint flake	9200±90	8640–8250
Thatcham III OxA-940	Bone	Worked distal humerus of pig: expected to be contemporary with OxA-732/-894: low collagen	6550±130	5720–5290
Thatcham III OxA-1201	Bone	Worked femur of beaver: expected to be contemporary with OxA-732/-894: low collagen	5100±350	4690–3020
Seamer Carr OxA-1030	Bone (dog)	Dog (vertebra?)	9940±100	9860–9240
Seamer Carr BM-2350	Bone	Fragmentary right mandibular ramus of horse	9790±180	9870–8720
Seamer Carr BM-1841-R	Bone	Aurochs rib from complete skeleton: this date replaces BM-1841	8740±120	8240–7570
Seamer Carr HAR-6498	Wood	Willow/poplar spp. from arrow shaft embedded in peat	8210±150	7580–6700
Faraday Rd R-24999/2**	Bone		9418±60	8830–8550
Faraday Rd R-24999/1**	Charred hazelnuts		8510±60	7600–7480
Cherhill BM-447	Charcoal		7230±140	6410–5830

Table 2.1 continued

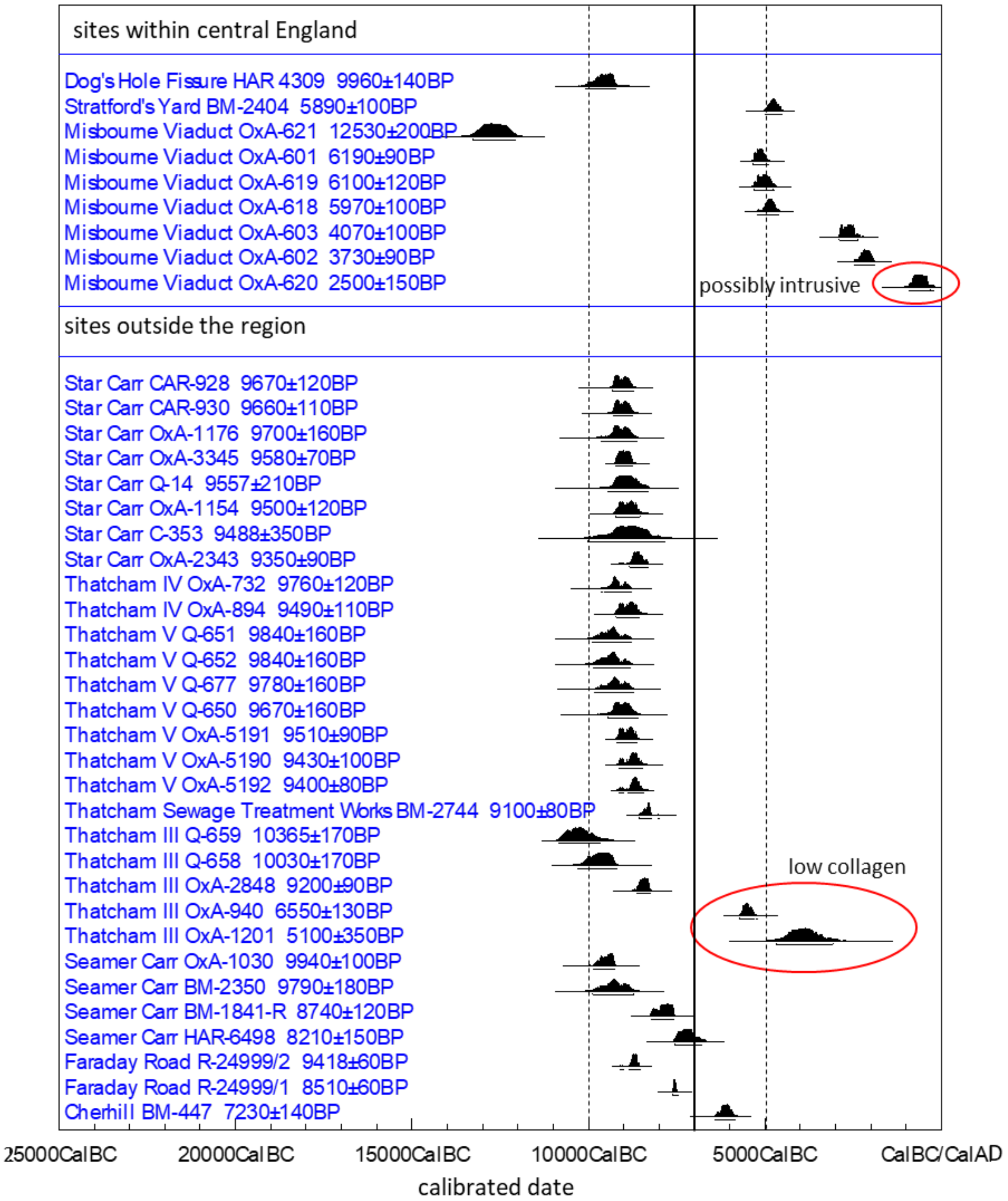

Fig 2.2 Probability plots for the radiocarbon dates listed in Table 2.1. Laboratory numbers and radiocarbon determinations are listed on the left (uncalibrated), while the dates plotted on the right are given in calibrated (Cal) years BC/AD. A solid vertical line separates dates that are pre- and post- c *7000 cal BC. Dotted vertical lines at 5000 and 10,000 cal BC are provided for orientation.*

2.2 The sites

The contextual information that we have from the Mesolithic sites of central England is unfortunately rather incomplete. The site of Stebbingford (*see* Fig 2.1) is in fact a medieval farm, but a shed antler was found in a palaeochannel and dated to the Mesolithic period. The antler shows no evidence of working but is in poor condition and it is therefore possible that any such signs may have been obliterated by weathering. It could be a non-anthropogenic find and, as it does not provide any extra information to what we already know for the Mesolithic in the region, it will not be mentioned again in this chapter.

The site of Misbourne Viaduct (236, Buckinghamshire; Wilson 1984) is an undefined settlement (presumably open), dated, according to its original report, to a generic Mesolithic. The zooarchaeology study is presented in an English Heritage Ancient Monuments Laboratory Report, and no formal publication of the site excavation as a whole seems to have been produced. It is possible that one of the reasons why the evidence from this site has not been published, when at first sight it is clearly important, is that the stratigraphy is rather mixed.

It is clear that, although some bones are definitely of Mesolithic date, the assemblage also includes earlier and later material, which of course has an important bearing on the interpretation of faunal representation. However, three of the radiocarbon dates (*see* Table 2.1 and Fig 2.2) indicate occupation close to 5000 cal BC, suggesting a late Mesolithic phase of occupation. The mixed dates do not, however, depend entirely on a mixed stratigraphy as the occurrence of several articulating elements (three red deer vertebrae, some cattle carpals, two sets of cattle phalanges, and other elements that may well have come from the same individual) indicate that some remains were in a primary deposit. We have no way of determining whether these articulated pieces are those that have been dated to the Mesolithic, although this does seem likely.

Stratford's Yard (354, Buckinghamshire; Grigson 1991) is the site for which we have the best-quality information. The occurrence of a flint-working floor indicates the rather specialised nature of this site, although the presence of a fair number of animal bones and charred hazelnut shell fragments suggests that consumption also occurred on-site. The presence of charred cereal grains is more problematic, and indicates some intrusion, such as might be caused by small rodents. A bulk sample of aurochs bone from various contexts (2nd and 3rd phalanges and a navicular) produced a date of 5000–4510 cal BC, which make this site approximately contemporary with the Mesolithic levels at Misbourne Viaduct and well within the late Mesolithic.

The site of Dog Hole Fissure (Creswell, Nottinghamshire; Jenkinson and Gilbertson 1984) is the only cave site of Mesolithic date in the region. It is radiocarbon dated to 10,090–9210 cal BC on bulk bone from several taxa combined (wolf, red deer and wild boar).

The presence of a 'warm-stage' vertebrate and molluscan fauna led Jenkinson and Gilbertson (1984) to suggest that the radiocarbon date was too early by as much as 1500 years. In addition, they suggest that the possible presence of 'old carbon' (a consequence of the 'hard water effect') may make a younger date feasible. However, Fig 2.2 shows the calibrated radiocarbon date to fall within the early part of the date range for sites such as Star Carr and Thatcham, which have a very similar vertebrate fauna. The vertebrate fauna, therefore, provides no grounds for questioning the validity of the radiocarbon date. Two non-diagnostic flint flakes were present in one stratigraphic layer, indicating human presence in the area at that time (which broadly corresponds with the layer with the most bone fragments).

No humanly modified bone was apparent. Gnawing marks on the bones, probably caused by foxes and perhaps also wildcats, suggest scavenging. Wild boar is represented by juvenile and even foetal animals, which suggests the occurrence of living animals on-site or nearby. Juvenile foxes are also present, suggesting denning. The overall impression is that this fauna is not necessarily anthropogenic. A real oddity of this report is that bovid remains are labelled as 'cow' and '*Bos taurus*', which would imply that we are dealing with the domestic form, a highly unlikely proposition for the Mesolithic, unless some mixing of the stratigraphy occurred. It seems reasonable to assume that these *Bos* specimens are in fact aurochs, also because they derive from a fairly well-sealed deposit.

The site of Steetley Cave (Worksop, Nottinghamshire; Jenkinson and Gilbertson 1984) is briefly mentioned here, as it has been suggested it represents a 5000-year-old badger den and it has a variety of animal species represented, some possibly dating to the Mesolithic. However, proper dating and stratigraphy cannot be fully deduced from the publication and the fauna includes species that represent much later introductions (eg rats). Because of this potential mixing, and the fact that we cannot be confident that the site includes any Mesolithic horizon, it has been excluded from the map in Fig 2.1 and will no longer be considered in this chapter.

2.3 Species occurrence

2.3.1 Main mammals

Although a large number of species was exploited in the British Mesolithic, those that are most regularly represented are the aurochs, wild boar, red deer and roe deer. This is also the case for the sites in central England. Table 2.2 and Fig 2.3 provide details of the frequency of these main species at Dog Hole Fissure, Misbourne Viaduct, Stratford's Yard and a number of other comparable sites outside the region. In the 10th and 9th millennium sites (cal BC) of Star Carr and Thatcham, red deer is the most common species. Aurochs is dominant at the three more recent sites, with dates falling after *c* 7000 cal BC (*see* Fig 2.2). The two sites with a preponderance of wild boar offer no clear chronological pattern. Despite this trend in species representation, it is difficult to establish whether such a change in the faunal spectrum is genuine or the result of chance. Although the increase in aurochs numbers in the late Mesolithic seems to be fairly clear-cut, we need more sites to test the hypothesis that Mesolithic people did indeed change their favourite prey in the course of the period.

All these four species were rather adaptable to different habitats and it is difficult to see how a general environmental change, perhaps in terms of an increase or decrease of woodland coverage, could explain their variable frequency. They all tended to live in forested areas, but red deer can also be found in open environments, as in most of northern Britain today, and the aurochs probably lived mainly in forest clearings, contributing to their maintenance and/or creation (Yalden 1999). The most specialised woodland species is probably the wild boar, relatively low levels of which, in sites after *c* 7000 cal BC, may lead to the speculation that a peak in forest density had occurred earlier and then declined by this time. This may be consistent with the suggestion of forest disturbance in the late Mesolithic caused by hunter-gatherer groups, for example in Derbyshire (Wiltshire and Edwards 1993). However, the two sites in which wild boar is dominant are somewhat separated in time and space, perhaps indicating changes in forest ecology on a more local scale, or that other factors may have been more influential.

Many explanations of the time variations in faunal composition, rather than environmental change, can be found. One of these is that the change is merely the result of prey choice, as the demise of other large animals, such as the elk and the horse (*see* section 2.3.2), may have led the late Mesolithic hunters to concentrate on other species of very large bulk, such as the aurochs. Local environmental and cultural factors may have also been significant. The finding of a number of skull frontlets of red deer (Fraser and King 1950), perhaps used in ceremonies or rituals, at Star Carr indicates that at this site this species may have also fulfilled a symbolic role (cf Conneller 2004). This may have not been the case in other regions and it is possible that during the course of the Mesolithic the situation may have changed, with human societies of the late Mesolithic not endowing the red deer with the same central role that it had fulfilled earlier on. Differences in excavation methods and zooarchaeological quantifications may also represent a contributing factor in the variable representation of taxa between sites, although Wilson (1984) claims that differential taphonomy or retrieval cannot explain the large number of aurochs bones at Misbourne Viaduct or other sites.

Maroo and Yalden (2000) attempted to reconstruct the composition of the Mesolithic mammal fauna of Britain, in quantitative terms, on the basis of a comparison with the species represented in the forest of Białowieza in Poland, regarded to be one of most pristine natural areas in Europe. The comparison led to the suggestion of a Mesolithic large mammal fauna dominated by red deer, followed in order by wild boar, roe deer and aurochs (the European bison was used as a proxy for this extinct species). If the comparison is of any validity it would therefore follow that it was in the early Mesolithic that the faunal spectrum, and consequently its surrounding environment, was most similar to that found today at Białowieza.

Table 2.2 Number of identified specimens (NISP) of the most common mammal species at a number of English Mesolithic sites. Sites from central England are in bold.

**Includes residual and intrusive material.*

Site	Location	County	Aurochs (NISP)	Wild boar (NISP)	Red deer (NISP)	Roe deer (NISP)	Reference
Stratford's Yard	Chesham	Buckinghamshire	24	19	18	9	Grigson (1991)
Misbourne Viaduct	Gerrards Cross	Buckinghamshire	43	27	32	13	Wilson (1984)
Cherhill	Calne	Wiltshire	82	19	23	3	Grigson (1983)
Faraday Rd	Newbury	Berkshire	5	166	7	10	Ellis *et al* (2003)
Star Carr	Scarborough	North Yorkshire	174	22	541	103	Legge and Rowley-Conwy (1988)
Thatcham	Newbury	Berkshire	12	110	141	69	King (1962)
Dog Hole Fissure	Creswell	Nottinghamshire	3	72	14	–	Jenkinson and Gilbertson (1984)

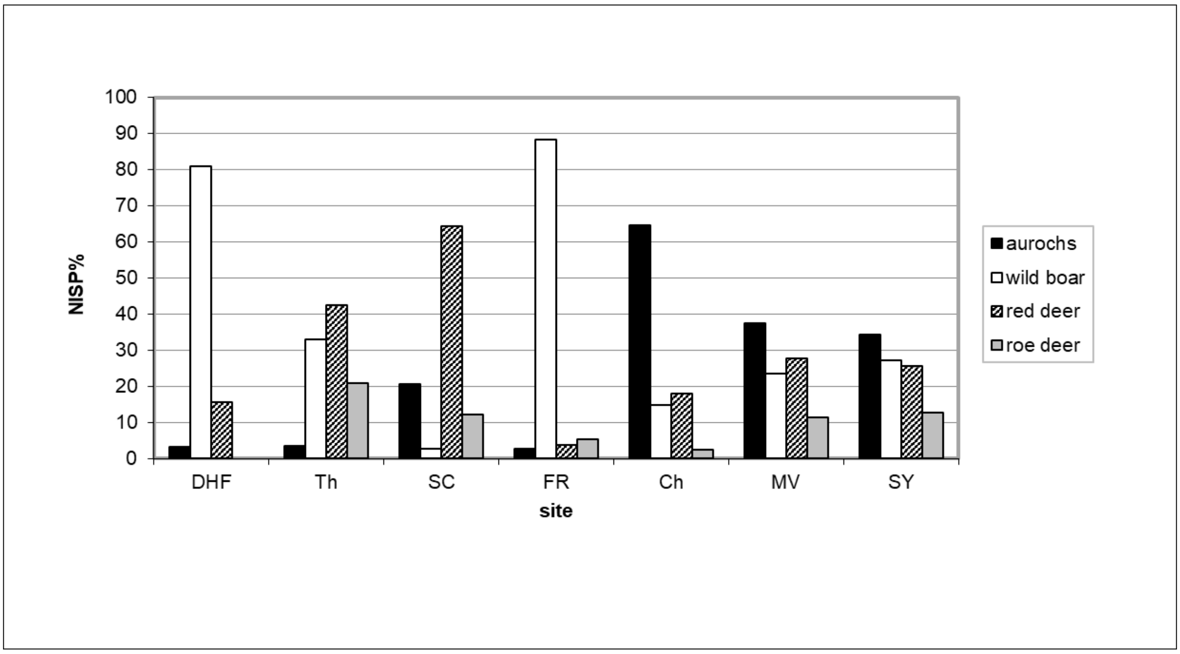

Fig 2.3 Summary of the four main large taxa hunted at Mesolithic sites across England, arranged in approximate chronological order (older sites on the left, younger sites on the right), as a percentage of number of identified specimens (NISP). DHF=Dog Hole Fissure, Nottinghamshire; Th=Thatcham, Berkshire; SC=Star Carr, North Yorkshire; FR=Faraday Rd, Berkshire; Ch=Cherhill, Wiltshire; MV=Misbourne Viaduct, Buckinghamshire; SY=Stratford's Yard, Buckinghamshire.

2.3.2 Mesolithic extinctions?

The only site in central England that has produced wild horse bones is Dog Hole Fissure, although these remains are not discussed in the original report. The absence of this species at Misbourne Viaduct and Stratford's Yard is unsurprising, as the wild horse is regarded to have become extinct by the late Mesolithic. Radiocarbon dates are given in Table 2.3. Clutton-Brock (1986) mentions a chance find of a metapodial from a gravel pit near the Darent River in Kent, which is dated to the 10th or early 9th millennium cal BC. A horse jaw was recovered at site K of Seamer Carr, in the Vale of Pickering (North Yorkshire; Schadla-Hall 1990), with a calibrated date range that falls slightly later than the Darent River specimen, but with considerable overlap. It is not possible, on this basis, to conclude which specimen is the later. If the bones from Dog Hole Fissure are genuinely as much as 1,500 years younger than the radiocarbon date given here, as Jenkinson and Gilbertson (1984) suggest, then this would make them the latest known horse remains from the British Mesolithic. However, there are uncertainties surrounding the dating of this site and the authors of the report only mention this find in passing. There is therefore insufficient evidence to move the date of the disappearance of the wild horse in Britain any further forward than the Seamer Carr and Darent River specimens.

The fact that there is no evidence of wild horses from the later 9th millennium cal BC does not necessarily mean that the species had completely vanished from the country. It is possible that small relict populations of wild horses lingered for longer. This issue is discussed in Yalden (1999, 78) and Bendrey (2010) and has a bearing on the interpretation of British Neolithic horses, which represents a subject for Chapter 2.

Table 2.3 Radiocarbon dates for English Mesolithic sites where horse is present.

Site and county	Material	Radiocarbon age, BP	Calibrated date range (95% confidence), cal BC
Seamer Carr, North Yorkshire	Bone (horse)	9790±180	9870–8720
Darent River, Kent	Bone (horse)	9770±80	9370–8920
Dog Hole Fissure, Nottinghamshire	Bulk bone (wolf, red deer and pig)	9960±140	10 100–9200

Another species that seems to have become rarer during the Mesolithic is the elk. It is therefore not surprising that it is not found at our later Mesolithic sites. Unlike the horse, the elk is also absent from Dog Hole Fissure, but occurs at other early Mesolithic sites such as Star Carr and Thatcham. Originally it was thought that by the 8th millennium BC this species had become extinct in Britain (Simmons *et al* 1981), but the dating of a specimen from Wigtownshire in Scotland has provided an uncalibrated date of 1925 BC (Kitchener and Bonsall 1997 in Yalden 1999, 74), which would indicate the survival of this species well into the Neolithic. Perhaps this is not so surprising if we consider that the elk survived in the Netherlands, at a latitude similar to the north of Britain, until the Roman period (4th century AD at Nijmegen IV; Lauwerier 1988, 145). However, even though elk seems to have survived until the post-Mesolithic in Britain, the evidence points towards its increasing rarity, and it is also possible that it was eventually confined to the north of the country.

Why did the wild horse and the elk become extinct, or at least rare? It has been suggested that the gradual forestation of the landscape is the cause of the demise of the horse, an animal best adapted to more open, tundra- or steppe-like environments (Clutton-Brock 1986; Yalden 1999). But this explanation can hardly apply to the elk, a typical woodland species. A combination of over-hunting and the eventual separation of Britain from the rest of continental Europe (Yalden 1999, 74) may well represent a reasonable explanation. Even if small pockets of elk survived for a number of millennia, these may have been so rare and elusive that they did not represent an attractive prey for human hunters. By the late Mesolithic hunting efforts were perhaps better concentrated on catching the equally large aurochs.

2.3.3 Other species

Although aurochs, wild boar, red deer and roe deer probably played the most predominant role in the protein diet and perhaps also the cultural sphere of the Mesolithic people, the central English sites have provided evidence for the exploitation of other species too. At Misbourne Viaduct, wildcat, badger, otter and beaver bones were found. Presumably these species were also hunted, as, at least for wildcat and beaver, evidence of butchery has been identified at other Mesolithic sites in Britain (Charles 1997). There is no mention of bird or fish bones but this might be because of a recovery bias, as no sieving was carried out at this site.

At Stratford's Yard only the four main mammals were retrieved through hand-collection, but sieving revealed the presence of rodent, bird and amphibian bones, which were not further identified. This is a pity as these species may represent useful environmental indicators.

The situation is rather different for Dog Hole Fissure, because, as mentioned in section 2.2, we cannot be sure of the anthropogenic origin of this assemblage. Does the fauna of this site represent animals hunted by people or is it instead a reflection of the species living in and around the caves independently from human occupation? Whatever is the case, in addition to the four main species, the mammalian fauna also included wolf (represented by a complete skull and more bones from the same individual), fox, wildcat, an unidentified mustelid, hare, beaver and the already mentioned horse (*see* section 2.3.2). The results of hand-collection and sieving were (unfortunately) combined and revealed the presence of a number of insectivores (common and pygmy shrew), rodents (bank vole and field mouse), bats (barbastelle, Natterer's bat and long-eared bat), birds (various passerines, mainly woodland species), fish (*Salmo* sp.) and amphibians. All these species were represented in small numbers, although at least four foxes were present. As a whole, these species represent a variety of different habitats, ranging from woodland (eg wildcat) to open steppe (eg bank vole) and riverine environments (eg beaver).

In general the dearth of fish remains at Mesolithic inland sites is intriguing, as one would expect this to be a useful resource to exploit, at least in the case of sites located in the vicinity of freshwater. In some cases, such as Misbourne Viaduct, where no sieving was undertaken, it is possible that fish bones were missed during hand collection, but even carefully excavated sites outside central England, such as Star Carr and Thatcham, have little or no fish remains. For Star Carr, Wheeler (1978) had originally argued that the absence of fish was biogeographical, as the environment was not conducive to the presence of pike and other species in the rivers located around the site. Price (1983, 768), however, has counter-argued that the site has produced bones of birds that are fish eaters, which indirectly proves the occurrence of fish in the area. Price's explanation for the lack of fish is that Star Carr merely represents a dump of waste material from a nearby settlement. Such waste may have been produced by a human group specialised in the processing of deer antlers and skins, as previously suggested by Pitts (1979). Fish bones were therefore not expected in this context. More recently, Robson *et al* (2018) have argued for the availability of fish and the occurrence of fish processing at Star Carr, based on new lines of evidence. To what extent these arguments can be applied to the central England sites is uncertain, particularly because we have such incomplete information about the archaeological context. It is, however, a subject that is worthy of further exploration, particularly in view of the propensity of coastal Mesolithic groups in Europe to rely extensively on water resources.

2.4 Domestication

Although it is widely believed that animal husbandry did not start until the Neolithic, there is evidence that the first animal domestication event occurred in the Upper Palaeolithic (eg Ovodov *et al* 2011) and that this was widespread by the Mesolithic. Fully domestic dogs have now been found at Mesolithic sites across the world (Olsen 1985; Benecke 1987; Chaix 2000), and Britain has its own example already in the early Mesolithic at Star Carr (Degerbøl 1961) and Thatcham (King 1962). There is, however, no evidence of dog occurrence in our area, and the only canid bones (identified as wolf) are from Dog Hole Fissure.

Concerning farmyard animals, sheep and goat do not have wild ancestors in Britain (or the rest of Europe). The domesticated forms do not turn up in European sites until the Neolithic and the idea that Mesolithic sheep were present in south-western Europe (Geddes 1985) has been superseded by further work on the origins of caprine domestication in the north-western Mediterranean (Vigne 1999). There is no record of these species in the Mesolithic of Britain and the eroded tibia shaft fragment thought to be 'comparable with small sheep' found at Misbourne Viaduct (Wilson 1984) is either from a roe deer or an intrusive specimen, which is highly likely in view of the radiocarbon dates for this site (Table 2.1).

It is more difficult to assess the wild or domestic status of cattle and pigs, as both species had wild ancestors in Europe, in the form of the aurochs and the wild boar, respectively. Recent genetic and zooarchaeological evidence has indicated that local events contributed to the domestication of both species in Europe (Götherström *et al* 2005; Larson *et al* 2005; Albarella *et al* 2006b), but it is much more difficult to establish a chronological framework for these phenomena. We cannot exclude the possibility that Mesolithic people had started at least to experiment with animal domestication. Zvelebil (1995) has, for instance, suggested that a close level of control of wild boar populations, perhaps comparable to taming, may have occurred in the Mesolithic of temperate Europe.

One of the criteria used to distinguish between domestic and wild populations relies on biometry; it is well known that domestication brought about a reduction in the size of animals (eg Davis 1987). The timing and mechanisms of such diminution are, however, variable and not fully understood. An extra difficulty is represented by the fact that the size of wild animals is also far from stable and, apart from obvious factors such as age, sex and individual variability, can change in both space and time.

At Misbourne Viaduct, Wilson (1984) claimed that, although all cattle bone measurements are within the range for aurochs, there is some size overlap with measurements from Neolithic domestic cattle. We have, however, seen (section 2.2) that some of the cattle bones are indeed Neolithic or later, and therefore this is hardly surprising. At Stratford's Yard, Grigson (1991) attributed all measurable bovine bones to aurochs, except for one metatarsal thought to be domestic. While the possibility of Mesolithic domestication should not be excluded completely, this evidence is not strong enough to suggest it. If the cattle metatarsal genuinely belongs to a domestic specimen this is more likely to represent an intrusion.

Pig bones from Misbourne Viaduct are said to represent 'wild stock largely unmodified by domestication' (Wilson 1984, 2). The greatest length of an astragalus from Misbourne Viaduct is much smaller than its equivalent at Stratford's Yard but is in keeping with the rather small size of the British Mesolithic wild boar (Albarella *et al* 2009; Albarella 2010). At Stratford's Yard specimens are listed as 'wild boar', and one astragalus (greatest length 52.4mm) is most definitely enormous (larger than any modern specimen from Europe; U Albarella, pers data).

These data make little sense if they are not interpreted in their more general context. Figure 2.4 compares the scant data of lower third molar dimensions from Mesolithic Britain with the much more abundant dataset from Mesolithic Denmark and with data from modern European wild boar. The few British measurements that are available derive from the sites of Star Carr (U Albarella, pers data; Legge and Rowley-Conwy 1988), Marsh Benham, Berkshire (U Albarella, pers data), and Faraday Rd (C Ingrem, pers comm, cited in Ellis *et al* 2003, where further details of the site may be found). The sample size is small, but it is clear that the British Mesolithic wild boars were much smaller than those inhabiting Denmark. They also tend to plot towards the lower half of the distribution of modern European wild boars. A lower third molar from Misbourne Viaduct measures 43mm and plots at the upper end of the British distribution, but it is smaller than most Danish specimens (it is not included in the diagram because the width is not available). Some of the measurements from the much later site of Roman Wroxeter (Shropshire; Hammon 2005) are well in excess of the measurements obtained for the Mesolithic and almost certainly derive from hunted wild specimens. British Mesolithic wild boar seem to have been small (with some, intriguing, exceptions) and size increase may have occurred in later periods. This trend has also been identified in other European areas, such as Italy (Albarella *et al* 2006b) and Portugal (Albarella *et al* 2006a). It is therefore unwise to assume that any small specimens from the Mesolithic may be indicative of an ongoing domestication process.

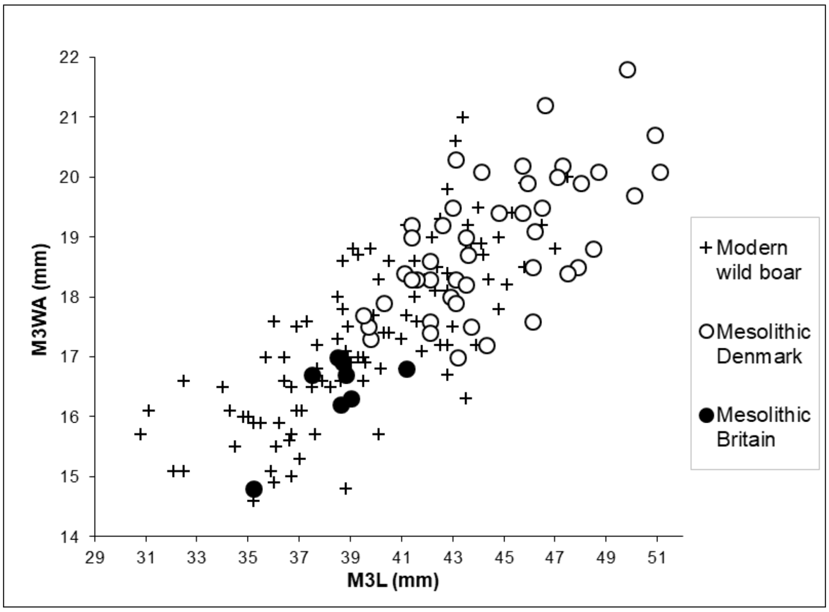

Fig 2.4 Size of the lower third molar (M_3) in modern and European wild boars and Mesolithic specimens from Britain and Denmark. Modified from Albarella et al *(2009). Measurement codes from Payne and Bull (1988). L=length; WA=anterior width.*

All in all, on the basis of the available evidence, the most pragmatic explanation for cattle and pig bones found at Mesolithic sites in Britain is that they derive from fully wild animals. Future research will perhaps clarify whether this is really the case.

2.5 Seasonality

Although we cannot be sure about patterns of behaviour in the past, it often appears that contemporary hunter-gatherer populations live a nomadic or partly nomadic existence, and therefore their settlements tend to be only seasonally occupied. A winter occupation was originally suggested for Star Carr (Fraser and King 1950) but this was based on the analysis of shed antlers, which, although seasonally cast by the deer, can be collected by people at any time of the year. On the basis of a re-analysis of ageing structures of several species, Legge and Rowley Conwy (1988) proposed a summer occupation of the site. More recently X-ray analysis of mandibles allowed a more detailed study of patterns of eruption in red and roe deer teeth, which led to the assumption that the site was also occupied in winter and spring (Carter 1997, 1998). A similar study was carried out on red deer mandibles from Thatcham, and also suggested that this site was occupied in winter (Carter 2001). The only seasonal information that we have in central England is represented by a roe deer skull fragment with pedicle and antler base, suggesting that the animal had been hunted between March and October (Corbet and Harris 1991, 520).

Various models reconstructing the movements of Mesolithic hunters between winter and summer camps and the coast have been suggested (Darvill 1987, 42–6; Price 1987). Isotopic analysis carried out on dog and bird bones from Star Carr and Seamer Carr has led to the suggestion that movement of people occurred between the inland and the coast (Clutton-Brock and Noe-Nygaard 1990; Schulting and Richards 2002), but this evidence has been questioned by others (Day 1996; Dark 2003). Animal remains certainly have the potential to contribute to the verification of possible seasonal movements and/or activities of Mesolithic people, but at the moment the evidence we have from central England is too scanty to add to this debate.

2.6 Human processes

There is little evidence in the central England Mesolithic sites of any direct modification of the bones caused by human activities. In particular, evidence of antler working, widely attested elsewhere for the Mesolithic, seems to be absent, despite the presence at both Stratford's Yard and Misbourne Viaduct of antler fragments. The only tentative evidence of bone handicraft is represented by a possibly worked metacarpal from Stratford's Yard, said to resemble a 'comb' (Grigson 1991).

The only sign of butchery is represented by cut marks on a cattle pubis reported at Stratford's Yard and suggested to indicate skinning (Grigson 1991). However, gutting and tendon severing are equally valid potential explanations.

There is little evidence of burning, with only a charred bird bone present at Stratford's Yard, but this is more likely to be accidental than related in any way to cooking practices. At the same site, Grigson (1991) notes the survival of foot bones above meat-bearing bones, and speculates that this may be the consequence of their use as a raw material (which is supported by the possible comb, and the presence of 'vertically split' bones). Alternatively, differential preservation of bone may have caused this apparent bias. She also rules out differential transport to the site as most body parts are represented. This, however, does not exclude the possibility that some animal carcasses may have been brought to the site whole and others as parts.

No evidence of modification of bones for potentially symbolic reasons, of the type found at Star Carr, has been observed at any of the central England sites. However, this does not mean that such use did not occur. Animals obviously played an important role in the subsistence of Mesolithic people and it would be surprising if they did not also influence the ideological sphere. This is yet another area in which future work will hopefully provide some information.

3 NEOLITHIC

3.1 The context

The Neolithic witnessed the beginning of plant cultivation, and the earliest domestication of livestock animals: cattle, sheep/goat and pigs. The date of the onset of these farming activities varies across the world, but there is a general consensus that such changes were already in place, although probably only in an incipient form, by the 9th millennium cal BC in the Near East (Peters *et al* 2005; Barker 2006). By the 7th millennium cal BC agriculture had spread into Europe, and by the end of the 5th millennium cal BC (Thorpe 1996; contributions in Whittle and Cummings 2007; Whittle *et al* 2011; Schulting 2013) it had reached British shores (therefore establishing the beginning of the Neolithic in our study area).

The first farmers are not only characterised by their use of domestic plants and animals, but also by the manufacture of pottery, polished axes and the adoption of a different flint technology. Monumental tombs (long barrows), wooden trackways and large enclosures, known as 'causewayed' enclosures because of the discontinuous nature of their ditches, also characterise the earlier part of the British Neolithic. In the course of the period there were substantial changes in both the domestic and ideological spheres of activities. The enclosures of the later Neolithic 'henges' tend to have continuous ditches. A variety of funerary monuments and tombs, including round barrows and monumental mounds, are also known for the period (Darvill 1987; Parker Pearson 2005).

The landscape was probably fairly densely forested at the time of the emergence of the first farmers, but the palynological evidence has indicated the early occurrence of clearings in the forest, with a particularly prominent decline in elm. We do not know to what extent this may have been caused by deliberate human activity, a mixture of environmental factors (including pathogenic attack similar to Dutch elm disease) or a combination of these phenomena (Peglar and Birks 1993). If we accept that clearings in the forest occurred naturally (*see* section 2.1), there would have been no absolute need for humans to fell trees to open up woodland areas for agriculture, yet evidence of anthropogenic forest clearing has been identified (Innes *et al* 2013).

3.2 The sites

The zooarchaeological evidence for the Neolithic of central England is extremely sparse, only marginally better than that for the Mesolithic. Only 13 Neolithic sites could be included in our database. To these, the sites of Foulmire Fen and Upper Delphs, Cambridgeshire (Legge 2006a, 2006b), not originally included in the database, have been added to the discussion. Not only are the sites few in number, but the assemblages tend to be small and the dating in several cases is uncertain. In addition, they are unevenly distributed, with virtually no Neolithic sites with reported faunas available for the western part of the region (Fig 3.1). As with southern England, there is a bias towards sites on chalk and limestone. The sites are listed in Appendix 1, and, with some additional detail, in Table 3.1.

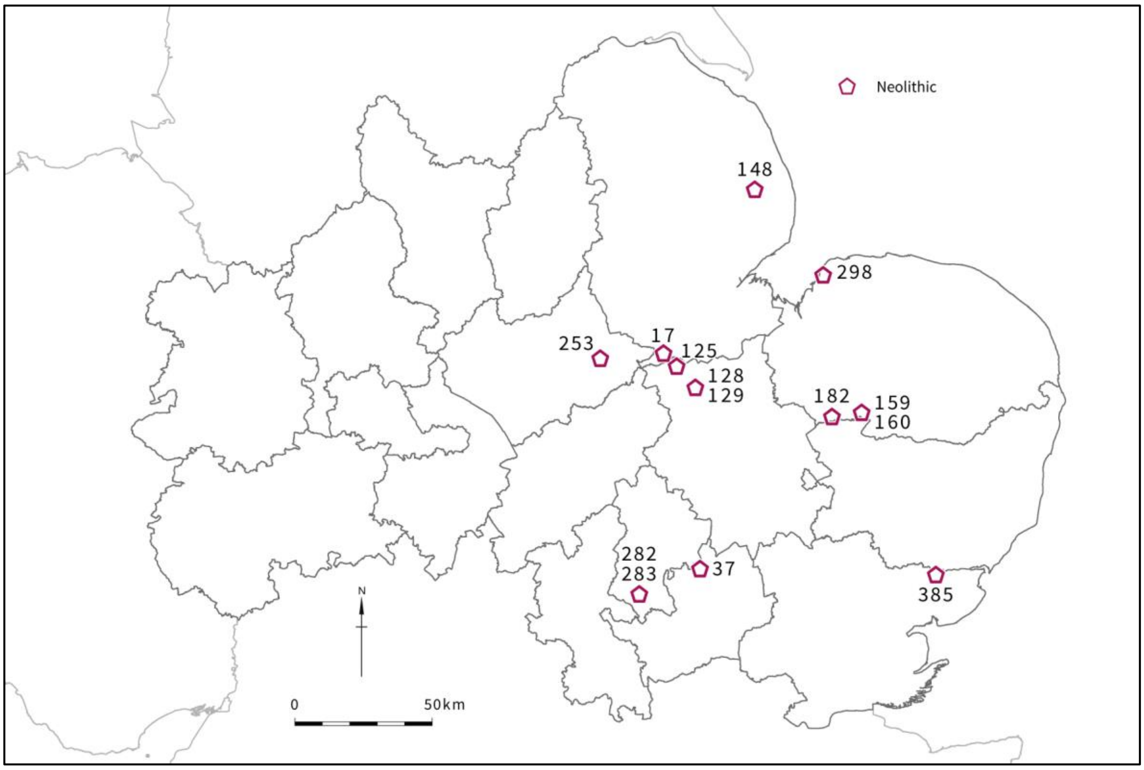

Fig 3.1 The distribution of Neolithic sites across central England. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text.

For some of the sites, radiocarbon dates are available via the ADS (*see* section 1.3.2 for details) and are presented in Table 3.2 and Fig 3.2. We compared these (calibrated) radiocarbon dates with the cultural attribution to period provided in the reports. The sub-division of the Neolithic period proposed by Parker Pearson (2005) has been adopted:

- early Neolithic, 4000–3200 cal BC
- middle Neolithic, 3200–2800 cal BC
- late Neolithic, 2800–2300 cal BC.

Interpretation of the dating must take into account the following potential questions.

- Can we assume that the animal bones are contemporary with the structural (architectural) evidence of the site?
- Can we assume that the animal bones are contemporary with the pottery?
- Can we assume that the animal bones are contemporary with the specimens that were radiocarbon dated?

To minimise this last problem, whenever possible, dating undertaken directly on bones, teeth or antler was selected. As shown in Table 3.2, this was not, however, always possible, and for some sites wood/charcoal dating had to be used. Figure 3.2 compares the dates of the central England sites with those of well-known sites with fauna occurring outside the study region. We selected the earlier phase at Windmill Hill (Avebury, Wiltshire) as representative of the early Neolithic, the earlier phase at Runnymede (Surrey) as representative of the middle Neolithic, and the assemblage from Durrington Walls (Durrington, Wiltshire), as representative of the late Neolithic. However, although published as a middle Neolithic site (Serjeantson 1991, 1996, 2006c), Runnymede has a chronology similar to Windmill Hill (and to the other Neolithic enclosure of Hambledon Hill, Dorset). Applying Parker Pearson's (2005) terminology to their chronologies, all three sites should be attributed to the early Neolithic. Consequently, we do not have an example of an animal bone assemblage that can be defined unambiguously as middle Neolithic, and the first part of the 4th millennium (ie the earliest Neolithic) is also virtually unrepresented.

The radiocarbon results summarised in Table 3.1 are illustrated in more detail in Table 3.2 and Fig 3.2. As a result of the rigorous re-analysis of the radiocarbon dates, the context of the bones and the associated material culture, the published dating of some of the assemblages has been reinterpreted.

Table 3.1 Summary of Neolithic sites in central England, indicating location, site type and associated pottery. Site numbers refer to those shown on the map in Fig 3.1, and as given in the gazetteer (Appendix 1). The reported period is that given in the original site report, while a reinterpretation of the period is based on radiocarbon evidence (summarised here, where available) in combination with cultural evidence. Ceramic types are as given in the site reports. The industry formerly known as 'Rinyo-Clacton' ware (asterisked) is now regarded as Grooved ware.

Foulmire Fen and Upper Delphs are not in the gazetteer.

BA=Bronze Age; EB=early Bronze Age; MB=middle Bronze Age; Neo=Neolithic; Mill=millennium.

Site no	Site name	County	Reported period	Approximate radiocarbon date	Pottery	Site type	Period reinterpretation
17	Barholm, near Peterborough	Lincolnshire	Late Neo	2nd half 4th mill to 1st half 3rd mill BC	Mainly Grooved ware	Open settlement	Early–middle Neo; fauna possibly not associated with pottery
37	Blackhorse Rd, Letchworth	Hertfordshire	Late Neo	2nd half 3rd mill to 1st half 2nd mill BC	Grooved ware and Beaker	Cluster of pits and/or ditches	Late Neo–EB
125	Etton, Stamford/ Peterborough	Cambridgeshire	Neo	2nd half 2nd mill BC	Mildenhall	Causewayed enclosure	MB; bones probably not contemporary with the monument and pottery, which suggests early Neo
128	Fengate (FN2), Peterborough	Cambridgeshire	Late Neo–EB	3rd mill to 1st half 1st mill BC	Grooved ware and Collared urn	Enclosure	Mainly late Neo, as pit with most bone has 3rd mill BC date and Grooved ware
129	Fengate (FN3), Peterborough	Cambridgeshire	Late Neo–MB	Long range of dates, with a clear 3rd mill BC component	Collared urn, Grooved ware, Deverel Rimbury and Beaker	Enclosure	Late Neo–MB
148	Giant's Hills 2, Skendleby, near Alford	Lincolnshire	Late Neo–EB	Relevant dates suggest mainly 3rd mill, though full range is late 5th/4th/3rd mill BC	Mainly Peterborough (though early Neo, late Neo, Beaker and BA all present)	Barrow	Neo (mainly late)
160	Grime's Graves 71–72, near Thetford	Norfolk	Late Neo	1st half 4th mill to 2 mill BC	Grooved ware with some Peterborough, Beaker and middle Neolithic bowl	Flint mine	Neo–BA; very poorly dated
182	Hockwold-cum-Wilton 61–62, near Brandon	Norfolk	Neo	No dates available	?	No information	Neo

Site no	Site name	County	Reported period	Approximate radiocarbon date	Pottery	Site type	Period reinterpretation
253	Oakham, Rutland	Leicestershire	Neo–EB	Late 3rd mill to 1st half 2nd mill BC	Various, including Peterborough	Ritual	Late Neo–EB (two ^{14}C dates suggest EB but Peterborough pottery indicates that the late Neo can also be represented) (later ^{14}C date is human burial: stratigraphic relationship to pit circles is unclear)
282	Puddlehill 51–76, Dunstable	Bedfordshire	Late Neo	No dates available	Grooved ware and Rinyo-Clacton*	Storage pit	Late Neo
283	Puddlehill, Dunstable	Bedfordshire	Late Neo	No dates available	Rinyo-Clacton*	Cluster of pits and/or ditches	Late Neo
298	Redgate Hill, Hunstanton	Norfolk	Late Neo	3rd mill to 1st half 2nd mill	Peterborough and Grooved ware	Open settlement	Middle-Neo–EB (because of ceramic association probably mainly late Neo)
385	Tye Field, Lawford, Colchester/ Manningtree	Essex	Late Neo	No dates available	Grooved ware	Enclosure	Late Neo
NA	Foulmire Fen, near Haddenham	Cambridgeshire	Early Neo	Mid-4th mill BC	Grimston-type bowl and Mildenhall bowl	Barrow	Early Neo
NA	Upper Delphs, near Haddenham	Cambridgeshire	Early Neo	Mid-4th mill BC	Mildenhall	Causewayed enclosure	Early Neo

Table 3.2 Radiocarbon dates from Neolithic sites within central England, and other English Neolithic sites mentioned in the text. All radiocarbon determinations and contextual information, unless asterisked, derive from the Archaeological Site Index to Radiocarbon Dates from Great Britain and Ireland, hosted by the Archaeology Data Service (ADS) at http://ads.ahds.ac.uk/catalogue/specColl/c14_cba/index.cfm (consulted 10.11.06).

Calibrated dates were obtained from OxCal Version 3.10, © C Bronk Ramsay (2005; https://c14.arch.ox.ac.uk/oxcal.html), using atmospheric data from Reimer et al *(2004). All calibrated dates with an error ≥25 years have been rounded to 10 years.*

**Source: Evans and Hodder (2006b, 21, table 1.1).*

***Source: U Albarella.*

Site and laboratory number	Material	Comments	Radio-carbon age, BP	Calibrated date range (95% confidence) cal BC
Sites within central England				
Giant's Hills CAR-819	Antler	Red deer antler (from mound)	4840±70	3770–3380
Giant's Hills CAR-820	Antler	Red deer antler (from primary fill of ditch)	4800±80	3710–3370
Giant's Hills CAR-818	Charcoal	Oak and ash charcoal (phase 5)	4450±70	3370–2900
Giant's Hills CAR-817	Charcoal	Ash charcoal (phase 5)	4370±70	3340–2880
Giant's Hills BM-2346	Bone	Aurochs tibia (phase 4)	4120±45	2880–2490
Giant's Hills CAR-816	Charcoal	Ash charcoal (phase 4)	3830±60	2470–2050
Barholm UB-457	Charcoal	Latest phase of Grooved ware	4305±130	3360–2570
Barholm UB-458	Bone	Collagen from animal bones	4255±135	3340–2470
Fengate 3 HAR-779	Charcoal		4190±90	3010–2490
Fengate 3 HAR-774	Charcoal		3980±100	2870–2200
Fengate 3 HAR-780	Charcoal	From around and below crouched inhumation	3850±120	2630–1950
Fengate 3 HAR-778	Charcoal		3780±90	2480–1940
Redgate Hill OxA-2311	Bone	Animal bone in association with Grooved ware	4170±90	2920–2480
Redgate Hill OxA-2310	Bone	Animal bone in association with Grooved ware	4005±90	2880–2230
Redgate Hill OxA-2309	Bone	Animal bone from construction/use phase of structure	3810±80	2480–2020
Redgate Hill OxA-2308	Bone	Animal bone from construction/use phase of structure	3370±70	1880–1490
Fengate 2 HAR-401	Charcoal	From pit Y4 (which contained >50% of the bone assemblage), in association with Grooved ware	3960±90	2860–2200

Site and laboratory number	Material	Comments	Radio-carbon age, BP	Calibrated date range (95% confidence) cal BC
Fengate 2 HAR-406	Wood	From stake driven into base of pit W17	3290±80	1750–1410
Fengate 2 HAR-786	Wood	Sample of young twigs from pit W17	2800±80	1210–800
Fengate 2 HAR-407	Wood	Sample of young twigs from pit W17	2670±90	1010–550
Blackhorse Rd BM-283	Charcoal		3830±140	2840–1890
Blackhorse Rd BM-284	Charcoal	In association with Beaker and Fengate ware	3590±130	2300–1610
Blackhorse Rd BM-186	Charcoal		3520±150	2290–1490
Blackhorse Rd BM-187	Charcoal		3310±150	1960–1260
Oakham OxA-2421	Charcoal	Hazel charcoal ('slightly later than expected, but acceptable')	3565±80	2140–1690
Oakham OxA-2587	Bone	Human bone	3390±70	1890–1500
Etton OxA-1311	Bone	Red deer (dates OxA-1311–1314 done with new pre-treatment)	3080±80	1510–1120
Etton OxA-1314	Tooth	Horse	3050±80	1500–1050
Etton OxA-1313	Tooth	Horse	3040±80	1490–1040
Etton OxA-1312	Bone	Red deer	3020±60	1430–1050
Grime's Graves BM-97	Antler	Antler from pit 12	4290±150	3370–2480
Grime's Graves BM-377	Antler	Antler from pit 12 (repeat of BM-97)	4250±130	3340–2480
Grime's Graves BM-944	Antler	Antler collagen from gallery 1	4153±64	2900–2490
Grime's Graves BM-945	Antler	Antler from gallery 3	4034±88	2880–2290
Grime's Graves BM-943	Antler	Collagen from antler by hearth	4104±55	2880–2480
Grime's Graves BM-88	Antler	Antler from pit 15	4050±150	2920–2140
Grime's Graves BM-99	Antler	Antler from pit 14	3980±150	2900–2030
Grime's Graves BM-93	Antler	Antler from pit 10B	3870±150	2870–1910
Grime's Graves BM-291	Antler	Antler from gallery III	3810±130	2580–1890
Grime's Graves BM-1546	Bone	(Collagen) Horse cranium from pit	3740±210	2860–1610
Grime's Graves BM-103	Antler	Antler from pit	3700±150	2560–1690
Grime's Graves BM-276	Antler	Antler from pit 12 (late infill)	3700±150	2300–1510

Site and laboratory number	Material	Comments	Radio-carbon age, BP	Calibrated date range (95% confidence) cal BC
Grime's Graves BM-812	Antler	Antler pick on working floor	3380±55	1880–1520
Grime's Graves BM-109	Antler	Antler from pit 8	3290±150	1950–1210
Foulmire Fen HAR-9178*	Bone	Secondary burial	5770±140	4950–4340
Foulmire Fen HAR-9177*	Wood	Proximal roof timber	5140±70	4060–3770
Foulmire Fen HAR-9176*	Wood	Façade timber	5050±60	3980–3700
Foulmire Fen HAR-9172*	Wood	Wall timber	4960±90	3970–3530
Foulmire Fen HAR-9175*	Wood	Floor timber	4950±70	3950–3630
Foulmire Fen HAR-9174*	Wood	Façade, bank timber	4930±60	3930–3630
Foulmire Fen HAR-9173*	Wood	Façade timber	4730±80	3660–3350
Foulmire Fen HAR-9171*	Charcoal	Cremation beneath mortuary structure	4660±50	3630–3350
Foulmire Fen UB-3167*	Wood	Floor timber	4947±20	3780–3650
Foulmire Fen UB-3168*	Wood	Floor timber	4900±18	3710–3640
Foulmire Fen UB-3169*	Wood	Floor timber	4891±18	3710–3640
Foulmire Fen UB-3170*	Wood	Floor timber	4893±18	3710–3640
Foulmire Fen UB-3171*	Wood	Floor timber	4874±20	3700–3630
Upper Delphs HAR-8092*	Charcoal	Ditch	4970±90	3970–3530
Upper Delphs HAR-10520*	Charcoal	Ditch	4690±90	3650–3120
Upper Delphs HAR-8096*	Charcoal	Ditch	4630±80	3640–3090
Upper Delphs HAR-8093*	Charcoal	Ditch	4560±90	3630–2930
Upper Delphs HAR-10512*	Peat	Ditch	4490±140	3630–2870
Upper Delphs HAR-10518*	Charcoal	Pit F	4020±110	2890–2200
Upper Delphs HAR-8094*	Charcoal	Palisade	3620±110	2300–1690
Sites outside central England				
Runnymede HAR-6131	Wood	(Waterlogged) Worked	4930±90	3960–3520
Runnymede HAR-6128	Wood	(Waterlogged) Pile	4920±80	3950–3530

Site and laboratory number	Material	Comments	Radio-carbon age, BP	Calibrated date range (95% confidence) cal BC
Runnymede HAR-6130	Wood	(Waterlogged) Worked	4830±70	3760–3380
Runnymede HAR-6133	Wood	(Waterlogged) Pile	4690±110	3700–3090
Runnymede HAR-6132	Wood	(Waterlogged) Pile	4630±70	3640–3100
Runnymede BM-2546	Bone	Collagen from middle Neolithic sequence (determinations at late end of range obtained elsewhere at site)	4600±90	3640–3020
Runnymede HAR-6136	Bone	Animal bone from late in Neolithic sequence	4270±110	3330–2570
Durrington Walls OxA-14800**	Bone	Human femur	4101±32	2870–2500
Durrington Walls OxA-14801**	Bone	Wild boar third metacarpal	4036±32	2830–2470
Durrington Walls BM-400	Antler	Antler protein, from base of main enclosure ditch	4000±90	2870–2210
Durrington Walls BM-399	Bone	Bone collagen, base of main enclosure ditch	3965±90	2860–2200
Durrington Walls NPL-240	Antler	Antler pick from N circle post-hole	3905±110	2840–2030
Durrington Walls BM-395	Antler	Antler protein, from post-packing, S circle phase II	3900±90	2620–2130
Durrington Walls BM-397	Bone	Bone collagen, from post-packing, S circle phase II	3850±90	2570–2030
Durrington Walls NPL-239	Antler	Antler pick from S circle post-hole	3760±148	2580–1750
Windmill Hill BM-2669	Bone	Collagen (cattle sp.) from primary chalk fill at base of outer ditch	4740±50	3650–3370
Windmill Hill BM-2670	Bone	Collagen (cattle sp.) from primary fill in middle ditch	4670±90	3650–3100
Windmill Hill BM-2671	Bone	Collagen (cattle sp.) at junction of primary/2nd fill in middle ditch	4550±50	3500–3090
Windmill Hill BM-74	Charcoal	From primary silt of ditch	4530±150	3640–2880
Windmill Hill BM-2672	Bone	Collagen (cattle sp.) at junction of primary/2nd fill in inner ditch	4370±50	3270–2890
Windmill Hill BM-2673	Bone	Collagen (cattle sp.) placed deposit in upper part of outer ditch	4310±60	3090–2870

Table 3.2 continued

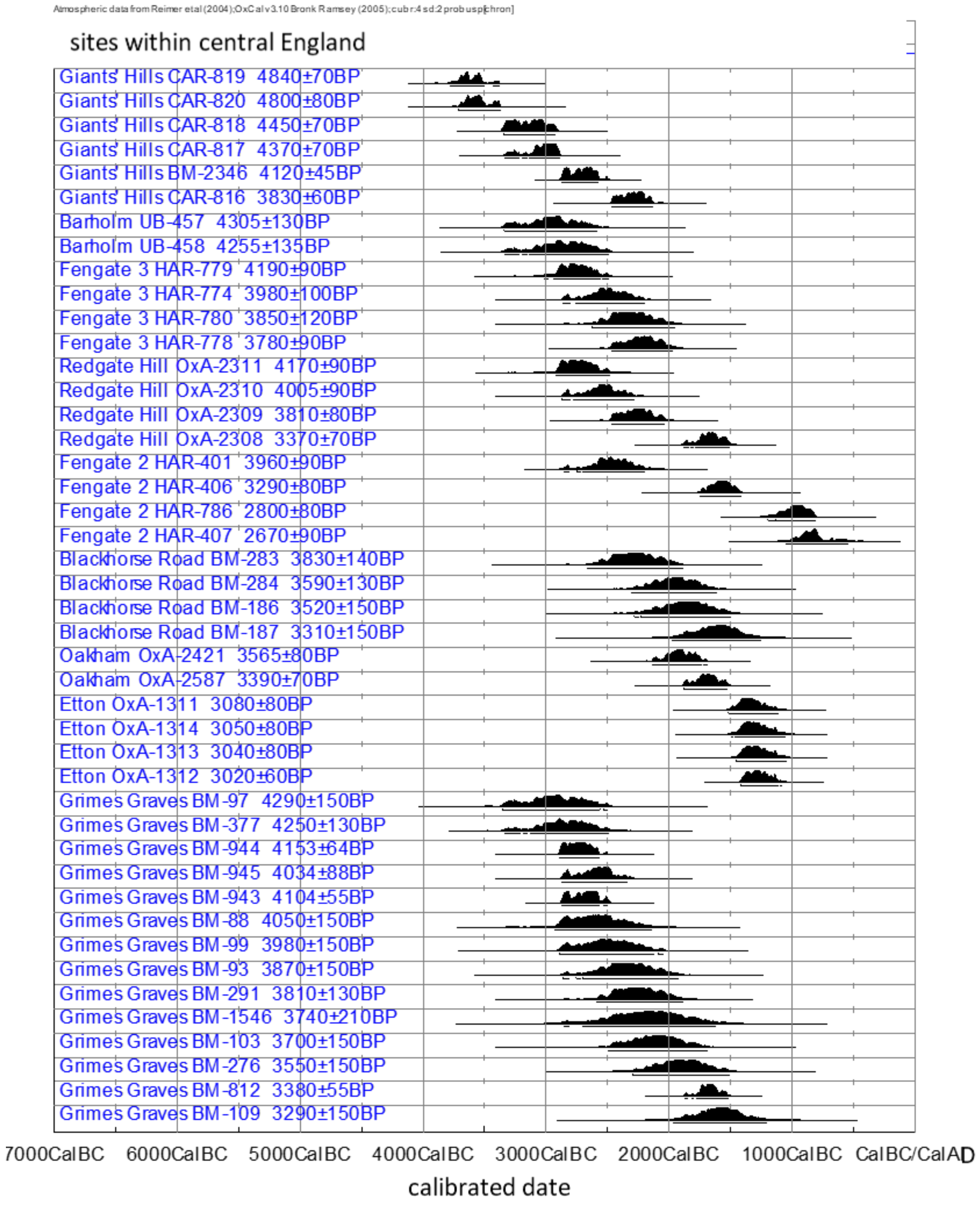

Fig 3.2 Probability plots for the radiocarbon dates listed in Table 3.2. Laboratory numbers and radiocarbon determinations are listed on the left (uncalibrated), while the dates plotted on the right are given in calibrated (Cal) years BC/AD. Data from three sites outside central England (Runnymede, Surrey; Durrington Walls, Wiltshire; and Windmill Hill, Wiltshire) are provided for comparison.

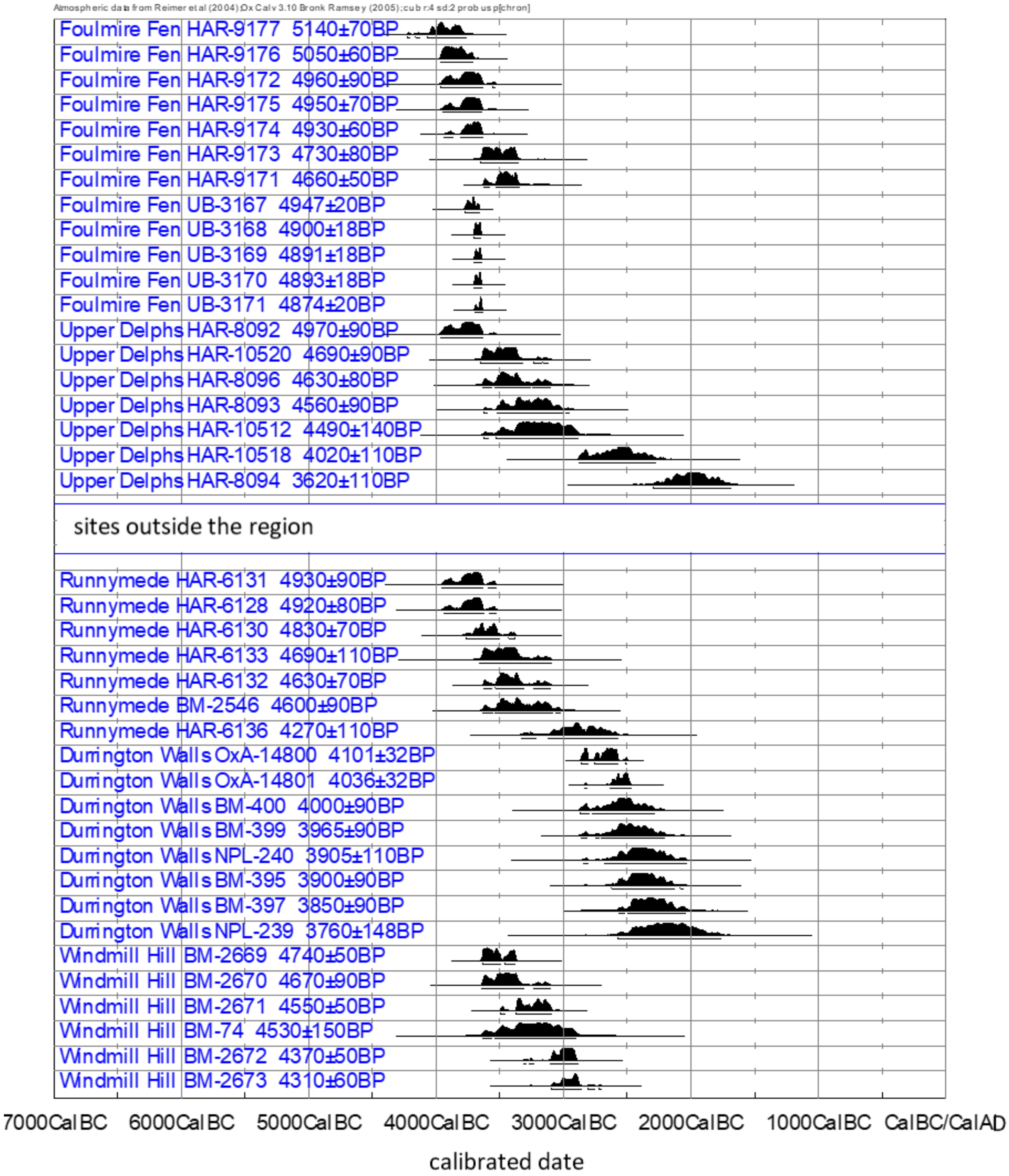

Fig 3.2 continued

What emerges from this chronological analysis is that the assemblage from one of the sites, Etton, Stamford/Peterborough (site code 125, Cambridgeshire; Armour-Chelu and Clutton-Brock 1985), probably belongs to the Bronze Age rather than the Neolithic, and therefore should be excluded from the discussion within this chapter. Etton is a causewayed enclosure, a monument characteristic of the early Neolithic in Britain, but some of the fauna has been radiocarbon dated to the second half of the 2nd millennium BC and is unlikely to be contemporary with the enclosure. Excluding this site's assemblage does not represent a substantial loss for the review, as the fauna from this site is not fully reported but it is only mentioned as part of a note on pathological conditions

(Armour-Chelu and Clutton-Brock 1985). The suggested hypothesis, based on palaeopathological evidence, that the cattle were used for traction, must therefore be applied only cautiously to the Neolithic, as is more likely to reflect a Bronze Age phenomenon. However, a later publication by Armour-Chelu (1998) does refer to genuinely early and middle Neolithic material from Etton (although without radiocarbon dating), which is discussed further in sections 3.3–3.6.

For a few other sites a very imprecise chronological definition emerges, with Bronze Age elements mixed with the Neolithic assemblage. For instance, the report for the site of Fengate (FH3) (the Newark Rd sub-site; 129, Cambridgeshire; Biddick 1980) suggests a very mixed stratigraphy covering both the late Neolithic and a substantial part of the Bronze Age, which is confirmed by the radiocarbon dating. The assemblage from Grime's Graves 71–72 (160, Norfolk; Legge 1981a) represents a similar case and is even less accurately dated; the initial suggestion of a purely late Neolithic fauna cannot be accepted because of the great range of radiocarbon dates. The alleged Neolithic fauna overlaps in dating with the better known animal bone assemblages from the Bronze Age midden, which will be discussed in Chapter 4.

The site of Oakham, Rutland (253, Leicestershire; Gouldwell 1998) was originally dated approximately to the Neolithic–early Bronze Age, but the two radiocarbon dates available are both suggestive of early Bronze Age activity. The occurrence of Peterborough ware does, however, suggest that some of the bones may belong to the late Neolithic, but they were perhaps not selected for dating. The uncertainty can only be resolved by a more extensive radiocarbon dating programme of this fauna.

The other assemblages are probably at least predominately Neolithic, on the basis of the radiocarbon dates and cultural associations, but the early Neolithic in central England is only represented by two small assemblages deriving from sites in the Haddenham area, Cambridgeshire. All the other sites are either generically Neolithic or late Neolithic, with these latter sometime including Bronze Age elements. No middle Neolithic assemblages are represented in the study area, although a few sites, noticeably Barholm (17, Lincolnshire; Harman 1993d), may have a middle Neolithic component.

3.3 Domestication

The occurrence of domestic livestock is one of the characteristics that helped us define the sites discussed in this chapter as Neolithic. While the wild or domestic status of cattle and pig bones is subject to interpretation, sheep and goats did not have wild ancestors in Europe and therefore their occurrence can safely be regarded as an indication of animal husbandry.

Caprine bones were found, albeit in small numbers, at both the early Neolithic sites of Foulmire Fen and Upper Delphs, Cambridgeshire, and were ubiquitous at all the other Neolithic sites in the study area. Bones definitely identifiable as sheep have been found at late Neolithic Fengate (FN2) (the Storey's Bar sub-site; 128, Cambridgeshire; Harman 1978a) and late Neolithic–early Bronze Age Oakham, whereas a goat mandible was found at the late Neolithic site of Redgate Hill, Hunstanton (298, Norfolk; G G Jones 1993b). The only early Neolithic site for which the presence of both sheep and goat is reported is Etton (Armour-Chelu 1998). It therefore seems that both species were probably present in central England by the late Neolithic, and it is likely that they were both introduced early in the Neolithic, although radiocarbon dating confirmation from Etton is needed. We have no other specific identifications of either sheep or goat in the early or middle Neolithic, which means that, apart from Etton, we cannot be sure whether only one, and, if so, which of the two, or both species were present. In addition, we have a gap of *c* 1,000 years between the latest Mesolithic site (Stratford's Yard) and the earliest Neolithic sites (Foulmire Fens and Upper Delphs). This means that we do not know whether in the period of the Mesolithic–Neolithic transition in central England the advent of domesticated animals was a sudden or gradual phenomenon.

The situation regarding cattle and pigs is more complex, because the distinction of wild and domestic forms is not straightforward. Wild forms tend to be larger and, considering that our sites post-date the very beginning of domestication events in Britain, it is possible that, by the Neolithic, morphological and size differences between the domestic forms and their wild ancestors had become more pronounced. There is known size overlap between female aurochs and male domestic cattle (Degerbøl and Fredskild 1970) and between wild boar and domestic pigs, as a result of a number of factors, including age, sex and individual variability (Payne and Bull 1988), which means that caution is required when making identification.

According to the sources used, aurochs was positively identified at the late Neolithic sites of Puddlehill (283, Bedfordshire; Ewbank 1964), Puddlehill 51–76 (282, Bedfordshire; Grigson 1976), Blackhorse Rd, Letchworth (37, Hertfordshire; Legge *et al* 1989), and Fengate (FN2), and the generically Neolithic sites of Hockwold-cum-Wilton 61–62 (182, Norfolk; Anon 1982) and Giant's Hills 2, Skendleby, near Alford (148, Lincolnshire; Noddle and Grigson 1991) (Table 3.3), as well as Etton (Armour-Chelu 1998). Domestic cattle are supposed to have been present at all sites mentioned in Table 3.1, but only in a few cases were the reasons for such identifications explained. At early Neolithic Foulmire Fen one of the three measurable specimens is large but still possibly belongs to domestic cattle, whereas the other two specimens are well within the assumed size range for the domestic form. At late Neolithic Redgate Hill, the cattle specimens are definitely smaller than aurochs, and at the late Neolithic Puddlehill sites both forms are thought to be present. In particular, at Puddlehill 51–76 four individuals are interpreted as aurochs, and one as probably domestic. These assumptions are based on comparisons of tooth measurements with modern Chillingham cattle (as an analogue for Neolithic domestic cattle), and bone measurements with Danish aurochs data and Windmill Hill cattle that are presumed to be domestic. The other Puddlehill site reports post-cranial measurements of two different size classes, interpreted as domestic cattle and possible female aurochs. The cattle remains from Hockwold-cum-Wilton 61–62 are considered to be similar in size to those from the Bronze Age and are therefore presumably mainly domestic. In the Bronze Age, aurochs had become rare.

At Redgate Hill, the pigs are larger than Romano-British specimens but generally smaller than wild boar, and are therefore interpreted as being domestic. Seven pig bones (part of a forelimb in articulation and three metapodials) found together in a pit at Puddlehill 51–76 are said to be large enough for wild boar. The humerus has a trochlear breadth of *c* 38mm, which is greater than the range calculated for this measurement at Durrington Walls (Albarella and Payne 2005). Other specimens from this site are, however, regarded as domestic. Wild boar is also said to have been found at Fengate (FN2) (Table 3.3).

There are no reasons to question the wild/domestic identifications for cattle and pig, but it is clear that the sites would benefit from a biometric re-analysis using recent reviews as a framework of reference (Viner-Daniels 2014; Wright and Viner-Daniels 2015; Wright 2016).

Overall, the evidence suggests that in central England, as elsewhere in Britain, cattle and pigs were mainly reared rather than hunted by Neolithic populations. However, we are still unsure of the relative proportions of the wild and domestic components and of the extent to which wild and domestic populations were genetically isolated.

Another important issue, for which we still have no answers, concerns the mechanisms of domestication of cattle and pig in Britain. Were the domestic animals introduced, domesticated locally, or did domestication arise from a combination of the two processes? Genetic work undertaken on cattle and pigs has proven that introduced elements from the Middle East and local animals both contributed to the creation of prehistoric domestic cattle and pigs in Europe (Götherström *et al* 2005; Larson *et al* 2005; Beja-Pereira *et al* 2006; Larson *et al* 2007). The work on pigs in particular proves that domestic animals of European origin were present in prehistoric Britain. We cannot, however, say whether these were the descendants of animals locally domesticated or imported from other European areas, as the characteristics of the mitochondrial DNA of wild boar help to discriminate between European and Middle Eastern animals, but not between Britain and other European areas (Larson *et al* 2007).

3.4 Species occurrence and frequency

3.4.1 Main mammals

Sheep and goats were introduced to Britain during the Neolithic, but throughout the period they never had the economic, nor perhaps the social, importance of cattle and pigs. Figure 3.3 shows that they are regularly the least represented of the three main livestock in central England. The only exception is the site of Fengate (FN3), which, probably not by chance, is the only assemblage that includes a substantial Bronze Age component. Even though we have to bear in mind that the cattle and pig may include some bones of wild forms that cannot be distinguished from domestic animals, the general impression that Neolithic animal husbandry relied mainly on cattle and pigs remains valid.

The general pattern in the relative proportions of cattle and pigs suggests a higher proportion of cattle in the earlier part of the Neolithic, a predominance of pig in the late Neolithic, and a return to a cattle-dominated husbandry in assemblages that have a Bronze Age component. The smaller assemblages, although not plotted in Fig 3.3, tend to provide information that is consistent with this pattern. Important sites located in southern England, such as Windmill Hill (Grigson 1999), Hambledon Hill (Mercer 1980), West Kennet Enclosure (Wiltshire; Edwards and Horne 1997) and Durrington Walls (Harcourt 1971a; Albarella and Serjeantson 2002), are consistent with the evidence from central England. At Runnymede, however, there is a surprisingly high frequency of pigs for such an early site (Serjeantson 2006c).

There are various factors, in addition to chronological changes, that must also be considered when interpreting the predominance of either cattle or pig, including the activities that were being undertaken at a particular site, the pottery associated with the animal bones, the accuracy of the dating and the efficiency of recovery.

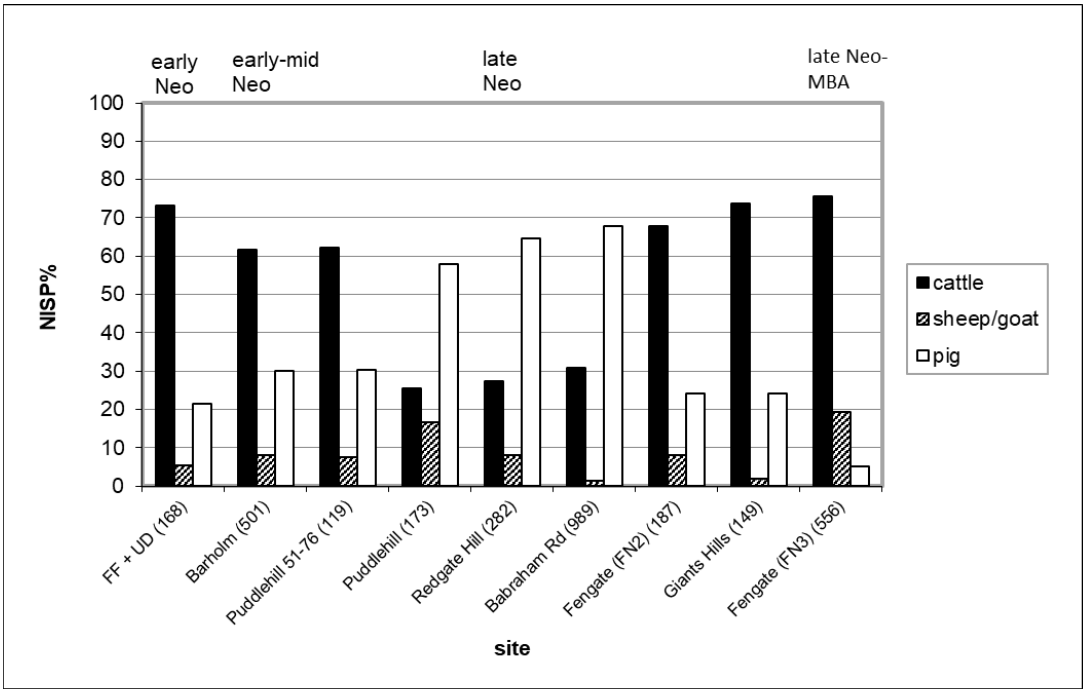

Fig 3.3 Summary of the three main domestic taxa at various Neolithic sites across central England, as a percentage of number of identified specimens (NISP). The numbers in parentheses refer to the NISP of cattle+sheep/goat+pig from each site. Only assemblages with a total NISP for the three taxa >100 are shown. The sites are arranged in approximate chronological order. Neo=Neolithic; MB=middle-Bronze Age. For further details see *Tables 3.1 and 3.2 and Fig 3.2. Foulmire Fen (FF) and Upper Delphs (UD) (Cambridgeshire; Legge 2006a, 2006b) and Babraham Rd (Cambridgeshire; I Baxter, pers comm) are not in the gazetteer.*

The site of Puddlehill 51–76, for instance, represents an exception to the rule of pig predominance in the late Neolithic. This may be related to the fact that the animal bones from the site derive from a storage pit, which may well have had a specialised function. Fengate (FN2), which we have interpreted as a predominately late Neolithic assemblage (Table 3.1), also has more cattle than pig bones, but the contribution of Bronze Age elements to this assemblage is difficult to establish with any precision.

It has been suggested that sites with Grooved ware may have more pig bones than sites characterised by other pottery styles (Grigson 1982; Albarella and Serjeantson 2002). This is difficult to assess on the basis of the evidence for central England, because of the dearth of late Neolithic sites with a clear predominance of Peterborough ware, the other widespread late Neolithic pottery in Britain. The only case is represented by the barrow at Giant's Hills 2, which does show a predominance of cattle bones. This may also be related to the nature of the sites, as Parker Pearson (2005) has suggested that funerary sites may have a predominance of cattle bones and feasting sites a predominance of pig bones. Of the sites not included in Fig 3.3, Blackhorse Rd and Tye Field, Lawford, Colchester/Manningtree (385, Essex; Shennan 1985), both with Grooved ware, have a predominance of pig bones, whereas Hockwold-cum-Wilton 61–62 and Grime's Graves 71–72, the former lacking radiocarbon dates and the latter having a long chronological range, have a predominance of cattle bones. These assemblages are very small, but nonetheless it is notable that they are consistent with the established pattern.

The reasons why the late Neolithic as a whole is characterised by such a great consumption of pork have been debated at length (Grigson 1982; Albarella and Serjeantson 2002). Whereas Grigson (1982) has emphasised the existence of potentially favourable environmental conditions for pig pasture in that period (mainly as a result of forest regeneration), Parker Pearson (2005) has drawn attention to the fact that the late Neolithic in Britain is mainly known for its ceremonial sites, which may have favoured the consumption of fast growing and reproducing animals such as pigs. However, work in progress by the author (U Albarella, unpublished data) indicates that, in Britain as whole, there is no association between ceremonial sites and pigs, whereas it is by and large true that sites with Grooved ware have more pig bones. We still lack a clear explanation for the predominance of pig in the late Neolithic, but hopefully future work will shed light on this important aspect of British prehistory. Whatever explanation new evidence provides, it is likely to be complex rather than mono-causal.

3.4.2 Equids

None of the vertebrate species that survived to the end of the Mesolithic seem to have become extinct in the Neolithic, but the case of the horse is complex and deserves some discussion. As mentioned in Chapter 2, there is no evidence for the survival of the wild horse in central England, or elsewhere in Britain, after the 9th millennium cal BC. This contrasts with the situation on the European mainland, where small numbers of wild horses seem to have survived well into the Neolithic, at least in central and western Europe (Uerpmann 1990).

Whether any horses, wild or domestic, were present in Britain in the Neolithic remains contentious. Middle 3rd millennium cal BC horse bone dates for Newgrange in Ireland (Van Wijngaarden-Bakker 1975; McCormick 2007) and Quanterness in Orkney, Scotland (Clutton-Brock 1986) suggest the early introduction of horses to the British Isles via an Atlantic route. These animals are presumed to be domestic and are associated with Beaker sherds, a style of pottery that in Britain is associated with the transition between the Neolithic and the Bronze Age (but overlaps with late Neolithic pottery styles such as Grooved ware and Peterborough ware) (Parker Pearson 2005). Recent new radiocarbon dates on the Newgrange horses have, however, put into question previous work and suggested an Iron Age date for these specimens (Bendrey *et al* 2013). It does remain possible that the so-called Beaker Folk were responsible for the introduction of the domestic horse to Europe, including Britain, but the topic is clearly in need of a systematic review of the chronological evidence.

In southern England, the site of Durrington Walls, which is roughly contemporary with Newgrange but dominated by Grooved ware pottery, has also produced horse bones. In the original report on the animal bones from this site, Harcourt (1971a) suggested that the horses were wild, as at the time of publication there was no notion of an introduction of domestic horse into Europe as early as the late Neolithic. Harcourt's (1971) suggestion has some support from the fact that most of the Durrington Walls horse bones are butchered (U Albarella, pers observ), perhaps indicating that the animals represent prey rather than valuable exotics that were utilised for riding. Our present knowledge regarding the chronology of wild and domestic horses, however, points more towards an interpretation of the Durrington Walls horses as being domestic.

The discussion of the wild or domestic status of the Durrington Walls specimens is a moot point if the radiocarbon dates on horse remains from this site published by Stevens and Hedges (2004, table 1) are verified. These dates suggest an Iron Age origin of the bones, opening up the possibility that they are intrusive. It is, however, also possible that the horse bones that have been radiocarbon dated belong to a different assemblage, deriving from the Iron Age site also known at Durrington Walls (Westley 1971). If this is the case, they would not disprove the occurrence of horses in the late Neolithic of

Wiltshire. Unfortunately, no details regarding the context of the dated horse remains are provided in Stevens and Hedges (2004). More recently, Bendrey (2010), referring to L Kaagan's unpublished PhD dissertation, provides late Bronze Age to Iron Age radiocarbon dates for three allegedly late Neolithic horse bones from Durrington Walls. Radiocarbon dating of horse bones found in late Neolithic contexts uncovered by more recent excavations at the same site have invariably produced Iron Age and Roman dates (M Parker Pearson, pers comm). Overall, there is insufficient evidence to regard the Durrington Walls horses as genuinely Neolithic; they are, in fact, more likely to be later.

The early Neolithic levels at Runnymede have also produced horse bones but, in the absence of radiocarbon dates, their chronology must be regarded as suspicious (Serjeantson 2006c). This is particularly true given that the site also has evidence of late Bronze Age occupation, which may be responsible for some stratigraphic mixing.

In central England the earliest post-Mesolithic evidence of horse remains comes from Barholm and Grime's Graves 71–72 (Fig 3.4). There are uncertainties about the dating of Barholm, which is reported as a late Neolithic assemblage but has been radiocarbon dated as early to middle Neolithic (Table 3.1). The presence of horse remains at Barholm (three specimens all from the same pit) is therefore noteworthy because, if consistent with the other dates obtained for the site, it would represent the earliest Neolithic horse known in Britain. To confirm this, however, we need radiocarbon data taken directly from the horse bone. For Grime's Graves 71–72, Legge (1981a) reports the occurrence of two horse bones in the old land surface located below middle Bronze Age mining dumps. A horse skull was also unearthed at this site that, according to radiocarbon dates provided by Clutton-Brock and Burleigh (1991), is only slightly younger than the specimens from Quanterness and, therefore, is another candidate for the earliest known domestic horse in England.

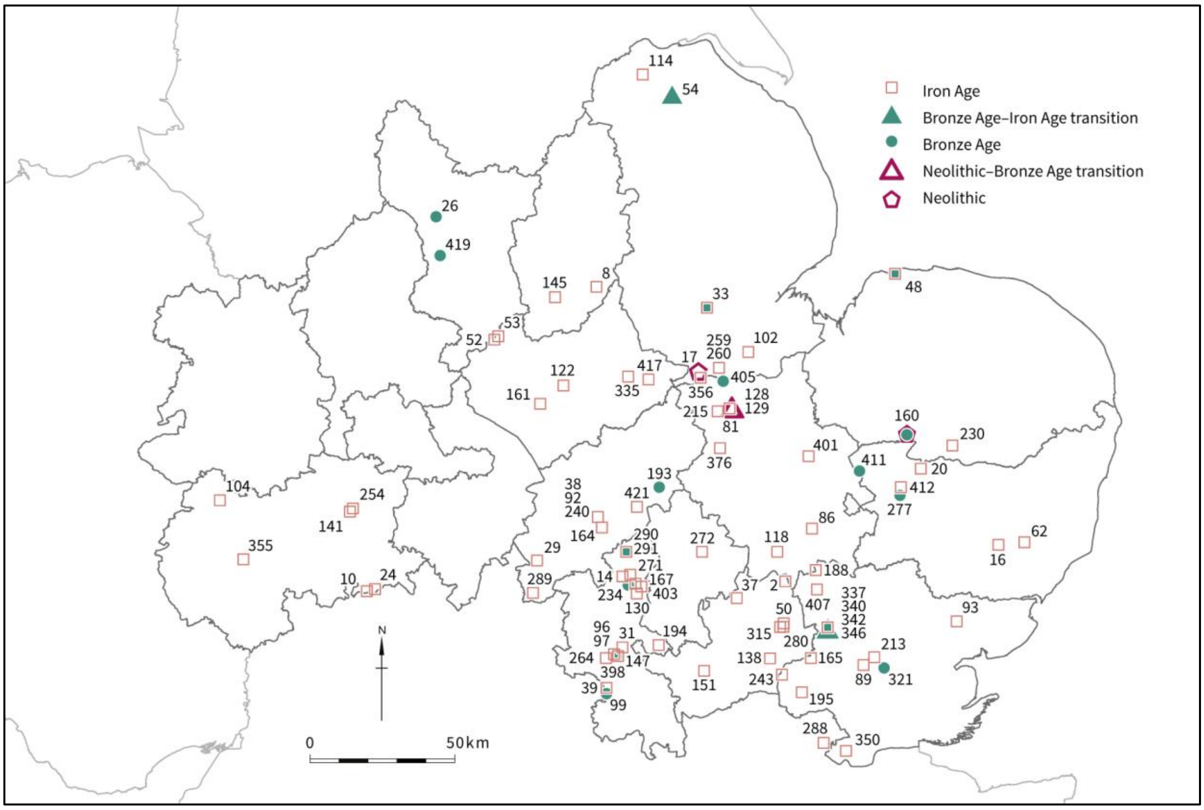

Fig 3.4 The distribution of prehistoric sites across central England with horse or equid present. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text. Neolithic sites: Barholm, site 17, and Grime's Graves 71–72, site 160.

Recently, the occurrence of horse bones at the, as yet unpublished, middle Neolithic site of Partney, Lincolnshire, has opened up the possibility of a late survival of wild horses or early introduction of domestic horses in central England. Radiocarbon dates have, however, revealed that one of the bones is of Iron Age origin, and a bone that produced a *c* 3000 cal BC date may in fact not be horse (I Baxter, pers comm).

In conclusion, despite gaps and uncertainties in the evidence, it seems likely that wild horses never graced the post-Mesolithic landscape of central England (and perhaps Britain as a whole), and that domestic horses were introduced towards the very end of the Neolithic or the beginning of the Bronze Age. More work, both in terms of dating and stratigraphic reinterpretation of some assemblages, is needed in order to understand the details of the chronology and mechanisms of such an introduction.

As far as the donkey is concerned, by the mid-3rd millennium cal BC this had been domesticated in the Near East and North Africa (Clutton-Brock 1992, 65), but we have no evidence of its occurrence in the Neolithic or in fact in any prehistoric period in central England. We must, however, consider the difficulties in separating the bones of horses and donkeys and their hybrids, which may hamper the detection of evidence for donkeys in England.

3.4.3 Other species

Dogs had already been domesticated in the Mesolithic (*see* section 2.4) and dog remains have unsurprisingly been found in the Neolithic, in particular at the sites of Hockwold-cum-Wilton 61–62, Barholm, Grime's Graves 71–72 and Foulmire Fen. At Redgate Hill there are no dog remains but the presence of these animals is suggested by gnawing marks on bones (although these can be difficult to be distinguished from those of wild canids).

According to Harcourt's (1974b) review of dog size from archaeological sites in Britain, Neolithic specimens had a shoulder height ranging from 430 to 620mm. More recently, Clark (2006) has suggested that the variability of Neolithic dogs is greater than previously thought, not only because of the existence of smaller dogs than originally found by Harcourt (as small as 370mm at shoulder height), but also in terms of their cranial shape. Clark (2006) also suggests that some of the 'dog' specimens unearthed from prehistoric sites in Britain may in fact represent hybrid forms of dogs and wolves. Because we do not know the size of the now extinct British wolves, it is hard to tell whether any pure wolves, rather than just hybrids, may be present in finds labelled as 'dogs'.

The only information about Neolithic dog size in central England comes from the site of Grime's Graves (159, Norfolk; Burleigh *et al* 1977), where the shoulder height of a specimen found at that site is given as 520mm. This is approximately in the middle of Harcourt's range and should quite safely be identified as a domestic dog. A possible wolf specimen is mentioned from the site of Fengate (FN3), but that site has a mixed Neolithic–Bronze Age stratigraphy. Wolf occurrence is also reported at Etton (Armour-Chelu 1998) but no explanation is provided for its identification. Considering that dog is also present, without further verification this finding cannot therefore be relied on.

Red and roe deer were both hunted in the Neolithic of Britain but, with the remarkable economic and social changes brought about by the introduction of husbandry, they had lost some of their importance compared with during the Mesolithic, and are found in relatively small numbers at Neolithic sites. Red deer is ubiquitous in central England, whereas roe deer has only been identified at Giant's Hills 2, Grime's Graves 71–72, Puddlehill, Redgate Hill, Hockwold-cum-Wilton 61–62 and Foulmire Fen (*see also* Table 3.3).

With the exception of Grime's Graves 71–72 (where red deer is more common than pig), the deer species are consistently less well represented than the main domesticates cattle and pig. A problem in assessing the frequency of deer species is that it is not always possible to determine whether the counts include antler fragments. Antler fragments should be excluded from quantifications as they are not present in all taxa and their occurrence does not necessarily indicate hunting of these species, as antlers can be collected once shed. At Puddlehill, however, unshed red deer antler was found, which is indicative of a carcass, or at least part of it, being brought to the site. Red deer is fairly common (and antlers are clearly excluded) at both the early Neolithic sites of Foulmire Fen and Upper Delphs, indicating that, at this time, at least in this area (the Fenlands), deer hunting was still of some importance.

Other wild mammals are rare and their occurrence is summarised in Table 3.3. Noteworthy are the findings of a bear mandible in a pit containing Grooved ware pottery at Blackhorse Rd (Legge *et al* 1989) and a bear scapula at Barholm (Harman 1993d). Neither specimen has any signs of human modification. Another species that is now extinct in Britain, the beaver (Coles 2006), is present at Barholm, and again no butchery marks were detected on the bones. Cat specimens from Barholm and Redgate Hill (G G Jones 1993b) are likely to belong to the wild form, as domestic cats are assumed to have been introduced to Britain much later (Yalden 1999). Fox has also been recorded at four sites. These species could all have been hunted mainly for their furs and pelts, although the killing of a large and potentially dangerous animal such as a bear is likely to have also been beneficial to the successful hunters in terms of social status.

The presence of an unidentified dolphin species at the coastal site of Redgate Hill (G G Jones 1993b) is also worth mentioning, as it could indicate either the exploitation of marine resources or the scavenging of stranded carcasses.

Although water vole was identified at Foulmire Fen (Legge 2006a, 2006b) and field/yellow-necked mouse at Redgate Hill (G G Jones 1993b), the only site that had a large range of small mammal species, as the result of a good programme of wet sieving, is Oakham (Gouldwell 1998). Field vole, mole, common shrew and pygmy shrew are all present. Surprising is the mention, without comment, of the recovery from this site of house mouse, a species regarded to have been introduced to Britain no earlier than the Iron Age (Yalden 1999, 124). The feature from which these bones were recovered is suggested to have acted as a pit-fall trap, which was perhaps left open for some time (Gouldwell 1998, 321). The accumulation of these remains is therefore unlikely to be anthropogenic, although it is possible that some of these species were commensal.

Birds and fish are poorly represented at the Neolithic sites of central England, but this may, to some extent, be a consequence of the fact that sieving was not regularly adopted during excavation. Passerine bones, unlikely to be anthropogenic, were a product of the sieving programme at Oakham, but no birds likely to have been hunted are known for the Neolithic of central England. Peat in Cambridgeshire, not an archaeological site, covering *c* 4,000 years spanning the Neolithic and the Bronze Age, has produced a long list of bird species, including Dalmatian pelican, bittern, mute swan, whooper swan, greylag goose, mallard, smew, red-breasted merganser, white-tailed eagle, common crane, moorhen, lapwing, woodcock and razorbill (Northcote 1980), and provides an insight into the richness of avifauna that was potentially available to the Neolithic hunters.

Table 3.3 Presence of selected wild taxa at Neolithic sites in central England.

Site	Aurochs	Wild boar	Red deer	Roe deer	Wolf	Fox	Bear	Cat	Dolphin	Beaver
Barholm			X			X	X	X		X
Blackhorse Rd	X		X				X			
Etton	X		?							
Fengate (FN2)	X	X	X							
Fengate (FN3)			X		?	X				
Giant’s Hills 2	X		X	X						
Grime’s Graves 71–72			X	X						
Hockwold-cum-Wilton 61–62	X		X	X						
Oakham			X							
Puddlehill 51–76	X	X	X							
Puddlehill	X		X	X		X				
Redgate Hill			X	X				X	X	
Tye Field										
Foulmire Fen			X	X		X				
Upper Delphs			X							

The evidence for fish is even more elusive, but with the absence of sieving at excavations of coastal (Redgate Hill) and estuarine (Tye Field) sites, this may just be the consequence of an insufficient level of bone recovery. Occasional unidentified fish remains are mentioned, eg at Oakham and Hockwold-cum-Wilton 61–62, but in general fish are absent from the faunal record of the Neolithic of central England. This supports the conclusion of Serjeantson *et al* (1994) that fish were avoided in Neolithic Britain, at least on inland sites. In addition, isotopic analysis of Neolithic human bones shows a limited contribution of marine resources to the diet (Richards *et al* 2003). It seems very possible that this pattern is the result of a genuine lack of interest in fishing on the part of Neolithic people rather than an oversight on the part of archaeologists.

The scarcity of wild fauna, including birds and fish, at Neolithic sites, is not only typical of central England but has also been reported at sites in southern England, such as Runnymede (Serjeantson 2006c). In general, it appears that hunting did not play a major role, at least in terms of subsistence, for Neolithic people. This is in contrast with Neolithic sites in the Netherlands, particularly those based in wetland areas, which have produced an abundance of fur species and birds (Zeiler 1997, 2006). This leaves open the possibility that, provided that a systematic programme of sieving is undertaken, new excavations of Neolithic sites, particularly in wetland areas such as the Fenlands, may in the future reveal a more diversified picture of animal exploitation. In this respect, it is noteworthy that the site of Barholm, in the Lincolnshire Fens, has, unlike other sites in central England, quite a wide range of wild species.

We must also consider the possibility that hunting, particularly of large species such as aurochs, red deer and wild boar, may have had an important social role, perhaps because of, rather than despite, its rarity. Prestige may have been gained with the killing of some of the large game, but on this aspect the archaeological evidence is so far silent, leaving us with only speculation.

Pollard (2006a) has suggested that the exploitation of wild mammals increased from the early to the late Neolithic. The evidence from central England is insufficient to test this hypothesis, but it should be noted that Pollard's (2006a) data derive from, among other evidence, the assemblages of Blackhorse Rd and Puddlehill 51–76, where 'bones of aurochs make up between 3–40 per cent of the faunal remains' (Pollard, 2006a, 143). This figure is presumably based on the data reported by Legge *et al* (1989, 91), but a careful examination of the evidence suggests that cautious interpretation is needed. The data from Blackhorse Rd, where aurochs represents *c* 30% of the identified large mammal fauna, are not based on Legge's own work but on archive material that Legge could not re-examine. Legge himself is suspicious of some of these identifications and claims that some bones reported as aurochs may in fact belong to domestic bulls (Legge *et al* 1989, 91). It is significant in this respect that in the interpretation of the assemblage from the site analysed by himself (not discussed here, as it includes intrusive material), Legge is much more cautious and includes all *Bos* bones in a generic 'cattle' category (Legge *et al* 1989, 93). As far as the data from Puddlehill 51–76 are concerned, these are also problematic as Legge *et al* (1989) report selectively (in order to make them comparable to Blackhorse Rd) the counts provided by Grigson (1976, 13). There is, however, some inconsistency between the two reports, as the sums do not seem to add up. Grigson (1976) definitely believes aurochs to be better represented than domestic cattle at Puddlehill 51–76 but, as far as precise frequencies are concerned, these are difficult to establish. This problem is exacerbated by the fact that these reports were published when we did not have the same awareness as today of the level of variability in wild and domestic forms. A re-analysis of some of these assemblages employing a more statistical, population-level approach is required.

3.5 Husbandry strategies

Because of the small sizes of the assemblages, we do not have data on mortality profiles that provide statistically reliable information. As ageing is our main guide to understanding strategies of animal husbandry, the style of management of domestic animals in the Neolithic of central England is at present unclear.

Until relatively recently it was assumed that in the Neolithic the economic use of farmyard animals consisted exclusively of meat production, and that secondary products/services, such as milk, wool and traction, represented a later innovation (Sherratt 1983). There have always been questions, however, about how late the origin of the use of secondary products really was, and the study of early Neolithic assemblages from both Windmill Hill and Hambledon Hill raised the possibility of a dairying economy, hypothesised in view of the large number of adult female cattle found in these assemblages (Mercer 1980; Legge 1981b; Grigson 1999). In the years following these publications, dominated as they were by the impression of a late Neolithic–early Bronze Age secondary product revolution, the idea of a milk economy in the Neolithic may have seemed unlikely. More recent evidence, based on the chemical analysis of organic residues in pots, has, however, indicated that milk was in fact produced and contained in the pots used by Neolithic people of Britain (Copley *et al* 2005; Mukherjee *et al* 2005).

The discussion so far has been based on evidence collected exclusively in the south of England, and no material from central England has been used for this type of analysis. The data supporting the use of dairy products in southern England should, however, provide some impetus for investigating the central England evidence further, particularly as the results of animal mortality curve analyses seem to be consistent with organic residue analyses. The ageing evidence therefore continues to provide a reliable guide to our understanding of husbandry strategies.

Concerning pigs, these are typically single-purpose animals with primary (meat, fat, etc), rather than secondary, products being by far the most important. The predominance of sub-adult animals recorded at Redgate Hill is consistent with that found at the pig-rich assemblage of Durrington Walls in Wiltshire (Albarella and Serjeantson 2002) and indicates the slaughtering of pigs at a prime age for meat provision. In prehistory, farmyard animals were probably rather slow-growing and consequently they would not be killed at as young an age (eg juveniles or immature) as 'improved' breeds are now.

As far as potential evidence of traction is concerned, widespread arthropathies have been recorded on cattle bones from Etton, but the bones from this assemblage are, on the basis of radiocarbon dating, more likely to belong to the Bronze Age. There are, however, other published cattle bones from Etton (Armour-Chelu 1998) that have been attributed to the Neolithic. The early Neolithic cattle, in particular, appear to be largely adult, but their association with perinatal bones points more towards dairying than traction use. Cattle cranial perforations are noted at the site of Letchworth, Hertfordshire, but the specimen is probably an aurochs rather than domestic cattle (Baxter 2002d). Cranial perforations have in the past been associated with the stress caused by the pressure of a yoke (Brothwell *et al* 1996), but an example has since been found in a wild bison from Armenia; therefore, this hypothesis is no longer valid (Manaseryan *et al* 1999, 74–5). While we are still not sure about the causes of the condition, its detection in wild animals, such as the aurochs, is not surprising and should not shake our confidence in the correct attribution of the Letchworth specimen to the wild form.

3.6 Human processes

3.6.1 Bone modification

Apart from the occasional cut marks recorded at Oakham and, more extensively, at Upper Delphs and Etton (Armour-Chelu 1998), very little information about butchery has been reported for central England. The heavy fragmentation of cattle and pig bones, caused by chopping and smashing, recorded at Runnymede (Serjeantson 2006c) is not reported for any sites in central England. This, however, may be a product of the type of analysis rather than of any real difference in the archaeological evidence.

Burning has been reported at Puddlehill, Oakham and Upper Delphs, but this occurs in some cases on teeth and is more likely to be the product of accidental contact with fire rather than any regular pattern of cooking or carcass processing of the type identified at Durrington Walls (Albarella and Serjeantson 2002).

A little more substantial is the evidence for bone working, reported with some detail at Upper Delphs and including a heavily worn cattle acetabulum, interpreted as a possible hide-working implement (Pollard 2006b). At Etton, in addition to other worked bones, a possible cattle scapula 'shovel' was found (Armour-Chelu 1998).

Evidence of antler working was found at Puddlehill 51–76, and antler picks occurred at Blackhorse Rd, Upper Delphs and, much more substantially, Grime's Graves 71–72 (Clutton-Brock 1984). The large number of such tools found at Grime's Graves 71–72 indicates that they were instrumental in the digging of the flint mines, which are the main reason for the Neolithic human occupation of the site. An antler comb, as well as other signs of modification on antlers, was found at Etton (Armour-Chelu 1998). The importance of antler as raw material for tool making is also reflected well in the evidence available for the rest of the country (Clutton-Brock 1984; Serjeantson 1995; Stallibrass 1995).

3.6.2 Bone disposal

It is important to consider that the use of animals was not exclusively geared towards economic concerns, particularly as many Neolithic sites also have an important ritual/ceremonial function (Bradley 2005). This is the case in central England, where, in addition to settlements, we have funerary and ceremonial sites (cf Table 3.1). This has some consequence on the disposal practices of the animals, as the evidence from the long barrow at Foulmire Fen in particular indicates (Legge 2006b). At this site, articulated bones (making up approximately one-third of the assemblage) are found in association with mortuary structures (dog hindlimb, partly burnt), mounds (red deer lower front limb) and ring banks (red deer front limb). Four groups of pig bones may have formed similar deposits, but are less well preserved. These include bones from two juvenile pigs found in the primary mound. Apart from the dog leg, they 'appear to have been placed as construction-related rituals' (Evans and Hodder 2006b, 175). At the nearby site of Upper Delphs, despite its claimed 'social rather than purely economic function' (Legge 2006b, 311), there is a low occurrence of articulated skeletal parts and a lack of bones that may have been specifically placed in ditches. This should alert us to the risk of automatically equating articulated skeletons with structured depositions and ritual interpretations.

It is interesting in this respect to consider the case of Oakham, a site regarded as predominantly of ritual use, but with an unremarkable animal bone assemblage, and no identified special bone deposits. Conversely, at Puddlehill 51–76, the presence of a partial fore limb, probably of a wild boar, does not necessarily indicate a ritual deposit.

More persuasive is the evidence from Etton (Armour-Chelu 1998; mainly early Neolithic), where most of the faunal assemblage has been interpreted as having had a primarily ritual meaning. The context of origin for most of the animal bones is monumental rather than domestic, and many bones were found in articulations. Complete sheep and pig skeletons were unearthed, while many cattle bones are articulated, although they do not represent the whole body. Depositions of aurochs and fox skulls from the early Neolithic, and cattle and roe deer from the middle Neolithic, add to the weight of evidence for a ritual interpretation of the remains. Evidence of cremation on the animal bones is also present, possibly associated with human funerary practices.

4 BRONZE AGE

4.1 The context

Although primarily characterised by the introduction of metalworking technologies to Britain, the Bronze Age was a time of significant transformation of the agricultural as well as the social and ritual landscape. The beginnings of the Bronze Age are marked by the arrival of 'Beaker' styles of pottery and other artefacts, and characteristic burial practices. Gold and copper artefacts have been identified in Britain perhaps as early as *c* 2700 BC, and bronze technology became well-established in the following centuries. At this time, the archaeological record is dominated by round barrows and occasional flat cemeteries, and early Bronze Age settlements have seldom been found. It is thought that impermanent dwelling places may have been the norm, and that dispersed groups may have practised extensive pastoralism (Parker Pearson 2005).

From *c* 1800 BC, the tradition of monumental tomb-building began to die out, although cremations continued to be inserted into older monuments. Later in the 2nd millennium BC, changes in the intensification of arable farming are seen, and heavy clay soils were utilised for agriculture for the first time. The fertile landscapes of East Anglia and Lincolnshire became increasingly important to the pastoral economy. During the 2nd millennium, field systems in some areas comprised complex droveways, stockyards and stock management systems, such as those at Fengate near Peterborough, Cambridgeshire (Pryor 1996, 1998). Settlements including roundhouses are also identified in the landscape more frequently, and larger defended settlements are seen in some parts of Britain.

Towards the end of the 2nd millennium, according to some authors (eg Burgess 1985), a sharp climatic deterioration had wide-ranging effects even in non-marginal areas. On the chalk area of Wessex, a change of use is apparent at this time, as the Celtic field systems of the 2nd millennium BC become overlaid by linear 'ranch boundaries' (Burgess 1985). This is seen as one of the markers of the switch from arable farming to stock raising that is characteristic of the 1st millennium BC. Burgess (1985) suggests the flooding of the edge of the Fenlands of eastern England and consequent abandonment of field systems as another such example. Dark (2006), on the other hand, finds little convincing evidence for national-scale climatic disaster in the late Bronze Age. Rather, she concludes that woodland regeneration in central southern England 'may reflect local land abandonment resulting from water-table rise and need not be indicative of major-scale landscape events away from sites prone to waterlogging' (Dark 2006, 1392). Nevertheless, whatever the origin of these events, complex and well-established landscapes, such as that of Fengate, were prone to disruption and abandonment by *c* 1000 BC (Pryor 1996).

4.2 The sites

The zooarchaeological evidence for the Bronze Age of central England would seem to be considerably more abundant than that for the Neolithic. The database contains 29 sites of Bronze Age date, two of which are multi-phase, while five sites span the Neolithic–Bronze Age transition. The sites are listed in Appendix 1, and a distribution map is provided in Fig 4.1. In addition, we must take into account sites previously described as Neolithic that have radiocarbon dates that evidently show a Bronze Age component. These sites are Etton, Stamford/Peterborough (site code 125, Cambridgeshire; Armour-Chelu and Clutton-Brock 1985) and Blackhorse Rd, Letchworth (37, Hertfordshire; Legge *et al* 1989), both of which were introduced in Chapter 3. Two more recently published barrow sites from the Haddenham area in Cambridgeshire, Snow's Farm (Beech 2006) and Hermitage Farm (Legge 2006c), are also considered, although both assemblages are very small. Several other sites discussed in this chapter display continuity from the Neolithic. These are the two Fengate sites (FN2 and FN3) (128 and 129, Cambridgeshire; Harman 1978a; Biddick 1980), Giant's Hills 2, Skendleby, near Alford (148, Lincolnshire; Noddle and Grigson 1991; O'Connor 1991a), and Oakham, Rutland (253, Leicestershire; Gouldwell 1998), which span the Neolithic–Bronze Age boundary, and Hockwold-cum-Wilton 61–62, near Brandon (182, Norfolk; Cram 1967), which has broadly dated Neolithic and Bronze Age phases.

Geographically, sites are more widespread in the Bronze Age than in the earlier periods, with some new clusters appearing in central and northern counties. The western part of the region continues to be the most sparsely represented, with only two sites. Many, although not all, of these new sites are barrows or cairns, or otherwise connected with burials. As with northern England (Stallibrass 1995), ritual sites predominate overall, but many of these are small assemblages and some (particularly those described in older reports) are lacking in detail. The outstanding exception is the large assemblage from the barrow at Irthlingborough (193, Northamptonshire; Davis 1989b), with a total NISP of 2,511. The character of these burial and ritual sites is discussed in section 4.6.2. In contrast, the most abundant assemblages have chiefly been obtained from enclosures, settlements, middens and other rural contexts.

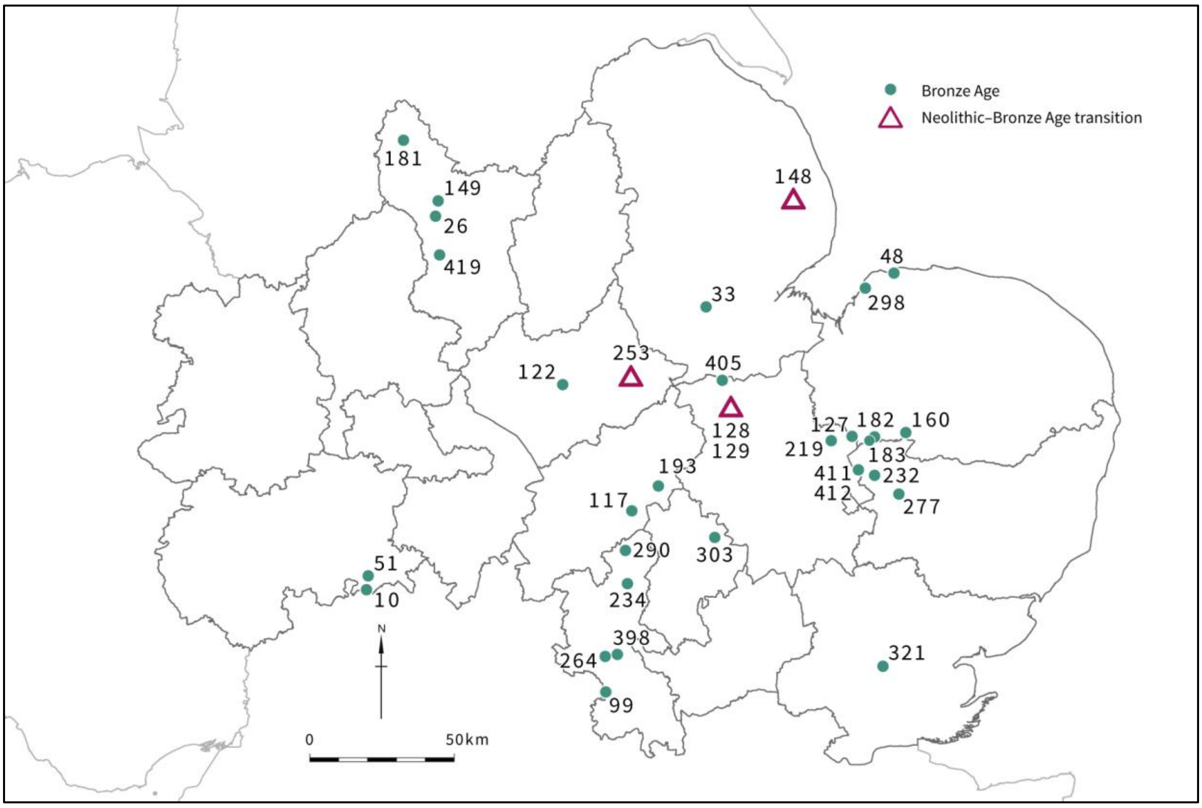

Fig 4.1 The distribution of Bronze Age sites across central England. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text.

As with Chapters 2 and 3, radiocarbon dates for all sites have been collated where available, and calibrated. These are summarised in Table 4.1, with further details presented in Table 4.2 and illustrated in Fig 4.2.

The sub-division of the Bronze Age proposed by Parker Pearson (2005) has been adopted:

- early Bronze Age, 2400–1600 cal BC
- middle Bronze Age, 1600–1150 cal BC
- late Bronze Age, 1150–700 cal BC.

These dates are approximate, however, and sites defined as Beaker may start in the late Neolithic and overlap considerably with those described as early Bronze Age. The approximate boundaries of these sub-time periods are also shown in Fig 4.2.

The most reliable radiocarbon determinations are those taken from securely stratified bone; however, here the most commonly dated material is charcoal. In some circumstances the stratigraphic relationship between the dated material and the bone assemblage is complex, and there are several cases where the calibrated dates presented do not conform to the expected cultural dating given in the site reports, and a few comments are required.

The broadly dated site of Earls Barton, near Wellingborough (117, Northamptonshire; Harcourt 1984), has two dates from charcoal attributed to it, both indicating a middle Bronze Age date for the pre-barrow surface. If this is taken at face value, then the barrow material itself may be considered to derive from the later Bronze Age (although the exact relationship of the bones to these charcoal samples is unknown). Similarly, Roxton, Bedford/St Neots (303, Bedfordshire; Grant 1985), is broadly dated according to the site report, but some or all of the material is likely to derive from the early and middle Bronze Age. An anomalously early date for the primary fill of one of the ring ditches at this site perhaps urges caution.

The 'middle Bronze Age' site of Grime's Graves 71–72, near Thetford (160, Norfolk; Legge 1981a) is composed of midden material backfilling an earlier shaft, and is considered stratigraphically secure. The dates given derive from material from Shaft X (Legge 1992), the chronology of which is said to be slightly broader than the earlier Department of the Environment excavation (Legge 1981a). A spread of dates (based on charcoal evidence) is suggested, from the early 2nd millennium until the beginning of the 1st millennium cal BC. Most of the calibrated date ranges, however, fall at least partly within the middle Bronze Age.

The barrow at Irthlingborough contains a Beaker inhumation, the covering cairn of which incorporated a substantial deposit of animal bones, mainly cattle. Four teeth, two each from an aurochs and a domestic specimen, provided radiocarbon dates spanning a wider date range. A date from bone from the human burial also falls squarely within this range. Davis and Payne (1993) note that the date range is somewhat wider than might be expected for a single event, but this is partly explained by the suggestion that the early dated aurochs specimen may represent a curio kept by people living in a later period.

The stray find of an aurochs skeleton from Lowe's Farm, Littleport (219, Cambridgeshire; Shawcross and Higgs 1961) provides the most anomalous radiocarbon dates. Pollen analysis of the peat suggested an early Bronze Age date to Shawcross and Higgs (1961). Two subsequent radiocarbon dates, taken from a mandible and closely associated peat, fall approximately into the middle Bronze Age, while a second determination (BM-1444) from bone is anomalously early. Burleigh *et al* (1982, 236) decided that 'BM-1444 evidently dates bones inadvertently mis-associated during storage in Cambridge Museum'.

The early Bronze Age barrow at Milton Keynes and Great Ouse Valley (234, Buckinghamshire; Westley 1974) produced a pair of dates spanning the early and middle Bronze Age. Westley (1974) interprets the later date (from the secondary inhumation) as too young, perhaps as a result of the effect of weathering on the sample. The earlier date (from the clearance horizon) is considered secure. The faunal assemblage, derived from material accumulated between the clearance phase and the inhumation (perhaps over the course of only a few decades), may indeed be early Bronze Age.

In conclusion, reassessment of the radiocarbon evidence has produced some minor changes to the dating of some sites, and a couple of tentative additions. These are summarised in Table 4.1. What is striking, however, is the dearth of radiocarbon dates for many of the sites, including the majority of the barrows or cairns and some of the largest non-ritual assemblages, particularly West Row Fen, Mildenhall (411, Suffolk; Olsen 1994) and Welland Bank Quarry, Deeping St James (405, Lincolnshire; Albarella *et al* in prep). In addition, some of the sites with the most abundant radiocarbon dates actually display very long date ranges. It is frequently difficult to associate these dates with the faunal assemblage, even when the assemblage has been split into phases. Although our ability to identify chronological trends may thus be hampered (particularly in the case of the Fengate sites, FN2 and FN3), we can bear in mind such broad date ranges where they occur, so as not to over-interpret the evidence.

While it was noted in section 4.1 that early Bronze Age settlements are apt to be rare, they do have a presence within the region. All the Beaker sites are funerary monuments, with the exception of the burnt mound at Feltwell Anchor (127, Norfolk; Bates and Wiltshire 2000) and those sites for which details are unknown. The early Bronze Age sites of West Row Fen, Redgate Hill, Hunstanton (298, Norfolk; G G Jones 1993b), and Aston Mill Farm, near Kemerton, Tewkesbury (10, Hereford and Worcester; Lovett 1990b), seem to have characteristics that are more domestic in character. It is apparent from Table 4.1 that most sites fall into the middle and late Bronze Age, and are also predominantly domestic, except Oxford Rd, Stone (264, Buckinghamshire; Baxter 2001) and Springfield, Chelmsford (321, Essex; Wade 2000a), which both have a ritual component. Lastly, the two sites from Fengate (FN2 and FN3) may give us some indication of the economy of settlement from the Neolithic–Bronze Age transition onwards.

Table 4.1 Summary of Bronze Age and Neolithic–Bronze Age sites in central England, indicating location and site type. Site numbers refer to those shown on the map in Fig 4.1, and as given in the gazetteer (Appendix 1). The reported period is that given in the original site report, while a reinterpretation of the period is based on radiocarbon dating in combination with cultural evidence. Neo=Neolithic; BA=Bronze Age; EBA=early Bronze Age; MBA=middle Bronze Age; LBA=late Bronze Age.

Site no	Site name	County	Reported period	Site type	Period reinterpretation (if different)
	Sites discussed in Chapter 3				
37	Blackhorse Rd, Letchworth	Hertfordshire	Late Neo	Cluster of pits and/or ditches	Late Neo–EBA
125	Etton, Stamford/ Peterborough	Cambridgeshire	Neo	Causewayed enclosure	Probably MBA
128	Fengate (FN2), Peterborough	Cambridgeshire	Late Neo–EBA	Enclosure	Mainly late Neo, but some material may be EBA
129	Fengate (FN3), Peterborough	Cambridgeshire	Late Neo–MBA	Enclosure	Late Neo–MBA
148	Giant's Hills 2, Skendleby, near Alford	Lincolnshire	Late Neo–EBA	Barrow	Mainly late Neo
253	Oakham, Rutland	Leicestershire	Late Neo–EBA	Ritual	Late Neo–EBA
All other sites with a BA component					
10	Aston Mill Farm, near Kemerton, Tewkesbury	Hereford and Worcester	EBA	Enclosure	
26	Bee Low, Youlgreave	Derbyshire	Beaker–EBA	Cairn	
33	Billingborough	Lincolnshire	MBA–LBA	Enclosure	
48	Brancaster 77, Hunstanton/Wells-next-the-Sea	Norfolk	Beaker, BA	No site information	
51	Bredon Hill, Tewkesbury/Evesham	Hereford and Worcester	Beaker–EBA	Barrow	
99	Cop Barrow, Bledlow	Buckinghamshire	EBA	Barrow	
117	Earls Barton, near Wellingborough	Northamptonshire	BA	Barrow	MBA–LBA
122	Elms Farm, Leicester	Leicestershire	LBA	Enclosure	
127	Feltwell Anchor	Norfolk	Beaker, EBA	Burnt mound	
149	Glebe Low, Great Longstone	Derbyshire	Beaker	Barrow	
160	Grime's Graves 71–72, near Thetford	Norfolk	MBA	Midden	
181	Hindlow Cairn, near Glossop	Derbyshire	BA	Cairn	
182	Hockwold-cum-Wilton 61–62, near Brandon	Norfolk	BA	Cairn	
183	Hockwold-cum-Wilton 62–66, near Brandon	Norfolk	Beaker	No site information	

Site no	Site name	County	Reported period	Site type	Period reinterpretation (if different)
193	Irthlingborough	Northamptonshire	Beaker	Barrow	
219	Lowe's Farm, Littleport	Cambridgeshire	EBA	Stray find	MBA
232	Mildenhall	Suffolk	BA	No site information	
234	Milton Keynes and Great Ouse Valley	Buckinghamshire	EBA	Barrow	Probably correct
264	Oxford Rd, Stone	Buckinghamshire	LBA	Ritual site	
277	Poor's Heath, Risby, near Bury St Edmunds	Suffolk	Beaker	Barrow	
291	Ravenstone 78, near Newport Pagnell	Buckinghamshire	Beaker	Barrow	
298	Redgate Hill, Hunstanton	Norfolk	EBA	Open settlement	
303	Roxton, Bedford/St Neots	Bedfordshire	BA	Burial/cemetery	Probably EBA–MBA
321	Springfield, Chelmsford	Essex	MBA–LBA	Enclosure/ritual	
398	Walton Lodge, Aylesbury	Buckinghamshire	MBA	Open settlement	
405	Welland Bank Quarry, Deeping St James	Lincolnshire	LBA	Rural	
411	West Row Fen, Mildenhall	Suffolk	EBA	Village	
412	West Row, near Mildenhall	Suffolk	EBA–MBA	Open settlement	
419	Wigber Low, White Peak, Ashbourne	Derbyshire	BA	Cairn	

Table 4.2 Radiocarbon dates from Bronze Age sites within central England. All radiocarbon determinations and contextual information, unless asterisked, derive from the Archaeological Site Index to Radiocarbon Dates from Great Britain and Ireland, hosted by the Archaeology Data Service (ADS) at http://ads.ahds.ac.uk/catalogue/specColl/c14_cba/index.cfm (consulted 2006).

Calibrated dates were obtained from OxCal Version 3.10, © C Bronk Ramsay (2005; https://c14.arch.ox.ac.uk/oxcal.html), using atmospheric data from Reimer et al *(2004). All calibrated dates with an error ≥25 years have been rounded to 10 years. Sites with no available radiocarbon determinations are also listed for comparison.*

BA=Bronze Age; EBA=early Bronze Age; MBA=middle Bronze Age; LBA=late Bronze Age; EIA=early Iron Age.

Site and laboratory number	Material	Comments	Radio-carbon age, BP	Calibrated date range (95% confidence) cal BC
Fengate 3 (Newark Rd) HAR-1971	Charcoal	From industrial area VII	2980±70	1420–1000
Fengate 3 (Newark Rd) HAR-1970	Charcoal	From industrial area VII	2910±70	1370–900
Fengate 3 (Newark Rd) HAR-1972	Charcoal	From industrial area VII	2950±70	1400–930
Fengate 2 *See* Table 3.2				
Aston Mill None				
Bee Low None		(Beaker pottery in site report)		
Billingborough (MBA–LBA phase) BM-1411	Charcoal	From primary silt, main enclosure ditch	3430±110	2030–1460
Billingborough (MBA–LBA phase) BM-1410	Charcoal	Lower fill of enclosure ditch, phase 1	3148±57	1530–1290
Billingborough (LBA–EIA) HAR-2483	Charcoal	Post-hole, phase 2	2390±70	770–360
Billingborough (LBA–EIA) HAR-2523	Charcoal	Upper fill of enclosure ditch, phase 2	2410±80	790–360
Billingborough (LBA–EIA) HAR-3101	Charcoal	Pit, phase 2	2500±100	840–390
Brancaster (Beaker phase) None				
Brancaster (BA phase) None				
Bredon Hill None				
Cop Barrow None				

Site and laboratory number	Material	Comments	Radio-carbon age, BP	Calibrated date range (95% confidence) cal BC
Earls Barton BM-680	Wood charcoal	Plank from old pre-barrow ground surface	3169±51	1530–1310
Earls Barton BM-681	Wood charcoal		3214±64	1630–1380
Elms Farm, Leicester None				
Etton *See* Table 3.2				
Feltwell Anchor (two phases) None				
Glebe Low None				
Grime's Graves (MBA) BM-1041	Charcoal	Phase II in Shaft X	3573±57	2130–1740
Grime's Graves (MBA) BM-1263	Charcoal	Phase II in Shaft X	3443±53	1900–1620
Grime's Graves (MBA) BM-1264	Charcoal	Phase III in Shaft X	3154±64	1600–1270
Grime's Graves (MBA) BM-1037	Charcoal	Phase II in Shaft X	3003±49	1410–1050
Grime's Graves (MBA) BM-1036	Charcoal	Phase II in Shaft X	2995±39	1390–1110
Grime's Graves (MBA) BM-1035	Charcoal	Phase II in Shaft X	2954±40	1310–1010
Grime's Graves (MBA) BM-1038	Charcoal	Phase II in Shaft X	2936±43	1300–1000
Grime's Graves (MBA) BM-1042	Charcoal	Phase II in Shaft X	2919±53	1300–930
Grime's Graves (MBA) BM-1040	Charcoal	Phase II in Shaft X	2905±54	1270–920
Grime's Graves (MBA) BM-1043	Charcoal	Phase II in Shaft X	2838±53	1200–840
Grime's Graves (MBA) BM-1266	Charcoal	Phase II in Shaft X	2834±53	1190–840
Grime's Graves (MBA) BM-1039	Charcoal	Phase II in Shaft X	2806±54	1130–820

Site and laboratory number	Material	Comments	Radio-carbon age, BP	Calibrated date range (95% confidence) cal BC
Grime's Graves (MBA) BM-1265	Charcoal	Phase II in Shaft X	2800±79	1210–800
Hindlow Cairn None				
Hockwold-cum-Wilton 61–62 None				
Hockwold-cum-Wilton 62–66 None				
Irthlingborough OxA-2085	Tooth	Aurochs	4040±80	2880–2340
Irthlingborough OxA-2086	Tooth	Aurochs (note: probably same animal as OxA-2085)	3810±80	2480–2020
Irthlingborough OxA-2087	Tooth	Domestic cattle	3810±80	2480–2020
Irthlingborough OxA-2084	Tooth	Domestic cattle	3610±110	2290–1680
Lowe's Farm BM-1443	Peat	Aurochs (stray find of skeleton)	3850±60	2480–2130
Lowe's Farm BM-1469	Bone	Aurochs (stray find of skeleton)	3340±45	1750–1500
Mildenhall None				
Milton Keynes and Great Ouse Valley I-7148	Charcoal	From clearance horizon, in association. with bipartite urn and Beaker/urn hybrid	3450±90	2020–1520
Milton Keynes and Great Ouse Valley HAR-341	Bone	Human bone from secondary inhumation	2990±80	1430–990
Oxford Rd None		Report says it's comparable with unurned cremation burials from Gadebridge Park, Hemel Hempstead: 1055–885 cal BC and 1140–820 cal BC		
Poor's Heath BM-2522	Bone collagen	Human femur	3660±50	2200–1890
Ravenstone 78 HAR-3000	Charcoal	From plank in female Beaker inhumation	3760±90	2470–1920
Redgate Hill None		None from pits associated with BA animal bone		
Roxton HAR-998	Charcoal	From primary fill of Ring Ditch B	7700±170	7050–6220
Roxton HAR-999	Charcoal	From Ring Ditch C primary burial	3800±130	2580–1880

Site and laboratory number	Material	Comments	Radio-carbon age, BP	Calibrated date range (95% confidence) cal BC
Roxton HAR-997	Charcoal	Oak timbers from Ring Ditch B primary burial (collared urn cremations)	3620±80	2210–1750
Roxton HAR-1003	Charcoal	From inverted urn cremation cut into primary fill of Ring Ditch C	3200±50	1610–1390
Roxton HAR-1001	Charcoal	From secondary burial in Ring Ditch C	3130±60	1520–1260
Springfield None		Although LBA dates exist from nearby Springfield Lyons		
Walton Lodge None		But contexts dated on mainly Deverel-Rimbury and some LBA–EIA pottery		
Welland Bank Quarry None				
West Row Fen None				
Wigber Low None				

Table 4.2 continued

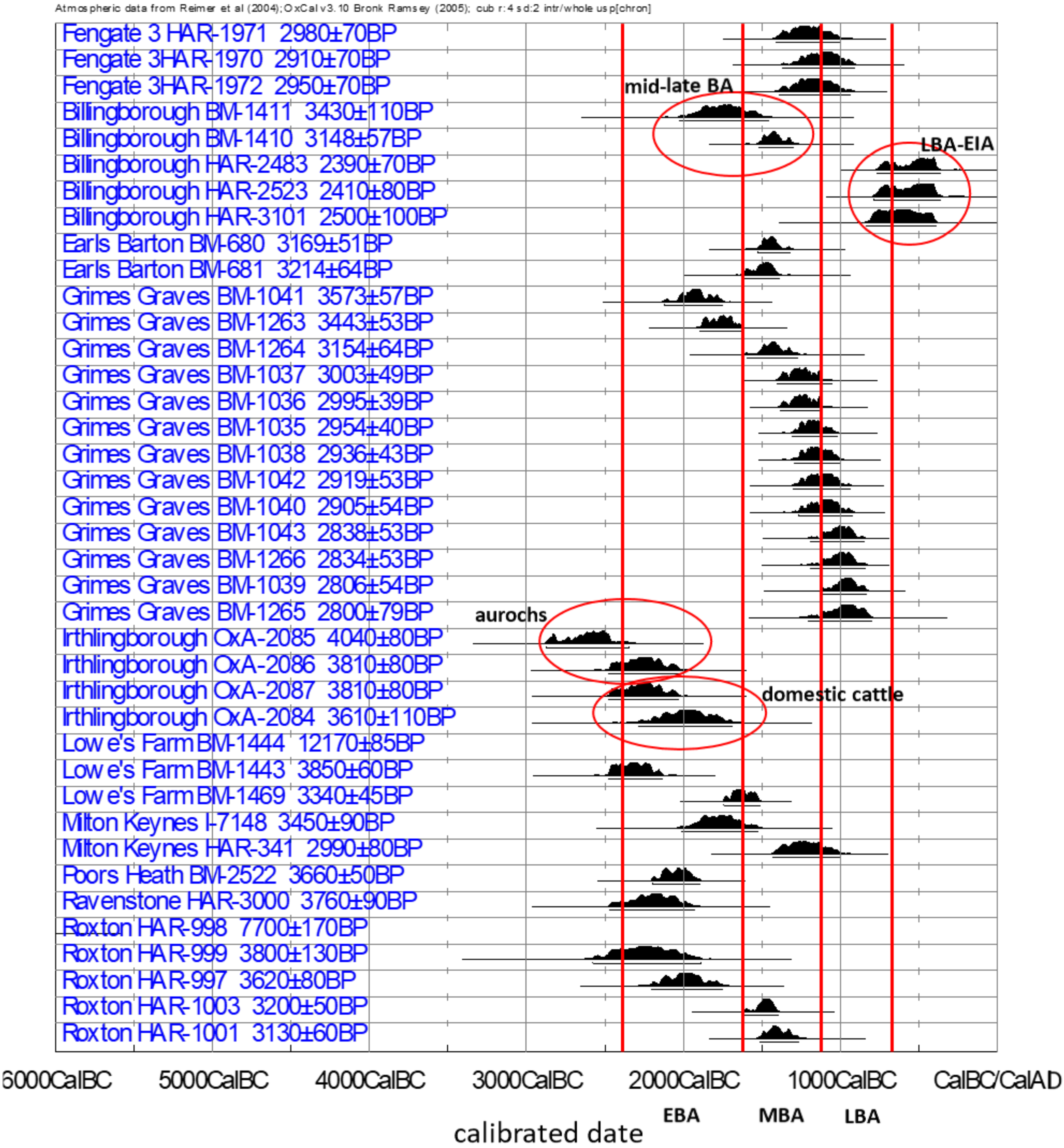

Fig 4.2 Probability plots for the radiocarbon dates listed in Table 4.2. Laboratory numbers and radiocarbon determinations are listed on the left (uncalibrated), while the dates plotted on the right are given in calibrated (Cal) years BC/AD. Bold vertical lines divide the period into early (EBA), middle (MBA) and late Bronze Age (LBA), after Parker Pearson (2005). BA=Bronze Age; EIA=early Iron Age.

4.3 The contribution of domesticated mammals (and their wild equivalents)

It was established in Chapter 3 that caprines are present in the early Neolithic and become ubiquitous in assemblages later in the Neolithic. It is not possible to determine the proportions of sheep and goat bones contained in these assemblages, as sparse positive identifications of either have been found before the late Neolithic. Such identifications are equally rare in the Bronze Age, despite the larger assemblages available. Goat has been identified at Grime's Graves 71–72 (middle Bronze Age), West Row Fen (early Bronze Age) and Welland Bank Quarry (late Bronze Age). Sheep has also been identified at the latter two sites, and in much greater proportions. It is noteworthy that these two assemblages are among the largest for the period. Of the other substantial assemblages (where we might hope for sufficient specimens to attempt the distinction), the Billingborough report (33, Lincolnshire; Iles 2001) does not discuss the distinction between sheep and goat, while only one specimen of goat (a horncore) was recorded from Grime's Graves 71–72. Legge (1992) commented on the Grime's Graves 71–72 midden material that, according to morphological criteria (Boessneck *et al* 1964; Payne 1985), goats are 'virtually absent' from the assemblage and the juvenile mandibles are evidently all sheep (Legge 1992, 33). From the very limited evidence available, it seems that goat is the rarer taxon in the archaeological record. Regarding the type of sheep, at West Row Fen, they are said to be 'small, slender-limbed, two-horned individuals that are within the size range of the Soay breed' (Olsen 1994, 139).

For cattle and pigs, the ongoing problem is not so much identifying the genus, as defining the difference between domesticated and wild specimens. The distinction between wild boar and domestic pig has rarely been made. Wild boar has been identified at one site from the Neolithic–Bronze Age transition, namely Fengate (FN2) (Harman 1978a). Of 21 Bronze Age periodsites reporting pig, only Poor's Heath, Risby, near Bury St Edmunds (Beaker; 277, Suffolk; Cornwall 1976), reports the possible presence of wild boar, while the only certain domesticated specimens are found at Grime's Graves 71–72, where measurements as a whole are said to fall at the low end of the range for Durrington Walls, Wiltshire (cf Albarella and Payne 2005); unfortunately, measurements were not presented in the Grime's Graves 71-72 report. At West Row Fen, two large adult *Sus* bones are present, but the author (Olsen 1994) notes that most of the specimens are not fully adult, so it is difficult to suggest what the typical size range at the site might have been.

Aurochs is positively identified at a number of sites, on the basis of size, while other *Bos* specimens are commonly presumed to be domesticated. As with wild boar, the wild form of cattle is regarded to have been present at Fengate (FN2), dating from the Neolithic–Bronze Age transition. The unpublished site of Babraham Rd, Cambridge, Cambridgeshire, has 48 aurochs specimens compared with 304 cattle in the late Neolithic–early Bronze Age, but no aurochs in the succeeding early–middle Bronze Age phase (I Baxter, pers comm). Aurochs teeth, bones and horncores are certainly present within the cattle-dominated material at the Beaker site of Irthlingborough, and there are four probable aurochs specimens out of 68 *Bos* specimens at Poor's Heath. At no site is aurochs (as defined by the authors of each site report) more common than domestic cattle. Three sites have specimens attributed to the early Bronze Age: a very large distal humerus from West Row Fen (width of distal trochlea = 99mm), a partial skeleton from Lowe's Farm, and a calcaneum from Aston Mill Farm (which may be from a very large domestic cow or small female aurochs). The West Row Fen aurochs bone has not been dated and, although the village site itself has been given a calibrated range of *c* 2290–1780 cal BC, it is not possible to define the specimen more closely than to the early Bronze Age. This being so, the Lowe's Farm skeleton is the most recent known specimen of aurochs from the region (1750–1500 cal BC), although mid-2nd millennium dates have also been reported for specimens from Beckford, near Tewkesbury (24, Hereford and Worcester; Gilmore 1972) and Wilburton (Cambridgeshire) (Legge 2010, 34). A later specimen is known from Charterhouse Warren Farm, Somerset (Clutton-Brock 1986), dated to 3245±40 uncal BP, although the calibrated date range exhibits some overlap with that of Lowe's Farm (Charterhouse Warren 1620–1430 cal BC). Yalden (1999) notes these dates as the latest of the period, although specimens from Maiden Castle and Testwood Lakes (Hampshire) are broadly attributed to the Bronze Age (Yalden 1999, 116, table 2). Additionally, Noddle (1993, 98) mentions a 4th-century AD Roman example, which may have been collected as a curiosity. In summary, there are no directly dated specimens known from later than the middle of the 2nd millennium cal BC, which means that by the middle Bronze Age the aurochs had become either extinct or extremely rare in the region, as well as in the rest of Britain. Considering the numerous specimens dated to that period, it is likely that the extinction occurred relatively rapidly (Legge 2010).

The definition of domestic cattle is as hazardous as for pigs, and specimens are often considered to be domestic by default if aurochs cannot be identified. Thus, diagnosis is rarely made except on the basis of whole assemblages. Cop Barrow, Bledlow (99, Buckinghamshire; Fraser 1940), has a cattle minimum number of individuals (MNI) of 7, and these animals are considered to be 'small' in size. A larger sample of cattle bones at Grime's Graves 71–72 provides measurements that are intermediate in size between Neolithic and Iron Age cattle. The sites of Hindlow Cairn, near Glossop (middle Bronze Age, 181, Derbyshire; Bramwell 1981; Harcourt 1981), and Walton Lodge, Aylesbury (broadly dated Bronze Age; 398, Buckinghamshire; Sadler 1989), have cattle similar in size to others of that period. Small, short-horned cattle (supposedly introduced from continental Europe during the Bronze Age) are found at West Row Fen: the two most complete specimens of horncore have a basal circumference within the range of domestic cattle from the Neolithic, but the outer curvature is estimated at only 200–250mm. All this evidence should now be reviewed on the basis of a new biometric framework for the aurochs (Wright and Viner-Daniels 2015; Wright 2016).

The only congenital anomaly reported in the database is a cattle mandible from West Row Fen, which is missing its second permanent premolar. The absence of certain teeth is often linked to genetic changes connected with domestication (Baker and Brothwell 1980). In addition, malocclusion of teeth in one mandible and unusual wear on an isolated tooth are seen at this site, and may derive from similar causes, or from nutritional stress during growth.

4.4 Species occurrence and frequency

4.4.1 The main domesticates

Figure 4.3 shows the frequency of the three main domesticates in the most substantial assemblages from the Bronze Age (where the total NISP of these taxa is greater than 300). The most readily apparent change from the Neolithic (*see* Fig 3.3) is the increased importance of sheep/goat. Caprines are not, however, as dominant in any of these assemblages as in some southern sites (cf Serjeantson 2007). In contrast with the earlier period, pig is consistently the least well-represented of the three domesticates.

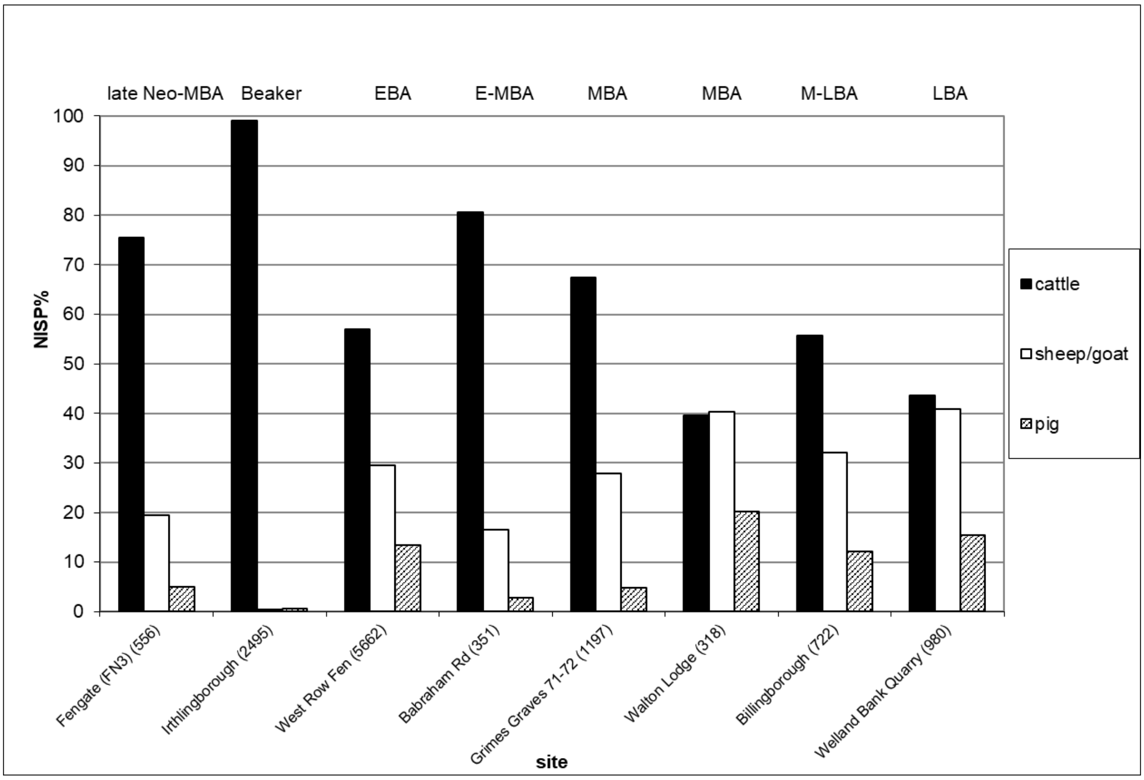

Fig 4.3 Summary of the three main domestic taxa at various Bronze Age sites across central England, as a percentage of number of identified specimens (NISP). The numbers in parentheses refer to the NISP of cattle+sheep/goat+pig from each site. Only assemblages with a total NISP for the three taxa >300 have been shown. The sites are arranged in approximate chronological order. Neo=Neolithic; EBA=early Bronze Age; E-MBA=early to middle Bronze Age; MBA=middle Bronze Age; M-LBA=middle to late Bronze Age; LBA=late Bronze Age; EIA=early Iron Age. For further details see Tables 4.1 and 4.2 and Fig. 4.2. Babraham Rd (Cambridgeshire; I Baxter, pers comm) is not in the gazetteer.

Figure 4.4 also shows this general trend, and demonstrates that the relative abundance of sheep and goat continues into the later period, with many more Iron Age periodsites falling into the central portion of the graph. Too few Bronze Age assemblages were available for the trends to be tested for statistical significance. A chronological trend within the period is difficult to discern, unless the increasing percentages of both sheep/goat and pig later in the period are significant (Fig 4.3). The variable frequency of the three main domesticates is likely to be dependent mainly on the nature of use of these sites, with the funerary early Bronze Age site of Irthlingborough representing the most extreme case, with an almost exclusive focus on cattle.

Serjeantson (2007) identified a particular cluster of sites from elsewhere in southern England that are anomalously pig-dominant at the late Bronze Age–Iron Age transition (Wallingford, Oxfordshire; Potterne, Wiltshire; and Runnymede, Surrey), where pig contributes more than 40% towards the combined pig and sheep/goat count. In central England, only Wigber Low, White Peak, Ashbourne (419, Derbyshire; Maltby 1983), is comparable. Irthlingborough fits the percentages but the actual numbers of non-cattle NISP are vanishingly small. Other than this pig-dominant cluster, Serjeantson (2007) was not able to identify any geographical or temporal groupings of similar sites. Grigson's earlier study of Beaker and early Bronze Age sites also failed to pick up a consistent pattern, although her sample of sites was small (Grigson 1982).

The only ritual site represented in Fig 4.3 is the barrow at Irthlingborough, with an anomalously high percentage of cattle specimens. A complete dominance of cattle is also found at the more recently published early Bronze Age Barrow at Gayhurst Quarry (Buckinghamshire; Chapman 2007). Of the sites with a slightly lower combined NISP (less than 300), the ritual site at Springfield (NISP=271) has a clear predominance of cattle whereas at Wigber Low (NISP=246) the three taxa are relatively evenly represented. Clearly these three burial or ceremonial sites were highly individual in character. It is unfortunate that a comparison between these and the several other ritual sites is hampered by small assemblage size and insufficient data. Indeed six of the site reports record no NISP at all: Cop Barrow; Glebe Low, Great Longstone (149, Derbyshire; Radley 1966); Hindlow Cairn; Milton Keynes and Great Ouse Valley; Ravenstone 78, near Newport Pagnell (291, Buckinghamshire; Jones 1981); and Roxton.

The case of Welland Bank Quarry is interesting: both hand-collected and sieved material is recorded (the latter recovering 183 NISP) but the species frequencies of both assemblages are almost identical. This may indicate a particularly careful approach to hand-collection, making this assemblage not entirely comparable with others in the region that are likely to be more affected by a collection bias. Conversely, the material from Grime's Graves 71–72 was apparently coarse sieved in its entirety, producing an assemblage that is also not directly comparable with those that were hand-collected. Nevertheless, the results are still strongly cattle-dominant, which indicates that the predominance of this species is genuine and not the result of recovery bias.

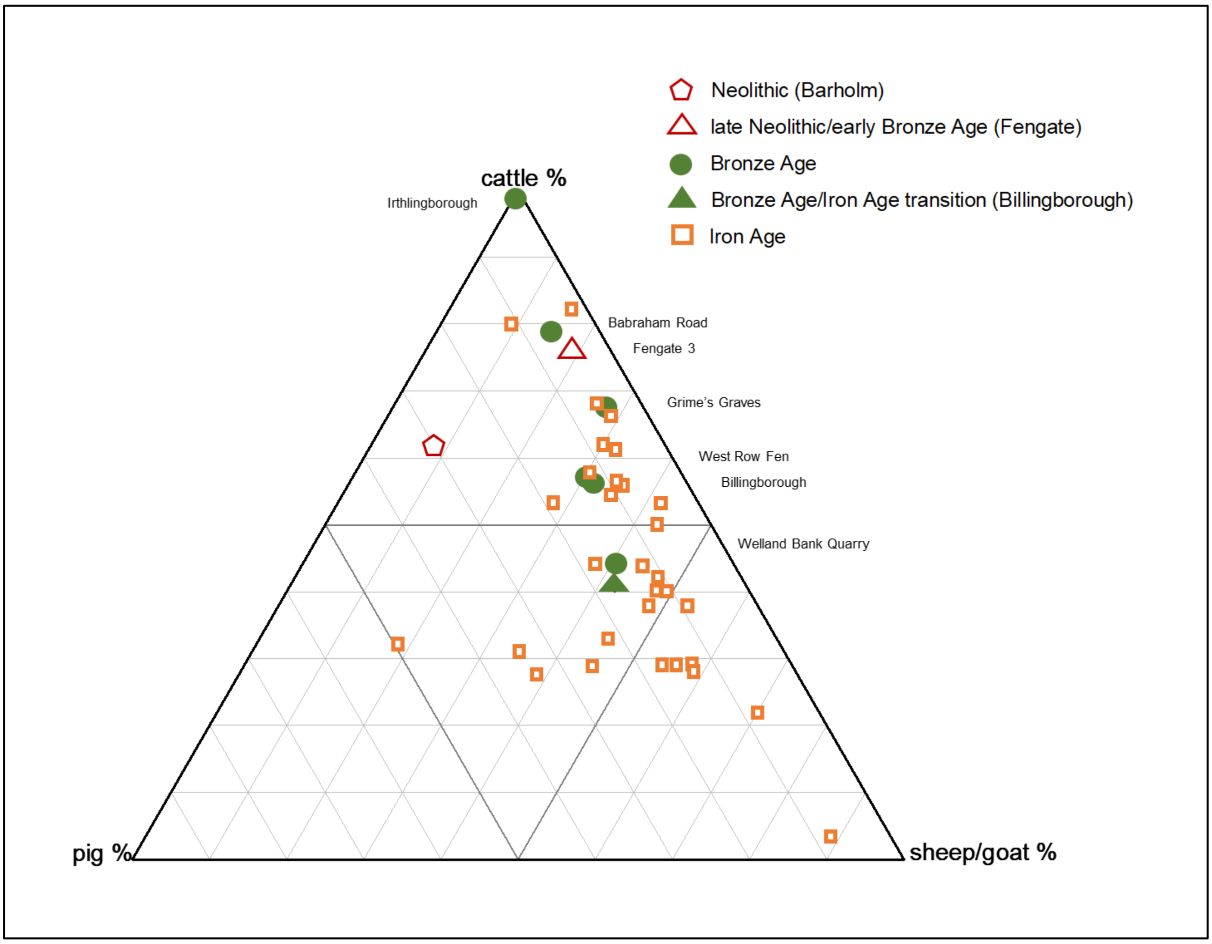

Fig 4.4 Relative proportions of cattle, sheep/goat and pig at periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from the Neolithic, Bronze Age, Iron Age and transitional periods of sites across central England. Babraham Rd, with a smaller NISP, is also shown for reference (I Baxter, pers comm).

Several sites in the region have continuity or near-continuity of use between the Neolithic and Bronze Age, or have more than one Bronze Age phase. Unfortunately, in each case either one or both phases comprise very small assemblages. For instance, Grime's Graves 71–72 has a large Bronze Age component but a small late Neolithic assemblage. The proportions of the main domesticates between the two phases are comparable, despite the change of use of the site from mine to midden. Hockwold-cum-Wilton 61–62 has 98% cattle in the Neolithic, falling to 77% in the Bronze Age, but both assemblages, particularly the earlier one, are quite small. An increase in pig (to 17%: a high percentage for the Bronze Age) makes up the shortfall in the later period. Feltwell Anchor has fewer than 50 specimens in both Beaker and early Bronze Age phases, but comprises almost exclusively cattle in both cases. The site report for Brancaster 77, Hunstanton/Wells-next-the-Sea (48, Norfolk; R Jones *et al* 1985), includes no itemised NISP values.

The only significant example of temporal continuity is seen at the unpublished site of Babraham Rd (I Baxter, pers comm). Here, a large pig-dominant assemblage from the late Neolithic–early Bronze Age (discussed in section 3.4.1) is superseded by a smaller assemblage that is cattle dominant (shown in Figs 4.3 and 4.4). Baxter suggests this may be because of a profound change in local habitat, resulting in the loss of woodland species (including pig). Certainly the wild species present in the earlier period are entirely absent in the later. The pig-dominant assemblage is not uncharacteristic of the late Neolithic (in fact Baxter compares it with the ceremonial site of Durrington Walls). Of the large non-ritual Bronze Age sites shown in Fig 4.3, Babraham Rd is relatively high in its proportion of cattle and low in its proportion of sheep/goat; it is possible that 'episodes of butchery and feasting' (I Baxter, pers comm) had a particular local character.

4.4.2 Equids

The reintroduction of the horse to Britain has been discussed in section 3.4.2. It is readily apparent from Fig 3.4 that equids become more widespread in the Bronze Age. In addition, finds are not confined to single specimens, although they only exceed 15 specimens at Welland Bank Quarry. Overall, 14 Bronze Age sites report the presence of horse bones, including four containing Beaker material, and horse is also present at the two Fengate sites (FN2 and FN3) from the Neolithic–Bronze Age transition. At Welland Bank Quarry, out of a total of 102 bones originally recorded as 'equid', some have recently been positively reattributed to horse on the basis of tooth morphology (after Davis 1981; U Albarella, unpublished data). Donkey has not been positively identified anywhere in the region, although a left mandible of horse from a pit at Ravenstone 78 is described as 'extremely small' (Jones 1981, 92). The abundance of horse/equid specimens at Welland Bank Quarry comprises 8% of the total large mammals recovered at this site. The typical percentage is 1% or less at other sites, with the exception of Springfield, which has 2%, but which is a small assemblage of 326 identified specimens.

Horse seems to be equally well represented at burial, ceremonial and non-ritual sites, and is present at all the sites shown in Fig 4.3, and in those with a NISP greater than 200. It is also present in all the geographical clusters shown in Fig 4.1, with the exception of the two small isolated sites in Hereford and Worcester. This would seem to indicate a general ubiquity of usage, even if at a low level.

Some evidence of the utilisation of horse carcasses for meat or hide is indicated in the Bronze Age. One specimen from Billingborough displays (unspecified) butchery marks, and the use for meat is suggested. At West Row Fen skinning is indicated by multiple transverse cuts to a metapodial, which are too far above the joint to suggest disarticulation. It is therefore probable that hides were utilised.

4.4.3 Other mammals

Table 4.3 shows the presence (and absence) of selected wild taxa in the region during the Bronze Age. It is perhaps inappropriate to compare the frequency of occurrence of wild animals in the Neolithic and Bronze Age, given that the former period is represented in the main by fewer and smaller assemblages. What is immediately striking, however, is that all the main food animals found in the wild occur relatively less frequently in the Bronze Age. For aurochs and wild boar, the decrease is pronounced, while red deer drops less steeply, and roe deer is found on almost as many sites. Of course, frequencies of aurochs and wild boar are to some extent at the mercy of biases in identification, as well as the size and fragmentation of an assemblage. Concerning the larger assemblages, notable absences of wild mammals occur at Babraham Rd (which consists of an entirely domestic fauna in the early–middle Bronze Age) and Irthlingborough (where aurochs is the only wild species, and does not represent a contemporary occurrence of living animals).

Table 4.3 Presence of selected wild taxa at Bronze Age sites in central England. Only taxa present at least two sites are shown; periodsites with NISP>200 and periodsites with NISP≤200 are shown. Babraham Rd (Cambridgeshire; I Baxter, pers comm) is not in the gazetteer.

Site	Aurochs	Wild boar	Red deer	Roe deer	Wolf	Fox	Badger	Wild cat	Beaver	Otter
Periodsites with NISP>200										
Babraham Rd										
Billingborough			x	x						
Fengate (FN3)			x		x	x	x			
Grime's Graves 71-72			x	x		x				
Irthlingborough	x									
Springfield			x	x						
Walton Lodge			x					x		
Welland Bank Quarry			x	x	?	?			x	
West Row Fen	x		x	x		x		x		
Wigber Low			x	x						
Periodsites with NISP≤200										
Aston Mill Farm					x		x			
Bee Low			x				x			
Brancaster 77										
Cop Barrow			x	x			x			
Earls Barton			x			x	x			
Elms Farm, Leicester										
Feltwell Anchor			x							
Fengate (FN2)	x	x	x							
Giant's Hills 2	x	?	x	x		?				
Glebe Low										x
Hermitage Farm			x						x	
Hindlow Cairn			x			x				
Hockwold-cum-Wilton 62–66			x	x						x

Site	Aurochs	Wild boar	Red deer	Roe deer	Wolf	Fox	Badger	Wild cat	Beaver	Otter
Hockwold-cum-Wilton 61–62			x	x						
Lowes Farm	x									
Milton Keynes and Great Ouse Valley			x			x				
Oakham			x							
Oxford Rd										
Poor's Heath		?	x	x		x	x			
Ravenstone 78			x	x						
Redgate Hill			x							
Roxton			x				x			
Walton Lodge			x							
Number of certain occurrences	5	1	25	12						
% occurrence in BA	15	3	76	36						
% occurrence in Neolithic	40	13	86	40						

As in the Neolithic, the two deer species, red and roe, are consistently represented at a lower frequency than the domesticates. Roe deer specimens are not only found at fewer sites, but are always found in lower frequencies than red deer. Usually, small numbers of deer bones are reported (NISP<20). The totals are higher at Grime's Graves 71–72, where red deer makes up 4% and roe deer 2% of the larger mammals (red deer is almost as common as pig at this site). Similarly, at West Row Fen, the percentages are 2% and 1%, respectively. No comparable percentages were found for the Neolithic, although most Neolithic assemblages are too small to provide reliable results. Of course, quantification of deer is complicated by the inclusion or exclusion of antler in fragment counts. At Ravenstone 78, for example, numbers of deer specimens are not given, but the presence of unshed antler, cut from the skull, is said to indicate that the species was hunted for food. Conversely, at Springfield, the deliberate collection of shed antler for antler-working is suggested. Industrial use of antler is considered in section 4.6.1.

Dog remains are found at 19 periodsites, a greater prevalence than in the Neolithic. Gnawed bones also attest to their presence. Wolf has been identified at Fengate (FN3) and at Aston Mill Farm, the latter being a partial skeleton. A worked tibia from Welland Bank Quarry is large and slender with strong muscular attachments and may have belonged to a wolf. There is no evidence to suggest that dogs were accorded symbolic status or were treated as companions. Indeed, at West Row Fen, dog carcasses were disposed of in a similar way to the other domesticates and they were probably eaten, as suggested by cut marks indicating decapitation and disarticulation. Partial skeletons have been found at Wigber Low and Fengate (FN2), but seem not to have been part of formal burials. A small dog from Cop Barrow is described as being closer in size to a modern King Charles spaniel than fox terrier (Fraser 1940).

Evidence for exploitation of smaller animals for skins (or other raw materials) is hard to find. With the exception of the several bones of a fox from West Row Fen (which had certainly been skinned), no indicative butchery marks are present. The occurrence of bones of animals such as the beaver or otter in the vicinity of settlements may suggest deliberate procurement, although fox, wildcat or badger bones may have been present as scavengers. An abundance of beaver bones was found at Welland Bank Quarry (87 from hand-collection and a further 21 from sieving). This represents 7% of the hand-collected assemblage. Beaver is also present at Hermitage Farm barrow. No details or counts are given of the otter bones from Hockwold-cum-Wilton 62–66, near Brandon (183, Norfolk; Anon 1982) and Glebe Low. Consequently, we do not know whether they were of particular importance, although in both cases they occur with an assemblage that is at least partly domestic refuse.

4.4.4 Birds, rodents and fish

Evidence for the exploitation of birds in the Bronze Age is poor. Although the diversity of birds reported is greater than for the Neolithic, and bird bones are found at more sites, it is uncertain to what extent these may have been natural mortalities. No butchery marks have been identified on any of these specimens. The presence of goose at Fengate (FN3), and two duck humeri at Grime's Graves 71–72, are likely to indicate food waste. The two heron bones found at Welland Bank Quarry certainly reflect the local environment, but it is not clear whether they were eaten. Swan was also present at Hermitage Farm barrow (Legge 2006c). The site reports from Grime's Graves 71–72 and Roxton also mention the presence of birds, but these have not been itemised. The most abundant evidence comes from two of the Derbyshire cairn sites, Wigber Low and Hindlow Cairn. The latter assemblage has five bones from black grouse, and one of long-eared owl, suggesting a moor-edge habitat. Seventy specimens of bird bone were found at Wigber Low, although numbers for each taxon are not given. More than half of these belong to thrush species. In addition, raven, skylark and woodcock were identified. Again, it is not possible to tell if any of these may have formed part of the diet.

Many of the cairn and barrow sites are notable for their variety of small mammals and amphibians. These seem to represent an environment where natural mortalities are likely to build up. Deposits of raptor pellets are one potential cause. Although the long-eared owl from Hindlow Cairn is the only identified raptor from the region, the presence of others may be assumed elsewhere. Water vole is the most abundant microfauna species at Bee Low, Youlgreave (26, Derbyshire; Clegg 1970), and it was reported that all but one of the skulls had been broken by predators, either bird or a small mammal. Water vole is also reported in small numbers at Hindlow Cairn and Ravenstone 78. At Bredon Hill, Tewkesbury/Evesham (another barrow site; 51, Hereford and Worcester; Jewell 1965), a small number of toad and bank vole bones were found inside a human skull. Jewell (1965) speculates that the corpse may have lain in the open for some time, and that the remains of kite or buzzard pellets (for instance) became incorporated inside the skull after a period of decomposition. Small rodent bones were also found at the other burial sites of Giant's Hills 2 (first mentioned in section 3.4.3), Glebe Low (field mouse, field vole and bank vole, in both cases) and Poor's Heath (one field vole specimen only), although details are not given. The deposits at Glebe Low are worth a special mention. Numbers of rodent bones, particularly water voles, were found towards the top of the mound in such quantities that even a small sample collected for analysis yielded several hundred specimens. The ubiquity and positioning of rodent bones at this and similar Derbyshire sites, led Radley (1966) to suggest that 'it is possible that they were part of the natives' diet' (Radley 1966, 68), although hibernation, owl pellets and a true abundance of voles during that period were also suggested as explanations. Unexplained subterranean 'graveyards' of water vole have been noted elsewhere in Britain (Wilson 1987, 2).

The large assemblage of rodents from Wigber Low includes 3,906 specimens of water vole, as well as small numbers of field vole, field mouse and common shrew bones. Frog and toad bones are very numerous, and 12 specimens of either stoat or weasel were found. In contrast to the large animals, the bones of these small taxa were complete and well-preserved. In this case, Maltby (1983) believes the small bones accumulated gradually into the earth around the cairn, as a result of the action of burrowing animals, and the presence of raptor pellets is not suspected. It is interesting to note that the water vole is present in large numbers despite the absence of its typical modern habitat, namely the well-vegetated banks of ponds or rivers (Corbet and Harris 1991). Maltby (1983, 48) suggests that the behaviour of this species in the Bronze Age may have resembled that of their modern equivalents elsewhere in Europe, where water voles are found in less aquatic environments, and are known as burrowing animals. A similar conclusion was reached in the site report from Hindlow Cairn (Harcourt 1981, 39), where at least four individuals are present.

The evidence for fish exploitation in the Bronze Age is very limited. To some extent this may be because of a lack of comprehensive sieving, although rodent and amphibian bones have been recovered in abundance at some sites, as already discussed. However, bulk-sieving was carried out at only five sites, three of which produced fish remains. Two specific fish reports exist in the dataset, dealing with successive analyses of material from 'Site 165, Mildenhall' in Suffolk, recorded here as West Row (412, Suffolk; A K G Jones 1983a) and Mildenhall (232, Suffolk; A K G Jones 1988). In total, the site produced 131 identified fish bones, all but 10 being from the 3-spined stickleback, the rest comprising pike vertebrae, Cyprinid vertebrae and scales, and the tooth of a shark. The latter was much abraded and may be a fossil. One possible specimen of burbot, a species now extinct in Britain, and a clupeid, probably herring, were present in a fragmentary condition. The stickleback remains may have been deposited by seasonal floodwaters, and in any case are too small to have value as food. The possible herring vertebra is interesting because it was found so far from the sea. A K G Jones (1988) suggests that it may have arrived in human or animal faeces, or have been contained in lumps of Fen Clay imported to the site for industrial purposes. The other fish bones (Cyprinid and pike) were recovered from dry parts of the site and may represent food waste. Analysis of incremental growth rings of one of the pike vertebrae suggests that it died in the summer (A K G Jones 1983a, 57).

The only other evidence of fish from the region consists of fish bones recovered from the barrow at Giant's Hills 2 (where the faunal assemblage may be partly Neolithic). A Cyprinid is certainly present, but other specimens were not quantified. Bulk-sieving at the site of Welland Bank Quarry retrieved no fish remains and, of the smaller taxa, only one water vole specimen was found. This general absence of fish from inland sites is in keeping with the conclusions of Serjeantson *et al* (1994), who identified only a small quantity of pike, Salmonids and Cyprinids from the late Bronze Age site of Runnymede, despite good preservation conditions and systematic recovery. Regarding the possibility of marine food, coastal (or near-coastal) sites are absent from the record in central England, with the exception of Redgate Hill and Brancaster 77, both of which only have very small hand-collected assemblages.

The only marine animal reported in the region for the Bronze Age period is a single specimen of grey seal from Welland Bank Quarry, an inland site that was probably prone to sea flooding.

4.5 Husbandry strategies

Only a small number of site reports provided data about the age and sex structure of domesticated flocks and herds. Even some of the largest assemblages from the Bronze Age, such as Babraham Rd and Fengate (FN3), were too small to provide such data, while full analysis of age profiles from Welland Bank Quarry is yet to be completed. The remaining sites are predominantly of middle or middle–late Bronze Age date. Summary data are given in Table 4.4.

Table 4.4 Summary of the husbandry strategies of cattle and sheep/goat from Bronze Age sites in central England where interpretations have been made. Mortality profiles are as interpreted by the respective authors of the site reports. The two sets of findings from Grime's Graves are from the British Museum (Shaft X) and Department of the Environment (DoE) excavations, respectively (Legge 1992). Elements of the former dataset have been reinterpreted (*) by Serjeantson (2007). BA=Bronze Age. Babraham Rd (Cambridgeshire; I Baxter, pers comm) is not in the gazetteer.

Site	Date	Cattle	Sheep/goat
Irthlingborough	Beaker	Meat	Small sample
West Row Fen	Early BA	Multi-purpose/traction	Dairy
Babraham Rd	Early–middle BA	Meat	Small sample
Walton Lodge	Middle BA	Meat	1–3 years: no interpretation given
Grime's Graves (Shaft X)	Middle BA	Dairy	Meat (*dairy)
Grime's Graves (DoE)	Middle BA	Dairy	Meat
Etton	Middle BA	Traction (age profile unknown)	Unknown
Billingborough	Middle–late BA	Multi-purpose/traction	Meat/?wool

4.5.1 Pigs

Few assemblages contained any great number of pig bones but, where age profiling was possible, the main cull was typically of sub-adult individuals. These would be animals that had reached their optimum meat-weight at the time of slaughter. At West Row Fen (with the largest number of pig specimens), some were killed before they were fully grown. Others were retained into adulthood for breeding, but few survived beyond 3 years of age. A couple of burial sites (Poor's Heath and Hindlow Cairn) reported the presence of neonatal pig bones, indicating that on-site breeding in the vicinity occurred and that some piglets may have been sacrificed. At Grime's Graves 71–72, juveniles predominate, although only 58 specimens are present in total.

4.5.2 Identifying a meat or dairy economy

Direct evidence for the use of dairy products in the Bronze Age is still elusive. However, as noted in section 3.5, milk residues have been identified in pottery dating from the Neolithic (Copley *et al* 2005; Mukherjee *et al* 2005), therefore we may assume that the technology was known and exploited to some extent. Regarding the material from Grime's Graves 71–72, Legge (1981b, 1992, 2005) uses a combination of factors to argue for a cattle economy based on milk. Firstly, a high proportion of (presumably male) juveniles were culled before they were 6 months of age. Secondly, investigation of the sex structure of the remaining adult herd reveals that most individuals were female.

The distinction between males, females and castrates relies primarily on size dimorphic distinctions between bone measurements (Albarella 1997e), in this case of the metapodials. Clearly, it is necessary to have a large enough pool of measurements for this to be statistically valid. Similarly, a suitable quantity of ageable mandibles is required for compiling a mortality profile. With sheep, the sex structure of a flock may be less apparent, because they are not as sexually dimorphic as cattle (Serjeantson 2007). We may therefore expect the use of sheep milk to be somewhat more difficult to identify from faunal evidence, although it is certainly known that sheep were milked in parts of northern Europe until the Industrial Revolution (Sherratt 1983). The optimum flock of sheep kept for milking (according to Serjeantson 2007) is characterised by juveniles culled between 2 and 4 months of age, and older adults, of which few will be rams and none will be wethers. Husbandry based on meat production will not display the same early kill-off pattern within a flock. For meat production it is more suitable to raise the majority of animals to their optimal slaughter weight (reached at approximately 2 years of age for cattle, about 18 months for sheep/goats). Sufficient adults will be left for the purposes of population replacement. Raising flocks for wool, or cattle for traction, will further complicate the age and sex profiles of the assemblage, and mixed economies may of course exist. In addition, certain consumer sites may receive a specified portion of the available animals, thus obscuring the pattern.

4.5.3 Cattle

A summary of identified husbandry strategies is presented in Table 4.4. Only the Grime's Graves assemblage clearly indicated a dairy economy (Legge 1981b). In a later publication, Legge (2005) compared the data from the various excavations of Bronze Age midden material at this site, and confirmed and reiterated these conclusions. A virtual absence of 2–3-year-old prime meat animals is seen, and almost 40% were killed before they were 3 months old. The high number of young animals cannot be explained by seasonal occupation of the site (in the birth season, for instance). The benefits of such a specialised husbandry strategy may have included the tradeable value and portability of cheeses, and their value as a buffer against famine. Given the low fertility and carrying capacity of soils in the area, this strategy may have been particularly worthwhile (Legge 1981b).

Of the other large assemblages, that from the barrow at Irthlingborough is particularly indicative of a meat economy. Young adults predominate, and calves and elderly animals are rare. However, it is important to note that selection of prime animals may have been specific to the demands of the funerary rituals, and may not reflect the age structure of local herds. The assemblage from Walton Lodge, although much smaller, probably also reflects a herd kept mainly for meat. At Babraham Rd mandibles represent four sub-adult and three adult cattle, and most bones are fused; no evidence for dairying is suspected. Baxter (pers comm) suggests that if prehistoric cattle were predominantly kept for milk, then this kind of slaughter may represent high-status or ceremonial activities.

Several site reports indicate a possible mix of uses for cattle. The report from Etton, dealing with an assemblage that most probably belongs to the Bronze Age, analyses a sample of 15 innominates and a number of scapulae from the site, many of which bear traces of osteoarthritis and eburnation associated with traction (eg Baker and Brothwell 1980; Armour-Chelu and Clutton-Brock 1985). These were found to belong mostly to females, which display these pathologies at a younger age than might be expected in modern, non-working cattle (Vaughan 1960). The extent of this assemblage is unknown, making it impossible to speculate about the composition of the herd. However, this is a particularly clear demonstration of the probable use of cows as draft animals. Osteoarthritis was also found on several cattle bones at West Row Fen, including one innominate (unsexed), an ulna and two phalanges, all of which may be load-bearing bones under traction. The few juvenile mandibles found at this site, and the abundance of adults (including many specimens aged 6–8-years), suggest use as draft animals and for meat. The assemblage from Billingborough has few juvenile deaths represented, and a multi-purpose usage was suggested. Although no traction-related pathologies are present, the age of some of the cattle indicate that retaining older animals for use as draft animals is plausible.

4.5.4 Sheep and goats

Sheep is clearly the predominant species and the mortality evidence discussed has been mainly attributed to this species. Fewer assemblages yielded sufficient ageing information about caprines, compared with cattle. Possible use for wool as well as meat is mentioned only at Billingborough. At this middle–late Bronze Age site, sheep/goat were killed at the optimum age for meat (18 months to 2 years), while the older animals may have been kept for wool or as breeding stock. The majority of animals from Walton Lodge were killed between 1 and 3 years, probably indicating a meat economy, although this is one of the smaller assemblages (sheep/goat NISP=128) and must be treated with caution.

Legge's (1992) analysis of the sheep mandibles from Grime's Graves concludes that meat production was the prime concern. Most animals were killed in early maturity, although there were differences between the two main assemblages with regard to timing. Legge (1992) also noted that the animals must have been raised locally, as newborn and older lambs are both present. Serjeantson (2007), on the other hand, has reinterpreted the Shaft X material as indicating management for milk, as the proportion of animals slaughtered before the age of 9 months (at or before mandibular wear stage C; Payne 1973) was greater in this assemblage than in the material from the Department of the Environment (DoE) excavation. Serjeantson's (2007, 85, fig 1) review of sites from the middle Bronze Age into the Iron Age concludes that the earliest management of flocks for milk occurred from the middle of the 2nd millennium, and can be demonstrated at five out of the nine assemblages she considered. Apart from Shaft X at Grime's Graves, Serjeantson (2007) identified dairy management strategies at East Chisenbury, Runnymede, Potterne and Wallingford. Each of these sites had evidence of a heavy kill-off during the first year. All but East Chisenbury date from the late Bronze Age–early Iron Age, and had a high percentage of pig bones. A 'wealthy' economy, based on intensive management of sheep and the raising of pigs for feasting, may be indicated. Neither West Row Fen nor Grime's Graves had a high percentage of pig bones.

Hambleton (2008), reviewing evidence from southern England, has suggested that the occurrence of older lambs may represent the culling of surplus stock in the autumn. She suggests that sheep, in such cases, are more likely to have been kept for a variety of purposes, with no specialisation in any product.

Of the remaining sites in central England, only the report from West Row Fen suggests the possibility of dairy management. A high proportion of individuals lived well beyond the age at which they would have attained their maximum meat weight. Nevertheless, the mortality profile peaks at about 1 year and large numbers of very young lambs are not present. If this evidence truly reflects a dairy economy, then it is surely a very early example; the sites identified by Serjeantson (2007) were dated no earlier than the middle

Bronze Age. It is interesting to note that Billingborough (a later site) and West Row Fen have very similar proportions of the three main domesticates, but a dissimilar economic strategy for sheep/goat.

It is unfortunate that the two Fengate (FN2 and FN3) assemblages are too small to make inferences about the population structure of sheep and goats. The site area is rich in evidence for the control of large numbers of animals, including the 'community stockyards' of Fengate (FN3) and the 'stock-handling system' of paddocks at Fengate (FN2) (Pryor 1996, 1998). Pryor's theory is that, during the 2nd millennium BC, pasture was under sufficient pressure here and elsewhere that it required elaborate sub-division for the separation of flocks and to enable grazing land to recover. Similar field systems incorporating possible stockyards are seen at West Deeping in Lincolnshire, and other likely candidates have been observed through aerial photography at Mucking and elsewhere in Essex (Pryor 1996). Monckton (2006) notes that the balance of pastoral and arable farming elsewhere in the east, particularly in the Trent Valley, deserves the attention that has been paid to the Fenlands.

4.6 Human processes

4.6.1 Bone modification

Few reports note butchery in any detail. Cattle is the most frequent mammal for which butchery is reported (at a total of five sites), while horse, pig and dog have one mention each. The frequency of identification is low, with only one or two chop or cut marks typically mentioned in the reports. The exception to this is the report from West Row Fen, for which the incidence and location of chop and cut marks on the bones of the main food animals can be compared in detail (cf Olsen 1994). Cattle bones are more heavily chopped than those of caprines and pigs (as befits their larger size), although the pattern of butchery is said to be very similar (disarticulation, segmentation of the carcass and filleting). Horncores and frontal bones of cattle display heavy, often multiple, chop marks, indicating the removal of horn for the manufacture of artefacts, or possibly for glue. Sheep or goat horns seem not to have been utilised. Marrow extraction is suggested by circular perforations made in the ends of several caprine long bones. Similar perforations found on two cattle phalanges were described as percussion marks caused by a chipped stone hammer, but may have been made by dog gnawing. At this site, skinning marks were recorded in detail on all three main domesticates, horse, red and roe deer and fox. The fox bones at the site may be from one individual, and display cut marks around the wrist and ankle joints. Unfortunately, no other sites report evidence of skinning.

The large assemblage of cattle bones from Irthlingborough was generally in too poor a condition for identification of butchery marks, but fine cut marks were found on scapulae (probably indicating defleshing) and skulls (although horn removal is not indicated). Meat-bearing long-bones are absent from the barrow.

The several excavations at Grime's Graves produced a large number of worked bone implements (described and illustrated in Legge 1992, 43–69). These include robust points and hafts made of red deer, horse or cattle bones; points and burnishing tools typically derived from caprine metapodials; and other small points and needles from unidentifiable mammals. Worked antler of red and roe deer is also present.

A quantity of bone and antler artefacts are reported at West Row Fen, including 76 awls made from sheep/goat bones. Red deer antler tools include pressure flakers used in the manufacture of flint tools, a hollow handle and two mace heads. Antler working is also identified at Springfield, where five pieces of red deer antler show evidence of being worked. Three red deer antler picks from Billingborough are not clearly phased. Use of roe deer antler is indicated at Hockwold-cum-Wilton, Ravenstone 78 and Poor's Heath, all of which are Beaker sites. At the last site, this interpretation is based only on the presence of a shed antler, which was presumed to have been collected for that purpose. From Ravenstone 78, a gouge with a U-shaped end is the only reported implement made from roe deer antler. Antler and bone spatulae, as well as perforated bones points, were identified at Gayhurst Quarry.

4.6.2 Bone disposal

Although many of the Bronze Age sites in central England are of funerary or ceremonial character, it has been noted already that the bone assemblages from these contexts are seldom large. It is important to remember that faunal material from a site such as a barrow may not have been incorporated with any ritual intention in mind. However, a few deposits are directly associated with cremations and other burials, while others are less certain. At Poor's Heath, a Beaker bowl barrow, a complete cattle forefoot with signs of burning is interpreted as a possible food offering or the remains of a funeral feast. The remainder of the assemblage is considered to be an accumulation of occupation debris incorporated into the material of the mound, although no nearby settlement has been discovered. Other than a few occurrences of articulated bones, animal burials do not seem to feature in the Bronze Age. The two partial skeletons of dogs at Wigber Low are reported without comment, but there is no reason to suppose they were not refuse. The articulated skeleton of a sub-adult pig, lacking its left limbs, was found in the fill of one of the shafts at Grime's Graves, although it is not known how it came to be there (Legge 1981a).

The middle–late Bronze Age enclosure at Springfield contained a sub-rectangular post-built structure tentatively interpreted as a shrine. Although Wade (2000a) interprets the large proportion of cattle bones as an artefact of hand-recovery and poor survival of smaller bones, they form 89% of this assemblage, which is a high proportion compared with other sites in the region. It is possible that cattle were the favoured species. Most of the animal bone is from the enclosure ditches, where redeposited human bone is also present. It is uncertain what activities are represented at Springfield.

Glebe Low, a Beaker barrow, contained a cist in which the cremation was accompanied by an impressively large pig canine and a fossil. A fragment of pig canine was also found with a human cremation burial at Roxton cemetery. Occasionally, ritual activity was found within a site that was predominantly domestic. At Oxford Rd, a rural site consisting of ditches, gullies and post-holes, one of several cremation burials contained two fragments of unidentified animal bone. The rest of the assemblage was also small. It is worth pointing out that animal bone from cremations is frequently not included as part of a faunal analysis and therefore we cannot discuss it comprehensively here.

The Beaker barrow at Irthlingborough not only provides us with the most definite ritual association, but also with the second-largest bone assemblage from the Bronze Age. The animal bones (almost entirely cattle skulls) were deposited above a burial pit containing an adult human inhumation and grave goods. It is suggested that they may have been funeral tokens rather than debris from feasting. This is because of the sheer amount of meat represented by 185 carcasses, but also because of the likelihood that the skulls had been defleshed, the smaller teeth perhaps falling out in the process and being lost (Davis and Payne 1993). Meat-bearing bones (other than a small number of scapulae and pelves) are absent, further reinforcing this theory.

A comparable site is represented by the early Bronze Age barrow at Gayhurst Quarry, where remains from a minimum number of *c* 300 cattle were buried (Chapman 2007). It is suggested that full carcasses were deposited near the top of the barrow, where they were left to decay but were protected by the action of scavengers (as demonstrated by the low frequency of gnawing marks). The remains were eventually buried in the inner barrow ditch, with some of the smaller bones lost in the process. The assemblage comprises limb bones (mainly) and skulls, and it has a minimal amount of butchery marks. This suggests that most of the animals were not used as food, but rather offered to the dead. The primary inhumation of the barrow is accompanied by an articulated pig limb bone. Nevertheless, both Gayhurst and Irthlingborough emphasise a shift in the symbolic importance of pig and cattle between the late Neolithic and the early Bronze Age. Pigs had, by this time, lost their predominance in the ritual and possibly also economic sphere.

At Flag Fen platform and Fengate Power Station post alignment (Cambridgeshire; Halstead and Cameron 1992), there are several structured depositions, the dating of which, within the Bronze Age, is unclear, even when analysed within the context of Pryor's (1992) general account of the sites and their excavations. Interestingly, however, partial burials of dogs and cattle, as well as selected elements of sheep, found at Flag Fen, appear to have been placed in a meaningful way. At Fengate Power Station, the bones are aligned along the post line, suggesting that they are 'in some way involved in the social and symbolic reinforcement of this boundary' (Halstead and Cameron 1992, 501).

In summary, the evidence from ritual and funerary sites in the region has produced several isolated instances of placed deposits and inclusions in burials, but few assemblages of a size that allow insight into economic practices. The various middens, enclosures and settlement sites have yielded the bulk of the quantifiable data. However, what little ecological information we have about local habitats and the diversity of wild fauna in the region derives mainly from the barrow and cairn sites [although the fish report from the site at Mildenhall (A K G Jones 1988) and the diverse list of taxa from Welland Bank Quarry have augmented this].

5 IRON AGE

5.1 The context

There was no dramatic change at the Bronze–Iron Age transition, and the landscape of farmsteads and small dispersed settlements that characterised the Bronze Age was also typical of the pre-Roman Iron Age. These settlements were often enclosed by a wall, bank or ditch, and practised mixed farming based on livestock, cereals and woodland management (Hill 1995a). There was, however, an increase in the density and permanence of settlement patterns (Cunliffe 1995), which has resulted in a more abundant archaeological record for the Iron Age. Such intensification may be associated with technological innovations, although iron working had already begun in the Bronze Age (Hill 1995a). Variation in cultural patterns across the region have been identified by previous synthetic studies (eg Bryant and Niblett 1997; Davies and Williamson 1999; Hill 2007).

Although isolated households (with circular buildings) represent the characteristic settlement type for the Iron Age, hillforts (ie hilltop settlements enclosed by earthen or stone walls) are also frequent, particularly in the south of England. The end of the Iron Age (1st centuries BC/AD) witnessed increased contact with the Roman Empire as well as the emergence of large enclosed sites, probably partly urbanised, known as *oppida*. Many of these evolved into Roman cities (Hill 1995a). Examples in central England include *Verulamium* (St Albans, Hertfordshire) and *Camulodunum* (Colchester, Essex) (Cunliffe 1991). The construction of communal funerary monuments had already ceased during the middle Bronze Age, and it was during the Iron Age (probably in the 7th century BC) that the practice of depositing bronze objects and scraps in hoards seems to have died out (Hill 1995a).

The harsher climatic conditions that had characterised the second half of the 2nd millennium BC seems to have continued in the first half of the 1st millennium BC (Hill 1995a), perhaps preventing substantial changes in lifestyle from the Bronze Age to the Iron Age.

5.2 The sites

The evidence discussed in this chapter relies on 102 periodsites. This represents a substantial increase (more than three-fold) in sites compared with the Bronze Age record, although a few of these sites are transitional, either with the preceding Bronze Age or the subsequent Roman period.

This larger number of sites covers a greater geographical area than the Bronze Age, although biases in the spatial distribution can still be clearly identified (Fig 5.1). As for all periods, the western part of the region is poorly represented, a clear consequence of preservation bias, although other factors may play a role. The counties of Shropshire, Staffordshire, West Midlands and Warwickshire have so far produced no Iron Age animal bone evidence, and other counties with notoriously acidic soils, such as Derbyshire and Nottinghamshire, are also poorly represented. The greatest concentration of sites can be found in the south-eastern part of the region, with the counties of Buckinghamshire, Hertfordshire and Essex being fairly well represented. It is worth bearing in mind, however, that the animal bone sample size is small at many sites and only two, Dragonby, near Scunthorpe (site code 114, Lincolnshire; Harman 1996a, 1996b; Jones 1996; late Iron Age), and Cat's Water Subsite, Fengate, Peterborough (81, Cambridgeshire; Biddick 1984; generic Iron Age), have exceptionally large assemblages.

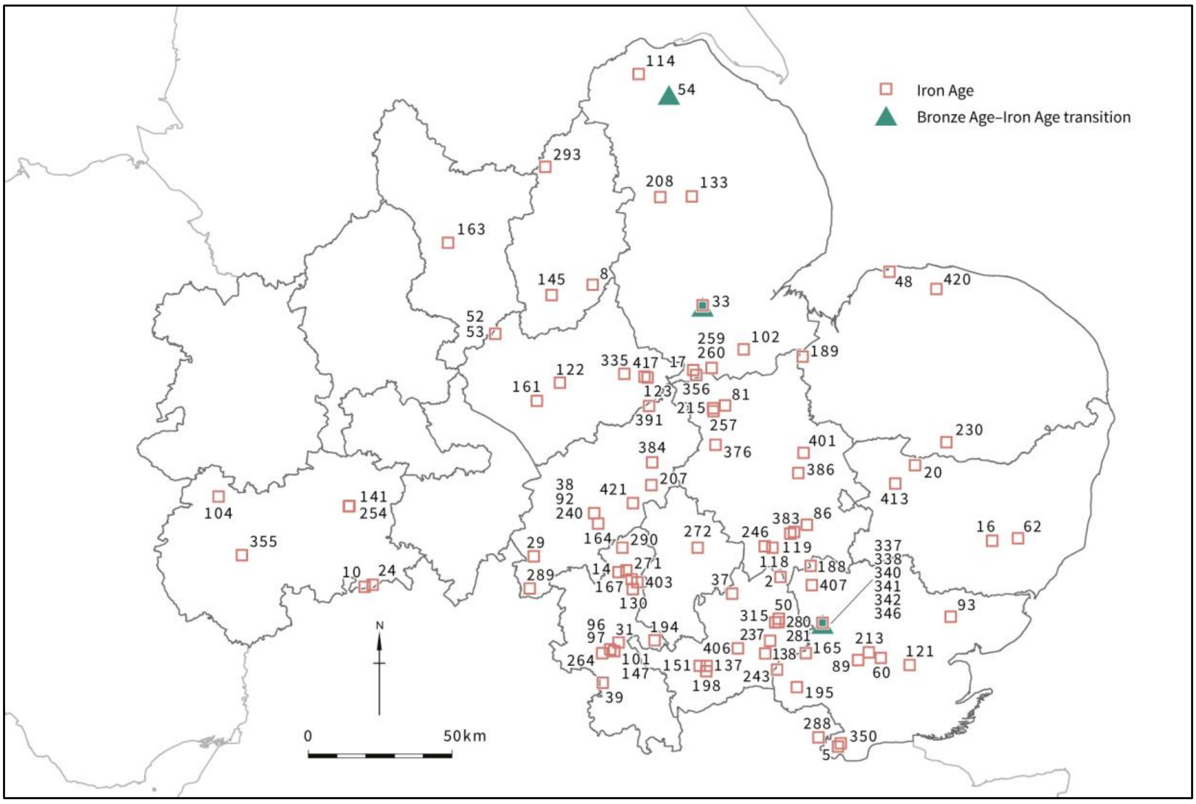

Fig 5.1 The distribution of Iron Age sites across central England. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text.

There are many different site types, but the most common are probably those defined as enclosures and open settlements. Hillforts were found at the following sites: Breedon-on-the-Hill 46 and 57, Derby/Loughborough (52 and 53, Leicestershire; Jackson 1950; Higgs 1964), Cherry Hinton War Ditches (86, Cambridgeshire; Phillipson 1963), Rainsborough Charlton, Brackley/Banbury (289, Northamptonshire; Banks 1967); Croft Ambrey, Ludlow/Leominster (104, Hereford and Worcester; Whitehouse and Whitehouse 1974), Stifford Clays, Grays (350, Essex; Luff 1988b), and Ivinghoe Beacon, Aylesbury/Dunstable (194, Buckinghamshire; Westley 1970). The only *oppidum* is represented by the site of Puckeridge and Braughing 75–9, Bishop's Stortford/Stevenage (280, Hertfordshire; Ashdown 1979; Croft 1979; late Iron Age), while Skeleton Green, Puckeridge, Bishop's Stortford/Stevenage (315, Hertfordshire; Ashdown and Evans 1981), which is in the same area, is defined as an open settlement. Ritual sites are represented by Fiskerton, Witham Valley (133, Lincolnshire; Jones 2003; Mulville *et al* 2003), Folly Ln, *Verulanium*, St Albans (137, Hertfordshire; Locker 1999b, 1999c, 1999d), Ivy Chimneys, Witham (195, Essex; Luff 1999), Oxford Rd, Stone (264, Buckinghamshire; Baxter 2001), and the intriguing Harlow Temple, Harlow (165, Essex; Legge and Dorrington 1985). Some animal bone assemblages are not associated with clearly defined settlements but rather with mere clusters of pits and/or ditches, the archaeological context of which is not always clear.

Unlike earlier time periods, no detailed revision of the dating of the bone assemblages from Iron Age sites has been undertaken. The margin of error is smaller for more recent periods, and typological changes are more rapid; although the dating of some assemblages is rather uncertain, it is unlikely that any should be part of an altogether different period. A number of assemblages are only generically dated to the Iron Age, which reduces their interpretive value substantially.

Whenever possible sites have been divided into three main phases of the Iron Age, following the terminology suggested by Hill (1995a):

- early Iron Age, 700–450 BC
- middle Iron Age, 450–100 BC
- late Iron Age, 100 BC to AD 43.

It must, however, be noted that, according to Cunliffe (1991) and Haselgrove (1999a), the late Iron Age starts at 150 BC. Inevitably the dating of some assemblages straddles different phases and also the transitions from the Iron Age to the earlier (Bronze Age) and later (Roman) periods. Chronologically, the animal bone evidence is unevenly distributed, with many more assemblages known for the later Iron Age.

5.3 Species occurrence and frequency

5.3.1 Domestic animals

As discussed in Chapter 4, the increased importance of sheep/goat, which is attested in the Bronze Age, is sustained and in fact possibly increased during the Iron Age (cf Fig 4.4). Figure 5.2 shows that, in the Iron Age, cattle and sheep/goat are the dominant taxa and pig is the least frequent of the three domesticates. This is a pattern that characterises most of the animal husbandry history of Britain and it is interesting to see that it is already well established in late prehistory. It is important to bear in mind, however, that this pattern is almost certainly affected by a recovery bias, such that sheep/goat is under-represented in comparison with cattle, but, because of their larger size, cattle are likely to have contributed the greater meat output.

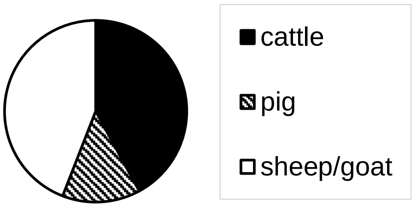

Fig. 5.2. Pie chart showing relative proportions of the three main domestic taxa in the Iron Age. This is based on the number of identified specimens (NISP) and includes all assemblages regardless of size. Only hand-collected assemblages are included.

Table 5.1 provides details of the proportions of the major domesticates for the main sites, and Figs 5.3 and 5.4 illustrate the same evidence as bar charts. Figures 5.3–5.5 all show an increase in the importance of sheep/goat in the later part of the Iron Age, as also suggested by van der Veen and O'Connor (1998) and Albarella (2007). Regrettably, the sample of early and middle Iron Age sites is small, but in all assemblages cattle is the most common taxon (Fig 5.3). This is at odds with what has been found in southern England, where drier environmental conditions and lighter soils led to a greater reliance on sheep/goat husbandry (Hambleton 1999). By the late Iron Age, the majority of central England sites also had a predominance of sheep/goat bones. Hambleton (1999) thought that this trend towards an increase in sheep/goat frequency was specific to Wessex, whereas Maltby (1996) was sceptical of its very existence. The evidence illustrated here indicates that the trend is real and can also be detected in central England.

Figure 5.6 shows that there is no regional pattern to the proportion of the three main domesticates throughout the Iron Age. Hambleton (1999) did not find any correlation either, between taxon frequency and site types, geological location or altitude. The increase in sheep/goat is therefore most likely to represent a chronological trend rather than, for example, a taphonomic influence or a geographic bias.

In order to explain this increased importance in sheep/goat husbandry, various hypotheses should be considered. One possibility is that the higher frequency of sheep/goat is associated with the spread in agricultural activities, the latter indicated by an increased clearance of forests and the colonisation of areas with heavier and damper soils (van der Veen 1992; Haselgrove 1999b). Sheep may have been particularly valuable for improving the fertility of the land via their manure (Cunliffe 1991; Hambleton 1999). If intensification of farming occurred, it is likely that this would have led to attempts to increase productivity from the fields and also a greater emphasis on crop production, as this generates a higher yield of food per unit area. In this scenario, animals would have mainly played a supporting role for arable production. The argument can, however, be reversed, by suggesting that cattle would have been the ideal animal for ploughing, particularly in the case of heavy soils. Their reduced frequency may therefore equally indicate a move towards a more pastoral-orientated economy. It is also worth pointing out that the ageing evidence (*see* section 5.4) is incompatible with an interpretation of increased wool production.

Another issue that we should consider is that, if cattle were, as has been suggested (Haselgrove 1999b), indicators of wealth, the reduction in their numbers in the late Iron Age must have made them even more valuable. Sites with higher cattle frequencies may therefore be high status, and it is also possible that changes in the proportion of species may have been dictated by social hierarchy and/or wealth inequality, rather than economic concerns.

Although it is interesting to identify regional patterns, it would be equally useful to find out whether there is any chronological change in the proportion of taxa on a site-by-site basis. There is, however, an unfortunate dearth of animal bone assemblages that cover the various phases of the Iron Age. The only exception is represented by the ritual site of Ivy Chimneys, which has both early–middle and late Iron Age phases. Unfortunately, the Ivy Chimneys assemblage is rather small (which is why the site is not included in Table 5.1), but in both phases cattle is the predominant taxon, with the later period even witnessing a decline in sheep/goat. The presence of exceptions to the general trend means that a diversification of strategies typifies the whole of the Iron Age. Ritual sites may have also had their own particular sources of livestock supply, which may explain the anomaly identified at Ivy Chimneys.

As mentioned, pigs are consistently the third most common taxon found on Iron Age sites (Figs 4.4, 5.3 and 5.4). There are, however, some remarkable exceptions, such as the adjacent sites of Skeleton Green and Puckeridge and Braughing 75–9, where pig percentages are as high as 49% of the three taxa. At Croft Ambrey, the assemblage is small but the proportion of pigs (34%) is still well above the average for the Iron Age. This is more in line with the situation in continental Europe (Grant 1984; Méniel 1987; Hambleton 1999) rather than Britain, and may reflect cultural influences from abroad.

Both Puckeridge sites date to the late Iron Age (Croft Ambrey is unfortunately poorly dated) and the higher frequencies of pig may be related to an increased ability to preserve meat arising from the increased salt production that characterises the Iron Age (Maltby 2006). Pigs are typical meat-producing animals and they are likely to be found in greater numbers on consumer sites and wherever meat consumption was substantial. Crop production may generally have been the main thrust of the economy in Iron Age Britain, but at some sites the situation appears to be the reverse, with animal husbandry and a carnivorous diet playing a bigger role. Such greater consumption of meat may be related to the availability of resources but also the status of the sites' inhabitants.

Other clear outliers regarding species representation (Figs 5.3–5.6) include the late Iron Age enclosure at Foxholes Farm, near Hertford (138, Hertfordshire; Ashdown 2004), which has 80% cattle, and Harlow Temple, which has more than 90% sheep/goat. The high proportion of cattle at Foxholes Farm has been interpreted as a consequence of the local environmental conditions, which were probably ideal for cattle rearing (Ashdown 2004). It is worth noting, however, that bone preservation at this site was poor, which may have favoured the preservation of the more robust cattle bones. Recovery has probably also played a substantial role, as the minimum number of individuals (MNI), which is less affected by recovery bias than the number of identified specimens (NISP), still indicates a clear predominance of cattle remains, but to a much lesser extent (*c* 60%). Harlow Temple obviously has a very specific ritual use and will be discussed further in section 5.5.3.

Table 5.1 Iron Age sites from central England with a combined cattle, sheep/goat and pig number of identified specimens (NISP) >400. Sites where the assemblage size was not clear have been omitted, with the exception of Croft Ambrey, for which no NISP is reported but it can be evinced to be a substantial assemblage from the report. The sites are grouped by date into the following categories: Bronze Age–Iron Age transition; Iron Age (ie broadly dated sites); more closely dated sites spanning the early and middle Iron Age; late Iron Age sites; large assemblages recovered by sieving. Coll refers to the method of collection (HC=hand-collected, CS=coarse sieved, BS=bulk sieved). The NISP shown is that of the three main domesticates combined. Site numbers refer to those shown on the map in Fig 5.1 and given in the gazetteer (Appendix 1).

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	33	Billingborough	Lincolnshire	Bronze Age–Iron Age transition	Industrial	41	42	17	492
HC	403	Wavendon Gate, Milton Keynes	Buckinghamshire	Iron Age	No site information	82	16	2	503
HC	14	Bancroft mausoleum, Milton Keynes	Buckinghamshire	Iron Age	Village	56	35	9	903
HC	413	West Stow, near Bury St Edmunds	Suffolk	Iron Age	Open settlement	55	35	11	2 550
HC	355	Sutton Walls, Sutton St Nicholas, near Hereford	Hereford and Worcester	Iron Age	Enclosure	44	38	18	2 000
HC	391	Wakerley, Stamford/Uppingham	Northamptonshire	Iron Age	No site information	42	47	11	468
HC	164	Hardingstone, near Northampton	Northamptonshire	Iron Age	Industrial	40	49	11	1 229
HC	421	Wilby Way, Great Doddington	Northamptonshire	Iron Age	Enclosure	38	53	9	2 272
HC	104	Croft Ambrey, Ludlow/Leominster	Hereford and Worcester	Iron Age	Hillfort	28	39	34	–
HC	194	Ivinghoe Beacon, Aylesbury/Dunstable	Buckinghamshire	Early Iron Age	Hillfort	61	32	7	2 041
HC	271	Pennyland, Milton Keynes	Buckinghamshire	Early–middle Iron Age	Open settlement	62	30	8	1 145
HC	37	Blackhorse Rd, Letchworth	Hertfordshire	Middle Iron Age	Enclosure	67	26	6	491

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	10	Aston Mill Farm, near Kemerton, Tewkesbury	Hereford and Worcester	Middle Iron Age	Enclosure	44	44	12	629
HC	122	Elms Farm, Leicester	Leicestershire	Middle–late Iron Age	Enclosure	66	29	5	1 223
HC	33	Billingborough	Lincolnshire	Middle–late Iron Age	Enclosure	53	42	5	859
HC	161	Grove Farm, Enderby Leicester	Leicestershire	Middle–late Iron Age	Farm	53	28	19	900
HC	138	Foxholes Farm, near Hertford	Hertfordshire	Late Iron Age	Enclosure	80	9	11	733
HC	240	Moulton Park, Northampton	Northamptonshire	Late Iron Age	Enclosure	57	30	12	635
HC	92	Clay Ln, Northampton	Northamptonshire	Late Iron Age	Enclosure	53	42	5	1 222
HC	62	Burgh, near Woodbridge	Suffolk	Late Iron Age	Enclosure	40	48	12	1 455
HC	164	Hardingstone, near Northampton	Northamptonshire	Late Iron Age	Enclosure	38	48	14	992
HC	31	Bierton, near Aylesbury	Buckinghamshire	Late Iron Age	Cluster of pits and/or ditches	33	45	22	1 356
HC	315	Skeleton Green, Puckeridge, Bishop's Stortford/Stevenage	Hertfordshire	Late Iron Age	Open settlement	32	18	49	2 437
HC	280	Puckeridge and Braughing 75–9, Bishop's Stortford/Stevenage	Hertfordshire	Late Iron Age	Oppidum	31	35	35	1 287
HC	337	Stansted Airport (ACS), Stansted	Essex	Late Iron Age	Open settlement	29	45	26	600
HC	401	Wardy Hill, Coveney	Cambridgeshire	Late Iron Age	Enclosure	29	56	15	1 262
HC	114	Dragonby, near Scunthorpe	Lincolnshire	Late Iron Age	Open settlement	28	58	13	4 995

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	114	Dragonby, near Scunthorpe	Lincolnshire	Late Iron Age	Open settlement	29	58	13	6 768
HC	118	Edix Hill, Barrington, near Cambridge	Cambridgeshire	Late Iron Age	Open settlement	29	55	17	616
HC	165	Harlow Temple, Harlow	Essex	Late Iron Age	Temple	3	89	8	1 987
CS	122	Elms Farm, Leicester	Leicestershire	Middle–late Iron Age	Enclosure	33	59	8	879
CS	81	Cat’s Water Subsite, Fengate, Peterborough	Cambridgeshire	Iron Age (broad category)	Rural	50	43	7	5 213
BS	386	Upper Delphs, Haddenham, near Ely	Cambridgeshire	Middle Iron Age	Enclosure	22	70	8	1 154

Table 5.1 continued

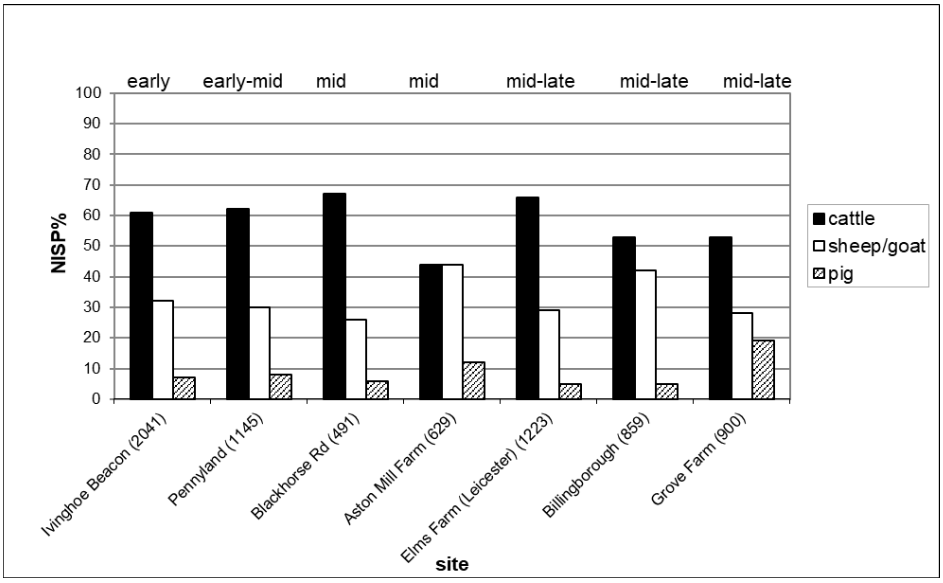

Fig 5.3 Summary of the three main domestic taxa at various early, early–middle, middle and middle–late Iron Age sites across central England, as a percentage of number of identified specimens (NISP). The numbers in parentheses refer to the NISP of cattle+sheep/goat+pig from each site. Only assemblages with a total NISP for the three taxa >400 have been shown. The sites are arranged in approximate chronological order. For further details see Table 5.1

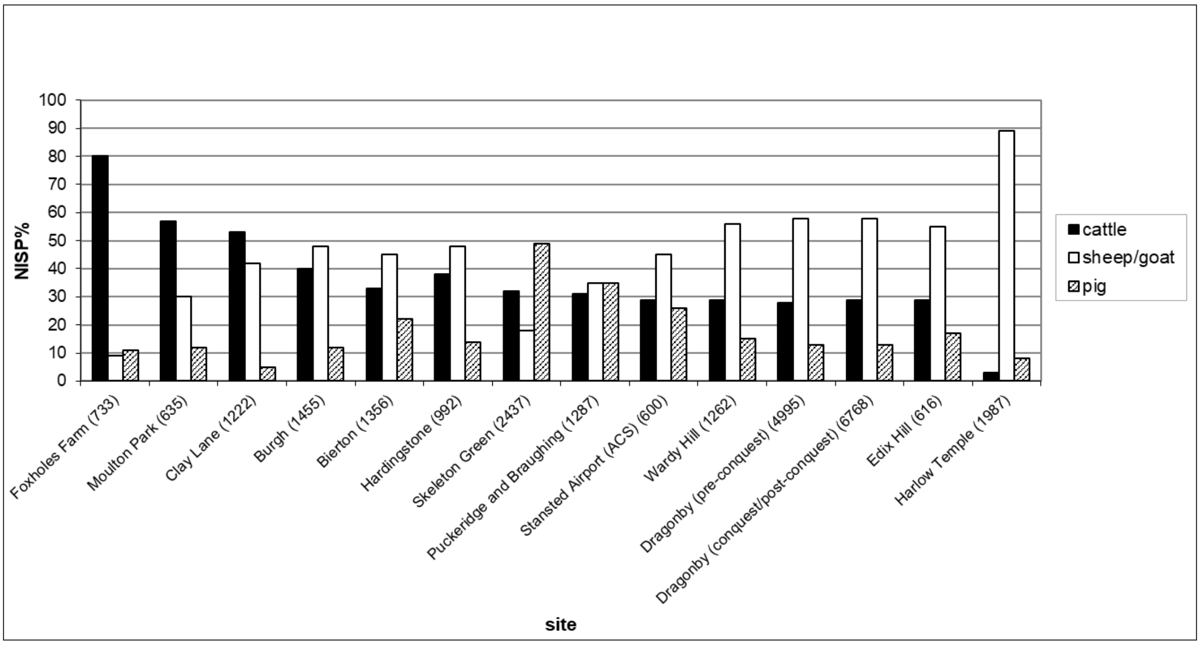

Fig 5.4 Summary of the three main domestic taxa at various late Iron Age sites across central England, as a percentage of number of identified specimens (NISP), grouped in order of decreasing cattle%. The numbers in parentheses refer to the NISP of cattle+sheep/goat+pig from each site. Only assemblages with a total NISP for the three taxa >400 have been shown. For further details see Table 5.1. Sieved sites and broadly dated sites have been omitted.

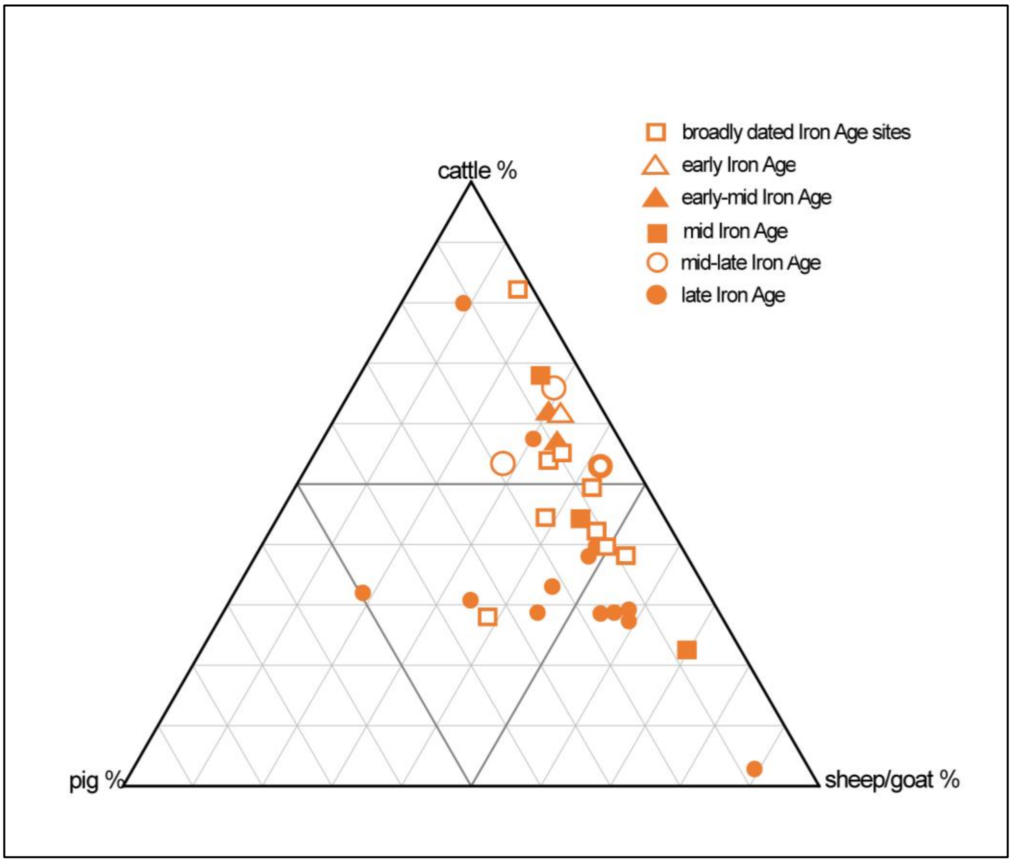

Fig 5.5 Relative proportions of cattle, sheep/goat and pig at periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from various sub-time periods of Iron Age sites across central England. Only hand-collected material has been included.

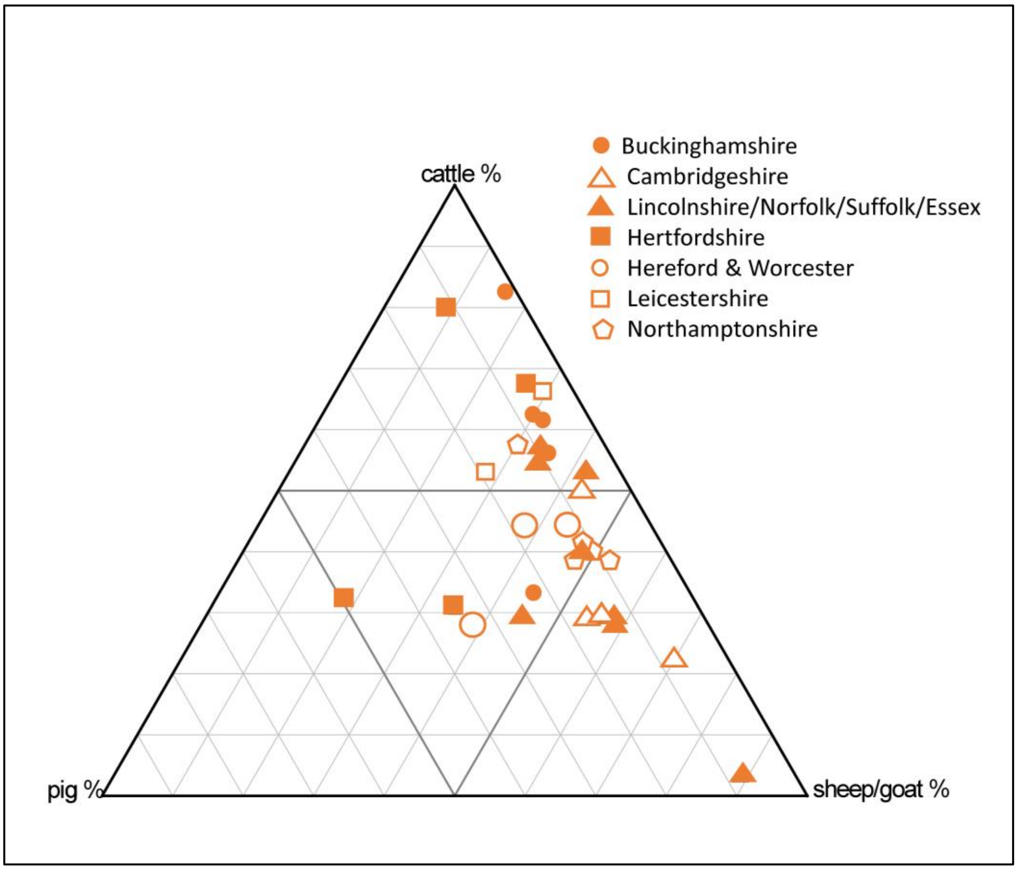

Fig 5.6 Relative proportions of cattle, sheep/goat and pig at periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from Iron Age sites across different counties of central England. Only hand-collected material has been included. BCK=Buckinghamshire; CAM=Cambridgeshire; LIN/NOR/SUF/ESX=Lincolnshire/Norfolk/Suffolk/Essex; HRT=Hertfordshire; H&W=Hereford and Worcester; LCS=Leicestershire; NHA=Northamptonshire.

Sheep and goat, so far discussed as a general sheep/goat category, are both present in the Iron Age of central England, although identification at species level has only been attempted in less than 25% of studies. The presence of goat is more commonly mentioned than that of sheep, almost certainly because zooarchaeologists perceive it to be the rarer species, with the presence of sheep being so obvious it is not worthy of emphasis. Whenever sheep and goat are mentioned as part of the same report, sheep is almost invariably the more common species, and often overwhelmingly so. One apparent exception is provided by the late Iron Age site of Puckeridge and Braughing 75–9, where more goat than sheep remains were recorded. This is, however, entirely a consequence of the fact that only horncore and skull fragments were identified. In many Iron Age sites where goat is present, it is predominantly represented by horncores, to the point that it is not unusual to have more goat than sheep horncores on a site. This is the result partly of taphonomic factors (goat horncores are particularly robust) and partly an identification bias (they are much more easily identified than other elements). These factors are, however, unlikely to provide a full explanation and we are inclined to believe that the phenomenon is real, which means that goat horn must have represented a popular working material. The situation does not change substantially in the following periods, ie goat continues to be relatively uncommon overall while goat horn continues to be used rather intensively. Goats are not particularly suited to the damp, heavy soils of Britain and it is therefore not surprising that they were not as widespread as in southern Europe.

The fact that goat is in all periods far less common than sheep confirms the view that its relative rarity is mainly the result of environmental factors rather than specific cultural choices.

The typical food domestic mammals, cattle, sheep/goat and pig, dominate the Iron Age animal bone assemblages, but among other domestic mammals the horse and the dog must have also played an important role. There is no evidence for donkey in the Iron Age of central England, although it is likely that for many assemblages equid bones have been routinely identified as horses without further consideration. Whenever appropriate identification was carried out, only horse remains were detected, and it is likely that they represent the clear majority, if not the entirety, of the equid remains.

The domestic horse, its early history in central England having been reconstructed in Chapters 2–4, was well established in Britain by the Iron Age, and in fact during the Iron Age is more common than in any other time period (Fig 5.7). Horses are also distributed across a broad geographical range (Fig 3.4), indicating that their importance was widespread. Horses must have been useful for riding and pulling chariots and carts, as is also proven by the common occurrence of metal harness elements. Spavin, the pathological fusion of metatarsal and tarsal bones, is attested on horse bones at Elms Farm, Leicester (122, Leicestershire; Charles and Powell 2000) and Pennyland, Milton Keynes (271, Buckinghamshire; Holmes 1993). This condition may be associated with traction stress. Horses must have also played an important status role.

Fig 5.7 Presence of horse/equid across central England from the Iron Age to the post-medieval periods, as a percentage of all hand-collected horse/equid+cattle+sheep/goat+pig number of identified specimens (NISP).

Dogs are also fairly ubiquitous and would have been kept for a variety of uses, while there is no positive evidence of the occurrence of the wolf. Cat remains have been identified at several sites but it is difficult to say whether they belong to the wild or domestic form. Generally they are reported without any specific comment, but the occurrence of a large specimen at the middle–late Iron Age enclosure at Billingborough (33, Lincolnshire; Iles 2001) is regarded as possible evidence of a wildcat. The occurrence of the domestic cat cannot be excluded as, at the time of the British Iron Age, this animal had been domesticated for several millennia in the Mediterranean (Vigne *et al* 2004). The occurrence of five kitten skeletons at Gussage All Saints (Dorset) has indeed been taken as probable evidence of the presence of the domestic cat in Iron Age Britain (Harcourt 1979).

The Iron Age also saw the introduction of the chicken, the first domestic bird to grace British soil. This species turns up at quite a few sites (Fig 5.8) and, although the possibility of the odd intrusive specimen cannot always be excluded, the bulk of the evidence suggests that the occurrence of this bird in the British Iron Age represents a genuine phenomenon. So far only remains from the eastern part of central England have been detected, but it is unknown whether this is merely because of the general scarcity of evidence from the western part of the country, or the fact that the species had not yet become widespread. The bird is already present in the early Iron Age, as proven by the evidence from Blackhorse Rd, Letchworth (37, Hertfordshire; Legge *et al* 1989). It is also tentatively identified at the Bronze–Iron Age transitional site of Stansted Airport (DFS), Stansted (342, Essex; Hutton 2004k). By the late Iron Age many more sites can be added, and by the early Roman period the species can also be found in the west of the region (Fig 5.8).

In the Iron Age as much as 42% of the total of bird remains is represented by chicken. This is a high frequency for a newly introduced species, but it is still far short of the remarkable 82% that we have for the Roman period. If we take into account the total of mammal bones too, chicken only represents 0.6% of the remains, but this again rises, to 3.4%, in the Roman period. It seems, therefore, that the chicken was already a commonly kept bird in the Iron Age, but it had not yet reached the popularity that it would have in later time periods. The introduction of the chicken must have represented an important cultural phenomenon (cf Sykes 2012), which is in line with the trade intensification that characterises the whole of the Iron Age.

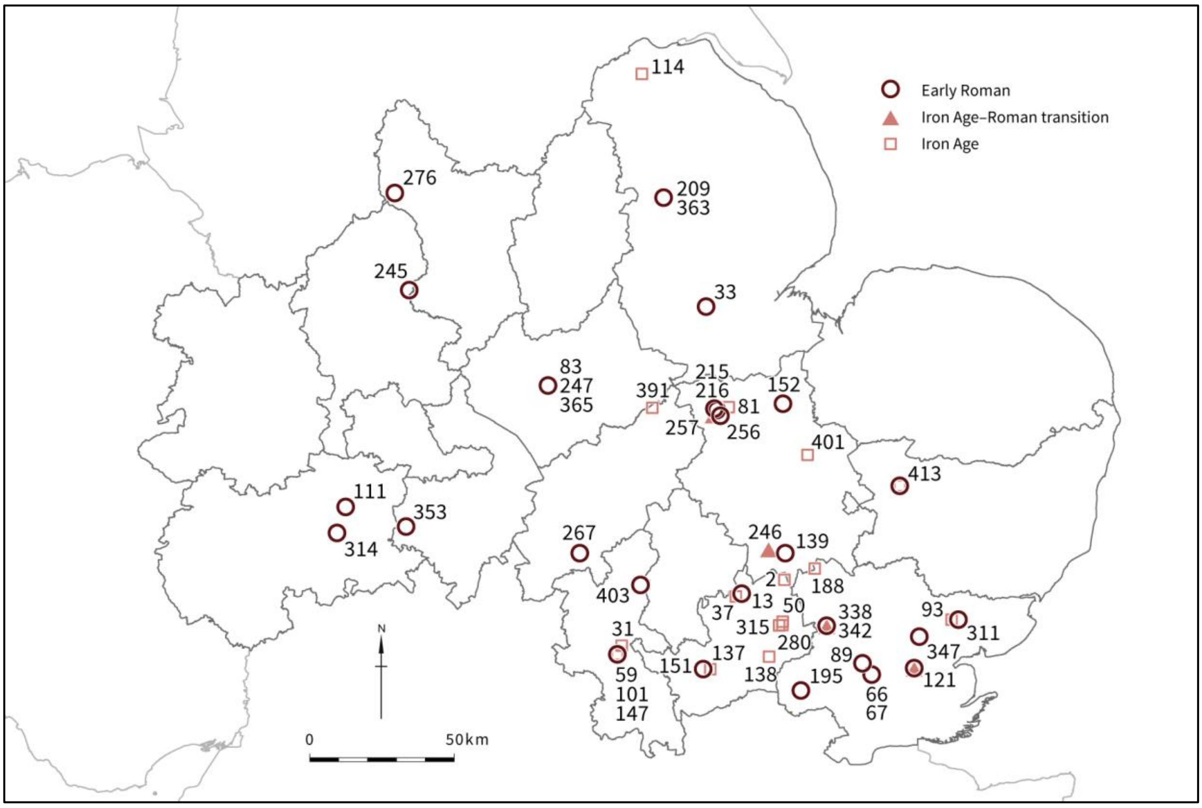

Fig 5.8 The distribution of Iron Age and Roman sites across central England with domestic fowl (chicken) present. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text.

5.3.2 Wild resources

Wild mammals are extremely scarce in the Iron Age, even more so than in the Bronze Age. Red deer is present at several sites, but the proportion of assemblages including red deer bones other than antlers is lower than in the Bronze Age. Red deer bones almost invariably represent less than 1% of the total of large mammal bones. Roe deer is even rarer, although it is generally represented by post-cranial bones rather than just antlers. The occurrence of a fallow deer worked antler at the generically dated Iron Age hillfort of Cherry Hinton War Ditches is presented without any comment and must therefore be treated with caution. If genuine, this would represent a surprisingly early occurrence of fallow deer in Britain. Sykes (2004a) has reviewed the evidence for the fallow deer in Iron Age Britain and mentions three other occurrences. Two of these have been dismissed on the basis of misidentification or intrusion, while two others, including the specimen from Cherry Hinton War Ditches, are worked antlers and could therefore represent imported items, with no implication that the animals ever lived on British soil.

The aurochs, as mentioned in Chapter 4, had probably become extinct during the Bronze Age and there is therefore no sign of it in the Iron Age record. Wild boar is likely to have been present in the Iron Age countryside but its archaeological visibility is limited, mainly because of the difficulty in separating wild boar from domestic pigs. The only site for which the occurrence of wild boar is claimed is the early Iron Age enclosure at Micklemoor Hill, West Harling, near Thetford (230, Norfolk; Clarke and Fell 1953), but no identification criteria are provided. The surprising absence of any reference to the domestic pig at this site is a further indication that this identification is unreliable. There is some evidence that, although in small numbers, the wild boar is present in the archaeological record of Britain at least until the 13th century AD (Albarella 2010), and we have therefore no reason to think this would not be a familiar animal to Iron Age people. A review of *Sus* morphometry is, however, badly needed if we want develop a better understanding of the characteristics and function of both wild and domestic pig populations in late prehistory in Britain.

A partial exception to the general Iron Age trend of a scarcity of wild fauna can be found at two sites in the Fenlands, Upper Delphs, Haddenham, near Ely (386, Cambridgeshire; Evans and Serjeantson 1988; middle Iron Age) and Cat's Water Subsite. Although at neither of these two sites is wild fauna predominant, there is a clear trend towards a relative wealth of species of wet environments. Most remarkable is the abundance of beaver at Upper Delphs, where it represents the third most common species. This seems to be a continuation of the tradition of beaver hunting in the Fenlands that was evident at the late Bronze Age site of Welland Bank Quarry, Deeping St James (405, Lincolnshire; Albarella *et al* in prep). Beaver is also present at the middle–late Iron Age open settlement site of Outgang Rd, Langtoft (260, Lincolnshire; Albarella and Mulville 2001a) on the edge of the Fenlands, and at the early Iron Age enclosure of Micklemoor Hill, although not in such abundance. Cat's Water Subsite has, surprisingly, no beaver, but the occurrence of eight otter 'partial burials' is mentioned, although the report only discusses the domestic fauna and merely lists the wild species. No details on the nature of these 'burials' are provided, but they do seem to represent a peculiar find and emphasise the association of the site with a wetland environment. Both Upper Delphs and Cat's Water Subsite have remarkable bird assemblages, which are discussed below. Red and roe deer bones are present at Cat's Water Subsite but not Upper Delphs, although they are no more abundant than at an average Iron Age site, which indicates that the peculiarity of these Fenland sites lies mainly in the use of water resources rather than a particular emphasis on hunting.

Among the commensal species, of interest is the status of the house mouse, which is regarded to have been introduced to Britain in the Iron Age or possibly even slightly earlier (Yalden 1999). Yalden's map (1999, 124, fig 4.13) of the early occurrences of this species, however, only includes Iron Age examples from southern England. This can now be integrated with the evidence of several sites from central England, including County Museum, Aylesbury (101, Buckinghamshire; Sadler 1998), Grove Farm, Enderby, Leicester (161, Leicestershire; Gouldwell 1992), and Skeleton Green. None of these sites has stratigraphic levels that are unambiguously earlier than the late Iron Age. According to Dobney and Harwood (1999), there is no evidence of the house mouse in northern England prior to the Roman period. This raises the possibility of the introduction of the species to the south of England in the late Bronze Age or early Iron Age and a consequent spread to central England in the late Iron Age and to northern England in the Roman period. To test this hypothesis, we need substantially more evidence from early and middle Iron Age sites, particularly from sieved deposits. The house mouse is likely to have been introduced accidentally and its presence in the Iron Age is again evidence of an intensification of contacts with mainland Europe.

Far more uncertain is the situation of the black rat. Bones of this species have been found at the late Iron Age site of Ivy Chimneys, but with no further details, either on the identification or the stratigraphic context, this evidence cannot be relied on. Questions concerning the introduction of this species to Britain will be discussed in Chapter 6.

Bird bones are not particularly common on Iron Age sites, representing less than 1% of the total mammal and bird bone assemblages. Of this total, slightly more than half comprises the remains of wild birds. Although birds are certainly under-represented in comparison with mammals because of a likely and widespread recovery bias, their general scarcity almost certainly represents a genuine phenomenon. This is not surprising considering the fact that wild mammals are also uncommon.

The anatids (ducks, geese and swans) represent the most common group of birds after domestic fowl. Ducks are generally more common than geese, both in terms of number of sites where they are found and abundance of remains per site. There is no convincing evidence of the domestication of either bird in the Iron Age, and the various references to 'domestic geese' mentioned in the literature cannot be taken seriously without the backing of solid identification criteria, which are currently missing. Because of the difficulty in identifying species, and often even genera, not many detailed identifications of ducks and geese are available. Furthermore, as identification criteria are rarely provided, it is hard to assess how reliable specific identifications really are. Nonetheless, Cat's Water Subsite has a long list of identified birds that includes barnacle goose, goosander, mallard, teal and pochard. As for mammals, wetland bird species obviously played a role in the life of the Fenland inhabitants. Swan is represented at four sites, including Upper Delphs, where there are no less than 44 swan bones, once again indicating the importance of wetland resources at this site.

Among other species, remarkable is the occurrence of the pelican, a bird whose European distribution is nowadays confined to the south-eastern end of continental Europe. There are two European species, the white pelican and the Dalmatian pelican, and the bones found in Britain seem to belong to the latter. Pelican bones have been identified at both wetland sites of Upper Delphs and Cat's Water Subsite and include immature bones, suggestive of local breeding. The species has been found at a few natural sites elsewhere in the Fenlands, but also in archaeological (Iron Age) and natural sites in the Somerset levels in southern England. One of the Fenland specimens has been dated to the Roman period (Serjeantson 2010), suggesting that the species survived for a few more centuries at least. Its eventual extinction is probably attributable to a combination of disturbance, habitat destruction and direct persecution.

Among other bird species that no longer live in England, it is worth mentioning the Iron Age presence of the white stork, identified at Cat's Water Subsite and Dragonby, and the white-tailed eagle, found at Cat's Water Subsite, Dragonby, Puckeridge and Braughing 75–9, and Fenny Lock, Milton Keynes (130, Buckinghamshire; Hamilton-Dyer 2001; middle-late Iron Age). An articulated skeleton of a white-tailed eagle was discovered at Dragonby, perhaps indicating that the bird was not used as food. The crane, which occasionally occurs in England as a migratory and wintering species but no longer breeds here, is found at no less than seven sites, including a partial skeleton at Upper Delphs.

Like the crane, the grey heron features particularly in wetland sites from the Fenlands, such as Cat's Water Subsite and Upped Delphs, but also at West Stow, near Bury St Edmunds (413, Suffolk; Crabtree 1989, 1990; generic Iron Age) and Colchester 30–39 (93, Essex; Bate 1947; late Iron Age).

The full list of raptors includes potential scavengers (red kite and buzzard) but also typical woodland predators such as the goshawk (found at Cat's Water Subsite and Dragonby) and species of steep, rocky environments, such as the peregrine. The latter was recorded at the open settlement of Edix Hill, Barrington, near Cambridge (118, Cambridgeshire; Davis 1995; late Iron Age). It must be noted that the red kite was identified at Dragonby in Lincolnshire, well beyond its area of latest survival in Wales (the species has now been reintroduced to England) (Yalden and Albarella 2008).

Species that were more likely to be used as food include the woodcock, found at Elms Farm (Leicester), Wardy Hill, Coveney (401, Cambridgeshire; Davis 2003; late Iron Age) and Dragonby, and the wood pigeon, found at Grove Farm (middle–late Iron Age) and Foxholes Farm (middle–late Iron Age).

Corvids are quite common, particularly the raven, which occurs at eight sites. The species is represented by more than 100 bones at Dragonby and more than 20 at Colchester 30–39 and Skeleton Green. It is worth noting that at Dragonby this bird is mainly represented by partial skeletons, which may indicate that it had a symbolic value attached to it, or may have been used for companionship. This possibility will be discussed further in Chapter 6.

The main problem in assessing the importance of fish resources is that only a few of the analysed assemblages were routinely collected through sieving. Most fish bones are small and will generally be overlooked during hand collection. The amount of fish bones recovered is, however, so scanty that it is reasonably safe to suggest that fish resources played a minor role in the diet and economy of the Iron Age people. Even at the sites where some sieving was carried out fish was scarce or absent.

Examination of the fish evidence en masse reveals that in the Iron Age there is a predominance of freshwater (*c* 70%) over migratory (ie anadromous and catadromous) (*c* 20%) and marine (*c* 10%) fish. This is in contrast with the evidence for later periods but confirms Coy's view from the south-west of England that prehistoric fish exploitation mainly relied on freshwater species (Coy 1987). It is likely that the Iron Age fishing and boating technologies were not sufficiently advanced to make marine fishing a particularly profitable activity, although cultural preferences and traditions may have also played a role.

In view of the emphasis on exploitation of water resources at the two Fenland sites of Cat's Water Subsite and Upper Delphs, it is worth examining the fish assemblages in some detail. At Cat's Water Subsite a total of 75 fish remains was identified, but it is not clear how many of these derive from hand collection and how many from the coarse sieving that is reported to have been carried out. Pike is the predominant species, with 34 remains, and the rest of the sample is composed entirely of other freshwater species, bream (31) and tench (9). At Upper Delphs, where sieving was not undertaken, only pike specimens were recovered (Serjeantson 2006a). The absence of any fine sieving at either site leaves the question of the possible occurrence of marine species unanswered, but the overall impression is that at both sites the reliance was on freshwater resources, in keeping with the mammal and bird evidence. Pike are large fish that could therefore represent a sought-after catch. At Wardy Hill, a pike specimen was determined to have come from a fish that was larger than 1m, which is fairly standard for this species (Miller and Loates 1997).

A very different picture emerges at the late Iron site of Skeleton Green where, despite the absence of any reported sieving, freshwater (chub and roach) as well as estuarine (eel) and marine (flounder and plaice) species were identified. It is worth noting the inland location of the site, which means that the presence of marine fish is the product of commercial contacts with coastal areas. That this trade was not just local is demonstrated by the occurrence at the same site of the Spanish mackerel, a Mediterranean species. This represents another piece of evidence for the trade intensification that characterises the late Iron Age. In the Roman period, the occurrence of the Spanish mackerel is generally associated with the marketing of salted fish or *salsamenta* (van Neer and Ervynck 2004). In view of the absence of any sieving it is impossible to quantify the real importance of fish for the inhabitants of Skeleton Green, but the fact that a number of fish remains were nonetheless recovered may suggest that this resource was more important at this site than is generally the case for the Iron Age.

It is also worth mentioning the occurrence of two other fish species, which make their first appearance in our database: the herring, found at County Museum, and the salmon, found at Dragonby. No sieving was carried out at either site.

5.4 Husbandry strategies

An evaluation of husbandry strategies relies mainly on kill-off patterns, as animals will be slaughtered at different ages according to their main use. Ideally, a regional study should be based on a full re-analysis of raw ageing data from all sites under investigation, and such data should be collected consistently to maximise the reliability of inter-site comparison. This would, however, represent a project on its own that is beyond the scope of this review. More modestly, here we try to make some determinations based on general ageing groups as discussed in the various reports. There are, of course, limitations to this type of analysis, exacerbated by the fact that most Iron Age samples are relatively small. This is why we can only attempt rather crude generalisations. The same caveats apply to the other time periods and to biometric analyses.

At most sites the majority of cattle bones are reported to belong to adult individuals, although this predominance is not as marked as in later periods (Fig 5.9). The high frequency of adults points to the possibility that cattle were frequently exploited for their traction power and therefore that their main use was supporting agriculture. At the same time, the fact that the predominance of adults is not particularly pronounced suggests that the Iron Age cattle economy was not specialised, and that a diversified use of the animals (ie traction, meat and probably milk) was probably the norm. The occurrence of splayed metapodials, a condition generally associated with traction stress (Bartosiewicz *et al* 1997), at Wardy Hill and Foxholes Farm supports the view that ploughing cattle were a feature of the Iron Age economy.

In contrast, two sites, the saltern at Cowbit Wash, Cowbit (102, Lincolnshire; Albarella and Mulville 2001b), and the rural settlement at Bancroft mausoleum, Milton Keynes (14, Buckinghamshire; Holmes and Rielly 1994), have produced a peculiar abundance of young calf bones, of the kind discussed in section 4.5.3 for Grime's Graves (Legge 1981b). In the Iron Age this pattern is frequent in the Scottish Isles (Mulville *et al* 2005) but rare in England (cf Hambleton 1999). A milk economy, which would also be consistent with a large number of female adults, represents a possible explanation. At Cowbit Wash, however, in addition to neonates and calves aged between 1 and 3 months, a number of foetal bones was also found, which is difficult to explain as part of a milk production strategy. Perhaps other factors contributed to this pattern; for example, with Cowbit Wash being a Fenland site prone to flooding, it is possible that flooding hazards may have led to an unusual level of cattle mortality, perhaps also affecting pregnant cows (Albarella 2001b).

Concerning sheep/goat, most sites are dominated by sub-adults/juveniles or animals of mixed ages (Fig 5.9). This is in sharp contrast with the situation witnessed for cattle, proving that by-and-large cattle and sheep were reared for different purposes. The evidence points out to a non-specialised economy mainly orientated towards meat production. Grant (1984) has suggested that the Iron Age sheep economy may have mainly been aimed at wool production, but this is not supported by the available evidence. Typical Iron Age mortality curves for sheep/goat, within and outside the central England region, are remarkably different from those known for the medieval period, when wool is attested to have been the main aim of sheep husbandry (Albarella 2007). Unfortunately, our evidence for the early and middle Iron Age is scanty, but Hambleton (1999), who reviewed the evidence for the whole of Britain, found no significant differences in sheep/goat kill-off patterns between various phases of the Iron Age. It has to be emphasised that the identified pattern does not exclude the production of wool, but simply indicates that wool may only have been obtained for self-sufficiency rather than for export/exchange, as was the case in the medieval period.

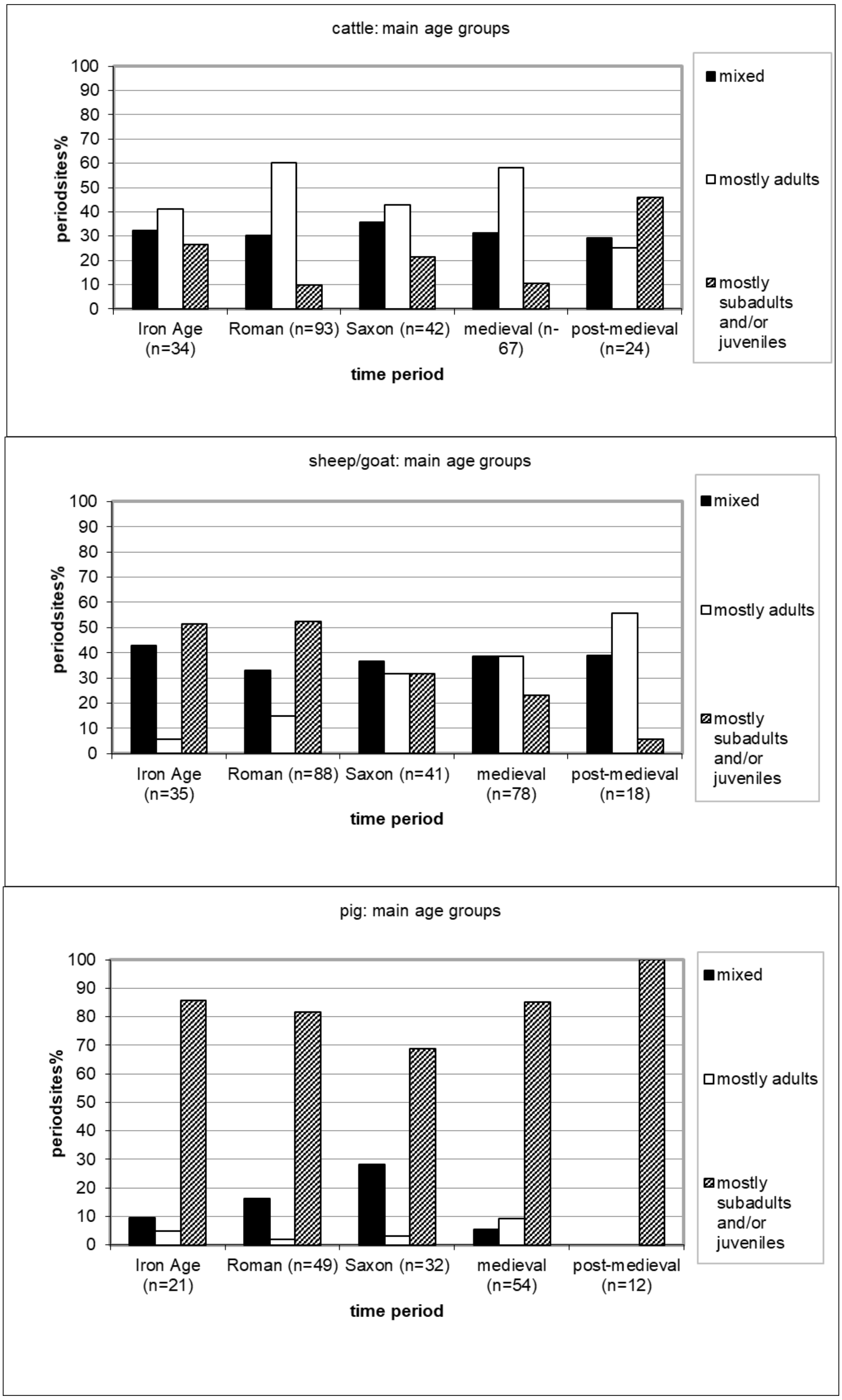

Fig 5.9 Comparison of broad Iron Age and Roman age groups of cattle, sheep/goat and pig, as a percentage of periodsites, where n *is the number of periodsites reporting ageing data for each taxon and period, from sites across central England. Periodsites for which ageing data were unreported or unspecific have not been included.*

Sheep/goat kill-off patterns may also have been influenced by seasonal factors. For instance, at Outgang Rd (Langtoft), on the Fenland edge and therefore in an area possibly still prone to periodical flooding, a seasonal culling has been suggested (Albarella and Mulville 2001a). The occurrence of neonatal sheep suggests that the site was occupied in spring, but mandibular wear stages are consistent with a concentration of killings in the late summer–early autumn. It is therefore possible that this site was occupied most of the year but not in winter, when livestock would be moved to drier areas.

As expected for an animal whose main potential product is meat, pig is generally represented by immature animals, consistent with what we find in other periods (Fig 5.9). This is also the case for the few pig-dominated sites, where the systems of pig husbandry do not seem to have been obviously different from sites with less pig present.

At various sites neonatal bones of all the main livestock species have been found, clearly indicating an element of on-site breeding. The frequency of assemblages with newborns is similar to the Bronze Age, but slightly higher than in later periods (although note the post-medieval pigs, discussed in Chapter 9) (Fig 5.10). This may be a consequence of the dearth of specialised consumer sites during later prehistory. Pig neonatal bones are more common than those of the other domesticates, probably a consequence of the fact that these animals produce large litters, which inevitably leads to a higher infant mortality.

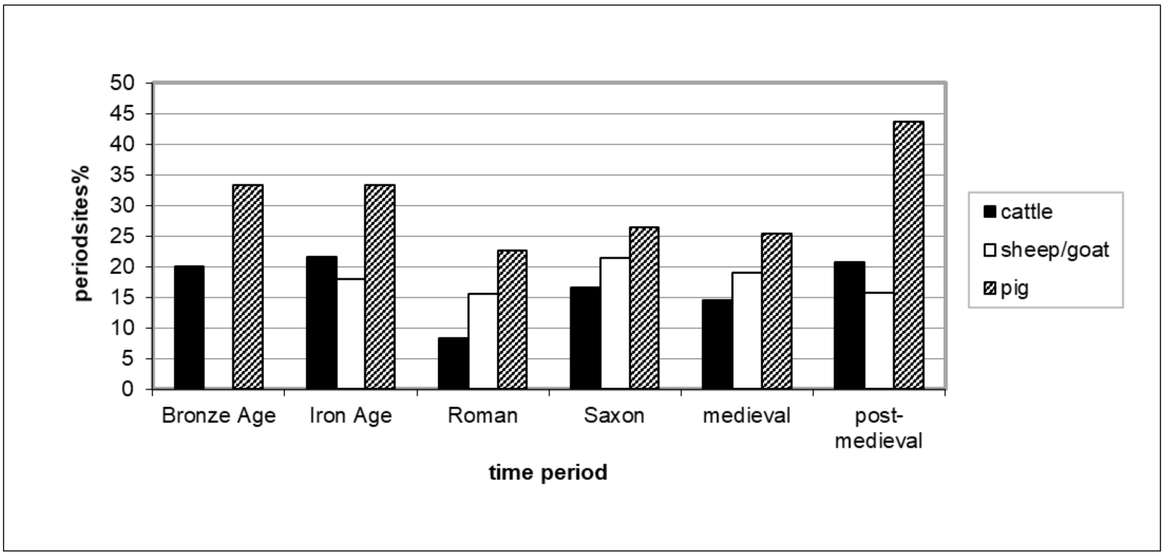

Fig 5.10 Presence of neonates of the three main domestic taxa, as a percentage of periodsites from across central England that reported any ageing data.

5.4.1 Livestock types

Evidence of the morphological characteristics of Iron Age livestock is frustratingly limited. This is only partly because of the limitation of the datasets, as more than 70% of the reports ignore this question altogether. The few comments that are available generally mention the occurrence of animals of small size and the lack of any size or morphological change between the early and late Iron Age. This is consistent with equally generic comments available from the south of England (Grant 1991; Maltby 1996). In Chapter 6 we will see that a comparison with Roman livestock confirms that Iron Age domesticates were generally small and unimproved. An exception is represented by the assemblage from the early Iron Age hillfort at Ivinghoe Beacon, where some very large cattle are reported, together with a majority of small and sturdy animals. In the absence of the original data, it is difficult to understand the nature of these allegedly large animals, but in view of the chronology of the site these are unlikely to represent an early input of improved cattle from continental Europe.

Most cattle are reported to have belonged to the 'short-horn' type, although 'medium horns' are mentioned at Bancroft mausoleum (Holmes and Rielly 1994). The absence or reduction of the third cusp (hypoconulid) of the cattle lower third molar, a non-metric trait that may help in characterising populations, is reported at seven different sites from the middle and late Iron Age. The congenital absence of the cattle lower second premolar, another useful non-metric trait, is reported at three sites, including two successive late Iron Age phases at Dragonby. Cranial perforations in cattle skulls, a condition the cause of which remains obscure, have been noted at Ardale, Grays (5, Essex; Luff 1988b), and Ivy Chimneys. The suggestion made for this latter site, that the perforations may have been caused by yoke damage, must now be questioned, in view of the identification of the same condition in wild bovines (Manaseryan *et al* 1999; Baxter 2002d). For the first time in the history of central England, examples of polled (hornless) sheep are reported, at Dragonby and Bierton, near Aylesbury (31, Buckinghamshire; G G Jones 1988). This condition is a reminder that, by the Iron Age, the domestication of these animals had operated for millennia, leading to livestock that were substantially different from the populations that had originally been introduced to England.

5.5 Human processes

5.5.1 Butchery

In general, cattle and sheep/goat butchery is more commonly reported for Iron Age sites than for Bronze Age sites (Fig 5.11). This may be because an increased use of metal could have led to more easily detectable butchery marks. Some of the butchery techniques seem to be fairly advanced. For instance, examples of longitudinally split vertebrae and skulls, which are not reported for the Bronze Age and may imply an organised system of carcass redistribution, have been identified at several sites. The hillfort at Croft Ambrey has split vertebrae for all three main domesticates, while split cattle vertebrae are noted at Skeleton Green and split skulls at Puckeridge and Braughing 75–9 for pigs and Bierton for sheep/goat. 'Hook damage' on scapulae, a feature more commonly associated with Roman processing techniques (eg Schmid 1972), is nevertheless seen at late Iron Age Bierton. Intriguingly a sheep scapula from Outgang Rd (Langtoft) has similar damage.

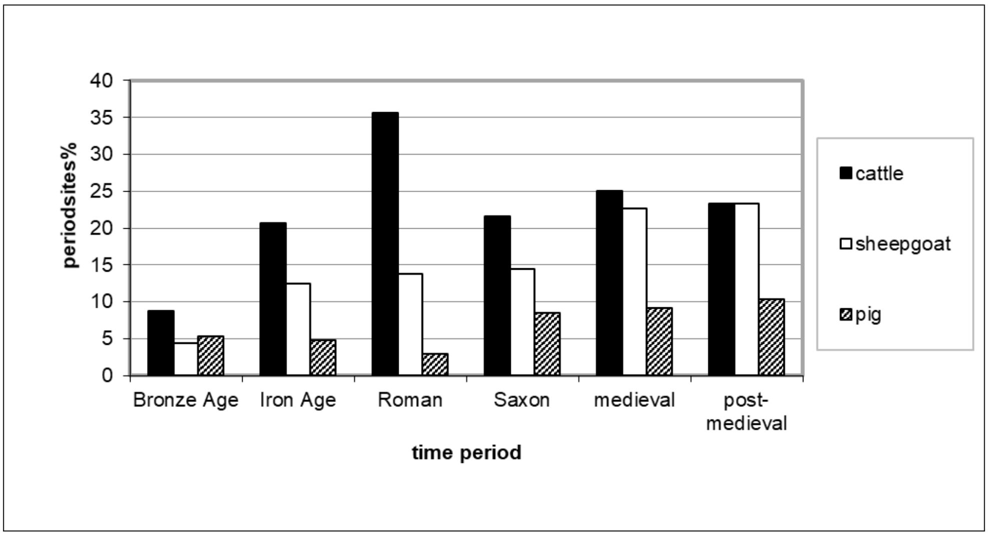

Fig 5.11 Occurrence of butchery for the three main domesticates, as a percentage of periodsites from across central England with reported evidence. Time periods with <10 periodsites have not been included.

Butchery and skinning on horse bones is attested at several sites, and its frequency is not substantially different from other periods (Fig 5.12). This indicates that, despite all the discussions regarding the taboo on horse consumption (eg Levine 1998), attitudes concerning hippophagy changed little over time. Horse meat was never particularly popular but at the same time never fully avoided. The evidence for horse butchery seems to be particularly extensive at the open settlement of Skeleton Green, where the consumption of horse meat is definitely suggested. Stansted Airport also has evidence of carcass dismembering, which is consistent with butchery. There is, however, no doubt that meat consumption was not the main purpose of horse breeding, in the Iron Age or any other period.

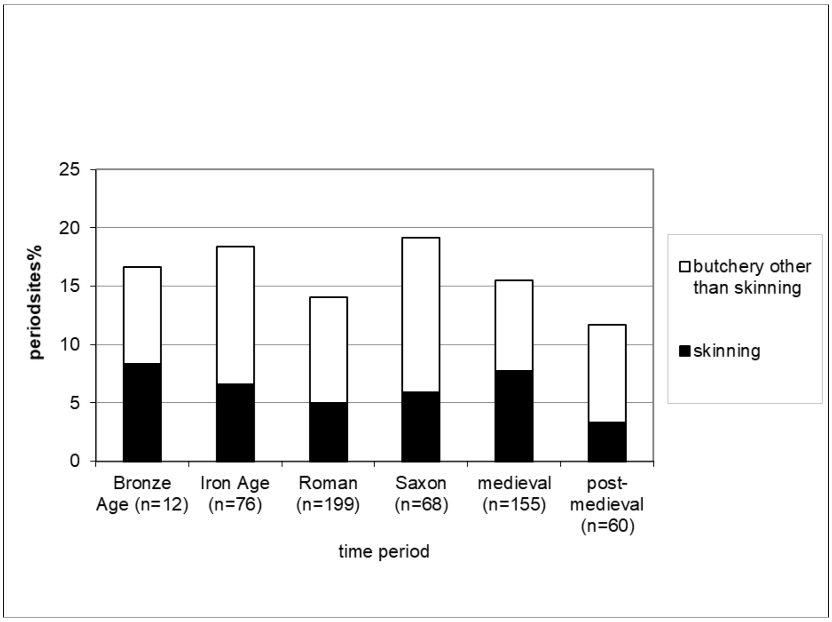

Fig 5.12 Occurrence of skinning and other types of butchery of horse, as a percentage of periodsites across central England, where n *is the number of all periodsites within a time period. Time periods with <10 periodsites have not been included.*

Butchery marks on dog bones are even less common, but an interest in dog pelts is definitely attested by clear skinning marks found at Wilby Way, Great Doddington (421, Northamptonshire; Maltby 2003), Billingborough and Stansted Airport. Cut marks on dog bones at Cowbit Wash and Puckeridge and Braughing 75–9 are more likely to be consistent with disarticulation and therefore probably flesh consumption. At Stansted Airport a butchered, partially disarticulated, skeleton of a dog was found, but this has been interpreted as having some ritual significance (Hutton 2004k).

Of the Iron Age sites with chicken bones, Puckeridge and Braughing 75–9 produced the highest number of chicken remains and is the only one where some butchery, presumably associated with consumption, is attested. Even though the site may post-date Caesar's invasion of Britain, the evidence puts into question Caesar's famous assertion that British people kept domestic fowl but refrained from eating it (*The Gallic War* V, 12).

Skinning and disarticulation marks are abundant on beaver bones from Upper Delphs, proving that this animal was exploited for both pelt and meat. Cut marks on pelican (Upper Delphs), white-tailed eagle (Fenny Lock, and Puckeridge and Braughing 75–9) and swan (Outgang Rd, Langtoft) (Albarella 1997a, plate 5.1) wing bones are more likely to be associated with the removal of feathers than meat. This may have been the main purpose of hunting these large birds.

5.5.2 Bone modification

Some of the marks left by people on the bones are associated with craft rather than butchery activities. Most obviously this is the case with the removal of horncores from the skull and/or horns from the horncores. Such practice is attested at several Iron Age sites for cattle, sheep and goat. Although marks at the base of horncores unquestionably indicate an interest in the production of horn as working material, it is more difficult to detect areas that were specialised in horn-working, even when the evidence is abundant. This has, however, been suggested for the open settlement at Aldwick, Barley, near Royston (2, Hertfordshire; Cra'ster 1960). When an abundance of cranial elements, generally with horncores removed, and foot bones are found together this may indicate the presence of a tanning area. Such occurrences have been noted at Burgh, near Woodbridge (62, Suffolk; Jones *et al* 1987), Hartigans, Milton Keynes (167, Buckinghamshire; Burnett 1993) and Stansted Airport.

Antler must have been another useful working material. As we can see in Fig 5.13, in comparison with the Bronze Age, many more Iron Age sites with red deer remains are dominated by antler pieces. In about 20% of these there is also direct evidence of antler working, most clearly at Elms Farm (Leicester).

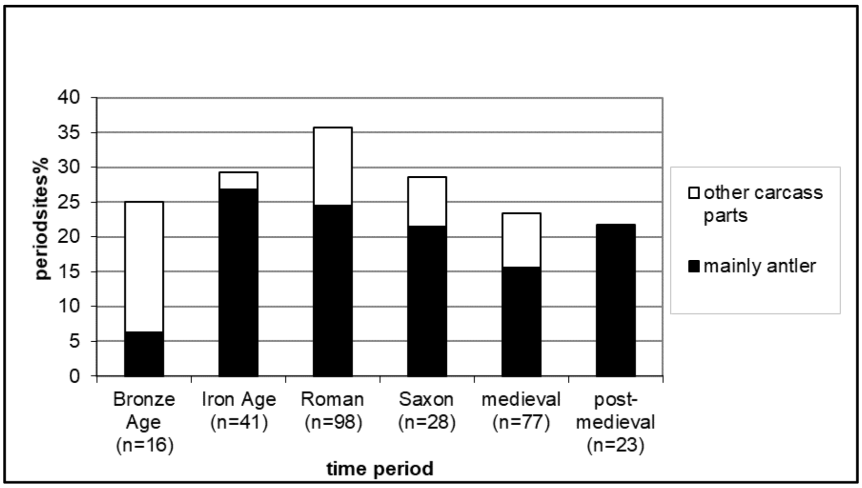

Fig 5.13 Occurrence of antler and other parts of the carcass of red deer, as a percentage of periodsites across central England, where n *is the number of periodsites where deer is present within a time period. Time periods with <10 periodsites have not been included.*

Worked bones are found at several sites, although in much less frequency than in later periods. Of these, the most interesting are probably the bone tools associated with wool working found at Stansted Airport CIS and SCS, Stansted (340 and 346, Essex; Hutton 2004j, 2004l). These include needles/shuttles made from sheep/goat metatarsals and tibiae and another 'weaving implement' made from a cattle ulna.

Beaver caudal vertebrae found at Fiskerton have been associated with the possible production of *castoreum*, a beaver secretion, which in later periods was used for medicinal and cosmetic purposes. The dating of these finds is, however, uncertain as they might belong to the Roman period rather than the Iron Age.

5.5.3 Bone disposal

In the Iron Age of Britain, the disposal of animal remains was not always a purely mechanical, random phenomenon. The great abundance of partial skeletons and other articulated bones in Iron Age sites from Wessex has been amply discussed and debated

(Grant 1984; Wilson 1992; Hill 1995b; Morris 2011), and for a full discussion of this phenomenon the reader is referred to this literature. In central England too, the occurrence of 'associated bone groups' (Hill 1995b) is higher than for later periods, only marginally for cattle and hardly at all for sheep/goat, but more markedly for pig (Fig 5.14). Although it is difficult to demonstrate this in each individual case (Wilson 1992), the balance of evidence suggests that these deposits represent 'structured depositions' with some symbolic or ritual function. They are found at a variety of different sites, with the enclosure at Wilby Way having a particular complex set of sheep/goat partial skeletons. These include two partial burials with butchery marks, one of which is of a ewe with two foetal lambs. This site also has a concentration of disarticulated horse bones (with butchery marks) in a pit and a horse skull (possibly placed) in a ditch.

Various other cases of bone disposal that seem to be associated with symbolic meanings are attested. At Ickleton Rd, Chesterford, near Cambridge (188, Essex; Smoothy 1990), unburnt chicken and pig bones were found in cremation vessels, while at Ivy Chimneys cattle pig bones were associated with a human burial. Burnt bear phalanges found at the Welwyn Garden City (406; Hertfordshire; Powers 1967) burial were assumed to represent the remains of a bear skin wrapping a human body. The causeway at Fiskerton has 41 tibia 'spearpoint' artefacts associated with votive deposits, but these may be later in date (ie Roman).

The most remarkable ritual site that we have for the Iron Age is, however, Harlow Temple, where the animal bone assemblage is dominated by juvenile sheep bones. These had obviously been selected for sacrificial use.

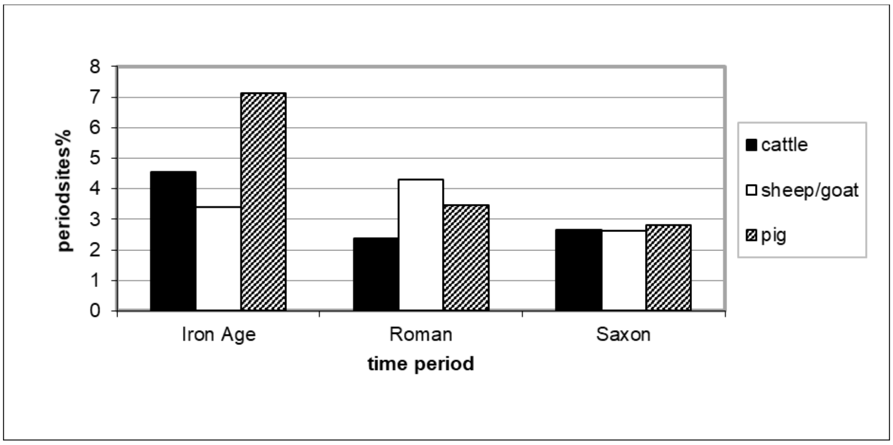

Fig 5.14 Occurrence of articulated bones, partial skeletons, skeletons and 'food offerings' of cattle, sheep/goat and pig at Iron Age, Roman and Saxon periodsites, as a percentage of all periodsites across central England for each taxon and time period.

6 ROMAN

6.1 The context

The beginning of the Roman period can quite conveniently be associated with the Claudian invasion of AD 43. Obviously an Iron Age way of life did not abruptly end that year, but significant modifications in the organisation of society and in the use of the countryside did eventually take place. The Britons certainly had a history of previous contact with the Roman world. We have seen in Chapter 5 that trade intensified in the late Iron Age, probably as a response to the presence of the Roman Empire on the other side of the Channel. As is well known, Roman military expeditions in Britain had also occurred before, with Caesar attempting to occupy part of the island in 55 and 54 BC (Todd 2004). Although the Roman invasion of Britain probably represented a rather abrupt event, the Britons must have had previous cultural awareness of the Roman lifestyle and economy.

Settlement organisation certainly changed, more so in the areas that were most intensively occupied and colonised. Most prominent among these changes was probably the gradual urbanisation, with several *oppida* becoming properly organised and functioning towns (Wacher 1995). Another important feature of the Roman period is the presence of large houses located in the countryside, often associated with farming activities. These are generally called villas, with the *Villa Rustica* distinguished from the *Villa Urbana* (de la Bédoyère 1993). Administratively, the period saw the emergence of *Civitates*, regional authorities representing a unit of population, typically equating to a tribe, inhabiting a specific territory, the archaeological visibility of which is, however, elusive (Millett 1990).

In comparison with the Iron Age, we also have a greater variety of potentially datable archaeological items, including monumental stones, bronze inscriptions, wooden tables, coins and various pottery types (Millett 1995). These provide a better opportunity than at any time before to date sites with reasonable accuracy.

The Roman period in Britain also witnessed the transition from prehistory to history, with written sources available for comparison with the archaeological evidence for the first time. There is a wealth of information about animal husbandry, and more in general concerning the relationships between people and animals, in treatises and accounts by authorities such as Pliny, Columella, Varro and Cato (White 1970). It is, however, uncertain to what extent these descriptions, which are mainly based on the Mediterranean, can realistically be applied to Britain. Direct evidence of British husbandry is unfortunately scanty, with only short, vague and potentially unreliable references provided by writers such as Caesar, Strabo and Tacitus.

6.2 The sites

The evidence discussed in this chapter relies on 167 gazetteer sites and 245 periodsites. This is therefore a substantial increase compared with the Iron Age. A small number of assemblages cross the boundary between the Iron Age period or the Saxon period, because they are either transitional or poorly dated.

Because of the increased number of sites with faunal evidence, the geographical coverage is more extensive for the Roman period than for the Iron Age, although some important gaps can still be identified (Fig 6.1). Unlike the Iron Age, evidence exists for sites in the north-western part of the region, but the area remains poorly represented. The West

Midlands is, however, the only county that has produced no assemblages at all. The overall distribution indicates that the spread of Roman sites by and large reflects that of the preceding Iron Age, suggesting either that many of the Roman sites developed from the Iron Age or that the same biases that affected the Iron Age distribution also apply to the Roman period. The south-east of central England has an even greater concentration of sites than previously recorded, with Buckinghamshire, Hertfordshire and Essex once again being the best represented counties. Many sites have small or medium sized assemblages, but exceptionally large animal bone samples have been retrieved from Colchester 71–85 (site code 94, Essex; Luff 1993), and Ivy Chimneys, Witham (195, Essex; Luff 1999), and, to a lesser extent, Baldock 68–72 (13, Hertfordshire; Chaplin and McCormick 1986), Caldecotte, Milton Keynes (70, Buckinghamshire; Holmes and Dobney 1994), Derby NW Sector (107, Derbyshire; Bramwell and Harman 1986; Harman 1986a; Jones 1986c), Elms Farm, Heybridge (121, Essex; Johnstone and Albarella 2002), Lincoln sites (209, Lincolnshire; Dobney *et al* undated), Milton Keynes 71–82 (235, Buckinghamshire; Field and Westley 1987), Sheepen, Colchester (311, Essex; Luff 1985), and Wroxeter (baths and macellum), near Shrewsbury (429, Shropshire; Meddens 2000). Some of these sites, such as Colchester 71–85 and Lincoln sites, derive from multiple sites located within the same urban area.

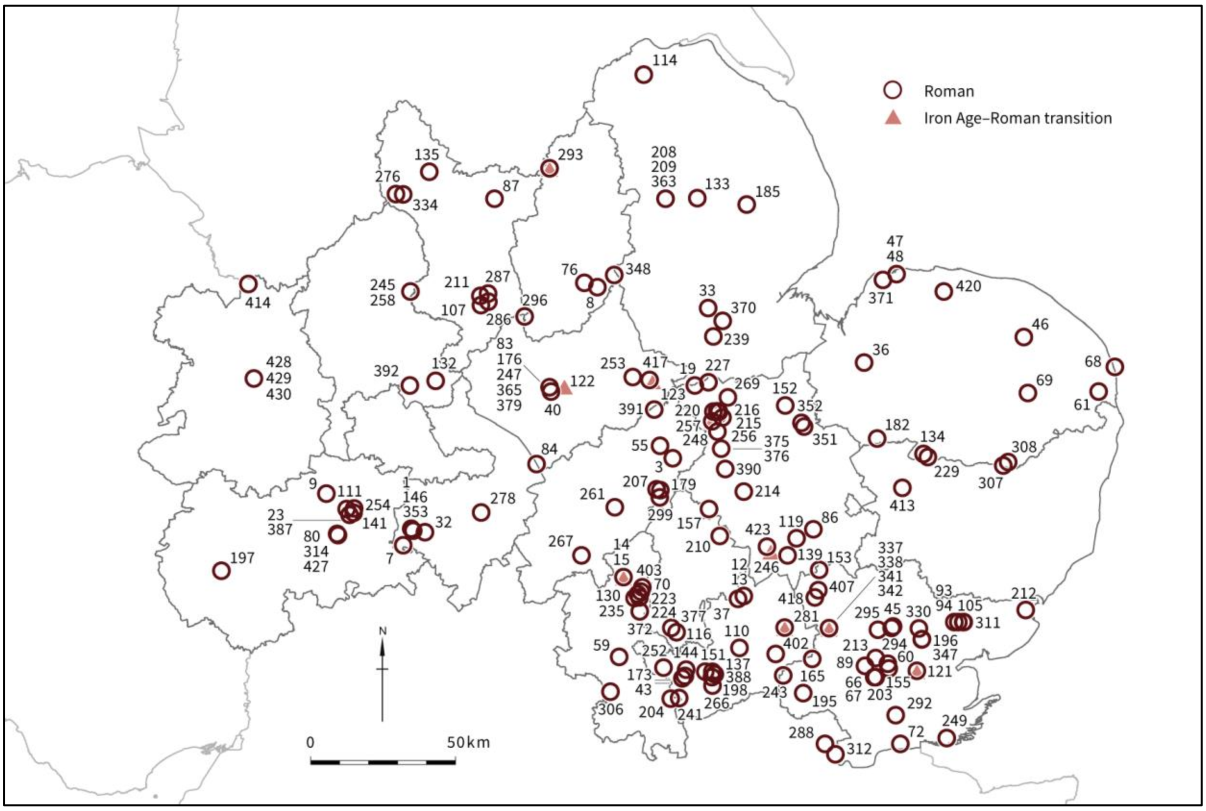

Fig 6.1 The distribution of Roman sites across central England. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text.

Zooarchaeological data have been obtained from a great variety of different site types, the most common being towns/urban sites, villas, farmsteads and enclosures. Specialised sites, of a type that was rare or absent in earlier periods, include industrial sites, such as Upwich, Droitwich (387, Hereford and Worcester; Meddens 1997), and Sheepen, forts, such as Burgh Castle, near Caister-on-Sea (61, Norfolk; Grant 1983a), and Dodder Hill, near Droitwich (111, Hereford and Worcester; Davis 1988), and roadside settlements, such as Tort Hill East, Stilton, near Peterborough (375, Cambridgeshire; Albarella 1998), and Wimpole Hall, Wimpole (423, Cambridgeshire; Wilson 1994). The temple at Harlow (165, Essex; Legge and Dorrington 1985) continued its existence into the Roman period, as is also the case for the temple that is part of the Iron Age–Roman complex at Elms Farm (Heybridge). New temples are found at Caesaromagus NE (66, Essex; Luff 1992), and Caistor St Edmund, near Norwich (69, Norfolk; Gurney 1986), and a shrine at Brigstock, near Corby (55, Northamptonshire; King 1963). Other site types represented include a bridge, burials/cemeteries, caves, open settlements, wells and an array of rural sites. As for the Iron Age, the status of many sites is unclear or unspecified, while several are represented by clusters of pits and/or ditches of uncertain function.

Although many assemblages could only be generically dated to the Roman period, whenever possible attempts have been made to assign them to more precise chronological categories. It is not always possible to be sure of the chronological meaning of the various sub-divisions of the Roman period as presented in site reports, but it may be reasonable to assume the following chronological separation:

- early Roman, 1st to 2nd century AD
- middle Roman, 2nd to 3rd century AD
- late Roman, 3rd to 4th century AD.

The ample overlap between these phases is deliberate and is indicative of the approximate nature of the sub-divisions. The early 5th century AD can probably already be considered a time of transition with the Saxon period and will only marginally be discussed as part of this chapter. All three phases are fairly well represented in our dataset, although it is slightly skewed towards the earlier and later parts of the period. This is probably more a consequence of the way phases are labelled than of any genuine reduced representation for the ‘middle’ period. We will, however, see that only a few sites provide evidence from the full Roman chronological sequence, which means that is rarely possible to reconstruct the evolution of husbandry practices and other forms of human–animal relationships on a site-by-site basis.

6.3 Species occurrence and frequency

6.3.1 Domestic animals

The Roman period saw a substantial change in the overall relative proportion of the main domesticates in comparison with the preceding Iron Age. Although the average frequency of pig remains approximately the same, cattle numbers increase substantially at the expense of sheep, a trend confirmed statistically, supported by a one-way ANOVA test (Table 6.1). The predominance of cattle in the Roman period is in fact more pronounced than that of sheep/goat in the Iron Age (Fig 6.2). The degree of change between the Iron Age and the Roman period appears even greater when we consider that sheep/goat had increased in importance in the later Iron Age, as discussed in Chapter 5. Species percentages are clearly affected by a recovery bias, but this applies to all periods and therefore does not undermine the suggestion of a change. Because of their larger size, the predominance of cattle bones is almost certainly over-estimated but, for the same reason, the predominance of sheep/goat bones in the Iron Age is likely to be under-estimated. Both of the two sites that do have large sieved assemblages, Gorhambury, near St Albans (151, Hertfordshire; Locker 1990) and Wroxeter (baths and basilica), near Shrewsbury (*Viroconium*; 428, Shropshire; Armour-Chelu 1997; Locker 1997b;

Hammon 2005), have a prevalence of cattle bones (Table 6.2), supporting the view that cattle dominance in Roman Britain represents a genuine phenomenon. It must be added here that at these two sites hand-collected and sieved material were unfortunately combined, thus making it impossible to estimate with any accuracy the effect that the two types of collection had on taxon representation.

The Roman increase in cattle numbers has been identified before and it is not specific to central England (cf Maltby 1981; Grant 1989, 2002; King 1999, 2001; Dobney 2001; Albarella 2007). Although widespread, it is not universal, and it does not necessarily manifest itself uniformly in terms of rate and degree of change (Grant 1989, 2002; Gidney 1999b; Hamshaw-Thomas 2000; Albarella 2007).

Fig 6.2 Relative proportions of the three main domestic taxa, based on the number of identified specimens (NISP) of all hand-collected assemblages from Roman periodsites across central England, regardless of assemblage size.

Table 6.1 Results of a one-way ANOVA test comparing means of the proportions of main domestic taxa between periods from sites in central England. The test was only carried out when, according to a Levene's test, the variance for the period was not significantly (>0.05) different from homogeneity. Data (in the form of percentages) are obtained only from periodsites containing hand-collected material where the cattle+sheep/goat+pig number of identified specimens (NISP) >400. Transitional periods (eg Iron Age–Roman transition) were not used. The difference was regarded as significant (*) when <0.05 and highly significant (**) when <0.01. F= ANOVA test value.

†Outliers removed from the comparison of Saxon and medieval assemblages. Saxon: St Albans Abbey (two phases), Wicken Bonhunt, Spong Hill, Nettleton Top. Medieval: West Cotton, Dudley Castle, Hall Farm.

	Sheep/goat		Cattle		Pig		
	F	Significance	*F*	Significance	*F*	Significance	Comments
Iron Age–Roman	11.965	0.001**	11.442	0.001**	0.253	0.616	Indicates move from sheep/goat towards cattle
Roman–Saxon	0.045	0.832	5.034	0.027*	10.099	0.002**	Indicates move from cattle towards pig
Saxon–medieval	–	–	–	–	–	–	Variances non-homogeneous
Saxon–medieval	9.273	0.003**	8.397	0.005**	0.476	0.492	With outliers removed indicates move from cattle towards sheep/goat†
Medieval–post-medieval	2.817	0.096	0.211	0.647	2.876	0.093	No significance

Table 6.2 details the proportions of the major domesticates for the main sites, and Figs 6.3–6.5 illustrate the same evidence as bar charts. The predominance of cattle bones gradually increases throughout the Roman period (Fig 6.6). Whereas 50% of early Roman periodsites are cattle-dominant (ie represent >50% of the NISP), this percentage rises to 79% in the late Roman period. Although, as in the Iron Age, pig is quite consistently the third most common taxon, it is worth pointing out that, with a few exceptions, the sites with a greater frequency of pig bones belong to the early Roman period. On average, the frequency of pigs is about 13% in the early Roman period and 11% in the middle and late Roman periods. More significantly perhaps, 21% of the early Roman sites have >20% pig, but this percentage decreases to 6% in the middle–late Roman periods. Although these differences are not particularly striking, they may be of some significance, given the popularity that pigs had in Roman Italy, which was not matched elsewhere in the Empire (cf King 1999).

These are, of course, generalisations, and there are many exceptions to the identified trends. For instance, the assemblage at Stansted Airport (DFS), Stansted (342, Essex; Hutton 2004d, 2004e, 2004i, 2004k) was almost completely dominated by pigs (87%) but these were mainly partial skeletons in contexts dominated by cremations. Temple sites tend to have very high sheep/goat percentages. At Harlow Temple, the Iron Age tradition of sheep sacrifice continues in the Roman period and here there are 84% sheep/goat, whereas at Caesaromagus NE the proportion is slightly lower but still high

(70%). The shrine at Brigstock has a small assemblage but it is also sheep/goat dominated. In contrast, the other non-temple ritual sites of Folly Ln, *Verulamium*, St Albans (137; Hertfordshire, Locker 1999d), and Ivy Chimneys have very high cattle proportions. In the late Roman period one of the most obvious outliers is Colchester 71–85, which (in continuity with the previous middle–late Roman phase, but not with earlier periods) has a slight predominance of pig bones. It must, however, be borne in mind that the material from Colchester combines assemblages from different sites, including some that have atypical body part distributions (particularly for cattle), and an accurate interpretation will have to take into account many taphonomic and contextual details, and is therefore beyond the scope of this work. Also unusual for the late Roman period is the site of Grandford, near March (152, Cambridgeshire; Stallibrass 1982), which has a predominance of sheep/goat and, perhaps significantly, is regarded to have been a village.

In Fig 6.7, the distribution of sites according to the frequency of the main domesticates is plotted by geographical area. No clear pattern emerges apart from a predominance of sites with higher pig frequencies coming from the eastern part of central England. It is unclear, however, to what extent this is a result of geography or chronology, as most of these assemblages are from the early Roman period (cf Fig 6.6). It is likely that both factors have an influence, as the eastern region was the earliest to be conquered and the closest to trade routes. It could therefore have been more subjected to cultural influence from the core of the Roman Empire.

Figure 6.8 illustrates the distribution of domesticates according to site type, and here the clearest trend that emerges is the predominance of rural sites in the group of assemblages with higher sheep/goat frequencies. This trend has been identified previously by King (1978, 1984, 1999) and may indicate some form of continuation of an Iron Age type of husbandry in rural settlements. It is also worth noting that the assemblages with high pig numbers are generally urban.

Although it is clear that the Roman period saw a remarkable overall change in husbandry strategies, with the importance of cattle being clearly enhanced, the reasons for such change are more difficult to establish. The most popular animal in Roman Italy was pig rather than cattle, and King's (1984, 1999) suggestion that the Roman period saw the introduction of a cultural custom originating from central rather than southern Europe remains the best documented and likely scenario. As King (1984, 1999) pointed out, cattle was already the most common domesticate in the Iron Age of central Europe and many of the troops travelling with the Roman army during the invasion of Britain originated from there. Military sites from central England do confirm a trend of high cattle reliance, although probably no more so than urban sites (Fig 6.8), but it is perhaps significant that village sites, which were likely to be less Romanised, tend to have higher frequencies of sheep/goat. In terms of meat consumption, beef must have been the most commonly eaten meat in Roman Britain, and by quite a margin, if we consider the much greater weight of a cattle carcass compared with pig and especially sheep.

Table 6.2 Roman sites from central England with a combined cattle, sheep/goat and pig number of identified specimens (NISP) >400. The sites are grouped approximately by date. Coll refers to the method of collection (HC=hand-collected, CS=coarse sieved, BS=bulk sieved). The NISP count shown is that of the three main domesticates combined. Site numbers refer to those shown on the map in Fig 6.1, and are as given in the gazetteer (Appendix 1). The site of Alcester (1, Warwickshire; Maltby 2001) was initially overlooked and only identified in the latest stages of this review, so is absent from Table 6.2 and Figs 6.1–8. We have, however, made reference to the evidence from Alcester in the text. The terms 'Roman' and 'Romano-British' are kept to reflect definitions in the original reports but they may, in fact, refer to the same cultural horizon.

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	45	Braintree	Essex	Roman	Town	83	12	5	2 118
HC	61	Burgh Castle, near Caister-on-Sea	Norfolk	Roman	Fort	73	13	15	430
HC	70	Caldecotte, Milton Keynes	Buckinghamshire	Roman	No site information	63	27	10	1 846
HC	94	Colchester 71–85	Essex	Roman	Urban	53	25	22	12 030
HC	107	Derby NW Sector	Derbyshire	Roman	Urban	55	36	9	5 412
HC	146	Gas House Ln, Alcester	Warwickshire	Roman	Urban	45	44	10	Unknown
HC	261	Overstone, near Northampton	Northamptonshire	Roman	Farm	58	37	4	824
HC	295	Rayne, near Braintree	Essex	Roman	Rural	65	29	6	1 511
HC	307	Scole, near Diss	Norfolk	Roman	Villa	50	41	9	1 673
HC	119	Edmundsoles, Haslingfield, near Cambridge	Cambridgeshire	Romano-British	Country house	56	39	5	Unknown
HC	220	Lynch Farm, Peterborough	Cambridgeshire	Romano-British	Farm	82	15	28	422
HC	235	Milton Keynes 71–82	Buckinghamshire	Romano-British	Urban	57	28	15	4 463
HC	337	Stansted Airport (ACS), Stansted	Essex	Romano-British	Enclosure	38	37	25	466
HC	418	Wicken Bonhunt	Essex	Romano-British	Cluster of pits and/or ditches	43	18	39	476
HC	33	Billingborough	Lincolnshire	1st century AD	Rural	50	45	5	618

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	89	Chignall Roman villa	Essex	1st century AD	Villa	72	21	7	409
HC	195	Ivy Chimneys, Witham	Essex	1st century AD	Enclosure	58	34	8	1 275
HC	121	Elms Farm, Heybridge	Essex	Late 1st to early 2nd century AD	Town	69	26	5	1 794
HC	256	Orton Hall Farm, Orton Township	Cambridgeshire	Late 1st to early 2nd century AD	Rural	37	60	3	1 920
HC	66	Caesaromagus NE, Chelmsford	Essex	Early Roman	Temple	22	70	8	1 785
HC	83	Causeway Ln, Leicester	Leicestershire	Early Roman	Urban	48	36	16	4 133
HC	94	Colchester 71–85	Essex	Early Roman	Urban	57	23	20	18 437
HC	114	Dragonby, near Scunthorpe	Lincolnshire	Early Roman	Open settlement	35	51	14	808
BS	151	Gorhambury, near St Albans	Hertfordshire	Early Roman	Villa	41	27	31	2 213
HC	152	Grandford, near march	Cambridgeshire	Early Roman	Village	28	60	12	770
HC	165	Harlow Temple, Harlow	Essex	Early Roman	Temple	4	84	12	728
HC	209	Lincoln sites	Lincolnshire	Early Roman	Urban	65	22	13	595
HC	216	Longthorpe, near Peterborough	Cambridgeshire	Early Roman	Fort	56	30	14	1 995
HC	215	Longthorpe II, near Peterborough	Cambridgeshire	Early Roman	Midden	58	36	6	2 113
HC	245	New Cemetery, Rochester	Staffordshire	Early Roman	Fort	65	14	21	473

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	281	Puckeridge and Braughing 71–2, Bishop's Stortford/Stevenage	Hertfordshire	Early Roman	Town	29	55	17	1 282
HC	311	Sheepen, Colchester	Essex	Early Roman	Industrial	52	20	29	6 009
HC	314	Sidbury, Worcester	Hereford and Worcester	Early Roman	Roadside settlement	45	47	7	953
HC	365	The Shires (Little Ln), Leicester	Leicestershire	Early Roman	Urban	46	32	22	1 634
HC	403	Wavendon Gate, Milton Keynes	Buckinghamshire	Early Roman	No site information	75	21	4	817
HC	413	West Stow, near Bury St Edmunds	Suffolk	Early Roman	Industrial	41	44	15	Unknown
HC	94	Colchester 71–85	Essex	Early–middle Roman	Urban	32	31	37	3 787
HC	137	Folly Ln, *Verulamium*, St Albans	Hertfordshire	Early–middle Roman	Ritual	88	11	1	2 914
HC	257	Orton Longueville (Monument 97)	Cambridgeshire	Early–middle Roman	Rural	53	41	6	2 009
HC	308	Scole-Dickleburgh	Norfolk	Early–middle Roman	Town	56	34	9	622
HC	353	Stratford Rd (Hockley Chemical Works), Alcester	Warwickshire	Early–middle Roman	Urban	58	34	8	946
HC	363	The Park, Lincoln	Lincolnshire	Early–middle Roman	Urban	78	15	7	113
HC	121	Elms Farm, Heybridge	Essex	Late 2nd to early 3rd century AD	Town	84	11	5	2 000
HC	195	Ivy Chimneys, Witham	Essex	Late 2nd to early 3rd century AD	Ritual	88	9	3	1 102

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	211	Little Chester, Derby	Derbyshire	Late 2nd to early 3rd century AD	Fort	43	53	6	640
HC	256	Orton Hall Farm, Orton Township	Cambridgeshire	Late 2nd to early 3rd century AD	Farm	66	28	6	672
HC	48	Brancaster 77, Hunstanton/Wells-next-the-Sea	Norfolk	Middle Roman	Fort	65	31	4	2 081
HC	94	Colchester 71–85	Essex	Middle Roman	Urban	86	9	6	7 943
HC	152	Grandford, near March	Cambridgeshire	Middle Roman	Village	30	63	7	739
HC	209	Lincoln sites	Lincolnshire	Middle Roman	Urban	50	38	13	499
HC	287	Racecourse, Derby	Derbyshire	Middle Roman	Roadside settlement	48	45	7	731
HC	352	Stonea 80–5, near March	Cambridgeshire	Middle Roman	Roadside settlement	40	48	12	1 042
HC	403	Wavendon Gate, Milton Keynes	Buckinghamshire	Middle Roman	No site information	82	16	2	401
HC	94	Colchester 71–85	Essex	Middle–late Roman	Urban	36	25	39	1 091
HC	294	Rayne Rd, Braintree	Essex	Middle–late Roman	Town	75	19	6	485
HC	89	Chignall Roman villa	Essex	Late 3rd to 4th century AD	Villa	79	17	4	1 585
HC	211	Little Chester, Derby	Derbyshire	Late 3rd to 4th century AD	Fort	71	23	6	1 526
HC	256	Orton Hall Farm, Orton Township	Cambridgeshire	Late 3rd to 4th century AD	Farm	67	30	3	3 449

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	121	Elms Farm, Heybridge	Essex	Late 3rd to 5th century AD	Town	87	10	3	875
HC	195	Ivy Chimneys, Witham	Essex	Late 3rd to 5th century AD	Temple	78	14	8	11 333
HC	15	Bancroft villa, Milton Keynes	Buckinghamshire	Late Roman	Villa	55	33	13	3 833
HC	68	Caister-on-Sea, near Great Yarmouth	Norfolk	Late Roman	Fort	73	11	15	3 509
HC	83	Causeway Ln, Leicester	Leicestershire	Late Roman	Urban	48	32	21	2 694
HC	110	Dicket Mead, Welwyn	Hertfordshire	Late Roman	Villa	55	31	16	1 251
BS	151	Gorhambury, near St Albans	Hertfordshire	Late Roman	Villa	53	27	20	693
HC	152	Grandford, near March	Cambridgeshire	Late Roman	Village	33	59	8	1 878
HC	154	Great Chesterford 53–5, near Saffron Walden	Cambridgeshire	Late Roman	Town	65	27	8	733
HC	209	Lincoln sites	Lincolnshire	Late Roman	Urban	79	13	7	5 277
HC	245	New Cemetery, Rochester	Staffordshire	Late Roman	Town	70	14	16	575
HC	254	Old Bowling Green, Droitwich	Hereford and Worcester	Late Roman	Industrial	68	26	6	2 214
HC	281	Puckeridge and Braughing 71–2, Bishop's Stortford/Stevenage	Hertfordshire	Late Roman	Town	40	48	12	1 021
HC	308	Scole-Dickleburgh	Norfolk	Late Roman	Town	57	32	11	2 258
HC	314	Sidbury, Worcester	Hereford and Worcester	Late Roman	Roadside settlement	60	31	8	2 801
HC	352	Stonea 80–5, near March	Cambridgeshire	Late Roman	Roadside settlement	45	44	12	2 905
HC	363	The Park, Lincoln	Lincolnshire	Late Roman	Urban	76	16	8	1 293

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	403	Wavendon Gate, Milton Keynes	Buckinghamshire	Late Roman	No site information	79	19	3	556
HC	429	Wroxeter (baths and macellum), near Shrewsbury	Shropshire	Late Roman	Urban	70	16	14	4 932
HC	430	Wroxeter (*natatio*), near Shrewsbury	Shropshire	Late Roman	Urban	69	19	12	2 549
HC	121	Elms Farm, Heybridge	Essex	Late 4th to early 5th century AD	Town	87	10	3	568
HC	137	Folly Ln, *Verulamium*, St Albans	Hertfordshire	Late 4th to early 5th century AD	Cluster of pits and/or ditches	46	40	14	749
HC	94	Colchester 71–85	Essex	Very late Roman	Urban	35	26	39	1 359
HC	121	Elms Farm, Heybridge	Essex	Very late Roman	Town	83	9	8	456
HC	204	Latimer, near Amersham	Buckinghamshire	Very late Roman	Farm	84	5	12	438
CS	428	Wroxeter (baths and basilica), near Shrewsbury	Shropshire	Very late Roman	Urban	63	21	16	3 876

Table 6.2 continued

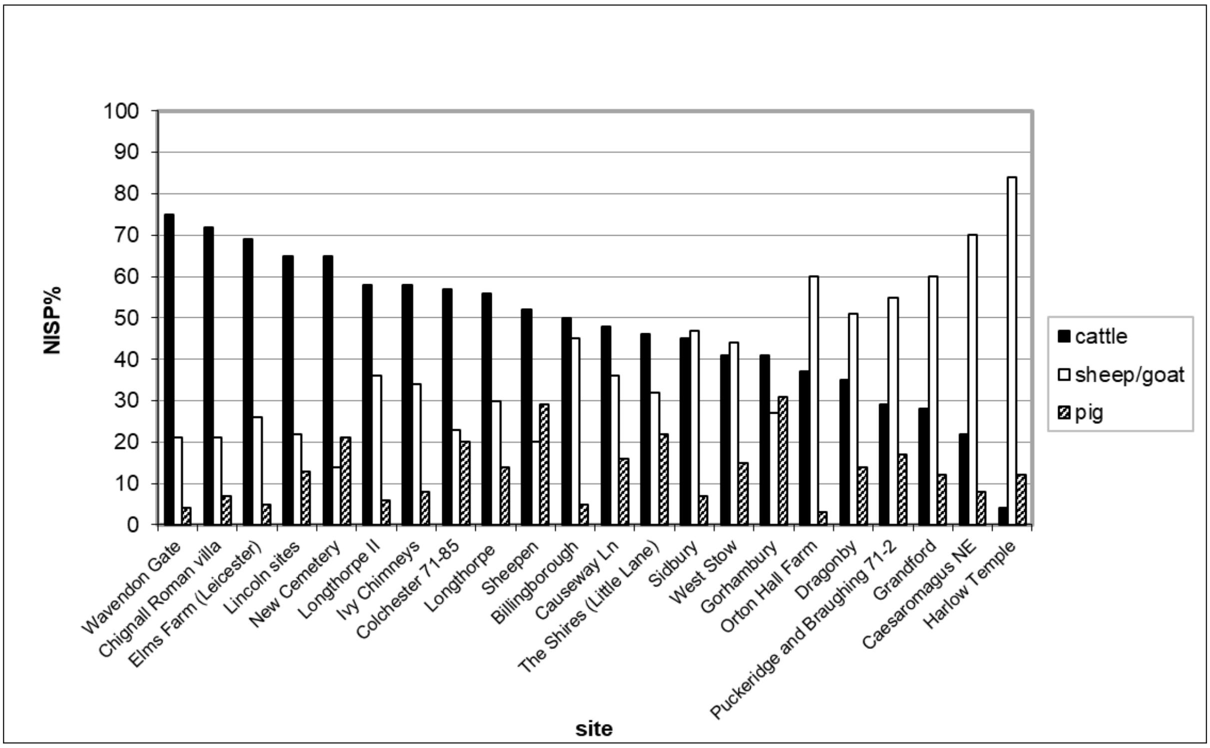

Fig 6.3 Summary of the three main domestic taxa at various early Roman sites across central England, as a percentage of number of identified specimens (NISP), grouped in order of decreasing cattle%. Only hand-collected assemblages with a total NISP for the three taxa >400 have been shown. For further details see Table 6.1.

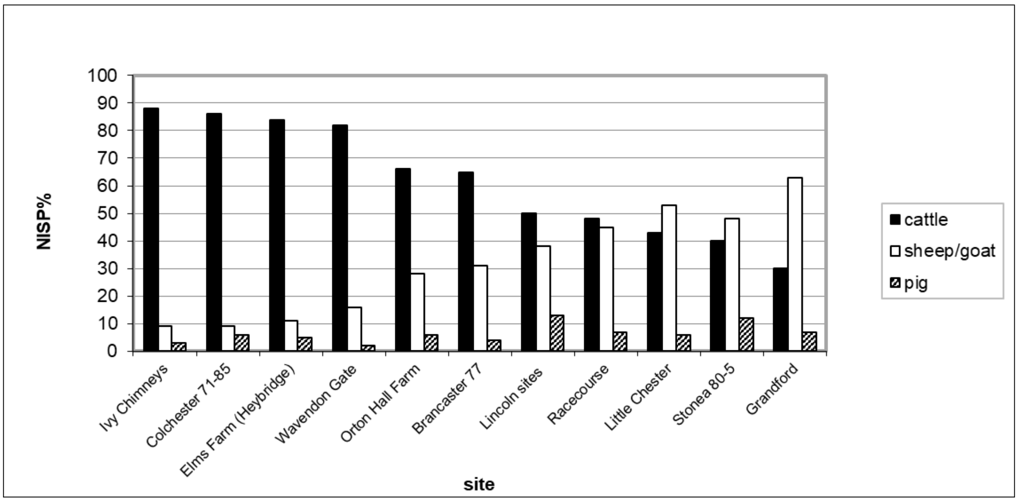

Fig 6.4 Summary of the three main domestic taxa at various middle Roman sites across central England, as a percentage of number of identified specimens (NISP), grouped in order of decreasing cattle%. Only hand-collected assemblages with a total NISP for the three taxa >400 have been shown. For further details see Table 6.1.

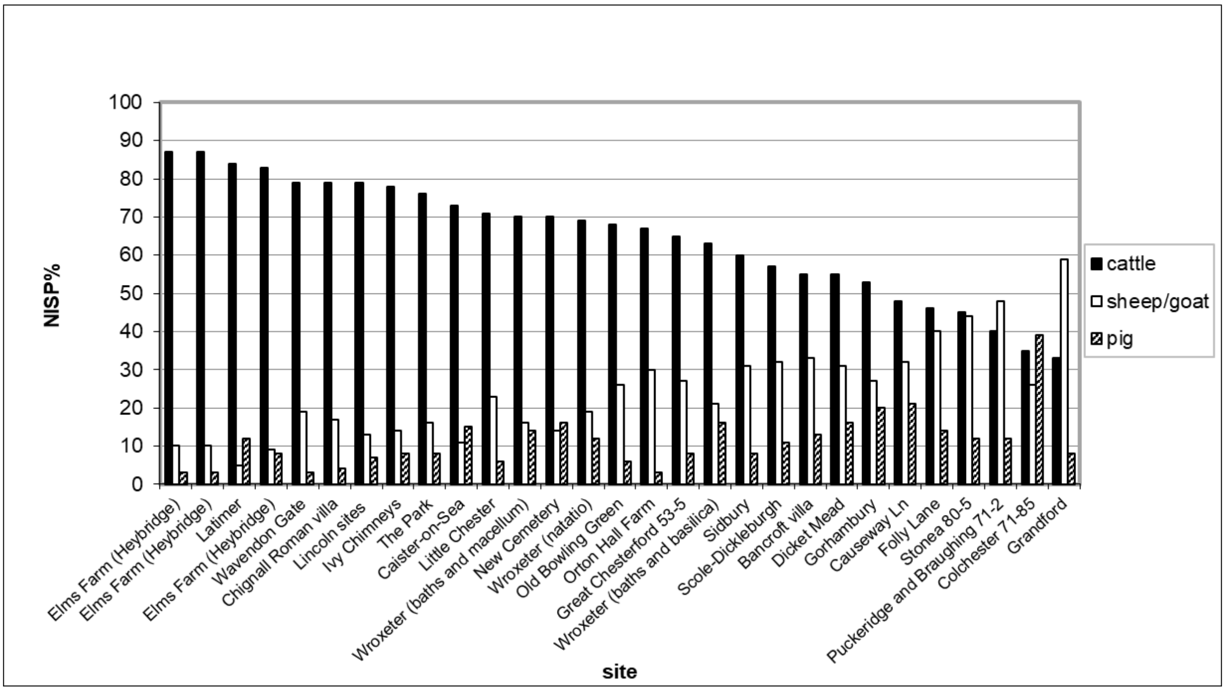

Fig 6.5 Summary of the three main domestic taxa at various late Roman periodsites across central England, as a percentage of number of identified specimens (NISP), grouped in order of decreasing cattle%. Only hand-collected assemblages with a total NISP for the three taxa >400 have been shown. For further details see Table 6.1.

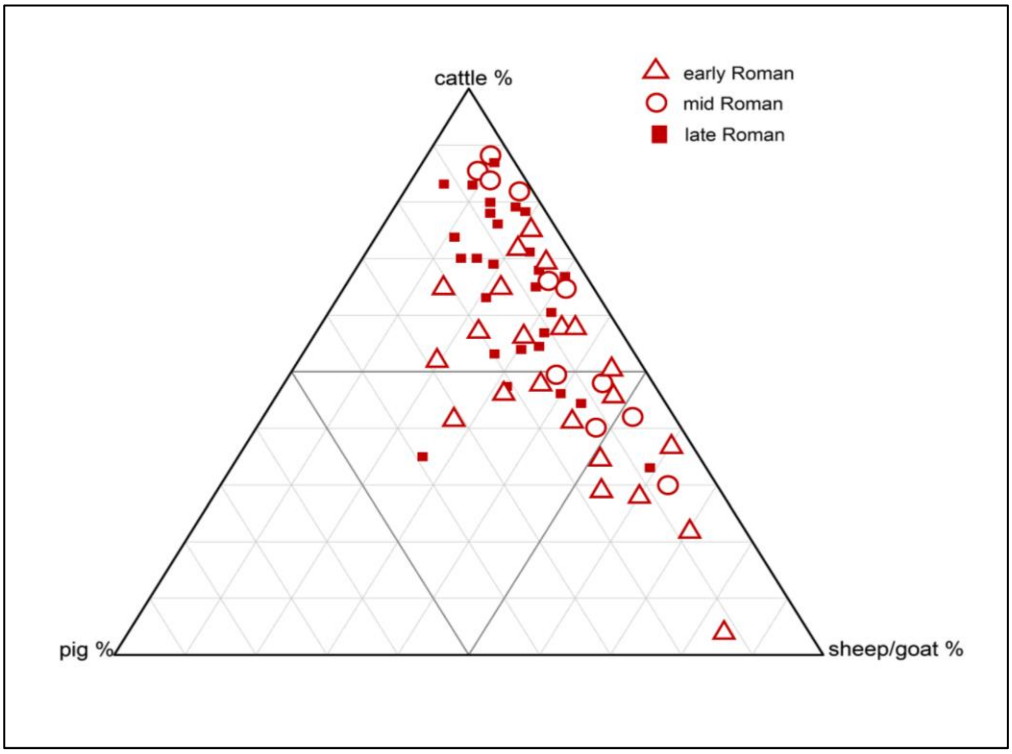

Fig 6.6 Relative proportions of cattle, sheep/goat and pig at periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from various sub-time periods of Roman sites across central England. Only hand-collected material has been included. Broadly dated periodsites have been omitted.

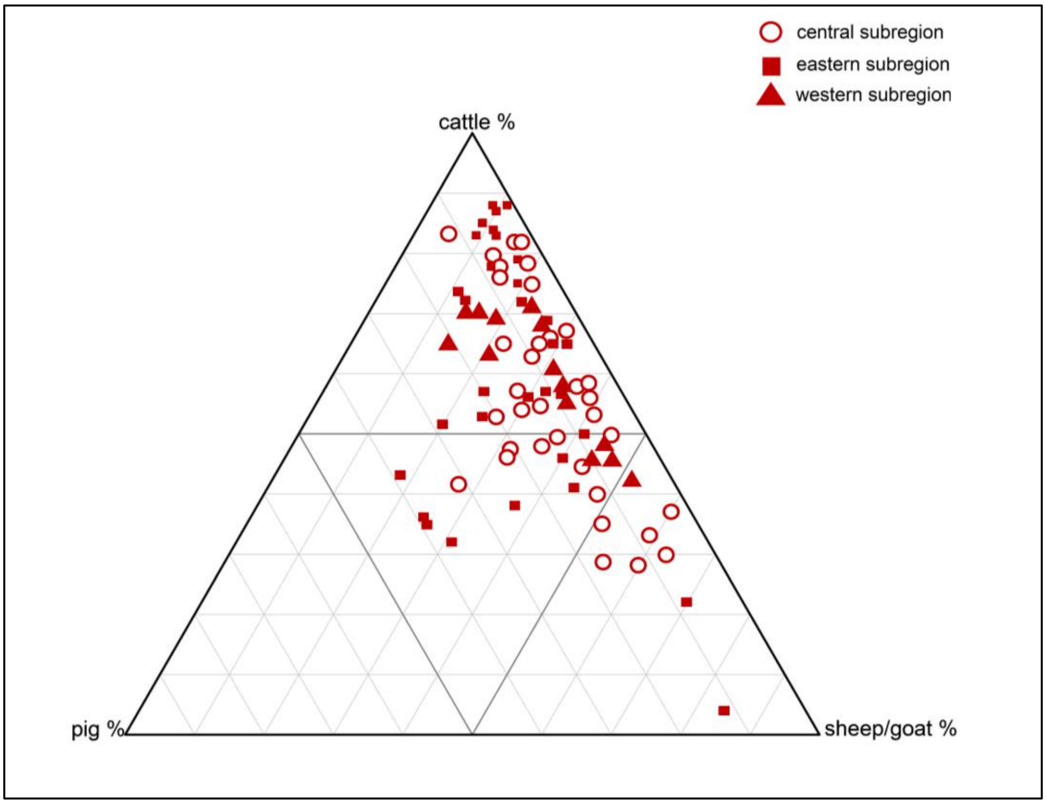

Fig 6.7 Relative proportions of cattle, sheep/goat and pig at periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from Roman sites across three different areas of central England. Only hand-collected material has been included.

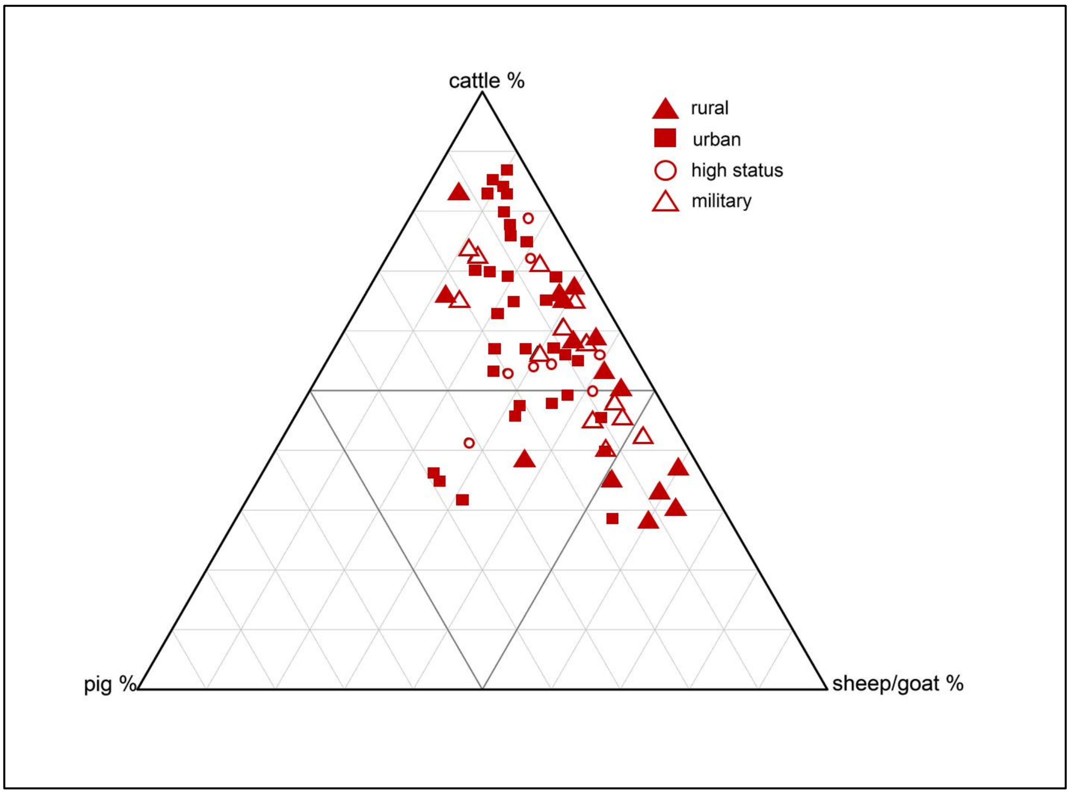

Fig 6.8 Relative proportions of cattle, sheep/goat and pig at periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from four different Roman site types across central England (other categories have been omitted). Only hand-collected material has been included.

Sheep and goat are both present at Roman sites in Britain, although identification at species level has not been attempted for all sites. For the same reasons discussed for the Iron Age, goat is more frequently mentioned than sheep, but in reality the latter is overwhelmingly more common. For instance, at Elms Farm (Heybridge), where a thorough estimate of sheep and goat morphological characters was undertaken, only two goat specimens (<1%) compared with 248 sheep specimens could be identified. Although the predominance of the sheep is not always as marked as at Elms Farm (Heybridge), it does characterise all Roman sites. At Alcester (1, Warwickshire; Maltby 2001), all 27 fused metapodials were attributed to sheep and none to goat. Many of the assemblages with goat remains are represented mainly by horncores (*c* one-third). The frequency of horncore-dominated goat assemblages declines during the course of the Roman period (Fig 6.9) and from east to west (Fig 6.10). This is interesting as it may reflect the intensity of overseas trade, which is likely to have been more pronounced in the earlier part of the period and in the eastern part of central England. A possible explanation for the inconsistency between the abundance of goat horncores and the dearth of other body parts is indeed the importation of goat horns from overseas for manufacturing production (Albarella 2003b).

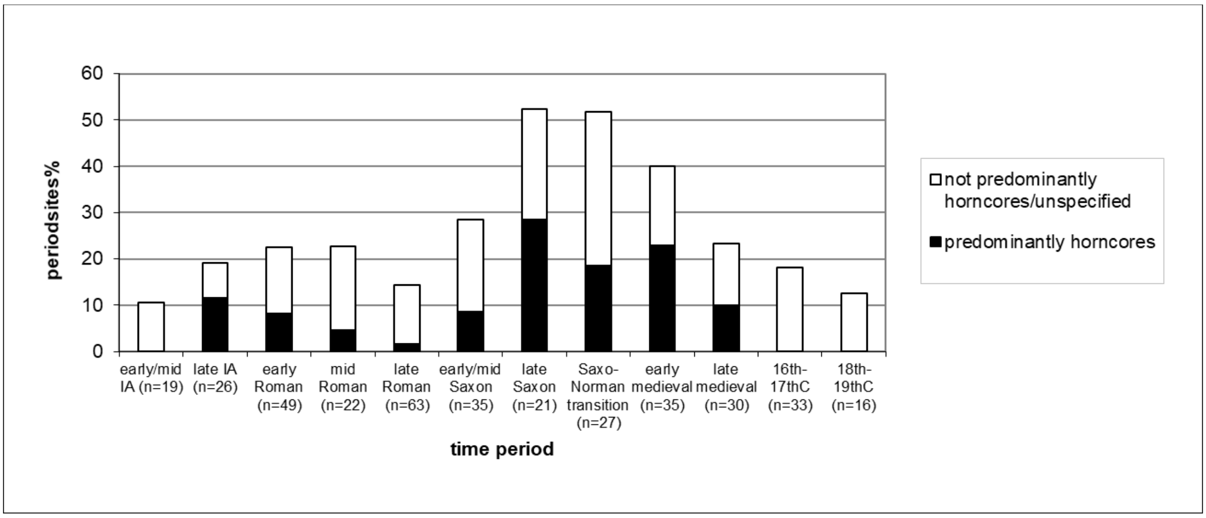

Fig 6.9 Occurrence of goat by body part, as a percentage of periodsites across central England, where n *is the number of periodsites where hand-collected sheep/goat is recorded within a post-Iron Age sub-time period. Sub-time periods with <10 periodsites have not been included.*

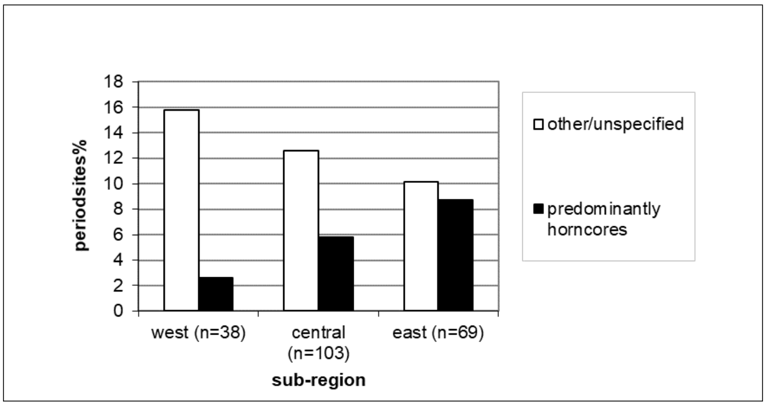

Fig 6.10 Occurrence of goat by body part and sub-region, as a percentage of periodsites across central England, where n *is the number of Roman periodsites where hand-collected sheep/goat is recorded within a sub-region.*

Most common amongst the other domestic species found in the Roman period are the horse and dog. Donkey and equid hybrids (mule or hinny) are only occasionally recorded in central England, and such rarity must be interpreted with caution, bearing in mind the difficulties in distinguishing the various equid forms. The occurrence of mule has been suggested for Roman London (Armitage and Chapman 1979), and both donkey and mule have been recorded elsewhere in the Roman Empire (Johnstone 2010). For central England, the occurrence of donkey is suggested for the generically dated Roman material from a well at Cave's Inn, Rugby (84, Warwickshire; Noddle 1973a) and possibly (it could also be mule) from Caldecotte. Mule remains are represented by an early Roman mandible from Dunstable (116, Bedfordshire; Jones and Horne 1981) and further remains from Kenchester, near Hereford (197, Hereford and Worcester; Noddle and O'Connor 1985). These findings are interesting and would confirm the important role that donkeys and mules had for the Roman economy (White 1970), but the morphological analysis of Roman equid remains needs urgent revision, employing, for example, proposed identification methods (Johnstone 2007); until then, these identifications must be treated cautiously.

Horses are not as common as in the preceding Iron Age (*see* Fig 5.7) but still fairly ubiquitous, and they must have had many important functions, ranging from transport to their use as war animals (for a full account of the Roman horse see Hyland 1990). That horses probably played an important role in the transport system of Roman Britain is supported by the high frequency of horse bones found at the roadside settlements of Tort Hill East (Albarella 1998) and particularly Tort Hill West, Stilton, near Peterborough (376, Cambridgeshire; Albarella 1998). At both these sites detailed morphometric analysis has demonstrated that the remains can confidently be attributed to the horse rather than the donkey or mule, and the occurrence of shed teeth and neonatal bones has proven that living animals were present on-site and that local breeding occurred. As the only other Roman sites where horses have been found in very high frequencies, such as the amphitheatre at Silchester, Hampshire (Grant 1989), or 'ranching' farms (King 1978), have specialised functions, the hypothesis has been raised that the two Tort Hill settlements may have been specialised in the supply of horses to people travelling along Ermine St (Albarella 1998).

For reasons that are difficult to reconstruct, horses appear to increase in frequency in the later Roman period (Fig 6.11). A more detailed study is required to check whether this is because of a change in disposal practices, the different nature of site types between periods, or a genuine increase in the abundance of this animal.

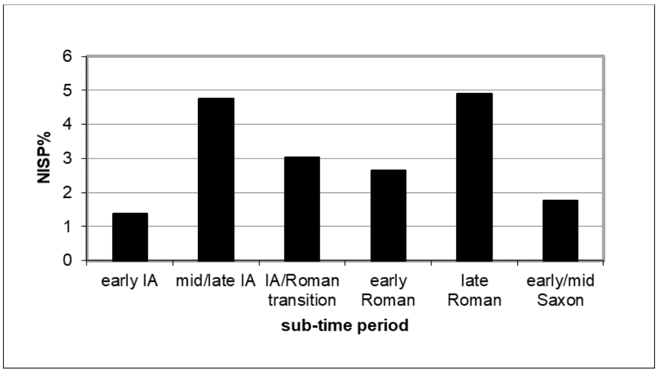

Fig 6.11 Occurrence of horse/equid as a percentage of all hand-collected horse/equid+cattle+sheep/goat+pig number of identified specimens (NISP) per sub-time period from sites across central England. IA=Iron Age. Broadly dated phases have not been included, and there is no overlap between phases.

Dog is also very common and widespread, and in some sites presents with many remains. As for the Iron Age, there is no evidence of the occurrence of the wolf and most of the canid remains are therefore likely to belong to domestic animals. By the Roman period the domestic cat must have certainly been present in Britain, and this is reflected in a much greater occurrence of this species than in the preceding Iron Age (it is reported at 55 periodsites). With the exception of the site of Poole's Cavern, Buxton (276, Derbyshire; Bramwell 1984), where the presence of the wildcat is hypothesised, all of these remains are likely to belong to the domestic form.

As mentioned in Chapter 5, the domestic fowl was introduced into Britain in the Iron Age, but it did not become widespread until the Roman period (*see* Fig 5.8). Domestic fowl bones become far more abundant during the Roman period (Fig 6.12), but this was a slow process, as attested by the gradual increase from the late Iron Age to the end of the Roman period (Fig 6.13). Domestic fowl bones are also found more commonly on urban than rural sites, with high-status and military/roadside settlements falling in between (Fig 6.14). This pattern corresponds well with Maltby's findings (1997, 412, fig 2): he interprets this as indicating that 'domestic fowl were more popular on Romanised sites but less readily accepted as a food source on native settlements'. An alternative, and possibly complementary, interpretation is that domestic fowl rearing may have been more orientated towards keeping a few birds in house backyards than as part of a larger scale rural economy. The overall frequency of domestic fowl remains is certainly under-estimated because of recovery bias, but this is likely to be the case across all periods and site types, and should therefore not affect the results substantially.

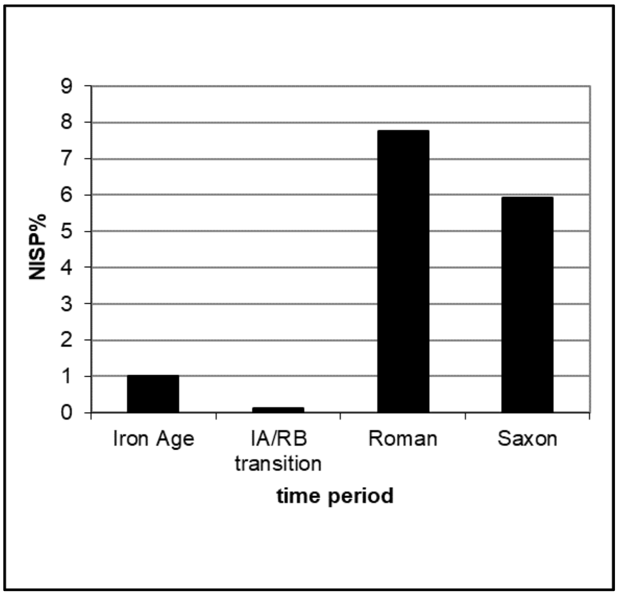

Fig 6.12 Occurrence of domestic fowl, as a percentage of hand-collected domestic fowl+sheep/goat+pig number of identified specimens (NISP) for different time periods, from across central England. IA=Iron Age; RB=Roman.

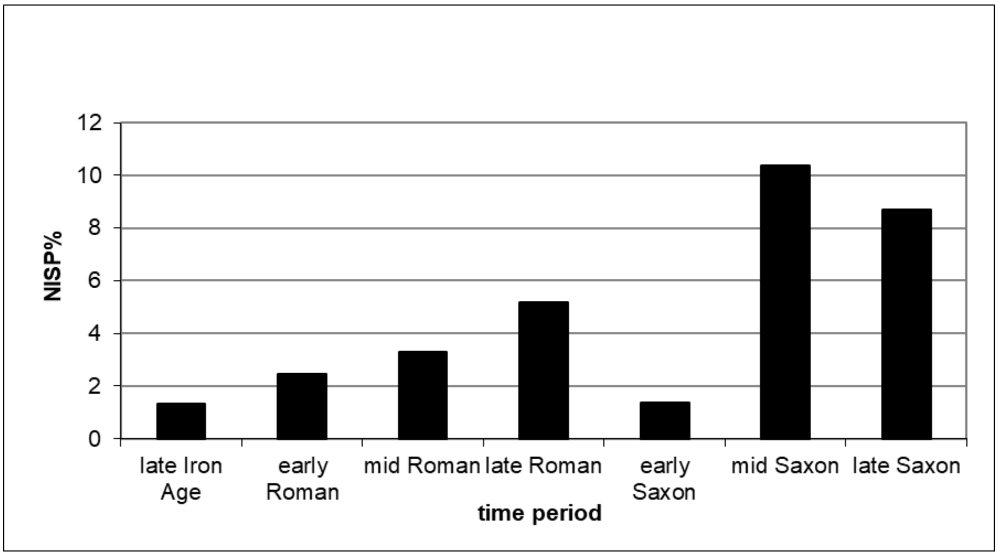

Fig 6.13 Occurrence of domestic fowl, as a percentage of hand-collected domestic fowl+sheep/goat+pig number of identified specimens (NISP), from late Iron Age to late Saxon periodsites across central England. Broadly dated periodsites and sub-time periods with NISP <500 (fowl+sheep/goat+pig) have not been included.

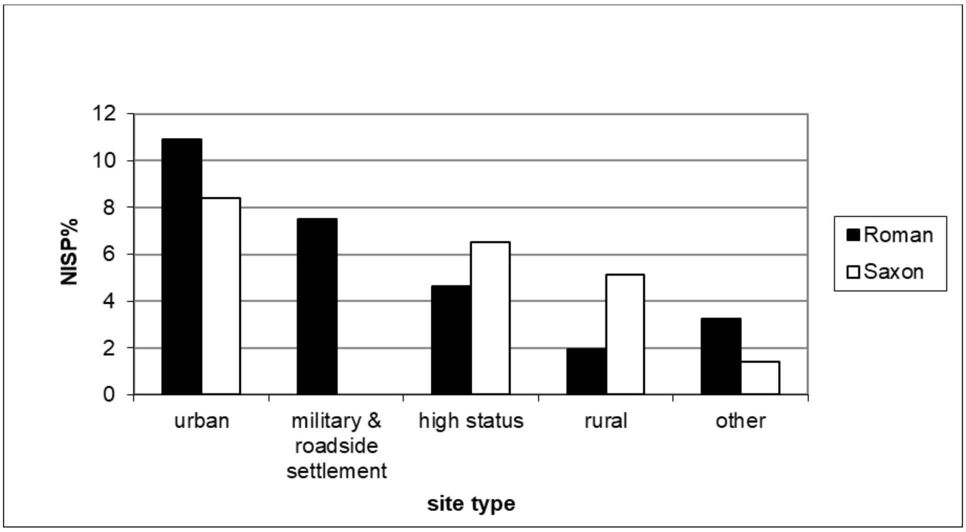

Fig 6.14 Occurrence of domestic fowl, as a percentage of hand-collected domestic fowl+sheep/goat+pig number of identified specimens (NISP), by site type for Roman and Saxon periodsites across central England.

6.3.2 Wild resources

The proportion of wild animals in Roman sites in central England is low, although not to the same extent as in the Iron Age. Red deer, the most common wild species, increases from a mere 0.2% of the total number of deer+cattle+sheep/goat remains in the Iron Age, to a still small but substantially higher 0.7% in the Roman period. These proportions are somewhat confused by the uneven, and sometimes even unclear, inclusion/exclusion of antler remains from the bone counts. Only a few sites have red deer frequencies that are substantially higher than this average. Of these, the most remarkable is represented by the *Villa Rustica* at Latimer, near Amersham (204, Buckinghamshire; Hamilton 1971), where, in the latest phase of occupation (regarded as ‘post-villa’), 95 red deer remains, amounting to an unusually high 18% of the total large mammal bone assemblage, were uncovered. In the earlier 'villa' phase, the assemblage is smaller but red deer is also very well represented, although the percentage is unknown as the counts do not discriminate between red and roe deer (although the former is said to be four times as common). Roe deer was absent from the post-villa phase. This very high occurrence of deer bones is likely to be a consequence of the high status of the villa occupants, who probably hunted deer more as a sign of status than for subsistence. Relatively high red deer frequencies (6% and 4%, respectively) have also been found at Dicket Mead Roman villa, Welwyn (110, Hertfordshire; King 1986), and at the Roman fort of Caister-on-Sea, near Great Yarmouth (68, Norfolk; Harman 1993b). Both these sites also include other wild species, such as roe deer, fox, badger and hare. The results from Caister-on-Sea suggest that hunting was practised by the Roman military as well as by high-status people. In general, sites with higher occurrences of wild species are those that are more likely to have been more intensively 'Romanised', which explains the difference in deer frequency between the Iron Age and the Roman period.

Although a predominance of antler elements is reported at several sites (but not as many as for the Iron Age), there is no doubt that red deer venison was also eaten, as post-cranial bones have also abundantly been found. At Dicket Mead, where antler fragments are fairly common (*c* 10% of the remains), they are, however, said to be no more abundant than skull remains, which proves that they mostly derive from hunted animals.

Remains of the fallow deer, a non-native species in post-glacial Britain, have been identified at five Roman sites in central England. These mainly include antler fragments, such as the shed pieces from the Roman villa at Park St, near St Albans (266, Hertfordshire; Jackson 1971), and the urban site of Scole-Dickleburgh (308, Norfolk; Baker 1998), and an additional specimen from a well at Astley, Stourport-on-Severn (9, Hereford and Worcester; Westley 1959). Post-cranial bones (a humerus and a radius, possibly from the same animal) have been found at Gadebridge Park Roman villa, Hemel Hempstead (144, Hertfordshire; Harcourt 1974a), whereas unspecified fragments are reported from Caldecotte and the late Roman Wroxeter *natatio*, near Shrewsbury (430, Shropshire; Noddle 2000). The evidence for an occurrence of the fallow deer in Britain in the Roman period is therefore more substantial than for the Iron Age but still insufficient to hypothesise a full introduction. Lister (1984, 222) regards the evidence as 'circumstantial and insufficient', although he accepts that enclosed or even wild populations may have had a limited existence. Along the same lines, Sykes (2004a) found the theory of the Roman introduction of breeding populations unconvincing, because it was based on misidentifications and poor dating, but regarded the trade in antler and body parts as plausible. More recent evidence from Fishbourne Palace, West Sussex, based on strontium isotopic analysis, tentatively supports the view that fallow deer were imported from overseas as living animals (Sykes *et al* 2006), which has led Sykes (2010) to reconsider her original suggestion, thus opening the door to the possibility of the existence of small breeding populations of this species, at least around high-status sites.

The wild boar, elusively present throughout British prehistory, must also have been rare in Roman Britain, as studies of very large assemblages, such as Colchester 71–85, have not revealed the occurrence of any particularly large porcine specimen. That the wild boar was, however, still present in our study area is demonstrated by the occurrence of several specimens of an exceptionally large size found at Wroxeter (baths and basilica) (Hammon 2005) and Chedworth Roman villa (A Hammon, unpublished data). Although these animals may have been imported, the occurrence of wild boar of comparable size from previous time periods in Britain indicates that this does not need to have been the case (Albarella 2010). Some of the wild boar specimens from Wroxeter and Chedworth have been subjected to mitochondrial DNA analysis, revealing a genetic affinity of these wild boar with those from most of Europe, but not Italy or the Near East (Larson *et al* 2007).

A decline in the frequency of beaver remains, which were still relatively abundant in the Iron Age, is evident in the Roman period. The only Roman site in central England where beaver was found (just one specimen) is Orton Longueville (Monument 97) (257, Cambridgeshire; Davis 2001a), an early–middle Roman rural site, unsurprisingly from the Fenlands. The dearth of beaver remains from Roman Britain is attested countrywide, and probably indicates a genuine decline of the species, perhaps because of over-hunting (Coles 2006).

Whale bones have been reported at a few sites, including four worked fragments from late Roman Caister-on-Sea, one sawn fragment from early Roman The Shires (Little Ln), Leicester (365, Leicestershire; Gidney 1991a), six fragments of butchered vertebrae from Brancaster 77, Hunstanton/Wells-next-the-Sea (48, Norfolk; R Jones *et al* 1985), and unspecified remains from Colchester 71–85. Some of these sites are located inland and these findings therefore indicate trade activities with the coast.

Among the commensal species, the house mouse, introduced to central England in the Iron Age (*see* section 5.3), is found at eight sites. Early Roman examples include Fison Way, Thetford (134, Norfolk; O'Connor 1992), Newarke St, Leicester (247, Leicestershire; Baxter 1996a), Elms Farm (Heybridge), Gorhambury and The Shires (Little Ln), all either urban or villa sites. The possibility of intrusion can never be completely discounted but, at the same time, the frequency of this species is likely to be grossly under-estimated because of the rarity of fully sieved assemblages. House mice have, in fact, been found at most British Roman sites where appropriate recovery techniques were carried out (O'Connor 2010).

There is now abundant evidence that the black rat was introduced to Britain in the Roman period (Rackham 1979; Armitage *et al* 1984; Armitage 1994; Rielly 2010). This rodent is identified to species level (ie black rat as opposed to the much later introduced brown rat) at three sites, including the early Roman villa of Gorhambury. Ivy Chimneys also has a 1st-century AD rat specimen but, considering the unreliability of the occurrence of an Iron Age specimen at this same site (*see* section 5.3.2), this finding must be treated with caution. The distribution of sites that have produced rat remains is shown in Fig 6.15. Like the house mouse, the likelihood of intrusion in archaeological layers of the Roman period cannot be entirely excluded, but for the specimens identified to species level this is less likely as the black rat, unlike the brown rat, is not a burrowing animal.

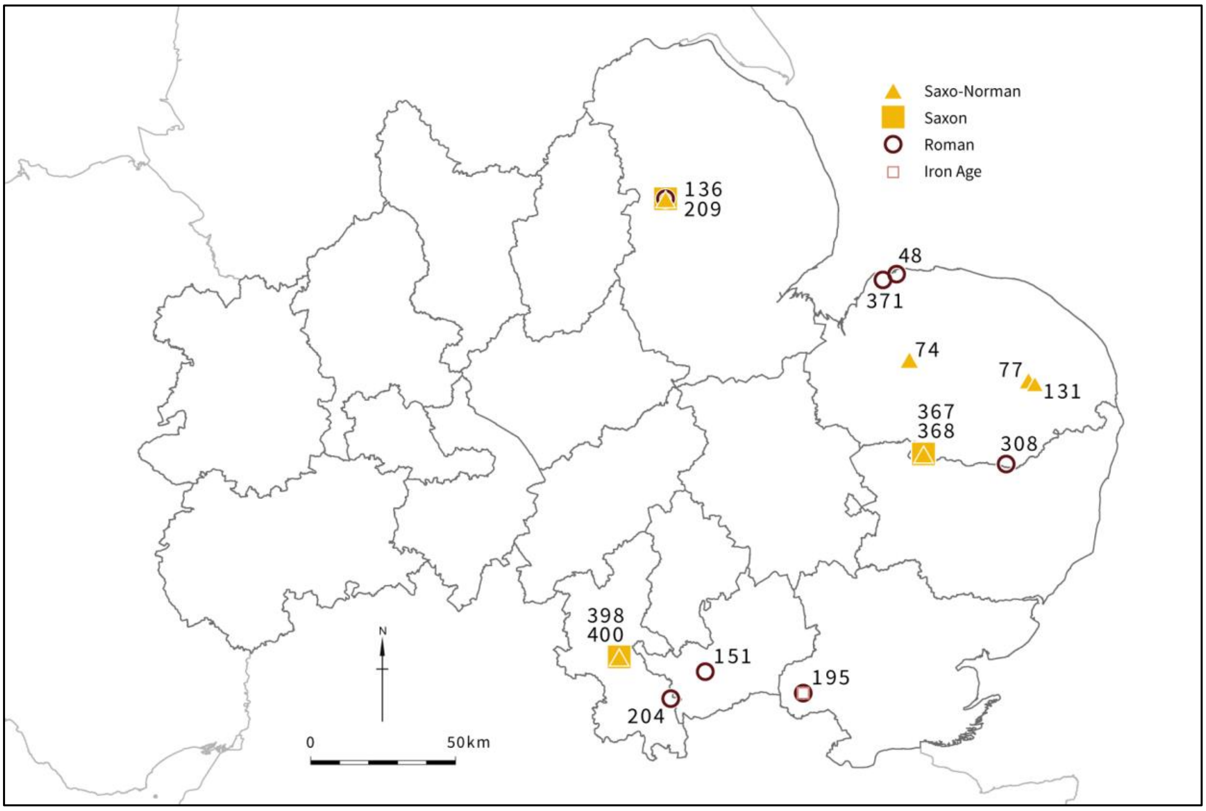

Fig 6.15 The distribution of Iron Age to Saxo-Norman (ie Saxon–Norman transition) sites across central England with rat present. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text.

Wild birds are not abundant on Roman sites from central England, although, in line with the rest of the wild fauna, they are not as rare as in the Iron Age. The occurrence of wild birds for the whole of Britain was reviewed by Parker (1988), and a few considerations can be added here. First of all, it is useful to consider the potential exploitation of ducks and geese, whose status as wild or domestic is for most specimens difficult to determine. In common with the Iron Age, but in contrast will later periods, ducks are more common than geese in Roman sites from central England (Fig 6.16). This topic has been reviewed by Albarella (2005b), who has suggested that this indicates that the majority of duck and goose bones from Roman sites derive from wild specimens. The argument is based on the fact that Roman literary sources clearly indicate that goose husbandry in the Roman period was far more developed than duck breeding. Consequently, if the British Roman specimens mainly derive from domestic birds, we would expect to find a predominance of goose rather than duck bones, as is indeed the case in the following Saxon period. The Roman evidence rather indicates a continuity with the wild fowling that typifies the Iron Age. The odd occurrence of fully bred birds or specimens kept in captivity cannot be ruled out, and is in fact quite likely, but the balance of the evidence points more towards hunting than husbandry. This also indicates that, as we may have expected, not all Roman practices developed in the Mediterranean area were exported to Britain. The relative importance of geese compared with ducks increases in the later Roman period (31% in the early Roman period and 41% in the late Roman period), raising the possibility that towards the end of the period goose husbandry had become more widespread, but was still probably a minority activity. The greater relative importance of ducks on rural sites (74%) compared with more Romanised high-status sites (54%) is a further indication that the prevalence of ducks represents a phenomenon in continuity with the Iron Age, more likely to have survived roughly unchanged on low-status rural sites. It is in this respect interesting to note that at Roman rural sites the duck/goose ratio is almost identical to that from Iron Age sites (Fig 6.16).

It is perhaps important to clarify at this point that we have purposefully ignored all identifications of duck and goose specimens as 'wild' or 'domestic', as almost invariably these identifications are not accompanied by explicit morphological and morphometric criteria. The identification of goose and duck bones to species level is notoriously difficult, particularly within the genera that have produced the domesticated forms (*Anser* and *Anas*). Wild and domestic specimens also overlap widely in size, and available identification criteria (Bacher 1967; Woelfle 1967) are too crude to allow more than the occasional identification. In view of the present situation we have regarded it to be much safer to consider ducks and geese en masse, with no attempt to elaborate on, possibly unreliable, specific identifications.

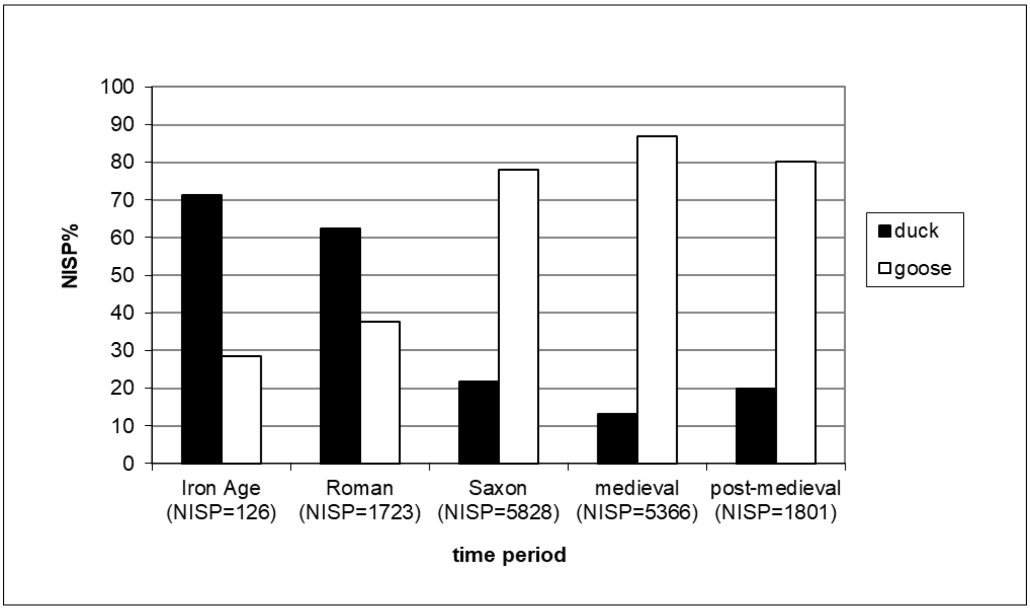

Fig 6.16 Occurrence of duck and goose, as a percentage of duck+goose number of identified specimens (NISP), from periodsites across central England. No attempt was made to differentiate between wild and domestic taxa. All methods of collection have been combined, with the total NISP for the two taxa combined shown in parentheses for each time period.

Although wild geese and ducks obviously appeared on the Roman-period table, in general there is little evidence that wild birds played a prominent role in the British Roman diet and economy. This does not, however, mean that they could have not had their own particular social and ritual significance. The overall increase in the frequency of anatids, columbids, waders and other gamebirds that characterises the Roman period may be taken as evidence that wild fowling was becoming more specifically addressed to the acquisition of typical food species. At the same time more 'typical' commensal and scavenger species, such as corvids and raptors, perhaps opportunistically hunted during the Iron Age, become less common. Nonetheless, the white-tailed eagle occurs at as many as seven sites in Roman central England. The habitat (Baxter 1993b) and ecological niche (Mulkeen and O'Connor 1997) of this species were probably different in the past, as the bird was more likely to be found inland and may have acted as a scavenger in urban environments. Another potential scavenger, the red kite, a species recently driven almost to extinction in Britain but now rapidly recovering (Yalden and Albarella 2008), is recorded at three sites: Stonea 80–5, near March (352, Cambridgeshire; Stallibrass 1996), Longthorpe II, near Peterborough (215, Cambridgeshire; King 1987b), and Dragonby, near Scunthorpe (114, Lincolnshire;

Harman 1996a). These are all in the east of England, while the last refuge of the red kite in Britain was in the far west (Wales). Obviously the species enjoyed a much greater geographical range in the past than in recent times. Of other bird species now regarded as rare breeders in Britain, remarkable is the frequency of the crane, recorded at as many as 10 sites. Bittern and grey heron are also recorded, but only with single occurrences at, respectively, Grandford and Bancroft villa, Milton Keynes (15, Buckinghamshire; Levitan 1990). Other species included by Parker (1988) in his survey of the birds of Roman Britain include white stork, night heron and great bustard, none of which today breeds in Britain, though the great bustard has recently been reintroduced (Burnside *et al* 2011). These species, however, have not been found in central England. In contrast, the single bone of a black-throated diver found at Brancaster 77 represents the only specimen known from the whole of Roman Britain.

Of some interest is the reporting of pheasant remains from the sites of Colchester 71–85 and Latimer, as this species is not native to Britain. The time of its introduction is debated (Yalden and Albarella 2008), partly because of the potential confusion of pheasant bones with those of the domestic fowl, which are similar but in some cases clearly distinguishable. Some of the early identifications of pheasant bones from Roman sites in Britain have subsequently been discounted, but there are still sufficient records of Roman pheasant remains from inside and outside central England to suggest that this bird may well have been occasionally imported, although probably not introduced to the countryside. It may have been regarded, like fallow deer, as an exotic curiosity.

As far as falconry is concerned, this is not known to have been introduced to Europe before the 4th to 5th century AD (Prummel 1997) and to Britain before the middle Saxon period (Parker 1988). However, evidence from the 4th-century AD levels from Great Holts Farm, Boreham, near Chelmsford (155, Essex; Albarella 2003a), is intriguing. At this site an indoor well, filled with anthropogenic remains, produced the bone of a sparrowhawk in association with many thrush bones (probably blackbird). Since birds of the genus *Turdus* represent the most typical prey of the trained sparrowhawk (Prummel 1997), and the sparrowhawk is a woodland species unlikely to occur accidentally in a human settlement, it is tempting to raise the possibility that these remains might indicate an early case of hawking, There are, however, alternative explanations, such as the possible use of this bird as a decoy, as for instance suggested by Rielly (1985) in his interpretation of hobby bones from the Italian Roman site of Settefinestre. Whatever the explanation, this evidence supports the view that the inhabitants of the site were engaged in activities that had close links with overseas (Murphy *et al* 2000). Other raptors potentially used for falconry found in our study area include a peregrine from Elms Farm (Heybridge), a goshawk from Dragonby and another sparrowhawk from Colchester 71–85.

Another interesting species, rather commonly found in Roman Britain, including central England, is the raven. Being a scavenger this is not a typical food species, and no butchery marks were found on its bones. Parker (1988) suggests that ravens may have had a particular symbolic significance for the Romans and may have also been kept as pets, as they survive well in captivity and may also have had the additional function of scaring hawks away. Serjeantson and Morris (2011) have also argued in favour of their ritual meaning, particularly through an interpretation of their burials. Today ravens are mainly confined to the west of Britain (Snow and Perrins 1998) but, like many other species, they probably had a more extended geographical range in the past.

The dearth of fully sieved assemblages makes the interpretation of fish remains from Roman sites in central England difficult. The evidence is scanty, but it is hard to assess to what extent this is because of a recovery bias. Having said that, it seems unlikely that fishing played a prominent role in the Roman economy, although this may have been greater than the current, rather limited, evidence seems to indicate.

Although freshwater fish species are still substantially more abundant than in later times, there is, in comparison with the Iron Age, a decrease of this resource at the expense of fish species of marine and particularly migratory origin (mainly eel) (Fig 6.17) (see also Locker 2007). Unsurprisingly, access to the sea appears to have improved since the Iron Age. Sites closer to the coast seem to have only a marginally higher frequency of marine fish, while those from inland areas are heavily reliant on eel. Trade must have been well developed in Roman Britain, allowing marine and estuarine fish to be transported inland. This presumably must have been cured fish, although we have no direct evidence for it, as butchery data are by and large unreported for fish assemblages from Roman central England.

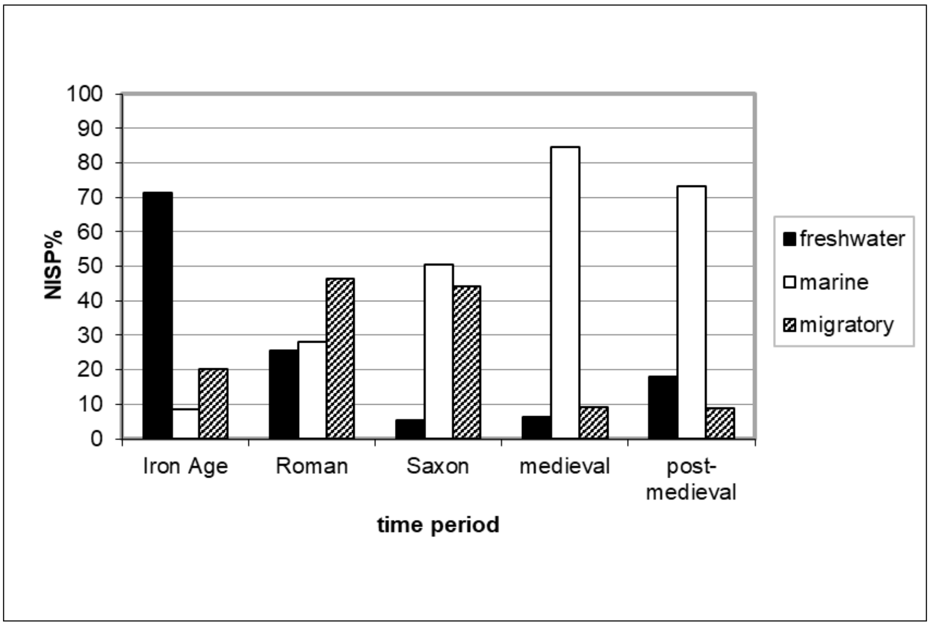

Fig 6.17 Occurrence of freshwater, marine and migratory fish, as a percentage of number of identified specimens (NISP), from periodsites across central England.

Gadids, which potentially could have been traded as stockfish (ie preserved fish), make their first appearance in the archaeological record of central England during the Roman period. Cod is found at Sidbury, Worcester (314, Hereford and Worcester; Scott 1992), Culver St, Colchester (105, Essex; Locker 1987c), and Folly Ln, haddock at Third Drove, Gosberton (370, Lincolnshire; Baker with Nicholson 2002), and Culver St, and whiting at Culver St.

Noteworthy is the identification of carp in 3rd-century AD levels from Lincoln sites (Dobney *et al* undated). This would represent a very early occurrence of this introduced species, but the reliability of the identification has been questioned (Ervynck 1997; Locker 2007). Historical sources point out to an introduction of carp to England no earlier than the 13th century AD (Currie 1991), which is confirmed by archaeological evidence (Locker 2010). Also from Lincoln sites, it is worth mentioning the occurrence of burbot, a freshwater species now extinct in Britain and a sad reminder of the impoverishment of the fauna caused by water pollution (Everard 2013).

Fish remains can also be valuable as an indication of overseas trade and exchange. For instance, the fin spine of a Nile catfish of the genus *Synodontis* was found from 2nd to 3rd-century AD levels at Dragonby, and it has been interpreted as having been imported as a curio or a talisman. van Neer and Ervynck (2004) suggest, however, that Nilotic fish (including *Synodontis*) were probably transported as sun-dried or smoked fish, and traded in the eastern Mediterranean/Levant from the Late Chalcolithic onwards. Roman sites in Italy have produced remains of another genus of catfish, *Clarias*, which is today distributed across Africa and the Near East. The finding of a vertebra, in addition to fin spines, of this fish suggests that preserved catfish rather than individual bones were indeed exported. According to Roman literary sources, the main function of catfish meat (and the ash derived from their spines!) was pharmaceutical rather than as food (De Grossi Mazzorin *et al* 2005).

Not as exotic as the Nilotic fish, but still probably imported, is the Spanish mackerel, found at Gorhambury villa and Great Holts Farm (Locker 2003). At the latter site, other imports, such as olive stones, were also found, and Locker (2003) has suggested that the mackerel, perhaps alongside scads, which also occur on-site and were a popular fish in the Mediterranean, were imported in amphorae.

Spanish mackerel may also have been introduced as part of *salsamenta* (salted fish), of which they are known to have been a component (van Neer and Ervynck 2004). The other typical ingredient, sardines, is, however, uncommon from central England sites. Fish sauces can be identified from deposits and not exclusively from amphorae (van Neer and Lentacker 1994), but the evidence from central England is tenuous. The use of local fish sauces (*allec* or *garum*, using clupeiforms, mainly herring or sprat) has been suggested for York and London (van Neer and Ervynck 2004), and, for central England, Locker (2007, 149) considers it as a possibility for Lincoln and Wroxeter. This is not based on the occurrence of the typical ingredients but rather of sand eel and small clupeids at the former, and bass, thin-lipped grey mullet, plaice and mackerel at the latter sites.

6.4 Husbandry strategies

The clear increase in cattle frequency in the Roman period raises the question of whether this is also accompanied by a change in the type of use of these animals. The evidence presented in Fig 5.9 illustrates that this is indeed the case, as in the Roman period cattle were slaughtered as adults far more often than in the Iron Age. This suggests a more specialised economy, probably geared towards the use of cattle mainly as traction animals, and therefore a greater emphasis on crop production. A few sites, eg Redlands Farm, Stanwick (299, Northamptonshire; Davis 1997a), Elms Farm (Heybridge) and Great Holts Farm, also report the occurrence of splayed metapodials, a condition that has been associated with traction stress (Bartosiewicz *et al* 1993).

A more fine-tuned analysis of cattle kill-off patterns, however, shows that the change in cattle husbandry regime did not necessarily occur immediately after the Roman conquest. It is interesting in this respect to look at the evidence from Elms Farm (Heybridge) indicating that in the early Roman period there is the same predominance of sub-adult animals that has been observed for the late Iron Age–transitional phase (Fig 6.18). This is an indication of an emphasis on beef production. The move towards a higher proportion of adult animals, and therefore a greater use of draught cattle, occurs later on, in the middle Roman period (mid-2nd to mid-3rd century AD), and is subsequently sustained in the later Roman phases.

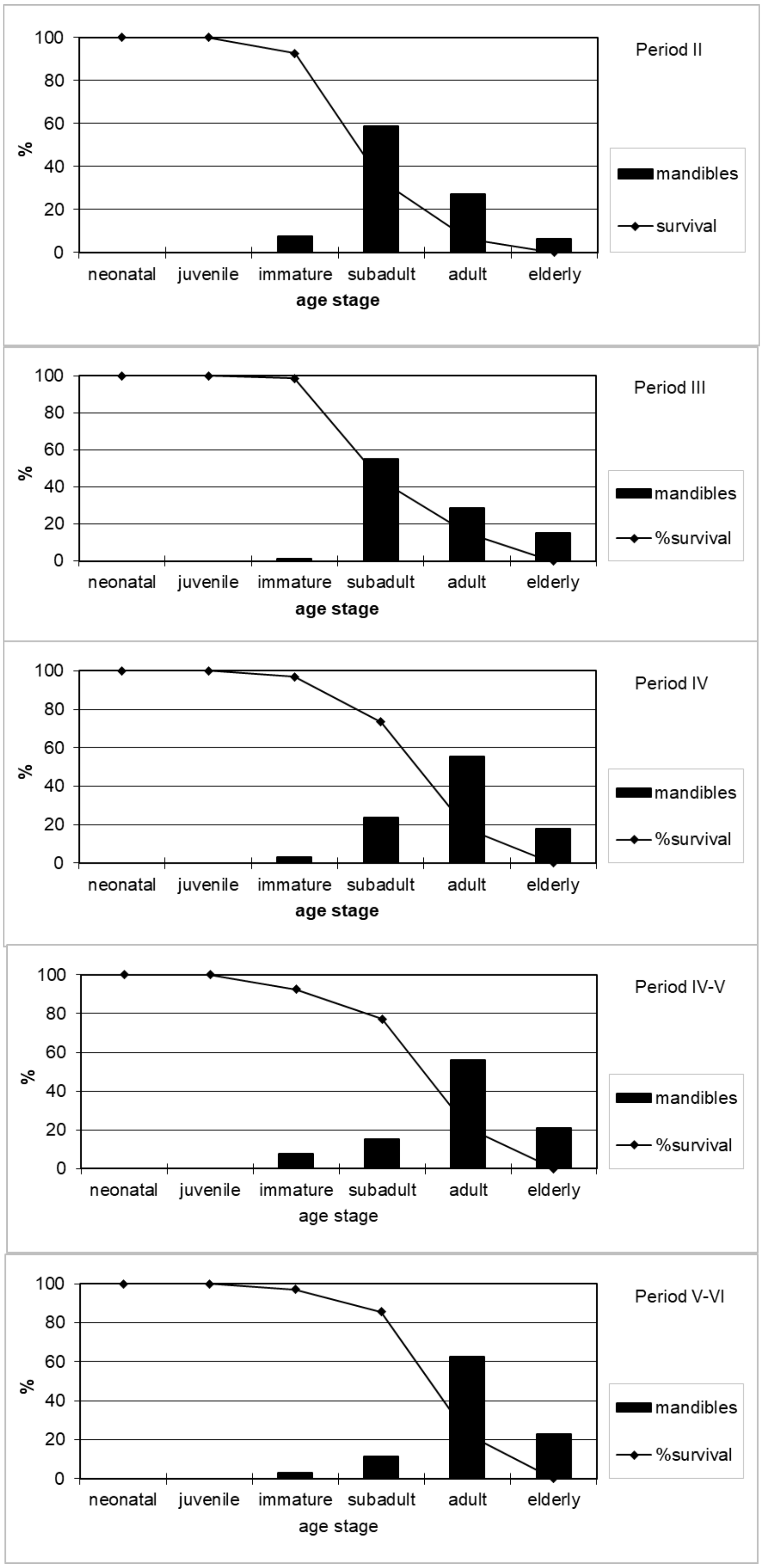

Fig 6.18 Cattle kill-off patterns based on the mandibular wear stage data, by period, from Elms Farm (site 121) (after Albarella et al *2008). Age stages follow O'Connor (1988), with the addition of the 'neonatal' stage.*

A cruder analysis at the regional level shows that an increase in the number of sites with mainly adult cattle can already be seen by the 1st to 2nd centuries AD, but that, consistently with Elms Farm (Heybridge), the largest proportion of sites with older cattle is found in later Roman phases (Fig 6.19). Late Roman Alcester also follows this trend (Maltby 2001). It is therefore likely that the timing of the change in cattle husbandry regimes varied according to site and area, but an overall trend towards a higher proportion of adults can, nevertheless, be detected.

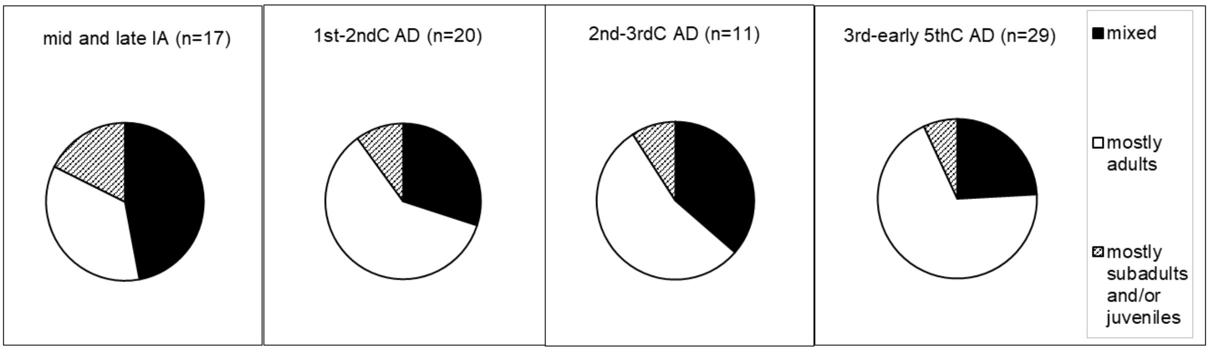

Fig 6.19 Comparison of the main age groups of cattle in Iron Age and Roman sub-time periods, where n *is the number of periodsites with reported ageing data for each taxon and time period from sites across central England. Periodsites for which ageing data are unreported or unspecific have not been included. IA=Iron Age; C=century.*

Concerning sheep/goat, a general comparison of the Iron Age and Roman kill-off patterns shows little change, with only a slightly higher proportion of adult animals in the later period (*see* Fig 5.9; *see also* Maltby 2001). This, however, hides a more complex development, which is reconstructed in Fig 6.20. Sites with a majority of adult sheep/goat only occur in the late Roman period, suggesting that it is only by this period that wool production became an important priority. In the later Iron Age and the early Roman period, sheep/goat were probably kept for a diversity of uses, but the economy became more specialised towards meat production in the early Roman period and a combination of meat and wool in the late Roman period. Obviously, these are very rough generalisations and these data certainly mask details that are dependent on geography, environment and cultural context.

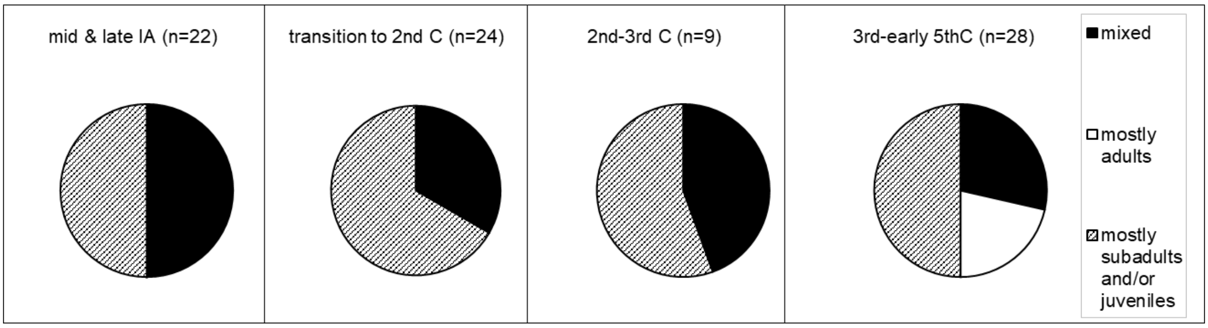

Fig 6.20 Comparison of the main age groups of sheep/goat in Iron Age and Roman sub-time periods, where n *is the number of periodsites with reported ageing data for each taxon and time period from sites across central England. Periodsites for which ageing data are unreported or unspecific have not been included. IA=Iron Age; C=century.*

Depressions on sheep horncores ('thumb-prints') have only been noted at Orton Hall Farm, Orton Township (256, Cambridgeshire; King 1996), and Elms Farm (Heybridge). This condition may be caused by different factors, including malnutrition and milking stress (Albarella 1995c), and its rarity suggests that neither feed shortage nor intensive milking occurred regularly in Roman Britain.

Sheep that were used in religious contexts appear to have been slaughtered at distinctively different ages from the typical flocks, although there is no consistency in these age patterns. For instance, at Harlow Temple most sheep were slaughtered at a very young age (probably seasonally), whereas at Elms Farm (Heybridge) most bones collected around the temple area are clearly older than those from other areas of the site. Presumably, different age patterns reflect the different nature of the rituals.

There is very little change in pig mortality patterns between the Iron Age and the Roman period, with an unsurprising emphasis in both periods on the slaughtering of immature animals (*see* Fig 5.9). Pigs are exclusively meat producers, and the survival of higher numbers of animals in adult life would make little economic sense. Microwear analysis carried out on pig teeth from Elms Farm (Heybridge) indicates that the animals were unlikely to be kept free-range, but would rather be stall-fed or kept in outdoor paddocks on a high plane of nutrition (Wilkie *et al* 2007). This indicates a rather high level of husbandry control, which probably led to a greater meat yield.

A general increase in arthropathic conditions in horses in comparison with the Iron Age probably indicates their greater use as working animals, or an overall older horse population, which would lead to the same interpretation.

6.4.1 Livestock types

The size and morphology of Roman livestock in Britain have been reviewed by Albarella *et al* (2008), so the key questions will only be addressed summarily here, and supplemented with newly collected evidence. To provide any reliable results biometry generally requires fairly large samples, and it is therefore unsurprising that the best available evidence is for cattle, as this was by far the most common livestock type in Roman Britain. More surprising, and somewhat disappointing, is the realisation that only a small minority of reports provide any biometrical information at all (Fig 6.21). Nevertheless, those reports that are biometrically informative are sufficient to identify a significant drop in the number of sites reporting ‘mostly small individuals’ of cattle from the Iron Age to the Roman period (Fig 6.21). Conversely, large individuals are more commonly reported at Roman than Iron Age sites. The somewhat surprising abundance of Bronze Age sites with large cattle individuals can be explained by the survival of the aurochs in the Bronze Age.

A similar trend of more smaller individuals in the Bronze and Iron Ages, and more larger ones in the Roman period, can be observed for sheep/goat (Fig 6.22), although the evidence for this taxon is scantier. The total absence of Bronze Age sites with large sheep/goat individuals confirms the view that the apparently anomalous record for Bronze Age cattle is because of the presence of the aurochs rather than the occurrence of large-sized livestock. Despite its crudeness, this analysis clearly points out to a larger size of Roman livestock compared with Iron Age livestock.

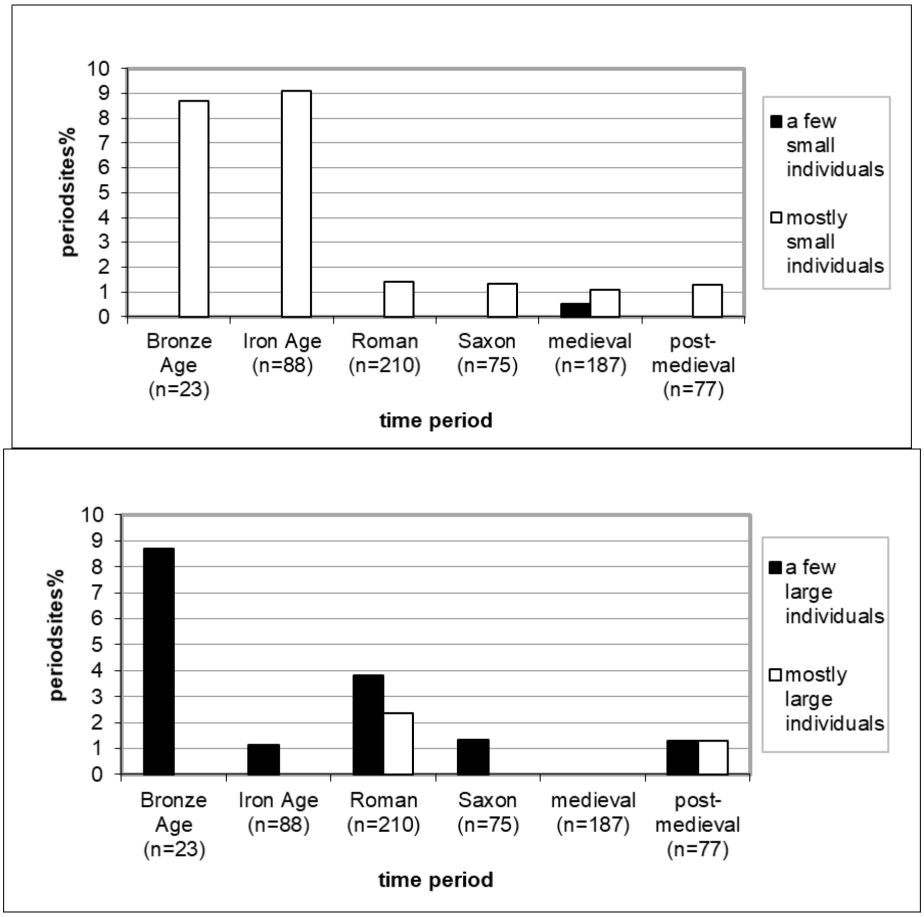

Fig 6.21 Cattle size, as a percentage of periodsites, where n is the number of periodsites for each time period from sites across central England where cattle is represented. The size categories are as defined in the site reports/database, and may vary between faunal studies.

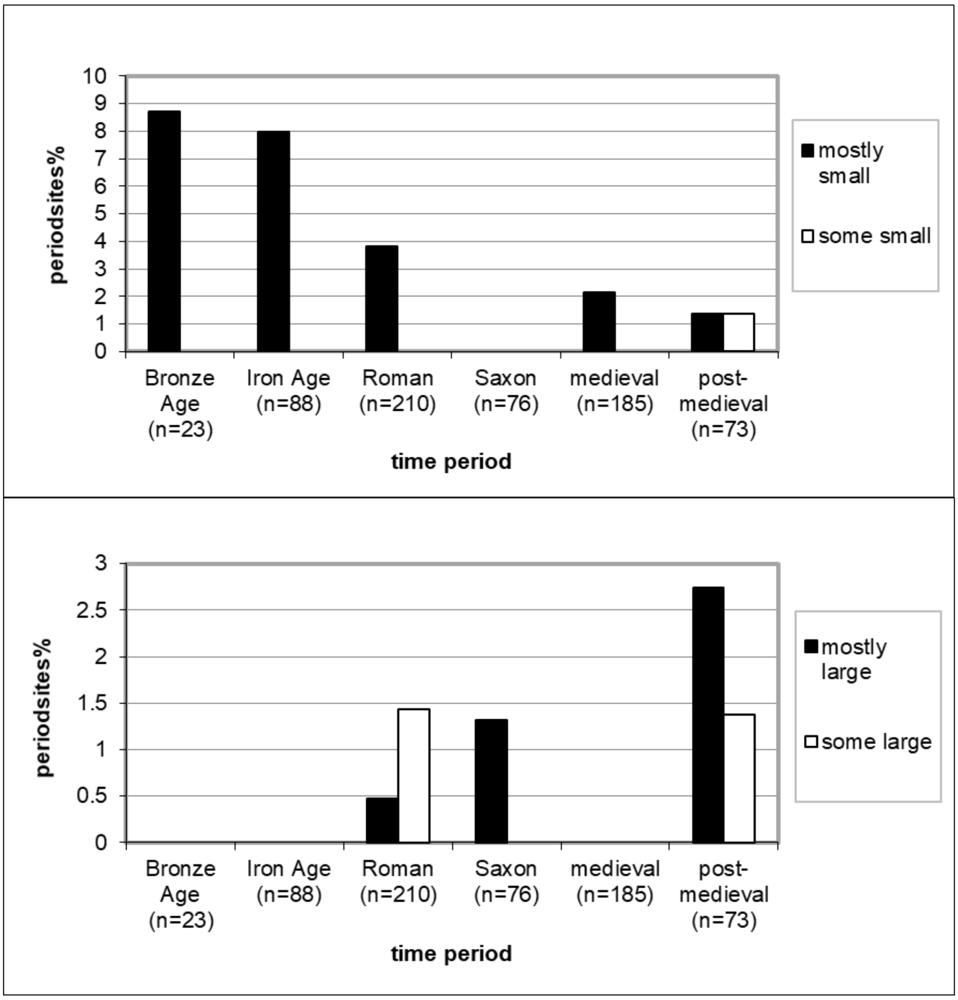

Fig 6.22 Sheep/goat size, as a percentage of periodsites, where n *is the number of periodsites, for each time period, from sites across central England where sheep/goat is represented. The size categories are as defined in the site reports/database, and may vary between faunal studies.*

This evidence, although fairly clear, does not, however, provide any information about the timing and modalities of the emergence of larger livestock in Roman Britain. For this we have to turn to individual case studies. A large biometrical dataset is available from the site of Elms Farm (Heybridge); to make the sample larger and more statistically reliable, different measurements were combined using a log-scaling technique (Simpson *et al* 1960). Figure 6.23 clearly shows that a considerable size increase occurred between the late Iron Age–transitional period and the early Roman period. Subsequently, and until the end of the Roman period, the size of cattle did not change substantially. These observations are supported statistically by a Mann–Whitney *U*-test (Albarella *et al* 2008). Although not as pronounced as for post-cranial bones, an increase in size also occurs in dental measurements. As teeth are less susceptible to environmental and dietary factors (Degerbøl 1963) and are also only marginally sexually dimorphic (Degerbøl and Fredskild 1970), this size increase must be, at least partly, the result of the introduction of different genetic types of cattle. Most importantly, the evidence indicates that important changes occurred soon after the Roman conquest.

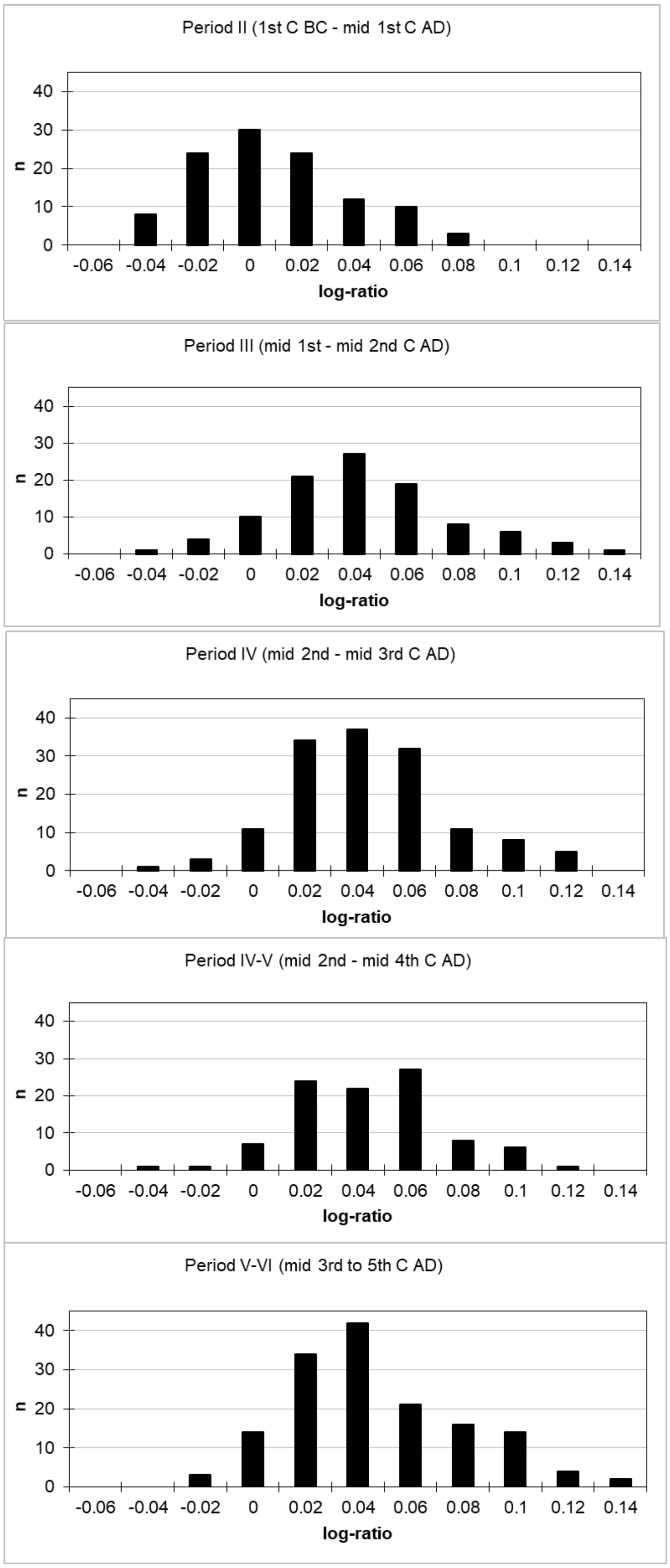

Fig 6.23 Log-ratio plots for cattle post-cranial bone width measurements, by period, from Elms Farm (site 121) (after Albarella et al *2008). The standard measurement used for comparison (0) is represented by the mean for the period II measurements (Johnstone and Albarella 2002). C=century.*

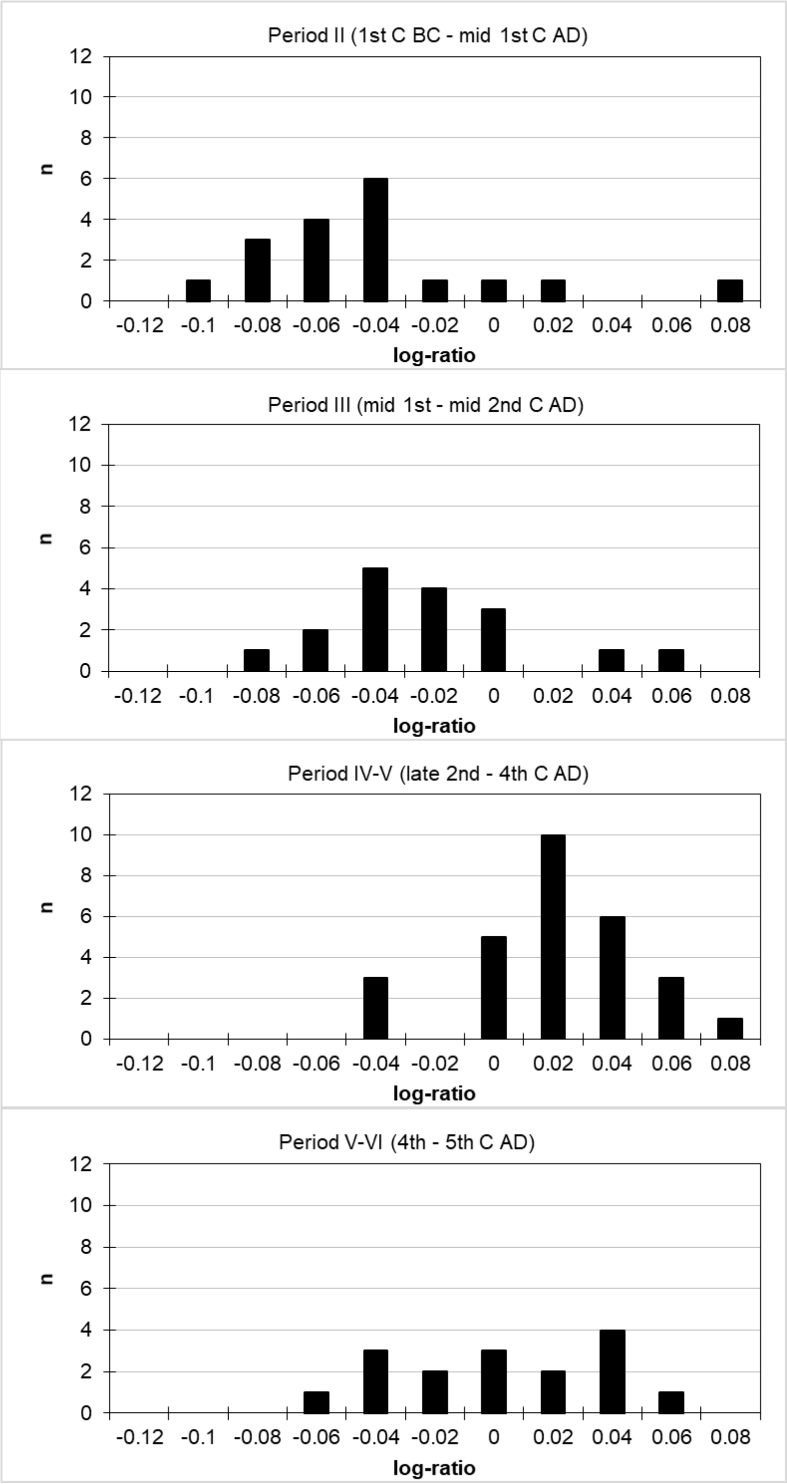

Fig 6.24 Log-ratio plots for horse post-cranial bone width measurements, by period, from Elms Farm (site 121) (after Albarella et al *2008). The standard measurement used for comparison (0) is represented by the mean of a sample of Roman horses from Britain (Johnstone 1996). C=century.*

This evidence, however, only tells part of the story, as biometrical data for other species indicate that, at Elms Farm (Heybridge), there were two main waves of change, as sheep/goat, pig and chicken also increased in size, but at a later date. This second wave of change occurred between the early and middle Roman periods, *c* late 2nd to early 3rd century AD, and coincided with the change in the cattle kill-off pattern already discussed (Fig 6.18). For horses, the middle and late Roman periods had to be combined to allow larger metric samples, but the evidence also points to a size increase coinciding with the later parts of the Roman period (Fig 6.24). Interestingly, in the latest period, which represents the end of the Roman occupation, horse size decreased, confirming a trend that has been identified countrywide (Johnstone 1996). It is likely that in the post-Roman period an emphasis on livestock 'improvement' was somewhat lessened.

The evidence from Elms Farm (Heybridge) clearly indicates that economic changes and the importation of livestock were not confined to the earliest stages of the occupation of Britain. They were not simply a reaction to the imminent needs of conquest, such as feeding the invading army, but they were also related to more complex and substantial changes in the structure of the society and the relationship between the original indigenous populations and those that invaded the country. However interesting a case study Elms Farm (Heybridge) may be, it is important to refrain from the temptation of applying its results to the whole region. Since the middle–late Roman transition at Elms Farm (Heybridge) is characterised by substantial stability, we may perhaps be inclined to conclude that, after the middle Roman period, there was no further influx of innovations from continental Europe. This is, however, contradicted by the evidence from another Essex site, the rural villa at Great Holts Farm, which has revealed the occurrence of extremely large cattle, interpreted as recent imports, as late as the 4th century AD (Albarella 2003a). The evidence can be even more complex, for instance at Lincoln sites there is some cattle size increase in the 3rd century AD, followed by a decrease in the 4th century AD. Presumably larger animals were imported and then subject to an average size decrease as a consequence of interbreeding with local livestock, in the same way as has been demonstrated for some Dutch sites (Lauwerier 1988).

At Colchester 71–85, the size increase in cattle parallels that observed at Elms Farm (Heybridge), but it occurs more gradually (for original data see Luff 1993; for interpretation see Albarella *et al* 2008). The reason for such a difference can probably be explained by the different nature of the two sites. Elms Farm (Heybridge) was a small town and also a local market centre (Atkinson and Preston 1998), and its livestock was therefore likely to be supplied from a restricted number of sources. It is reasonable to expect that the introduction of large animals, possibly from continental Europe, would result in a rather abrupt change in the archaeological record. Conversely, Colchester 71–85 was a large urban centre, the most important in the region, and would probably rely on a much larger catchment area, where a greater diversity of livestock types was likely to live. Alongside larger improved cattle, smaller animals still probably found their way into the city, which also explains the greater size variation seen at Colchester in comparison with Elms Farm (Heybridge).

Although few sites in the study area have biometrical datasets as large as Elms Farm (Heybridge) and Colchester 71–85, it is worth mentioning that evidence of some livestock size increase in the Roman period has also been reported at Rainham Moor Hall Farm, Rainham (288, Essex; Locker 1985c), Nazeingbury, near Broxbourne (243, Essex; Huggins 1978), Wendens Ambo, near Saffron Walden (407, Essex; Halstead 1982), Kelvedon (196, Essex; Luff 1988a) and Chelmsford (only in horses; Caesaromagus NE; Luff 1992). It is probably not accidental that all these sites are, like Elms Farm (Heybridge) and Colchester 71–85, located in Essex. Alcester, in Warwickshire, however, also has large cattle in the late Roman period (Maltby 2001).The comparison between periods is, however, not always easy, as variation also occurred in the Iron Age. For instance, the late Iron Age cattle and sheep from the ritual site of Ivy Chimneys are particularly large, which may reflect a highly selective strategy in the choice of animals to sacrifice. This is also mirrored by the very large size of the sheep from the Roman temple at Chelmsford (Luff 1992). Among the sites placed outside Essex, most important is the evidence from Wroxeter (baths and basilica) (*see* Hammon 2005 in particular) in the western part of central England. Here, despite a large dataset and extensive biometrical analysis, no evidence of livestock improvement could be found. It is tempting to interpret this in terms of cultural geography, with south-eastern sites, located nearer the initial areas of Roman influence, being more prone to adopt Roman innovations, and sites located further away tending to be more conservative. This would reflect a wider trend within the Roman Empire, where the degree of size change in cattle seems to be inversely correlated with the distance from Rome (Audouin-Rouzeau 1991).

Livestock types are of course not only determined by size, but detailed morphological and shape analyses would require a re-analysis of primary data, which is beyond the scope of this review. It is, however, of some interest to observe the proportion of cattle horn morphological types in different periods. As Fig 6.25 shows, the short-horn cattle that dominated the Iron Age record are also the prevalent type for the Roman period, but, perhaps significantly, in the later period there is a higher frequency of sites that have a large variation of horn types present. Early examples of long-horn cattle are reported at Orton Hall Farm, Sheepen, Park St, near St Albans (266, Hertfordshire; Bate 1971; Jackson 1971), and Little Oakley (212, Essex; Barford *et al* 2002). This greater morphological variation supports the view that the Roman period saw the opening of new sources of livestock supply.

This is supported by the sheep horncore evidence. Cases of polled sheep, identified for the first time in the Iron Age, are by the Roman period common; a pattern also recognised for the south of the country (Maltby 2010). In addition, and for the first time in the history of this species in Britain, we have evidence of four-horned (or polycerate) sheep. These have been recorded in very early Roman levels from the military site of Longthorpe II and there are also two more early Roman examples from the open settlement at Dragonby. The Dragonby report (Harman 1996b, 159) mentions a similar occurrence at Long Bennington (Lincolnshire), further up the Trent Valley. There is no question that the variety of livestock types that could be seen in the British countryside had increased after the Roman conquest.

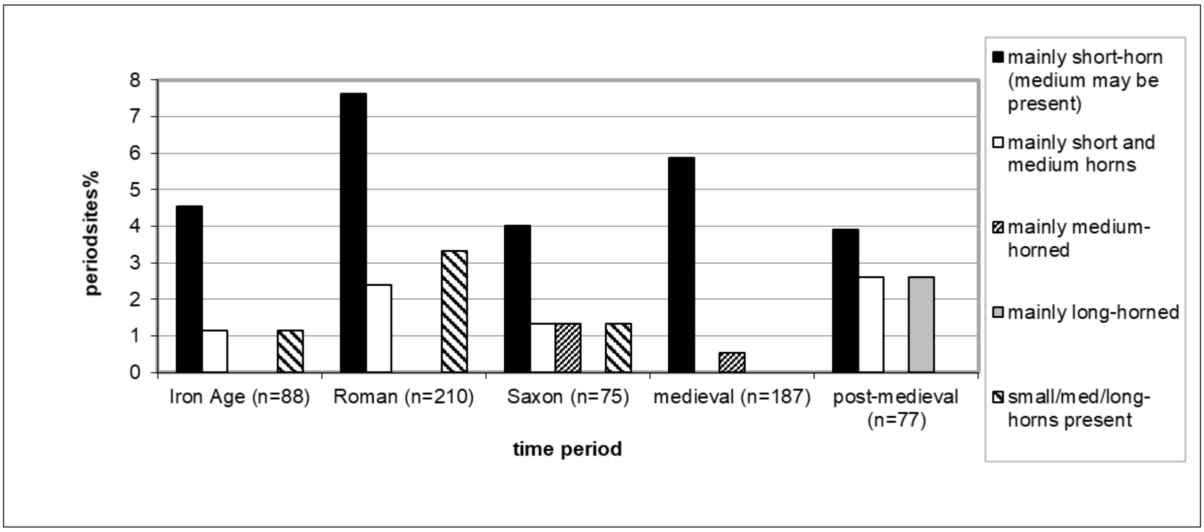

Fig 6.25 Presence of different cattle horn types, as a percentage of periodsites, where n *is the number of periodsites for each time period at sites across central England where cattle is represented.*

The greater variation in animal size that characterises the Roman period is not limited to livestock but also affects dogs. More than 40 years ago, Harcourt (1974b) reviewed the size of dogs in prehistoric and early historic Britain and, although dated, his work still represents a useful reference point for the interpretation of dog remains from archaeological sites in Britain. He found that, apart from the occasional Iron Age specimen, the introduction of small dog breeds was a predominately Roman phenomenon. Our dataset from central England confirms this and in fact extends the already wide biometric range for Roman dogs in Britain. A late Roman dog from Causeway Ln, Leicester (83, Leicestershire; Gidney 1999a), has an estimated shoulder height of 220mm, which is smaller than any of the dogs from Harcourt's sample. Dogs from Redlands Farm villa and Park St (near St Albans; early Roman) plot at the lowest end of Harcourt's range, while late Roman Lincoln sites, Dicket Mead and Longthorpe II, and later 3rd to 5th-century AD Ivy Chimneys, also have tiny dogs. At Godmanchester (Cambridgeshire), a group of small and stocky dogs with bowed legs could clearly be differentiated from the rest of the canine population (Brück 2003). All these animals are likely to have been pets kept as status symbols, although small dogs can also be used for specialised forms of hunting.

There does not seem to be a particularly coherent pattern in the occurrence of non-metric traits among livestock species. The congenital absence of the third lower molar hypoconulid and of the second lower premolar is reported for cattle in about 5–10% of the sites (almost certainly a gross under-estimate). Both traits are much rarer in sheep, but the absence of the lower second premolar is mentioned at 3% of the sites, which, according to O'Connor (1988), is exactly the kind of frequency that we should expect for this condition in sheep. The evidence from central England does not therefore stand out. Despite uncertainties about their interpretative value, it is also worth mentioning the occurrence of three examples of perforations in cattle skulls, at London Rd, Godmanchester (214, Cambridgeshire; Hammon and Buckley 2003), Elms Farm (Heybridge) and Lincoln sites.

6.5 Human processes

6.5.1 Butchery

Butchery information is reported more frequently than for the Iron Age but only as far as cattle is concerned (*see* Fig 5.11). Arguably, the most important aspect of Roman butchery is the rapid emergence of butchery styles that were either rare or unknown in the Iron Age. Most prominent among these are:

- the occurrence of accumulations of cattle scapulae with peculiar hook-like damage on the blades and sometimes accompanied by chopping marks around the edge of the glenoid cavity (cf Schmid 1972)
- the accumulation of intensively chopped fragments of cattle bones, so-called 'soup-kitchen deposits' (van Mensch 1974).

Both these types of butchery have been reported at several sites in central England, from different chronologies and different geographical areas, as well as elsewhere in the country (Seetah 2006; Maltby 2007). Hooked scapulae are thought to derive from hooks being put through the shoulders to hang them up for smoking or other curing processes (Schmid 1972; Dobney *et al* undated). The interpretation of the soup-kitchen deposits is more controversial as different suggestions, in addition to the making of soup, have been raised, including the production of glue and, perhaps most likely, the extraction of fat. Hooked scapulae and soup-kitchen deposits have been noted on cattle bones from Dutch sites (Lauwerier 1988), from the famous site of Augusta Raurica in Switzerland (Schmid 1972) and from other north-western Roman provinces (Luff 1982b), but not in Italy. This shows that these Roman butchery techniques appear to have been adopted across a very wide area but their introduction to Britain is more likely to represent a central European rather than Mediterranean phenomenon.

Figure 6.26 shows that 'intensive butchery' is more common on urban than rural sites. This category not only includes the soup-kitchen deposits but is taken to encompass the various, intensive, cleaver-orientated butchery practices that Maltby (1989) identifies as typical of Roman urban sites. Hooked scapulae are also more commonly found on urban than rural sites, which confirms the view already expressed that Roman innovations were likely to be more enthusiastically taken up in urban environments.

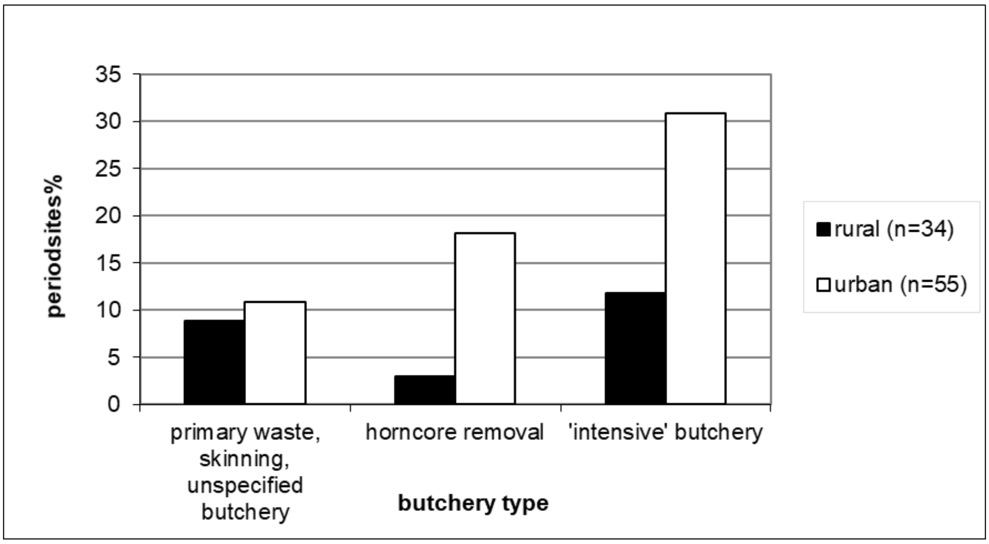

Fig 6.26 Cattle butchery (broad categories), as a percentage of periodsites, where n *is the total number of Roman rural and urban periodsites across central England.*

Considering the greater level of work specialisation that the increased urbanisation of the Roman period must have brought about, it is surprising that specialised types of carcass processing are not reported more frequently; they are in fact less common than in the Iron Age. It is, however, in the Roman period that for the first time the occurrence of longitudinally split cattle skulls is mentioned, in the early Roman phase at Old Bowling Green, Droitwich (254, Hereford and Worcester; Locker 1992b). At the same site, similarly broken sheep skulls were found, but these are also known from the Iron Age. In general, the longitudinal splitting of skulls and vertebrae is more common in pigs and sheep than cattle. A peculiar pig assemblage is represented by an accumulation of foot bones in a well at the rural site of Nazeingbury, which probably represent the remains of carcass (eg curing) or skin processing.

Figure 5.12 shows that the frequency of butchery marks on horse bones has varied very little during the course of British history. In the Roman period it represents the lowest frequency of all periods except post-medieval. The fact that horse butchery is less common in Roman than in Saxon and medieval periods strongly indicates that the avoidance of horse meat consumption did not occur with Christianisation but was a much earlier phenomenon. On the basis of Dutch evidence, Lauwerier (1999) has suggested that the Roman military had a specific taboo concerning the consumption of horse meat, perhaps because of the special role played by the war horse. The very low frequency of butchery marks at military sites in central England supports Lauwerier's (1999) view, and shows that the phenomenon could have been widespread. The occurrence of skinning marks is, however, particularly common at military (and roadside) settlements (Fig 6.27), which means that the taboo was confined to the consumption of the meat rather than the processing of the carcass. Although horse remains can be found as loose fragments mixed with the rest of the bone assemblages, most of them have been uncovered as complete or partially articulated skeletons. As for the Netherlands (Lauwerier 1999), the most likely cases of horse butchery pertaining to meat consumption derive from ritual sites.

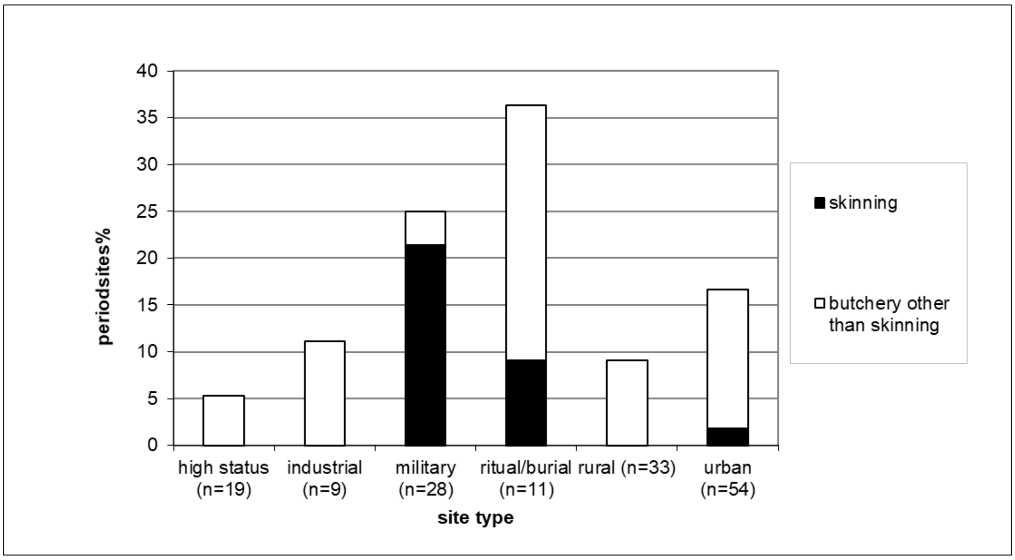

Fig 6.27 Horse butchery, indicated by the occurrence of skinning and other types of butchery evidence, as a percentage of periodsites, where n *is the total number of Roman periodsites across central England for different site types.*

The butchery and skinning of dogs is less common in the Roman period than in the Iron Age, and a substantial amount of dog remains occur as articulated carcasses. Most butchery in dogs is represented by cut marks, presumably caused by skinning, although chop marks are reported for Lincoln sites. Dog meat consumption must have been a rare event. No butchery or skinning has been reported on cat bones. There is limited evidence of butchery marks on chicken bones, but there are enough examples to suggest that this bird was consumed.

6.5.2 Bone modification

In general, the level of bone modification for craft/industrial activities in the Roman period is greater than in the Iron Age (Fig 6.28), but only as far as cattle is concerned.

The removal of cattle horncores, which can be associated with craft/industrial activities such as horning and tanning, is more commonly reported for urban sites (Fig 6.26). This is not surprising as such levels of specialisation in the processing of animal carcasses are more likely to occur within the larger and more diversified urban communities. Although cattle horncore removal is often reported, only at Braintree (45, Essex; Smoothy 1993) were there concentrations of frontlets/horncores in some areas. Other sites reporting cattle assemblages that are definitely interpreted as 'horn-working waste' include early Roman The Shires (Little Ln) (also sheep) and Causeway Ln, and late Roman Caister-on-Sea. At late Roman Great Chesterford 53–5, near Saffron Walden (154, Cambridgeshire; Serjeantson 1986), a similar accumulation is taken to represent either horn-working or tanning waste. The Shires (Little Ln) (Gidney 1991a) and Causeway Ln (Gidney 1999a) reports both note some 'heads and feet' deposits. An early Roman pit containing sheep horncores was noted at Sheepen (Luff 1985), but 'heads and feet' assemblages for this species tend to be interpreted as primary butchery, which is inconsistent with the view taken for cattle.

Evidence of bone working is represented by the occurrence of sawn post-cranial bones and horncores, which is reported for several sites. At Rayne Rd, Braintree (294, Essex; Luff 1976), a few cattle carpals and tarsals were drilled to be possibly used as loom weights. At Three Locks Golf Course, Stoke Hammond (372, Buckinghamshire; Hamilton-Dyer 2000), the occurrence of pin blanks/roughouts deriving from cattle bones is attested. The use of sheep bones for tool making is less frequently mentioned, but a handle derived from a sheep metatarsal is reported from Upwich. Horse bones were also used for handicraft and, as we have seen in Chapter 5 (Fig 5.13), the Iron Age tradition of antler working persisted in the Roman period. At the rural site of Billingborough (33, Lincolnshire; Iles 2001), a fox ulna from a 1st-century AD context was trimmed to a point.

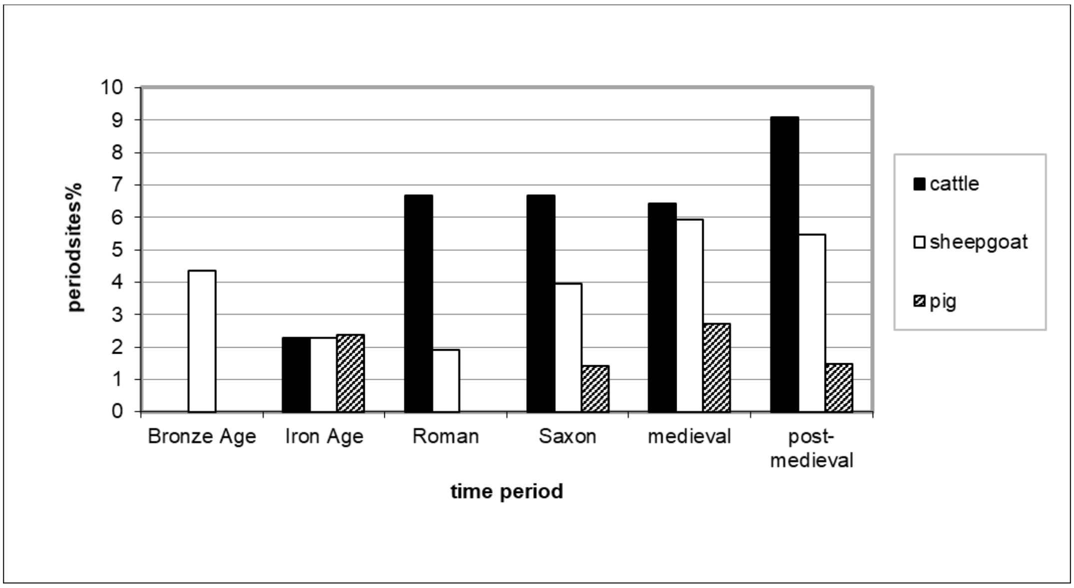

Fig 6.28 Evidence of bone-working, horn-working and tanning for cattle, sheep/goat and pig, as a percentage of all periodsites across central England for different time periods. Periods with <10 periodsites have not been included.

6.5.3 Bone groups and rituals

'Associated bone groups' (Hill 1995b; Morris 2011) of cattle and pig bones, whose significance has been discussed in Chapter 5, occur less commonly in the Roman period, but this is not the case for sheep/goat, which in fact occur slightly more frequent (*see* Fig 5.14).

Cattle remains in specific ritual contexts include fragments of a cattle skull in a vessel associated with cremations at Little Waltham, near Chelmsford (213, Essex; Gebbels 1978), three partial skeletons in association with cremations at Stansted Airport (DCS), Stansted (341, Essex; Hutton 2004c), a possible partial skeleton in association with human remains at Foxton (St Neots–Duxford Pipeline) (139, Cambridgeshire; Moore 1997), and food offerings (some articulated) at the late Roman shrine of Brigstock.

Brigstock also includes sheep and pig 'food offerings'. Sheep and/or pig partial skeletons are also associated with human cremations at Fenny Lock, Milton Keynes (130, Buckinghamshire; Hamilton-Dyer 2001), and Stansted Airport (DFS) (Hutton 2004e), and at Little Waltham a pig immature skull and neonatal partial skeleton were found in association with human cremations (Gebbels 1978).

At the early Roman urban site of Lasts Garage, Chelmsford (203, Essex; Bedwin 1988c), a horse skeleton (complete but for the deliberate removal of the front first phalanges) is interpreted as the product of a ritual killing. Another peculiar deposit at Wavendon Gate, Milton Keynes (403, Buckinghamshire; Dobney and Jaques 1996) contains two horse skulls and a tibia. Further association between human burials and horses is found at Dunstable (Jones and Horne 1981), although the context in this case is a rather prosaic cesspit. Although all these remains may, and probably do, have a ritual significance, horse remains do not seem to be presented as food offerings, as also observed for the Roman Netherlands (Lauwerier 1999). Other articulated horse remains, to which no ritual interpretation must necessarily be attached, include a group of four articulated feet that were found in a pit, with signs of bone-working, at late Roman Causeway Ln (Gidney 1999a), and partial skeletons found in early Roman wells at Baldock (AML 3854) (12, Hertfordshire; Chaplin and McCormick 1983) (as many as 13 in two wells!) and late Roman Elms Farm (Heybridge). Dog partial skeletons are also often found in wells. Examples are known from Little Waltham, Dragonby, Elms Farm (Heybridge), Cave's Inn and Little Chester (211, Derbyshire; Harman and Weinstock 2002), which may or may not be ritual.

The chicken did not have an exclusively economic function for the Romans, as also noted by Parker (1988), who emphasises in particular the role of cocks in grave offerings and sacrifice. In central England too, some of the articulated (and non-articulated) remains may be interpreted as having been a part of ritual activities. Food offerings were found at the Brigstock late Roman shrine, and a partial skeleton was associated with that of a piglet at Little Waltham (Gebbels 1978). Associations with human cremations also occur, for instance chicken calcined bones were found in a cremation jar at Fenny Lock (Hamilton-Dyer 2001), and further examples include early Roman findings from Wavendon Gate; Dobney and Jaques 1996) and Stansted Airport (DFS) (Hutton 2004e). In the latter case the chicken bones are accompanied by pig remains.

Most of the examples mentioned concern bone remains that have been interpreted independently from their architectural context. We also have, however, finds from sites that have provided structural evidence for the existence of religious buildings. The evidence for animal remains from Roman temples and other religious complexes has been reviewed by King (2005), who has, on the basis of the zooarchaeological evidence, identified various categories of religious complex types. We have already seen that some of the temple sites, such as Harlow Temple, Caesoromagnus NE and the complex that occurs within the site of Elms Farm (Heybridge) (which are not included in King's review), have very high sheep frequencies, whereas at other ritual sites, such as Folly Ln and Ivy Chimneys, cattle predominates. King (2005) regards the first group of sites as well-established 'Romano-Celtic' temples, often originating within the Iron Age and generally rural. Zooarchaeologically, these temples tend to have highly unusual species frequencies in comparison with domestic sites, and evidence of sacrifice and possibly seasonal killing. A second group, which includes the sites of Folly Ln and Ivy Chimneys, and also the Bancroft mausoleum (14, Buckinghamshire; Holmes and Rielly 1994), where cattle is predominant but not as much as at the other two sites, is possibly associated with chthonic rituals and may also include hunting motifs. Zooarchaeologically, in this group horses and dogs tend to be well represented.

The information at our disposal is largely consistent with King's (2005) view. The temple at Elms Farm (Heybridge), with its high frequency of sheep (and chicken) remains, is certainly unusual in species representation and, considering also its origins in the Iron Age, should definitely been grouped with Harlow Temple, despite other obvious differences between the two sites. Although also belonging to this same category of Romano-Celtic temples, the early Roman religious complex at Caesoromagnus NE has produced a dog skull, probably placed at the bottom of a ditch and with a likely ritual meaning. At this site six chicken articulated skeletons were also uncovered, and these may also represent ritual offerings.

The assumed chthonic sites also include chicken food offerings (Folly Ln; Locker 1999b), but most remarkably horse remains. These are very common in the enclosure ditch at Folly Ln, and in late 3rd to 5th-century AD levels from Ivy Chimneys (Luff 1999) a horse skull was found in association with a human foetal burial. The dog remains are also remarkable, with Ivy Chimneys producing six partial skeletons of lapdog-size and others that are also smaller than guard dogs, all almost certainly of ritual significance. Most bizarre is the occurrence of 'placed' dog teeth, including a pierced canine. At Folly Ln various young dog skeletons were found, generally in pits likely to be votive.

7 SAXON

7.1 The context

*7.1.1 Early Saxon (*c *AD 400–650)*

The conventional beginning of the Saxon (or Anglo-Saxon) period is taken to be AD 410, which marks the formal end of Roman control. Following a late 4th-century AD decline, there was little continuity in villa and urban settlements with the end of the Roman period (although there may have been some continuity of habitation in larger centres such as London, York, Wroxeter and Cambridge). In addition, there is evidence for the disuse of Roman roads (for instance between Cambridge and Essex; Loyn 1991) and the abandonment of Roman coinage (Hinton 1990). Esmonde-Cleary (1989) also notes a diminished diversity of site types, and a difference in archaeological visibility between the two periods, structures of the early Saxon period being chiefly timber-built. Timber halls and sunken-featured buildings (or *Grubenhäuser*) replaced Roman-style buildings. Artefactual evidence from the early Saxon period largely derives from furnished inhumation and cremation burials, as well as finds from small farmsteads (Reynolds 1999). By the 7th century AD, however, high-status settlements were in evidence, and very wealthy burials have been found (for instance at Sutton Hoo; Carver 2005).

*7.1.2 Middle Saxon (*c *AD 650–850)*

The start of the middle Saxon period is typically defined by the conversion of the Anglo-Saxons to Christianity and the foundation of monasteries. One major implication of this is the creation of a literate ecclesiastical and administrative elite, leading to an increasingly documented society. Previous burial practices, however, were superseded by Christian burial practices (ie without grave goods) only to varying degrees. The middle Saxon period sees an intensification of the process of settlement and colonisation. By the end of the 7th century, *emporia* (or *wics*) were becoming established (notably at Ipswich in central England, as well as at London, York and Southampton) as coastal/estuarine trading settlements and manufacturing sites, and are thought to have served other centres inland (Hodges 1989).

*7.1.3 Late Saxon (*c *AD 850–1066)*

During the late Saxon period, social changes were brought about by (Danish) Viking invasions of the east coast, and subsequent settlement. From the late 9th century AD, a network of defended settlements, or *burhs*, was established, some of which were a direct response to the threat of attack, but which in general developed into urban centres, with a mint and market (Loyn 1991; Reynolds 1999).

7.1.4 Landscape and agriculture

In the post-Roman period, Loyn (1991) notes a pattern of agricultural change comprising the abandonment of old rural settlements, and a move from lighter soils on the higher contour lines to valley farms, some with gravelly soils and others requiring heavier ploughing. Particularly in the richer lowland crop-growing areas, open-field agriculture began to be practised, a system based on common ownership, and by the late 9th and early 10th centuries AD nucleated settlements had largely replaced the scattered farmsteads of the earlier period (Hooke 1998). Low-status rural settlements themselves are rarely found (most often accidentally, under later layers) (Reynolds 1999). Our knowledge of rural settlement and land-use patterns is based predominantly on aerial photography, augmented by a wealth of documentary evidence, particularly the Anglo-Saxon charters of the late 7th century AD onwards, documents that deal with the conveyance of land or rights (Reynolds 1999).

7.2 The sites

The evidence discussed in this chapter relies on 81 gazetteer sites; one is Roman–Saxon Wroxeter, near Shrewsbury (*Viroconium*; baths and basilica; site code 428, Shropshire; Armour-Chelu 1997; Locker 1997b; Hammon 2005) and five are broadly dated to the 10th to 13th centuries AD. This amounts to a total of 93 periodsites, which excludes the duplications arising from the occasional separate reporting of mammals, bird and/or fish bones. There is therefore a considerable decrease in the wealth of evidence in comparison with the Roman period, and also a lower frequency of multi-phased sites within the Saxon period. This makes the analysis of the evolution of the human–animal relationship for the period more difficult, at least on a site-by-site basis. On the other hand, it provides a greater chance of stratigraphic integrity, as on single-phased sites problems of intrusion and residuality are obviously minimised.

Because of the smaller number of animal bone assemblages, the geographical coverage is inevitably sparser than in the Roman period (Fig 7.1). Evidence from the south-east of the region in particular is much thinner on the ground, probably indicating that this was no longer a key region of cultural influence and consequently settlement. Important clusters of sites are found in the central area, between Northamptonshire, Bedfordshire and Buckinghamshire, which was also fairly well represented in the Roman period, and inland on the border between Suffolk and Norfolk. The north-west is, as usual, poorly represented, which confirms the impression that the scarcity of suitable sites in this area is the result of preservation bias. Compensating to some extent for the shortage of sites, there are more exceptionally large animal bone assemblages for the Saxon period than for the Roman period. These derive from the sites of West Stow, near Bury St Edmunds (413, Suffolk; Crabtree 1989, 1990), Brandon (49, Suffolk; Crabtree 2012), Ipswich 74–88 (192, Suffolk; Crabtree 1994), Wicken Bonhunt (418, Essex; Crabtree 2012) and Flaxengate, Lincoln (136, Lincolnshire; O'Connor 1982; Wilkinson 1982). All these sites are from the eastern area, which remains the most productive region in terms of abundance of evidence, if not number of sites.

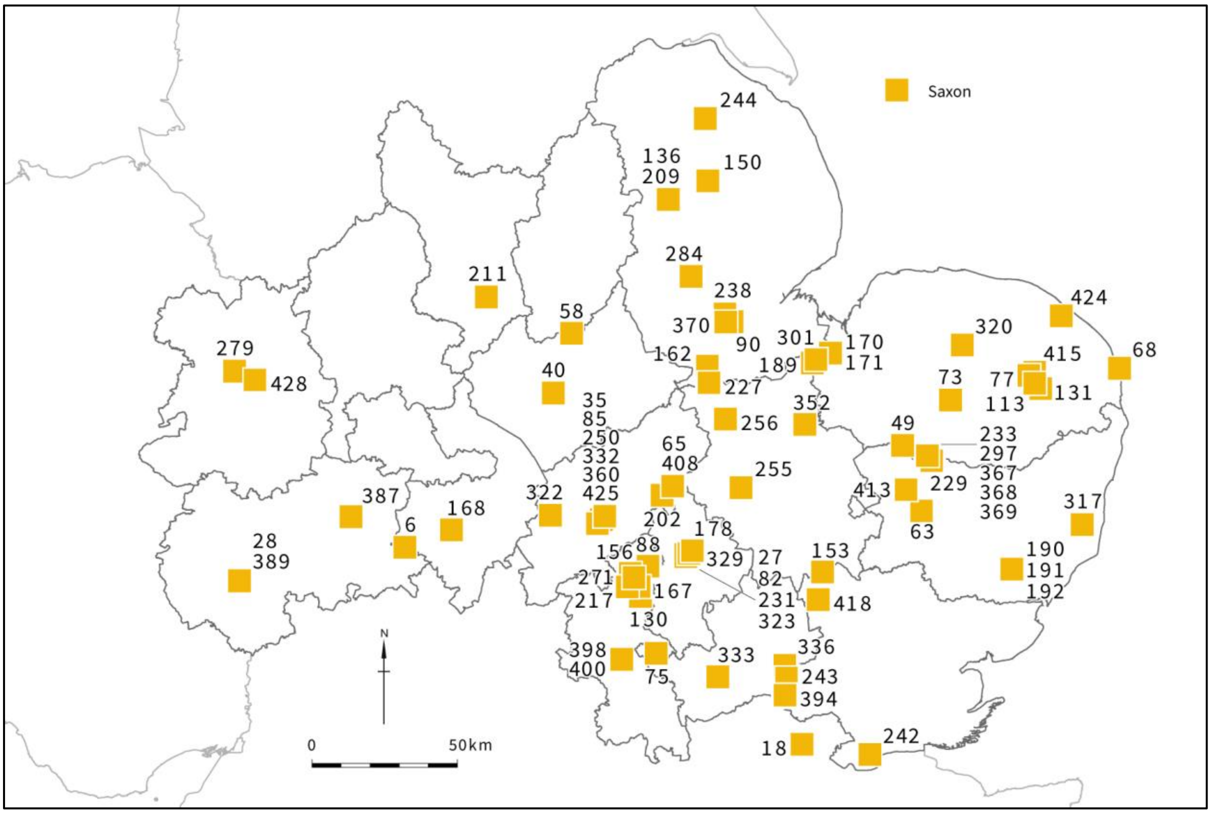

Fig 7.1 The distribution of Saxon sites across central England. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text.

Most data derive from rural sites generically defined as 'open settlements', 'villages' or more rarely 'farms', while 'enclosures', commonly represented in the Iron Age and the Roman period, are now rare. There are, however, also numerous assemblages from urban sites, particularly in the later part of the period. Sites with specific functions and more rarely represented in the dataset include funerary sites, such as Snape Cemetery, Snape (317, Suffolk; Davis 2001b), industrial sites, such as Upwich, Droitwich (387, Hereford and Worcester; Meddens 1997), and palaces, such as Hatton Rock, near Stratford-upon-Avon (168, Warwickshire; Bramwell 1973a; Noddle 1973b). Ecclesiastic sites, such as Barking Abbey, Barking (18, Essex; Hamilton-Dyer 2002) and St Albans Abbey (333, Hertfordshire; Crabtree 1983), appear for the first time in this period.

A few assemblages could only generically be dated to the Saxon period, but in most cases it was possible to attribute them to more precise chronological categories. Bearing in mind the usual caveat that chronological divisions may in some cases be rather arbitrary, the following chronological classification is used:

- early Saxon, *c* AD 400–650
- middle Saxon, *c* AD 650–850
- late Saxon, *c* AD 850–1066.

All three phases are represented in our dataset, although the richest evidence derives from the late Saxon period. A few transitional assemblages occur, and there are also a few assemblages dated as Saxo-Norman (ie overlapping with the very beginning of the following, medieval, period) which will be discussed in Chapter 8. As already mentioned, multi-phased sites are not a common occurrence in the Saxon period.

7.3 Species occurrence and frequency

7.3.1 Domestic animals

The Roman to Saxon transition once again saw substantial changes in the overall frequencies of the main domesticates. Although cattle is still the most common taxon (Fig 7.2), its predominance is much reduced in comparison with the Roman period. The decline in cattle numbers occurs mainly to the advantage of pigs and only marginally sheep/goat. This is confirmed by a one-way ANOVA test (*see* Table 6.1), which indicates a highly significant increase in pigs, a significant decline in cattle and no significant differences in the frequency of sheep/goat between the Roman and Saxon periods. Despite the pig's status as the least common of the three main domesticates, its enhanced frequency is a peculiar characteristic of the Saxon period, which is not matched in any other period, except the late Neolithic, in the history of Britain. Considering the likely recovery bias, pig and sheep/goat remains are likely to be under-represented, and the frequency of the three taxa is thus probably even more evenly matched than Fig 7.2 indicates. There is an insufficient number of sieved assemblages to test this hypothesis, but those that do exist all have a rather reduced frequency of cattle, with the exception of the various phases at Wroxeter (baths and basilica), where cattle is, despite the sieving, greatly predominant (Table 7.1), possibly in continuation with the Roman tradition.

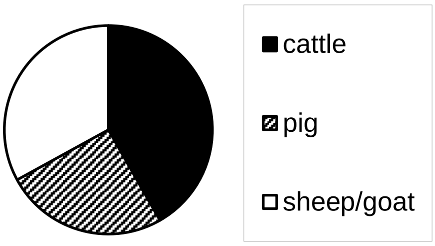

Fig 7.2 Relative proportions of the three main domestic taxa, based on the number of identified specimens (NISP) of all hand-collected assemblages from Saxon periodsites across central England, regardless of assemblage size.

Table 7.1 details the proportions of the major domesticates for the main sites, and Figs 7.3–7.5 provide the same evidence as bar charts. It can be seen that the decrease in cattle is gradual, with most early Saxon, but only a small minority of the middle and late Saxon, sites having more than 50% cattle. In Fig 7.6, which shows the same data but as a tripolar diagram, it can be seen that most early Saxon sites plot in the top triangle (ie >50% cattle), which is not the case for the later periods. The decrease in cattle between the early and late sub-time periods is indeed statistically significant based on a one-way ANOVA test (P=0.010). This pattern is inconsistent with the evidence provided by Sykes (2006a, 58), which suggests a gradual rise in cattle numbers from the 5th to 7th centuries to the 7th to 9th centuries AD, and eventually also in the late Saxon period. Without a direct comparison of the two datasets it is difficult to understand why such a difference occurs, but it is worth pointing out that Sykes' (2006a) data derive from the whole of England rather than the central area. It is therefore possible that our conclusions for central England cannot be applied to the rest of the country, where different trends in husbandry development may have occurred.

In central England the abandonment of a Roman style of husbandry seems therefore to have been progressive, but nonetheless a change had already occurred at the late

Roman–early Saxon transition. If we compare Fig 6.5 with Fig 7.3, it is possible to observe that in the late Roman period 15 out of the 26 plotted sites have >70% cattle, whereas that is the case for only one of the 10 early Saxon sites. The end of the Roman period therefore saw a rather abrupt change, which intensified during the course of the Saxon period.

However, an issue that remains unresolved is to what extent the change in livestock frequency depends on the evolution of local husbandry practices or a completely new pattern of settlement. To address this question, we need to take a look at those few sites that have a continuity of occupation between the Roman and Saxon periods. The clearest case of husbandry continuity is provided by Wroxeter (baths and basilica) (late 4th to late 7th centuries AD), where there is a cattle-dominated pattern throughout. At the rural site of Orton Hall Farm, Orton Township (late 2nd to early 6th centuries AD; 256, Cambridgeshire; King 1996), changes across three phases are also imperceptible. The other rural site, of Wicken Bonhunt, has a staggering amount of pig bones in the early and middle Saxon phases, but this anomaly was already in place in the Roman period, although not quite to the same extent. At the roadside settlement of Stonea 80–5, near March (352, Cambridgeshire; Stallibrass 1996), a small increase in sheep/goat and decrease in pig does occur between the Roman and Saxon periods, but the change is once again negligible. Elms Farm, Heybridge (121, Essex; Johnstone and Albarella 2002) has been discussed extensively in Chapter 6, as this is a predominantly Roman site, but the latest phase (late 4th to 5th centuries AD) overlaps with the early Saxon period. This, however, does not indicate any substantial difference in livestock frequency, apart from a slight rise in pigs. The two sites of West Stow and Caister-on-Sea, near Great Yarmouth (68, Norfolk; Harman 1993b) are in a different category, as they have both Roman and Saxon levels but the occupation is not continuous. Little change occurs at West Stow, but at Caister-on-Sea cattle decreases by about 10%. In summary, it seems that at these sites there is a rather strong element of husbandry continuity between Roman and Saxon periods, and, when change occurs, it is normally along the lines of a decrease in cattle frequency. All in all, it seems that regional husbandry changes are more likely attributable to the creation of entirely new settlements rather than the development of old ones.

A different, but complementary, question is why a change in animal husbandry became necessary at all. It is unlikely that just one cause may explain this process, but unquestionably the end of the Roman period saw the physical arrival and influence of new cultural trends. As we have seen in Chapter 6, the Roman animal economy was heavily dependent on cattle, which, particularly in the later part of the period, were mainly kept for traction. Such emphasis on ploughing probably meant that it was crops rather than meat that the Roman Britons were mainly focused on. The decrease in the frequency of cattle in the Saxon period, and the increase of that most typical meat-producing animal, the pig, may signify a change in emphasis on the use of land. Rather than an extensive agriculture system requiring a large amount of ox power, the Anglo-Saxons may have preferred smaller scale plots, placing greater emphasis on livestock than crop production.

Figure 7.7 plots the assemblages with a number of identified specimens (NISP) greater than 400 by sub-regions rather than period. As usual, central England has been divided into eastern, central and western areas. The pattern that emerges is fairly clear, with the western area characterised by cattle, and the eastern and central areas distinguished by an average frequency of pigs that is higher in the east (note how the eastern data points plot more towards the pig vertex).

It is, however, important to point out that the western cluster is made up of only two sites, four phases from Wroxeter (baths and basilica) and one from Berrington St, Hereford (28, Hereford and Worcester; Noddle 1985a), and may therefore only reflect the specificities of those particular sites, rather than a regional pattern. The differences between the eastern and central areas are very significant for pigs and significant for sheep/goat, but only when the outliers are removed. There are indeed two sites that do not fit any of the described trends, mainly because of their anomalously high frequencies of pig bones. These are represented by the two phases (early–middle and middle Saxon) from the ecclesiastic site of St Albans Abbey and the middle-Saxon rural site of Wicken Bonhunt.

In Fig 7.8 the tripolar plot distinguishes the sites by type rather than period or region. The most important element that emerges is the large level of coincidence between eastern and urban sites on the one hand, and central and rural sites on the other. The differences in livestock frequencies that we have discussed therefore may not reflect geographical variation but only an adaptation of the urban and rural economies. This is, in fact, a more likely hypothesis, considering pigs are more suitable for raising in urban environments than sheep or cattle. To make things more complicated, most urban sites are late Saxon, which raises the possibility that the higher pig frequency may also result from a chronological trend. Apart from this general trend, the situation in the urban centres appears to have been rather varied, as also exemplified by the various late Saxon Thetford sites, 48–59, 64–70 and 73–80 (sites 367–369, Norfolk; A L G Jones 1984, 1993; G G Jones 1984, 1993a). These have produced rather fluctuating livestock frequencies, although all are characterised by the same ranking of the main domesticates: cattle is the most common, followed by sheep/goat and then pig. Peculiar is the situation at Northampton site N80–82 (250, Northamptonshire; Locker 1985b), which is sheep/goat-dominated, despite the nearest large rural sites at Pennyland, Milton Keynes (271, Buckinghamshire; Holmes 1993) and Burystead, Raunds, near Wellingborough (65, Northamptonshire; Davis 1992), all having cattle as the predominant species. It seems to indicate that the town supply relied on long-distance trade rather than just the local hinterland.

Table 7.1 Saxon sites from central England with a combined cattle, sheep/goat and pig number of identified specimens (NISP) >400. The sites are grouped approximately by date. Coll refers to the method of collection (HC=hand-collected, CS=coarse sieved, BS=bulk sieved). The NISP count shown is that of the three main domesticates combined. Site numbers refer to those shown on the map in Fig 7.1, and are as given in the gazetteer (Appendix 1).

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	28	Berrington St, Hereford	Hereford and Worcester	Saxon (broad category)	Urban	63	19	19	2 636
HC	242	Mucking, Tilbury/Basildon	Essex	Saxon (broad category)	Open settlement	75	10	15	2 057
HC	244	Nettleton Top, near Caistor	Lincolnshire	Saxon (broad category)	Open settlement	84	10	6	546
HC	352	Stonea 80–5, near March	Cambridgeshire	Saxon (broad category)	No site information	40	51	9	807
HC	400	Walton, Aylesbury	Buckinghamshire	Saxon (broad category)	Rural	42	35	23	1 445
HC	227	Maxey 60, near Stamford	Cambridgeshire	Early Saxon AD 400–650	Open settlement	44	43	13	444
HC	229	Melford Meadows, Brettenham	Norfolk	Early Saxon AD 400	Rural	62	28	10	462
HC	284	Quarrington, near Sleaford	Lincolnshire	Early Saxon AD 400	Rural	64	25	11	1 004
HC	320	Spong Hill VII, North Elmham, Norwich/Fakenham	Norfolk	Early Saxon AD 400	Village	84	12	4	587
HC	413	West Stow, near Bury St Edmunds	Suffolk	Early Saxon AD 400	Village	41	45	14	63 603
HC	256	Orton Hall Farm, Orton Township	Cambridgeshire	Late 4th to early 6th century AD	Rural	65	31	4	5 496
CS	428	Wroxeter (baths and basilica), near Shrewsbury	Shropshire	Late 5th to early 6th century AD	Urban	68	13	19	2 210

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
CS	428	Wroxeter (baths and basilica), near Shrewsbury	Shropshire	6th century AD	Urban	58	15	27	3 835
CS	428	Wroxeter (baths and basilica), near Shrewsbury	Shropshire	Early 6th to late 7th century AD	Urban	62	13	25	6 896
CS	428	Wroxeter (baths and basilica), near Shrewsbury	Shropshire	Early 6th to late 7th century AD	Urban	61	15	24	2 736
HC	271	Pennyland, Milton Keynes	Buckinghamshire	Early–middle Saxon	Open settlement	49	37	14	2 394
HC	333	St Albans Abbey	Hertfordshire	Early–middle Saxon	Ecclesiastical	19	12	70	730
BS	49	Brandon	Suffolk	Middle Saxon AD 650–850	Rural	28	52	19	47 214
HC	68	Caister-on-Sea, near Great Yarmouth	Norfolk	Middle Saxon AD 650–850	High status	62	22	16	490
HC	190	Ipswich (AML 3951)	Suffolk	Middle Saxon AD 650–850	Urban	47	25	27	7 190
CS	192	Ipswich 74–88	Suffolk	Middle Saxon AD 650–850	Urban	45	22	32	10 076
HC	284	Quarrington, near Sleaford	Lincolnshire	Middle Saxon AD 650–850	Rural	59	35	6	1 000
HC	332	St Peter’s St, Northampton	Northamptonshire	Middle Saxon AD 650–850	Urban	34	48	18	478
HC	333	St Albans Abbey	Hertfordshire	Middle Saxon AD 650–850	Ecclesiastical	15	14	71	712
HC	418	Wicken Bonhunt	Essex	Middle Saxon AD 650–850	Rural	17	13	70	29 950
HC	65	Burystead, Raunds, near Wellingborough	Northamptonshire	Late Saxon	Village	46	37	17	990
HC	77	Castle Mall, Norwich	Norfolk	Late Saxon	Urban	51	22	26	1 054

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	136	Flaxengate, Lincoln	Lincolnshire	Late Saxon	Urban	58	31	11	19 581
HC	190	Ipswich (AML 3951)	Suffolk	Late Saxon	Urban	63	18	19	631
CS	192	Ipswich 74–88	Suffolk	Late Saxon	Urban	42	28	31	6 579
CS	192	Ipswich 74–88	Suffolk	Late Saxon	Urban	34	34	31	14 271
HC	209	Lincoln sites	Lincolnshire	Late Saxon	Urban	61	27	12	1 689
HC	332	St Peter's St, Northampton	Northamptonshire	Late Saxon	Urban	30	59	11	3 425
HC	360	The Green, Northampton	Northamptonshire	Late Saxon	Urban	35	50	15	910
HC	367	Thetford 48–59	Norfolk	Late Saxon	Urban	57	25	18	569
HC	369	Thetford 73–80	Norfolk	Late Saxon	Urban	47	33	20	1 963
HC	425	Woolmonger St, Northampton	Northamptonshire	Late Saxon	Urban	39	52	9	0
HC	368	Thetford 64–70	Norfolk	10th century AD	Urban	48	35	16	2 955
HC	131	Fishergate, Norwich	Norfolk	11th century AD	Urban	62	20	19	1 825

Table 7.1 continued

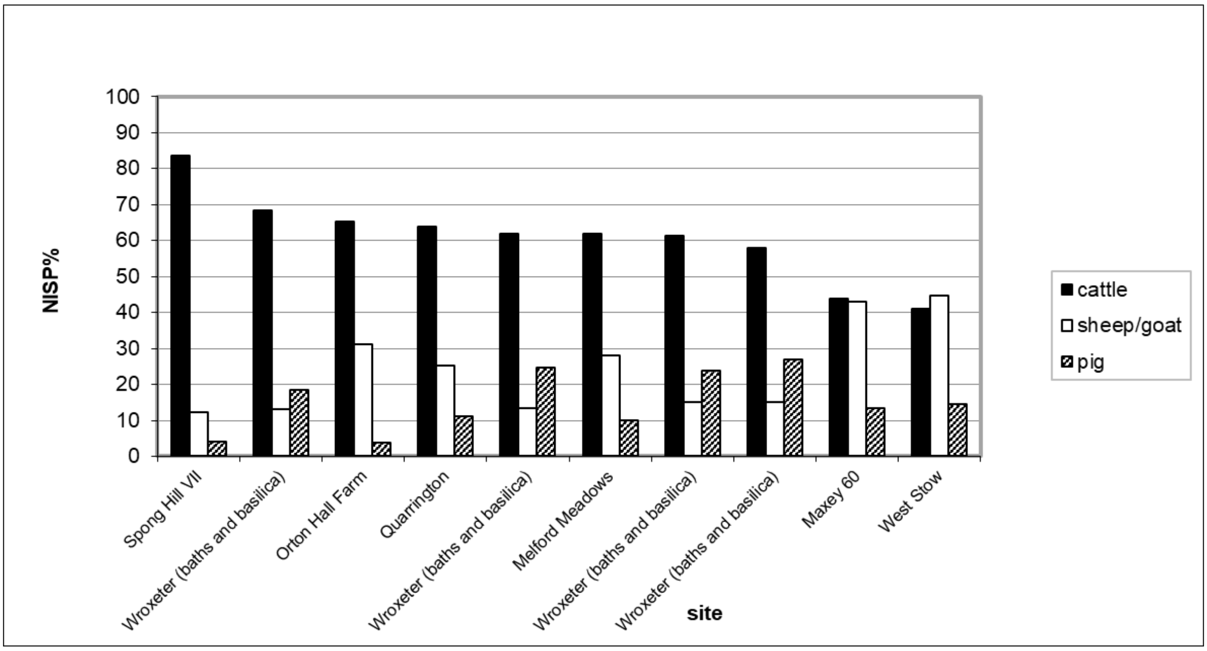

Fig 7.3 Summary of the three main domestic taxa at various early Saxon periodsites across central England, as a percentage of number of identified specimens (NISP), grouped in order of decreasing cattle%. Only hand-collected assemblages with a total NISP for the three taxa >400 have been shown. For further details see Table 7.1.

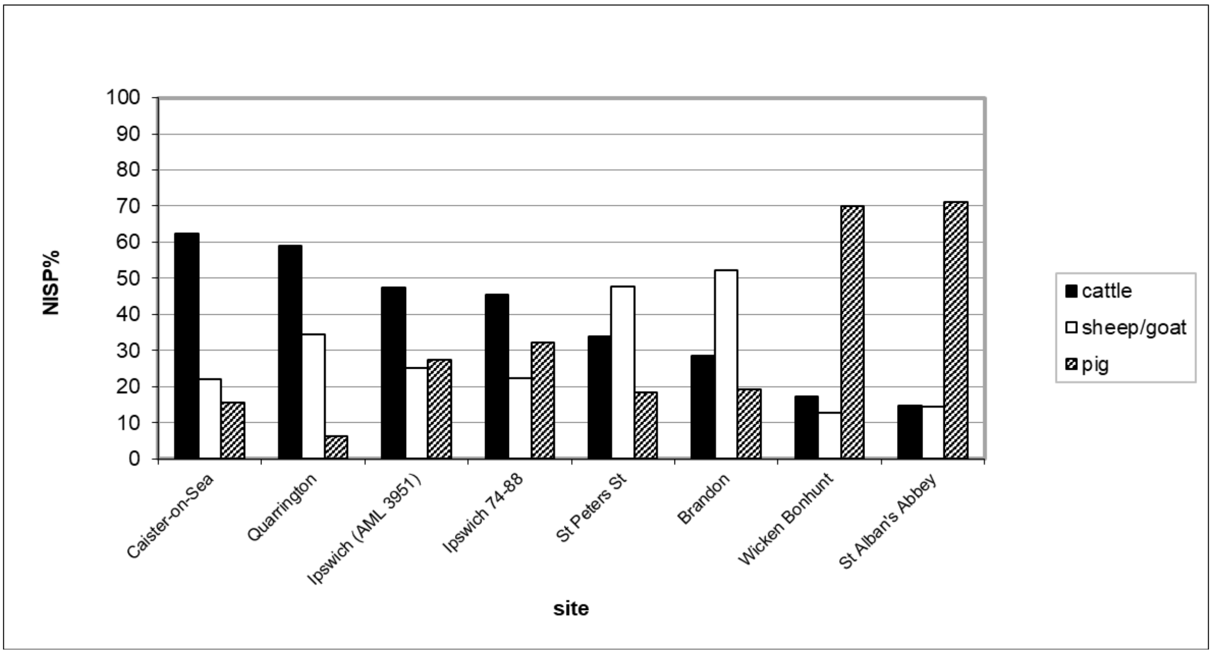

Fig 7.4 Summary of the three main domestic taxa at various middle Saxon periodsites across central England, as a percentage of number of identified specimens (NISP), grouped in order of decreasing cattle%. Only hand-collected assemblages with a total NISP for the three taxa >400 have been shown. For further details see Table 7.1.

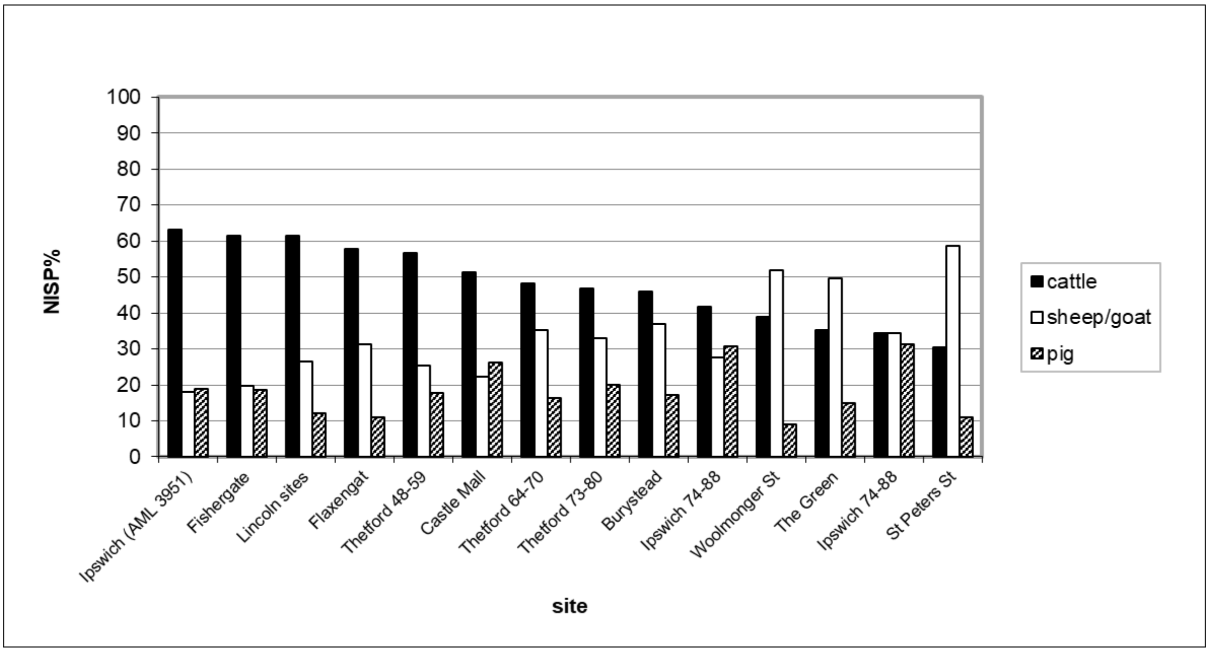

Fig 7.5 Summary of the three main domestic taxa at various late Saxon periodsites across central England, as a percentage of number of identified specimens (NISP), grouped in order of decreasing cattle%. Only hand-collected assemblages with a total NISP for the three taxa >400 have been shown. For further details see Table 7.1.

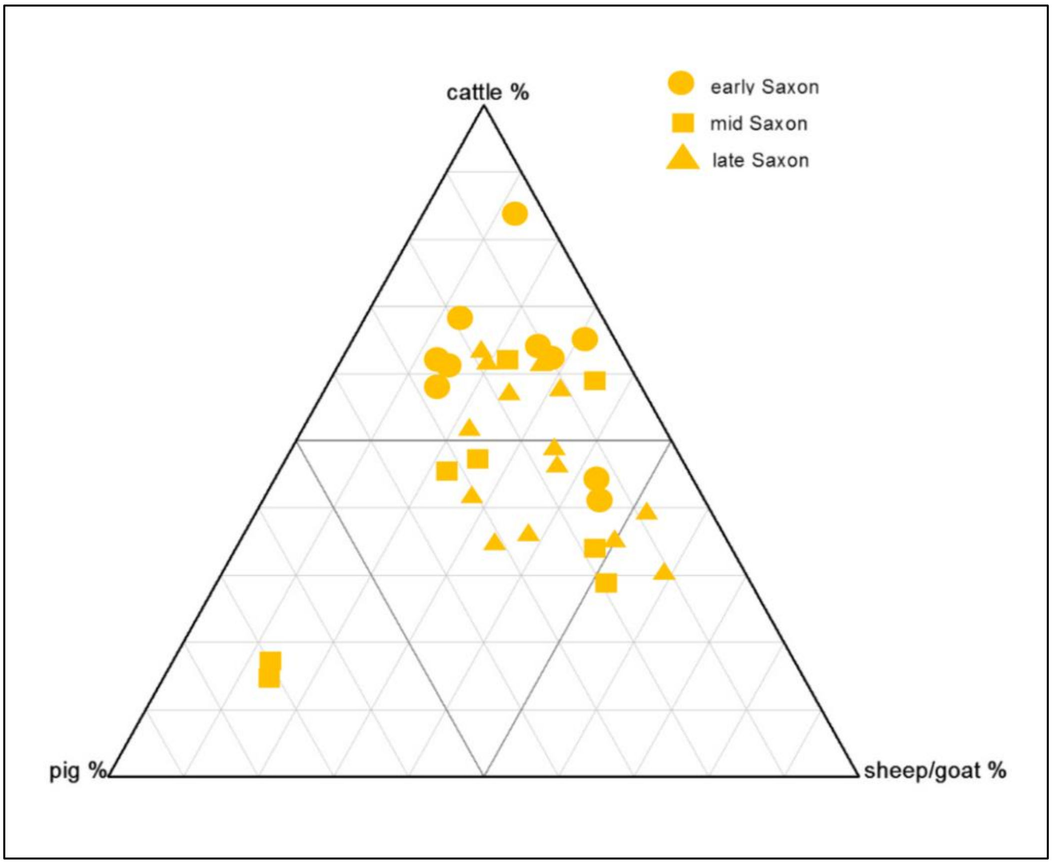

Fig 7.6 Relative proportions of cattle, sheep/goat and pig from periodsites containing a cattle+sheep/goat+pig combined number of identified specimens (NISP) >400 from various sub-time periods of Saxon sites across central England. Most assemblages were hand-collected, with a few including some sieving (for details see Table 7.1). Broadly dated periodsites have been omitted.

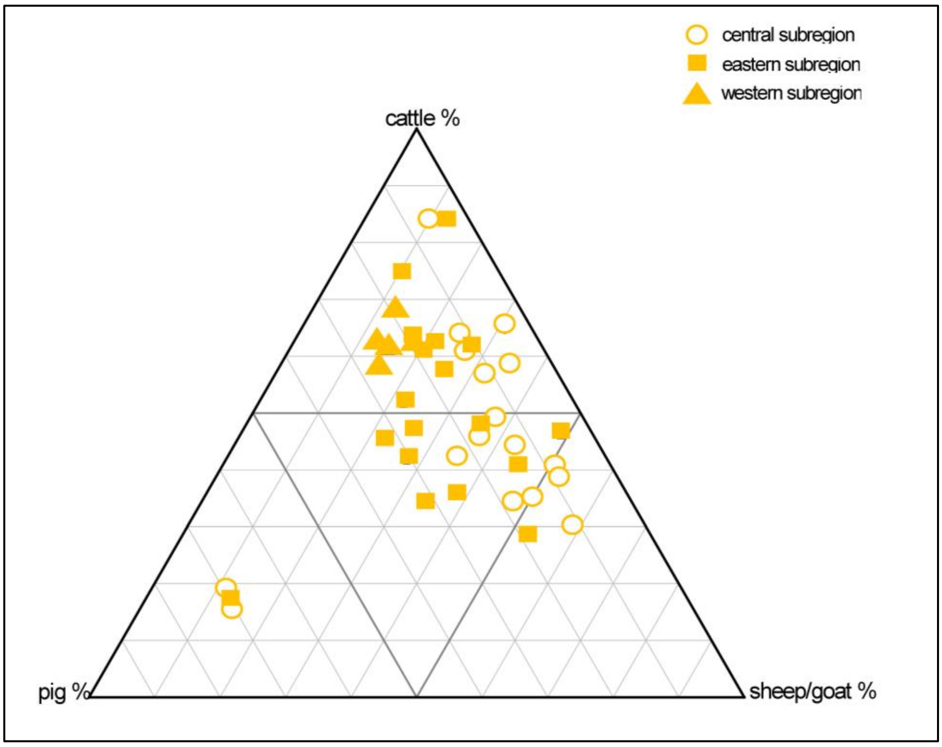

Fig 7.7 Relative proportions of cattle, sheep/goat and pig from periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from Saxon sites across three different areas of central England. Most assemblages were hand-collected, with a few including some sieving (for details see Table 7.1).

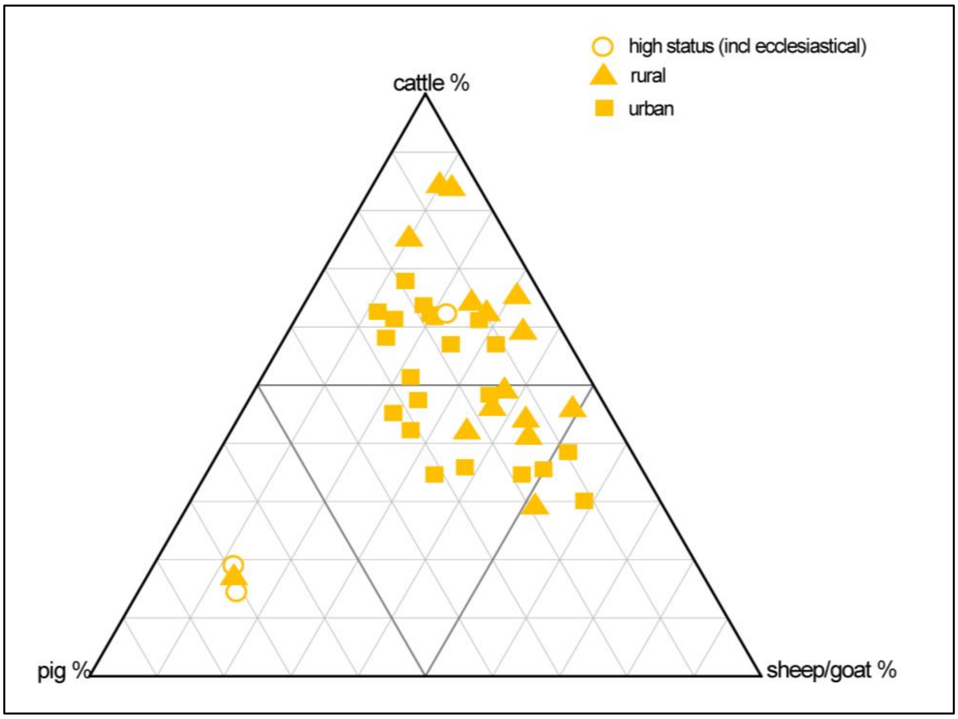

Fig 7.8 Relative proportions of cattle, sheep/goat and pig from periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from three Saxon site types across central England (other categories have been omitted). Most assemblages were hand-collected, with a few including some sieving (for details see Table 7.1).

As usual, sheep is overwhelmingly more common than goat, but the latter has been recorded at a substantially higher proportion of Saxon periodsites (41% in total) than in the Roman period. This frequency gradually increases during the course of the period, reaching its maximum at the Saxo-Norman phase (*see* Fig 6.9). Although of negligible economic value in comparison with the sheep, the value of the goat therefore increased in the Saxon period, which contradicts Trow-Smith's suggestion that the 'species was already declining in numbers' (Trow-Smith 1957, 62). As in the Roman period, the frequency of recorded goat occurrence is much higher in urban (70%) than rural (24%) sites. This is mainly attributable to the greater number of urban goat assemblages that are predominantly represented by horncores. This is likely to reflect a concentration of industrial activities such as horning and tanning in the urban environment rather than a more common occurrence of the actual animals in towns. In the Roman period we saw that goat horncore deposits were more common in the eastern area of central England, and this is again the case in the Saxon period (Fig 7.9). It is, however, difficult to establish to what extent this is because of the greater frequency of urban sites in the east or the continuation of a horn trade centred on the eastern coast.

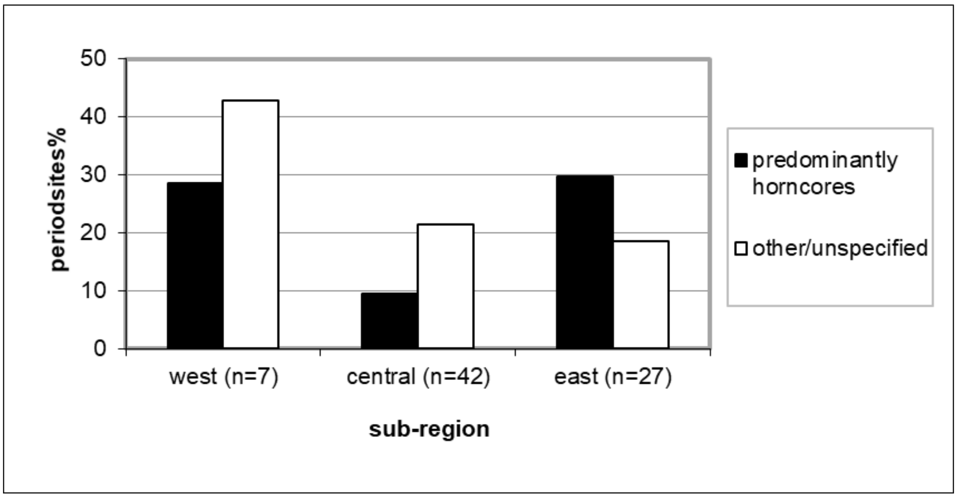

Fig 7.9 Occurrence of goat by body part and sub-region, as a percentage of periodsites across central England, where n *is the number of Saxon periodsites where hand-collected sheep/goat is recorded within a sub-region.*

Of the other domesticates, the horse must have also played an important role in Saxon society, although this animal is less frequently reported than in the Iron Age and Roman periods. It represents only 1.8% of the total number of cattle, sheep/goat, pig and horse specimens, while this figure was almost 4% in the Roman period and more than 5% in the Iron Age. No sites in the Saxon period suggest the occurrence of donkey or mule. There is no historical evidence that horses were used in the Saxon period for ploughing (Langdon 1986), and their use must therefore have been limited to riding and pulling, which of course were still very important activities. Dog and cat are also commonly reported; they both turn up in about 50% of the Saxon assemblages (dog in 56 periodsites and cat in 47). They are found both as isolated bones and/or as partial skeletons. The presence of the rabbit, a species widely regarded to have been introduced by the Normans (Yalden 1999), is surprising, but in four cases at least it is regarded to be intrusive, and this may indeed be the case for the other records as well.

The frequency of domestic fowl remains, as part of the overall bone assemblage, is similar in the Saxon period to the Roman period. This indicates that chicken rearing had already been fully established in the Roman period and no substantial progress was made subsequently in the Saxon period. Chicken bones, however, represent a smaller percentage of the overall avifauna than in the Roman period (Fig 7.10), although this is likely to be mainly a consequence of the increase in goose husbandry, which will be discussed below.

Fig 7.10 Occurrence of chicken and other birds, as a percentage of all hand-collected mammal+bird number of identified specimens (NISP), from Iron Age, Roman and Saxon periodsites across central England. Including material from sieved assemblages produced similar results (data not shown).

These data, however, hide a more nuanced pattern that sees chicken bone frequencies increase steadily during the course of the Roman period, then drop substantially in the early Saxon period, only to rise again in subsequent Saxon phases (*see* Fig 6.13). The high frequency of chicken bones in the middle Saxon period is mainly because of the contribution of the large assemblage from Wicken Bonhunt, where chicken bones are particularly common. An increase across the Saxon period is, however, also recorded on an individual site basis, as at Ipswich 74–88, where chicken bone frequency increases steadily from the early, middle and finally late Saxon periods. There is therefore more than one line of evidence that supports what looks like a genuine pattern. We can only speculate on the reasons why chicken became suddenly less popular after the end of the Roman period, only to pick up again later in the Saxon period. Although the earliest introduction of the chicken dates to the Iron Age, breeding of this bird was fully established in Britain by the Romans, and it is therefore possible that the Anglo-Saxons introduced, perhaps even deliberately, new farming practices that sidelined some of the hallmarks of Roman farming. With time this cultural clash was probably forgotten and the economic usefulness of the chicken eventually prevailed. As in the Roman period, this bird occurs more frequently in urban sites, although the difference with other sites is less substantial than in the Roman period. At both high-status and rural sites, chicken bones are more frequent in the Saxon period than they were in the Roman period (*see* Fig 6.14).

In Chapter 6, ducks and geese were discussed in section 6.3.2 (wild resources), but in the Saxon period we see such a large increase in the frequency of goose remains (*see* Fig 6.16) that the evidence for the domestic status of this bird becomes rather overwhelming, and this is also supported by documentary evidence (see Albarella 2005b for a review). This increase occurs both in relation to overall animal bone assemblages and to duck bones.

The status of the duck in the Saxon period is very uncertain. We have seen that the Romans kept captive ducks but did not breed them (*see* section 6.3), and various lines of evidence indicate that a full domestication of the duck did not occur until later medieval times (cf Harper 1972; Kear 1990). The overall evidence for the Saxon period suggests that the bulk of goose bones derive from domestic birds. Conversely, the majority, if not the entirety, of duck bones derive from wild birds. The striking change in the proportion of the two taxa between the Roman and Saxon periods (*see* Fig 6.16) is therefore because of the establishment of goose husbandry on a substantial scale.

There are only small fluctuations in the relative proportions of geese and ducks during the course of the Saxon period, therefore suggesting that no substantial innovations in the exploitation of these birds occurred over this time period. As in the Roman period, goose bones are especially predominant at urban sites (Fig 7.11), which may indicate a continuation of a Roman tradition, as well as a lesser role played by wildfowl in the urban diet. Conversely, the relatively higher frequency of duck bones at high-status sites is likely to be an indication of a higher proportion of wild bird consumption by the upper echelons of society. We must be cautious about this last suggestion, however, as it is based on only three substantial assemblages, one from Caister-on-Sea and two from St Albans Abbey. It is, however, also worth pointing out that Serjeantson (2006b, 137) interprets the low frequency of goose bones in a wealthy Saxon suburb from Winchester, Hampshire, as an indication that goose meat may have not been favoured by the nobility.

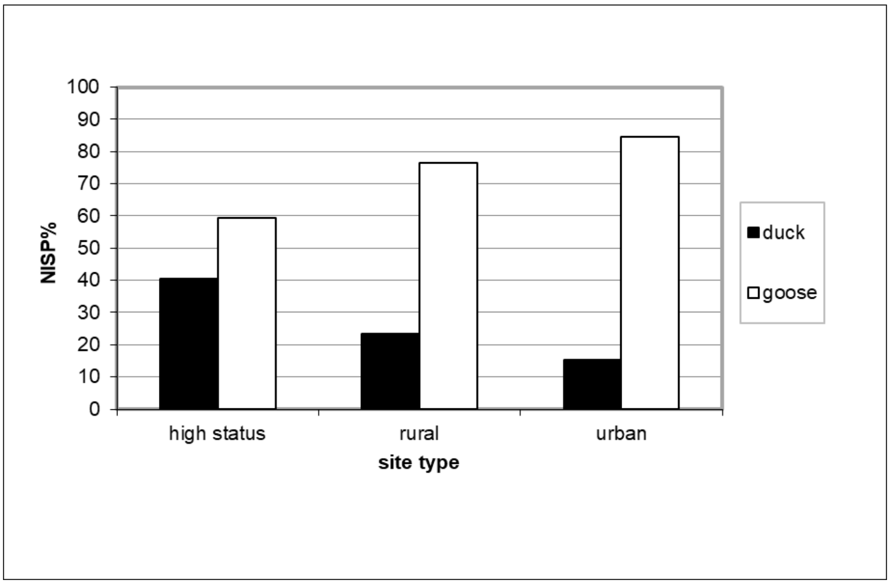

Fig 7.11 Occurrence of duck and goose, as a percentage of all duck+goose number of identified specimens (NISP), by site type for Saxon periodsites across central England. No attempt was made to differentiate between wild and domestic taxa. All methods of collection have been combined. High status includes castle, manorial and ecclesiastical sites.

The only other potential domestic bird to be reported for the Saxon period is the pigeon, whose domestic status is indeed suggested for middle Saxon to Saxo-Norman levels at Wicken Bonhunt. Columbid bones are present in small numbers in 14 other periodsites throughout the Saxon period, but their wild or domestic status is uncertain.

7.3.2 Wild resources

In the Saxon period, wild animals are not often represented (as in all other historic periods), but a greater range of wild birds and fish seems to have been exploited than in the Roman period.

Among wild mammals, deer are the best represented, but they occur less commonly than in the Roman period. They represent about 0.3% of the total of deer+cattle+sheep/goat remains, and are therefore more comparable with the Iron Age (0.4%) than the Roman period, when they represented about 0.7%. As mentioned in Chapter 6, this pattern may be affected by collections of antlers, which is not easy to factor out as in many reports species counts do not discriminate between antlers and other body parts. Unlike earlier periods, when only hand-collected assemblages are considered, it is the roe deer rather than the red deer that predominates, although only marginally (Fig 7.12). This difference is mainly generated by the much higher number of roe deer bones at high-status and, to a lesser extent, rural sites, whereas at urban sites red deer still clearly predominates (Fig 7.13). Figure 7.13 also shows that, when sieved assemblages are included, the proportion of roe and red deer is inverted, with the latter species becoming more common. This is because of the inclusion of large sieved assemblages from Wroxeter (baths and basilica) and Ipswich 74–88, where red deer is clearly the more common species. In Table 7.2, the frequency of the three deer species for individual assemblages with a deer total NISP >40 is presented. The very high frequency of roe deer bones at Wicken Bonhunt and St Albans Abbey is noteworthy. Whatever the adopted count, the pattern that emerges is that the roe deer was more frequently hunted in the Saxon period than in the Roman period, and a higher status value was attached to this species. This may also be influenced by the predominately ecclesiastic nature of the high-status sites in the Saxon period. Looking at country-wide trends, Sykes's data (2006b, 166–7) are consistent with our results from the combined hand-collected and sieved assemblages, in indicating that red deer was predominant. However, the higher frequency of roe deer bones on high-status sites is consistently identified in Sykes's (2006b) review too.

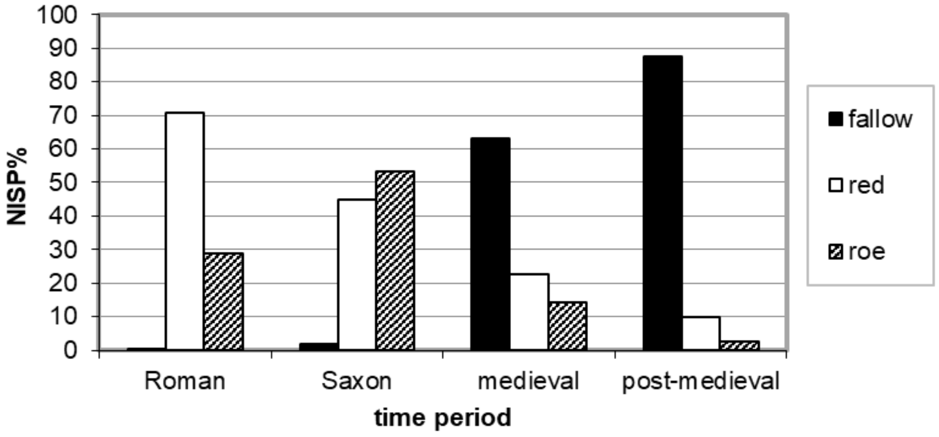

Fig 7.12 Occurrence of deer species, as a percentage of all hand-collected red+fallow+roe number of identified species (NISP), from Roman to post-medieval periodsites across central England. Generic deer has not been included.

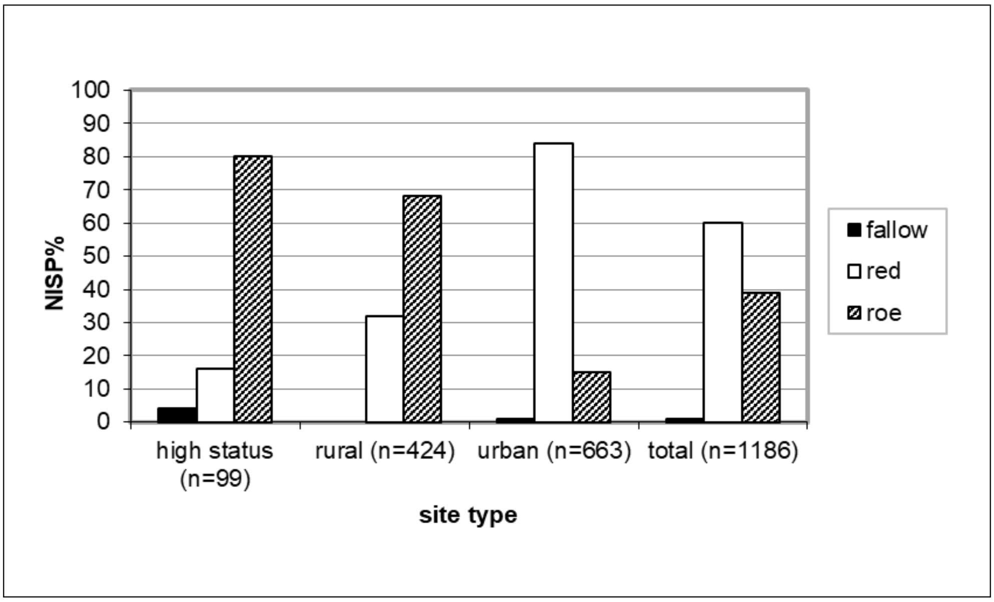

Fig 7.13 Relative occurrence of deer species, as a percentage of all red+fallow+roe number of identified species (NISP), at high-status, rural and urban Saxon sites across central England. Both hand-collected and sieved assemblages included. Generic deer has not been included.

Table 7.2 Number and proportion of the three deer species at Saxon sites across central England where the combined total of deer number of identified specimens (NISP) is >40.

Date	Site type	Periodsite (total NISP)	Red	Roe	Fallow	*Total*	Red, %	Roe, %	Fallow, %
Early–middle Saxon	High status	St Albans Abbey (43)	2	41	0	*43*	5	95	0
Middle Saxon	Rural	Brandon (158)	50	108	0	*158*	32	68	0
Early Saxon	Rural	West Stow (91)	58	33	0	*91*	64	36	0
Middle Saxon	Rural	Wicken Bonhunt (159)	16	143	0	*159*	10	90	0
Saxon	Urban	Berrington St (87)	84	0	3	*87*	97	0	3
Late Saxon	Urban	Ipswich 74–88 (90)	82	7	1	*90*	91	8	1
Early 6th to late 7th century AD	Urban	Wroxeter (baths and basilica) (171)	158	13	0	*171*	92	8	0
Early 6th to late 7th century AD	Urban	Wroxeter (baths and basilica) (57)	47	10	0	*57*	82	18	0
6th century AD	Urban	Wroxeter (baths and basilica) (92)	77	15	0	*92*	84	16	0

The fallow deer has been recorded at several Saxon sites in central England (Fig 7.14), although it occurs in much lower frequencies than the other deer species (Fig 7.12), at all site types (Fig 7.13). The earliest occurrences of this species for the Saxon period date back to early–middle Saxon periods, with slightly higher numbers turning up in the late Saxon period. In total, the species is found at eight periodsites (total NISP=10), some of which are only broadly dated. The earliest examples are from middle Saxon Barking Abbey and Ipswich (AML 3951) (190, Suffolk; Jones and Serjeantson 1983), and the early–middle Saxon open settlement at Pennyland (tentatively identified). Sykes (2004a) suggests that the Ipswich specimen is misidentified and, as no details are given for Barking Abbey or the three broadly dated specimens from Berrington St, these merit further investigation. The late Saxon metatarsal from Castle Mall, Norwich (77, Norfolk; Albarella *et al* 1997) is possibly intrusive, as Norman material is also present in that context. Some problems also exist with the stratigraphy at Thetford 64–70 (10th century AD; G G Jones 1993a), where fallow deer was also found. Sykes (2004a, 80) concludes that ‘the only specimens which can be attributed confidently to the Saxon period are antler’. She also notes that evidence for the species in northern France is very slight for this period. Therefore, even assuming that the British specimens were imported, their origin remains unclear.

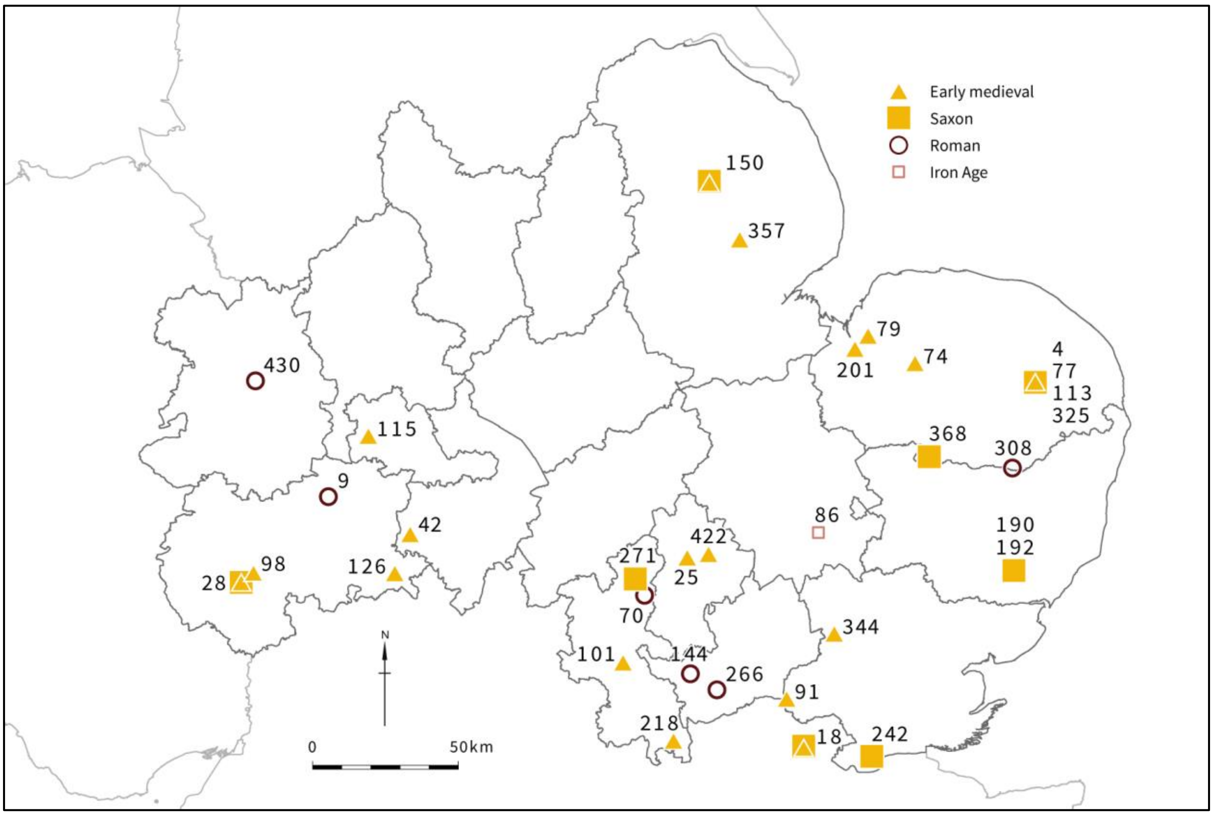

Fig 7.14 The distribution of Iron Age to early medieval sites across central England with fallow deer present. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text.

Documentary sources attest that the wild boar was still present in Saxon England (cf Albarella 2010) but it is rarely recorded at archaeological sites. The most significant presence of this species in central England is an isolated skeleton from Stanstead Abbots, Ware/Harlow (336, Hertfordshire; Ashdown 1982), dated to the middle Saxon period. Biometrical analysis clearly indicates that this is a very large specimen, unlikely to be domestic at a time when major breed improvement had certainly not yet occurred. A total of 59 specimens from four phases at Wroxeter (baths and basilica) (late 5th to late 7th centuries AD) are also possibly identified as wild boar (Hammon 2005). Other single specimens tentatively attributed to the species are noted for Walton, Aylesbury (400, Buckinghamshire; Noddle 1976; generically Saxon), and late Saxon Flaxengate. Although more wild boar specimens may in fact be confused with the plethora of domestic pig remains, the species is likely to have been much more rarely hunted than either the roe or red deer. Considering its rarity, the hunting of wild boar is likely to have carried a considerable status.

Among other wild mammals, hare is the most commonly reported (at 24 periodsites), although invariably in small quantities, whereas badger and fox occur more occasionally. Wildcat is tentatively identified at 6th-century AD Wroxeter (baths and basilica), while neither wolf nor canid bones of unusually large size or morphology are reported. During the Saxon period, the wolf probably still survived in England but must have become very rare, and is documented at only one Saxon site outside the region (Yalden 1999, 147). Bear and beaver specimens from early Saxon West Stow and Saxon Walton, respectively, represent the latest records of these species in central England. Both animals were probably extinct by the end of the period, which is consistent with evidence from the rest of England (Yalden 1999). An additional bear phalanx from Spong Hill VII, North Elmham, Norwich/Fakenham (320, Norfolk; Bond 1995), is associated with cremations and may represent the remains of an imported skin rather than a carcass. Beaver is also mentioned among the cremated remains from this site. Most interesting is the occurrence of a barbary ape phalanx from early 6th to late 7th-century AD levels at Wroxeter (baths and basilica). This is an imported species and indicates that the site was part of a distant trade network. Cetacean bones are represented by a small whale or dolphin from middle Saxon Brandon and a whale from late Saxon Ipswich 74–88 (Crabtree 1994). Brandon is located well inland and this finding therefore attests to commercial contacts with coastal areas.

The frequency of birds other than chicken increases from the Roman to the Saxon period (Fig 7.10), but this is to some extent caused by the rise in goose husbandry. Having said that, most bird groups are better represented in the Saxon period than they were in the Roman period. The most noteworthy increases relate to columbids, cranes, game species and swans, whereas corvids decrease. This latter trend is mainly because of a decline in the raven, which perhaps by the Saxon period had lost the symbolic status it had in the Roman period (but see below for some evidence to the contrary). Heron and crane seem to be mostly (but not exclusively) associated with high-status sites. Of the rarest species, noteworthy are the occurrences of the red-throated diver at Brandon and the quail at 6th to 7th-century AD Wroxeter (baths and basilica). The pheasant, whose initial introduction into Britain is probably attributable to the Romans (Yalden and Albarella 2008), is poorly represented, with its only record deriving from late Saxon Flaxengate. Considering its scarcity, it is likely that this species was initially introduced as an exotic or even captive bird and that a full introduction into the countryside only occurred later in the medieval period.

In general, scavenger species seem to decline during the Saxon period, although buzzards, harriers and red kites are occasionally reported. Conversely, other birds of prey are more commonly reported than in the Roman period. Some of these may have been used for falconry, which was certainly established in Britain by the Saxon period (Prummel 1997). The strongest evidence for this derives from partial skeletons of raptor species that are known from documentary sources to have been trained for hunting (Prummel 1997; Cherryson 2002). Articulated bones of the peregrine, the highest status of the hawking birds, were found at the middle Saxon rural site of Brandon, whereas a partial skeleton of a goshawk derives from late Saxon urban levels at Castle Mall. Individual specimens of the typical hawking species (sparrowhawk, goshawk, kestrel, merlin and peregrine) were found at several other sites (for a review, see also Cherryson 2002). The interpretation of these loose bone fragments is more problematic, although some, because of the lack of suitable nearby habitats, are unlikely to derive from birds caught in the vicinities of the sites.

In the Saxon period the economic role of fishing increased substantially. Overall, about 10 times more fish remains are reported for the Saxon period than they are for the Roman period. If we consider the smaller number of animal bone assemblages from the Saxon period, this difference assumes double significance, but it must also be interpreted bearing in mind the particularly large size of some of the Saxon faunal assemblages.

In terms of the habitat of the most commonly used fish, the Saxon period is clearly transitional between earlier and later periods. The decrease in importance of freshwater fish that had occurred between the Iron Age and the Roman period continues in the Saxon period. This is mainly compensated for by an increase in marine fish (which starts a trend that continues in later periods), while the contribution of estuarine fish remains approximately stable (*see* Fig 6.17). Once again it is important to emphasise the fact that the amount of fish recovered is even more dependent than other classes of vertebrates on the adopted recovered strategies, which have very unevenly been applied to Saxon sites.

The early Saxon period has an insufficient fish record, but a comparison of the middle and late Saxon periods indicates that the change in fishing strategy occurs at the middle–late Saxon, rather than the Roman–Saxon, transition. The contribution of marine fish in particular rises from 31% to 59% from middle to late Saxon periods, thus making the earlier part of the Saxon period rather similar to the Roman period (Fig 7.15). This change should approximately correspond with what Barrett *et al* (2004) have called a 'fish event horizon', namely a rapid rise in marine fish occurring at about AD 1000. Because of the imprecise dating of most of our late Saxon sites, our dataset does not permit verification of this approximate cut-off date. Possible reasons for this increased exploitation of marine fish in the late Saxon period include the growth of trade, the adoption of floating 'driftnets', a decreased availability of freshwater fish, and changes in Christian fasting practices. Barrett *et al* (2004), however, favour a 'commercial revolution' linked to trade and urbanism.

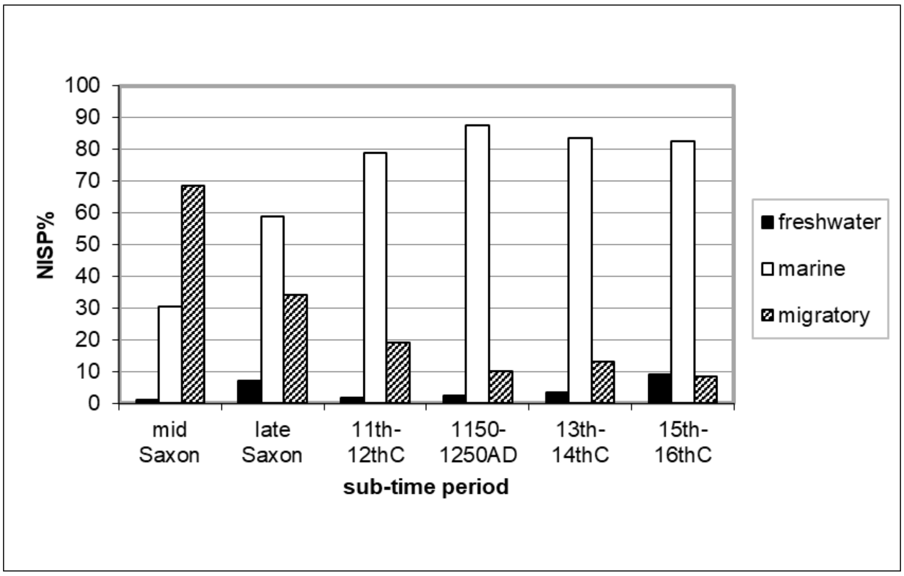

Fig 7.15 Occurrence of freshwater, marine and migratory fish, as a percentage of number of identified specimens (NISP), from Saxon and medieval periodsites across central England. The middle Saxon period is almost entirely represented by an assemblage from Ipswich 74–88 (site 192).

Figure 7.16 shows that the increased importance of marine fish in the Saxon period is to a considerable extent because of the greater frequency of herring bones found in this period. Conversely, the frequency of eel bones remains the same as in the Roman period. These two species are compared directly because they are of approximately similar size and therefore presumably similarly affected by recovery bias. They are also by far the most common fish species in the dataset, making up about 75% of the total of fish bones for the Saxon period.

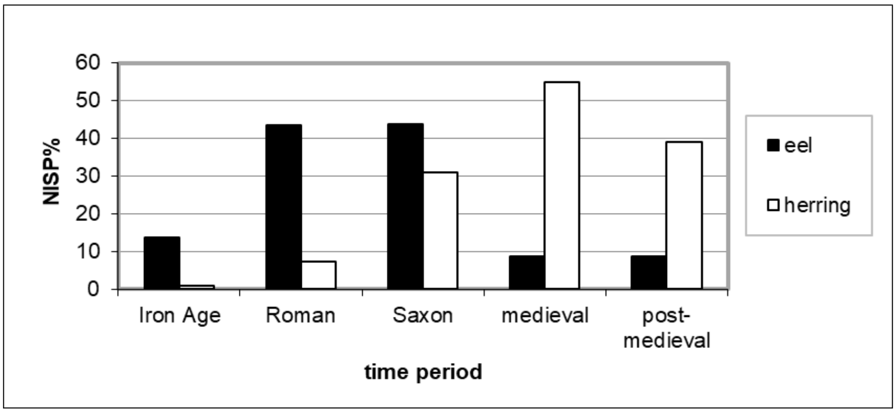

Fig 7.16 Occurrence of eel and herring, as a percentage of the total fish number of identified specimens (NISP) for different time periods from sites across central England.

There is, however, a fair amount of inter-site variability in our dataset. The largest late Saxon sites (all urban) do show differences in the predominance of fish species (even when only fine-sieved assemblages are considered). Castle Mall and 11th-century AD Fishergate, Norwich (131, Norfolk; Locker 1994) have herring as the most common species, followed by eel and cod, while at Ipswich 74–88 eel predominates, followed by herring and cod. That pattern is also mirrored by the coarse-sieved, 11th-century AD Dragon Hall, King St, Norwich (113; Norfolk, Nicholson 2005) assemblage, which is noteworthy, given that we might expect cod to be over-represented in a non-fine-sieved assemblage. The Lincoln sites (209, Lincolnshire; Dobney *et al* undated) are dominated by cyprinids and eel. The only actual waterfront assemblage is Whitefriars St, Norwich (415, Norfolk; A K G Jones 1983b), which has a small fish assemblage (NISP=107) with herring as the most common species, followed by eel and cod, in line with two of the other Norwich sites.

Unsurprisingly the contribution of freshwater fish is greater in sites from inland counties (16% compared with 5% in coastal counties), although the assemblages are rather small. Marine fish such as gadids and herring are generally found in Norfolk and Suffolk, but there is a small presence in the Northamptonshire assemblages too, along with mackerel, plaice/flounder/flatfish, eel, tench, salmonid and perch. These are mainly from late Saxon Woolmonger St (St Peter's Walk), Northampton (425, Northamptonshire; Locker 1999a), but also early Saxon Northampton (site N80–82; Locker 1985b) and West Cotton, Raunds, near Wellingborough (408, Northamptonshire; Albarella and Davis 1994). Hardly any fish was identified from Essex and none in any other inland counties. This may at least partly be because of the lack of sieving outside the urban centres, and the small number of sites in the more westerly counties.

At the late Saxon Thetford sites (48-59, 64–70 and 73–80), which are about as far inland as you can get in Norfolk, fish bones were retrieved but no NISP is provided, thus direct comparison with the coastal sites is not possible. Between them they produced eel, herring, cod/gadid, haddock, perch, plaice, cyprinid and possibly tench. Redcastle Furze, Thetford (297, Norfolk; Nicholson 1995) reported eel and herring in both its early and late Saxon phases. In inland Suffolk, the urban broadly Saxon-dated site of Bury St Edmunds (63, Suffolk; Locker 1981a) reported 47% herring and 40% eel, cod/ling/whiting, elasmobranchs, pleuronectids, perch and roker.

Six rural Fenland sites (Baker with Nicholson 2002) have small assemblages, mainly recovered by bulk sieving, with eel consistently present and occasional records of pleuronectids, haddock, cyprinids and gadids. The only other rural sites to have recovered fish are late Saxon West Cotton (two herring and one eel) and early Saxon West Stow (one plaice/flounder, two perch and 12 pike).

Among the marine species mentioned, herring is clearly the most common, but a large proportion is also represented by gadids, of which cod is typically the predominant species. In general this is followed in order of importance by whiting and haddock, with the former species present with a higher NISP (sometimes >60), and the latter recorded at a higher number of periodsites (ie 11). Rarer gadid species include hake, present at two periodsites, and ling, pollack and saithe, only recorded once. Among freshwater species, noteworthy is the occurrence of the burbot, now extinct, at late Saxon Flaxengate.

The inland occurrence of marine species and the substantial rise in the overall frequency of marine fish leave no doubt that fish was traded and that opportunities to exploit sea resources had both increased and improved since the Roman period. Direct evidence of trade is difficult to detect, although at some sites some speculations are possible. At middle and late Saxon Ipswich (191, AML 4578; Locker and Jones 1985), the small size of the cod suggests that this was not caught in deep water and may indeed represent a local catch. Similarly at late Saxon Castle Mall, the occurrence of many cranial elements of cod is indicative of the consumption of fresh fish, although preservation must have also occurred, as chop marks on some cleithra indicate severance of the head, presumably as part of the preparation of stockfish. Cod caudal vertebrae found at late Saxon Woolmonger St are also said to possibly derive from stockfish, as these elements are retained when the fish is left to dry. Long-distance traded fish originating from the

Baltic and the North Sea has, however, been discounted for the Saxon period, on the basis of isotopic evidence (Barrett *et al* 2011).

7.4 Husbandry strategies

As for the Iron Age–Roman transition, changes in the frequency of the main domesticates between the Roman and Saxon periods are accompanied by the emergence of new kill-off patterns.

Overall, cattle mortality profiles for the Saxon period resemble far more those of the Iron Age than the Roman period (*see* Fig 5.9). The percentage of sites containing a majority of adult cattle is substantially reduced, although they still represent the most common age category. Conversely, the Saxon period sees an increase in assemblages showing higher percentages of juveniles and/or sub-adults specimens, or a combination of different age categories. Unquestionably, the high frequency of adult cattle indicates that traction was still a key function of this species, but at the same time cattle exploitation seems to have become less specialised, with more herds kept to a substantial extent for meat production.

Once again, it can be demonstrated that this general pattern hides a more complex chronological development. The evidence from the few sites that have continuity of occupation between the Roman and Saxon periods indicates that cattle husbandry strategies did not change abruptly at the transition between the two periods. At Elms Farm (Heybridge) a similar predominance of adult individuals can be found both in the late Roman and very late Roman–early Saxon phases, and a similar situation has been recorded at Wroxeter (baths and basilica) between the 4th and 7th centuries AD and at Orton Hall Farm between the late 4th and the early 6th centuries AD. Conversely, when the situation at Lincoln sites is considered, it emerges that the late Roman levels are characterised by the typical Roman pattern of mainly adult cattle, whereas a greater diversity of ages can be found in late Saxon levels. At Quarrington, near Sleaford (284, Lincolnshire; Rackham 2003), the early Saxon levels have mainly adult cattle, whereas in the middle Saxon period more animals that were killed in their third year are recorded. Finally, at Ipswich 74–88 there is an increase in the number of sub-adults compared with adults between the middle Saxon and late Saxon periods. At Ipswich 74–88, this change in mortality pattern is also accompanied by a size reduction, particularly in height, which is suggested to be possibly associated with a reduction in the number of castrates (Crabtree 1994). This hypothesis is consistent with the idea that traction (which relies to a substantial extent on oxen) played a diminishing role in the course of the Saxon period. It therefore looks like the Roman pattern of keeping most cattle until adulthood did not abruptly change at the beginning of the Saxon period, but it was rather gradually replaced during the course of the period. A perceivable change in cattle culling patterns can only be fully identified in the late Saxon period.

Of interest in the interpretation of the use of cattle in the Saxon period is the high frequency of reports that mention the occurrence of splayed metapodials, a condition that, as discussed in Chapter 6 (*see* section 6.4), is associated with traction stress (Fig 7.17). In view of the hypothesis raised that the lower frequency of adults in the Saxon period indicates a less frequent use of cattle for traction, this result is surprising. A possible explanation, however, is that the Saxon farming economy mainly operated at a smaller scale. The large, villa-driven, estates of the Roman period allowed the keeping of substantial numbers of oxen, which may have provided the opportunity of a relatively rapid turn-over of ploughing beasts. Although many cattle would be slaughtered as adults, these may have been replaced by younger animals before they developed heavy arthropathic conditions. In the Saxon period, smaller farms may have more commonly used their ploughing animals to the point of exhaustion, and therefore these animals were more likely to develop visible articular pathologies. It is also worth pointing out the greater use of areas with heavy soils that is attested for the Saxon period (section 7.2). Sites that mention the occurrence of splayed metapodials include three of the middle Saxon rural Fenland sites, Chopdike Grove, Gosburton (90, Lincolnshire; Baker with Nicholson 2002), Hay Green (TSC17), Terrington St Clement (170, Norfolk; Baker with Nicholson 2002) and Rose Hall Farm, Walpole St Andrew (301, Norfolk; Baker with Nicholson 2002), and St John's Square, Daventry (322, Northamptonshire; Locker 1997a).

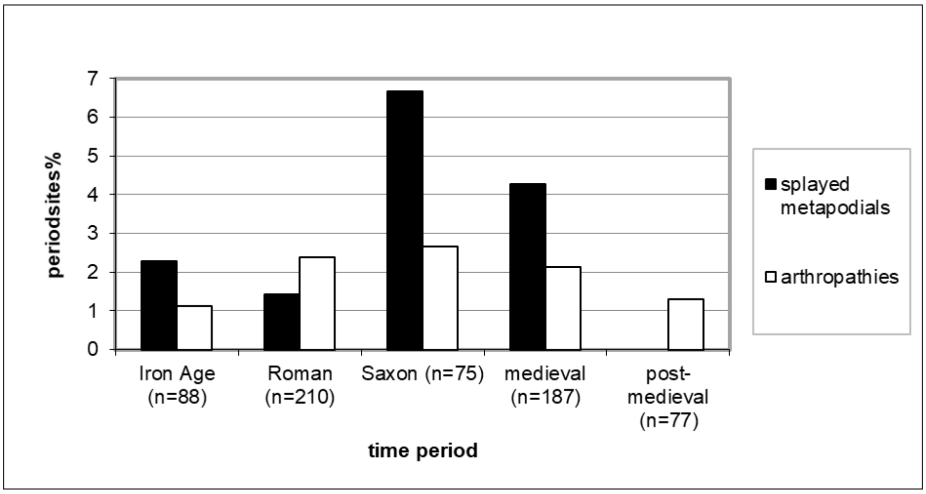

Fig 7.17 Cattle pathologies possibly associated with traction, as a percentage of periodsites, where n *is the number of periodsites for each time period from sites across central England where hand-collected cattle is represented.*

Sheep/goat culling patterns also changed between the Roman and Saxon periods, but in the opposite direction to the change that occurred in cattle. In caprines, the frequency of adult animals increases, leading to a situation in which the number of assemblages reporting mainly adults and mainly juveniles and/or sub-adults is approximately equal. The most common category, albeit marginally, however, reports a diversity of age categories (*see* Fig 5.9). As we have seen in Chapter 6, the trend towards an increased number of adult sheep/goat had already started in the late Roman period, with which the Saxon period must therefore be seen in continuity. Although sheep/goat kill-off patterns for the late Roman and Saxon periods hardly point towards specialisation, the higher frequency of adults suggest an increased interest in wool production, for which particularly strong evidence derives from the rural middle Saxon site of Brandon (Crabtree 1996). In the Saxon period this economic choice may also be related to the increased amount of beef, which must have been obtained through the overall slaughtering of cattle at a younger age. This may have freed more caprine flocks from meat-producing needs.

The lack of any distinct change in culling patterns of sheep/goat at the Roman/Saxon transition is confirmed by the evidence from those few sites that have continuation of occupation between the two periods. As for cattle, at Elms Farm (Heybridge) there is no change in age profiles of sheep/goat between the late Roman period and the late Roman–early Saxon transitional phase. At the rural site of Orton Hall Farm, a combination of sub-adults and adults is found in both the late 3rd to 4th-century AD and 4th to early 6th-century AD phases, with only slightly more juveniles in the later phase.

All phases at Wroxeter (baths and basilica) (late 4th to late 7th centuries AD) have a combination of juveniles, sub-adults and adults approximately in the same proportions.

Although the increase in the number of adults is a phenomenon already rooted in the Roman period, there is some evidence from multi-phased sites that it continued in the Saxon period. At Ipswich 74–88, the middle Saxon period is characterised by a culling peak of animals towards the end of their first year, but by the late Saxon period mainly adults were slaughtered. At Quarrington, the early Saxon phase is characterised by a combination of juveniles and adults (with neonatals and elderly specimens also present) but the overall age profile increases in the middle Saxon period. At the urban site of Redcastle Furze, the early Saxon phase is mainly characterised by immature and sub-adult animals, but again the overall age at slaughter increases in the late Saxon period, although distinct age groups can still be identified. This evidence indicates an element of mortality change within the Saxon period but also the occurrence of rather distinct age groups at most sites. This may mean that different animals and/or flocks were associated with different products (eg meat and wool), rather than the same animals being used for a combination of purposes (for instance, kept to produce at least one fleece before being slaughtered for mutton).

Depressions (thumb-prints) on sheep horncores are only reported at middle Saxon Chopdike Drove and at late Saxon Castle Mall. Therefore the same considerations made for the Roman period apply here (*see* section 6.4). The animals must have been reasonably well fed and any milk exploitation that may have occurred was probably not exceedingly intense, which is consistent with a lack of specialisation in kill-off patterns.

Consistent with the exclusive use of these animals as meat producers, pig culling patterns did not change between Roman and Saxon periods. Most animals were slaughtered before reaching adulthood, although a slightly greater diversity of age patterns than in the Roman period is reported in the Saxon period. However, the number of assemblages containing mainly adult pigs remains negligible (*see* Fig 5.9). The evidence from sites encompassing the Roman–Saxon transition, such as Elms Farm (Heybridge), Orton Hall Farm and Wroxeter (baths and basilica), confirms that no culling changes occurred between the two periods.

Age information for horse is sparse but it is worth mentioning the occurrence of spavin, a condition causing exostoses and fusion of tarsal bones (Baker and Brothwell 1980, 117), in specimens from middle Saxon West Stow and late 4th to early 6th-century Orton Hall Farm. This condition can be associated with traction stress, but not necessarily so, as it is also found in non-traction animals such as sheep (Albarella *et al* 1997). At middle Saxon Wicken Bonhunt, four horse vertebrae were found fused together, which may represent direct evidence of the use of the animal for riding (cf Pluskowski *et al* 2009), although this condition can also occur naturally in old animals.

Ageing data for chicken are only reported at a few sites. Comparability between sites is particularly problematic for this type of evidence, partly because not all zooarchaeologists identify juvenile bird bones with the same degree of confidence. In addition, juvenile bird bones are subject to much taphonomic destruction and will be more rarely collected than the denser and larger bones of adults. Nevertheless, it is worth mentioning that percentages of juvenile chicken bones ranging between 15% and 25% are reported for late Saxon assemblages from Castle Mall, Mill Ln, Thetford (233, Norfolk; Albarella 2004), and Chalk Ln, Northampton (85, Northamptonshire; Coy 1981). At the urban site of Castle Mall, neonatal bones are also present, thus indicating on-site breeding. At Chalk Ln a rather high frequency of medullary bones (ie from laying hens) is also reported. Unquestionably meat and eggs were both used as products of domestic fowl breeding.

Unlike chicken, no juvenile goose bones are reported for any sites. Juvenile goose bones are more robust and larger than those of chicken, therefore there are no taphonomic reasons why they should be found less often than those of chicken. Although it is possible to suggest that goose breeding in the Saxon period emphasised egg production, it is also important to bear in mind that goose bones will look 'adult' at a rather early stage in life (Serjeantson 2002) and therefore meat consumption cannot be discounted.

7.4.1 Livestock types

The topic of the size and morphology of Saxon livestock has been insufficiently explored and is much in need of an in-depth appraisal, which is beyond the scope of this review. The information that is currently available is sparse, incomplete, inconsistent and highly unsatisfactory. Those few elements that are suitable are summarised here.

Only a small percentage of Saxon animal bone reports provide any information about cattle size, but those few that do illustrate a pattern that is not dissimilar to that of the Roman period. Occasionally reports indicate the occurrence of 'mostly small individuals' or 'a few large individuals', which is consistent with the evidence from the Roman period (*see* Fig 6.21). At early Saxon West Stow, there is no evidence that cattle size was any different to that in the Roman period, and also no change in size between late Roman and early Saxon levels is observed at Orton Hall Farm. The only site where some evidence of change occurs is Pennyland, where cattle are on average smaller than in the Roman period. No report indicates an increase in size following the Roman period. There is also not much evidence of variation within the Saxon period, although at 10th-century Thetford 64–70 cattle are said to be smaller than in the middle Saxon period. An element of regional variability is indicated by sites such as St Albans Abbey, which is at the lower end of the cattle size variability for the period, and Walton Lodge, Aylesbury (398, Buckinghamshire; Sadler 1989), which is at the top.

Data are even scantier for sheep/goat, but again there is no evidence of any clear size change between the Roman and Saxon periods or even within the Saxon period. For instance, late Saxon animals from Lincoln sites appear to be similar to those from the 4th century AD. Surprisingly, St Albans Abbey, which had small cattle, has instead rather large sheep. At the urban site of Ipswich 74–88, an increase in sheep/goat bone length occurs between the middle and late Saxon phases. Considering that no similar increase is attested for bone widths, this change may reflect a higher number of wethers, known to be longer legged, in the later period. This may tie in well with the suggested increase in the use of wool during the course of the Saxon period. At Wroxeter (baths and basilica) the occurrence of some large individuals in the latest phase of the site has also been interpreted as a possible change in sex (ie more males) rather than size variation.

Pigs also show no clear evidence of size change between the Roman and Saxon periods or within the Saxon period. Some regional variability is indicated by the small size (in respect to West Stow) of the pigs from early–middle Saxon St Albans Abbey and middle Saxon Brandon.

The decrease in horse size that occurs soon after the end of the Roman occupation at Elms Farm (Heybridge) has been discussed in section 6.4.1. No similar evidence is available from other sites in our dataset, but the phenomenon of size reduction after the Roman period is known for Britain and Europe as a whole (Rizzetto *et al* 2017). In general, Saxon horses from central England seem to have had withers heights ranging between 1,250mm and 1,400mm, classifying them as 'ponies'. An exception is represented by a larger horse with a withers height of almost 1,600mm found at middle Saxon Wicken Bonhunt. This must have been an animal of some importance, perhaps indicating the high status of some of the site's inhabitants.

Dog size is characterised by rather large variability at most sites, although no dogs are as small as the specimen from Causeway Ln mentioned in section 6.4.1. Most animals seem to have ranged in height between 500 and 600mm, although a small specimen (*c* 300mm tall) from late Saxon Ipswich 74–88 indicates that pet dogs may have still occurred in this period. Their use for small game hunting represents an alternative explanation.

There is no information about possible size changes in domestic fowl between periods, with the exception of the evidence from Wroxeter (baths and basilica), which indicates continuity. Most of the biometric evidence for this species is interpreted in view of sexual dimorphism. At Brandon, however, the possibility of the occurrence of two distinct breeds has been raised (within a large assemblage of 1,306 fowl NISP). The late Saxon Flaxengate chickens (NISP=378) fall into two size classes based on measurements of the tarsometatarsus, but a few unspurred individuals are noted in the larger group, which could be a different breed, capons or entire males that failed to develop a spur.

Concerning horn shapes, as in the Iron Age and Roman periods, most cattle are short-horned, although medium-horned and occasionally even long-horned animals are recorded. This is thus the same situation as observed for the Roman period. Polled sheep individuals are not as common as they are in the Roman period, possibly indicating a reduction in morphological types in the Saxon period or simply a decline of some specific breeds. They are, however, recorded at the late Saxon sites of St Peter's St, Northampton (332, Northamptonshire; Harman 1979), Thetford 64–70, Thetford 73–80 and Flaxengate. These latter two sites also have examples of four-horned (polycerate) sheep. At Flaxengate, 77 sheep specimens are recorded as being normally horned, three as four-horned and one as polled.

The congenital absence of the second lower premolar in cattle follows an interesting trend at Wroxeter (baths and basilica), where it ranges between 5% and 8% of the cases in the 5th and 6th centuries AD, therefore in line with the Roman evidence, but rises to 17% in the two 6th to 7th-century AD phases, perhaps indicating the introduction of new livestock (but note that there is no size change). The congenital absence of the lower third molar hypoconulid also slightly rises from 8–11% in the first two phases to 10–14% in the two later phases. At late Saxon Castle Mall, the absence of the second lower premolar in cattle is extremely high, at about 50%, whereas at the late Saxon Lincoln sites it is only about 2%. There seems to be substantial variability, but we must also wonder to what extent this could depend on observer error. Of some interest is the report of the congenital absence of the second lower premolar in pigs at 10th-century AD Mill Ln, Thetford. The condition at this site is common, as it occurs in 32% of the cases, and may indicate the peculiarity of that particular population.

7.5 Human processes

7.5.1 Butchery

Butchery information for cattle is reported less frequently for the Saxon period than for the Roman period, but conversely we have more evidence from pigs (*see* Fig 5.11). This probably reflects the relative importance of the two species in the two periods. Figure 5.11 is independent from the absolute number of specimens, but when a large assemblage of bones of a certain species is available the probability that this will provide some useful information about butchery is higher. Although there are several Saxon cattle deposits that are rather intensively butchered, probably for marrow extraction, the typical Roman butchery styles, hooked scapulae and soup-kitchen deposits (*see* section 6.5.1), disappear completely in the Saxon period. This represents a strong indication of cultural change.

Systems of redistribution of the carcass, such as longitudinally split vertebrae and skulls, are more commonly reported than in the Roman period, for both cattle and sheep/goat (Fig 7.18). For pigs the pattern is inconsistent, with split skulls in particular less commonly reported (Fig 7.18), but the small sample of sites reporting pig butchery provides us with little confidence in these results. However, a butchery style that goes beyond the consumption of meat at a family level is clearly present in the Saxon period. Butchery based on bone sawing, which was present but rare in the Roman period, is completely absent in the Saxon period (Fig 7.18). We will see that this technique does not become firmly established until the post-medieval period.

Horse butchery is more common in the Saxon period than in any other period, although only marginally so (*see* Fig 5.12). Skinning of horse is approximately as common as in the Roman period. Butchery and/or skinning are reported at nine periodsites, with a greater occurrence in the earlier part of the period. At early Saxon West Stow, butchery is said to resemble that practised on cattle, including decapitation and possible marrow extraction (Crabtree 1989). At early Saxon Spong Hill VII, cut marks on the ileum and chop marks on femurs and metapodials strongly point towards dismemberment and marrow extraction (Bond 1995). At middle Saxon Wicken Bonhunt, marrow extraction is also suggested, as long bones are split (Crabtree 2012). In general it does not seem that in the Saxon period a taboo on the consumption of horse flesh was strictly followed, if at all.

Isolated occurrences of dog butchery are reported at five periodsites, and of skinning at two. At Kings Meadow Ln, Higham Ferrers (6th to 7th-century AD enclosure; 202, Northamptonshire; Albarella and Johnstone 2000), two dog skulls from partial skeletons were smashed at the back, possibly for brain extraction; these were found in a ditch with horse and cat partial skeletons. At 6th to 7th-century AD Wroxeter (baths and basilica) there is evidence of the disarticulation of a pelvis, and a definite chopped ulna has been reported for 11th-century AD Fishergate. Overall it looks like the use of dog skin and the consumption of dog flesh took place, albeit rarely.

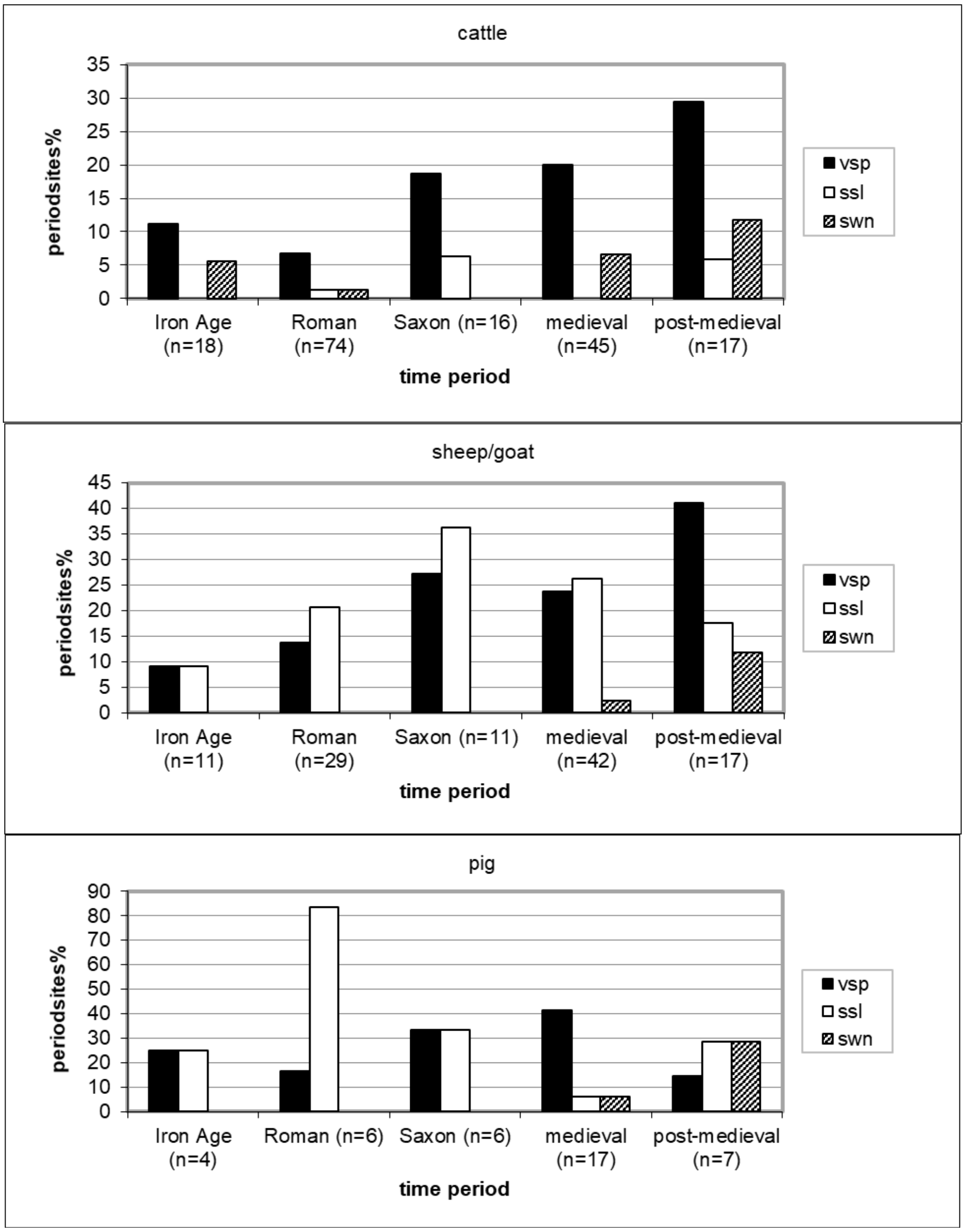

Fig 7.18 Specialised carcass processing of cattle, sheep/goat and pig, as a percentage of Saxon periodsites across central England, where n *is number of periodsites reporting butchery for each taxon. Note the change of scale for the y-axis. vsp=split vertebrae; ssl=skull longitudinally split; swn=sawn bones.*

No butchery is reported on cat bones, but evidence of skinning, which is absent for the Roman period, occurs at early Saxon West Stow, 6th to 7th-century AD Wroxeter (baths and basilica) and late Saxon Castle Mall. At this latter site juvenile cat specimens are reported, raising the possibility that these may have specifically been killed, or even reared, for their pelts.

Among wild mammals evidence of butchery is scanty, but at 6th-century and early 6th to late 7th-century AD Wroxeter (baths and basilica) two fox bones show cuts consistent with dismemberment. Sixth-century AD levels from the same site also produced a badger tibia with skinning marks. The evidence is equally scarce for wild birds, but at late Saxon Chalk Ln cut marks on a raven humerus may be associated with the removal of the wing.

At early 6th to late 7th-century AD Wroxeter (baths and basilica), evidence of butchery has also been found on the ulna of a grey partridge, a typical gamebird.

7.5.2 Bone modification

Bone working and other craft activities associated with animal products are frequently reported for the Saxon period. The evidence for cattle remains is as abundant as in the Roman period, but for both sheep/goat and pig it is more substantial (*see* Fig 6.28).

Horn-working seems to have reached its zenith in the Saxon period, and is more commonly reported for this than any other period, for cattle and sheep/goat (Fig 7.19). The only site, however, where a deposit directly associated with a horn workshop is suggested is Orton Hall Farm (late 4th to early 6th centuries AD). Other industrial activities are scantily represented and no suggestion of tanning deposits has been made for the period. Unquestionably, horn must have been an important working material for the Anglo-Saxons. Hides and skins were also certainly commonly produced, as proved by the frequent skinning marks left on the bones, but their manufacture may have occurred at a small scale, and is therefore archaeologically elusive. It is, however, worth mentioning a pit containing many cattle foot bones from the rural site of Orton Hall Farm (late 4th to early 6th centuries AD). This may represent primary butchery as well as a tanning deposit (Albarella 2003b).

Evidence of worked antler occurs approximately as commonly as in the Roman period, and is generally associated with discreet dumps of antlers, although worked pieces are also found in mixed deposits. Working of horse bones is attested by metapodials made into skates from late Saxon Thetford 73–80 and chopped metapodials from the Saxon open settlement of Mucking, Tilbury/Basildon (242, Essex; Done 1993), which are also interpreted as working pieces. More bone working on horse bones is attested at the late Saxon village of Burystead. Working on bird bones is rarely documented but a goose ulna was worked into a cylinder at late Saxon Castle Mall, although no evidence of the use of goose quills is available for the period.

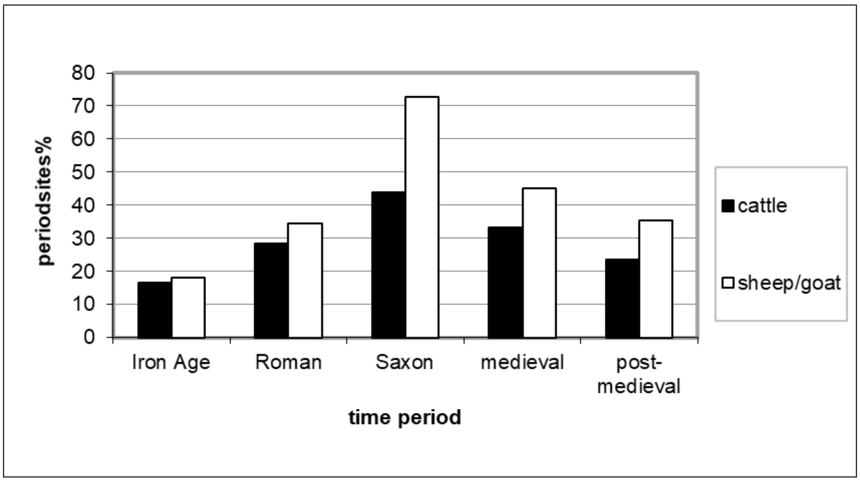

Fig 7.19 Evidence of horncore removal from cattle and sheep/goat, as a percentage of sites across central England with reports of butchery, by time period (information used: horncores chopped from base, sawn through base, chopped from skull).

7.5.3 Bone groups and rituals

Associated bone groups occur in the Saxon period only slightly less frequently than in the Roman period (*see* Fig 5.14). For a more detailed discussion of this evidence see Hamerow (2006) and Morris and Jervis (2011).

The evidence for the three main domesticates is very similar in its frequency. Of particular interest in the Saxon period is the occurrence of several examples of animal skeletons associated with funerary sites. Of such sites, the most famous is unquestionably the burial ground at Sutton Hoo (Suffolk), where, together with cremated remains of several other animals, a horse skeleton was found buried together with the body of a young man (Carver 2005). At Broughton Lodge, Willoughby-on-the-Wolds, Keyworth (58, Nottinghamshire; Harman 1993c), three horse and one sheep/goat skeleton were uncovered. One of the horses is certainly associated with a human male burial, while the sheep/goat is linked to a female inhumation. A horse articulated leg was also found in association with another human female burial. At Great Chesterford 52, near Saffron Walden (153, Essex; Serjeantson 1994), horse (two) and dog (two) skeletons were also found in connection with inhumations. One of the graves at this site also included a pig canine. Conversely, the early–middle Saxon funerary site of Little Chester, Derby (211, Derbyshire; Harman and Weinstock 2002) has produced an animal bone assemblage, but no partial skeletons, and no evidence is available of the use of animal remains as grave goods.

At the other early–middle Saxon burial site of Snape Cemetery, the truncated skeleton of an elderly horse was found. Most animal remains from this site are associated with cremations and include tentatively identified bone fragments of cattle, pig and equids. Another early Saxon cremation cemetery was found at Spong Hill VII, where 1,500 cremations were studied, 43% of which included, in addition to human bones, remains of the following animals: horse, sheep/goat, pig, cattle, dog, bear, red deer, roe deer, beaver, hare, domestic fowl, goose and fish (Bond 1996). Horse, 23% of the remains, is the best represented species in the cremations, and sheep/goat is mainly represented by the dismembered joints of prime meat animals. Both red and roe deer are exclusively represented by antler fragments, whereas the only bear specimen is a third phalanx. Spong Hill VII has also revealed an additional, unburned, animal bone assemblage deriving from sunken featured buildings and pits adjacent to the cemetery. This assemblage has an unusually high frequency of cattle bones, which is interesting in view of the fact that this species is not particularly well represented in the cremations. Bond (1996) also mentions other cremation sites, such as Caistor-on-Norwich (Norfolk), which has 28 cremations, 18% of which with animal bones, and Millgate, Newark on Trent (Nottinghamshire), which has 220 cremations, 18% of which with animal bones. Horse and sheep/goat are the best represented taxa at these other cemeteries, although cattle, pig and red deer are also common.

Bond and Worley (2006) note that few cremation cemeteries have been studied by zooarchaeologists. Animals are present in inhumations, but at a lower frequency and with less diversity. Bond and Worley (2006) compare the Spong Hill VII cremation fauna with that at West Stow: sheep/goat being the most common food animal in both, but with cattle being much rarer at the cemetery site. Dog and horse, well represented in the cremations, are also rare at West Stow.

Partial skeletons of dogs have been found at several Saxon sites, most remarkable among these being late Saxon Castle Mall and Flaxengate, where multiple skeletons were uncovered. None of these, with the exception of Great Chesterford 52, can, however, be confidently linked with any ritual or ceremonial significance. An interesting case is represented by a dog skeleton that was found inside a kiln (beneath the firebars) at Salter St, Stafford, Staffordshire (Clark 1998), which was subsequently filled with potsherds, and has been dated to early–mid-11th century AD. The dog was at least 4 years old, with a withers height of 530–570mm, similar in type to a large version of an English bull terrier. Clark (1998) speculates whether this is a deliberate burial, possibly votive, or whether the dog crept in through the flue, to die there. Whatever the interpretation of this find, it is unquestionable that the social perception of dogs was different from that of the main food domesticates, and the more frequent occurrence of dog bones in an articulated condition demonstrates this. A similar consideration can be made for domestic cats, which are also commonly found as articulated skeletons (at nine periodsites).

The discovery of several goose partial skeletons in a late Saxon pit at Flaxengate is intriguing and hard to interpret with any certainty. Similarly, three partial skeletons of raven were found at late Saxon Chalk Ln, a site that also produced cut marks on bones of this species (section 7.5.1). Considering the symbolic value that it had in the Roman period (*see* section 6.5), it is conceivable that this species was still regarded as having a special meaning and therefore that these burials may have a ritual significance.

8 MEDIEVAL

8.1 The context

The medieval period covers about five centuries encompassing more well-documented historical events than could be summarised within this review. There are, however, a few key events and phenomena that characterise the period that are essential for the interpretation of the zooarchaeological evidence, and a brief mention is required for the understanding of the rest of this chapter.

The Norman Conquest of AD 1066 traditionally signals the end of the Saxon period and the beginning of the Middle Ages in England. This terminology is rather obsolete and inconsistent with that adopted in the rest of Europe, where the beginning of the medieval period coincides with the demise of the Roman Empire. It is, however, adopted here out of convenience, as it would have been problematic to review a whole millennium of zooarchaeological data within a single chapter. Needless to say archaeological layers do not abide by the neater rules of historical chronology and it is often not possible to separate late Saxon and early medieval phases, also because of similarities in ceramic forms. The term Saxo-Norman has therefore been created for these situations, and is applied to some of the site periods discussed here.

Apart from marking the transition into a new historical period, the Norman invasion also provided us with an important document, the Domesday Book, which surveyed properties across the country and was completed in 1086. Livestock was also censused, but the raw figures of the number of animals are only preserved in that part of the book known as Little Domesday, which covers the eastern counties of Essex, Suffolk and Norfolk (all within the central England study area). Despite the well-known difficulty in comparing livestock and deadstock data, the Domesday Book should not be ignored by zooarchaeologists.

The five (or four and half) centuries of the medieval period can also rather naturally be divided into pre- and post-Black Death periods, because of the immense impact that the plague of the mid-14th century had on the English population (Postan 1972; Hatcher 1977). With one of the worst famines in history also documented for the earlier part of the century, the 14th century can clearly be regarded as a time of crisis. This is important for our understanding of landscape use, mainly because of the substantial population decline. The population did not start increasing again until the 16th century (Wrigley and Schofield 1981), therefore leaving the country with almost two centuries of relatively low demographic density, and an increased reliance on pasture rather than arable agriculture.

The level of urbanisation increased substantially from the Saxon period, although it was subject to much fluctuation, before starting to increase steadily again in the post-medieval period. This obviously had many consequences on trade, mobility, settlement and consumption. Linked to this phenomenon is the expansion of a market economy. Although it would be wrong to assume that the early medieval economy was entirely based on self-sufficiency, by the late 13th century a gradual change was well on its way, with many more items being purchased rather than produced (Dyer 1988).

The increasing social inequality that characterises the medieval period means that conspicuous consumption by the aristocracy (cf Woolgar 1999) reached greater heights than in preceding periods, and stone-built castles typically included deer parks for the exclusive entertainment of the lords and their acolytes (Sykes 2006b). This has obvious consequences for the interpretation of social status and wealth through zooarchaeological evidence.

8.2 The sites

The evidence discussed in this chapter relies on 157 gazetteer sites, which includes material attributable to the Saxon–medieval transition. These also include nine reports that exclusively deal with fish bones, with no equivalent evidence available for mammals or birds. Assemblages dated to the medieval–post-medieval transition, which also occur, will be discussed in Chapter 9. In total, the medieval period includes 255 periodsites, with material deriving from hand-collection, sieving or both. This value excludes the occasional duplication arising from separate reporting of different categories of vertebrates. The amount of evidence is approximately double that for the Saxon period, and highly comparable with the number of assemblages known for the Roman period. The proportion of multi-phased sites is much greater that for the preceding periods, therefore providing a greater opportunity for intra-site diachronic comparison. There are many sites that produced animal bone assemblages that could be assigned to two different phases, and some (15) have material that comes from three or more phases. The site with the highest number of medieval phases is Alms Ln, Norwich (site code 4, Norfolk; Cartledge 1985; Harman *et al* 1985; Jones and Scott 1985), which has five chronologically distinct assemblages.

The geographical distribution of sites is remarkably similar to the Saxon period (*see* Fig 7.1), with a concentration of evidence in Norfolk and the counties located in the central–southern part of central England (Fig 8.1). In the medieval period, however, Essex is also fairly well represented, and the evidence from the western part of the region, though still sparse, is richer than the Saxon period. This is probably a consequence of the greater spread of urban centres, where local environmental contexts may have produced less acidic soils than those commonly found in the surrounding countryside. There is no medieval site that has provided assemblages comparable in size to the largest sites of the Saxon period, but there is, however, a larger number of sites that have reasonably large animal bone assemblages. The sites providing the largest animal bone assemblages are summarised in Table 8.1, by time period and county.

Most sites that have provided zooarchaeological data can generically be attributed to the various 'urban' and 'rural' categories, although the former are approximately three times as common as the latter, therefore enhancing further a trend already seen in the late Saxon period. Among other site categories it is worth mentioning the occurrence of 12 castles and 11 ecclesiastic sites.

Whenever possible assemblages have been attributed to the following approximate and fairly arbitrary periods:

- Saxo-Norman, *c* AD 950–1150
- early medieval, *c* AD 1150–1250
- high (or middle) medieval, *c* AD 1250–1400
- late medieval, *c* AD 1400–1500.

Many sites, however, could only be assigned to the generic medieval period, and others did not fit these chronological categories. Those that could be attributed are rather evenly spread between the sub-time periods, therefore allowing more reliable chronological comparison.

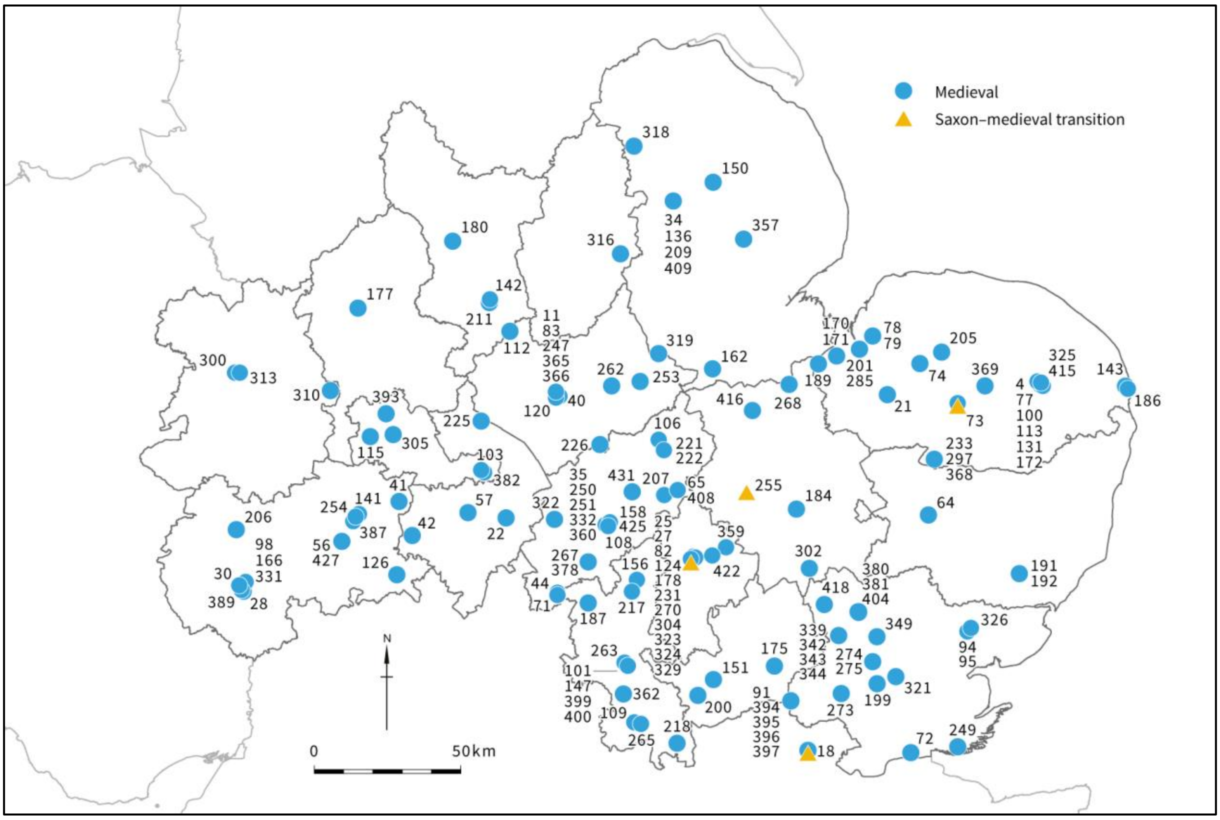

Fig 8.1 The distribution of medieval sites across central England. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text.

Table 8.1 Sites with a total number of identified specimens (NISP) of the main food species (cattle, sheep/goat and pig) >400.

County	Saxo-Norman	Early medieval	Middle medieval	Late medieval
Northamptonshire		Lyveden; West Cotton	Lyveden; West Cotton; The Green	St Peter's St; The Green (12th to 14th century AD)
Leicestershire		Shires sites	Shires sites	Shires sites
Lincolnshire	Flaxengate; Goltho		Flaxengate; Lincoln sites	
Norfolk	Castle Acre; Castle Mall; St Martin-at-Palace Plain; Thetford 64–70	Castle Acre; Castle Mall; St Martin-at-Palace Plain; Thetford 64–70	King's Lynn; St Martin-at-Palace Plain; Whitefriars St	Alms Ln ×2; Castle Mall; King's Lynn
Hereford and Worcester/West Midlands/Warwickshire		Berrington St; Evesham Abby; Friar St	Dudley Castle; Friar St	Dudley; St Peter's School; Town Wall

8.3 Species occurrence and frequency

8.3.1 Domestic animals

A crude analysis of the proportions of the main domestic mammals in the medieval period reveals an increase in the frequency of sheep/goat at the expense of pig (Fig 8.2), in comparison with the Saxon period (*see* Fig 7.2). Once outliers are removed, this difference is highly statistically significant according to a one-way ANOVA test (*see* Table

6.1) but, when this is done, the decline shows up in cattle rather than pig. The inconsistency is because some of the removed outliers are large assemblages that contribute significantly to Figs 7.2 (Saxon) and 8.2 (medieval). Whatever calculation is adopted, however, sheep/goat bones are, as a whole, relatively more abundant in the medieval rather than Saxon period. Although cattle is still, even in the medieval period, the most common taxon, this is almost certainly an artefact of recovery bias, although there are too few large sieved assemblages to test this hypothesis. A comparison of documentary, including the Domesday Book, and archaeological sources also indicates that sheep is likely to be under-represented in the archaeological context (Albarella 1999).

Fig 8.2 Relative proportions of the three main domestic taxa, based on the number of identified specimens (NISP) of all hand-collected assemblages from medieval periodsites across central England, regardless of assemblage size.

Details of the proportion of the main domesticates in the largest assemblages can be found in Table 8.2. These are arranged by periods in Figs 8.3–8.5 and indicate clearly that the differences between the Saxon and medieval periods are the product of a long-term change. However we look at the data, a trend showing an average increase in sheep/goat and decrease in cattle and pig emerges. For instance, sites with a cattle frequency that is higher than 40% amount to 81% in the early medieval period, but they decrease to 75% in the high medieval and further to 59% in the late medieval period. Pigs also decline gradually, with 36% of the early medieval sites having more than 20% pig remains, but only 17% in the high medieval and none at all in the late medieval period. A statistically significant decline in pig frequencies also emerges when Saxo-Norman sites are compared with the middle and late medieval sites combined (P=0.002**). A gradual increase in sheep/goat is demonstrated by the increase in the proportion of assemblages with more than 40% remains of this taxon: 36%, 50% and finally 76% in the three sub-time periods, respectively. Visually this trend can also be observed in the tripolar diagram in Fig 8.6, which shows that the late medieval assemblages tend to plot in the right and lower part of the distribution, namely towards the sheep/goat vertex. Figure 8.7 plots the relative proportions by summing all remains from all available assemblages and then calculating the percentage, rather than calculating the percentage for each site and then establishing the mean value. This has allowed us to include the contribution of small assemblages which, otherwise, taken on their own, may have provided too small a sample size to generate a reliable percentage value. The trend of a gradual increase in sheep/goat, mirrored by a decrease in pig, within the medieval period, is apparent. Although cattle is most abundant in the early medieval period, the difference between sub-time periods in this type of calculation is tenuous.

Table 8.2 Medieval sites from central England with a combined cattle, sheep/goat and pig number of identified specimens (NISP) >400. The sites are grouped approximately by date. Coll refers to the method of collection (HC=hand-collected, BS=bulk sieved). The NISP count shown is that of the three main domesticates combined. Site numbers refer to those shown on the map in Fig 8.1, and are as given in the gazetteer (Appendix 1).

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	11	Austin Friars, Leicester	Leicestershire	Medieval (broad category)	Friary	60	29	11	6 530
HC	30	Bewell House, Hereford	Hereford and Worcester	Medieval (broad category)	Urban	56	34	10	5 330
HC	57	Brook St (25–33), Warwick	Warwickshire	Medieval (broad category)	Urban	25	64	11	1 468
HC	65	Burystead, Raunds, near Wellingborough	Northamptonshire	Medieval (broad category)	Village	39	43	17	459
HC	79	Castle Rising Castle, near King's Lyn	Norfolk	Medieval (broad category)	Castle	33	24	43	1 212
HC	94	Colchester 71–85	Essex	Medieval (broad category)	Urban	45	29	26	2 408
HC	205	Launditch Hundred	Norfolk	Medieval (broad category)	Village	31	51	18	422
HC	217	Loughton, Milton Keynes	Buckinghamshire	Medieval (broad category)	Village	44	38	19	296
HC	387	Upwich, Droitwich	Hereford and Worcester	Medieval (broad category)	Industrial	34	56	10	670
HC	400	Walton, Aylesbury	Buckinghamshire	Medieval (broad category)	Manor	36	47	16	1 784
HC	18	Barking Abbey, Barking	Essex	10th to 12th century AD	Ecclesiastic	37	30	33	472
HC	82	Cauldwell St, Bedford	Bedfordshire	10th to 12th century AD	Urban	48	36	16	284
HC	233	Mill Ln, Thetford	Norfolk	10th to 12th century AD	Urban	51	23	26	1 547
HC	77	Castle Mall, Norwich	Norfolk	Saxo-Norman (11th to 12th century AD)	Castle	51	24	25	870
HC	136	Flaxengate, Lincoln	Lincolnshire	Saxo-Norman (11th to 12th century AD)	Urban	47	42	11	20 217
HC	150	Goltho, near Wragby, Lincoln/Horncastle	Lincolnshire	Saxo-Norman (11th to 12th century AD)	Manor	33	41	26	1 177
HC	192	Ipswich 74–88	Suffolk	Saxo-Norman (11th to 12th century AD)	Urban	43	28	29	9 198

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	325	St Martin-at-Palace Plain, Norwich	Norfolk	Saxo-Norman (11th to 12th century AD)	Urban	40	29	30	3 766
HC	368	Thetford 64–70	Norfolk	Saxo-Norman (11th to 12th century AD)	Urban	44	39	17	4 018
HC	400	Walton, Aylesbury	Buckinghamshire	Saxo-Norman (11th to 12th century AD)	Rural	36	44	20	2 005
HC	115	Dudley Castle	West Midlands	Mid-11th to late 12th century AD	Castle	43	26	31	253
HC	323	St John's St (20–4), Bedford	Bedfordshire	11th to 13th century AD	Urban	40	51	8	2 177
HC	324	St John's St (29–39), Bedford	Bedfordshire	11th to 13th century AD	Urban	36	52	12	2 910
HC	399	Walton Rd, Aylesbury	Buckinghamshire	11th to 13th century AD	Urban	34	51	15	469
HC	409	West Parade, Lincoln	Lincolnshire	11th to 13th century AD	Urban	49	45	7	3 280
HC	427	Worcester Rd, Droitwich	Hereford and Worcester	11th to 13th century AD	Urban	46	44	10	491
HC	83	Causeway Ln, Leicester	Leicestershire	11th to 14th century AD	Urban	40	46	14	4 895
HC	141	Friar St, Droitwich	Hereford and Worcester	12th century AD	Urban	50	28	21	513
HC	25	Bedford Castle	Bedfordshire	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Castle	53	31	16	1 880
HC	28	Berrington St, Hereford	Hereford and Worcester	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Urban	64	25	12	1 578
HC	94	Colchester 71–85	Essex	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Urban	53	23	24	780
HC	126	Evesham Abbey, Evesham	Hereford and Worcester	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Ecclesiastic	49	37	13	441

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	142	Full St, Derby	Derbyshire	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Urban	40	50	10	603
HC	201	King's Lynn	Norfolk	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Urban	34	46	20	1 764
HC	325	St Martin-at-Palace Plain, Norwich	Norfolk	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Urban	39	34	27	5 274
HC	365	The Shires (Little Ln), Leicester	Leicestershire	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Urban	41	44	15	511
HC	366	The Shires (St Peter's Ln), Leicester	Leicestershire	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Urban	41	43	15	1 524
HC	408	West Cotton, Raunds, near Wellingborough	Northamptonshire	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Manor	47	33	20	1 609
HC	415	Whitefriars St, Norwich	Norfolk	Early medieval, ie AD 1150–1250 or mid-12th to mid-13th century AD	Urban	46	30	24	897
HC	98	Commercial Rd, Hereford	Hereford and Worcester	12th to 13th century AD	Urban	71	20	9	755
HC	313	Shrewsbury Abbey, Shrewsbury	Shropshire	12th to early 14th century AD	Monastic	55	17	27	771
HC	35	Black Lion Hill, Northampton	Northamptonshire	12th to 14th century AD	Urban	34	59	7	594
HC	77	Castle Mall, Norwich	Norfolk	12th to 14th century AD	Urban	47	36	17	366
HC	147	George St, Aylesbury	Buckinghamshire	12th to 14th century AD	Urban	45	38	17	1 128
HC	221	Lyveden (III)	Northamptonshire	12th to 14th century AD	Deserted medieval village	33	44	22	365

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	254	Old Bowling Green, Droitwich	Hereford and Worcester	12th to 14th century AD	Urban	60	32	8	506
HC	332	St Peter's St, Northampton	Northamptonshire	12th to 14th century AD	Urban	43	40	17	2 442
HC	360	The Green, Northampton	Northamptonshire	12th to 14th century AD	Urban	31	61	7	4 327
HC	360	The Green, Northampton	Northamptonshire	12th-14th century AD	Industrial	6	92	3	953
HC	44	Brackley Castle Ln, Brackley	Northamptonshire	13th century AD	Urban	31	61	8	1 482
HC	113	Dragon Hall, King St, Norwich	Norfolk	Late 13th to early 14th century AD	Urban	39	40	21	409
HC	115	Dudley Castle	West Midlands	Late 13th to early 14th century AD	Castle	19	10	71	902
HC	115	Dudley Castle	West Midlands	14th century AD	Castle	66	20	14	1 554
HC	207	Lime St, Irthlingborough	Northamptonshire	14th century AD	Manor	41	46	13	394
BS	313	Shrewsbury Abbey, Shrewsbury	Shropshire	14th century AD	Monastic	59	18	23	472
HC	4	Alms Ln, Norwich	Norfolk	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Urban	41	44	15	1 093
HC	25	Bedford Castle	Bedfordshire	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Urban	61	26	13	589
HC	136	Flaxengate, Lincoln	Lincolnshire	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Urban	47	44	9	1 952
HC	141	Friar St, Droitwich	Hereford and Worcester	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Urban	46	29	24	1 193

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	187	Hunter St, Buckingham	Buckinghamshire	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Farm	4	96	0	432
HC	201	King’s Lynn	Norfolk	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Urban	49	36	15	5 118
HC	209	Lincoln sites	Lincolnshire	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Urban	54	35	10	403
HC	222	Lyveden (IV)	Northamptonshire	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Deserted medieval village	49	42	8	415
HC	365	The Shires (Little Ln), Leicester	Leicestershire	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Urban	41	43	16	447
HC	366	The Shires (St Peter’s Ln), Leicester	Leicestershire	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Urban	47	37	16	1 623
HC	373	Thuxton, near East Dereham	Norfolk	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Deserted medieval village	25	34	41	552
HC	408	West Cotton, Raunds, near Wellingborough	Northamptonshire	High medieval, ie AD 1250–1400 or mid-13th to beginning 15th century AD	Village	28	56	16	1 463
HC	98	Commercial Rd, Hereford	Hereford and Worcester	13th to 15th century AD	Urban	68	22	10	542
HC	325	St Martin-at-Palace Plain, Norwich	Norfolk	High medieval–late medieval	Urban	52	24	24	1 308
HC	366	The Shires (St Peter’s Ln), Leicester	Leicestershire	High medieval–late medieval	Urban	45	39	16	1 459
HC	4	Alms Ln, Norwich	Norfolk	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	53	35	12	1 022

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	4	Alms Ln, Norwich	Norfolk	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	46	41	12	909
BS	40	Bonners Ln, Leicester	Leicestershire	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	1	95	3	796
HC	77	Castle Mall, Norwich	Norfolk	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	42	41	16	743
HC	115	Dudley Castle	West Midlands	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Castle	68	21	11	2 716
HC	156	Great Linford, Milton Keynes	Buckinghamshire	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Village	37	44	19	945
HC	201	King's Lynn	Norfolk	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	50	35	15	1 356
HC	209	Lincoln sites	Lincolnshire	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	55	35	10	375
HC	222	Lyveden (IV)	Northamptonshire	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Deserted medieval village	42	41	17	711
HC	331	St Peter's School, Gaol St, Hereford	Hereford and Worcester	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	38	48	14	481
HC	332	St Peter's St, Northampton	Northamptonshire	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	30	61	8	1 282
HC	360	The Green, Northampton	Northamptonshire	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	42	49	10	1 394

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep/goat, %	Pig, %	NISP
HC	365	The Shires (Little Ln), Leicester	Leicestershire	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	33	50	17	1 291
HC	365	The Shires (Little Ln), Leicester	Leicestershire	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	33	52	15	584
HC	366	The Shires (St Peter's Ln), Leicester	Leicestershire	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	44	44	13	1 671
HC	382	Town Wall, Coventry	West Midlands	Late medieval, ie AD 1400–1500 or beginning 15th to beginning 16th century AD	Urban	48	40	12	645
HC	408	West Cotton, Raunds, near Wellingborough	Northamptonshire	Late AD medieval, ie 1400–1500 or beginning 15th to beginning 16th century AD	Rural	14	77	9	400
BS	313	Shrewsbury Abbey, Shrewsbury	Shropshire	Mid-15th to early 16th century AD	Monastic	58	18	25	410

Table 8.2 continued

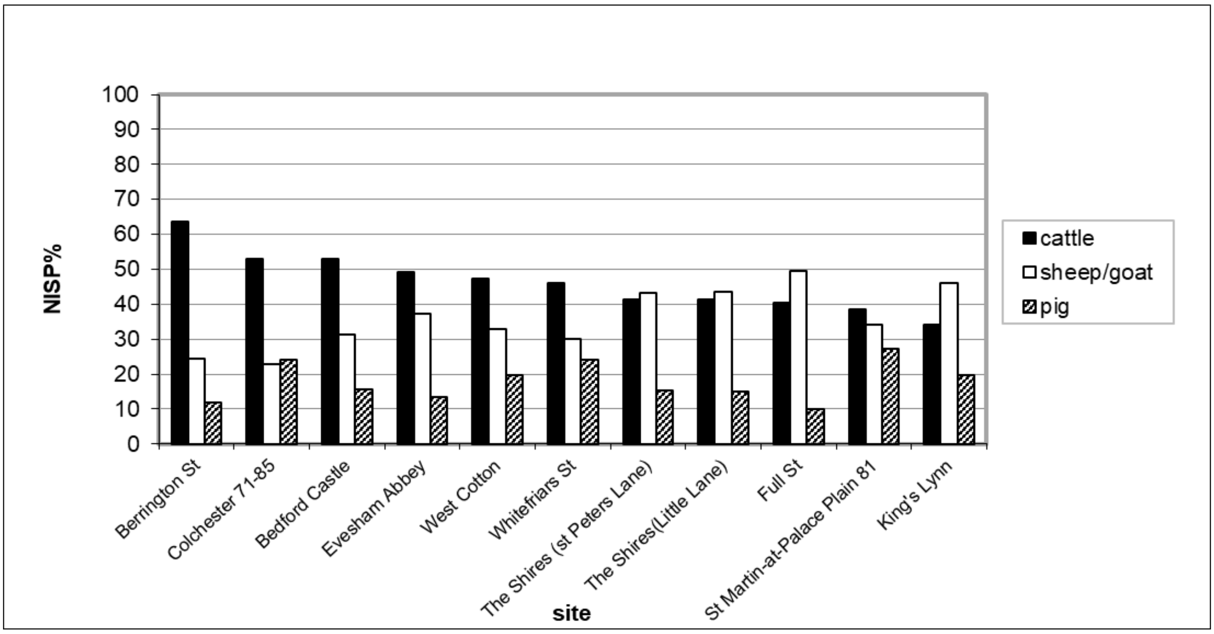

Fig 8.3 Summary of the three main domestic taxa at various early medieval sites across central England, as a percentage of number of identified specimens (NISP), grouped in order of decreasing cattle%. Only hand-collected assemblages with a total NISP for the three taxa >400 have been shown. For further details see Table 8.2.

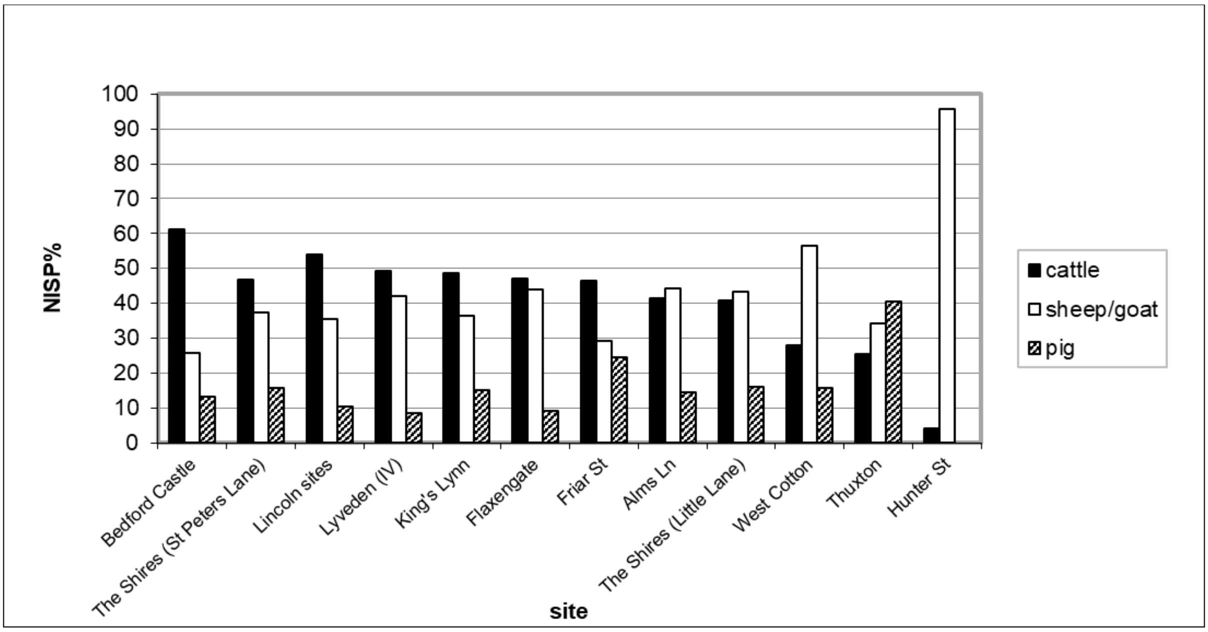

Fig 8.4 Summary of the three main domestic taxa at various high medieval sites across central England, as a percentage of number of identified specimens (NISP), grouped in order of decreasing cattle%. Only hand-collected assemblages with a total NISP for the three taxa >400 have been shown. For further details see Table 8.2.

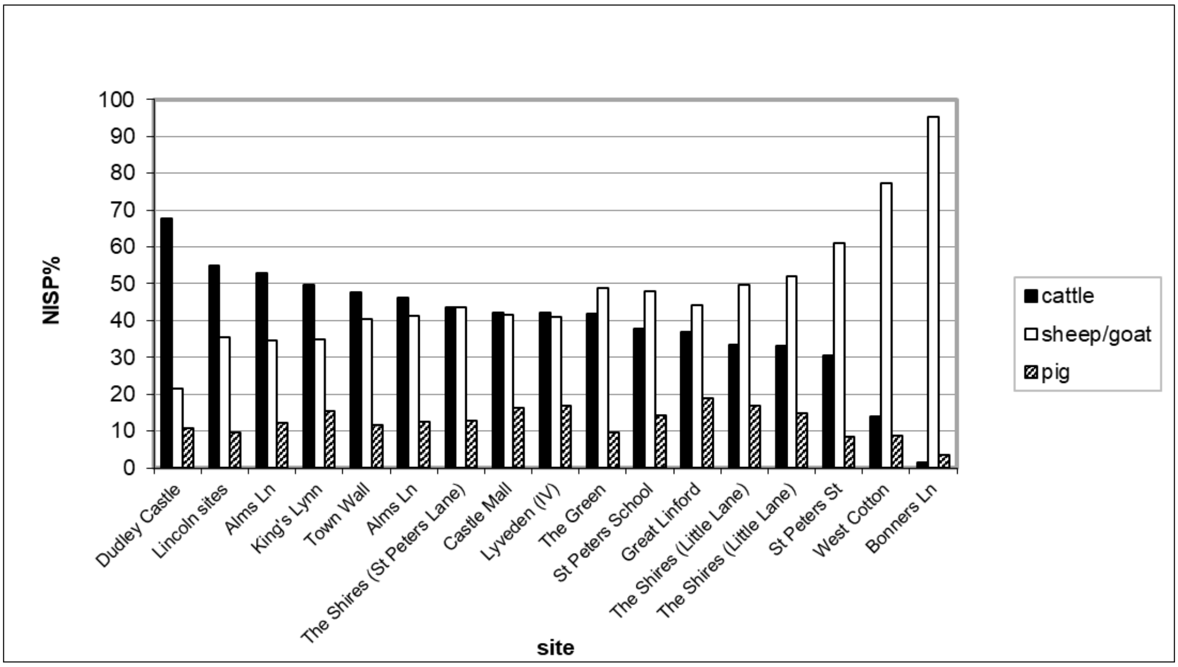

Fig 8.5 Summary of the three main domestic taxa at various late medieval sites across central England, as a percentage of number of identified specimens (NISP), grouped in order of decreasing cattle%. Only hand-collected assemblages with a total NISP for the three taxa >400 have been shown. For further details see Table 8.2.

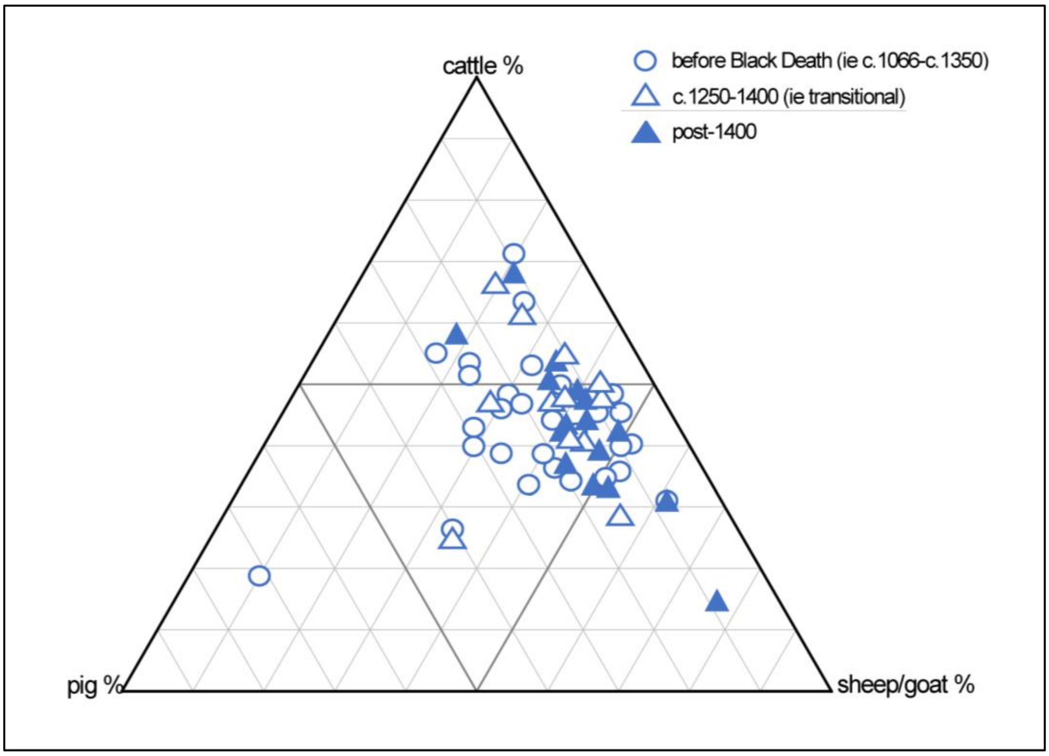

Fig 8.6 Relative proportions of cattle, sheep/goat and pig at periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from various sub-time periods of medieval sites across central England. All assemblages were hand-collected except a few where some sieving had occurred (for details see Table 8.2). Broadly dated periodsites have been omitted.

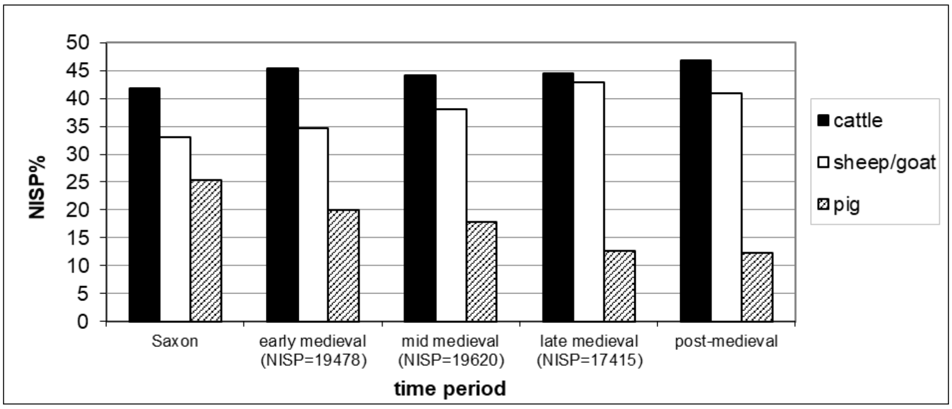

Fig 8.7 Relative proportions of cattle, sheep/goat and pig, as a percentage of the cattle+sheep/goat+pig number of identified specimens (NISP) for each time period, from periodsites across central England.

When taxon proportions are plotted geographically (Figs 8.8 and 8.9), the main trend that emerges is a higher frequency of sheep/goat in the central area of central England, which is likely to have been more rural and consequently more pastoral than the eastern area. The western area is anomalous in comparison with the trend for the period as a whole, mainly because of its relatively low sheep/goat frequencies. It has to be emphasised, however, that this area is only represented by a small number of sites and therefore small-sample bias may be influential. Pig frequency, which is higher in the eastern area, does not follow the pattern expected from historical sources, including the Domesday Book, which emphasises the East Midlands (ie the central area of central England) as the main area for pig husbandry (Harvey 1988; Campbell 2000). It is, however, possible that many of the pigs produced in the central area may have been exported to the urban markets further east, therefore ending up in bone assemblages from that area (Albarella 2006).

Figure 8.10 plots the larger assemblages according to rough categorisations of site types as urban, rural and high status. A trend that emerges fairly clearly is for rural sites to plot towards the sheep/goat area of distribution and for high-status sites to have a higher proportion of pigs. The different relative proportions of cattle and sheep/goat at medieval urban and rural sites has been discussed elsewhere (Albarella 2005a). It can be explained by the higher value attached to beef, which was more likely to be afforded by wealthier sectors of the urban population. In addition, urban markets made it easier to distribute the meat from the carcasses of larger animals, such as cattle. Being a typical meat animal, pig is unsurprisingly found in higher frequencies in high-status sites, where the average consumption of meat was likely to be high. A more in-depth discussion of these issues can be found in Albarella and Davis (1996) and Albarella (2006).

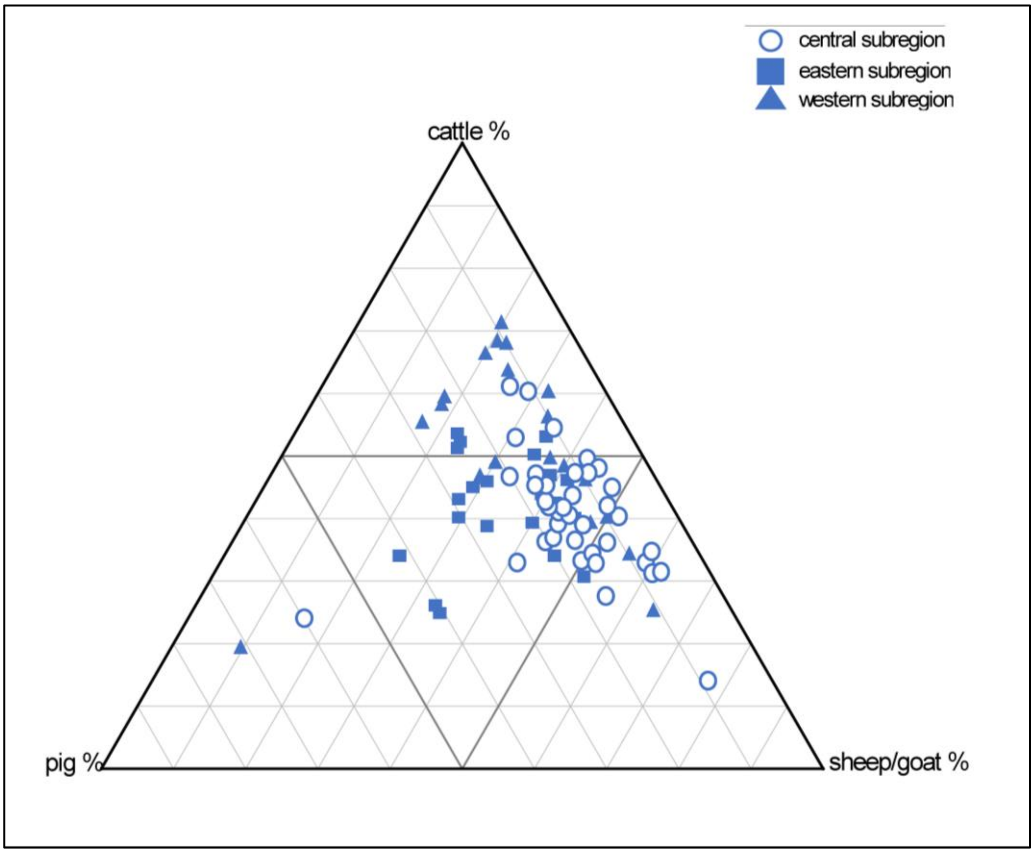

Fig 8.8 Relative proportions of cattle, sheep/goat and pig at periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from medieval sites across three different areas of central England. All assemblages were hand-collected except a few where some sieving had occurred (for details see Table 8.2).

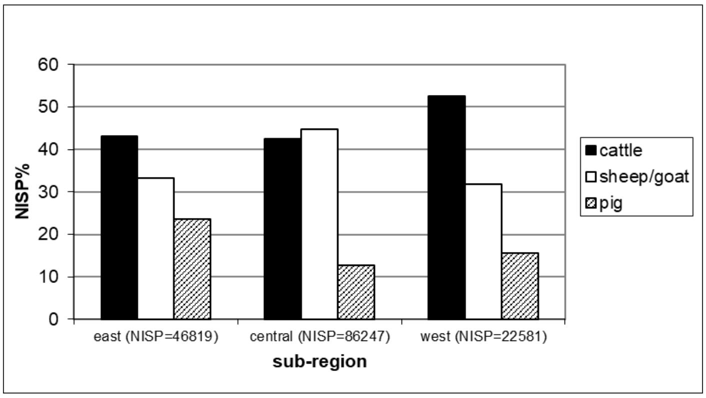

Fig 8.9 Relative proportions of cattle, sheep/goat and pig, as a percentage of the cattle+sheep/goat+pig number of identified specimens (NISP) for each sub-region, from medieval periodsites across central England.

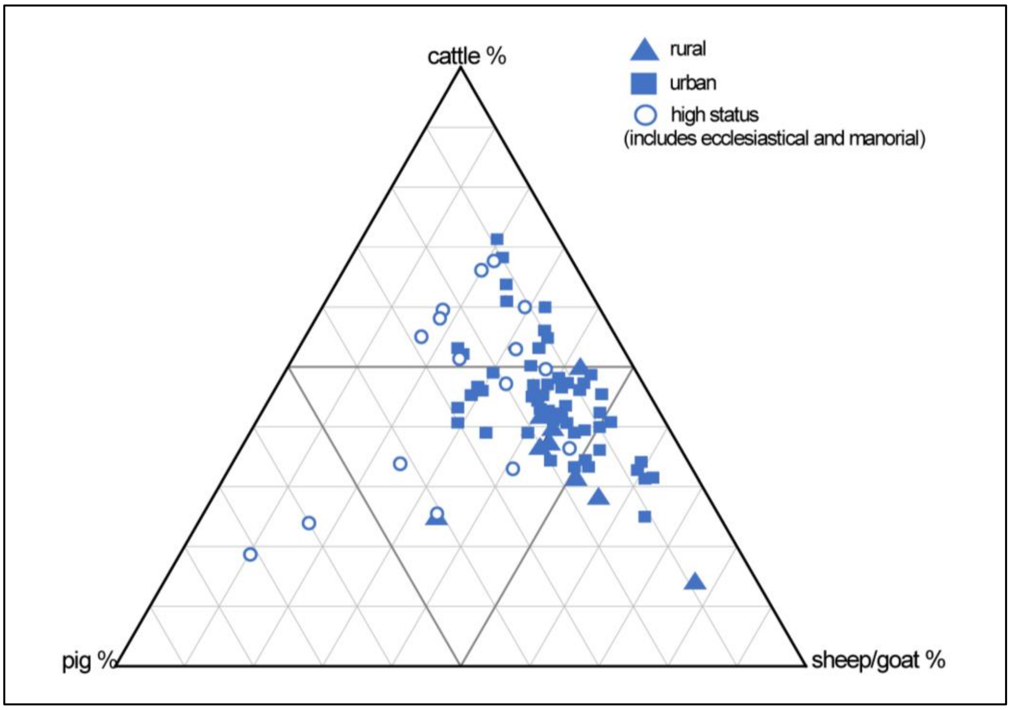

Fig 8.10 Relative proportions of cattle, sheep/goat and pig at periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from three medieval site types across central England (other categories have been omitted). All assemblages were hand-collected except a few where some sieving had occurred (for details see Table 8.2).

The identification of large-scale, general trends is useful but we must be wary of applying them uncritically to individual cases. In Fig 8.11, the variability that may exist between sites is clearly illustrated. Three urban sites are selected because of their rather large sample sizes (Table 8.2). At Castle Mall, Norwich (77, Norfolk; Albarella *et al* 1997, 2009), there is little change between late Saxon and Saxo-Norman phases, but the late medieval period is characterised by a much higher frequency of sheep/goat, that fits well with the countrywide trend. Data from the high medieval phase are not plotted as the assemblage from this sub-time period is small, but it does appear to be intermediate between earlier and later phases. Unlike Norwich, at Flaxengate, Lincoln (136, Lincolnshire; O'Connor 1982), the increase in sheep/goat occurs immediately after the Norman Conquest, and it is just sustained in later times. Both Castle Mall and Flaxengate have large proportions of cattle bones, which is in line with the characteristics identified for urban sites in the region, but Woolmonger St (a possibly revealing name!), Northampton (425, Northamptonshire; Armitage 1999), already has high sheep/goat frequencies in the late Saxon and Saxo-Norman levels, although these increase further in the medieval period.

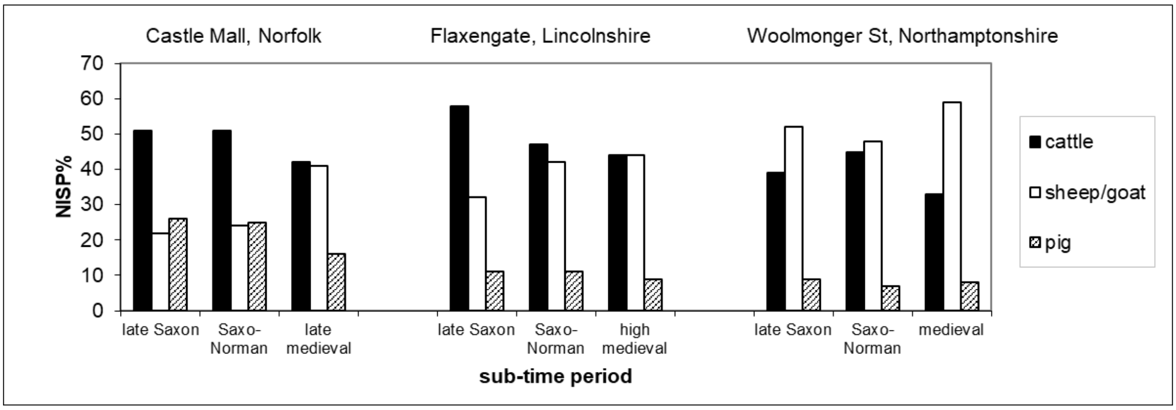

Fig 8.11 Relative proportions of cattle, sheep/goat and pig, as a percentage of the cattle+sheep/goat+pig number of identified specimens (NISP) for sub-time periods of selected sites within central England that have large periodsite assemblages.

What emerges from this discussion is that, despite inter-site and geographical variability, in central England a consistent pattern of gradual change in the relative proportion of the main domestic mammals can be detected. This pattern is part of a long-lasting trend, which is mainly characterised by the ever-increasing importance of wool production (Albarella 1997d), which is reflected in increasing frequencies of sheep/goat remains. The pig decline can probably be associated with, among other factors, the gradual depletion of woodland (Albarella 2006), while cattle gradually lost the importance that it had had as the main traction animal, at the expense of the horse, a phenomenon that in East Anglia is known to have already begun in the early medieval period (Langdon 1986). Similar diachronic patterns have also been identified in northern England (Huntley and Stallibrass 1995) and in the southern Midlands (mainly Oxfordshire) (Robinson and Wilson 1987).

There are indications that this general economic change had already started taking place at the Saxon–medieval transition, but it certainly continued throughout the medieval period. The effect of the plague in the 14th century must certainly have been intense, but this is difficult to demonstrate because of the dearth of sites that have a stratigraphy that allows a pre- versus post-Black Death comparison. An exception is represented by Dudley Castle (115, West Midlands; Thomas and Locock 2000; Thomas 2005a), where post-13th-century changes, eg a clear decrease in pigs, can indeed be detected. Forest depletion, the emergence of the market and tenurial reorganisation can all be linked with the zooarchaeological data (Thomas 2005b). In general, the opening up of the landscape, as a result of the demographic decline caused by the Black Death, probably contributed to a move towards a more pastoral economy (Harvey 1991), in which large flocks of sheep probably fitted well.

As in all periods in central England, sheep far outnumber goats, although in the Saxo-Norman phase the presence of the goat is recorded at about 50% of the sites, in line with the situation witnessed in the late Saxon period. Subsequently, however, goat remains gradually become rarer (*see* Fig 6.9), and by the late medieval period the species is as infrequent as it was in the Roman period. As in the Saxon period, there is a particular dearth of goat remains on rural sites. In the medieval period, goat occurrence is recorded at only two rural sites: Boteler's Castle, Alcester (42, Warwickshire; Pinter-Bellows 1997), and Walton, Aylesbury (400, Buckinghamshire; Noddle 1976). In neither case do these remains seem to derive from industrial refuse, as is instead the case for a number of urban sites. At Harrison St, Hereford (166, Hereford and Worcester; Baxter in press), a deposit of goat horncores and foot bones has been interpreted as evidence for hide processing. The geographical distribution of goat remains is remarkably similar to the Saxon period, with the highest frequency of records in the western area, but a relatively higher proportion of horncore deposits in the presumably more urbanised east (Fig 8.12).

The gradual decline of the goat in the medieval period has been documented before, by both historical (Dyer 2004) and archaeological sources (Albarella 1997d). The depletion of the forest and the enclosure of the fields made the goat an unwelcome animal in the later part of the medieval period, mainly because of its destructive feeding habits (Albarella 1997d). The over-representation of horncores compared with teeth and post-cranial bones may be the product of an independent overseas trade, which may have been more intensive in the east (Albarella 2003b). The greater importance of goat husbandry in the western areas is also supported by documentary evidence (Dyer 2004).

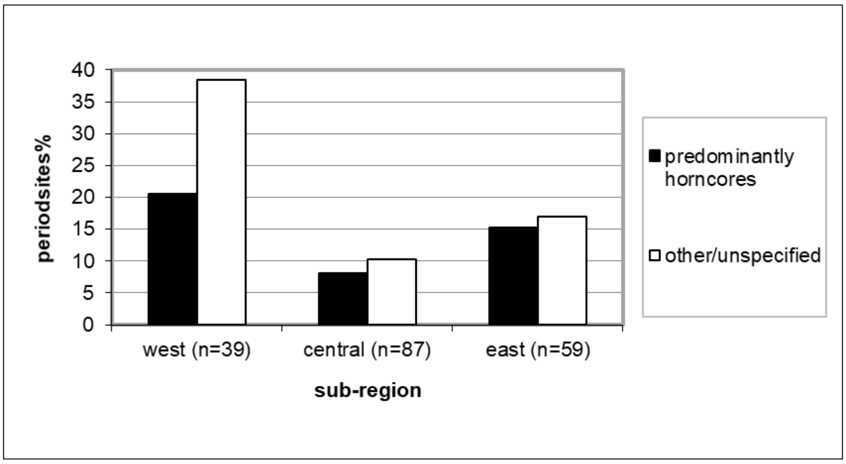

Fig 8.12 Occurrence of goat by body part and sub-region, as a percentage of periodsites across central England, where n *is the number of medieval periodsites where hand-collected sheep/goat is recorded within a sub-region.*

Horse was an important component of medieval life and is almost ubiquitous in animal bone assemblages from the area (it is reported at 142 periodsites). Its overall frequency in comparison with the Saxon period increases (from 1.7% to 2.7%), but it is still lower than in the Roman period. However, so many factors affect the deposition and consequent recovery of horse bones, that it would be unwise to read too much in these figures. More significant is the clear prevalence of horse bones in rural sites (Fig 8.13), which is also probably a consequence of several factors (cf Albarella 2005a). Firstly, horses were often used in urban environments but probably rarely died there (see also Langdon 1986), which means that their bones would not often turn up in the same rubbish tips as those of the more typical food animals. Secondly, the rarity of sealed deposits in villages means that in these sites the overall preservation of animal bones tends to be worse, which favours the large and robust equid bones and teeth. Finally, average meat consumption in rural sites (especially those of lower status) was lower than in towns, which means that non-food animals tend, in relative terms, to be better represented.

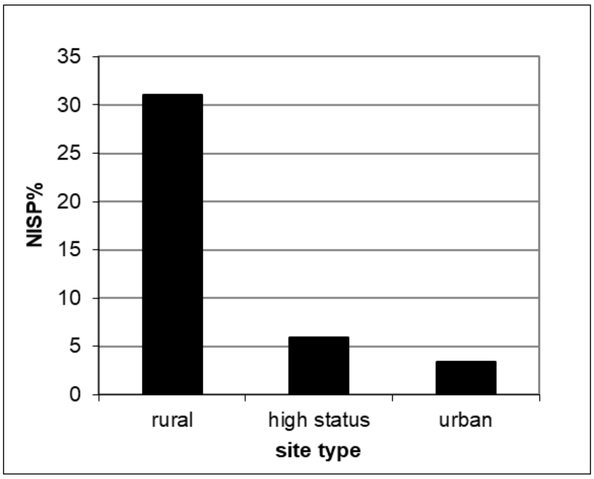

Fig 8.13 Occurrence of horse, as a percentage of hand-collected cattle+horse number of identified specimens (NISP), at different types of medieval sites across central England.

The gradual replacement of oxen with horses during the medieval period is a well-attested historical phenomenon (Langdon 1986). A crude comparison of the overall relative proportions of cattle and horses between early and late medieval periods does not reveal any significant difference, with the latter representing on average about 5–6% of the total of cattle and horse bones. The large number of factors affecting these figures, such as site type, context and geography, should, however, guard us from interpreting this evidence as contradicting the historical sources. A better approach is to analyse diachronic trends site by site in order to reduce the number of complicating factors, particularly in rural sites. The only rural site in central England with a large assemblage and an appropriate chronological sequence is West Cotton, Raunds, near Wellingborough (408, Northamptonshire; Albarella and Davis 1994), which indeed confirms a clear trend towards an increase in horse remains in the later medieval sub-time period. More work is needed to find out if this pattern occurs at other sites.

For the first time since the Roman period, the occurrence of the donkey is reported at two sites. These are King’s Lynn (201, Norfolk; Noddle 1977a), where two mandibles were discovered in high medieval levels, and Woolmonger St, where a single molar derives from a late medieval context. Perhaps identifications based on loose teeth should be considered cautiously, but at the same time the possibility that donkey remains may have been overlooked among the plethora of equid bones labelled as ‘horse’ is high. Donkeys are frequently mentioned in the Domesday Book (Williams and Martin 1992) and were therefore clearly present in medieval England, although they certainly did not have the economic importance that characterises this species at lower latitudes.

Dog is even more frequently recorded than horse (160 periodsites) and, as in the Saxon period, is found both as loose and articulated bones. Examples of partial or complete skeletons include those found at St Peter’s St, Northampton (12th to 14th century; 332, Northamptonshire; Harman 1979), Causeway Ln, Leicester (11th to 14th century; 83, Leicestershire; Gidney 1999a), Stansted Airport (RWS), Stansted (13th century; 344, Essex; Hutton 2004g) and Stansted Airport (DFS), Stansted (medieval; 342, Essex; Hutton 2004d). These include neonatal, immature and adult animals and may represent a combination of casualties and pet burials.

Cat is only marginally less frequently reported than dog (143 periodsites). Considering that their smaller bones are more likely to be overlooked on-site, it is likely that cats were at least as common as dogs. Particularly abundant assemblages have been found at

Causeway Ln (11th to 14th century, NISP=525), Flaxengate (11th to 12th century, NISP=240; high medieval, NISP=78), and The Shires (Little Ln and St Peter's Ln), Leicester (early medieval, NISP=52; high medieval, NISP=25; high–late medieval, NISP=230; late medieval, NISP=37) (365 and 366, Leicestershire; Gidney 1991a, 1991b, 1991c, 1992a, 1992b). At Castle Mall and West Cotton they are also common, although at these sites the more selective recording system means that the actual numbers are lower. Cats are often found as articulated skeletons or partial skeletons, either individually or as groups. These larger groups are discussed in greater detail in section 8.5.

Rabbits are supposed to have been introduced to the English countryside by the Normans (Veale 1957), although Sykes and Curl (2010) suggest that this event should be post-dated to the late 12th century. As expected, rabbit frequency is much increased from the Saxon period, being found at 62 periodsites. Dudley Castle has a particularly large assemblage, with more than 500 remains, possibly intrusive. These animals were certainly exploited in the medieval period, probably for both meat and fur. Although they could be hunted, rabbits were mainly exploited with the use of warrens, and they increased in importance after the Black Death, at least in East Anglia (Bailey 1988). The burrowing habits of this species generate a constant problem in establishing a secure chronological context for their remains, however, preventing the opportunity of a reliable diachronic comparison.

In the medieval period domestic fowl is the most common bird in central England, as in any period from the Iron Age onwards. Although its overall frequency increases from the Saxon period, its relative frequency compared with other birds decreases (Fig 8.14). The greater abundance of bird remains in the medieval period is probably associated with a greater diversification of the diet, perhaps a consequence of greater overall wealth.

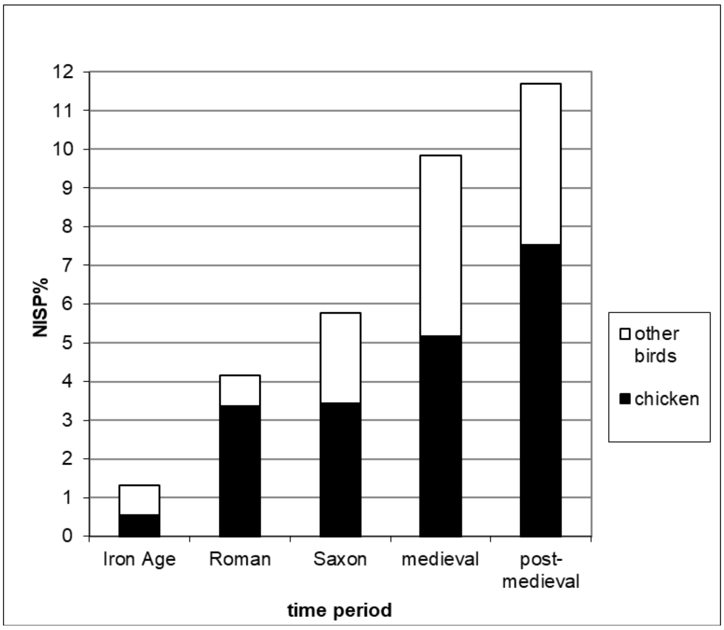

Fig 8.14 Occurrence of chicken and other birds, as a percentage of all hand-collected mammal+bird number of identified specimens (NISP), from Iron Age to post-medieval periodsites across central England. Including material from sieved assemblages produced similar results (data not shown).

The domestic goose is the second most common bird in medieval sites from central England. While in the Roman period the domestication of the goose is questionable, this is beyond doubt in the Saxon period (*see* section 7.3), and by the medieval period most ‘goose’ identifications probably represent domestic birds. Geese were likely to have been used for a variety of purposes, including the production of meat, eggs, feathers and down, which made them valuable as part of a minor economic activity.

The relative proportion of geese to ducks does not change substantially during the medieval period, although geese appear to be slightly more predominant than in the Saxon period. It is possible that domestic ducks did not become widespread until the late medieval period (Harper 1972), and in any case their meat was regarded as much less valuable than that of the goose (Albarella 2005b). The relative proportion of ducks and geese at rural and urban sites is almost identical to the pattern recorded in the Saxon period, but the higher proportion of duck bones on high-status sites that typifies the Saxon period does not characterise the medieval period (Fig 8.15). This supports the view provided in Chapter 7 that a higher incidence of wild duck consumption occurred on Saxon high-status sites. Conversely, in the medieval period a higher component of the ‘duck’ category probably comprises domestic birds, which explains why that anomaly no longer exists.

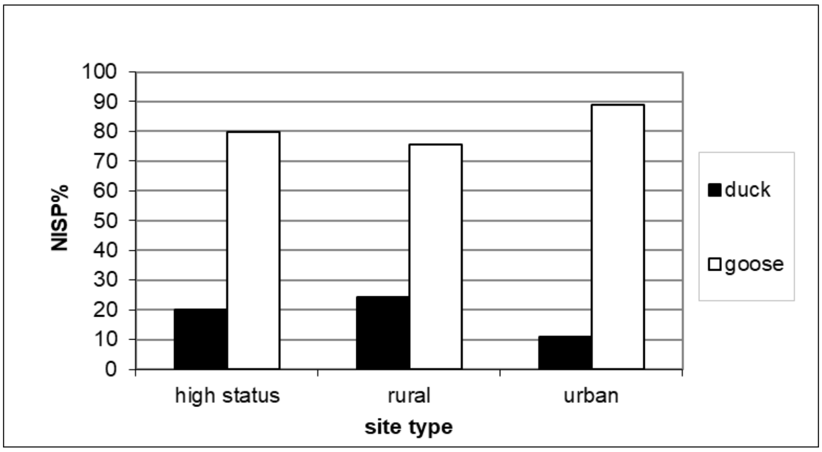

Fig 8.15 Occurrence of duck and goose, as a percentage of all duck+goose number of identified specimens (NISP), by site type for medieval periodsites across central England. No attempt was made to differentiate between wild and domestic taxa. All methods of collection have been combined.

The peafowl, probably kept as an ornamental bird at high-status sites, is found for the first time in England in an 11th to 12th-century context at Carisbrooke Castle (Isle of Wight) (Poole 2010). This chronological detail is unfortunately unavailable for central England, but the species is found in layers generically dated to the medieval period at Castle Rising Castle, near King’s Lyn (79, Norfolk; Jones *et al* 1997), and Berrington St, Hereford (28, Hereford and Worcester; Bramwell 1985), and in a late medieval context from Dudley Castle. This species was clearly associated with the aristocracy and, in other areas of England and France, as in central England, it is generally found in high-status contexts (Poole 2010).

The occurrence of domestic pigeon has already been suggested for the Saxon period at Wicken Bonhunt (*see* section 7.3), and bones of this species are again found in the Saxon-Norman levels of the same site (418, Essex; Crabtree 2012). The domestication of pigeon is certain at the rural site of West Cotton, where remains of a dovecote have been found. Pigeon bones, many juveniles, are found in abundance in both early and high medieval levels from West Cotton, and appear to be concentrated around the dovecote area. A substantial columbid assemblage, with many juveniles, is also found at the generically dated medieval manor house at Walton, although the size of these bones is said to be closer to that of the stock dove (a wild species) than the rock dove (the species to which the domestic form belongs). In a late medieval garderobe shaft from Dudley Castle, many juvenile bones and a few partial skeletons were found, but, partly because of their association with corvid (jackdaw or magpie) bones, these remains have not been interpreted as anthropogenic and therefore probably belonged to either wild or feral birds.

8.3.2 Wild resources

In the medieval period, domestic animals are overwhelmingly more abundant than wild species, but the diversity of wild resources is greater than in the Saxon period, particularly at high-status sites.

As in earlier periods, deer is the most common wild mammal to be exploited, but the relative proportion of the three main species, red, roe and fallow, changes, with the fallow deer, absent or rare in the Saxon period, becoming the most common species in the medieval period (*see* Fig 7.12). We have seen in Chapters 6 and 7 that, although occasional fallow deer living specimens or body parts may have been imported into England in Roman and Saxon periods, it is unlikely that the species was fully naturalised in the countryside then. The Normans therefore are likely to have been responsible for its introduction (Sykes 2010), as the species is found in Saxo-Norman levels at Castle Acre, near Swaffham (74, Norfolk; Lawrence 1982), Goltho, near Wragby, Lincoln/Horncastle (150, Lincolnshire; Jones and Ruben 1987), St Martin-at-Palace Plain, Norwich (325, Norfolk; Cartledge 1988), and Castle Rising Castle, and in a 12th-century context at Dragon Hall, King St, Norwich (113, Norfolk; Murray and Albarella 2005). Only five fallow deer specimens are found in the late Saxon period, but this rises to 258 in the early medieval period, therefore clearly indicating a substantial change at the Saxo-Norman transition. Sykes (2004a), however, notes that the fallow deer was not well established in Normandy at the time of the Conquest, and therefore its introduction may have occurred directly from Sicily, which was under Norman control. The predominance of the fallow deer further increases during the course of the medieval period (Fig 8.16), and is probably associated with the spread of deer parks around castles and manor houses, which would represent an ideally constructed environment for the species, which has a preference for mixed forest with access to open ground (Lister 1984).

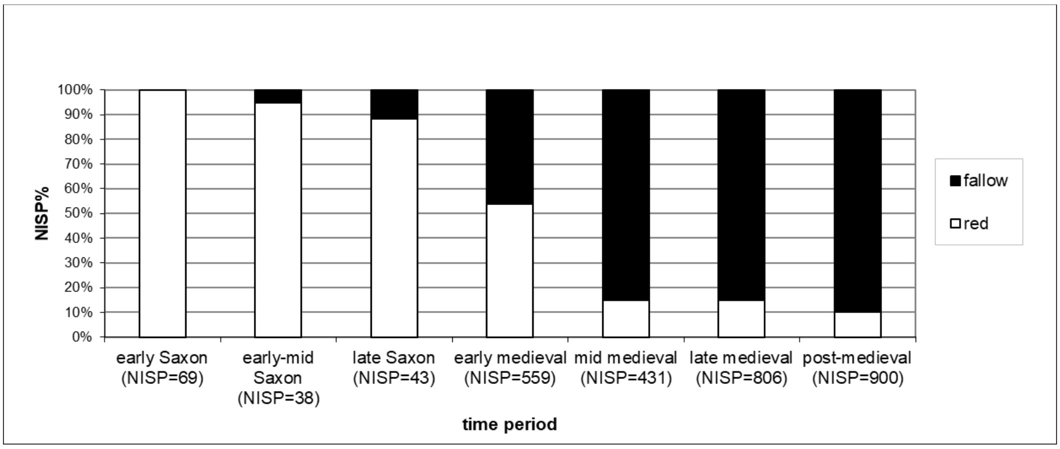

Fig 8.16 Relative occurrence of fallow and red deer, as a percentage of number of identified specimens (NISP), where the NISP total represents hand-collected fallow+red deer from periodsites across central England for each time period. The NISP values may or may not include antler, depending on the relevant faunal studies. Broadly dated phases and those with a combined fallow+red deer NISP <30 have not been included.

In Fig 8.17, it can be seen that high-status sites provide by far the largest samples of deer bones (see the NISP values at the bottom of the bars). This is hardly surprising, as deer hunting was an aristocratic privilege. Fallow deer is predominant at high-status and rural sites, replacing the role that the roe deer had in the Saxon period (Fig 8.18; but note the much smaller sample size for the Saxon period). In urban sites, red deer is still the predominant species, but not at the same level as it was in the Saxon period (Fig 8.19), as the rise in fallow deer numbers affected the urban market too. The predominance of red deer in urban sites, however, indicates that the small amount of venison that reached the towns was only to a limited extent supplied from deer parks.

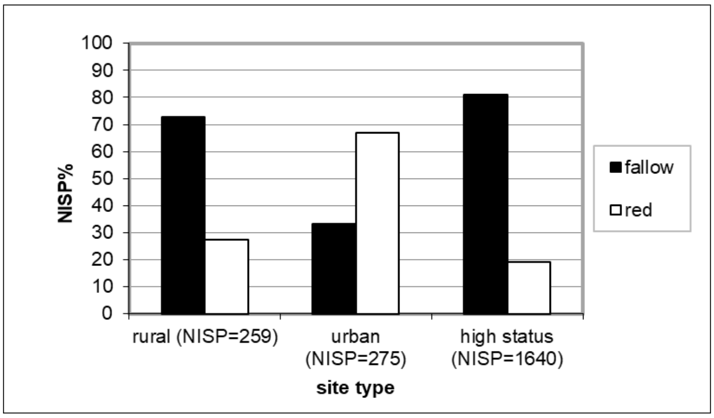

Fig 8.17 Relative occurrence of fallow and red deer, as a percentage of number of identified specimens (NISP), where the NISP total represents hand-collected fallow+red deer from different medieval site types across central England. High status=ecclesiastical, manorial and castle sites. The NISP values may or may not include antler, depending on the relevant faunal studies.

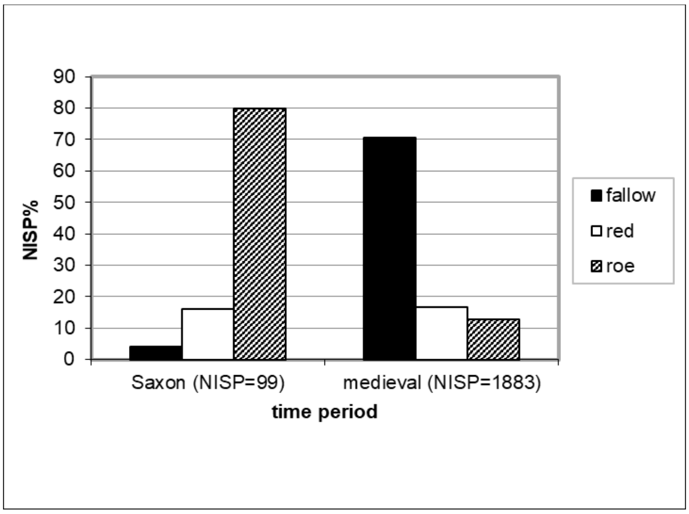

Fig 8.18 Relative occurrence of fallow, red and roe deer, as a percentage of number of identified specimens (NISP), where the NISP total represents hand-collected fallow+red+roe deer from high-status Saxon and medieval site types across central England. High status=ecclesiastical, manorial and castle sites. The NISP values may or may not include antler, depending on the relevant faunal studies.

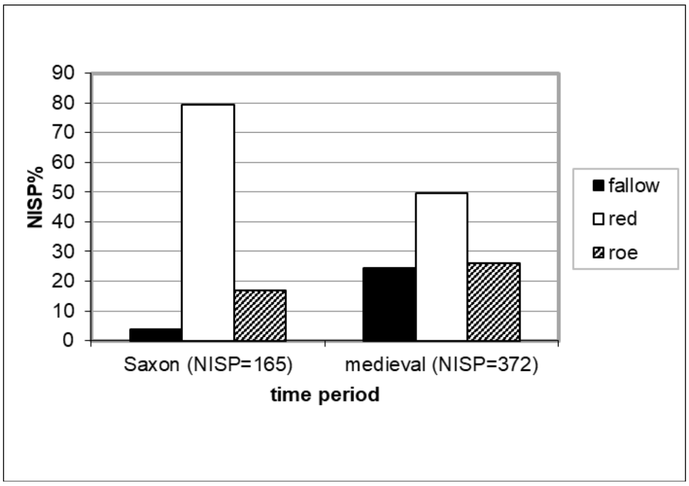

Fig 8.19 Relative occurrence of fallow, red and roe deer, as a percentage of number of identified specimens (NISP), where the NISP total represents hand-collected fallow+red+roe deer from urban Saxon and medieval site types across central England. The NISP values may or may not include antler, depending on the relevant faunal studies.

Of the various types of high-status sites, fallow deer is especially predominant at castle and ecclesiastic sites, while the frequency of the red and fallow deer is more even at manor houses (Fig 8.20). This is perhaps a consequence of the relatively lower status of manor houses, which may not have had the luxury of their own deer parks.

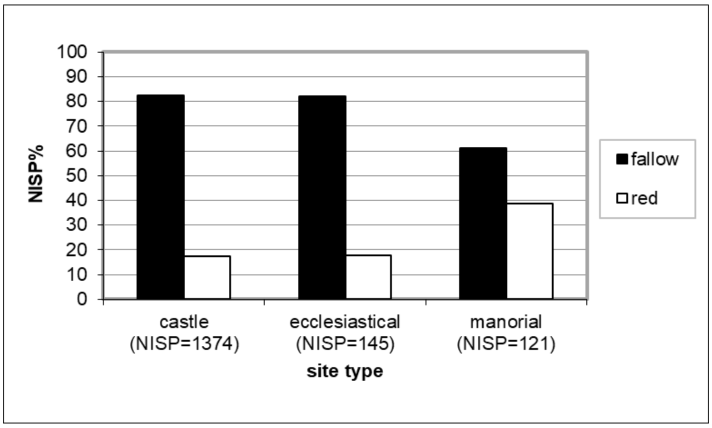

Fig 8.20 Relative occurrence of fallow and red deer, as a percentage of number of identified specimens (NISP), where the NISP total represents hand-collected fallow+red deer from different high-status medieval site types across central England. The NISP values may or may not include antler, depending on the relevant faunal studies.

The changes that have been discussed did not occur at once after the Norman Conquest. In Fig 8.21, it is possible to see that, although there is a substantial rise in the frequency of fallow deer between Saxon and early medieval sites, in this latter period roe deer is still the predominant species. The more substantial change occurs at the early to high medieval transition, when fallow deer becomes by far the predominant species on high-status sites. This situation remains unchanged in the late medieval period.

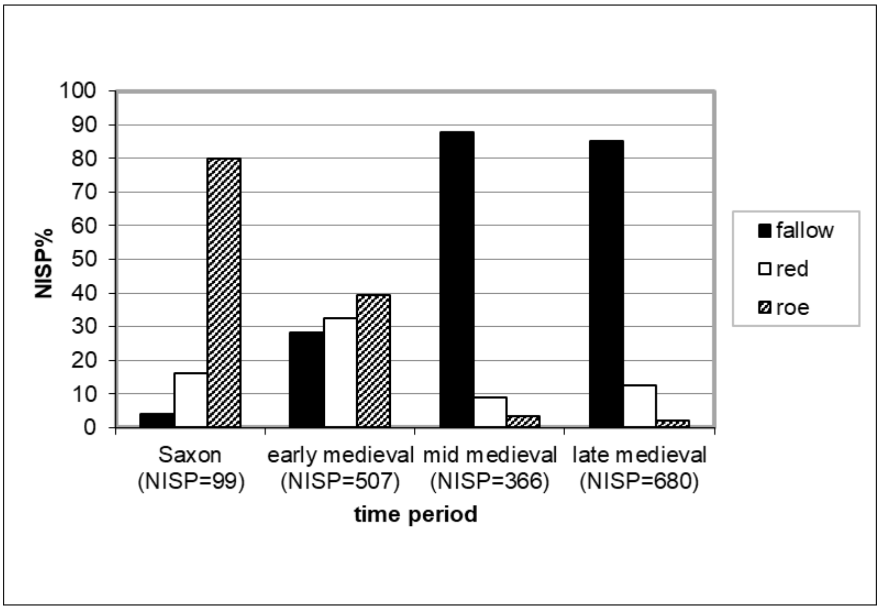

Fig 8.21 Relative occurrence of fallow, red and roe deer, as a percentage of number of identified specimens (NISP), where the NISP total represents hand-collected fallow+red+roe deer from high-status Saxon and medieval site types across central England. The NISP values may or may not include antler, depending on the relevant faunal studies.

No other wild mammals remotely approach the social and economic importance of deer in the medieval period. The wild boar could have fulfilled a similar role, but historical sources point out that the species had become very rare in Britain in the medieval period (Rackham 1997) and that by the end of the 13th century it was fully extinct (Albarella 2010). In central England, the occurrence of wild boar is suggested for undefined medieval levels from Bewell House, Hereford (30, Hereford and Worcester; Noddle 1985b). Two size classes of *Sus* specimens seem to occur in late 13th to 14th-century levels from Dudley Castle, and these have been interpreted as indicating the contemporary occurrence of domestic pigs and wild boar. If confirmed by further evidence, this would suggest the possible survival of the wild boar beyond the time when documentary evidence indicates its final demise. Because of the rarity and fierceness of the species, the killing of a wild boar must have held formidable status. Wild boar are, however, difficult to fence (Rackham 1997), which means that they would easily stray from parks, therefore providing a tempting poaching opportunity.

As in the Saxon period, the wild mammal species most commonly recorded after deer is the hare, found at 75 periodsites. This represents 29% of periodsites, which is very similar to the Saxon period, for which the species is recorded in 26% of the dataset. The species is particularly abundant at Dudley Castle and at a few other sites, including the urban site of Dragon Hall. At the latter site the bones are potentially associated with a house belonging to a merchant, and the contemporary abundance of hare and roe deer (as opposed to more obvious status symbols such as fallow and red deer) has tentatively been interpreted as an indication of wealth, but not necessarily particularly high social status.

Unlike the Saxon period, wolf is reported in the medieval period for at least one site. This is a 13th to 14th century toft from the deserted medieval village of Lyveden (IV) (221, Northamptonshire; Grant 1975a), where a distal humerus and two long bone shaft fragments are attributed to the wolf, although no identification criteria are provided. A large mandible from the medieval village of Burystead, Raunds, near Wellingborough (65, Northamptonshire; Davis 1992), is also tentatively attributed to wolf. Pluskowski

(2006) suggests that the rarity of wolf in the archaeological record is because of the limited hunting value of the species in relation to other fur-bearing species, and also to its tendency to live in rather remote areas. Nevertheless, the wolf did become extinct in England at some point in the medieval period, so its numbers must have been shrinking, perhaps as a result of habitat loss and direct persecution.

Among other wild mammal species, the badger is surprisingly rare and is only found at four periodsites, while the fox is more common (17 periodsites) and probably under-estimated because of its potential confusion with the more common domestic dog. The otter is attested at only one site, Tattershall College, near Horncastle (357, Lincolnshire; Harcourt 1969e), in the early medieval period. At West Cotton several bones of smaller mustelids were found, some belonging to weasels, others, conceivably, to rather small polecats. It is plausible that these could represent ferrets (ie the domesticated form of polecat), particularly in view of the tantalisingly large number of rabbit bones found at the site. As is well known, ferrets used to be kept mainly for catching rabbits (Sykes and Curl 2010). The polecat is also found with single specimens in generically medieval levels from Austin Friars, Leicester (11, Leicestershire; Thawley 1981), and in the 14th to 15th centuries AD at Shrewsbury Abbey, Shrewsbury (313, Shropshire; A K G Jones 2002; G G Jones 2002). It is hard to establish whether this association with ecclesiastic sites is at all significant. In addition to West Cotton, the weasel is also found at the other rural site of Bascote, Southam (22, Warwickshire; Hammon and Albarella 1998). A single stoat specimen exists in our dataset, and this is from a late 13th to early 14th-century context from Dudley Castle.

The red squirrel is a woodland species that rarely occurs on archaeological sites, but its remains have been found in no less than three phases from Dudley Castle, which is intriguing considering that this is not a commensal species. Consequently, the bones are unlikely to have turned up on-site by chance, and are more likely to represent the remains of animals that were deliberately killed in or around the forest.

As we have seen in section 7.3, the beaver became extinct in the Saxon period but, intriguingly, a pair of beaver jaws was found in a late 12th-century context from Castle Acre. The stratigraphic context is, however, not entirely secure, as it consists of make-up associated with spine wall additions, the content of which may be residual. Even if the context was secure, the jaws do not demonstrate the survival of a living animal in the countryside, as they may have been attached to a traded skin.

Rats had a devastating effect on medieval life, as the potential ultimate carriers (via their fleas) of the bacterium *Yersinia pestis* that caused the Black Death. This issue is, however, contentious, with alternative hypotheses for the transmission of the disease having also been proposed (cf Hufthammer and Walløe 2013 for a review of the problem). Rat remains have turned up at 24 periodsites and they are probably under-estimated because of recovery bias. In 10 cases the bones have been specifically attributed to the black rat, but the other remains must belong to the same species, unless they are intrusive, as the brown rat was only introduced in the 18th century (Yalden 1999). It has been suggested that the black rat may have become extinct in the Saxon period, only to be reintroduced in the later part of the period (Rielly 2010) or in the medieval period (Somerville 1999). Unquestionably, the species is much more common from the 11th century onwards, although it is unclear whether we can speak of a complete early–middle Saxon disappearance (Rielly 2010).

Gardiner (1997) has reviewed the occurrence and importance of cetaceans at medieval sites in England. Gardiner (1997) suggests that whaling was uncommon, but that cetaceans were prized for food, bone (for carving) and oil. They were claimed by the king as 'royal fish' between *c* 1000 and 1300, and are mainly found on high-status sites (particularly religious houses granted the right to eat them), but strandings were occasionally taken advantage of by others. Meat imported from France is known in the early medieval period (Gardiner 1997). Cetacean meat was permitted on occasions when the consumption of other meat types was forbidden (such as during Lent), hence it was prized at high-status tables. Finds of cetacean bone are rare, but not confined to coastal sites. Although Gardiner (1997) does not mention cetacean findings in central England, our dataset suggests the occurrence of a dolphin specimen at Castle Rising Castle (generically medieval) and a whale specimen at Saxo-Norman Ipswich 74–88 (192, Suffolk; Crabtree 1994). Both sites are located only a short distance from the sea.

The increase in the diversity of wild resources that has been mentioned also affects birds, which are found in a greater range than in the Saxon period (Fig 8.14). The process of increased diversity in wild birds is gradual, and it becomes evident only in the later medieval period (Fig 8.22), a trend also supported by historical evidence (Woolgar 2001). The issue is discussed by Albarella and Thomas (2002), who suggest that the greater overall wealth that characterises the later medieval period (Dyer 1989a) meant that meat consumption had, by then, become an insufficient symbol of status. The hunting, eating and display of unusual birds for the table therefore became a gradually more important way to emphasise social differentiation.

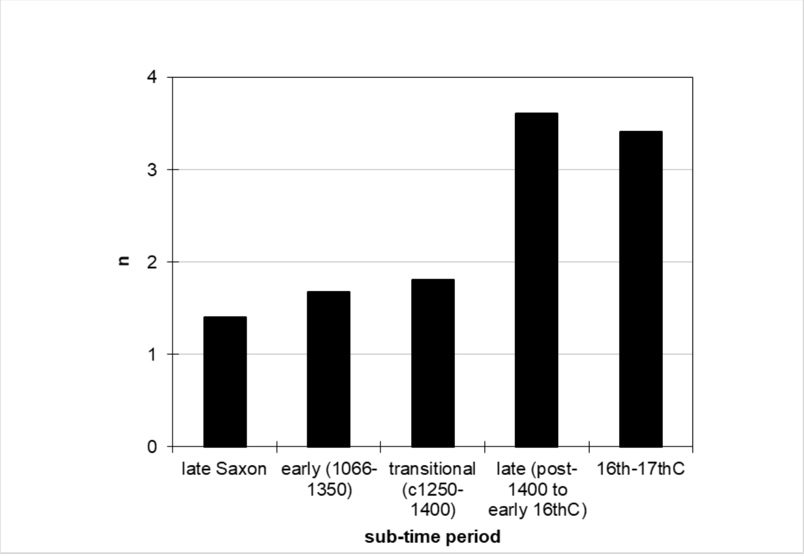

Fig 8.22 Diversity of wild birds, as the average number of bird taxa per periodsite (excluding domestic fowl and all anatids) across central England. Broadly dated periodsites have not been included. All methods of collection have been combined.

Most bird groups increase in frequency throughout the medieval period, with cranes and teals being the most obvious exceptions (Fig 8.23). The clearest late medieval increase is in swan and woodcock (Albarella and Thomas 2002; Sykes 2004b). The swan in particular was a highly prized bird (Wilson 1973) and would commonly be kept in parks in designed areas (MacGregor 1996); this is reminiscent, to some extent, of the role played by the fallow deer, another species increasing in frequency throughout the medieval period. Unsurprisingly, most bird groups are more commonly found on high-status sites (Fig 8.24). An exception is represented by plovers, which are more common on rural sites, perhaps indicating a lower market value attached to these birds.

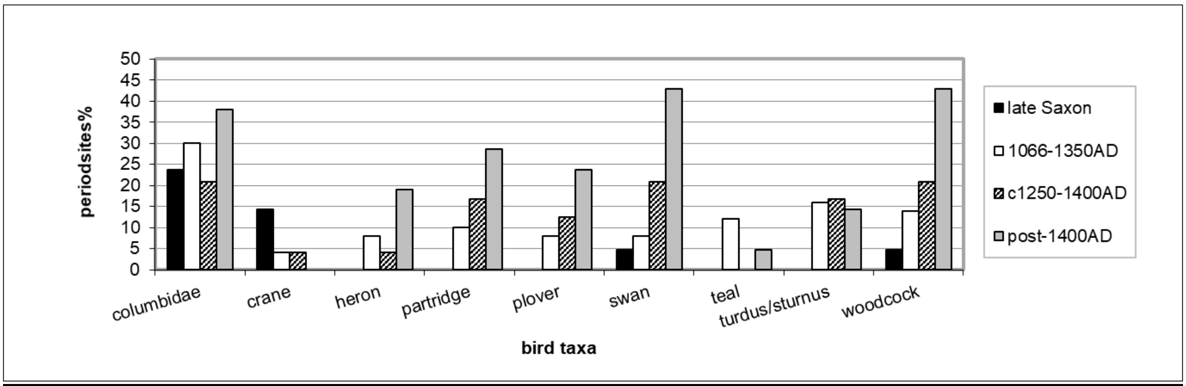

Fig 8.23 Occurrence of wild bird taxa, as a percentage of periodsites containing wild and domestic bird taxa, from late Saxon and medieval periodsites across central England. Broadly dated periodsites have not been included. All methods of collection have been combined.

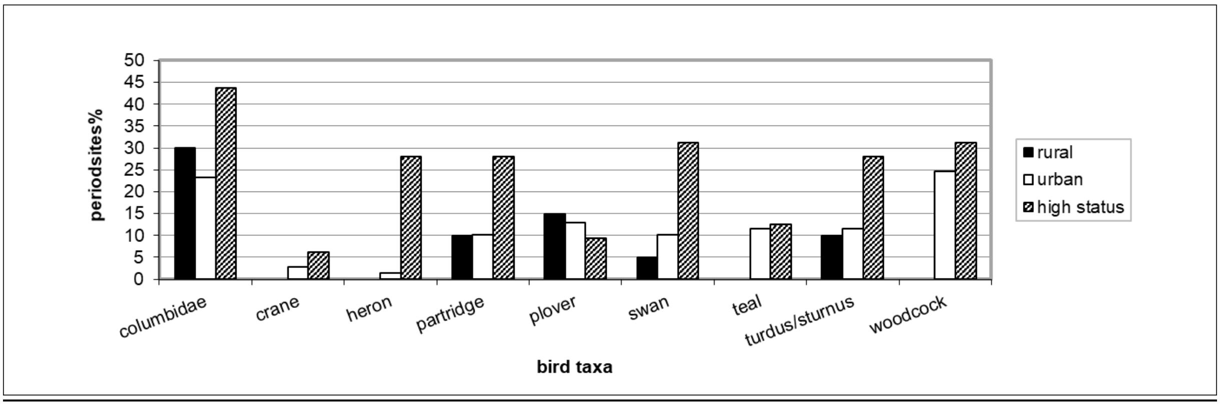

Fig 8.24 Occurrence of wild bird taxa, as a percentage of medieval periodsites containing wild and domestic bird taxa, for different site types across central England. High status includes castle, manorial and ecclesiastical sites. All methods of collection have been combined.

Some bird species are known from documentary sources to have been especially prized and to feature in aristocratic banquets (Woolgar 1999). From among these, the crane occurs at five periodsites in our dataset, including towns, castles and friars. It occurs with single specimens in all cases, except the manor house at Walton, where 13 specimens were recorded, including a juvenile, which probably indicates breeding of the species in the area. The bittern is only reported at Flaxengate, while the bustard, which is present but very rare in the rest of the country (Albarella and Thomas 2002), does not feature in medieval central England. This latter species eventually became extinct in Britain at an unknown time (Serjeantson 2010), although it has recently been reintroduced (Burnside *et al* 2011).

Among other bird species, worth mentioning is the occurrence of the manx shearwater, a strictly marine species only found at castle sites in the medieval period (Albarella and Thomas 2002). The only occurrence in central England is from 14th-century Dudley Castle, far away from the coast. Evidence of the trade of marine species also comes from the finding of the bone of a gannet, another oceanic bird, mainly nesting on islands, at Berrington St.

Other noteworthy birds include the capercaillie, a rare species today confined to Scotland, and the stork, today only an occasional visitor to Britain, both found in early medieval levels from the urban site of The Shires. The occurrence of the cormorant, found at West Cotton and Austin Friars, is particularly intriguing in view of the documented training of this bird for river fishing, although, admittedly, this reference refers to the 17th century

(MacGregor 1989). The finding of the green woodpecker, not a common species on archaeological sites, at Dudley Castle is interesting, particularly when seen in connection with the occurrence at this same site of the red squirrel, another woodland species. The pheasant, probably introduced in the Roman period, seems to have become relatively widespread in the medieval period, as it is reported at six sites. It is likely to be under-represented, however, because of the potential confusion with the much more common domestic fowl.

Castle Rising Castle has a remarkable variety of bird species, probably because of its location near a particularly rich bird area on the Norfolk coast. It includes very high-status species, such as crane, heron and spoonbill, but also several species of waders, sea birds and passerines. The occurrence of several birds of prey, peregrine, sparrowhawk, goshawk and buzzard, suggests that some of these birds may have been caught by trained raptors. The only other site that has a variety of species typically associated with falconry (cf Prummel 1997; Cherryson 2002) is Dudley Castle, where sparrowhawk, goshawk and kestrel were all found. The high-status nature of the latter site, as well as the contemporary occurrence of several other wild birds and mammals, suggest that some form of hawking is likely. In general, however, the occurrence of species that are potentially linked with falconry is no greater in the medieval period than in the preceding Saxon period. Individual bones of birds of prey occur at a number of sites but, as discussed in section 7.3, these can be subject to multiple interpretations. The occurrence of partial skeletons does not prove falconry but it certainly represents more robust evidence. Castle Rising Castle has, as we have already seen, tantalising evidence for the practice of falconry and has also produced eight bones all deriving from the same peregrine specimen. This is particularly significant when we consider that the peregrine was the species that carried the highest possible status as a trained bird (Prummel 1997). The only other evidence for articulated raptor skeletons comes from the rural site of Little Chester, Derby (211, Derbyshire; Harman and Weinstock 2002), which has produced two (or more) partial skeletons of female sparrowhawks. The female, because of its larger size, was the more likely (and prized) sex to be used for falconry. It is, however, unfortunate that this site is very poorly dated (9th to 15th centuries), which means that the specimens could potentially belong to the late Saxon period.

The 'fish event horizon' (Barrett *et al* 2004) marks a clear move towards a greater emphasis on the exploitation of marine fisheries around AD 1000 (*see* section 7.3). This trend continues in the medieval period, which, with its great predominance of marine fish, develops further the pattern already identified for the late Saxon period (*see* Fig 7.15). While in the Saxon period marine fish represent about 50% of fish remains overall, this percentage increases to *c* 80% in the medieval period. The pattern characterises both coastal and inland areas (Figs 8.25 and 8.26), although in the interior it seems to be delayed, with the earliest medieval phase producing similar results to the late Saxon period. It is possible that the effect of these intensified marine fishing activities and trade was initially felt on the coast, but eventually led to the organisation of trade inland. The overall contribution of freshwater fish is unsurprisingly higher at inland sites, where, intriguingly, it increases in the later medieval period. This process is reminiscent of the increase in wild bird consumption, and it may in fact be parallel, as freshwater fishing was also a privileged activity, subject to restrictions (Dyer 1989b).

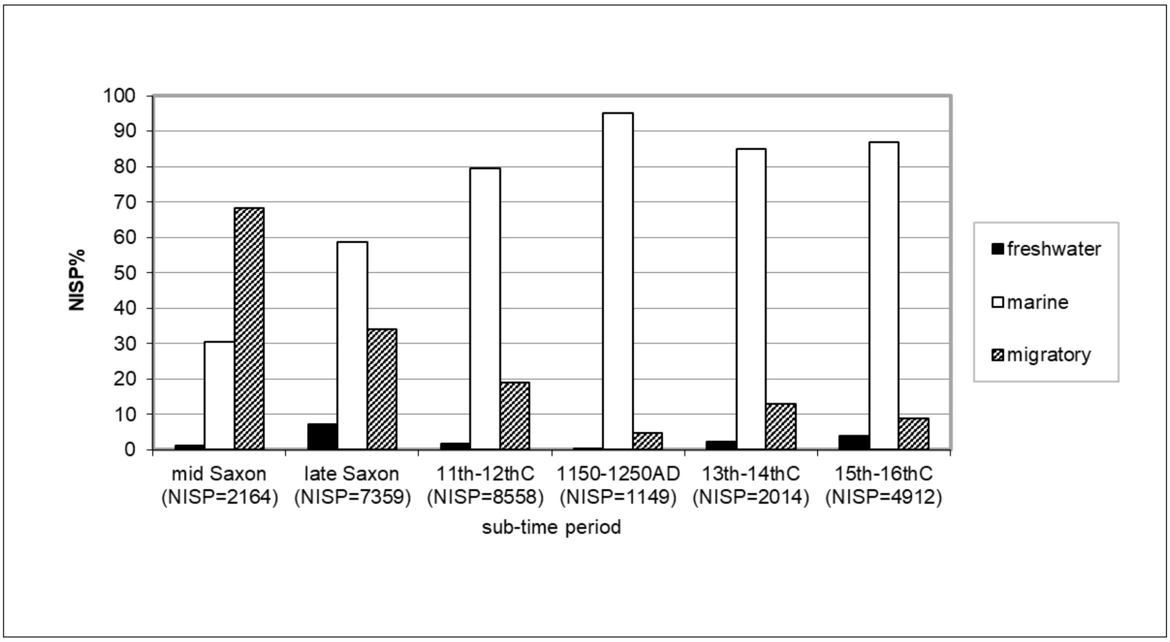

Fig 8.25 Occurrence of freshwater, marine and migratory fish, as a percentage of the total fish number of identified specimens (NISP) for different sub-time periods from sites in the coastal counties (Lincolnshire, Norfolk, Suffolk and Essex) of central England.

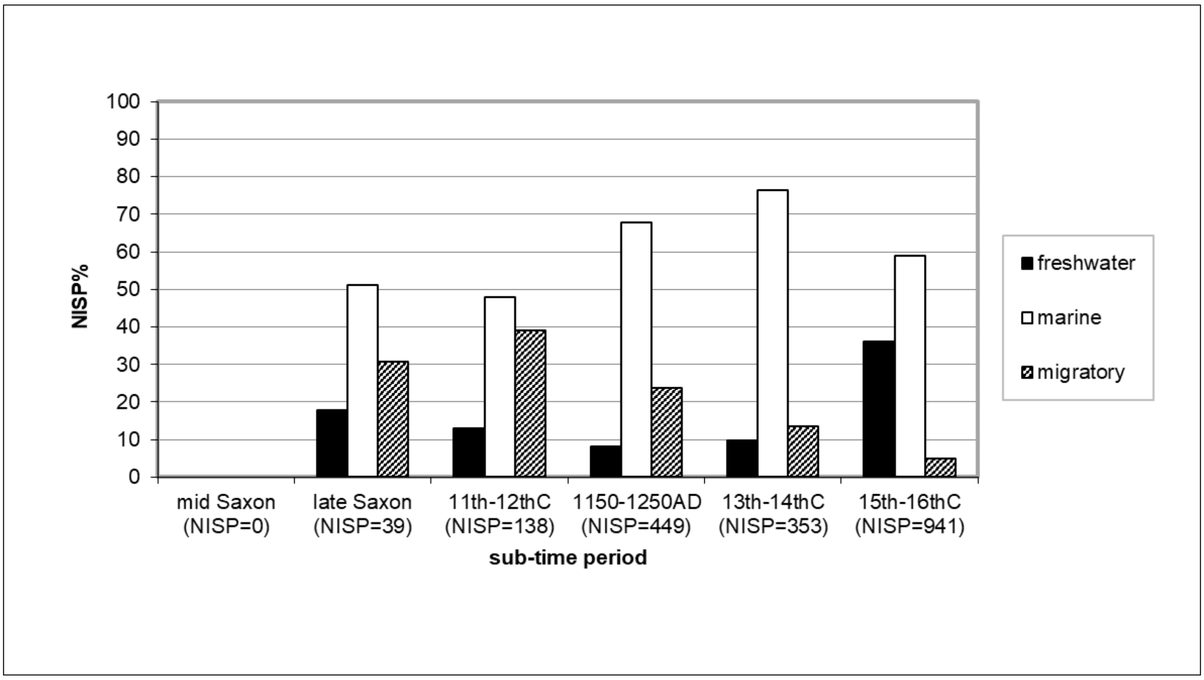

Fig 8.26 Occurrence of freshwater, marine and migratory fish, as a percentage of the total fish number of identified specimens (NISP) for different sub-time periods from sites in the inland counties of central England.

The ratio between eel, a migratory fish, and herring, a strictly marine one, with herring becoming predominant in the late Saxon period, continues to favour the herring even further. Despite minor fluctuations between early and late medieval periods, herring remains comfortably the more common of the two species across the medieval sequence (Fig 8.27). The comparison in frequency of these two species is particularly significant as they are, in terms of number of specimens, by far the most abundant fish species to be found at medieval sites in central England. Cod, however, occurs at a greater number of sites (68, with herring at 53 and eel at 54), but this includes hand-collected small assemblages, which are certainly biased in favour of the larger species.

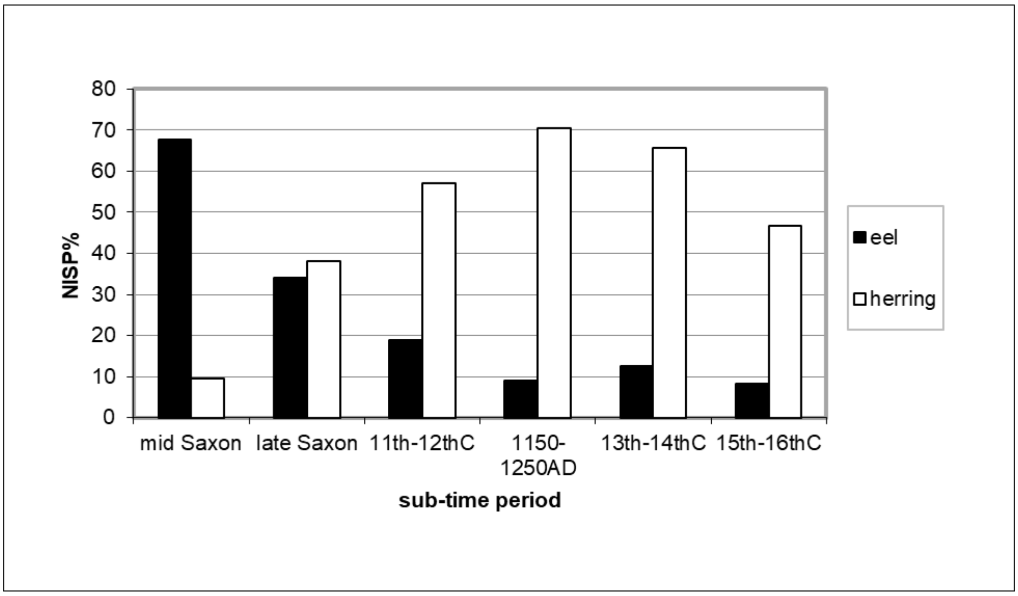

Fig 8.27 Occurrence of eel and herring, as a percentage of the total fish number of identified specimens (NISP) for different sub-time periods from sites across central England.

In general, gadid species (all marine) are well represented. Cod is the most common, although it tends to decrease in abundance at the expense of other species, particularly whiting, towards the later medieval period (Fig 8.28). This trend towards a greater diversification in gadid species is explained by Barrett *et al* (2004) as the increasing inability of cod populations to fulfil demand. The gadid-dominated fish assemblages that Barrett *et al* (2004) note for the 13th to 16th centuries are, however, not apparent in central England, at least as far as the largest fish assemblages (NISP >500) are concerned. The only exception is represented by small, hand-collected fish assemblages, where small species such as herring and eel are bound to be under-estimated. One such case is represented by the fish assemblage from Austin Friars (NISP=108), which is mainly composed of ling, cod and haddock. At this site sturgeon, a likely delicacy, is also present (Thawley 1981).

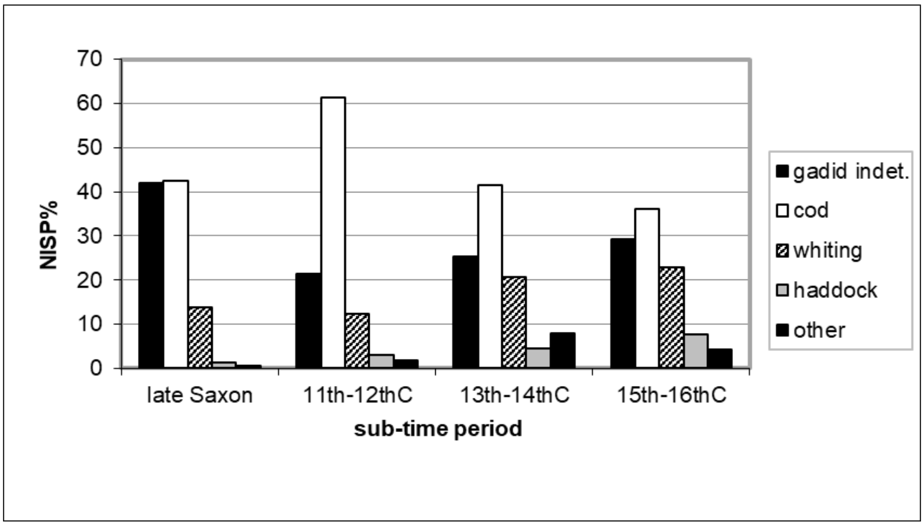

Fig 8.28 Gadid species composition, as a percentage of the total gadid number of identified specimens (NISP) for different sub-time periods, from sites across central England. Indet.=indeterminate. Other includes hake, ling, pollack and saithe.

There are a few sites that have a special importance for their fishing activities. One of these is Whittlesea Mere (416, Cambridgeshire; Irving 1999), which consists of two 13th to 15th-century fishing platforms and where fish comprise all the bones reported. The bulk-sieved assemblage includes 588 fish specimens, mainly comprising undetermined cyprinids, a family of freshwater fish species. All identified species are freshwater or estuarine, and they include (in order of frequency) eel, roach, perch, pike, burbot, bullhead, trout and three different species of stickleback. All fish measurements are said to be consistent with a length of approximately 100mm, except the pike. It is thought that the smaller fish were the gut contents of the pike, which was therefore the preferred human prey (Irving 1999). This suggestion is supported by the fact that some of the fish bones showed signs of having been ingested. The pike was likely to be a very valuable fish to eat, and the site is also interesting for revealing the occurrence of the burbot, today sadly extinct in England (Everard 2013). This is the only medieval occurrence of this species in central England, and also the latest.

The medieval bulk-sieved assemblage from Owston Abbey, near Leicester (262, Leicestershire; Shackley *et al* 1988), consists of fish remains from a fishpond, and includes pike, rudd, perch, bream, roach and chub (total NISP=27). The assemblage is poorly dated but Shackley *et al* (1988)speculate that it could date from the Dissolution period (16th century), given the small size of the deposit. Jones (1989) suggests that the occurrence of freshwater fish *in situ* in a fishpond is exceptional, and also that the monastic diet would mainly consist of marine fish. This is supported by carbon isotopic work carried out on human bones from the Gilbertine Priory at Fishergate, York, which indicates a higher marine component in the diet compared with other individuals not associated with the priory (Mays 1997).

Another interesting site is Canvey Island (72, Essex; Jones 1986b), a possible fish-processing site on the Thames Estuary, unfortunately also poorly dated. Cod, whiting, horse mackerel, conger, thornback ray, haddock and sprat/herring are present. The conger, in particular, is a rather interesting species as it is especially common on the southern coast. It was likely to have been fished in the English Channel or have been imported from the Channel Islands (Serjeantson and Woolgar 2006). In central England, it is recorded at 13 periodsites (representing 10 different sites), with a possible special emphasis on the ecclesiastic sites of Leominster Old Priory, Leominster (206, Hereford and Worcester; Locker 1981b), Shrewsbury Abbey and Austin Friars.

Another species that may have been imported to central England is the hake (a gadid) that, again according to Locker (2001) and Serjeantson and Woolgar (2006), is particularly common in the south-west, which may have been its main reproductive area. In central England, this species is attested at seven periodsites (five sites), which include the western sites of Shrewsbury Abbey and Berrington St, which may indeed have been supplied from further south. The Atlantic wolf-fish, only found in late medieval levels from Castle Mall, was probably fished off-shore.

8.4 Husbandry strategies

Cattle kill-off patterns in the medieval period are more similar to those identified for the Roman, rather than the Saxon, period. Sites reporting a majority of adults are more common than in the Saxon period (*see* Fig 5.9), probably indicating an increased use of these animals as traction force. This is somewhat supported by the rather high occurrence of arthropathic metapodials, which may have been caused by traction stress (*see* Fig 7.17) (cf Thomas 2008).

The predominance of adult cattle is particularly obvious at high-status sites (Fig 8.29), which indicates that, for most of the period at least, no status value was associated with the tenderness of the meat. It is also possible that large estates associated with high-status sites may have particularly emphasised the role of cattle for ploughing.

This relatively 'old' mortality profile does, however, seem to characterise mainly the earlier part of the medieval period. None of the multi-phased sites indicates an increase of this phenomenon during the course of the period. Conversely, some of them suggest a higher frequency of either immature or even juvenile bones in the later phases (cf Albarella 1997d, 2005a). The phenomenon is particularly evident at urban sites, such as sites from Norwich and Leicester, where groups of calf bones, which are completely absent in earlier phases, start appearing around the 15th century. This trend is also attested at Shrewsbury Abbey and at sites outside the region (Albarella 1997d). This evidence indicates that a trend towards an increased demand for veal, which mainly characterises the post-medieval period, had its roots in the later medieval period. It was possibly a consequence of the greater wealth of an increasingly urbanised society (cf Thirsk 1967), as well as of the enhanced power of the market.

At rural West Cotton there is a decline in the age of cattle in the later medieval phase, but this is more in terms of a reduced frequency of elderly animals than an increase in very young ones. This is possibly associated with the gradual replacement of cattle with horses as the main traction animals (Langdon 1986), as the change goes hand in hand with a substantial increase in the frequency of horse bones.

All in all, it seems that throughout the medieval period the main role of cattle was for traction, but that veal production also became a concern towards the end of the period. The replacement of draught cattle with horses in some areas may have facilitated such economic changes. This, logically, may have been linked with an increase in dairy production, as the killing of calves would have facilitated the use of cow's milk for human consumption.

Unlike cattle, the culling pattern for sheep/goat is much more similar to the preceding Saxon period than the Roman period (*see* Fig 5.9). In fact, the trend observed in the Saxon period is further emphasised in the medieval period, as the proportion of sites characterised by a predominance of adult sheep/goat increases slightly. Overall, the kill-off pattern tends, however, to be younger than for cattle, which is a consequence of the fact that sheep/goat could not be used as draught animals. In addition, this betrays the mixed nature of the sheep husbandry regime, which may have been focused on the obtainment of particular products, but was certainly not specialised.

The pattern is more skewed towards a predominance of animals of 'mixed' ages at rural sites (Fig 8.29), which may indicate less specialisation in what were mainly low-status villages. The sample size is, however, small and therefore needs to be interpreted cautiously. No substantial differences occur between urban and high-status sites. Unquestionably both meat and milk would be of concern for medieval sheep husbandry, but the tendency towards the slaughter of older animals indicates that the main product was wool, which does not require an early slaughter. This is consistent with the historical evidence, which emphasises the importance that the wool trade had in medieval England (Farmer 1991).

As for cattle, there is a chronological pattern to the sheep/goat culling strategy. This is initially exemplified by a move towards an increased number of adults at the Saxo-Norman transition. Sites providing evidence of this phenomenon include Flaxengate

(Lincoln), Dragon Hall (Norwich), Berrington St (Hereford) and Walton (Aylesbury). The trend did not stop there, however, and several sites, such as West Cotton, Dudley Castle and Shrewsbury Abbey, also indicate a move towards slaughtering older sheep between the early and later medieval period. Although historical sources point to a peak in wool production in the 13th to 14th centuries (Dyer 1988), zooarchaeological data provide no evidence that wool became any less important towards the end of medieval period. For the sake of a balanced argument it is, however, also worth pointing out that at some other multi-phased sites no evidence of change in culling strategies is apparent. These sites include Burystead, St Martin-at-Palace Plain, The Shires (St Peter's Ln) and Thetford 64–70 (368, Norfolk; G G Jones 1993a). Although these sites do not support an increased emphasis on wool production, at the same time they do not indicate that wool had become any less important.

Although examples of pathological depressions on sheep horncores are more abundant than in previous periods, proportionally they remain infrequent. Unsurprisingly, this indicates that intensive milk exploitation was rare, or perhaps even absent. At the same time nutritional or environmental stresses do not seem to have affected sheep body growth in any substantial way.

The inability of pigs to provide secondary products means that their age profiles tend to be rather predictable, with a large majority of immature and sub-adult animals. This is indeed also the case in the medieval period, when the emphasis on young animals is even greater than in the Saxon period (*see* Fig 5.9). The explanation may rest on the fact that by the later medieval period some fast-growing pig breeds had been created or introduced, thus providing the opportunity to slaughter the pigs at a younger age. This hypothesis is supported by the evidence from Castle Mall, where a trend towards a larger number of juveniles can be identified across the medieval sequence.

Rather puzzling is the occurrence of a small number of sites where most pigs were slaughtered as adults. Of these the most obvious case is represented by Shrewsbury Abbey, where this pattern has been identified in all phases. There does not seem to be an obvious explanation for this, as, in economic terms, such a strategy appears to be counter-productive. Although it is possible that these sites may have owned particularly slow-growing breeds, this would not explain the pattern entirely. It is likely that a cultural choice (possibly associated with monasticism) that did not give priority to optimising yield was involved. It is also worth pointing out that, as for other livestock, young pigs are no better represented at high-status sites (Fig 8.29), which once again indicates that the tenderness of the meat was not a concern of the aristocracy.

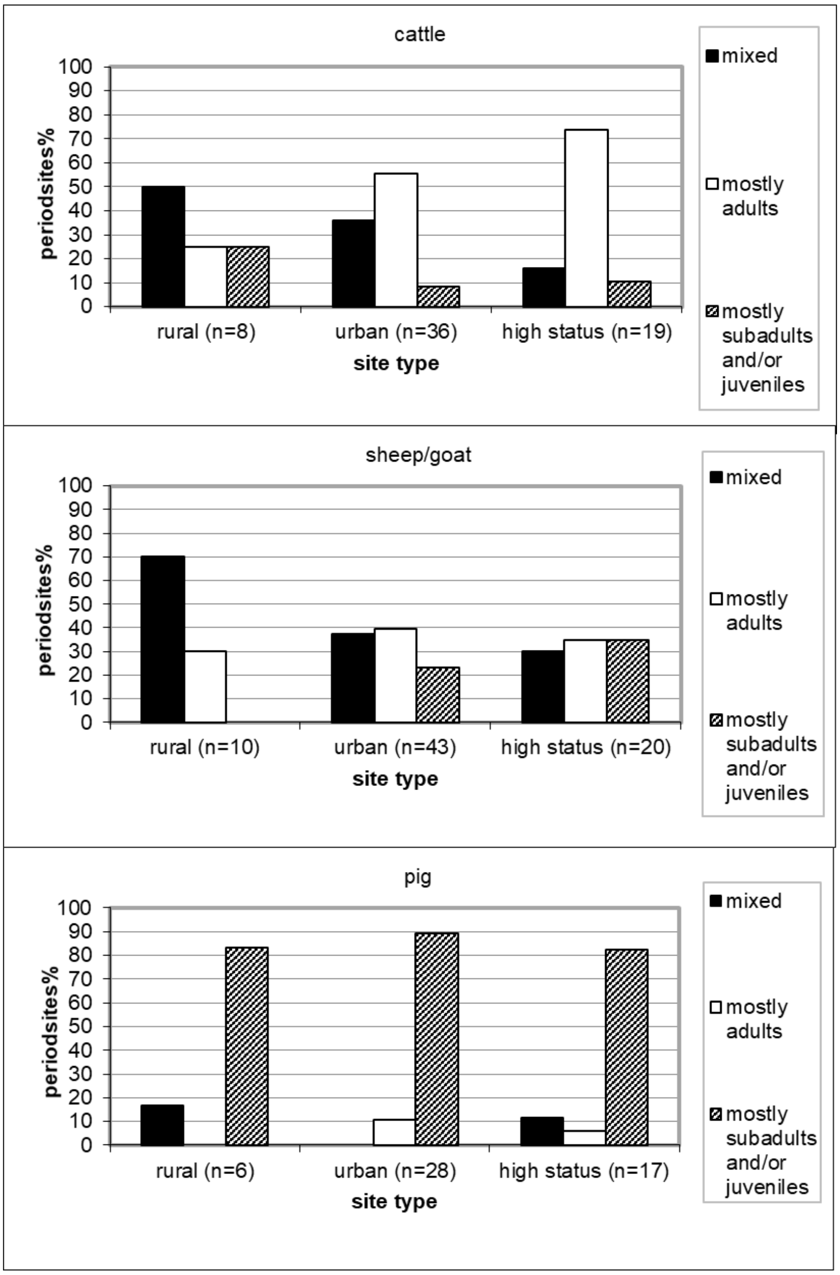

Fig 8.29 Broad age categories of cattle, sheep/goat and pig, as a percentage of medieval periodsites across central England, where n *is the number of periodsites reporting ageing data for each taxon and site type.*

Ageing data are uncommonly reported for domestic birds (only 13% of periodsites), thus reducing the available sample size and the reliability of this type of evidence. Nevertheless, it is still worth pointing out that at most sites the frequency of juvenile chicken bones is around 10–20% of the assemblages. This is likely to be an under-estimate, because of recovery, preservation and identification biases. A generalised predominance of fully grown birds suggests that egg production must also have been valued. This is supported by the predominance of adult female birds (presumably laying hens) noted at Causeway Ln, West Cotton, Dragon Hall and Dudley Castle. Outliers to this age pattern are represented by Castle Rising Castle, which has a greater number of juvenile bones, and The Shires (St Peter's Ln), which has almost no juvenile bones, despite the large sample size. These cases possibly indicate that there was some variation in the style of chicken husbandry, with different products prioritised at different sites. The evidence from Castle Mall indicates that a greater emphasis on juvenile birds occurs in the later medieval phases, probably suggesting a switch towards increased meat production (Albarella 1997d). This chronological trend is not isolated and has been noted at other medieval sites outside central England (Grant 1988).

The age pattern for geese is similar, but more pronounced. At Dudley Castle the frequency of juvenile bones is around 7%, with no perceivable variation through time. At other sites where evidence is available, including several Thetford sites, Castle Rising Castle and West Cotton, adult bones greatly predominate. This more pronounced 'adult' pattern, in comparison with chicken, is perhaps generated by the use of geese for feathers, eggs and meat. The increased frequency of juvenile chicken bones attested at late medieval Castle Mall is also noted in geese, a pattern already observed, outside central England, at Winchester (Serjeantson and Rees 2009). This probably indicates a husbandry move towards increased meat production (Albarella 1997d). The warning provided in Chapter 7 that an 'adult' appearance of the bones should not necessarily be equated to an adult age of the birds (Serjeantson 2002) remains valid, but this applies to the whole chronological range and therefore an explanation for the change in the kill-off pattern must still be found.

8.4.1 Livestock types

Biometrical evidence illuminating size and shape characteristics of livestock represents one of the most difficult topics to synthesise without referring to the raw data per individual site, which would take this review in a very different direction. Unlike the Saxon period, in the medieval period there is quite a substantial body of biometric data, but this is generally presented in a way that makes regional comparisons difficult to achieve. Many definitions are also vague, for example animals defined as 'small', 'large' or 'standard for the period' without a clear framework for reference, thus making generalisations hard to achieve.

A highly informative site is Dudley Castle, which has provided consistent evidence for a size increase in cattle, sheep/goat, pig and domestic fowl in the 14th century. The evidence is particularly interesting for pigs as it applies to both teeth and post-cranial bones. This suggests that the change is likely to be genetic and not just the result of improved feeding, as teeth are rather conservative and will not rapidly respond to purely environmental stimuli. This increase occurs very early compared with evidence from other sites in the country, both inside and outside central England (Davis 1997b; Davis and Beckett 1999). Currently Dudley Castle remains an isolated case and, as such, difficult to explain. It is possible that, in an immediate post-Black Death context, breeders at Dudley Castle successfully experimented with animal 'improvement' (Thomas 2005b). The current evidence indicates that such improvement did not spread to other areas for a long time, but of course there are still large gaps in the data and it is possible that future work will reveal parallel evidence to the Dudley Castle case study. After the 14th century, cattle and sheep/goat seem to have continued to increase in size, although to a very limited extent. Conversely, pigs became smaller, regarding both their teeth and bones. Over-stocking and poor nourishment may have contributed to the decrease in overall size (Thomas 2005a), but the reduction in tooth size indicates that further introduction of new genetic stock may have also played a role.

For cattle the evidence for improvement outside Dudley Castle is slim. At both Castle Mall and Shrewsbury Abbey a slight increase occurs in the late medieval phases. This change is also associated with an increase in variation, as is typically the case for late medieval and post-medieval livestock size increases (cf Albarella and Davis 1996). It is likely that this increase represents an early improvement, anticipating the larger changes that occurred in the post-medieval period. The reason for pursuing improvement is likely to be associated with an attempt to increase meat output, probably through the creation of faster growing breeds. With the increase in wealth and urbanisation following the relaxation of the pressure on the landscape caused by the 14th-century demographic decline, meat must have been in increasing demand (Albarella 1997d).

At Ipswich 74–88, in the Saxo-Norman period cattle are slightly smaller than in the preceding late Saxon period. This change, however, is probably attributable to an increased number of female animals. As these are also associated with an older kill-off pattern, it is likely that they indicate an increased interest in dairy products.

For sheep, apart from the unusual Dudley Castle case, Castle Mall is the only site in central England that provides unambiguous evidence for some size improvement in the late medieval period. Evidence from elsewhere in the country suggests that, by the end of the medieval period (ie the beginning of the 16th century), sheep improvement had definitely started (Davis 1997b; Davis and Beckett 1999), although O'Connor (1995) lists a number of sites where such an occurrence appears to be later.

One piece of metric information that is often provided in site reports concerns withers heights. These are not particularly useful, as they rely on length measurements that are uncommon and therefore lead to typically small sample sizes. Nevertheless, some of these data are listed in Table 8.3. The evidence is not straightforward and often relies on individual measurements of limited use, but it can be observed that, for both sheep/goat and cattle, larger animals mainly occur in the later phases.

*Table 8.3 Withers height values for sheep/goat and cattle from a number of medieval sites in central England. *Mean derived from values listed in the dataset; **ranges given in dataset; all other values are individual measurements.*

Site	Date	Withers height (mm)
Sheep/goat		
Loughton	Medieval	540
Castle Rising Castle	Medieval	580
St John's Square	12th century AD	561
Causeway Ln	11th to 14th century AD	580
Shrewsbury Abbey	12th to 14th century AD	586
St John's Square	13th to 14th century AD	548*
Shrewsbury Abbey	14th to early 15th century AD	570*
Harrison St	14th to 15th century AD	510–700**
Bonners Ln	Late medieval	550–560**
Cattle		
Commercial Rd	Medieval	980–1 230**
Thetford 64–70	Saxo-Norman	1 120
Causeway Ln	11th to 14th century AD	1 120*
St John's Square	12th century AD	111
Shrewsbury Abbey	12th to 14th century AD	1 110
St John's Square	13th to 14th century AD	121*
Shrewsbury Abbey	Mid-15th to early 16th century AD	117

Medieval horses may have been slightly larger than in the Saxon period (Albarella 1997d), but the difference is minimal and horses from various medieval phases from

Castle Mall, West Cotton and Burystead do not differ much in size from those of early Saxon West Stow, near Bury St Edmunds (413, Suffolk; Crabtree 1989). Most horses would have a shorter withers height than 14 hands and 2 inches (one hand = 4 inches), and would therefore be regarded as 'ponies'. There is no evidence in the archaeological record of the large ploughing horses that are supposed to have occurred in England and France from the 14th century onwards (Langdon 1986).

For dogs the best available biometric information derives from burials. For instance, a dog with a shoulder height of 570mm was identified in 11th to 12th-century layers from Woolmonger St. Clearly in the medieval period a variety of dog types must have occurred. In this respect an interesting finding is represented by a partial dog skeleton found in high to late medieval levels from Oxford Rd Watermill, Aylesbury (263, Buckinghamshire; Baxter 2004). This specimen is bow-legged, with a consequent short shoulder height of *c* 460mm. It also congenitally lacks a first premolar, and has a crowded lower dentition. It must have been either an abnormal specimen or have belonged to a highly selected dwarf breed. At the urban site of Castle Mall, shoulder heights reveal a wide range of sizes, covering almost the full size range of British Saxon and Roman dogs (Harcourt 1974b). At rural West Cotton, however, all dogs seem to belong to a generic medium-sized category, possibly suggesting a greater homogeneity of the animals kept in the countryside.

Biometrical evidence for domestic birds is scanty but sufficient to indicate that improvement attempts also affected fowl. At Dudley Castle the 14th-century size increase can also be observed in chicken. It is truly remarkable that at this site all livestock, mammals and birds, were subject to some improvement. A late medieval (*c* 15th-century) size increase in domestic fowl is also attested at Castle Mall. This change probably goes hand in hand with the tendency towards the slaughtering of younger birds in pointing to an increased concern with meat production. The occurrence of a five-toed chicken breed is attested in late medieval levels from The Shires and Dudley Castle, and represents the earliest occurrence of this morphological type in central England. It makes sense in the context of an improvement and diversification of domestic fowl types.

In addition to metric data, non-metric traits can help define the morphological characteristics of the medieval animals. Cattle continue to be mainly short-horned, as they were in the Saxon period. This is, for instance, the case throughout the medieval sequence at Castle Mall. Armitage (1980) suggests that a long-horned type of cattle makes its appearance in the late 14th to early 15th centuries, but we have no archaeological evidence of it in central England.

Polled sheep occur at a much greater number of medieval periodsites (24) than in the Saxon period, making their frequency more comparable with that of the Roman period. The condition is either particularly common, or commonly reported, at sites in Hereford, such as all phases at St Peter's School, Gaol St, Hereford (331, Hereford and Worcester; Baxter in press), Commercial Rd (98, Hereford and Worcester; Baxter in press), Harrison St and Bewell House. It has not, however, been noted at Berrington St, also in Hereford. Sites outside Hereford where the condition is reported for more than a single specimen include Causeway Ln (11% polled, 11th to 14th-century) and Flaxengate (13 out of 106, Saxo-Norman). Four-horned or polycerate sheep are reported at five (*c* 2.5%) periodsites, which is more than both the Roman and Saxon periods, for which only two occurrences are known. Three of the five sites with four-horned sheep are once again in Hereford, and include St Peter's School (late medieval), Commercial Rd (12th to 13th-century) and Bewell House (generically medieval). It seems that either these phenomena have been investigated with particular care in Hereford, or this sub-region was genuinely characterised by a wide variety of sheep morphological types.

The non-metric traits generally reported for cattle are the congenital absence of the lower third molar hypoconulid and of the lower second premolar. The first of these two conditions occurs more rarely than in previous periods, which contrasts with the situation at Launceston Castle (Cornwall), where it was common in the medieval period but disappeared almost entirely in the post-medieval period (Albarella and Davis 1996). The absence of the lower second premolar appears to be more common, but it is so sporadically reported that it is difficult to reconstruct a clear pattern of its occurrence. It is very common at Castle Mall, where, in both Saxo-Norman and late medieval phases, it occurs in as many as 50% cases. It is absent in the intermediate phases, but these produced much smaller sample sizes. Among other sites it is also reported at Dudley Castle. The lack of a second lower premolar is also occasionally reported for sheep and pig.

8.5 Human processes

8.5.1 Butchery

Although it is difficult to synthesise evidence for the distribution of animal body parts at a scale larger than the individual site, it is of interest that for all main domesticates body part distributions that are defined as a generic 'range of elements' occur less frequently in the medieval than in the Saxon period (Fig 8.30). This is probably a consequence of an increasingly more organised system of waste disposal.

Butchery is reported slightly more frequently in the medieval than in the Saxon period, particularly for cattle and sheep/goat (*see* Fig 5.11). As discussed in previous chapters, this evidence is indirectly affected by the abundance of a species in an assemblage, but because the trend applies to all domesticates, albeit marginally, it probably represents a genuine phenomenon. This may be caused by the adoption of new, perhaps more invasive, tools or the splitting of the carcass into a larger number of portions (possibly as dictated by market demands).

Of the various known indicators of redistribution of the carcass, the longitudinal split of vertebrae is reported with approximate equal frequency for the three domesticates, and does not show any substantial change in frequency compared with the Saxon period (*see* Fig 7.18). Conversely, split skulls become rare, perhaps suggesting an overall change in butchery practices. Sawn bones, for butchery rather than craft, which were completely absent in the Saxon period, occur at a few sites (for all domesticates), anticipating a trend that will become more common in the post-medieval period (*see* section 9.5). The earliest evidence comes from pig bones dated to Saxo-Norman levels from Castle Acre, whereas for sheep the earliest evidence is later and dates to the 13th to 14th centuries from St Peter's School. Split vertebrae are mainly found at urban sites but are also reported for Hertford Castle (high–late medieval; 174, Hertfordshire; Armitage 1978) and Bedford Castle (early medieval; 25, Bedfordshire; Grant 1979c).

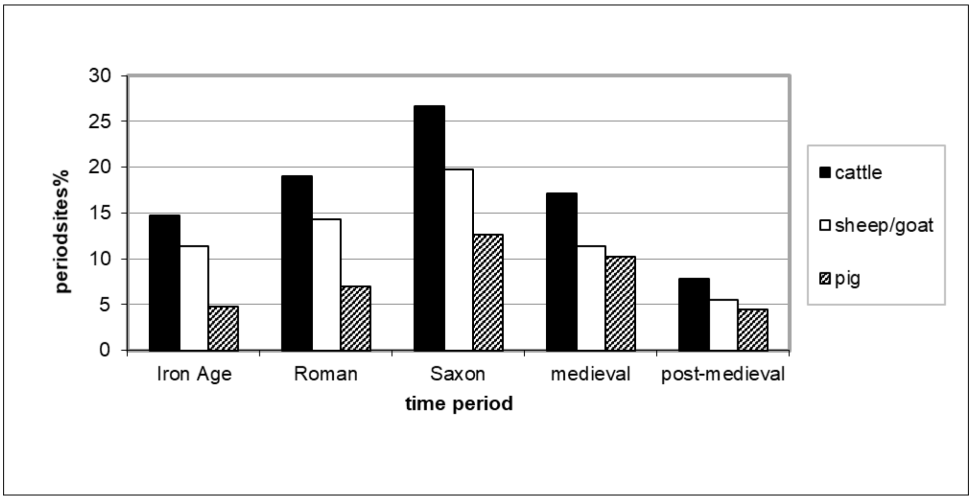

Fig 8.30 Occurrence of 'a range of elements' for cattle, sheep/goat and pig for different time periods, as a percentage of all periodsites across central England for each taxon and time period. Time periods with <10 periodsites have not been included.

The frequency of horse butchery is lower, but not substantially so, than in the Saxon period, whereas the evidence for skinning is reported at a slightly higher proportion of sites (*see* Fig 5.12). Chop and/or cut marks on horse bones are reported from all site types, except those of an ecclesiastic nature (Table 8.4). The sample is, however, a little too small to be sure that such an absence from ecclesiastic sites is because of a strict adherence to religious precepts (the consumption of horse meat was famously proscribed by Pope Gregory III in 732 AD). The evidence of skinning is unsurprising, as horse hide was certainly valued, but butchery and dismembering seem to continue a little publicised hippophagy tradition that had its roots in earlier time periods. Some sites have produced multiple instances of butchered bones and, although it is possible to speculate that the butchery was for the benefit of dogs (cf Markham 1633), instances of marrow extraction point to the likelihood that horse flesh were also consumed by humans. Horse meat is reported to have been consumed in times of famine (Hollis 1946), and by people of higher status, which would explain the evidence of horse butchery at castle and manor sites as well.

Table 8.4 Medieval sites providing evidence of horse butchery and/or skinning in central England. NISP=number of identified specimens.

Site	Date	Site type	Horse NISP	Butchery
Dudley Castle	Late 13th to early 14th century AD	Castle	6	One sawn pelvis and one radius with cut marks
Castle Mall	Saxo-Norman	Castle	34	Chop marks on a scapula and a metapodial and cut marks on a humerus
St John's Square	12th century AD	Enclosure		One case of skinning and possibly also defleshing
Springfield	Early medieval	Farm	5	Two butchered bones
Parson Drove	14th century AD	Industrial	6	Skinning
Friar St	Saxo-Norman	Industrial	5	Butchery on metapodials

Site	Date	Site type	Horse NISP	Butchery
West Cotton	Early medieval	Manor	177	Butchery fairly common; one tibia chopped and burnt probably for marrow extraction; skinning
Bordesley Abbey	12th to early 14th century AD	Mill	6	One longitudinally split bone and one tibia with cut marks; skinning
Home Farm	Saxo-Norman	Rural	4	Skinning
Market Harborough	Early medieval	Urban	117	Cuts and chops on two humeri
St John's St (29–39)	11th to 13th century AD	Urban	291	Dismembered partial skeleton
Walton Rd	11th to 13th century AD	Urban	13	One chopped first phalanx (disarticulation?); skinning
Causeway Ln	11th to 14th century AD	Urban	94	Several heavily chopped bones found together, possibly for marrow extraction
Friar St	12th century AD	Urban		Some butchered bones
Dragon Hall	12th century	Urban	1	Cut marks on a tibia midshaft; skinning
Coslany St	12th to 14th century AD	Urban	1	Cut marks on a tibia
George St	12th to 14th century AD	Urban	29	Chopped metacarpal and phalanx; skinning
Castle Mall	12th to 14th century AD	Urban	6	Skinning
St Peter's School	13th to 14th century AD	Urban	9	Skinning marks on a metatarsal
Commercial Rd	13th to 14th century AD	Urban		Unspecified butchery
Friar St	High medieval	Urban	120	Butchery and skinning on metapodials
Lincoln sites	Late medieval	Urban	3	Two chopped radii
Slaughter House Ln	Medieval	Urban	5	Cuts on a scapula
West Cotton	High medieval	Village	261	Butchery and skinning on various bones
Loughton	Medieval	Village	69	Butchery and skinning on various bones
Burystead	Medieval	Village	262	Skinning

Butchery and skinning of dogs is reported with approximately equal frequency as in the Saxon period. Specific occurrences include chopped and cut bones from the Saxo-Norman phase of Castle Mall, and cut marks on a tibia at Dragon Hall (late 13th to early 14th-century). At Bordesley Abbey (a 12th to early 14th-century mill; 41, Hereford and Worcester; Lovett 1993), a chop mark on a scapula suggests disarticulation. At Heigham St, Norwich (late 14th to early 15th century; 172, Norfolk; Weinstock 2002), de-fleshing marks were noted on the tibia of a partial skeleton. Skinning is reported at four periodsites. At West Cotton, one nasal bone has skinning marks from the early medieval phase, and all mandibles in the high medieval phase also bear cut marks. Cut marks attributed to skinning were found on a metacarpal from St Peter's School (early medieval), and a tibia midshaft from Gorhambury, near St Albans (medieval; 151, Hertfordshire; Jones and Ruben 1987). The use of dog skin for making gloves (and probably other products) is well attested historically (Serjeantson 1989), but the consumption of dog flesh is less known, yet the evidence seems to suggest that this did occasionally occur.

Butchery and skinning are reported for cats more frequently for the medieval period than in any other, and more commonly than for dogs. Although Fig 8.31 merges both butchery and skinning data, the former is only reported at a few sites, such The Green, Northampton (360, Northamptonshire; Harman 1996d) (cut marks on the femur of a sub-adult), St John's St (29–39), Bedford (324, Bedfordshire; Grant 1979a) (unspecified butchery) and St Peter's School (disarticulation marks on a proximal femur from a late medieval layer). As for dogs, cat consumption seems to have occurred, although it was not widespread. Conversely, the use of cat pelts was common, as frequent reporting of skinning marks demonstrates. These marks are generally found at the extremities of the carcass, most commonly on mandibles. The most remarkable English medieval site for cat pelt production is Bene't Court, Cambridge, where 79 cat skeletons were uncovered and all showed indications that they had been skinned before being dumped in a well (Luff and Moreno Garcia 1995). Early medieval articulated cat skeletons with signs of skinning on mandibles, skulls and phalanges were also found at Castle Mall, therefore suggesting the continuation of a tradition that dated back to the late Saxon period (*see* section 7.5.1). An intriguing collection of cat foot bones was found in a 12th to 14th-century pit at the tanning site of The Green. These bones were accompanied by eight partial skeletons with no metapodials, suggesting skin preparation activities. Cat skinning is not confined to urban sites and it is in fact also rather common at West Cotton, where it is predominantly associated with young animals, a situation paralleled by the evidence from both Cambridge and Norwich. This supports McCormick's (1988) and Serjeantson's (1989) view that young cats may have been selected for their higher quality pelts.

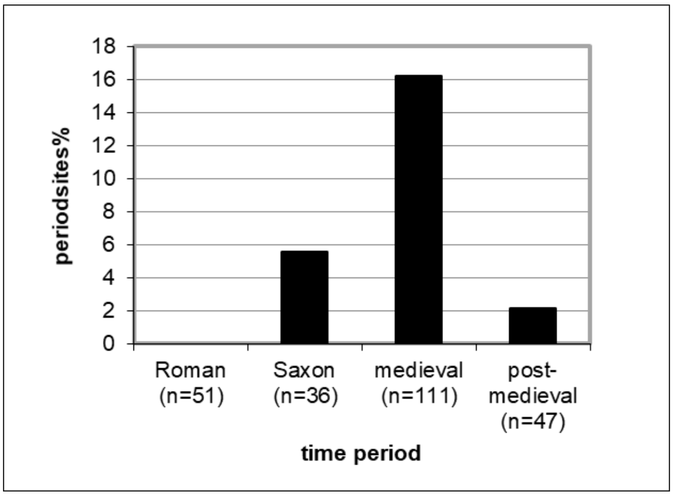

Fig 8.31 Cat butchery, indicated by the occurrence of skinning and other types of butchery evidence, as a percentage of periodsites, where n *is all periodsites for each time period from sites across central England. All the evidence was reported as recorded skinning, except for two of the 18 medieval periodsites, which recorded butchery only.*

As far as the butchery of wild game is concerned, the most interesting pattern is represented by the bias towards hindlimbs of fallow deer, which, in central England, is clearly demonstrated at Dudley Castle, in various phases from the 13th century onwards. The pattern is also tentatively identified in generically medieval levels from the monastic site of Austin Friars. It is, however, commonly reported at castle sites outside central England, such as Launceston, Barnard, Sandal, Prudhoe and Okehampton (cf Albarella and Davis 1996 for a full review of the evidence). The predominance of these hindquarters of fallow deer was certainly a mark of high social status and must be interpreted as part of the highly ritualised 'unmaking' of the deer carcass, which characterised the nobility from the 12th century onwards (Sykes 2005).

More mundane butchery patterns affecting fallow deer include the predominance of metapodials and phalanges, interpreted as primary butchery waste, at King John's Hunting Lodge, Writtle, near Chelmsford (medieval, moated site; 199, Essex; Harcourt 1969b), and the evidence for skinning from Dudley Castle (late 13th to early 14th-century) and George St, Aylesbury (12th to 14th-century; 147, Buckinghamshire; G G Jones 1983). The peculiar body part representation of this species at castle sites means that it is difficult to evaluate to what extent the hides of this species were regularly used. Had the hides been as extensively used as those of the main domesticates, we should expect to find more cuts marks on metapodials and phalanges.

The body part pattern found at castle sites for fallow deer has no equivalent in red deer, with the possible exception of post-14th century Dudley Castle (Thomas 2007). Butchery is, however, common, with 31% of the specimens from Dudley Castle affected by either cut or chops marks. The former are more common in an earlier phase (late 13th to early 14th-century) and the latter in a later phase (14th century). Skinning of this species is reported at the village of Loughton, Milton Keynes (generically medieval; 217, Buckinghamshire; Hamilton-Dyer 2003). The frequency of butchery on roe deer bones at Dudley Castle is lower (18%) than for red deer, which can be explained by the smaller size of the carcass.

Skinning marks have also occasionally been reported for smaller game, all the evidence deriving from Dudley Castle. This includes cut marks on two fox mandibles from a late 13th to early 14th-century context, and knife marks on various hare and rabbit bones (including mandibles) from different phases. Both meat and skins of the two lagomorphs were likely to have been used.

With their smaller bodies, birds do not need to be as intensively butchered as the main food mammals, but there is still a suspicion that bird butchery is under-reported. Domestic fowl butchery (knife marks) is reported for both 13th- and 14th-century phases from Dragon Hall as being mainly concentrated on distal epiphyses. Butchery of duck bones is mentioned at Loughton, whereas cut marks on goose carpometacarpi from late medieval levels at The Shires may be associated with the removal of feathers (this is discussed in greater detail in section 8.5.2). At The Shires, several split skulls of chickens, geese and even one whooper swan (all from the late medieval period) are recorded. Brain extraction and consequent consumption seems to be the most pragmatic explanation, although ritual use (witchcraft?) cannot be ruled out. Among the rarely reported evidence of butchery on wild bird bones, of note is the occurrence of cut marks on a late medieval little grebe bone from Castle Mall, as it attests to the likely consumption of a species not typically associated with food. Less surprising is the occurrence of cut marks on woodcock bones from late 13th to early 14th-century levels from Dragon Hall.

Evidence of butchery on fish bones is of particular interest for the identification of patterns of stockfish preparation and therefore fish inland trade. The evidence for the Saxon period is too scanty to be genuinely informative, but it is slightly richer for the medieval period. Gadids are particularly suitable for this type of analysis because of their substantial cleithra, a bone of the cranium that is expected to be chopped during the process of stockfish preparation. Such a pattern has been identified on cod bones from Saxo-Norman and late medieval levels from Castle Mall, Saxo-Norman Woolmonger St, late medieval Northampton (site N80–82) (250, Northamptonshire; Locker 1985b), medieval Ipswich (AML 4578) (191, Suffolk; Locker and Jones A 1985) and 15th to early 16th-century Shrewsbury Abbey. Some of these sites are far inland, and the occurrence of traded and cured marine fish is therefore unsurprising. The late medieval assemblage from Northampton (site N80–82) has vertebrae in addition to cleithra, but no other head bones, thus confirming the idea of imported stockfish. At this site, ling is also characterised by the absence of heads and is therefore likely to have been imported. This is also the case at the nearby 12th to 14th-century site of St Peter's St. A different type of curing evidence characterises the assemblage from Austin Friars, as here cod and salmon vertebrae were longitudinally cut, implying filleting. Cleithrum butchery was also noted on a haddock specimen from Harrison St (again a far inland site).

Conversely, gadids (cod and whiting) from Saxo-Norman and early medieval phases from St Martin-at-Palace Plain are characterised by many head elements in addition to vertebrae. Many of these fish are small and were probably caught inshore and not cured. The situation seems to be typical at St Martin-at-Palace Plain and at Castle Mall, where, in addition to the butchered cleithra, a variety of cod anatomical elements were also found, which indicates that both fresh and preserved fish were imported to the site.

8.5.2 Bone modification

The evidence for the use of animal remains for craft or industrial activities increases slightly during the medieval period, compared with the Saxon period (*see* Fig 6.28). Horn-working, however, decreases in importance (*see* Fig 7.19), and it is the emergence of tanning that represents the most important difference between the medieval and previous periods (Fig 8.32) (cf Albarella 2003b).

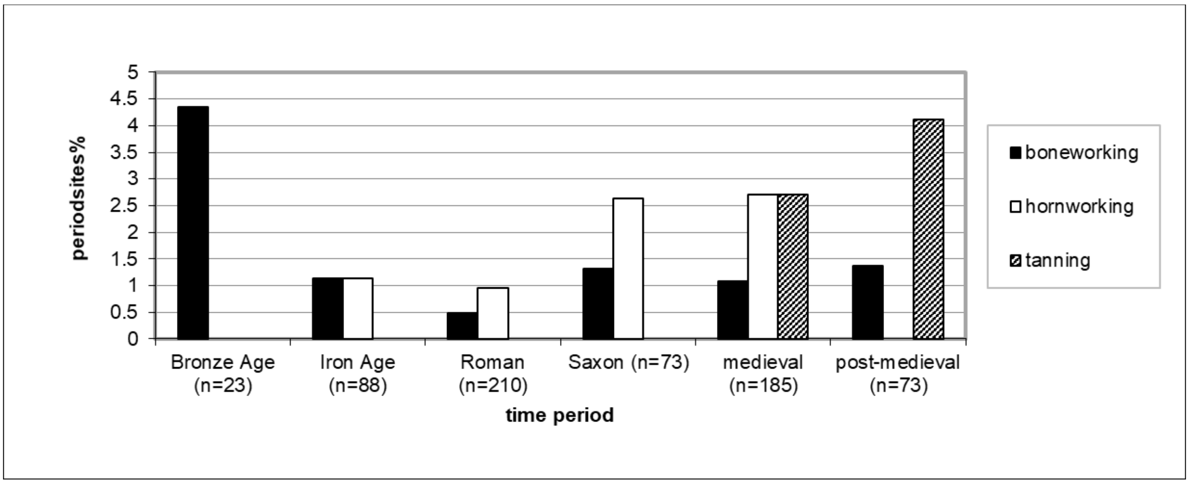

Fig 8.32 Evidence of bone-working, horn-working and tanning for sheep/goat, as a percentage of periodsites, where n *is all periodsites for each time period from sites across central England.*

The decline of horn-working mainly affects sheep/goat, although evidence for the use of this material is still found in various 11th to 14th-century contexts from sites in Bedford, Norwich and Northampton. The nature of the evidence is diverse. In some cases, it is mainly represented by the accumulation of horncores, such as the Empire Cinema, Bedford (124, Bedfordshire; Grant 1983d), where most of the remains are goat, and St John's St (29–39), also in Bedford. In other cases there is either an abundance of horncores chopped at the base, such as early medieval Bedford Castle and 11th to 14th-century Causeway Ln, or of skulls from which horncores have been chopped off, such as Saxo-Norman Flaxengate and Castle Mall.

Accumulations of cattle horncores were also found at sites such as St Peter's St (12th to 14th century and late medieval), Coslany St, Norwich (100, Norfolk; Albarella 1997c), St John's St (29–39), and Friar St, Droitwich (high medieval; 141, Hereford and Worcester). At the tanning site of The Green (late medieval), an oven had been infilled with cattle horncores (NISP=11).

Tanning deposits are not easy to identify and potential criteria are provided by Serjeantson (1989) and Albarella (2003b). Sites from central England where bone accumulations are certainly, probably or possibly the consequence of tanning or other skin processing include the following.

- The Green, Northampton. This is known to be a tannery on the basis of structural evidence (pits, etc). Deposits with sheep/goat heads and feet, predominantly metapodials, occur. A 12th to 14th-century special pit deposit also exists, and this has more sheep/goat heads than feet; it may represent a combination of primary butchery waste and skin processing.
- Bonners Ln, Leicester (40, Leicestershire; Baxter 1993a). A late medieval special deposit of distal limb sheep elements is said to be linked with tanning.
- Castle Mall, Norwich. A large assemblage of sheep head and foot bones in a late medieval pit. Individuals in the pit were horned, probably female and small sized (unimproved).
- Church St, Waltham Abbey (91, Essex; Clarke *et al* 1993). A late medieval–early post-medieval pit with a deposit of caprine heads and feet. This was not interpreted as a tanning deposit in the original report, but is likely to be.
- Waltham Abbey 74–5 (396, Essex; Huggins 1988). A late medieval church. Caprine metapodials and phalanges were found in a dump of lime, with shears and knives. This is interpreted as parchment production, in which lime would be used to loosen the hairs from the skin. The deposit is situated inside monastic precincts.
- St Peter's St, Northampton. An accumulation of caprine metapodials and phalanges in a late medieval pit is interpreted as primary butchery waste, but tanning is a possibility.
- Hunter St, Buckingham (187, Buckinghamshire; Rackham 1975). A deposit from this high medieval farm contained caprine heads and feet but no horncores. Phalanges were probably retained with the skins. This is a rare example of a rural site where primary butchery waste specifically suggests removal of skins elsewhere.
- Harrison St, Hereford. A small assemblage of goat metapodials and horncores is interpreted to derive from skins to which they were originally attached. This is therefore not a tanning site but attests to the use of goat skin.
- Colchester 71–85 (94, Essex; Luff 1993). A predominance of cattle distal limb elements suggests a possible industrial use.

It is worth noting that most of the sites in this list are late in the medieval sequence, with The Green being the earliest site with definite tanning evidence. This confirms a previously identified trend, which sees tanning increasing in frequency towards the end of the medieval period (Albarella 2003b).

Clearly, bones in the medieval period were used as valuable working material. The evidence is, however, uneven. This is partly because reports on worked bones are often presented separately, thus making their integration with more typical zooarchaeological analyses rather difficult. Nevertheless, a few interesting cases are worth mentioning.

A particularly abundant deposit of cattle worked bones was found at Town St (rear 34), Thaxted (381, Essex; Wade 1998). This includes rejects and offcuts (mainly metapodials) from what was probably the manufacture of cutlery handles. At Saxo-Norman Castle Mall, the manufacturing of spindle whorls from femur heads is also noteworthy. Pig metapodials were commonly used as toggles in the medieval period and there is evidence of this at Saxo-Norman Castle Mall and late medieval St Peter's School. Worked pig metapodials are also noted in both early and high medieval levels from West Cotton. Skates were typically made with horse metapodials, and there is an example of this from early medieval levels at The Shires. Various other worked horse bones were found at early medieval Market Harborough (226, Leicestershire; Baxter 1996b) and late medieval St Peter's School.

The late medieval barbican well from Castle Mall produced an abundance of worked goose ulnae and radii, and worked goose bones were found at 12th to 14th-century George St. The occurrence of cut marks on goose wing bones as a likely consequence of the removal of feathers has been mentioned before (*see* section 5.5.1). The deposit from Norwich is especially rich, and here left wing bones are more than twice as frequent as right wing bones (the left feathers being preferred by right-handed scribes; Moreno García 2009). At Loughton, wingtip removal is interpreted as aimed at preventing the birds from flying, but an alternative explanation could be quill pen production (Hamilton-Dyer 2003). Serjeantson (2002) notes that goose quills have been in use at least since the 6th century AD. Primary feathers could be plucked during life, although this is a rare practice today. Harvesting feathers after death may be evidenced if the distal wing is removed (as at 13th to 14th-century Winchester; Serjeantson 2002), or may leave no trace in the record. As we have seen for the ageing evidence (section 8.4), a predominance of adult geese may indicate an interest in feathers as well as eggs.

Another important working material was antler. The frequency of medieval sites reporting evidence of antler working is slightly reduced in comparison with the Saxon period, perhaps suggesting that the use of antler, like horn, was declining. Nevertheless, as many as 13 of the 83 periodsites reporting the presence of the red deer are characterised mainly by antlers. A similar number of sites also provides direct evidence of antler working (this could be on either shed or unshed antlers). Fallow and roe deer antler working is also occasionally reported, but it is clearly rarer (four sites for fallow and three for roe deer), as these antlers are smaller and less suitable for working.

Table 8.5 presents the proportion of rural and urban sites that have produced bone deposits associated with craft/industrial activities. This is an updated version of fig 7.6 in Albarella (2003b, 137), and it confirms the suggestion that such deposits are more likely to be found in towns than the countryside. Although there are obvious advantages in placing smelly and polluting activities, such as tanning, in rural areas, it is likely that the various animal-related trades (butchery, tanning, horning, etc) benefited from the close proximity that the level of specialisation and concentration of activities of the urban centres allowed.

Table 8.5 Number of rural and urban periodsites from medieval central England providing specialised distribution, presumably related to industrial activities, of animal body parts.

Rural *n*=51 periodsites	Urban *n*=108 periodsites
2 (4%) have specialised distribution: 1 mainly skull and foot bones 1 lack of horncores	19 (17%) have specialised distribution: 2 mainly skull and foot bones 5 lack of horncores 5 mainly horncores 3 including horncore dumps 3 mainly foot elements 1 mainly mandibles and scapulae

8.5.3 Bone groups and rituals

Associated bone groups are very rarely reported for the medieval period. It is hard to say to what extent this is a consequence of a decline in animal-related ritual depositions, a change in the nature of the sites, or a decline in reporting this phenomenon. Whatever the case, partial skeletons of the main domesticates certainly occur but they are rarely explicitly presented as such.

The burial of the bow-legged dog from Watermill has already been mentioned (*see* section 8.4.1). The unusual morphological characteristics of this animal may have given a special meaning to its burial, but this is hard to demonstrate. More remarkable is a mass burial of eight to 11 disarticulated dog skeletons from an 11th to 12th-century pit at Woolmonger St. Ten cat skeletons were also present in the same pit. Both the dogs and cats were mostly young. The meaning of this pit is hard to understand without a detailed analysis of its content. The young age of the animals may suggest the use of pelts, but no skinning marks are mentioned. Casualties from an epidemic, or cleansing of the streets, are possible and no ritual significance needs necessarily to be advocated.

As mentioned (section 8.3), multiple cat partial skeletons were found in both high and late medieval phases from The Green. Considering that this is a tanning site, any ritual interpretation is highly unlikely. Given the context and the body part distribution (section 8.5.1), pelt exploitation is the most obvious explanation.

Two intriguing deposits of red deer bones have been reported for the medieval period. One derives from generically medieval levels from Stansted Airport (DFS) and includes an odd assortment of several phalanges, a scapula and an antler, all found in the same pit, with no butchery marks. The second puzzling deposition is from the village of Lyveden (IV), where a 14th-century well revealed the skeleton of an antlered (male) red deer with only its front limb missing. Butchery is noted on pelvis and vertebrae but not long bones. Although the meaning of this deposition is obscure, it is possible that it must be interpreted in view of the unusual role that deer had at this site. Lyveden (IV) is indeed peculiar in being a low-status site with a high frequency of deer bones. Whether the deer were poached or obtained through different means, these animals must have fulfilled a special role in the psychology of the village dwellers, or perhaps had to be buried in a hurry to hide the evidence of the 'crime'.

9 POST-MEDIEVAL

9.1 The context

The post-medieval (or 'modern') period covers the five centuries from the beginning of the 16th century to the 20th century but, in reality, the zooarchaeological evidence for the study area for the last two centuries is so scanty that most of this chapter only deals with the evidence up to 1800. In fact, the 18th century is also insufficiently documented, and many assemblages that are potentially from the post-medieval period are poorly dated. The dearth of evidence for the late post-medieval period is particularly lamentable as this is obviously the period that has the most direct connection with the way our current relationship with animals has evolved (cf Thomas 2009).

Until the relatively recent past, the post-medieval period was not regarded to have been 'old' enough to be of much interest for archaeologists. Fortunately, this attitude has been changing in recent decades, although much emphasis has been placed on industrial heritage, with other aspects of everyday life often neglected. An additional problem with animal bone assemblages from the post-medieval period is that they often derive from urban multi-stratified sites, which can be severely affected by problems of residuality and contamination.

Several important historical events provide an essential background against which the zooarchaeological data for the period must be interpreted. The continuing population expansion, as well as increasing urbanisation, are important factors to bear in mind, as they clearly affected the ways animals were exploited, as well as the physical and cultural landscapes in which the human-–animal interaction operated.

The so-called 'agricultural revolution' (Kerridge 1967) is a phenomenon that is normally associated with the early modern era, but we have seen in Chapter 8 that the roots of several of its characterising elements can be traced back to the medieval period. Zooarchaeological evidence from the post-medieval period contributes further to our understanding of this important historical event. It adds weight to the view that the agricultural revolution was in reality a long-term process of gradual improvement of animal breeds and husbandry techniques (Davis and Beckett 1999).

If the increased urbanisation means that our evidence for the post-medieval period is skewed towards towns, as a consequence of the 16th-century 'dissolution of the monasteries' (Hoyle 1995), our evidence for ecclesiastic sites, which is scanty for the medieval period too, almost completely disappears. Conversely, castle sites remain active and maintain some of their medieval characteristics, despite the obvious changes in social and economic contexts, mainly exemplified by the overall greater material wealth of the population.

New and more efficient means of transport caused an exponential increase in national and international trade (Parker 2010). The world gradually became 'smaller', and this meant a much enhanced opportunity for the deliberate or accidental transport of livestock, game and animal products; a phenomenon that needs to be considered in our interpretations.

9.2 The sites

There are 65 gazetteer sites for the post-medieval period specifically, nine from the medieval–post-medieval transition, and six that are 'broadly dated', including a post-medieval component. The 55 post-medieval gazetteer sites have produced 84 unique periodsites (ie not double-counting sites with separate fish reports). The greater number of periodsites is because 19 sites are multi-phased. Two reports only deal with fish bones: Berrington St, Hereford (site code 28, Hereford and Worcester; Noddle 1985a), and Northampton Green, Northampton (251, Northamptonshire; Locker 1985a). In addition, some sites have fish reports phased in a different way to the mammal and bird bones: the Hereford sites of Harrison St (166, Hereford and Worcester; Baxter in press; Hamilton-Dyer in press), St Peter's School, Gaol St, Hereford (331, Hereford and Worcester; Baxter in press; Hamilton-Dyer in press) and Commercial Rd (98, Hereford and Worcester, Baxter in press; Hamilton Dyer-in press) are treated separately for mammals and combined for fish (as is the phasing), and the various Shires reports from Leicester (365 and 366, Little Ln and St Peters Ln; Gidney 1992a, 1992b; Nicholson 1992) also phase the fish differently.

Clearly the evidence is much scantier than for the medieval period and, in fact, it does not even approach the amount of information we had for the Saxon period. The proportion of multi-phased sites is intermediate between the Saxon and medieval periods.

In continuity with the medieval period, the site with the highest number of distinctively phased animal bone assemblages is Alms Ln, Norwich (4, Norfolk; Cartledge 1985, 1988, 1989; Harman *et al* 1985; Jones and Scott 1985), which has four. Other multi-phased sites with abundant material include The Shires (St Peter's Ln) and Dudley Castle (115, West Midlands; Thomas and Locock 2000; Thomas 2005a), both with continuing occupation from the medieval period.

The geographical distribution of sites in the post-medieval period (Fig 9.1) is very similar to the preceding period, although it is clearly much sparser, because of the smaller number of informative assemblages. There is therefore little evidence of any substantial difference in settlement patterns, with most sites continuing from the medieval occupation. Unsurprisingly, western counties remain poorly represented, but there is also an acute dearth of evidence from Cambridgeshire and Suffolk.

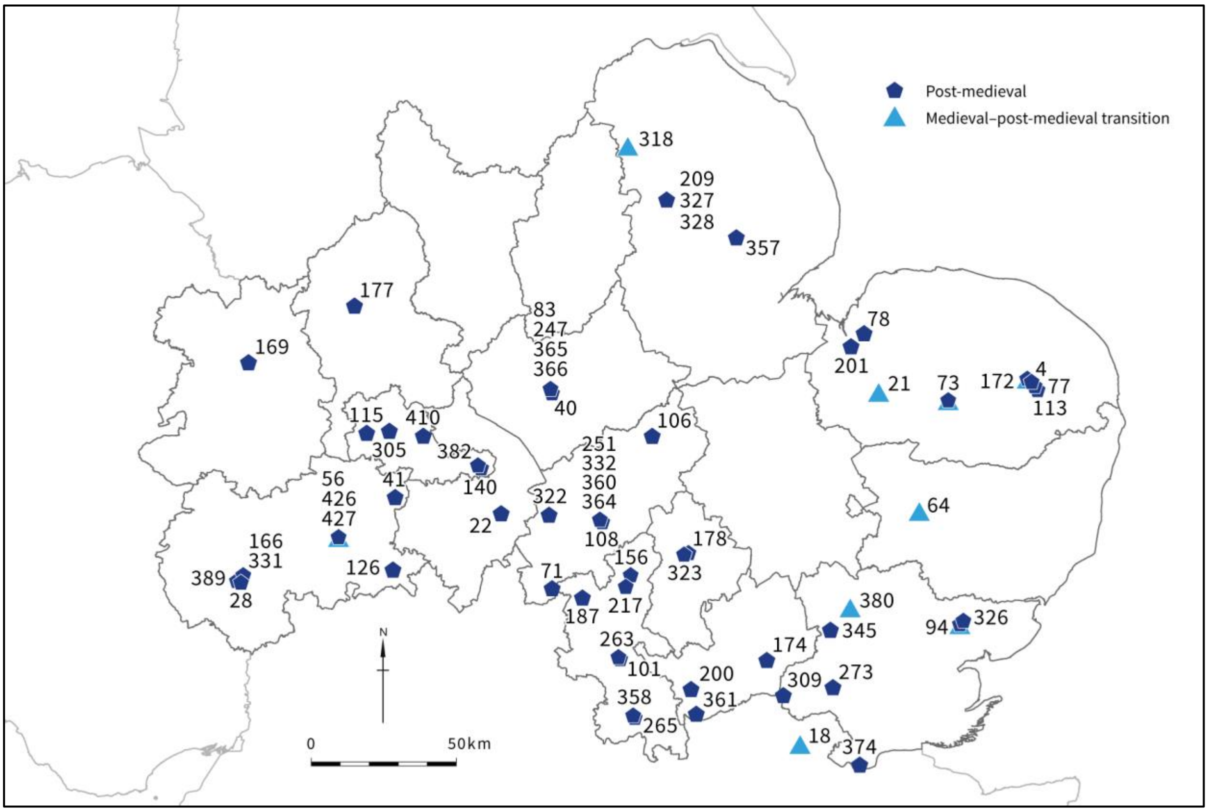

Fig 9.1 The distribution of post-medieval sites across central England. Numbers refer to the site codes given in the gazetteer (Appendix 1) and at first mention of a site in the text.

Even more than in the medieval period, assemblages from towns predominate (52 of the 84 post-medieval periodsites), although rural and castle sites are also represented. This is the unsurprising consequence of the increased level of urbanisation, and it is a trend also reported further north (Huntley and Stallibrass 1995). Ecclesiastic sites are only represented in the medieval–post-medieval transition phase, which is to be expected as the beginning of the post-medieval period roughly coincides with the dissolution of the monasteries (Hoyle 1995). Very broadly dated sites include a hospital and a mill. In terms of chronological spread, most assemblages originate from the earlier part of the period (16th and 17th centuries), which is useful for a direct comparison with the medieval period but disappointing in terms of our understanding of the shaping of the contemporary world.

9.3 Species occurrence and frequency

9.3.1 Domestic animals

The overall proportion of the main mammal taxa is very similar to the medieval period, with cattle and sheep/goat being roughly equally represented and pig of much less importance (Fig 9.2). The only perceivable difference from the previous period is represented by a further slight decline in pig remains, although, according to a one-way ANOVA test (*see* Table 6.1), this is not statistically significant, even when outliers are removed. It is, as usual, important to remember that cattle frequencies are probably over-represented because of recovery bias. This is particularly true for the post-medieval period, for which we have no substantial assemblages with a sieved component (Table 9.1).

Fig 9.2 Relative proportions of the three main domestic taxa, based on the number of identified specimens (NISP) of all hand-collected assemblages from post-medieval periodsites across central England, regardless of assemblage size.

Details of the frequency of the main taxa for sites that have provided the most substantial animal bone assemblages can be found in Table 9.1. In Fig 9.3 it can be seen that there is a certain variation in the frequency of the main animals between sites, but the tripolar plot (Fig 9.4) clearly indicates that all sites tend to plot towards the right-hand side of the distribution. This means that they all have rather low pig frequencies, and in fact almost all have pig frequencies that are lower than 20%. Assemblages with a clear predominance of cattle (ie >50%, top triangle) are better represented than those dominated by sheep/goat remains (bottom right triangle). This differs from what has been reported for northern England, where sheep/goat more commonly predominate (Huntley and Stallibrass 1995).

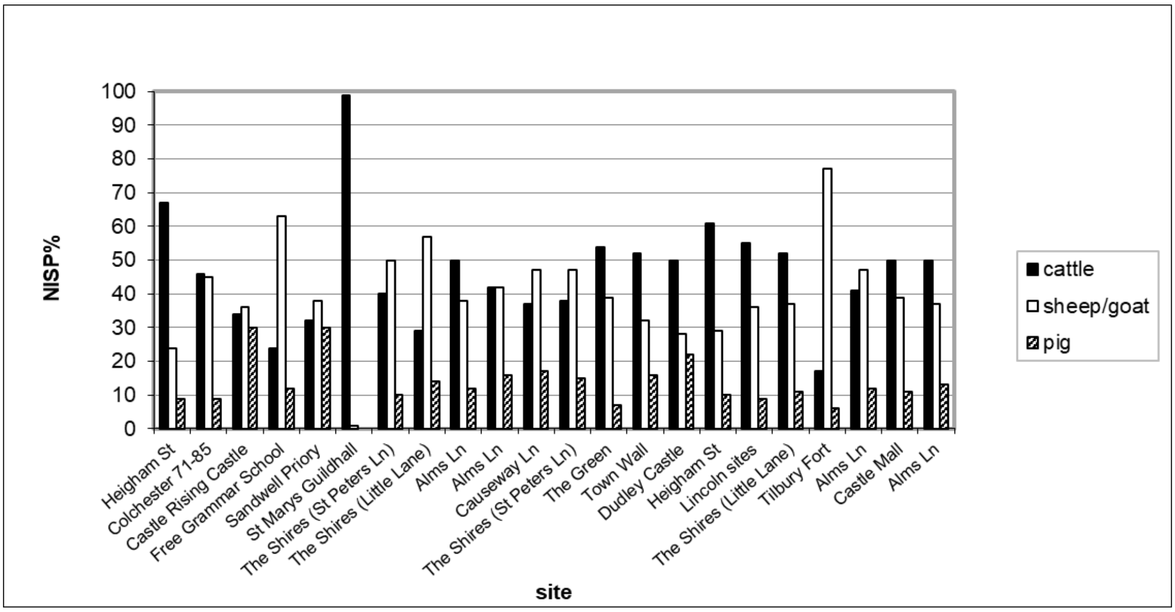

Fig 9.3 Summary of the three main domestic taxa at various post-medieval sites across central England, as a percentage of number of identified specimens (NISP), grouped in approximate chronological order. Assemblages generically dated to the post-medieval period have been excluded. For further details see Table 9.1.

Table 9.1 Post-medieval sites from central England with a combined cattle, sheep/goat and pig number of identified specimens (NISP) >400. The sites are grouped approximately by date. Coll refers to the method of collection (HC=hand-collected; none of the sieved assemblages met the threshold). The NISP count shown is that of the three main domesticates combined. Site numbers refer to those shown on the map in Fig 9.1 and as given in the gazetteer (Appendix 1).

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep–goat, %	Pig, %	NISP
HC	172	Heigham St, Norwich	Norfolk	Late 15th to mid–late 16th century AD	Urban	67	24	9	966
HC	94	Colchester 71–85	Essex	Late medieval–early post-medieval	Urban	46	45	9	3 101
HC	115	Dudley Castle	West Midlands	Post-medieval, ie AD 1500–1750	Castle	74	18	8	728
HC	156	Great Linford, Milton Keynes	Buckinghamshire	Post-medieval, ie AD 1500–1750	Village	33	52	15	1 575
HC	201	King’s Lynn	Norfolk	Post-medieval, ie AD 1500–1750	Urban	55	34	12	1 641
HC	263	Oxford Rd Watermill, Aylesbury	Buckinghamshire	Post-medieval, ie AD 1500–1750	Mill	100	0	0	1 110
HC	345	Stansted Airport (SCS), Stansted	Essex	Post-medieval, ie AD 1500–1750	Unknown	100	0	0	721
HC	360	The Green, Northampton	Northamptonshire	Post-medieval, ie AD 1500–1750	Urban	41	52	7	430
HC	79	Castle Rising Castle, near Kings Lynn	Norfolk	16th century AD	Castle	34	36	30	555
HC	140	Free Grammar School, Coventry	West Midlands	16th century AD	Friary	24	63	12	1 041
HC	305	Sandwell Priory, West Bromwich	West Midlands	16th century AD	Country House	32	38	30	463
HC	328	St Mary’s Guildhall, Lincoln	Lincolnshire	16th century AD	Urban	99	1	0	1 119
HC	366	The Shires (St Peter’s Ln), Leicester	Leicestershire	16th century AD	Urban	40	50	10	475
HC	365	The Shires (Little Ln), Leicester	Leicestershire	16th century AD	Urban	29	57	14	2 007

Coll	Site no	Site name	County	Period	Site type	Cattle, %	Sheep–goat, %	Pig, %	NISP
HC	4	Alms Ln, Norwich	Norfolk	Early post-medieval, ie AD 1500–1600	Urban	50	38	12	1 601
HC	4	Alms Ln, Norwich	Norfolk	Early post-medieval, ie AD 1500–1600	Urban	42	42	16	1 141
HC	83	Causeway Ln, Leicester	Leicestershire	16th to 17th century AD	Urban	37	47	17	417
HC	366	The Shires (St Peter's Ln), Leicester	Leicestershire	16th to 17th century AD	Urban	38	47	15	970
HC	360	The Green, Northampton	Northamptonshire	16th to 17th century AD	Industrial	54	39	7	695
HC	382	Town Wall, Coventry	West Midlands	16th to 17th century AD	Urban	52	32	16	2 410
HC	115	Dudley Castle	West Midlands	Mid-16th to mid-17th century AD	Castle	50	28	22	1 036
HC	172	Heigham St, Norwich	Norfolk	Mid–late 16th to 17th century AD	Urban	61	29	10	870
HC	209	Lincoln sites	Lincolnshire	17th century AD	Urban	55	36	9	2 128
HC	365	The Shires (Little Ln), Leicester	Leicestershire	17th century AD	Urban	52	37	11	981
HC	374	Tilbury Fort	Essex	17th century AD	Fort	17	77	6	1 048
HC	4	Alms Ln, Norwich	Norfolk	Late post-medieval, ie AD 1600–1750	Urban	41	47	12	1 101
HC	77	Castle Mall, Norwich	Norfolk	Late post-medieval, ie AD 1600–1750	Urban	50	39	11	1 357
HC	4	Alms Ln, Norwich	Norfolk	19th century AD	Urban	50	37	13	446

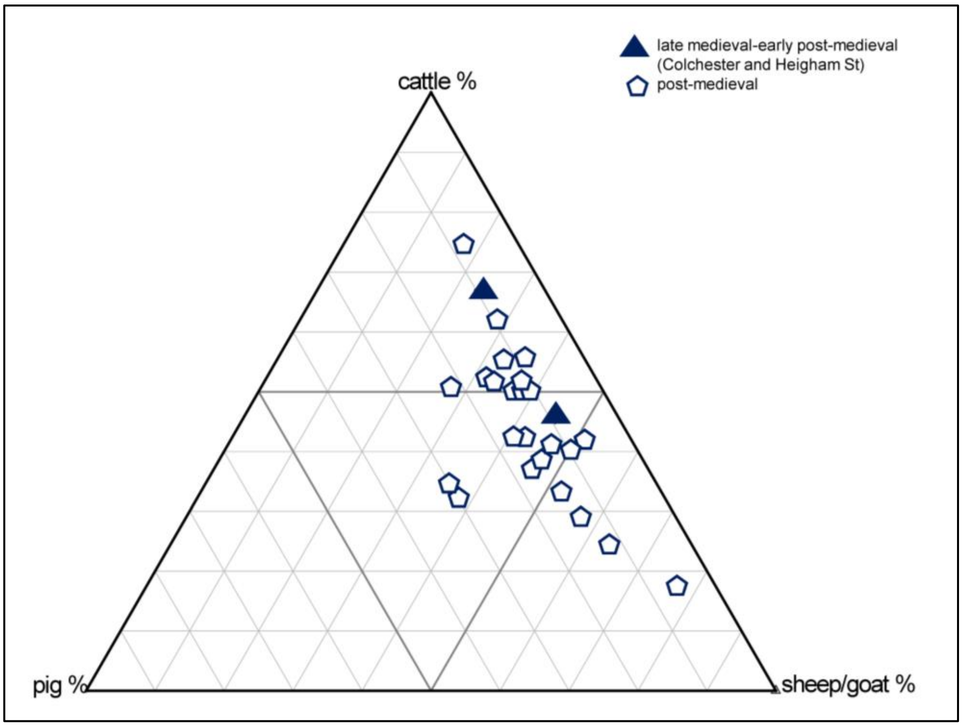

Fig 9.4 Relative proportions of cattle, sheep/goat and pig at periodsites containing a combined cattle+sheep/goat+pig number of identified specimens (NISP) >400 from post-medieval sites across central England. All assemblages were hand-collected (for details see Table 9.1). Assemblages that only had cattle bones were excluded.

The relative scarcity of post-medieval assemblages with large samples prevents us from undertaking a detailed chronological analysis but, nonetheless, an attempt to focus on two main phases (Fig 9.5) reveals that the decline in pig frequency was a slow and gradual phenomenon. Pre-17th-century assemblages are in fact rather similar to the late medieval phase (cf Fig 8.7), whereas around the 17th century pig frequencies start falling again. The main reason for this is an intensification of the phenomenon already identified for the late medieval period (*see* section 8.3), namely the move from keeping large free-range pig herds to a system in which small groups of pigs, or even individual animals, are predominately kept enclosed. Clearly this represents a social as well as an economic change, as settlement patterns, jobs and community relationships are all affected by it.

The variation in the distribution of the main farm animals must also take into account the possibility of regional differences. In Fig 9.6, we can see that the pattern identified from the medieval period, in which sheep/goat was more abundant in the central part of the region, also applies to the post-medieval period. The persistency of this trend suggests that the more pastoral characteristics of the landscape of central England were preserved after the medieval period.

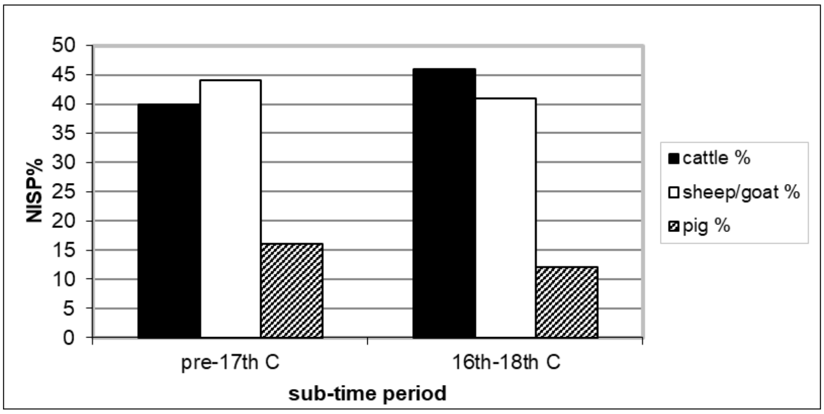

Fig 9.5 Summary of the main domestic taxa, as the average percentages of the cattle+sheep/goat+pig number of identified specimens (NISP) from selected sites within central England, for two post-medieval sub-time periods. Ten assemblages from pre-17th century and 12 from the 16th to 18th centuries have been included (see Table 9.1 for more details). The site of St Mary's Guildhall (site 328) has not been included, as this is a special deposit containing almost only cattle horncores. C=century.

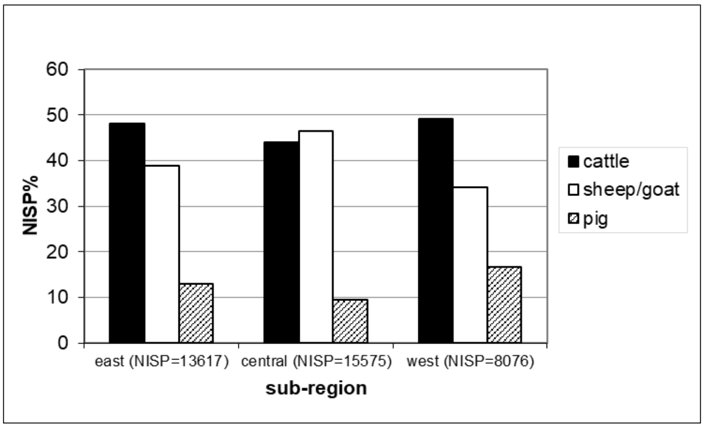

Fig 9.6 Relative proportions of cattle, sheep/goat and pig, as a percentage of the cattle+sheep/goat+pig number of identified specimens (NISP) for each sub-region, from post-medieval periodsites across central England.

The frequency of periodsites for which goat remains are reported had already decreased in the late medieval period, and continues to do so in the post-medieval period (*see* Figs 6.9 and 9.7). At King's Lynn (201, Norfolk; Noddle 1977a), where goat remains were routinely identified, the frequency of remains of this species (in relation to sheep) drops from 13% to 7% between the late medieval and post-medieval periods. However, a remarkable difference with previous periods is the almost complete disappearance of goat assemblages mainly represented by horncores. This is a clear sign of the decline in the horn trade. Like the medieval period, goats are better represented in the western area of central England (Fig 9.8). Because of the absence of horncore-dominated assemblages, we can be fairly confident that this is not a pattern determined by industrial activities or trade, but is genuinely because of a greater occurrence of these animals in the west of the region. Although the difference is not as marked as in the medieval period, goats are more commonly reported on urban than rural sites, but we must remember that the sample is small. As in the medieval period, goat is also fairly well represented at high-status sites, perhaps an indication of the high value attributed to, mainly young, goat meat (Albarella and Davis 1996).

As for pig, the causes of the decline in goat can be attributed to an intensification of the phenomena that had already contributed to the loss in the popularity of this animal in the late medieval period, which were discussed in section 8.3.

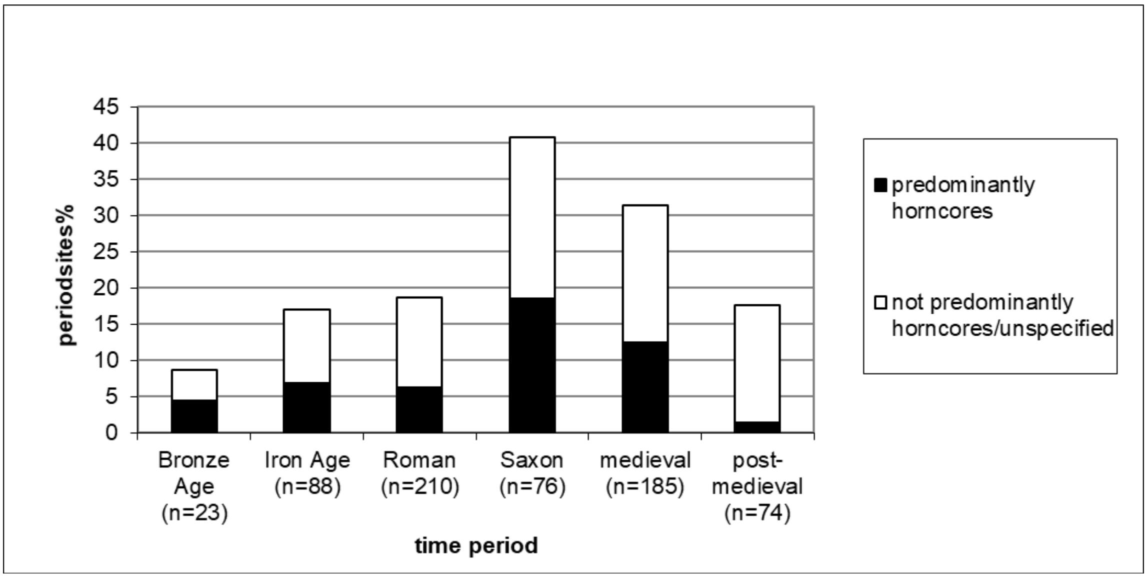

Fig 9.7 Occurrence of goat by body part, as a percentage of periodsites across central England, where n *is the number of periodsites where hand-collected sheep/goat is recorded within Bronze Age to post-medieval time periods. Time periods with <10 periodsites have not been included.*

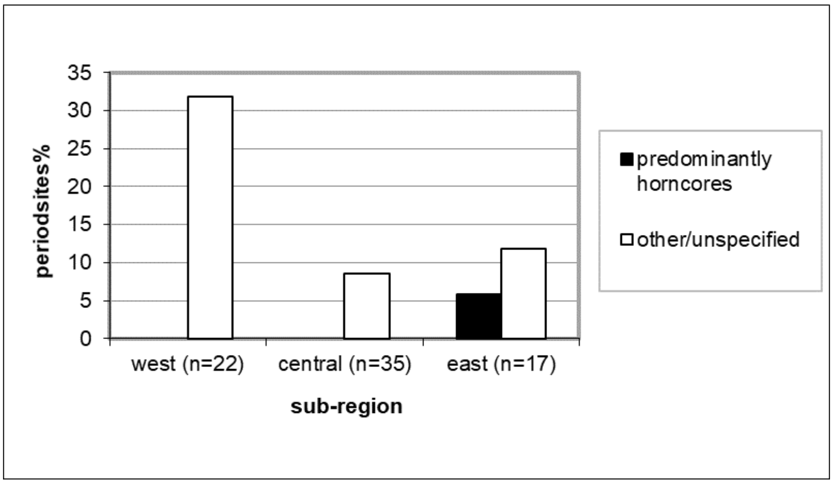

Fig 9.8 Occurrence of goat by body part and sub-region, as a percentage of periodsites across central England, where n *is the number of post-medieval periodsites where hand-collected sheep/goat is recorded within a sub-region.*

The frequency of horse bones (out of the total of the main domestic mammals) increases in the post-medieval period, rising to about 4% (cf Monckton 2006). This occurs despite the higher proportion of urban sites, where, for reasons explained in section 8.3, horse remains tend to be less frequent. There are many factors affecting patterns of horse carcass disposal, but it is likely that the increased frequency of horse remains reflects a genuine phenomenon, which is well-attested historically (Langdon 1986). In many areas of the country horses had, by the post-medieval period, replaced oxen as the main traction animals.

As in the medieval period, donkeys remain infrequently reported. The only record from the post-medieval period derives from 16th to 17th-century levels from Town Wall, Coventry (382, West Midlands; Noddle 1986). Although donkeys are certainly much rarer than horses, the extent to which they are under-represented because of difficulties in their identification remains uncertain.

Dogs are slightly less commonly reported than they are in the medieval period (60% of hand-collected assemblages, in comparison with 73% from the medieval period), and they no longer outnumber horses in terms of the number of periodsites in which they occur. They are generally represented by loose bones, although partial skeletons have been reported from Castle Mall, Norwich (*c* 1600–1750; 77, Norfolk; Albarella *et al* 1997), and from 17th-century levels from Castle Rising Castle, near Kings Lynn (79, Norfolk; Jones *et al* 1997).

Unlike dogs, there is no decline in the frequency of cats in the post-medieval period; they are as commonly reported as dogs. Periodsites with particularly abundant cat assemblages include 17th-century Lincoln sites (209, Lincolnshire; Dobney *et al* undated) and late medieval–early post-medieval Colchester 71–85 (94, Essex; Luff 1993), where all bones are loose. A partial cat skeleton was found at 16th to 17th-century Bonners Ln, Leicester (40, Leicestershire; Baxter 1993a).

By the post-medieval period, rabbits were certainly well established in the English countryside and they are indeed found in abundance at a number of sites. These include Dudley Castle (1533–1647), which has no less than 270 specimens (some from partial skeletons), in continuity with the abundance of this species already attested from previous phases (*see* section 8.3). Other sites with abundant rabbit remains include late 15th to mid–late 16th-century Carbrooke Preceptory (73; Norfolk; Hammon 2006), 16th-century Free Grammar School, Coventry (140, West Midlands; Holmes 1981), 16th-century Castle Rising Castle, and 17th-century Tilbury Fort (374, Essex; Sidell and Locker 2000). Although rabbits may have occasionally been hunted, these assemblages are more likely to derive from animals kept in warrens.

Chicken represents the most common bird at central English archaeological sites since its introduction in the Iron Age, and in the post-medieval period its predominance increases further (*see* Fig 8.14). The gradual rise in the relative abundance of chicken bones from the Iron Age onwards attests to the increasing popularity in the breeding of domestic fowl. By the post-medieval period wild birds had probably lost some of their value as social status indicators, which may explain why chicken also increases in importance in relation to other birds.

Goose continues to be the second most common bird in the post-medieval period, but its frequency in comparison with duck decreases slightly in comparison with the medieval period (*see* Fig 6.16). This may be because the duck (*see* section 8.3) had become firmly established in the medieval period, following its rather late domestication. We must also consider that there is some variation between different site types (Fig 9.9). The proportions of duck are slightly higher than in the medieval period at high-status and urban sites, but it is at military and rural sites that ducks outnumber geese. These data should not be over-emphasised, however, as numbers are small and military sites are only represented by a relative small assemblage from 17th-century Tilbury Fort. Nonetheless, the marked difference compared with other sites is noteworthy and may be explained by a higher component of wild birds (including wild ducks) at Tilbury Fort and a lower status diet at the rural sites. As mentioned in section 8.3, domestic duck meat was not particularly prized. All these relative proportions will probably include a component of wild birds, but this is likely to be small, particularly at urban sites.

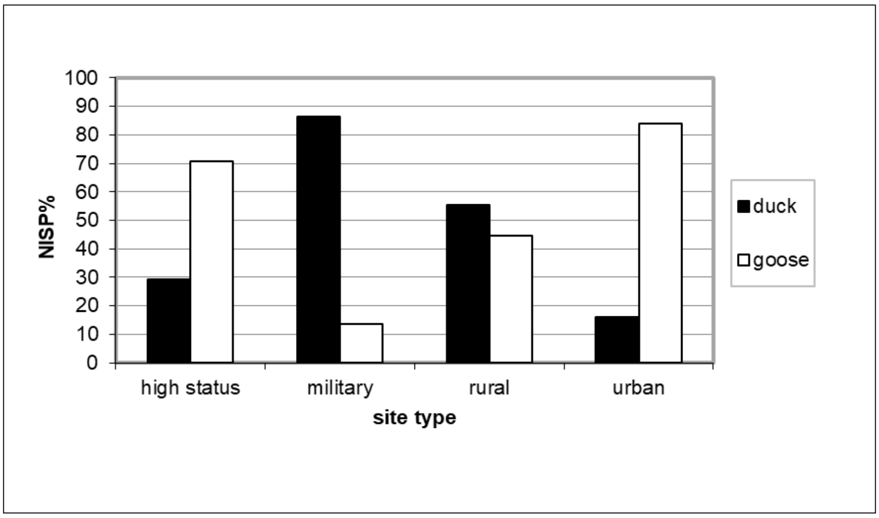

Fig 9.9 Occurrence of duck and goose, as a percentage of all duck+goose number of identified specimens (NISP), by site type for medieval periodsites across central England. No attempt was made to differentiate between wild and domestic taxa. All methods of collection have been combined.

A new domestic bird makes its first appearance in the post-medieval period: the turkey, an introduction from the American continent. A bone of this species has in fact been found at a late medieval phase at Castle Mall, but the unlikelihood of this occurrence is confirmed by the presence of intrusive post-medieval pottery in the same context. However, another turkey bone occurs at the same site in the more credible 17th to 18th-century levels. The species has also turned up at a number of other urban periodsites. The earliest occurrence in central England is from 16th-century Alms Ln, where it is also recorded in later post-medieval layers. The turkey is present at 18th-century The Shire (St Peter's Ln), and in broadly post-medieval levels from St Mary's Guildhall, Lincoln (328, Lincolnshire; Scott 1986). Of particular interest is the occurrence of as many as eight turkey bones from a small 17th-century assemblage from Worcester Cathedral (426, Hereford and Worcester; Thomas 2000), which has been interpreted as probably deriving from a single ecclesiastic banquet. Although the turkey is not particularly common, it has been found with sufficient regularity to suggest it was relatively regularly eaten following its introduction.

Several remains of peafowl were uncovered at Castle Rising Castle, both in 16th-century and 17th to 19th-century levels, thus continuing a tradition dating back to the medieval phase (*see* Chapter 8). Another castle where the species occurs is Dudley Castle (generically post-medieval context), but it is also present at the 16th-century friary site of Free Grammar School. The only urban site for which the species is recorded is Town Wall (18th century). Unlike turkey, the peafowl is likely to have represented an ornamental rather than food species, and it is probably significant that it mainly occurs at high-status sites.

The importance of domestic pigeons as a component of the diet is difficult to assess because of the difficulties in identifying the various columbid species and also in the separation of wild, feral and domestic birds. These last, however, certainly occurred, as demonstrated by the presence of a late 15th to 16th-century dovecote at Carbrook Preceptory. At this site several dove bones were also found, mainly juveniles, and one also butchered, thus demonstrating the consumption of the meat of this bird. Columbid bones have been reported at an additional 14 periodsites, mainly high-status (castle and ecclesiastic) and urban sites.

9.3.2 Wild resources

The relative importance of wild resources in comparison with earlier periods is difficult to assess because of the scarcity of high-status sites, which typically include a high number of wild species, with substantial assemblages. Economically, however, wild resources (except fishing) are likely to have played a minor role. Their continuing importance as a means to emphasise social and cultural differences should, however, not be under-estimated.

As in earlier periods, deer bones turn up at archaeological sites more frequently than those of other wild mammals. They continue to be far less common than those of the main farm animals, but they do slightly increase in frequency in the post-medieval period compared with the medieval period (Fig 9.10). This perhaps indicates that venison was becoming marginally more mundane and that urban populations could more commonly afford a greater diversity of foodstuff. The greater abundance of deer bones is entirely attributable to an increase in fallow deer, which occurs both in comparison with domestic mammals and other deer species.

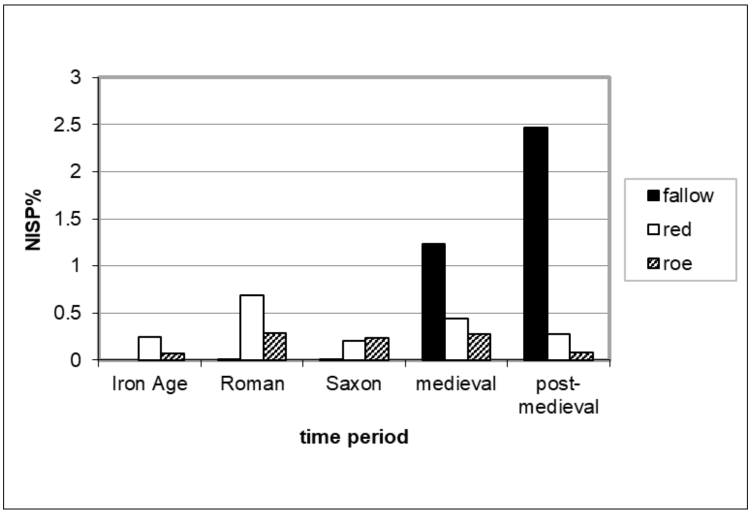

Fig 9.10 Relative occurrence of fallow, red and roe deer, as a percentage of number of identified specimens (NISP), where the NISP total represents hand-collected deer+cattle+sheep/goat from periodsites across central England, for different time periods. The NISP values may or may not include antler, depending on the relevant faunal studies.

This represents a consolidation of a phenomenon that occurred not at the medieval–post-medieval transition, but rather well within the medieval period (cf Chapter 8 and Fig 8.16 in particular). In contrast with the medieval period, fallow deer is by this time predominant at all main site categories (Fig 9.11). This includes urban sites, where in the medieval period red deer had maintained its predominance; this probably indicates some movement of the elite into towns. Aristocratic estates, where fallow deer meat would be obtained, had probably also become more involved in trade and gift transactions.

At Castle Rising Castle, which has the largest fallow deer assemblage in the post-medieval dataset, an increase in size of this species, in comparison with the medieval period, is noted. Perhaps this is a consequence of males being more frequently targeted.

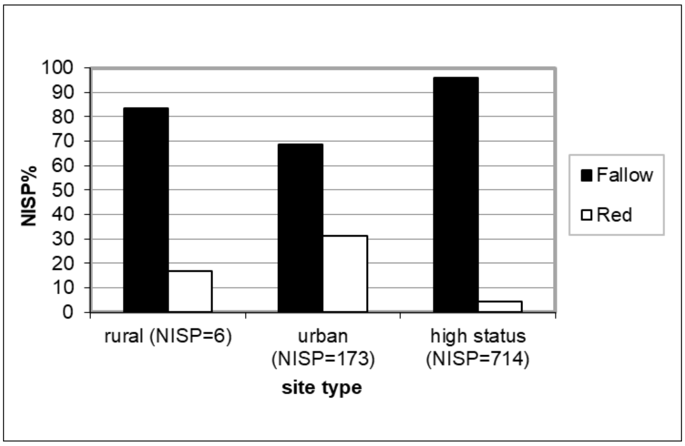

Fig 9.11 Relative occurrence of fallow and red deer, as a percentage of number of identified specimens (NISP), where the NISP total represents hand-collected fallow+red deer from different post-medieval site types across central England. High status=ecclesiastical, manorial and castle sites. The NISP values may or may not include antler, depending on the relevant faunal studies.

As mentioned in Chapter 8, the wild boar had probably become extinct by the end of the 13th century, but historical evidence indicates that reintroductions of this species occurred in the 16th and 17th centuries (Albarella 2010). Its post-medieval occurrence is therefore not impossible, and its presence has indeed been suggested for late 15th to mid-16th-century Broad St, Worcester (56, Hereford and Worcester; Chaplin 1968–9) and, more tentatively, for broadly dated 16th to 18th-century levels from the village of Great Linford, Milton Keynes (156, Buckinghamshire; Holmes 1992a). Neither of these identifications are, however, supported by detailed biometrical analysis, and therefore cannot be relied on. Although the specimens are claimed to be large, this may also be because of the presence of improved pig breeds. Therefore, currently we do not have, in central England, any definite archaeological evidence of the reintroduction of the wild boar in the post-medieval period.

The most commonly represented wild mammal, after the fallow deer, is the hare. This species is found in very small numbers at urban sites. More substantial assemblages derive from Dudley Castle, 17th to 19th-century Castle Rising Castle, Free Grammar School and Tilbury Fort. These are all high-status sites, which suggests that hare meat did not represent everyday food.

Among the wild carnivores, unsurprising is the absence of the wolf and the bear, as these species were extinct by the post-medieval period (Pluskowski 2010; Hammon 2010). Badger remains fairly uncommon but, unlike the medieval period, so is the fox. Although bones of this species can be confused with those of the domestic dog, this applies to all periods, and therefore does not explain the decline in this species. It is possible that the occasional consumption of fox as food in the medieval period had largely died out in the post-medieval period. While the polecat is completely absent from the post-medieval record, bones of its domestic form, the ferret, have tentatively been identified at Lincoln sites (generically post-medieval). The Lincoln sites also produced the only otter record for the post-medieval period, while stoat occurs at late post-medieval Haughmond Abbey, near Shrewsbury (169, Shropshire; Levitan 1989).

The red squirrel, which in the medieval period only occurs at Dudley Castle, is also found at one site only, St Peter's School, in both early and late post-medieval phases. The occurrence of this woodland species at an urban site is rather intriguing and probably suggests the deliberate catching of these animals. As for wolf, bear, and possibly wild boar, the absence of the beaver is unsurprising as the species had probably disappeared several centuries earlier (Coles 2010).

Moving on to commensal species, a most important post-medieval introduction is the brown rat, which rapidly became a major pest and gradually replaced the black rat as the more common rat species in the region. The burrowing habits of the brown rat make it difficult to attribute the bones of this species to a secure stratigraphic context. If we also consider the difficulties of separating its bones from those of the closely related black rat, it is perhaps unsurprising that the species has only been positively identified at one site, the village of Great Linford (16th to 18th-century). More tentative identifications (based on larger bone size than the average black rat) derive from late post-medieval levels at St Peter's School. Records of the house mouse are attested for 16th to 17th-century phases at the urban sites of Bonners Ln and Harrison St.

Cetacean bones are rarely reported in central England, but a chopped dolphin vertebra has been recorded in generically post-medieval levels from Colchester 71–85. Dolphins may have not necessarily been specifically targeted as they may represent a by-catch of fishing. Nevertheless, they must have occasionally been exploited and traded.

The overall contribution of birds, other than chicken, compared with mammals decreases slightly in the post-medieval period (*see* Fig 8.14). Many factors, including recovery bias, may contribute to this and it is probably more productive to focus on the fact that chicken becomes more predominant than it had been in the medieval period, in comparison with other bird species (wild and domestic). This apparent reduction in bird diversity can also be appreciated in Fig 8.22, which plots the average number of bird taxa per periodsite. This reduction is, however, only slight, indicating the lack of any substantial change in the use of this resource after the medieval period. As in the late medieval period, in 16th to 17th-century central England wild bird consumption probably represented a useful indicator of social status and wealth.

As far as more specific bird groups are concerned, perhaps most significant in the post-medieval period is the increased frequency of plovers and partridges, continuing a trend already identified in the medieval period (*see* Fig 8.23). Woodcock, grey partridge and swan (in order of frequency) remain among the most commonly reported wild birds.

Noteworthy bird occurrences include the finding of several puffin bones at Castle Rising Castle (which is not far from the coast). This is the only record of this species in central England, and it is conceivable that the bird was eaten. The guillemot, which occurs in similar habitats to the puffin, is also present at the site. Pheasant, present since the Roman period and widespread by the medieval period, occurs at two sites, the 16th to early 17th-century manor at The More, Rickmansworth (361, Hertfordshire; Anon 1959), and 17th-century Tilbury Fort. Most unusual is the finding of two parrot bones at Castle Mall, from a 17th to early 18th-century context (Albarella and Thomas 2002). These belong to a medium-size parrot, but unfortunately could not be identified to species or even genus because of the great morphological homogeneity of the order Psittaciformes. Despite this disappointing uncertainty, the finding attests the role that maritime trade must have had for the city of Norwich.

Of the sites highlighted in the Chapter 8 as having abundant and diverse bird assemblages, Castle Rising Castle continues to do so in both its post-medieval phases. It is probably an indication of an unabated high status of the site's occupants. The same seems to be true for Dudley Castle, particularly for its 16th to 17th-century phase. Seventeenth-century Tilbury Fort also has a fairly large bird assemblage, but the wild birds are mainly represented by corvids. This is a military site, and the occupants' diet seems to differ from that of the more typical high-status sites.

The evidence for falconry for the post-medieval period is disappointing. The kestrel is recorded at Lincoln sites, the sparrowhawk at The More and the goshawk at King's Lynn, but, without supporting evidence, none of these occurrences can be safely interpreted as birds trained for falconry.

The clear predominance of marine fish that characterises the medieval period continues in the post-medieval period, but it is slightly less pronounced. Conversely, the proportion of migratory fish remains fairly stable (*see* Fig 6.17). An increase in freshwater fish is almost entirely attributable to a change occurring in inland counties, while coastal counties are virtually unaffected (cf Figs 9.12 and 9.13). Although the small sample size from post-medieval inland counties invites caution, the trend is probably pronounced enough to be genuine. The most likely explanation is that the restriction in the use of freshwater resources (*see* section 8.3) had been relaxed, and greater overall wealth provided the opportunity to a greater section of society to enjoy fresh fish as opposed to the rather low-status stockfish. The issue does not apply to coastal areas, where fresh marine fish could also be eaten.

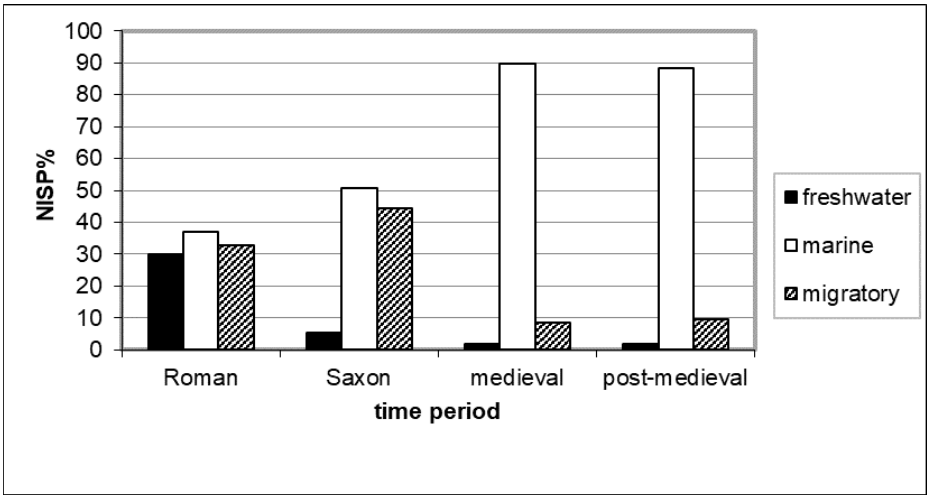

Fig 9.12 Occurrence of freshwater, marine and migratory fish, as a percentage of the total fish number of identified specimens (NISP) for different time periods from sites in the coastal counties (Lincolnshire, Norfolk, Suffolk and Essex) of central England.

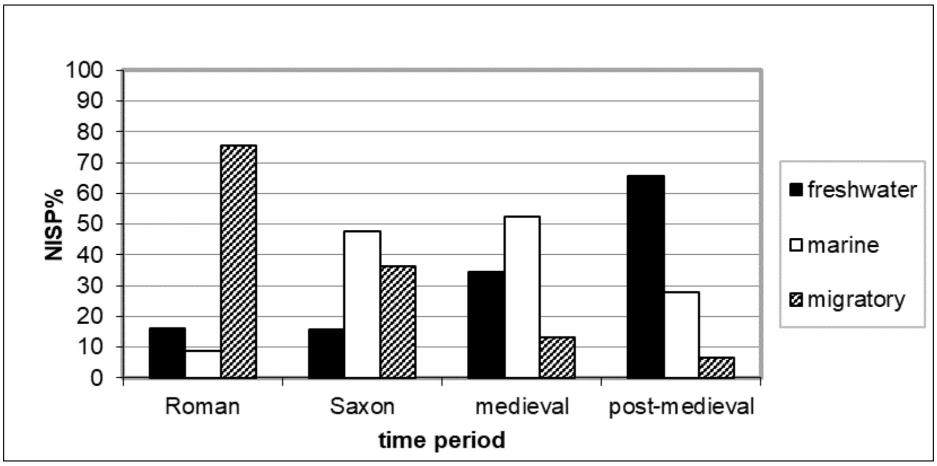

Fig 9.13 Occurrence of freshwater, marine and migratory fish, as a percentage of the total fish number of identified specimens (NISP) for different time periods from sites in the inland counties of central England.

The relative reduction in stockfish consumption is also reflected in the relatively smaller contribution that herring provides to fish assemblages of the post-medieval period (*see* Fig 7.16), although this trend began in the late medieval period (*see* Fig 8.27). Herring is still, nonetheless, much more common than eel, as a consequence mainly of the contribution of coastal sites. The species that occurs at most sites is, however, the cod. This is the case in the medieval period as well, and probably for the same reason: larger cod bones are proportionally over-represented because of recovery bias. The point is well illustrated by a comparison of hand-collected, coarse-sieved and fine-sieved assemblages from Castle Mall. The first of these comprises almost entirely cod bones, in the coarse-sieved assemblage cod is still predominant, but not to the same extent, and in the fine-sieved assemblage the main species is herring. In other sieved assemblages, such as Alms Ln (all phases) and 16th to 17th-century Dragon Hall, King St, Norwich (113, Norfolk; Murray and Albarella 2005), herring is also predominant. An unusual sieved assemblage is represented by 17th-century Tilbury Fort, as in this case eel is the predominant species. It is possible that the vicinity of the Thames Estuary encouraged the catching of this estuarine fish.

Noteworthy fish species for the post-medieval period include the conger, found at 17th-century Tilbury Fort and 16th to 17th-century Harrison St. This species is regarded to have been common in the south-west of Britain in the medieval period (Serjeantson and Woolgar 2006). The presence of a shark tooth at Tilbury Fort, and of the sturgeon, a high-status indicator, at 18th-century Berrington St, are also worthy of note.

9.4 Husbandry strategies

The types of animal resources used in the post-medieval period are largely similar to those exploited in the medieval period, but substantial changes occurred in husbandry practices and in the morphological characteristics of the domestic animals.

The evidence presented in Fig 9.14 must be interpreted bearing in mind the relatively small sample of post-medieval reports providing ageing information. Nevertheless, the trends reflect developments that are consistent with the historical evidence and could, to some extent, already be identified in the late medieval period (cf Albarella 1997d).

Whereas the proportion of sites that have mixed age groups remains fairly constant, the post-medieval period sees a clear increase in the number of assemblages characterised by younger cattle. This represents a continuation and intensification of a phenomenon already identified for the late medieval period (*see* section 8.4). Two main factors explain such a change. One is the already discussed decline of the use of cattle as traction, a role which, in many regions, the horse had gradually assumed. The other is the increase in the proportion of calf bones, a consequence of the increased combined exploitation of veal and milk, which continues a trend first seen in the 15th century. As in the medieval period (Albarella 2005a), the increased frequency of calf bones mainly represents an urban phenomenon, and is attested at 16th- and 17th-century sites located within towns, such as Norwich, Colchester, Lincoln and Leicester. At the sites of St Peter's School and Castle Rising Castle, however, adult cattle predominate in the post-medieval phases. This is not surprising, as it is well known that the replacement of ploughing oxen with horses was not a universal phenomenon (Langdon 1986).

The reduced use of cattle as draught animals is also indicated by the very low frequency of arthropathies in limb bones reported for the post-medieval period (cf Thomas 2008). Splayed metapodials, in particular, seem to disappear completely from the record (*see* Fig 7.17). As discussed in previous chapters, these two conditions are generally linked and can be associated with traction stress, although they can have other causes. Conversely, the condition known as spavin (the pathological fusion of metapodials and carpals/tarsals), which can also be associated with traction stress, is, in horses, more frequently reported in the post-medieval period than it was in the medieval period (Fig 9.15).

Mortality patterns in sheep/goat change in the opposite direction to cattle. The pattern mainly applies to sheep, as goats are uncommon. Assemblages with a predominance of adult individuals predominate far more than they did in the medieval period (Fig 9.14). Once again, this is a trend that started in the later medieval period (*see* Chapter 8) and is intensified in the post-medieval period. Although England is mainly known for its wool production capability during the medieval period, the evidence indicates that wool was still the main product of sheep husbandry in the early modern period, in fact probably even more so. The suggested increased role of sheep for meat production in the north of England (Huntley and Stallibrass 1995) is not confirmed for central England.

For pigs, the number of medieval assemblages for which age data are reported is particularly scanty but all that we have provide evidence that juvenile/sub-adult animals predominate (Fig 9.14). Although this is unsurprising, given that pigs are almost exclusively reared for meat, it is worth noting that in the medieval period there was a slightly greater diversity of age groups. This may be explained by the larger sample available for the medieval period. However, the direct evidence of a younger kill-off pattern that we have for some sites for which we have both medieval and post-medieval phases, such as assemblages from sites in Norwich and Lincoln, suggests that the trend is likely to be genuine. Clearly, for pigs, no main change in the type of used resource can be expected, but it has been suggested that an increase in size and the introduction of faster growing breeds meant that pigs could be slaughtered at a younger age without any loss of meat output (Albarella 2006).

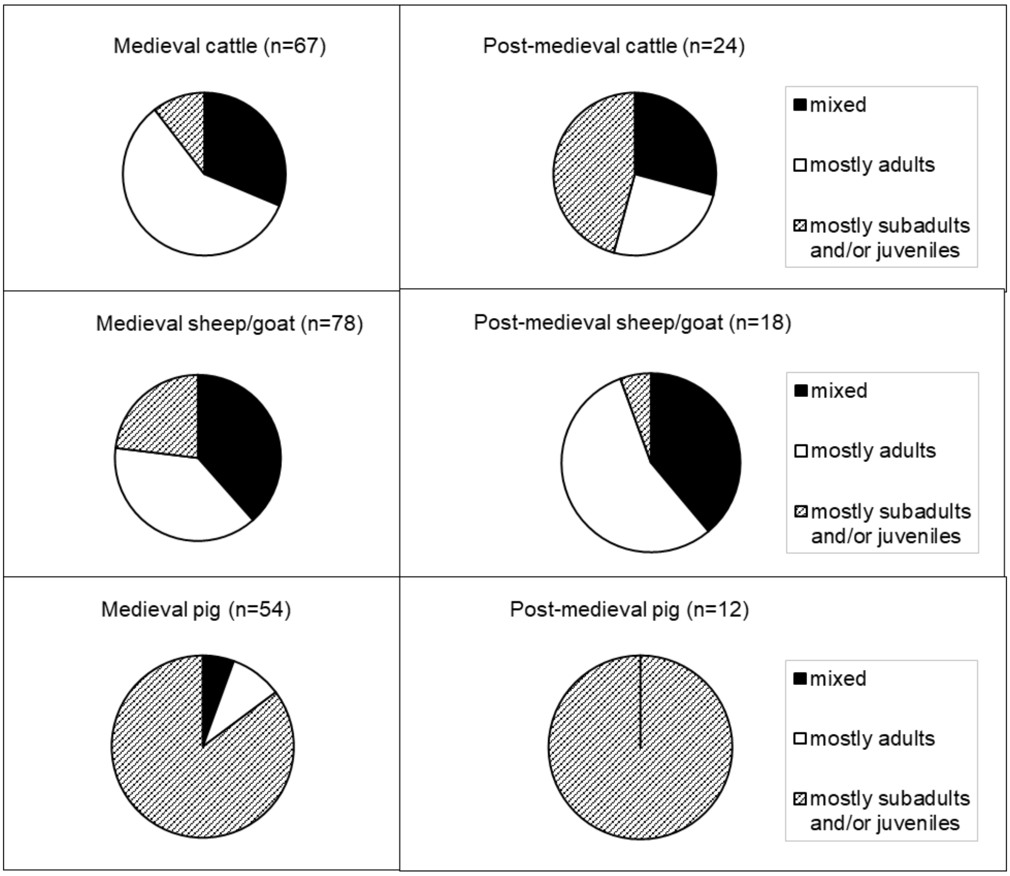

Fig 9.14 Comparison of age groups of cattle, sheep/goat, and pig in medieval and post-medieval time periods, where n *is the number of periodsites with reported ageing data for each taxon and period from sites across central England. Periodsites for which ageing data are unreported or unspecific have not been included.*

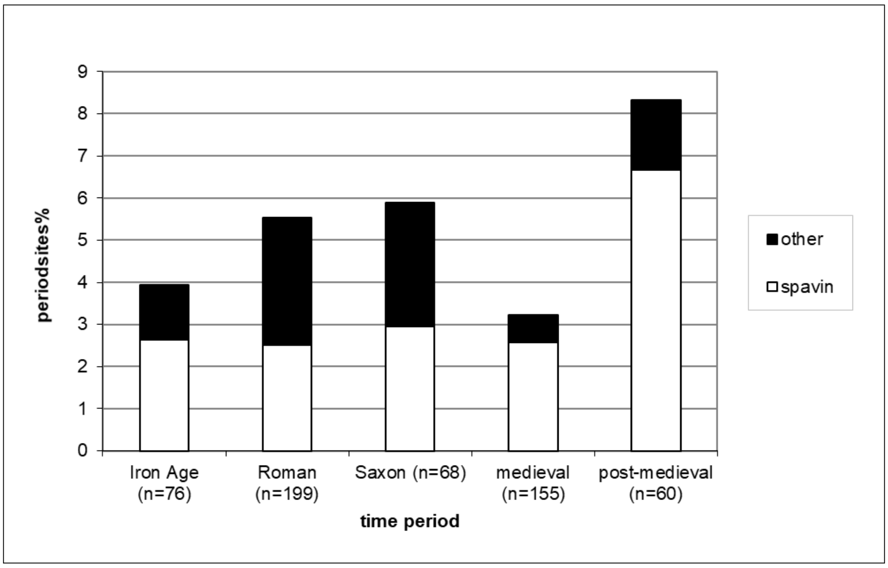

Fig 9.15 Horse pathology, as a percentage of periodsites, where n *is the number of periodsites for each time period from sites across central England where hand-collected horse represented.*

Another interesting trend that has been noted for the post-medieval period is the increased frequency in neonatal pigs, indicating on-site breeding. Not much change is detected in the other domestic mammals (*see* Fig 5.9). This pattern is particularly evident at Castle Mall, where it is interpreted as a potential consequence of the increased level of urbanisation of the town. The consequent reduction in open space within the town walls made it difficult for animals such as cattle and sheep to be bred inside the town, and indeed the frequency of the neonatal bones of these species decreases at that particular site. To compensate, animals such as pigs, which could more easily be kept in the backyard of a house, became more commonly bred in towns, hence the higher frequency of neonatal bones. The pattern illustrated in Fig 9.16 indicates that Castle Mall does not represent an isolated case, and that the phenomenon of the post-medieval 'urban pig' may in fact have been widespread. Another factor that may have contributed to these data is represented by the likely enhanced offspring numbers that improved post-medieval pigs may have generated. Larger litters meant that more often individual piglets could have been purposefully killed when food was scarce.

The sparse ageing information we have for other domestic animals includes the remark that at 16th-century Free Grammar School, the predominance of immature/sub-adult rabbit bones suggests the exploitation of this species for meat. The ageing evidence for domestic birds is also very limited. The reduction in the slaughtering age of chicken that had been noted for the late medieval period at Castle Mall continues in the post-medieval phase. This indicates a further emphasis on meat production, at the expense of egg production. At Castle Mall, exactly the same trend has been identified for geese. Apart from the mention of juvenile geese at Harrison St (16th to 17th century), the evidence from Castle Mall is, however, isolated and it is difficult to know to what extent it represents a regional pattern.

A more unusual use of chickens has been suggested for the 16th-century periodsite at Free Grammar School, where exostoses were identified near the spur of two specimens (possibly from the same individual). These have been interpreted as possible evidence of stress as a result of cockfighting (Holmes 1981). A different situation is represented at late 15th to early 16th-century Colchester 71–85, where one metatarsal with a sawn off spur is noted. Such removal was likely to have been carried out in life and may perhaps indicate the keeping of chickens in high density, a situation in which long spurs may have been dangerous (Luff 1993).

9.4.1 Livestock types

The post-medieval period gave rise to contemporary animal breeds and, as such, it is an important time for understanding the mechanisms of animal selection and breed development. The analysis of this phenomenon is, however, hampered by the unfortunate dearth of evidence that we have for the 18th century and especially the 19th century. Data from the 16th and 17th centuries do, however, indicate that some of the mechanisms of livestock improvement that have already been identified for the late medieval period (*see* section 8.4), albeit to a limited extent, continue to operate but at an increased rate.

Data presented in Figs 9.16–9.18 indicate that an 'increase in size' is reported far more frequently for the post-medieval period than any other period. Although the evidence is admittedly based on only a small number of sites, it is likely to represent a genuine trend, as it is consistent for all three main domestic mammals, and is mirrored by a complete absence of evidence of size decrease and very limited support for continuity with the medieval period.

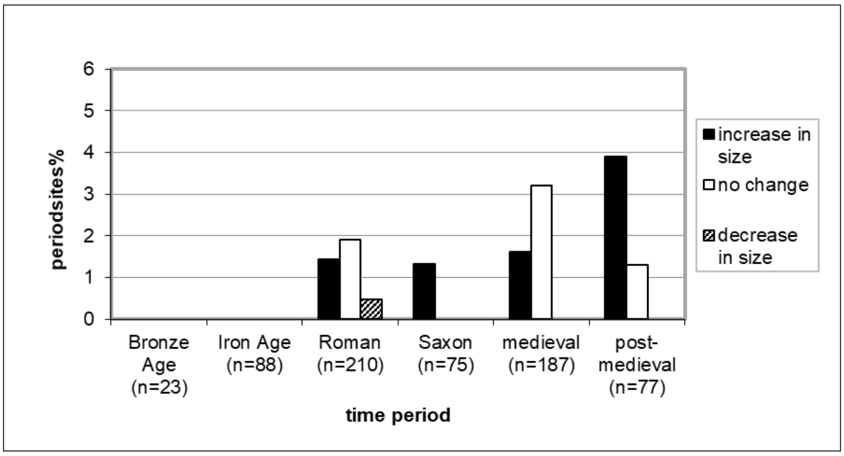

Fig 9.16 Changes in cattle size, as a percentage of periodsites, where n *is the number of periodsites for each time period at sites across central England where cattle is represented.*

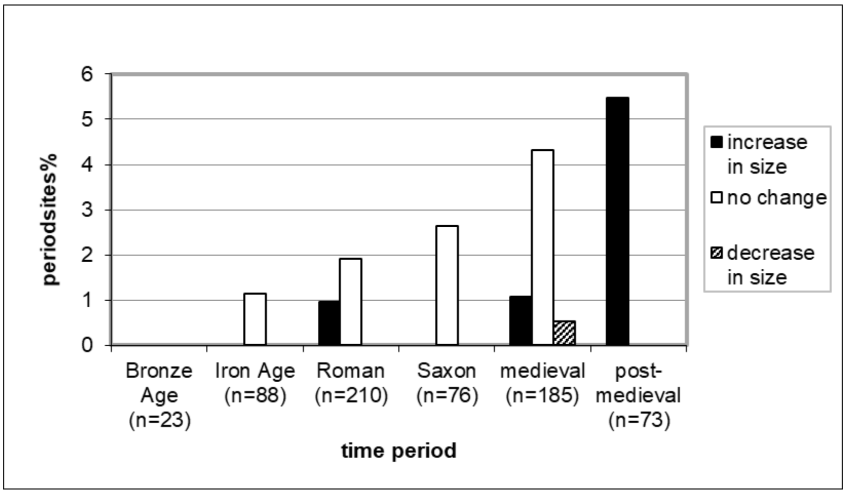

Fig 9.17 Changes in sheep/goat size, as a percentage of periodsites, where n *is the number of periodsites for each time period at sites across central England where sheep/goat is represented.*

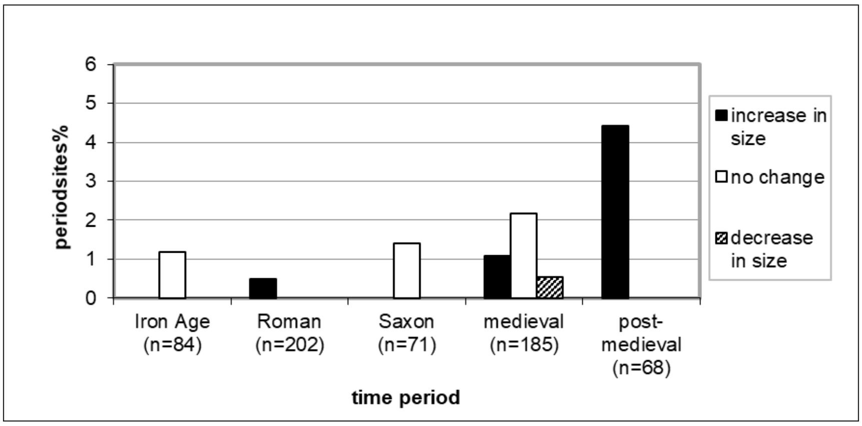

Fig 9.18 Changes in pig size, as a percentage of periodsites, where n *is the number of periodsites for each time period at sites across central England where pig is represented.*

For cattle, the earliest evidence of post-medieval size increase in central England derives from Town Wall (16th to 17th century). At 17th-century Lincoln sites, cattle is reported to be taller than in previous periods, but more gracile. A size increase is also reported for slightly later assemblages at King's Lynn and Castle Mall. At the latter site, the size increase affects teeth as well as bones, which indicates the occurrence of a new genotype (Albarella 2002), rather than merely an improved feeding regime. The evidence is not that striking, but we must consider that some size increase in cattle had already occurred during the medieval period.

The earliest evidence for post-medieval size increase in sheep/goat can be dated to the 16th century, and derives in particular from periodsites from Free Grammar School and Lincoln sites. An accumulation of metapodials belonging to particularly large animals, which exceed the size of those from later phases, was uncovered from 16th-century Lincoln sites. Slightly later evidence of size increases is attested at various sites from Norwich [Heigham St (172, Norfolk; Weinstock 2002), Alms Ln and Castle Mall], and King's Lynn. In contrast, the sheep from Oxford Rd Watermill, Aylesbury (263, Buckinghamshire; Baxter 2004; 1500–1750), are said to have been 'unimproved'. Outside central England, O'Connor (1995) has suggested that improvement in sheep did not occur until the late 18th century, a pattern that he believes can be applied to the rest of the country. The evidence from central England, however, supports the view of an earlier size increase in sheep, although it is likely that further improvement occurred in the later post-medieval period.

Concerning pigs, particularly large animals are reported at 16th-century St Peter's School; these are said to be much larger than medieval pigs from other sites in Hereford. At Castle Mall (1600–1750) and Lincoln sites (17th century), the size increase affects bones more (or rather) than teeth. This is a pattern that has been detected elsewhere (cf Albarella 2006) and can be explained by an increase in body mass accompanied by a shortening of the snout. It is also likely that improvements in feeding regimes affected bones more than teeth.

Countrywide, there is some evidence that post-medieval horses were larger than their medieval counterparts, but also that in the 16th century these were still rather small and generally of 'pony' size (ie below 14 hands 2 inches in withers height) (Albarella 1997d). There is rather limited evidence from central England, but, taken together, what there is supports this observation. Few animals above pony size are reported for the period and, even in those cases where they exist (eg Lincoln sites, Castle Mall and Dudley Castle), the average size of the horses is invariably within the pony size range. At Bonners Ln (16th to 17th century) and Oxford Rd Watermill (generically post-medieval), horses are particularly small, well below 13 hands in height. It does therefore seem that any substantial size increase in horse, at least in central England, only occurred in recent times. This is rather puzzling considering that horses were assuming greater and greater importance as traction animals, but such use must be balanced against the consideration that larger horses may have been expensive to feed, and that probably a large proportion of these animals was owned by the peasantry (Langdon 1986; Albarella 2005a).

The great variety of dog sizes that is reported in the medieval period is possibly even increased in the post-medieval period, although the reported evidence is, once again, scanty. Castle Rising Castle, near King's Lynn (17th century), Harrison St (16th to 17th century) and Castle Mall (*c* 1600–1750) have particularly large varieties of dog sizes, ranging from tiny animals (300mm in height or even smaller) to large greyhound-type dogs (>700mm) possibly used for hunting. An achondroplastic femur (ie belonging to a dwarf animal) was found at Harrison St, mirroring similar findings from the medieval period (*see* section 8.4).

Interest in livestock improvement was not confined to mammals, as we also have some evidence for size increase in domestic fowl. The earliest for this derives from 17th-century County Museum, Aylesbury (101, Buckinghamshire; Sadler 1998), and Lincoln sites, but it is also attested in generically post-medieval levels from Colchester 71–85. Some very large specimens are also reported at Castle Mall (*c* 1600–1750) although it is unclear to what extent they amount to a size increase from previous periods. Five-toed chickens, attested for the first time at two medieval sites in the region, are also reported from 16th to 17th-century Dudley Castle.

In cattle, size increase is also accompanied by morphological changes, attesting to the appearance of new morphological types. Long-horn cattle first appear in the post-medieval period, in proportions not dissimilar to short- and medium-horned animals (*see* Fig 6.25). The evidence for this is particularly striking at Castle Mall, where careful biometrical analysis was carried out (Fig 9.19). This is not peculiar to central England: it has been reported further south in England (Robinson and Wilson 1987).

The congenital absence of the second premolar is reported in approximately equal proportions to that seen in the medieval period (*see* section 8.4). The absence of the third molar hypoconulid is occasionally reported. At Dudley Castle this condition is only slightly less common than in the medieval phases, which contrasts with the evidence from Launceston Castle, Cornwall, where it almost completely disappears in the post-medieval period (Albarella and Davis 1996). The extent to which these conditions (or non-metric traits) can be associated with morphological types and breeds is still rather uncertain.

Polled sheep are reported at only five sites which, even considering the much lower number of periodsites for the post-medieval period, is a lower proportion than in the medieval period. This indicates that breed improvement was not necessarily associated with a congenital loss of the horns. No examples of four-horned sheep are known for the post-medieval period.

In general, it is clear that post-medieval animals were subject to some form of selective breeding, although this varied in extent and character in different periods and areas. The most obvious consequence of such selection was an increase in the size of the animals, which could have been achieved through the importation of new stock, the deliberate selection of native animals or the improvement of feeding regimes. It is most likely that all three of these factors played a role. Size increase will have had the advantage of increasing yield, which may have been essential, given the growing population and its greater overall wealth.

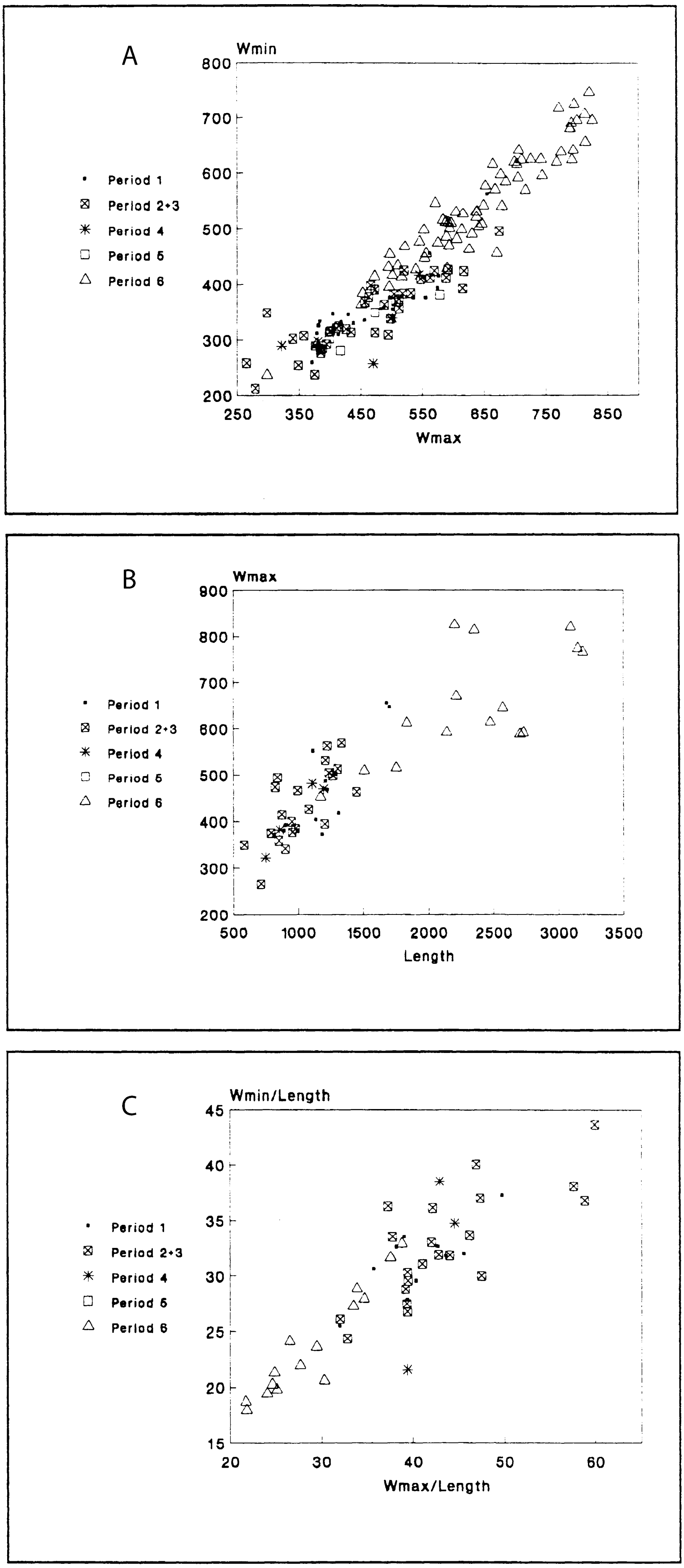

Fig 9.19 Size (A and B) and shape (C) variation of cattle horncores from Castle Mall (site 77). Wmax=maximum diameter at the basis; Wmin=minimum diameter at the basis. Period 1=late 9th to 11th century; periods 2+3=late 11th to 12th century; period 4=late 12th to mid-14th century; period 5=mid-14th to late 16th century; period 6=late 16th to 18th century. Measurements in tenths of mm. Note the longer and more slender post-medieval specimens.

9.5 Human processes

9.5.1 Butchery

It was mentioned in Chapter 8 that a reduction in the number of medieval assemblages characterised by a generic range of anatomical elements of the main domesticates could be the result of a more organised system of waste disposal. Such a trend increases further in the post-medieval period (*see* Fig 8.30). This is unsurprising given the increased urbanisation and the greater population density, which probably made the implementation of an organised system of waste disposal even more pressing than in the medieval period.

Butchery is reported as frequently in the post-medieval period as for the medieval period (*see* Fig 5.11), which means that the intense processing of animal carcasses observed for the medieval period continued into the post-medieval period. An increase in the frequency of longitudinally split vertebrae, at least in cattle and sheep/goat (*see* Fig 7.18), indicates that systems of redistribution of the carcass were further enhanced compared with the medieval period. Longitudinally split skulls, despite increasing in frequency for cattle and pig, do not follow an equally clear trend and cannot be considered as an equally good indicator of carcass processing. Sawn bones, possibly for butchery purposes, which were only occasionally present during the medieval period, are more commonly represented in the post-medieval period, for all main food mammals (*see* Fig 7.18). It is possible that saws had by this time become more commonly used as butchery tool. However, this interpretation must be considered carefully, as it does require a substantial amount of work to saw through the shaft of a long bone, even with modern saws (Rixson 1989).

The frequency of skinning in horses is lower in the post-medieval period than the medieval period, but butchery increases slightly (*see* Fig 5.12). Although the use of horse hides may have declined by the post-medieval period, it certainly did not die out, as demonstrated, amongst other evidence, by the occurrence of complete horse bones concentrated in a number of tanning pits at The Green, Northampton (360, Northamptonshire; Harman 1996d). Evidence of disarticulation at Lincoln sites, Tilbury Fort and Oxford Rd Watermill, indicates that horse flesh was likely to be still occasionally exploited. At Castle Mall (1600–1750) and Dudley Castle (1647–1750), both butchery and skinning are reported, suggesting that, at least occasionally, horse carcasses were exploited thoroughly. It would be valuable to build up an accurate record of horse butchery for the 18th and 19th centuries, to identify when horse carcasses ceased to be used. At the moment the evidence is too scanty to be sure.

Dog skinning appears to have all but disappeared in the post-medieval period, although knife marks are reported at Great Linford (*c* 1500–1750) and butchery at Castle Mall (*c* 1600–1750). The frequency of human modifications on cat bones also plummets in the post-medieval period (*see* Fig 8.31). The only example is from Castle Mall (*c* 1600–1750), where skinning marks were noted on just one radius. At this site the evidence of cat skinning was more prevalent in earlier phases. In the post-medieval period, an overall increase in the age of the cat population may also indicate a reduced interest in cat pelts (cf McCormick 1988).

For fallow deer, the evidence of the predominance of hindlimb bones already reported for the medieval period at Dudley Castle (*see* section 8.5) continues in the post-medieval phases. This mirrors the evidence from other study areas, eg at Launceston Castle, Cornwall (Albarella and Davis 1996). Clearly, the ritualisation of the butchery of the deer carcass had not lost any of its significance by the post-medieval period.

Given the relatively small size of the bird carcass, it is not surprising that butchery is only scantily reported. Cut marks on chicken bones are, however, noted at Tilbury Fort (17th-century), including on the skull, where they are likely to indicate removal of the head. At 16th-century Free Grammar School, the scarcity of chicken head and foot bones indicates that the bones derive from secondary butchery waste. This site is a friary and the bones may represent food refuse from the table rather than the kitchen. At the same site, goose bones are mainly represented by wing elements, which may indicate a complementary assemblage, deriving from either primary butchery waste or quill production. At 16th to 17th-century Dragon Hall, rather peculiarly, knife marks are noted on a goose beak.

In wild birds, evidence of butchery is even rarer, but it is worth mentioning the occurrence of several butchery marks on crow bones from 17th-century Tilbury Fort. Significantly, such marks are not found on the partial crow skeletons also uncovered at this site. Marks on ulnae may be related to the removal of wing feathers but those on the femur are more likely the result of dismemberment, possibly for food consumption. Also at this site, cut marks are noted on columbid and heron bones. That swan meat may have also been eaten is suggested by the occurrence of cut marks on a femur from Carbrook Preceptory (late 15th to 16th century).

Evidence of fish processing is very rare in the post-medieval period, which may support the view that in this period fish was more often eaten fresh. Chop marks on cod cleithra (associated with the removal of the head) from Castle Mall (1600–1750) do suggest that some processing took place. Conversely, the abundance of gadid head bones at Heigham St indicates that the fish were sold whole and therefore probably fresh.

9.5.2 Craft and industry

Evidence for the use of animals in craft and industrial activities increases in the post-medieval period for cattle, but slightly decreases for sheep/goat and pig (*see* Fig 6.28). In sheep/goat, the picture is mainly affected by the decline in horning (*see* Fig 8.32), although this also affects cattle (*see* Fig 7.19). Conversely, tanning evidence increases in the post-medieval period compared with the medieval period (*see* Fig 8.32), attesting to the importance of this industry in early modern times, a point previously made by Monckton (2006).

The best tanning evidence once again derives from the industrial site of The Green (Harman 1996d). At this site, 16th to 17th-century deposits include concentrations of sheep horncores, mostly attached to skulls, in three pits. Although metapodials are not present, the lack of any evidence of horn removal, together with the structural evidence, supports the view that this is a tanning rather than horn-working deposit. Other pits from the same periodsite have cattle metapodials and phalanges in one case and cattle metapodials and skull fragments in another. Both these deposits are certainly the product of tanning activities. There is further tanning evidence in the later 18th to 19th-century phase, despite the lack of structural evidence. One pit from this later phase has large quantities of cattle metapodials and horncores still attached to the skulls. The 16th to 18th-century Oxford Rd Watermill has a concentration of sheep metapodials and phalanges, with some horncores, from several contexts. Despite the absence of tanning pits, tanning probably represents the best explanation for this deposit. A similar interpretation has been provided for a 16th-century accumulation of sheep metapodials from Lincoln sites. The interpretation of a deposit of cattle horncores and skull fragments from Heigham St is more uncertain, as this could derive from horning as well as tanning activities. Tanning evidence appears to increase during the post-medieval period further south in England as well, as demonstrated by evidence from Abingdon (Oxfordshire) and Bicester (Oxfordshire) (Robinson and Wilson 1987).

Despite the decline in horning, there is still some evidence that horn played a role in the post-medieval period. For instance, debris from a horn-worker are claimed to have been found at 17th-century Sewardstone St, Waltham Abbey (309, Essex; Chaplin 1970). A rather different use of horns is suggested for St Mary's Guildhall 82–83, Lincoln (327, Lincolnshire; O'Connor 1991b), where cattle horncores lined up in a pit may have acted as a soakaway.

Bone-working is just as prevalent in the post-medieval period as the medieval period. The most frequently utilised bones were cattle metapodials, which were often sawn through (eg 16th to 17th-century Town Wall, Coventry) or show evidence of 'faceting' (eg 17th to 18th-century Norwich, which has also similarly modified sheep metapodials). Sawn cattle metapodials from Town St (rear 23), Thaxted (380, Essex; Bedwin 1996; late medieval–early post-medieval) are interpreted as by-products of the cutlery industry. Toggles made of pig metapodials were found at St Peter's School (1600–1750). Most remarkable are two polished horse mandibles from Castle Mall, which are likely to have been used as part of child sledges.

Antler was also still used as working material, mainly from red deer (cf Fig 5.13). There is evidence of worked antler from several urban sites from Norwich and Leicester. Antler objects were mainly made from shed specimens, but the occurrence of a red deer frontal, with pedicels and sawn antler bases, from 18th-century The Shires (St Peter's Ln), indicates that unshed antlers were also used. Worked antlers still attached to skulls were also retrieved from other Leicester sites. An unusual finding is from two different phases of Castle Rising Castle (16th to 19th century), of 12 sets of antlers chopped at an oblique angle, in a manner consistent with a display on a wall.

Another peculiar discovery is represented by various bones with pieces of iron embedded in them found at Free Grammar School. These include a rabbit scapula, a piglet scapula and cattle rib, metatarsal and metacarpal. The iron is regarded to have been more likely embedded post-mortem and crossbow practice is suggested, as the wound size is said to be consistent with this.

9.5.3 Bone groups

The ritual deposition of animal bodies or partial carcasses seems to have all but disappeared in the post-medieval period. To what extent this is a consequence of a shortage in research intensity or a genuine absence, will need to be evaluated in the context of similar work undertaken in other parts of England (cf Morris 2011), which appears to suggest that there is more variability than our review accounts for.

Partial skeletons are still occasionally found, such as a dog from Castle Mall. Rather interesting is a large assemblage of horse bones deposited *c* 1710 at Dudley Castle, many of them butchered and many more displaying gnawing marks. One interpretation is that dismembered carcasses from a knackers' yard may have been used to feed a pack of hunting hounds (Thomas and Locock 2000).

10 CONCLUSIONS

10.1 A diachronic overview

A data review of the type presented in this publication has the disadvantage of operating at a large-scale, low-resolution level. At the same time this 'broad-brush' approach can provide a valuable overview of long-term trends in human–animal relationships in our study area. Many of these trends have already been discussed in the individual chronological chapters, but in this chapter some of them will briefly be summarised, adopting a particularly broad diachronic approach.

10.2 Introductions and extinctions

Table 10.1 summarises the various fluctuations regarding introductions and extinctions of some of the vertebrate species that may have played an important role in human societies. Table 10.1 must not be taken at face value as the presence/absence of one species in a particular time period indicates its first or last appearance in our study area rather than representing proof of its introduction or extinction. Other lines of evidence, such as historical, have also been considered in compiling Table 10. The evidence is firmer for some species rather than others. For instance, it seems fairly certain that the aurochs did not survive the end of the Bronze Age (cf Legge 2010). Can we, however, be equally certain that the bear did not survive beyond the Saxon period (cf Hammon 2010)? Equally, we do not have any evidence for the presence of the donkey in prehistoric central England but it is arguable whether we can use this absence of evidence as evidence of absence, particularly considering the difficulties in distinguishing donkey and horse remains.

It is also important to consider that animal bone assemblages from archaeological sites are not necessarily a direct reflection of the local fauna, but rather of the fauna that interacted with humans. This rather obvious truth is, however, often forgotten, particularly by zoologists, when assessments of the histories of regional faunas are undertaken. The concepts of 'fauna' and 'anthropic fauna' may coincide, but not necessarily so. It is, for instance, possible that small populations of wild horses survived in the Neolithic, but in remote areas, sparsely populated by humans, where their hunting may have represented an unworthwhile enterprise.

*Table 10.1 Summary of the introduction and extinction of several vertebrate species in central England. Introduction indicates the occurrence of viable reproductive populations, rather than the importation of the occasional specimen or body part. Most suggestions are tentative. Names of domestic species are in italics. *These species could also have been domesticated from native animals. **The wild boar was wiped out, and then reintroduced and then extirpated again.*

Time period	Introduction	Extinction
Mesolithic	*Dog**	Wild horse, elk
Neolithic	*Sheep, goat, cattle*, pig**	
Bronze Age	*Horse*	Aurochs
Iron Age	*Cat**, house mouse, *chicken*	Pelican
Roman	*Donkey*, black rat	
Saxon	*Goose**	Bear, beaver
Medieval	Fallow deer, rabbit, *duck**, pheasant, *peafowl, carp*	Wild boar**, wolf
Post-medieval	Wild boar**, brown rat, *turkey*	Wild boar**, great bustard, burbot

It is a great shame that some of the most iconic wild mammal species, bear, wolf, wild boar and beaver, which are still relatively widespread today across continental Europe, were extirpated in Britain in the historic period. With the exception of wild boar in the Mesolithic and localised cases of late prehistoric beaver exploitation, these species are, however, never particularly abundant in the archaeological record. Although this means that they may have not played a prominent economic role in the history of human societies in central England, it is possible, if not likely, that their symbolic, psychological and/or social role may have been important. This is an assumption that is backed up by documentary sources for the historical periods (eg Salisbury 1994) but for which we have only scanty, circumstantial prehistoric evidence.

It is difficult to conceive that pelicans, now confined to south-eastern Europe (Snow and Perrins 1998), once lived in England, but the archaeological record demonstrates that they did. They are no longer found after the Iron Age and it is possible that this is when they became extinct, as they are not mentioned by historical sources (cf Serjeantson 2010). This is unlike the case of the great bustard, which is mentioned in 16th-century texts (Stone 2006) and has been found at a few archaeological sites dating up to the 17th century (Serjeantson 2010). It eventually became extinct in the 19th century (Snow and Perrins 1998).

Amongst the extinct fish, it is worth mentioning the burbot, a freshwater species that is found no later than the medieval period in our records, but that in fact survived until the 1970s (Locker 2010).

Concerning the introduction of wild species, most important is that of the fallow deer, a species that, as we have seen, eventually assumed a very important social role in the medieval period. The current abundance of rabbits is also a reminder of the contribution that this species, which, like the fallow deer, was not fully introduced until the Norman invasion, has had in the shaping of the English countryside. In Table 10.1 the rabbit is not indicated as a domestic species, but many populations would in fact have been kept in warrens under close human control.

The imported species that had the greatest impact on human life are, however, not those that were deliberately introduced but those commensal animals that arrived in England accidentally. House mice and both species of rats markedly changed the characteristics of the English household, but the black rat in particular, as the potential indirect carrier of the plague, had a most devastating effect on human societies (for a cautionary note on this issue see Hufthammer and Walløe 2013). The Black Death wiped out a large proportion of the English population and, as a consequence, triggered a number of changes that led to the creation of the modern, and eventually, contemporary world.

10.3 Domesticates

As mentioned in Chapter 3, the occurrence of caprine bones in the Neolithic proves that animal husbandry was taking place by then. Sheep and goat did not have wild ancestors in Britain (or the rest of Europe) and therefore must have been introduced. The situation for cattle and pig is more uncertain, because of the local occurrence of their wild ancestors, aurochs and wild boar. Genetic evidence has indicated that, in Europe, the domestication of these species, particularly the pig, was likely to represent the combined result of the introduction of foreign animals and the taming of local stock. In Britain, however, the exogenous component is likely to have been predominant (Viner-Daniels 2014). In other words, domestic cattle and pigs were probably introduced to central

England. Unquestionably, the beginning of animal farming in central England dates back to the early Neolithic, but this does not necessarily mean the very beginning of the Neolithic, as this is a period for which the zooarchaeological evidence is completely missing. The extent to which the switch from the Mesolithic to the Neolithic was abrupt cannot therefore be resolved on the basis of the available evidence.

The farmyard animals were, however, not the first domesticates to occur in Britain. This accolade belongs to the dog, presumably domesticated from local wolf populations, which was already present in the Mesolithic. In Table 10.1, dogs are listed under potentially introduced species, although an introduction is in fact unlikely, but not impossible. It is significant that genetic evidence has suggested that dogs are likely to have been domesticated from multiple, separate wolf populations (eg Savolainen *et al* 2002).

Domestic horses were almost certainly introduced to England. Unlike sheep and goat, the wild ancestor of the horse lived in England but had probably been extinct for several millennia by the time the first domestic horses arrived. Even if small populations of wild horses had survived in some local refugia, these would represent unlikely candidates for domestication, as humans would have had limited contact with them. Domestic horses were probably introduced at the transition between the Neolithic and the Bronze Age, during the Beaker phase (cf Bendrey 2010). It is therefore mainly in the Bronze Age that horses made a substantial impact on human life in central England. The presence of horses is an important cultural element that helps distinguish the Bronze Age from most of the Neolithic. Horses would have provided calories, but most importantly they would have been ridden, thus revolutionising human mobility in a way that is comparable in importance to the introduction of motorised vehicles in modern times.

Among the more recent introductions of domestic animals, particularly important is that of the chicken (domestic fowl). Although this bird was first imported in the Iron Age, it is in the Roman period that it became a staple element of the animal economy (*see* Fig 6.12), a role that continues today. Other domestic birds were introduced later. The Romans probably kept some domestic geese and (possibly) captive ducks, but goose breeding only gained momentum in the Saxon period, and duck breeding in the medieval period. Unlike the chicken (whose wild ancestor originates from South Asia), goose and duck could have potentially been domesticated from local populations but, considering the volume of trade that took place in historic times, they are more likely to have been imported. Pheasant, peafowl and, finally, turkey, represent other late introductions of domestic birds, none of which have local, wild ancestors. These species had very different functions. The turkey, an American species, was introduced for its meat, fulfilling a role similar to that of other farmyard birds. The impressive-looking peafowl is mainly found at high-status sites and is likely to have been an ornamental bird. The pheasant should be regarded as semi-domesticated at most, and was mainly released into the countryside, where it was hunted for food or, later, recreational purposes.

A later domesticated mammal is represented by the domestic cat, introduced into England by the Iron Age (*see* Chapters 5–9; Kitchener and O'Connor 2010). Cats are valuable rodent catchers, a role that became particularly important when house mice and rats were introduced.

The date of the first introduction of the donkey in central England is rather dubious. A Roman occurrence is fairly certain, but an earlier Iron Age presence has tentatively been suggested (Johnstone 2010). Donkeys never had the same importance in England as in Mediterranean countries, but they were certainly used, as historical sources attest. We must also not forget the potential economic value of the mule, the hybrid of a male donkey and a female horse. Mules played an important role as transport animals in the classical world, and their archaeological occurrence in Roman Britain has been suggested (Johnstone 2010).

An important contributor to aquaculture activities, the carp, was introduced probably in the late medieval–early post-medieval period. There are some dubiously identified specimens recorded for central England (*see* Chapter 6), but Locker (2010) also mentions an unpublished record from Ely (Cambridgeshire) dated to the 15th century. Further reliable identifications from Surrey date to the 16th and 17th centuries (Currie 1991). Once established, the carp eventually became a valuable economic resource.

10.4 Relative importance of the main domesticates

Although sheep and goat were introduced in the Neolithic, their quantitative, and presumably economic, importance in this period was minor compared with that of cattle and pig. In general, early Neolithic sites are dominated by cattle bones, whereas in the late Neolithic most sites have a predominance of pig remains. This situation mirrors the pattern found in southern England, where many more sites are available (cf Grigson 1982; Albarella and Serjeantson 2002). Such a high pig frequency is unique within the British archaeological record, an issue that is discussed in Chapter 3. After the oddity of this late Neolithic 'pig horizon', cattle resumes as the most common domesticates at sites of the Neolithic–Bronze Age transition and much of the Bronze Age, but, after the end of the Neolithic, the frequency of caprines (mainly sheep) also gradually increases (*see* Fig 4.3). By the middle–late Bronze Age sheep had become established as a key economic resource, rivalling cattle as the most numerous animal, a role that it held until modern times.

From the Iron Age onwards the archaeological record for central England becomes more dependable in terms of the number of sites we can rely on. This provides the opportunity to plot the quantitative information for the most important domestic mammals in a more systematic way (Figs 10.1 and 10.2). The patterns have been discussed in the chapters for the individual periods, but it is worth taking a long-term perspective. In Figs 10.1 and 10.2, two different systems have been adopted to express the relative importance of the main domesticates. Comparing the two is a useful way to check that any identified pattern is not merely an artefact of the adopted quantification system. By and large the two plots are consistent in highlighting the following points.

- The heyday of cattle predominance is definitely to be found in the Roman period, although the species is very important throughout the chronological sequence. Recovery bias is, however, certainly and severely affecting these data, with sheep/goat and pig under-represented in comparison with cattle. The rate of recovery bias should, however, be approximately the same for all periods, so that variations in species proportions remain meaningful.
- Pig is consistently the third most common species, but a clear rise in pig frequency in the Saxon period can be detected. Although the late Neolithic pig predominance remains a unique phenomenon, the Saxon period still stands out for its emphasis on pig husbandry in comparison with other periods.
- Like cattle, sheep is prominent in all periods but it does increase in frequency from the Saxon period onwards, a likely consequence of the rising importance of the wool trade.

- The only period in which sheep outnumbers cattle is the Iron Age (Fig 10.1), when the importance of sheep husbandry may be because of various factors, discussed in Chapter 5. We must also not forget that a small component of goat bones contributes to the sheep/goat proportions in all periods.

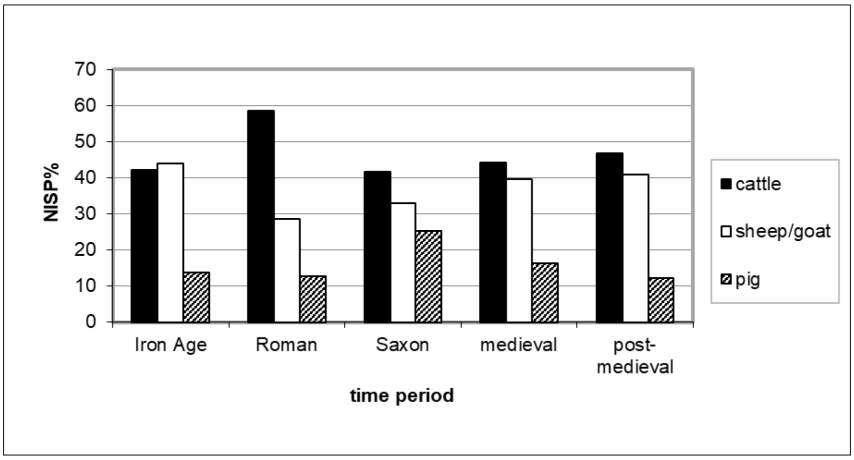

Fig 10.1 Relative proportions of cattle, sheep/goat and pig, as a percentage of the cattle+sheep/goat+pig number of identified specimens (NISP) for each of the main time periods. All assemblages have been included, regardless of size.

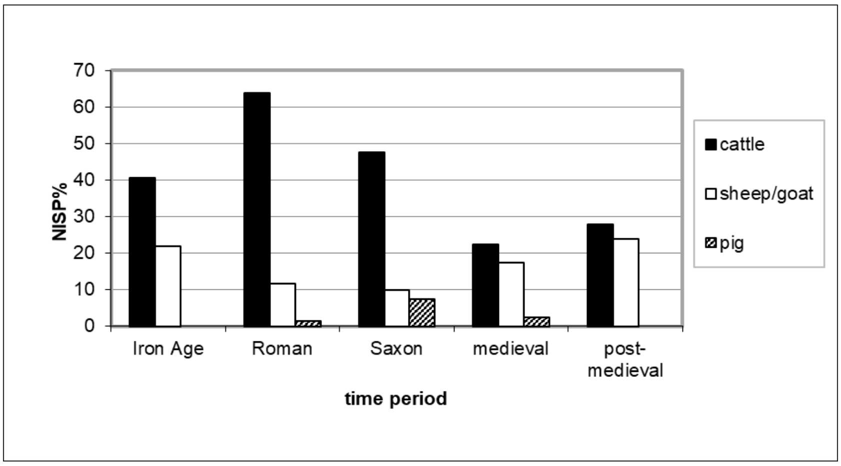

Fig 10.2 Relative proportions of cattle, sheep/goat and pig, as a percentage of (NISP) for those periodsites where cattle+sheep/goat+pig NISP >400 and in which each of these taxa form >50% of the total NISP. This equates to the percentage of data points plotted in each corner of the tripolar plot for each period.

10.5 Uses and products

Most remains of domestic animals found on archaeological sites are the result of direct consumption by humans. The fact that the animals were finally eaten does not necessarily mean that meat was the main purpose of their rearing, however. In the past, when people could not afford as much waste as we can today, animals would be used intensively, both in terms of their potential in life and the products of their carcasses. An interest in meat was probably the key reason for the first domestications, but there is mounting evidence that milk was already used in the early Neolithic (*see* section 3.5). Other 'secondary products' (*sensu* Sherratt 1981), such as wool and traction, although probably exploited later (cf Ryder 1983), would have still been of interest for most societies discussed in this review. For most of the period covered in this review, there is little doubt that all animal products and available uses were exploited, specialisation mainly being a very late phenomenon. At different times and in different places there was, however, a different emphasis on the main aim of the animal husbandry, and such emphases may have been, and in fact often were, different for different species.

The most powerful tool we have to detect husbandry strategies is the analysis of kill-off patterns. For prehistoric sites the evidence we have is patchy, but the remarkable case of Grime's Graves (Legge 1981b) provides us with an indication of the exploitation of cattle mainly for milk production. The original evidence has been fiercely debated, but Legge (1992) defended it robustly, eventually adding more data to his initial analysis. Table 4.4 provides a summary of the suggested husbandry strategies for cattle and sheep/goat at a number of Bronze Age sites. The evidence is too sparse to identify any reliable trend, but it does seem that a fair amount of variation occurred, suggesting that different products were sought after at different sites. An overall lack of specialisation is also apparent in the Iron Age, although cattle tend to occur at older ages than sheep/goat. This probably indicates that cattle were mainly reared for their secondary products, while caprine breeding was mainly focused on meat production. Changes occurred at the end of the Iron Age, but also in the course of the Roman period, with an emphasis initially placed on traction use for cattle (probably aimed at crop production) and then mainly meat. The evidence is clear for Essex, but more detailed analysis of multi-period sites is needed, particularly from other areas.

Figure 10.3 provides information about the main age categories of cattle and sheep/goat from the Saxon period onwards. The evidence emerging from this analysis has been discussed before but there are a few long-term trends that are worth reiterating. The tendency to slaughter caprines at gradually older ages is apparent and it has been interpreted as an indication of an increased emphasis in wool production. The zooarchaeological evidence does not therefore support the view expressed in the historical literature that the wool trade peaked in the medieval period (*see* Chapters 8 and 9). Conversely, it seems that the importance of wool continued unabated into the post-medieval period and, if a change occurred, it was towards an increase rather than a reduction in production. This is supported by the increase, although relatively small, in the frequency of caprine remains (Figs 10.1 and 10.2). Future work needs to investigate how the apparent contradictions between the two sources, archaeological and historical, can be resolved.

Concerning cattle, the most obvious change is represented by the reduction in the age profile that typifies the post-medieval period, which is also accompanied by the emergence of a number of sites where large proportions of calves were found. We have seen that this is a phenomenon that in fact begins in the late medieval period (*see s*ection 8.4), although the pooling of the data that characterises Fig 10.3 obscures this. The interpretation is straightforward: cattle were losing the prominence they had held during earlier medieval times as traction animals, and an increased section of cattle husbandry became devoted to dairy and veal production.

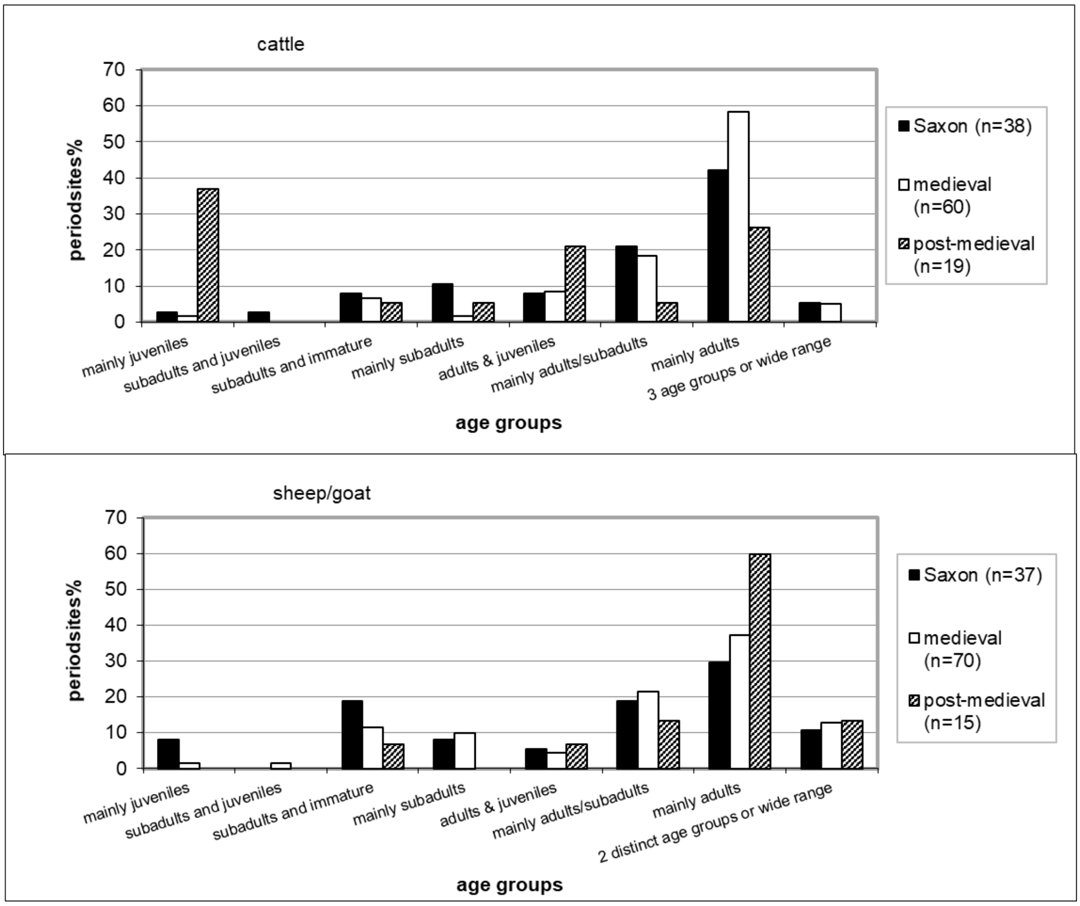

Fig 10.3 Distribution of selected age groups for cattle and sheep/goat at Saxon, medieval and post-medieval sites from across central England, as a percentage of periodsites, where n *is the total number of periodsites per time period for which ageing data has been reported in this way. Age categories are as defined in the site reports and therefore may vary depending on the definitions used in the reports (after Albarella 2005a, fig 7.5).*

10.6 Morphological modification and the evolution of breeds

Because of climatic and environmental changes, as well as a large variety of other factors, the size and shape of wild animals was potentially subject to substantial change during the time period covered by this review, but it is the human-induced change in the morphology of domestic animals that is of particular archaeological interest. This topic is particularly difficult to review without resorting to a full re-analysis of the raw metric data, which would amount to several different projects. Nonetheless some attempts to summarise the evidence have been made in the course of the review.

We have no information about how the very first domesticates looked in central England. The later Neolithic evidence is also scanty, but it is likely, although unproven in central England, that some size reduction occurred in prehistory, as the domestic animals gradually differentiated from their wild ancestors. There is a parallel indication of such a trend in other geographical areas (cf Viner-Daniels 2014 for southern England).

The first evidence of a reversal of this trend is found in the Roman period, by which time we know from historical sources that breeders had become conscious of the possibility of selecting favourite morphological characters in animals. Although varied in quality and extent, and not universal, there is sufficient evidence from central England to suggest that in the Roman period livestock was on average larger than in the Iron Age. In all domesticates such a size increase was likely to be aimed at increasing productivity in meat yield and, for cattle, traction power as well.

Although there are a few hints that the Saxon period may have seen a slight reduction in the size of the animals, the overall evidence points to stability after the Roman period. No further improvement occurred until the late medieval period. During medieval period, the changes that would become even more dramatic at the time of the so-called 'agricultural revolution', were already in place. The gradual demographic increase that followed the Black Death, as well as the opportunities generated by the greater availability of land, probably provided the necessary stimuli to create improved animal breeds. Morphological as well as size changes occurred. These were partly an adaptative response to new living environments, for instance snout shortening in pigs, but partly also to meet the need to generate specific livestock types aimed at providing certain products at the expense of others.

Although we can probably only talk of proper genetic breeds from the post-medieval period onwards, it would be wrong to assume a complete sameness of the animals before the post-medieval period. We have seen that regional differences occurred in all periods for which we have sufficient evidence. In addition, some characteristic morphological traits had emerged in earlier time periods. Polled sheep are found from the Iron Age, and four-horned sheep from the Roman period, although the typical long-horned cattle were not present before the post-medieval period. Horses were mainly pony-sized until the 16th century. Although some large horses must have been present during the medieval period, their almost complete absence from the zooarchaeological record indicates that they must have been rare, and therefore carried a substantial social status.

10.7 Carcass treatment

Systems of dealing with the animal carcass are difficult to review from a broad diachronic perspective, because they can be so much affected by local and regional traditions. The data are also more subjectively collected than for other lines of evidence, and are therefore more difficult to compare.

Arguably the most important change in the way carcasses were processed concerns the transition from stone-tool to metal-tool butchery, but, despite the theoretical potential of distinguishing between the two (eg Greenfield 1999), no research has been carried out on this subject for central England. As for other lines of evidence, butchery data are scanty for the prehistoric period, but the greater abundance of chop and cut marks recorded for the Iron Age is indeed likely to be related to the more widespread use of metal tools, which tend to leave more distinguishable marks on the bones. It is, however, in the Roman period that a more intensive hacking of the bones with heavier tools starts emerging, supporting views previously expressed by Grant (1987), Maltby (1989) and Seetah (2006). The Roman period is also the only time in our chronological sequence that is characterised by some butchery patterns that appear to be highly diagnostic: hooked cattle scapulae and soup-kitchen deposits (*see* section 6.5).

It is from the Saxon period that regular systems of redistribution of the carcass start appearing, as demonstrated by the increased frequency of longitudinally split vertebrae, indicating the separation of the carcass into left and right sides. Although such vertebrae are also found in earlier periods, they tend to be uncommon (cf Grant 1987).

Skinning marks on bones of many different species, including horses, dogs and cats, are found throughout the diachronic sequence, but tanning deposits do increase, mainly in medieval and post-medieval periods. Conversely, horning appears to have declined by the post-medieval period, while bone and antler working seems to have survived unabated. The interest in cat pelts also waned in the post-medieval period.

Butchery on horse bones is found in all periods and in a remarkably consistent frequency, indicating that the various cultural and religious taboos known from historic times concerning uses of the horse, had little role in creating the archaeological evidence. Such taboos may have been literary ideals rather than actual proscriptions.

Associated bone groups (Morris 2011) are found in all periods but are particularly common in the Iron Age, particularly for pig (Fig 10.4), which was expected on the basis of the extensive evidence of such deposits in sites outside central England (cf Grant 1991). These groups are often, but not always, associated with ritual depositions. In Roman and Saxon periods, the deposition of associated bone groups continued, although the evidence is (proportionally) slightly scantier and there is no longer an emphasis on pig depositions. By the medieval period these deposits are less common, which does not necessarily suggest a reduced ritualisation in the treatment of the animal carcass, but merely that there may have been many different forms of carcass treatment. One of these was the ritualised butchery of deer carcasses, which characterises both medieval and post-medieval high-status sites, and results in an uneven distribution of the body parts found in archaeological assemblages.

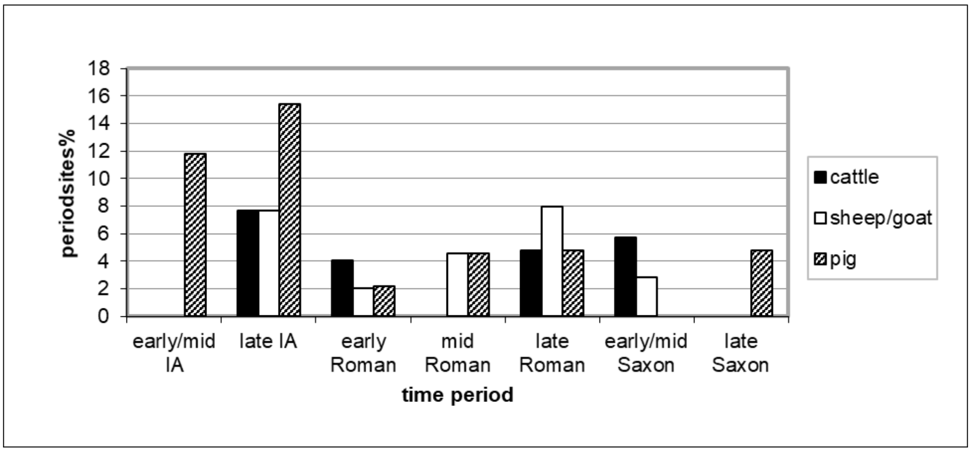

Fig 10.4 Reports of articulated bones, partial skeletons, skeletons and 'food offerings' in early Iron Age to late-Saxon periodsites across central England, as a percentage of all periodsites for each taxon and time period. Broadly dated periodsites have not been included. Note that there is some temporal overlap between Roman time periods.

10.8 Potential and future directions

The compilation of this review has provided us with an excellent tool to assess the effectiveness of zooarchaeological studies for our understanding of past societies. Almost 1,000 animal bone assemblages (periodsites) from central England have been considered, a formidable dataset, which few other regions of the world can boast. This evidence has been accumulated over several decades and, inevitably, there is extensive variation in both its nature and quality. As discussed in Chapter 1, inter-site comparison is challenging and large-scale analysis requires its own specific approach, which will inevitably have a number of limitations. To focus on highly specific points, spatially, temporally or culturally, would have meant to transform this review into a long list of 'interesting' examples. Although many small points have been raised, the main aims have, however, been the identification of general trends and addressing the 'big questions' regarding the evolution of human societies within the study area of central England. Whether we have succeeded in this particular enterprise is for the reader to judge but, certainly, we are aware of the existence of shortcomings in the analysis. Although some of these are inevitable, and have been discussed throughout, it can be interesting to ponder on how the zooarchaeological record could be improved in the future.

10.9 Sampling and collecting

Of the many factors affecting the formation of animal bone assemblages, the recovery of the material from the soil is one that can be controlled by archaeologists. Retrieval strategies will have a profound effect on the nature of the zooarchaeological record (eg Payne 1972) and will depend mainly on choices made during the excavation. Decisions made on where to excavate and how will greatly affect the quantity and type of animal remains that will be recovered. An important element that will determine the effectiveness of recovery is represented by the decision of whether to sieve the excavated deposits, and, if so, to what extent. As discussed in Chapter 1, lack of sieving will inevitably lead to a biased record, although this is only one of the many factors that leads to bias in the zooarchaeological record. Consequently, zooarchaeologists are used to taking account of these biases when interpreting the data. That said, an archaeofaunal dataset should never be taken at face value. Hand-collected assemblages are not ideal, but they can still be useful, and indeed they represent the main foundation of this review. Sieving an archaeological deposit will contribute to the collection of more material, particularly small animals and small anatomical elements of large mammals, but it is a common misconception that the main aim of sieving is to get more bones. What is valuable about sieving is that, unlike hand-collected material, it allows us to assess and monitor the degree of loss, which is why even the use of a large mesh size, although not ideal, can still be useful.

However, as we have seen, only a small proportion of the data used in this review derive from sieved material. Considerations about the effects of the lack of sieving on the nature of the data have been made in all chapters, and in Chapter 1 we highlighted how sheep/goat and pig are under-represented in comparison with cattle, as the few sieved assemblages clearly demonstrate. Other vertebrate categories, such as small mammals, birds and fish, are even more severely affected, and we must simply accept that for many sites quantitative information about these animals is irretrievably lost.

If selected sieved assemblages are rare, even more so are cases where the whole excavated deposit is fully sieved. Partial sieving can, however, be very useful in assessing the degree of loss in the fraction that was hand-collected. This is why it is absolutely essential that the material from hand-collection and sieving are kept separate, both physically and in terms of their data. When this is not done, such as for the Iron Age site of Cat's Water Subsite, Fengate, Peterborough (site code 81, Cambridgeshire; Biddick 1984), this has disastrous effects on our ability to interpret the evidence accurately. In terms of both intra-site and inter-site comparability, the mixing of the two fractions is a worse option than not to sieve at all, as it obscures the evidence in a way that is very difficult to assess. When the whole deposit is sieved, avoiding mixing of hand-collected and sieved material is less essential but still very valuable, partly for methodological reasons, but mainly to allow the comparison of the hand-collected fraction with other hand-collected assemblages from other sites, which are likely to be the majority.

A major problem we have had with this review is that often we have not been able to understand what kind of assemblages we are dealing with; when sieving was carried out, it was often difficult to determine how much of the excavated deposit was sampled and sieved versus collected by hand. It is fairly certain that this has detrimentally affected the quality of our reviewed evidence. Whenever we had the opportunity, we have drawn attention to the problem, for instance highlighting the assemblages that had a sieved component, but we are aware that in many cases recovery strategies were insufficiently explained in the relevant reports.

Clearly the ideal scenario would have been for us to deal with animal bone assemblages that had been fully wet-sieved on a rather small mesh (2mm or less). This situation is, however, rare and, in fact, often logistically and financially unfeasible, but much can still be done to mitigate the problem. In summary, here are some recommendations (cf Baker and Worley 2014).

- Whenever possible, sieving of key stratified deposits that are reasonably well dated should be carried out on archaeological sites. The sieving will help assess the degree of loss of faunal remains, as well as other archaeological finds, in the unsieved deposits.
- Extensive sieving of large quantities of soil is definitely the strategy to use for animal bones. The intensive strategy of sieving small soil samples (eg 20l) on a very fine mesh, which is often adopted for the recovery of plant remains, is rarely of much use in zooarchaeology, as insufficient material will be retrieved to assess the degree of loss from the rest of the site.
- Fine sieving (eg 2mm mesh) will allow the recovery of most animal bones, but even a much coarser mesh (eg 5mm or more) will be useful in addressing issues of proportional representations of the larger mammals. It is, however, likely to be insufficient for categories of smaller vertebrates, such as rodents, insectivores, small birds such as passerines, and fish.
- Wet sieving is almost always preferable to dry sieving, as it allows for much better visibility of the material collected on the mesh.
- Material recovered from hand-collection and sieving should always be kept separate. Data can only be combined after they have been presented separately.
- Whatever recovery strategy is adopted, this needs to be clearly described in the final report. The lack of such explanation may mean that hours, days or even weeks of work used to process samples will have been completely wasted.
- As mentioned in Chapter 1, different zooarchaeological quantification systems are variably affected by a recovery bias. It is therefore desirable that various quantitative approaches are taken, and in particularly that minimum numbers of individuals (MNIs) are produced alongside the more commonly used number of identified specimens (NISPs), at least for large assemblages.

10.10 Assemblage size

A substantial problem with this review is that many of the assemblages that have been considered are rather small (Fig 10.5). Although all assemblages included in this review were selected as potentially providing some valuable information (those that were uninformative were excluded at the outset and were not included in the database), reliable quantitative information could only be provided by the larger assemblages. A threshold of 400 specimens was arbitrarily chosen for assessing the proportion of the main species, which means that almost 70% of the assemblages could not be used for this purpose. We are also aware that NISPs are highly problematic as their values depend on the adopted counting system. The concept of 'identified specimen' is highly subjective and very rarely do zooarchaeological reports include information on how it was defined. When a 'diagnostic zone' system was used this would tend to be much more selective and also provided more clarity, as the identified specimens had to belong to a pre-selected list of 'countable specimens' for them to be recorded. Such an approach was, however, rarely used, which means that it is very difficult to assess to what extent assemblages with similar NISPs are indeed of similar size. Because of the widespread absence of such details we therefore had no choice but to treat all NISPs as equal, although this was plainly untrue.

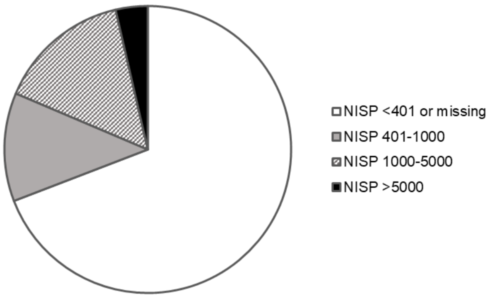

Fig 10.5 Relative sizes of the animal assemblages used for the central England review. Only 31% of the assemblages belong to the category of >400 number of identified specimens (NISP), which was used as the cut-off figure for providing quantitative information .

The problem of small sample size affected even more detrimentally other categories of analysis, ranging from ageing to biometry and butchery, as it was difficult to reconstruct any patterns on the basis of small datasets.

Although small assemblages can provide useful information, it is only through large assemblages that we can reliably reconstruct patterns and trends in the use of animals in the past. The uncovering of substantial quantities of bones from individual sites should therefore be a priority for future research, but this is unfortunately not in line with the current trend to preserve *in situ* (Corfield 1996). Such a policy means that only features that are going to be directly destroyed by any development project are dug, with the inevitable consequence of a reduction in the size of available animal bone assemblages. In our experience most developer-funded excavations undertaken in the last couple of decades have produced so little material that it is often only barely worth studying.

An example of the problem deriving from our review is provided by the site of Outgang Rd, Market Deeping (259, Lincolnshire; Albarella 1997a), which has produced an informative animal bone assemblage. At this site, excavated as part of the Fenland Project (Crowson *et al* 2000), expectations were raised concerning the possibility of the animal bone assemblage shedding light on activities and movements of Iron Age communities in this typical wetland area (T Lane, pers comm). Although the material was interesting, the assemblage was, however, too small to draw firm conclusions about husbandry strategies, although an attempt was made. Yet, the opportunity existed to generate what would have been one of the most important animal bone assemblages for the Iron Age of central England. It is unfortunate that the excavation team was advised to excavate only partially important features particularly rich in animal bones. This, as a consequence, reduced substantially the sample size, and consequently the analytic potential of the material. The practice has unquestionably been repeated at many other sites.

For the future we therefore recommend the following.

- High priority is given not just to the retrieval of animal bones, but to the building up of substantial assemblages that can provide information that goes beyond just a list of species present.
- Zooarchaeologists are more explicit about the system of counting and recording, and especially about how they define their 'specimens', so that proper assessments of sample size can be made.

10.11 Preservation by record?

Although reports can be relatively uninformative because of circumstances beyond the control of the zooarchaeologist, for instance small sample size, our review has also exposed a long list of what seem to have been lost opportunities. While some assemblages were studied very comprehensively, other studies appeared to be inadequate, either because they were purely descriptive or lacking in depth of analysis, or because important lines of investigation had been neglected. For instance, in the medieval period, which has probably the richest zooarchaeological record for central England, only <40% of the assemblages provide any information about cattle ageing. It is unlikely that this is entirely because of an insufficient size of assemblage. This evidence is even more noteworthy if one considers that ageing represents one of the most basic lines of investigation in zooarchaeology and cattle is, overall, the most common taxon.

If we look at other areas of investigation, such as butchery (Fig 10.6) and biometry (Fig 10.7), it becomes clear that for most assemblages we have no information whatsoever about these aspects of zooarchaeological analysis. For butchery the proportion of informative reports typically ranges between 5% and 25%, and for biometry between 10% and 30%. Fluctuations in the amount of available information clearly depend on the wealth of the zooarchaeological record for a period and the abundance of a given species, but we have come across many reports in which such aspects were inexplicably neglected.

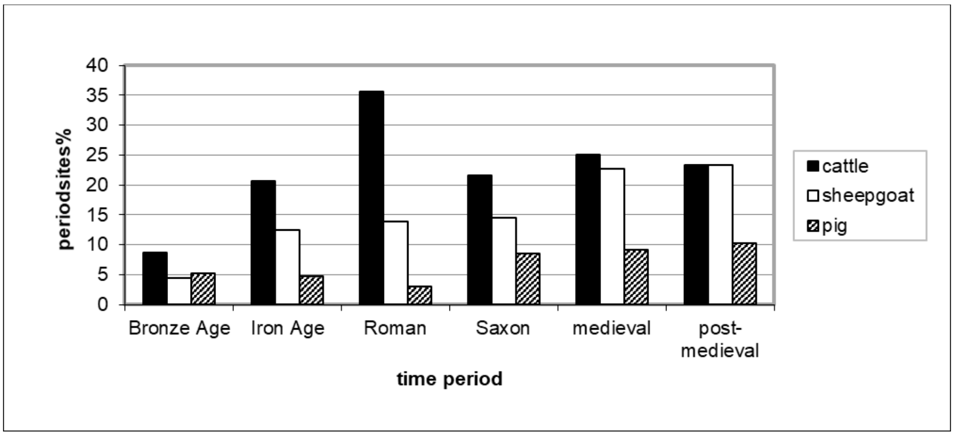

Fig 10.6 Reports of butchery from periodsites across central England, as a percentage of all periodsites for each taxon and time period. Time periods with <10 periodsites have not been included.

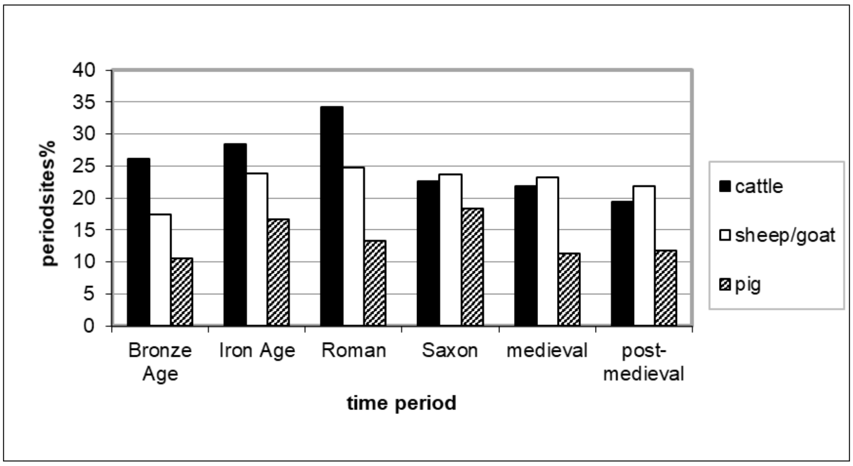

Fig 10.7 Available biometric data from periodsites across central England, as a percentage of all periodsites for each taxon and time period.

It is inevitable that the topics tackled in a zooarchaeological report will depend on the specific interests of the researcher involved, as well as the potential of the material. In most cases, however, the insufficiency of the analysis was probably avoidable. Raw data are also rarely published, which means that, in most cases, the only way to fill in the gaps is to go back to the actual material.

There are in fact many other reasons why one might want to re-analyse faunal material that has already been studied, which have nothing to do with the inadequacy of the original reporting. New methods and techniques are being developed all the time, and new research questions may open up new ways to look at the material. Individual researchers may also want to investigate in-depth some particular aspects that it was not feasible or desirable to approach in the original analysis. Archaeological excavations are expensive and time-consuming enterprises, and it is important that the finds they produce are investigated comprehensively by a variety of researchers, even belonging to different generations. This is why animal bone assemblages should be regarded as valuable archives, that are rarely, if ever, fully exhausted. Within the limits of what is logistically possible, they should be preserved for future generations of researchers.

The idea that animal bone assemblages could be 'preserved by record' (Department of the Environment 1990) is completely delusional. Plainly some record is better that no record at all but, in reality, even the most thorough researcher will not be able to investigate all possible aspects of the zooarchaeological analysis. In addition, the zooarchaeological report is not a banal exercise that will provide the same results whoever studies the material. Fortunately, different researchers have different expertise, approaches and ideas, which can potentially complement each other. To consider the report as a standard output that, once produced, is definitive, demeans the role of the researchers, who build up their expertise over many years in order to be involved in a creative rather than mechanical process. In this review there are plenty of examples of animal bone assemblages that could have been studied using many different approaches, each in their own way potentially valid.

On the basis of these considerations we recommend the following.

- Once the initial zooarchaeological study has been completed, animal bone collections from archaeological sites should be preserved and made accessible to other researchers. If it is inevitable that some material should be disposed of, priority should be given to those parts of the assemblages that are poorly dated or stratified, and therefore have limited archaeological potential. Often this material can be valuable to academic departments, where it can be used for educational and training purposes.

- It is desirable for zooarchaeologists to make their raw data available to others. While in the past there were continuous problems with the availability of space to print these data fully in publications, today the problem can be circumvented by uploading the data on informatic supports that are available via the internet. A link to this online material can be added to the publication.

10.12 Output

This review mostly relies on zooarchaeological evidence that is published, or widely available as grey literature, but we are aware of the fact there was the potential to include a much larger body of data.

Although we are not in a position to assess accurately the scale of the problem, there is no question that many animal bone assemblages from central England have never been studied. We have direct knowledge of a number of such cases. An even more serious problem is that many of the studied assemblages have never been published, for a variety of reasons that would be unfeasible, and perhaps inappropriate, to investigate here.

This is clearly an important drawback of this review. Many of the patterns and trends that have been discussed could have potentially been clarified if such additional evidence had been available. In addition, entirely new evidence that has not been discussed at all in this publication may be available in unpublished reports or museum boxes. There are many gaps in our knowledge of the history of the human–animal relationship in central England that it would be desirable to fill. Although new excavations can contribute to such an endeavour, the priority has got to be the use of the evidence that has already been unearthed. Priority can be given to geographical areas (eg the western part of central England) or periods (eg the late post-medieval), for which there is a particular dearth of data.

There is a further and rather serious problem that is occasionally apparent, but more often not, in the analysis of published reports. Some of these have been heavily edited and even curtailed without consultation with the original authors. This malpractice is rather widespread and may lead to the publication of information that is incomplete or, in a worst case scenario, biased and misleading. This situation can also be dictated by circumstances, particularly when there is a long delay between the writing of the original report and the preparation of the publication. It is not unusual for many years, even decades, to pass between these two stages. This increases the chances of a breakdown in communication within the team originally involved in the project. People may have moved on to other jobs or become unavailable for a variety of different reasons. This is a concern regarding the reliability of the published evidence, which affects this review and potentially any others that may be produced in the future. It is also worrying for the individuals involved, and for the professional body as a whole, to see potentially sub-standard reports published in their names, therefore to the detriment of their professional reputation.

In terms of the output of the zooarchaeological work, we would therefore like to make the following suggestions for the future.

- Every possible effort needs to be made to study and eventually publish animal bone assemblages deriving from archaeological sites. As is well known, the archaeological excavation represents an experiment that cannot be repeated. Once the excavation has been completed, project managers and any other professionals with a responsibility towards the project, have a duty towards the research community and the wider public to make the evidence available through publication.

- The excavation of an archaeological site and the consequent study of its finds often represent a complex undertaking that may take years to complete. In that period, it is important that all involved specialists act as a team, communicating openly and frequently. When the time to completion of a project is stretched too much, there is a high risk that the team will disband during the course of this process, with consequent detrimental effects on the quality of the publication output. This is therefore a situation that will need to be avoided. If a field project is carried out over many years, the need to produce interim publications will arise.
- Zooarchaeologists are ultimately responsible for the quality of their published output, and also have intellectual ownership of their work. Editing zooarchaeological reports for publication purposes is likely to be necessary, but needs to be carried out in consultation with the original author of the report. Should this not be possible, the process by which others have contributed to the final output will need to be clearly explained. If the evidence cannot be relied on, then all consequent synthetic works will suffer from this drawback, ultimately leading to a false understanding of our past.

10.13 Closing

The occurrence of potential areas of weakness in the evidence should not detract from the fact that animal remains represent a formidable tool for our understanding of the human past. The commitment of zooarchaeologists has made it possible for us to reconstruct and understand many aspects of past human societies that were virtually unknown only a few decades ago. This review would have not been possible without such painstaking work, which has required financial investment, time, expertise and dedication. Reviews are not possible without site-based analyses, and hopefully this work has proven that regional and chronological patterns can indeed be identified, and that they do help in providing us with a better perception of the deep roots of our modern societies. Central England is, zooarchaeologically, one the best known regions in the world, and yet, much remains to be done. One of the aims of this review has been to identify avenues in which research can be further developed. Hopefully, this will enthuse and stimulate a new generation of researchers, and help emphasise the need for proper education and training in the field of zooarchaeology.

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Ag	Agricultural	Monogr	Monograph
Anthropol	Anthropological	Osteoarchaeol	Osteoarchaeological/ Osteoarchaeology
Antiq	Antiquaries	Prehist	Prehistoric/Prehistory
Archaeol	Archaeological/ Archaeology	Proc	Proceedings
Brit	British	Quat	Quaternary
Counc	Council	Rep	Report
Engl	England	Res	Research
Fld	Field	Rev	Review
Hist	Historical	Sci	Scientific/Science
Int	International	Ser	Series
J	Journal	Soc	Society
Mag	Magazine	Trans	Transactions
Natur	Natural	Univ	University

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APPENDIX 1: LIST OF SITES INCLUDED IN THE DATASET

Abbreviations: Gaz, gazetteer; ref, reference; Meso, Mesolithic; Neo, Neolithic; BA, Bronze Age; IA, Iron Age; Rom, Roman; Sax, Saxon; Med, medieval; PM, post-medieval; Ln, lane; nr, near; Rd, road; St, street/Saint; BCK, Buckinghamshire; BED, Bedfordshire; CAM, Cambridgeshire; DER, Derbyshire; ESX, Essex; H&W, Hereford and Worcester; HRT, Hertfordshire; LCS, Leicestershire; LIN, Lincolnshire; NHA, Northamptonshire; NOR, Norfolk; NTT, Nottinghamshire; SLP, Shropshire; STA, Staffordshire; SUF, Suffolk; WAR, Warwickshire; WMD, West Midlands.

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
137	1	Alcester	409000 257000	WAR					x				Urban	Hamilton 1989
83	2	Aldwick, Barley, nr Royston	539800 238800	HRT				x					Open settlement	Cra'ster 1960
162	3	Aldwincle, nr Thrapston	500500 281500	NHA					x				Bridge	Harcourt 1976
61/62/63	4	Alms Ln, Norwich	622980 309090	NOR							x	x	Industrial, urban	Cartledge 1985; Harman, Baker and Bramwell 1985; Jones AKG and Scott 1985
251	5	Ardale, Grays	559785 179820	ESX				x					No site information	Luff 1988b
474	6	Arrow Valley: Broom	407500 251500	WAR						x			Rural	Pinter-Bellows 1999a
473	7	Arrow Valley: Salford Priors	407500 251500	WAR					x				Villas	Pinter-Bellows 1999b
359	8	Aslockton, Vale of Belvoir	474500 340500	NTT				x	x				Defended settlement	Hamshaw-Thomas 1992
314	9	Astley, Stourport-on-Severn	381000 269300	H&W					x				Well	Westley 1959
231	10	Aston Mill Farm, nr Kemerton, Tewkesbury	395200 235400	H&W			x	x					Enclosure	Lovett 1990b
313	11	Austin Friars, Leicester	458000 306000	LCS							x		Friary	Thawley 1981
69	12	Baldock (AML 3854)	525000 234000	HRT					x				Town	Chaplin and McCormick 1983
21	13	Baldock 68–72	525000 234000	HRT					x				Open settlement	Chaplin and McCormick 1986
408	14	Bancroft mausoleum, Milton Keynes	483500 240500	BCK				x	x				Village, enclosure	Holmes and Rielly 1994
234	15	Bancroft Villa, Milton Keynes	483500 240500	BCK					x				Villas	Levitan 1990

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
87	16	Barham, nr Ipswich	613400 251400	SUF				x					Enclosure	Martin 1993
16	17	Barholm, nr Peterborough	510100 289800	LIN		x		x					Open settlement	Harman 1993d
430	18	Barking Abbey, Barking	543930 183790	ESX						x	x	x	Ecclesiastical	Hamilton-Dyer 2002
327	19	Barnack, nr Stamford	508100 306600	CAM					x				Rural	Harman 1993a
308	20	Barnham, nr Thetford	586600 277700	SUF				x					Enclosure	Denston 1993
263	21	Barton Bendish, Swaffham/Downham Market	571000 305000	NOR							x	x	Rural	Murphy and Locker 1988
405	22	Bascote, Southam	441000 263000	WAR							x	x	Village	Hammon and Albarella 1998
289	23	Bays Meadow, Droitwich	389000 262000	H&W					x				Urban	Potts 1957
124	24	Beckford, nr Tewkesbury	398000 236100	H&W				x					Enclosure	Gilmore 1972
111	25	Bedford Castle	504000 249000	BED							x		Castle, urban	Grant 1979c
75	26	Bee Low, Youlgreave	419100 364700	DER			x						Cairn	Clegg 1970
109	27	Bennett's Works, Bedford	504000 249000	BED						x	x		Urban	Grant 1986
330/332/333	28	Berrington St, Hereford	350700 239900	H&W						x	x	x	Urban	Bramwell 1985; Jones and Spencer 1985; Noddle 1985a
353	29	Berry Hill Close, Culworth, nr Banbury	454000 246000	NHA				x					Enclosure	Davis 1993–4
331	30	Bewell House, Hereford	350800 240200	H&W							x		Urban	Noddle 1985b
203	31	Bierton, nr Aylesbury	483500 216000	BCK				x					Cluster of pits/ditches	Jones GG 1988
404	32	Billesley Manor, Billesley	415000 256000	WAR					x				Rural	Albarella 1995a
453	33	Billingborough	512700 333300	LIN			x	x	x				Enclosure, industrial, rural	Iles 2001
95	34	Bishops Palace, Lincoln	498000 371000	LIN							x		Garderobe pit	Ellison 1975
175/176/177	35	Black Lion Hill, Northampton	475000 261000	NHA						x	x		Urban	Harman and Baker 1985a, 1985b; Locker 1985d

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
509	36	Blackborough End, Middleton	566500 314500	NOR					x				Industrial	Albarella and Mulville 2001a
226	37	Blackhorse Rd, Letchworth	523000 233000	HRT		x		x	x				Cluster of pits/ditches, enclosure, no site information	Legge *et al* 1989
282	38	Blackthorn, Northampton	475000 261000	NHA				x					Enclosure	Orr 1974b
100	39	Bledlow, Princes Risborough	478000 202000	BCK				x					Farm	Fraser 1946
382	40	Bonners Lane, Leicester	458500 304500	LCS					x	x	x	x	Urban	Baxter 1993a
459	41	Bordesley Abbey	404500 268600	H&W							x	x	Mill, no site information	Lovett 1993
373	42	Boteler's Castle, Alcester	409000 257000	WAR							x		Village	Pinter-Bellows 1997
120	43	Boxmoor House School, nr Hemel Hempstead	503800 205600	HRT					x				Villas	Gebbels 1977a
218	44	Brackley Castle Lane, Brackley	458500 237500	NHA							x		Urban	R T Jones *et al* 1985a
304	45	Braintree	576500 223500	ESX					x				Town	Smoothy 1993
199	46	Brampton, Aylsham/Hoveton	621600 323300	NOR					x				Industrial	Jones 1977b
215	47	Brancaster 74, Hunstanton/Wells-next-the-Sea	577700 345000	NOR					x				Fort	Jones 1985
216	48	Brancaster 77, Hunstanton/Wells-next-the-Sea	577700 345000	NOR			x	x	x				No site information, fort	R Jones *et al* 1985
502	49	Brandon	578500 286500	SUF						x			Rural	Crabtree and Campana in prep
37	50	Braughing Bath House, nr Puckeridge	539200 224300	HRT				x					Village	Ashdown and Evans 1978
188	51	Bredon Hill, Tewkesbury/Evesham	395800 240200	H&W			x						Barrow	Jewell 1965
185	52	Breedon-on-the-Hill 46, Derby/Loughborough	440600 323400	LCS				x					Hillfort	Jackson 1950

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
139	53	Breedon-on-the-Hill 57, Derby/Loughborough	440600 323400	LCS				x					Hillfort	Higgs 1964
190	54	Brigg	501000 407000	LIN			x	x					No site information	Jope 1958
222	55	Brigstock, nr Corby	496100 285800	NHA					x				Shrine	King 1963
70	56	Broad St, Worcester	385000 255000	H&W							x	x	Cluster of pits/ditches or both	Chaplin 1968–9
138	57	Brook St (25–33), Warwick	428000 264800	WAR							x		Urban	Hamilton 1992
165	58	Broughton Lodge, Willoughby-on-the-Wolds, Keyworth	464800 325000	NTT						x			Burial/cemetery	Harman 1993c
365	59	Buckingham St, Aylesbury	482000 213000	BCK					x				Urban	Jones 1982b
49	60	Bulls Lodge Farm, Boreham, nr Chelmsford	574680 210640	ESX				x	x				Farm	Bedwin 1993
104	61	Burgh Castle, nr Caister-on-Sea	647400 304500	NOR					x				Fort	Grant 1983a
212	62	Burgh, nr Woodbridge	622400 252300	SUF				x					Enclosure	Jones *et al* 1987
246	63	Bury St Edmunds	585000 264000	SUF						x			Urban	Locker 1981a
89	64	Bury St Edmunds Abbey 73	585000 264000	SUF							x	x	Well	Jones 1976
94	65	Burystead, Raunds, nr Wellingborough	499500 272500	NHA						x	x		Village	Davis 1992
258	66	Caesaromagus NE, Chelmsford	570000 206000	ESX					x				Temple	Luff 1992
20	67	Caesaromagus SE, Chelmsford	570000 206000	ESX					x				Local centre	Luff 1988c
174	68	Caister-on-Sea, nr Great Yarmouth	653000 313000	NOR					x	x			Fort, high status	Harman 1993b
15	69	Caistor St Edmund, nr Norwich	623000 304000	NOR					x				Temple	Gurney 1986
409	70	Caldecotte, Milton Keynes	489500 235500	BCK					x				No site information	Holmes and Dobney 1994
412	71	Cantor and Silver site, Brackley	458560 237200	NHA							x	x	Urban	Baxter 2002b

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
209	72	Canvey Island	579000 183000	ESX					x		x		Coastal	Jones 1986b
505	73	Carbrooke Preceptory	594970 302100	NOR						x	x	x	Cluster of pits/ditches or both	Hammon 2006
223	74	Castle Acre, nr Swaffham	582100 315600	NOR							x		Castle	Lawrence 1982
429	75	Castle Cement Works, Pitstone	493820 215070	BCK						x			Open settlement	Hambleton 2005
170	76	Castle Hill, East Bridgeford	470000 342000	NTT					x				Fort, roadside settlement	Harman 1969
368/339	77	Castle Mall, Norwich	623190 308503	NOR						x	x	x	Urban, castle	Albarella *et al* 1997; Locker 1997c
244	78	Castle Rising, nr King's Lynn	566000 325000	NOR							x		Castle	Locker 1984
465	79	Castle Rising Castle, nr Kings Lynn	566000 325000	NOR							x	x	No site information, castle	Jones *et al* 1997
415	80	Castle St, Worcester	384710 255410	H&W					x				Town	Baxter 2002c
504	81	Cat's Water Subsite, Fengate, Peterborough	520500 298500	CAM				x					Rural	Biddick 1984
112	82	Cauldwell St, Bedford	504000 249000	BED						x	x		Urban	Grant 1979d
355/356	83	Causeway Lane, Leicester	458000 306000	LCS					x		x	x	Urban	Gidney 1999a; Nicholson 1999
268/269	84	Cave's Inn, Rugby	453500 279500	WAR					x				Well	Bramwell 1973b; Noddle 1973a
80	85	Chalk Ln, Northampton	475000 261000	NHA						x			Urban	Coy 1981
288	86	Cherry Hinton War Ditches	549000 257000	CAM				x	x				Hillfort	Phillipson 1963
306	87	Chesterfield	439000 371000	DER					x				Urban	Stallibrass 1990
202	88	Chicheley, nr Newport Pagnell	491000 245000	BCK						x			No site information	Jones 1980
462	89	Chignall Roman Villa	566800 209900	ESX				x	x				Enclosure, rural, villas	Luff 1998
492	90	Chopdike Grove, Gosberton	519880 329000	LIN						x			Rural	Baker with Nicholson 2002
74	91	Church St, Waltham Abbey	538100 200600	ESX							x		Urban	Clarke *et al* 1993

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
219	92	Clay Ln, Northampton	475000 261000	NHA				x					Enclosure	R T Jones *et al* 1985b
186/187	93	Colchester 30–39	599000 225000	ESX				x	x				No site information, urban	Jackson 1947; Bate 1947
388	94	Colchester 71–85	599000 225000	ESX					x		x	x	Urban	Luff 1993
257	95	Colchester Castle	599000 225000	ESX							x		Castle	Luff 1982a
295	96	Coldharbour Farm 90, Aylesbury	480600 213650	BCK				x					Open settlement	Sadler 1990
455	97	Coldharbour Farm 96, Aylesbury	480600 213650	BCK				x					Enclosure	Johnstone 1997
513/515	98	Commercial Road, Hereford	351500 240500	H&W							x	x	Urban	Baxter in press; Hamilton-Dyer in press
99	99	Cop Barrow, Bledlow	478000 200000	BCK			x						Barrow	Fraser 1940
348	100	Coslany St, Norwich	622810 308910	NOR							x		Urban	Albarella 1997c
376	101	County Museum, Aylesbury	482000 213000	BCK				x			x	x	No site information, urban	Sadler 1998
397	102	Cowbit Wash, Cowbit	527000 318000	LIN				x					Industrial	Albarella and Mulville 2001b
340	103	Cox Street, Coventry	433500 278500	WMD							x		Urban	Armour-Chelu 1986
319	104	Croft Ambrey, Ludlow/Leominster	344400 266800	H&W				x					Hillfort	Whitehouse and Whitehouse 1974
249	105	Culver St, Colchester	599500 225000	ESX					x				Urban	Locker 1987c
425	106	Deene End, Weldon	493030 289650	NHA							x	x	Rural, village	Deighton 2003a
27/28/29	107	Derby NW Sector	435000 335000	DER					x				Urban	Bramwell and Harman 1986; Harman 1986a; Jones 1986c
421	108	Derngate, Northampton	475800 260200	NHA							x	x	Urban	Charles 2002
294	109	Desborough Castle, High Wycombe	484710 193320	BCK							x		Castle	Sadler 1988
220/221	110	Dicket Mead, Welwyn	523500 216100	HRT					x				Villas	King 1986; Rielly 1986
92	111	Dodder Hill, nr Droitwich	388000 264000	H&W					x				Fort	Davis 1988

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
50	112	Donington Park, Castle Donington	442300 326600	LCS							x		Enclosure	Bent 1978
498/499	113	Dragon Hall, King Street, Norwich	623550 308180	NOR						x	x	x	Urban	Murray and Albarella 2005; Nicholson 2005
361/362/363	114	Dragonby, nr Scunthorpe	490500 413800	LIN				x	x				Open settlement	Harman 1996a, 1996b; Jones 1996
483	115	Dudley Castle	394700 290700	WMD							x	x	Castle	Thomas 2005a; Thomas and Locock 2000
189	116	Dunstable	501800 221500	BED					x				Burial/cemetery	Jones and Horne 1981
159	117	Earls Barton, nr Wellingborough	487000 262700	NHA			x						Barrow	Harcourt 1984
93	118	Edix Hill, Barrington, nr Cambridge	537000 249000	CAM				x					Open settlement	Davis 1995
262	119	Edmundsoles, Haslingfield, nr Cambridge	543200 253900	CAM				x	x				Cluster of pits/ditches or both, country house	Miller and Miller 1981
60	120	Elbow Ln (15–23), Leicester	458000 304000	LCS							x		Urban	Brown 1989
394	121	Elms Farm, Heybridge	584700 208200	ESX				x	x	(x)			Town	Johnstone and Albarella 2002
419	122	Elms Farm, Leicester	463100 306400	LCS			x	x	x				Enclosure	Charles and Powell 2000
431	123	Empingham II, Rutland	493600 308200	LCS				x	x				Cluster of pits, ditches or both	Hamilton-Dyer 1996
106	124	Empire Cinema, Bedford	504800 249800	BED							x		Urban	Grant 1983d
36	125	Etton, Stamford/Peterborough	513800 307300	CAM		x							Causewayed enclosure	Armour-Chelu and Clutton-Brock 1985
230	126	Evesham Abbey, Evesham	403740 243630	H&W							x	x	Ecclesiastical	Lovett 1990a
463	127	Feltwell Anchor	563200 288500	NOR			x						Burnt mound, no site information	Bates and Wiltshire 2000
180	128	Fengate (FN2), Peterborough	521300 298900	CAM		x	x						Enclosure	Harman 1978a
52	129	Fengate (FN3), Peterborough	521300 298900	CAM		x	x						Enclosure	Biddick 1980
434	130	Fenny Lock, Milton Keynes	488450 234600	BCK				x	x	x			Open settlement, enclosure	Hamilton-Dyer 2001

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
205/206	131	Fishergate, Norwich	624000 308000	NOR						x	x		Urban	Jones 1994; Locker 1994
307	132	Fisherwick, nr Tamworth	418700 308200	STA					x				Rural	Startin 1979
470/471	133	Fiskerton, Witham Valley	508960 371200	LIN				x	x				Ritual site	Jones 2003; Mulville *et al* 2003
279	134	Fison Way, Thetford	587000 283000	NOR					x				Urban	O'Connor 1992
358	135	Fissure Cave, Hartle Dale	416500 380300	DER					x				Cave	Hamshaw-Thomas 1997
334/335	136	Flaxengate, Lincoln	498000 371000	LIN						x	x		Urban	O'Connor 1982; Wilkinson 1982
516/517/518	137	Folly Lane, Verulamium, St Albans	514150 207860	HRT				x	x				Cluster of pits/ditches or both, ritual site	Locker 1999b, 1999c, 1999d
410	138	Foxholes Farm, nr Hertford	534500 212200	HRT				x					Enclosure	Ashdown 2004
488	139	Foxton (St Neots-Duxford Pipeline)	540100 248000	CAM					x				Rural, burial/cemetery	Moore 1997
142	140	Free Grammar School, Coventry	434100 278700	WMD								x	Friary	Holmes 1981
236	141	Friar St, Droitwich	389700 263400	H&W				x	x		x		Industrial, urban	Locker 1992a
284	142	Full St, Derby	435300 336400	DER							x		Urban	Patrick 1975
117/118	143	Fuller's Hill, Great Yarmouth	652200 307900	NOR							x		Urban	Gebbels 1976; Wheeler and Jones 1976
158	144	Gadebridge Park, Hemel Hempstead	505100 208600	HRT					x				Villas	Harcourt 1974a
232	145	Gamston, nr West Bridgeford	460200 336900	NTT				x					Open settlement	Levitan 1992
357	146	Gas House Ln, Alcester	408500 257500	WAR					x				Urban	Hamilton 1996
200/201	147	George St, Aylesbury	482000 213000	BCK				x			x		No site information, urban	A K G Jones 1983c; G G Jones 1983
273/274	148	Giant's Hills 2, Skendleby, nr Alford	542900 370900	LIN		x	x						Barrow	Noddle and Grigson 1991; O'Connor 1991a
374	149	Glebe Low, Great Longstone	420000 370000	DER			x						Barrow	Radley 1966
211	150	Goltho, nr Wragby, Lincoln/Horncastle	511600 377400	LIN						x	x		Manor	Jones and Ruben 1987

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
238	151	Gorhambury, nr St Albans	511700 207900	HRT				x	x		x		Farm, villas	Locker 1990
305	152	Grandford, nr March	539300 299700	CAM					x				Village	Stallibrass 1982
377	153	Great Chesterford 52, nr Saffron Walden	551000 243000	ESX						x			Burial/cemetery	Serjeantson 1994
297	154	Great Chesterford 53–5, nr Saffron Walden	551000 243000	CAM					x				Town	Serjeantson 1986
341	155	Great Holts Farm, Boreham, nr Chelmsford	575000 209000	ESX					x				Villas	Albarella 2003a
58/59	156	Great Linford, Milton Keynes	485600 241900	BCK						x	x	x	Church, village	Burnett 1992; Holmes 1992a
56	157	Great Staughton, nr St Neots	513000 264000	CAM					x				Villas	Bramwell 2000
181	158	Greyfriars, Northampton	475500 261500	NHA							x		Friary	Harman 1978b
325	159	Grime's Graves, nr Thetford	581800 289800	NOR		x							Industrial	Burleigh *et al* 1977
224	160	Grime’s Graves 71–72, nr Thetford	581800 289800	NOR		x	x						Mine, midden	Legge 1981a
126	161	Grove Farm, Enderby, Leicester	455100 300100	LCS				x					Farm	Gouldwell 1992
426	162	Hall Farm, Baston	511400 313800	LIN						x	x		Village, manor	Dobney 2003
53	163	Harborough Rocks, Brassington, nr Wirksworth	424200 355100	DER				x					Open settlement	Bishop 1991
123	164	Hardingstone, nr Northampton	476400 257400	NHA				x					Enclosure, industrial	Gilmore 1969
225	165	Harlow Temple, Harlow	548600 212300	ESX				x	x				Temple	Legge and Dorrington 1985
512/515	166	Harrison Street, Hereford	351500 240500	H&W							x	x	Urban	Baxter in press; Hamilton-Dyer in press
145	167	Hartigans, Milton Keynes	488000 238000	BCK				x		x			Open settlement	Burnett 1993
270/271	168	Hatton Rock, nr Stratford-upon-Avon	423500 257500	WAR						x			Palace	Bramwell 1973a; Noddle 1973b
233	169	Haughmond Abbey, nr Shrewsbury	354000 315000	SLP								x	Farm, garden, country house	Levitan 1989

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
495	170	Hay Green (TSC17), Terrington St Clement	553700 318200	NOR						x	x		Rural	Baker with Nicholson 2002
496	171	Hay Green (TSC23), Terrington St Clement	553700 318200	NOR						x	x		Rural	Baker with Nicholson 2002
500	172	Heigham Street, Norwich	622200 309500	NOR							x	x	Urban	Weinstock 2002
121	173	Hemel Hempstead Station	504300 206000	HRT					x				Villas	Gebbels 1977b
324	174	Hertford Castle	532500 212500	HRT								x	Urban	Armitage 1978
364	175	Hertford Castle (outer bailey)	532500 212500	HRT							x		Castle	Jaques and Dobney 1996
44	176	High St (33–47), Leicester	458000 306000	LCS					x				Well	Baxter 1993b
472	177	High St (9), Stone	390500 334500	STA							x	x	Urban	Pinter-Bellows 1998
438	178	High St (rear 29–41), Bedford	505500 249500	BED						x	x	x	Defended settlement, cluster of pits/ditches, industrial, castle	Hutchins 1999
156	179	Higham Ferrers, nr Rushden	496000 268000	NHA					x				No site information	Harcourt 1969c
479	180	Hill Top Farm, Aldwark nr Brassington	422800 357300	DER							x		Farm	Sampson 2001
160/161	181	Hindlow Cairn, nr Glossop	408000 391000	DER			x						Cairn	Bramwell 1981; Harcourt 1981
82	182	Hockwold-cum-Wilton 61–62, nr Brandon	571000 288300	NOR		x	x		x				No site information, villa and vicus	Cram 1967
40	183	Hockwold-cum-Wilton 62–66, nr Brandon	569200 287000	NOR			x						Open settlement	Anon 1982
395	184	Home Farm, Longstanton	540000 266000	CAM							x		Rural	Hammon 2001
179	185	Horncastle	526000 369000	LIN					x				Town	Harman 1983

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403	186	Howard St, Great Yarmouth	653000 307000	NOR							x		No site information	Hammon, undated
291	187	Hunter St, Buckingham	469000 234000	BCK							x	x	Farm, no site information	Rackham 1975
303	188	Ickleton Rd, Chesterford, nr Cambridge	550290 242670	ESX				x					Burial/cemetery	Smoothy 1990
494	189	Ingleborough WNW, West Walton	547500 315500	NOR				x		x	x		Rural	Baker with Nicholson 2002
217	190	Ipswich (AML 3951)	616000 244000	SUF						x			Urban	Jones and Serjeantson 1983
247	191	Ipswich (AML 4578)	616000 244000	SUF						x	x		Urban	Locker and Jones A 1985
392	192	Ipswich 74–88	616000 244000	SUF						x	x		Urban	Crabtree 1994
90	193	Irthlingborough	496200 271300	NHA			x						Barrow	Davis 1989b
316	194	Ivinghoe Beacon, Aylesbury/Dunstable	496000 216800	BCK				x					Hillfort	Westley 1970
460	195	Ivy Chimneys, Witham	545500 200500	ESX				x	x				Enclosure, ritual, temple	Luff 1999
252	196	Kelvedon	586400 219000	ESX					x				No site information	Luff 1988a
264	197	Kenchester, nr Hereford	344800 242700	H&W					x				Farm	Noddle and O'Connor 1985
91	198	King Harry Ln, St Albans	514000 206000	HRT				x	x				Burial/cemetery	Davis 1989a
152	199	King John's Hunting Lodge, Writtle, nr Chelmsford	567500 206500	ESX							x		Moated site	Harcourt 1969b
239/240	200	King's Langley	506400 202500	HRT							x	x	Royal palace, no site information	Locker 1977; Wheeler 1977b
276/277/278	201	King's Lynn	561500 320500	NOR							x	x	Urban	Bramwell 1977; Noddle 1977a; Wheeler 1977a
501	202	Kings Meadow Lane, Higham Ferrers	495850 269350	NHA						x			Rural, enclosure	Albarella and Johnstone 2000
45	203	Lasts Garage, Chelmsford	570500 206000	ESX					x				Urban	Bedwin 1988c

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328	204	Latimer, nr Amersham	499800 198600	BCK					x				Farm, villas	Hamilton 1971
30/31	205	Launditch Hundred	589500 319500	NOR							x		Village	Ambros 1980; Lepiksaar 1980
242	206	Leominster Old Priory, Leominster	349000 259000	H&W							x		Priory	Locker 1981b
424	207	Lime Street, Irthlingborough	494900 270800	NHA				x	x		x		Cluster of pits/ditches, manor	Deighton 2003b
10	208	Lincoln (181–3 High Street)	498000 371000	LIN				x	x				No site information, urban	Scott 1988
387	209	Lincoln sites	498000 371000	LIN					x	x	x	x	Urban	Dobney *et al* undated
490	210	Little Barford (St Neots-Duxford Pipeline), Tempsford	516700 254700	BED					x				Rural	Moore 1997
435	211	Little Chester, Derby	435500 337500	DER					x	x	x		Fort, other military, burial/cemetery, rural	Harman and Weinstock 2002
420	212	Little Oakley	622250 229170	ESX					x				Cluster of pits/ditches, villas	Barford *et al* 2002
122	213	Little Waltham, nr Chelmsford	570500 212600	ESX				x	x				Open settlement, no site information	Gebbels 1978
402	214	London Rd, Godmanchester	525000 270000	CAM					x				Roadside settlement	Hammon and Buckley 2003
18/19	215	Longthorpe II, nr Peterborough	516400 297500	CAM				x	x				Farm, military	King 1987a, 1987b
260	216	Longthorpe, nr Peterborough	515800 297700	CAM					x				Fort	Marples 1974
432	217	Loughton, Milton Keynes	483900 237900	BCK						x	x	x	Village, rural	Hamilton-Dyer 2003
197	218	Low Farm, Fulmer	499300 186200	BCK							x		Manor	Jones 1982a
299	219	Lowes Farm, Littleport	556000 287000	CAM			x						Stray find	Shawcross and Higgs 1961
323	220	Lynch Farm, Peterborough	514500 297600	CAM					x				Farm	Wilson 1975

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
164	221	Lyveden (III)	494800 286100	NHA							x		Deserted medieval village	Grant 1971
105	222	Lyveden (IV)	494800 286100	NHA							x		Deserted medieval village	Grant 1975a
241	223	Magiovinium 78–80, nr Fenny Stratford	489000 233500	BCK					x				Town	Locker 1987b
367	224	Magiovinium 90–91, nr Little Brickhill	489000 233500	BCK					x				Urban	Locker 1995
77	225	Mancetter Village, Mancetter, Atherstone	432500 296000	WAR							x		Manor	Cook 1981
383	226	Market Harborough	473000 288000	LCS							x		Town	Baxter 1996b
296	227	Maxey 60, nr Stamford	512000 308000	CAM						x			Open settlement	Seddon *et al* 1965
136	228	Maxey 79–81, nr Stamford	512800 307700	CAM					x				Village	Halstead 1985
476	229	Melford Meadows, Brettenham	587800 282600	NOR					x	x			Rural	Powell and Clark 2002
73	230	Micklemoor Hill, West Harling, nr Thetford	597500 285700	NOR				x					Enclosure	Clarke and Fell 1953
113	231	Midland Rd, Bedford	504000 249000	BED						x	x		Urban	Grant 1979e
208	232	Mildenhall	571000 275000	SUF			x						No site information	A K G Jones 1988
347	233	Mill Lane, Thetford	587000 283000	NOR						x	x		Urban	Albarella 2004
315	234	Milton Keynes & Great Ouse Valley	485500 237500	BCK			x						Barrow	Westley 1974
380	235	Milton Keynes 71–82	488000 234000	BCK					x				Urban	Field and Westley 1987
321	236	Misbourne Viaduct, Gerrards Cross	500000 188000	BCK	x								No site information	Wilson 1984
39	237	Moles Farm, Thundridge, nr Ware	536200 216600	HRT				x					Cluster of pits, ditches or both	Ashdown and Merlen 1970
493	238	Mornington House, Gosberton	517470 331700	LIN						x			Rural	Baker with Nicholson 2002
508	239	Morton Fen, Morton	514500 323500	LIN					x				Industrial	Albarella and Mulville 2001a

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
281	240	Moulton Park, Northampton	475000 261000	NHA				x					Enclosure	Orr 1974a
317	241	Mount Wood, Chenies, nr Amersham	502700 198800	BCK					x				Cluster of pits, ditches or both	Westley 1985
88	242	Mucking, Tilbury/Basildon	567300 180300	ESX						x			Open settlement	Done 1993
148	243	Nazeingbury, nr Broxbourne	538600 206600	ESX				x	x	x			Farm, church	Huggins 1978
51	244	Nettleton Top, nr Caistor	510700 398800	LIN						x			Open settlement	Berg 1993
366	245	New Cemetery, Rocester	410000 339000	STA					x				Town, fort	Levitan 1996
489	246	New Wimpole (St Neots-Duxford Pipeline)	534300 249500	CAM				x	x				Cluster of pits, ditches or both	Moore 1997
413	247	Newarke St, Leicester	458000 306000	LCS					x		x	x	Burial/cemetery, urban, cluster of pits/ditches	Baxter 1996a
343	248	Norman Cross, Stilton, nr Peterborough	515900 290700	CAM					x				Roadside settlement	Albarella 1998
207	249	North Shoebury, Southend-on-Sea	595000 185000	ESX					x		x		No site information	Jones 1995
245	250	Northampton (site N80–82)	475000 261000	NHA						x	x		Urban	Locker 1985b
243	251	Northampton Green, Northampton	475000 261000	NHA							x	x	Urban	Locker 1985a
119	252	Northchurch villa, nr Berkhamsted	497300 209300	HRT					x				Villas	Gebbels 1977c
427	253	Oakham, Rutland	486700 309500	LCS		x	x		x		x		Ritual site, no site information	Gouldwell 1998
235	254	Old Bowling Green, Droitwich	389900 263500	H&W				x	x		x		Industrial, urban	Locker 1992b
400/401	255	Orchard Ln, Huntingdon	523000 272000	CAM						x	x		Urban	Albarella 1997b; Smith 1997
466/467	256	Orton Hall Farm, Orton Township	517650 295550	CAM					x	x			Rural, farm	King 1996; Harman 1996c
423	257	Orton Longueville (Monument 97)	516500 296500	CAM				x	x				Rural	Davis 2001a
436	258	Orton's Pasture, Rocester	410000 339000	STA					x				Enclosure	Hammon 2000

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
342	259	Outgang Rd, Market Deeping	515870 311540	LIN				x					Open settlement	Albarella 1997a
507	260	Outgang Road, Langtoft	515870 311540	LIN				x					Industrial	Albarella and Mulville 2001a
167	261	Overstone, nr Northampton	480500 264600	NHA					x				Farm	Harman 1976
298	262	Owston Abbey, nr Leicester	477000 308000	LCS							x		Ecclesiastical	Shackley *et al* 1988
416	263	Oxford Rd Watermill, Aylesbury	481390 213680	BCK							x	x	No site information, mill	Baxter 2004
417	264	Oxford Rd, Stone	477800 212300	BCK			x	x					Ritual site, rural	Baxter 2001
481	265	Pann Mill, High Wycombe	487000 192800	BCK							x	x	Mill	Steane 1997
183/184	266	Park St, nr St Albans	514200 203100	HRT					x				Villas	Bate 1971; Jackson 1971
286/287	267	Park St, Towcester	469000 248000	NHA					x		x		Urban	Eastham 1980; Payne 1980
510/511	268	Parson Drove	537500 308500	CAM							x		Industrial	Albarella 2001b; Irving 2001
398	269	Paston Reserve, Peterborough	519500 302500	CAM					x				Enclosure	Hammon and Albarella 2001
107	270	Peacocks Yard, Bedford	504000 249000	BED							x		Urban	Grant 1983b
143/144	271	Pennyland, Milton Keynes	486200 241100	BCK				x		x			Open settlement	Ashdown 1993; Holmes 1993
351	272	Plantation Quarry, Willington, nr Bedford	511000 249000	BED				x					Enclosure	Clark and Hutchins 1996
485	273	Pleasance Car Park, Chipping Ongar	555270 203150	ESX							x	x	Town	Wade 2000b
320	274	Pleshey Castle 59–63, nr Chelmsford	566000 214000	ESX							x		Castle	Allen 1977
47	275	Pleshey Castle 87, nr Chelmsford	566000 214000	ESX							x		Castle	Bedwin 1988a
55	276	Pooles Cavern, Buxton	405000 372600	DER					x				Cave	Bramwell 1984
79	277	Poor's Heath, Risby, nr Bury St Edmunds	579400 268500	SUF			x						Barrow	Cornwall 1976
141	278	Pounce Hill Villa,	434400	WAR					x				Villas	Hodgson 1977

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
		Radford Semele, nr Leamington Spa	262800											
265/266	279	Pride Hill Chambers, Shrewsbury	349000 312000	SLP						x			Urban	Bramwell 1983; Noddle 1983
84/85	280	Puckeridge and Braughing 75–9, Bishop's Stortford/ Stevenage	539100 223100	HRT				x					Oppidum	Ashdown 1979; Croft 1979
98	281	Puckeridge and Braughing 71–2, Bishop's Stortford/ Stevenage	539100 223100	HRT				x	x				Open settlement, town	Fifield 1988
101	282	Puddlehill 51–76, Dunstable	500900 223800	BED		x							Causewayed enclosure	Grigson 1976
97	283	Puddlehill, Dunstable	500900 223800	BED		x							Cluster of pits, ditches or both	Ewbank 1964
477	284	Quarrington, nr Sleaford	505810 344570	LIN						x			Rural	Rackham 2003
318	285	Queen St, King's Lynn	561500 320500	NOR							x		Urban	Wheeler 1982
25/26	286	Racecourse Cemetery, Derby	435500 335500	DER					x				Burial/cemetery	Harman 1986b; Bramwell 1986a
182	287	Racecourse, Derby	436100 337600	DER					x				Roadside settlement	Harman *et al* 1986
248	288	Rainham Moor Hall Farm, Rainham	553000 183000	ESX				x	x				No site information	Locker 1985c
41	289	Rainsborough, Charlton, Brackley/ Banbury	452600 234800	NHA				x					Hillfort	Banks 1967
140	290	Ravenstone 66, nr Newport Pagnell	484800 249000	BCK				x					Enclosure	Millard 1970
214	291	Ravenstone 78, nr Newport Pagnell	484800 249000	BCK			x						Barrow	Jones 1981
255	292	Rawreth, nr Rayleigh	577400 192900	ESX					x				Farm	Luff 1977
458	293	Raymoth Lane, Worksop	458000 381500	NTT				x	x				Enclosure	Kitch 2004
254	294	Rayne Rd, Braintree	576000 223000	ESX					x				Town	Luff 1976
302	295	Rayne, nr Braintree	571270 222350	ESX					x				Rural	Smoothy 1989
169	296	Red Hill, Ratcliffe-	449400	NTT					x				No site	Harman 1982

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
		on-Soar, Derby/ Loughborough	330400										information	
385/386	297	Redcastle Furze, Thetford	587000 283000	NOR						x	x		Urban	Nicholson 1995; Wilson 1995
198	298	Redgate Hill, Hunstanton	567800 339800	NOR		x	x						Open settlement	G G Jones 1993b
354	299	Redlands Farm, Stanwick	496200 270500	NHA					x				Villas	Davis 1997a
267	300	Riggs Hall, Shrewsbury	349000 312500	SLP							x		Urban	Locker 1983
497	301	Rose Hall Farm, Walpole St Andrew	548740 316000	NOR						x			Rural	Baker with Nicholson 2002
253	302	Round Moat, Fowlmere, nr Royston	544400 245800	CAM							x		Moated site	Luff and Stallibrass 1977
103	303	Roxton, Bedford/ St Neots	515700 253500	BED			x						Burial/cemetery	Grant 1985
108	304	Salvation Army, Bedford	504000 249000	BED							x		Urban	Grant 1983c
228	305	Sandwell Priory, West Bromwich	402500 291400	WMD							x	x	Priory, country house	Locock 1991
43	306	Saunderton, nr Princes Risborough	479000 201000	BCK					x				Villas	Bate 1940
204	307	Scole, nr Diss	614500 279000	NOR					x				Villas	Jones 1977a
350	308	Scole-Dickleburgh	615500 279500	NOR					x				Town	Baker 1998
71	309	Sewardstone St, Waltham Abbey	538200 200400	ESX								x	Town house, garden	Chaplin 1970
237	310	Shackerley Mound, Telford/ Wolverhampton	381100 306400	SLP							x		Moated site	Locker 1987a
256	311	Sheepen, Colchester	600000 225000	ESX					x				Industrial	Luff 1985
484	312	Ship Lane, Aveley	556600 179400	ESX					x				Enclosure	Wade 2002
456/457	313	Shrewsbury Abbey, Shrewsbury	349500 312500	SLP							x		Monastic	A K G Jones 2002; G G Jones 2002
309	314	Sidbury, Worcester	385000 255000	H&W					x				Roadside settlement	Scott 1992
22/23/24	315	Skeleton Green, Puckeridge,	538000 223000	HRT				x					Open settlement	Ashdown and Evans 1981; Wheeler 1981; Ashdown 1981

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
		Bishop's Stortford/ Stevenage												
349	316	Slaughter House Ln, Newark-on-Trent	480000 353000	NTT							x		Urban	Beech 1993
422	317	Snape Cemetery, Snape	640200 259300	SUF						x			Burial/cemetery	Davis 2001b
154	318	Somerby, Corringham, nr Gainsborough	484600 389700	LIN							x	x	Deserted medieval village	Harcourt 1969a
157	319	South Witham, Melton Mowbray/ Bourne	493000 319000	LIN							x		No site information	Harcourt 1969d
379	320	Spong Hill VII, North Elmham, Norwich/ Fakenham	599000 321000	NOR						x			Village	Bond 1995
487	321	Springfield, Chelmsford	573900 208900	ESX			x				x		Enclosure, farm	Wade 2000a
464	322	St John's Square, Daventry	457500 262500	NHA						x	x	x	Cluster of pits/ditches, enclosure, no site information	Locker 1997a
115	323	St Johns St (20–4), Bedford	504000 249000	BED						x	x	x	Urban	Duke 1979
114	324	St Johns St (29–39), Bedford	504000 249000	BED							x		Urban	Grant 1979a
66/67	325	St Martin-at-Palace Plain, Norwich	623470 309160	NOR							x		Urban	Cartledge 1988; Locker 1988
475	326	St Mary Magdalen's Hospital, Brook Street, Colchester	599500 225500	ESX							x	x	Leprosy hospital, hospital, almshouse	Pinter-Bellows 2004
280	327	St Mary's Guildhall 82–83, Lincoln	498000 371000	LIN								x	Urban	O'Connor 1991b
312	328	St Mary's Guildhall, Lincoln	498000 371000	LIN								x	Urban	Scott 1986
116	329	St Marys St (17–19), Bedford	505100 249400	BED						x	x		Urban	Grant 1979b
48	330	St Peters School, Coggeshall	585400 222800	ESX					x				Enclosure	Bedwin 1988b
514/515	331	St Peters School, Gaol Street,	351500 240500	H&W							x	x	Urban	Baxter in press; Hamilton-Dyer in press

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
		Hereford												
171/172/173	332	St Peters St, Northampton	475000 261000	NHA						x	x	x	Urban	Bramwell 1979; Harman 1979; Jones 1979
352	333	St Alban’s Abbey	515000 207000	HRT						x			Ecclesiastical	Crabtree 1983
54	334	Staden, nr Buxton	407500 372500	DER					x				Open settlement	Bishop 1990
396	335	Stamford Rd, Oakham	485500 309500	LCS				x					Cluster of pits, ditches or both	Hammon 1998
38	336	Stanstead Abbots, Ware/Harlow	538000 211000	HRT						x			Stray find	Ashdown 1982
443	337	Stansted Airport (ACS), Stansted	554400 222900	ESX				x	x				Open settlement, enclosure	Mainland 2004
445	338	Stansted Airport (BLS), Stansted	554400 222900	ESX				x	x				Enclosure	Hutton 2004a
449	339	Stansted Airport (CHS), Stansted	554400 222900	ESX							x		Moated site	Hutton 2004b
441	340	Stansted Airport (CIS), Stansted	554400 222900	ESX			x	x					Open settlement	Hutton 2004j
446	341	Stansted Airport (DCS), Stansted	554400 222900	ESX				x	x				No site information, burial/cemetery	Hutton 2004c
442/444/447/448	342	Stansted Airport (DFS), Stansted	554400 222900	ESX			x	x	x		x		Enclosure, cemetery, no information	Hutton 2004d, 2004e, 2004i, 2004k
450	343	Stansted Airport (MGS), Stansted	554400 222900	ESX							x		Moated site	Hutton 2004f
451	344	Stansted Airport (RWS), Stansted	554400 222900	ESX							x		Rural	Hutton 2004g
452	345	Stansted Airport (SCS cow burial), Stansted	554400 222900	ESX								x	No site information	Hutton 2004h
440	346	Stansted Airport (SCS), Stansted	554400 222900	ESX			x	x					Open settlement	Hutton 2004l
478	347	Star and Fleece Hotel, Kelvedon	586460 219120	ESX					x				Cluster of pits, ditches or both	Roberts 2001
168	348	Staunton, nr Newark on Trent	480300 344700	NTT					x				Village	Harman 1975
482	349	Stebbingford, Felsted	567450 222500	ESX	x						x		Natural deposit, rural	Wade 1996
250	350	Stifford Clays, Grays	560750 180250	ESX				x					Hillfort	Luff 1988b

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
42	351	Stonea 75, nr March	545100 293100	CAM					x				Open settlement	Barker 1976
378	352	Stonea 80–5, nr March	544900 293700	CAM					x	x			Roadside settlement, no site information	Stallibrass 1996
411	353	Stratford Rd (Hockley Chemical Works), Alcester	408900 257200	WAR					x				Urban	Ayres and Clark 2001
102	354	Stratford's Yard, Chesham (East St)	495900 201500	BCK	x								Industrial	Grigson 1991
78	355	Sutton Walls, Sutton St Nicholas, nr Hereford	352500 246400	H&W				x					Enclosure	Cornwall and Bennet-Clarke 1953
17	356	Tallington, nr Stamford	510500 309100	LIN				x					Enclosure	Harman 1993e
155	357	Tattershall College, nr Horncastle	522000 358000	LIN							x	x	No site information	Harcourt 1969e
437	358	Temple End, High Wycombe	486470 193580	BCK								x	Farm	Higbee 2003
375	359	Tempsford Park, nr Sandy	516000 253000	BED							x		Moated site	Roberts 1996
360	360	The Green, Northampton	475000 261000	NHA						x	x	x	Urban, industrial	Harman 1996d
32	361	The More, Rickmansworth	508200 194000	HRT								x	Manor	Anon 1959
285	362	The Mount, Princes Risborough	481000 203000	BCK							x		Manor/moated site	Pavry and Knocker 1958
310	363	The Park, Lincoln	498000 371000	LIN					x				Urban	Scott 1999a
178	364	The Riding, Northampton	475000 261000	NHA								x	Urban	Harman 1984
128/129/130/134	365	The Shires (Little Lane), Leicester	458000 306000	LCS					x		x	x	Urban	Gidney 1991a, 1991c, 1992b; Nicholson 1992
131/132/133	366	The Shires (St Peters Lane), Leicester	458000 306000	LCS							x	x	Urban	Gidney 1991b, 1992a; Nicholson 1992
191/192	367	Thetford 48–59	587000 283000	NOR						x			Urban	A L G Jones 1984; G G Jones 1984
195/196	368	Thetford 64–70	587000 283000	NOR						x	x		Urban	A K G Jones 1993; G G Jones 1993a
193/194	369	Thetford 73–80	587000 283000	NOR						x			Urban	A L G Jones 1984; G G Jones 1984

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
491	370	Third Drove, Gosberton	517720 328880	LIN					x	x			Rural	Baker with Nicholson 2002
13	371	Thornham, nr Hunstanton	573000 343000	NOR					x				Enclosure	Lawrence 1986a
433	372	Three Locks Golf Course, Stoke Hammond	489100 228700	BCK					x				Cluster of pits, ditches or both	Hamilton-Dyer 2000
68	373	Thuxton, nr East Dereham	604300 308000	NOR							x		Deserted medieval village	Cartledge 1989
480	374	Tilbury Fort	564500 176500	ESX								x	Fort	Sidell and Locker 2000
344	375	Tort Hill East, Stilton, nr Peterborough	517200 284800	CAM					x				Roadside settlement	Albarella 1998
345	376	Tort Hill West, Stilton, nr Peterborough	517200 284800	CAM				x	x				Open settlement, roadside settlement	Albarella 1998
261	377	Totternhoe, nr Dunstable	500000 223000	BED					x				Villas	Matthews *et al* 1992
146	378	Towcester	469000 248000	NHA							x		Urban	Holmes 1992b
127	379	Town Defences, Leicester	458000 306000	LCS					x				Urban	Gouldwell 1987
418	380	Town St (rear 23), Thaxted	561200 230800	ESX							x	x	Industrial	Bedwin 1996
486	381	Town St (rear 34), Thaxted	561230 231035	ESX							x		Industrial	Wade 1998
33/34/35	382	Town Wall, Coventry	433000 279000	WMD							x	x	Urban	Bramwell 1986b; Jones 1986a; Noddle 1986
86	383	Trumpington, Plant Breeding Institute	544500 254500	CAM				x					Enclosure	Davidson and Curtis
151	384	Twywell, nr Kettering	495200 278700	NHA				x					Open settlement	Harcourt 1975
300	385	Tye Field, Lawford, Colchester/Manningtree	608800 230850	ESX		x							Enclosure	Shennan 1985
96	386	Upper Delphs, Haddenham, nr Ely	546000 275000	CAM				x					Enclosure	Evans and Serjeantson 1988
371	387	Upwich, Droitwich	389000 262000	H&W					x	x	x		Industrial	Meddens 1997
322	388	Verulamium, St Albans	515000 207000	HRT					x				Town	Marples and Wilson 1984

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
329	389	Victoria St, Hereford	350700 240000	H&W						x	x	x	Urban	Harcourt 1985
346	390	Vinegar Hill, Stilton, nr Peterborough	518600 277800	CAM					x				Roadside settlement	Albarella 1998
11	391	Wakerley, Stamford/Uppingham	494100 298300	NHA				x	x				No site information, rural	Jones 1978
326	392	Wall Mansio, nr Lichfield	409800 306600	STA					x				Villas	Round 1992
275	393	Walsall Moat, Walsall	400100 298500	STA							x		Moated site	Noddle 1977b
150	394	Waltham Abbey 69–71	538100 200700	ESX						x	x		High status, ecclesiastical	Huggins 1976
149	395	Waltham Abbey 72–3	538100 200700	ESX							x		Manor	Huggins and Huggins 1973
147	396	Waltham Abbey 74–5	538100 200700	ESX							x		Church	Huggins 1988
76	397	Waltham Abbey Bridge	538100 200700	ESX							x		Bridge	Clifford and Atkinson 1971
293	398	Walton Lodge, Aylesbury	482000 213000	BCK			x			x			Open settlement, rural	Sadler 1989
292	399	Walton Rd, Aylesbury	482000 213000	BCK							x		Urban	Sadler 1991
272	400	Walton, Aylesbury	482000 213000	BCK						x	x		Rural, manor	Noddle 1976
391	401	Wardy Hill, Coveney	547800 282000	CAM				x					Enclosure	Davis 2003
283	402	Ware Lock, Ware	536000 214000	HRT					x				No site information	Partridge and Day 1979
406/407	403	Wavendon Gate, Milton Keynes	490000 237000	BCK				x	x				No site information	Dobney and Jaques 1996; Rielly 1996
46	404	Weaverhead Ln, Thaxted	561000 231000	ESX							x		Industrial	Bedwin 1989
506	405	Welland Bank Quarry, Deeping St James	518300 307900	LIN			x						Rural	Albarella *et al* in prep
290	406	Welwyn Garden City, Welwyn Garden City	525000 214000	HRT				x					Burial/cemetery	Powers 1967
135	407	Wendens Ambo, nr Saffron Walden	550700 236000	ESX				x	x				Farm, villas	Halstead 1982

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
337	408	West Cotton, Raunds, nr Wellingborough	499500 272500	NHA						x	x		Rural, manor, village	Albarella and Davis 1994
311	409	West Parade, Lincoln	498000 371000	LIN							x		Urban	Scott 1999b
229	410	West Pond, Castle Bromwich Hall, nr Birmingham	414200 289700	WMD								x	Pond	Locock 1990
372	411	West Row Fen, Mildenhall	565400 276900	SUF			x						Village	Olsen 1994
210	412	West Row, nr Mildenhall	565400 276900	SUF			x						Open settlement	A K G Jones 1983a
81/336	413	West Stow, nr Bury St Edmunds	579700 271300	SUF				x	x	x			Open settlement, industrial, village	Crabtree 1989, 1990
125	414	Whitchurch	354100 341600	SLP					x				Town	Gittleson 1968
64/65	415	Whitefriars St, Norwich	623400 309100	NOR						x	x		Urban	Cartledge 1983; Jones AKG 1983b
454	416	Whittlesea Mere	525000 299600	CAM							x		Midden	Irving 1999
166	417	Whitwell, Oakham/ Stamford	492500 308500	LCS				x	x				Open settlement, farm	Harman 1981
503	418	Wicken Bonhunt	549500 233500	ESX					x	x	x		Cluster of pits/ditches, rural	Crabtree and Stevens, unpublished
259	419	Wigber Low, White Peak, Ashbourne	420500 351300	DER			x						Cairn	Maltby 1983
14	420	Wighton, Fakenham/ Wells-next-the-Sea	594000 339000	NOR				x	x				Enclosure	Lawrence 1986b
461	421	Wilby Way, Great Doddington	488500 264500	NHA				x					Enclosure	Maltby 2003
110	422	Willington, nr Bedford	511300 250200	BED							x		Moated site	Grant 1975b
381	423	Wimpole Hall, Wimpole	533000 251000	CAM					x				Roadside settlement	Wilson 1994
213	424	Witton Parish, nr North Walsham	633000 331000	NOR						x			Open settlement	R T Jones 1983
468/469	425	Woolmonger St, Northampton	475500 261500	NHA						x	x		Urban	Armitage 1999; Locker 1999a
393	426	Worcester Cathedral	385000 255000	H&W								x	Ecclesiastical	Thomas 2000

Database site no	Gaz ref no	Site name	Grid ref	County	Meso	Neo	BA	IA	Rom	Sax	Med	PM	Site type	References
414	427	Worcester Road, Droitwich	385000 255000	H&W					x		x	x	No site information, urban	Baxter 2002a
389/390/439	428	Wroxeter (baths & basilica), nr Shrewsbury (=Viroconium)	356000 309000	SLP					x	x			Urban	Armour-Chelu 1997; Locker 1997b; Hammon 2005
369	429	Wroxeter (baths and macellum), nr Shrewsbury	356000 309000	SLP					x				Urban	Meddens 2000
370	430	Wroxeter (natatio), nr Shrewsbury	356000 309000	SLP					x				Urban	Noddle 2000
153	431	Wythemail, nr Badsaddle	484000 271900	NHA							x		Village	Harcourt 1971b

APPENDIX 2: LIST OF SPECIES INCLUDED IN THE DATASET

Neolithic–Bronze Age and Bronze Age–Iron Age transitions are presented to show more precisely those taxa that may be sparsely represented in the adjacent periods.

For other transitions, no specimens were present that were not also found in both the period before and after. For this reason, other transitional periods are not given here.

Doubtful specimens are represented by '?' only where no certain specimen exists from the period in question. See Notes for details.

Abbreviations: Meso, Mesolithic; Neo, Neolithic; BA, Bronze Age; IA, Iron Age; Rom, Roman; Sax, Saxon; Med, medieval; PM, post-medieval; sp., species.

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA– IA	IA	Rom	Sax	Med	PM	Notes
Accipitridae	Accipitridae						x	x		x	x	
Alcidae	Alcidae									x		
Ammodytidae	Ammodytidae							x				
Apodemus	*Apodemus* sp.		x					x	x	x		
Atlantic wolffish	*Anarhichas lupus*									x		From Castle Mall, formerly listed as 'catfish'
Aurochs	*Bos primigenius*	x	x	x	x							See also cattle
Aythya sp.	*Aythya* sp.								x			
Badger	*Meles meles*	x		x	x		x	x	x	x	x	
Ballan wrasse	*Labrus bergylta*									x		
Bank vole	*Myodes glareolus*		x	x	x		x	x	x	x		
Barbary ape	*Macaca sylvanus*								x			
Barn owl	*Tyto alba*							x		x	x	
Barnacle goose	*Branta leucopsis*						x	x	x	x		
Bar-tailed godwit	*Limosa lapponica*							x		x		
Bass	*Dicentrarchus labrax*								x	x		
Bat	Chiroptera							x	x			
Beaver	*Castor fiber*	x	x		x		x	x	x	x		
Bib	*Trisopterus luscus*									x		

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA– IA	IA	Rom	Sax	Med	PM	Notes
Bitterling	*Rhodeus sericeus*							x				
Bittern	*Botaurus stellaris*							x	x			
Blackcap	*Sylvia atricapilla*	x										
Black goby	*Gobius niger*									x		
Black grouse	*Tetrao tetrix*				x				x		x	
Black rat	*Rattus rattus*							x	x	x	x	
Black sea bream	*Spondyliosoma cantharus*								x			
Black throated diver	*Gavia arctica*							x				
Blackbird	*Turdus merula*							x		x	x	
Black-headed gull	*Larus ridibundus*									x		
Black-tailed godwit	*Limosa limosa*							x		x		
Bream	*Abramis brama*						x	x	x	x		
Brent goose	*Branta bernicla*							x		x		
Brill	*Scophthalmus rhombus*							x				
Brown bear	*Ursus arctos*		x				x	x	x			
Brown hare	*Lepus europaeus*							x		x	x	
Brown rat	*Rattus norvegicus*										x	
Bullhead	*Cottus gobio*							x		x		
Burbot	*Lota lota*							x	x	x		
Buzzard	*Buteo buteo*						x	x	x	x	x	
Canid	Canid			x	x		x	x	x	x	x	
Capercaillie	*Tetrao urogallus*									x		
Carp	*Cyprinus carpio*							x				See main text (ID has been challenged)
Cat (see also wildcat)	*Felis catus*	x	x		x		x	x	x	x	x	*Felis silvestris* specimens may be included
Catfish	Siluriformes							x				Synodontis from Dragonby
Cattle	*Bos taurus*		x	x	x	x	x	x	x	x	x	(see also aurochs)

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA–IA	IA	Rom	Sax	Med	PM	Notes
Cervid	Cervid							x		x		
Cetacean	Cetacean								x			(see also whale)
Chicken	*Gallus gallus*						x	x	x	x	x	
Chicken/guinea fowl	*Gallus/Numida*							x	x			
Chicken/guinea fowl/pheasant	*Gallus/Numida/Phasianus*					x		x	x	?	x	?=broadly dated specimen that may be Saxon or medieval
Chicken/pheasant	*Gallus/Phasianus*							x	x			
Chub	*Leuciscus cephalus*						x	x	x	x	x	
Chub/Dace	*Leuciscus* sp.							x		x		
Clupeid	Clupeid							x	x	x	x	
Cod	*Gadus morhua*							x	x	x	x	
Cod/whiting	*Gadus/Merlangius*								x	x	x	
Columbidae	Columbidae							x	x	x	x	
Common gull	*Larus canus*						x		x	x	x	
Common scoter	*Melanitta nigra*						x	x				
Common shrew	*Sorex araneus*		x		x			x	x	x	x	
Conger	*Conger conger*								x	x	x	
Coot	*Fulica atra*						x	x	x	x	x	
Cormorant	*Phalacrocorax carbo*						x	x		x	x	
Corncrake	*Crex crex*							x	x			
Corvus sp.	*Corvus* sp.							x	x	x	x	
Crane	*Grus grus*						x	x	x	x	x	
Crow	*Corvus corone*						x	x		x	x	
Crow/rook	*Corvus corone/frugilegus*						x	x	x	x	x	
Curlew	*Numenius arquata*						x	x		x	x	
Cyprinid	Cyprinid			x	x		x	x	x	x	x	
Dab	*Limanda limanda*								x			
Dace	*Leuciscus leuciscus*							x	x	x	x	
Daubenton's bat	*Myotis daubentonii*										x	
Deer	Cervid		x				x	x	x	x	x	

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA– IA	IA	Rom	Sax	Med	PM	Notes
Dog	*Canis familiaris*		x	x	x	x	x	x	x	x	x	
Dog/fox	*Canis familiaris/Vulpes vulpes*							x	x			
Dolphin	Delphinidae		x							x	x	
Donkey	*Equus asinus*							x		x	x	
Dove (cf. domestic)	*Columba livia*								x	x		
Duck (domestic)	*Anas platyrhynchos*							x	x	x	x	
Duck (wild)	Anatinae			x		x	x	x	x	x		
Duck sp.	Anatinae						x	x	x	x	x	
Dunlin	*Calidris alpina*							x		x		
Eagle	*Aquila chrysaetos*							x				
Eel	*Anguilla anguilla*						x	x	x	x	x	
Elasmo	Elasmobranchii							x	x	x	x	
Equid	*Equus* sp.				x		x	x	x	x	x	
Falconiformes	Falconiformes								x			
Fallow	*Dama dama*						x	x	x	x	x	
Fallow/red deer	*Dama dama/Cervus elaphus*								x			
Ferret	*Mustela furo*							x		x	x	Cf. *M. putorius* if wild
Field mouse	*Apodemus sylvaticus*			x	x		x	x	x	x	x	
Field vole	*Microtus agrestis*		x	x	x		x	x	x	x	x	
Fieldfare	*Turdus pilaris*									x		
Flatfish	Pleuronectiformes							x	x	x	x	
Flounder	*Platichthys flesus*						x	x	x	x		
Fox	*Vulpes vulpes*		x	x	x		x	x	x	x	x	
Fringillidae	Fringillidae									x	x	
Frog	*Rana temporaria*	x					x	x	x	x	x	
Frog/toad	*Rana/Bufo*		x		x		x	x	x	x	x	
Gadid	Gadid							x	x	x	x	
Gadwall	*Anas strepera*							x		x	x	
Gannet	*Morus bassanus*									x		(formerly *Sula bassana*)

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA–IA	IA	Rom	Sax	Med	PM	Notes
Garfish	*Belone belone*								x	x		
Garganey	*Anas querquedula*								x	x	x	
Garganey/teal	*Anas crecca/querquedula*							x	x	x	x	
Goat	*Capra hircus*		x		x	x	x	x	x	x	x	(see also sheep/goat)
Godwit	*Limosa* sp.							x		x		
Golden grey mullet	*Liza aurata*									x		
Golden plover	*Pluvialis apricaria*							x	x	x	x	
Golden/grey plover	*Pluvialis apricaria/squatarola*							x	x	x		
Goldeneye	*Bucephala clangula*							x				
Goosander	*Mergus merganser*						x		x			
Goose	*Anser/Branta*			x			x	x	x	x	x	
Goose (domestic)	*Anser anser*						x	x	x	x	x	
Goose (wild)	*Anser/Branta*					x	x	x	x	x		
Goshawk	*Accipiter gentilis*						x	x	x	x	x	
Grass snake	*Natrix natrix*									x		
Grayling	*Thymallus thymallus*							x	x	x		
Great tit	*Parus major*	x										
Grey heron	*Ardea cinerea*						x	x	x	x	x	
Grey plover	*Pluvialis squatarola*							x	x	x		
Grey seal	*Halichoerus grypus*								x			
Grey shrike	*Lanius excubitor*							x				
Grouse	*Lagopus mutus*							x		x		
Gudgeon	*Gobio gobio*							x	x		x	
Guillemot	*Uria aalge*										x	
Gull	*Larus* sp.							x		x	x	
Gurnard	Triglidae							x	x	x	x	
Haddock	*Melanogrammus aeglefinus*							x	x	x	x	
Hake	*Merluccius merluccius*								x	x		

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA–IA	IA	Rom	Sax	Med	PM	Notes
Halibut	*Hippoglossus hippoglossus*								x	x	x	
Hare	*Lepus timidus*				x		x	x	x	x	x	
Harrier	*Circus* sp.								x			
Harvest mouse	*Micromys minutus*								x			
Hedgehog	*Erinaceus europaeus*				x			x		x	x	
Hen harrier	*Circus cyaneus*								x	x		
Heron	*Ardea* sp.				x		x		x	x	x	
Herring	*Clupea harengus*						x	x	x	x	x	
Herring gull	*Larus argentatus*							x			x	
Herring gull/lesser black-back	*Larus argentatus/fuscus*								x			
Herring/sprat	*Clupea harengus/Sprattus sprattus*								x	x		
Horse	*Equus caballus*		x	x	x	x	x	x	x	x	x	(see also equid)
Horse mackerel	*Trachurus trachurus*									x		
House mouse	*Mus musculus*		x		x		x	x	x	x	x	
House sparrow	*Passer domesticus*							x				
Jackdaw	*Corvus monedula*						x	x	x	x	x	
Jackdaw/magpie	*Corvus monedula/Pica pica*								x	x	x	
Jay	*Garrulus glandarius*							x	x	x	x	
John Dory	*Zeus faber*								x			
Kestrel	*Falco tinnunculus*							x			x	
Knot	*Calidris canutus*							x		x	x	
Lacerta sp.	*Lacerta* sp.							x				
Lagomorph	Lagomorph							x	x	x	x	
Lapwing	*Vanellus vanellus*						x	x	x	x	x	
Lemon sole	*Microstomus kitt*									x		
Ling	*Molva molva*							x	x	x	x	
Little grebe	*Tachybaptes ruficollis*									x		

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA– IA	IA	Rom	Sax	Med	PM	Notes
Long-eared owl	*Asio otus*				x			x				
Long-tailed duck	*Clangula hyemalis*							x				
Long-tailed tit	*Aegithalos caudatus*	x										
Mackerel	*Scomber sombrus*							x	x	x	x	
Magpie	*Pica pica*							x	x		x	
Mallard	*Anas platyrhynchos*						x	x	x	x	x	
Marsh harrier?	*Circus aeruginosus*									x		?=Possible specimen
Marten sp.	*Martes* sp.								x			
Merganser	*Mergus merganser*						x	x				
Merlin?	*cf. Falco columbarius*									?		?=Possible specimen
Mistle thrush (?)	*Turdus viscivorus*							x	?	x		?=Possible specimen
Mole	*Talpa europaea*		x		x		x	x	x	x	x	
Moorhen	*Gallinula chloropus*								x	x	x	
Mouse	*Mus* sp.							x	x		x	
Mule	*Equus caballus x Equus asinus*							x				
Mullet	*Mugil cephalus*							x				
Otter	*Lutra lutra*	x			x		x	x	x	x	x	
Oystercatcher	*Haematopus ostralegus*								x	x	x	
Pandora	*Pagellus erythrinus*									x		
Parrot	Psittaciformes										x	(Castle Mall)
Partridge	*Perdix perdix/Alectoris rufa*							x	x	x	x	
Passerine	Passerine		x				x	x	x	x	x	
Peafowl	*Pavo cristatus*							x	x	x	x	
Pelican (Dalmatian)	*Pelecanus crispus*						x					
Perch	*Perca fluviatilis*							x	x	x	x	
Percidae	Percidae						?	x	x	x		?=broadly-dated specimen that may be Iron Age or Roman
Peregrine	*Flaco peregrinus*						x	x	x	x		
Pheasant	*Phasianus colchicus*							x	x	x	x	

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA– IA	IA	Rom	Sax	Med	PM	Notes
Pig	*Sus domesticus*		x	x	x	x	x	x	x	x	x	
Pike	*Esox lucius*				x		x	x	x	x	x	
Pilchard	*Sardina pilchardus*								x	x	x	
Pink-footed goose	*Anser brachyrhynchus*								x	x		
Pintail	*Anas acuta*								x	x	x	
Plaice	*Pleuronectes platessa*						x	x	x	x	x	
Plaice/flounder	*Pleuronectes platessa/Platichthys flesus*							x	x	x	x	
Pleuronectid	Pleuronectidae							x	x	x	x	
Pochard	*Aythya ferina*						x	x	x	x	x	
Pochard/tufted duck	*Aythya ferina/fuligula*									x		
Polecat	*Mustela putorius*						x			x		
Polecat/ferret	*Mustela putorius/M. furo*									x		
Pollack	*Pollachius pollachius*								x	x		
Puffin	*Fratercula arctica*										x	
Pygmy shrew	*Sorex minutus*		x					x		x		
Quail	*Coturnix*							x	x			
Rabbit	*Oryctolagus cuniculus*	x		x	x		x	x	x	x	x	
Rajidae	Rajidae									x	x	
Rat	*Rattus* sp.						x	x	x	x	x	(single Iron Age specimen from Ivy Chimneys)
Rat/water vole	*Rattus* sp./*Arvicola terrestris*										x	
Raven	*Corvus corax*				x		x	x	x	x	x	
Ray	Batoidea							x	x	x		
Red-breasted merganser	*Mergus serrator*							x				
Red deer	*Cervus elaphus*	x	x	x	x	x	x	x	x	x	x	
Red grouse	*Lagopus lagopus scoticus*								x			

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA–IA	IA	Rom	Sax	Med	PM	Notes
Red kite	*Milvus milvus*						x	x	x	x	x	
Red mullet	*Mullus surmuletus/barbatus*								x			
Redpoll	*Carduelis flammea*	x										
Red squirrel	*Sciurus vulgaris*			x			x			x	x	
Redshank	*Tringa totanus*							x				
Redshank/green shank	*Tringa totanus/nebularia*								x	x		
Redstart	*Phoenicurus phoenicurus*	x										
Red-throated diver	*Gavia stellata*								x			
Redwing	*Turdus iliacus*							x	x	x	x	
Roach	*Rutilus rutilus*						x	x	x	x	x	
Rock dove	*Columba livia*							x	x	x	x	
Roe	*Capreolus capreolus*	x	x	x	x	x	x	x	x	x	x	
Rook	*Corvus frugilegus*						x	x		x	x	
Rook/crow	*Corvus frugilegus/corone*						x	x	x			
Rudd	*Scardinius erythrophthalmus*								x			
Ruffe	*Gymnocephalus cernuus*							x	x	x		
Saithe	*Pollachius virens*								x	x		
Salmon	*Salmo salar*						x	x		x	x	
Salmonid	Salmonidae							x	x	x	x	
Sanderling	*Calidris alba*									x		
Sandsmelt	*Atherina presbyter*								x			
Scad	*Trachurus trachurus*								x	x		
Scombrid	Scombridae									x		
Scoter	*Melanitta* sp.									x		
Sea bream	*Spondyliosoma cantharus/Pagellus bogaraveo*								x	x		

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA– IA	IA	Rom	Sax	Med	PM	Notes
Seal	Phocidae				x							
Shad	*Alosa* sp.									x		
Shag	*Phalacrocorax aristotelis*							x				
Shark	Selachimorpha				x						x	
Sheep	*Ovis aries*			x	x		x	x	x	x	x	Neo/BA specimens at Oakham + Fengate 2. Note Neolithic presence of sheep/goat
Sheep/goat	*Ovis/Capra*		x	x	x	x	x	x	x	x	x	
Shelduck	*Tadorna tadorna*							x	x			
Short-tailed vole	*Microtus agrestis*						x				x	
Shoveler	*Anas clypeata*								x			
Shrew sp.	*Sorex* sp.		x					x	x	x		
Silver bream	*Abramis bjoerkna*								x			
Skylark	*Alauda arvensis*				x							
Smelt	*Osmerus eperlangus*							x	x	x	x	
Smew (?)	*Mergellus albellus*								?	x	x	Possible Saxon specimen
Snake	Ophidia				x							
Snipe	*Gallinago gallinago*							x	x		x	
Sole	*Solea solea*								x	x	x	
Songthrush	*Turdus philomelos*							x	x	x	x	
Spanish mackerel	*Scomberomorus maculatus*						x	x				
Sparrow	*Passer domesticus*							x				
Sparrowhawk	*Accipiter nisus*							x		x	x	
Spoonbill	*Platalea leucorodia*									x		
Sprat	*Sprattus sprattus*								x	x	x	
Sprat/Herring	*Sprattus sprattus/Clupea harengus*									x		
Spurdog	*Squalus acanthias*									x	x	
Starling	*Sturnus vulgaris*							x		x	x	

Taxa	Latin name	Meso	Neo	Neo–BA	BA	BA–IA	IA	Rom	Sax	Med	PM	Notes
Stickleback (3 spined)	*Gasterosteus aculeatus aculeatus*				x			x	x	x	x	
Stoat	*Mustela erminea*							x	x		x	
Stoat/weasel	*Mustela erminea/nivalis*				x				x			
Stock dove	*Columba oenas*							x	x	x		
Stone loach	*Barbatula barbatula*							x				
Stork	*Ciconia* sp.						x			x		
Strigidae	Strigidae								x			
Sturgeon	*Acipenser sturio*									x	x	
Swallow	*Hirundo rustica*							x				
Swan	*Cygnus* sp.						x	x	x	x	x	
Swan (mute)	*Cygnus olor*						x	x	x	x	x	
Swan (whooper)	*Cygnus cygnus*								x	x		
Tawny owl	*Strix aluco*									x		
Teal	*Anas crecca*						x	x	x	x	x	
Tench	*Tinca tinca*							x	x	x	x	
Thick-lipped grey mullet	*Chelon labrosus*							x				
Thin-lipped grey mullet	*Liza ramada*							x	x	x		
Thornback ray/roker	*Raja clavata*								x	x	x	
Toad	*Bufo bufo*				x		x	x	x	x	x	
Triglidae	Triglidae								x	x		
Trout	*Salmo trutta*							x		x		
Tub gurnard	*Trigla lucerna*									x		
Tufted duck	*Aythya fuligula*							x		x	x	
Tufted duck/goldeneye	*Aythya fuligula/Bucephala clangula*						x	x				
Turbot	*Scophthalmus maximus*									x	x	
Turdus sp.	*Turdus* sp.				x		x	x	x	x	x	

Taxa	Latin name	Meso	Neo	Neo –BA	BA	BA–IA	IA	Rom	Sax	Med	PM	Notes
Turdus/sturnus	*Turdus/Sturnus*							x	x	x		
Turkey	*Meleagris gallopavo*									x	x	
Vole sp.	*Microtus* sp.		x		x		x	x	x	x	x	
Vole/mouse	*Microtus/Mus*						x	x		x	x	
Wader	Charadriiformes							x			x	
Water rail	*Rallus aquaticus*								x			
Water shrew	*Neomys fodiens*						x	x		x		
Water vole	*Arvicola terrestris*				x		x	x	x	x	x	
Weasel	*Mustela nivalis*							x	x	x		
Whale	large Cetacean							x	x	x		
Whimbrel	*Numenius phaeopus*							x		x		
White Stork	*Ciconia ciconia*						x					
White-fronted goose	*Anser albifrons*								x			
White-tailed sea eagle	*Haliaeetus albicilla*						x	x				
Whiting	*Merlangius merlangus*								x	x	x	
Wigeon	*Anas penelope*							x	x	x	x	
Wild boar (see also pig)	*Sus scrofa*	x	x	x			x	x	x	x		
Wildcat? (see also cat)	*Felis silvestris*								?			Possible Saxon specimen
Wolf	*Canis lupus*			x	x					x		
Woodcock	*Scolopax rusticola*				x		x	x	x	x	x	
Woodpigeon	*Columba palumbus*						x	x	x	x	x	
Yellow-necked mouse	*Apodemus flavicollis*		x				x	x	x	x		

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