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ENVIRONMENT AND ECONOMY IN ANGLO-SAXON ENGLAND

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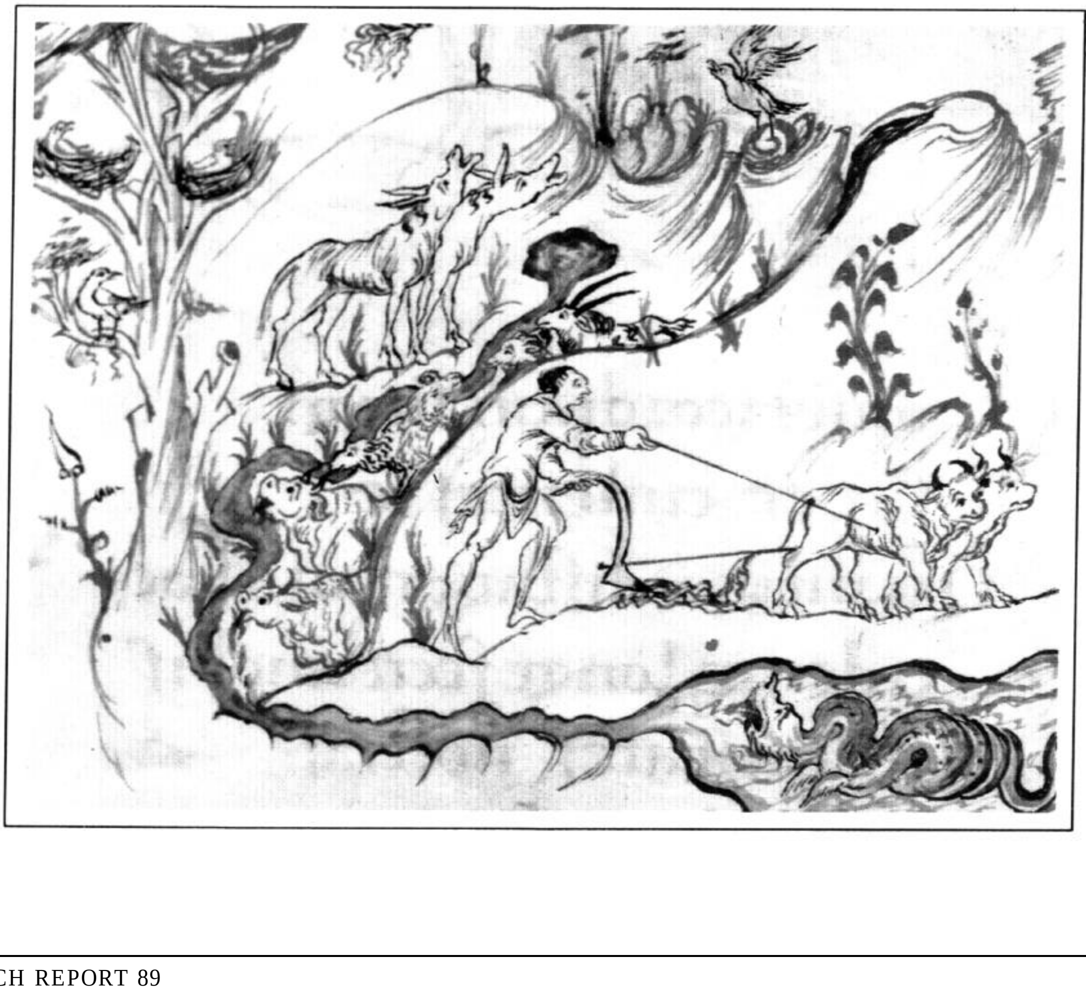

Environment and economy in Anglo-Saxon England

A review of recent work on the environmental archaeology of rural and urban Anglo-Saxon settlements in England

Proceedings of a conference held at the Museum of London, 9-10 April, 1990

editedby James Rackham

with contributions from
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Preface

The 1980s saw a number of major field events in Anglo-Saxon archaeology and the publication of accounts of work of national importance. These included the discovery of the middle Saxon settlement in London (Biddle 1984; Vince 1984) on the Strand, and in York at Fishergate (O'Connor, this volume). These were particularly significant in that they contradicted current views (Hodges 1982) on the status of documented major Saxon centres and supported the authority of the early sources such as Bede. Major rural settlements were excavated at West Heslerton, found at Flixborough, and published from West Stow.

Perhaps one of the most important aspects of these excavations for environmental archaeology was that they took place during a period of increasing awareness of the archaeological potential of environmental studies, yet at a time when they had moved sufficiently far to have established a reasonable level of field practice. The results are that these and more recent projects such as Flixborough have generated environmental data of considerable research potential. The decade has also seen a major change in the thrust of Anglo-Saxon archaeology from settlement patterns and religious houses (Wilson 1976), to social and economic studies, politics and international trade networks.

With the volume of environmental work on this particular period reaching such a level that it was beginning to make a significant contribution to our archaeological understanding, it seemed appropriate to gather together some of these contributions and more recent as yet unpublished work into a review of our knowledge. The papers that follow are clearly not comprehensive but most authors have responded positively to a request to consider their work within the framework of the period. To put even more emphasis upon this collection of papers as an archaeological contribution to the subject rather than a collection of esoteric biological accounts I asked two leading archaeologists of the period to introduce the two parts, rural and urban, into which the volume is broadly divided.

Préface

Les années 1980 virent nombre d'importants travaux sur le terrain dans le domaine de l'archéologie anglo-saxonne ainsi que la publication d'importants compte-rendus sur des travaux d'importance nationale. Ceci comprenait la découverte d'un peuplement du milieu de la période saxonne au Strand, Londres, (Biddle 1984; Vince 1984) ainsi qu'à Fishergate, York, (O'Connor, ce volume). Ils étaient particulièrement importants en ce qu'ils contredisaient les opinions courantes (Hodges 1982) sur la position des principaux centres saxons document& et appuyaient I'autorité des premieres sources comme Bede. On effectua la fouille d'un important peuplement rural à West Heslerton, on en découvrit un autre à Flixborough et on publia les découvertes d'un autre grand peuplement à West Stow.

Un des plus importants aspects de ces fouilles en ce qui concerne l'archéologie de l'environnement est peut-être qu'elles eurent lieu à un moment où on devenait de plus en plus sensibilisé au potentiel archéologique des etudes de l'environnement mais où, en même temps, ces études avaient suffisamment progressé et où on avait done établi un niveau raisonnable d'expérience sur le terrain. Le résultat, c'est que ces découvertes et les projets plus récents comme celui de Flixborough ont généré des données sur l'environnement offrant un considerable potentiel de recherche. La décennie a également vu un grand changement de direction de l'archéologie anglo-saxonne, des structures de peuplement et des maisons religieuses (Wilson 1976) aux études socio-économiques, à la politique et aux réseaux de commerce international.

Le volume du travail sur l'environnement sur cette période particulière a atteint un tel niveau qu'il commençait à contribuer de façon significative à nos perceptions archèologiques; il nous paraissait donc opportun de rassembler certaines de ces contributions ainsi que des travaux plus récents, mais pas encore publiés, pour faire un bilan de nos connaissances. Il est évident que les articles qui suivent n'embrassent pas tout, mais la plupart des auteurs ont répondu de manière positive lorsque nous leur avons demandé d'examiner leur travail dans le contexte de la période. J'ai vraiment voulu souligner que ce recueil d'articles constitue une contribution archéologique à ce sujet, plutôt qu'un ensemble de rapports biologiques ésotériques; ce volume étant, génerale-ment parlant, divisé en une partie rurale et une partie urbaine, j'ai donc demandé à deux archéologues de tout premier plan de rédiger les introductions de ces deux parties.

Vorrede

In den Jahren von 1980-1990 wurden eine Anzahl von bedeutenden Aktivitäten im Bereich der anglosachsischen Archeologie unternommen und wichtige Studien von nationaler Bedeutung veröffentlicht. Diese beinhalteten die Entdeckung der mittelsachsischen Niederlassung in London (Biddle 1984, Vince 1984) am Strand und in York am Fishergate (O'Connor, dieses Band). Diese Siedlungen sind von besonderer Bedeutung, da sie den Stand gegenwärtiger Meinungen (Hodges 1982) mit Hilfe von dokumentierten, bedeutenden sächsischen Zentren widerlegten und die Vorlagen von früheren Quellen, solche wie die von Biede bekräftigten.Bedeutende ländliche Niederlassungen wurden in WestHeslerten ausgegraben, in Flixborough gefunden und deren Studien von West Stow veröffentlicht.

Vielleicht war es eines der bedeutendsten Aspekte von diesen Ausgrabungen im Bereiche der Sozial - und Kulturarcheologie, daß in dieser Zeitperiode des wachsenden Bewußtseins das Potential der Umweltforschung erkannt wurde, und doch erst dann als diese Studien genügend weit fortgeschritten waren und ein hinreichendes Niveau an Verfahrungsweisen vorhanden war. So kam es, daß bei diesen und noch neueren Projekten, wie Flixborough, Umweltdaten von erheblichen Forschungspotential entstanden, In diesem Jahrzehnt rückte der Schwerpunkt von der anglosachsischen Archeologie der Niederlassungsschablonen und geistlichen Häusern (Wilson 1976) auf soziale und wirtschaftliche Forschungen, Politik und internationale Handelsnetze.

Das Volumen dieser Umweltstudien aus dieser Zeit war so umfassend, daß es anfing, einen wichtigen Beitrag zu unserem Verständnmis der Archeologie zu machen und es deshalb angebracht ist, einige dieser Beiträge und neuere, bis jetzt noch nicht erschienene Studien zu sammeln und sie in eine Übersicht unseres Fachwissens zu reihen. Obwohl die Mehrheit der Autoren auf die Aufforderung, ihre Studien in diesem Rahmen der Zeitperiode zu betrachten, positiv reagiert haben, sind die folgenden Schriftstücke bei weitem nicht vollständig. Diese Sammlung von Dokumenten soll als ein archeologischer Beitrag in diesem Fachgebiet hervorgehoben werden und nicht als eine Sammlung von esoterishen biologischen Berichten betrachtet werden. Deshalb bat ich zwei führende Archeologen dieser Zeitperiode fur beide Teile, den ländlichen und den städtischen, in welche dieses Werk geteilt wurde, eine Einleitung zu schreiben.

1 Environment and commodity in Anglo-Saxon England

Martin O H Carver

Abstract

In modern studies of Anglo-Saxon society the emphasis is on economy and social structure, and the role that economic, ideological and environmental imperatives played in the changes that occurred. The political mood as expressed in the taxation system is here seen as the most important agent of change, and the analysis of anthropogenic biological assemblages (particularly for domestic plants and animals) the most important method of detecting the signals of change: surplus and commodity. Emphasis is also given to taphonomic studies and the maritime environment.

Introduction

The traditional beginning of Anglo-Saxon England is the *Adventus Saxonurn*, the somewhat ill-defined arrival of insecurely identified Germanic peoples, in unknown numbers, via uncertain maritime routes, at much debated destinations. The island of Britain was a Roman province and these Germanic immigrants therefore encountered within it the **Romano-British,** whom they proceeded to dispossess, enslave, marry or kill, presumably in that order. From then on the British, if they were alive at all, were 'living in brackets' (as *1066 and all that* has it), except in the South West, the North and wild Wales, where they reverted to Iron Age behaviour patterns and became tribal, Christian and Celtic. Meanwhile, the new immigrants donned their green wellies and became pioneering farmers, clearing woodland, turning the heavy clay soil with their new ploughs and refreshing those parts of marshy, muddy, bushy Britain which the British had not reached. By AD 600 they had organised themselves into a number of Kingdoms with Kings who adopted Christianity and fought each other (when they were not exterminating the British), taking it in turns to claim sovereignty over the whole island; the top Kingdoms being Kent in the 6th century, East Anglia and Northumbria in the 7th century, Mercia in the 8th, and Wessex in the 9th. Only the last of these, Wessex, led by Alfred and his descendants, actually succeeded in uniting the territory of Central and Eastern Britain into a politically coherent Kingdom, which they did thanks to a war with Norwegian and then Danish Vikings who had to be defeated, married, killed or converted to Christianity The new English Kingdom was based on a number of fortified towns or *burhs,* where trade was concentrated and regulated, and by the 11th century, the country was divided into shires. Both the *burhs* and the shires provide the basic framework of the England we still have, and continuity with the present is only marred by the Norman Conquest and the redrawing of the county boundaries in 1979.

This is the skeleton of the traditional Anglo-Saxon story taught in schools, or at least in the schools that I went to, most of which were in the colonies of the British Empire. The new National Curriculum will no doubt impose its own version and it will be interesting to see how much impact the new archaeological work of the last two decades has managed to have upon it. The new story is of course determined by the evidence and, to some extent, by how much that evidence appeals. The first point to make about Anglo-Saxon Britain, or early medieval Britain as I would rather call it, is how unevenly distributed that evidence is.

The **written sources** are concentrated on Wales in the 6th century, Northumbria in the 7th century, and in Wessex in the 9th century and later. They are all the product of the Church; that is written by orthodox church politicians at Monasteries or Minsters. The same is true of the **illustrations** pertaining to Anglo-Saxon life, which mainly originated in the 10th and 11th centuries in the South East, but contain in any case large amounts of anachronistic material derived from Frankish, Byzantine and Roman exemplars (Carver 1986; cf Fowler 1981). Looking back from the 20th century, written and illustrative sources lose their perspective and become matted together in a kind of generalised Anglo-Saxon cultural episode. But the period of course lasted several hundred years, that is the same length of time which separates us from the Black Death or the Cistercians. So whereas the English of Edward the Confessor's day could appreciate a Roman building, just as we appreciate a Gothic Cathedral, they could not really imagine themselves to be similar economically, socially or culturally to the people of Alfred or of Ine or Hengest and Horsa, except by historical contrivance and propaganda.

The cultural diversity of the period is even more obvious from its archaeology, which is, however, just as unevenly distributed as the other sources. For the first period (early Saxon, 5th to the 7th century) we have very few settlements or ritual centres anywhere, and in the South East, the evidence is dominated by cemeteries. For the second period (middle Saxon, 7th to 9th centuries) we have a scatter of settlements all of high status, churches, and cemeteries but very few artefacts and hardly any pottery. For the third period (late Saxon, 9th to 11th centuries) we have plenty of pottery and a great variety of other artefacts, but they are mainly concentrated in settlements of a particular kind, the new towns. It is hard to know how much of this odd pattern is the result of Anglo-Saxon behaviour and how much is due to the subsequent decay trajectory of things above and below ground. Early Saxons may in practice have had no congregational religion, but buried their possessions systematically at death and lived mainly out of doors; perhaps middle Saxons did mainly live in nucleated proto-manorial settlements and ports, and late Saxons predominantly in towns. On the other hand, settlements may simply be hard to find because of the materials they are built in and the terrain on which they were constructed. Because of differential decay we know in advance that at Chalton we shall find bones but no leather and at Sutton Hoo we shall find iron but no bones. There is therefore no point in embarking on a major research project on Saxon shoes on the chalk of the Sussex Downs, or animal husbandry in the acid sand of the Suffolk Sandlings.

There is one type of evidence that ought to be free of distortion in its chronological distribution, namely the environmental. They may not have had much pottery in the middle Saxon period but trees still produced pollen. However, environmental evidence within a particular period does not of course escape the tyranny of cultural and taphonomic factors. Pollen reservoirs which offer the vegetation sequence are not evenly distributed over the island, and the bulk of the evidence for animal, vegetable and mineral exploitation relies on anthropogenic assemblages, – assemblages from settlements and cemeteries which have been selectively gathered by man and immediately subject to the decay processes dictated by the particular terrain and its chemistry.

All this is to say that the first item on the archaeological agenda for early Medieval Britain is source-criticism, long practised in the study of documents and pictures. Couched in often pretentious and prolix terminology, source-criticism is actually what most of the modem theoretical debate is about: some claiming that the archaeologic1 pattern is caused by economics or environmental factors, others that the pattern is partly due to site formation processes, and others that the pattern is partly due to cultural choice including choice of symbol, ritual and belief. Lumping all these together does no great damage to their sense, in my view, since many archaeologists adopt a kind of unspoken source-criticism in their methodology in any case. Where I think it will be worth elevating the subject into a study of its own is in the field of taphonomy, both on the national and local scale. I would very much like to see studies of surviving material compared with terrain in a national and indeed a European search area. This will require excavators in future to record routinely the natural terrain, especially parameters such as pH. I would suggest that the natural should also be sampled and recorded as part of landscape surveys. I also think taphonomy is highly relevant, for all the same reasons, to cultural resource management projects such as the scheduled monument enhancement programme. This type of source-criticism is also advanced by work such as Bethell, Boddington and others have done on micro-taphonomy. In this case the detection of materials which have gone beyond visibility on the decay trajectory, by recording their chemical signature (Bethell and Smith 1989; Carver 1988).

Now let us turn back to the big picture and look again at early medieval Britain with modern eyes. Let us draw a sharp contrast with the rather frivolous portrayal I gave at the beginning, and construct a new model and a new agenda for archaeology and for environmental archaeology in particular. I have assumed that our objective will be to find out about people, how people lived, what they did, how they were organised socially and what they believed and why. All these things are in reach of archaeology, although our current interpretive skills are often rather primitive. These objectives will not be shared by everyone and nor will the interpretations I give, but I think the new story is just as interesting as the old one and can offer just as reasonable a new page one for British History in the National Curriculum.

For the sake of this study, the early middle ages is taken as the first millennium and the area of our interest in this case is Britain south of the Clyde, in other words the part made into a Roman Province in the 1st century AD. Roman ideology and life style were imposed in the 1st century, and modified in the 2nd, 3rd and 4th centuries. Romanism continued to re-appear and was adopted, adapted, confronted or rejected, in writing, art, technology, building, town-planning, economics, government, religion and social organisation throughout the millennium. It therefore makes sense to consider the whole period as one; or rather it is very difficult to make sense of any aspect of Anglo-Saxon archaeology without taking into account the Roman idea, whose influence must have been obvious – at least to them. Whether in its imperial or Christian form, ‘romanism’ was I believe a political position and was confronted, often bitterly, with the ethos of Germanic peoples outside the Romanised area. I do not mean the two attitudes were endemically Roman or German in an ethnic sense, but that the political battle-lines were permanently drawn between those who embraced ideals of pan-Europeanism, organised religion, towns, tax and the state, such as Trajan, Constantine, Wilfrid, Edward the Elder and Dunstan; and those who believed in folk, family, rural autonomy and self-help – or helping oneself, such as the Saxons and the Vikings. Some might say that not a lot has changed. The political emphasis lurched backwards and forwards in different parts of Europe throughout the millennium, by no means always in sync; but its importance for us is that it was a region's current ethos which to a large extent determined its material culture, and, within material culture, those anthropogenic assemblages of floral and fauna1 fossils with which environmental archaeologists are mainly concerned.

Thus a small dispersed settlement with a mixed non-exotic plant and animal-bone assemblage should mean an autonomous smallholder, subsisting on local resources and not receiving, and probably not paying, tax or tribute. While a nucleated settlement, especially if planned, with a granary and/or a specialised animal-bone assemblage with uniform kill rates should mean an organised work-force accumulating surplus for the purpose of tax or tribute payable to a lord. A settlement rich in manufacturing evidence and exotic goods should mean that wealth creation is here being achieved by the promotion, or at least the concentration and regulation, of trade, presumably so that it can be taxed. Such organising trends towards more centralised decision-making can also be seen in the cemeteries, where the change is from folk cemeteries such as Spong Hill, where wealth is distributed by social class, to those where little is buried in the majority of graves, and the ritual investment is concentrated, on behalf of the new polity, in a demonstrative barrow cemetery such as Sutton Hoo, or a minster such as Barton-on-Humber. I have suggested that the cessation of the grave-good habit can be equated not with religious change, but with the onset of tax (Carver 1989).

If these generalisations seem a bit trivial, it is not because our objectives or these factors are trivial, it is rather because we do not yet know how to read these complicated matters clearly in the archaeological record. But with these models in mind we can try to re-tell the story of early medieval Britain using the few examples we have.

The imperial system was imposed on the province by constructing a series of forts connected by roads. Tribute and trade were centred at first in these forts and their *vici*, and then in the towns. Rural settlement production and overseas imports were therefore delivered to these authorised points. In the 3rd and 4th centuries there was some relaxation of the state system, and the Province appears to have fragmented. On the smaller scale the character of towns and their refuse changes, while villas become centres of power, and arguably taxation points. This process desperately needs more archaeological research, but the agenda has been clearly set by historians such as Chris Wickham; for him the farmers of the late Roman empire are changing their allegiance from state-protected tax payers to landlord-dependant rent payers. The landlord protects the tenant from tax and initially everyone wins except the state which is losing its grip. This should be reflected in changing animal bone and plant assemblages in the late Roman towns and villas in England too.

As Thompson (1982) has suggested, the so-called migrations of Germanic and Slavic people in the 4th and 5th centuries were not necessarily invasions but largely the result of *hospitalitas,* the decision by the Roman administration itself to impose an alien tribal group on a Roman province or part of it. Visigoths, Burgundians and Vandals were given a share in the large villa-based estates in exchange for their protection of the landlord system against invasion, or, as he suggests, against the rebellious peasantry by now reduced to feudal conditions by excessive rents.

It is a lot less certain that the same process was responsible for transporting Angles, Saxons and Jutes into the British Province. The first area to be settled, as Böhme (1986) has recently shown, was actually East Anglia. Here we find small dispersed settlements, such as West Stow and Mucking have now been shown to be, together with large folk cemeteries related to family groups, such as Spong Hill. The population was refreshed in the 6th century by new migrations of Scandinavians, and it could be argued that Scandinavian incursion, with its ideological commitment to deregulated enterprise, continued on and off along the east coast until the 9th century attempts at Scandinavian domination which culminated in the Norman Conquest (Carver 1989, and references there cited).

The East Angles apparently did not have kings, nor therefore, taxation, until the 7th century, a crucial period of political transition. After that date the first ports of trade, such as Ipswich, appear, and also proto-manorial settlements such as Wicken Bonhunt or Brandon. East Anglia in the earlier middle Saxon period is very well favoured archaeologically, having an almost continuous pottery production. This is one area where the whole settlement pattern can actually be found and mapped as John Newman has done for the Sandlings (Carver 1988). Field walking has here evolved into such a sophisticated art that not only settlement location and size can be known in advance, but also the amount of land under the plough, as has been demonstrated brilliantly for Witton (Wade 1983). This example certainly does not indicate a people under stress. The amount of arable was doubling every few hundred years but, on the other hand, it does not have to mean that the population was also doubling. It may be that as the embryonic kingdom-state took hold in the 7th century, food renders were required in wheat rather than cattle, perhaps because it could be more easily traded and converted into wealth at the ports. The environmental assemblages, here as elsewhere, are the key to the economic system and its social changes.

The same observations can be made for the early period in the British north and west, where changes in our perception are scarcely less dramatic, thanks to the work of Alcock, Thomas, Gilchrist, Driscoll, Nieke, Foster and others (eg Gichrist 1988). Tintagel for example first came into prominence as the site of an enormous deposit of Mediterranean amphora and African red-slip ware of the 5th to 6th century, associated with a 'pueblo' of beehive huts. For its excavator in the thirties, Raleigh Radford, it was a monastery in contact with the Christian mediterranean. But now, after comparison with Dunadd and Dinas Powys where the animal bones show properties of specialisation and local exchange, it is seen rather as a princely stronghold, receiving tribute from its hinterland, and exotic commodities including wine and olive oil direct from the imperial capital at Byzantium; for all the world like a Roman Client Kingdom, its *romanitas* periodically refreshed by red plates (Fulford 1989). The new project directed by Chris Morris will need expert evaluation and study of the biological assemblages as its highest priority.

Britain in the 5th to 9th centuries is therefore a frontier zone where a Romanised Irish Sea zone confronts a Germanised North Sea zone. The affiliation between peoples and incipient nations and the economics they adopted are determined, then as now, not by physical proximity but by political proximity. To this end, there is a vital study, environmental in the true sense of the word, which badly needs the input of biological scientists, namely the environment of the seas. Here wind, current, food resources, coastline characteristics and the use of maritime space in general have not received the same attention as the environment on land, and yet there is little doubt that all these early medieval people were boat people, relying on the sea and rivers for many if not most of their social interactions.

This is certainly a conclusion one can come to for the later period too, when the new urban network was imposed during the great changes of the 9th-10th centuries in the form of the *burhs*. As with the Romans before them, the architects of the English state first imposed a network of forts, connected occasionally by road, but sited predominantly on rivers; and then confined transactions to them, building or allowing to develop, a town on the same spot. Even where not obviously planned, the *burhs* were certainly the result of administrative organisation, and by the 10th century many can be seen to be organised in allocated tenements of standard size, as at Durham and York, property boundaries which have endured until the present. If any of our other correlates work, then the *burhs* were, in their turn, points for the delivery of taxation and tribute from the hinterlands, surplus which could then be turned into manufactured items which in turn could be turned into more surplus, under a firm administrative hand. In no way can I see the developments of the 9th century, anymore than those of the 7th, as the release of a 'free market economy'. Why else would Anglo-Saxon pennies carry their *burh* of origin as a mint mark, if not to measure taxation rendered to the king?

Two examples will try to show how pivotal to this history are the biological assemblages. In the Midlands, Stafford is one of a number of new *burhs* founded in the early 10th century by Aethelflaed, Lady of the Mercians and her brother Edward the Elder. The excavations at Clark Street and Eastgate Street show that it was a producer of standardised pottery forms, and a processor of regulated animal products on a large scale. Excavations in the town centre by St Mary's Church gave a sequence of grain-related activities (Cane and Carver, forthcoming; Moffat this volume). The sequence has post-Roman four-posters, late Saxon ovens processing grain, Norman dumping of burnt grain, 13th century corn-drying and the area was finally the site of a post-medieval tithe barn. This cannot just be coincidence. Whoever was benefitting, it would appear that the grain surplus was traditionally gathered here from a time before the *burh* was imposed until long after it had been forgotten.

At York, there are now animal-bone groups from 5th to 6th century, 8th to 9th century, and 10th to 11th century contexts, and York is in an excellent position to explore animal husbandry in a general sense, at a particular place, throughout the period. But once again it has been shown, by Terence O'Connor (1989) and James Rackham, that the biological evidence is not merely a commentary on the economy, it is virtually the only way (in some cases) that the economy can be characterised. James Rackham's work on the York Minster excavations are shortly to be published (Phillips and Heywood forthcoming) and may be anticipated here. Under the collapsed roof of the *basilica* of the Roman *principia* (headquarters building) was a deposit of multiple layers of trodden sand overlying the last Roman floor. There was much debate about whether this represented post-Roman use of the *basilica*, and if so for how long. The excavator, Derek Phillips, and his collaborator Brenda Heywood were convinced that the *basilica* had stood until the 8th to 9th centuries, since there were three sherds of Yorkware in associated contexts. The multiple layers contained a very large assemblage of animal bones dominated by pigs, many of them young. This 'small pig horizon' is not at all like assemblages produced by the early or late Roman town, or by the nearby middle Saxon port at Fishergate, or by the Anglo-Scandinavian new town. The 'small pig horizon' suggests centralised processing for specialised consumption on a reasonably large scale, as do the contemporary coal-using metal-worker's furnaces which were found in adjacent rooms of the same building. The pointers are that these activities do not fit in easily to the Roman, middle or late Saxon economic contexts we have elsewhere for York, and therefore we are maybe seeing, for the first time, the economy of the sub-Roman period. What that economy was, however, is a matter still to be explored. Here the important item on the agenda is to distinguish environmentally-favoured fauna from cultural preference, and both from the demands of taxation and a common economy (cf Davis 1987; Crabtree 1989). In other words to distinguish, among the environmental assests of a region, those which were selected as commodities, whether wheat, rye, beef or hides. This applies to every phase and every region of what must be expected to be a varied and fluctuating political economy in early medieval Britain.

To sum up: I believe we urgently need research projects on the taphonomy of the evidence, and on the biological correlates of the economy This last is particularly difficult, and it may be that analogies will be very helpful, here as elsewhere in archaeology; analogies with modern or historic peoples in Africa, Asia and South America, not to mention the British Colonials with their tea-drinking and boned pork. From these it should be possible to model early medieval plant and animal assemblages to see where, when and how subsistence moves to surplus and surplus moves to commodity and so identify the cash crop (cf the suggested trajectory in Hodges 1988). It is clear that animal and plant resources and landscaped features such as field boundaries should be studied together, and we should assume that the assemblage recorded from settlements represents primarily a sample of the economy rather than the environment - ie the results of human choice, operating within a political system. Terry O'Connor (1983) may be right that sheep dominate 11th century Lincoln while cattle dominate 11th century York because of differences in the hinterlands of these two cities. But the dominance of any species at all is the result of human interference and the motivation is, as likely as not, to be economic - 'what crop can most easily be turned into cash at a particular moment?' This obviously relates to the possibilities offered by the local environment, but in the end money talks louder than humus.

Common sense suggests that lords would seek to develop an easily transportable, conservable, cashable surplus. Among plants, this might be wheat, bread or beer, and this has implications for the size, standardisation and character of pottery too: but we should also have a hard look at flax and hemp, especially in the late Saxon period. The animal triad of cattle, pig and sheep can all be commoditised: as dried beef, leather, salt pork or wool. Whatever the chosen commodity, a feudal owner can consume it on the premises, distribute it to followers, issue it to an army or trade it with other lords. All these things ought to be reflected in the assemblage and tell us whether we are in the presence of a homestead, a princely stronghold, a manor, a fort or a town and its concomitant economy, or if you must, a free market - if anyone can find one. One further indication of resource control, available in most assemblages, is the presence or absence of game, venison, salmon, and grouse, which disappeared at Durham for example at the very time that Norman order was imposed (Rackham in Carver 1979).

I am conscious that I have left out many traditional targets of environmental archaeology, but that is not because I do not believe they matter. Judy Turner's work on woodland in Cumbria is the best evidence of any kind we have for activities there in the 4th to 6th centuries (Higham 1986), and thanks to Oliver Rackham, Martin Jones, and Peter Murphy, among others (Rackham 1986; Jones 1986; Murphy 1984), we now have a much more sophisticated idea of the Anglo-Saxons than the green-wellied land-clearers I evoked to begin with. Land is clearly being taken in and out of cultivation throughout the period, and 'cultivation' can mean arable, or pasture or woodland. I do not believe that any of these things 'ran out' during the first millennium and thus caused stress or social change. Nor do I believe that plague and climate, although influential, can have been influential in quite that way Recent work on famine in India in the 1940s seems to have shown that years of famine actually coincided with good harvests, not bad. On these occasions, at least, it was the human economic system, not the weather, which actually led to starvation. If the ecology or the environment determine human behaviour at all, it may be that they influence some deep sub-conscious in the brain, well out of reach of archaeologists. For our study, I think, it is the political mood which most influences the economy, and to get at both in the first millennium - with its crucial periods of transition the 3rd, 5th, 7th and 9th centuries (the effects of which are still with us) - nothing is more important than the study of the environmental, or more properly the biological, evidence.

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2 'Trees and woodland in Anglo-Saxon England: the documentary evidence

Oliver Rackham

Abstract

This article presents a summary of previously published work by the author on the documentary, charter and place-name evidence for woodland in the Anglo-Saxon period. Types of woodland, their uses and regional variation are discussed. The distribution of woodland is seen to change little during the period, although it was probably reduced in extent.

Introduction

No Anglo-Saxon document gives even a partial account of woodland. Such an account has to be pieced together out of evidence from many sources: documentary, archaeological and ecological. Anglo-Saxon woodland was one stage in the development of woodland from pre-Neolithic wildwood to the cultural landscape of trees and woodland among farmland that we have today.

In the beginning, England was covered with **wildwood:** trees upon trees, stretching almost continuously across chalkland and sand, clay and limestone and granite, from the edge of the salt-marshes nearly to the tops of the mountains. Pollen analyses show that wildwoods were of many types, but there was a broad division between those of Lowland England and those of the Highland Zone of the north, Welsh Border and the south-west. In the lowlands, lime was the commonest tree, but there were areas of hazel-wood, elmwood, alder-wood, ashwood (especially in Norfolk), pinewood (in the Fens), and a general scatter of other species, especially oak and yew. In the Highland Zone, there was a similar variety, but oakwoods and hazel-woods predominated.

By the 13th century, when documentary evidence becomes copious enough to tell a coherent (if not complete) story, the landscape was not unlike that of today. England consisted of farmland and moorland with only a few percent of woodland, but also with many non-woodland trees in hedges and fields. Woods had names, definite areas (seldom more than 200 acres) and boundaries, and were private property. They were a valuable resource, and were permanent. Wide areas of country, and many individual settlements, had no woodland at all. A wood could be grubbed out in times of pressure on land, but this was not common: many woods of that period still exist (for example Hayley Wood, Cambridgeshire; Bradfield Woods, Suffolk). Much effort was put into woodland conservation, as witness the massive **woodbanks** which still surround such woods.

Woods were managed to provide **underwood** and **timber.** Underwood was produced by **coppicing.** Every four to ten years (or occasionally longer) the majority of the trees in a wood were felled and allowed to grow again from the stumps to provide successive crops of rods and poles, used for many purposes: wattle-and-daub (in which form they are often preserved), fencing, and especially for fuel. Scattered among the underwood stools were timber trees, allowed to stand for thirty years or more and then felled to make beams and planks. Underwood could be of a great variety of species (preserving much of the variation of the wildwood), but timber was predominantly oak. Woodmanship depends on using the trees' capacity for self-renewal, and not on planting trees.

There were additionally **wood-pastures,** which combined grazing animals and trees. This was a different practice, since the shade of the trees spoils the pasture, and animals would eat the regrowth of the trees. A common practice in wood-pasture (and among non-woodland trees) was **pollarding,** in which a tree is cut like a coppice stool, but at about 10 ft above ground, so that livestock cannot get at the regrowth. There were three branches of wood-pasture: **wooded commons,** on which there were common-rights of grazing cattle, sheep etc, and sometimes of woodcutting; **parks,** private wood-pastures which were deer-farms; and **wooded Forests,** commons on which (in addition to the commoners' beasts) the king claimed the right to keep deer.

The area of woodland

To what extent did Anglo-Saxon England resemble one or the other of these states? It was in no way a primaeval land. Five thousand years before, Neolithic people had introduced farming and had begun to grub out wildwood, and to convert parts of the remaining wildwood to managed woodland. This had continued through the Bronze Age, until by at latest the Iron Age – say 300BC – half the land had ceased to be woodland.

Roman Britain cannot have been very wooded even by the standards of today. Archaeological surveys find remains of settlements and farms, not only on the good land but in such unlikely places as the Fens. These turn up also in the midst of what in the Middle Ages were great woods: for example the Weald, the Forest of Dean, Wychwood (Oxfordshire), and the site of Stansted Airport (Essex). Woodland in Roman Britain can hardly have been more extensive than in the Middle Ages. Presumably, too, it was intensively managed. The Romans indulged in bricks, pottery, iron, glass, baths, hypocausts, and innumerable other things that could not long have been sustained without a renewable supply of fuel.

At the end of the Anglo-Saxon period, Domesday Book appears to give a complete record of woodland. In 1980 I attempted to add up the area of the 7,800 woods recorded, and made this come to 15% of the area of England. Woodland in 1086 was very unevenly distributed. There were great woods in the south-east and around London – the Weald and the Chiltern plateau – and in Worcestershire, north-west Warwickshire, mid-Derbyshire, and east Cheshire, though nowhere was it possible to get into a wood more than five miles from some habitation. On the other hand, there was no woodland at all in the Fens, around Cambridge, or in much of east Yorkshire and the east Midlands. Half the settlements in England possessed no woodland.

In ten years these conclusions have not seriously been challenged. Comparison with other evidence convicts Domesday Book of a quite large over-recording in north-east Yorkshire, and suggests minor under-recording in the Fens, mid-Hampshire, and occasionally East Anglia. I am now inclined to regard the estimate of 15% as a little too high, since by the Black Death the proportion had fallen to well under 10%. England at the end of the Anglo-Saxon period had less woodland, in relation to its area, than France today.

At the end of the Roman period there was a great recession in prosperity, and at least some decrease of population. This would inevitably have caused woodland to increase: it is a law of nature that any land left unused is invaded by trees. This would have been counterbalanced by population and prosperity recovering, and by people extending farmland at the expense of trees, during the Anglo-Saxon centuries. The extent of the post-Roman recession is one of the great uncertainties of archaeology. The two processes are linked: the more woodland sprang up in the early Anglo-Saxon period, the more time later Anglo-Saxons must have spent grubbing out trees.

This argument, based on earlier and later evidence, makes it very probable that the place of woodland in Anglo-Saxon England was more like that of medieval England, or of France today, than of aboriginal England. Even the Weald could not have been an untrodden desert of wildwood. What do Anglo-Saxon documents themselves say?

The charters, dating mostly from between AD 600 and 1080, mention a total of 14,342 objects as landmarks on boundaries. Of these, 342 are woods – 471 if we include place-names involving woods, thus making up about one in thirty of all boundary features. This may be compared with 378 hedges, 32 walls (though few charters extend into stone-wall country), 47 heaths, numerous downs, meadows and moors, and 629 mentions of furlongs, headlands, gores and other technical terms of open-field agriculture. I infer that woods tended to occur on boundaries, where they would attract more than their share of attention. The 766 mentions of trees also strongly indicate a non-wooded landscape: with rare exceptions, a tree is usable as a landmark only if it is not in a wood.

Woodland: change or stability?

Place names are a source of evidence dating, in many instances, from earlier than the charters. We are concerned with two types of name: those of the woods themselves (of which more later), and those of settlements implying substantial woodland. The latter comprise names in *-leah, hyrst,* and the Norse equivalent *-Þveit* (as in Bradley, Leigh-on-Sea, Hawkhurst, and Bassenthwaite), which appear to mean an inhabited clearing, and imply sufficient woodland to sustain the idea of a clearing. Following a proposal of Margaret Gelling, we should add to the list names in *-feld* (eg Bradfield), which imply not a 'field' in the modern sense but an open space in sight of woodland. All these names are not uniformly scattered over England. They are clustered in areas where Domesday Book indicates extensive woodland, especially in the south-east and around London – the Weald and the Chiltern plateau – and in Worcestershire, north-west Warwickshire, mid-Derbyshire, and east Cheshire. There are few or none in the Fens, around Cambridge, or in much of east Yorkshire and the east Midlands, where Domesday has no woodland. The correspondence between the settlement names and the woods of 1086 is remarkable, considering the difference of date. (Place-names indicate another big wooded area in the Lake District, beyond the limits reached by Domesday.)

Charters also fit this pattern. Statistical analysis is less straightforward, because charter material is unevenly distributed, but there is a similar correspondence between woods in the charters and in Domesday Book. For example, there are few or no woods in charters for south-east Warwickshire, the eastern Cotswolds, north-west Berkshire, or south Wiltshire – all areas for which neither Domesday nor the place-names indicate woodland. There are, however, some discrepancies. Charters appear to capture the last remaining woods of the Fens, which would have been few but valuable as landmarks in that otherwise rather featureless region.

All this points to the Anglo-Saxon period as a time of relatively stable woodland. Woods may have been rather more extensive in the 6th century than in the 11th, but there is no indication that their distribution was radically different. Nowhere do charters or place-names suggest that areas which Domesday records as woodless had formerly been as wooded as the rest of the country.

Anglo-Saxon writings have remarkably little to say about destroying woodland. This might be because it was too commonplace to mention, but if so one would expect at least casual allusions: 'the site of a wood called X which Y grubbed out' in a charter, a land grant allowing (or requiring) the grantee to grub out the woods, an account of a battle in which the troops were fighting through a half-grubbed wood, etc. I am not aware of anything of the sort in the entire corpus of Old English writing. There is nothing to suggest that the Anglo-Saxons spent long weeks every year digging up trees, as their descendants were to do in America a thousand years later. If woodland was destroyed, this may have been done without effort, by grazing animals eating young trees: a process which was to turn the 12th century Thorpe Wood, Norwich, into the 15th century Mousehold Heath.

Ownerships and names of woods

The charters establish that all woods belonged to some individual or community. Often the name of a wood is given: thus the Ilminster (Somerset) charter, dated 725, mentions a wood *Catschaga*, 'Catshaw'. There was a distinction between wood-pasture and private woods: in property belonging to Felpham (Sussex) in 953, the wood-pasture common *(communi silva pascuale)* called *Palinga Schittas* was distinguished from other woods.

K P Witney (1976) has studied the Weald of Kent, making good use of the not very copious documentation. He shows that the Kentish kings were the first to assert ownerships in the Weald, and that much of the commons was parcelled out among other private owners in the 8th to 10th centuries, The Weald, however, was much the biggest wooded area in England, and we would expect it to preserve traditions of less intensive ownership and use which died out earlier elsewhere.

Anglo-Saxon woods were not always located in the places to which they belonged. For example, the charter of Benson (Oxfordshire), dated 996, perambulates the main boundary, and has an appendix giving 'the bounds of the wood that belongs to the land', which turns out to be a separate territory some miles away in the Chilterns. Such relationships are known, or can be inferred, in other regions where a concentration of woods was surrounded by non-wooded country. W J Ford (1976) has shown that most of the woods which Domesday attributes to places in south-east Warwickshire and north Oxfordshire were really situated at a distance in the wooded halves of these counties. The supreme example is in Kent, where most of the settlements in the Weald originated as dependencies, and eventually colonies, of places outside it. Witney (1976) claims, for example, that the name of Tenterden reflects its origin as the wood of the men of **Thanet,** 35 miles away.

Something like one in four of the woods in the charters still exists: for example *Palinga Schittas* has become The Mens in Kirdford. *(Minnis* or *Mens* is itself an ancient name for a common in south-east England.) Many other medieval woods, still extant, have names which on linguistic grounds go back to Anglo-Saxon times. An obvious example are those with Old Norse *lúindr,* a grove or sacred grove, such as **Wayland** Wood, Norfolk, which gave its name to Wayland Hundred (mentioned in Domesday Book); the wood still exists. Other wood-names involve special Old English words for woods, such as *fjtrhþ* (as in Lawshall **Frithy** Wood, Suffolk, or **Free** Wood, Elmdon, Essex) and *bearu* (as in the various **Bere** Woods, Hampshire). The Old English *leah can* mean a wood as well as a clearing, whence the ancient woods called **Hayley, Brockley** (badger *leah)* or **Smilley** (narrow *leah).* Other wood-names preserve Anglo-Saxon vocabulary or inflexions: for example **Mincing** Wood in The Blean, Canterbury (from *mynecen*, 'nun'), and **Munces** Park, Bradfield St Clare, Suffolk (genitive of *munuc,* 'monk').

Woodbanks, surrounding and sometimes subdividing woods, are recorded in the thirteenth century, and may well be much earlier. *Wyrtruma,* literally 'plant-strength' or 'plant-wall', occurs 93 times in the charters as a linear feature associated with woodland, and one is tempted to interpret it as the Old English word for a woodbank. Woodbanks on the ground often reveal many stages in the embanking and dividing of a wood. I have shown in south-east Essex (Rackham 1986b) that the banks reflect a long series of subdivisions in the ownerships of woods, beginning well before the Conquest – the earlier banks correspond to parish boundaries – and continuing down to the Black Death or a little later.

An example documented in the charters are the bounds of Long Itching-ton (Warwickshire), dated 1001, which pass through 'a high oak in the middle of Wulluht grove'. Mr D R Morfitt has taken me to the spot. The 'grove' is a 200-acre wood shared between Long Itching-ton and Ufton. It is bisected by a massive bank going all round the Itching-ton part; this was built in two stages, the second perhaps connected with the making of a medieval deer-park.

Uses and management of woods

The distinction between wood-pasture and coppiced woodland is widely recorded in Domesday For example, in 1086 *silua pastilis* covered 1.6% of upland Lincolnshire; *silua minuta* covered 1.5%; and there was a mixed category of *silua pastilis per loca,* 'wood pasturable in places', amounting to 0.9% of the county.

Coppicing had originated in the Neolithic, as part of the first stage in the transformation from wildwood to the cultural landscape. By the 11th century AD, it was probably present throughout England, but only in less-wooded areas was it yet the dominant form of woodmanship.

Anglo-Saxon charters are not primarily concerned with the use of woodland, but they allude to woodcutting often enough to show that coppicing was a normal practice not calling for special mention. For example, a grant at Sempringham (Lincolnshire) in 852 included the [annual] right to 60 fothers – a kind of cartload – of wood in the wood at Horn (Rutland), 12 fothers of 'grove' (whatever that was) and six fothers of poles. Here we have three different kinds of product, excluding timber, to be collected from a wood 16 miles away. At Wolverley (Worcestershire) in 866 King Burgred granted firewood, timber (one oak annually), and 5 wagons-full of good rods a year. At Mersham (Kent) in 863 the terms of a grant of wood for salt-boiling mention that it was the custom to cut wood after Whitsun, which seems odd to us.

The commonest references to woods, however, especially in the south-east, are to pasturage and pannage. In what to us today is a 'normal' wood, full of trees, pasturage would be scanty, because the animals would eat up the foliage within reach, and it would not grow again at a height at which they could get at it. Wood-pastures would thus often have consisted of widely-set trees plus grass. Was not King Edmund the Magnificent, hunting the hart in c944, able to ride at speed through Cheddar Wood *(silva),* until only the miraculous intervention of St Dunstan saved his neck from Cheddar Gorge?

Pannage is referred to surprisingly often. It means feeding pigs in autumn on acorns or beechmast (beech being then much less common than it is now). The word *denn* (as in **Tenterden),** the commonest term for a secondary settlement in the south-east, is glossed *pascuum procorum*, 'pasture of swine'. We are invited to suppose that a pig economy dominated south-east England to such an extent that people commuted for this purpose to *denns* up to 35 miles away. This seems an extravagant thing to do: man does not live by pork alone, not all woods produce acorns, and the acorn crop varies enormously from year to year. However, as Witney suggests (1976), pannage was probably put on record as a symbol of more general claims to the woods and their produce, notably timber and underwood.

Domesday Book, annoyingly, records woods in east and south-east England in terms of their capacity to feed swine. Let us not be deluded into taking that for their main use. Rather, it was a minor use that applied to nearly all woodland and was the means of putting on record even those woods that were too big to exploit more extensively

Pasture-wood corresponded to the wooded commons of the Middle Ages. The husbandry of deer begins right at the end of our period, when there is a solitary reference in a will of 1045 at Ongar (Essex) to a *derhage,* 'deerhay', which appears to be the medieval Ongar Great Park, the prototype of English parks; it survived into the 1950s. Forests, wooded or not, are a post-Conquest development.

Hedges and non-woodland trees

Charters are full of mentions of hedges (the terms include *haga, hege, hegerœwe* (hedgerow'), *rœw)* and of non-woodland trees. Hedges are distinctly less abundant in the Midlands and chalklands of England – the medieval stronghold of open-field, and later of Enclosure-Act, territory – than in the peripheral regions. There is a similar distinction among trees. The total numbers are not very different, but open-field regions tend to have more mentions of hawthorn, blackthorn, apple and elder, while peripheral regions have oak, lime and [wild] pear.

There are frequent mentions of Pollard trees and 'stubs', perhaps coppice stools. Some trees were 'marked', and others were known individuals, such as a 'red-leaved oak', 'footy oak', 'earthnut-thorn', and 'crucifix oak'.

Among trees after which settlements are named, thorn, ash and willow (including willow and withy) are the most common, followed by oak, then alder, hazel and elm. We must not suppose these were the commonest trees: a **Birkham** could easily have been named after the only birch for miles around.

Conclusions

The Anglo-Saxon landscape was a somewhat wilder and rougher predecessor of the cultural landscape of the Middle Ages, with woods, hedges and hedgerow trees among farmland. It had much less in common with aboriginal England. Wildwood lay in the distant past, and was not remembered. Woods had long ago vanished from the best and second-best agricultural land; much of the third-best land was heath, and the fourth-best was moorland.

All the features that distinguish woods from wildwood – the names of woods, ownerships, boundaries, management – were already present, even in well-wooded regions like the south-east, but were not as universally established as they were later to become. Another distinction was almost completed: lime, the commonest tree of wildwood, had become relatively rare as a wild tree, as it is today Most early lime place-names are in areas where the tree still grows, but there are a few (eg **Lyndhurst** in the New Forest) where it is now extinct. Pollen analysis shows that lime persisted into the Anglo-Saxon period in what is now Epping Forest (Baker *et al* 1978), where not one tree now survives.

Much of the distribution of woodland in Anglo-Saxon England had been determined earlier. The legacy of the Romans, and of the post-Roman recession, was of very wooded areas with clearings in them, of woodless country, and of terrain with islands of woodlands among farmland – not so very different from France today. The Anglo-Saxons grubbed out woods (and allowed other areas to revert to woodland) and renamed the clearings, but did not radically alter the distribution. The post-Roman legacy left a fundamental distinction which has cut deep in English landscape history; it is still visible as the way in which, for example, Suffolk and Herefordshire are more like each other than either is like Cambridgeshire. The central parts of England, with little woodland in Anglo-Saxon times, developed a strong open-field tradition, later to be converted by Enclosure Acts to the 'Planned Countryside' of today; the peripheral regions, full of woods and hedges in Anglo-Saxon times, escaped both changes and are the 'Ancient Countryside' of today.

This previous history explains the Anglo-Saxons' awkward arrangments for woodland at a distance. They were not pioneers, able to plan a new landscape to their convenience, but had to make shift to apportion a distribution of woodland handed down to them by their predecessors.

Woodland conservation, though not explicitly recorded before c1100, is likely to have been a consideration where woodland was scarce. Even in the Weald, wood-rights were not free to all comers. The making of banks around woods is a clear sign that people took trouble in conserving them.

Our knowledge of Anglo-Saxon woodmanship is very incomplete. There was a large vocabulary for woods: wudu 'wood', graf 'grove', scaga 'shaw', hangra 'hanger', bearu, holt, fyrhb, hris etc. The last means 'underwood', as in the name Lynderswood, anciently Lindris, 'Lime Coppice' - the wood is near Braintree, Essex, and still has lime underwood. What the other terms meant at the time we do not know and should not guess, except that they distinguish different kinds of woodland. The Anglo-Saxons could easily have had a deeper insight into woodland, its behaviour and management, than their successors.

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This article is a summary of what I have published on other occasions, where I give a fuller treatment of its various aspects, with references to primary sources.

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3 Trees and woodland in the Saxon period: the dendrochronological evidence

Ian Tyers, Jennifer Hillam, and Cathy Groves

Abstract

The techniques of dating by dendrochronology are briefly described. Problems associated with archaeological samples are discussed and it is shown that some of these problems can be solved by complete sampling. Sites from England and Wales with dated timbers are reviewed, and the tree-ring data are then examined to provide further information on woodland exploitation, re-afforestation following the departure of the Romans, and trade links with other parts of Europe. These aspects are further developed by comparison with tree-ring data from Germany and Ireland.

Introduction

Dendrochronology is now established as a routine dating method in the British Isles. There is a network of regional site chronologies for the historic period which means that, provided a well-replicated site chronology can be constructed, the chances of dating are very high. This has resulted in the production of many tree-ring dates, some of which have had a profound effect on archaeological interpretation. This is particularly true for the first millenium AD where archaeological dating has often been very hazy and where on occasion Roman contexts turned out to be Saxon in date. This paper reviews some of the results which have been obtained for the Saxon period and also examines other information which can be extracted from the tree-ring data. For example, do they tell us anything about continuity of settlement and of woodland regeneration in the first millenium? Before such questions can be answered, it is necessary to look at the tree-ring methodology in order to highlight its strengths and explain its weaknesses, and suggest ways of overcoming some of the latter.

Methodology

Tree-rings are laid down by most trees in the temperate zone on an annual basis. Some trees, such as oaks, beeches, and elms, have well defined annual rings, while others, for example hazel and alder, are less clear. In the British Isles, the common occurrence of oak *(Quercus* spp) as a building timber has meant that absolute dating has relied on this species (but see also Groves & Hillam 1988; forthcoming). The width of each ring is a measure of the annual growth rate of the tree. For many trees, the amount of growth in any one year is affected by a variety of genetic and environmental factors, such as nutrition levels, local soil conditions and, more particularly, climate. Since climate operates on a regional basis it is possible to compare tree-ring sequences over a relatively large geographical area and synchronise their ring patterns. By this mechanism chronology blocks can be linked together; we can extend our chronologies back through time and theoretically provide dates for many excavated timbers. This possibility has lead to the adoption of dendrochronology by archaeologists as a highly accurate dating method. It does however have its

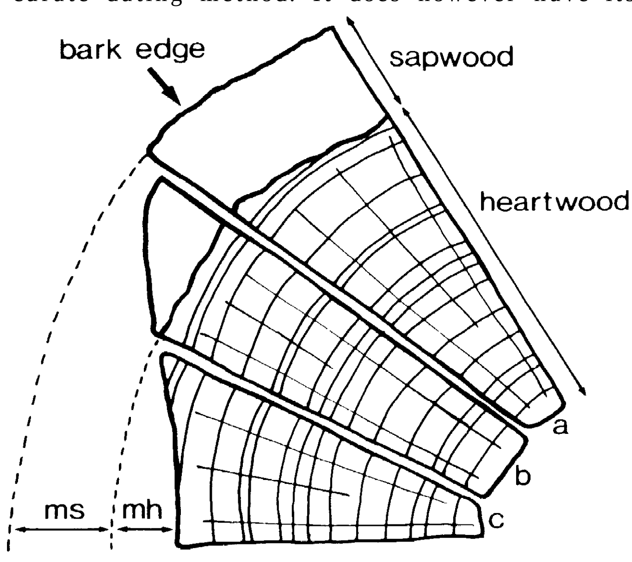

Figure 3.1 Interpretation of tree-ring dates. The precision of a tree-ring date depends on the completeness of the sample:
a) bark edge present -precise felling date
b) missing sapwood (ms) - a felling date can be calculated
c) missing sapwood and an unquantifiable amount of missing heartwood (mh) - terminus post quem is quoted.

problems and these affect the quality of the date that is possible from any given structural feature.

The precision, and hence the usefulness, of the date provided by a dendrochronology laboratory is dependent on the quality of the sample. This is determined by how much of the outer part of the tree trunk is present. The date of the outer ring of all three samples in Fig 3.1 is known, but the exact felling date of the timber can only be determined from the sample with bark edge (sample a). Where sapwood is present, allowance can be made for an unknown but statistically quantifiable number of rings (sample b). A sapwood estimate of 10-55 rings is used to calculate the 95% confidence limits for the felling date range throughout this paper (for further details, see Hillam *et al* 1987). Where only heartwood rings remain (sample c), there is an unquantifiable number of rings missing, and the felling date must be quoted as a *terminus post quem*.

A second problem is that the statistics that allow the matching of two ring sequences normally demand at least 50 rings for reliable and replicable results. Some samples of 100 or more rings may be required from a feature to give an absolute date. However the perverse nature of tree-ring samples usually means that the samples with all the sapwood are those which have few rings. The best way to overcome this problem is to sample every timber. It may then be possible to align some of the shorter ring sequences on an intra-site, or within feature, basis.

Once there is an opportunity to examine a high proportion of timbers with bark-edge, the tree-ring dates become more meaningful. As well as chronological details which relate to felling and construction, the results which can be obtained may also include whether timbers are being stored, how often timbers are re-used, what times of the year trees are felled, or how often a structure needs repairing. All these opportunities are lost on the sites where only a handful of timbers are taken, particularly if the importance of sapwood is ignored, or where the assemblage is sampled in some biased way, such as only taking the bigger timbers. Despite the precision of tree-ring dating, a tree-ring date is only of any real use if most of the samples are examined. It should be clear that a sample of all the timbers from any site produces a better level of interpretation. It should be equally clear that, prior to sampling, a critical examination of the timbers for signs of re-use is necessary. Furthermore, the sampling must be carried out with proper regard for sapwood survival, and the temptation to only sample the small or the large must be resisted.

Saxon tree-ring dates

In examining the geographical spread of the 'Saxon' chronologies from England and Wales (Fig 3.2), four points can be made. First, most of our data derives from the southern half of the country with only York and Carlisle from the more northern half. Second, the map does not give any indication of the date of the features concerned nor the number of timbers involved from each (see Table 3.1 for these details). Third, York and London exhibit some major differences from all the rest, and finally, it should be noted that not all the sites which have produced 'Saxon' wood have also produced tree-ring chronologies. Some sites were found to have no suitable wood after submission to the dendrochronology laboratory, others have not dated successfully, and there may be sites producing wood and timber of which we are unaware.

Early and middle Saxon sites

In the early and middle Saxon period, many of the timbers come from wells. Unfavourable preservation at the extensive settlement at Hamwic has resulted in the excavation of only one feature containing waterlogged wood. This was a timber-lined well

Figure 3.2 Map showing locations of sites mentioned in text. SHF - Slough House Farm

Table 3.1 Summary of Saxon sites with dated timbers

Site		Structure	Dated timbers	Felling dates (ad)
Brandon		building	4	612+
Carlisle	Castle St	timber lined pit	10	770-805
Hamwic	Six Dials	well	11	695-733
Ipswich	Greyfriars	well 0630 barrel well 0697	5 19	712+ 754+
	Smart Street	well	5	712+
Llangorse		crannog	5	869-905
London	Barking	leat	42	705, 745, 748, 768, 784+
		well 2	24	800+
		well 3	24	730/1,800-835
	Billingsgate	revetments	300+	11th C various
	Buckingham St	Plank	1	672+
	Cherry Garden	plank	1	679/80
	Hackney	logboat	1	950-1000
	Hibernia Wharf	post	1	955+
	Milk St	timber lined pit	2	914+
	New Fresh Wharf	revetments	9	10th/11th C various
		boat timbers	8	920-955
	Tudor St	plank	1	928+
	York Buildings	revetment	16	679/80
Medmerry		boat timbers	2	765-810
Mersea Strood, essex		causeway	2	670-715
Odell		4 wells	7	523+,572+,606+,633+
Old Windsor		Water mill	2	676+
Portchester		well	15	602±2,750±3
Slough House Farm, Essex		well F130 well F2957	10 6	602/3 504/5,507/8,539/40
		replacement shaft	4	599+
Tamworth		horizontal mill	10+	855±9
York	Coppergate	buildings, fences	200+	10th/11th c various

Where appropriate, felling dates are calculated using a 10-55 ring sapwood estimate, except for Portchester and Tamworth which use their author's original estimates

from the Six Dials site which was constructed from large, straight-grained planks felled between AD695-733 (Hillam 1984). In addition, there was a stray timber felled after 720 plus an undated timber. Unfortunately the latter was the only one to have complete sapwood.

At Greyfriars Street, Ipswich, two wells contained timber (Hillam 1989). The first was constructed from a hollowed-out tree-trunk which was felled after 698 whilst the second was made from a re-used barrel. The timbers from the latter, which were felled after 754, are of particular interest because their tree-ring pattern matches German chronologies but not those from the British Isles. This indicates trade links with Saxon settlements on the other side of the North Sea. One of these is Dorestad in the Netherlands where barrels have also been excavated. Dendrochronological analysis suggested, on the basis of the cross-matching, that the timbers for these wine barrels had originated from the Mainz-am-Rhein area of Germany, and that the barrels were transported down the Rhine to Dorestad (Eckstein *et al* 1975).

Barking Abbey (BAI) is also a site containing wells, but here there is evidence of more than one phase for one of them. The timbers from Well 2 are later than 800, whilst Well 3 was originally constructed in 730 or just after and repaired in 800-835. Also at

Barking is a possible leat structure which on tree-ring evidence was clearly operative for some time. Some of the piles are felled in 705, others were felled in 745, 748, and 768, and stray timbers within the fills are later than 784 in date (Tyers 1988).

Results from Slough House Farm in Essex illustrate the importance of having a methodology that is independent of the archaeological interpretations.

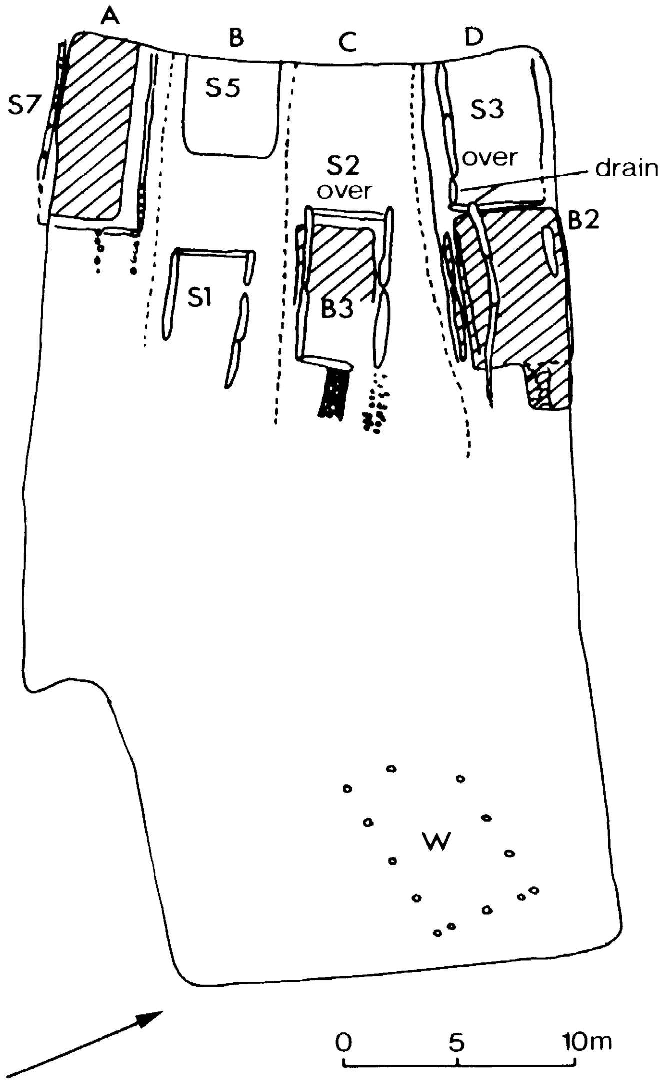

Figure 3.3 Plan of Tenements A-D at 16-22 Coppergate, York, during the sunken buildings phase (after Hall 1984)

S1 - structure 1 (Period 5/4)
S2 - structure 2 (5/6)
S3 - structure 3 (5/8)
S7 - structure 7 (5/1)
B2 - building 2 (5/7)
B3 - building 3 (5/5)
W - warehouse (5/12)

Dating was uncertain but was thought to lie within the Roman period. When the timbers from the two wells were examined, they proved to be of Saxon origin. The timbers from feature F130 were felled in 602/3. The quality of the timber was similar to that used in the well at Hamwic, although the method of conversion was different. The Essex timbers were generally larger in cross-section and had been hewn from halved or quartered trunks rather than radially-split planks as at Hamwic.

The well from feature F2957 at Slough House Farm contained timbers of at least four different dates, although archaeologically only two distinct phases are apparent. The first phase was a collapsed shaft of very poor quality timber, which was wavy-grained and full of knots. The timbers were felled in 507/8 and 539/40, whilst a stake, probably from the shaft's packing, was felled in 504/5. This group includes our earliest dated Saxon timbers. The second phase is represented by a replacement central shaft of a hollowed-out trunk packed with other timbers. None of the timbers from this phase had sapwood. They were felled some time after 599, and may be contemporary with the timbers from well F130 (Hillam unpubd).

If the remaining sites with dated timbers are reviewed briefly, there is evidence of several other wells. The well from Portchester Castle is two-phased with 7th and 8th century dates (Fletcher & Tapper 1984); that at Smart Street in Ipswich is 7th century (Groves 1987); and four wells at Odell in Bedfordshire were 6th and 7th century in date, although lack of sapwood made precise dating impossible (Hillam 1981). Although a late 8th century date has been given for the well at North Elmham in Norfolk (Fletcher & Tapper 1984), re-examination of the data indicates that it should remain undated.

Other features include an 8th century timber lined pit from Castle St, Carlisle (Baillie pers comm). There are two mills, a 9th century horizontal mill from Tamworth (Baillie 1982) and an 8th century mill from Old Windsor (Fletcher & Tapper 1984), and two causeways, one at Mersea Stroud in Essex (also originally thought to be Roman in date) (Hillam 1981) and an undated one at Brandon, Suffolk (Groves and Hillam 1986). Several buildings were also found at Brandon, a crannog at Llangorse (Groves unpubd), boat timbers from Medmerry, Sussex (Tyers unpubd), and a revetment from York Buildings (YKB) in London (see below). All of these sites have timbers that derive from features apparently constructed in the 6th to 9th centuries.

Late Saxon sites

The situation is totally different for 10th-11th century features. The only two places of significance are York and London. Other cities have produced late Saxon timbers, but these have produced few dates. A re-used timber from Exe Bridge in Exeter, for example, was felled after 951 (Hillam 1980), whilst Saxon timbers from Gloucester remain undated

(Morgan unpubl). The only non-urban find is the Graveney boat which is supposedly dated to the late 9th century (Fletcher & Tapper 1984). It is not included here because no confirmation of the dating can be found.

The York data derive from the Anglo-Scandinavian site at 16-22 Coppergate (Hall 1984). Many posts were dated from the wattle-and-daub phases (periods 3-5), the timbers being felled throughout the 10th century with a few possibly felled in the late 9th and early 11th centuries. Most of the timbers did not have bark edge, but there was a definite phase of felling in 955/6 (Hillam 1987).

Many of the timbers were also examined from the period 5B post-and-plank buildings (Fig 3.3). Felling dates were obtained for timbers from 8 out of 9 structures (Hillam 1985). Structures S1 (period 5/4), S5 (5/3) and S7 (5/1), and Buildings B2 (5/7) and B3 (5/5), were probably all constructed in, or shortly after, 973. Buildings B2 and B3 were in use at least 14 years before structures S3 (5/8) and S2 (5/6) replaced them in 987 or just after. Structure S3 was repaired in 1008/9, and a drain was probably added at that time, whilst the warehouse W (5/12) was built some time between 1014 and 1054. Many of the timbers were fine quality radially-split planks which had come from relatively large, long-lived oaks. Others were tangentially-split planks from smaller, younger trees. As well as the physical difference between the timbers, the crossmatching also suggested that several sources of woodland were used for the sunken buildings. This aspect was further explored by Nigel Holman as part of a PhD thesis (Holman unpubd).

There is also a large amount of data from London (Fig 3.4). The earlier timbers are from outside the City, such as those at York Buildings felled in 679 (Tyers 1989), or the single plank from a sandbank at Rotherhithe, also felled in 679 (Tyers unpubd). Timbers from ‘Lundenwic’ (see J Rackham, this volume), were generally felled in the 10th century The later timbers are from sites in the City such as Billingsgate Lorry Park (BIG) or New Fresh Wharf (NFW). At Billingsgate (Hillam 1988), the late Saxon waterfront was developed on both sides of an inlet in 1039/40. An earlier structure must have existed

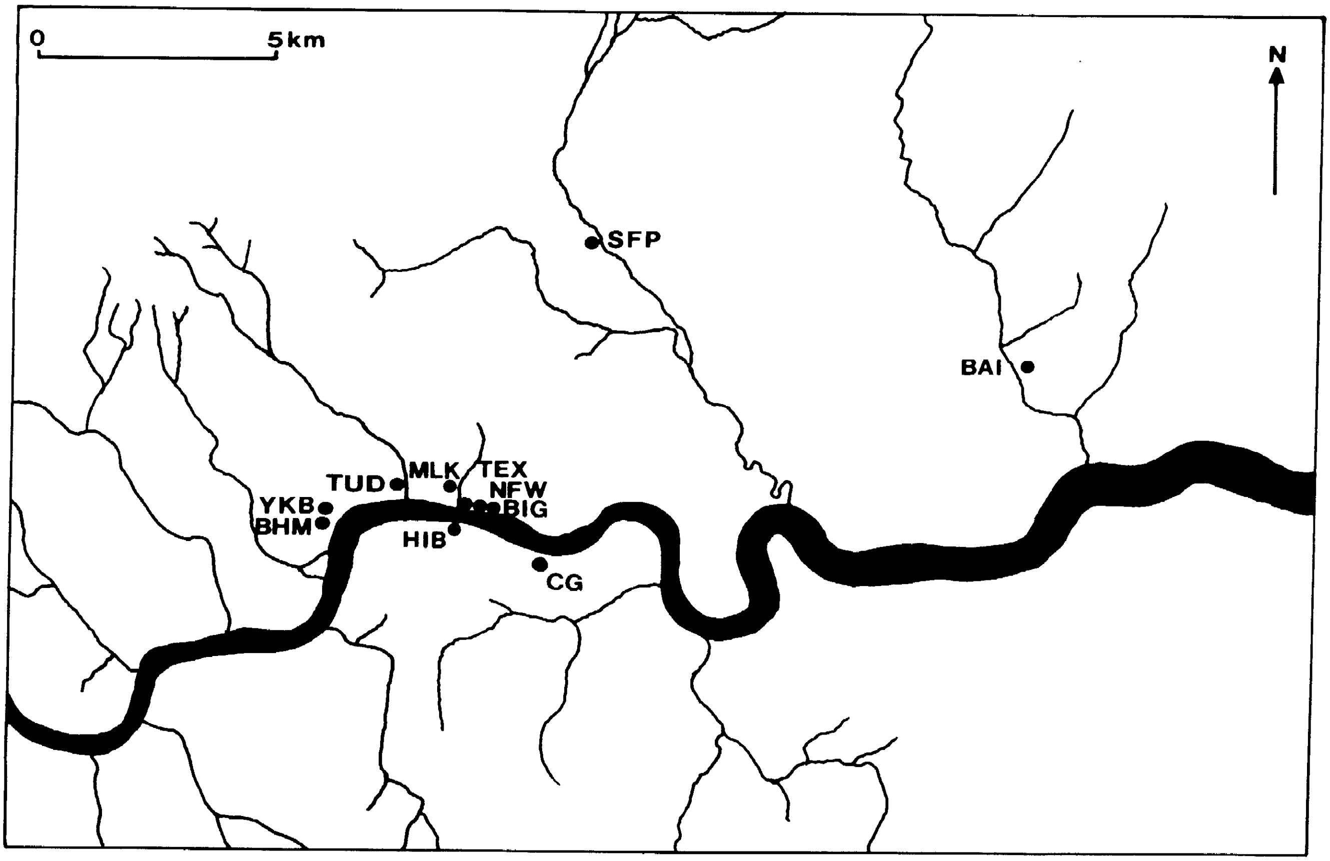

Figure 3.4 Map of London sites mentioned

BAI - Barking Abbey
BHM - Buckingham St
TUD - Tudor St
NFW- New Fresh Wharf/St Magnus
SFP - Springfield Park logboat
HIB - Hibernia Wharf
MLK - Milk St
YKB - York Buildings
CG - Cherry Garden
TEX - Thames Exchange
BIG - Billingsgate

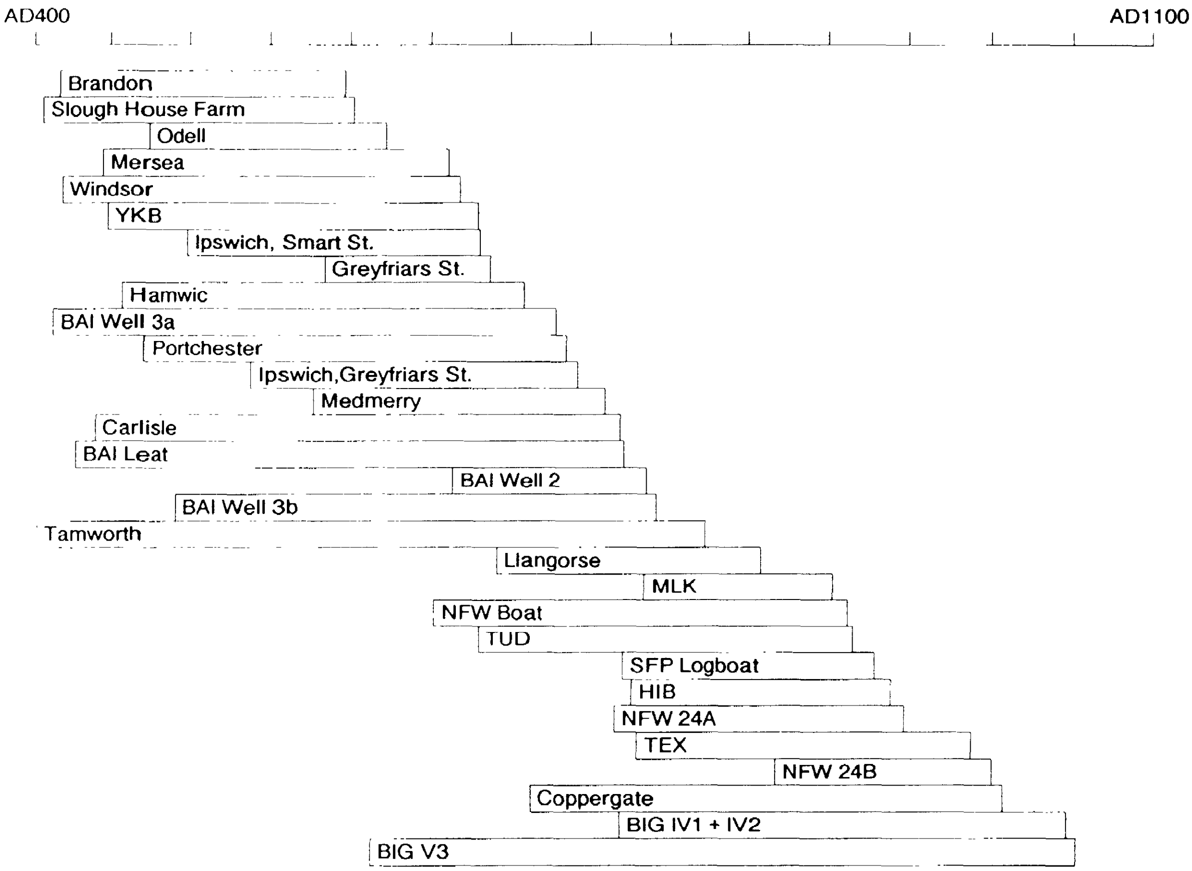

Figure 3.5 Bar diagram showing the temporal relationship of Saxon chronologies, arranged in order of end dates

because timbers felled in the late 10th century were also found in the 1039/40 development. In 1055, a stave front was added to the west bank, and both banks were consolidated with extra timbers. Further development continued in the late 11th century, and a new revetment added to the west bank after 1080. Fewer timbers were examined from New Fresh Wharf so a detailed chronological history cannot be given. However a date was obtained for planks from a re-used ship (Tyers 1989b). The unusual form of the ship suggested that it was not British, but the tree-rings indicate a south-east English origin.

Another London site which deserves a mention is Tudor Street (TUD)(Hillam 1981). The timbers were sampled on a watching brief and were thought to be from Bridewell Palace. One of the timbers, a radially-split plank, dated to 682-918 and felled after 928, was one of the earliest from a 'city' site. It should be noted, however, that the site is on the west side of the River Fleet, the same side as the middle Saxon settlement. It has already been hypothesised that the Fleet may have been the port area of the 'middle Saxon' town, and it is possible that the Tudor Street timber was part of that.

What else does the data tell us?

The sites described above represent the source of the data that we have at our disposal. If the data are re-examined in a non-chronological way (that is, without the emphasis on felling and construction dates), it is possible to extract other information about the use of timber and woodlands in the first millennium. Examination of the bar diagram (Fig 3.5), which illustrates the temporal relationship of the tree-ring chronologies, highlights a number of aspects already mentioned. First, all the later material is from York and London, and any London material amongst the early group does not come from the Roman and Medieval city area. Second, much of the early group is derived from wells. Third, there is evidence of more or less continuous occupation somewhere in the country right through the period, but we do not seem to find anything outside York and London during the 10th and 11th centuries, This raises the question of where the rural settlements were at this period. What was being built out of wood, and why is there no evidence of the timbers?

Is it also possible to throw light on the question of forest regeneration after the departure of the

Romans? The evidence for regeneration comes from the frequency of Roman settlements and field systems within the boundaries of medieval and thus Saxon forests (Hooke 1989; O Rackham, this volume). The alternative, based mainly on pollen evidence, is that farmland reverts from arable to grazing with no major changes in forest cover (Murphy, this volume), although pollen can rarely tell us about changes in forest type.

'lb determine whether the tree-rings can contribute to either hypothesis, it is necessary to review the method of chronology extension. Long chronologies are constructed by producing site or feature chronologies and cross-matching these to other chronologies, some of which will extend forward and others backwards in time. This method relies on replication on at least two levels since the site chronologies are usually based on multiple samples, and the long composite chronologies are based on multiple site chronologies at any one point. It has been noted by Baillie (1982) that chronologies themselves tend towards similar start and end dates in a way which demonstrates that they are not randomly distributed. In addition, as long tree-ring chronologies have been constructed, there have been several key points in which particular timbers have linked subparts of these chronologies together. The Tudor Street timber mentioned above was important in linking together the earlier Saxon group of chronologies with the later ones (Hillam 1981), and for a long time was the only British timber with a ring sequence which completely bridged the 9th century.

The linking of chronology units across gaps has involved a fair amount of effort during the projects to build the long chronologies that were used for radiocarbon calibration (Baillie 1982). Since most of the chronologies are now complete the only way to see the existence of past gaps is by looking at the number of trees present in the chronologies at various points. If the number of trees present at each point in the main chronology from northern Germany (Fig 3.6a) and the current state of the London chronologies (Fig 3.6b) are examined, it becomes obvious that the years where there are few or no trees represented are very similar in both Germany and England. In the 4th century AD, there are no English ring sequences and few German ones, and there is a trough in both countries between the groups of middle Saxon and late Saxon data. This can be contrasted with the situation for Ireland (Fig 3.6c) where there is no gap in the 4th century. Instead there is a 9th century trough, which was originally bridged by the Tudor Street sequence. There is therefore a clear distinction between Ireland on the

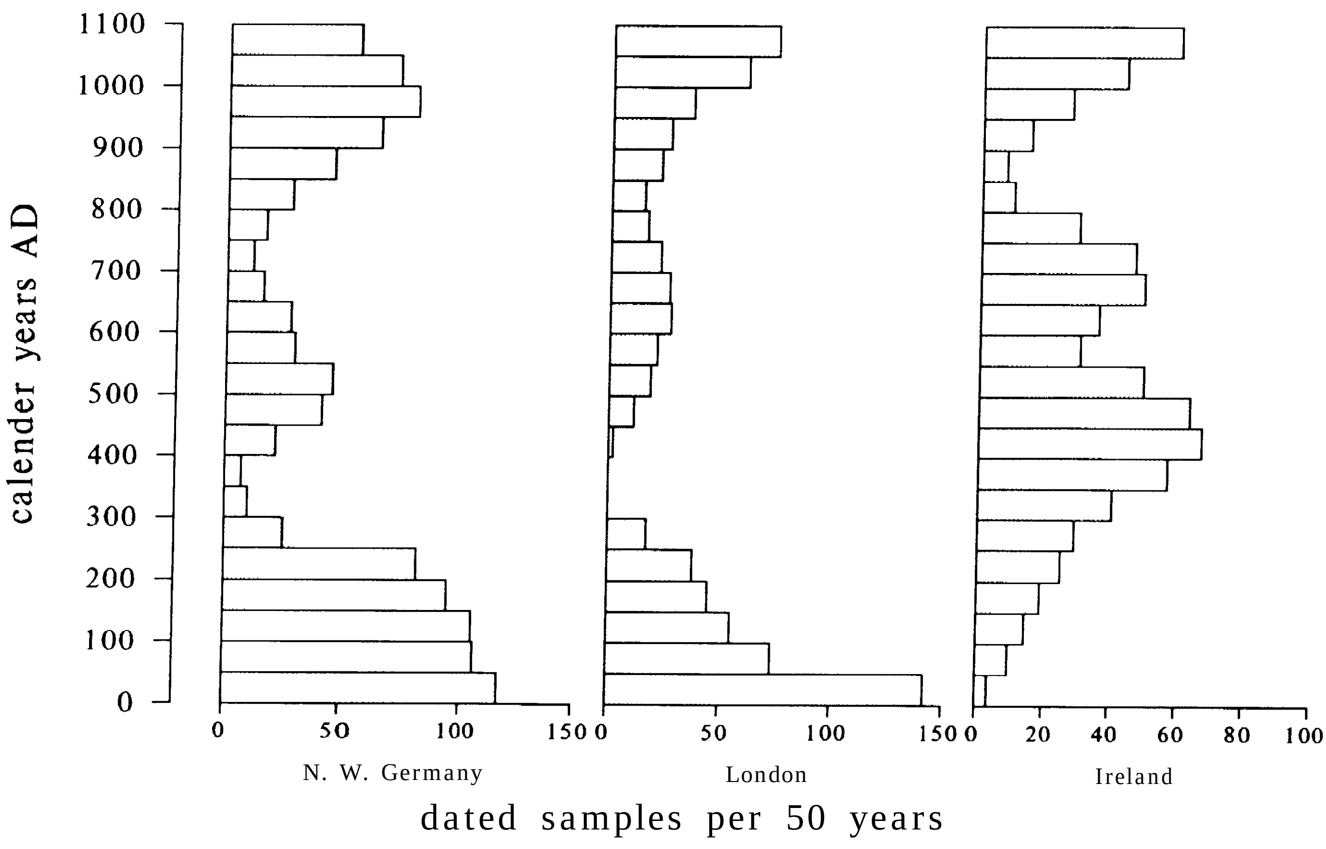

Figure 3.6 Histogram of numbers of dated trees from Germany, London and Ireland AD1-1100, (Germany - Hollstein 1980, London -authors unpubd data, Ireland - Brown & Pilcher pers comm)

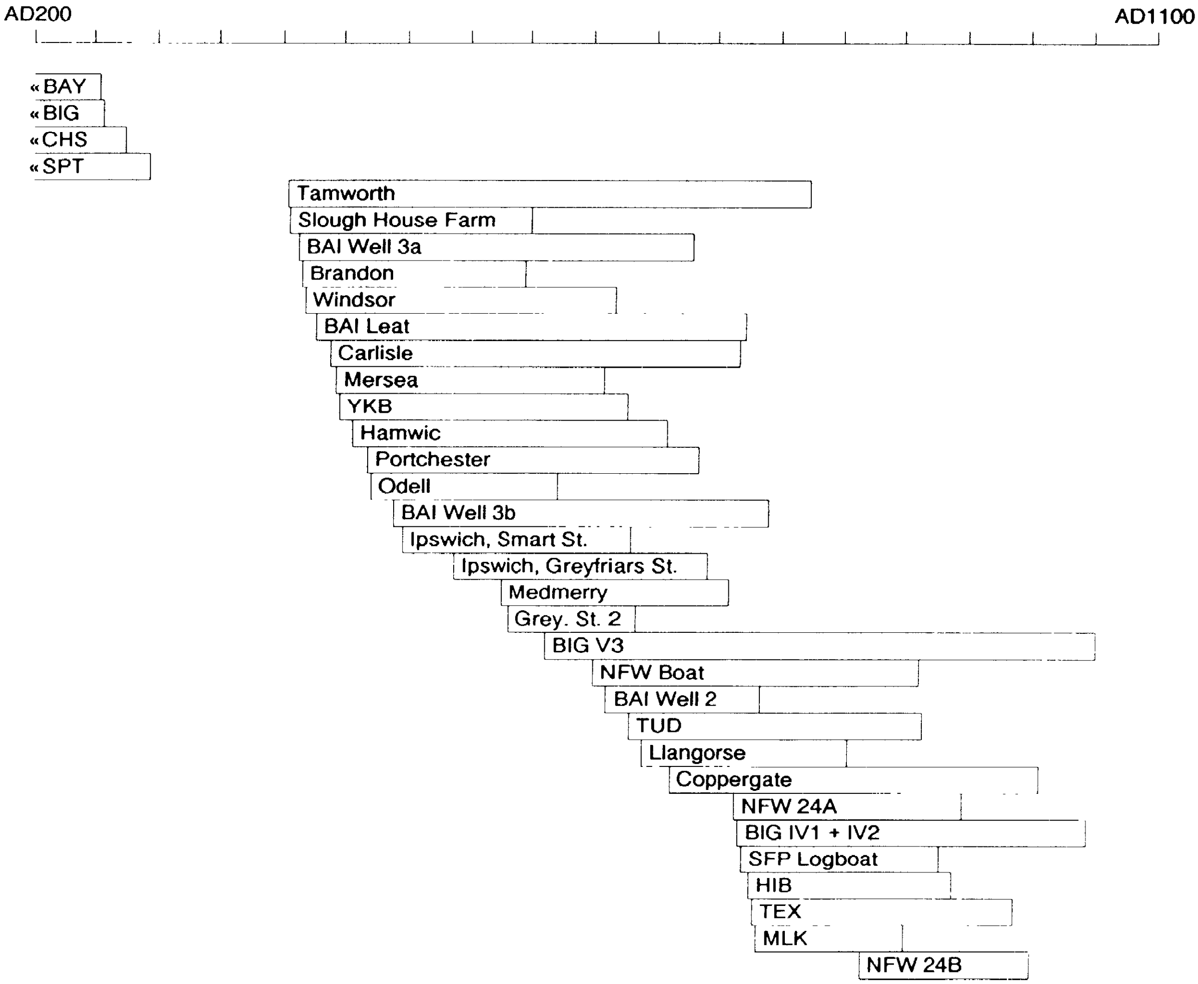

Figure 3.7 Bar diagram of English-Saxon chronologies arranged by start date

one hand and England and Germany on the other. Clearly there is the implication that the 4th century gap in England and trough in Germany is linked somehow to the departure of the Romans. In addition it is of interest for its implications about forest regeneration after their departure.

This argument can be further developed by examination of the chronology start dates. The start dates of most tree-ring chronologies relate to the centres of at least some of the trees and thus patterns of ‘birth-dates’ for trees can be examined. The data in Figure 3.5 are re-arranged in order of the start dates of the chronologies (Fig 3.7). There are nine sites all starting between 404 and 448, and another six that begin between 770 and 790. If a similar diagram of the main northern German chronology (Hollstein 1980) is examined (Fig 3.8), it shows that there are seven chronologies starting between 383 and 425, and another five between 712 and 745. The English Roman chronologies end around AD300. Hollstein’s Roman and Saxon chronology blocks are linked by only two chronologies. On the British mainland but outside the sphere of Roman influence, there is a Scottish chronology from Whithorn which goes back to 278. The Irish chronology (Fig 3.9) consists almost exclusively of crannogs and horizontal mills over this period. In 1982, for instance, it contained data from thirteen horizontal mills constructed between 630 and 930, and seven crannogs between 550 and 650 (Baillie 1982). It now includes much other data, including that from Deer Park Farm, County Antrim (see Kenward & Allison, this volume).

The numbers of timbers in the Irish curve (Fig 3.6c) shows ‘no major drop off in dateable trees during the 4th century, and not much of one in the 8th century Baillie (1988) has highlighted an apparent hiatus in building activity within the 7th century in Ireland, but no similar events are apparent in either the English or German bar diagrams. The Irish event has been correlated by Baillie with a known plague event during the same period.

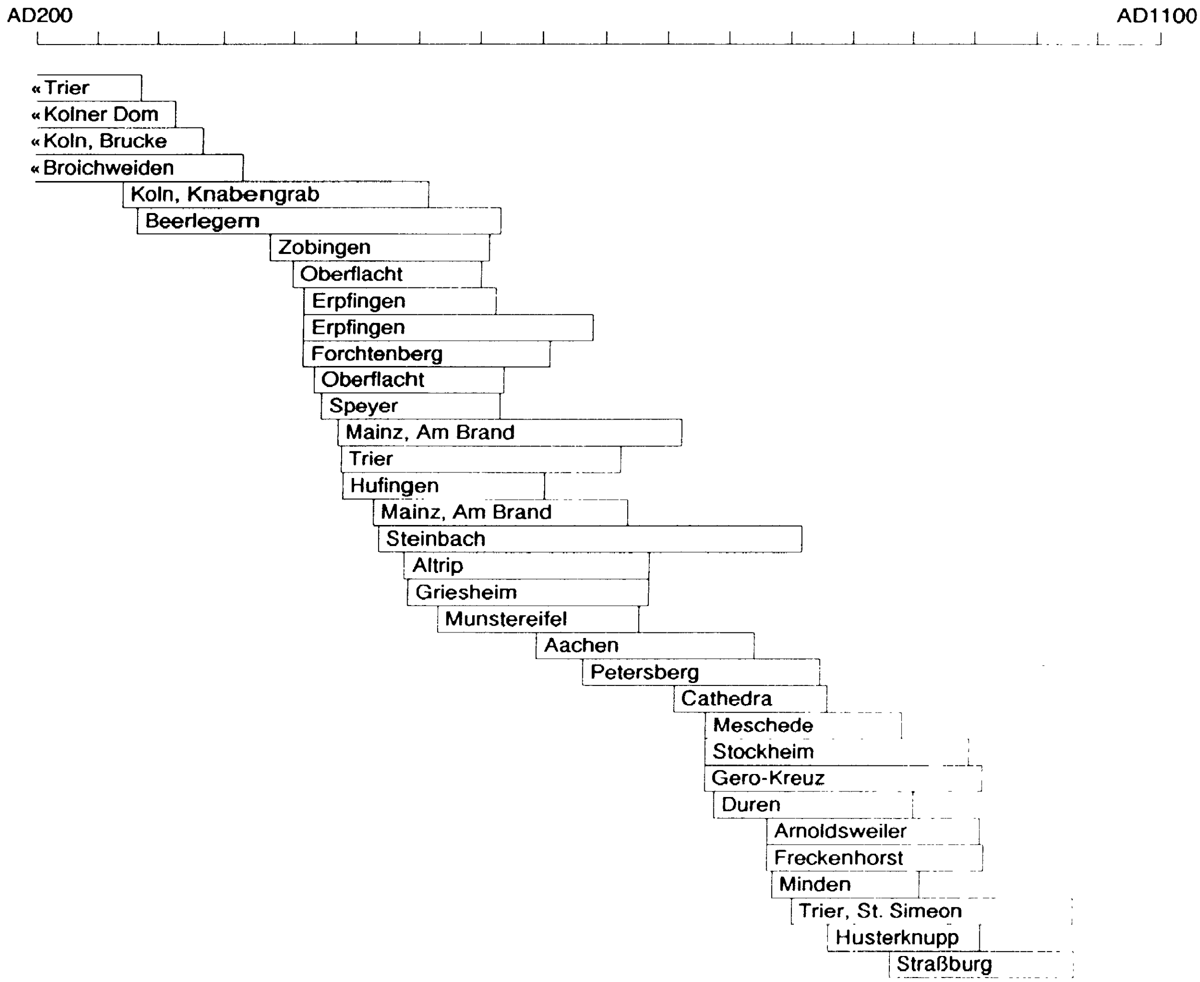

Figure 3.8 Bar diagram of North-German Saxon chronologies, arranged by start date (after Hollstein 1980)

Is this a regeneration phase?

Any woodland is the product of its past exploitation patterns. Thus it is necessary to review the Roman evidence briefly before turning to the Saxon period.

There is a distinct reduction in the tree-age of timber trees used by the Romans for a variety of constructions such as revetments and pile foundations from the 1st to the 3rd centuries. Most tree-ring chronologies constructed from 1st century features produce chronologies that extend back 250-350 years, whereas most tree-ring chronologies constructed from 3rd century features only extend back 100 years. There are several possible reasons for this, but the most likely candidate is intensive exploitation of the available resources by rapidly expanding populations or industrial usage. We have no datable tree-ring samples from a 4th century site in England. Although timber continues to be used at this period, none of the samples so far examined has more than 50 rings.

This is not to suggest that there are no trees of any great age in England and Wales in AD400. It may be that the areas of woodland which produced Roman timber were not in the areas exploited by the Saxons, although possibly areas of Roman coppice woodland or perhaps trees from abandoned agricultural areas did get used throughout the early and middle Saxon period. It is extremely difficult to make more than general observations at this point, since many timber trees of AD400 could have been hopelessly rotted out by AD500 and 600 and simply been ignored or burnt. However it must also be remembered that we consistently fail to find datable tree-ring material from 4th century contexts even on major urban sites.

There are two possible reasons for the widespread use of trees which began to grow in the first decades of the 5th century in middle Saxon settlements. Either Roman short-cycle coppice ceased to be managed effectively and grew on into timber trees, or areas which were not wooded became colonised by

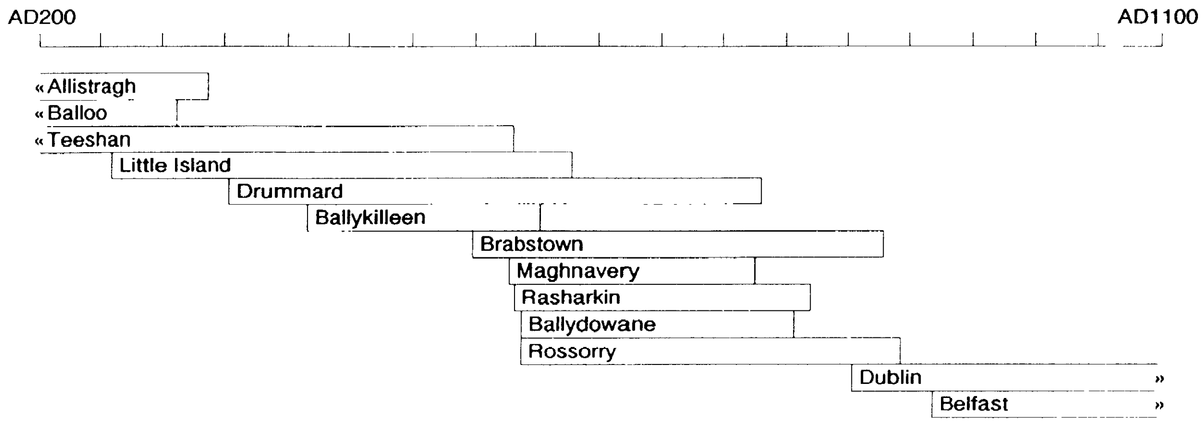

Figure 3.9 Bar diagram of some of the Irish Saxon chronologies, arranged by start date (data from Baillie 1982)

trees after they ceased to be occupied. Whether coppice or pollards that cease to be managed could produce the quality of timbers seen for instance at Hamwic and Barking is unclear. If there is an expansion of the wooded area, there should be pollen evidence for increased amounts of woodland, which does not appear to be the case. There is however plenty of landscape evidence that supports this view (Hooke 1989).

Later changes in woodland exploitation patterns

At the end of our period there is evidence of other effects which can only be seen by examining large quantities of data from an urban site. Nigel Holman's (unpubd) innovative analysis of the Coppergate data involves statistical analysis of the degree of correlation between timbers from different structures). The low correlation values between the ring sequences from structures S1 and S5, both of which are on tenement B (Fig 3.3), suggest that two different woodland sources are involved. The analysis also suggests that there is a degree of multiple sourcing in the timber-supply which implies the existence of a middle-man. This supports the view that the towns are by now developing as markets for such products. However it should be pointed out that only for the end of this period do we have sites with sufficient data to be able to do these sorts of analyses. Some of the large groups of data from Roman and medieval assemblages may produce equally interesting results. Until this is done the full implications of the Coppergate analysis may remain obscure.

Future work

Much remains to be done. Pollen and landscape evidence appears to be at odds at a regional level, and this needs closer examination- Tree-ring evidence points to a consistent pattern of recovery of timbers in England and Germany which is different from that in Ireland. If we are to interpret the tree-ring data as a record of past exploitation of now lost woodland, further studies of modern woodland are necessary. This might include, for example, examination of modern abandoned pollard and coppice. There are currently large amounts of such material standing that have not been exploited for 50 or more years. The characterisation of these groups may allow improved analysis of timber assemblages from the immediate post-Roman period, when conditions may have been similar,

In addition Holman's study of the non-chronological aspects of an urban tree-ring assemblage from Coppergate points the way to studies of large collections of data from a range of urban sites.

Conclusion

This paper summarises what has been achieved in Saxon dendrochronology during the last 20 years, not only in the field of dating but also in other areas. The main emphasis so far has been on dating, and tree-rings have provided a series of totally independent and accurate dates for Saxon features which would not be possible from any other method. Without dendrochronology, for example, it would not be possible to determine which of the many Saxon wells was the earliest and which the latest. The study of tree-ring data as a means of extracting other information is still in its infancy, and it is in this area that future exciting discoveries are likely to be made. The sourcing of timber, for example from 10th century Coppergate in York, and the identification of imported timber, such as the barrel well from Grey-friars Road, Ipswich, provides information on the timber trade and trade links with mainland Europe, and may eventually tell us something about social organisation during Saxon times. In Ireland, analysis of the tree-ring data has made it possible to identify a building hiatus that is completely invisible to more ordinary archaeological investigation. Analysis has also identified different patterns of woodland exploitation in those areas within the sphere of Roman influence and those outside it.

Further research may yield more information on the spread and use of woodland after the departure of the Romans, and may help solve the conflict on re-afforestation during this period that has arisen due to differing evidence from pollen and from landscape studies.

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4 The Anglo-Saxon landscape and rural economy: some results from sites in East Anglia and Essex *Peter Murphy*

Abstract

This paper summarises some results from recent work on rural sites of Anglo-Saxon date in Eastern England. Sites in three contrasting landscapes are considered: the coastal marshes of Essex, the river valleys of central Essex, and the Breckland of West Suffolk. Evidence for adaptations of arable and pastoral farming to these differing environments, and for continuity and discontinuity of crop production from the Roman period, is presented and discussed. Palaeoecological data from these areas are reviewed. They are not thought to indicate widespread or permanent woodland regeneration in the 5th–6th centuries. Results suggesting a shift towards the cultivation of heavy clay soils are outlined.

Introduction

In recent years results from field-walking, the study of relict field boundaries and aerial photography have established that the Romano-British landscape over extensive areas of East Anglia was the product of large-scale planning and was intensively exploited. On the g-ravel terraces of the main rivers rectilinear field systems, partly of Roman date, are known from aerial photographs and from excavation (Brown 1988, Fig 2; Wilkinson 1988, 126-8). In some central Boulder Clay areas extensive co-axial field systems have been reconstructed from surviving patterns of field boundaries (Williamson 1987). The relationship of some of these to Roman roads, which cut across them, establishes a pre-Roman origin, whilst others were laid out on the same orientation as Roman roads, and are thought to be of Roman or, more probably, later date. Where intensive field-walking has been undertaken a high density of settlement has been established: in a 28 square kilometre sample area of NW Essex it is estimated that there were about 1.3 settlements per square kilometre, and stray Roman sherds derived from manuring were found throughout the area studied (Williamson 1984).

The intensively farmed landscapes of this part of Eastern England, and indeed much of lowland Britain, supported a level of production well beyond subsistence. Agricultural produce was required to maintain not only the inhabitants of the countryside but also a standing army, state administration and construction projects and the urban population. Although there is some evidence for the importation of cereals in the early Roman period (notably the first century AD London forum deposit (Straker 1984)) historical sources establish that by the fourth century cereals were being exported to the Rhineland (Frere 1973, 349–50).

The collapse of the imperial economic and administrative system in the 5th century, associated with the decline or ending of city life and the severing of long-distance trade links must obviously have had profound effects. At Colchester the Roman city was in decline in the 4th century and the earliest Saxon finds date to about 440450; subsequently, in the 8th and 9th centuries there was only a low level of

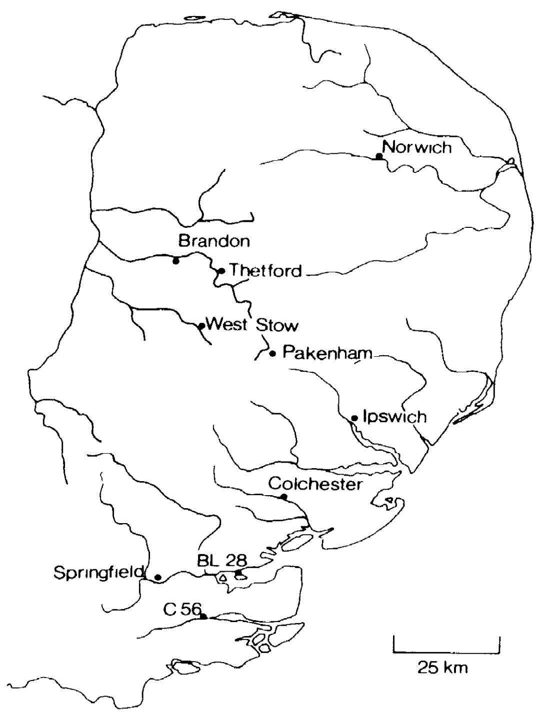

Figure 4.1 Location of main sites discussed in the text

occupation (Crummy 1981, l–23). One building of the Roman villa at Rivenhall, Essex, continued to be occupied into the 5th century and beyond (Rodwell & Rodwell 1985, 74–5) but elsewhere, for example at West Stow, Suffolk, early Saxon settlements were established on unoccupied sites (West 1985, 167). Even where farms continued in use, however, there can be no doubt that their economies differed significantly from those of the late Roman period. Throughout the later 5th and 6th centuries 'population densities were low and political units small' (Arnold 1988, 194). In these circumstances the pressure to produce a surplus of agricultural produce beyond subsistence needs would have been reduced, although the presence of prestige grave-goods in early Saxon cemeteries must point to some disposable income. Subsequently, from the 7th century onwards, these small and essentially self-sufficient communities coalesced to form larger political and economic units and town life was eventually re-established, in this area most notably at Ipswich, Colchester, Norwich and Thetford.

Whilst the general pattern of social and economic development between the 5th and 10th centuries is becoming increasingly well-established, data on agricultural change have, until recent years, been sparse; and palaeoecological results, which would help to clarify the effects of agrarian change on the landscape virtually non-existent. Nevertheless, some advances have been made in our understanding of the Anglo-Saxon countryside. Whitelock (1952, 14) thought that the early Saxon landscape was 'heavily forested' and 'areas under cultivation were on the whole small, surrounded by woodland and waste' outside some chalk and limestone areas. More recently Rackham (1986, 75-85; this volume), using evidence from the Domesday survey, Anglo-Saxon charters and place-name studies, concluded, to the contrary, that there was no large scale secondary woodland development at the end of the Roman period. Apart from a few areas of more extensive woodland, such as the Weald and the Chiltern plateau, much of England consisted of farmland interspersed with limited areas of woods. On parts of the East Anglian clays field-walking evidence does indeed suggest that many settlements were abandoned in the late 3rd to 4th centuries, but the survival of the co-axial field systems seems to indicate that scrub regeneration was suppressed in the post-Roman period by grazing, even if the fields were no longer under arable cultivation (Williamson 1988, 171).

In this paper some palaeo-economic and ecological results from two areas of Eastern England will be presented: the coast and central river valleys of Essex and the west Suffolk area (Fig 4.1). These results provide new and independent sources of information on Anglo-Saxon farming and rural landscape, which complement the historical and field archaeological data. Work has also been done at excavations of urban sites, particularly at Norwich and Ipswich (Ayers & Murphy 1983; Murphy 1987a; 1987b). Questions about the relationship between these early trading settlements and towns and their rural hinterland, and about the extent to which early urban populations had a partly agricultural economy lie outside the scope of the present paper, but will be considered elsewhere.

The Essex coast

Between 1982 and 1987 a survey of intertidal sites along the estuaries and open coast of Essex was undertaken (Wilkinson & Murphy 1986a). Many later prehistoric wooden structures were found stratified within estuarine sediments and numerous 'Red Hills' (salt-producing sites, mainly of Late Iron Age to Roman date) were located. Anglo-Saxon sites were, however, very uncommon. In some areas, particularly in the estuary of the River Crouch, this seems to be related to localised changes in coastal morphology. Throughout much of the upper Crouch estuary, within a deep sequence of estuarine clays, there is a thin, often humified, band of *Phragmites* peat dated to between 1610±70BP (HAR–5225) and 1380±80 BP (HAR–6589). Analysis of diatoms and macrofossils (Manson 1983; Wilkinson & Murphy 1988) indicates that this peat was formed in fresh, or at most slightly brackish, water conditions. It overlies a layer of mineral sediment deposited in open freshwater, which in turn had been deposited on an estuarine sediment surface, 'ripened' as a result of sub-aerial weathering and desiccation. Pollen is generally absent or poorly preserved in this peat, though at one site, (Crouch Site 9), Scaife (forthcoming) obtained a count of 200 grains. The spectrum is dominated by Gramineae (76% of total pollen) with *Taraxacum*- type at 8.5% and other herbs at lower levels. Tree pollen is sparse: *Quercus* comprises 2.5% of total pollen, Pinus 1% and *Corylus*- type *6%.* The high percentage of grass pollen probably is related to local vegetation, dominated by *Phragmites* and other fen grasses, though tentatively a generally open coastal landscape may be inferred.

In the upper estuary, development of extensive reedswamp must have made the channel relatively inaccessible; the one site definitely datable to the Anglo-Saxon period in this estuary (Crouch Site 52) is a rather haphazardly-laid platform of *Quercus, Corylus, Alnus, Prunus* and possibly *Tilia* brushwood, presumably intended to provide access to the river across the reedswamp (Cl4 date: 1420±70BP (HAR–6581)). In general it seems probable that the growth of fringing reedswamp markedly reduced the value of the river for transportation, with a corresponding reduction in estuary-edge activity.

Such considerations do not, however, apply to the Blackwater Estuary, where there is no evidence for a late Roman/early Saxon regression phase. Here open estuarine conditions persisted, yet evidence for Saxon activity is again sparse. Again, only one structure of this date is known: 98 at Blackwater site 28 with a radiocarbon date of 1020±80BP (HAR-7058). This comprised a group of ten surviving vertical posts around which was a confused scatter of horizontal roundwood and timber (Wilkinson & Murphy 1986b, 31-3 72). Discrete patches of matted plant material proved to consist of indeterminate monocotyledenous stems and woody stems, with grass culm fragments and fruits and seeds of *Suaeda maritima, Salicornia* sp, *Limonium / Armeria, Aster tripolium* and *Ruppia* sp. There were also areas of reddish-brown clay loam containing flecks of red-fired clay and carbonised plant material, including charcoal of oak *(Quercus* sp), charred *Halimione*- type stems, charred calyces of *Limonium/Armeria,* capsule lids and seeds of *Plantago maritima,* charred *Juncus* capsules and, surprisingly, two glume bases of emmer *(Triticum dicoccum).* 'Finds' were sparse, but included scatters of heat-shattered flints and some friable pottery sherds. This structure, and others of prehistoric date, is exposed on a planed-off horizontal mudflat surface, but extensive hand-augering in this area has defined an underlying pattern of infilled channels, and the relationship of the wooden structures to them. Structure 98 has been shown to be located probably on a former salt-marsh surface, unlike some other structures, which clearly bridged, or gave access to, salt marsh creeks.

Taking all the available evidence together, 98 seems to represent a collapsed 'domestic' structure of insubstantial type; apparently a shelter built on the salt marsh for occasional transient use. Archaeological evidence provides no basis for assessing what activities might have been involved. However, in historical times, these marshes were used primarily as sheep pasture. According to the Domesday survey most coastal settlements were grazing sheep on the marshes, and it is estimated that the total flock on the coast was in excess of 18,000 (Darby 1957, 241–4; Smith 1970,9).

Sites with animal bone are uncommon along the coast, though limited sampling of midden-type deposits on the foreshore at Canvey Island, of Roman and medieval date, has produced some small bone assemblages in which sheep/goat bones, mainly sheep, predominate (Luff 1987). It is hoped that further work on these deposits will be possible but provisionally the results from Canvey are thought to provide some evidence for marshland sheep grazing having been established at least by the Roman period.

In summary, then, historical sources show that by the 11th century the marshes were extensively grazed by sheep and archaeological data suggest that this form of land use may have begun in the Roman period, if not before. Direct evidence for sheep grazing in the 5th–10th centuries is lacking, and indeed could only be supplied by the discovery of domestic deposits with appropriate bone assemblages, but it seems most improbable that such an important resource as salt-marsh pasture would have been neglected. Unfortunately, on the marshes themselves, sheep grazing is a form of land-use which is archaeologically invisible. Little more than insubstantial structures such as 98 could be expected to survive.

The Chelmer Valley

The catchment of the River Chelmer comprises a large area of central Essex, and the river flows into the Blackwater Estuary near Maldon. Flanking the river channel, on the gravel terraces and glacial gravels overlooking the terraces are extensive areas of crop marks (Brown 1988, Fig 2; Buckley & Hedges 1987, Fig 1). At Springfield, about 3km to the south-east of Chelmsford, cropmark sites of Neolithic to Late Saxon date have been under excavation since 1979. The Springfield Lyons excavation (Buckley & Hedges 1987) was initially undertaken to investigate a large circular ditched enclosure, about 60m in diameter, which proved to be a Late Bronze Age settlement. Unexpectedly, however, the excavations also exposed a mixed inhumation/cremation cemetery of early Saxon date and a late Saxon settlement. During the excavations construction work was also proceeding for the new Al2 Chelmsford By-Pass, and contractors' excavations during bridge and culvert building exposed sections through infilled river channels. Reports on these excavations and river valley sections are currently being prepared for publication in the journal *East Anglian Archaeology* and brief summaries of the main results will be presented here.

The Sandon culvert section

Where the new road crossed the Sandon Brook, a tributary of the Chelmer, a section was exposed during the construction of a culvert. The section, 7m in length and about 2.5m deep, showed a shallow asymmetrical infilled channel with a maximum depth of 60cm, incised into sub-alluvial gravels and overlain by 105cm of fine-textured, mainly oxidised, mineral alluvium. The channel fill was a humic dark grey silt loam (or organic detritus mud) with abundant fragments of wood and leaves and included sandy lenses and laminations. There was a 7cm thick layer of dark grey medium coarse sand with wood fragments at its base. A sample of wood from the base of the channel fill gave a radiocarbon date of 1770±70BP (HAR-6580), and wood from near its top was dated to 860±70BP (HAR–6570). The organic detritus mud is thought to indicate infilling of the channel partly as a result of seasonal flooding from other, active, channels, though the sandy sediments imply some active stream flow.

The results of the plant macrofossil analysis are summarised in Fig 4.2. Pollen analysis was not undertaken. Macrofossils of wetland and aquatic taxa comprise the larger part of the assemblages, though only the most common taxa are plotted individually in Fig 4.2. The progressive reduction in abundance of Alismataceae fruits and embryos and concurrent increase in *Carex* nutlets implies that conditions became drier as the channel was infilled and mixed sedge fen developed. The mineral alluvium overlying the channel fills, deposited presumably by over-

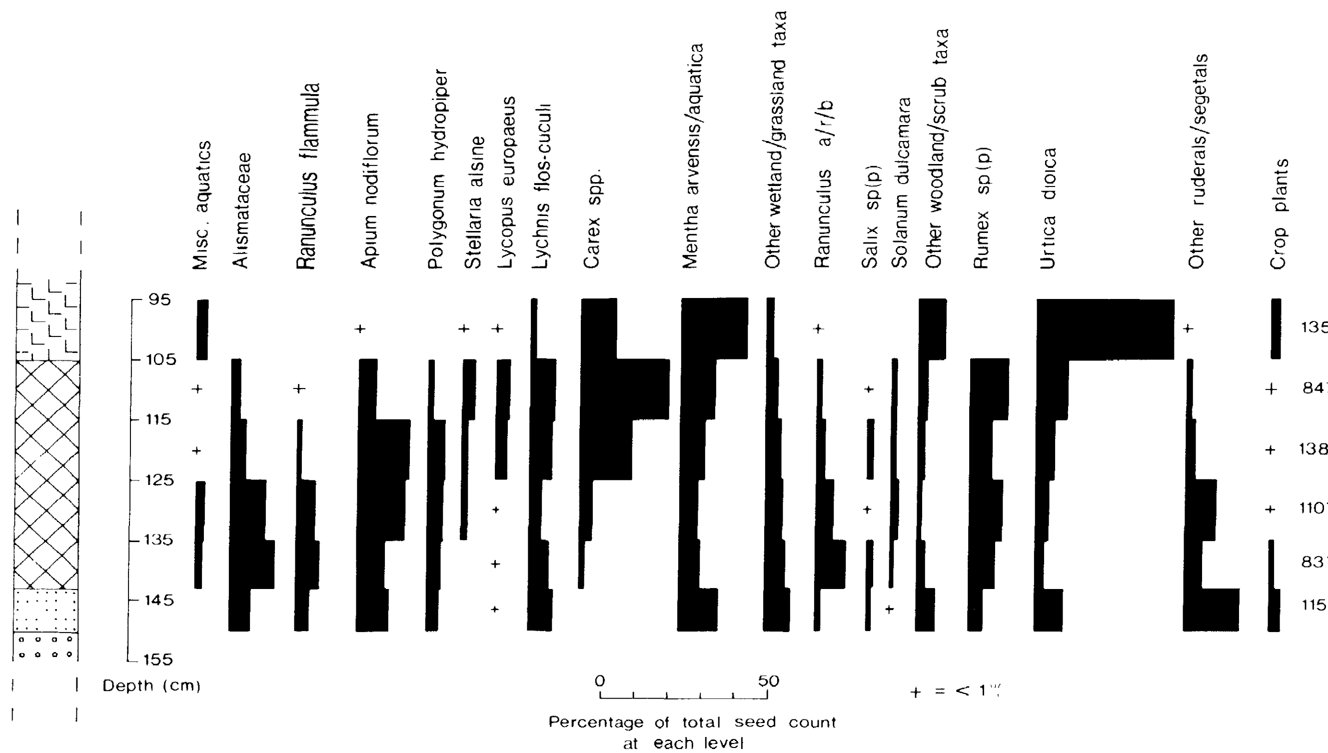

Figure 4.2 Plant macrofossils from the Sandon Culvert channel (summary diagram). Only the most abundant or ecologically distinctive taxa are plotted individually. Unidentified macrofossils, fragmentary unquantifiable material and Juncus seeds are omitted.

bank flooding from another channel, produced an assemblage dominated by *Urtica dioica.*

Macrofossils of woodland, scrub and hedgerow plants are present. Taxa include *Moehringia trinervia, Acer campestre, Rubus fruticosus, Rubus idaeus, Prunus spinosa, Prunus domestica* ssp. *insititia, Crataegus monogyna, Cornus sanguinea, Anthriscus sylvestris, Mercurialis perennis, Corylus avellana, Quercus* sp, *Salix* sp, *Solanum dulcamara* and *Sambucus nigra.* These macrofossils appear to be derived both from wet valley-floor woods and from woodland on better-drained soils on the valley slopes. Despite a relatively wide range of taxa, macrofossils of woodland plants are uncommon, never comprising more than 7.5% of total 'seeds'; in marked contrast channel fills dated to the Bronze Age elsewhere on the roadline produced assemblages with up to 55% *Alnus* fruits and 9% *Tilia* fruits, besides other macrofossils of woodland taxa. Evidently, throughout the infilling of the Sandon Brook channel conditions locally remained open. There is no evidence for the development of extensive willow *(Salix)* or alder *(Alnus)* carr.

Remains of crop plants and charcoal fragments were also present. Carbonised grains and spikelet fragments of spelt wheat *(Triticum spelta)* were present in all samples, and oats *(Avena* sp) remains occurred near the base of the channel. The sample from 105–115cm included a capsule fragment of flax *(Linum* sp).

In summary these results appear to indicate persistence of open conditions in the vicinity from the late Roman to Saxon periods, whilst the crop plant remains imply continued agricultural activity between 1770 and 860BP.

The Springfield Lyons early Saxon cemetery

Samples for bulk flotation were collected from nineteen cremation pit fills, four grave fills, and two pits during excavations at this site. The pits, however, are only tentatively dated to the early Saxon period and will not be considered further. Carbonised plant remains from the funerary contexts are summarised in Table 4.1. Sample size was very variable; some of the cremation pits were small and produced only samples of approximately eight litres, but some of the grave fills were completely sieved and floated.

The most frequent and abundant macrofossils in these samples are 'tubers' (swollen basal internodes) of the onion couch, *Arrhenatherum elatius.* This grass is commonly found on well-aerated, moderately deep, neutral or near-neutral soils as a component of lightly grazed or mown grasslands on verges or under hedges (Pfitzenmeyer 1962). Other taxa commonly found in grassland include *Ranunculus* spp, *Stellaria graminea* (abundant in one cremation pit fill), *Medicago/Trifolium* spp, *Vicia/Lathyrus* spp, *Rumex acetosella* and *Plantago lanceolata*. *S. graminea* and *R. acetosella* are often indicative of light sandy soils (Clapham *et al* 1962). Weed taxa are also represented, and stem and root/rhizome fragments common. The assemblages of wild plant remains from these contexts are thought to represent rough weedy grassland from which plants were uprooted to provide kindling for cremation pyres.

Carbonised remains of crops are also present, but in very small amounts. Taxa include spelt, possibly emmer, a free-threshing hexaploid wheat, indeterminate barley *(Hordeum* sp), and oats, rye *(Secale cereale)* and a poorly-preserved seed possibly of pea *(Pisum sativum)*. There is evidence from two other sites in Eastern England – West Stow, Suffolk (Murphy 1985) and Mucking, Essex (Van der Veen 1981–3) – that the cultivation of spelt, a characteristic Roman crop, continued through into the early Saxon period (see also J Rackham, this volume). The sparse results from the Springfield cemetery seem consistent with this. Whether the cereals from these features are chance or intentional inclusions is uncertain, though Whitelock (1952, 25) mentions the pagan Saxon practice of burning grain after a death 'for the health of the living and the house'.

The Springfield Lyons late Saxon settlement

The archaeological features from this phase of activity at the site comprised mainly post-holes and slots, defining rectangular buildings, large pits, gullies and ditches (Buckley & Hedges 1987). No floor levels survived, and only traces of possible hearths were detected. Most of the samples came from the structural features (sixty contexts – the fills of post-holes and slots) and pits (thirty-one contexts). Sample size was variable. The minimum sample was an 8 litre unit, but normally several units were collected per context. In some cases entire layers, comprising up to *c* 688 litres, were processed. Precise dating is a problem. Several of the buildings are superimposed and must represent more than one phase of activity, but datable finds were extremely rare. Pottery and other artefacts from the pits point to 10th to 11th century occupation. In Essex, however, there are grounds for suspecting an almost aceramic phase between the early 8th and 10th centuries, so the settlement could have been established prior to the 10th century. For present purposes, however, all samples will be considered as a single chronological aggregate.

Typical carbonised crop plant remains from the site are illustrated in Fig 4.3, and the results are summarised in Table 4.2. This gives a general impression of the frequencies and abundance of macrofossils, but conceals patterns of spatial variability across the site and between different types of feature. Though relevant to the interpretation of the functions of buildings and pits this spatial patterning will not be discussed here.

In order of abundance the cereal grains are of oats, wheat, barley and rye, though the relative amounts of spikelet and rachis fragments are different. The apparent predominance of rye rachis fragments is misleading, for most of the rye rachis came from only three contexts and may perhaps represent fuel waste *(cf* Moffett, this volume). The identifiable wheat grains are exclusively of short hexaploid forms. Rachis nodes of free-threshing hexaploid wheat are present, but spikelet fragments of glume wheats – mainly spelt with one emmer glume base – are more common. This result seems anomalous. No other major late Saxon settlement site in Eastern England has so far produced remains of spelt or emmer (two emmer glume bases were, however, found in a sample from the late Saxon coastal structure discussed above). At a multi-period site the possibility of residual material being present has to be considered; late Bronze Age features at Springfield Lyons certainly contained abundant glume wheat spikelet fragments. If residual Bronze Age plant remains had become incorporated into the Saxon deposits, however, one would have expected contamination to be most severe in that part of the Saxon settlement which overlapped with the area of Bronze Age settlement, but in fact glume wheat spikelet fragments are present at low densities right across the Saxon settlement. Furthermore, the spelt:emmer glume base ratio in Bronze Age contexts was, overall, about 1.85: 1. Cross-contamination ought to reflect this ratio, but in the Saxon features emmer is scarcely represented. For these reasons the spelt and emmer remains are thought to be genuinely of Saxon date. These spikelet fragments are therefore believed to indicate either continued cultivation of spelt and emmer, or their persistence as contaminants of free-threshing wheat crops. There are no firm grounds for distinguishing between these two alternatives, though the latter is perhaps more likely.

No nodes of free-threshing tetraploid wheat were noted at this site, though rivet-type wheat has been reported from near-contemporary contexts at West Cotton (Campbell, this volume). In Essex, however rivet-type wheat occurs quite frequently in medieval contexts (eg. the 13th century Round Wood site at Stansted Airport (Murphy, 1990), but has not so far been found in pre-conquest deposits.

The predominance of oats is unusual. Though partly resulting from the presence of some large deposits of oats in the post-holes of one building, oat grains are nonetheless frequent in a wide range of contexts. The importance of oats might perhaps be related, in part, to the production of animal fodder. Unfortunately, virtually no bone survived at the site, so no reconstruction of patterns of animal husbandry is possible. Other crops included horse beans *(Vicia faba* var *minor)*, possibly peas, and flax. There was one fruitstone of bullace/small plum, probably a cultivated form, but most of the fruits

Table 4.1 Summary of carbonised plant macrofossils from early Saxon cremation pit fills and grave fills at Springfield lyons

	Frequency	Total of specimens
Cereal grain fragments	16	-
Indeterminate cereal grains	8	28
Triticium spp. grains	8	25
Hordeum spp. grains	2	2
Avena spp. grains	3	6
Secale cereale grains	1	4
Triticium spp. glume bases	3	5
Triticium spp. spikelet bases	3	5
Triticium aestivum s.l rachis nodes	1	1
Triticium spelta glume bases	5	17
Triticium spelta rachis internodes	1	1
Triticium cf dicoccum spiklet bases	1	1
Avena sp. awn fragments	1	-
Pisum-type	1	1
Ranunculus acris / repens / bulbosus	1	1
cf. Ranunculus spp	1	8
Stellaria gramenia L	2	170
Chenopdium album L	2	-
Chenopodiaceae indet	2	-
Malva sp	1	1
Medicago / Trifolium sp	2	5
Medicago / lupulina - type	2	10
Vicia / Lathyrus spp.	4	11
Polygonum aviculare agg	2	5
Polygonum lapathifolium / persicaria	1	1
Fallopia convolvulus	1	1
Rumex acetosella agg	2	9
Rumex spp	5	22
Polygonaceae indet	2	12
Plantago lanceolata L	1	4
Galium sp	1	1
Anthemis cotula L	1	6
Tripleurospermum maritimum (L) Koch	1	1
Carex spp	1	1
Arrhenatherum elatius var bulbosum 'tubers'	9	148 + frags
Bromus mollis / secalinus	2	4
cf Sieglingia decumbens (L) Bernh	1	1
Gramineae indet	5	18
Stem fragments	7	-
Root/rhizome fragments	12	-
Contexts sampled	23	

Unless otherwise indicated taxa are represented by fruits or seeds. In some cases accurate counts of fragmentary macrofossils could not be obtained.

and nuts could be from wild plants. A few fruits of *Iris* and *Spargunium* probably reached the site with reeds collected for thatch or litter.

The composition of the assemblages (particularly the rarity of chaff fragments) indicates that most are largely composed of semi-cleaned crop products. Cereal grains consistently predominate and there are no deposits of crop cleaning waste. The weed flora is consequently dominated by taxa with large propagules (at least when originally contained within their inflorescence bracts etc.). The abundance of *Anthemis cotula* fruits may seem inconsistent with this assertion. However, the presence of some aggregates of *A. cotula* fruits implies that at least some of the fruits from the site were originally present as intact or semi-intact capitula which subsequently disintegrated in the soil or during sample processing.

Some weeds characteristic of acid sandy soils are present (eg *Scleranthus annuus, Spergula arvensis, Rumex acetosella* and *Aphanes* sp (Ellenberg 1988, 633)), and there are some damp grassland species, but the high frequency of *A cotula* fruits (though not necessarily their numerical predominance) does imply that much of the arable land was located on clay soils. *A cotula* is nowadays largely confined to poorly drained, alkaline, clay soils (Ray 1971). Soils of this type occur on the southern margins of the chalky till to the north and west of the site, where they are mapped as the Hornbeam 3 Association (Hodge *et al* 1984,221).

West Suffolk

Separated from the coastal zone by the central Boulder Clay plateau of East Anglia, the western part of Suffolk is characterised by generally low relief with predominantly light sandy and chalky soils, including those of the Breckland (Corbett 1973), with broad flat river valleys draining westwards towards the peat fens. Two large sites, as yet not fully published, have been extensively excavated in recent years; the Roman fort and settlement at Pakenham and the Middle Saxon settlement at Staunch Meadow, Brandon. A third important site, the early Saxon settlement of West Stow has recently been published (West 1985).

Pakenham and Micklemere

In 1984-5 part of the Roman fort and a large 30 hectare settlement at Pakenham was excavated by the Suffolk Archaeological Unit in advance of road construction. Extensive sampling produced large assemblages of carbonised plant remains, bone, shell and other material. Apart from the Roman contexts a few late Neolithic and Iron Age features were also sampled, but no Anglo-Saxon features were found. However, the opportunity was taken to cut a machine trench into the deposits at the margin of Micklemere, a largely infilled lake basin adjacent to the site. The section is described in Table 4.3. Samples were collected for pollen and macrofossil analysis, loss on ignition determination and dating. A radiocarbon date of 1290±100 BP (HAR-5936) wag obtained on peat from the base of the shelly mud at 164cm, whilst the sandy peat with fired clay, charcoal and bone at 203-214cm is thought, from the presence of a chip of glass, to be of Roman date. The section thus provides information on local habitat change from the immediate pre-Roman period onwards.

The basal peat produced plant macrofossil assemblages dominated by *Apium nodiflorum* and *Rorippa* spp, with a range of other grassland, wetland and aquatic taxa and a few weed seeds. A local environment of open fen and wet grassland subject to occasional flooding is indicated. The sandy peat between 192-214cm contained higher frequencies of *Ranunculus sceleratus, Eleocharis* sp, *Carex* sp and *Urtica dioica* with other weed taxa, pointing to locally damp conditions, somewhat disturbed and nutrient-enriched. Above this partly artificial deposit peat formation seems to have continued under less disturbed conditions until about 1290BP, when a layer of shelly lake mud was deposited over the peat. This mud produced rich assemblages of plant macrofossils, again mainly of aquatic and wetland taxa with some weed seeds. Ostracod valves, caddis larval cases, fish vertebrae and shells of aquatic molluscs were also present. *Salix* capsules and *AZnus* fruits occurred only at low frequencies, presumably just representing a few trees around the margins of the mere. In no samples from the section were macrofossils of trees common. The lake mud was overlain by thick sandy deposits, thought to be colluvial and related to tillage immediately upslope.

Pollen analysis was undertaken by Patricia Wiltshire (Murphy & Wiltshire 1989; Wiltshire 1988). Pollen was not well preserved and only low counts of identifiable grains were obtained. However from the relative paucity of arboreal pollen it was possible to establish that the local landscape was essentially open. Changing frequencies of pollen from wetland and aquatic plants and the presence of microbially derived iron sulphide spherules confirm a high water table (Wiltshire *et al,* in prep.) with occasional flooding while the basal peat was forming, with subsequent drier conditions until the lake mud was deposited. The relationship between cereal pollen and the percentage loss on ignition of the deposits is shown in Fig 4.4. Clearly at times when there was a high influx of mineral sediment cereal pollen levels were also high. This implies that soil erosion within the catchment and mineral sediment deposition in the lake basin, associated with cereal cultivation, occurred in two discrete phases: one in the Roman period and a second from about 1290BP, with a marked reduction between the two. Wiltshire *(op.cit)* notes that *Plantago* pollen persisted at relatively high levels after the reduction in cereal pollen levels, up to 190cm, and suggests tentatively that this might indicate that grazing continued after cereal farming had largely or entirely ceased. Obvi-

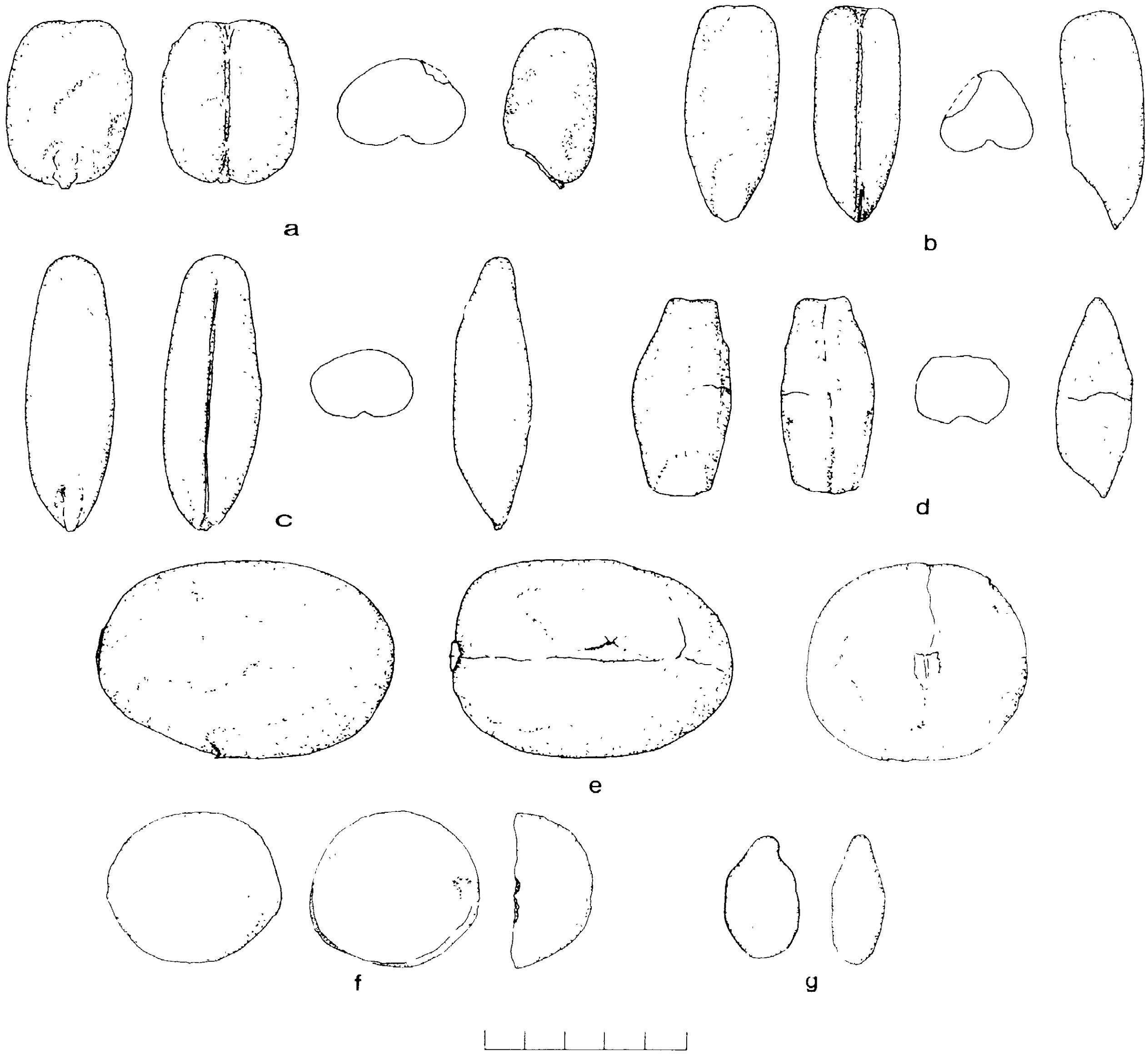

Figure 4.3(1) Carbonised crop plant remains from Late Saxon contexts at Springfield Lyons
Scale 5mm

a *triticum aestivum s. l. Grain 7283*
b *Secale cereale Grain 7313*
Avena sativa Grain. 7032
d *Hordeum vulgare hulled Lateral grain. 7304*
Vicia faba var minor Seed. 7032
f *Pisum-type Cotyledon. 7313*
g *Linum sp Seed. 7572*

ously, however, the lack of any woodland regeneration in the post-Roman period must indicate continued grazing in the area.

The inwashed sediment forming the lake mud is fine-textured and calcareous, in contrast to the sandy mineral component of the peat of Roman date. This must indicate a different sediment source. Soils in the vicinity are very varied, for the site is located close to the boundary between the light sandy, loamy and chalky soils of the Breckland (the Newmarket 2, Ludford, and Worlington Associations) and the heavier soils of the Boulder Clay Plateau (the Beccles 1 Association and Hanslope series) (Hodge *et al* 1984). The change in the type of lake sedimentation could be related to tillage of different types of soil. Although some of the sandy sediment in the Roman peat is probably of very local origin, it may be suggested that the Roman arable area was mainly on light sandy soils. The extreme rarity of *A cotula* in the large carbonised weed seed assemblages from excavated features at the Roman settlement site seems to support this suggestion. Cultivation of heavier soils on the Chalky Boulder Clay during the Anglo-Saxon period may have been one factor resulting in the deposition of the lake mud.

Staunch Meadow, Brandon

The middle Saxon settlement, consisting of rectangular timber buildings with an associated industrial area, church and cemeteries was located on a sand ridge surrounded by peat on the flood plain of the River Little Ouse, and was connected to higher ground by a timber causeway (Carr *et al 1988). Sec*tions through the peat surrounding the site were examined at four locations, and column samples were collected for analysis of pollen, macrofossils and radiocarbon dating (Fig 4.5). In all four sections the peat overlay a basal grey or greyish brown sand. 'Iwo radiocarbon dates from the base of the peat in the deep section 4, close to the present river channel were 1950±70BP (HAR-6475) and 1920±60BP (HAR-6474), whilst in the shallower section 1, further back from the river, the base of the peat was dated to 181±80BP (HAR-4087). Within the top 40cm of peat, in sections 1 and 3 were layers of charcoal with radiocarbon dates of 1350±70BP (HAR-4086) and 1330±80BP (HAR-6605). In section 2 there was a band of white sand in an equivalent stratigraphic position, relating to increased soil erosion on the sand ridge. Peat from above this was dated to 1390±80BP (HAR-5072). These charcoal and sand layers relate to a widespread fire on the sand ridge, falling within a calibrated date range of AD605-660. In section 1 carbonised remains of Cal*luna vulgaris* were common, whilst the charcoal layer in section 3 also produced charred twigs and

Figure 4.3(2) Scale 1mm

a *Triticum spelta Rachis internode. 3334*
b *Triticum dicoccum Glume base. 7371*
c *Triticum aestivum s.l Rachis node. 7119*
d *Triticum spelta Glume base. 7085*
e *Avena sativa Floret base. 7116*
f *Linum sp Capsule fragment. 7305*
g *Secale cereale Rachis section. 7290*
h *Hordeum sp Basal rachis internodes 7081*

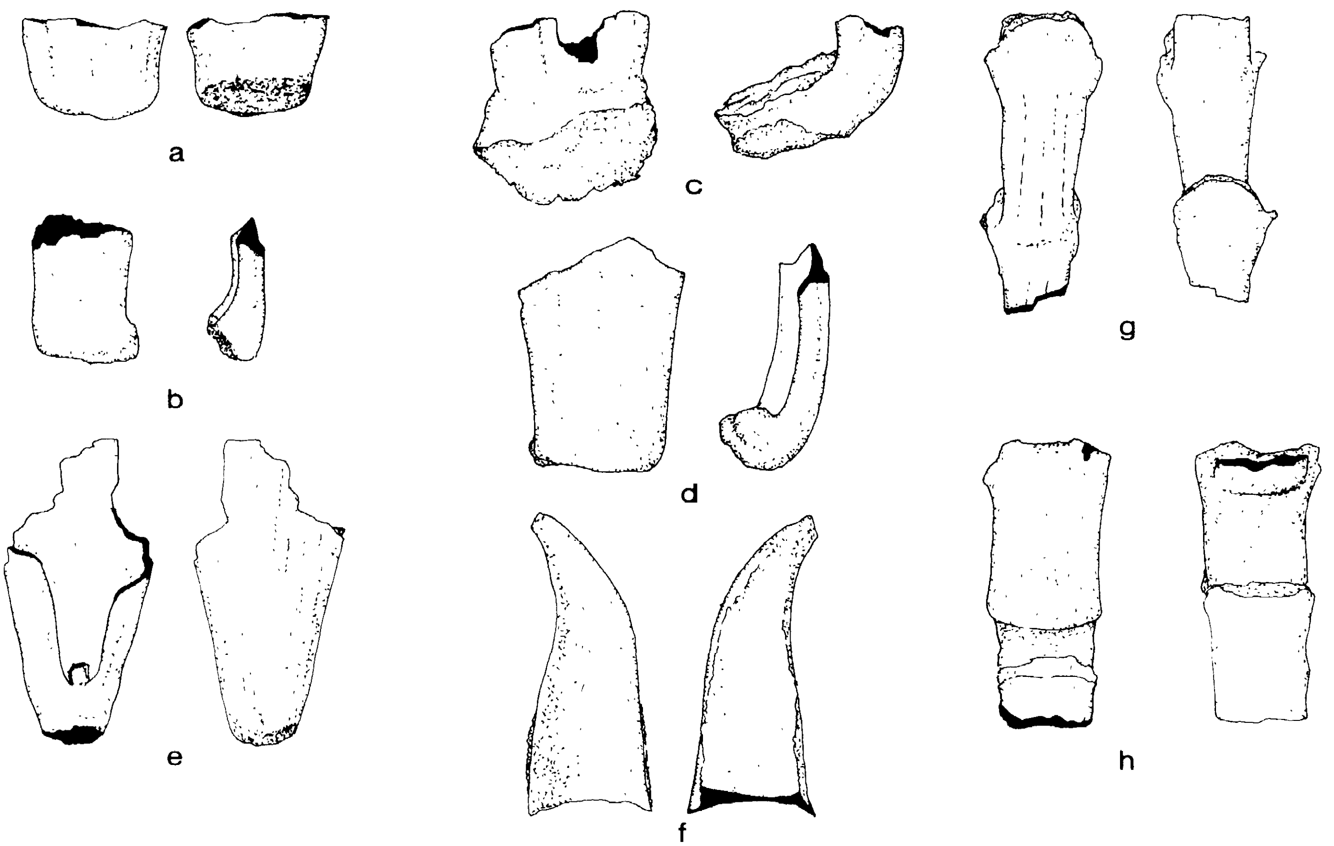

Table 4.2 Carbonised and mineralised plant macrofossils from Late Saxon contexts at Springfield Lyons

	Frequency	Total number of specimens
Cereal grain fragments	85	-
Indeterminate cereal grains	75	1310
Triticum spp grains	65	770
Hordeum vulgare L emend Lam grains	11	155
Hordeum sp grains	23	49
Avena spp grains	71	1789
Secale cereale L grains	25	81
Cereal/grass culm nodes/fragments	13	-
Cereal indet rachis fragments	1	1
Triticum spelta L. glume bases	23	32
Tritucum spelta L. spikelet bases	1	2
Triticum spelta L. rachis internodes	2	2
Trticum dicoccum Schubl glume bases	1	1
Triticum aestivum sl rachis nodes	6	11
Triticum sp(p) glume bases	8	11
Triticum sp(p(spikelet bases	16	17
Hordeum sp(p) rachis internodes/nodes	2	3
Avena sativa L floret bases	7	14
Avena sp(p) floret bases	3	4
Avena sp(p) awn fragments	2	-
Secale cereale L rachis internodes	10	86
Vicia faba L var minor	17	23
Pisum-type	13	36
Large Leguminosae fragments	29	-
Linum sp seed	1	1
Linum sp capsule fragments	1	3
Rubus cf idaeus L.	1	1
Rubus fruticosus agg	1	18
Rubus sp	4	53
Rosa sp	2	84
Prunus spinosa L	9	20
Prunus domestica spp *insititia*	1	1
Prunus sp	6	-
Crataegus monogyna Jacq	1	8
Malus sylvestris/domestica	2	2
Sambucus nigra	1	1
Corylus avellana	47	-
Ranunculus acris/repens/bulbosus	3	3
Silene sp	2	2
Agrostemma githago L	14	20

Stellaria graminea L	1	1
Spergula arvensis L	1	1
Scleranthus annuus L	1	1
Caryophyllaceae indet	1	1
Montia fontana ssp *chondrosperma*	1	1
Atriplex sp	5	-
Chenopodium *album* L	14	-
Chenopodiaceae indet	20	-
Malva sylvestris L	1	1
Malva sp	10	51
Medicago lupulina-type	4	6
Medicago / Trifolium	4	5
Trifolium sp	2	2
Vicia / Lathyrus spp	48	143
Vicia tetrasperma-type	1	3
cf Ulex / Cytisus sp	1	1
Aphanes arvensis / microcarpa	1	1
Umbelliferae indet	2	6
Polygonum aviculare agg	8	10
Fallopia convolvulus L	9	11
Polygonum lapathifolium / persicaria	5	10
Rumex acetosella agg	3	5
Rumex sp(p)	29	133
Polygonaceae indet	14	26
Urtica dioica L	4	61
Urtica urens L	2	2
Solanum nigrum L	1	2
Hyoscyamus niger L	6	8
Prunella vulgaris L	2	6
Stachys sp	1	1
Labiatae indet	2	2
Plantago lanceolata L	7	29
Galium aparine L	15	25
Galium sp	4	5
Tripleurospermum maritimum (L) Koch	3	3
Anthemis cotula L	33	355
Centaurea sp	2	4
Lapsana communis L	3	4
Compositae indet	8	11
Iris pseudacorus L	1	1
Sparganium sp	5	5
Eleocharis sp(p)	6	9
Scirpus sp	1	1
Isolepis setacea (L) R Br	1	1
Carex spp	14	31

Bromus mollis / secalinus	35	165
sieglingia decumbens (L) Bernh	2	2
Arrhenatherum elatius var *bulbosum* 'tubers'	8	10
Gramineae indet	33	183
Mineralised seeds, stem frags etc	2	-
Root/rhizome frags	14	-
Unidentified seeds etc	59	336
Total number of contexts	96	

Unless otherwise indicated taxa are represented by fruits or seeds. Fragmentary specimens are usually not quantifiable.

branches of hazel, some with transverse cuts, charcoal from larger wood of ash *(Fraxinus)*, and oak, charred culm nodes of *Phragmites*, inflorescences of *Juncus acutiflorus*, seeds of other wetland taxa and some remains of cereals and crop weeds. It would appear that areas of *Calluna* heath on the sand ridge were burnt, whilst the carbonised material from section 3 seems to represent destruction debris from a building washed or dumped onto the contemporary peat surface.

In section 4 this fire debris was not evident, but peats and dumped sand deposits between 50-130cm produced plant macrofossil assemblages with a high proportion of ruderal and segetal species and wetland plants (particularly *Ranunculus scelerutus* and *Carex* spp). Remains of food plants from these wet layers included *Prunus domestica* ssp *insititia, C avellana, Linum cf usitatissimum, Cannabis sativa* and carbonised grains and rachis nodes *of S cereale.*

In an area excavated on the waterfront three artificial mounds constructed by dumping sand on the peat surface were found. On these mounds were several phases of clay features evidently relating to industrial activity. Samples from this area were very varied in composition. Some were charcoal-rich, and two included large deposits of charred cereals. There was a thin scatter of *Linum* capsule fragments and seeds and some small discrete patches of flax stem waste (identified by Phillippa Tomlinson). Processing of flax certainly was one activity taking place in this area. Within the surrounding peat there were also some very dense but localised deposits of *Sambucus nigra* seeds, up to about 150 seeds per cubic centimetre. Elderberries were clearly being processed in some way, possibly to produce beverages or, bearing in mind the evidence for fibre production in the vicinity, for dye production. Elderberry juice yields a greyish-blue dye and is known to have been used for dyeing in medieval Germany (Brunello 1973, 154). Seeds of *Reseda luteola*, dyer's rocket, were also present and might also indicate dyeing. Other organic deposits in this

Table 4.3 The section at the edge of Micklemere

0–73cm	Thin modern topsoil over dumped layers of gravel, brick rubble and chalk. Sharp boundary.
73–144cm	Brown to dark greyish-brown sand merging down into wet very dark grey (10YR 3/1) sand at base; common distinct large brown and reddish-brown mottles in upper part; structureless, friable; stoney, with gravel to large subangular and rounded flints; fibrous and fleshy roots; very sharp, undulating boundary.
144–164cm	Dark greyish-brown (10YR 4/2 to 5/2) mud (silt loam) with occasional sandy laminations; structureless, generally stoneless but with occasional gravel to medium rounded flints; freshwater mollusc shells locally abundant; fairly sharp, even boundary.
164–192cm	Very dark reddish-brown peat; abundant monocotyledonous plant remains; fairly sharp, even boundary.
192–203cm	Very dark reddish-brown fibrous peat; slightly sandy; rare flint chips, small pebbles; rare charcoal fragments; merging even boundary.
203–214cm	Sandy dark reddish-brown peat; slightly stoney with flint chips, small pebbles and fired clay fragments up to 3cm; charcoal, bone fragments; fairly sharp even boundary.
214–250+cm	Very dark reddish-brown peat with some roots and rhizomes; small patch of shelly mud at 221cm.

part of the waterfront produced fruitstones of *Prunus domestica* ssp *insititia*, seeds and endocarp fragments of apple *(Malus sylvestris/domestica)*, and nutshell fragments of *C avellana* and *Juglans regia*.

Much of the time available for environmental analysis at this site was devoted to the examination of the peats and other organic deposits at the margins of the sand ridge, but some flotation was undertaken to retrieve carbonised plant remains from features with dry sandy fills and from the sandy occupation deposit which covered parts of the sand ridge. Dry features were, however, sampled on a much smaller scale than comparable contexts at Springfield Lyons, discussed above. The two most abundant cereals were rye and six-row hulled barley. Free-threshing hexaploid wheat *(Triticum aestivum sl)* was also present, but oats were rare, and represent, in part, a wild species. Some seeds of pea, horse bean and flax were also recovered. The assemblages are composed largely of cereal grains with few chaff fragments or weed seeds, and seem to represent semi-cleaned crop products.

Identifications of carbonised crop plant remains from archaeological features and natural/semi-natural deposits at the margins of the sand ridge are summarised in Table 4.4. The types of ‘natural’ and artificial deposits sampled were extremely varied and hence figures for frequency (numbers of contexts in which each taxon is present) would be rather meaningless. For this reason only simple counts of specimens identified are given. Because of the limited scale of sampling specifically for carbonised cereals the results are less reliable than those from the Springfield Lyons site. Nevertheless, compared to the Springfield Lyons assemblages the abundance of rye, and to a lesser extent of flax is conspicuous. This presumably represents a response to local soil and climatic conditions. Terrace soils in the Little Ouse valley include well-drained sandy brownearths (Freckenham Series) and humus podzols (Redlodge Series) (Corbett 1973, 35). The low mean annual rainfall of the Breckland area (less than 25 inches per annum in the period 1938-1965 at Santon Downham) combined with the free-draining characteristics of these sandy soils makes available soil moisture a limiting factor for arable farming. The drought-resistance of rye, due to its extensive root system, would have permitted maximum arable production to be obtained on the terrace soils. Flax cultivation, however, must have been confined to the alluvial soils of the valley floor, for flax is very drought-sensitive in its early stages.

Conclusions

Having outlined the data now available for this area we are in a position to consider some general points of relevance to economic and landscape changes between the 5th and 10th centuries. Firstly, is there evidence for large-scale post-Roman woodland regeneration? As was noted at the beginning of this paper field archaeological, place-name and historical evidence has recently been interpreted as indicating that the notion of extensive regeneration at this time should be rejected. The palaeoecological results from the Sandon Culvert section and Micklemere seem quite consistent with this. Pollen and macrofossils from Micklemere indicate a continuously

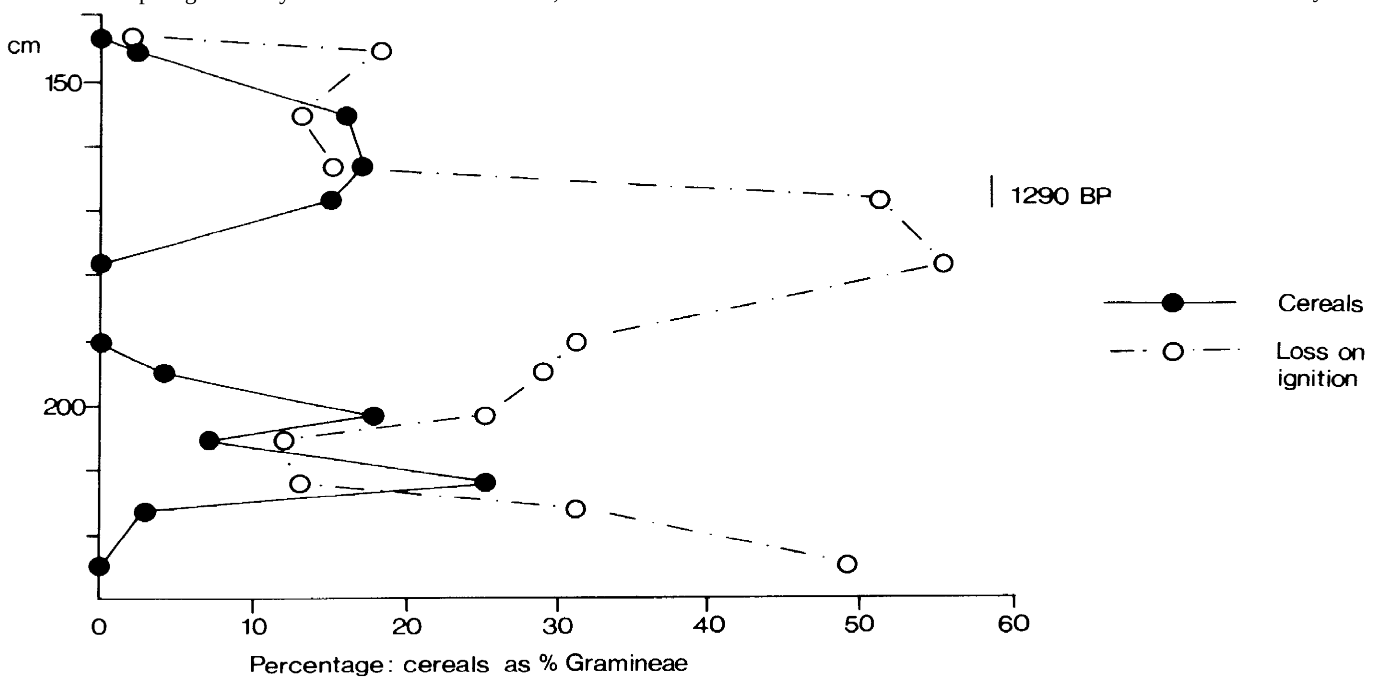

Figure 4.4 Relationship between cereal pollen and organic content of sediments at the margin of Micklemere (redrawn from Wiltshire 1988)

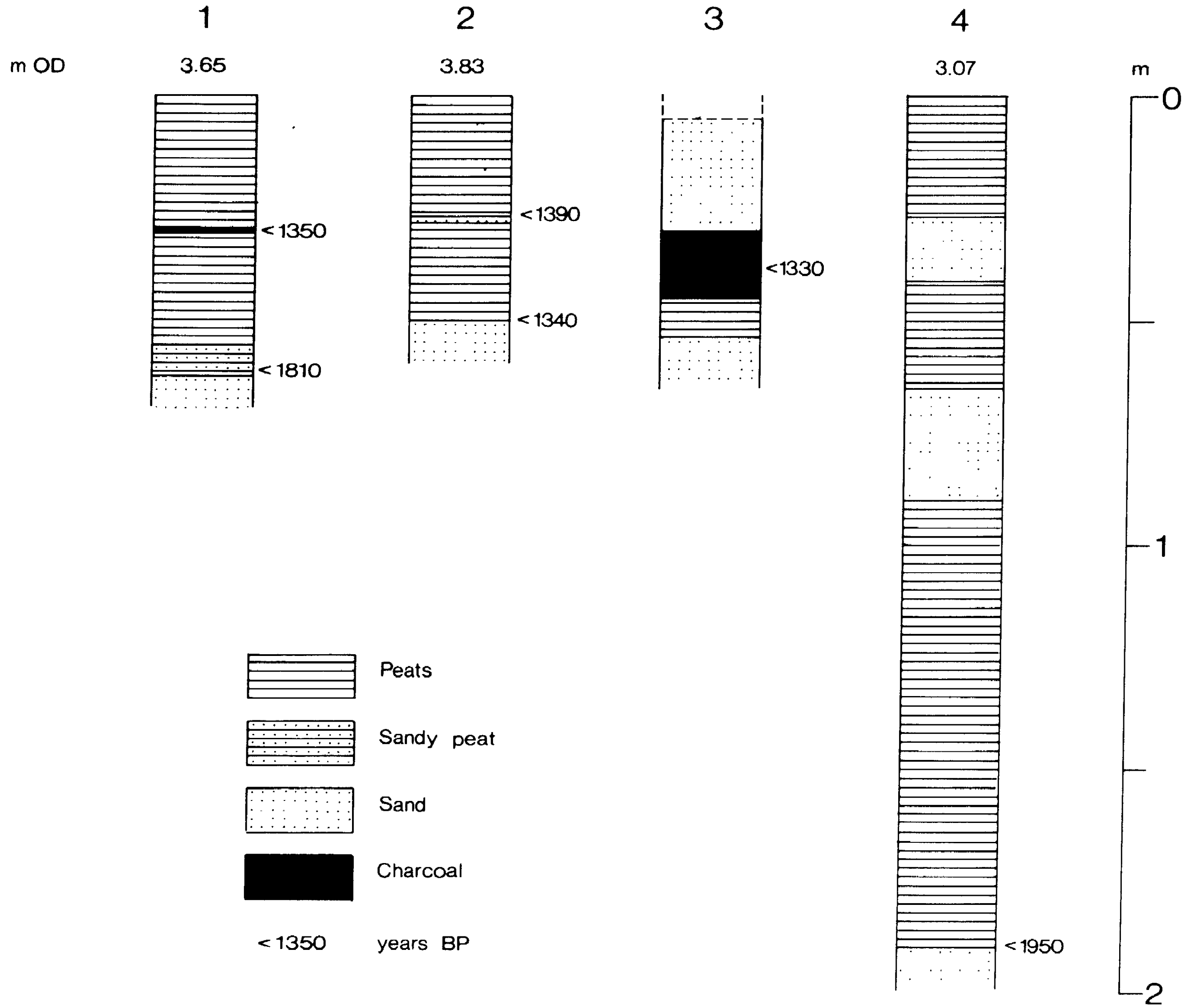

Figure 4.5 Peat stratigraphy at Staunch Meadow, Brandon

open landscape with little tree cover in the post-Roman period within the catchment of the mere. The macrofossils from the Sandon Culvert channel, though obviously relating to a more local area, give no basis for thinking that there was any significant valley woodland development. Results also come from elsewhere in eastern England. At Diss Mere in Norfolk a transient increase in pollen percentages of birch and hazel, reported by Peglar *et al.* (1989,218) is tentatively interpreted as indicating some tree growth on cleared land in the late/post-Roman period. Unfortunately no radiocarbon determinations are available to confirm the dating of this event. Scaife (in Wilkinson 1988, 109-114) reports a slight increase in some tree pollen in the valley of the Mar Dyke in Essex at a level thought to be of early Saxon date, but this might just be related to localised valley woodland development (Wilkinson

Table 4.4 Counts of carbonised crop plant remains from Middle Saxon contexts at Staunch Meadow, Brandon

These specimens came from eleven pits and other features dug into the sand ridge; from grid square samples from the 'occupation layer'; from three samples of organic waterfront deposits, and from three of the peat columns.

Secale cereale (rye:grains)	736
Secale cereale (rye:rachis fragments)	17
Hordeum sp(p) (barley:grains)	139
Hordeum sp(p) (barley:rachis fragments)	1
Triticium aestivum sl (wheat:grains)	29
Triticium aestivum (wheat:rachis fragments)	1
Avena sp(p) (oats:grains)	20
Pisum sativum (pea:seeds)	3
Vicia faba var minor (horse-bean:seeds)	4
Linum cf usitatissimun (flax:seeds)	27

1988, 125). In short, the results now available, taken together, give no grounds for believing that large tracts of countryside reverted to woodland in Essex and East Anglia in the post-Roman period, though on a local level some regeneration no doubt occurred.

However, at Micklemere cereal farming decreased to such an extent that there was no detectable influx of cereal pollen in sediments of post-Roman date. Cereal pollen does not reappear in the sedimentary sequence until about 1290BP. The landscape none-theless remained open and this must indicate that scrub growth was suppressed by grazing over large areas. Indeed, the persistence of *Plantago* pollen after cereal pollen disappears from the record is thought by Wiltshire to provide some evidence that pastoral farming did indeed persist in this area after cereal farming ceases to be detectable. Williamson (1988, 171), noting the abandonment of Romano-British farms in some clay-land areas, yet the survival of their field systems, also argues that grazing must have continued on a substantial scale.

A shift towards a pastoral economy in the 5th to 6th centuries would have reduced agricultural production. Estimates of past production are inevitably conjectural, but under modern conditions one hectare of land under winter wheat produces about 469kg of crude protein and almost 70,000MJ gross energy, compared to a yield of 53kg crude protein and almost 4,000MJ gross energy when the same area is used for beef production (with higher figures if dairying is involved). One hectare of land can support fifteen to twenty people annually when under wheat, one to five people annually when used as pasture (Spedding *et al* 1981, 360). Obviously such figures give only order of magnitude estimates of possible population densities in the past, but the overall conclusion must be that, if an increased emphasis on grazing after the 4th century is accepted, then production must have been reduced. This would have been possible without any reduction in the rural population because in the later 5th century there was no longer a need to produce a surplus to support the cities and the machinery of the Roman Empire. But in fact there is some evidence for plagues in the 5th and 6th centuries which presumably had a lasting impact on population levels (Frere 1973, 377 and 380; Rackham 1988, 46).

Despite this, in some areas there is evidence for continuity of arable farming. Carbonised cereal remains were present in all samples from the Sandon Culvert section, dated from 1770 up to 860BP. Remains of spelt, apparently the main crop of Roman Britain, have been found in early Saxon contexts at Springfield Lyons, West Stow and Mucking, in association with rye and bread wheat, crops which only seem to have become important at this date. Spelt, with some emmer, was also identified in late Saxon samples from Springfield Lyons. If this indicates continuous cultivation a remarkable, and in this area unique, degree of agricultural continuity is indicated. Even if (as seems more likely) glume wheats were merely persisting in late Saxon times, as contaminants of other crops, continuous use of the same arable fields seems to be indicated. It is hard to see how spelt could be present as a contaminant at this late date if the land went out of use at any stage and was only later brought back into cultivation using new seed-corn.

One point of particular interest in East Anglia is the relative importance of light soils and heavy clay soils for cereal farming. There is clear field archaeological and palaeobotanical evidence for late Iron Age and Roman arable farming on the Boulder Clay areas of central East Anglia. At the margins of the Boulder Clay plateau, at Micklemere, changes in lake sedimentation have been interpreted as indicating a shift from tillage of light soils in the Roman period to heavier clay soils in mid-late Saxon times. The weed seed assemblages from Spring-field Lyons likewise indicate farming on clay soils, though in this area there are no comparative results from the Roman period.

In conclusion it is perhaps worth re-emphasising the great diversity of Anglo-Saxon landscapes and agriculture, even within the restricted areas considered in this paper. On the Essex coast an economy based on salt-marsh sheep grazing may be inferred; in the Essex river valleys an economy in which oat cultivation on heavy soils seems to have been important; at Brandon an arable economy based on rye-growing on impoverished sandy soils, with flax production in the river valley. Further investigations of sites in other ecological situations may be expected to add to this picture of diverse types of production in very varied landscapes.

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5 Animal exploitation in East Anglian villages *Pam J Crabtree*

Abstract

This paper reviews the economic evidence obtained from animal bones from Anglo-Saxon sites in East Anglia, comparing it to the results from earlier Iron Age and Roman assemblages in the area. Both time and settlement differences are recognised. West Stow is interpreted as a self-sufficient or rural producer site, while Wicken Bonhunt is seen as possibly of higher status with kill patterns similar to urban centres, suggesting a supply through food rents or a market.

Introduction

When Clutton-Brock wrote her review article on Anglo-Saxon animal exploitation in 1976, she included only five Saxon sites: North Elmham (Norfolk), Thetford (Norfolk), Sedgeford (Norfolk), Sandtun (Kent), and Mawgan Porth (Cornwall). Recent excavations and faunal analyses have broadened our knowledge of animal husbandry and hunting practices in East Anglia. In particular, faunal analyses from the early Saxon village of West Stow, Suffolk (Crabtree 1982; 1984; 1989a; 1989b; 1990a) and the middle Saxon village of Wicken Bonhunt, Essex (Pat Stevens, pers comm) have provided new information on East Anglian rural economy. Analyses of fauna from middle and late Saxon urban sites within Thetford (Jones 1984; Jones, in press a), Norwich (Cartledge 1983; 1987; Jones, in press b), and Ipswich (Pat Stevens, pers comm) have provided new data on animal use in East Anglian urban centres. This paper uses the faunal data from West Stow and Wicken Bonhunt to examine the uses of animals in East Anglian Anglo-Saxon villages. These patterns of exploitation will be compared to those of Iron Age and Roman Britain based on the analysis of the fauna from West Stow (Crabtree, in press) and Icklingham. The rural Saxon animal husbandry and hunting practices will also be contrasted to those seen in the middle and late Saxon towns of East Anglia.

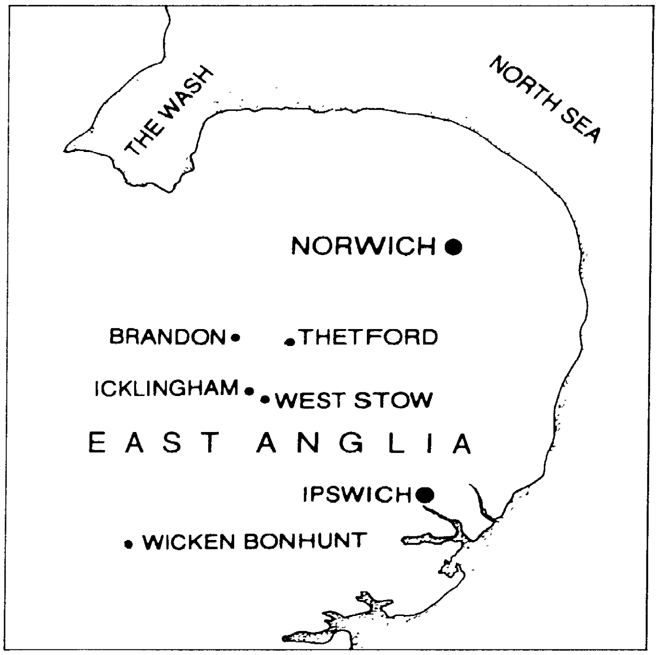


Figure 5. 1 Map showing the locations of East Anglian sites mentioned in the text

Materials and methods

The patterns of animal exploitation in pre-Anglo-Saxon East Anglia are revealed through the analysis of the fauna from the sites of West Stow and Icklingham (Fig 5.1). The Iron Age settlement at West Stow (West, in press) produced over 7500 animal bones and fragments, of which approximately half could be identified to species or higher order taxon. The West Stow site also produced a number of early Roman (1st-2nd century) pottery kilns and associated features, and these yielded a small collection of about 1800 animal bone fragments. The site of Icklingham (West & Plouviez 1974) provides evidence for late Roman (primarily 3rd and 4th century) animal exploitation in the west Suffolk area. Icklingham has traditionally been identified as a villa because a bathhouse was discovered there in the mid-19th century, but is more likely to represent one of the sprawling East Anglian market centres of the Roman period (Anon 1973, 152). Approximately 11,000 animal bone fragments from the 1974 excavations at Icklingham were analysed during the summer of 1989.

The early Anglo-Saxon settlement at West Stow (West 1985) produced a collection of over 175,000

Table 5.1 Species ratio based on the NISP for the main domestic mammal species from selected Iron Age, Roman and Anglo-Saxon sites in East Anglia

Iron Age and Roman sites:

	West Stow Iron Age		West Stow Roman		Icklingham Roman	
	N	%	N	%	N	%
Cattle	1390	50.3	257	37.9	2932	64.3
Sheep/goat	890	32.2	279	41.2	1058	23.2
Fig	270	9.8	97	14.3	445	9.8
Horse	215	7.8	45	6.6	123	2.7

Saxon villages:

	West Stow		Wicken Bonhunt	
	N	%	N	%
Cattle	8617	33.7	5318	17.3
Sheep/goat	12344	48.3	3858	12.5
Pig	4296	16.7	20954	68.2
Horse	323	1.3	613	2.0

Saxon urban sites:

	Thetford Brandon Rd		Thetford Site 1092		Norwich St Martin		Ipswich	
	N	%	N	5%	N	%	N	%
Cattle	1427	47.4	919	45.0	1524	40.3	7696	43.7
Sheep/goat	1050	34.9	650	31.8	1102	29.1	4724	26.8
Pig	483	16.1	394	19.3	1140	30.2	5142	29.2
Horse	49	1.6	78	3.8	15	0.4	68	0.4

animal bones and fragments dating from the early 5th to mid-7th centuries AD. The site includes 69 sunken-featured buildings (SFBs) or grubenhäuser clustered around seven small timbered halls. Particular attention was paid to the animal bones recovered from the SFBs, since most of these buildings can be assigned to either the 5th century (Phase 1), the 6th century (Phase 2) or the late 6th to early 7th century (Phase 3).

Evidence for middle Saxon animal exploitation in East Anglia is provided by the faunal remains recovered from the village of Wicken Bonhunt (Pat Stevens, pers comm) located near the Cambridgeshire border in Essex. Wicken Bonhunt was excavated by Keith Wade in the early 1970s. An area of over 7000 m^2 was excavated, revealing approximately 25 middle Saxon buildings and three Saxo-Norman buildings, as well as boundary ditches, pits, and wells. Interim notes on the Wicken Bonhunt excavations can be found in *Medieval Archaeology* **17** (1973, 143) and *Medieval Archaeology* **18** (1974, 175-6). Over 36,000 bones have been identified from the Bonhunt site to date. In addition, approximately 19,000 animal bones had been identified from the middle Saxon urban site of Ipswich by 1987 (Pat Stevens, pers comm).

Several sites in Thetford provide evidence for late Saxon animal exploitation in towns. Over 2300 bones were identified from site 1092, an industrial area on the periphery of the late Saxon (11th century) town. The 10th century features at the Brandon Road site in Thetford yielded over 5500 bone fragments, of which just over half could be identified (Jones, in press a). Smaller faunal assemblages are available from the late Saxon waterfront excavations at Norwich (Cartledge 1983) and from the middle to late Saxon features at the Fishergate site in Norwich (Jones, in press b).

While the large faunal collections from East Anglia are a rich source of information on Anglo-Saxon animal husbandry practices, hunting patterns, and diet, the are some limitations to the kinds of inferences that can be drawn from these data. Most of these faunal assemblages, including the West Stow assemblage, were recovered by careful hand-collection without the use of fine screening. It is therefore

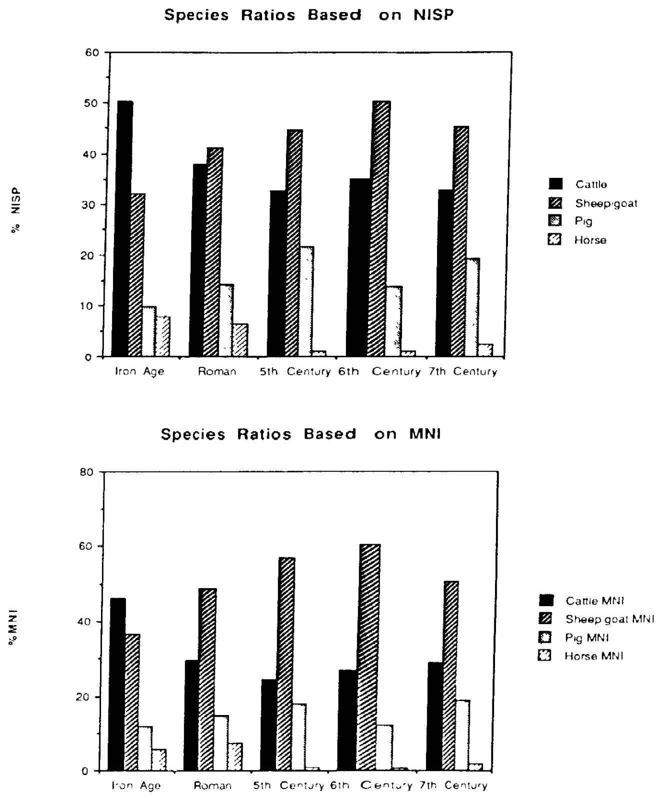


Figure 5.2 Species ratios based upon MNIs and NISPs for Iron Age and Roman features and 5th, 6th and early 7th century sunken featured buildings from West Stow

likely that the bones of birds, fish, and other small vertebrates are under-represented in these faunal samples. In addition, some of the carpals, tarsals, and other small bones of medium-sized mammals such as sheep, goat, and roe deer may have been overlooked during excavation. For example, the carpals, tarsals, phalanges, and sesamoids of sheep and goats are conspicuously under-represented at West Stow (Crabtree 1990a, 7-8). Similarly, sheep calcanei, astragali, and phalanges are rare in the 10th century deposits at the Brandon Road site in Thetford, and this may be attributed, at least in part, to recovery bias (Jones, in press a). The lack of screening at many important East Anglian excavations makes it difficult to assess the relative importance of fish, birds, and mammals in the Anglo-Saxon economy. At both West Stow and Wicken Bonhunt domestic fowl *(Gallus* sp) and domestic goose *(Anser* sp) make up the vast majority of the bird remains. At West Stow these domestic birds are supplemented by a wide range of wild species, primarily water birds and waders, including cranes, swans *(Cygnus* sp), teal *(Anas crecca),* and white-fronted *geese (Anser albifrons).* Because of the recovery problems, this paper will focus primarily on large mammal remains from these East Anglian sites.

The composition of the faunal assemblages, the kill-patterns for the domestic mammal species, and measurement data will be examined to determine the patterns of animal use in East Anglia in the Anglo-Saxon period.

Composition of the faunal assemblage

A major goal of contemporary faunal analysis is the estimation of the relative importance of various animal species at an archaeological site (Perkins 1973). Unfortunately, there is no consensus among faunal analysts as to the way species ratios ought to be calculated. For recent reviews of the problems of estimating taxonomic abundance see Grayson (1984) and Gautier (1984). Species ratios based on fragment counts (often termed NISP or number of identified specimens per taxon) are simple to calculate but can be biased by differential fragmentation and differential recovery of taxa of varying sizes. In addition, fragment counts fail to account for associated skeletal elements (bones which originally came from the same animal). While the use of species ratios based on minimum numbers of individuals (MNIs) can overcome the problems of independence, MNI-based estimates are subject to problems of aggregation. Species ratios based on MNIs respond unpredictably when archaeological contexts are combined to form meaningful analytical units. In an attempt to overcome this problem, both MNI- and NISP-based species ratios were calculated for the main chronological periods at West Stow (Crabtree 1989a, Table 2). To facilitate intersite comparisons, the species ratios presented in this paper have been based on fragment counts, since MNIs can be calculated in a variety of different ways by different researchers (see, for example, White 1953 and Chaplin 1971).

Cattle, sheep, and pig are the most commonly represented species at all Iron Age, Roman, and Anglo-Saxon sites in East Anglia (Table 5.1). At West Stow, species ratios based on both MNIs and fragment counts suggest a long-term trend toward increasing numbers of sheep and pigs and fewer cattle and horses (Fig. 5.2). Documentary evidence indicates that this trend continued into the medieval period in the region. By the time of the Domesday survey in the late 11th century, sheep were the predominant animals in the West Stow region, and cattle are not even mentioned in the survey (West 1985, 169).

The one change in species ratios that can plausibly be attributed to the *Adventus Saxonum* is a slight increase in the proportion of pigs seen in the early part of the 5th century (Fig 5.3). Since pigs are fecund animals that mature quickly and multiply rapidly, the increased use of pigs in the early 5th century may have allowed the West Stow farmers to establish their herds. This change does not represent the imposition of a continental Saxon pattern of animal husbandry in East Anglia. Continental Saxon sites such as Feddersen Wierde near Bremerhaven (Reichstein 1972) have produced high proportions of cattle and horse bones and relatively low numbers of sheep and pigs (Fig 5.4). In fact, the species ratios seen at Feddersen Wierde are more like those seen at Iron Age West Stow than those seen in the early Anglo-Saxon period.

The species ratios seen at early Anglo-Saxon West Stow also contrast markedly with those calculated for the nearby late Roman site of Icklingham (Fig 5.5a). At Icklingham cattle make up nearly two-thirds of the identified large domestic mammal bones, and sheep and pigs are relatively poorly represented. The meat consumed at Icklingham appears to have been obtained through the large-scale late Roman market system in meat products. The bones are butchered in very standardized ways. For example, nearly all the cattle radii are chopped through axially. Red deer and horse long bones show the same standardized butchery marks. The early Anglo-Saxon animal bones from West Stow are butchered in very different ways. This evidence indicates that the large-scale late Roman meat markets based on the towns and villas did not survive into the 5th century. A case can be made for local continuity in animal husbandry practices at West Stow from the Iron Age to the Anglo-Saxon period, but there is no clear evidence for continuity between Icklingham and West Stow.

The species ratios calculated for the early Anglo-Saxon sunken-featured buildings at West Stow also differ strikingly from those seen at the middle Saxon site of Wicken Bonhunt (Fig 5.5b). At Wicken Bonhunt over two-thirds of the large domestic mammal remains are those of pigs. No other Anglo-Saxon site in East Anglia has produced such a high proportion of pig remains. The faunal remains from the 5th to 9th century features at St Albans Abbey in Hertfordshire (Crabtree, unpubl) show a similar high proportion of pigs (Fig 5.5c). In an analysis of the fauna from the late medieval site of Greyfriars in London, West (Armitage & West 1985, 119) has suggested that pork may have been a high status dietary item in the Middle Ages. If pork was also a high status item in the Anglo-Saxon period, then it might be suggested that both Wicken Bonhunt and St Albans Abbey represent high status sites.

The middle and late Saxon urban sites in East Anglia show very different patterns of taxonomic abundance. In all cases, cattle are the predominant species on the basis of NISP, and cattle certainly would have contributed most of the meat in the urban diet (Jones, in press a). Cattle are the main source of meat at Anglo-Saxon urban sites in other parts of England including Hamwic (Bourdillon, this volume), Fishergate, York (O'Connor, this volume), and the middle Saxon Strand sites in London (J. Rackham, this volume). Both Site 1092 and the Brandon Road Site in Thetford have produced substantial quantities of sheep bones (Fig 5.6), and this is not surprising given the historical evidence for high numbers of sheep in much of West Norfolk (Darby 1935). Fewer sheep and somewhat higher numbers of pigs are seen in the middle Saxon faunal assemblage in Ipswich and the late Saxon faunal collection from St Martin-at-Palace Plain, Norwich (Fig 5.7).

Goats are poorly represented at almost all East Anglian sites. At West Stow goat remains make up only about 1% of the sheep and goat bones that could be identified to species. Very few goat bones were identified from Wicken Bonhunt, from St Martin-at-palace Plain (1 of 32, Cartledge 1987), and from Brandon Road, Thetford (1 in 34 immature mandibles, Jones, in press b). At Site 1092 in Thetford, a number of male goat horn cores appear to be waste from horn-working, since few post-cranial goat bones were present (Jones 1984, 189). The low proportion of goats at these sites is consistent with the Domesday record for Norfolk which lists 3,020 goats and 46,458 sheep on demesne land (Jones, in press a). The fauna from Fishergate, Norwich provide the one exception to this pattern. At Fishergate, goats make up about 13% of the caprine mandibles and metapodia which could be identified to species (Jones, in press b).

Deer are also poorly represented at Anglo-Saxon sites in East Anglia (Table 5.2). While small numbers of post-cranial bones of both red deer and roe deer were identified from early Anglo-Saxon contexts at West Stow, the overall numbers of deer bones are quite small. Deer bones are also rare at Wicken Bonhunt, although roe deer outnumber red deer at the Bonhunt site. Few deer bones have been recovered from urban sites in East Anglia. Only 4 deer bones were identified from the Period I faunal assemblage from St. Martin-at-Palace Plain, Norwich (Cartledge 1987, 111), and Site 1092 in Thetford produced only fragments of red deer antler (Jones 1984,190). The evidence from both the urban and the rural sites in East Anglia suggests that deer hunting played only a very limited role in the Anglo-Saxon economy In contrast, Anglo-Saxon sites in other areas of Britain including Portchester Castle (Grant 1976) and St. Albans Abbey (Crabtree, unpublished MS) have produced higher proportions (5%) of deer bones. The paucity of deer remains at sites in the Breckland areas of western Norfolk and Suffolk would be consistent with the extensive use of these areas for sheep pastures (Jones, in press a).

Kill-patterns for the main domestic species

Age profiles or kill-patterns can be used to identify the exchanges of animals between producer and consumer sites (Crabtree 1990b; O'Connor, this volume). Wapnish and Hesse (1988) have developed three models for the production and consumption of domestic mammal resources.

1 In a self-sufficient economy, domestic animals are both produced and consumed locally. Harvest profiles should include all age classes, or 'all of the mortality experienced by a domestic herd' (Wapnish & Hesse 1988, 84).

Species Ratios for Early and Late 5th Century SFBs

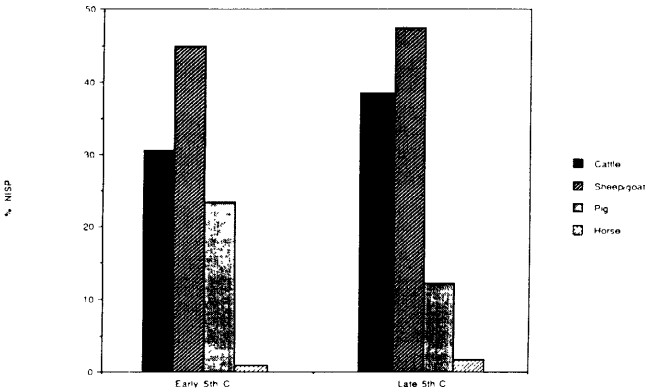
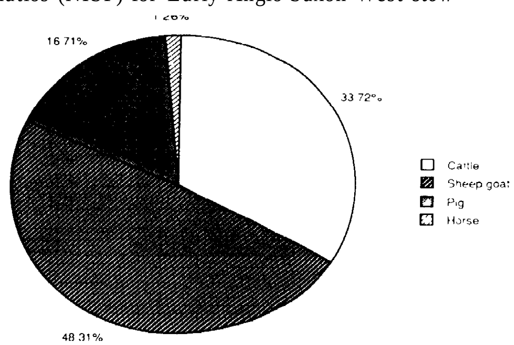


Figure 5.3 Species ratios based upon the NISP for early 5th century (N=3124) and late 5th century (N=l647) sunked-featured buildings from West Stow

Species Ratios (NISP) for Early Anglo-Saxon West *stow*



Species Ratios (NISP) for Feddersen Wierde

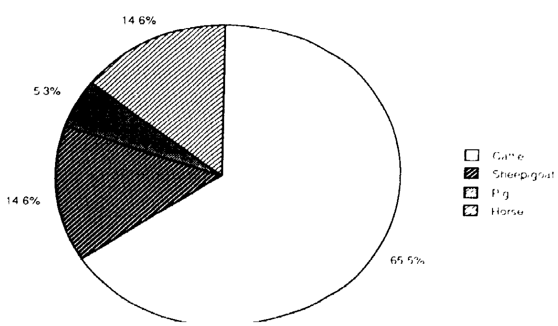
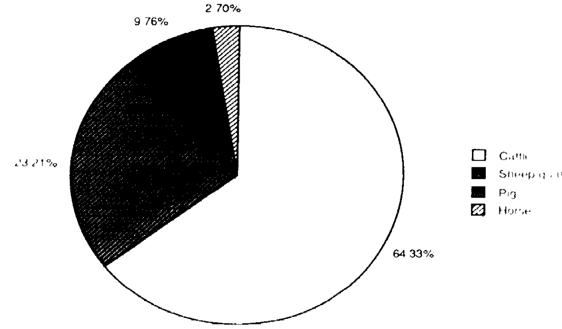
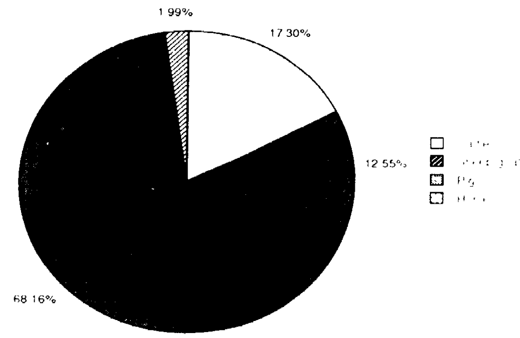


Figure 5.4 Pie chart of species ratios based on the NISP for Feddersesn Wierde (N=42, 754) and for all Anglo-Saxon SFBs from West Stow

Species Ratios (NISP) for Late Roman Site of Icklingham



Species Ratios (NISP) for Middle Saxon Wicken Bonhunt



Species Ratios (NISP)
5th-9th C. Fauna from St. Albans Abbey

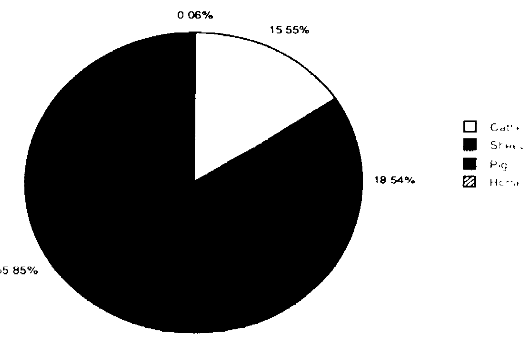


Figure 5.5 Pie chart of the species ratios based upon the NISP for Icklingham, Wicken Bonhunt, and St Albans Abbey (N=l443)

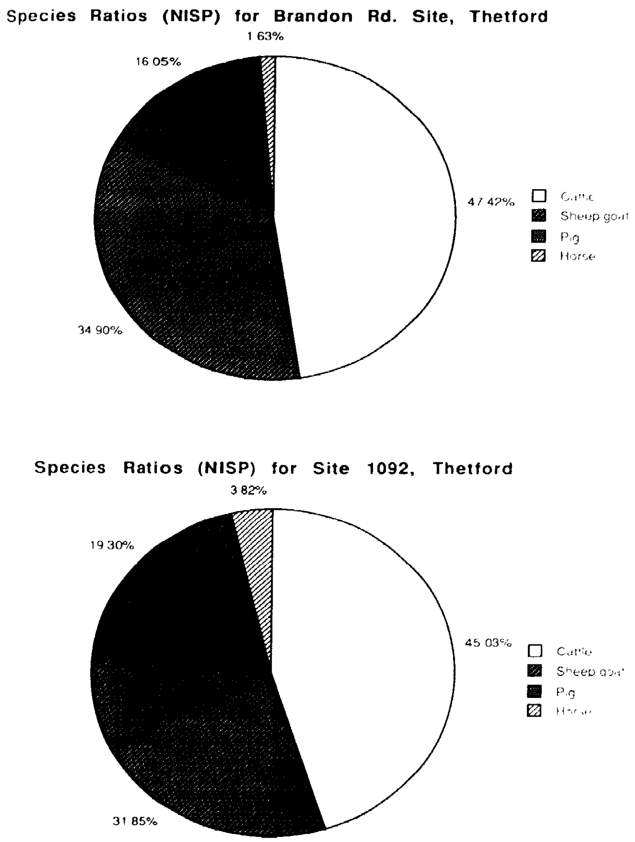


Figure 5.6 Pie chart of the species ratios based upon the NISP for the Brandon Rd site and site 1092 in Thetford

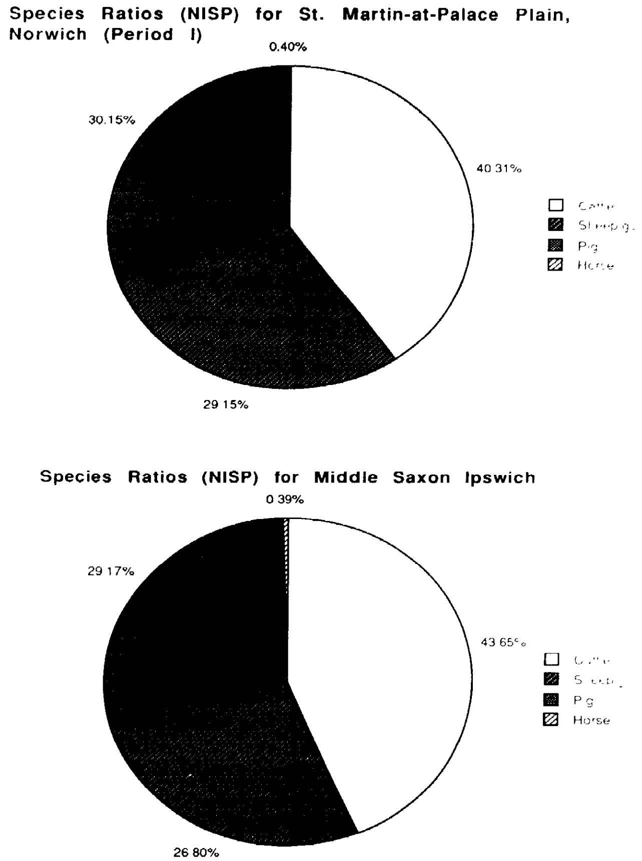


Figure 5.7 Pie chartof the species ratios based upon the NISP for middle Saxon Ipswich and late Saxon St Martin-at-Palace Plain, Norwich

2 In a consuming economy, animals raised locally are supplemented by animals acquired elsewhere. Harvest profiles should include an abundance of market-age animals, and relatively few animals of reproductive age.
3 Producer sites should include remains of perinatal mortalities and older animals culled from the breeding stock.

These models may be usefully applied to the Anglo-Saxon fauna from East Anglia, since excavations have centred on both rural producer and urban consumer sites. At self-sufficient sites and producer sites, age profiles may also reveal the economic uses, such as meat, milk, and wool, to which the domestic animals were put (Payne 1973).

At West Stow and Wicken Bonhunt, kill-patterns were based on dental eruption and wear on mandibles following Grant (1975; 1982). In order to permit comparisons between sites, the cattle and sheep/goat mandibles were grouped into broader classes following Bourdillon and Coy (1977; 1980).

Sheep. The kill-pattern for sheep (and goats) from all Anglo-Saxon features at West Stow is summarized in Fig 5.8. The age profile includes a small number of perinatal mortalities and a large number of sheep killed during the second half of the first year of life. This may represent culling of excess stock in the fall or winter. Relatively few late adolescent and young adult animals were killed. The mature animals that were killed were probably culled from the breeding stock, and few sheep survived to senility The kill pattern closely resembles the mortality profile for the Iron Age sheep from West Stow (Fig 5.9). This kill pattern is one that might be expected from a self-sufficient or producer site.

In contrast, the sheep kill-patterns from late Roman Icklingham (Fig 5.10) indicate a classic consumer assemblage. The assemblage produced no perinatal or first year mortalities. Most sheep were killed in late adolescence or early adulthood (Stages 3 and 4; see Fig 5.8 for ages), and a small number were older animals culled from the breeding stock (Stage 5). No senile animals were recovered.

The kill-patterns for sheep seen at the middle Saxon village of Wicken Bonhunt are also significantly different from those from West Stow (Fig 5.11). The Wicken Bonhunt assemblage included a smaller proportion of perinatal mortalities and first-

Table 5.2 Proportions of deer bones in relation to the total number of large domestic mammal bones for East Anglian sites

		Deer	Large domestic mammal	% Deer
		N	N	%
West Stow	Iron Age	13	2765	0.47
West Stow	Roman	2	678	0.29
Icklingham	Roman	20	4558	0.44
West Stow	Saxon	34	25553	0.13
Wicken Bonhunt	Saxon	159	30743	0.52
St Albans Abbey	Saxon	78	1443	5.41
Thetford, Brandon Rd	Saxon	2	3009	0.07
Thetford, Site 1092	Saxon	4	2041	0.20
Ipswich	Saxon	59	17630	0.33
Norwich, St Martin	Saxon	4	3781	0.11

year culls and significantly higher numbers of adult sheep. The differences between the West Stow and the Wicken Bonhunt kill-patterns are significant at p=0.0l, based on a Kolmogorov-Smimov test. If we see Wicken Bonhunt as a relatively self-sufficient agricultural village, it is possible that these sheep were kept for wool production. Alternatively, if Wicken Bonhunt was part of a larger redistribution or market system, the inhabitants of this middle Saxon village may have been supplied with mutton raised elsewhere.

The sheep kill-pattern seen at Wicken Bonhunt is generally similar to the mortality pattern for the sheep from the Brandon Road site in Thetford (Fig 5.12). During the late Saxon period at Thetford, 'sheep were not normally killed during their first year. Surplus animals were slaughtered during their second year. Thereafter there was a range of slaughter-age up to perhaps six or seven years old' (Jones, in press a, 6-7). Since there were ecclesiastical rights to sheep pasture within the town of Thetford itself, it is not clear whether this kill-pattern represents local culling practices or whether it represents the ages of sheep sent to market from a wider area.

The kill-pattern for sheep from Ipswich (Fig 5.13) suggests that local sheep husbandry was supplemented by sheep sent to market from the surrounding countryside. As at West Stow, the Ipswich assemblage shows a substantial number of sheep that were killed during their first year (Stage 2). The Ipswich assemblage also includes a number of older individuals (Stage 5) which appear to have been culled from the breeding stock. The Ipswich sample, however, also has a high proportion of young adult animals (Stage 4) which may have been sent to market in the town. In contrast, young adult sheep appear to be less well represented in the 8th to 9th century deposits from Fishergate, York (O'Connor, this volume).

Cattle. The kill-patterns for cattle reveal similar contrasts. The mortality profile for early Anglo-Saxon cattle from West Stow (Fig 5.14) includes a small number of neonates and young juveniles which must have been killed early in the first year of life (Stage l), and a somewhat larger number of young animals which probably represent autumn or early winter kills (Stage 2). A sizable number of animals, possibly bullocks, were killed in their second year (Stage 3), but few animals were killed in late adolescence (Stage 4). At West Stow, less than half the cattle survived to adulthood. The small sample of mandibles from the Iron Age features at West Stow shows a similar kill-pattern.

The ageing data from Wicken Bonhunt present a very different picture (Fig. 5.14). No neonatal cattle mandibles were recovered and only a few cattle appear to have been slaughtered in the fall or winter of their first year. The vast majority of the Wicken Bonhunt cattle were killed as adults, including many elderly animals with heavily worn molar teeth.

The differences between the West Stow and the Wicken Bonhunt kill patterns can be accounted for in several ways. These differences are significant at p=0.0l based on a Kolmogorov-Smirnov test. The West Stow pattern might be seen as one of self-sufficiency, in which animals which were not needed for breeding or working were slaughtered in the first 18 months of life. The adult animals would represent culls from the breeding and working stock. On the other hand, the West Stow pattern could be seen as a producer pattern, in which many of the market age animals (late adolescents and young adults) were sent to market elsewhere. The Bonhunt pattern appears to be more of a consumer pattern, with

Table 5.3 Comparisons of the distal breadth (Bd) of sheep/goat tibiae from Iron Age, Roman and Anglo-Saxon sites in East Anglia (all measurements in mm)

	Date	Mean	s.d.	N	Range
Wicken Bonhunt	Middle Saxon	25.3	1.2	174	22–29
West Stow	Iron Age	25.6	2.6	13	18–28
West Stow	1st-2nd cent.	25.6	1.9	9	22–27
Thetford, Brandon R	10th century	25.7	1.5	20	23–29
Ipswich	Middle Saxon	25.8	2.1	21	23–29
West Stow	6th century	26.0	1.5	96	23–29
West Stow	7th century	26.1	1.7	42	23–29
West Stow	5th century	26.2	1.7	42	23–29
Icklingham	3rd-4th century	26.5	1.4	37	23–29

Table 5.4 Measurements of the greatest lateral length (GL1) of the astragalus for cattle from East Anglian sites (all measurements in mm)

West Stow	Iron Age	58.0	3.0	8	54–61
West Stow	6th century	60.1	2.7	61	54–67
Thetford, Brandon R	10th century	60.3	3.6	16	53–67
West Stow	7th century	60.7	4.4	8	56–70
West Stow	1st-2nd century	60.8	-	4	60–63
West Stow	5th century	61.6	3.2	27	54–66
Ipswich	Middle Saxon	61.7	3.7	15	56–69
Wicken Bonhunt	Middle Saxon	61.8	3.5	115	51–70
Icklingham	3rd-4th century	63.5	3.0	52	58–71

most of the animals that were consumed being mature to elderly adults. The inhabitants of Wicken Bonhunt may have been supplied with excess breeding or working animals from other sites.

The Wicken Bonhunt pattern more closely resembles the cattle kill-patterns seen at Icklingham, at Ipswich, and at the Brandon Road site in Thetford (10th century) (Fig 5.15) where the majority of the cattle were killed as adults. In these cases it can reasonably be argued that the inhabitants were supplied with older cattle which may have been culled due to barrenness, to bad character, or for economic reasons (Jones, in press a).

Pigs. Cattle, sheep, and goats can be raised for a wide variety of purposes including milk, wool, hair, horn, and traction. Pigs, on the other hand, have only one major economic use – as food animals. Studies of pig kill-patterns can reveal the preferred age of slaughter, whether pigs were raised locally, and possibly whether sty husbandry or pannage was practiced (see, for example, Noddle 1980, 400).

The kill-patterns for pigs seen at West Stow (Fig 5.16) and Wicken Bonhunt (Fig 5.17) indicate that most pigs at both sites were killed in late adolescence or early adulthood (MWS=21–35). This is not surprising, since most growth has taken place by this age. The Bonhunt assemblage includes a higher proportion of elderly culls, while the West Stow faunal collection includes a higher proportion of neonatal mortalities and young juveniles (MWS less than or equal to 10).

The differences between the West Stow and the Wicken Bonhunt kill-patterns can be explained in two ways. At West Stow only limited areas of oak forest would have been available along the Lark River terraces. More extensive pannage would have been located several kilometres away in the central clay belt. The limited availability of pannage may have forced the West Stow farmers to cull excess piglets early in their first year. If more extensive areas of pannage were available near Wicken Bonhunt, farmers may have needed to cull fewer young animals. Alternatively, the low proportion of juvenile animals at Wicken Bonhunt might indicate that fewer animals were raised there, and that many of the adolescent and adult pigs were supplied to Wicken Bonhunt from elsewhere, possibly from small producer sites such as West Stow.

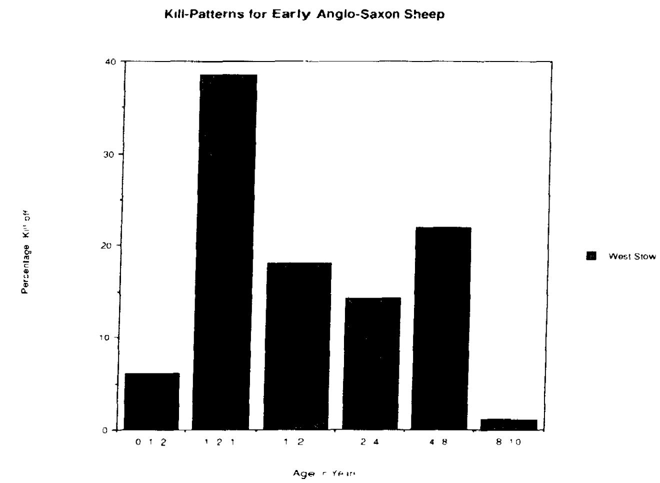


Figure 5.8 Kill pattern based upon the mandibles of sheep and goats from all Anglo-Saxon features at West Stow (N=l293). Mandibles grouped into stages, following Bourdillon & Coy (1977;1980)

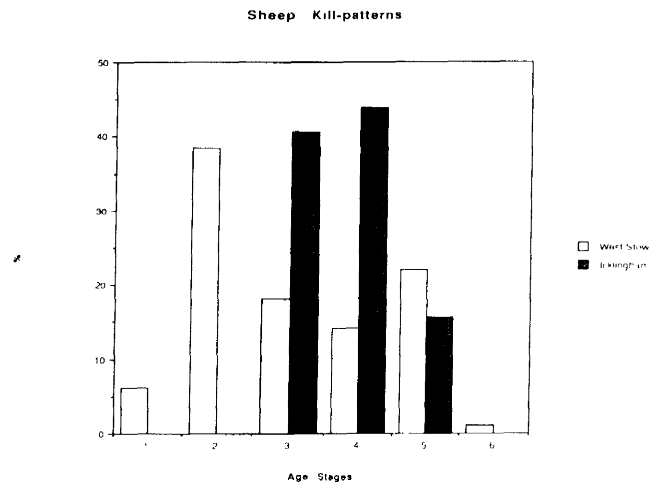


Figure 5.10 Kill-patterns for sheep and goats from Icklingham (N=32) and West Stow Anglo-Saxon features

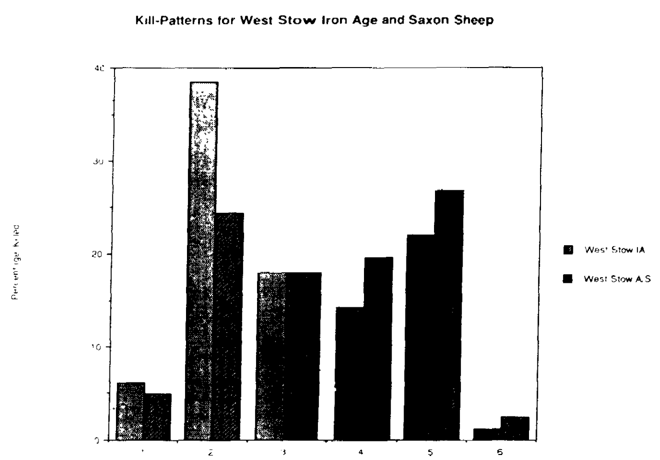


Figure 5.9 Kill-patterns for sheep and goats from West Stow Iron Age (N=41) and Anglo-Saxon features

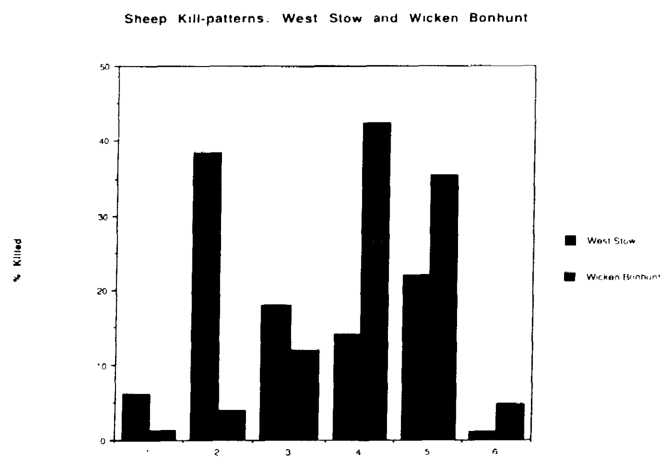


Figure 5.11 Kill-patterns for sheep and goats from West Stow and Wicken Bonhunt (N=231)

Measurements

Bone measurements can be used to assess changes in animal sizes through time and possibly to identify different breeds or types in the archaeological record. All the measurements described here were taken following the recommendations of von den Driesch (1976), and withers height estimates were calculated following von den Driesch and Boessneck (1974).

Sheep. In a survey of British fauna1 remains from the Iron Age to the Anglo-Saxon period, Maltby (1981) showed that the distal breadth (Bd) of the tibia was the most commonly taken measurement on sheep and goat bones. In Maltby's survey, many of the largest sheep tibiae came from middle and late Saxon sites in East Anglia (Maltby 1981, 189–90). New metrical data from several recently analysed Anglo-Saxon sites in East Anglia bear out Maltby's conclusions. As can be seen from Table 3, the distal tibial breadths average between 25 and 26mm for all Anglo-Saxon sites in East Anglia. The Saxon sheep tibias generally range between *c* 22 and 29mm in distal breadth. The largest sheep came from the late Roman site of Icklingham near West Stow.

Withers height estimates confirm the generally large size of the Anglo-Saxon sheep from East Anglia

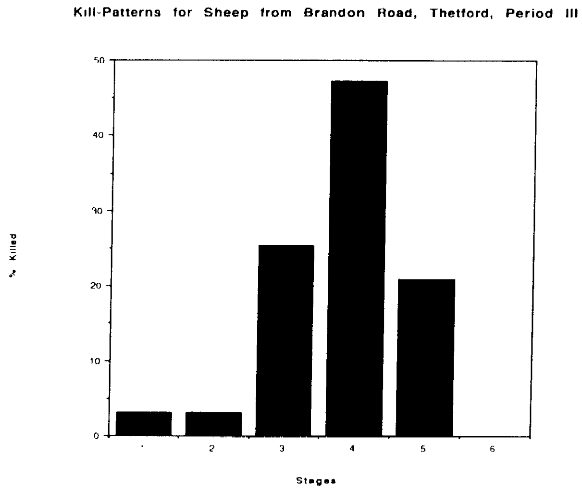


Figure 5.12 *Kill-patterns for sheep from the Brandon Rd site in Thetford (N=63)*

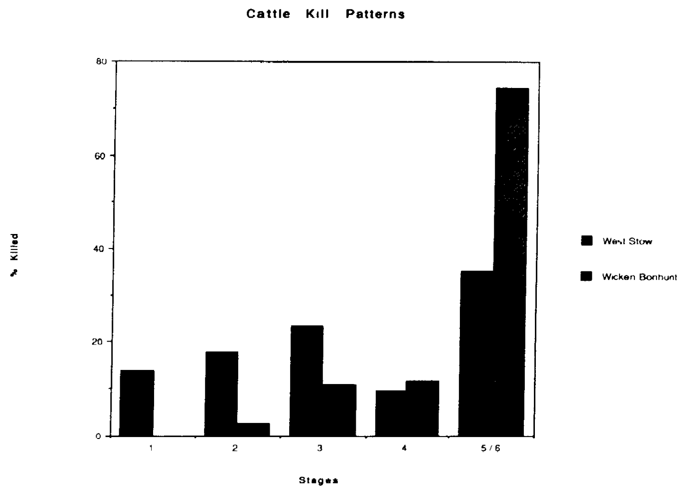


Figure 5.14 *Kill-patterns for cattle from West Stow (N=290) and Wicken Bonhunt (N=211)*

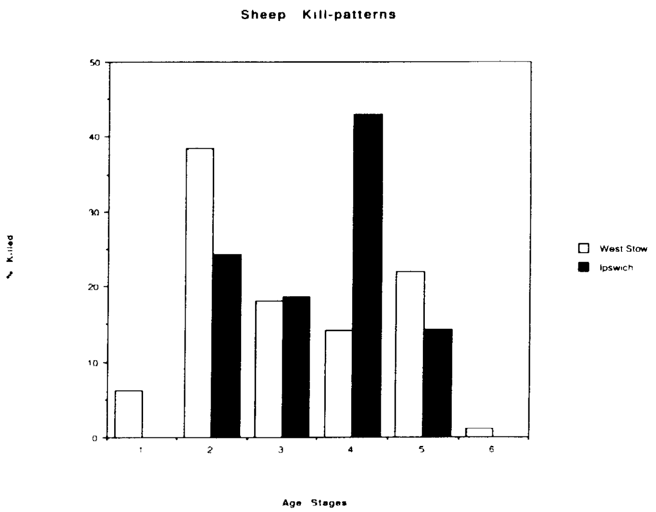


Figure 5.13 *Kill-patterns for sheep and goats from West Stow and Ipswich (N=70)*

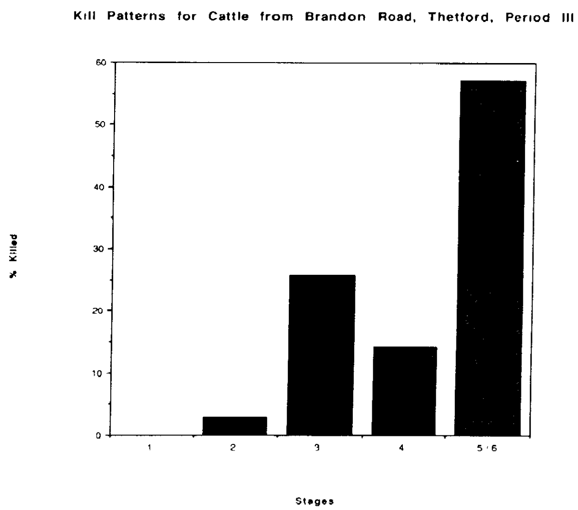


Figure 5.15 *Kill-pattern for cattle from the Brandon Rd site, Thetford, Period III (N=35)*

(Fig 5.18). Modal withers heights range between 57 and 63cm, with the largest sheep coming from Icklingham. The withers heights also point up a second feature of the Anglo-Saxon Sheep in East Anglia: a marked variability in size that does not appear to be a reflection of sexual dimorphism. Considerable variation in long bone lengths has been recorded for sheep from early Anglo-Saxon West Stow (Crabtree 1990a, Plate IV), for the 10th to 12th century sheep from Brandon Road in Thetford (Jones in press a), and for the late Saxon sheep from Fishergate in Norwich (Jones, in press b).

Cattle. Maltby (1981) has shown that the greatest lateral length of the astragalus (von den Driesch's GLl) is the measurement most commonly taken in cattle remains from prehistoric, Roman, and Anglo-Saxon sites in Britain. Astragalus lengths for cattle from Anglo-Saxon sites average between 60 and 61mm. The Iron Age astragali from West Stow are somewhat smaller on average, and the late Roman astragali from Icklingham are generally larger. The size increase that is seen in the late Roman period at Icklingham does not appear to be a result of changing the proportions of males and females culled. A scatter plot of the distal breadth of the metacarpus (Bd) against the distal fusion point breadth (following Higham and Message 1969) suggests that most of the cattle from Iron Age West

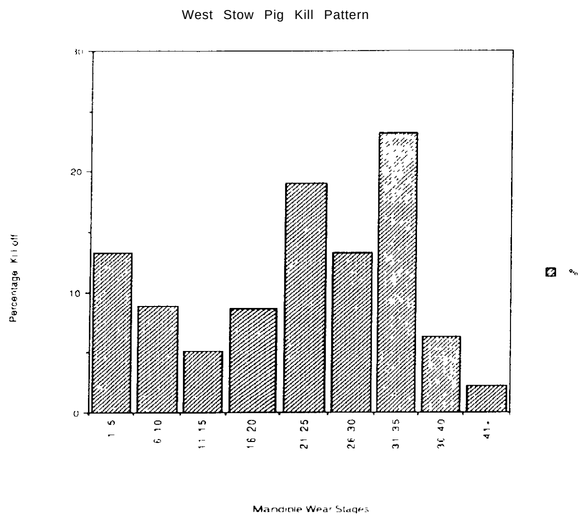


Figure 5.16 Kill-patterns for pigs from West Stow, following Grant (1982)

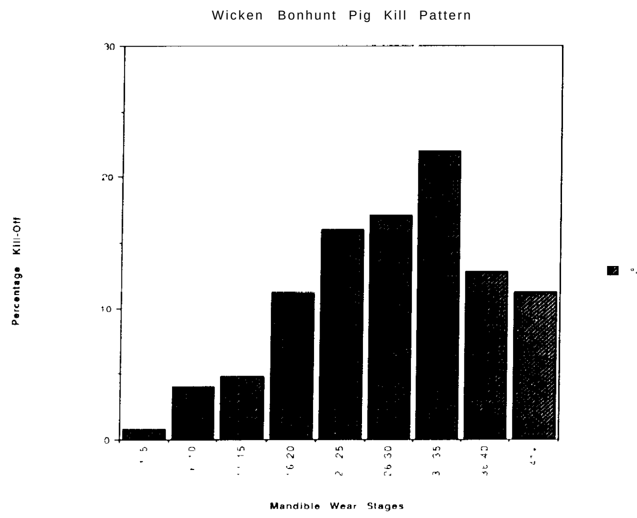


Figure 5.17 Kill-patterns for pigs from Wicken Bonhunt, following Grant (1982)

Stow, Roman Icklingham, and Early Anglo-Saxon West Stow were females and castrates rather than intact bulls (see Crabtree 1990a, Fig 21).

These size differences are also seen in the withers height estimates for East Anglian cattle (Fig 5.19). The Iron Age cattle from West Stow are smaller (mean withers height= l.07m, n=12) than those from the other East Anglian sites. The cattle from Icklingham and Wicken Bonhunt appear to be somewhat larger than those from West Stow, Ipswich, and the Brandon Road site in Thetford (10th century, mean withers height= 1.14m, n=30) (Jones, in press a). The relatively large size of the cattle from Wicken Bonhunt might reflect the slaughter of a larger proportion of castrates at this site.

General conclusions

What can the faunal assemblages from West Stow and Wicken Bonhunt tell us about the patterns of animal exploitation in East Anglian villages? First, it is clear that while there may be some continuity in animal husbandry practices from Iron Age and rural Romano-British sites to early Anglo-Saxon West Stow, the patterns of trade and exchange in animal products seen at late Roman sites such as Icklingham do not continue into the early Anglo-Saxon period. The species ratios and kill-patterns for the domestic stock seen at the West Stow Anglo-Saxon village are much more like those seen at the West Stow Iron Age site than they are like those seen at late Roman Icklingham.

The species ratios and kill-patterns seen at West Stow suggest that the site is a small self-sufficient or rural producer site. Species ratios based on both MNIs and NISPs indicate that sheep were the predominant animals at West Stow throughout the early Anglo-Saxon period. This is consistent with the Domesday Record that indicates that the West Stow area was a major sheep producing region in the 11th century (Darby 1935, 443). The presence of substantial numbers of very young cattle, sheep, and pigs indicate that these animals were raised at the site. The kill-patterns also provide some evidence for the autumn slaughter of excess young stock. The West Stow sheep and cattle are quite comparable in size to the domestic stock seen at later Anglo-Saxon sites in East Anglia, including Thetford and Ispwich. The metrical data suggest that East Anglian types (breeds?) of cattle and sheep had been established by the early Saxon period. The second conclusion that can be drawn is that the pattern of animal exploitation seen at the middle Saxon village of Wicken Bonhunt differs markedly from the West Stow pattern. The high proportion of pig bones recovered from the Wicken Bonhunt site is unparalleled in East Anglia in the Anglo-Saxon period and may indicate that Bonhunt was a high status site. The mortality profiles include high numbers of mature adult sheep, cattle, and pigs. The kill-patterns for cattle and sheep at Wicken Bonhunt are more similar to the mortality profiles seen at urban sites such as Thetford than they are to the West Stow kill-patterns. It is possible that Wicken Bonhunt was supplied with market age animals from other producer sites. Hodges (1982, 142) has suggested a possible explanation for the kill-patterns seen at Wicken Bonhunt. Place-name evidence suggests that Wicken Bonhunt was a royal farm, and Hodges has suggested that it might have served as a royal food-rent collecting centre. This could explain the high percentage of market age animals found at the site.

The contrasts between West Stow and Wicken Bonhunt indicate that there was great variability in

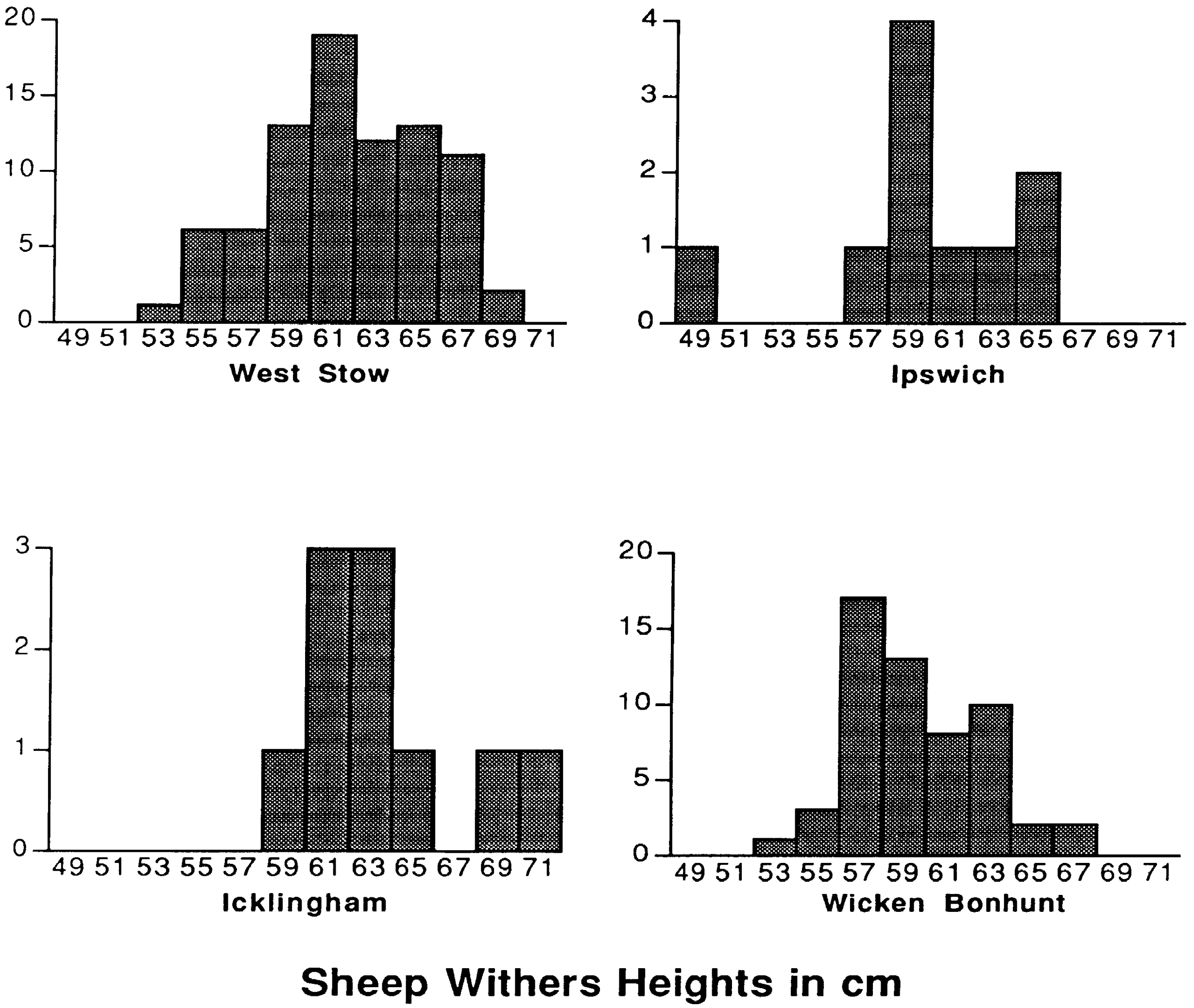


Figure 5.18 Withers height estimates for East Anglian sheep

the patterns of animal exploitation in East Anglia in the Anglo-Saxon period. On the basis of available evidence it is not possible to talk about an East Anglian pattern of animal husbandry. A thorough understanding of the animal economy of East Anglian villages is critical, since these are the villages that supplied the emerging Anglo-Saxon towns such as Ispwich, Norwich, and Thetford. If we want to understand the process of urban growth and development in East Anglia we cannot concentrate solely on the excavation of towns. More village sites need to be excavated, and archaeologists need to concentrate on the interactions between town and countryside. Comparisons of faunal remains from rural and urban sites in East Anglia will allow us to study the ways in which rural villages organized animal production to support the rapidly growing Anglo-Saxon towns in East Anglia. Regional studies that focus on an urban centre and a number of rural sites in the immediate vicinity would be particularly useful for the study or urban-rural interactions.

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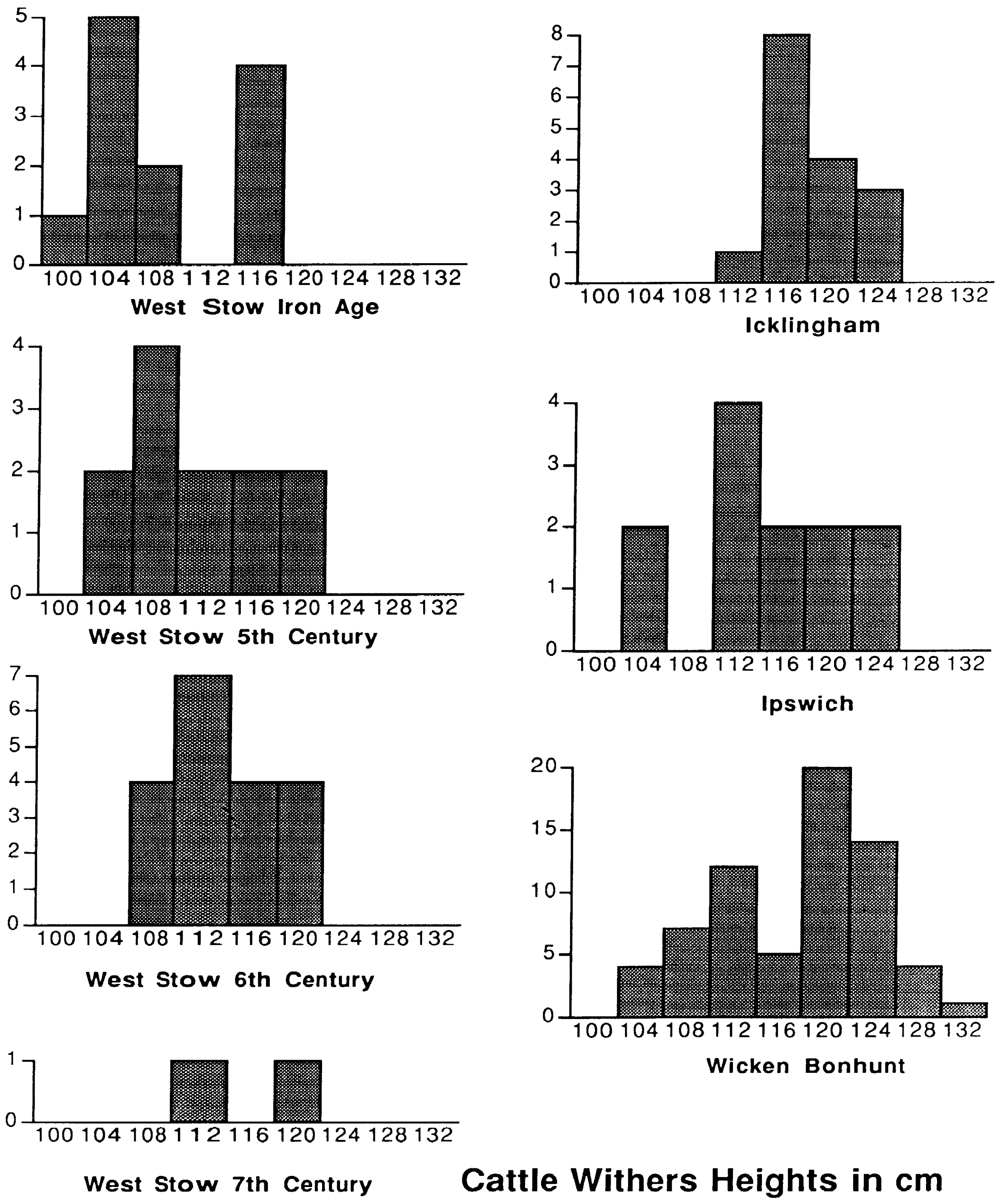

Figure 5.19 Withers height estimates for East Anglian cattle

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6 Charred cereals from some ovens/kilns in late Saxon Stafford and the botanical evidence for the pre - *burh* economy

Lisa Moffett

Abstract

The results of the analysis of carbonised remains, particularly cereal seeds and chaff, from four late Saxon ovens or kilns in Stafford are presented, and used to interpret the function of the ovens and the use of crop processing by-products. The significance of the assemblages for the agricultural landscape and character of the settlement are discussed.

Introduction

Excavations in advance of redevelopment in several areas of the town centre of Stafford were conducted from 1975-1983 by the Birmingham University Field Archaeology Unit under the direction of Martin Carver. These and other smaller excavations by BUFAU and other excavators carried out over a number of years have more or less defined the extent of the Saxon settlement (Cane *et al* 1984) and uncovered many aspects of the late Saxon settlement and medieval town.

The town of Stafford lies in the central lowlands of Staffordshire. It sits on a terrace in a bend of the River Sow near where the River Penk flows into the Sow from the south. The Sow itself joins the Trent about 8km to the east of the town. From the floodplain of the river the ground rises slightly to the river terraces and then gradually to the uplands of Cannock Chase about 10 km to the south-east and the Pennines further to the north (Fig 6.1). The light soils on the river terraces are easily worked and suitable for cereal cultivation, while the heavier soils above the terraces are also mainly good agricultural soils. The upland soils are less suitable for agriculture by modern standards but were probably cultivated from time to time depending on economic conditions. It must be noted that the soils of the Saxon period were not necessarily the same as the modern soils in the region today (Limbrey pers comm). It seems a safe assumption, however, that the area around Stafford would have been suitable for arable cultivation on a substantial scale.

There is little environmental evidence from the area generally, but fortunately a pollen core was taken from the King's Pool on the east side of Stafford, just outside the area of the medieval town. The pollen diagram (Colledge & Greig, forthcoming) shows that the landscape was open by the Iron Age or Roman period, with some woodland but probably not primary forest. Although the dating is not precise, it seems that in the late Saxon period, after a phase of scrub regeneration, the landscape was again open, with evidence for an increase in cultivation compared to the Iron Age/Roman phase. Cereal pollen is about 10% with evidence also for secondary woodland or possibly hedgerows.

Stafford was one of the settlements on the frontier of the Danelaw which was fortified by Aethelflaed in the early 10th century as part of the Saxon effort to drive back the Danes. The *Anglo-Saxon Chronide* states that Stafford was fortified in AD 913, but no definite evidence of the Saxon defences has so far been recognised in any of the excavations in the town. It is not known what actually constituted the *burh* that Aethelflaed fortified. Presumably there was some kind of *pre-burh* settlement but at the time of writing the actual pre - *burh* settlement has not been identified. There is also very little to link the archaeological evidence uncovered so far with the establishment of the *burh*.

This paper is concerned with just one of the town centre sites. This is the site at St Mary's Grove next to St Mary's church (Fig 6.1). On present evidence it seems likely that this area near St Mary's may have been the nucleus of the late Saxon settlement (Carver, in Cane *et al*, 1984). Evidence of habitation structures, however, is lacking. What has emerged is that certain areas of the settlement seem to have specialised in certain activities (Carver *et al*, in prep). The area uncovered at the site at Tipping Street, on the other side of the early town, seems to have specialised in the production of a late Saxon type of pottery now called Stafford ware. The St Mary's Grove site produced evidence to indicate some specialisation in activities apparently connected with cereals.

This area appears to have had a long association with cereal-related activities. The earliest features found at this particular site were two, possibly three, four-post structures which may have been granaries, and are radiocarbon dated to 342±70 bc

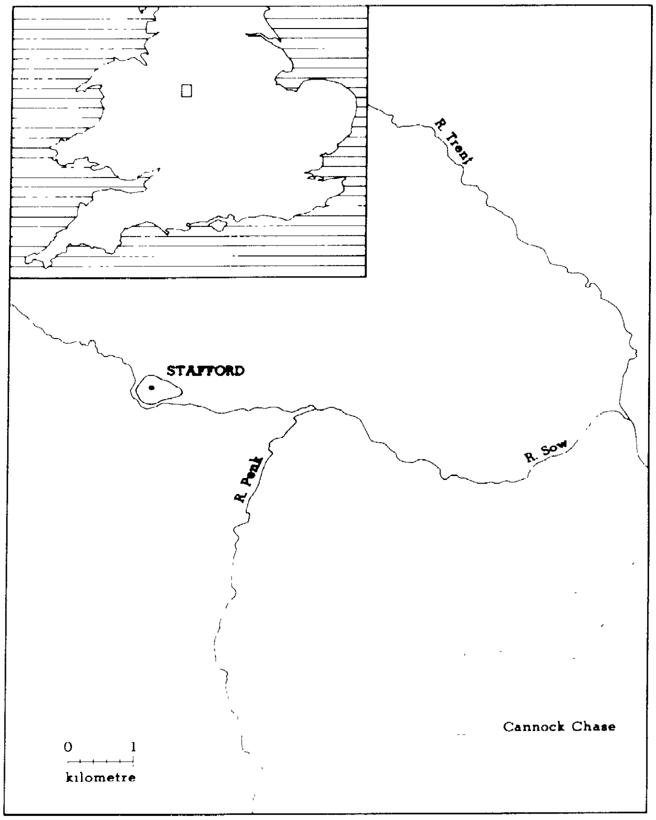

Figure 6.1 The region of Stafford, showing the outline of the medieval town and the location of St Mary's Grove site. Dotted line is the 150m contour

(Cane pers comm). Remains in the post-holes of charred cereals, possibly representing spikelet stores of emmer and spelt, reinforce the interpretation of these structures as granaries which were apparently destroyed by fire, although the destruction layers were later truncated, probably by cultivation. In the medieval period a great deal of quarrying was carried out in the area and some of the quarries were partly backfilled with dumps of charred grain. An oven, possibly used at least sometimes for malting, and a stone-built malting kiln were also found. It is rather striking, though possibly only a coincidence, that this area seems to have been used so frequently for cereal-related activities from the Iron Age until perhaps as late as the 14th century (Carver, this volume).

During the late Saxon period at least four ovens or kilns were constructed, which were found on excavation to contain substantial quantities of charred material, and more charred material was dumped nearby. Samples were taken of this material and were processed by water flotation. The resulting 'flots' contained far too much material to analyse completely in a reasonable length of time, and most of the flots were subsampled. For details of the samples and methods see Moffett (1987) and Carver *et al* (in prep).

The term 'oven' is used in this paper for brevity's sake and is not intended to imply any particular function or form. The ovens were of two types, both similar in plan but one clay-lined and the other not. They were grouped around a cobble surface and were in pairs, one of each type in each pair. Apparently the ovens were not enclosed by a building, although this is not certain.

Dating

Stafford ware was found on the cobble surface between the ovens. Stafford ware has been radiocarbon dated using charcoal from the last firing of the Tipping Street kilns, and has produced a calibrated radiocarbon date of early to mid-9th century. Radiocarbon dates were also obtained from the grain from an undisturbed context in one of the ovens. The sample produced three dates, 1270±70 bp, 1310±70 bp and 1120±70 bp, which when calibrated fall in the early-mid 9th century (Cane). At least one oven, therefore, was in use well before the fortification of the *burh* and probably the others were also.

Oven types

The basic plan of the ovens was keyhole-shaped, consisting of a round chamber and adjoining chamber or pit which is interpreted as a probable stoking area. All of the ovens had evidence of stakeholes in the main chamber. In some cases it was clear that the chamber was lined with stakes, sometimes in pairs. There were postholes at the juncture of chamber and stoking pit/chamber. The superstructure is unknown, but two of the ovens had a large amount of clay in the backfill. The other two ovens had no clay in the backfill, and the absence of clay is so complete that it seems unlikely that they were robbed. There were, therefore, two types (Fig 6.2), one type with a clay superstructure and the other with a superstructure of unknown materials.

Of the ovens with clay in the backfill, one (214) had evidence of burning just inside the main chamber, but the chamber itself was nearly clean of charred material and most of the charred remains were found in the 'stokepit'. The other (584), though only half-excavated, appeared to be similar except that the charred material was found in the main chamber. A shallow depression just inside the chamber floor was filled with charred material, and it was from a sample of this that the radiocarbon dates were obtained.

Of the two ovens which produced no clay in the backfill, one (130) appeared to be two-chambered with evidence of stakeholes in both chambers but a burned patch in only one. Charred material was found in both chambers but mostly in the chamber with the burned patch. The other oven (585) was keyhole-shaped, and although the floor was scorched the charred remains appeared redeposited.

In fact in only one of the ovens (584), where the charred material was still in a depression just within the chamber floor, is the charred material *in situ*. In all the others the charred remains have clearly been disturbed from their original place of burning within the ovens.

The botanical remains

The cereals represented in the ovens were bread/club wheat *(Triticum aestivum sl)*, six-row hulled barley *(Hordeum vulgare)*, *rye (Secale cereale)*, common oat *(Avena sativa)* and bristle oat *(Avena strigosa)*. There were also just a few traces of bean *(Vicia faba)*, pea *(Pisum sativum)*, cherry *(Prunus cerasus/avium)* and dill *(Anethum graveolens)*. *Also* found at this period though not represented in the ovens were two-row hulled barley *(Hordeum vulgare)* and *flax (Linum usitatissimum)*. These crops are mainly those one would expect for the late Saxon period, except that bristle oat is not frequently reported, possibly because it cannot usually be identified unless the diagnostic chaff parts, which generally preserve poorly, are present. All of the cereals were represented both by grains and by chaff fragments and there were also many weed seeds. Wood charcoal was present but not in large quantities.

All of the cereals were present in every oven, usually represented by both chaff and grains. The amount of weed seeds varied from 13 to 41%, by numbers, of the charred material from each oven. These were obviously mixed assemblages and interpretation was very difficult. Since the aim of the botanical study, in general, was to attempt some interpretation of crop husbandry practices, and also in this particular case to suggest functions for the ovens, it was necessary to try and identify the kinds of crop processing products which went to make up the mixed assemblages. A full discussion of the identification of crop processing products from charred assemblages based on ethnographic parallels has been given by Hillman for glume wheats (1981; 1984) and by G Jones for free-threshing cereals (1984). In very general, simplified terms, the crop processing products concerned here are:

a) The large and light chaff, culm, rachis and weed remains which are separated from the crop by threshing and winnowing
b) The large and dense culm nodes, seed heads, other culm fragments, etc. which are too heavy or too small to be removed by winnowing and are removed with a coarse riddle which retains these large contaminants and allows the grains and smaller contaminants to pass through
c) The weed seeds and small and dense chaff fragments (mostly rachis fragments) which are separated from the crop by sieving through a riddle with holes just small enough to retain the grains while allowing the small contaminants to pass through
d) The cleaned or semi-cleaned crop itself

Since products A and B are generally indistinguishable archaeobotanically *(cf* modem crop samples from an ethnographic study in Jones 1990), they will here be considered together as winnowings/coarse cleanings.

Although tools and techniques can vary to some extent, the basic sequence of processing is fixed by the demands of the crop itself and therefore the resulting products and by-products at each stage tend to be similar, regardless of the tools and methods used (Hillman 1981; Jones 1984). One factor which affects the composition of these stages to some extent is harvesting methods, since this determines what components go through the processing sequence in the first place. If, for example, a crop is harvested by reaping just below the ears, then the long straw (culms and culm nodes) never enters the crop processing sequence. If the crop is harvested by uprooting, then not only the long straw but also the culm bases will be included. Finally, if the crop is harvested by reaping low on the straw then the long straw will be included but not the culm bases (Hillman 1981).

Generally for free-threshing cereals such as those at Stafford, the rachises, glumes and light chaff, culm fragments and seed heads would be in the winnowings/coarse cleanings, while the fine cleanings would have mostly weeds seeds and tail grains smaller than the prime cereal grains. The processed crop itself would still have remaining weed seeds and seed heads which are about the same size as the prime grains, bits of grit and a few broken culm and chaff fragments which could only be removed by hand sorting. In charred material this picture is complicated by the fact that only certain elements survive charring well, while others may disappear completely (Boardman & Jones 1990). Generally the lighter, papery elements such as culms, glumes, lemmas and light weed seeds survive poorly as they tend to be consumed by fire almost immediately. Heavier elements such as dense weed seeds and grains survive better because they sink to the lower portions of the fire where reducing conditions prevail and they are more likely to be charred than burned up. Free-threshing rachises may survive rather poorly even though the rachis nodes are quite dense because they remain joined together and hence are more likely to get caught in the upper, aerobic portions of the fire where they will be consumed (Hillman 1981). Culm nodes may also become under-represented in this way if they have long sections of culm attached. In the following discussion, therefore, it has been assumed that chaff fragments (which in this case are wheat, rye and barley rachis fragments and oat spikelet forks), and possibly culm nodes, are under-represented relative to cereal grains, but no attempt has been made to estimate the degree of loss.

Since the weed seeds could not be assigned to any particular crop, for the purposes of identifying crop processing products with regard to particular cereals

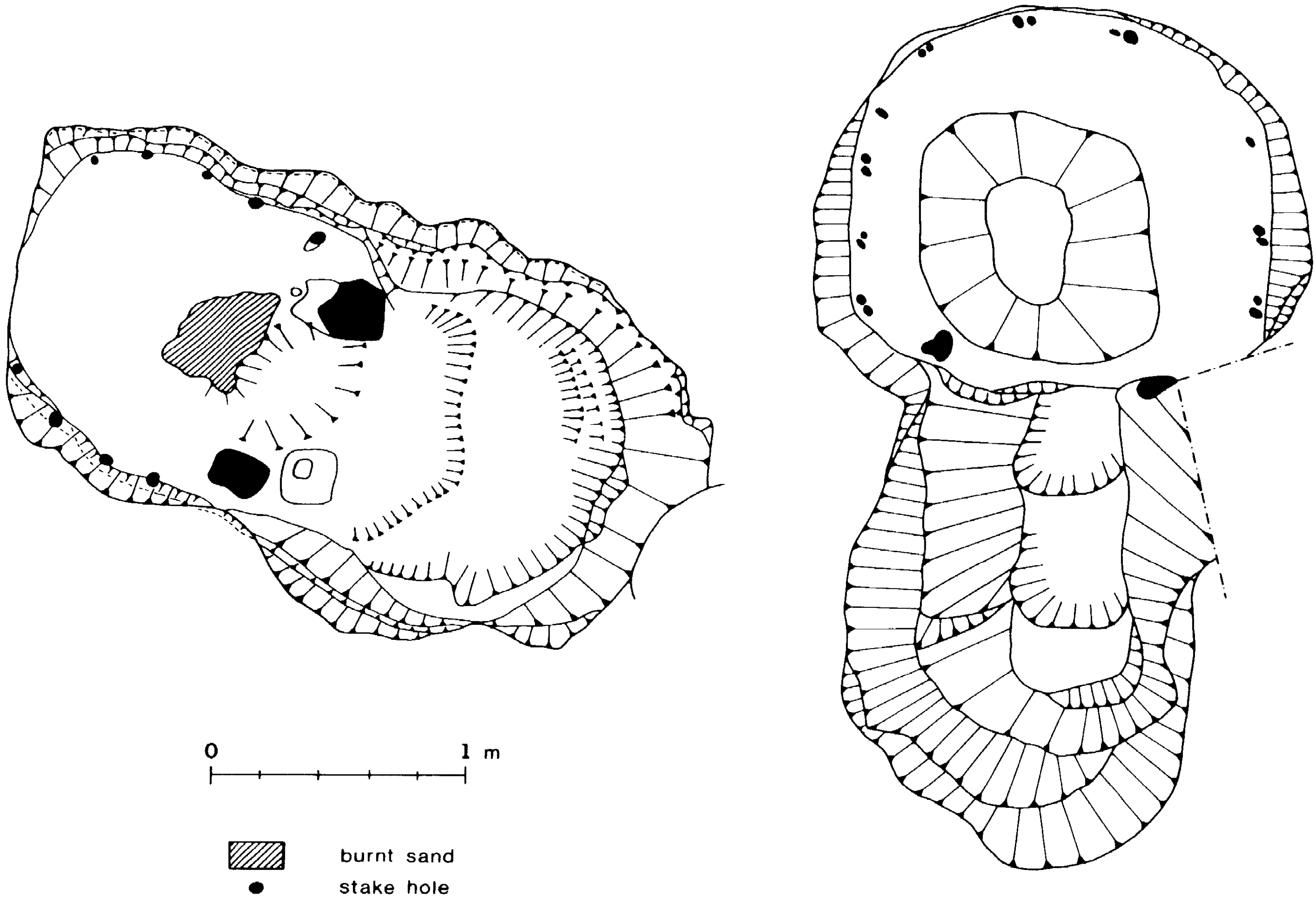

Figure 6.2 Two of the late Saxon ovens from Stafford. Left – Oven 130, not clay-lined. Right – Oven 214, clay-lined.

they had to be ignored. Only the ratios between the identified chaff fragments and the identified grains could be used. This may have partially compensated for the assumed under-representation of chaff because a large number of cereal grains were unidentified whereas a relatively small number of chaff fragments were unidentified.

In order to determine whether grains or chaff predominated in a sample for any given species, it was first necessary to compare the ratio of chaff to grains in whole unthreshed ears with the ratios of chaff to grains in the samples. These ratios are given in Table 6.1. In most cases the ratio of chaff to grain shows that the amount of chaff in the samples is equal to or less than what would be expected from an unprocessed crop. This does not, however, indicate whether an unprocessed or a fully processed crop is represented. Since the degree of preservation bias for chaff relative to grain is unknown, the ratio of chaff to grain for any given species being equal to or less than the ratio of chaff to grain in an unprocessed crop of the same species in fact tells us very little. What is significant is where the ratio of chaff to grain is greater than that for an unprocessed crop. Where this is the case it has to mean that the elements of winnowings/coarse cleanings have been introduced into the ovens as a product in their own right, not as an inclusion in poorly cleaned or unprocessed grain.

In all of the ovens the ratio of rye chaff to rye grains is substantially greater than that for an unprocessed crop, and in one oven (584) this is also true of wheat. This can be seen in terms of simple percentages which are shown as histograms in Figures 6.3 and 6.4. The most likely explanation for the relatively high percentage of rye chaff is that this material was being used for tinder or for fuel. If this was the case, however, then the scarcity of culm nodes needs further consideration, as these would be expected in the winnowings/coarse cleanings and probably should survive at least as well as the rachises.

One possible explanation is that rye may have been harvested by cutting just under the ear. The

Table 6.1
Approximate ratios of rachis nodes or spikelet forks to grains for each of the four major cereals identified to genus in samples from the Stafford ovens

	Chaff : Grains			
Oven	**Wheat**	**Rye**	**Barley**	**Oats**
130	1:1	3:1	1:11	0:6533
585	1:4	5:1	1:1	1:29
585	1:2	4:1	1:3	1:225
585	1:2	7:1	1:6	1:42
214	1:2	1:1	1:5	0:41
214	1:19	2:1	0:2	0:7
584	2:1	4:1	1:9	1:12

Expected approximate ratio of rachis nodes (spikelet forks in oats) to grains in unthreshed ears

Wheat	**Rye**	**Barley**	**Oats**
1:2 or 1:3	1:2	1:3 (6-row); 1:1 (2-row)	1:2 or 1:3

straw would be left standing in the field to be harvested later. This would have the advantage of leaving the straw whole so that it could be used for thatching, and of course the straw with its nodes would not be in the winnowings/coarse cleanings. Rye is the tallest of the cereals and its long, strong straw may have been of particular value for purposes such as thatching.

Possible evidence against this explanation is the large number of weed seeds, some of which are not from tall species. Reaping just under the ears tends to eliminate many weeds (Reynolds 1981) as it is easier for the reaper to avoid cutting them with the cereals. Those weeds which are included would be those of about the same height as the crop. Many of the weed species found are tall, but there are also a substantial number such as sheep's sorrel, ribwort plantain, stinking mayweed and corn spurrey, which, though they can grown up to 60cm, are unlikely to grow tall enough to be harvested in this way (rye grows to about 150-200cm). However, since it cannot be shown which weeds went with which crop, some of the tall weeds may well have been contaminants of the rye, while other shorter weeds may be associated with the other cereals. There are also some culm nodes present, which may perhaps be associated with the other cereals.

If rye chaff was readily available for fuel, then either the chaff was being brought in specially as a product in its own right, or the rye crop was arriving in the *burh* unprocessed and the activities of threshing, winnowing, etc. were being carried out near at hand. Although in the medieval period straw and chaff were probably brought into towns and bought for bedding, fodder, building materials, or even for fuel (Moffett 1988), it seems extremely improbable that Stafford at this period was urbanised enough for this to be necessary. Rye, therefore, was probably a locally grown crop, as unprocessed crops are very bulky, and it is unlikely to have been economical to have transported them very far. This is no indication, however, that the other cereals came from any further afield. Certainly rye would have been a suitable crop for the well-drained, slightly acid soils found locally on the river terraces. Also a number of the weeds present such as *Papaver cf dubium, Papaver cf argemone, Raphanus raphanistrum, Silene latifolia* ssp *alba, Silene cf nutans, Scleranthus annuus, Chenopodium murale, Aphanes arvensis, Rumex acetosella* agg and *Chrysanthemum segetum* are commonly found on light, dry or acid soils, although it is not possible to establish whether these plants were growing with the rye. These plants are too short to have had much chance of being harvested with a tall crop if just the ears were reaped and may have been growing with the other cereals. *Centaurea cyanus* was also present and is an autumn germinating weed which has often been associated with winter sown crops such as rye and wheat.

Possible functions of the ovens

Despite the large amount of charred cereal remains associated with these ovens, it was actually very difficult to deduce their functions. The presence of rye chaff as fuel is little clue since the ovens could have been used for purposes unrelated to any form of cereal processing. The presence of large numbers of cereal grains does, however, suggest that grain

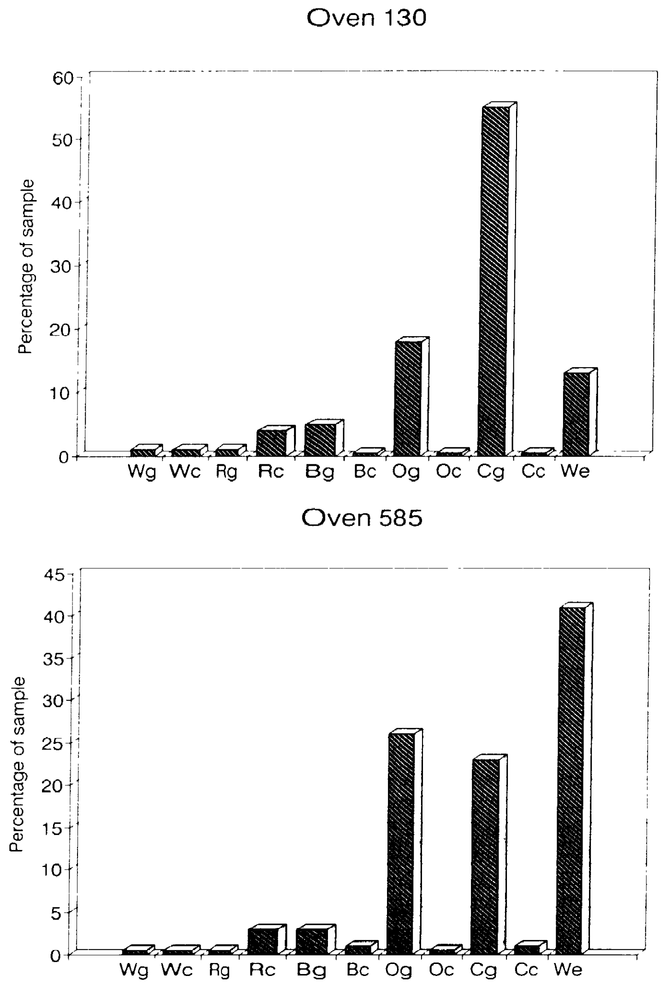

Figure 6.3 Histograms showing the sample composition by percent of the material from the ovens not clay-lined. Top – Oven 130 (approximately 37000 items from 43kg of soil). Bottom – Oven 585 (approximately 73000 items from 158kg of soil)

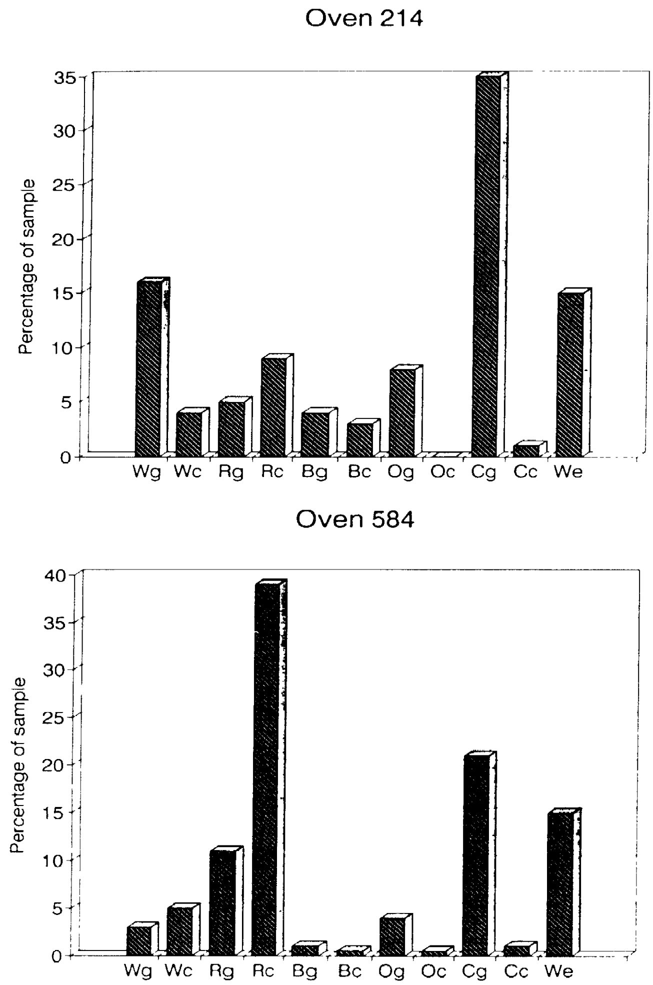

Figure 6.4 Histograms showing the sample composition by percent from the clay-lined ovens. Top – Oven 214 (approximately 500 items from 23kg soil). Bottom – Oven 584 (approximately 7800 items from 6kg of soil)

Key for Figures 6.3 & 6.4:

Wg	*Triticum* grain	Bg	*Hordeum* grain	Cg	indet. cereal grain
Wc	*Triticum* grain	Bc	*Hordeum* chaff	Cc	indet. cereal chaff
Rg	*Secale* grain	Og	*Avena* grain	We	weeds
Rc	*Secale* chaff	Oc	*Avena* chaff		

was being processed. A likely possibility is that the fuel component has become mixed with the product being processed. Several possible functions are suggested here. The two different types, however, may have had different functions. They each may also have had several functions. The presence of legumes, dill and cherry in one of the ovens may represent accidental inclusions or may suggest that the function of that oven (130) was possibly not confined to the processing of grain, though dill seeds could have been sprinkled on bread just as various kinds of seeds are today,

Bread making: Bread making was suggested by Carver as a possible function of the clay-lined ovens, with the large amount of cereal material perhaps derived from cereal grains used to keep the loaves from sticking. It was thought, however, that because the clay was not fired the ovens might not have been repeatedly fired at a sufficiently high temperature to bake bread. Experiments later showed that this was not the case and that the bread could be baked in such ovens without firing the clay (see *below).*

Grain drying: Drying grain before storage usually increases its storage life, though seed corn may not be dried as this can impair its viability. The storage life of grain depends upon a combination of factors including moisture, temperature, the degree to which the grain has already been invaded by storage fungi, and also the degree of infestation of insects and mites, as these increase the moisture content and carry fungal spores (Christensen & Kaufmann 1969).

Drying and low temperatures inhibit the growth of the storage fungi, which are usually the major cause of grain spoilage. The lower the temperature at which the grain is stored the higher the safe moisture content, particularly if there is free circulation of air (Ministry of Agriculture 1966). Drying of grain, therefore, is not always necessary, especially if the air temperature is low. Fenton (1978), in his ethnographic study of the Northern Isles, describes a method of storing threshed grain outdoors on a circular straw foundation. The grain was surrounded by large straw ropes and covered by thatch. Grain was said to store for up to a year this way, no doubt helped by the low average temperature of the local climate. In areas where the growing season was short corn drying was used to ripen the crop (Fenton 1978, Williamson 1948).

Reynolds, in reference to Romano-British 'corn driers', points out the impracticality of attempting to dry several tons of grain (an annual harvest's worth from a few hectares) in one of these structures, and concludes that malting was a more likely function (Reynolds & Langley 1980; Reynolds 1981). The capacity of the Stafford ovens would perhaps be equally impractical for drying a whole harvest's grain. It is probable that corn drying for storage or ripening the crop was practised only when it was seen to be necessary and would not have been an automatic procedure for the whole harvest nor undertaken every year.

Modern ethnographic evidence from the North Atlantic region suggests that the main function of corn-driers was to parch grain prior to milling (Bowie 1979; Evans 1957; Fenton 1978; Scott 1951). Damp grain is inefficient to mill as it tends to crumble between the millstones rather than grind to a flour. Even fully ripe grain, stored relatively dry, mills much more efficiently after being hardened by parching and the flavour is also improved provided the grain is not smoked. Experiments using restored Romano-British rotary querns, showed that a pound of parched grain was ground to a flour in a few minutes, and needed to be put through the quern only twice, but a pound of unparched grain took three quarters of an hour and needed to be put through the quern eight or nine times (Curwen 1941). Grain need not be milled only for flour. Meal was also used for cereal pottages, another dietary staple (Wilson 1984). Milling is also a way of removing the tightly enclosing chaff parts of oats and barley when these are intended for human consumption, and the grain would usually be parched beforehand to make this process easier (Curwen 1941; Fenton 1978).

Malting: When grain is malted it is first germinated and then roasted to kill the sprouts without killing the enzymes which are needed to convert starch to sugar during fermentation (Hunter 1952). This process requires a gentle heat similar to that needed in grain drying. The ovens, however, produced no clear evidence for malting. Only a few grains among thousands showed clear signs of germination – no more than one would expect from a grain harvest grown by traditional methods in an oceanic climate. However, in drying malt it is important to keep the malt well protected from smoke and fire to avoid over-roasting or tainting the flavour of the ale. The malted grain, therefore, might have a relatively lower chance of becoming charred. Malt-drying cannot be ruled out as a function of these ovens, but the charred grain associated with the ovens had not germinated and must have been there as the result of some other activity.

Experimental evidence: Preliminary experiments were carried out by J Cane and C Cane at Shugborough Hall, Staffordshire, over one weekend. Both grain drying and bread making were attempted and both types of ovens were reconstructed. The superstructures of the two types had to be guessed at, but one was made with a clay dome and the other with an open wattle and stake frame on which was laid straw and cloth to support grain. This latter structure was quite effective and, under favourable conditions it was possible to dry 15kg of damp grain to a moisture content of 10% in an hour. Bread making in the other type was equally successful especially after a clay shelf (which also did not fire and would be archaeologically indistinguishable from the clay superstructure) was added to support the loaves and make it possible to stoke the oven continually. This arrangement made it possible to produce loaves at the rate of 15–20 in about three-quarters of a hour. The use of a layer of grain to keep the bread from sticking to the shelf proved to be essential (Cane & Cane,). This layer of grain, would, of course, be very vulnerable to charring, as it would almost certainly get swept off the shelf either accidentally or deliberately during the use of the oven. The grain used for such a purpose would not need to have been fully cleaned and therefore could still be contaminated with weed seeds.

These experiments were only preliminary and would need to be repeated many times under different conditions before firm conclusions could be drawn. It would also be necessary to use winnowings/coarse cleanings for fuel, which were not available for these experiments. However, the mere practical demonstration of the possibility of bread making and grain drying in the two different types of structures has drying in the two different types of structures has done much to advance the possible interpretations of these ovens. This underlines the great need that exists for practical experimentation in many circumstances where internal analysis of charred assemblages may not be adequate for interpreting function. This is particularly the case where there is reason to suspect that the composition of the charred assemblages may have been biased by differential preservation, or where possible use as a fuel means that its composition may be unrelated to the function of the structure.

Comparisons with other Saxon ovens

Very few of the excavated post-Roman grain driers/ ovens/kilns have produced charred plant remains which have been analysed. Those that have vary structurally and in terms of date so it is difficult to compare them. The post-Roman kilns at Poundbury were rectangular pits which had a stoke-hole area and a main chamber but no evidence for a clay superstructure. They generally contained several species of cereal, many weed seeds and few chaff fragments. They were interpreted as possible grain driers where the remains of the product being dried had probably become mixed with crop processing by-products being used for fuel (Monk 1987). An L-shaped 'corn drier' from Hereford (Rahtz 1968) contained mainly wheat grains with a few grains of barley and oats (Arthur 1985) while a similar one from Chalton Manor Farm in Hampshire also produced mainly grain, in this case chiefly oats with wheat and barley (Monk 1978). In London, a 10th century oven from Peninsular House had a mix of several cereals with many weed seeds and cereal sprouts, though little chaff or culm nodes. By contrast, at Well Court (also in London), an ash deposit thought to be the rakings from a nearby 10th or early 11th century oven contained mostly wheat, with just a few grains of other cereals and a few large weed seeds. The Peninsular House material could be interpreted in several ways, including the possibility that an incompletely cleaned crop destined for animal fodder may have been dried to prevent further spoilage. The Well Court deposit may be the remains of grain charred while being parched to harden it for milling (Jones *et al* 1991).

The examples represent at least three different types of structures, none of them the same as the Stafford ovens. The nearest structural parallels with Stafford may be two keyhole-shaped Saxo-Norman 'corn driers' from Nottingham (Cherry 1973). One of these was said to contain 'corn husks', but whether any archaeobotanical analysis was done is not known. The exact structural form, however, need not always be tied that closely to function, since several forms may have been used for the same purpose and the same structure may have served several purposes. Of the kilns/ovens where archaeobotanical analysis has been done, the type of plant remains they contain also seems to be very variable. It is perhaps unlikely that they were all used for the same purpose but without more data there is little effective comparison to be made.

The problem of function, it seems, has progressed little since Monk's (1981) discussion with regard to the Poundbury kilns. This may be, in part, because it is not a problem which can be addressed by internal analysis of charred assemblages alone. It is still necessary to recover charred plant remains from these structures in order to record the character of the assemblages and to discover whether there are associations between certain types of assemblage and certain types of oven/kiln. Our present understanding of the taphonomic processes that led to these final assemblages, however, relies very heavily on ethnographic parallels. Although, when used properly, this is an entirely valid, indeed a necessary, approach to interpretation, in this particular case there is a serious gap in the ethnographic data. There is no published data on the charred assemblages which resulted from the use of the corn drying and malting kilns documented by ethnographers for the North Atlantic. This gap now needs to be filled by a programme of practical experimentation. In the case of the Stafford ovens the interpretation of function was enhanced, even though no final conclusions could be drawn, just by the small amount of practical experimentation that was conducted.

Some concluding inferences

The capacity of the ovens for baking bread and drying grain is substantial, assuming that batches of grain were dried for milling, not whole harvests for storage. Even if the ovens are not all exactly contemporary and only two of the ovens, one of each type, were in use at one time (and this may not have been the case), the implication seems to be that these structures were not for the needs of a single small household but rather a large establishment such as an ecclesiastical community, a high-ranking residence, perhaps some kind of military establishment, or for a whole community.

Oats represent a high percentage of the identified cereals in the two ovens which may have been used as grain driers and this merits some further discussion. In part this high percentage is a result of a bias in identification because the grains were very poorly preserved and the long slender shape of oats (mostly identified as AuendLarge Gramineae) is more easily distinguished than the other cereals. It still seems, however, that oats were the dominant cereal. If the oats represent the grain product being dried rather than the remains of fuel, it may be that a substantial amount of the grain could have been destined for fodder. This might also help to explain the high percentage of weed seeds, which would probably not be fully cleaned from fodder.

The use of oats for fodder is often taken to imply the presence of horses, which, unlike oxen, need to be fed substantial amounts of grain if they are rarely for ploughing in the Anglo-Saxon period, but may have been used for packing, riding, and perhaps harrowing. Mostly the horse seems to have been a luxury animal (Langdon 1986). The presence of such large quantities of oats suggests that drying of fodder may have been more important, or frequent, than drying the grain for humans, but perhaps there were substantial numbers of livestock to be maintained. It is worth noting that oats were a major crop on many estates in Staffordshire during the medieval period (Birrell 1979), presumably because much fodder was needed to feed working stock. Fodder may have been less carefully handled than grain destined for human consumption and perhaps more likely to get charred. Alternatively, the presence of large amounts of oats in both of the possible grain drier-types may reflect only their last use, while the remains from drying earlier batches of cereals, perhaps, had been mostly cleaned out.

Oats may have been an important crop in late Saxon times at Springfield Lyons in East Anglia (Murphy, this volume) and oats appear consistently in charred assemblages of late Saxon date in various parts of the country even when other cereals predominate (eg Campbell; Green; Murphy; Rackham; all this volume; also Green 1979; Monk 1978; 1987). It has been suggested that the infrequent mention of oats in Old English texts compared with other cereals may indicate that people ate oats less frequently than other cereals (Grube 1934). Despite this the consistent appearance of oats in association with other cereals in archaeobotanical assemblages may indicate that the oats also were intended for human consumption. We should not assume too readily that oats were always used as fodder.

Oats can tolerate poor soils and climatic conditions, but return a poorer yield than other cereals under optimum conditions. They are, therefore, generally not grown on the good soils which will support other crops. This does, of course, depend on the amount of pressure there is on the land and also on the demand for oats. If the local Staffordshire landscape was being very intensively exploited during the late Saxon period then it is possible that the other crops were grown in the lowlands and that oats were cultivated on the uplands, such as Canneck Chase. Otherwise oats are likely to have been grown more locally. There is no evidence from the presence of threshing waste that oats might have been a local crop, but oat chaff is so fragile that probably all of it would be consumed if it had been burned *in* the ovens. However, *Avena strigosa, in* particular, is often associated with poor arable conditions and today is usually cultivated only where conditions are unsuitable for *Avena sativa* (Hubbard 1954). It seems an unlikely crop for lowland agriculture, unless it was present as a weed or had become unintentionally mixed with seed *corn* of A *sativa.*

The picture which seems to emerge, albeit still hazily, is one of a possible high-status establishment or perhaps a community which dedicated this area of the settlement to the essential household tasks of drying grain for milling and baking bread. The local arable landscape may have been fairly well-developed, an hypothesis supported by the King's Pool pollen diagram, allowing for the problem of its precise dating (Colledge & Greig forthcoming). The processing of rye, and possibly wheat, was probably carried out fairly near at hand. Rye straw may have been used as thatch, or for other purposes, with the ears being harvested separately.

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7 The preliminary archaeobotanical results from Anglo-Saxon West Cotton and Raunds *Gill Campbell*

Abstract

Preliminary results from the botanical analyses of a series of sites within the Raunds Project are presented. Most of the samples date to the late Saxon period, with evidence for the introduction of rivet wheat, processing of flax, and vetch probably being grown as a fodder crop. The results are used to suggest a well developed agricultural economy with possibly 2 or 3 field crop rotation.

The sites of West Cotton and Raunds, the latter comprising three sub-sites, Furnells, Burystead, and Langham Rd, form part of a series of major sites of different periods being studied within the Raunds Area Project. This project has involved the detailed survey of an area of 40 square kilometres in the Upper Nene valley, with full excavation of the sites within this area where they were under threat from gravel extraction, housing development, and road building. The sites have included Neolithic/ Bronze Age monuments at Irthlingborough and West Cotton, a Roman villa at Stanwick, the deserted medieval village of West Cotton, and Saxon/medieval sites in the village of Raunds itself. Minor excavations have also taken place at other sites within the area as part of the general survey work (Fig 7.1).

The village of Raunds lies on Jurassic clays and limestone, The higher ground to the west is capped by Boulder Clay, while in the valley bottom there is a low terrace and floodplain of calcareous gravel. The floodplain is now covered by alluvium which appears to be of medieval date. The onset of major alluviation probably occurred towards the end of the late Saxon period as a result of increased exploitation of the uplands in the catchment of the River Nene. Before this date, it is possible that the floodplain gravels were not experiencing even extensive seasonal inundation. West Cotton is situated on the edge of the gravel terrace adjacent to a palaeochannel of the Nene.

This paper will discuss in detail the plant macrofossil evidence from these sites. Most of the material has been preserved by charring, but there is also a little mineralised material, and some waterlogged material from a silted-up river channel adjacent to the site of West Cotton. Samples collected for charred remains were of the order of 10 litres, and were processed using a simple wash-over technique. Material was placed in a large dustbin and hosed with water. The water was then gently poured out through a 0.5mm sieve allowing lighter charred material to pass out with the water. The process was repeated, sometimes after allowing the washed sample to dry, before ‘floating’ it again, until no charred remains were visible in the sample. The sample remaining in the dustbin was then washed through a 2mm sieve and sorted for bone and other finds. Samples taken for the analysis of waterlogged plant remains were of the order of lkg and were wet-sieved in the laboratory on a mesh of 0.212mm.

Although at one stage it was thought that the Saxon and medieval pottery analysis from the Raunds sites was complete, this work has proved unsatisfactory and the entire assemblage is now being reassessed. Thus close dating of many contexts is not possible at present and the limits given for the broader periods, such as late Saxon, are somewhat in flux. The present date range given for the late Saxon material from the sites is AD850 to 1150, well into the Norman period.

Settlement at West Cotton began during the early Saxon period when there was one, or possibly two ‘grubenhäuser’ at the site. Subsequently, the site became deserted and sometime between AD600 and 850 it was overlain with a strip field system. Then, in the early 9th century, the south of the site was divided into a series of parcels of land with no occupation while on the northern half of the site there appeared a manorial type building consisting of a large hall with domestic quarters off to one side. This building complex went through some reorganisation in the 10th to 11th centuries and was eventually replaced in stone, sometime in the 12th century. Each of these phases appears to be associated with a water mill (see Fig 7.2).

Most of the material has come from deposits dated to the late Saxon period but there are also a few samples from the early Saxon grubenhaus. Most of the material is from features such as ditches and has undergone considerable mixing, and can thus only provide a general picture. There are however, also good assemblages from primary contexts such as ovens that can be related to specific events or activities.

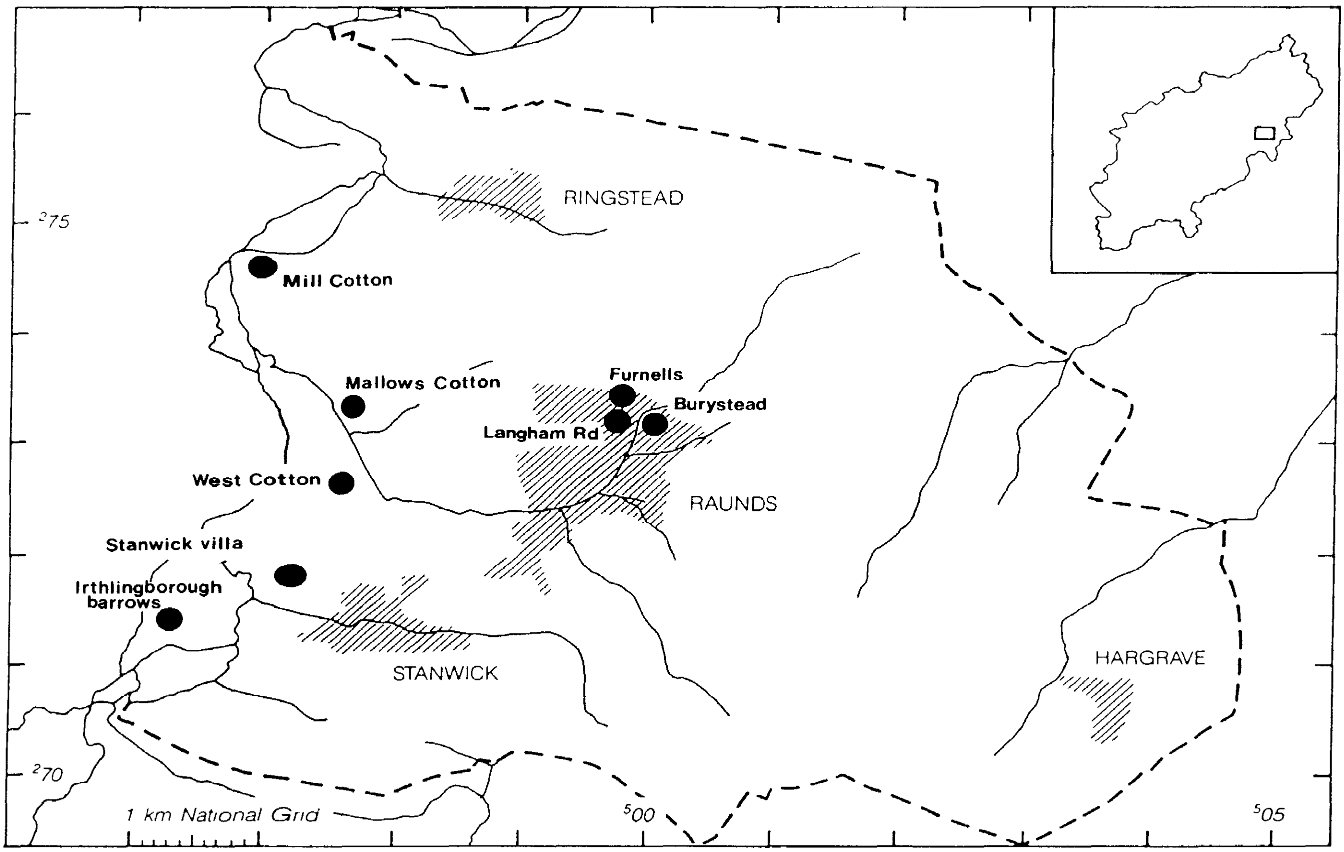

Figure 7.1 Location map for the sites in the Raunds project

The sites at Langham Rd and Burystead, in Raunds itself, have produced only limited material. There are few primary contexts dated to the Anglo-Saxon period and most of the material has been recovered from ditch fills and is very mixed. Much of the material from Langham Rd, at least, probably relates to activities centred on the site of Furnells. This, latter site was dug in 1977 prior to the setting up of the Raunds project and although some environmental work was done at the time, and subsequently, when this site was included in the Raunds Area Project, very few samples were available for study, Only one of these, a cess/refuse pit containing some mineralised material, has proved to be of Anglo-Saxon date.

There is little stratigraphy at either Langham Rd or Burystead. The two sites are separated by a stream and in the early/mid-Saxon period there were a number of grubenhäuser at Langham Rd and Furnells, and also some timber post buildings. Settlement seems to have been very scattered and there is little or no structural activity at Burystead. In the late Saxon period (? late 9th or 10th century) a large timber hall and a church were constructed at Furnells. These underwent various developments until, by ? 1150, the hall was replaced by a new manor house on the site of the then redundant church. The various enclosures and buildings at Langham Rd probably relate to the hall at Furnells but until the dating of the pottery has been sorted out little more can be said. According to historical evidence, there is also meant to have been a manor and church at Burystead in the late Saxon period. These buildings may lie to the south of the site excavated, and again, until the work on the pottery is completed it is difficult to establish the chronology for the site at this time.

Taking these factors into consideration, it seems logical to treat the data from the Raunds Area Project sites in a very general manner rather than making detailed intra- and inter-site comparisons. For the late Saxon period it is possible to discuss some of the more promising samples already analysed from West Cotton from contexts which have been assigned to one of the three phases already mentioned.

Early Saxon (AD450-650)

Very few features have been dated to the early Saxon period. 'Iwo samples from the early Saxon grubenhaus at West Cotton produced remains of free-threshing wheat and a few grains of barley, but very few weed seeds. Both samples were dominated by charcoal and one sample produced a fragment of *Prunus* sp stone and a possible fragment of *Cornus sanguinea* (dogwood), showing the exploitation of scrub.

Weed seeds from the samples are very scarce and are most likely to reflect plants growing on, or near, the settlement, rather than those associated with the crops. The occurrence of *Bupleurum rotundifolium* (thorowax) along with *Valerianella dentata* (slender corn-salad) would indicate the continued use of calcareous loam to clay soils. This had been suggested for the Roman period by finds of *Anthemis cotula* (stinking mayweed) and *Odontites verna* (red bartsia), which were found waterlogged, in association with a large amount of waterlogged spelt chaff and cereal bran, in samples from a well at Stanwick Roman villa.

Early/mid-Saxon (AD450-850)

The only samples looked at that date to the early/mid-Saxon are from Langham Rd, and are associated with another grubenhaus. There was a single seed of *Linum cf usitatissimum* (cultivated flax). Free-threshing wheat grains were quite plentiful in the samples and there was also a little chaff, including a few rachis fragments. One was identifed as *cf* hexaploid, two as *cf* tetraploid and one as definitely tetraploid. However, since the finds are so scarce and some intrusion is probable, this early record for tetraploid wheat must be treated with some caution. The paucity of chaff from the site in all periods though would be in favour of its authenicity. Barley was also present at Langham Rd but is only represented by a few grains and although one of these is definitely hulled, it is not possible to detect whether six-row or two-row barley or both is present. Weed seeds are again very sparse, but the general picture appears similar to that established for the early Saxon period at West Cotton, with the exception of the possible introduction of a tetraploid free-threshing wheat.

Late Saxon (AD850-1100/1150)

As already mentioned the material from this period forms the main bulk of the evidence and is especially useful for the site of West Cotton. The main cereal crop is free-threshing wheat and from the rachis fragments it is clear that both tetraploid and hexaploid types are present. *Hordeum vulgare* var *vulgare* (six-row hulled barley), *Secale cereale* (rye), *Avena sativa* (cultivated oat), and *L usitatissimum* (cultivated flax) were also being grown. There is also some evidence for the cultivation of legumes, *Vicia faba* var *minor* (horse bean) and possibly *Vicia sativa* spp *sativa* (cultivated common vetch).

Cereals

The ratios between different cereal grains seem to be roughly similar at all the sites (see Fig 7.3(a)). Free-threshing wheat is by far the most abundant grain, apart from that which could only be designated indeterminate cereal. Thus it would appear that free-threshing wheat was the main crop and from the chaff it is clear that both tetraploid and hexaploid types were important. In Britain, work by Lisa Moffett has shown that tetraploid wheat is present at many sites dating from the 12th century onwards (Moffett, 1991). It is thought that the species involved is probably *Triticum turgidum* (rivet wheat) as there is historical evidence for its growth in the British Isles from 1580 onwards (Percival 1934, 90), and since *Triticum durum* (macaroni wheat) would not do well in our oceanic climate. The hexaploid wheat present is an ordinary bread wheat *(Triticum aestivo-compactum* type). No attempt has yet been made to identify it further.

As regards the importance of the two types of wheat. evidence based on identifiable rachis nodes. would suggest that free-threshing tetraploid wheat was more important (Fig 7.3(c)). However, the rachis nodes which are only identifiable to the level of free-threshing wheat far outnumber those assignable to species. It tends to be easier to identify poorly preserved tetraploid rachis fragments than to assign battered fragments as definitely hexaploid. This may in part explain the apparent abundance of tetraploid rachis nodes but it could be due to other factors. It may be a reflection of the use of tetraploid wheat chaff as fuel or tinder in a similar manner to that suggested for rye (Moffett, this volume). *T turgidum* produces the tallest of the wheat straws and this is strong and rarely lodges (Percival 1921, 242 & 243). In this respect then it is similar to rye straw and thus similar uses for the straw and chaff of both cereals might be expected. Straw and chaff from bread wheat however might have very different uses. If the bread wheat was an awnless variety, its chaff might well be fed to animals rather than used as fuel since it would not irritate the eyes, nostrils and tongues of the cattle or horses to which it was fed (Percival 1943, 99). This would lead to hexaploid chaff being under represented in the record due to a reduced chance of exposure to fire.

Why was there a need to grow two types of wheat at all? The grain from the two types would almost certainly have different uses. Bread wheat produces a relatively strong flour suitable for bread making, while *T turgidum* produces a weak flour, and is used for making biscuits. In the Anglo-Saxon period the former would probably be used for bread and the latter for groats/meal for porridge or gruel.

Tetraploid wheats show resistance to rust and *T turgidum* is practically immune. On the other hand

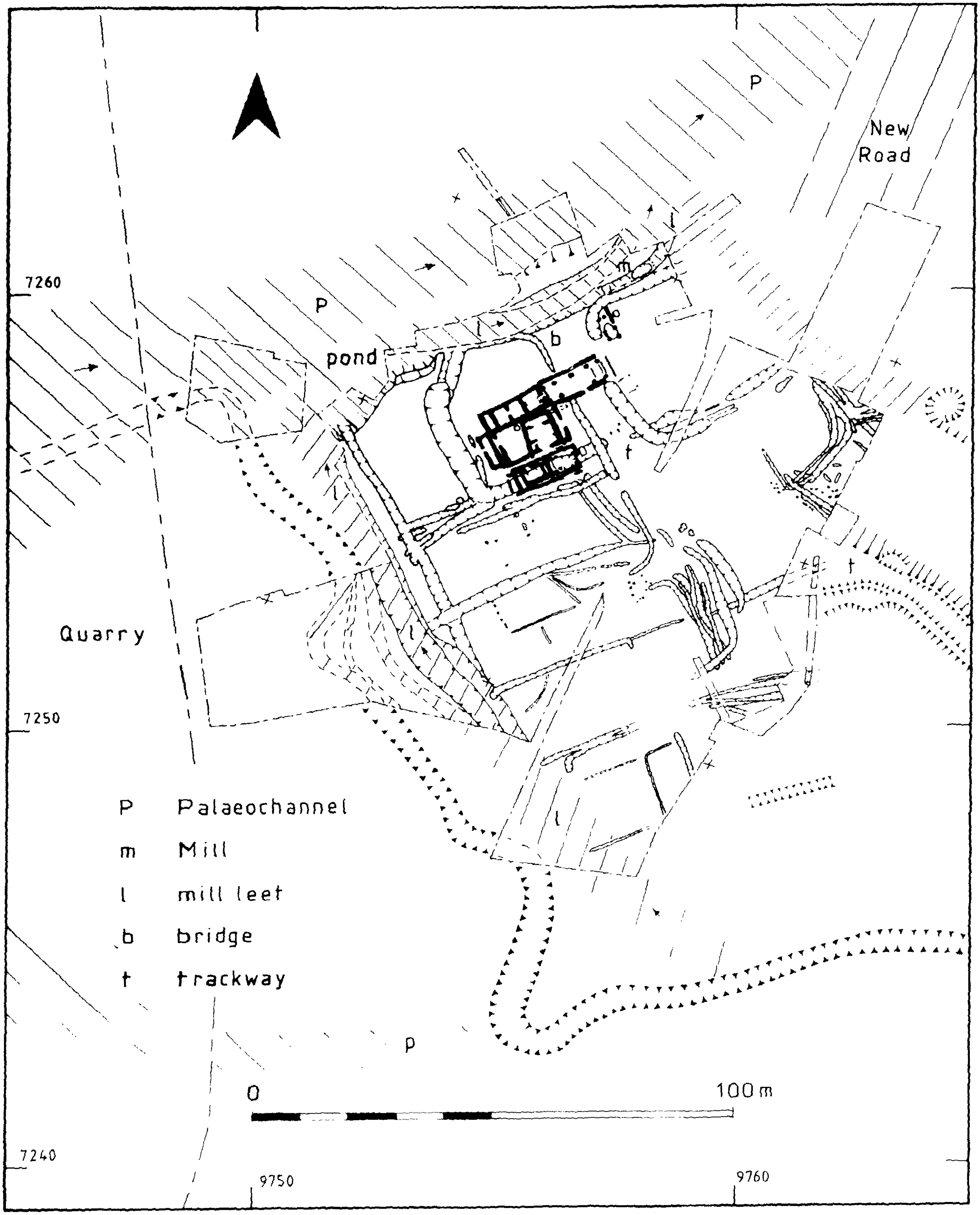

Figure 7.2 Plan of the late Saxon features at West Cotton

many varieties of bread wheat are susceptible (Percival 1921). Thus in an area where wheat was the main staple, growing the two types would ensure an acceptable crop even in years when the wheat was particularly badly affected by this fungus. A similar role might have been taken by spelt wheat which is also highly resistant to rust, and this maybe one of the reasons for its continued cultivation at some sites during the Saxon period (Murphy, this volume).

The next crop in order of importance, according to the relative proportions of different grain from the sites (Fig 7.3(a)), was barley, which appears to be hulled six-row barley *(Hordeum vulgure* var *vulgare)* though hulled two-row barley may be present but not identified as a result of the scarcity of the characteristic barley chaff. Oats fall just behind. However the figures given in Figure 7.3(a) are based on total numbers of *Avena* sp grain, and thus include wild oat grains where the lack of surviving florets did not allow identification to species level. The reason for including possible wild oat grain here is twofold. Firstly, for those grains with surviving floret bases, *A sativa* (cultivated oat) occurs in far greater quantity than *Avena fatua/sterilis* (wild oat). It is likely that many of the smaller oat grains are secondary or tertiary grains of *A sativa. Sec*ondly, the status of wild oat as a weed is blurred. Markham (1635, 107) encourages his readers to clean their barley of wild oats claiming that though they are the best weeds they are a 'disgrace'. This would imply that this was not the practice in his time and that wild oats were often tolerated along with the crop. As far as the cultivation of oats is concerned, though, it is likely its importance as shown in Figure 7.3(a) is exaggerated. Detailed measurement of these grains and further comparison with modern material will be needed to clarify the situation.

At West Cotton and Raunds there tends to be a close association of oats with barley which raises the possibility that *A sativa* and *H vulgare* var *vulgare* were grown together. The evidence for this is particularly strong in an exceptional sample taken from a dump of material (sample 1080, context 7154, ?10th century, Dave Windell, pers comm, see Table 7.1) within the channel deposits adjacent to West Cotton. The assemblage consisted almost entirely of a mixture of oats and barley, with many of the oat grains still in their florets and identifiable as *A sativa.* About a third of the grains in each case had germinated. Although weeds were relatively poorly represented, the assemblage was unusual in that it contained seventeen seeds of *Fallopia convolvulus* (black bindweed), which is only present as a single seed in other samples from the site. This weed is regarded by Silverside (1977, 179 & 180) as particularly indicative of spring barley, and other weeds present such as *Stellaria media* gp. (chickweed) and *Polygonum* species (bistorts), support the view that this was a spring sown crop, *Scandix pecten-veneris* (shepherd's needle), regarded as a winter annual by Salisbury (1964, 261), is also well represented. It is difficult to know whether this plant would have been favoured by spring sowing. Winter annuals are believed to be favoured by the soil being worked in autumn or early spring (Pals 1987, 74) and possibly this species does well under such conditions, The evidence would therefore support the idea that this assemblage represents a 'dredge', a mixture of oats and barley grown together, normally as spring corn (Slicher van Bath 1963), which had either sprouted in the ear or was prepared as a malt before deliberate or accidental burning. That the latter was the case is suggested by the paucity of small weed seeds and the low percentage of chaff.

Evidence for the malting of barley and oats has been found in samples from other features at West Cotton. Samples from the oven fills 292 and 4571, 10th and possibly 12th century respectively (see Table 7.1), have produced a mixture of oats and barley with many of the grains sprouted, sometimes in the company of whole wheat grains and/or pulses, and sometimes as virtually pure assemblages. Tusser (1557, 105) recommends the threshing of dredge and barley in November ready for malting. So malting a mixture of barley and oats was not considered unusual in his time. Beer made from oats was thought to be tolerable but not as good as that made from barley alone. Markham recommends that oats be added only when the barley was found to be 'wanting' (Markham 1681, 15). So mixing of the two could also take place after harvest. Judging from the number of samples containing sprouted grain, malting and brewing were important activities at West Cotton. The proximity of a mill would have facilitated the brewing, since the kiln-dried malt needs to be 'cracked' in the mill before it is mashed.

Rye may also have been important in the process of brewing. Although rye grain is extremely scarce from the sites, suggesting that this was only a very minor crop, the evidence from the chaff gives a very different picture (Fig 7.3 (a)&(b)). Rye rachis fragments are much more frequent in samples than barley rachises, even though barley grain is far more frequent than rye. This may be due in part to the ratio of the different grain (ie 3:2), but this can not be the entire explanation. Moffett (this volume) has suggested that rye rachises were used as fuel or as kindling in ovens at Stafford and that rye straw may have been treated with special care. Markham (1681, 162) recommends the use of rye straw as a bedding for malted grains in drying kilns, with the straw to be cut off at the ear and spread on the wooden rafters of the kiln to shield the grain from the heat. If this was done on the spot there is a strong likelihood that the rye rachises would end up as part of the fuel for the drying kiln, whatever the product being dried. The straw itself would probably be burnt away.

A sample from a pit (3037, final phase of late Saxon ?12th century, Table 7.1.) at West Cotton maybe offers an example of this use of rye chaff. The assemblage is dominated by the remains of rye rachises, over 250 internodes, and most of the unidentified chaff present is likely to have derived

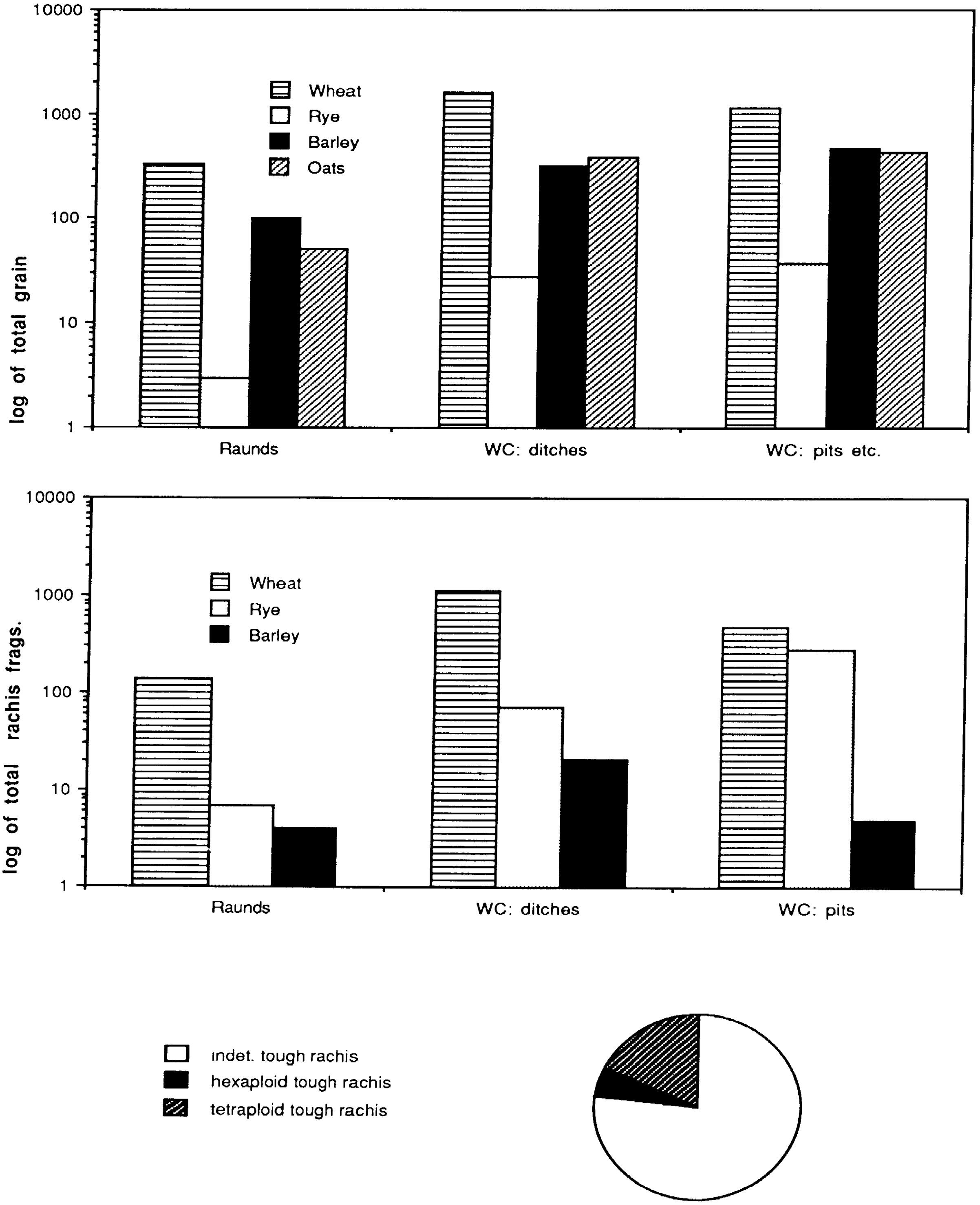

Figure 7.3 a) Proportions of cereal grains from Raunds, West Cotton (WC) ditches and West Cotton pits b) Proportions of cereal chaff from Raunds, West Cotton ditches and West Cotton pits c) Proportion of free-threshing hexaploid, free-threshing tetraploid and indeterminate free-threshing wheat chaff from the sites

Table 7.1 Charred plant remains from West Cotton, Langham Road and Burystead

The table below gives full lists of the charred plant remains recovered from West Cotton, though further work is needed, particularly on grass caryopses. Samples from individual features at West Cotton are cited in the left-hand columns. To the right there is a presence/absence listing of non-cereal remains, summarising data from other late Saxon samples from West Cotton looked at in detail to date – a total of 43 samples. Similar data for Langham Rd (11 samples), and Burystead (12 samples) are also given. *All identifications refer to seeds or fruits unless otherwise indicated. Presence is denoted by a '*' common items, not quantified are denoted by '+++'. Species are given in taxonomic order acording to Clapham* et al, *(1989).*

Context type	spread	oven	oven	pit	West Cotton	Langham Rd	Burystead
Sample no	1080	47	755	385	-	-	-
	7154	292	4571	3037	-	-	-
Ranunculus L / repens L / bulbosus L	1	-	1	-	-	-	-
Ranunculus Subgen *Ranunculus*	-	-	-	-	*	-	-
Ranunculus arvensis L	-	-	1	-	-	-	-
Papaver argemone L	-	1	-	-	*	-	-
Papaver argemone L (capsule) top)	-	-	-	-	*	-	-
Papaver not *argemone*	-	1	-	-	*	-	*
Brassica sp	-	1	-	-	-	-	-
Sinapsis sp	-	1	-	-	-	-	-
Brassica / *Sinapsis* sp	-	-	1	-	*	*	-
Raphanus raphanistrum L	-	-	1	-	*	-	*
Thalaspi arvense L	-	-	-	-	*	-	-
Reseda luteola L	-	-	-	-	*	-	-
Silene latifolia ssp *alba* (Miller) Gr & Bur	-	-	-	-	*	-	-
Silence cf vulgaris (Moench) Garcke	-	-	5	-	-	-	-
Silence sp	-	2	-	-	*	*	-
Agrostemma githago L	-	1	-	5	*	*	*
Agrostemma githago L (capsule tops)	-	1	-	10	*	-	-
Cerastium sp	-	-	1	-	*	-	-
Stellaria media gp	2	-	1	-	*	-	*
Stellaria graminea L	-	-	1	-	*	-	-
	-	1	-	-	*	-	-
	-	1	1	1	*	-	*
	-	-	1	-	-	-	-
	-	-	2	-	*	*	*
	-	-	-	-	*	-	-
	8	3	40	-	*	*	*
	1	4	15	-	*	*	*
	-	-	-	-	-	-	*
	-	-	1	-	-	-	-
	-	-	-	-	*	-	-
	-	-	-	-	*	-	-
	-	-	1	-	*	-	-
	1	-	-	-	*	-	-

Vicia faba var *minor* L	-	-	4	-	*	-	-
Lathyrus aphaca L	-	-	5	-	-	-	-
cf Lathyrus nissolia L	-	-	-	-	*	-	-
Vicia / Lathyrus sp	8	1	41	1	*	*	*
Vicia / Pisum sp	-	-	-	7	*	-	-
Lathyrus / Vicia / Pisum sp	1	5	14	8	*	*	*
Lathyrus / Pisum sp (pod frag)	1	-	++++	-	*	-	-
Lathyrus / Vicia / Pisum sp (peduncle)	-	-	7	-	-	-	-
Medicago lupulina L	-	-	5	-	-	-	-
Medicago sp	-	-	9	1	*	-	*
cf Trifolium sp	4	-	-	-	*	*	*
Leguminosae indet	1	2	34	-	*	-	-
Pyus sp	-	-	-	-	*	-	-
Aphanes sp	-	-	-	-	*	-	-
Potentilla sp	-	-	-	-	*	-	*
Scandix pecten - veneris L	8	-	-	-	*	-	-
Bupleurum rotundifolium L	1	-	5	-	*	*	*
Bupleurum cf rotundifolium L	-	-	1	-	*	-	-
Umbelliferae indet	-	3	1	1	*	*	*
Polygonum aviculare agg	2	-	7	-	*	-	*
Polygonum persicaria L	-	-	1	-	*	-	-
Polygonum lapathififolium L	-	-	-	-	*	-	-
Polygonum sp	2	1	-	-	*	-	-
Fallopia convolculus (L) A Löve	17	-	-	1	*	-	-
Rumex acetosella agg	-	-	-	-	*	-	-
? *Rumex acetosella* agg	-	-	-	1	*	-	*
Rumex sp	20	1	32	4	*	*	*
Polygonaceae indet	1	-	1	-	*	*	-
Urtica urens L	-	-	-	-	*	-	-
Urtica dioica L	-	-	-	-	*	-	-
Corylus avellana L	-	-	-	1	*	*	-
Salix sp (capsule frag)	-	-	-	-	*	-	-
Anagallis arvensis L	2	-	1	-	*	-	-
Lithospermum arvense L	-	-	-	-	*	-	-
Hyoscyamus niger L	-	1	-	-	*	*	*
Odontites verna (Bellardi) Dumort	-	-	2	-	-	-	*
Odontites / Euphrasia sp	-	-	11	5	*	*	*
Verbena officinalis L	-	-	-	-	*	-	-
Lycopus europaeus L	-	-	-	-	*	-	-
Prunella vulgaris L	1	-	-	-	-	*	-
Labiatae indet	-	-	1	-	*	-	-

Plantago major L	-	1	-	-	*	-	-
Plantago media L/*lanceolata* L	1	-	-	-	-	*	*
Legousia hybrida (L) Delarbre	-	-	-	-	*	-	-
Sherardia arvensis L	-	-	-	-	*	-	-
Galium aparine L	3	-	1	-	*	-	*
Galium sp	1	2	3	-	*	*	*
Sambuces nigra L	-	-	1	-	*	-	-
Valerianella dentata (L) Pollich	1	-	-	-	*	-	-
Valerianella sp	-	-	-	-	*	-	-
Knautia arvensis (L) Coulter	1	-	-	-	-	-	-
Anthemis cotula L	9	18	87	212	*	*	*
Anthemis sp	-	3	8	10	*	-	*
Tripleurospermum sp	-	-	2	-	*	-	-
Cirsium sp	-	-	-	-	*	-	-
Cirsium/Carduus sp	1	-	-	-	-	-	-
Centaurea cyanus L	-	-	-	-	*	-	-
Centaurea nigra tye	-	-	-	-	*	-	-
Centaurea sp	-	-	2	-	*	-	-
Lapsana communis L	1	-	1	-	*	-	-
Leontodon sp	-	-	-	-	*	-	-
Picris echioides L	-	-	-	-	*	-	-
Crepis cf capillaris (L) Wallr		-	-	-	*	-	-
Compositae indet	1	-	1	-	*	-	-
Sparganium cf erectum L	-	-	-	-	*	-	-
Eleocharis palustris gp	4	3	-	-	*	-	-
Schoenoplectus lacustris (L) Palla	-	-	-	-	*	*	-
Carex sp	10	-	1	-	*	*	-
Cyperceae indet	1	-	-	-	*	*	-
?*Arrhenatherum elatius* (L) B ex J&CP (tuber)	-	-	1	-	*	*	*
Bromus sp	-	-	-	-	*	-	-
cf Bromus sp	-	-	-	2	*	*	*
Gramineae indet	12	21	44	15	*	*	*
Gramineae indet (culm node)	-	-	2	2	-	-	-
Gramineae indet (chaff)	-	-	-	2	*	*	*
IGNOTA	15	2	16	24			
Triticum sp tetraploid (tough rachis node)	-	9	30	5			
Triticum sp *cf* tetraploid (tough rachis node)	1	-	8	1			
Triticum sp hexaploid (tough rachis node)	1	11	4	3			

Triticum sp *cf* hexaploid (tough rachis node)	-	-	4	1			
Triticum sp free-threshing (tough rachis node)	1	70	10	54			
Triticum sp	5	51	87	401			
Triticum sp (germinated grain)	-	-	5	-			
Triticum sp (awn base/glume beak)	-	-	10	-			
Triticum sp (awwn frag)	-	-	1	-			
cf Triticum sp	2	-	10	-			
Secale cereale L	-	-	1	26			
Secale cereale L (rachis internode)	-	6	6	251			
cf Secale cereale L	-	-	-	5			
cf Secale cereale L (rachis)	1	-	-	-			
Secale / Triticum sp	-	-	3	5			
Hordeum vulgare (rachis internode)	-	-	1	-			
Hordeum sp (hulled, indet grain)	-	1	-	-			
Hordeum sp (indet grain)	89	48	17	21			
Hordeum sp (sprouted, indet grain)	23	26	2	-			
Hordeum sp (*cf* sprouted, indet grain)	-	7	-	-			
Hordeum sp (twisted grain)	7	-	3	3			
Hordeum sp (sprouted, twisted grain)	4	-	-	-			
Hordeum sp (hulled, straight grain)	-	2	-	-			
Hordeum sp (straight grain)	12	31	1	7			
Hordeum sp (sprouted, straight grain)	5	26	-	-			
Horedeum sp (*cf* sprouted, straight grain)	-	8	-	-			
Hordeum sp (rachis internode)	7	-	4	30			
cf Hordeum sp	2	4	8	-			
cf Hordeum sp (rachis internode)	-	1	1	-			
Hordeum/ Searle sp (rachis internode)	6	-	20	-			
Avena sativa L	13	-	-	-			
Avena sp	173	39	7	7			
Avena sp (sprouted grain)	59	26	2	-			
Avena sp (twisted grain)	-	-	1	7			
Avena sp (floret base)	-	1	-	-			
cf *Avena* sp	-	-	8	12			
Cereals indet	47	93	152	734			
Cereals indet (coleoptile)	-	63	1	-			
Cerelas indet (embyro)	-	3	-	-			
Cereales indet (awn)	-	15	-	-			
Cereals indet (rachis)	2	8	11	168			
Cereals indet (culm node)	7	2	4	4			
Straw/hay	+++	*	7	*			
Herbage	+++	-	+++	-			

from rye. The other major component of the sample is wheat grain, although the wheat grains are outnumbered by those cereal grains that it was not possible to identify. There is also a small amount of barley, oats, and rye grain. *Agrostemma githago* (corn cockle) was relatively abundant in this sample. There were over 200 seeds of *Anthemis cotula* and *Odontites / Euphrasia* sp (red bartsia/ eyebright [though probably red bartsia on ecological grounds]) was also well represented. This assemblage could be interpreted as the results of an accident occurring during the drying of wheat grain prior to milling, with rye chaff forming part of the fuel for the process.

Other uses to which rye could have been put may also have been important if not as clear in the archaeobotanical record. Rye was used as a fodder crop for sheep and the straw was highly valued for thatching (Green 1981, 140). Tusser (1557, 111) suggests that animals should be given first rye straw then wheat, pea, oat, and barley straw in descending order with hay given last, as otherwise once they had tasted hay 'they would rather fast' than eat anything else. This would imply that rye straw followed by wheat straw was least favoured as a fodder and thus is more likely to have been put to other uses such as fuel for drying malt and grain. This use of rye straw might lead to rye rachis being especially prevalent in the archaeobotanical record with a similar situation also holding for the straw of rivet wheat.

Pulses

Large legume seeds are present in many of the samples both from the Raunds sites and West Cotton However, except in a few cases, these legumes have been poorly preserved and there are no surviving testa or hila. Those from the West Cotton samples tend to be better preserved. It has been possible to assign some to *Vicia faba* var *minor* (horse bean) on the basis, not only of surviving hila but also size and shape. Most of the indeterminate large legume seeds are rather small even for pea. A few specimens, some from ditch (2090) and others from an oven fill (4571), both belonging to the final phase of the late Saxon period at West Cotton, and therefore possibly as late as the 12th century in date, have been identified as *Vicia satiua* spp *satiua* (cultivated common vetch).

Documentary evidence has shown that common vetch was cultivated for fodder, often grown as a hitch on fallow fields, in the medieval period. Early records, dating from AD1250 to 1349, would suggest that its cultivation was confined to a line stretching from the Devon/Dorset coast to the Wash, with another cluster of records from the north-west Midlands, and show a fairly good correlation with chalk and limestone (Campbell 1988). Raunds, situated in part on the Great Oolite limestone, would fit this pattern. The earliest documentary evidence for the cultivation of vetch is AD1208 when it is specified as a field crop in the manorial accounts of the estates of the Bishop of Winchester (Currie 1988), though it was probably established as a field crop sometime before this date (Currie 1988; Campbell 1988).

The archaeobotanical record for cultivated *V satiua* has been examined by Lisa Moffett (1988, 47-49). There are no definite Roman records apart from that of Helbeak, from Isca, where the sample was interpreted as representing imported grain. Moffett *(op cit)* has recorded cultivated vetch from quite a few medieval sites but only found a single specimen, in a deposit at Alyesbury, that could be as early as the 11th or 12th century and thus pre-date the earliest documentary evidence. Glynis Jones (1988; pers comm) found significant quantities of a large *Vicia/ Lathyrus* sp, which she now believes was probably cultivated vetch, in samples of Anglo-Saxon date from a site at Wraysbury, Berks. Although at this site most contexts showed evidence of early medieval contamination.

Thus the presence of cultivated common vetch at West Cotton adds to a growing body of archaeobotanical data that would suggest that vetch was cultivated at least as early as the 12th century and possibly earlier. Evidence from early medieval contexts at Burystead, where cultivated common vetch has also been found, suggests that in this area, the crop is associated with the early medieval rather than the late Saxon period.

A sample from an oven at West Cotton (4571, see Table 1), which contained definite *V sativa* ssp *sativa,* also contained a few *V faba* var *minor,* large numbers of large *Vicia/Lathyrus* sp seeds, and pod fragments from a large seeded legume. This sample also produced several seeds of *Lathyrus aphaca* (yellow vetchling). This latter plant appears quite well established locally in the south of England, though is only able to survive mild winters (Salisbury 1964, 132). Moffett (1988) has recorded it from medieval sites at Alyesbury and Dean Court, Oxford. It has also been recorded as a casual on compost heaps and spoil banks in Northamptonshire (Druce 1930, 61). Salisbury (1961, 132) notes that it is often present as an impurity in clover and lucerne seed. At West Cotton it may be present either as a weed of cereals, or horse bean, or as an impurity in a vetch crop grown for fodder.

Flax

The other crop for which there is evidence in the late Saxon period, is *Linum usitatissimum* (cultivated flax). As well as finds of large numbers of waterlogged capsules and seeds from the stream or river channel, adjacent to the village of West Cotton, there are occasional finds of charred seeds from the site itself. This maybe indicate the use of the seeds as a food, as Pals (1987, 61) has suggested for similar finds. However, it seems more likely, that in these samples, it is present as a volunteer in cereal crops, and is being processed along with the cereals and becoming charred with other processing waste.

Flax is thought to have been grown mainly for fibre, as a summer crop, in the Anglo-Saxon and medieval period (Greig 1988; Finberg 1972, 420). It was grown either as a garden crop (Greig 1988) or on small plots, often called ‘plecks’ (Hoskins 1957, 70) and thus its importance may have been overlooked due to its absence from documents relating to field crops. However, flax cultivation was presumably common in the Raunds area in the medieval period as, at this time, Higham Ferriers was able to support five flax merchants (Paul Courtney, pers comm).

The evidence from the West Cotton channel clearly suggests that flax was being grown for fibre and it is likely that this assemblage represents the debris from flax retting. The channel would have been an ideal place for this process (Boase 1918). Evidence from the molluscs suggests that the water in the channel was flowing all the year round and therefore, the products of the fermentation would have been safely carried away while the relative warmth of the water in summer would have helped to promote the retting process.

Flax is present in all the samples taken from deposits of late Saxon date in this feature and one 1kg sample contained nearly 200 seeds and the equivalent of 48 whole capsules, although no definite identifications of flax stern have been made as yet. It could be argued that this assemblage is not the remains of flax retting but that of the waste from threshing (Pals & Dierendonck 1988, [stage C1 or C2]). However the bolls were not always removed from the flax before retting (Boase 1918), and given the location of the samples it would seem unlikely that this assemblage resulted from anything other than retting.

The samples from the channel also contained seeds of *Camelina sativa* (gold of pleasure) and capsule fragments, either of this plant, or *Camelina alyssum*. Both are characteristic weeds of flax (Salisbury 1961, 121 & 122). Also present is a large seeded form of *Spergula arvensis* (corn spurrey). The seeds measure from between 1.2 and 1.5mm in diameter and would fall within the range given for *S arvensis* var *sativa* by Berggren (1981, 53). Pals (1987; Pals & Dierendonck 1988) has found large seeded forms of spurrey in samples containing flax which were tentatively identified as *S aruensis* var *maxima* on the basis of seed size, and due to the association of this variety with flax. The seeds present in the samples from West Cotton would seem a little small for this variety, and given that the divisions within *S arvensis* are less well known for Britain it seems best to just note the occurrence of a large seeded form and its possible significance in this context. Other components of this assemblage that may also be present as weeds of flax include *Bidens tripartita* (trifid bur-marigold) and *Atriplex* sp (orache), both of which, though likely to have been part of the natural vegetation growing beside the channel, seem to have been associated with flax in the past on the continent (Pals & Dierendonck, 1988).

Other activities associated with cloth production may also have been taking place in the channel at this time. Sheep ked *(Melophagus ovinus)* was also present in many of the samples. This is a blood-sucking ectoparasite of sheep and Mark Robinson (pers comm) has suggested that its presence here maybe due to the washing of wool or sheep in the channel. Tusser recommends the washing of sheep prior to shearing in June (Tusser 1557, 75).

Other useful plants

Use of fruits such as *Corlyus avellana* (hazel), *Prunus* sp (plum/sloe), and *Pyrus* sp (pear) is attested from occasional finds from the sites. The extent to which pear or plums were cultivated is unclear. It could be that wild trees were being exploited. The occurrence of mineralised *Brassica / Sinapis* (cabbage/ charlock) seeds in a cess or refuse pit at Furnells is also of interest. Both types can be used for mustard, and this maybe the case here. Large numbers of seeds have been obtained from cess pits of medieval date, at Furnells, though evidence from the late Saxon period is rather slight.

General environment and weed flora

The channel deposits have also produced information concerning the general environment of the site. Plants growing within and beside the channel are well represented, but the catchment must also have included a traditional hay meadow, with *many* plants characteristic of an MG4 or MG5 mesotropic grassland type of Page (1980). These include species such as *Trifolium* sp (clovers), *Rhinanthus minor* (yellow rattle), *Leucanthemum vulgare (ox-eye* daisy), and *Centaurea nigra* (hardheads), with the wetter end of the community represented by *Lychnis flos-cuculi* (ragged robin), *Filipendula ulmaria* (meadow sweet), and *Thalictrum flavum* (meadow rue). Such species-rich grassland is the result of a particular type of management. Animals are excluded from the meadow from February or March until sometime in June or July when a hay crop is taken. After this the ‘aftermath’ is grazed until the following spring when the cycle begins again (Greig, 1984). This protection from grazing is very important for producing a distinctive flora. Grazing in winter causes plants such as *Arrhenatherum elatius* (oat-grass) to disappear while light sensitive herbs which produce seed early in the year flourish.

There is also a scrub or woodland element present in the samples, including small numbers of *Prunus spinosa* (blackthorn), and *Crataegus* sp (hawthorn) stones, *Alnus glutinosa* (alder) seeds, and the buds and capsules of *Salix* (willow). These may well represent the trees growing alongside the stream, or possibly, hedges skirting the meadowland.

The weed flora present in the late Saxon charred samples from West Cotton is fairly extensive and is also much more substantial from the Raunds sites than for the earlier periods (see Table 7.1). There are several finds of interest including a single occurrence, in each case, of *Legousia hybrida* (venus looking-glass) and *Ranunculus arvensis* (corn buttercup). These two species, along with taxa that occur more frequently (eg *Bupleurum rotundifolium*), show that by this time there was a well developed weed flora similar to that found at later sites on similar soils.

Most of the species fall into the Alliance Caucalidion lappulae of the Order Centauretalia cyani, typically a community of autumn-sown cereals on calcareus soils in south and south-east England (Silverside 1977, 343-360). Character and differential species include: *A githago, S pecten-veneris, Valerianella dentata,* and *R arvensis* (corn buttercup). It would seem that both light, well drained calcareous soils and heavier calcareous claylands were all exploited. The former is suggested by weeds such as *Papaver argemone* (long prickly headed poppy) and *Silene alba* (white campion), and the latter by *A cotula* and *Odontites verna.*

Species characteristic of circum-neutral and acidic sandy-loam soils are also present. These include *Rumex acetosella* agg. (sheeps sorrel), *Spergula arvensis,* and *Raphanus ruphanistrum* (wild radish). Together with weeds such as *Medicago lupulina* (black medick), *Lapsana communis* (nipplewort), and *P argemone,* they are suggestive of the the Alliance Aphanion-arvenis (Order: Centauretalia cyani). The only suitable soils for this community are likely to have been on the gravels. Possibly both spring-sown crops (eg 'dredge'), as well as winter crops, were grown on these soils, though as yet evidence is very scant. These soils would be more suitable for the cultivation of rivet wheat and rye than the heavier clay soils.

As well as segetal weeds, the assemblages from West Cotton contain a fair number of perennial species characteristic of the Class Molino-Arrhenatherum (grassland communities) but which enter Stellarietea (arable weed) communities. These include *Prunella vulgaris* (self-heal), *Stellaria graminea* (lesser stitchwort), and *A elatius* (oat grass) (Silverside 1977, 391-92). Grasses, not yet identified any further, are present in surprisingly large numbers in nearly every sample, while other species such as *Knautia arvensis* (field scabious), *Centaurea nigra* (hardheads), *Leontodon* sp (hawkbit), *Crepis cf capillaris* (smooth hawks-beard), and thistles, more normally associated with grassland, or perhaps wasteland, also form part of the assemblage. Single occurrences of *Verbena officinalis* (vervain) and *Reseda luteola* (weld) would also seem unusual in charred assemblages associated with cereal remains.

Some of these taxa may have been growing on the site, while others, such as verbena, may represent the exploitation of scrub or hedgerows for fuel, with plants likely to be growing in such places being brought to the site along with the fuel, and burnt. The single seed of verbena was found in association with *Salix* sp (willow) capsules and seeds of *Sambucus nigra* (elder). So in this assemblage, there is clearly a hedge/scrub component. Coarse grasses and waste land flora could also have been cut for fuel, but it seems more likely that such areas would have been used as pasture. Thus the source of the 'grassland' element must lie elsewhere, and probably originates in the fields themselves.

Possible arable practices

It is generally thought that the strip fields characteristic of the medieval period were already laid out by the late Saxon period in this area (Hall 1988), and the archaeological evidence from both West Cotton and Raunds would support this view. The features of these fields would encourage particular plants depending on the type of management and field cropping system. Grassland plants, and species typical of field margins, would have grown on the field headlands or baulks, where they would act as a reservoir of seed. Seeds from such a source could enter the fields seasonally, and once germinated, the plants' survival would depend on the cropping system.

It seems that baulks and headlands were often ploughed after the main field, or dug with spades, and sown with a crop (Slicher van Bath 1963). However, in the medieval period, some baulks and headlands do seem to have been used as pasture, or for access, and left under grass (Hoskins 1957, 67). This may have been a later development resulting from increased pressure for grazing but clearly some access to crops would have been necessary The extent to which headlands, etc., were ploughed and sown with crops is likely to have changed depending on circumstance, but it is probable that there were always some left under grass, acting as a source of grassland weeds and helping to maintain them within the cropping areas.

Ellenburg (1988, 30) has suggested that the number of grasses and perennial weeds in a three-course field system (winter grain, spring corn, fallow) would greatly increase, as they would only be disturbed by ploughing twice every three years. The same kind of trend would presumably hold true for a two-course system (crop, fallow) where plants would be disturbed only once every two years. However, this would assume that fallow was not ploughed between the harvest of one year's crop and the planting of the next one, a year later. This was clearly not the case in the medieval period where fallow seems to have been ploughed for the first time in the spring, and then 'stirred', using a lighter plough in mid- summer, possibly receiving a second stirring in August or September. Such a regime would have been likely to encourage particular weeds and from Tusser's book *(op cit)* it is clear that docks and thistles were a particular problem on

Table 7.2 Waterlogged plant remains from Saxon palaeochannel deposits at West Cotton

This gives a full listing of waterlogged plant remains recovered from a series of samples taken from deposits within the channel adjacent to West Cotton. All are believed to be of Saxon date.

Sample no	3	5	6	7
Sample size	1kg	1kg	1kg	1kg
Caltha palustris L	1	10	3	1
Ranunculus cf acris L	2	-	3	-
Ranunculus acris L / *repens* L *bulbosus* L	2	16	12	5
Ranunculus sceleratus L	2	-	-	-
Ranunculus Subgen *Batrachium*	6	2	4	3
Ranunculus sp	-	1	-	-
Thalictrum flavum L	-	-	2	-
Nymphaea alba L	1	-	-	-
Nuphar lutea L	3	15	16	5
Papaver not *argemone*	1	-	-	-
Papaver sp	10	-	-	-
Fumaria sp	-	1	-	-
Brassica rapa cf sylvestris (L) Janchen	-	1	-	1
Sinapsis cf arvensis L	1	-	-	-
Raphanus Raphanistrum (L) case	-	1	-	-
Barbaris vulgaris R Br	4	-	1	2
Rorripa cf palustris (L) Besser	10	-	2	1
Camelina sativa (L) Crantz *sensu latu*	-	-	3	-
Camelina sp (capsule frags)	-	1	3	1
Hypericum sp	10	-	30	-
Lychnis flos-cuculi L	4	4	5	3
Cerastium cf fontanum Baumg	1	-	-	-
Cerastium sp	1	1	-	-
Stellaria media gp	7	8	8	4
Stellaria graminea L	-	-	2	-
Spergula arvensis L (large seeded form)	-	5	2	-
Carypohyllaceae indet	-	2	2	2
Cheonopodium polyspermum L	-	-	1	-
Chenopodium cf album L	4	1	-	1
Chenopodium rubrum type	-	-	1	-
Chenopodium sp	1	2	-	-
Atriplex sp	1	3	4	-
Linum usitatissimum L	4	85	199	10
Linum usitatissimum L (whole capsules)	1	15	48	2
Medicago lupulina L	1	-	-	-

Trifolium sp (calyx)	3	-	-	1
Trifolium sp (petal)	14	1	2	10
Leguminosae indet (pod frag)	3	1	-	-
Filipendula ulmaria (L) Maxim	2	11	8	14
Rubus sp	-	1	-	-
Aphanes arvensis L	1	-	-	-
Prunus cf spinosa L	-	-	2	-
Crataegus sp	-	1	-	-
Crataegus / Prunus type (thorn)	1	2	-	-
Epilobium sp	1	-	-	-
Myriphyllum sp	-	-	1	-
Callitriche sp	-	-	-	1
Hydrocotyle vulgaris L	-	1	-	-
Sium latifolium L	19	2	2	-
Oenanthe pimpinelloides type	8	6	14	8
Oenanthe aquatica type	12	39	121	8
Oenanthe sp	3	1	11	7
Aethusa cynapium L	2	-	-	-
Apium nodiflorum (L) Lag	-	-	-	1
Umbelliferae Tribe Peucedabeae	-	-	-	4
Umbelliferae indet	3	1	2	1
Umbelliferae indet (stalks)	*	-	*	-
Polygonum aviculare agg	-	2	1	1
Polygonum persicaria L	1	-	1	1
Polygonum lapathifolium L	6	1	1	-
Polygonum hydropiper L	1	3	-	-
Polygonum sp	1	-	-	-
Rumex cf acetos L	-	1	-	-
Rumex crispus L	1	-	-	-
Rumex cf crispus L	2	2	3	-
Rumex conglomeratus Muray	-	1	-	-
Rumex conglomeratus Murray	-	-	1	-
Rumex matrimus L	8	-	1	-
Rumex sp	43	11	16	7
Urtica urens L	-	-	1	-
Urtica dioica L	6	4	1	7
Alnus glutinosa (L) Gaertner	1	2	2	1
Alnus glutinosa (L) Gaertner (catkin:fruit)	-	-	-	1
Salix sp (bud)	-	-	-	1
Salix sp (capsule frag)	-	-	-	2

cf Salix sp (capsule frag)	1	-	-	-
Myosotis scorpioides type	6	-	3	5
Myosotis sp	8	-	-	2
Solanum sp	-	1	2	-
Veronica subgen *Beccabunga* sp	-	10	20	-
Veronica sp	-	10	-	-
Rhinanthus minor L *sensu lato*	38	55	-	8
Mentha cf aquatica L	4	-	-	16
Mentha sp	3	4	9	3
cf Mentha sp	-	-	-	1
Lycopus europaeus L	-	-	3	-
Prunella vulgaris L	2	3	1	-
Lamium sp	-	-	1	-
Plantago major L	24	6	32	13
Sambucus nigra L	1	-	1	-
Bidens tripartita L	-	1	3	-
Bidens cf tripartita L	2	-	-	-
Bidens sp	-	-	-	1
Senecio sp	14	7	8	2
Anthemis cotula L	22	5	13	2
Achillea sp	2	1	1	5
Leucanthemum vulgare Lam	3	1	1	2
Articum sp	-	1	-	-
Carduus sp	3	-	-	2
Cirsium / Carduus sp	2	-	-	-
Cirsium sp	1	1	2	1
Centaurea nigra L (involucral bracts)	-	1	-	2
Centaurea sp	1	1	1	-
Hypochaeris sp	1	-	-	-
Leontodon sp	11	-	2	-
Picris sp	2	-	1	-
Sonchus oleraceus L	1	1	-	3
Sonchus asper (L) Hill	9	-	3	-
Crepis sp	-	-	-	1
Taraxacum sp	-	1	4	-
Compositae indet	4	-	1	1
Alisma plantago-aquatica L	33	6	32	15
Alisma lanceolatum With	5	8	5	16
Alisma sp (case)	15	4	2	13
Sagittaria sagittofolia L	12	4	9	6

Potamogetum sp	1	18	9	2
Zannichellia palustris L	-	-	6	-
Juncus bufonius type	271	40	-	-
Juncus effusus type	90	20	-	-
Juncus articulatus type	50	20	-	-
Juncus sp	20	70	40	-
Iris pseudocorus L	-	1	-	-
Schoenoplectus lacustris (L) Palla	197	163	149	92
Carex sp (nutlet case)	1	-	1	2
Carex sp	11	12	8	10
Cyperaceae indet	2	3	4	7
Bromus Subgen *Eubromus* sp	-	1	2	1
Gramineae indet	72	24	70	32
IGNOTA	9	1	3	11

fallow land. Both are present in the West Cotton samples, and docks are particularly common.

This evidence, along with the 'grassland' element in the samples would be consistent with agriculture taking place in open fields and might suggest that either a two or three-field system of crop rotation was in operation during the late Saxon period at West Cotton. The species that such a system would encourage, especially when the possibility of the grazing of fallow during some of the period between harvest of the previous year's crop and the first ploughing of the fallow is considered, is difficult to predict. However, it is likely that it would include tough perennials such as *Knautia arvensis* which is capable of regeneration after ploughing (Salisbury 1977, 261) and grasses resistant to grazing. Clearly though, much more needs to be known about the kinds of species such farming practice would encourage. Maybe there is a good case for conducting experimental archaeology along such lines.

Summary

Evidence from the early Saxon period is very sparse. The only real change when comparing the evidence available with that from Stanwick Roman villa is the introduction of free-threshing wheat. Spelt wheat is apparently dominant at Stanwick.

Again there is very little evidence for the early to mid-Saxon period. When compared to that of the early Saxon period there appears to have been little change. *Triticum turgidum* may have been introduced at this time but the evidence is very slight and it would seem that this wheat only became an established crop during the late Saxon period.

By the late Saxon period the archaeobotanical results show that there was a well developed agricultural economy at West Cotton involving all the major cereal crops. Hay was produced from traditionally-managed meadows and brewing would appear to a have been an important activity The processing of flax also took place. Later in the period, possibly as late as the 12th century, there is evidence for vetch being grown as a fodder and the cultivation of horse bean either as a fodder or for human consumption-

There is some evidence for a two or three-field system of crop rotation already being in place by the late Saxon period. The first historical evidence for a two-field system in Raunds dates from the early 14th century (Hall 1988), and although the exact nature of the rotation of crops, the crops involved and the way in which land was allocated may have changed there seems to be no reason to suspect that the laying out of open strip fields would not have been accompanied by some form of rotation involving fallow.

Evidence from the two Raunds sites is less detailed but clearly the same cereal crops were cultivated. Details of activites such as brewing are lacking but these could have been taking place nearer to the main centre, for instance on the site of Fumells hall.

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8 Cereals and plant food: a reassessment of the Saxon economic evidence from Wessex *Francis J Green*

Abstract

The paper reviews the evidence for economic plants from a series of recent excavations in small rural centres in Wessex. Mineralised remains from cess pits have extended the list of economic species recorded for the period, although the bulk of the evidence is from carbonised material. Quite dramatic differences in cereal importance at different sites are seen as possibly reflecting specific aspects of site economy and some specialisation, with some contrast between rural and urban sites.

Introduction

It is now some ten years since any assessment of Saxon plant remains from central southern England was published. This includes Peter Fowler's (1981) paper on farming in the Anglo-Saxon landscape, and the contribution by the present author (Green 1981, 129-153) in *The Environment of Man, the Iron Age to the Anglo-Saxon Period* (Jones & Dimbleby (eds) 1981). Nearly ten years later we are in a position to question some of the generalisations then proposed. These earlier assessments were produced from a great deal of then unpublished data, much of which was the work of Mick Monk (1978) and the present author. During the intervening period a number of additional sites have been excavated and the botanical evidence from some of these was presented by the author at the 7th International Palaeoethnobotanical Work Group Conference held at Cambridge in 1986 (Green 1991, 363-377).

This point highlights a general problem in attempting to draw together all the available published, and more particularly unpublished, evidence from this period. Specialist reports do exist for a considerable number of excavated sites and it is not uncommon for many of them to remain unpublished, even ten years after production. At the present time we are still awaiting the detailed publication of the plant remains from both Hamwic and Winchester. Whilst this is not the subject matter of this paper, it does have a direct bearing in that colleagues currently cannot independently examine the available data.

Unlike the mid-1960s to mid-1970s, the bulk of the archaeological work within the Wessex area now consists of salvage or rescue excavations, rather than those specifically conducted for research purposes. This does not mean that research questions are ignored. However, it is increasingly difficult to correctly frame these questions if the earlier work remains unpublished. In an attempt to alleviate some of these problems, environmental archaeologists within the Wessex Group of the IFA have produced a Research Priorities Document. This document, which is in draft form and being used, is divided into themes and periods. The section on Saxon plant remains is as follows: 'The study of Saxon plant remains can answer specific questions of residuality, contamination, and formation processes, providing important data for archaeological interpretation. There is a need to establish the precise nature of crops from the end of the Roman period, through to the later 10th century. Whilst there is scope for more detailed work in Hampshire, it is important that sites of this period in Dorset, Wiltshire, and Berkshire are given higher priority There is a desperate need for data with which to compare the Hamwic evidence. Material of contemporary date is required from other large urban centres and especially from small towns, in order to establish the nature and diversity of crop utilisation in these centres'. Over and above this document most units in the region have formulated their own site manuals and instructions for project managers, which greatly improve the ability of site staff to appreciate which deposits are most crucial and what the research objectives and aims of the different environmental interests are.

Whilst such documents can go part of the way to improve the field archaeologists' ability to assess sites and to ask the right questions of them in environmental terms, there is still a fundamental problem in that few, if any, units employ a full time environmental advisor. The exception is the Trust of Wessex Archaeology No unit currently employs a full-time archaeobotanist, and thus all work is undertaken on an *ad hoc* consultancy basis. As a consequence the work within and between units is haphazard and the methods of sampling, processing samples and production of reports is very varied. The lack of on-site advice is a serious problem and results in somewhat uninformative results, the 'so what, we already know that' syndrome. This in turn leads to project managers doubting whether any further or detailed work on plant remains from the Saxon period is really worthwhile. This leads to staff who are hard pressed for time and money giving minimal attention to plant remains. It is absolutely necessary for archaeobotanists not only to produce evidence about past environment and agriculture, but to demonstrate that plant remains can also provide archaeologically important new information about the formation of the archaeological deposits, which can lead to a better interpretation of the archaeological site. This is certainly what the present author is attempting to achieve. Whilst it may not be a popular thing to say, unless archaeologists improve on their recent record in this area of their work, there is a compelling argument that they should not be excavating at all, since they are destroying this knowledge, with, in many cases, only a minimal attempt to record it.

It is, therefore, worthwhile giving examples of more detailed work which can provide more specific site information. The only two examples currently available in Wessex come from the Test Valley in Hampshire and consist of work being undertaken by the Test Valley Archaeological Trust. For a number of reasons it is appropriate for this particular district to receive attention. The area consists of the Hamwic, Winchester and Salisbury hinterland. The examples are the Waitrose Extension site in Romsey and the excavation of a sunken-floored dwelling at King's Somborne. The detailed evidence from the Waitrose Extension site in Romsey is being published elsewhere (Green, in press). The site consists of a back land area which throughout its known history has been used for horticultural and agricultural purposes. Even the evidence of its place name, Periton, indicates that from possibly the late Saxon period it was a place where pear trees grew (Gelling, pers comm). The brickearth soils on this site are particularly well-suited to the deep rooting habits of pear trees.

The Waitrose site revealed that charred plant remains were preserved in the buried and developed soil profiles and within surviving archaeological features. It was considered that a detailed study of the only finds, the charred plant remains and ceramics, could provide useful data. The evidence most likely reflects manuring of this area during horticultural and agricultural activities. What the data show is that in certain cases it is possible to study refuse from a settlement even where the bulk of that settlement might either not be available for study or has been destroyed, but where surrounding areas of intense horticultural activity, involving past manuring are available. In the case of Romsey we are lucky we still have large areas of the town preserved and can, therefore, expect to continue to test this model for the foreseeable future.

The examination of an early Saxon sunken-floored feature at King's Somborne is another important example, because it shows that detailed sampling was required to provide the data which was used in defining the formation processes involved in the filling in of this particular sunken-floored structure. It potentially can help answer the all important questions – was the structure earthen floored, or did it possess a raised wooden floor? Only the integrated analysis of the pottery, bones and seeds will help answer such archaeological questions. Their size and distribution will give us this information.

Background

By the Saxon period it can be argued that local geology was of considerable importance with respect to the cultivation of different crops. In earlier prehistoric periods it is possible that local geology had only a small part to play, since a greater part of the landscape was covered in deep soils that prohibited the parent geology having any effect on the growing crops. At the present time there is relatively little data from sites not situated on the chalk or for that matter from river valleys in Wessex, and there is a general paucity of data on the soil types. It is only in the past ten years, for example on the brickearth soils in the lower Test Valley, north-west of Southampton, that evidence for long periods of agricultural activity has emerged, similar to the evidence from the Thames Valley. Current excavations are revealing the intensity of agricultural activity from at least the middle Bronze Age onwards and the soil types being cultivated. The intensity of the most recent agricultural activities has in many cases removed or destroyed a great deal of the evidence, in particular for the Saxon period.

It is all too easy to assume that crops that in genera1 favour one soil type over another, due to moisture and other basic requirements, will be most frequently grown where they are most productive. 'lb some extent the evidence available from a number of sites has in the past reinforced the idea, not the least when large quantities of barley were recovered from sites on the chalkland, for example, at Shavards Farm, Meonstoke or Chalton (Green 1991). Views expressed in the past by the present author may be hopelessly naive in the light of the current available data. It is, however, perhaps unwise to simply equate different soil types with different crops.

The cereals

The evidence suggests that it is no longer possible or wise to make any generalisations about which crops may have been most important. Monk (1978, 49–70) suggested on the then available data from Hamwic and Chalton, that six-rowed hulled barley *(Hordeum vulgare)* was probably the most important cereal followed by wheat *(Triticum aestivum/compactum)*, oats *(Avena sativa)*, and rye *(Secale cerecde)*. Further work by the present author (Green 1979a) suggested that this was not the case and that statistically it was possible to show that wheat was present in more contexts and was more dominant than barley, in the deposits from middle Saxon Hamwic and later Saxon Winchester. More recent, and as yet unpublished, data from both these towns support this assertion. In addition the available evidence indicates that oats were clearly more important by the end of the Saxon period than might have previously been expected. The lack of rye from these larger urban centres with the exception of one poorly dated assemblage (Green 1984, 105) from Winchester, continues to suggest that, in these urban centres, this particular crop was of less significance. It can, therefore, be said that continued work in these larger urban centres is not at the present time materially increasing our knowledge about cereal crops and that we may already have a good data base for these centres.

It is the evidence from the smaller urban places such as Newbury, Romsey, Andover and Trowbridge that is so important. The recent extensive sampling programme on excavations in Romsey of late Saxon deposits has indicated (Green and Lockyear 1992) that rye was a much more significant crop than the present author had ever considered possible when writing in the late 1970s and early 1980s. In fact, on some sites, for example Church Street, Romsey (Green, 1991), over 60% of the features contained this species. Detailed analysis including the radiocarbon dates (Ox A2316 & 2317) which, at 2 Sigma, are AD1060-1395 and AD10351290 respectively, indicates that a single event has allowed residual material to pervade all deposits. More recent work on the Waitrose Extension site in the town (Green and Lockyear 1992) has shown that buried soils of Saxon-Norman date (calibrated radiocarbon date at 2 Sigma AD1030-1270 (Ox A2312)), in fields immediately adjacent to the town centre at Romsey, contain nearly 10% rye. It is significant that the Church Street deposits contain no barley, and on the Waitrose site barley is less than 10% of the evidence. Bread/club wheat *(Triticum aestivum)* is the most important cereal on both sites.

The specific use of rye in the late Saxon period has been encountered on a number of sites in southern England (eg Gloucester, Green 1979). However, the evidence from Romsey is the first in Wessex. The use of this cereal for a relatively short period around the late 10th to early 12th centuries may have simply been a localised attempt to introduce this species into cultivation. An introduction that never became popular. It may also reflect the needs of the local community during a major period of expansion; rye straw may have filled a gap in the supply of reed for thatching. Many different reasons can be put forward and most relate to mundane local necessities. One other possibility is that it may represent a deliberate introduction by the principal landowner, by the new Norman masters, who no doubt had specific food preferences. Whilst this may be a far fetched explanation, it could explain the relatively short-lived cultivation of this species. Only further work in small towns throughout the region will establish if a similar pattern emerges.

The most recent evidence from rural sites is also challenging the previous views. In the past, many early Saxon sites produced very low concentrations of charred cereal remains; for example, Old Down Farm near Andover (Green 1981a) and Cowdery's Down near Basingstoke (Green 1983). On many of these sites the dominant charred cereal crop recovered was barley However, recent work at King's Somborne, some seven miles north of Romsey, involving the detailed sampling of one sunken-floored dwelling and a number of ditches, has produced a different pattern of discard. The cereal and other botanical evidence from the sunken-floored structure is summarised in Fig 8.1-8.4. From Fig 8.1 it can be seen that wheat, barley and oats were the rank order of magnitude. It is noticeable that on this site, rye is singularly absent. Similarly, at Abbots Worthy, Carruthers (pers comm) recorded only a single caryopsis of rye.

This brief resume of the evidence for cereals from early and middle and later Saxon sites indicates that there are noticeable variations between similar sites of the same general period, and there is a greater degree of variation through the Saxon period than had previously been suggested. The exception to this is the regional variation discussed by the present author (Green 1979b, 188) to account for the very different evidence recovered from Gloucester as compared with Hamwic and Winchester.

How can we possibly begin to explain such variation? It would be easy to try and account for the evidence of rye on the sites in Romsey by simply arguing that the settlement, situated on the heavier clay soils of the Hampshire basin and itself situated on a brickearth, might favour the cultivation of this species. Hamwic is situated on similar soils and rye rarely occurs beyond single grains.

It is equally possible to argue that the function of the settlement may explain the observed cereal assemblages. The settlement, whilst having some urban characteristics, probably has even greater affinities with the surrounding rural landscape, to a greater degree, than the larger settlements at Winchester and Hamwic. This is a feature which, to some extent, it still possesses.

Romsey in the early and middle Saxon period seems to have had a predominantly industrial function. The extent of the early to middle Saxon iron smelting in this settlement is probably second to none in central southern England. The method of smelting (Schlackenklotz) is a peculiarly continental technique. The archaeological evidence from Romsey is, therefore, anomalous. Only detailed analysis of all the other artefact categories and the animal bones may throw additional light on these pecularities.

In respect of the differences that are emerging for early Saxon rural sites, once again different functions for these sites may well provide some answers. The evidence from King's Somborne might well be anomalous. The site clearly was the focus of a large and ancient royal estate. It may be that different royal estates specialised in the production of

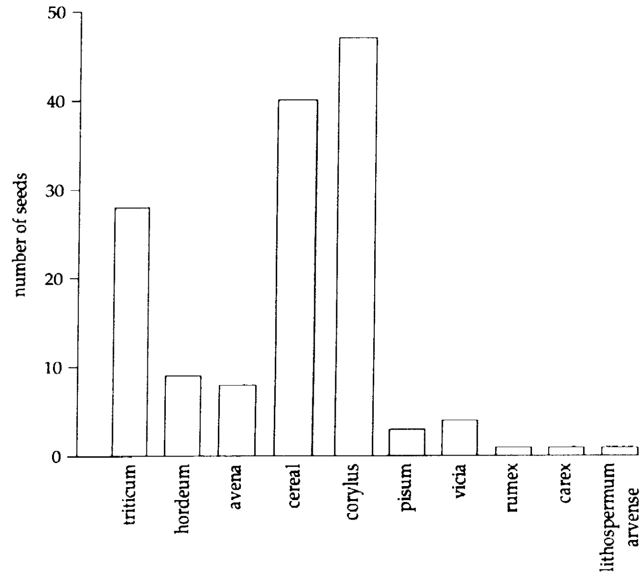

Figure 8.1 King's Somborne, A1990.2. Total number of seeds,

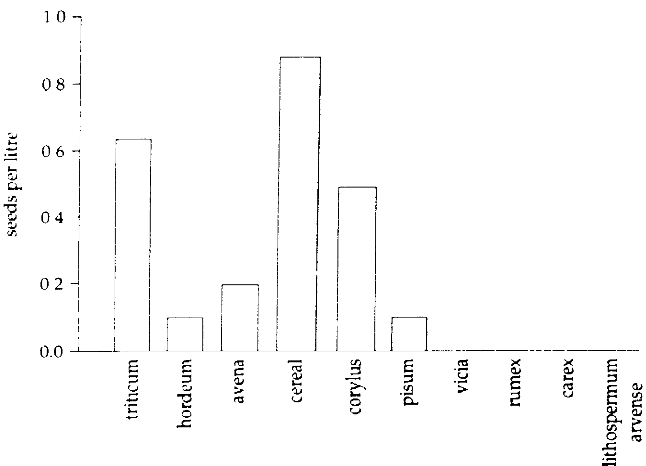

Figure 8.2 King's Somborne, A1990.2. Phase 2, seeds per litre.

different products. It is of course possible that the products consumed may reflect different site status. It may, therefore, not be at all reasonable to assume that these sites should have near identical assemblages. It is, therefore, necessary to construct a more complex model so that when further sites are discovered more detailed research programmes can be implemented. At the present time, it is only possible to indicate that cereal production, consumption,

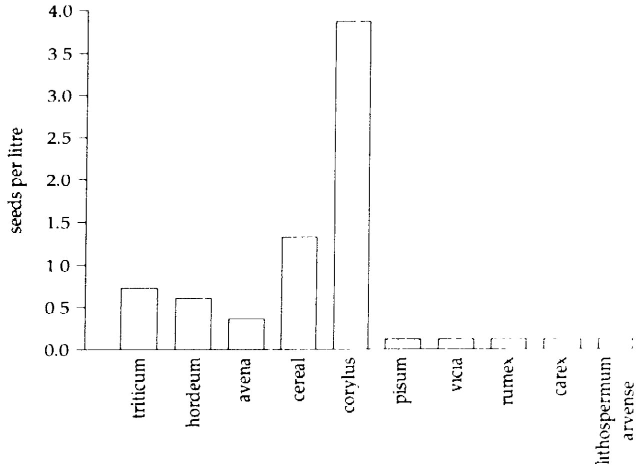

Figure 8.3 King's Somborne, A1990.2. Phase 3, seeds per litre.

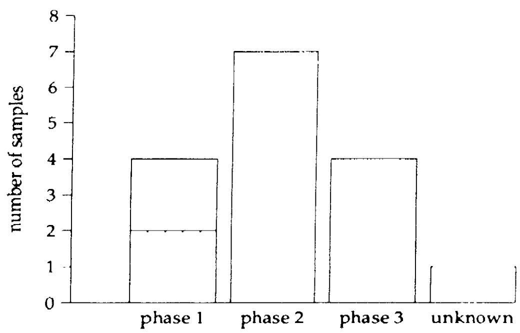

Figure 8.4 King's Somborne, A1990.2. Number of samples per phase. Shaded area represents samples with no identifiable plant remains.

and discard is a complex mosaic. That, like a mosaic, the individual cells may consist of subtle or dramatic variation.

Legumes

Peas, beans and vetches are invariably under-represented on Saxon sites. Increased knowledge has become available as a result of mineralised assemblages containing, in many cases, hilum fragments recovered mainly from cess or faecal deposits. Increased evidence has been recovered from Hamwic (Biddle, pers comm), and more recently from Abbots Worthy (Carruthers, pers comm) and from Meonstoke. Whilst charred pea *(Pisum sativum)* fragments occur on most sites, they are usually very badly preserved and rarely can they be accurately identified, as for example at Abbots Worthy (Carruthers, pers comm). Hilum fragments of peas have been recovered by the present author from Shavards Farm, Meonstoke. It is only faecal deposits that really produce consistent evidence for these legumes.

The evidence for vetches is also slender (see Campbell, this volume), invariably poorly preserved and usually confined to single specimens. At present it is still not possible to indicate what part vetches may have played in the economy. Imported legumes eg *Lens* sp do not seem to have been consumed on the sites examined. It is possible that legumes played a similar part in the economy throughout the Saxon period and possibly had the same importance as is recorded in the later Middle Ages. Clearly they could form an important part of a crop rotation.

Fruit species

In general once again apart from the evidence from urban centres, fruit species are generally under-represented, if present at all. Plums *(Prunus* sp), cherries *(Prunus avium),* blackberries *(Rubus fruticosus),* and strawberries *(Fragaria* sp) have been recorded from Winchester and Hamwic. No evidence for any fruit species has yet been recovered for this period from any of the smaller urban centres such as Romsey or Andover. The evidence from rural sites is very varied and dependent on preservation conditions. Evidence from Abbots Worthy is amongst the best to date, with species such as elderberry *(Sambucus nigra),* sloe *(Prunus spinosa),* apples *(Malus* sp) and blackberries being recorded. Evidence for grapes *(Vitis vinifera)* comes mainly from the towns such as Winchester or Hamwic (Biddle, pers comm) and from one rural site, Shavards Farm, Meonstoke. It is because mineralised preservation has been encountered on the Meonstoke site that a wider range of plant materials has been recorded. It is, therefore, quite possible that further work on sites with this preservation will reveal a similar pattern. Viticulture may well have been more widespread in the Saxon period than the archaeological evidence currently suggests.

Vegetable crops

The same general comment about under-representation holds good for vegetable species and like fruit crops, the only real evidence comes from sites with waterlogged or mineralised assemblages, Thus once again the sites at Abbots Worthy and Meonstoke have produced a wide range of species. Similarly, the range from Hamwic has been increased where mineralised deposits have been sampled. The species involved at Abbots Worthy include carrot *(Daucus carrota),* celery *(Apium graveolens)* and various cabbage, turnip and mustard *(Brassica/Sinapsis)* species. At Hamwic, celery, brassica species, and carrot have been recorded (Biddle, pers comm). As the evidence comes from seeds rather than actual remains of the vegetables themselves, there is always the possibility that the seeds may simply represent wild species or seeds collected for flavourings or for medicinal purposes. This point has been made repeatedly. By the late Saxon period seeds of beet *(Beta vulgaris)* occur in waterlogged contexts, as for example, at Winchester (Green 1984, 104). It is quite likely that these species were more widely grown in yards and gardens close to settlements, much as they are today

Herbs and food flavourings

The archaeological evidence for the range of herbs and food flavourings has increased considerably in the past ten years. This is also largely due to mineralised deposits being encountered on a number of sites. The recent work by Biddle (pers comm) on the plant remains from Hamwic has expanded our knowledge of the species used, particularly in the middle Saxon period. The species involved include celery *(Apium graveolens),* thyme *(Thymus* sp), various mustard varieties, sweet cicily *(Myrrhis odorata),* carroway *(Carum carvi),* oregano *(Oreganum* sp), sage *(Salvia* sp), coriander *(Coriandrum sativum),* and hops *(Humulus lupulus).*

Nuts

Hazelnuts *(Corylus avellana)* are a frequent component of Saxon plant assemblages. Evidence from King's Somborne (see Fig 8.1, 8.2 and 8.3) indicates that fragments were commonly recovered from all phases on the site, and were particularly numerous in the fills of the late Saxon post-holes. It is possible that this indicates a coppiced and well-managed landscape as has been suggested by Rackham (1986, 84). Walnuts *(Juglans regia)* have been recorded at Hamwic. Their absence elsewhere in the region until early medieval times may indicate a luxury import.

Exotic and imported species

The evidence for species that could never have been grown in this country during the Saxon period is at the present time limited from Wessex. The artefactual evidence for international trade through Hamwic in the middle Saxon period suggests that we might expect a wider range of exotic species than has presently been recorded. To date only *fig (Ficus* sp) has been recorded. Further evidence, albeit rare, might just be expected in a settlement like Hamwic, even if not from surrounding rural sites.

Conclusion

The foregoing discussion gives a broad indication of the present state of knowledge.

It is probably true to say that we know the range of major crops cultivated during the period under discussion. It is inevitable that the range of species will be added to in the future. In general it can be said that the bulk of the economic botanical evidence from Wessex consists of charred plant assemblages. In recent years a number of sites have produced mineralised plant remains, which have added appreciably to our knowledge, particularly through analyses of faecal deposits, containing incidence of bran, legumes and fruit species. For example, Abbots Worthy near Winchester (Carruthers, pers comm) and Shavards Farm, Meonstoke (Green 1991). Similarly, though more rarely encountered, anaerobically preserved material recovered from sites in the past ten years has broadened the species range, particularly in respect of wild and weed species. However, the reason for confining this paper to cereals and plant foods was because, even at the present time, the quantity of well-preserved plant materials does not really provide a sufficient database to give generalised comments on localised environments or ecological aspects, nor about fibre and dye plants.

What clearly emerges from the plant remains, particularly those from Hampshire sites of early-middle Saxon date, is that it is difficult to establish overall trends or a general pattern through time. The surviving plant remains appear to reflect a complex pattern of agricultural production and utilisation.

Large centres produce predominantly wheat, barley, oats and little, if any, rye. Some of the rural sites produce greater evidence for barley than wheat, though this is not always the case, as, for example, the latest evidence from King's Somborne. Some small towns such as Romsey seem to produce somewhat anomalous evidence. Perhaps this is what we should expect, Each type of site or settlement possibly has a clearly defined function in the agricultural production and consumption that is clearly complex and requires a great deal more research.

Acknowledgements

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9 A preliminary view of the insect assemblages from the early Christian rath site at Deer Park Farms, Northern Ireland

Harry K Kenward and Enid P Allison

Abstract

An account is given of the results obtained during the first year of a three-year investigation of the plant and invertebrate remains from anoxic waterlogged deposits associated with wattle structures at the early Christian rath mound at Deer Park Farms, Glenarm, County Antrim, Northern Ireland. A good proportion of the insect assemblages have been investigated in detail, with surprising results: they have much stronger similarities than predicted to those from deposits formed in and around wattle or wooden structures on urban sites.

It has been possible to identify the remains of creatures such as lice, ticks and some of the less well-known groups of bugs. This work has proved particularly rewarding. Host-specific parasites of a range of domestic mammals and humans, have been found, sometimes in large numbers. Several homopteran bugs indicating the importation of particular plant materials were also found in quantity.

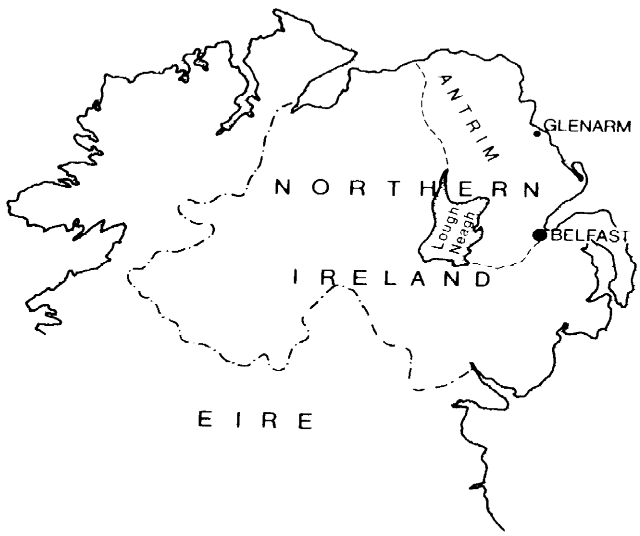

Figure 9.1 The location of the Deer Park Farms site

Introduction

While in Northern Ireland in 1987, Dr Peter Addyman, Director of the York Archaeological Trust, visited excavations at a unique 'waterlogged' rath site at Deer Park Farms (DPF), Antrim (Figure 9.1) and on return to York brought the site to the attention of the staff of the Environmental Archaeology Unit (EAU), University of York. Subsequent negotiations led to a preliminary phase of assessment of the plant and invertebrate remains, and it immediately became obvious that the site had exceptional potential for environmental archaeology, both from a biological standpoint and in terms of archaeological interpretation. Dr C Lynn, the director of excavations at Deer Park Farms, had perceived the importance of biological investigations and, making the provision of funding for an adequate study a high priority, was able to obtain support for a three-year programme of work in the EAU. In contrast to most project funding, the principle of an appropriately applied 'research' component in the work was implicit from the start. This, as much as the special nature of the material, has already lead to some remarkable discoveries and important advances, especially in the field of entomology.

The bones from the site have been investigated by Finbar McCormick at Belfast, and charred plant remains from the non-waterlogged layers have been worked on by Beth Cassidy. Dendrochronological work has been carried out by Dr M Baillie. Plant remains preserved from the anoxic layers are being examined by Dr A R Hall at York, and the authors are responsible for work on the arthropods, principally insects. Fly puparia from some samples have been examined by Professor J Phipps. Andrew Jones initiated work on eggs of intestinal parasites, but responsibility for this study has been assumed by the present authors as AJ has left the EAU.

We are only half way through the three years of the main project. It has only been possible to carry out preliminary botanical work, although results so far are most promising, for site interpretation and in comparison with material from English and continental European sites. The main phase of botanical work had been initiated at the time the current report was finalised.

Entomological studies have moved far enough ahead for some results to be presented, although any general conclusions can only be tentative. So far, 87 samples have been processed by paraffin flotation (Kenward *et al* 1980, using the abbreviated process described by Kenward *et al* 1986). Insects from 31 of these samples have been identified in detail at the time of writing, and most of the other assemblages have been given at least a cursory inspection. A substantial proportion of the time spent so far has been devoted to intensive work on some 'difficult' groups which it has not generally been practical to study in detail for other sites but which are proving to be of particular importance at the present site.

There were three principle reasons for studying insects from the site. The first was routine interpretation; cataloguing assemblages and determining their archaeological implications. This should obviously be seen as an essential component of good excavation practice since much information can be obtained only from insect remains. Secondly, Deer Park Farms presented an opportunity to work on a new kind of site which was in an unfamiliar landscape and of a little known period. Thirdly, there are many questions concerning the past distribution of the insect fauna of Ireland, an island of considerable zoogeographical interest whose insects are still in a rather early stage of study (the recent publication of a bibliography of Irish entomology Ryan *et al* (1984) will, it is hoped, stimulate more intensive work on Irish insects). A fourth reason for study was to test hypotheses formed gradually over the past decade or so concerning the development of the north-west European 'urban' insect fauna - perhaps more wisely called by some other name in view of the results so far from Deer Park Farms. These reasons apart, this chance to see Irish material was grasped with particular enthusiasm in view of the tragically lost opportunities in excavations in Dublin, from which only a very small amount of insect material was studied, albeit to a high standard (Coope 1981).

The site (after Lynn 1987)

The site at Deer Park Farms stood at 150m above sea-level, some 150m south of the Glenarm river and four miles from the coast. Prior to excavation the site consisted of a large, approximately circular, mound about 26m in diameter, standing at a maximum of 4.5m above the level of the surrounding field and encircled by a ditch. Excavations carried out by the Historic Monuments and Buildings branch of the Department of Environment of Northern Ireland revealed that the summit had been occupied in the Early Christian period and that two souterrains were dug into it: Occupation levels within the mound provided evidence for the presence of about 25 circular wattle houses varying from 4.5-7m in diameter, only 3 or 4 of which had been present on the summit at any one time. Several of these houses had been double walled.

As excavation progressed it became clear that the mound had been built up gradually inside the bank of an earlier multi-phase rath or ring-fort constructed at ground level. As houses were abandoned their roofs, door jambs and other parts which could be reused were removed and the remainder was left *in situ*. Continual rebuilding on one or two house sites at a time resulted in the gradual heightening of the mound. The final levels of this original rath had been covered by dumps of gravel and soil 1.5m deep, which formed the primary level of the mound proper. The houses of the final phase of the first rath were therefore either encased in build-up or pushed over and sealed with it (Figures 9.2-9.4). As a result of the heightening of the mound the water table rose and remains were preserved by anoxic waterlogging: it was in these layers that the astonishing preservation of organic remains was observed. Six high-precision carbon-14 dates obtained from wattles of various houses indicate that these levels date from the early 8th century. The dendrochronology dates are slightly earlier than this, presumably because of reuse of timbers.

The earlier rath was approximately 26m in diameter internally and encircled by a 1.6m high bank which was faced on the inside with a cladding of basalt boulders. It was entered by a gate which led into a large stone-lined 'antechamber' 10m long by 3m wide. Inside the inner opening of the 'antechamber' at the time when the waterlogged layers were sealed was a substantial circular wattle house (structure X) 7m in diameter. A slightly smaller wattle building was joined to the back of this, producing a figure of eight structure. Central stone-kerbed fireplaces were present in both houses, and against the walls of structure X were two slightly raised platforms made of brushwood covered with fine plant litter. These structures were interpreted as bedding areas. From the inner end of the 'antechamber' two stone-kerbed paths ran around structure X in both directions leading to smaller houses. All the buildings were of a double walled construction with the walls approximately 30cm apart (Fig 9.3). The outer walls were always less carefully made than the inner ones. An estimated 5 miles of hazel rods were used in the construction of each house. Finds recovered from the site included a few metal objects, glass beads, leather shoes, a few fragments of wooden vessels and the hub of a paddle wheel from a horizontal mill. A size 5½ shoe last was recovered from an oak trough which was sealed under the collapsed wall of the house attached to structure X.

The approach to the study

The site was extensively sampled by the excavators, who collected what, in EAU terminology, are called General Biological Analysis samples from most of

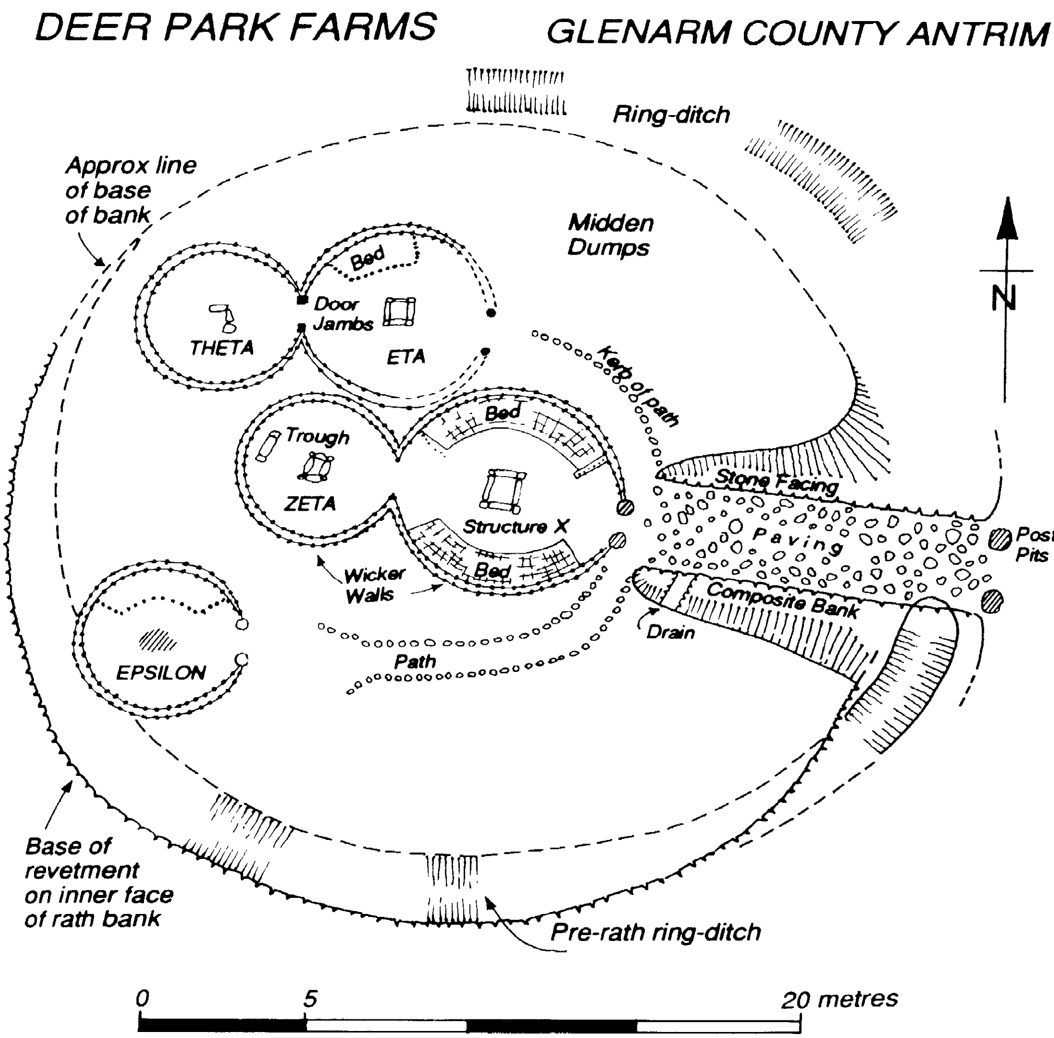

Figure 9.2 Deer Park Farms site: plan at the stage with waterlogged preservation. Crown Copyright.

the more substantial layers with waterlogged preservation of organic remains. This was something of an act of faith as no arrangements for work on most of the material from the samples existed at the time. It is intended that, for work on insect remains, a lkg 'test' subsample will be examined from all non-duplicate samples from phases with 'waterlogged' preservation of organic remains. A quantitative listing of a substantial proportion of the assemblages is planned, with semi-quantitative or subjective recording of the remainder; work on such a large scale is practicable using the sort of technique described by Kenward *et al* (1986), although increasing familiarity with the material means that the proportion of samples which are not recorded quantitatively may be quite small.

The explicit request to follow up 'research' aspects of the insect assemblages (and of other remains) was a welcome contrast with the much more limited approach to be expected with most projects, however important they are. Dr Lynn and DoE(NI) are to be heartily congratulated in this respect; their faith has certainly proved to be justified on the basis of the results so far. (A similar accolade should be afforded to the Ancient Monuments Laboratory, English Heritage for their continued support for work on 16-22 Coppergate, York, which allowed development of the methods for large scale work employed on DPF.) 'Research'so far on DPF has included very thorough work on groups not previously studied intensively as fossils, for example the lice and some difficult groups of bugs. Future work will include systematic comparison of assemblages of beetles with those from other sites, especially Anglo-Scandinavian 16-22 Coppergate, York (Kenward & Hall, forthcoming), Medieval Oslo (Kenward 1988), Iceland (Buckland & Perry 1989) etc. Some preliminary observations in this respect are made below.

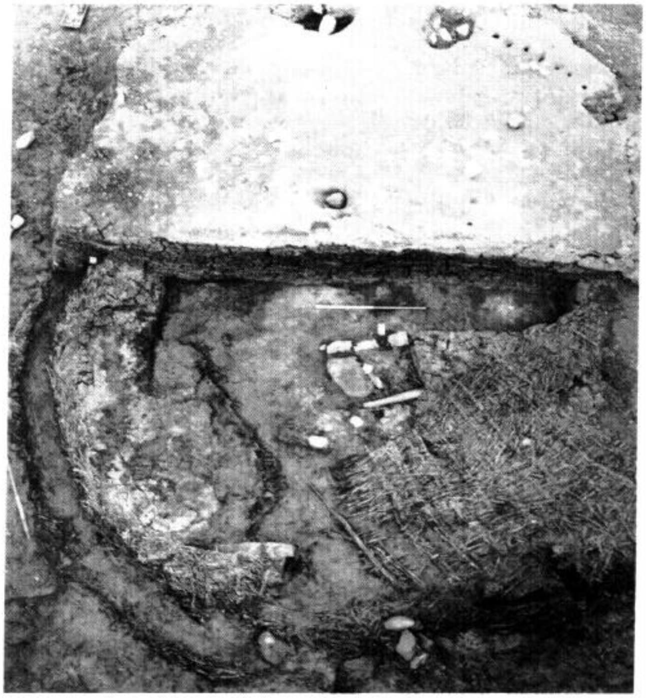

Figure 9.3 Structure Eta in its second phase, viewed from the west. Note 1m scale above central hearth, the double walled construction with cavity packing on the left and the large panel of collapsed wicker work to the right. Crown Copyright.

Figure 9.4 The carefully-squared oak door jambs of Structure Theta, felled in AD648. This doorway was closed with secondary wattling when Theta was demolished and its doorway was incorporated into the back of Eta. Crown copyright.

The plant remains

Dr A R Hall has provided the following notes on the botanical material:

So far 37 samples have been examined in some way, about three-quarters of them by means of a quick check for plant remains in the flots (picked out by John Carrott during sorting for insects). The remains from the latter group have proved to be very similar from sample to sample, though clearly only a very small percentage of the material left after sieving is actually examined by this means and it will be necessary to return to a selection of the whole flots as well as the wet residues to assess the full complement of plant macrofossils and other components.

Preservation is usually excellent, with large amounts of vegetative fragments (including mosses) present as well as 'seeds'; the latter may be very much diluted by the former, of course. Heather has been recorded from more than half the contexts examined so far, with bracken from about a quarter. Buds and bud- scales of several trees - mainly birch and hazel with traces of alder, oak, poplar/aspen and willow - indicate trees at or near the site and/or brushwood used in the construction of buildings or used inside them. Spikelets and caryopses of the heath grass, *Danthonia decumbens* are present in several samples and these are thought to indicate the use of turves - indeed, the largest concentration of spikelets is from a sample recorded archaeologically as 'staked turves' (presumably in the sense of living vegetation rather than peat). Grassland/ heathland taxa like tormentil *(Potentilla erecta)*, identified tentatively from about a quarter of the samples, may eventually prove to be strongly associated with 'turf'. The mosses in these samples mostly indicate grassland or heathland, and they too may have arrived with turf if not collected deliberately There is also a distinct component of mosses from bark - similar to those from Anglo-Scandinavian Coppergate - which perhaps arrived accidentally on brushwood or timber. A further category, not recorded from York, are those mosses with a distinctly western, montane distribution, which would presumably have been growing locally on the Antrim plateau.

All samples gave at least some evidence of weeds of a fairly restricted range. Most frequent in terms of both numbers per sample and numbers of samples in which they were recorded were hemp-nettle *(Galeopsis* Subgenus *Galeopsis)*, chickweed *(Stellaria media)*, oraches *(Atriplex* spp) fat hen *(Chenopodium album)*, nipplewort *(Lapsana communis)*, persicarias *(Polygonum persicaria, P lapathifolium)*, docks (*Rumex* spp), prickly sowthistle *(Sonchus asper)*, corn spurrey *(Spergula arvensis)* and stinging nettle *(Urtica dioica)*. Some are more likely to be weeds of cultivated soils in fields and gardens, others may be plants of the immediate vicinity of the site.

Amongst the cultivated plants, cereals are so far limited to single records of barley (including some chaff) and a wheat/rye caryopsis. Pod fragments of woad *(Isatis tinctoria)* have been recorded from three samples, whilst flax seeds and/or capsule fragments were present in about a third of them. The woad pod remains are of great interest. This appears to be the only fossil record of the plant from Ireland, and is much earlier in date than the comparable material from 9th–10th century Coppergate, York (Tomlinson 1985). The plant was presumably cultivated for its blue dye: this might have been used to colour linen made from flax fibres, though it is perhaps equally likely that it was used to dye wool. The only potential foodplants apart from flaxseed are hazelnut, blackberry, raspberry and sloe – all presumably wild-collected. Only blackberry was recorded in more than one sample, however.

The insect assemblages: general comments

The most immediate impression of the material from Deer Park Farms is the superb preservation of the remains in most samples and the abundance of fossils in a large proportion of them. This splendid preservation is probably the main reason why so many soft-bodied creatures such as lice and ticks are present in the samples from the site, rather than their having been absent in the past on other sites (indeed lice have now been recovered from several other sites with particularly good preservation). Beetles predominate, but Hemiptera–Homoptera (planthoppers and jumping plant lice (Psyllidae) and lice *sensu stricto* (both sucking lice, Anoplura, and biting lice, Mallophaga) are at least occasionally very numerous. There are lesser numbers of many other groups of invertebrates, for example fleas (Siphonaptera), parasitic wasps (Hymenoptera Parasitica) and ants (Formicidae), mites (Acari) and pseudoscorpions. Fly puparia are regularly present, and include the house fly *(Musca domestica)* and the stable fly *(Stomoxis calcitrans)*. Larval spiracles of the ‘rat-tailed maggot’ larvae of hoverflies (Syrphidae) were recovered from some samples. From the archaeological point of view there is clearly enormous potential for interpreting past utilisation of materials and living conditions at the site.

Broadly the same range of insect species has been recovered from most of the samples with a significant concentration of remains, but there were large variations in the relative numbers of the different species, these variations being of interpretive value. Most DPF groups include a varied mixture of ‘outdoor’ forms dependent on natural or semi-natural habitats, together with decomposers from rotting matter ranging from fairly dry mouldering litter to dung or equally foetid substances.

Obviously it is not appropriate to attempt a detailed reconstruction of conditions at the site on the basis of preliminary work. However, the first impression gained is of buildings with a variable degree of access to the open air and at least sometimes with a considerable accumulation of organic matter, probably usually mouldering, rather than rotting, on the floors. This material can be asserted to have been deposited during the period of use of the buildings because of the presence of fleas and human lice. Fleas were recorded from several samples, and layer 540, in particular, contained substantial numbers (over 50). All of those examined closely have proved to be the human flea, *Pulex irritans* (Figure 9.5), which appears to have been carried wherever man settled. Human lice, even better evidence of human occupation since they remain on the host and, unlike human fleas, are believed to be completely host-specific, have been recorded from most samples so far examined, occasionally being present in large numbers (see below).

Layers likely to have formed in the open air contained a variety of insects in addition to the decomposer fauna and analysis of these should provide a crude picture of the ecology of the surroundings of the site. On the basis of superficial examination, the only plant which it can be argued grew on the mound is stinging nettle *(Urtica dioica)*, for there are not only achenes (‘seeds’, which might have been imported with cut plants) but frequent records of nettle-feeding insects: the beetles *Brachypterus* spp and *Cidnorhinus quadrimaculatus* drop off the host plant at the slightest disturbance and are not likely to have been brought onto the site with cut mature nettles, collected, for example, for fibre. Adults and nymphs of the nettle-feeding psyllid bug *Trioza urticae* were present in several samples.

Destruction of native woodland on a substantial scale appears to have begun early in Ireland, so records of wood-associated species from DPF deserve further consideration. *Anobium punctatum*, the woodworm beetle, is present at the site in small numbers, in contrast to its abundance at, for example, Anglo-Scandavian Coppergate, York. Presumably there was not enough large structural timber to support a substantial population. *Grynobius planus* may have infested timber on site and is also represented by only small numbers of fossils. *Rhinosimus planirostris*, which lives under bark, has been recorded from several samples – it may have colonised the wattle. There are two records of cisids (associated with bracket fungi), and one specimen of *Scaphisoma ? boleti*, associated with fungi of various kinds on wood. There are only a few other taxa associated with wood or trees. All of these species could find habitats in hedgerows and scrub; there are no good woodland indicator species and certainly no evidence for ancient woodland. Although it has been claimed that in AD1600 about one eighth of Ireland was forested (McCracken 1971), the history of Irish woodland is not very well known. This is clearly a

Table 9.1 List of the more abundant beetle taxa (and one bug) in over 600 assemblages from deposits of Anglo-Scandinavian date at the 16-22 Coppergate site, York, and their presence (+) or absence (-) from the Early Christian rath at Deer Park Farms, Co Antrim, N Ireland

Taxon	DPF
Acritus nigricornis	+
Acrotrichis spp.	+
Aglenus brunneus	+
Aleocharinae sp. x	+
Anobium punctatum	+
Anotylus complanatus	+
Anotylus nitidulus	+
Anotylus rugosus	+
Anthicus formicarius	-
Aphodius granarius	-
Aphodius prodromus	+
Apion spp.	+
Atomaria nigripennis	+
Atomaria spp.	+
Blaps sp.	-
Carpelimus bilineatus	+
Carpelimus fuliginosus	+
Carpelimus pusillus group	+
Cercyon analis	+
Cercyon atricapillus	+
Cercyon haemorrhoidalis	+
Cercyon terminatus	+
Cercyon unipunctatus	+
Ceutorhynchus contractus	+
Chaetocnema concinna	+
Coprophilus striatulus	+
Cordalia obscula	+
Corticaria punctulata	?
Corticaria spp.	+
Cryptophagus scutellatus	+
cryptophagus spp.	+
Cryptopleurum minitum	+
Enicmus sp.	+
Ephistemus globulus	+
Falagria caesa or sulcatuza	+
Gyrohypnus angustatus	+
Gyrohypnus fracticornis	+
Helophorus sp (probably mainly *brevipalpis)*	+
Heterogaster urticae	-
Laemostenus terricola	-
Lathridius minitus group	+
Leperisinus varius	+
Leptacinus intermedius	+
Leptacinus pusillus	+
Lyctocoris campestris	+
Lyctus linearis	-
Megasternum obscurum	+
Meligethes spp. (many probably *aeneus)*	+
Monotoma longicollis	+
Monotoma picipes	+
Mycetaea hirta	+
Neobisnius sp. (probably all *villosulus)*	+
Ochthebius sp.	+
Omalium rivulare	?
Omalium caesum/italicum	+
Omosita colon	-
Omosita discoidea	-
Orthoperus sp.	+
Oxyomus sylvestris	-
Oxytelus sculptus	+
Philonthus spp.	+
Phyllotreta nemorum group	+
Phymatodes alni	-
Platystethus arenarius	+
Platystethus cornutus group	+
Platysthethus nitens	-
Ptenidium spp.	+
Pterostichus melanarius	+
Ptilinus pectinicornis	-
Ptinus fur	?
Stenus sp.	+
Tenebrio obscurus	-
Trechus micros	+
Trechus obtusus / quadristriatus	+
Trox scaber	-
Xylodromus concinnus	+

matter amenable to further investigation through work on insect remains. The re-use of door jambs at DPF may have reflected a shortage of large timber, but ritual cannot be ruled out in view of the importance attached to gateposts in Ireland (Evans 1957).

It is worthwhile considering the insect assemblages from some of these samples in more detail. Those selected have features of particular entomological interest, and are typical of many from the site both in terms of quantity and quality of remains, and of the species present. Sample 1000 was collected from a layer of dark grey-brown moist humic silt in structure Eta. Woody and herbaceous detritus could be clearly seen in the raw sediment. Although selected as interesting, the assemblage from this sample was by no means untypical of many from the site. The 1kg subsample processed by paraffin flotation gave an estimated 232 individuals of 101 taxa of beetles and bugs. The diversity of this assemblage was high as estimated using Fisher *et al's* (1943) index of diversity (alpha=68; SE=7), although ecological (as opposed to mathematical) diversity was subjectively rather limited. A large proportion of the species (42%) and of the individuals (31%) were classified as 'outdoor' - that is, unable to breed inside a building. The diversity of this outdoor component was moderate (alpha=42; SE=9), although outdoor fauna is obviously inherently more

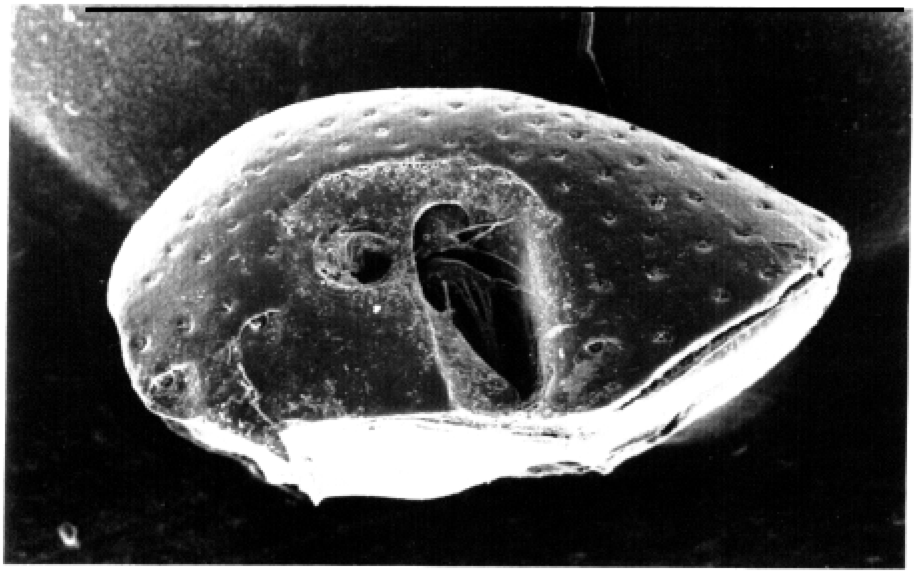

Figure 9.5 Head, left lateral aspect, of human flea Pulex irritans. From Subsample 540/T Context 1281, Structure X. Approximate length 0.6mm.

diverse than the restricted range of taxa able to live within buildings or in piles of decomposing matter. Some outdoor taxa were quite numerous: for example, two species of planthopper, *Conomelus anceps* (14 individuals) and *Cicadella viridis* (3); a psyllid bug *Livia juncorum* (9); and a leaf beetle *Gallerucella* sp (3). *C anceps* is common on *Juncus* spp (Le Quesne 1960, 38). *L juncorum* (Figures 9.6 and 9.7) is also found on *Juncus* spp, in which it induces the formation of tassel galls (Hodkinson and White 1979). *C viridis* occurs on grasses in marshy places (Le Quesne 1965, 21). Several *Gallerucella* species live on marshland vegetation. These species are repeatedly found in the DPF samples, although in varying numbers.

Another repeatedly observed, although less abundant, ecological group are heathland species. Sample 1000 included only single individuals of two such taxa, the weevil *Micrelus ericae* and the planthopper *Ulopa reticulata* (Fig 9.8), both associated with *Erica* and *Calluna* spp (Hansen 1965; Le Quesne 1965, 18).

The decomposer component (ie species associated with rotting matter of some kind) was proportionately only moderately large by comparison with many urban assemblages, making up only 56% of the individuals as compared with many values of around 70% at, for example, the 16-22 Coppergate site, York. The concentration of these decomposers was high, however (130 individuals per kg), and the diversity of the decomposer component low (alpha= 18; SE=3); the relatively low percentage representation was a result of dilution by other components. This, together with the ecologically consistent nature of the more abundant decomposers, indicates the presence of the remains of an *in situ* breeding community. *Monotoma longicollis* (27 individuals), *M picipes* (17), *Anthicus floralis* (11), *Atomaria* sp (9), *Cryptophagus* sp (5), *Xylodromus concinnus* (4) and many of the less abundant taxa together indicate mouldering, damp but not wet, perhaps somewhat foul, loose-textured plant remains. This kind of decomposer community is typical of a good proportion of the DPF samples. If this material included cut waterside or damp-ground vegetation, it is possible that many of the 'outdoor' insects were imported with it - including the four most abundant outdoor taxa listed above. The planthoppers may have been brought as the relatively immobile nymphs rather than as agile adults.

Human fleas, of which there were nine heads and other remains including three abdomens containing male genitalia, may have bred in this plant litter, indicating that the building was a human dwelling, but, as suggested above, even better evidence for human occupation comes from the lice. Human lice, *Pediculus humanus,* were astonishingly abundant, 136 individuals being counted. There were, however, also some lice associated with domestic animals – *Damalinia ovis, D bovis,* and *D caprae.* The usual hosts of these, as implied by their specific epithets, are sheep, cattle and goats, respectively The literature suggests that these lice only occur on other hosts quite exceptionally, so that considerable confidence may be placed in them as evidence of the animals' presence on the site. It is, however, important to establish in any particular case whether the animals were kept on the site, or their corpses or skins only were present. There were also the remains of *five* sheep ticks *(Ixodes ricinus)* (Fig 9.9).

Sample 1046/T was collected from a layer east of the bedding area in Structure Iota. Like sample 1000, it gave a substantial group of insects (235 beetles and bugs from 88 taxa). Whole-assemblage diversity was only moderately high (alpha=51; SE=5), and inspection of the species list and statistics for individual components strongly suggested that some species bred in (or were very strongly attracted to) the layer as it formed. The outdoor component was large, with 72 individuals, but a large proportion of these were *Aphodius prodromus,*

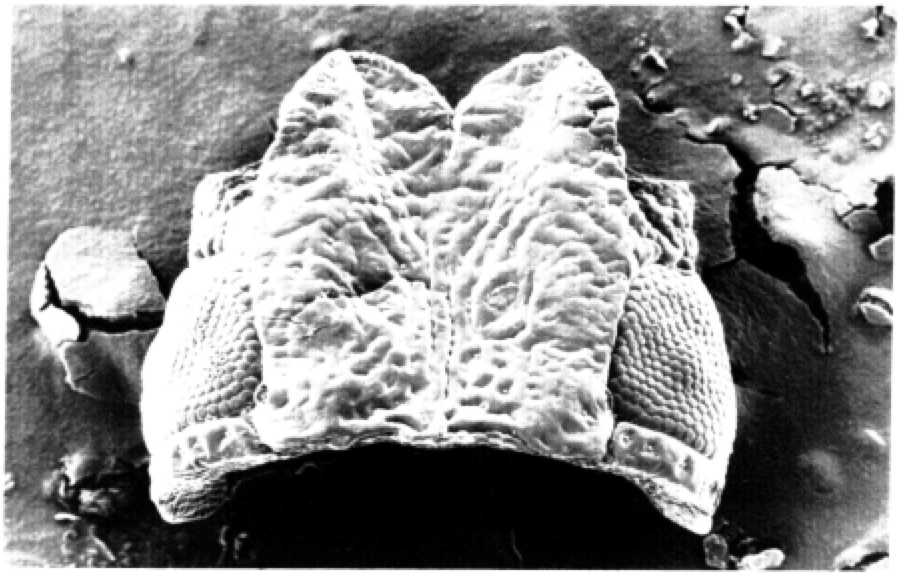

Figure 9.6 Head, dorsal aspect, of the psyllid bug Livia juncorum. From sample 898/T, Context 3549, Structure Lambda. Approximate length 0.6mm.

coded 'ob' (probable rather than certain 'outdoor'), and perhaps one of the most likely 'ob' taxa to breed in a building. This dung beetle was responsible for depression of the index of diversity for the outdoor component (to alpha=22; SE=4). The remaining outdoor species were much less numerous – only *Livia juncorum* (4 individuals), *Pterostichus melanarius, Chaetocnema concinna, Meligethes* sp and an indeterminate *Aphodius* being represented by two or more individuals. *L juncorum* may have been imported, or have lived on rushes on the site; *P melanarius* is common about buildings, sometimes straying into them; *C concinna* feeds on docks *(Rumex* spp) and persicarias *(Polygonurn* spp) (Hansen 1927, 189); *Meligethes* species are very common on herbaceous vegetation and fly freely

Decomposers were important in this assemblage, accounting for 68% of the individuals: here again diversity was low (alpha=17; SE=2) and it is likely that the following taxa all bred *in situ* in material which was foul to varying degrees: *Carpelimus bilineatus* (37 individuals); *Aphodius prodromus (32); Ptenidium* sp. (17); *Cercyon analis* (11); *Carpelimus pusillus* group (6); *Philonthus ? cephalotes (6);* and *Cordalia obscura* (6). Some rarer taxa would have co-existed with these, for example *Philonthus laminatus*.

Lice were abundant in the sample. There were a few *Pediculus humanus* and several each of *Damalinia equi,* found on horses and asses (Figure 9.10), *D bovis* (Fig 9.11), *D caprae* (Fig 9.12) and *D ovis,* but the majority (43 individuals) were of the sucking louse *Haematopinus apri.* This is the species found at the present day on the wild boar *(Sus scrofa)* and it is not known from the British Isles. In the past it presumably infested the domesticated version of the European wild pig. Another species, *Haematopinus suis,* lives on modern domestic pigs, which are much less hairy and presumably present a quite different habitat for a louse. Modern domestic pigs are largely derived from oriental stock introduced during the post-medieval period. It is difficult to reject the hypothesis that this layer formed in a pen or building in which pigs were kept. Whether this was during human occupation is uncertain, although there is ample evidence for co-occupation by pigs and humans in Irish houses (Evans 1957, 41). On the other hand, McCormick (pers comm) has tentatively identified pig pens *sensu stricto* in Dublin. Further work will centre on testing the possibility that the last use of structure Iota, perhaps temporarily before rebuilding, was as a pig house. Since so many dung beetles invaded, it is possible that the structure was no longer completely roofed, although

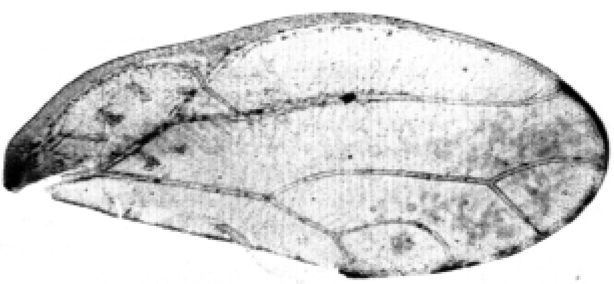

Figure 9.7 Right forewing of the psyllid bug Livia juncorum. From sample 898/T, Context 3549, Structure Lambda.

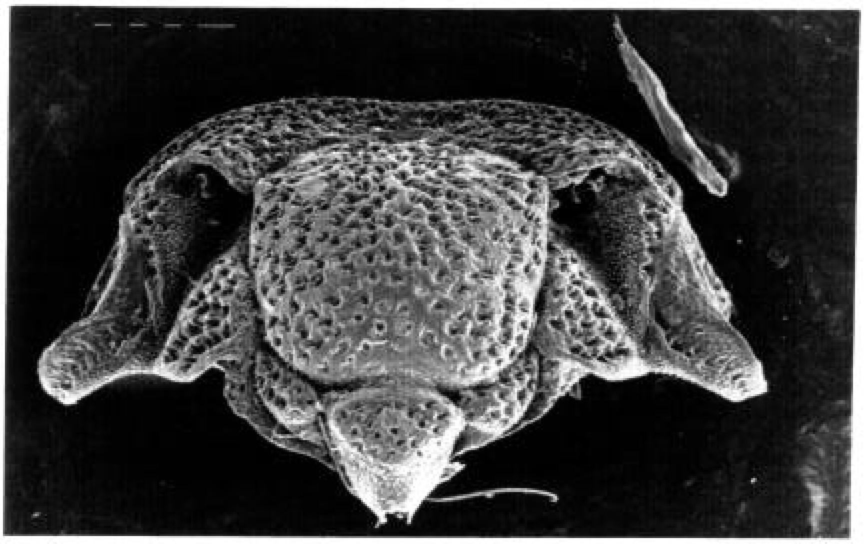

Figure 9.8 Head, anterior aspect, of the froghopper Ulopa reticulata. From sample 1021/T: Context 3652, Woody clay over path 3661 and entrance to Structure Iota. Approximate width 1.4mm.

other outdoor taxa might be expected in larger numbers if this were the case, as well, perhaps, asevidence of bird droppings. An interesting parallel, albeit involving a different domestic mammal, has been observed in the Yorkshire Dales, where, near Dent, there are abandoned buildings with a build-up of up to a metre of what appears to be dung from sheltering sheep. These modern deposits have yet to be studied.

Species diversity and the origin of the DPF fauna

It was predicted that isolated settlements like that at DPF, assumed to have been set up *de novo in* a sea of natural. semi- natural and farmland habitats. should have received from these a small number of species able to adapt to the habitats created by intensive human occupation. Such species, it was-postulated, would develop large populations in the absence of natural checks (parasites, predators); the massive populations of insects seen in stored grain and in field-crop infestations presenting a parallel to this stage. It was suggested that these primary invaders would mostly have been eurytopic species which were also rapid colonisers adapted to temporary habitats and that slow colonisers, such as wingless species and less migratory taxa adapted to long-lived natural habitats, would be mostly lacking. (The relationship of migratory behaviour to habitat is discussed by Southwood (1962).) The number of species successfully colonising might be expected to be limited in Ireland as compared with mainland Britain or Continental Europe, as the number of available species was considerably smaller. Rural sites were predicted to lack communities rich in decomposers of many kinds like those which had gradually developed in the very long-lived urban decomposer complexes seen in Roman (eg Hall & Kenward 1990), Anglo-Scandinavian (Kenward & Hall, forthcoming) and early medieval sites (Kenward 1988). The idea that rural sites would be depauperate in the typical urban synanthropes was

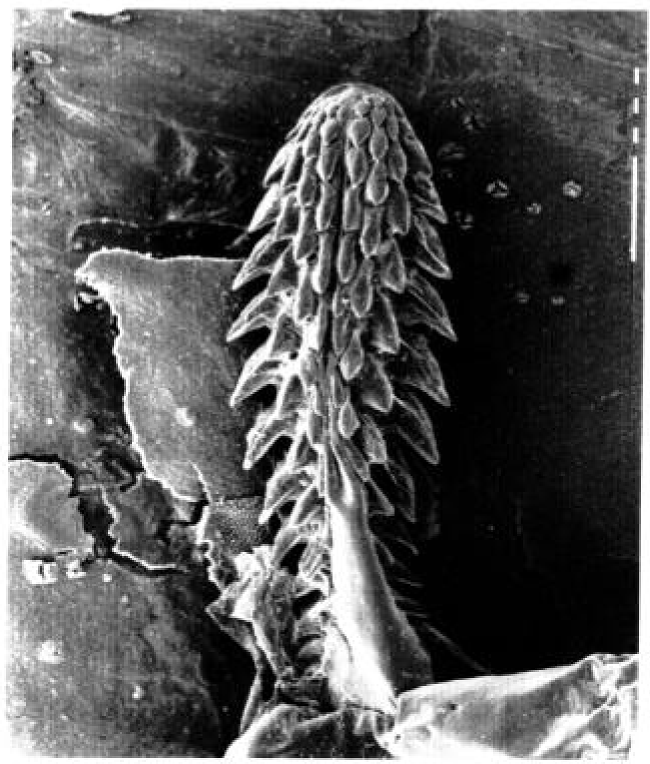

Figure 9.9 Hypostome (the piercing mouthpart) of female sheep tick Ixodes ricinus. From sample 1045, Context 3691, Structure Iota. Approximate length 0.4mm.

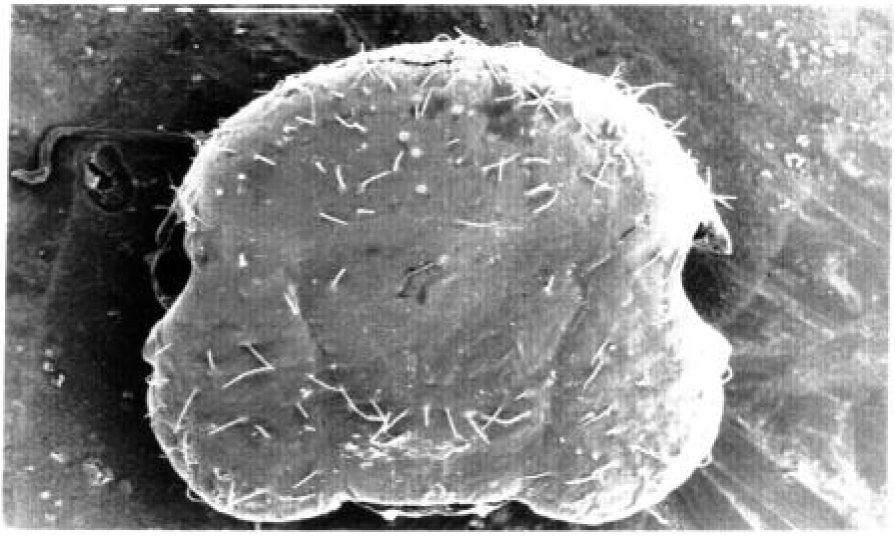

Figure 9.10 Head, dorsal aspect, of the horse Louse Damalinia equi. From Sample 381/T, Context 1209, an external layer Approximate length 0.4mm.

reinforced by work on an isolated Iron Age to Roman settlement at North Cave, Humberside (Allison *et al* 1990), where there was barely a trace of the group of species generally found in deposits formed in and around human habitation. Some of these taxa have been recorded from other, probably longer-lived and more intensive, rural settlements, however – at Farmoor, Oxfordshire (Lambrick & Robinson 1979), and Peel Castle, Isle of Man (Allison *et al* forthcoming), for example.

On the evidence so far available these predictions have not proved entirely correct. The majority of the insect assemblages have a strong subjective resemblance to those from many urban sites. This came as a considerable surprise. The authors still find it hard to believe that all of the species seen at Deer Park Farms invaded *de novo* from the surroundings. *Aglenus brunneus* and *Tipnus unicolor,* in particular, seem likely to have been imported by human activity – presumably accidentally – from other settlements. The strong similarities between the insect faunas of Dark Age and early medieval urban deposits in various towns in Britain, as well as at Dublin and Oslo, have been ascribed by the authors to the transport of live insects incidentally to trade. There is gradually increasing evidence that the same was true of Roman towns (York, Carlisle and London at least). There must, naturally, have been similar habitats available for colonisation in each of these urban centres. To find so similar a fauna in a small, relatively isolated settlement like the rath at Deer Park Farms has two possible implications: that the mechanism of invasion by these 'urban' insects was natural, or that there was, indeed, transport of materials to the rath in sufficient quantity for carriage of live insects from other settlements at which an 'urban' fauna was already established. Of course, either or both of these processes may have taken place over a very long period of time – the presence of Neolithic artefects at the site may even indicate that there had been more than a millennium of occupation before the phases examined here. Unbroken occupation over a few centuries may well have lead to the gradual accretion of a wider range of less rapid colonisers, both from the surroundings and by accidental human importation over greater distances. It is very probable that one cause of the great similarity between the insect faunas of Anglo-Scandinavian/early medieval settlements in England, Ireland, Norway and Iceland was wholesale carriage of insects in materials such as animal bedding – whether similar importation would have occurred at DPF is open to speculation.

Some of the DPF taxa are regarded as slow colonisers and are rare or very rare in nature. *Aglenus brunneus* (Fig 9.13), recorded from a good proportion of the samples and abundant in several (926 individuals per kilogramme in the subsample from sample 540 and over 2000 from sample 898), is characteristic of thick organic accumulations in urban archaeological deposits. It is a blind, flightless, and probably essentially subterranean beetle which is often found in association with a group of taxa suspected of post-depositional entry to deposits (Hall & Kenward 1990). What is known of its modern biology suggests that it probably would breed in accumulations of plant debris on house floors, and this is believed to have been the case in structures at Anglo-Scandinavian York (for example, Lloyds Bank and Coppergate). The modern and archaeological records (including one from Dublin) are considered by Kenward (1975; 1976). *A brunneus* is a burrower, perhaps with buried wood and other organic matter as its natural habitat and, as mentioned above, it is conceivably a post-depositional invader in some archaeological deposits. It seems very unlikely to have invaded long after the burial of the layers in which it was found at DPF, however, since *A brunneus* is extremely rare in nature and very much more likely to have been introduced in antiquity with the other

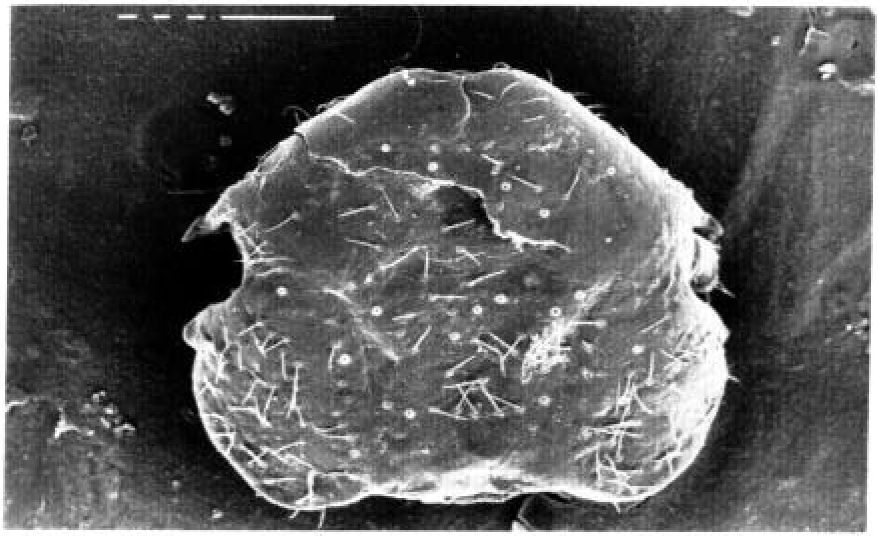

Figure 9.11 Head, dorsal aspect of the cattle louse Damalinia bovis. From sample 381/T: Context 1209, an external layer: Approximate length 0.4mm.

camp-followers of man. None of the specimens appeared to be exceptionally fresh, so the population in eachlayer must have died out long ago. *A brunneus* is not entirely unknown from rural sites; Lambrick and Robinson (1979) record it from Iron Age Farmoor. It is possible that *A brunneus* was common in deep wood-rich forest floor litter before extensive woodland clearance and perhaps under a warmer climatic regime. Other 'subterranean' taxa were generally present only in small numbers.

A second species which appears particularly likely to have been imported by humans is *Tipnus unicolor* (Fig 9.14). This spider beetle is most typical of rather damp old buildings, although there are a few records from natural habitats in Britain and elsewhere in north-west Europe (Allison & Kenward in preparation); the insect seems to be native to Britain. It is frequently recorded from Roman and later medieval sites, where it may be abundant – indeed it is sometimes one of the commonest species at the latter. It has, however, only been found in very small numbers from the 9th to 10th centuries. There is no obvious reason why it should not have lived successfully in Dark Age and early medieval buildings, unless they were too short-lived for large populations to build up. If this were so, why did it apparently succeed in what must have been equally short-lived structures at DPF? It has been found in association with Roman wooden buildings which were probably also short-lived at Tanner Row, York (Hall & Kenward 1990) and Carlisle (Kenward forthcoming), but in these cases there were presumably more substantial and long-lived structures nearby. *T-unicolor is* thus a somewhat surprising component of the Deer Park Farms fauna, not only because of the relative isolation of the site (the beetle is flightless and has been described as a 'slow walker' (R A Crowson, pers comm), but because it is decidedly not typical of otherwise very similar assemblages from later periods in Britain.

Atomaria nigripennis is another strongly synanthropic species (Hinton 1945, 232) regarded as an indicator of buildings at sites in York. It seems more likely to have been transported to DPF than to have originated in the surrounding countryside.

While the similarity of the insect assemblages from DPF to those of urban sites had not been predicted (at least by the present authors), the many similarities of plant remains are not surprising. It has been argued elsewhere that the majority of plant remains found in occupation deposits originated in materials collected by people, to be utilised for food, building or craft purposes, for example. It is hardly surprising, therefore, that in landscapes with a limited range of resources, the same materials were exploited. This does not make the plant remains any less valuable as a source of information: the evidence they give us is just of a different kind to that provided by the insects!

Although only a fairly small number of the insect assemblages from DPF have been listed in detail, the majority of taxa regarded as typical of 'dark age' and early medieval urban assemblages have been recorded. For comparison, the more abundant and frequently occurring beetle and bug taxa at Anglo-Scandinavian and early medieval 16-22 Coppergate, York, are listed in Table 9.1. It can be seen from this list that most of these species have already been recorded from Deer Park Farms. The present fauna of Ireland is poorly known but it is certainly rather restricted in comparison with lowland mainland Britain. Some species absent from DPF may have climatic limits to their distribution in Ireland, and others may not have been physically able to colonise the site, but a lack of suitable habitats may also have prevented their becoming established. Systematic comparison between these sites and others, particularly Oslo and Dublin, is required.

Many of the species which appeared early in the project to be 'absentees' from DPF were probably

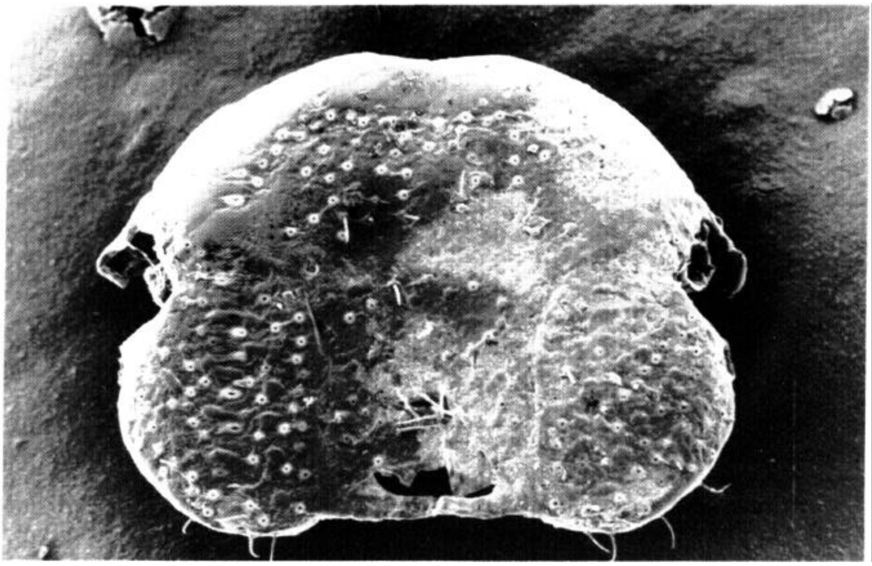

Figure 9.12 Head, dorsal aspect of the goat louse Damalinia caprae. From sample 898/T Context 3549, Structure Lambda. Approximate 0.4mm.

missing by chance – for example *Anotylus complanatus*, *Ochthebius* sp. and *Ceutorhynchus contractus*, all known from Ireland at the present day, have been found in assemblages identified during the preparation of this text. *Anthicus formicarius* may be a chance absentee, but it is interesting that *A floralis* has been found at DPF. These beetles form a remarkable species pair. They are often found together in modern communities and apparently occupying identical niches, a clear case where recent speciation might be suspected. It will be fascinating to chart their past history. *A formicarius* is the species generally found in Roman to medieval sites in England; there were very few records of *A floralis* from 16–22 Coppergate, for example.

Some species 'missing' from DPF seem not to have been recorded living in Ireland, or appear to be very rare. *Heterogaster urticae*, a nettle-feeding bug, is now restricted in the British Isles to southern England, but it was common enough in York before the 'Little Ice Age', at Coppergate for example (Kenward & Hall forthcoming). Ireland may always have been climatically unsuitable for it despite higher temperatures in the past. *Platystethus nitens*, a small beetle which now appears normally to live in organic-rich mud by water, is another species which may be restricted climatically – it too was common in York in the past and has been recorded from Carlisle, but its range has apparently shrunk, with its main distribution now in the south of England (Hammond, 1971). Other species not to have succeeded at DPF, because it is beyond their natural ranges, may have included *Trox scaber;* this species was recorded by Coope (1981) from Dublin, however.

Other 'absentees' (Table 9.1) are relevant to problems of the origin of the more strictly 'urban' fauna. The darkling beetles *Blaps* sp. and *Tenebrio obscurus* are two species generally regarded as 'stored products' beetles, although best considered as characteristic of dirty buildings rather than particularly of the materials stored in them. Their relative dependence on the presence of man has led to the suggestion that they may not be native British beetles (Brendell 1975). Fragments of *Blaps* sp are frequently recorded from archaeological deposits in England, but in the few cases where specific identification has been possible the remains have almost always been of *B lethifera*, which is not known to live in Ireland at the present day Both *B lethifera* and *B mucronata* have been recorded from Viking Dublin (Coope 1981). *Blaps* species are wingless, so dispersal other than by human activity is very weak. *T obscurus* (the dark mealworm beetle) is recorded from Ireland at the present day It, rather than the familiar yellow mealworm beetle *(T molitor)*, is very frequently found in Anglo-Scandinavian and early medieval deposits including those from Dublin (Coope 1981). The flightless ground beetle *Laemostenus terricola* can be grouped with these species – it is primarily found in buildings, but there are some outdoor records. Species like these, and *T scaber*, may only have been able to exist in towns at the fringes of, or beyond, their natural range because they presented raised temperatures and continuous habitats, both in space and time. Rural settlements may rarely have provided the combination of quantity and continuity of habitat required for such species to persist. Raised temperatures in towns – 'urban heat islands' – which probably existed in the past (Brimblecombe 1982) may also have played an important part, and of course complexes of buildings would have provided raised internal temperatures more or less continuously. The heat from decomposing matter may also have played a part.

As to the rarer taxa, with only 31 samples listed it is clearly too soon to draw any conclusions – when all the DPF samples have been examined it will be possible to consider a wider range of species.

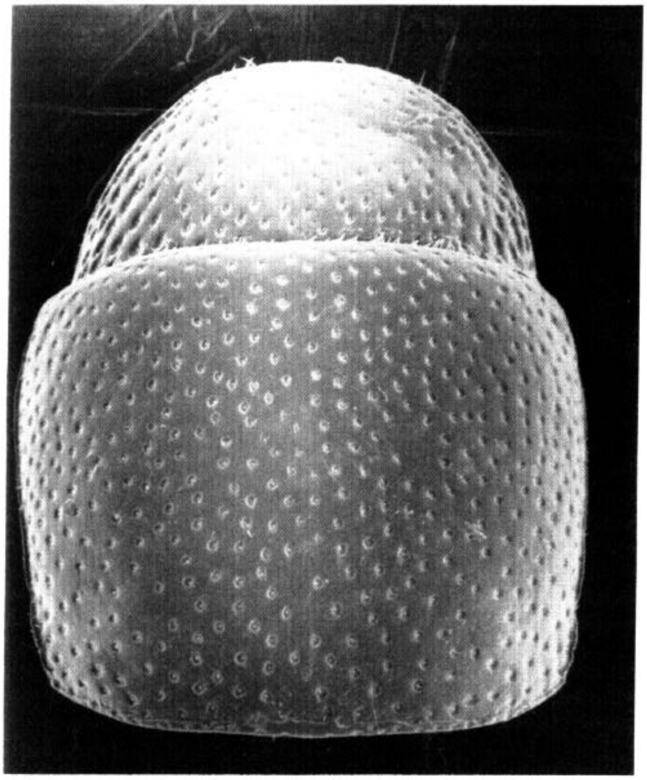

Figure 9.13 Head and pronotum (dorsal aspect, approximate length 0.8mm) of Aglenus brunneus. From sample 1007/T, Context 3617, peat.

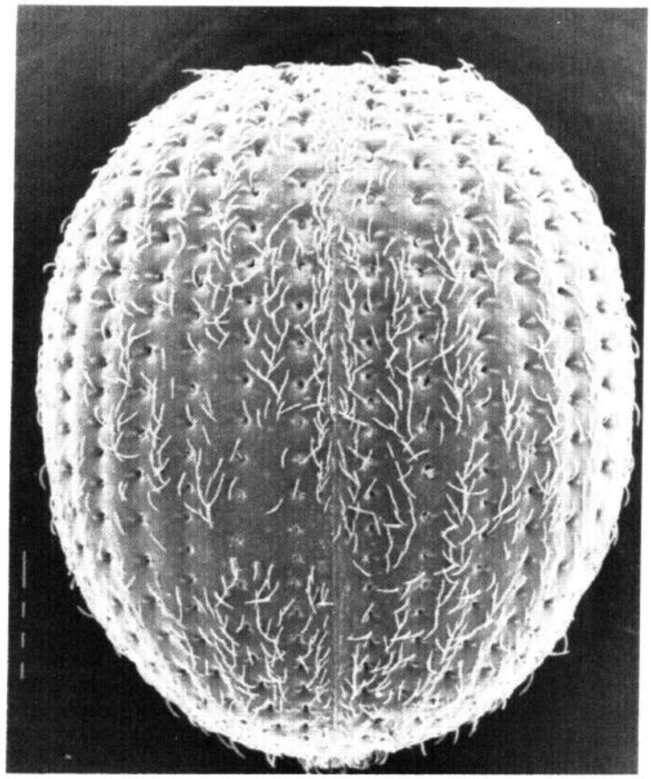

Figure 9. 14 Fused elytra, dorsal aspect, of the spider beetle Tipnus unicolor From sample 610/T, Context 1290, Structure X. Approximate length 1.3mm.

Further questions need to be considered as work progresses: How did this fauna arrive at DPF? Could it have been by diffusion site-to-site in materials carried by humans? Such a mechanism would suggest either large scale transport or a very long time scale; we need to look at pre-Roman Iron Age and earlier settlements. Considering north-west Europe as a whole, was the urban fauna a survival of fauna spread by trade in the Roman period? Or, could this fauna have been native, widespread and sufficiently abundant to colonise human dwellings? There is ample evidence that components of the typical urban fauna were carried to Iceland and perhaps Greenland in the Viking period (Buckland 1988; McGovern *et al* 1983) and many of the species survived in Iceland until the 20th century (Lindroth 1931). Many dung-inhabiting beetles seem to have been transported to North America with livestock (Hammond 1974,334).

If any of the species at DPF arrived from other settlements, the number of colonist individuals would be expected to have been small, so the so-called 'founder effect' might have led to a population with a uniform genotype, perhaps of an unusual type, in an isolated colony. This would need a new, primarily biological, project to test it; comparison with material from Iceland might also be instructive.

The records of human fleas are of interest. All other known *Pulex* species are from the Americas which may suggest that the human flea also had its origin there (Hopla 1980; Traub 1985), although man may not have been the original host. If it did originate in the New World there are two routes by which it could have reached western Europe: via Asia (Beringia/N Pacific/Aleutian Is), which could have taken place at a very early date (man may have been present in the Americas for much longer than is generally accepted (Guidon & Delibras 1986 and liguistic and genetic evidence summarized by Lewin (1990)), or across the North Atlantic as a result of contact between Viking settlers in the New World and native Americans (Buckland & Sadler 1989). The latter route was suggested because of the then lack of records of human fleas from pre-Viking deposits in Western Europe and can now be discounted. Human fleas, have now been recorded from Roman deposits in York and Carlisle (Hall & Kenward 1990; Kenward, forthcoming), and from early Iron Age deposits at Peel Castle on the Isle of Man (Allison *et al* forthcoming) and the Assendelver

Polders in the Netherlands (Hakbijl 1989). If human fleas did evolve in the Americas, they must have dispersed to Europe via Asia.

The presence of lice of several species of domestic animals suggests that animals may have been kept indoors or in pens made from disused houses, or that their skins and/or fleeces were being treated. At Coppergate and the Icelandic farmsteads sheep lice and keds deposited in houses probably came from fleece or skin processing. The significance of the fact that no keds have been recorded from DPF so far is uncertain.

Pigs surely were kept on the site since dung and lice occur together. Examination of samples for the presence of ova of intestinal parasites might provide more proof of this. Pigs seem unlikely to have been tolerated indoors as companions by humans for long enough to produce the dungy layer seen in Sample 1046, so we must seriously consider the possibility that the building functioned as a pig sty, at least for a while.

Concluding remarks

Work on the insects from this site is by no means complete, but it has already set us thinking about several issues. Archaeological interpretation will obviously be very detailed, and the plant and insect evidence together promise to provide an unusually clear picture of a previously completely unexaminable kind of settlement. Evidence for the presence of stock within the enclosure is particularly important, necessitating re-evaluation of the range of functions of the site. Was this rath particularly mucky because it was damp, or did other sites receive just as much organic matter, but lose it by decay?

This evidence contributes quite unexpectedly to our earlier thoughts concerning the possibility that the only extant parallel with ancient urban insect faunas might be relicts in the nuclei of long-lived modern farmsteads. These have probably accumulated their fauna over a very long period, and may have received a component from the rich, abundant urban fauna. It was thought that perhaps, in terms of the range of habitats presented, there was little difference between a rather neglected mucky farmyard and a Dark Age town. (Modern towns, of course, do not provide suitable habitats for the insect communities found in most archaeological deposits.) It should have been realised that early farmyards may equally have been the precursors, in ecological terms, of the towns. We had, in fact, been considering this possibility in view of the possible formation of at least some towns by subdivision of essentially agricultural small holdings - perhaps in function, though not in form, much like the settlement at Deer Park Farms - to form tenements.

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Appendix

Lists of adult Coleoptera and Hemiptera from two samples from the Deer Park Farms site arranged in rank order. For explanation of ecological codes see Hall and Kenward (1990). Percentage rounded to nearest whole number (hence zeros for low values).

Context: 4023 Sample: 1000/t

Taxon	Number	%	Rank	Ecodes
Monotoma longicollis (Gyllenhal)	27	12	1	rt
Monotoma picipes Herbst	17	7	2	rt
Conomelus anceps (Germar)	14	6	3	oa p
Anthicus floralis (Linnaeus)	11	5	4	rt
Atomaria sp.	9	4	5	rd
Livia juncorum (Latreille)	9	4	5	oa p d
Cryptophagus sp. A	6	3	7	rd
Lathridius minutus group	6	3	7	rd
Cercyon analis (Paykull)	5	2	9	rt
Xylodromus concinnus (Marsham)	4	2	10	rt
Aleocharinae sp. c	4	2	10	u
Ptenidium sp.	3	1	12	rt
Philonthus sp. c	3	1	12	u
Falagria caesa or *sulcatula*	3	1	12	rt
Aphodius sp. A	3	1	12	ob rf
Aglenus brunneus (Gyllenhal)	3	1	12	rt
Galerucella sp.	3	1	12	oa p
Cicadella viridis (Linnaeus)	3	1	12	oa p
Acritis nigicornis (Hoffman)	2	1	19	rt
Catops fuliginosus Erichson	2	1	19	u
Micropeplus staphylinoides (Marsham)	2	1	19	rt
Anthobium sp.	2	1	19	oa
Stenus sp.	2	1	19	u
Leptacinus ? batychrus (Gyllenhal)	2	1	19	rt
Leptacinus pusillus (Stephens)	2	1	19	rt
Gyrohypnus sp.	2	1	19	rt
Philonthus sp. D	2	1	19	u
Aleocharinae sp. A	2	1	19	u
Aleocharinae sp. B	2	1	19	u
Tipnus unicolor (Piller and Mitterpacher)	2	1	19	rd
Ephistemus globulus (Paykull)	2	1	19	rd
Rhinosimus planirostris (Fabricius)	2	1	19	l
Auchenoryncha sp. A	2	1	19	oa p
Carabus sp.	1	0	34	oa
Notiophilus sp.	1	0	34	oa
Dyschirius sp.	1	0	34	oa
Trechus obtusus or *quadristriatus*	1	0	34	oa
Pterostichus sp. A	1	0	34	ob
Pterostrichus sp. B	1	0	34	ob
Lebia ? chlorocephala (Hoffmannsegg)	1	0	34	oa p
Carabidae sp.	1	0	34	ob
Helophorus sp. A	1	0	34	oa w
Helophorus sp. B	1	0	34	oa w

Magasternum obscurum (Marsham)	1	0	34	rt
Acrotrichis sp. A	1	0	34	rt
Acrotrichis sp. B	1	0	34	rt
Micropeplus fulvus Erichson	1	0	34	rt
Megarthrus sp.	1	0	34	rt
Olophrum sp.	1	0	34	oa
Omalium sp. A	1	0	34	rt
Omalium sp. B	1	0	34	rt
Omaliinae sp.	1	0	34	u
Carpelimus ?bilineatus Stephens	1	0	34	rt
Platystethus arenarius (Fourcroy)	1	0	34	r f
Anotylus rugosus (Fabricius)	1	0	34	rt
Anotylus sculpturatus group	1	0	34	rt
Anotylus tetracarinatus (Block)	1	0	34	rt
Paederinae sp.	1	0	34	u
Philonthus sp. A	1	0	34	u
Philonthus sp. B	1	0	34	u
Philonthus sp. E	1	0	34	u
?Gabrius sp.	1	0	34	rt
Tachyporus sp. A	1	0	34	u
Tachyporus sp. B	1	0	34	u
Aleocharinae sp. D	1	0	34	u
Aleocharinae sp. E	1	0	34	u
Aleocharinae sp. F	1	0	34	u
Aleocharinae sp. G	1	0	34	u
Aleocharinae sp. H	1	0	34	u
Geotrupes sp.	1	0	34	oa rf
Aphodius sp. B	1	0	34	ob rf
Aphodius sp. C	1	0	34	ob rf
Dryops sp.	1	0	34	oa d
Cantharidae sp.	1	0	34	ob
Grynobius planus (Fabricius)	1	0	34	1
Anobium punctatum (Degeer)	1	0	34	1
Ptinus sp.	1	0	34	rd
Brachypterus sp.	1	0	34	oa p
Cryptophagus sp. B	1	0	34	rd
Corticaria sp.	1	0	34	rt
Cisidae sp.	1	0	34	1
Phylloteta sp.	1	0	34	oa p
Longitarsus sp. A	1	0	34	oa p
Longitarsus sp. B	1	0	34	oa p
Chalcoides sp.	1	0	34	oa p
Chrysomelidae sp.	1	0	34	oa p
Apion sp.	1	0	34	oa p
Phyllobius sp.	1	0	34	oa p
Micrelus ericae (Glyllenhal)	1	0	34	oa p m
Coleoptera sp.	1	0	34	oa p
Berytinus sp.	1	0	34	oa p
Heteroptera sp.	1	0	34	oa p
Ulopa reticulata (Fabricius)	1	0	34	oa p m
Auchenorhyncha sp. B	1	0	34	oa p
Auchenorhyncha sp. C	1	0	34	oa p
Auchenorhyncha sp. D	1	0	34	oa p
Auchenorhyncha sp. E	1	0	34	oa p

Auchenorhyncha sp. F	1	0	34	oa p
Auchenorhyncha sp. G	1	0	34	oa p
Auchenorhyncha sp. H	1	0	34	oa p

Context 3692 Sample: 1046/t

Carpelimus bilineatus Stephens	37	16	1	rt
Aphodius prodromus (Brahm)	32	14	2	ob rf
Ptenidium sp.	17	7	3	rt
Cercyon analis (Paykull)	11	5	4	rt
Aleocharinae sp. A	9	4	5	u
Carpelimus pusillus group	6	3	6	u
Philonthus ?cephalotes (Gravenhorst)	6	3	6	r t
Cordalia obscura (Gravenhorst)	6	3	6	r t
Xylodromus concinnus (Marsham)	5	2	9	rt
Livia juncorum (Latereille)	4	2	10	oa p d
Trechus obtusus or *quadristriatus*	3	1	11	oa
Stenus sp. A	3	1	11	u
Lathridius minutus group	3	1	11	r d
Aglenus brunneus (Gyllenhal)	3	1	11	rt
Pterostrichus melanarius (Illiger)	2	1	15	ob
Acrotrichis sp.	2	1	15	rt
Omalium sp. A	2	1	15	rt
Omalium sp. B	2	1	15	rt
Coprophilus striatulus (Fabricius)	2	1	15	rt
Anotylus rugosus (Fabricius)	2	1	15	rt
Xantholinus linearis or *gallicus*	2	1	15	rt
Neobisnius sp.	2	1	15	u
Philonthus laminatus (Creutzer)	2	1	15	rf
Aleochara sp.	2	1	15	u
Aleocharinae sp. B	2	1	15	u
Pselaphidae sp. A	2	1	15	u
Aphodius sp. A	2	1	15	ob rf
Meligethes sp.	2	1	15	oa p
Ephistemus globulus (Paykull)	2	1	15	rd
Chaetocnema concinna (Marsham)	2	1	15	oa p
Carabus granulatus Linnaeus	1	0	31	oa
Trechus ? rubrens (Fabricius)	1	0	31	u
Bembidion sp.	1	0	31	oa
Pterostichus sp.	1	0	31	ob
Carabidae sp. A	1	0	31	ob
Carabidae sp. B	1	0	31	ob
Carabidae sp. C	1	0	31	ob
Helophorus sp. A	1	0	31	o a w
Helophorus sp. B	1	0	31	oa w
Cerycon haemorrhoidalis (Fabricius)	1	0	31	rf
Hydraena sp.	1	0	31	oa w
Catops sp.	1	0	31	u
Silpha ? atrata Linnaeus	1	0	31	u
Micropeplus fulvus Erichson	1	0	31	rt
Micropeplus staphylinoides (Marsham)	1	0	31	rt
Olophrum fuscum or *piceum*	1	0	31	oa

Phyllodrepa floralis group	1	0	31	rt
Omaliinae sp.	1	0	31	u
Carpelimus sp.	1	0	31	u
Platystethus arenarius (Fourcroy)	1	0	31	r f
Anotylus sp.	1	0	31	rt
Stenus sp. B	1	0	31	u
Gyrohypnus ? *fracticornis* (Muller)	1	0	31	rt
Philonthus sp.	1	0	31	u
Staphylininae sp.	1	0	31	u
Aleocharinae sp C.	1	0	31	u
Aleocharinae sp. D	1	0	31	u
Aleocharinae sp. E	1	0	31	u
Pselaphidae sp. B	1	0	31	u
Geotrupes sp.	1	0	31	oa rf
Aphodius ater (Degeer)	1	0	31	oa rf
Aphodius sp. B	1	0	31	ob rf
Aphodius sp. C	1	0	31	ob rf
Clambus sp.	1	0	31	r t
Heterocerus sp.	1	0	31	oa d
?Cantharidae sp.	1	0	31	ob
Rhizophagus ?picipes (Olivier)	1	0	31	u
Cryptophagus sp. A	1	0	31	r d
Cryptophagus sp. B	1	0	31	r d
Cryptophagus sp. C	1	0	31	rd
Cryptophagus sp. D	1	0	31	rd
Atomaria sp. A	1	0	31	rd
Atomaria sp. B	1	0	31	rd
Orthoperus sp. A	1	0	31	rt
Ortoperus sp. B	1	0	31	r t
Corticaria sp.	1	0	31	rt
Gastrophysa viridula (Degeer)	1	0	31	oa p
Galerucella sp.	1	0	31	oa p
Longitarsus sp. A	1	0	31	oa p
Longitarsus sp. B	1	0	31	oa p
Coleoptera sp. A	1	0	31	u
Coleopera sp. B	1	0	31	u
Drymus ?ryei Douglas and Scott	1	0	31	oa p
Auchenorhyncha sp. A	1	0	31	oa p
Auchenorhyncha sp. B	1	0	31	oa p
Auchenorhyncha sp. C	1	0	31	oa p
Auchenorhyncha sp. D	1	0	31	oa p
Hemiptera sp.	1	0	31	u

10 Saxon urban economies: an archaeological perspective *Alan Vince*

Abstract

Environmental archaeologists have several roles to play in the study of tiglo-Saxon towns. First, they can look for evidence of a difference in environment or diet between town and country. Second, they can examine the way in which the provisioning of a large settlement affected the economy of the surrounding region and, third, they can contribute to the debate as to the precise function of Anglo-Saxon towns. In this paper it is argued that individual regions within the British Isles passed through economic stages as they became incorporated into an international trade network, followed by the collapse of that network and the emergence of a new trade axis in the 9th century Midland and western Britain, largely unaffected by these earlier developments, may have experienced a similar transformation following the foundation of *burhs* in the late 9th and early 10th centuries and the subsequent development of coastal ports, inland towns and rural markets in the later 10th and 11th centuries.

Introduction

Environmental archaeology has an important role to play in the further understanding of the function and history of Anglo-Saxon towns and in this paper I will indicate some of the areas which most need attention. First, however, we must look at what is known about urbanism in the period from *c* 600 to *c* 1000. We will find that certain basic facts have been established for many years; for example, the size and sophistication of the *wic* at Hamwic in the 8th century or the role of Alfred in town foundation in the late 9th century, but we will also find that the interpretation of these 'facts' can change and that the pendulum has in recent years swung from one extreme, in which 'real towns' began with Alfred, to another, in which the late 9th and early 10th centuries are seen as a period of recession in between periods in which elaborate and sophisticated urban economies prevailed. Finally, I will summarise the various strands of evidence for Anglo-Saxon towns and present hypotheses which can be tested using data provided by environmental archaeology.

The chronology of Anglo-Saxon towns

Before we can usefully examine our archaeological evidence for Saxon towns we need to divide the time between the end of the Roman period and the Norman Conquest into phases. For the purposes of studying the economy these phases must correspond to periods in which the same system was in operation. They should not be arbitrary and I hope to demonstrate that in fact there are four quite separate economic phases within the period under study, although for completeness I will briefly examine the preceding two phases and the succeeding one.

The Late Roman period

Commentators on the fate of Roman towns have, in the main, assumed that town life continued for some time into the 5th century, or later, accompanied by an increasingly less recognisable material culture. The absence of evidence for the sudden or calamitous cessation of occupation on most urban excavations certainly suggests a period of unceasing decline rather than catastrophe. My own view is that 'Romanised' life continued on the sites of some towns well into the 5th century but that already by *c* 400 these sites had ceased to be urban settlements. In Merovingian France we would have no difficulty in using the term 'Palace' to denote an aristocratic/religious complex which was the seat of local power and administration and it may be that this will turn out to be the best term to use for the settlements which existed at Verulamium, Wroxeter, Lincoln and probably elsewhere too. Much remains unclear about the extent and structure of the latest Roman towns but in Lincoln it is evident that while there is a change in the late 4th century, (probably close to the now-discredited corner-stone of 4th-century chronology, AD 367), there is less evidence for what that change actually signified (Bartholomew 1984). Sites in Lincoln's extra-mural suburbs, for example, suffer the same changes at the same time as those within the walls. At Hungate in the Lower City a masonry building was systematically demolished and the ground level raised by *c* 1.5m. The top *c* 0.5m of this dumping was then subjected to soil formation – 'dark earth' – and in the clean turf line which had formed over this dump by the

10th century there were scores of coins of the House of Theodosius, perhaps a scattered hoard but certainly evidence that there was life after 'dark earth (Mann in prep; Vince in prep). A similar sequence was found at St Mark's railway station, in Wigford close to the eastern bank of the Brayford Pool. There, also some time in the late 4th century, masonry buildings had been demolished but over the stumps of their walls was a 'dark earth dump which appears to have been dumped to reclaim *c* 25m of what had been flood plain (Steane in prep). Initial study of the animal bone assemblages from late Roman deposits in Lincoln by Terry O'Connor has shown that even at the very end of the 4th century they are dominated by commercial butchery waste.

Non-urban society: 5th to 7th centuries

While there is certainly evidence for life in towns in the 5th to 7th centuries there is no reason at present to believe that any of these former towns (or future towns) were actually functioning as urban centres in the 5th to 7th centuries. The 5th century remains an almost complete Dark Age as far as towns are concerned. Even at Canterbury where there is evidence for remarkably early re-occupation there are nevertheless indications that the walled area was virtually deserted at some time during the century (Tatton-Brown 1984).

There is evidence from at least two walled Roman towns that some public buildings were subsequently used as the sites of Christian communities. At Lincoln the complex sequence at St Paul-in-the-Bail is still being analysed but at present it is believed that a church was built within the Roman period in the centre of the forum courtyard, with access from the portico of the forum, and that in the 5th and 6th centuries an inhumation cemetery with unaccompanied east-west burials is evidence for the existence of a Christian community within the walls. This community seems to have survived into the 7th century, to judge by a hanging bowl found in one grave (Gilmour 1979; Rodwell 1981; Steane in prep). Similar evidence comes from Exeter, while it is at least possible that the survival of standing Roman remains in towns such as Wroxeter and Leicester is due to their being incorporated into later structures, most likely churches. None of this evidence implies the existence of a large settlement or that the settlement has any kind of commercial or market function.

As we have seen (Murphy; Crabtree; this volume), rural settlement in the 5th to 7th centuries shows an economic and social continuity even if the evidence from sites such as West Stow and Mucking does now suggest that within this stable framework the actual settlement sites could be short-lived. Analysis of the early Anglo-Saxon settlement at Mucking by Helena Hamerow (1987a; 1987b; 1991) shows that there is evidence for increased specialisation in the latest settlements and the occupants of these settlements had access to imported Frankish pottery unavailable to their predecessors. These developments may imply that by the later 6th or early 7th century the south Essex coast was being drawn into a more integrated economy and I would suspect that this might be linked to the first emergence of a port at London, which we can show through numismatic evidence was in existence in some form or other by *c* 640 at the latest (Vince 1989, 85-7). I suggest below that this development ought to be reflected in animal bone assemblages, either in the form of evidence for the rearing of animals for consumption off site or for a growing specialisation in a particular form of animal husbandry linked to the sale or exchange of animal products, such as leather and wool.

Early to Mid Saxon: late 6th to mid-8th centuries

The likelihood that east Kent was in advance of other areas of Anglo-Saxon England in terms of overseas contacts and the level of commercial activity is well-known. Two recent studies have examined the evidence for the nature of Kent's economy in the 5th to 7th centuries and confirm that this area was indeed different. They emphasise that the absence of settlement archaeology, and in this context especially archaeozoological studies, is to be deeply regretted. Martin Welch (forthcoming) has summarised evidence from both south-east England and north-west France for cross-channel contact. The nature of this contact is discussed and he concludes that there is evidence both for the movement of a small number of individuals across the channel and for the exchange of goods. He suggests that the best explanation for the presence of small numbers of Kentish settlers at Herpes and in western Normandy and the Somme-Boulogne regions in the 6th century is in terms of a Frankish-Kentish monopoly of cross-channel trade. Huggett (1988) explores the nature of this contact in greater detail by studying the distribution in time and space of certain types of imported goods found in Anglo-Saxon burials. These are divided into two groups. Group 1 consists of items, all of which are undoubtedly imported from the Frankish world or beyond, which occur in quantity in Kentish graves but have only a thin distribution throughout the rest of Anglo-Saxon England, where they typically occur in graves of high social status. There is a hint that Group 1 items, which occur throughout the 5th to 7th centuries in Kent, become more frequent elsewhere with time. Group 2, by contrast, consists of items whose status as imports is in most cases open to doubt. They include ivory rings (which might be fossil mammoth ivory), amber beads (which might come from the east coast of England) and crystal beads (which could have numerous local English sources). Significantly, these items occur in Kent but are not concentrated there. There is therefore a consensus that Kent and the Isle of Wight, to which it was related politically, had a monopoly of contact with Frankia and that, although evidence for this contact increases through time, it is likely that there had been some sort of intercourse between Kent and Frankia since the 5th century

A recent study of the political development of Kent by Brooks (1989) suggests that there were originally two kingdoms, based on the old Roman towns of Canterbury and Rochester respectively He suggests that the eastern Kentish kingdom was initially divided into four regions, administered from vills at Wye, Canterbury, Lympne and Eastry. Of these, two have produced documentary evidence for ports in the 7th century. Fordwich, on the Stour immediately downstream of Canterbury, was mentioned incidentally in a charter of Hlothere in 675 (Sawyer 1968, No.7). The location of this port in relation to the documented royal vi11 at Sturry has long been commented upon. Sandwich, at the south end of the Wantsum, is recorded in 664/5 as the landing place of St Wilfrid. Topographic analysis by Tim Tatton-Brown (1984) indicates that initially access to the port was from the south-east (ie from the royal vill at Eastry) and not directly from the west, to Canterbury. Another port on the Wantsum was at Sarre, famous for its rich 6th-century cemetery and situated on the Isle of Thanet, opposite the junction of the Stour and the Wantsum. This port too is poorly situated for access to Canterbury and from there to the rest of England but is ideal to serve Thanet itself. The church at Minster-in-Thanet lies relatively close to the cemetery at Sarre but the precise location of the port is not known. In the 8th century the abbess of St Peter's Minster, Thanet was granted remission of toll due on two ships landing at Sarre and at Fordwich (Sawyer 1968, No 29). By that time, however, both the churches at Minster-in-Thanet and Rochester had interests in shipping in London (Sawyer 1968, Nos 86 and 88).

The two other administrative regions of east Kent contain places which were certainly towns and ports in the medieval period and were important ecclesiastical and administrative centres in the mid-Saxon period. The Wye region was later served by Faversham, situated where an inlet from the Swale (separating the mainland from Sheppey) was crossed by Watling Street. A rich 6th and 7th-century cemetery once existed there but was destroyed by the cutting of the railway from 1855 onwards (Tatton-Brown 1984, 28–32). The Lympne region was served in the Roman period by *Portus Lemanis* and in the 10th century by *Limen*, recorded on coins of Edgar, and by the 11th century by Hythe (op *cit* 23-28).

In Kent, therefore, there are indications that in the 6th and 7th centuries there were ports, some termed *wics*, which served single administrative districts but whose use was nevertheless controlled directly by the king (whose 'court' would at that stage have moved at intervals from royal vi11 to royal vi11 living off the food rents collected at the vill). It is possible that these Kentish *wics* were involved in the export of surplus goods from the vi11 and if this was the case it would explain the failure of Sarre to survive as a port, although local environmental changes may also have been a crucial factor. The likely early date for the port at Sarre is not only indicated by the cemetery there and by the concentration of imported pottery in the Thanet cemeteries (Huggett 1988, 74-6 fig.8) but also by the fact that Bede states that at the start of his mission St Augustine landed on the Isle of Thanet.

Whatever the case for Kent, the 7th century marks the beginning of urban life at London, Ipswich and York (Vince 1989; Wade 1989; Hall 1989). Urban life at Hamwic, however, began within a few years of *c* 700, by which time substantial settlements had existed at the other towns for anything between 50 and 100 years (Brisbane 1989). There is circumstantial evidence for the existence of a *wic* at Pagham harbour, in Sussex and the historical evidence suggests that this too would have been a relatively late development, related to the establishment at Selsey, first, of a monastery *c* 680 and then of a see between 705 and 709 (Munby 1984, 322; Welch 1989). Further west, in Dorset, the existence of trading settlements or ports becomes even more speculative. Swanage, at the south end of Poole Harbour, is referred to as *Swanawic* in the *Anglo-Saxon Chronicle* for 877 but only as the location of a storm in which the Viking army lost 120 ships (Whitelock 1968, No.1, 179). The existence of a harbour or landing place under the control of the Reeve of Dorchester can be inferred from the chronicle entry for 789, amplified by (Æthelweard's chronicle in which he states that the reeve mistook the Vikings for traders (Whitelock 1968, No.1 166). Laurence Keene suggests that this harbour may have been at Weymouth Harbour rather than the traditional site of Portland (Keene 1984, 207). A recent study of the single coin finds of Anglo-Saxon date from Dorset shows that there are few early *sceatta* finds but that late *sceattas* and early pennies are not only more common than earlier coins but may be more common than contemporary coins in south-east England (Archibald & Keene forthcoming).

Travelling up the east coast past Ipswich and Dunwich (where archaeological evidence has been conveniently removed by coastal erosion) and Norwich (whose mid-Saxon precursor is still enigmatic) we arrive in Lindsey, where archaeological work has failed to confirm Reynold's suggestion of a mid-Saxon *wic* at Wigford, the southern suburb of Lincoln (Reynolds 1977, 24–7). One needs little imagination to see the foundation of *wics* in this period as an innovation slowly diffusing from Kent, occasionally skipping an area (as perhaps in Lindsey). Following the elucidation of the early history of Wessex by Yorke (1989), Welch links the development of Hamwic with the conquest of the Isle of Wight by the West Saxons (Welch forthcoming). Before the 680s raiders based on the island would have been able to inhibit the use of Southampton Water.

Accompanying the formation of *wics* was the spread of coin use and manufacture. Opinion is divided about the importance of coins in the operation of the 7th and 8th century economy To some, the issuing of coins was merely a device by which to enable taxes to be paid in a more convenient medium than the food render. To others, the distribution of coin finds points clearly to their having been used, from at least the late 7th century onwards, for local and international commerce (Metcalf 1975). The largest concentration of coin finds comes from *wic* sites, such as Hamwic, from so-called 'productive sites' which are thought in the main to be the sites of mid-Saxon fairs and markets (Metcalf forthcoming), and from the sites of religious houses. To date there is no concentration of finds on the sites of royal vills or palaces and Wicken Bonhunt, for example, only produced one early 8th-century sceatta despite the scale of excavation at the site (Rigold & Metcalf 1984). Metcalf has clearly demonstrated that at Hamwic the formation of the mint *c* 720 was preceded by a brief phase in which currency minted further east was circulating. He has also demonstrated that within certain kingdoms during the 8th century local currency areas were in operation, so that only the coins of the local mints are found. The debasement of coinage during the 7th and early 8th centuries is well-known and the way in which the English currencies seem to have kept in step with those on the other side of the channel is a remarkable testament to the strong links which must by this time have existed between the economies of Frankia and Kent. This is further emphasised by the fact that Kentish coins occur on Frankish sites and vice versa.

Late Mid Saxon: mid-8th to mid-9th centuries

The third quarter of the 8th century is marked numismatically by the cessation of minting, if not of use, of *sceattas* and, after a brief interlude when coinage may not have been used, the broad flan pennies, struck out of sheet metal with a much higher silver content than the *sceattas*, came into use in England south of the Humber. The south Humbrian kingdoms were following the continental trend at this time whereas the North Humbrians continued to mint a denarial coinage, firstly Rigold's Series Y and later the copper-alloy styca coinage (Booth 1984; Pirie 1986). This in itself may well be significant, since it shows that the Northumbrians were less interested in maintaining parity with the continent than were the kingdoms south of the Humber. Nevertheless, styca finds do occur outside of Northumbria, for example in the lower Trent valley and the north and west coasts of Lincolnshire. Pennies are much less common site finds than are *sceattas* or stycas but one must bear in mind the fact that the intrinsic value of the coins was probably more comparable with *sceattas* of the later 7th century, which are also rare finds. Similar patterns of loss can be found at other periods, when base metal and silver coins circulated together. Nevertheless, the coins seem to point to the middle of the 8th century as a period of transition and we should therefore examine the archaeological and environmental evidence in this light.

The significance of this break has been discussed by Richard Hodges and David Whitehouse (1983, 98) and by Mark Brisbane, in so far as it affects the interpretation of Hamwic (1989, 103). The latter author sees no evidence for any decline or subsequent recovery. Keith Wade (1988), however, sees a change in the character of the settlement at Ipswich in this period, shown most graphically at the recent Buttermarket site, where a cemetery founded in the 7th century was replaced by a pottery kiln in the 9th century. The latest datable burial in the cemetery contained a coin of Offa (Blinkhorn 1989).

Nevertheless, the later mid-Saxon period, here defined by the introduction of broad-flan pennies, is apparently characterised in urban archaeology by the continued occupation of earlier towns. At Hamwic a late' phase was recognised in the ceramic sequence by Jane Timby (1988, 114). It is characterised by an increase in the frequency of pottery with mixed grits (Group IV) and by the presence of sherds with shell or flint tempering (Groups V and VI). These late types were associated with finds of Tating and Beauvais wares as well as 9th-century pennies. Generally, however, the imports (Group IX) have a similar distribution to the earlier coarsewares, which may indicate their main period of use.

At Hamwic there has been considerable debate over the interpretation of the later settlement. There appears to be two published positions, in both of which the town is abandoned by the late 9th century following a decline. The argument concerns both the nature and dating of this decline. On one side Richard Hodges (1982) and others have suggested that the pattern of coin loss should be taken at face value, which would imply some sort of decline in the later 8th century, a recovery in the early 9th century and then a continuous decline from that point on. The importance of the year AD840 for the history of Southampton has been emphasised, implying that the Viking attack on the settlement was a turning point in its fortunes. On the other, the finds of coins minted between *c* 840 and *c* 870 can be taken to show that occupation continued at least until the reign of Alfred in the 870s and Brisbane sees no evidence for a decline in the late 8th century, while admitting that there is a decline in the second or third quarter of the 9th century (Metcalf 1988; Brisbane 1989, 103). A similar decline from *c* 840 onwards is visible in the coin histograms from the Strand in London (Stott 1991, fig.4.1) whereas the York evidence appears to be different (Pirie 1986, 51–4). Firstly, there is a peak in the 9th century rather than a decline and secondly an appreciable number of these early to mid 9th-century coins have been found on the site later occupied by the Anglo-Scandinavian town. It would be begging the question to say that these were intra-mural finds since we do not yet know the precise chronology of the York defences.

Recently, Mark Blackburn and Michael Bonser (forthcoming) have produced data for 9th century coin losses south of the Humber which, allowing for the fact that coins continue to circulate for some time after minting, show that there is a general decline in coin losses over the whole country. The proportion found on the sites of *wics*, or which might have come from *wics* in cases where the findspot or archaeological context is uncertain, does not decline during the 9th century. What these figures show is that relative to the countryside there was no decline in trading in *wics* at all ! The big question, of course, is whether the decline in coin finds represents a decline in coin use and what these figures mean for the size of settlements such as Hamwic or London. All that can be said at present is that late' pottery at Hamwic is found over as wide an area as earlier pottery so that there is no evidence for a reduction in the settled area between the earlier and the late' periods. This does not prove, of course, that there was not a reduction in the extent of the settled area within Timby's (1988) late phase, still less that the intensity of settlement was as high throughout the late phase as it was earlier. The problems for the interpretation of archaeoeconomic or environmental data are that there is no possibility yet of dating strata closer than *circa* late 8th to late 9th century whilst there is a strong possibility that the economy was in quite a different condition at one end of this period compared with the other.

Early Late Saxon: late 9th to early 10th centuries

There then follows a period in which a number of places originally founded as forts, with or without the intention of supplying them with a permanent garrison, became towns. The chronology of these settlements is not yet precise enough to correlate their development closely with the rapidly changing political events of the reigns of Alfred and Edward the Elder. Here too we have to use numismatic evidence in lieu of adequate archaeological data. This period saw the establishment of the principle that a port or *burh* would also have a mint, or at least had the right to have one. By the late 10th century this had lead to the foundation and operation of scores of mints, some of which are known from single coin finds and others from literally thousands of coins. A detailed study of the coinage of Alfred by Mark Blackburn (forthcoming a) suggests that this principle may have already been followed during his reign, and might even have been instigated by Burgred of Mercia in the 860s or 870s. Unfortunately, Alfred's coins do not regularly bear the name of the mint, although the names of London, Gloucester and Exeter are recorded. Since the latter two mints are known from single coins only it is not possible to use this evidence to show the existence of a town at these sites. They may, for example, have been coins minted for religious purposes (since both sites had abbeys) or to commemorate specific events (such as the refurbishing of defences). Nevertheless, stylistic analysis does suggest that whereas minting was limited to three or four mints in the late 8th to mid 9th century this number may have doubled in the late 9th century (Blackburn forthcoming b).

One settlement which undoubtedly had a mint by this date was Winchester, which is also identified as the site of a Wessex mint for the early to mid 9th century by Blunt, Lyon and Stewart (1963). Whether this earlier mint was at Winchester or Southampton is perhaps debatable, as is the significance of the move to Winchester. There is no doubt that Winchester was becoming a major royal centre in the early 9th century and therefore minting might have been moved to a site where coins were needed for the redistribution of tax. The dating of the street pattern at Winchester to the reign of Alfred is based upon the fact that some elements of the street system were in existence before the establishment of the New Minster *c* 901-3. Furthermore it is reasonable to suppose, being the capital of Wessex, that its development would pre-date that of London in the late 880s (Biddle 1976, 273 fn.7). There is as yet no published evidence to show the extent of any settlement along these streets, nor a coin histogram to show the pattern of coin loss during the 9th and early 10th centuries. Nevertheless, it is to be expected that Winchester was amongst the most preferred settlements of the time, if only because of the royal and ecclesiastical patronage which it enjoyed.

Excavations in other towns in Wessex do not seem to have produced the relevant evidence, or, if they have, it cannot yet be dated with enough precision to say at what stage between *c* 850 and *c* 1050 they came to be towns. Towns in English Mercia are similarly disappointing. London and Oxford were mentioned in the *Anglo-Saxon Chronide* for 911 in a context which suggests that they were the centres of much larger regions than their subsequent counties of Oxfordshire and Middlesex. Both have produced evidence for the existence of extensive occupation within the late Saxon period, mainly in the form of finds of a shell-tempered pottery (London's LSS and Oxford's Fabric B). I know of no evidence to show that this ware was being made before c 920 and it is my suspicion that the technology and skills used to produce this pottery only became available in Mercia south of Watling Street after the reconquest of the Danelaw by Edward the Elder between 913 and 918. One possible way to disprove this hypothesis would be to find sherds of this ware stratified within or under the ramparts of Edward's *burhs* at Buckingham (914), Bedford (915), Maldon (916) or Towcester (917).

At Gloucester, the first post-Roman occupation of a site right in the city centre, at 1 Westgate Street, and dated roughly to the 9th century was hardly urban in character. The remains of a wattle-walled building with a rush matting floor had been buried under a deposit of what environmental evidence suggested was stable sweepings (Green 1979). This occupation pre-dated the common use of pottery in

Gloucester, although there was one sherd definitely from the deposit, found ironically enough, by an environmental archaeologist, Dr Mark Robinson, when collecting a column sample. Local conditions had allowed good preservation of organic material but where these conditions were not present the evidence for the whole occupation episode simply vanished, providing a shocking example of the limited value of negative evidence in archaeology. Later occupation on that site and others was more definitely of urban character, for example timber buildings fronting the streets, but could be as late as the mid 11th century.

One has to travel north of Watling Street, into the territory ceded to the Viking armies in the 870s, to find strong evidence for the existence of urban life at this date. In Lincoln, which is likely to have entered Viking hands soon after 874 when the Vikings unseated Burgred of Mercia at Repton, there is evidence for the continued existence of a religious centre at St Paul-in-the-Bail, in the centre of the Roman fortress. Four pennies of the *lunette* type, one definitely of Alfred, one of Æthelred of Wessex and the other two uncertain (Blackburn *et al* 1983, 10-11), were found at different locations on the excavation. While they may be remnants of a scattered hoard, this possibility was both considered and rejected by Blackburn, Colyer and Dolley. The St Paul-in-the-Bail excavation has also produced a facetted-headed copper-alloy pin and a silver strap end with nielloed decoration in the Trewhiddle style, which suggest pre-Viking activity, while a silver gilt buckle and strap slider is closely paralleled in a late 9th or early 10th century Viking grave at Balladoole, Isle of Man (Wilson 1966, 367).

Immediately to the south of the Bail, on the hillside between the Bail and the Witham, was the Lower Colonia, surrounded by its Roman defences. Despite the presence of a scatter of early and mid-Saxon pottery within the walls there is no indication of settlement, nor need any of the fourteen or so medieval churches located in the lower city have been founded before the Viking period. If there was a mid-Saxon emporium at Lincoln it must have been outside the walls, probably to the east or west of the walled town rather than to the south, at the suggestively-named Wigford, where excavations have produced no archaeological evidence for human activity in the mid-Saxon period. However, of the 22 excavations carried out in the Lower Colonia since 1972 half have produced definite evidence for late 9th or early 10th century occupation (in the form of residual potsherds) although only three have produced stratified occupation sequences: Flaxengate 1972–6; Hungate 1983-5 and Silver Street 1973 Area F (Perring 1981; Camidge 1985; 1986; Reynolds 1979). Of these, Flaxengate is the only site to have been excavated on a sufficient scale to produce what may be a complete sequence. There, the site seems to have lain derelict during the 5th to 9th centuries. A loam dump, originally laid down in the late 4th century, seems to have formed the ground surface but there is no evidence for agriculture or other human activity Dating evidence for this sequence comes from a St Edmund Memorial penny, minted *c* 905, found in the fill of a pit sealed by the levelling dump for the second phase of timber buildings fronting onto Flaxengate. The site produced five other late 9th or lOth–century coins, all apparently in residual contexts but demonstrating considerable activity on the site, or nearby, from *c* 890 onwards. Exactly how the early part of the Flaxengate sequence should be dated or interpreted is uncertain. There is wheelthrown, shelly pottery of Anglo-Scandinavian type from levels pre-dating the first buildings. There must have been occupation nearby in the late 9th century, even though the site itself was unoccupied. It is difficult to escape the conclusion that Anglo-Scandinavian occupation in the Flaxengate area must stretch back into the late 9th century, even if Flaxengate itself and the buildings fronting onto it are of very early 10th century date. A further conclusion follows from the first; that the pottery industry in Lincoln must have begun at a very early stage in the town's reoccupation (Adams Gilmour 1988; Miles *et al* 1989).

At York there is now evidence from Fishergate for an extra-mural settlement just south of the junction of the Ouse and the Fosse starting, apparently, in the 7th century and continuing, after an 8th-century interruption, to the mid 9th century (Kemp 1987). Upstream of the Ouse/Fosse confluence there is evidence for settlement at Coppergate in the mid 9th century, following a period of abandonment lasting from the end of the Roman period (Coppergate Period III). There was also activity at this date over much of the area of the later medieval city, as revealed by a scatter of residual coins, pottery and other finds and by coin hoards and Anglian sculpture. The precise interpretation of this data is difficult. Some of the finds, although culturally 'Anglian' or 'Anglo-Saxon' are likely to have been approximately contemporary with the Viking capture of York in 866 (Smyth 1978, 9) and it is perhaps not possible to say whether the abandonment of the Fishergate site and occupation of the old Roman city took place before or after the Viking takeover (or indeed whether the two events are related as closely as I have suggested). Precisely a decade later, the Viking, Halfdan, having taken over the kingdom of Northumbria from the puppet sub-king Ricsige, settled his followers in the Vale of York. It was not until *c* 895 that there was a mint operating at York and it is apparently at about that time that the Coppergate site underwent a total reorganisation, involving the realignment of property boundaries along lines which survived throughout the medieval period.

Perhaps two decades before this a coinage was circulating in the East Midlands and East Anglia, initially using Alfred's London monogram pennies as models but from *c* 895 using a distinctive design incorporating the name of St Edmund, last Anglo-Saxon king of East Anglia (Blackbum forthcoming a). Mark Blackbum has established that from the beginning these coins were struck on a lighter module than the contemporary West Saxon issues upon which they were based. These Viking imitations were not, as Dolley thought, intended as forgeries of Alfred's coins but were meant to circulate in their own right and in a distinct territory, the Danelaw. The evidence from archaeology at Lincoln and from numismatics throughout the Danelaw south of the Humber shows that at least one large town existed there before the reconquest by Edward and Æthelflaeda and that from *c* 880 onwards there was a widely circulated coinage as well. Furthermore, numismatists have suggested that the only mint operating in the Kingdom of York during the reign of Sitric I, who controlled parts of the southem Danelaw until *c* 927, was located south of the Humber (Stewart 1982).

Mid Late Saxon: mid-10th to mid-11th centuries

From the time of Edward the Elder onwards many of the *burhs* of Wessex and English Mercia appear to have acquired permanent inhabitants, if they did not have them before. Crafts such as shoe-making and cobbling, pottery-making, glass-working, copper-alloy and precious metal working and iron-smithing took place in these towns. The evidence for any one site is too slim to demonstrate whether or not there was any specialisation in particular streets or quarters, as documentary evidence tells us was the case in late 10th century Winchester. Excavations in Gloucester suggest that occupation was limited to the four cardinal street frontages and that there were large areas within the walls which were unoccupied, and perhaps even under the plough (Berkeley Street, H Hurst pers comm). Thus, although the Norman castle in Gloucester displaced earlier buildings, these buildings were quite probably themselves a recent development (Hurst 1984; Darvill 1988). On a much larger scale, excavations in the City of London tell the same story. There are parts of the walled area of the City which were unoccupied in the late 10th and early 11th centuries but developed immediately afterwards, perhaps immediately before the Norman Conquest (Vince 1990, 44-5). Even so, the occupied area of 10th and early 11th century London was extensive.

A study of pottery distribution in the 10th and early 11th centuries shows that there was a large amount of traffic between *burhs* and from *burhs* into the countryside. It also confirms that pottery-making was at this time mainly an urban activity north of the Thames. In the south the earlier traditions of rural manufacture without the use of the wheel seem to have survived. The distribution of glazed wares such as Stamford ware and Winchester-type ware is even more extensive than that of the contemporary cooking wares and it is interesting to note that there is no apparent boundary to the distribution of Stamford ware along Watling Street, which until the early 10th century may well have been a barrier to trade as well as a political frontier.

Excavations in London show that imported pottery was rare until early in the 11th century, indeed the number of stratified imported sherds dating before *c* 1000 can be counted on one hand. I have taken this absence of imports, together with the way in which settlement seemed to me to spread out from Cornhill to East Cheap and then down the hill to Billingsgate and New Fresh Wharf, to suggest that initially the refounded, walled city of London was not reliant on international trade for its existence. With this in mind it might just be significant that the earliest public wharf in the City was at Queenhithe, upstream of London Bridge, and there is no reason why the boats which were intended to land there in Alfred's reign were not coming down the Thames from Oxford (Dyson 1985, 19–20; Vince 1990, 21-2). I would suggest as a hypothesis that the inland towns of southern England mainly came into existence as forts in the 9th century, developed local marketing roles in the 10th and early 11th centuries and only later became part of the network for distributing goods to the coast in one direction and circulating imports inland in the other.

Saxo-Norman: mid–11th century to post-Conquest period

As a post-script we must briefly look at the state of English towns in the later 11th century. The City of London's first artificial waterfront can be dated by dendrochronology to the late 10th century and the continuous embankment seems to have been constructed *c* 1040. Finds associated with this waterfront and from contemporary deposits inland provide evidence for cross-channel trade with the Rhineland and the Meuse valley but much less with northern France. These include Norwegian Ragstone hones, Mayen Lava quems as well as pottery. By contrast, the earliest pottery from medieval Southampton shows a strong trading connection with northern France, as one might expect, and this is confirmed by the finding of a hoard of Norman coins of *c* 1030 (Dolley 1975, 326-8). Large fish-hooks from Billingsgate and the evidence from fish bones show that deep sea fishing was practised at this time, but not before. All in all there is plentiful evidence for a complex economy involving the movement of low-cost goods over considerable distances by ship and their redistribution through a network of inland towns and markets.

Chronological summary

To recap, the late Roman urban economy seems to have collapsed quickly in the early 5th century, although much more basic data is required to study this phenomenon. Roman towns ceased to function as urban centres in the 5th and 6th centuries, even though some may have remained inhabited and served as political and religious centres (Esmonde-Cleary 1989). Between the late 6th and the early 8th centuries, towns were founded, or grew up, at a number of locations on the south and east coasts of England. This urbanisation started first in Kent, perhaps in the late 6th century, and by the early 7th century there were similar settlements at London and Ipswich, and, quite probably, at York as well. In the early 8th century the town at Hamwic was founded, and by this date there seems little doubt that the development of town infrastructure was guided by some central authority

This smooth process of urban development, spreading from the south-east, may have been halted in the third quarter of the 8th century, but the only clear evidence for some sort of setback comes from numismatics. However, the fact that there are changes in the nature of the settlement at Ipswich, changes in pottery supply at Southampton and similar changes in the pottery found at London (Blackmore forthcoming) suggest that this numismatic change may have been accompanied by other changes.

In the late 9th and early 10th centuries the focus of economic activity seems to have shified north, as a reflection of Viking activity in the North Sea and further east, but even at this time the presence of permanently garrisoned towns in Wessex and English Mercia must have placed demands on the surrounding countryside for the supply of foodstuffs. For a century from the mid 10th century onwards, there is evidence for towns on both sides of the Danelaw producing trinkets, pottery and other consumer goods, presumably as a by-product of the trade in agricultural produce. However, it is only at the end of our period, in the mid 11th century, that there is evidence from archaeology for the resumption on a large scale of international trade.

Saxon towns and environmental archaeology

Archaeology and numismatics can, therefore, produce a coherent outline of the development of Anglo-Saxon towns. This outline, however, requires much fleshing out and critical analysis before it can be accepted as fact. How, then, can environmental archaeology help to confirm or refute our models?

Firstly, the most obvious feature of the location of pre-Viking towns is that they were on rivers and, apparently, were ‘green field’ developments. Their abandonment or decline during the 9th century or later is often said to be due to the changes in river silting, and there were undoubtedly changes in the hydrology of all southern English river systems during the late and post-Roman periods. Environmental archaeologists are needed to test whether environmental change might be a factor in the shift in location of towns such as Southampton, London, York and Fordwich, as they seem to have been in the replacement of Lympne by Hythe. We would want to know, however, why it is that towns such as Ipswich and Sandwich survived on the same site.

Secondly, we can look at the development of specifically urban environments and diets by comparing data from town and country. The work of the EAU at Deer Park Farms (Kenward & Allison this volume) suggests that we need to know more about what we take to be typical urban and rural environments before definitive comparisons can be made. Nevertheless, there are aspects of urban conditions which seem to be worth exploring. These include:

i) Specifically urban flora and fauna

At what point did the concentration of refuse within a town give rise to communities of plants and animals dependent upon human waste? Birds of prey, for example, seem to be common finds in medieval urban deposits. What about the house mouse or the black rat? At a microscopic scale, there is evidence from York and London that intestinal parasites were endemic in the 10th and 11th centuries. Was this true in rural settlements as well, and was it true of all towns at this date or just of the largest ones?

ii) The reliance of towns on a rural hinterland

Archaeobotanists can determine whether or not grain has been threshed on a site by the presence or absence of carbonised chaff and rachis fragments. In a considerable programme of analysis on 9th to 11th century carbonised material from the City of London (J Rackham, this volume) there was no evidence at all for threshing. Is this pattern found at other towns and can we confirm how common chaff is on rural settlements? Later on, in London, the finds of quern stones decline rapidly This must mark the replacement of hand-grinding of corn by the use of mills. Quems, of course, continued to be used into the later medieval period but for specialised grinding rather than for corn. If mills had a monopoly of flour production, one might have expected to find that carbonised grain itself would become a rare site find but this is evidently not the case. Grain was obviously still present in towns, perhaps as animal fodder, fuel, seed corn or in transit.

Fruit was obviously freely available in some 10th and 11th century towns. A pit dug on the berm between the town wall and the city ditch at Gloucester and probably filled in the 9th or 10th century contained blackberry/raspberry, sloe, hawthorn, rose and plum but mainly large quantities of apples. These finds suggested to Frank Green that, although there was a contribution from human cess, some sort of apple processing was being carried out nearby (Green 1983,246). It may be significant that a sandstone crushing or grinding wheel, with an eccentrically-placed square socket was recovered from the same feature (Bryant 1983, 221 fig 125 No 7). Whilst 9th/10th century Gloucester may have been sufficiently sparsely occupied to allow orchards and gardens to be present within the boundaries of the town it is likely that larger towns, such as London or Lincoln, would have been ringed by market gardens. Chris Dyer has suggested that there is a concentration of *cottars* recorded in the Domesday Book in estates bordering towns and that these people could have been involved in provisioning the town through market gardening or orcharding. Since there are few if any relevant documents for our period we can only hope that environmental archaeologists can provide evidence for this sort of land-use. At Stoclhart Place, outside the walls of the City of London, off Bishopsgate, there was evidence for activity that has been interpreted as orcharding later than the use of the site as a late Roman cemetery and earlier than its occupation as suburban tenements in the late 11th or 12th century (Christopher Sparey Green pers comm).

Archaeozoologists can tell us whether sheep, cattle and pigs were reared in towns by the presence of neo-natal bones and by the pattern of exploitation revealed in the age at death data. Studies of the bones from Ipswich, the Strand sites in London, Hamwic, and Fishergate in York have shown that mid-Saxon *wic* sites were characterised by the absence of neo-natal bones, even in sieved deposits, showing that herds and flocks were not kept in the settlement. However, we should remember that the *wic* at Dorestad has been found to have had a commercial zone parallel to the waterfront but a series of less densely occupied compounds behind this zone which have been interpreted as associated farms (Verwers 1988, 53). It is just possible that sites such as the Treasury in Downing Street and the National Gallery basement whose bone assemblages have been analysed by the Greater London Environmental Archaeology Section (GLEAS) (J Rackham, this volume) performed a similar function.

Since cattle, sheep and pigs were not being reared to any extent in Hamwic or the Strand this is clear evidence that they must have been driven in from the surrounding countryside. Terry O'Connor has made calculations of the size of region needed to supply 11th century Lincoln's estimated meat-eating population of *c* 4000 people with meat, while keeping a breeding stock (O'Connor, 1983, 328). He calculated an annual slaughter of 500 cattle, 700 sheep and 400 pigs. For sheep, which only supplied 7% of Lincoln's meat, a flock of 5000 head would have been needed. The area needed to graze these sheep would have been extensive (between 2000 and 4000 hectares). Furthermore, for simplicity O'Connor left out of his calculations the requirements of the rural population itself, so that the existence of a hungry urban population of comparable size at Hamwic, London or York in the 7th, 8th or 9th centuries would have undoubtedly provided a stimulus to sheep-farming (and indeed many other types of agriculture) in a wide zone around the town. Keith Wade (1988) has made calculations of the carrying capacity of the land within the Liberty of Ipswich, which represents the Anglo-Saxon borough boundaries. This land, *c* 12,000 acres (*c* 4800 ha) would have supported a population of 2000 using low technology agricultural methods (Wade 1988, 97) and was available within a circle 4km in diameter surrounding the town. This need for provisioning would affect the 'town' population even if they were not actually engaged in urban tasks. The garrisons which the *burghal hidage* tells us were required by the *burhs* of Alfred's and Edward the Elder's times would have needed to be fed. The *Burghal Hidage* lists the number of hides needed to support a *burh* and a formula which states that each hide was to supply one man. Winchester, with 2,400 hides and therefore a garrison of 2,400 men, would therefore have created a similar demand to 11th century Lincoln while a small west country *burh* like Lydford (140 hides) or Lyng (100 hides) would undoubtedly have had a much lesser effect. Interestingly, these small *burhs* would have had similar-sized populations to the smaller 11th century towns of Lincolnshire (such as Grantham and Louth) according to the Domesday survey.

To test the actual effect of provisioning on the countryside I put forward the following hypothesis:

First, we can suggest that the greatest difference between early Saxon and mid-Saxon agricultural strategies should be noted in the south and east of England, becoming less and less pronounced as one moves away from the coast (and therefore from the *wics).*

Second, we can suggest that the greatest difference between mid-Saxon and late Saxon/Anglo-Scandinavian agricultural strategies should be noted in the midlands and west of England; areas which should have been unaffected by the market provided by the mid Saxon *wics.*

While ideally one would like to know the relative importance of cattle, sheep and pig rearing to cereal cultivation, I would include many aspects of rural settlement as a reflection of agricultural strategy, For example, the development of water meadows noted in the Upper Thames valley some time in the 7th century or later, the nucleation or dispersal of settlement, and the colonisation of uplands and wetlands; both specialised environments.

Finally, we come to the crucial question of what exactly was the function of Anglo-Saxon towns, or, more importantly, into what sort of economic framework did they fit? I readily admit that towns in the 10th and 11th centuries were both more varied in their functions and had a wider variety of functions than those of the 6th to 9th centuries. In Kent, and perhaps in Essex, Hampshire and Suffolk too, one can see functions which later would probably have taken place within a single town – port, administrative centre and ecclesiastical centre – being carried out at separate but closely related settlements. In the 10th and 11th centuries such functions would have been able to take advantage of the same services, supplying amongst other things food and consumer goods.

There must be a strong suspicion that the sort of economy which supported the *wics* was extractive and powered by the need for the rural population to produce an agricultural surplus and supply raw materials in order to pay tax and/or rents. Towns in this sort of economy exist mainly to export goods which are collected through a series of intermediate centres, fairs, markets, administrative centres and religious houses, linked by river and road to the town. The Bishop of Worcester, whose estates would have been situated mainly (or even wholly) within the territory of the Hwicce, in the Severn Valley, was given remission on toll on a ship using the port of London (Sawyer 1968, No 96). While this is not itself proof that Hwiccian goods were being exported through London, or that goods imported to London were ending up in western Mercia, it does strongly suggest that this might be the case.

What goods might these have been and is there any way in which environmental archaeology can throw any light upon the problem? Firstly, let us deal with the proposition that the *wics* were concerned solely with the international trade in luxury goods. By the late 12th century it was certainly a poetic truth to see ports such as London as being full of exotica; furs and spices from the Orient. There was almost certainly an element of reality within this image, echoed by the way in which noble families in the late middle ages preferred to use the major ports rather than their local county towns because of the increased range of goods on offer and because of the possibility they then had of striking a good bargain by buying in bulk at the quayside (Dyer 1989, 310). Such luxuries may have included dried fruit, such as figs and grapes, and furs, such as that of the pine martin, whose pelts Terry O'Connor has shown were being processed at Fishergate (O'Connor 1991; this volume). It is, however, not possible to imagine a port extending over 45ha, as did that at Hamwic, with a population which must be estimated in the 1000's, whose main *raison d'etre* was the importation of luxuries. At the other extreme, it is clear that if Hamwic and other *wics* did have a function in the local redistribution of agricultural goods then it was not their main purpose, since so far as we know no urban settlements existed before the late 9th century to serve those parts of England without easy access to the coast.

We are left, then, with the function of 'international port' but without any clear idea of the range of goods coming in or going out of the town. Brisbane has suggested that Hamwic may have been exporting mainly cloth and, perhaps, leather (1989, 106). Cloth manufacture and/or export has also been put forward as a function for the *wic* at London (Vince 1984, 310; Blackmore 1986, 216). One would predict, on that basis, that within the hinterlands of Hamwic and London there would be evidence for an increased concentration on sheep-farming for wool between the early and mid Saxon periods. This should manifest itself in both an increase in the frequency of sheep bones in archaeological assemblages and in an increase in the average age at death. The evidence for large-scale leather-working at Hamwic appears to come solely from the importance of cattle within the animal bone assemblages. This is a function of the absence of waterlogged deposits in which leather waste might be preserved. Cattle had an advantage for early traders in that they could be moved over large distances on the hoof; there are records of the payment of tribute in cattle in the 7th and 8th centuries which confirm that such long-distance movement was possible, although Charles-Edwards (1989) suggests that in some cases the cattle would have been sold at a local market and the tribute paid in coin. It is tempting to seize on the production of combs and other goods as evidence for the use of by-products from a leather trade, but most combs seem to be made from deer antler, suggesting that comb manufacture was an economically unimportant craft which just happens to be easily recognised archaeologically (Riddler forthcoming). Other candidates for the staple goods passing through *wics* include slaves and metals (as at Romsey, Green, this volume). Querns and hones, demonstrable imports, were probably of little economic importance, despite the correspondence regarding querns between Offa and Charlemagne (Whitelock 1968, No.197, 781-2). I would see few 10th and early 11th century towns as having a similar size and function to the *wics* although on the other hand they were a lot more numerous. By the late 10th century the whole country was divided into administrative shires and each shire was provided with at least one *burh*. Places like London may well have had cross-channel contacts in the 10th century but there is an absence of the sort of confirmatory evidence which is abundant on the mid-Saxon Strand sites. There is little imported pottery (a feature also of late 9th and 10th century Lincoln, *contra* Adams Gilmour 1988) although there is a similar quantity of evidence for crafts or industries. In London, however, even these are rare before *c* 1000 but in this instance it seems that London was out of step with the rest of the country. Certainly, the occurrence of streets in 10th-century Winchester which took their names from specialist crafts, such as tanners, shield-makers and butchers, is telling (Biddle 1976, 427-41). Archaeological evidence of a similar date comes from Coppergate in York. In other words, there is a contrast between pre-Viking towns whose main purpose was international trade and the earliest post-Viking towns, which seem to have developed as towns first to serve a rural hinterland. Long distance, international trade is hardly in evidence at this period, even on or close to sites which were demonstrably international ports both before and after this date.

There is, furthermore, a tremendous difference in the size of the occupied areas of archaeologically investigated 10th to 11th century towns. Gloucester seems to have been occupied only along its cardinal streets while London probably had buildings along perhaps half of its medieval street frontages. Lincoln too has produced evidence that it had a large built-up area in the 10th century but, like London, it grew even bigger in the 11th and 12th centuries both within and without its walls. In a recent review of the archaeological evidence for the Five Boroughs, Richard Hall (1989) has shown the tiny size of the likely pre-conquest settlements, a conclusion which agrees with the populations calculated as a result of their Domesday assessments. With the exception of Hereford, which suffered a devastating Welsh raid in 1055, all the towns whose 10th and 11th century development is known to me grew from a 10th to 11th century core to fill in behind the main street frontages and along the approach roads in the later 11th and 12th centuries. Another sign of this very late Saxon or early Norman growth in inland trade is the development of the small town. Small undefended towns seem to have been a creation of the middle of the 11th century, for example Newbury in Berkshire or Uxbridge in Middlesex (both of which were probably Norman foundations). The position of these small, undefended towns at important river crossings, at regional administrative centres or midway between larger towns suggests that these places came into existence as a result of geographical and economic pressures rather than to support a garrison, as appears to have been the case initially with the *burhs* and with Anglo-Norman towns on the Welsh border. The timing of their growth was such that I suspect Domesday Book provides us with a snapshot taken just at the moment when they were first growing. Some had already achieved legal borough status whilst others were still officially *vills.* Jeremy Haslam has recently suggested that small towns like these first emerged in the mid-Saxon period, giving as examples places such as Calne, Chippenham and Wilton in Wiltshire (Haslam 1984, 136-40 and fig 57). So far, however, archaeology has failed to confirm that such places actually supported a large population in the 7th to 9th centuries, even though many were obviously important as administrative or ecclesiastical centres. We may here be beyond the scope of environmental archaeology and looking at a fundamental social distinction between pre- and post-Viking society. Did 7th to 9th century Anglo-Saxons have inland towns and, if not, then why not?

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11 The animal provisioning of Saxon Southampton *Jennifer Bourdillon*

Abstract

The animal bone results from excavations in Hamwit are reviewed within a framework that considers the settlement's impact on the surrounding countryside and the character of its supply A low diversity of food resource and the age structure of the domestic animal samples are used to suggest a non-agricultural population, being supported by food whose supply is controlled. Some changes are recognised through the 150 year life of the settlement but no evidence to indicate a decline, although the general size of cattle appears to diminish.

The background

The discussion in this paper stems from the large deposits of animal bones from the middle Saxon settlement of Hamwic, which lies within the boundaries of modern Southampton. Hamwic was established about the year AD700 on the west bank of the River Itchen, across the water and a little way downstream from the former Roman settlement at Clausentum. It covered a large area – well over 40ha have been found by excavation so far – with properties aligned in quite intensive settlement within a grid of streets. Excavations have found a stretch of boundary ditch at or near the north-west corner, and perhaps from a shallow stretch in the south. In the north the ditch was deeper but there it was filled in quickly and it would seem to have been dug for demarcation rather than defence. Harnwic indeed fits the pattern of the many open and undefended settlements of that time in the trading network of north-west Europe, those emporia and craft centres which kept their trading contacts to the Viking Age.

These settlements were one wave ahead of the 10th century growth of towns in this country, but Hamwic and its like were important whether or not one takes them as urban. Environmentalists do not depend on the categories of social, political, military, legal or economic historians, all of whom have tried to define or describe what is meant by a town. One may simply start with what may not be called into question, that Hamwic was a large and concentrated settlement and that its people disposed of great quantities of bones. From town or not-town, the bones can tell about the land which reared the animals, and about the settlement itself; they may even allow some inferences on the links between the two

The settlement at Hamwic spanned some 150 years. The end may have come quite abruptly, or there may have been a more gradual decline: the evidence of the animal bone may be relevant here but there is still discussion continuing with the archaeologists. Fresh settlement on the Southampton peninsula came further to the south, and the place which had been Hamwic went back, in the main, to fields. The importance for archaeology is that the area was spared the disturbance of cumulative development until the railway age reached Southampton in the 19th century and the town expanded quickly; even then, the new houses were mostly humble workers' cottages and their foundations were not deep. These cottages have been ripe for post-war redevelopment. The large and largely pristine deposits of the former middle Saxon town were seen as important on a national scale.

The archaeology

Bones have been found well preserved and in abundance from a series of rescue sites. A few bones came from the wealth of postholes, but mostly they came from large deep pits dug deeply into the natural brickearth (redeposited loess), often down to the underlying gravels. On many of the first sites that were excavated some cutting of features gave rudimentary phasing, but this was only at the level of the site, which was often small. One was left with a wealth of bone assemblages, all securely sealed, but all similarly derived and with no clear differences in time. Later, adjacent sites were examined to trace a spread of surface archaeology: the most exciting for the bone studies has been the group of sites at Six Dials where the wider area and a wider range of context types gave variety, stratigraphy and phasing.

Early excavations were worked almost entirely by normal trench recovery. In 1972 one large pit – and as it proved a very rich one – was sieved experimentally (SOU5, F16). More recently there has been routine sampling of virtually all contexts for disaggregation and fine sieving, and there have been other recovery checks.

Review of past work

Though sites were dug *ad* hoc as rescue opportunities arose, their publication has been more ordered. First Addyman and Hill (1968 and 1969) reported on their Clifford Street site (now known as SOU 32). They reported very promptly The processess of the bone working industry were dealt with in detail, but the animal bones as such were left for later study

Some years later five sites, close together at Melbourne Street and fairly central in Hamwic, were the subject of a major report (Holdsworth 1980). Buckland, Holdsworth and Monk (1976) had made an early start in using environmental material to examine site formation, here in one particular pit on site 11, but their study dealt only with insects and with plant remains. It was in the Melbourne Street report that the animal bones were first seriously discussed (as were the plant remains by Michael Monk, and the marine molluscs in a pioneering study by Jessica Winder).

The animal bone report for the five Melbourne Street sites (Bourdillon & Coy 1980) dealt with some 75,000 fragments. At the time of the study there were few contemporary comparisons from this country. A picture of solid animal achievement for the middle Saxon period was established, and this caused some surprise.

Contact with wild species, either of mammals or of birds, seemed to have been very restricted at Hamwic – save for the antler used in bone-working, but there were abundant bone remains from the basic domestic species. Mostly these were of cattle and sheep, with less pig, with fowl and goose as minor but quite regular additions to the diet, and with a small amount of goat (mainly horn cores) and with a few unbutchered bones of horse. Not only were the domestic animals there in plenty: in the main these had been healthy animals, sturdy and quite large, and many had been mature. It was suggested in the report that the cattle were often used for traction and that many of the sheep were kept for wool. Only pigs had been killed at a good age for eating, and exploitation even for them was not intensive. Butchery was a matter mainly of rough cuts and breaks; all parts of the body seemed well represented and no separation of prime butchers' waste could be found. Nor could differences be seen in the assemblages between the sites, though the small amount of occupation surface seemed to give rather more pig than did the pits (a contrast not found again in later Hamwic work).

The difference of greatest interest lay in the finds from the only sieved feature (SOU 5, F16). The relative representation of the main domestic mammals was barely affected by this recovery, nor was there more young material. However by Hamwic standards the pit gave a wealth of small wild material. It had eight species of wild bird, the same total as that found from all the rest of the five sites, and it had nearly all the fish. Save for its size and its recovery there had been nothing to set the feature apart: the excavator saw the area as basic and industrial, not different in kind from the other sites at Melbourne Street (Cottrell 1980). One wondered what richness of bone had been missed by not sieving other features. The general interpretations on the larger mammals were confident in the Melbourne Street report: solid, basic provisioning from sturdy domestic animals, mostly working cattle and sheep. On the smaller material, however, the verdict had to be more cautious.

Since that time there have been several published studies on the Hamwic material and more attempts at its interpretation. Coy (1981; 1982) compared the Hamwic results with those from the rural settlement of middle Saxon Ramsbury; Bourdillon (1980) contrasted them with those from Southampton's medieval town. There was a study of mandible pairing and likely bone loss (Bourdillon 1983). Driver (1984) examined Hamwic bone-working practices. Colley conducted a major excavation of one single pit at Six Dials in which more than 10,000 finds were individually recorded with three-dimensional co-ordinates; this served as a major recovery study, as a new consideration of the site formation processes, and (in conjunction with IBM at Winchester) as the basis for important work on computer graphics (Colley *et al* (1988). More generally Bourdillon (1988) used the Hamwic material to discuss the provisioning of the settlement and some possible links with the countryside.

Other works on the animal bones are not yet published. There have been various recovery studies; a detailed search for likely groupings among some of the pit assemblages; and work on contextual variability at Six Dials, leading to a better understanding of its phased material. Jennie Coy has looked more closely at the wild species, and Sarah Colley at the fish. Ian Riddler (forthcoming) has made a careful study of the bone-working, both objects and offcuts.

Such is the work, published and unpublished, on which this discussion is based.

Bones and the settlement

Condition

The bones gave some information about the state of the settlement. There were amphibians, both frogs and toads: near to the river the settlement may have been a little damp. There were a few small mammals, mostly from sieved recovery; but there were no rat bones, nor have signs of rat gnawing been seen anywhere in Hamwic. Indeed, Hamwic seems to have been quite a clean place, or at least quite a tidy one. Few bones from the Six Dials study (<1%) showed heavy chewing, and few showed serious erosion: house occupation, yard occupation, even street surfaces, all were strangely clean. Only one likely midden has been located, and this was quite a small one, with a spread of chewed bones on the surface at SOU 24 from Six Dials. Otherwise it would seem that waste material – if it was not taken right outside the settlement – went quickly into the pits before it had much chance to be chewed by dogs or to be scuffed and kicked around. This scarcely fits with unorganised human nature. It may perhaps be a hint that there was some control afoot.

Wastage similarities

The bones also show a broad uniformity of wastage in the different areas of Hamwic. The similarity in animal bones between the five sites was stressed in the Melbourne Street report, and other studies, other sites, have given largely similar results. A study was made on three Hamwic sites (SOU 7/11/18) to relate the animal bone assemblages very closely to the archaeology and so perhaps to trace some groupings in the final uses of the pits, but no such groups were found. Even with the contextual variation of Six Dials, differences in the bone assemblages lay mostly in the practical uses to which the bones had been put: some large heavy fragments had been thrown away in the ditch or had been used to build up a hollow under the surface of a street or for the likely metalling of a yardway. There were few signs of changes in the diet. Some form of communal disposal which masked any household differences was considered as an explanation for this uniformity, and the results of Colley's pit study could support the suggestion of the throwing in of waste from various directions. Even if some form of communal disposal helped to merge differences of wastage, of household say from household, there remains the overall sameness as between the areas and as between the sites. Again this seems a little strange, for many historical sources show middle Saxon society as one of status and of varying ranks.

Links with the wild

The common diet was basic. It was seen from trench recovery at Melbourne Street that little food had been drawn from the wild. The one sieved pit posed questions, but nothing like its richness has been found from later work. Even the fish bones are quite dull. Most are small eel vertebrae from likely cess, or the bones of flatfish. There is more herring than was thought at the time of the Melbourne Street report, and there is the occasional fragment of bone from one of the larger sea species, and the people of Hamwic had clearly varied their diet by some exploitation of the sea; but mostly it was the easy estuarine fish that they caught,

It was seen from Melbourne Street that postcranial deer bones were rare, and this was emphasised by Coy's comparisons with the far richer deer remains, and with remains from other wild species, from the more rural settlement of middle Saxon Ramsbury. Fragments of wild bird proved disappointing from later fine sieving at Hamwic. In a further recovery study the spoil from a whole site (SOU 15) was water sieved through garden sieves (*c* 6 mm mesh). Fragments of birds could now be seen as more abundant in relation to mammals, but there was very little change in the low ratio of wild bird fragments to those of domestic fowl and goose (1:30). Only one new species of bird was found from the study of this material, and others were missing from the list.

There was, then, a measure of separation between the people of the settlement and the wild countryside. This could have been from distance or from the lack of opportunity; or it could have sprung from some social restriction.

Links with husbandry

What may be more surprising is that there was also a distancing of the people of Hamwic from the common activities of animal husbandry. This is shown by the dearth of very young material in the bone assemblages – even of jaws, for both in the Melbourne Street report and in a later study the young unfused epiphyses had been shown to be scarcer still. The gathering corpus of later material showed very few really young jaws, those of foetal or neonatal animals or of casualties in the first few weeks of life, which would have given evidence of animal breeding nearby.

The garden-sieved material gave similar results for such very young mandibles and other checks were made. The rate of small porous bones in that study was quantified as a percentage of total recovery, species by species, and was compared with the results from Six Dials. For pig, such material was twice as frequent as in the Six Dials excavations, but it was still quite rare (1% as against 0.5%). For cattle and sheep such fragments were rarer still (both less than 0.5%).

The first question had to be whether or not the results were a fair reflection of the material deposited: were they biassed by differential preservation in the ground, or perhaps by fragile material breaking up in garden sieves? It was a reassurance to find a high rate of foetal/neonatal material for dog. Many puppy fragments had survived both the preservation conditions and the sieve, and since this was so there was no need to postulate any special fragility for bones of calves, lambs or piglets. Such material had indeed been rare in the rubbish deposition at Hamwic. Where the practice of animal husbandry was concerned, the settlement had been a place apart.

The countryside

Provisioning needs

With such a separation the animal provisioning of the settlement must have been a serious and deliberate undertaking. What was the rural hinterland called on to supply?

As large animals needing careful nurture over several years before they reach their prime, the cattle would have called for the bulk of the effort in rearing. The importance of cattle was established for Hamwic from Melbourne Street, some 52% of the food mammals by the fragment count, and 75% by weight. From trench recovery on other sites these figures still broadly stand. By fragment count from the garden-sieved recovery, identified bones of cattle were rather less well represented, but it was sheep and not pig that gained; by weight the correction against cattle was minimal. The judgement must be that cattle were preponderant at Hamwic, that sheep were very important, and that pigs were something of an extra. Domestic fowls and geese formed less than 2% of the meat supplies by fragment count, but they would have been useful extras too.

Of the main food animals, the pigs were mostly killed soon after reaching full size. This would be economical, and it would make for good eating. Some cattle and sheep, too, came in this full-sized and tender eating group; but many of them were mature animals with all their molars in full wear (53% of the cattle in the main phase at Hamwic, and 46% of the sheep). These animals had of course been eaten but they would have been quite tough. This indicates some lack of choice in the food sent in, and not a situation where the customer demands - and gets - the best. It would perhaps mark the diet of artisans, but not that of entrepreneurs.

Many animals, then, were eaten after a working life; but it may be too simple to suggest that Hamwic just passively took what the country no longer required. For food supplies it seems likely that the pressure for quality was not great. Yet Hamwic was a place of industry, and industry too needs its supplies: many of the older animals may have been reared to meet the settlement's needs. In the Melbourne Street report the ages and likely sexing of the sheep were taken to suggest the running of a wether flock and the importance of the wool trade. Signs of exostosis on the lower limbs of cattle gave evidence of hard work, no doubt at the plough but sometimes surely for traction in the settlement itself. There must have been a call for leather, and there was certainly the working of horn, This too would have been a form of provisioning. Hamwic seems not to have distorted the countryside by wasteful demands for animals raised just for food; but one should not forget that the settlement may well have exerted strong pressures on the countryside to meet its industrial needs.

Provisioning successes

The sizes of the animals show that the countryside did well to meet the needs of Hamwic. The good figures for the stature of the cattle which were given for Melbourne Street have been closely borne out in later work (a range of l0l-138cm for shoulder height, with most individuals quite near the mean of 115cm). Such sizes are good and they betoken some long continuity of stock. The generally small sizes of Iron Age cattle had given way in the Roman period to many larger animals so that the mean stature then was higher and the range much greater (Jewel1 1962, 163). A similar pattern was found all over Roman Europe but not in the lands outside it (eg Matolcsi 1970, 119; Teichert 1984). If then there had been a total dislocation of the farming stock on the Roman withdrawal from Britain the loss of larger animals could not have been made good by cattle brought directly from the continent by the new arrivals, since the lands from which the new arrivals came were those of smaller stock. The incomers might have chosen to build up new stock of larger size after their arrival in this country, but if this had not been done at home, with Roman practices setting an example just across the frontier, why should it have happened here when the Roman example had come to an end? It is far more likely that there had been a good continuity of stock in this country, and presumably some good continuity in the general standard of care. Size in cattle may not be all-important; but size would help with ploughing in the countryside or with traction in the settlement. It may be seen as a sign of success.

The sheep were of a good size too. Here the Melbourne Street report was more cautious, for at the time of the writing of that report shoulder heights of from 50-70cm had seemed quite small. It was the small sheep of medieval Southampton, a few under 50cm and nearly all of them under 60cm, which had emphasised the good middle Saxon sizes. Again these were higher than those of the later Iron Age and again it is likely that there was some measure of continuity from Roman times. This is not to say that the small medieval sheep were anything other than excellent, for they were kept for wool and their wool brought great wealth; but it is to suggest that the Saxon sheep retained some measure of continuity with the Roman flocks, and if this is so it would seem to discount any time of total dislocation in the intervening years.

The tapping of the good resources of the countryside must have taken planning and control. From the broad homogeneity one may suggest that the source of such control was not located in the settlement itself, and if historians and archaeologists see the control as most likely from the kings of Wessex, that would not be disputed from the bones. One would simply say that if the kings supported a large and well organised settlement they must have done so for some reason, Was this gift exchange? Perhaps and possible; but the dull substantial feeding and the scale of artisan activity would seem to suggest something more.

The animals were driven into Hamwic. It was established for Melbourne Street that all parts of the animals were fairly represented in the pits and that meat came in on the hoof. This contrast on the one hand with Haithabu, a slightly later foundation than Hamwic but one in the same northern European trading network, which seems to have been fed from special large farms some way outside the settlement (Hvass 1979), and where a separation of butchers' waste was evident from a lack of cattle head fragments within the town itself (Reichstein &

Tiessen 1974, 23). It contrasts, on the other hand, with Carolingian Dorestad, Hamwic's near contemporary settlement near the mouth of the Rhine, which was fringed by buildings resembling large farmsteads. Wietske Prummel (1983, 248-58) has calculated that these farmsteads could have made that settlement effectively self-sufficient for its food.

Had the animals at Hamwic come from far? One might suspect that the land at that time was not geared for the distant travel of flocks and herds, but one might be wrong. In fact if there was strong organisation from some power outside the settlement, the good well-ordered countryside may have stretched far afield. The historians talk of multiple estates, and Hamwic maybe was part of some royal complex of properties; or some of its provisioning might have come from taxes due to the king.

Settlement and country over time

In the Melbourne Street report the Hamwic bones had to be taken as an entity; but the phasing established for Six Dials gives results which may relate to changes in the character of the settlement, and perhaps to pressures which it put upon the countryside.

The three main changes over time lay in the relative representation of the main food species, in the ageing pattern for the cattle, and in the animals' size. There are hints that the settlement may have been slightly more rural at the start, or - perhaps more likely - less heavily populated and so better able to select meat from the tender age-groups: only 28% of the cattle had their molars in full wear. In the main phase there was a relative increase of cattle (up from 49% to 52% of the main food mammals on the fragment count) and if the settlement itself was more heavily populated this would imply a great increase in cattle absolutely. More of these cattle were now older (now 53% with molars in full wear). One wonders if the age difference was the result of far greater need for food and so far less choice; or if there was now more positive need for working animals so that these were kept alive for longer before they were killed at last and eaten. In this main phase the cattle sizes rose slightly; and there was more domestic poultry. It does not look as though any extra stress was too severe.

In the last phase at Six Dials there were still more cattle (58%), and still more of these were old (60%): it is as though these trends established in the main phase went steadily on towards the end. But the cattle sizes slightly fall. Such a fall may be perhaps a sign of stress, yet it does not seem to mark too great a strain upon the countryside. There were more horses in Hamwic in the last phase; there was more deer, seen both in the antler used in the highly skilled bone-working and also in the post-cranial fragments used for food. There was more skilled butchery too. This does not seem to be the picture of a place in terminal decline. A very tentative suggestion is that it would fit the picture of a place still provisioned with a royal surplus or with the product of royal taxes in an economy of peace, but that such things were soon to be used for other purposes, most likely for defence. It has to be stressed, though, that this suggestion is based only on the animal bone. The full interpretation must be based on all the classes of evidence, and the Southampton archaeologists are not sure.

It is possible that at that time the cattle sizes had started to get smaller over a wide area of the country as part of a general decline. They were still far from coming down to the small post-conquest measurements, but the trend may have set in already. The figures for the late phase at Hamwic compare well with Jennie Coy's (pers comm) small sample from contemporary Winchester. Comparisons are not yet available for the main middle Saxon phases at Winchester and one cannot plot any changes there over time, but it could be that one should take the falling off in the Hamwic sizes as an early intimation of a coming decline linked to something far wider than the simple interaction of Hamwic and its hinterland - perhaps to strain on the land from a general rise in population and not just from one large settlement; or to more concentration on the arable, with some marginalisation of the animals; or to the passing of a more favourable climate; or to the loss of earlier skills.

Much hangs on comparative data from elsewhere. We should be moving beyond the site and the region, to look at the country as a whole.

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12 Economy and environment in Saxon London *James Rackham*

Abstract

Recent environmental work on Saxon London is reviewed with a summary of the new results from the middle Saxon settlement on the Strand. Differences in the assemblages from peripheral or rural sites is contrasted with the consistency seen in the sites in the centre of Lundenwic. Results from later Saxon sites are discussed and the high status character of late Saxon assemblages from Westminster Abbey illustrated.

The independent identification, in 1984, of the middle Saxon settlement of Lundenwic centred on the Strand, by Martin Biddle and Alan Vince has lead to a rash of field work and reviews. The debate that started in the 30's between Wheeler and Myres on the location of this 'town' had fizzled out after 10 years of excavation in the City of London by the Department of Urban Archaeology had been almost completely unproductive of middle Saxon evidence, to the point where Hodges (1982) had suggested that middle Saxon occupation was largely a 'series of farms along the banks of the Thames.' This paper deals mainly with a review of the environmental evidence that has resulted from the fieldwork that started with the excavation, in 1985, of a middle Saxon site a Jubilee Hall and which is still going on almost monthly with excavations and evaluations by the Museum of London Archaeology Service at various sites.

Whilst much attention has focussed on the discoveries along the Strand, excavations by the Museum of London and Passmore Edwards Museum in recent years have recovered early and middle Saxon settlement evidence outside central London at sites in Harmondsworth, Battersea, Clapham, Enfield and Barking. The 15 years of excavation in the city of London itself while negative for middle Saxon evidence has produced much of late Saxon date.

The vegetational history for this period in the London region is poorly recorded. Few suitable deposits occur and even fewer are analysed. The only radiocarbon dated pollen diagram that covers the period under discussion is that from Lodge Road, Epping Forest by Baker *et al* (1978). Mixed deciduous woodland with lime as the dominant tree is the typical pre-Saxon forest cover. The evidence of Iron Age and Roman impact in the area is restricted, in the pollen diagram, to a reducing component of oak with increasing alder counts probably associated with local changes to the water-table, but no evidence of major clearance. The post-Roman period is reflected in quite dramatic changes in the pollen spectra. Lime pollen falls dramatically during the Saxon period with oak, hazel and willow increasing. The middle Saxon period sees a rise in birch pollen while pine disappears from the sequence. Herb pollen rises dramatically with grasses, Cyperacea and particularly fern spores showing peaks in the Saxon period. There is little evidence in this diagram of woodland regeneration in the post-Roman period (see also Murphy, this volume) although clearly the character of the forest is changing. The first major clearance indicated in the diagram has a radiocarbon date of AD600 (1350±100 BP, Birm690) for its commencement, and is still continuing at AD840 (1110±160 BP, Birm582) and suggests substantial clearance of lime in the late and middle Saxon period. These changes may reflect a decrease or change in woodland management and a largely pastoral rather than arable landscape at the time of the start of the clearances in the 7th century, but it would be unwise to extrapolate these results beyond the Epping region to London as a whole.

Unfortunately settlement distribution during this period has been largely obscured by the immense growth of London and the agricultural development of the region, and apart from charter and estate evidence the character of the Saxon landscape around London is unknown. In the Roman period the countryside is likely to have been fairly intensively cultivated. Some Roman sites have been found on the claylands in areas apparently covered by woodland in the Saxon or medieval period, belieing the pollen evidence from Epping and suggesting some forest regeneration. A view that the early and middle Saxons were working within a landscape largely laid out during the Roman period while plausible is still nevertheless conjectural (but see O Rackham, this volume).

Early Saxon

Excavations by the Department of Greater London Archaeology (DGLA) in West London have located a number of 6th or 7th century structures, or sunken-featured buildings, in Harmondsworth which have suggested dispersed settlement along the edge of the River Colne at this period (Mills pers comm). Other sites possibly of this period include Rectory Grove, in Clapham, and are often only represented by a single hut, pit, or merely a spread of early Saxon finds. Recent excavation has revealed a similar series of sunken-featured buildings at Hammersmith on the banks of the River Thames. These sites are largely on the brickearth and gravel terraces of the Thames basin. The environmental evidence from this period is literally a handful of bones, which are rarely preserved on the brickearth, and the waterlogged and carbonised remains of plants extracted from six contexts from the fills of the sunken-featured buildings and an enclosure ditch.

At both Holloway Lane and Holloway Close in West London the fills of these sunken-featured buildings yielded two types of wheat, bread or club wheat and a glume wheat, probably spelt, but poorly preserved (Davis, forthcoming). Barley and oats were present among the few cereal grains recovered. Only one sample was studied from each of these buildings and although the weed seeds and chaff considerably outnumbered the cereal grains in both, the weeds are small and the samples reminiscent of fine cleanings of the grain prior to use rather than an early stage in the processing of the crop. They are therefore little different from the middle Saxon samples from central London except for the presence of spelt. These are the only two Saxon sites so far studied in the London region to yield a glume wheat which is otherwise recorded only from Roman deposits in London. At Manor Farm, Harmondsworth (Davis forthcoming) in a similar hut and deposits in an enclosure ditch, bread or club wheat, barley and oats were identified, although since the features lay under a medieval farmyard some of these remains could be contaminants. The very little oats at all three sites may be wild or a crop contaminant. Although the samples are very poor the absence of definite rye grains from these sites in contrast to the mid and late Saxon sites is worth noting (see also Green, this volume).

While these sites are clearly small rural settlements the carbonised remains give little clue as to whether the cereals are being grown and processed on them. The small quantities of chaff and the weeds seeds which are as numerous or more so than the cereal remains are neither unequivocally processing debris nor clean cereals. Interestingly, the waterlogged remains from the hut and ditch deposits at Manor Farm include fig and grape pips as well as blackberry or raspberry, wild strawberry, elder and pear or apple. These suggest human faeces were deposited within the disused hut and the ditch. Although the samples from Manor Farm come from the Saxon features the organic survival in the upper fills has thrown doubt on these finds being contemporary, although in all respects other than frequency the plant remains are consistent throughout the deposits.

Animal bones have only been recovered from Manor Farm and this small sample produced **only** 306 fragments among which pig predominated with cattle and sheep present. No other species were identified.

The recent discovery of a group of similar sunken-featured buildings in Hammersmith offers a continuing opportunity to study these rural settlements, but large and preferably numerous samples are needed to establish the character of these early Saxon sites. Unfortunately their occurrence on the brickearth militates against finding animal remains, although unusually on the Hammersmith site bones have survived, but the cereal crops and other carbonised plants are likely to be present on all sites.

Middle Saxon

Within the middle Saxon period our picture is more extensive and based on much more reliable data. The sites assigned to this period essentially fall in the 8th and 9th centuries although both Barking Abbey and Lundenwic were founded earlier and may include 7th century material.

The sites include Barking Abbey founded in AD666, with excavated features some of which have been dated by dendrochronology to between the late 7th and the late 9th century (Tyers *et al* this volume; Tyers forthcoming) and a group of sites in the Strand area including York Buildings, National Gallery Extension, National Gallery Basement, Jubilee Hall, Maiden Lane and Peabody Buildings. The site of the Treasury excavated in 1961 produced a collection of animal bone analysed by Raymond Chaplin and dated to the 9th century, and a site at Althorpe Grove, Battersea has produced a small sample of animal bones studied by Alison Locker (1975). Apart from the Treasury site the dating of these middle Saxon settlements is problematic. Although individual sites produced phased sequences of occupation there is no intrinsic dating evidence for dividing up the two centuries represented. Individual sites can therefore be described as no more than middle Saxon and later phases will clearly contain reworked earlier material. This inability at present to clarify the dating of these deposits has removed the temporal division from a settlement which historically we can expect to have been undergoing major changes and expansion (see Vince this volume). We are therefore largely forced to treat these groups of data as one unit until refinement of the dating framework is possible. It has been suggested by Bob Cowie and Rob Whytehead (1989) that Jubilee Hall, with an inhumation dated by radiocarbon to AD 630-675, and the early phase of Peabody Buildings, where a high proportion of pottery was chaff tempered, may include late 7th century deposits, and clearly the site at York Buildings with a dendrochronological date for felling of AD 679 (Tyers forthcoming), indicates construction of a waterside structure in the later 7th century. Otherwise finds include 8th and 9th century material with no conclusive evidence for any continued occupation beyond the 9th century.

Environmental material was sampled with varying degrees of expertise on all these sites. The animal bones have been studied from all of them and plant remains from a number of samples from those on the Strand and Barking Abbey. Most of the material studied derived from pits and ditches, but floor, midden, hearth, dark earth and well deposits were studied. Little structural evidence survived on the sites although floors, hearths and evidence for buildings were found at Jubilee Hall, Peabody Buildings and Barking Abbey.

Vince (1988) has suggested that the function of settlements at this period is more important than their identification as urban or rural. It is probable that the emporia or markets described by Hodges (1982) may well be environmentally urban in character while not so economically. In principle both the environmental and economic character of a settlement may be determinable from the environmental evidence.

I have therefore made an attempt in this paper to consider the economic character of these sites as well as their environment.

The site at Barking is presumed to be part of the Abbey (MacGowan 1987) and the soil samples studied are derived from floors, hearths, wells and pits, which have yielded only charred remains dominated by cereals and associated crop weeds except in one pit. There is little to indicate the environmental character of the settlement from this evidence. In Lundenwic, however, the excavations have produced more evidence and the waterlogged and mineralised material surviving in some features at Maiden Lane and National Gallery Basement have produced plant assemblages typical of early medieval deposits in London and those found elsewhere on 'urban' sites (de Moulins in 1993; Davis 1993). This is not to say that they are indicative of urban conditions but in fact reflect the disturbed nature of the ground around human habitations which plants such as stinging nettle, elder, blackberries and goosefoots readily colonise. These species also commonly occur in the carbonised fraction with other ruderals more typical of grassland and cereal crops. The presence of these plants on all the sites with waterlogged material is testimony to occupation and disturbance and they occur equally abundantly in the waterlogged deposits of the hut and ditch at Manor Farm, in a clearly rural context. It is difficult to envisage which element of the flora could be described as typically urban and it is likely that exclusivity, ie an absence of all but species characteristic of disturbed and probably enriched ground, may be the only clear indication. In this respect insects are likely to be a better indicator than plants although as Kenward and Allison (this volume) have shown even these are less typical than had been assumed. Another element of the environmental data can perhaps help in this respect. Samples from over 108 contexts representing over 2 tons of soil were wet-sieved on a 2mm mesh from features and pits at Jubilee Hall and Maiden Lane. The subsequent analysis of the small terrestrial vertebrate bones sorted from the residues has identified only house mouse and frog in the samples. This lack of diversity and absence of the normally ubiquitous shrews, voles and field mice that one might expect in well vegetated or grassy environments suggests that even the ruderal plant species are offering little ground cover for any non-synanthropic small animal species. Taphonomic aspects may be a factor in this absence, but a simplistic conclusion is that human and domestic animal density is such that wild small mammal habitats are not available for some distance around the human and presumably animal habitations. A similar lack of diversity of the small terrestrial vertebrate remains can be seen in many of the phases at Coppergate in a demonstrably urban context (O'Connor 1989). A contrast to this is offered by the assemblage from the late medieval fills in the well at Greyfriars (Armitage & West 1987). There is therefore little from the plant and animal remains to separate the environmental 'character' of the sites along the Strand from those of later periods in London and other towns in Britain.

The economic component of the environmental data from these middle Saxon sites is intriguing because of its variety There were definite limitations in the sampling and processing of the soil samples and the collection of animal bone from some sites but the general view taken here is not invalidated by these. The variety found is not affected by the feature type since similar assemblages occur throughout the contexts.

Among the carbonised plant remains cereal grains were consistently the most abundant seeds (Fig 12.1). At Jubilee Hall free threshing wheat, either bread or club wheat, is the most common cereal grain and present in the most samples. At Maiden Lane in a much larger number of samples barley is the most frequent grain although wheat occurs in a greater number of samples. The smaller collection from Peabody Buildings also shows a dominance of barley both in terms of grains and presence in samples. Wheat and barley dominate at these three sites with little oats or rye present. Within the sites individual samples also vary with either wheat or barley in abundance, but one sample from Maiden Lane where 50% of the cereal grain is rye suggests the specific selection of this crop sometimes, although it is entirely absent from the Jubilee Hall samples. Apart from this sample there is little evidence for the oats and rye being anything other than a weed in the wheat and barley being used at these sites.

The National Gallery Basement site, also in the Strand area, but to the west of the apparent focus of the settlement, consists of only three large pits. These yielded a cereal assemblage of barley and wheat in broadly equal proportions with a slightly higher general level of rye but still low concentrations of oats. All four cereals occurred in a higher proportion of the samples from this site than any others of this date.

In contrast to these central London sites the samples from Barking Abbey produced the lowest proportion of wheat. Barley was the most abundant cereal generally, although all four species were dominant in individual samples suggesting that all were being grown as major crops and being individually utilised at this site, rather than as a maslin or dredge.

The interpretation of this data is not clear. Wheat and barley are generally the dominant cereals in the Strand sites but rye is clearly significant at National Gallery Basement and Barking Abbey. These latter two sites appear to exploit all four cereal types to some degree while the others are largely dependent upon wheat and barley This may reflect aspects of supply or use in the Strand settlement barley and wheat forming the major source of cereal supply and human food consumption. Oats and rye may have been grown as fodder crops on the 'rural' sites.

The absence of glume wheats from all these sites contrasts with the early Saxon samples and among the barley grains from Maiden Lane, a hulled two-row variety is probably present. This latter type is a post-Roman introduction into Britain and both these changes, accompanied by clear indications of the cultivation of oats and rye, suggest major changes in agricultural practice between the periods.

In other respects the charred remains are fairly uniform. Little chaff occurs on any of the sites (Fig 12.2), only a single sample from Maiden Lane yielding any significant proportion of chaff. Only three samples from Jubilee Hall and Maiden Lane included almost pure sorted grain of both wheat and barley. This has suggested that most of the cereal has been pre-processed although reasonably high proportions of weed seeds occurring in some samples suggests a semi-cleaned rather than pure crop. Leaving aside these four samples the results divide into two groups. One assemblage is rich in cereals with between 10--35% weeds suggesting the consumer end of the market and the probable supply of

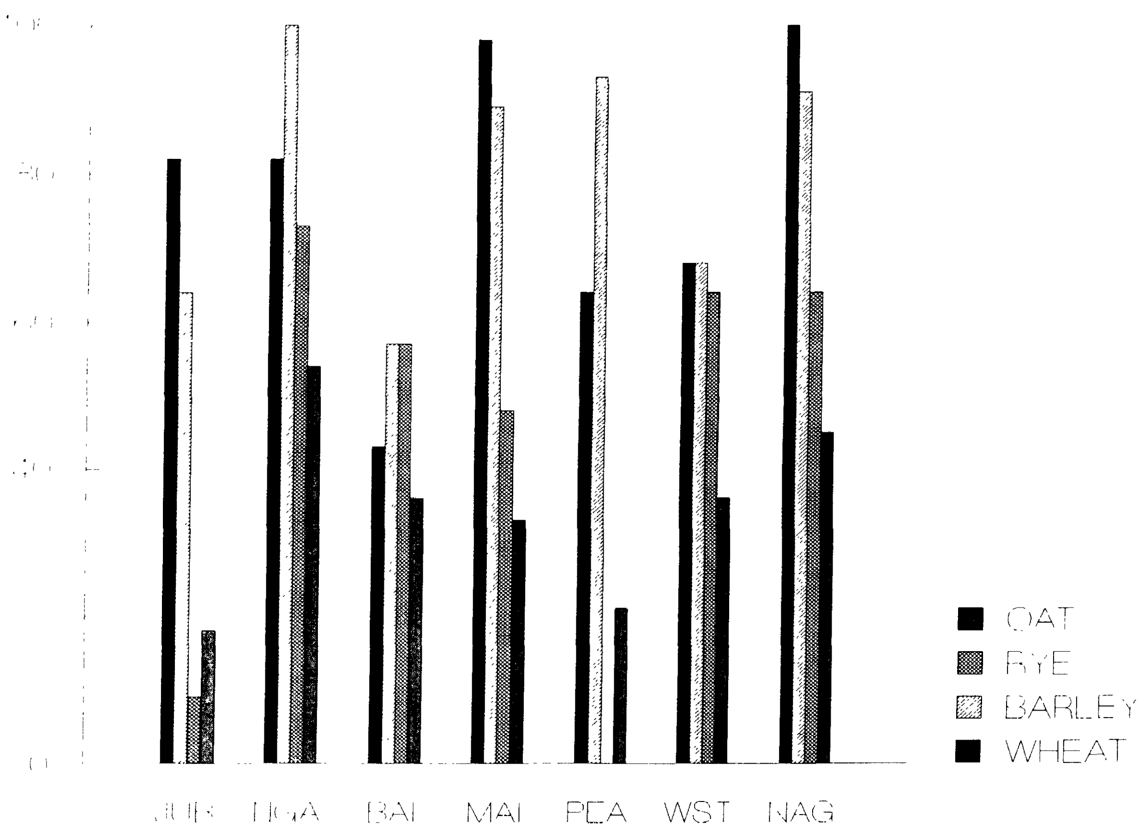

Figure 12.1 The percentage of the total number of samples from each site which produced each cereal type. JUB - Jubilee Hall; NGA - National Gallery Basement; BAT - Barking Abbey; MAI - Maiden Lane; PEA - Peabody Buildings; WST- Westminster Abbey; NAG - National Gallery Extension; (Number of samples are: JUB-11, NGA-11, BA1-14, MA1-27, PEA -14, WST-22, NAG-11)

corn to the settlement in only a semi-cleaned state. The second group shows a domination of weeds seeds. A concentration of samples from a pit on National Gallery Basement occurs in this group and they contained numerous small leguminous seeds, probably clover, and grass seeds, perhaps suggesting the presence of hay.

At Barking Abbey one of the samples high in oat grains included almost exclusively brome and other grasses among the weed seeds. This may indicate wild grasses and oats being grown together, possibly as a fodder crop.

Moving on from the cereals other plants of economic importance include among the carbonised remains flax, possible lentil, celtic bean and a possible pea. These are in very low numbers. Apple or pear, strawberry, blackberry or raspberry, plums or sloe, hazelnuts, figs and grapes occur in a waterlogged or mineralised condition. At first glance the fig, grape and lentil finds suggest importation but whether they reflect trade or status is problematic since both fig and grape have been found at the Strand sites and Harmondsworth wherever waterlogged preservation conditions have been present. Vines may have been grown at this period, vineyards are certainly recorded in the 11th century, but the importation of dried fruit into London at this time is a more exciting interpretation. Among these finds the pulses, fig and grape are the only definite cultivars and although reasonably frequent the other remains may reflect exploitation of wild fruits.

The variability in the cereal assemblages is mirrored by the domestic animal remains from the sites (West 1993 a; b; West & Rackham 1993; forthcoming). While quantification of animal bones has been a thorny topic for many years the two methods used here, fragment counts and weight, while not in complete agreement, both illustrate the variability. The Strand sites are suspiciously similar in species proportions (Fig 12.3), if not in age, sex and carcass distribution and they show a dominance of cattle in which the majority of animals were killed while subadult and perhaps 1 in 3 survived to maturity, living beyond about four years. There is little evidence for animals that died in their first year at either Jubilee Hall or Maiden Lane although at Peabody Buildings bones of one or two individuals of this age were recovered. Neonates (Table 12.1) were never more than 2% of the cattle bones. The National Gallery Basement site does not follow this pattern. Not only are the cattle considerably less frequent, losing their dominant position to sheep in the fragment ratio, but in a relatively small sample, 1st year animals were clearly slaughtered and probably less than 1 in 5 animals reached maturity. As much as 7.1% of the cattle bones at this site were from neonates or very

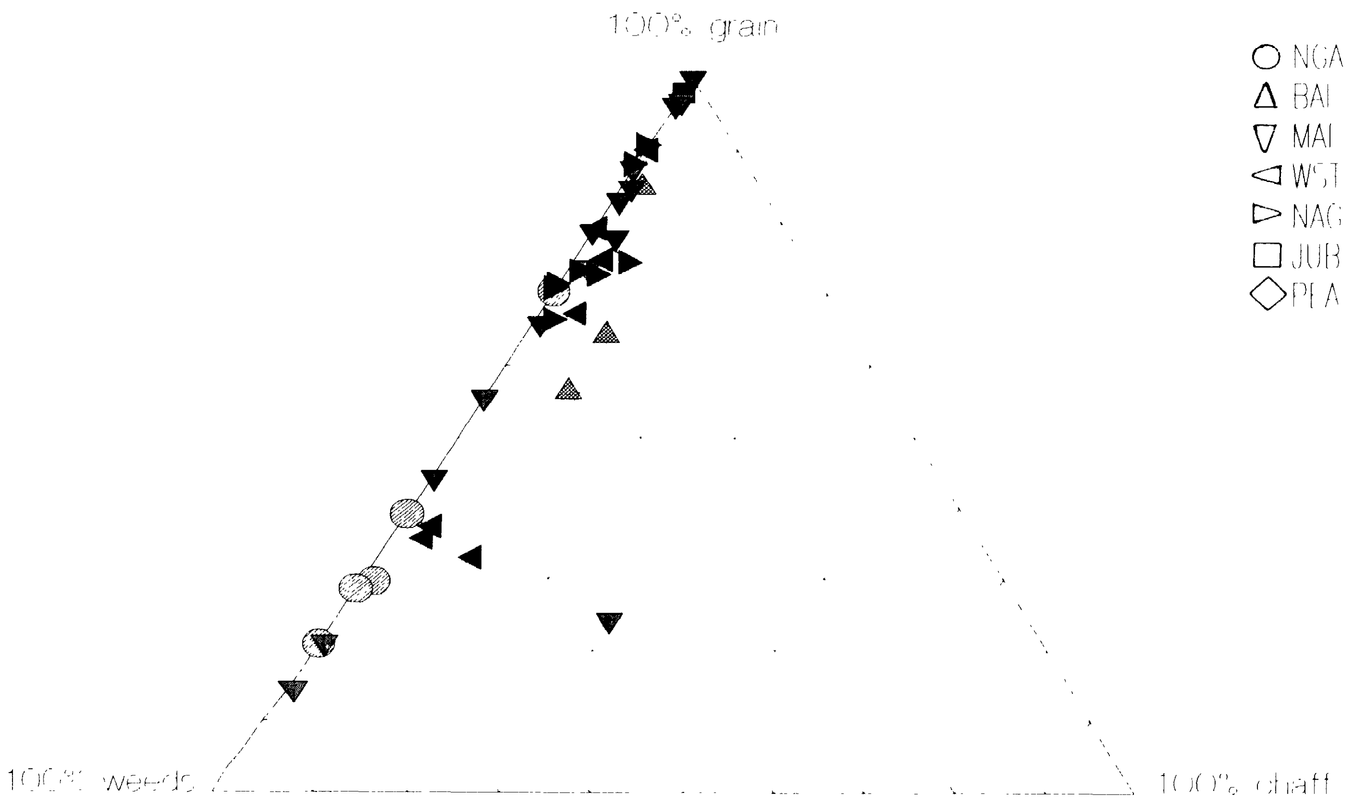

Figure 12.2 Percentage of grain, chaff and weeds in each sample with over 100 identified items, from Saxon sites in London. (Sites are NGA, BAI, MAI, WST, NAG, JUB)

young calves. The contemporary site at Barking Abbey shows a similar reduction in cattle numbers, with a few animals being slaughtered in their 1st year but otherwise a juvenile and sub-adult kill similar to the Strand sites but with a greater survival of old animals. The neonatal cattle consituted 3 _ 7 % of the bones. At this site pig rather than sheep has taken over the dominant role. These latter two sites reflect a greater diversity in their domestic animals and their slaughter pattern adding to the diversity already noted from the cereal evidence. The pigs do not show any great variability in slaughter and the high incidences of young animals, between 20-30% in their 1st year, and some very young individuals and neonates suggests that probably all the sites were keeping some pigs, this is most evident at National Gallery Basement. Variations do occur in the sheep slaughter pattern although these are minor. There is less evidence at Barking Abbey for animals slaughtered at ages of less than 18 months to 2 years, otherwise most animals, approximately 80% including juveniles, are slaughtered before 4 years of age, with perhaps 20% possibly being slaughtered in the 4th year. The National Gallery Basement site again shows the highest porportion of juveniles.

The central Strand sites clearly focus in terms of demand on young sub-adult cattle and sheep and they have the lowest proportion of neonates.

If we move onto the actual diversity of edible species at these sites (op cit), that is species for which bones from meaty parts of the carcass have been found, only Barking Abbey stands out. At this site red, roe and fallow deer appear among the food remains, and chicken, goose, duck and wildfowl occur with much greater frequency than on the Strand sites. Goose was particularly abundant. National Gallery Basement has no greater diversity of species than the other Strand sites.

Comparing these sites with the 9th century site at the Treasury (Chaplin unpubl.; 1971), for which only data on the minimum number of individuals, rather than fragments or weight, are available, shows a high proportion of cattle and sheep, 45 and 40% respectively, with a much lower proportion of pig than on any of the other sites. There was no evidence for cattle in the youngest age groups and over 70% appear to have survived beyond 4 years old. This is a considerably older age profile than any of the other sites. The sheep age profile is similar in the younger age groups but shows nearly 60% of the sheep reached maturity, again a very much higher proportion than on the other sites. Chaplin concluded some slaughter and marketing of dressed meat from the site and some marketing on the hoof. The site has always been described as a farm. One thing is clear, despite the absence of neonates or young cattle on the site, it is the sub-adult cattle and sheep which are so common on the Strand settlement that are absent from the Treasury sample.

A considerable number of fish were found in the soil samples from the Strand sites which have been studied by Alison Locker (forthcoming). The most interesting result from these data is the major contribution made by freshwater fish obtainable from the Thames, with eel being particularly numerous. Only herring and a few plaice and haddock bones reflect a trade in fish from the estuary (Table 12.2).

If we reconsider the overall picture presented by this environmental data it is one of low diversity on the Strand sites a pattern also found by O'Connor at Fishergate (1991). A concentration on the consumable portion of the plant and animal husbandry. Except for pigs, chicken and geese there is little evidence of the animals being bred or the cereals being grown. The cereals are being 'marketed' semi-cleaned and the stock is being brought into the settlement on the hoof since many phalanges and sesamoid bones were present in the sieved samples (Table 12.3). Nevertheless the rather broad age structure for the domestic animals perhaps suggests a market economy rather than a controlled supply through food rents in contrast to O'Connor's interpretation of Fishergate (1991; this volume). The site at the National Gallery Basement conflicts with this in that many more young animals occur and animal breeding is almost certainly taking place on site, although not on the scale suggested by the Treasury site which appears to be a farm geared to supplying beef and mutton to the nearby 'town'. It is unfortu-

Table 12.1 The percentage of neonates amongst the hand collected animal bone

	Cattle		Pigs		Sheep/Goat	
	N	%	N	%	N	%
Peabody Building	22	1.7	7	0.7	9	1.4
Jubilee Hall	0	0	1	0.5	1	1.3
Maiden Lane	24	1.6	5	0.5	3	0.6
National Gallery	21	7.1	1	0.3	1	0.3
Barking Abbey	8	3.7	3	0.9	9	3.2
Westminster Abbey	0	0	2	0.7	9	5.0

	N	%
Peabody Building	20	28
Jubilee Hall	6	23
Maiden Lane	8	8

Percentage occurrence of neonates of pig in the samples that produced pigbones

(No cattle or sheep neonates were found in the samples)

nate that we have no samples from this site because the cereal remains may have helped confirm or otherwise such a view, and many of the old cattle may have been plough animals. Barking Abbey appears to fall between the extremes of Lundenwic and the Treasury, making it easy, but perhaps rather simplistic, to view it as g-rowing and supplying its own needs, permitting greater variety - possibly to ensure a strict diet for the Benedictines - but with less of the commercial motive suggested by the Treasury assemblage.

These ideas are very much something to build on, test or contradict. Considerably more material has been excavated by the Department of Greater London Archaeology and the Passmore Edwards Museum over the last three years and this, and a refined dating of the middle Saxon phases, will significantly increase the potential of this type of approach.

Later Saxon

Recent work on the later Saxon material in London has concentrated on the botanical remains from a number of sites in the City of London and the plant and animal remains from early 11th century deposits beneath the undercroft at Westminster Abbey (Davis forthcoming; West & Rackham forthcoming). The Abbey, which by this time was the richest in the London area, exhibits the greatest variety of economically important environmental evidence of all these Saxon sites. Red deer, roe deer, hare and dolphin were among the mammal remains and over 11 species of wild bird seem likely to have been eaten. The most dramatic difference by comparison with the middle Saxon sites is the increase in number and range of marine fish in the samples. At least 19 marine species, dominated by herring, smelt, flatfish and whiting, composed over 78% of the fish

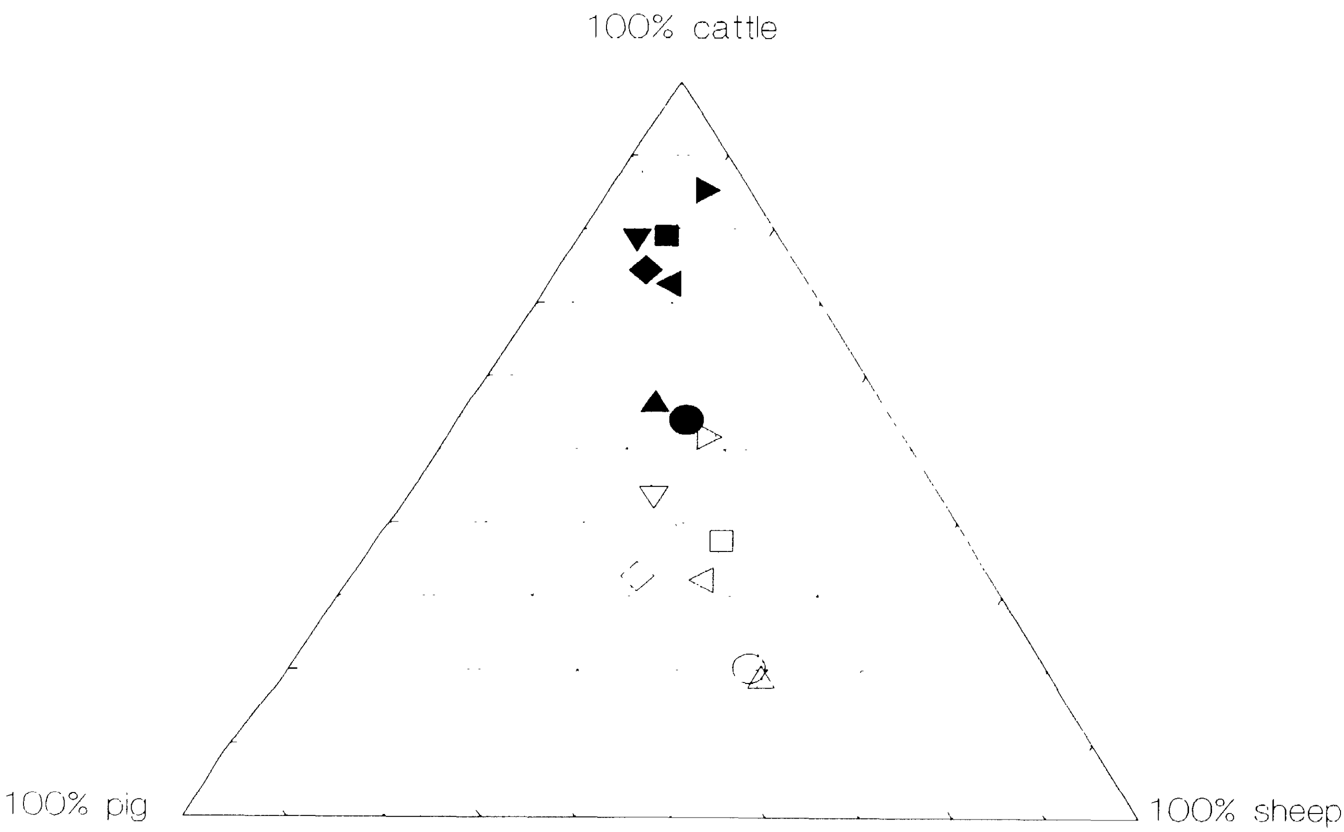

Figure 12.3 The percentage contribution by weight (filled symbols) and the most frequent anatomical element (open symbols) of cattle, sheep and goat, and pig, from Saxon sites in London. (Key as in Fig 12.2)

Table 122.2 The presence of species or group as a percentage occurrence in the soil samples

The sample sizes were approximately 30 litres

	Maiden Lane	Peabody Buildings	Jubilee Hall
No of samples	140	92	32
Sieve mesh	2mm	lmm	lmm
	%	%	%
Cattle	69	60	80
Pig	71	77	81
Sheep or goat	64	75	75
Cat	9	1	3
Dog	0.1	1	0
Antler waste	4	12	6
House mouse	0.2	6	3
Small mammals	0	4	0
Frog/toad	16	59	16
Chicken	21	30	37
Goose	14	1	15
Eel	42	66	47
Herring	26	33	1
Whitefish (gadids etc)	13	8	0
Cyprinids	26	29	34
oyster	63	38	47
Mussel	23	1	3
Cockle	0.5	1	0

bones in contrast to only 8% maximum on the Strand sites. This fishing still suggests a heavy concentration on the estuary of the Thames and inshore waters and may reflect the status of the Abbey rather than an expanding inshore fishery. The domestic animal bones from this site are more strongly indicative of the consumer end of the supply chain than any other site. The site has lower numbers of first year and old animals for all species. A dramatically sharp cull of pigs, 60% of the whole sample at about one year old and virtually no immature or older animals smacks of a heavily controlled supply of the best quality pork. The cereals show a dominance of rye and as at Barking Abbey all four types were common (Fig 12.1). In other respects the carbonised material was similar to the earlier sites with both semi-cleaned and weed dominated assemblages occurring. It is probably inappropriate to use the assemblages from this site as representative of the late Saxon period since they actually suggest a well controlled supply of high status character reflecting the richness of the abbey at this time. This control may indicate food rents or supply from the Abbey estates.

The analysis of the plant remains from late Saxon London within the old Roman city has been conducted by Glynis Jones, V'enessa Straker and Anne Davis (1991). No other studies have yet been carried out. This study was based largely on waterlogged material and so is not directly comparable with the earlier material from the Strand. Two samples however produced large quantities of carbonised material. Both came from hearths or ovens, one from the site of Peninsular House and one from Well Court. The Well Court sample was clean bread or club wheat with occasional grains of oat, rye and barley That from Peninsular House was a mixture dominated by oats with rye and barley and a little wheat. This sample was heavily contaminated with weeds and is similar to the weed dominated samples from

Table 12.3
The percentage occurrence of phalanges and sesamoids in the samples from Peabody Buildings and Maiden Lane

	Cattle		Pig		Sheep/goat	
	N	%	N	%	N	%
Peabody Buildings	26	47	34	48	22	32
Maiden Lane	53	55	60	60	29	32

the middle Saxon sites. The interpretation offered as the most likely explanation for this assemblage was that it was intended for animal fodder *(op cit).*

There is a tendency for oats and rye to be more common on these late Saxon sites but more assemblages are needed.

The waterlogged remains *(op cit)* produced considerably more probable garden cultivars than earlier deposits. These included opium poppy, flax, dyers' rocket, celery, carrot, probable fennel and possible brassicas. Most of the pits included fruit pips, and pea, celtic bean and possible lentil were found mineralised. The fruit pips indicated the presence of strawberry, plum or bullace, cherry, sour cherry, a single mulberry, grape, fig and one find of walnut. This greater variety than the middle Saxon deposits may merely reflect the much greater number of waterlogged or mineralised samples studied. Possible status was inferred from the presence of large numbers of fig and grape pips in one pit at Watling Court and a second at Milk Street. One conclusion of this study is the suggestion of cultivated areas nearby the pits which were growing vegetables, fibre and medicinal plants. The abundance of fruit stones may indicate fruit trees in the town at this time but Alan Vince (1990; this volume) has drawn attention to the possibility that the cottars in the Domesday Book who were particularly concentrated around London may have been market gardening to supply the growing city with vegetables and fruit from orchards.

It is unfortunate, but until work is done on the animal bones from this period and further work carried out on the botanical remains, we can draw no further comparisons. We do not have enough evidence to determine whether, when the focus of settlement moved from the Strand to the walled city in the late 9th century, it also underwent an economic change, and we have no assemblages to compare with the Anglo-Scandinavian samples from Coppergate, York (O'Connor 1989).

The mid-Saxon settlement clearly has the makings of a town, but most sites produce querns and loomweights. Individual domestic groups are still grinding their own corn, although records show that mills were present, they are manufacturing their own cloth, keeping their own pigs and chickens and probably catching their own fish. They are probably buying semi-cleaned corn, beef and mutton and presumably wool. Unless they are weavers and millers there is little evidence so far of the specialisation associated with later urban communities such as those at Coppergate in York.

The lack of organic preservation on these sites however may well be obscuring the truth.

Acknowledgements

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13 8th-11th century economy and environment in York

Terence O'Connor

Abstract

An interpretive approach is applied to the environmental remains from Anglian and Anglo-Scandinavian sites in York that models the observed data in terms of changes to the nature of the settlement and its mechanisms of supply. The results are presented in terms of the social and hierarchical organisation that may have supported the 'town' in the Anglian period as against a developing 'market economy' in the later Anglo-Scandinavian town,

The background

York owes its origins and position to the construction of a fortress in AD71 by Legio IX Hispana, at a point where the areas of influence of the Brigantes and Parisii met, and where a conjunction of two rivers and a slightly elevated moraine offered communications and reasonable drainage in the otherwise flat and irriguous landscape between the Wolds and the Pennines. Around the Fortress developed the *canabae legionis,* and the military base rapidly became a major town. By early in the 3rd century, *colonia* status was g-ranted, and York became the first city of *Britannia Inferior.* The archaeology of Roman York has been investigated at a number of sites on either side of the River Ouse. This is not the place to enumerate the findings to date, except to observe that the 4th century has not generally been well represented by structures or deposits, and so the effect on York of the upheavals of the later part of that century are not well understood.

The history, extent and function of York in the centuries following the Roman withdrawal from Britain remain somewhat obscure. Historical sources indicate some continued importance as an ecclesiastical centre, and the rather fragmented excavations around York Minster, in the area of the fortress *principia,* have given tenuous indications of continuity of use. The very fact that the Minster overlies the *principia* may itself be some indication of continuity of function or of perceived status. Archaeologically, however, the 5th-8th centuries are notable for the effective absence of evidence over much of the city, despite an intensive campaign of excavation and record since 1972.

Across the area of York which lies to the north-east of the River Ouse, and which was the area of the Fortress and its associated extra-mural activity, medieval deposits either immediately overlie Roman structures, or are separated from them by anything up to a metre of greyish, structureless sediment with abraded Roman pottery and little else. This deposit can apparently be equated with the 'Dark Earth' seen in other towns. Thus at 16-22 Coppergate (Fig 13.1), Roman features cut into underlying fluvioglacial sandy clays were separated from Anglo-Scandinavian deposits of 9th-11th century date by this featureless grey sediment. Though nicknamed 'the Anglian greys', this deposit had little to date it as an Anglian accumulation apart from the broad stratigraphical position. In the 1990 excavations at the junction of Grape Lane and

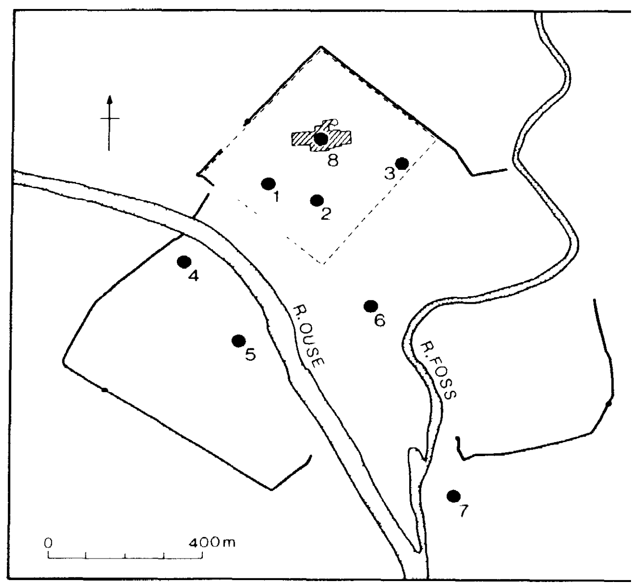

Figure 13.1 Central York showing the position of major sites referred to in the text relative to each other, to the city's two rivers, and to the Roman (broken line) and medieval (continuous line) walls

Key:

1 - City Garage, Blake Street
2 - Swinegate
3 - The Bedern
4 - 5 Rougier Street
5 - Queen's Hotel
6 - 16-22 Coppergate
7 - 46-54 Fishergate
8 - York Minster

Swinegate, Roman structures were immediately overlain by undiagnostic dumped deposits containing 12th-13th century, and abraded Roman, pottery. Deposits of Anglian date were likewise not encountered in any archaeologically recoverable form at the City Garage site, Blake Street. Several pits on the complex site at The Bedern were attributed to the Anglian period, largely on the basis of a single radiocarbon date of ad 740±80 (Kenward *et al* 1986, 268-277). These pits gave a biota indicative of abandonment, or at least of 'cessation of occupation at urban densities' *(ibid).* Samples from a very small excavation on High Ousegate gave similar indications, with a 5th century radiocarbon date. The evidence for continuity of use of the *principia* is ambiguous in terms of the date and nature of activities, A horizon containing numerous bones of pigs, many of them neonatal or very young, was identified in several of the many small excavation trenches, but a lack of associated datable artefacts precludes a more precise attribution of date than 5th to 9th century (D J Rackham, M O H Carver, pers comm; this volume).

The south-west part of York has conventionally been equated with the Roman *colonia* (but see Mason 1989), and has similarly produced only frustratingly small traces of 5th-8th century occupation. A thick deposit of greyish silt was encountered in excavations at 5 Rougier Street, overlying 4th century deposits and cut by features of 12th century date. Salvage excavations at the Queen's Hotel site located traces of a post-built structure, apparently of Anglian date, cut into the rubble fills of a Roman building. The post-Roman pottery sequence from this site begins with 8th century forms, including imported wares, amongst which a single sherd is provisionally identified as Tating ware (A Mainman, pers comm). At the time of writing, however, there is still nothing from this site clearly of post-Roman, pre-8th century date. A rapid examination of hand-collected bone assemblages from this site has shown that several assemblages with numerous bones of rodents and scavenging birds (corvids and raptors) are associated with 8th-9th century pottery There may, therefore, be some evidence for unintensive occupation of the site during this period.

Over much of the city, there have been isolated chance finds of 8th-9th century pottery and other artefacts of Anglian date, but with little structural association. The overall impression is of a Roman fortress and associated settlement which were largely abandoned, though there is the problem that the cultural context of any 5th-7th century occupation may have been aceramic and structurally diffuse, and thus archaeologically almost invisible. There may have been some continued use of the *principia* area, and that use may have been historically important, but in terms of intensity of human occupation, 5th-8th century York appears to have been only sparsely inhabited. The scattered finds of Anglian pottery and other artefacts across the city have been taken as evidence of continued occupation during this period, and pottery distributions, in particular, can be interpreted to indicate some concentration of activity along the banks of the River Ouse in the heart of what had been the Roman city (A Mainman, pers comm). The quantity of material involved is small and in the absence of structural evidence it remains quite possible that artefacts of various kinds were distributed well beyond occupied areas by the removal of night soil and other domestic waste. A scatter of artefacts certainly implies that people lived nearby, but structural evidence is required to show the location of that occupation, and such structural evidence is lacking over much of York.

Eoforwic

Excavations at 46-54 Fishergate in 1985-6, on the site of the former Redfearn National Glass works, located structures and deposits of 8th-9th century date. The excavation of these deposits was far from simple, as they were overlain and cut by 11th-12th century graves and pits, and by foundation trenches and other elements of a 13th-16th century priory, However, a clear pattern of structures has emerged, and analysis of the stratigraphy has enabled the recognition of several phases of occupation within the Anglian period across some parts of the site (Figure 13.2). Coin evidence indicates occupation to have begun at the beginning of the 8th century, with the establishment of a boundary ditch, followed by the construction of rectilinear post-built structures and fences within the area partially delineated by the boundary ditch. Groups of pits were dug, often close to one end of the post-built structures. The assemblages of artefacts from 8th century deposits include a wide range of pottery types, coins, glass vessels, slag, lava quernstone fragments, and debris from the manufacture of bone and antler tools. It is proposed that the site represents part of a trading settlement, a *wic,* perhaps cognate with an emporium in the sense used by Hodges (1989). Alcuin, writing around the turn of the 8th century, used the term 'emporium' to refer to York, though it is by no means clear in what sense he was using the word.

The initial phase of Anglian occupation was abruptly truncated in the mid-8th century. The site was covered by an occupation-derived deposit rich in charcoal and bone fragments, and there is evidence that some of the post alignments were systematically dismantled. Although the deposit consisted in the main of occupation debris, the circumstances of its stratigraphical relationship to early 8th century features, and a chronological break in the coin series from features below and above the deposit, point to some cessation of occupation, at least in this part of the site. Occupation was re-established early in the 9th century, but at a lower intensity, and this re-occupation appears to have been short-lived, and possibly different in character to the 8th century occupation. Coin evidence indicates that the site was abandoned again in the mid-9th century, remaining so for nearly two centuries.

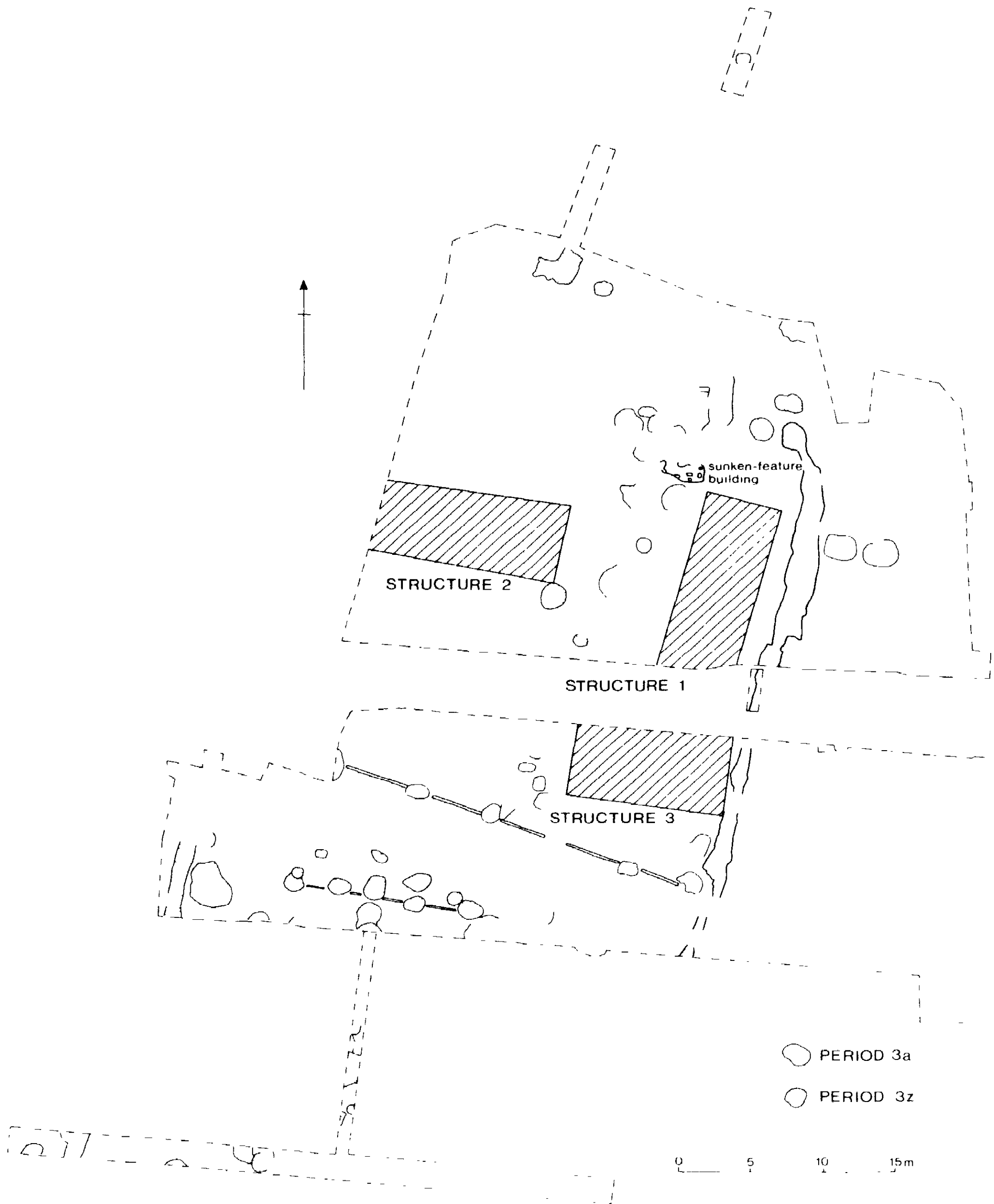

Figure 13.2 46-54 Fishergate site showing major Anglian boundary ditches and structures

The subsoil into which Anglian features were cut at the Fishergate site was a rather heterogeneous series of glacial and fluvioglacial deposits consisting of clays and silts with more or less pebbly facies, at least some of which may have originated as flow tills. There was little preserved organic matter other than bone or charcoal in any of the Anglian deposits, whether in surface spreads of refuse or in fills of even quite substantial cuts. Two explanations may be offered for this lack of preserved organic matter. Unimpeded drainage of ground water and concomitant oxidation of buried material may have destroyed a formerly substantial organic component in all Anglian deposits, and this was the immediate interpretation which was offered; that the lack of organic matter was a consequence of preservation. It is possible, however, that the organic refuse which the settlement is presumed to have been generating was not disposed of in any quantity into the deposits which were subsequently excavated. The lack of preserved organic remains would thus be a consequence of deposition, not of preservation. How can this question be resolved? On the one hand, the presence of abundant bone fragments would seem to imply that occupation debris was deposited in large quantities and thus that deposition of organic materials may be assumed, on analogy with accumulations of occupation debris seen at other sites in York and elsewhere. There is no immediate local analogue for these deposits, however, as Fishergate was the first examination of substantial Anglian settlement in the vicinity of York. The 'usual' pattern of refuse disposal and accumulation should not, therefore, be assumed.

One clue for the solution of this conundrum may lie in the paucity of even the most robust of plant macrofossils in Anglian deposits. If these deposits had originally included a substantial component of plant-derived food debris, it is surprising that relatively few specimens of cherry or plum *(Prunus* spp) fruitstones or hazel *(Corylus avellana)* nutshell were recovered, despite an intensive campaign of sieving. Small numbers of mineralised plant remains were recovered, as were small numbers of mineralised insects, but the latter, for example, were not in the quantities encountered in samples from Saxon deposits in Southampton (H K Kenward, pers comm). Taking the rather tenuous evidence in sum, it may be suggested that differential disposal of refuse was practised, with bone debris and other 'hard' refuse such as quernstone fragments allowed to accumulate around the occupied area, whilst 'soft' refuse was disposed of by different means, perhaps by burning or deposition into the nearby river or onto cultivated land. One consequence of this is that evidence of the subsistence and redistribution activities undertaken on the site rests very largely on the bone debris.

The 8th century deposits at Fishergate yielded a large archive of bone fragments, mostly recovered by sieving on 12mm and on lmm meshes. The results of the analysis of these are described in detail in *The Archaeology of York* **15/4** (O'Connor 1991a). It is the interpretation of the bone debris, or, more precisely, the extent to which the empirical evidence concurs with any theoretically tenable model of the ecology of this settlement, which is the concern of the present paper. To start with obvious questions of resource exploitation, the settlement seems to have had a rather narrow subsistence base, with mature cattle providing the great majority of red meat, perhaps as much as 80% by weight. In this respect, the results from Fishergate closely resemble those from Saxon Southampton (Bourdillon & Coy 1980; Bourdillon 1988). There is little evidence that young or very old cattle were exploited for meat for this settlement, most recovered cattle mandibles being attributable to beasts aged between about 3 and 8 years at death (Table 1). Sheep mandibles and epiphysial fusion data indicated a concentration on the slaughter of individuals between 1 and 2 years old (shearlings) and adults of about 4 to 7 years old, with the intervening two and three year-olds being markedly under-represented in the recovered sample. Pigs, similarly, seem to have been markedly age-selected, with slaughtering peaks at 12 to 15 months old and at 2 to 2% years old. A similar pattern of exploitation of sheep and pigs has been seen in assemblages from mid-Saxon Ipswich (Jones & Serjeantson 1983).

The lack of perinatal and other very young domestic livestock at Fishergate would not be consistent with any interpretation of the site as 'rural', by which it is usually meant that a site was a net producer of agricultural resources rather than a net consumer. The selected pattern of slaughter seen at Fishergate is more consistent with consumer-derived refuse. If livestock production is seen as analogous with other manufacturing processes, then we would expect the production site to include the waste materials of that production, in this case surplus young animals killed to maintain herd demography or accidental perinatal deaths. Just such 'production waste' may be seen in the assemblages of young pigs from post-Roman deposits at York Minster (D J Rackham pers comm), but this element was conspicuously absent from the Fishergate assemblages. Livestock appear to have arrived on the site on the hoof, since cattle and sheep, at least, were represented by all major body parts, with little evidence of differential disposal or of the provision of dressed or jointed carcasses in any quantity. Amongst the pig bones, there was a significant under-representation of metapodials, the number of axial metapodials recovered being only about half of what would have been expected in proportion to other paired limb elements. Poor recovery seems an unlikely explanation, given the extensive use of sieving, and, although some use of pig metapodials as artefacts was apparent, this was hardly on the scale required to produce the observed depletion. The number of pig *phalanges primae* which were recovered was consistent with the number of distal metapodials, implying that the recovered assemblages were depleted in pigs' feet, not just in metapodials. There may, therefore, be some evidence that at least a proportion of the pigs consumed by the Anglian settlement arrived on site as dressed carcasses.

The minor sources of meat available to a settlement, such as wild mammals, birds and fish, were notably under-represented. Very few bones attributable to hare *Lepus europaeus,* wild pig *Sus scrofa,* or deer *Cervus* or *Cupreolus* species (other than fragments of red deer *Cervus eluphus* antler), were recovered. Similarly, the range of wild birds represented can largely be accounted for in terms of synanthropic scavengers and other species likely to have been incidental to the human settlement. Having thus accounted for the records of taxa such as rook *Corvus frugilegus,* raven *C. corax,* jackdaw *C. monedula,* kite *Milvus milvus,* wren *Troglodytes troglodytes,* house sparrow *Passer domesticus* and swallow *Hirundo rustica,* only two bones are left which might be interpreted in terms of hunted game, one each of pheasant *Phasianus colchicus* and

Table 13.1
Mandibular eruption and attrition at death, for cattle, sheep and pigs from Anglian or mid-Saxon deposits at Fishergate, York, and Ipswich based on mandibular fragments with at least one recordable molar or fourth premolar

Figures for Ipswich derived from data given in Jones and Serjeantson (1983)

Fishergate

Cattle	N	J	I	S1	S2	A1	A2	A3	E	
		2	2	3	3	1	5	3	2	
Sheep	N	J	I	S1	S2	A1	A2	A3	E	
		1	5	7	2	1	7	12		
Pig	N	J	11	12	S1	s2	A1	A2	A3	E
			1	7			1	8	1	-

Ipswich

Cattle	N+J	I	S1	S2	A1+2	A3+E		
	1	5	14	11	9	15		
Sheep	2	43	18	8	20	8		
Pig	N	J	11	12	S1	S2	A1+2	A3+E
		3	-	18	6	24	30	22

For cattle and sheep:
= neonatal
N = juvenile; LMl not in wear
= immature; LMl in wear, LM2 not in wear
S = subadult; LM2 in wear, LM3 not in wear
S1 = LM3 forming, to just erupting, through bone
S2 = LM3 erupting from bone to occlusal plane
A = adult; LM3 in wear
A1 = LM3 up to minor dentine exposure on mesial column
A2 = LM3 dentine exposure across central column
A3 = LM3 dentine exposure on distal column
E = elderly; dentine exposure on accessory style

For **pigs:**
N = neonatal
J = juvenile ; LMl not in wear
I = immature; LMl in wear, LM2 not in wear
11 = LM2 prsent in crypt
12 = LM2 erupting up to occlusal plane
S = subadult; LM2 in wear, LM3 not in wear
S1 = LM3 present in crypt
S2 = LM erupting up to occlusal plane
A = adult; LM3 in wear
A1 = LM3 with enamel attrition only
A1 = LM3 with enamel attrition only
A3 = LM3 dentine exposure merging on mesial cusps
E = elderly; three main areas of dentine exposure across LM3 merging

of a small goose *cf Branta* sp. The pheasant bone is of some biostratigraphical importance, as well-stratified pre-Norman records of this species are rare. Basically, the occupants of the Fishergate site appear to have made little or no use of hunted mammals and birds as a supplement to their beef-centred diet. Fish bones were recovered in very large numbers, and were mostly of eel *Anguilla anguilla* and other river fish, with herring *Clupea harengus* and estuarine taxa such as salmon *Salmo salar* and shad *Alosa* sp(p) also well-represented. Smelt *Osmerus eperlanus* were evidently taken during the early 9th century, though the bones of this species were absent from 8th century assemblages. About 3% of the fish bones from Anglian deposits were of cod *Gadus morhua*. The persistent presence of this marine species, albeit at a low level of abundance, may indicate the importation of dried fish. It is a little surprising that of the several inshore marine fish which could have been exploited, cod is the only one consistently present, suggesting that this species came onto the site as something other than part of a mixed local catch. Despite the cod, fish resources concentrated on taxa likely to have been available in the local rivers or nearby estuarine waters, and the overall picture which is given is of a settlement which had, or which took, little opportunity to diversify its diet.

Some other use was made of vertebrates. Anglian deposits at Fishergate yielded several specimens of beaver *Castor fiber*. Whether the species was exploited principally for food or for fur it is not possible to say on the bone evidence alone. The specimens recovered include elements such as the femur and os innominatum which are unlikely to have been retained on a roughly-dressed pelt, so it must be assumed that whole beavers were being brought into the settlement. Given that rodents have, on the whole, been shunned as a food resource in Europe, it seems most likely that beavers were hunted for their fur. Either way, the availability of this species presumably indicates that a suitable breeding habitat, with woodland and substantial bodies of fresh water, was available within the Vale of York or Humber region. A very different habitat would be indicated by the numerous specimens of pine marten *Martes martes* recovered from the site. All of these specimens were bones of the feet, mostly phalanges, and one calcaneum bore faint transverse knife cuts, consistent with skinning. It is possible that partially-dressed pelts were being traded into York from a considerable distance, though Devensian coversands in the Vale could have carried substantial stands of coniferous woodland in the 8th and 9th centuries, and small colonies of pine marten are believed to persist within 50km of York to the present day.

So much for the questions of what and when, but it is matters of how and why which should also concern us. What theoretical framework, be it social or processual, would account for the observed narrow resource base? Lack of natural resources can hardly be invoked, as earlier and later populations in York had little difficulty in locating hares and wild ducks, geese and waders to exploit, and there surely were, quite literally, plenty more fish in the sea. A better line of investigation might be to assume that the settlement was in some way inhibited from exploiting a wider range of resources. Such inhibition might have operated through limitation of currency, such that the settlement could not afford to trade for supplies, or through an institutional mechanism, such as laws or codes which overrode what we would today regard as the functioning of a free market. It has already been suggested that the Anglian occupation at Fishergate had the characteristics of a *wic* or emporium, and it can be argued that it was this status which limited the resource base.

If it is hypothesised that a *wic* was a highly-developed port-of-trade, maintained by a ruling elite in order to control the movement and possession of prestige goods, it follows that the resident population of such an institution, if, indeed, it had a resident population, may have had little economic power of their own. The ruling elite probably maintained ownership of the land on which the *wic* stood, and thus the residents may have had little opportunity for ‘backyard smallholdings’ in which to raise a few pigs, hens or geese, all three species being rather poorly represented in the Anglian deposits at Fishergate, and similarly uncommon in Saxon deposits in Southampton. If the *wic* was maintained in subsistence, as well as institutional, terms, then the population may have been dependent on the ruling elite for the great majority of their food supply, and have had little opportunity for direct trading with food producers, such as coastal fishing communities, or the wildfowlers depicted in Aelfric’s *Colloquy* (lines 123-6). The food supply to the *wic* would thus have been largely dependent upon the supplies which the ruling elite could procure by legalised extortion, such as the food rent system (eg see Clapham 1949, 42). This would place an intermediate stage between producers and consumers, and might be expected to have reduced the diversity of resources from what was potentially available to that which the appropriate legal code specified. In economic terms, then, it is suggested that the 8th-9th century settlement at Fishergate exhibited a narrow food resource base because prevailing institutional mechanisms inhibited the settlement population’s freedom to obtain such other resources as may potentially have been available. Underpinning this hypothesis is the supposition that a wider range of food resources was available, and that the population would have traded for such other resources had they been able to do so.

The environment of the Anglian settlement is not well represented in the archaeological record, again because of the paucity of preserved organic materials. The bone debris included a range of small wild vertebrates, from which some information may be drawn. Although house mouse *Mus* sp. was much the most abundant small rodent, there were frequent records of wood mouse *Apodemus* sp(p) and short-tailed vole *Microtus agrestis*, which implies that tussocky grassland or light scrub existed within 100m or so. A lack of vegetational ground cover immediately around the settlement is indicated by the lack of records of shrews *Sorex/Neomys* species, and hedgehog *Erinaceus europaeus*. Specimens of frog *Rana temporaria* greatly outnumbered those of toad *Bufo bufo*, as is usually the case on sites in York, and a number of specimens of slow-worm *Anguis fiagilis* and of an unidentified small snake were recovered. The predominance of frog, rather than toad, has some bearing on the question of organic preservation, as it implies that ground surface conditions around the settlement were generally damp rather than dry, and thus that the ground conditions are unlikely to have inhibited organic preservation if other factors were favourable. The bird taxa represented included a number of woodland species (wood pigeon *Columba palumbus*, jay *Garrulus glandarius*, magpie *Pica pica*, and rook), and others which would be consistent with a mosaic of woodland and rough pasture (buzzard *Buteo buteo*, and pheasant). One species notable for its absence was black rat *Rattus rattus*. *This* species has been recorded in Roman deposits in York (Rackham 1979; O'Connor 1988) and from Anglo-Scandinavian deposits (O'Connor 1989), so its absence from samples of 8th-9th century date which contained numerous bones of other rodents may be of considerable importance in the context of the history of this species in the city, a point which is discussed at length elsewhere (O'Connor 1991b).

To summarise the rather sparse evidence for the environment of the Fishergate Anglian settlement - the settlement within a few tens of metres of the excavated area appears to have been fairly well cleared of ground vegetation, and thus probably quite intensively occupied, with a considerable infestation of house mice- Within an area of a few hundreds of metres, the settlement was probably set in a landscape of rough grassland and patches of woodland. This reconstruction is certainly consistent with the establishment of a trading settlement on a green-field site within an unintensively farmed landscape.

The main impression which one gains of the economy and environment of 8th-9th century York is that it is unfamiliar, both to the modern eye, and in the context of the archaeological remains from the Anglo-Scandinavian and medieval town. This is at once a challenge to the interpretative skills and an opportunity to escape from what M K Jones has called the 'Happy Valley' approach to environmental reconstruction, that insidious tendency to coax reconstructions towards a model which is satisfying and comfortable to the modern eye. Mid-Saxon nucleated settlements may not have been towns, in the complex sense in which that noun is applied in later periods, and it may require a considerable effort of the imagination, as well as a purposefully objective reading of the data, in order to understand their provisioning and ecology

Jorvik

Although 9th-11th century deposits have been encountered on a number of sites in York, it is the sequence at l6-22 Coppergate which has been most intensively studied, and which was most extensively investigated in plan. In terms of Roman topography, Coppergate lies a little to the south of the south corner of the Fortress, close to the presumed course of the River Foss. The re-occupation of the site in the third quarter of the 9th century is thought to indicate a general reoccupation of the area of the Roman city by, or as a consequence of the arrival of, settlers from Scandinavia. It is probably thus not mere coincidence that the occupation sequence at Fishergate appears to end roughly contemporaneously with the beginning of substantial post-Roman occupation at Coppergate. Elsewhere in the city there is evidence of reoccupation, or of an increased intensity of occupation, in the later part of the 9th century.

The 9th-11th century sequence at Coppergate begins with a phase of rather unintensive occupation, evidence of glass - and perhaps metal-working - having been recovered from the fills of a number of large pits. Although no structural remains were identified from this period of occupation, the distribution of pits shows roughly rectilinear gaps, which may represent areas occupied by structures. At the beginning of the 10th century, there is evidence that the site was subdivided into plots. Around AD935, the site was reorganised upon a slightly different axis, with the laying-out of a series of tenements perpendicular to the presumed line of the predecessor of the modern street, and rectilinear buildings of post-and-wattle construction were erected. At this time, surface accumulation of large amounts of organic-rich debris appears to have commenced, and a considerable depth of material rapidly built up. Late in the 10th century, and after two or three phases of rebuilding in each tenement, the post-and-wattle structures were succeeded within the same tenement boundaries by substantial buildings of plank-walled and sunken-floored construction (Fig 13.3). These structures appear to have continued in use into the early 11th century

The richly organic debris which accumulated during this sequence of Anglo-Scandinavian occupation varied somewhat in composition. Essentially it comprised an unsorted mineral component probably derived in part from reworking of the drift subsoil and in part from accidental and deliberate movement of alluvium from the nearby riverside, together with a wind-blown element. The organic component included unrecognisable humified vegetable matter, in addition to seeds, fruits and other robust elements of herbaceous vegetation, twigs and other small pieces of wood, charcoal, ash, fragments of bone and shell, fragments of arthropod integument, and probably much more besides which was simply not recovered during the processing of samples or recognised during the sorting of disaggregated material. There was every indication that the deposits had been waterlogged and anoxic for much of the

Figure 13.3 16-22 Coppergate site showing late 10th century timber structures

period of burial. Efflorescences of vivianite (a hydrated iron phosphate) were frequent, and the corrosion products observed during conservation of ferrous and copper alloy artefacts were generally inconsistent with burial in an oxidising medium.

The substantial accumulations of occupation debris are central to any discussion of the economy and environment of this part of York through the 9th-11th centuries, as these deposits contain the debris of economic activities of all kinds, and the plant and animal death assemblages by which the environment is represented. There is, however, a clear danger that the wealth of information will obscure important questions concerning the formation of these deposits and therefore what they actually represent in terms of human settlement and activities. Why did these deposits accumulate? Clearly because people were disposing of very large amounts of predominantly organic refuse, together with the accumulation of material derived from the decay or demolition of *in situ* structures of wood and other plant materials, but why did this refuse not rapidly decompose? The most plausible answer to the latter question would seem to be that the rate of input was sufficiently high to seal, and to maintain a high water content in, the accumulating refuse, and thus to produce anoxic, waterlogged conditions within the refuse deposits, independent of the level of ground water in the underlying subsoil. Some of the structures observed at Coppergate may have been ditches dug to carry away surface water. Furthermore, the state of preservation of organic materials and metal artefacts from the underlying Roman deposits indicates that these deposits were at best only intermittently waterlogged. This reinforces the hypothesis that the waterlogged character of the 9th-11th century deposits was a consequence of some characteristic of the deposits, and not of their location or depth below modern ground level, unless some major change in precipitation or ground-water drainage between the 4th and 10th centuries could be demonstrated, which, at present, it cannot. The importance of rate of input of materials to the development of these deposits perhaps provides another explanation for the lack of richly organic deposits at Fishergate, as the intensity of occupation at that site appears to have been somewhat lower than at Coppergate. If this explanation of the formation of highly organic, waterlogged deposits at Coppergate is correct, then what we have at this site may be a detailed record of economy and environment in one particularly squalid and densely-occupied part of the town. The evidence will not have been preserved in other cleaner, or more sparsely settled, areas.

The bone debris from the late 9th century occupation at Coppergate shares with the Anglian samples from Fishergate a marked lack of diversity, both in the predominance of cattle bones amongst those of the major domesticates and in the paucity of hunted birds and fish. Assemblages associated with the 10th century post-and-wattle buildings show a distinct change in exploitation, with a marked increase in those taxa identified above as being most suitable for raising in backyards, that is, pigs, geese and fowls. The fish bones from this period of occupation show an intensive exploitation of the river. There are herrings and other marine species in the assemblages, but eels and cyprinid species predominate. The plant remains from the organic accumulations also reflect exploitation of local resources, with elder *Sambucus nigra,* blackberry *Rubus fruticosus,* raspberry *R. idaeus,* and sloe *Prunus spinosa* all well represented, and less frequent records of a range of other wild fruit-bearing taxa including rowan *Sorbus aucuparia,* hawthorn *Crutaegus* sp(p), rose *Rosa* sp(p), and possibly bilberry *Vaccinium cf. myrtillus.* Other plant remains included the debris of craft or industrial exploitation of timber and herbaceous vegetation for artefact manufacture and dyestuffs, mosses apparently used for sanitary purposes, and a range of nitrophile taxa likely to have been urban weeds. A number of cultivated crops was represented, including cereals (wheat *Triiticum* sp(p), barley *Hordeum* sp(p), oats *Avena sativa* and rye *Secale cereale),* and a number of species likely to have been exploited as herbs or spices (coriander *Coriandrum sativum,* dill *Anethum graveolens,* opium poppy *Papaver somniferum,* hops *Humulus lupulus,* and summer savoury *Satureja hortensis).*

An important category of plants is those which were potentially used as a source of dyes for colouring yams and textiles. Fragments of all above-ground parts of dyer's greenweed *Genista tinctoria* and root fragments of madder *Rubia tinctoria* were frequent, and sometimes abundant in particular samples, with less frequent specimens of weld *Reseda luteola,* and woad *Isatis tinctoria,* together with an abundance of a clubmoss *Diphasium complanatum* which may have served as a source of a mordant (Tomlinson 1985). The widespread use of these plants is shown by their recovery from 10th-11th century deposits elsewhere *in* the city G. *tinctoria* was recovered in small quantities from Anglo-Scandinavian deposits at the General Accident site, Tanner Row (Hall & Kenward 1990), and from contemporaneous levels at the nearby Queen's Hotel site, and one fragment of *D complanatum* was recovered from 11th century deposits overlying the Anglian occupation at Fishergate. The clubmoss was almost certainly imported - its modem distribution is in Scandinavia - though the other dye-plants can all be grown successfully in the York area today, so may be assumed to have been locally grown in the Anglo-Scandinavian period. Whether they represent the gathering of a wild resource or some degree of cultivation is not clear, though the sheer quantities involved would seem to indicate deliberate cultivation, unless the plants were much more abundant in the wild than seems likely, given their modem distribution.

Timber was used selectively, with a view to the properties of different woods. The post-and-wattle structures of the early 10th century were predominantly of oak *Quercus* sp(p) and hazel, whilst oak provided the massive timbers necessary for the late 10th century plank buildings, with willow *Salix* sp(p), used for some internal fittings. One of these plank buildings yielded copious debris from the manufacture of wooden artefacts, with field maple *Acer campestre* and alder *Alnus glutinosa* being particularly favoured for lathe-turned objects. An interesting side-effect of the use of timber for construction and the accumulation of organic detritus on ground surfaces was the colonisation of the site by a species of snail commonly found in woodland or dense scrub. *Discus rotundatus* was abundant, an observation consistent with the known synanthropic propensity of this species, but the frequent recovery of adults and juveniles of *Clausilia bidentata* indicates that this, the most versatile species of a predominantly woodland-dwelling family, successfully colonised the site. The use of woodland mosses, apparently for sanitary purposes, must have provided a means for the accidental importation of woodland invertebrates, and insect remains from the site include taxa characteristic of woodland litter.

Evidence of the deposition of human faeces, in the form of intestinal parasite ova and mineralised concretions of faecal material, was, not surprisingly, concentrated in pits, which presumably were extensively used as latrines. Such evidence also extended to surface deposits, so sanitation may not have been particularly refined. It must be allowed, however, that the processes of digging pits, and larger excavations during construction of the late 10th century plank buildings, would have redeposited faecally contaminated soil from earlier occupation, thus introducing 'faecal indicators' into accumulating surface deposits which might not have been receiving a direct input of faeces. Given the proximity of the site to the presumed course of the River Foss, it could be argued that the refuse accumulations were at least in part an attempt to raise ground levels against seasonal inundation. If so, then the choice of materials, soft organic detritus unlikely to have provided a firm ground surface, shows little forethought, and the raising of levels seems to have gone on in a very haphazard manner, unlike, for example, the original laying-out and subsequent reorganisation of the tenements.

The late 10th century rebuilding in substantial plank-construction seems to have been associated with a change in the environment and economic relations of the Coppergate area. Preliminary analyses of' invertebrate death assemblages indicate that the insides of the structures and their immediate surroundings were less squalid than the earlier post-and-wattle buildings, and the bone debris indicates a broadening of the catchment area of the site. Though there is little change in the exploitation of the main domestic animals, the fish bone assemblages show an increased exploitation of inshore marine fish, especially cod *Gadus morhua,* at the expense of freshwater cyprinid taxa.

The trend which can be discerned at Coppergate is one of a transition from a narrow resource base, presumably predicated by a lack of trading opportunity, in the late 9th century, moving through a period in which home-production and the exploitation of local resources was important, to a pattern of trade and exploitation which is more akin to that seen in later medieval York, with the urban catchment area extending over great distances and pulling in commodities from a wide area (Table 13.2). At the same time, there is a change in apparent attitude to the immediate environment, from the rather unintensive occupation of the late 9th century, with pits used for the disposal of refuse and excrement, to the apparently uncontrolled disposal of refuse and all kinds of filth in large, perhaps self-perpetuating, accumulations, to finally somewhat less squalid conditions by the end of the 10th century.

The widening of the food resource base seen at Coppergate is not expressed in terms of the staple meat species, as cattle certainly provided the great majority of the meat consumed between the late 9th and early 11th centuries. It is in the minority species, which would have provided the variety to an otherwise rather monotonous diet, that the changes are to be seen. If the procurement of wildfowl and fish is seen as a process of consumer demand rather than external provision, then the changes seen in the bone debris may be reflecting important changes in the economic functioning of the developing town. What we may be seeing is the emergence of a substantial element in the town's population with disposable wealth, by the 10th century probably largely expressed as coinage, which they could use to obtain commodities additional to the staple food resources. The influence of such an element in the population would have been quite different from the ruling elite which, it has been suggested above, largely controlled the movement of resources in the York area in the 8th-9th centuries. For instance, a moneyed 'middle class' of merchants and craftsmen would have had a freedom of economic function which their maintained predecessors would have been denied. It could be argued that the rapidly-growing town would have had difficulty in feeding its population, thus putting pressure on the food supply, and in this model the utilisation of locally-available river fish might be seen as a response to food shortage. In fact, it is unlikely that freshwater fish could have made much of a difference to the town's food supply in bulk terms, although individual households might have been grateful for the occasional basket of mixed cyprinids. Any such pressure is more likely to have been manifested as a change in the husbandry of cattle, which were, of course, the main source of meat. Depending on the relative value of meat and cereals, this could have taken the form of retaining plough cattle, in order to maximise cereal production, thus increasing the modal age at death of cattle slaughtered in the town, or of disposing of relatively young cattle to slaughter, thus maximising meat production in the short term, at the longer term expense of cereal production. This latter strategy was certainly adopted in some parts of England in the 16th and 17th centuries in a response to urban demand for meat, and in some places legislation had to be enacted in order to prevent the stock of plough-oxen from being seriously run down in pursuit of short-term profit. In fact there is no evidence for either response in the 10th century material from Coppergate, nor for any other change in exploitation of wild or domesticated resources which could be explained in terms of a shortage of food.

Discussion

The 8th to 11th centuries saw many changes in York, both in the appearance of the city and in its economic functioning. It is a moot point whether we should refer to York as a town or city in the 8th century. Certainly it appears to have been a polyfocal settlement, perhaps with centres around Fishergate and the Roman *principia*, but mere nucleation of population alone cannot, of course, justify the attribution of urban status. Though the Anglian settlement at Fishergate may have resembled urban occupation in terms of its ecology, Kenward and Allison (this volume) have shown that even a relatively small settlement may develop the suite of habitats necessary to constitute an 'ecologically urban' environment. The difficulty which we face when trying to understand the biological remains from Fishergate is the lack of a coherent theoretical framework onto which to fit the empirical data. The Anglo-Scandinavian period is easier, in that York was becoming something recognisable as a town, and the data can be understood by analogy with what we know of the functioning of other ancient and modem towns. This gives at least the illusion of objective interpretation. Where is the analogy for 8th century York? We have little idea about the extent, population, or function of the settlement, and

Table 13.2 An attempted correlation of dietary diversification with market development in Anglian to Anglo-Scandinavian York

	Fishergate 8th century	Coppergate late 9th century	Coppergate mid 10th century	Coppergate late 10th/ early 11th century
Pig + Fowl + Goose *	12.2%	9.0%	14.9%	26.3%
Wild birds	few, almost none hunted	few almost wood pigeon	few, some golden plover	much more including 'game species'
Fish	mostly eels and cyprinids, some herring	mostly eels and cyprinids, some salmon and pike	mostly eels, cyprinids, herring, salmon, smelt, perch and pike	mostly herring, eel, and cyprinids, some cod and pike
	community possibly not free to trade for food resourses	poorly developed market with little 'gravity'	urban community diversifying diet by using locally available resourses	market big enough to draw in commodities from wide area by consumer demand

* as % (cattle + sheep + pig + fowl + goose frags)

have only a rather piecemeal historical record to which to turn.

It has been necessary to take a particular socio-economic model for 8th-9th century York in order to have some context in which to discuss the data from Fishergate. The model which has been used, that of a maintained and fairly closely-controlled trading settlement, is not inconsistent with what is known of the social relations and functioning of England in this period, and is consistent with the archaeological data from a number of sites (O'Connor forthcoming). The implications of accepting this model are that between the early 9th and late 10th centuries, the pattern of trade in resources in the York area changed from one centred on nodes of wealth and power to one based on a commercialised market operating through the developing towns. In the terminology developed by Smith (1976), it is a change from a dendritic pattern of trade, presumably with a down-the-line movement of commodities, to an interlocking central-place system, with York having different levels and degrees of economic interaction with other settlements, which in turn interacted at different levels with each other. In strictly substantivist terms, it is a change from a redistributional system to one of exchange. These trading models have largely been developed with regard to trade in artefacts, in particular with artefacts perceived to have high prestige or status value. It is, however, important not to forget that food was a traded bulk commodity, and therefore that any fundamental changes in the economic functioning of the settlement will have had an impact on the humble food debris, and thus on at least one component of the so-called environmental evidence from a site.

In the specific case of York, the similarities between the interpretation of the bone debris from Fishergate and from the late 9th century deposits at Coppergate suggest that the Anglian/Anglo- Scandinavian transition may not have been as drastic in economic terms as might otherwise have been thought. There was certainly a shift in the centre of population, and probably some change in the ethnic composition of that population, The gradual development of the town as an economic unit appears to have continued, though this continuity should perhaps be tested again when a sequence from the 8th to 10th centuries can be investigated in detail on another site or group of sites. There is, it must be admitted, a tendency in archaeology, and perhaps most especially in environmental archaeology, to treat diachronic change in a dataset as being the thing which must be sought out and explained, as if the material culture and ecology of a human community obeyed laws analogous to Newton's laws of motion and would thus only change direction or velocity if interfered with in some way. Culture and ecology may not be so conservative; perhaps we actually need to explain lack of change when it is encountered.

The 1980s saw considerable advances in our understanding of the origins of the medieval town and of pre-Conquest settlement patterns, insofar as we advanced from knowing virtually nothing to knowing just a little. It is important that the investigation and interpretation of biological remains is not left behind as the study of this period goes forward. The allocation of some data to 'environmental archaeology', as if to some separate discipline, is detrimental to the development of archaeology as a whole, most particularly for the 8th-11th centuries when the entire subject of the use of natural resources and their trading, and of the provisioning of the developing nucleated communities, is so fundamental. This is a topic which needs a fully-integrated investigation, not merely in lip-service, but in practice. The work which has been undertaken to date in York has certainly benefitted from close co-operation between specialists in all fields of archaeology, and the same approach must be strongly recommended elsewhere.

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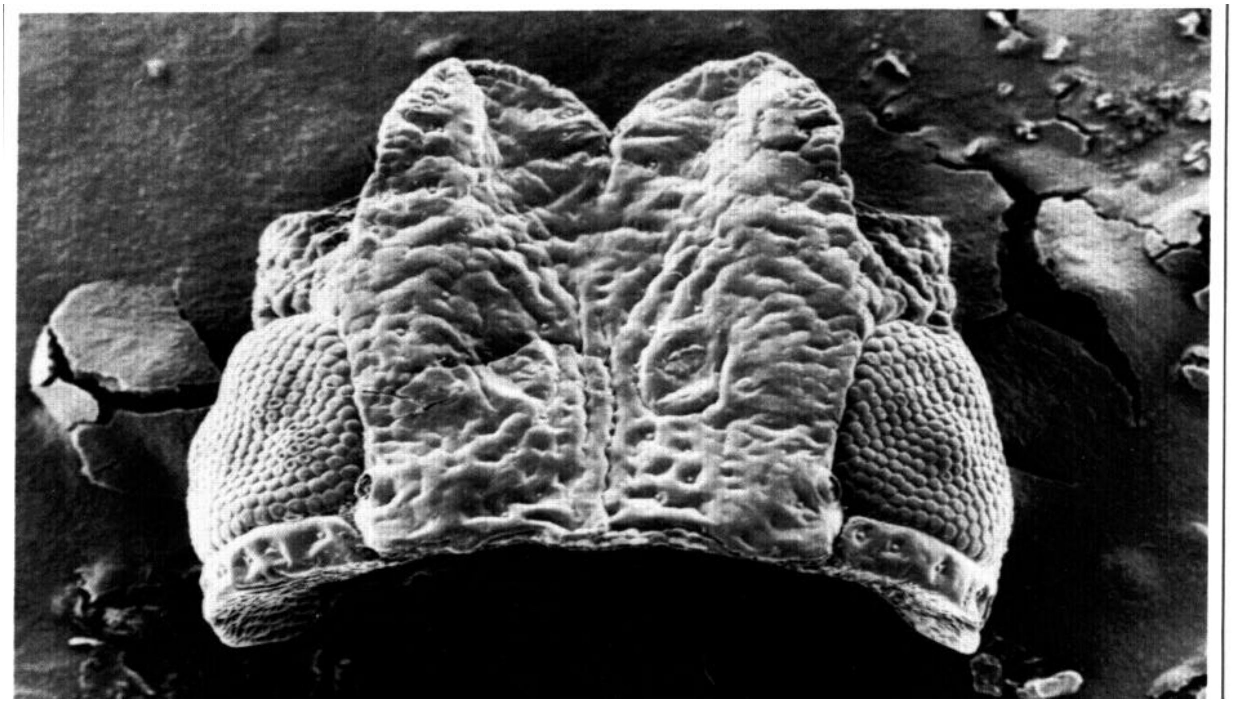
ENVIRONMENT AND ECONOMY IN ANGLO-SAXON ENGLAND

This collection of papers was given at a conference at the Museum of London in 1990 and provides up to date information on a wide range of environmental issues in Anglo-Saxon archaeology.
The articles, dealing with urban and rural topics, address both economic and environmental premises. Archaeological questions concerned with post-Roman continuity in the landscape, trade, agricultural surplus, markets, social hierarchy and the social and economic role of individual sites are tackled, using environmental evidence.
The papers combine old and new evidence, mainly botanical and zoological, within an intellectual framework that has led to a reinterpretation of the data. The articles cover the period from the 5th to the 1lth centuries and include York, Southampton, London, Lincoln, Wessex, Stafford, Raunds, West Cotton, Wicken Bonhunt, West Stow and other sites in their discussions. Two of the papers consider woodlands - one from a documentary perspective and the other using dendrochronology and the archaeological resource.
The volume is divided into two parts, each introduced by a paper that considers the archaeological framework for the period, suggesting how environmental studies might contribute to Anglo-Saxon archaeology.
It will be of interest to both environmental archaeologists and Anglo-Saxon specialists.



Magnified head of the psyllid bug - Livia juncorum.

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