The Zooarchaeology of the Anglo-Saxon Christian Conversion: Lyminge, a case study

PhD Archaeology

Department of Archaeology, School of Archaeology, Geography and Environmental Science

Zoe Knapp

May 2018

Declaration of original authorship

Declaration: I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Signed,

Zoe Knapp

Table of Contents

List of Figures

List of Tables

Appendix 3

Abstract

The study of human-animal relationships in their myriad forms has the potential to answer some of the most fundamental questions relating to human behaviour and cultural identity. It is therefore surprising that zooarchaeology has rarely been utilised to its full potential to inform on the significant changes that took place over the course of the Anglo-Saxon period, with analysis seldom moving beyond socio-economic interpretations of animal husbandry. The large, well-dated zooarchaeological assemblage from Anglo-Saxon Lyminge, Kent, offers an exceptional opportunity to examine how human-animal relationships were shaped and reconfigured by key historical processes encapsulated by a 500-year occupation sequence. Lyminge is a high-status Anglo-Saxon settlement of international importance, incorporating a fifth – sixth century settlement, which developed into a seventh century hall-complex, and finally evolved into a spatially distinct documented eighth – ninth century pre-Viking monastery (Thomas 2017).

This thesis presents the results of the zooarchaeological analysis and interpretation of the faunal assemblage from Lyminge, adopting an integrated multi-disciplinarily approach which includes the results of a small-scale isotope study of the faunal remains. Thesis data is contextualised within a broader synthesis of archaeological and zooarchaeological data from contemporary sites to assess how shifts in animal husbandry, attitudes to the wild, treatment of companion animals and the consumption of food, reflect changing world-views on both a site-based and regional scale.

The results of this analysis indicate that there were distinct diachronic trends in species representation and, in the case of domesticated animals, management strategies, that coincide with Lyminge’s transformation from a pre-Christian royal *vill* into an affluent monastic community. These transformations are particularly evident in the shift from the consumption of large quantities of pigs in the fifth – seventh century to the consumption of high numbers of chicken in the eighth – ninth century, a change that is accompanied by more intensive sheep husbandry and a new focus on arable agriculture. Such dramatic shifts in dietary patterns identified through innovative zooarchaeological research reflect wider changes in cultural practices and religious affiliations of the Kentish elite at a pivotal moment in the formation of Christian kingdoms throughout Anglo-Saxon England.

Acknowledgements

The completion of this thesis is due to the assistance and support of a great number of people, beginning with my supervisors. Firstly, many thanks go to Dr Gabor Thomas, my principle supervisor and Director of the Lyminge Archaeological Project, for his support, guidance and valuable insight. Thanks also to Dr Aleks Pluskowski, for his zooarchaeological supervision as well as Prof Grenville Astill for numerous insightful discussions. A great deal of gratitude goes to Prof Naomi Sykes, for her generosity, collaboration and continued belief in me. A special thank you also goes to Dr Alexandra Knox, for being my PhD guide and a fantastic friend.

This thesis was made possible by a fully funded award from the Arts and Humanities Research Council as part of the Lyminge Archaeological Project, for which I am very grateful. The opportunity to undertake isotopic work would not have been feasible without Dr Gundula Müldner and Tina Moriarty, for which I am very thankful. Much appreciation also goes to the members of the AHRC Cultural and Scientific Perception of Human Chicken Interactions Project, for their collaborative role in analysing the Lyminge chickens.

There were many others who have kindly provided me with unpublished data, access to the bones themselves and helpful discussion, for which I am greatly appreciative: Dr Robin Bendrey, Dr Simon Maslin, Prof Pam Crabtree, Prof Greger Larson, Dr Umberto Albarella, Dr Kris Poole, Dr Matilda Holmes, Dr Holly Miller, Dr Tyr Fothergill, Dr Julia Best, Dr Alison Foster, Dr Rebecca Reynolds, Dr Martyn Allen, Dr Poly Baker, Enid Allison, Jane Richardson, Sarah Lambert-Gates, Dr Joanne Cooper, Charlotte Scull, Dr Matt Austin and James Rackham. My time working with the Lyminge Archaeological Project has been hugely fun and enlightening and I extend an enormous thank you to all of the team and our volunteers. There are also several fantastic colleagues and friends, without whose relentless support I would have been lost: Polly Tudball, Nicola Sandford, Cheryl Woodhouse, Lynda McCulley, Ann Morgan, Lesley Lord, Rachel Helsby, Eleanor Saxon and Katie Gibson.

Huge thanks go to my wonderfully supportive family, who have always been a pillar of strength and source of motivation. Finally, and by no means least, I am forever grateful to James Westoby whose patience, love and support has known no bounds. This thesis would not have been possible without him.

Chapter 1 Introduction: Background and research rationale

1.1 Introduction

This thesis presents a detailed synthesis, analysis and interpretation of the faunal assemblage from Lyminge, Kent. The aim of this research is to move beyond the traditional socio-economic interpretation of zooarchaeological assemblages and assess the diachronic shifts in worldview that accompanied the Christian conversion and how this affected human-animal relationships at Lyminge within the wider context of Kent and Anglo-Saxon England. This will be achieved through the integration of zooarchaeological and wider (both inter- and intra-disciplinary) evidence.

The Anglo-Saxon period has been characterised as one of dynamic transition and change (Faith 1997; Holmes 2014a; Knox 2012:1) and the conversion of communities in Anglo-Saxon England to Christianity is one of the most significant events in post-Roman history (Knox 2012:1). The social, economic and political impetus behind the re-adoption of Christianity across Anglo-Saxon England has been studied at length, primarily through historical sources, changing settlement patterns and trade and exchange patterns of material culture (Mayr-Harting 1991; Higham 1997; Carver 2003; Blair 2005; Yorke 2006). It is now commonly recognised that zooarchaeology also holds the potential to inform on changes in socio-political organisation throughout the Anglo-Saxon period, as demonstrated by research by Crabtree (2010; 2012) and Sykes (2006), who have linked changes in animal management during the Anglo-Saxon period to an increased commercialisation of arable farming and wool production in addition to changing cultural attitudes. Faunal studies can also note changes in the procurement and consumption of particular animal species, and how such patterns can be used to characterise site settlements (for example see, Dobney *et al.* 2007; O'Connor 2013b; Sykes 2007a; 2007b; Albarella 2006; Ervynck 1997; Dobney and Jaques 2002). Whilst it is important and necessary to address questions of economics and subsistence strategies through the analysis of past husbandry regimes, faunal studies also present the archaeologist with an opportunity to shed light on some of the most fundamental issues of past societies: human thought and behaviour (Sykes 2014). Increasingly zooarchaeologists have been turning their attention to the symbolic interpretation of faunal remains, addressing questions beyond economics through a holistic approach to the data (see Maltby 2002, 2006; Hamilakis 2003; deFrance 2009; Sykes 2007a;2011;2014; Poole 2011; 2013; 2015; Russell 2012; Morris and Jervis 2011:75). Despite these recent developments, however, many zooarchaeological reports, particularly those concerning the Anglo-Saxon period, continue to primarily focus on socio-economic questions based on the numerical value of livestock and livestock size (Dobney *et al.* 2007; Crabtree 2010; Holmes 2014a; Jones and Randell 2015).

This thesis will add to the growing body of research taking a nuanced and holistic approach to the interpretation of the Lyminge zooarchaeological assemblages by considering the evidence as more than a passive reflection of changing economic circumstances, but rather as a window into the active role played by royal estate centres and monastic establishments in investigating the natural world and its resources, at a time of significant social change.

1.2 Background to the Thesis

This thesis forms part of the Arts and Humanities Research Council (AHRC) funded 'Lyminge Archaeological Project'. Lyminge, Kent, is a key site for the understanding of the social dynamics of the Anglo-Saxon conversion, as it presents a unique opportunity to explore the development of both an early Anglo-Saxon *Royal Vill* and historically documented double monastery, founded in the seventh century (Thomas 2013: 109).

The significant size and national importance of the Lyminge faunal material-particularly the fish assemblage, which is one of the largest assemblages yet recovered from a rural settlement site in Anglo-Saxon England - was recognised at an early stage of the Lyminge Archaeological Project (Thomas 2013: 115; Reynolds 2008; 2015). Therefore, this PhD was designed in order to gain a zooarchaeological perspective on the dynamics of the settlement through the integration of the exceptional faunal assemblage with wider multi-disciplinary evidence. This thesis will inform on diet, animal husbandry, food production and consumption, as well as providing indications of cultural identity and status accompanying a changing Anglo-Saxon worldview[1] within the regional context of Kent.

1.3 Research Themes in Context: Background and Rationale

Agriculture was the backbone of Anglo-Saxon economy. The majority of Anglo-Saxons were involved with farming in some way, from the upper echelons of society who owned the land that animals were grazed upon, down to the average Anglo-Saxon, who engaged more directly with the animals and arable produce that would either be sold or made into products for local or home consumption (Banham and Faith 2014:2). Animals represented more than calories and protein, they were crucial to the functioning of society and could reflect status, wealth and prestige, and there was deep symbolism attributed to particular species (Twiss 2012). Therefore, the way that people were engaging with animals, in their multifarious forms can act as a barometer from which we can interpret past human thought and behaviour (Sykes 2014).

It is because the Anglo-Saxons were farmers that in most cases, zooarchaeological assemblages from this period are dominated by cattle, sheep and pig, and as such the majority zooarchaeological reports have focused on socio-economic importance of these three, dominant, species. The discipline of zooarchaeology has strong foundations in processual archaeology, from which many of the methods and influential texts still used today were created (e.g. Bökönyi 1970; Binford 1978; 1981; Brain 1981; Grayson 1973, 1979; Payne 1973; Ringrose 1993; Lyman 1987; Shipman 1981; Sykes 2014:2). It may be that the economic focused nature of many zooarchaeological specialist reports stems from the theoretical and methodological development of this discipline (Poole 2011:12-13). However, an increasing number of zooarchaeologists (and non-zooarchaeologists) are producing new and insightful questions that go beyond the traditional questions (e.g. Albarella and Serjeantson 2002; MacKinnon 2004; O'Connor 2013a; Outram *et al.* 2009; Pluskowski *et al.* 2011;

---

[1] The term 'worldview' should be seen as broadly descriptive, in an attempt to discuss the *potential* ways in which the Anglo-Saxon peoples of Lyminge perceived themselves and animals within their cultural environment. Therefore, within the context of this thesis, the term 'worldview' refers to shared perceptions of regional identity and the ways in which they were expressed in Anglo-Saxon Lyminge.

Poole 2011; 2013; 2015; Reynolds 2015; Russell 2012; Twiss 2012; Sykes 2005; 2010; 2014) paving the way for a more holistic approach to the study of animal bones from archaeological sites.

The analyses of Anglo-Saxon faunal assemblages have evolved considerably since Juliet Clutton-Brock (1976) wrote about the 'the animal resources' in Anglo-Saxon England based on the only five sites with both available zooarchaeological assemblages and sufficient accompanying information. Clutton-Brock (1976:389-90) concluded that Anglo-Saxons were predominantly farmers with the evidence to suggest that there was also close interaction between humans and the wild, and began to explore the important symbolism of human interactions with their natural environment as reflected in Anglo-Saxon literacy and art. Subsequently there have been numerous excavations that have produced Anglo-Saxon assemblages that provide a sizeable body of data from which to explore and contextualise the research questions outlined in this thesis.

One of the key sites that has shaped the field of Anglo-Saxon zooarchaeology is early Saxon West Stow, Suffolk, which produced a large, three phased zooarchaeological assemblage analysed by Pam Crabtree (1989). Since this report Crabtree (1989; 1994; 1996; 2010; 2012; 2013) has written extensively on Anglo-Saxon zooarchaeology, taking a regional based approach to analysis focusing on East Anglian settlements. The general evidence suggests that between the early to middle Saxon periods there was shift from relative self-sufficiency to one of specialised wool production on high-status sites such as Brandon, Suffolk, in East Anglia (Crabtree 2012b; Crabtree and Campana 2014). Crabtree (2012) has also highlighted the benefits of a site-based approach with the assemblage from middle Saxon Wicken Bonhunt, Essex, which has been interpreted as a site specialising in the production of pork. Sue Stallibrass (1995) also takes a regional approach to analysis, concentrating on the northern Anglo-Saxon region and concluded that cattle were more common on northern and upland areas (Holmes 2011:20). This paper is particularly significant as it was the first to suggest that species diversity increased following the Roman period, as well as highlighting the increased consumption of fish (Holmes 2011:20). Jennie Coy (1982) has produced a regional synthesis on Anglo-Saxon Wessex, specifically looking at *Hamwic* (Southampton), Hampshire, and Ramsbury, Wiltshire, and the nutritional affects different species may have had on diet. Bruce Levitan (1987) reviewed the faunal remains from a number of sites in south-west England using zooarchaeological signatures to distinguish between site types as well as incorporating the effect environmental factors have on the choice in livestock. Polydora Baker (2002) has also produced a comparison of six sites from Norfolk and Lincolnshire. More recently Terry O'Connor (2010;2013) has published papers summarising regional and diachronic variation in animal husbandry for the three main domesticates covering the fifth – eleventh centuries, focusing primarily on eastern and southern Anglo-Saxon sites, with the exception of Wroxeter (Hammon 2005).

Edited volumes such as Rackham (1994) drew together a range of specialist zooarchaeological, archaeobotanical and environmental archaeological papers to examine environment commodity from the early – late Saxon period, which provided useful models to employ when interpreting faunal remains in light of the shifting nature of a settlement. Further to this, recent papers have begun to look at how faunal signatures of specific taxa, or groups of taxa, such as wild birds, may be used to characterise Anglo-Saxon sites (Cherryson 2002; Dobney and Jaques 2002; Sykes 2005; Wallis 2017). Similarly, through the examination of the representation of wild fauna, particularly deer, Naomi Sykes (2007) has revealed changing attitudes to worldview in line with wider religious and socio-economic change from the Saxon period through the post-Conquest.

There have also been a number of site-based analyses completed, a selection of which has been included as comparison data for the purposes of this thesis (Appendix 1 and 2). Of particular note is Keith Dobney *et al.*'s (2007) analysis of faunal remains from the middle – late Saxon high-status site of Flixborough, North Lincolnshire. This highly detailed volume provides a comprehensive overview of zooarchaeological methods employed to study a large assemblage, and thorough regional contextualisation successfully showed how zooarchaeological patterns can be a reflection of the changing nature and character of Anglo-Saxon settlements. Increasingly, Anglo-Saxon zooarchaeological studies have become multi-disciplinarily, drawing on evidence from archaeobotany, landscape studies metalwork and visual arts to explore regionality, changing identity and site signatures, beyond questions of economics (e.g. Banham and Faith 2014; Dickinson 2005; Holmes 2015; Poole 2011; 2013; 2015; Rippon *et al.* 2014; Sykes 2010; 2011; 2014; Wallis 2017).

More detailed methodological studies, such as that of animal palaeopathology demonstrates further the beneficial nature of research beyond the 'traditional' zooarchaeological questions, highlighting trauma and care of animals throughout various time periods (e.g. Bartosiewicz 2013, MacKinnon 2010; Vann and Thomas 2006).

Isotopic studies are also starting to shed light not only on what humans ate, but also what the animals were eating, from which we can infer patterns of husbandry and management (Britton *et al.* 2008; Mays and Bevan 2012; Müldner and Richards 2005; O'Connell and Hull 2010) in addition to identifying preferential treatment of select animals, such as dogs and cats (Poole 2010b; 2015; Askew 2017; Sykes 2014). Increasingly anthropological studies are also being sought as a guide by which to understand and interpret Anglo-Saxon society, as they are arguably closer in nature to Anglo-Saxon society than our modern Western society, although caution should be applied to avoid direct comparison (e.g. Abbink 2003; Crate 2008; Morris 2008; Sykes 2014:149-5; Twiss 2012).

Sykes (2007), Poole (2011) and Holmes (2011; 2014) have published detailed but broad syntheses of the available zooarchaeological data, focusing on the late fifth – eleventh centuries. Sykes (2007) demonstrated that historical and zooarchaeological data can be successful integrated to examine site-based changes in human-animal relationships at a time of significant social upheaval, taking both English and Continental data into consideration. Holmes's (2011;2014) thesis and subsequent publication provided a useful syntheses of Anglo-Saxon zooarchaeological data focusing primarily on livestock and questions of socio-economics, with a brief consideration of wild signatures and how they can be used to characterise sites. Whilst highly engaging, her focus was predominantly on changing provisioning strategies throughout the duration of this period and only briefly touches on the social impetus behind changing husbandry regimes and trade networks. Kris Poole's (2011) thesis complements the work of Holmes (2011; 2014), filling some of the lacunas concerning the social and symbolic value attributed to animals during the Anglo-Saxon period. Poole (2011) successfully highlights ways in which zooarchaeological research can begin to inform on Anglo-Saxon worldview, providing a useful and broad baseline from which this thesis hopes to build upon.

There has been little attempt to synthesise the zooarchaeological data from Kent and its surrounding counties (Thomas 2013b: 23), an issue that this thesis will begin to address. This is partly a result of the limited number of large scale, good quality excavated faunal assemblages from rural Anglo-Saxon sites in southeast England. However, the number of zooarchaeological reports for the south-east is slowly on the rise, as a result of better excavation sampling strategies (Appendix 1 and 2) (Thomas 2013b: 23). Sites such as Sandtun, West Hythe, Kent and Bishopstone, Sussex, demonstrate that throughout the Anglo-Saxon period the inhabitants of these communities were exploiting a wide resource base, taking advantage of coastal plains, Downland environments, estuaries, and the Weald, in addition to practicing deep-sea fishing from an earlier stage than previously documented in this period (Barrett *et al.* 2004; Hamilton-Dyer 2001; Thomas 2013; Poole 2010b; Reynolds 2010; Thomas 2013b: 23). Studies are only just beginning to shed light on the extent to which Kent is similar or distinct in to other areas of Anglo-Saxon England and contemporary sites on the Continent, particularly with relation to its zooarchaeological and environmental evidence (e.g. Bendrey *et al. in prep*; Jones and Randall 2015; Thomas 2013; 2017; McKerracher 2017; Maslin 2017; Broadley 2017; Welch 2007; Harrington and Welch 2014) and this is an area to which this thesis hopes to contribute to.

1.4 Anglo-Saxon cultural background: a zooarchaeological perspective

It is essential to outline current perceptions and arguments concerning pre- and post-Christian Anglo-Saxon England to set the zooarchaeological analysis of Lyminge against the wider backdrop of ‘changing contexts of belief’, and the social impetus behind such changes (Carver 2010:8). The discussion below will highlight general trends in zooarchaeological patterns that elucidate husbandry and production patterns from the early – middle Saxon period, in addition to beginning to exploring ways in which zooarchaeology can further our understanding of human behaviour.

1.4.1 Early Anglo-Saxon period, c. AD 400-600

The end of the Roman period had a significant impact on the agricultural economy, as there was no longer a need to supply urban populations and armies with surplus production through markets, tax and rent. Therefore, the emphasis in husbandry shifted towards a more localised economy, based on self-sufficiency and mixed agriculture, with little evidence for social hierarchy or agricultural specialisation (Sykes 2006a:57; Poole 2011:93; Holmes 2011:4). Poole (2011: 93-4) has highlighted this shift in his synthesis of data from early Saxon sites (see Poole 2011, Table 1.1. and Appendix 3.1, for a full list of sites). The majority of sites demonstrate a range of age profiles in the herds of domestic ungulates, indicating a range of mortality rates, which indicate self-sufficient settlements, with some evidence for the preference of younger 'prime meat aged' animals (Holmes 2014a:12; Poole 2011:93-4). Similarly, following the withdrawal of the Roman Empire from Britain in AD 410, Sykes (2010; 2011;2014) has demonstrated that there was a significant decline in the hunting, fishing and wildfowling culture that had developed over the previous four centuries, expressed by a dearth of wild taxa on early and middle Saxon sites.

In some respects, it is unsurprising that so many of the zooarchaeological reports from this period have taken a purely economic approach in their interpretations given that, as in the Roman period, the three main domesticates dominate the early Saxon zooarchaeological record, as well as commonly occurring in Anglo-Saxon law codes and charters concerning animals (Hagen 2010). Place-name evidence provides a good indication of the types of animals present in Anglo-Saxon England, and the majority of animal-based place-names relate to domestic species or activities associated with them, with relatively few wild mammal place-names in comparison (Everitt 1986; Yalden 1999:131-6). Evidently the primary focus of Anglo-Saxon economy was based around farming domestic species, with the hunting and procuring of wild species being less common, a fact that is supported by the zooarchaeological record (Holmes 2011:7; O'Connor 2011; 2013; Sykes 2014:43). The minimal exploitation of wild fauna in the early Anglo-Saxon archaeological record is intriguing when seen in the light of the important symbolic role they played, as evidenced by their heavy incorporation in Salin's Style I art and the later Salin's Style II, that ornamented a wide variety of objects (Pluskowski 2010:103). Lévi-Strauss (1966) has asserted that animals are not only good to eat but are also 'good to think', a factor that clearly influenced what was, and was not, consumed within early Anglo-Saxon culture.

1.4.2 Middle Anglo-Saxon period, c AD 600-850

Towards the end of the early Saxon period there is evidence for increasing social stratification, visible in the emerging sixth – seventh century 'great hall complexes' on sites such as Lyminge (Thomas 2017), Sutton Courtenay, Oxfordshire (Hamerow and Brennan 2015) and Yeavering, Northumbria (Hope-Taylor 1977). By the sixth century there were significant cross-channel connections between Kent and Francia, which later eighth century charters attest to (Brookes 2007:809; Kelly 1992). The middle Saxon period saw the crystallisation of kingdoms and the formation of aristocracies, by AD 700 there were seven principle English Kingdoms: the West Saxons, the South Saxons, Kent, the East Saxons, East Anglia, Mercia and Northumbria (Arnold 1999), which were relatively politically stable (Hinton 1990:60). While the previous period has been described as a kinship-based society based on reciprocity, the new political stability is argued to have facilitated the establishment of a tributary based society, reflecting the new, developing, social hierarchies (Hodges 1988:4; Holmes 2014a:13). Through this system of tribute payments, the ruling elite were able to take control of the redistribution of agricultural surplus through the collection of food rents at estate centres. Historical sources reveal that kings and thegns collected tolls on traded goods and gave out tax exemptions, and a number of clergy and religious institutions were recorded to be exempt from taxes within charters (Holmes 2014a:13; Whitelock 1979). Artefacts and contemporary documents also attest to increasing trade with the Continent, building on cultural exchange from the late fifth century (Blair 2005:49-50).

During this period of significant social change, St Augustine re-introduced Christianity to Kent in AD 597, and the subsequent two – three hundred years saw the gradual conversion of Anglo-Saxon England, led by the upper echelons of society (Blair 2005; Yorke 1990). Historical sources stress the pivotal role royal courts played in the spread of monastic culture throughout the Anglo-Saxon kingdoms (Yorke 1999:122-8; 2006:161-70; Thomas 2013a: 112). There has been much archaeological debate questioning the association between *royal vills* and the foundation of monastic establishments (for instance see, Morris 1989:131-3; Pestell 2004: 63-4; Blair 1992; 2005; Loveluck 2009:145; Thomas 2013a: 112). Current research indicates that regional diversity had a strong part to play in the character of royal centres of power during the period of monastic establishments (Thomas 2013a: 112). Of particular note is the region of Kent, which is one of the only regions to have a distinct network of *royal vills* established within the landscape by the later sixth and seventh centuries, some of which established royal monasteries during the seventh century – typified by the Frankish model of double houses (Everitt 1986:116-7; Blair 2005: 278; Brookes 2011; Thomas 2013a:113). Lyminge is recorded to have played host to mixed-sex monastic community from *c*. AD 633, when Æthelburh, daughter of King Æthelbert of Kent, is said to have been given a grant of land from her brother King Eadbald, on which to found a monastery and rule over as an abbess (Kelly 2006:101-102).

These early monasteries played a multi-faceted role; providing places of refuge in times of war, places of education, places to have ceremonial and political gatherings and feasts as well as being religious institutions (Blair 2005:76-7; Foot 2006:236). Counter to what contemporary hagiography suggests, a diversity of rules guided daily life or diet in these early monastic establishments, a fact that early monastic zooarchaeological assemblages clearly demonstrates, and that will be explored further within this thesis (Murray *et al.* 2004; Blair 2005:80; Dobney *et al.* 2007:220; Huntley and Rackham 2007: 121; Thomas 2013a: 138).

1.4.3 The zooarchaeology of ecclesiastical sites

Much of the published zooarchaeological work on this period focuses on rural and secular high-status sites or the emergence of urban *wics* as centres of trade and commerce towards the end of the middle Saxon period (Crabtree 1989; Bourdillon 1994; Holmes 2014a; Rackham 1994). However, increasingly more consideration is being given to ecclesiastical sites and their role in the wider economy (Crabtree 2010; Jones and Randall 2015; Mulville 2003; Poole 2011; O'Connor 2013b; Sykes 2007a). This bias is in part due to the much smaller number of excavations that have produced faunal assemblages of a state and size to be included in analysis and interpretation (Holmes 2011:183). The available (albeit limited) data indicates that in *some* cases the occupants of these early ecclesiastical communities were practicing a level of self-sufficient husbandry akin to that on contemporary rural sites, such as that identified in Phase III at St Augustine's Abbey, Canterbury

(Jones and Randall 2012:311), Hartlepool, Lincolnshire, (Rackham and Huntley 2007), and Eynsham, Oxfordshire (Mulville 2003). However, at other sites ecclesiastics had a diet and lifestyle similar to those living at elite secular centres, consuming a wide range of fauna, including a higher quantity of marine fish and domestic birds. Such patterns were identified in Wearmouth and Jarrow, Co. Durham (Noddle 2006) and the potential monastic phases of Brandon, Suffolk (Crabtree and Campana 2014) and Flixborough, North Lincolnshire (Dobney *et al.* 2007; Sykes 2005: 86; Poole 2011:161-2; Holmes 2011:183). Ervynck (2004: 216-217) and Dobney *et al.* (2007: 224) suggest ecclesiastical sites might be characterised by a dearth of game species and pork, in addition to higher numbers of fish, domestic fowl and sheep (Holmes 2011:51). However, new data from this thesis throws such broad stroke characterisations of ecclesiastical sites into question.

Higher quantities of bird and fish remains at monastic sites have often been linked with the influence of St Benedict's Rule, which incorporated dietary laws prohibiting the consumption of quadrupeds, from which only the weak and sick were exempt (Ervynck 1997:73; Dobney *et al.* 2007:231). Although there are no direct historical references to the diet of these early Christian communities, it is likely that religious institutions, such as Lyminge, adhered to *regula mixta*, a selection of different traditions governing daily routines and diet for the ordained and also secular guests (Foot 2006:52). While the Benedictine reform did not take place until the tenth century, copies of the Benedictine rule were in circulation during the eighth and ninth centuries and arguably played a role in governing diet (Foot 2006; Frantzen 2014), the influence of which may be seen within the zooarchaeological record.

1.4.4 Summary

To date, historical and archaeological research has contributed significantly to forming an understanding of the multifaceted and nuanced social and political changes that occurred in Saxon England: from the collapse of the Roman Empire in the early fifth century, to the establishment of self-sufficient kin-based groups, development of a hierarchy with increasingly complex trade and exchange networks based on reciprocity and the gradual development of markets and taxation through food renders in the middle Saxon period (Holmes 2011; 2014). Zooarchaeological studies have revealed evidence for the diachronic shifts in husbandry practices between the early and middle Saxon period, that were influenced by a range of factors, including the assimilation of Continental tastes into the existing Saxon culture and the introduction of Christianity (Blair 2005:50).

Over the last couple of decades there have been important advances in the zooarchaeological study of Anglo-Saxon assemblages, which have taken a more refined regional perspective and started to address new cultural questions in nuanced ways. Clearly, zooarchaeology can contribute in a meaningful way to the interpretation and understanding of these changes, as the treatment of animals reflect human responses to social change (Caplan 1997). Although the development of Anglo-Saxon zooarchaeology has predominantly taken place within a socio-economic framework this field is slowly being broadened to encompass what is now termed, ‘social zooarchaeology’ (Russell 2012). In addition to the consideration of traditional zooarchaeological questions that encompass assemblage taphonomy, formation processes and the quantification of bones, zooarchaeological analysis should also include the consideration of the active role of animals in the construction of human identity (Russell 2012; Sykes 2014). It is with this in mind that the research questions for this thesis were formed.

1.4.5 Research Questions

1. Can diachronic trends be detected in the assemblage and how can these inform an understanding of changes in the economy, cultural trajectory and ideology of Lyminge’s inhabitants structured through their relationships with animals?
2. To what extent do zooarchaeological signatures conform to Lyminge’s identity as an Anglo-Saxon royal centre?
3. Do attitudes towards animals change with the shifting status and role of Lyminge before and after the Christian conversion? Can this be detected in animal paleopathology and special deposits?
4. How can the Lyminge assemblage contribute to wider understandings of the deeper cultural and social significance of human-animal interactions and dietary practices in Kent specifically and Anglo-Saxon England more generally?

1.5 Summary of research design

Inferring past human behaviour and beliefs from the treatment of their animals requires the contextualisation of contemporary data to elucidate site based, regional and national patterns. In order to assess the diachronic changes in the Lyminge assemblage a holistic approach was required which began with the analysis of the Lyminge zooarchaeological assemblages from the 2008 – 2013 excavations by the author. Comparative zooarchaeological data were sought from published contemporary excavation reports sites in east, south east and southern England. Anglo-Saxon sites from the majority of northern and western England were not included within analysis, because these regions have been incorporated within a number of broad regional synthesis of zooarchaeological data, whereas sites from Kent, and neighbouring counties, have gone relatively unconsidered. Therefore, by being more discrete and focusing analysis on sites from the east, south-east and south of England it was possible to start building a more focused picture of life in a Kent during this period. Primary analysis of species representation, mortality profiles, butchery, pathology and anatomical skeletal representation was undertaken to gain an understanding of the changing nature of animal husbandry and production and diet. Interpretations of the data built on a general understanding of animal management practices at Lyminge, and a regional approach to the consideration of data was employed to assess the extent to which the Lyminge zooarchaeological signature was characteristic of Kent. It is important to note the varying nature of Anglo-Saxon settlements, and even when a site has been characterised as 'rural', 'secular' or 'ecclesiastical' there are more subtle nuances at play behind the construction of a sites identity.

It is widely recognised that archaeological excavation and the recovery of faunal and environmental material vary significantly between sites, as can the subsequent methods that are employed in zooarchaeological analysis (Lyman 1994; Poole 2011:21; Holmes 2013:35). The various advantages and disadvantages of different quantification techniques in zooarchaeology have been debated at length and will not be discussed here (for a summary see Lyman 2008). Within this thesis two quantification methods have been employed, the 'number of identified specimens' (NISP) and the 'minimum number of individuals' (MNI). NISP is the most broadly used quantification method as it enables data comparison between different archaeological sites, whereas MNI can be calculated in a range of ways by different specialists. Therefore, NISP was employed in this research, when comparing Lyminge to other sites, to enable the most efficient synthesis of data.

It was not possible to examine the seventh century phase of great-hall construction in isolation, due the minimal material excavated from the foundations of the halls. Most faunal material from the late fifth-mid-seventh century (Phase I) was excavated from SFBs and a cluster of pits, that were associated with the timber halls. As such, Phase I material was considered as one large assemblage to create a larger sample.

1.6 Thesis structure

As outlined in the preceding sections, this thesis is concerned with the contextualisation of the zooarchaeological assemblages from the two phases of settlement activity in Anglo-Saxon Lyminge. This data needs to be interpreted and understood in light of the wider social changes occurring in Kent and wider Anglo-Saxon society during a time of significant social change. In order to address the research aims, Chapters 2 and 3 summarise the Anglo-Saxon historical and archaeological evidence from Lyminge and Kent, outlining the background and rationale of the Lyminge Archaeological Project’s excavations and situating Lyminge and Kent within a wider national, and international framework. Chapter 4 defines the methods used to record and analyse the Lyminge zooarchaeological data as well as the methods employed in a pilot isotopic study of the three main domesticates. The results of the zooarchaeological and isotopic analysis are presented in Chapter 5, where the data are considered and presented systematically on a taxa-by-taxa basis, grouped by domestic mammals, wild mammals, domestic birds and wild birds. The following chapters present a thematic discussion of the data, exploring husbandry and production (Chapter 6), the representation of wild fauna and attitudes to the wild (Chapter 7), the presence of cats and dogs and their role as companion animals (Chapter 8), and an exploration of how consumption patterns change between the two phases of Lyminge settlement (Chapter 9). Finally, Chapter 10 will summarise the discussion chapters, providing conclusions and suggestions for further work.

Chapter 2 Lyminge: historical and archaeological background

This chapter provides a brief outline of the historical and archaeological evidence for Anglo-Saxon Lyminge as a contextual framework for this thesis. Lyminge is located 8km from the coast, in the Kent Downs, at the head of the valley of the river Nailbourne and presents a rare sequence of continued Anglo-Saxon occupation from the fifth – ninth centuries, as evident from high resolution dating available from both artefacts and radiocarbon dating (Thomas 2013; 2017; Maslin 2017:19).

2.1 Historical background and early archaeological investigations

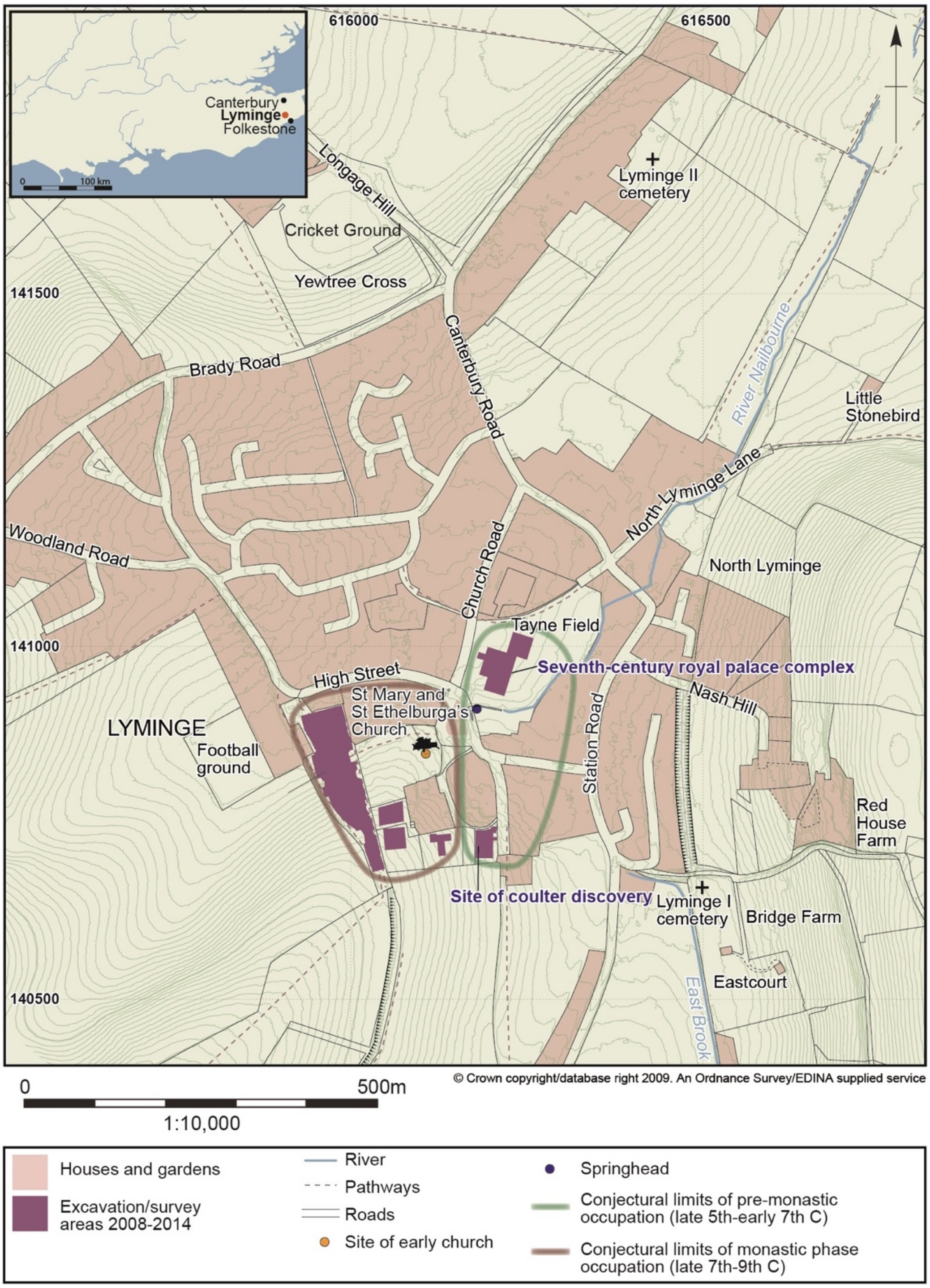
One of the first clues to Lyminge's history lies within the name itself; originally a district name combining the name *Limen* with the rare suffix, -*gē* (district capital), it highlights the settlements ancient role as a Kentish administrative centre, also known as a *Lathe* (Brooks 1989: 71-4; Kelly 2006:99; Thomas 2013:116). The district name *Limenwara* is derived from suggested connections with the river Limen, a coastal branch of the River Rother, near West Hythe, and the coastal settlement Lympne (Everitt 1986:20,342; Thomas 2013:116). It is still not clear how the Lyminge district came to be associated with a coastal settlement, although it has been speculated that royal and ecclesiastical administration within the *Limenwara* lathe was divided between Lympne and Lyminge (Brooks and Kelly 2013:28; Thomas 2013:116). To date there is no archaeological excavation from Lympne to indicate that it was connected in any way to Lyminge (Brooks and Kelly 2013:28; Thomas 2013:116; Williams 2002).

Lyminge has two pre-Christian cemeteries dating from the fifth – seventh century; Lyminge I, situated at the southern extremity of the modern village, c.280 metres south-east of the parish church, and Lyminge II, sited on a spur overlooking the River Nailbourne on the northern edge of the modern settlement (Figure 2.1) (Thomas 2013:118; Richardson 2005; Warhurst 1955). In addition to the prominent location of these cemeteries on routeways, both burial grounds contained inhumation graves with wealthy grave goods, attesting to the status and power of the individuals buried within the grounds (Thomas 2013:118-9; Warhurst 1955). Of particular note is a female grave containing Scandinavian derived gold bracteates, a form of prestige jewellery depicting Wodeninspired iconography. Behr (2000:27) has argued that such artefacts were not *just* items of jewellery and highlights the important role that women played in the development of royal power and religious legitimisation in Kent during this period.

Lyminge has a strong hagiographic tradition, as recorded in the *Legend of St Mildreth*, and the foundations of the minster are attributed to Æthelburh, daughter of King Æthelberht I of Kent and widow of King Edwin of Northumbria, in AD 633 (Kelly 2006:101; Thomas 2013:114; Yorke 1990:25-37). However, the earliest documented historical reference to Lyminge dates to AD 689, when King Oswine granted land in Lyminge, previously owned by the *cors* and containing an iron mine, to Abbot Hadrian's monastery of 'St Peter's' (St Augustine's), Canterbury (Brooks and Kelly 2013:28; Kelly 2006:105). This is the first in a series of royal charters extending into the mid-ninth century from which we can begin to build a picture of a religious community. The social composition of the community appears to have fluctuated through time, as sources indicate that sometimes Lyminge minster was presided over by a royal abbess whereas at other times it was ruled by a priest abbot (Brooks and Kelly 2013:30-31; Kelly 2006:105-113; Thomas 2013). Kelly (2006:104) notes that Lyminge, in common with other early Kentish monastic houses, enjoyed royal patronage and maintained a close connection with the founding royal dynasty throughout the eighth and ninth centuries.

The antiquarian Canon Jenkins was the first to unearth evidence of the core buildings of the Anglo-Saxon monastery in the late nineteenth century (Thomas, G. 2005; Kelly 2006:99). Although the exact nature of the masonry foundations remains ambiguous the generally accepted view is that Jenkins excavated the foundations of two separate Anglo-Saxon structures, a seventh-century minster-church superimposed by the south wall of the existing parish church; and another structure, with a western apse, just south-west of the Parish church tower (Kelly 2006:99; Thomas 2013:115).

Aside from the excavations of the two pre-Christian cemeteries (Warhurst 1955; Richardson 2005) there were no further archaeological discoveries in Lyminge until 2007, when Dr Gabor Thomas of the University of Reading initiated the Lyminge Archaeological Project.



© Crown copyright/database right 2009. An Ordnance Survey/EDINA supplied service

Figure 2.1: Map of modern day Lyminge, showing the location of excavations undertaken in 2008 – 2014 and the estimated extent of the sixth – seventh century and eighth – ninth century settlement foci (Lyminge Archaeological Project).

2.2 Lyminge Archaeological Project excavations

The Lyminge Archaeological Project was initially conceived to improve archaeological understanding of the documented monastery, building on the work started by Canon Jenkins. The Lyminge Project has since gone on to uncover the remains of a separate, and spatially distinct royal estate centre (Thomas 2017:97). The excavations are presented below by the chronological phases, the late fifth-mid-seventh century (Phase I) and the eighth – ninth century (Phase II).

2.2.1 *Phase I: late fifth – late seventh century AD occupation*

Occupation sequences dating from the later fifth – late seventh centuries were excavated during the 2010 and 2012 – 2015 excavation campaigns.

Excavations 2010: Rectory Lane

A large 30x30m excavation in a field east of the Rectory Lane site revealed evidence for a pre-Christian settlement, with four sunken-feature buildings (SFBs 1-4) and a post-built structure, dating between the later fifth – mid-seventh centuries. SFBs 1 and 2 produced rich assemblages of animal bone and pottery a wide spectrum of high-status items, including vessel glass. One of the stand-out discoveries was a 5.6kg iron plough coulter deposited in the base of SFB 1 (Thomas and Knox 2012; Thomas *et al.* 2016). The plough coulter is of special significance as the earliest evidence for heavy plough technology in Anglo-Saxon England. The context in which it was discovered returned a radiocarbon date of cal AD 570-650 (SUERC-35927, Table 2.1) (Thomas and Knox 2012; Thomas *et al.* 2016).

Excavations 2012 – 2015: Tayne Field

Excavations from 2012-2015 focused on Tayne Field, 200 metres north of the Rectory Lane site and north-east of the monastic core (Figure 2.2 and Figure 2.3). These excavations unearthed two successive, but chronologically distinct phases of early medieval occupation spanning the later fifth – seventh centuries. This has been identified as the core of the early Anglo-Saxon settlement focus (Thomas 2013:116; 2017:97). The excavations also unearthed a number of prehistoric features, most notably a Bronze Age barrow and a satellite Beaker burial. The evidence suggests that the barrow influenced the layout and spatial development of the earlier early Saxon settlement, as it was superimposed by a post-built hall from the fifth – sixth century occupation (Figure 2.3) (Thomas 2017:99-100), a practice identified in other contemporary contexts such as Sutton Courtenay, Oxfordshire (Hamerow and Brennan 2015; Semple 2013). The first phase of early medieval occupation comprised a further four SFBs (SFBs 5-8) dating to the fifth – sixth centuries (Table 2.1) (Thomas 2017:97-99). A number of non-structural features can be attributed to this phase. This includes a cluster of three pits in the western corner of Tayne Field, which produced significant volumes of midden material. Most notable was a large infilled hollow, with plan dimensions of *c.*18 metres north-south by 12 metres east-west, with a 2-metre-deep sequence, containing prodigious quantities of midden material in addition to evidence for industrial waste (Thomas 2017:99-103; Maslin 2017:55).

The early Saxon settlement was subsequently remodelled with the establishment of a series of monumental timber halls. The scale and construction of these structures closely resembles the ‘great halls’ that first emerge elsewhere in the Anglo-Saxon landscape *c.* 600 AD and are closely associated with centres of royal power (Thomas 2013:126; 2017:106-110). These structures comprise of three sequences (Hall sequence A-C), each of which was radiocarbon dated (Table 2.1). Hall A, excavated in 2012 represents a single building phase, whereas Hall B and C were both replaced sequentially (Thomas and Knox 2012; Thomas and Knox 2014; Thomas and Knox 2015; Thomas 2017). Associated finds of high-status glassware, metalwork, a board game piece and *opus signinum* attest to the importance of this phase as a royal residence complex (Thomas 2017: 107-111; Maslin 2017:55). The abandonment of these structures marked the end of the early Anglo-Saxon occupation sequence.

2.2.2 Phase II: eighth – ninth centuries AD

Excavations of the eighth-ninth century monastic centre began in 2007 with a series of test-pits to elucidate the archaeological context of the Anglo-Saxon monastic core identified by Jenkins (Figure 2.2) (Thomas 2013:128). Work continued in 2008 and 2009 with a number of open area excavations that uncovered extensive evidence for middle Saxon occupation within the outer precinct of the monastic settlement. This including structural evidence, boundary ditches and pit clusters organised into a series of distinct spatial zones for domestic habitation, agricultural processing and industrial activities (Thomas 2013:129). A radiocarbon date of cal AD 660-780 (SUERC-35934, Table 2.1) from the primary fill of the boundary ditch of the monastic settlement established a terminus post quem for the establishment of the monastic core (Thomas 2013:131).

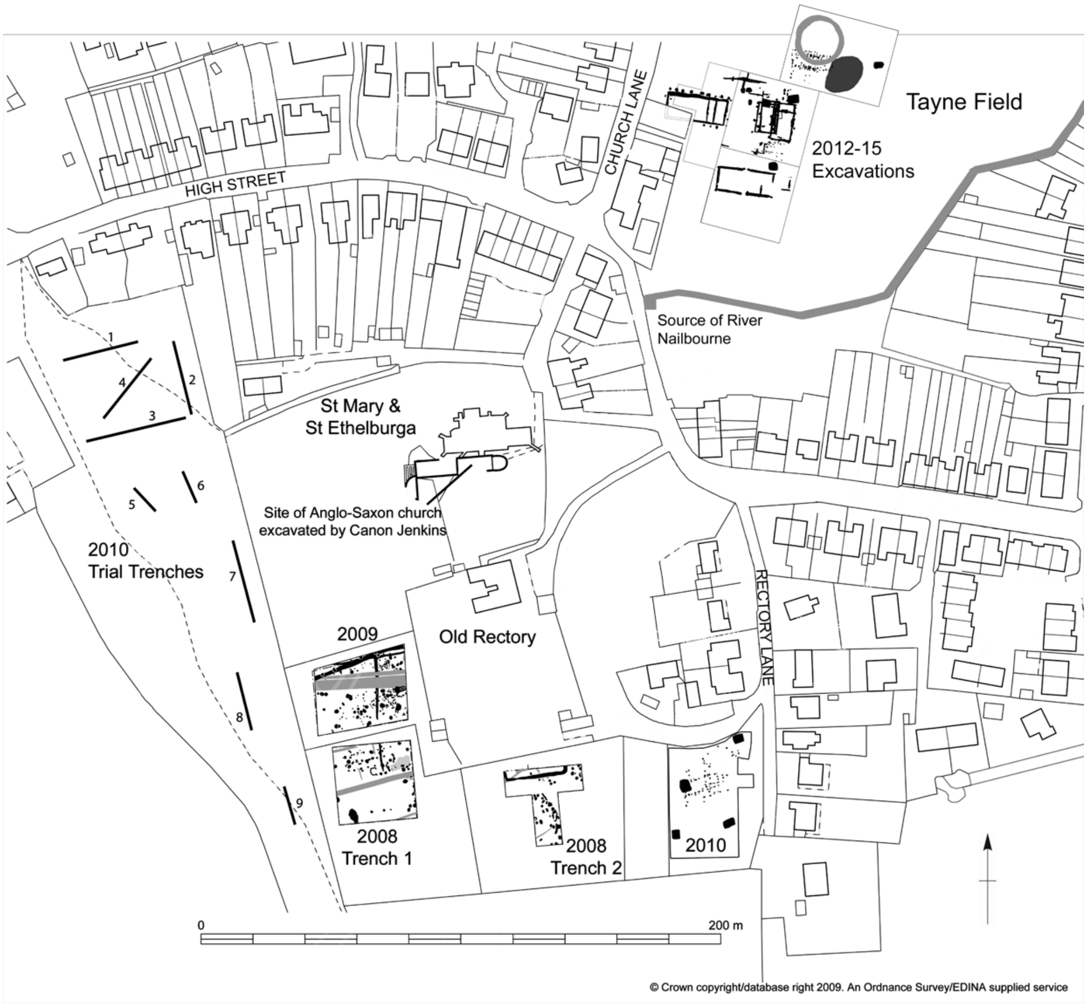


Figure 2.2: Lyminge site excavation plans from all seasons of excavation 2008 – 2015 in the context of the modern village (Lyminge Archaeological Project).

h

				Uncalibrated		Calibrated AD (IntCal 13)		
Oxford Ref	Site code	Context	Association / structure	C14 BP	± BP	from	to	%
OxA-31749	LYM08	656	Pit 539	1313	26	656	768	95.4
OxA-31750	LYM08	12	Pit 11	1322	27	653	767	95.4
OxA-31751	LYM08	197	Pit 125	1254	25	674	864	95.4
OxA-31752	LYM09	1506	Pit 1064	1267	25	667	776	95.4
OxA-31753	LYM09	1672	Pit 1663	1322	26	653	766	95.4
OxA-31713	LYM10	2609	SFB 2	1485	28	537	644	95.4
OxA-31714	LYM12	3105	Timber Hall	1517	29	428	612	95.4
OxA-31715	LYM12	3560	Timber Hall	1544	27	426	577	95.4
OxA-31716	LYM12	3560	Timber Hall	1528	27	428	600	95.4
OxA-31717	LYM12	3445	Timber Hall	1479	27	544	640	95.4
OxA-31718	LYM13	6119	Pit 6118	1596	27	405	539	95.4
OxA-31719	LYM13	7205	Pit 6118	1629	27	347	535	95.3
OxA-31720	LYM13	7351	Pit 6134	1634	27	343	535	95.5
OxA-31721	LYM13	7288	Pit 6788	1602	26	401	537	95.4
OxA-31722	LYM12	3704	SFB 5	1608	28	396	537	95.4
OxA-31723	LYM12	3739	SFB 5	1561	28	421	561	95.4
OxA-31724	LYM13	6879	SFB 6	1575	27	416	547	95.4
OxA-31725	LYM13	6971	Timber Hall 2	1519	26	430	606	95.5
OxA-31726	LYM13	6649	Timber Hall 2	1409	35	579	668	95.4
OxA-31727	LYM13	7075	Timber Hall 2	1598	27	404	538	95.4
OxA-31728	LYM13	6637	Timber Hall 3	1557	26	424	559	95.4
OxA-31784	LYM13	6687	Timber Hall 1	1553	26	425	564	95.4
OxA-31961	LYM13	6277	SFB 7	1612	28	392	537	95.4
SUERC-35927 (GU-24773).	LYM10	2508	SFB 1	1444	25	570	650	95.4
SUERC-35929 (GU-24775)	LYM10	2653	Post built hall, LYM10	1448	24	565	650	95.4
SUERC-35934 (GU-24777)	LYM09	1820	A/S Minster ditch	1291	20	660	780	95.4
SUERC-50220 (GU32537)	LYM13	7035	LYM13 Building 1	1284	42	655	865	95.4
SUERC-50221 (GU32538)	LYM13	6687	LYM13 Building 3	1269	42	662	870	95.4
SUERC-50222 (GU32539)	LYM13	7025	Building 2, west wall	1549	42	416	598	95.4
SUERC-50223 (GU32540)	LYM13	7156	Anglo-Saxon pit	1624	42	341	541	95.4
SUERC-50224 (GU32541)	LYM12	3965	LYM12 Timber Hall	1655	42	257	535	95.4

Table 2.1: Selected radiocarbon dates (94.5% confidence) from the Lyminge excavations with reference to this thesis. Radiocarbon dates were obtained from the Oxford Radiocarbon Accelerator Unit (OxA) and Scottish Universities Environmental Research Centre (SUERC).

Figure 2.3: Annotated site plan of the Lyminge excavations of Phase I features on Tayne Field from 2012 – 2015 (Lyminge Archaeological Project).

Chapter 3 The history and archaeology of Kent*, c.* AD 550 – 800.

Building on the historical and archaeological background of Lyminge, this chapter presents a contextualisation of the development of the Anglo-Saxon kingdom of Kent. This overview of socio-political developments and cultural exchange in Kent enables a deeper understanding of the external influences on the Lyminge communities, situating the evolution of the high-status *royal vill* and minster settlements within a wider framework of social change, in which economy, diet, and attitudes to the natural world shifted dramatically.

3.1 Formation of the Kentish kingdom

By AD 700 there were seven main English kingdoms: The West Saxons, the South Saxons, the East Saxons, East Anglia, Mercia, Northumbria and Kent (Arnold 1997: xvi;). The foundation and development of the Anglo-Saxon kingdoms in southern England was a feature of the second half of the sixth century (Harrington and Welch 2014:5-6). The formation of the Anglo-Saxon kingdom of Kent is an important case study for this period, as from the seventh century (when historical records were first kept) it appears to be the first region to show unequivocal evidence for early medieval kingship, statehood, developed economic and legal structures, as well as an institutionalised religion. There is also an abundance of evidence for international contact with both the Frankish and Scandinavian worlds (Brookes 2007:1).

We are fortunate that the kingdom of Kent was the first Anglo-Saxon state to be converted to Christianity, and with the introduction of Christianity came the introduction of written records. Thus, there is a series of historical sources that document the evolution of the Kentish kingdom including; Bede's *Ecclesiastical History*, the *Anglo-Saxon Chronicle*, the Kentish Lawcodes, and a large number of ecclesiastical charters, which provide glimpses into the lives of lay aristocracy and ecclesiastics (Brooks 1989; Whitelock 1979; Brooks and Kelly 2013). The Lawcodes of Kent (and of Ine, King of Wessex) in particular, provide important insights into the social organisation of Kent. Dating from the late sixth – early seventh century, they demonstrate the significant divisions that existed between the free and unfree, and the mechanisms by which Christianity became embedded within society during the seventh century (Whitelock 1979; Harrington and Welch 2014:7). The problematic nature of relying on historical sources to document the past has been well discussed (Yorke 1993; Yorke 1999), however, if we accept the inherent bias that they present they may provide a valuable framework for the basis of further archaeological study. There has been notably less archaeological and zooarchaeological work conducted in Anglo-Saxon Kent than in other southern regions. However, in recent years archaeology has increasingly been contributing to the discussion of state evolution and the results appear to broadly corroborate with some of what is recorded in the historical sources, in addition to highlighting social changes not visible in contemporary documents (Brooks 1989:55; Thomas 2013). The landscape of Kent itself is another important source of information, and studies such as Witney (1976), Everitt (1986), Brookes (2007), and Harrington and Welch (2014) have highlighted how the physical landscape had a powerful influence on settlement patterns and political geography in Kent.

The Kentish origin myth that is recorded in Bede's *Ecclesiastical History*, the *Anglo-Saxon Chronicle* and the *Historia Brittonum,* recounts the tale of the arrival of Hengist and Horsa and their 'Jutish' followers in AD 449 in East Kent (Brooks 1989:62; Whitelock 1979:153). Whilst the validity of this origin myth has been proven to be in legend rather than fact (Sims-Williams 1983; Brooks 1989) the majority of the earliest Anglo-Saxon artefacts in this region date from the last quarter of the fifth century (Brookes 2007:7), lending support to the date given in the historical sources.

Kent was quite unique in that it had the foundation of two bishoprics within one kingdom, at Canterbury and Rochester, which reflects the long-standing subdivision of Kent into East and West, mirrored in the practice of often having two kings reigning together in Kent, with the dominant king taking the seat in the East (Yorke 1983: 14-15; 1990:32). Indeed, this division is also reflected in the archaeology; not only is there a larger quantity of Anglo-Saxon archaeology in the East of Kent, but the material culture is also richer and more culturally distinct (Brooks 1989:68; Yorke 1990:26; Brookes 2007:79, 149-50).

3.2 *Regiones* and Lathes

It is clear that further subdivisions existed within the bipartite division of the Kentish Kingdom, often referred to in sources in the Latin '*regiones',* or 'regions' (Brookes 2011:159). Such divisions are suggested to pre-date the establishment of the Anglo-Saxon kingdoms and were arguably essential to the formation of each of the south-eastern kingdoms (Harrington and Welch 2014:5). Although there is no clear definition of the term *regiones*, it is likely that this term referred to areas in which small-scale tribal groups, or folk groups, subsisted, and it has been argued that such a system potentially pre-dated the regional administrative structure of the 'hundred' and the 'lathe' recorded in the Domesday Book (Brookes 2011:159). Certainly, place-names comprising the Old English elements *–ingas* (gen. pl. *–inga*) and *–ware* are often found clustered into territories defined by natural features, which may attest to the presence of local folk groups (Welch 1983:242-250; Bassett 1989:18; Yorke 1990: 42-52; Gardiner 2001:141; Brookes 2011:159). Indeed, Kentish mortuary practice and grave goods from this early period reveal a social structure modelled on small, internally-organised, social groups who were exploiting ancestral territories (Scull 2011:852), particularly evident in locations such as Eastry and Lyminge (Brookes 2011:159). However, in most cases it is not totally clear whether these groupings represented true cultural affiliations or merely geographical ones (Brookes 2011:159).

When discussing the substructure of the early Kentish kingdom, it is impossible to separate the role of *regiones* in kingdom formation from what Brooks (1989:69) refers to as, 'the thorny problem of the Kentish lathes'. The term 'lathe' derives from the Old English term *lǽð* and seems to have been interchangeable with 'jurisdiction', 'court' and 'authority over landed possessions' (Joliffe 1933:39-41; Witney 1976:32; Brooks 1989:69; Brookes 2011:156). It is a term that appears to have been both territorial and jurisdictional in nature (Brookes 2011: 156). Use of the term 'lathe' in Domesday Book is unique to the entry for Kent, used in reference to the grouping of estates, alongside the headings of 'hundred' – a more commonly used administrative term in most other parts of England at this time (Brookes 2011:156). In total there were five lathes and two half-lathes referenced in Domesday Book; Aylesford (*Ailesford*); The Borough (*Burhwaralæð),* referring to Canterbury; Eastry (*Estrea*);

‘Limen’ (*Limenwaralæð);* Wye (*Wiwaralæð*); and the two half-lathes of Milton (*Middletone*) and Sutton (*Sudtone*) (Brooks 1989:69-73; Brookes 2011:156).

Jolifffe (1933) was the first to write on the subject of lathes, arguing that those recorded in Domesday represented a far older institution dating back to antiquity. Whilst Joliffe’s (1933) work was highly influential, his arguments concerning the evolution of the kingdom of Kent were primarily based on the premise that such social institutions were the guiding force behind state formation, with little consideration of how these developing societies were affected by landscape, environment or other cultural influences (Brooks 1989:71). However, further work has revealed that lathes were not wholly developed institutions during the Anglo-Saxon period. Rather, they were evolving administrative concepts, not static but diverse and changing, affected by developing institutions, locality, as well as environment (Everitt 1986:8-11; Brooks 1989:70).

It is likely that the smaller *regiones* gave way to the lathe during the Anglo-Saxon period, which would have been centred on a focal settlement (a *caput,* or *inland)*, which, in many cases, was a *‘villa regalis’,* or, royal estate centre (Everitt 1986:9). Such a sub-structure of Kent is alluded to in the early laws of King Æthelberht (Brooks 1989:67). Brooks (1989:71-4) argues that the four lathes of East Kent are the most likely to have existed from an early stage, as not only did three of the four have a single –*ge* name in their territory (Lyminge, Eastry and Sturry), indicative of administrative centres, but three (including *Limenwaralæð*) also had woodland commons in the Weald mentioned in early charters. The archaeological evidence from Lyminge certainly verifies the presence of an important royal estate centre, located near major routeways, with archaeological and historical evidence for centralised control over peripheral resources in the Weald, marshes and the coast from an early period (Brooks and Kelly 2013:286, 294,326,332; Faith 1997; Thomas 2013). Furthermore, the close location of the Lyminge royal estate centre to the earlier fifth – sixth century ‘Jutish’ cemetery, and construction of one of the sixth century halls atop a Bronze Age barrow points to the presence of a community closely tied to their ancestors and past, making clear statements regarding their ancestral territory (Scull 2011). Whilst the connection between *regiones* and lathes is by no means straightforward, and much debate still surrounds this subject (Witney 1976; Everitt 1986; Brookes

2011) it is evident that Lyminge played a central role in the local environment, regardless of the nature of the boundaries of the *Limenwaralæð* during the early Saxon period.

Fortunately, due to the high number of historical documents for Anglo-Saxon Kent, as well as a series of excavated cemeteries, there have been a number of broad scale analyses conducted on the landscape and topography of Kent (e.g. Witney 1976; Everitt 1986; Brookes 2007) which complement, and expand on, the work of Joliffe (1933). These influential works have demonstrated that Kent's physical geography was a guiding force for both Anglo-Saxon settlement and state formation. Much of the archaeological excavation in Kent to date has focused on the mortuary landscape, resulting in a dearth of excavation of Anglo-Saxon settlement sites and a limited knowledge concerning the internal spatial and social organization of settlements throughout this period (Brookes 2007:36). However, the excavations at Lyminge have begun to address this imbalance and provide a useful case-study for future research into the many historically documented royal estate centres and minster sites within Kent.

3.3 The influence of environmental *pays* and 'marginal' resources on settlement

The drift geology of Kent has produced a broad diversity of local soil-types, many of which feature within very short space of one another, which ultimately has been one of the primary influences on settlement location throughout time (Everitt 1986:44). Not only has the terrain and landform significantly affected settlement formation but it has also impacted greatly on husbandry practices and the development of routeways (Everitt 1986:43). Anglo-Saxon settlement in this region is said to have been based on the 'Jutish system' of scattered farms and hamlets, which were not isolated but part a larger community of networks within the formation of a lathe, which may extend over 200 square miles or more. Putting the question of exact lathe boundaries to one side, Witney (1976) effectively sums up the varied topography one might encounter within a lathe, noting that the typical lathe consisted of either; "a river valley enclosed by chalk hills and issuing on sea marsh, or else of a littoral fringed by marsh on the seaward side and backing on downs to landward. The arable lands were mostly confined to the valley or littoral, which was often extremely fertile; here too were the water meadows; the downs gave hill pasture and wood; and the marshes then (as now) pasture for sheep and cattle. Outside the lathe lay vast oak forests of the Weald, where it had its own fattening grounds for swine, and the Romney Marsh provided alternative pasture, particularly for those of the lathes that were land-locked, such as Wye, or where, as in north-east Kent, the local marshes were insufficient for the stocks" (Witney 1976:57). At the centre of the lathe was the royal estate centre, or a township, and the socio-economic structure of each lathe was likely based on land parcellation, hamlets and inland tenants who worked the land (Faith 1997; Witney 1976:57). Everitt (1986:44) developed Witney's (1976) arguments by placing Anglo-Saxon settlements within the context of environmental zones, or *pays*, largely based on place-name evidence (Harrington and Welch 2014:46; fig. 6). In doing so he was able to confirm that the socio-political and economic evolution of Kentish territories were dependent on locality and environment (Everitt 1986:45-65). As such, Everitt (1986) successfully demonstrated that the structure and boundaries of these territories were not strictly rigid, but fluctuating and dynamic. Just as landscape changed over time, so did boundaries and economy.

Everitt (1986:46) argued that the Holmesdale, Downland and Foothills *pays* were some of the most fertile and well-watered areas of Kent, resulting in their continued occupation from earlier periods of time into the Anglo-Saxon period. These areas which Everitt referred to as the 'Original lands' continue to be the areas most densely settled into the modern day. Evidence from the Soilscapes dataset from the National Soil Resources Institute, Cranfield University, confirms Everitt's hypothesis, revealing that some of the most fertile soil in the south of Britain lies in the Holmesdale in Kent, as well as the lower reaches of the River Darenth (near the North Downs) (Harrington and Welch 2014:48-49). Archaeological and place name evidence also indicates that the Original lands were the primary areas of Anglo-Saxon settlement. These were then followed by a secondary infilling of woodland and Marshland areas beyond the Original lands, eventually spreading into the marginal areas away from main routes of communication (Everitt 1986:46; Brookes 2007:100-1). The location of these secondary settlements between different environmental zones highlights the importance of networks in these more marginal zones and the high level of inter-connectivity between settlements in Kent. Furthermore, these connections appear to be archaeologically visible in the settlement of places such as the North Downs (Brookes 2007:101).

The Kentish charters effectively capture the relationship between the core areas of settlement and peripheral areas of woodland, marshland and coastland (Thomas 2016:10; Everitt 1986). Whilst these secondary settlements areas were mostly located on the periphery of settlements, or in locations which are considered marginal, they were really only marginal in the literal sense; as such environments give good returns to those farmers who know how to maximise on their potential, particularly for animal husbandry (Banham and Faith 2014:163-4). For instance, sheep can thrive on marshlands, browsing on a wide array of saltmarsh plants, and if cattle are provided with a decent drinking source they too can be effectively pastured on marshland (Banham and Faith 2014:164). Recent evidence from carbon and nitrogen stable isotope analysis on cattle and sheep/goat bone provides compelling evidence that such practices did occur in other parts of England and on the Continent throughout prehistory into the later medieval period (Britton *et al.* 2008: 3112; Müldner *et al.* 2014: 322).

Charters documenting the gifting of land to the Lyminge community indicate similar husbandry practices also occurred in Kent during the Anglo-Saxon period. These charter references include the AD 700 grant of marshland for the pasture of 300 sheep in Romney Marsh to the minster community in Lyminge by King Wihtred (Brooks and Kelly 2013: 294-297), as well as fishing rights in the River Limen, and a portion of land suitable for grazing 150 cattle near the marsh named *Bishopswic* (modern day Broomhill) (Brooks and Kelly 2013: 332-337). Such sources reveal the value of marshland and coastland to the Lyminge monastic community during this period, as well as the increasing power of the church over the exploitation of scattered marginal resources previously owned by the king of Kent. By the end of the eighth century Lyminge owned a considerable amount of land within Romney Marsh (Brooks 1988; Thomas 2016: 359) signifying that the community held significant power and control over a number of scattered resources.

One particular charter, dating AD 732, reveals links between the monastic community of Lyminge and the site of *Sandtun,* located on a coastal inlet of the River *Limen* (near modern-day West Hythe) about 6 km south of Lyminge (S 23; Brooks and Kelly 2013: 332-337; Thomas 2016:360-1). This charter documents the granting of land in *Sandtun* to the Lyminge monastic community to prepare salt, in addition to a further 100 acres of land and 120 cartloads of timber to aid the salt making process (Brooks and Kelly 2013:332-337). Archaeological evidence from excavations at *Sandtun* date the site to *c*. AD 700 – 875, making it contemporary with the monastic phase of Lyminge (Gardiner *et al.* 2001:161). An array of activities were practiced by the community of *Sandtun*, including fishing, silt stone spindle whorl manufacture, crop processing, and bone working, in addition to the salt-making also alluded to in the charter (Gardiner *et al.* 2001:161-272). Furthermore, a high proportion of the ceramic assemblage was made up of imported continental pottery, leading the excavators to conclude that this site may have been a landing place for trading ships (Gardiner *et al.* 2001:161). The location of the site would have made an ideal port; not only was it immediately facing France, but it was also within the mouth of an inlet that was well protected from prevailing south-westerly winds (Gardiner *et al.* 2001:270-274).

Aside from Lyminge, *Sandtun* is one of only a small handful of other middle Saxon sites pre-dating AD 1000 to produce a large fish assemblage, *c*. 4000 fragments, with a dominance of large marine fish, that would have most likely have been caught by hook and line (Hamilton-Dyer 2001:258-9). The identified fish species indicate seasonal exploitation, limited to spring, summer and early autumn, which may suggest *Sandtun* was a dependent community only occupied on a seasonal basis (Gardiner *et al.* 2001:272). Such large quantities of imported pottery, the level of craft working, fishing, and the documentary evidence for salt-production certainly suggest that this was not an isolated site, and the archaeological signature can arguably be described as one of a ‘producer site’ (Gardiner *et al.* 2001:273-4), perhaps supplying Lyminge with fresh fish and other material goods. The large fish and mollusc assemblage recovered from the monastic settlement at Lyminge testifies the importance of coastal resources to the inhabitants, which is even more significant when its location 5 miles in land from the contemporary coastline is taken into consideration (Campbell 2011; Reynolds 2010; Thomas 2016:362). Given the historical link between Lyminge and *Sandtun*, the charter reference to fishing rights in the River Limen, and the important role fish played in diet during the monastic phase of Lyminge, it is evident that these secondary settlements were extremely important resources for *inland,* ‘original’ settlements (Brooks and Kelly 2013: 332-337).

The importance of marginal resources is further suggested by evidence from other secondary settlement sites such as the late Saxon site of Chestfield, near Whistable, which relied on both the Weald and coastland resources for its subsistence (Allen 2004: 117-132). Evidently Lyminge was part of an intricately inter-connected landscape where communities were exploiting, and building upon, pre-established connections and routeways, displaying a deeply ingrained knowledge concerning the environmental resources on offer across different areas of Kent (Brookes 2007).

Recent research has highlighted that when discussing the different environmental zones of Kent and how they may have influenced primary and secondary settlement, terms such as ‘*pays’* should be used with caution. Everitt’s (1986) system has yet to be tested against modern, chronologically refined, archaeological evidence (Harrington and Welch 2014:48). Harrington and Welch (2014:51) criticise Everitt’s system as they argue that the proposed areas are “not coherent in terms of their soil capabilities”. However, regardless of the term used to portray particular environmental zones throughout Anglo-Saxon Kent, what is critical in this instance is to stress the high variability in soil fertility and subsequently the environmental resources that occur within one county. Based on the research discussed above it is worth noting how the development of subsistence strategies in Kent throughout the Anglo-Saxon period was driven by agricultural innovation to exploit the varied landscape on offer.

3.4 Woodland resources

Woodland was also a highly valued and much exploited marginal resource in this period, imbued with symbolic associations of ‘otherness’ a concept explored further in Chapter 7. Place names and historical sources provide us with glimpses of how Anglo-Saxon communities maximised on the potential of the diverse topography of Kent. One of the unique characteristics of Kent is that alongside some of the most fertile land in the southern counties are also large swathes of intractable clay, mottled with chalk and flint, and dense woodland (Harrington and Welch 2014:49). The Weald of Kent was once part of the great Forest of Andredsweald; an immense area of oak and chestnut surrounded to the north, west and south by chalk hills and opening out in the east onto marshland and sea (Witney 1976:1). In the eighth century Bede described the Weald as dense and inaccessible, a place where deer, swine and wolves resided (Campbell 1986) an area seemingly shrouded in mystery and associated with hard toil. The Downland was also a relatively well-wooded area, and to this day Kent remains one of the most heavily forested counties in England (Everitt 1986:25).

As such, the Weald of Kent has been a well-known and invaluable source of timber and iron ore since prehistory and is one of the England's best-known areas of historic iron working, confirmed by archaeological deposits from the Iron Age, Roman and later medieval periods (Thomas 2016: 359). However, there is a dearth of data for the Anglo-Saxon period, with the only securely dated Wealden site being Millbrook, in the East Sussex portion of the Weald, dated by radiocarbon and archaeomagnetic samples to AD 800 – 835 (Tebbutt 1982; Thomas 2016:359). The value of iron ore deposits, and the importance of their ownership is revealed in a charter dating AD 689, whereby the Mercian usurper Oswine, (king of Kent) granted iron-bearing land previously belonging to the *royal vill* at Lyminge to Abbott Hadrian at St Augustine's Abbey, Canterbury (Kelly 2006: 33-36; Thomas 2016:360). This retrospective charter is unusual and shows the control that Lyminge had previously held over scattered resources during the pre-Christian phase. This charter is even more significant when seen in the light of the archaeological evidence at Lyminge for iron working from all stages of the manufacture process, from smelting through to primary and secondary smithing (Thomas 2017). What is interesting about this evidence is that it is present throughout the sixth – ninth century deposits, implying that iron manufacture was not reduced or slowed by the redistribution of land to Canterbury (Thomas 2016: 360). The Lyminge charter dating AD 732 also hints at the use of the Weald for timber to aid the salt making process (Brooks and Kelly 2013). Evidently, despite the relatively infertile nature of the soil in the heavily wooded areas, the Wealden portions of Kent were a valued and productive resource. In particular, the evidence from Lyminge provides good examples of how settlements were exploiting woodland for a wide variety of resources.

As a result of the low fertility of the woodland soil the Kentish landscape necessarily lent itself to pastoralism and transhumance from an early period. Whilst the antiquity of this practice is unknown, it is clear from historical sources and place name evidence that the forest was exploited for pannaging livestock on oak mast, chestnut, hornbeam and beech throughout the late summer and autumn throughout the Anglo-Saxon period (Everitt 1986:30). The common use of the Weald for swine pasture during this period is apparent in the high number of Wealden place names terminating in *den,* a place-name associated with swine pasture (Everitt 1986:34). In addition, woodland names such as Shepherds Hill, Cowden, Cowlees, Milsted, Woodstock and Shiphurst, give reference to a time when both cattle and sheep were also pastured in the forest (Everitt 1986:31).

The earliest *den* charter reference was in AD 762 in Wye when rights of pasture were granted in Andred (Brookes 2007:58), although it is likely that this practice was already well established before the advent of written documents. A number of other mid-eighth century charters also refer to *dens* (Kelly and Brooks 2013:332, 399, 405; Kelly 1995) some of which are associated with place-names in both the Weald and the Blean (Brookes 2007: 60). The swine pannage season is believed to have lasted for seven weeks, with herdsmen likely travelling significant distances along droveways to their destination. Therefore, it is likely that herdsmen built temporary shelters in the woodland for protection against the elements during these months, in addition to pens for their pigs (Witney 1976:76). Whilst it is nigh impossible to reconstruct a location map plotting all *dens*, there does appear to be a more tightly clustered pattern near Roman roads and along the banks of the main rivers, such as the Beault, Sherway and Hammer Stream (Witney 1976:76). Historical documents such as the Laws of Ine (688-694) from Wessex make several references to swine herding and pannaging, providing further evidence for the economic importance of this livestock in the southern counties (Whitelock 1979).

There is a strong argument that many, if not most, of the droveways running north-south, across the grain of the county were a result of individuals driving their swine herds from their settlements north of the Downs into the Weald and Romney Marsh in the summer months. That these routes originated as droveways, rather than cart tracks, is evident in the gradient of the Downland escarpment which is generally too steep for horse or oxen drawn transport (Everitt 1986:36-7). Brookes (2007:61) has developed a mathematical model, based on the spatial modelling of prehistoric trackways, to calculate ‘low cost paths’ between primary Anglo-Saxon settlements in the Original lands and their associated *dens*. Within this model he also incorporated social and cultural considerations which include, the distributional relationship of settlements between potential droveways and associated *dens,* as well as the distribution of settlements with relation to the Anglo-Saxon mortuary landscape, taking both archaeological and early place-name elements into account. With this nuanced approach Brookes (2007:61-5) has demonstrated that there is a strong association with the potential ‘low cost’ droveway and the placement of Early Anglo-Saxon burials. In addition, this model provides further proof that there was an established economic link between certain Original land settlements and the Weald by the early Saxon period (Brookes 2007:65), prior to the introduction of formalised recorded documents.

Whilst this model assumes purely economic reasoning behind past choices in ‘routes of least resistance’, landscape archaeology clearly shows that Kent is a county of twisting lanes. These lanes are often sunk so low into the ground that they unquestionably date back to antiquity and possibly even further back to prehistory. It is likely that such lanes were created by individuals taking the easiest route to avoid awkward parts of the landscape, such as bogs and fallen trees, when making long-distance journeys with their valuable livestock during the spring and summer months (Everitt 1986:268; Harrington and Welch 2014: 70). When considering Anglo-Saxon place-name elements, historical documents and landscape archaeology together the evidence seems to confirm that pastoral transhumance was a vital part of Anglo-Saxon husbandry. Each region, or *pays*, adapted to the seemingly wild Kentish landscape to maximise on its resources to their benefit. This practice of seasonal transhumance continued into the seventeenth century in Kent and has ultimately shaped the landscape and settlement that we see today (Everitt 1986:61).

Thus far the primary focus has been on the practice of pig transhumance, as this is often the most commonly referenced form of livestock management in modern works on Anglo-Saxon Kent (Witney 1976; Everitt 1987; Brookes 2007). It should be noted here that in general terms the majority of place names across the whole of Anglo-Saxon England relate to the three main domestic mammals (such as Oxford and Sheepden), rather than to wild mammals, the evidence for which is considerably sparser (Yalden 1999:136-140). That the Anglo-Saxon's were farmers first and foremost is indisputable, which may be a reason why so much academic discussion rests on the livestock that we continue to farm today. Whilst swine pannaging was undeniably important to the development of Kentish Anglo-Saxon settlement and economy, Anglo-Saxon Lawcodes and charters also allude to the social and economic importance of sheep and cattle (Whitelock 1979). Indeed, a number of the Wessex Laws of Ine suggest that cattle, in particular, were very highly valued in monetary terms, possibly above sheep or pigs. These laws include compensation for the purchasing of unsound cattle, as well as laws concerning cattle theft and compensation for damage done by cattle to another individual's property (Whitelock 1979: 403-5). Ine's laws also record that if a wife was widowed with a child she was to be provided for with a cow in the summer and an ox in the winter each year until the child was fully grown (Whitelock 1979:403). Such laws reveal the direct impact cattle had on daily life. While this is in reference to Wessex it is highly possible that similar practices existed in Kent. Not only were livestock a source of livelihood, but also, they were important enough to include within the lawcodes, implying connections between cattle, prestige, wealth and mediums of exchange (Tipper 2004:152; Hamerow 2002: 127). Sheep also had financial value, albeit lower than cattle and pig, during the Anglo-Saxon period, as in the Laws of Ine it is stated: "a ewe with her lamb is worth a shilling until 12 days after Easter" (Whitelock 1979: 405; Hagen 2010:94). A grant of pastureland in Ewehurst in the Weald is referred to in a charter of AD 822, and whilst swine, cattle and goats are listed as the animals for which this pasture is intended, the place name indicates that sheep rearing was also carried out here (Whitelock 1979:515; Hagen 2010:85) providing further evidence that livestock other than pigs were also grazed in the Weald.

Zooarchaeology largely supports the historical sources, demonstrating that the major livestock of the Anglo-Saxon period were indeed cattle, sheep and pig. The relative quantity of each of these animals varies over time and is regionally dependent (Harrington and Welch 2014:69), not only on a county level but also from site to site. The Anglo-Saxon sites that have produced published zooarchaeological reports in Kent present a varied picture of animal exploitation, one that shall be discussed in more detail in Chapters 5 and 6. Based on the data and arguments presented in

Holmes's (2014) overview of animal husbandry and food provisioning in Anglo-Saxon England (and as discussed in Chapter 2 the zooarchaeological evidence suggests that in the post-Roman period there was a shift to self-sufficiency based on the individual household, with animals being exploited primarily for their meat but also for their secondary products (Holmes 2014a:78). This mixed-herd husbandry practice continued into the middle Saxon period, with a few minor changes. Increased social stratification and the subsequent diversification of site types is argued to be the reason behind an increase in 'specialised producer sites', such as Wicken Bonhunt, Suffolk, and St Albans, Hertfordshire (Crabtree 2010:130), however, broadly speaking animal husbandry continued to be based on a mixed-herd strategy, with most livestock being exploited for their meat (Holmes 2014a:78). It was not until the middle – late Saxon period that there was significant change in animal husbandry practices, as it is in this period that we start to see higher numbers of older castrate oxen indicative of an increase in arable farming (Holmes 2014a:78). This increase in arable farming is further attested to by the environmental record, which reveals evidence for increased cereal cultivation at sites such as Yarnton, Raunds and West Cotton, from the eighth – ninth century onwards (Hamerow 2012:147). The zooarchaeological trends highlighted in Holmes's (2014) synthesis are generalised and broad by necessity. This is a result of the lack of archaeological work carried out in some regions, such as Kent, and on particular site types, such as ecclesiastical sites (Holmes 2014a). However, when viewed against the wider backdrop of the significant socio-political and economical changes that were occurring throughout the Anglo-Saxon period such broad generalisations help to shed light on how the dynamics of society were affecting animal husbandry, at a time when the reciprocity and the exchange of landed and material wealth were at the heart of society (Scull 2011:860).

3.5 'Persistence of place' and Continental cultural influence

It is clear that there were distinct 'landscapes of continuity' in Kent (Witney 1976; Everitt 1986; Brookes 2007; Harrington and Welch 2014), which is unsurprising given the importance of land as an indicator of wealth and the Anglo-Saxon desire to connect with their ancestral past (Scull 2011). As previously mentioned, not only did the formation of Anglo-Saxon Kent evolve out of coalescing folk-groups, but the administrative system that guided settlement inherited an already existing structure from the Roman, and prehistoric, past (Brooks 1989:57). This is reflected in the Roman road system, focused on the Romano-British *civitas* capital *Durovernum Cantiacorum* (Canterbury); as well as in several place-names, including the name of the county itself which derives from *Cantium* and *Cantia*, names that were known to Ptolemy, Caesar and Bede (Brooks 1989:57). Likewise, the Anglo-Saxon name for the Sussex and Kentish Weald, *Andredswald,* is derived from *Anderita,* the Roman name for Pevensey (Oosthuizen 2011:163). Brookes (2007:100-1) has confirmed Everitt's model of Kentish settlement 'colonisation', whereby initial Anglo-Saxon settlement was concentrated in the Foothills and Holmesdale, where previous Roman settlements had also been focused, and the evidence suggests that estate centres such as Faversham and Wingham were often located near sites of Roman villas, temples or pre-existing areas of metal working (Everitt 1986: 93-117). Many of these original settlements bear the old English name forms (-*gē*), like Lyminge, Sturrey and Eastry, and are sited near rivers, streams and recognized prehistoric and Roman routeways, such as Watling Street and The Pilgrims Way (Everitt 1986:117). Thus suggesting that rather than breaking new ground by creating new settlements and road systems in different areas, Anglo-Saxon settlement was established in the same areas as their Romano-British predecessors (Everitt 1986:117).

The location of the *royal vill* was key, as they functioned as the central nodes in the landscape, both socially and economically. Travelling kings and their retinue acted as agents of communication, maintaining social cohesion via their travels, hence why most estate centres are located near major routeways, including roads, rivers and streams, and are often associated with Early Anglo-Saxon cemeteries (Brookes 2007:75). Brookes' (2007) viewshed analysis has shown how in the movement along The Pilgrims Way one would have encountered a series of prominent cemeteries including, the Stowing Cemetary, Lyminge and Saltwood, acting as legitimisation of various different Anglo-Saxon groups territorial claims (2007:69-71) and reinforcing this idea of ancestral rights and 'persistence of place'. It is of note that although there is evidence for Lyminge's connections to a prehistoric past, as yet there is no direct archaeological evidence for antecedent Romano-British occupation in this area, besides the occasional find of repurposed *opus signinum* and Roman glass (Jenkins 1974; Warhusrt 1955; Maslin 2018).

It is important at this point in the discussion to highlight other external cultural influences on the development of Kentish Anglo-Saxon society, particularly the evidence for contact with the Merovingian and Frankish kingdoms - often referred to collectively as *Francia* (Harrington and Welch 2014:174). From an early stage in the study period there is evidence for Kentish contact with other Anglo-Saxon kingdoms, in addition to the Continent. The Kentish lawcodes refer to trade between Kent and London from the late seventh century onwards (Whitelock 1979:295). In addition, eighth century travelling privileges, as discussed by Kelly (1992), reveal that not only were commercial activities being targeted at Kent, and via Kent to London by this time, but also that a toll was in place on profitable shipping routes on merchant ships (Kelly 1992:19), suggesting a high level of social and economic organisation. Similarities between the Kentish *wic-gerefa,* cited in the seventh century lawcodes, and the contemporary *prefecti* provide further indication that a toll-collection was being enforced in the seventh century on merchants ships that were travelling to London, most likely via the Wantsum Channel in Kent (Kelly 1992:19) signifying that there were also well-established communications via trade routes between the Anglo-Saxon and Frankish kingdoms. Furthermore, the office of Anglo-Saxon reeve was very similar to Frankish and Visigothic counterparts, which Brookes (2007:31) suggests is in imitation of the latter. To have such similar pan-European institutions in place would have eased mercantile interaction and appears to confirm that well-established, taxable trade routes were operating by the seventh century (Brookes 2007:31). While there is a general lack of other direct references to trade between England and the Continent during this period, a number of cross-Channel journeys made by bishops and missionaries were recorded (Brookes 2007:9; Whitelock 1979:82) revealing that it was possible to gain access to a boat and that individuals considered it safe enough to travel (Kelly 1992; 1995; Brookes 2007:9).

The kingdom of *Francia* was one of the closest and most powerful neighbours to the south east of England (Wood 1983; 1994; Harrington and Welch 2014:174). Historians and archaeologists have repeatedly linked the expansionist policies of the Merovingian and Frankish realms with the formation of the Kentish kingdom during the sixth century (e.g. Brooks 1989; Yorke 1990; Hodges 1988; Harrington and Welch 2014:174). Indeed, when compared with other south-eastern kingdoms it appears that Kent held particularly strong connections with *Francia* during this period (Yorke 1990:39). From the writings of Procopius it is clear that the Merovingian's claimed authority in southern England during the mid-sixth century, when an embassy sent to Constantinople announced that the Franks ruled over *Brittia*, which is likely to have been a reference to a part of the British Isles (Wood 1994:176). Wood (1994:176) highlights that references in the panegyrics of Venantius Fortunatus potentially imply that similar claims persisted into the reign of Sigibert I and Chilperic I in the late sixth century (Wood 1983:10-11; Wood 1994: 176). Gregory the Great also records that Theuderic I (reigned *c.* 596-612) and Theuderic I (*c.*596-613), exercised some authority in England, which is most likely have been in the kingdom of Kent (Wood 1994:176). If this were indeed the case, then it would explain the parallels between the Kentish and Frankish law-codes and the similarity in the *wergild* prices of the two kingdoms (Wood 1983:12-13). When seen against this background of influence, the marriage of King Æthelberht and the Frankish Princess Bertha would also be explained (Wood 1983: 13; 1994:176). A number of other Frankish princesses are recorded as having been married to Anglo-Saxon men from royal courts, and it has been suggested that intermarriage only occurred between Frankish women and Saxon men, and never the other way around, as Saxon women did not bring any 'prestige' to Merovingian men (Wood 1992:240; Harrington and Welch 2014:177). However, others have postulated that the union of Æthelberht and Bertha's Kingdoms may have resulted in stronger Kentish independence from their Continental neighbors as a result of reinforcing bonds between houses of unequal status (Harrington and Welch 2014:177-8; Welch 2007: 190-1). Whatever the circumstance, Frankish royalty continued to take an active interest in the Kentish royal family from here on, as Æthelberht and Bertha's son, Æadbald, married an elite Frankish women, Emma, and Bertha's daughter, Æthelburga (of Lyminge fame) sent her children to Dagobert I for protection following the death of her husband, Edwin of Northumbria in the early seventh century (Wood 1994:177).

The Kentish practice of direct royal succession from father to son is unique to the Anglo-Saxon Kingdom of Kent (Yorke 1990:34-5) and is arguably a practice modelled on the customs of the Merovingian royal house. However, Yorke (1990:42) highlights that is not always easy to untangle Frankish from other cultural influences, as the royal families of Kent and *Francia* were both descendants of Germanic and Imperial relations. Another custom often attributed to the influence of Frankish culture was the establishment of 'double- house' monasteries throughout Kent following the Christian Conversion of AD 597. In the Synod of Bapchild, King Wihtred granted immunity to eight royal minsters, five of which – Minster-in-Thanet, Lyminge, Folkestone, Sheppey and Hoo- were double monasteries of a form first found in *Francia*, which housed mixed communities of nuns and monks, or male secular clergy ruled over by an abbess (Yorke 1990:37; Kelly and Brooks 2013:303; 330). According to the Mildreth Legend, most of these churches were founded by, or for princesses or queens of Kent, who were subsequently honoured as saints. In the case of Lyminge it is St Æthelberga, daughter of Æthelberht and Bertha, who is said to have founded St Mary's minster, on land gifted to her by her brother King Æadbald between 633 and 640 (Yorke 1990:37; Kelly and Brooks 2013:288-9). Frankish influence on the English church was not confined to the foundation of these Kentish double-houses, as Bede records that a number of Anglo-Saxon princesses also entered into ecclesiastical establishments in *Francia* (Wood 1994:179). Other parts of Anglo-Saxon England were equally affected by Merovingian Frankish church culture following the Christian conversion, also seen in Northumbrian monasteries. When founding their monasteries during the middle to late seventh century, both Benedict Biscop and Wilfrid drew on the monastic traditions of Merovingian *Francia* (Wormald 1976: 142-3; Wood 1990:8-17; 1994:252). For example, Biscop especially drew on Frankish traditions, acquiring manuscripts for his new monasteries from Vienne and also employed Gallic stonemasons and glaziers to construct his stone buildings (Campbell 1968; Wood 1994: 252-3).

Although it is evident from historical sources that there was a certain level of communication and exchange between the Frankish and Kentish kingdoms, the level of control *Francia* held over this portion of south-east Britain appears to be 'vague and inconstant' over time (Wood 1992: 241; Harrington and Welch 2014:177). Whilst historical sources are useful in guiding research, it is difficult to build a complete narrative from them (Wood 1994:3). Furthermore, it is likely that sources represent idealised Frankish political expansionist policies, rather than reality (Brookes 2007:8). However, enough evidence exists from the historical sources to elucidate that there was substantial cross-cultural contact from the sixth century onwards between *Francia* and Kent (Brookes 2007:8).

Archaeology confirms that from the fifth century onwards significant relationships existed between *Francia* and Kent (Harrington and Welch 2014:177). It is now widely recognized that Frankish material culture was highly influential in southern Britain throughout the late fifth to eighth century (Welch 1991:261) and it now an accepted fact that Merovingian and Frankish culture was a catalyst for change in the south-east during this time (Harrington and Welch 2014:175-77; Welch 1991:261). The most obvious cultural effect of the Frankish material was on the development of characteristically Kentish styles (Harrington and Welch 2014:178).

Harrington and Welch (2014:183-205) have mapped the distribution of Frankish and Kentish personal artefacts and weapons from *c.*450 to 750 across south-eastern England. This comprehensive analysis has revealed that the geographical location of Frankish (and Kentish) items across Kent alters over time. It is evident that during the sixth century Kent held the monopoly over trade with *Francia*, with numbers of imported Frankish items increasing until the second half of the sixth century. Following this apex there is an obvious contraction of Frankish material culture after c. 575, although Kentish imitation of Frankish styles continues into the seventh century (Harrington and Welch 2014:182). The evidence from the earlier phase suggests a distributional focus on nodal points and near major routeways, associated with the development of central places (Harrington and Welch 2014:195). It is also apparent that some settlements did not have access to either Frankish nor Kentish style material culture, suggesting that some areas held no interest to landholders or traders (Harrington and Welch 2014:195). From the middle seventh to middle eighth century, although fewer objects are represented, there is evidence for continued contact with *Francia* (Harrington and Welch 2014:205); examples include the Frankish continental pottery at *Sandtun*, and from further afield, there is also evidence for direct contact with the Frankish continent from *Hamwic* (Gardiner *et al.* 2001: 271; Harrington and Welch 2014: 205). Harrington and Welch (102014:205) conclude that the evidence indicates the "sustained presence of a small number of Frankish people, whose societal roles in Britain can only be conjectured." These individuals seem to have been free weapon-bearers, spouses, and in some cases lords, entrepreneurs and traders. Their standing in society may have caused tensions between them and their Kentish contemporaries, as there may have been rivalry over access to resources, merchandise and tribute, that provided or increased prestige (Harrington and Welch 2014:205).

Welch (1991:267) has previously suggested that the Frankish-Kentish monopoly over cross-Channel trade may have been a result of the kingdom of Kent accepting Merovingian overlordship. However, there is no clear evidence for taxes, gifts or food-rents being forcibly extracted from Kent, where as there is clear archaeological evidence for a flow of Merovingian material goods into south-eastern England and Britain during this period (Harrington and Welch 2014:178). That such significant levels of trade were occurring between Anglo-Saxon Kent and *Francia* begs the question, what resources did the south-eastern kingdoms have to trade in return for these items of wealth and prestige? (Harrington and Welch 2014:178). The availability of valuable raw resources within Kent, such as iron ore, has been suggested as one possible medium of exchange (Harrington and Welch 2014:178-9). Likewise, historical sources suggest that hides, fur, wool, glass, slaves and even hunting dogs may have been goods traded in the other direction (Chadwick -Hawkes 1982:72; Hinton 1990: 23). From the early sixth century, there is evidence for the production of glass vessels in Kent, particularly claw beakers, which were of equal craftsmanship, if not even better than, counterparts produced on the Continent. There is some evidence that these Kentish glass vessels were being exported both to the rest of England, as well as overseas (Broadley 2017; Chadwick-Hawkes 1982:74).

Ultimately, it appears that the debate concerning the true relationship between *Francia* and Kent will continue to remain somewhat shrouded in mystery. Whilst the reality of Merovingian overlordship of Kent remains uncertain, the strong connections between Kent and *Francia* are blatantly clear. Imported Frankish material goods evidently had a significant impact on Kentish culture and economy, as well as bringing prestige to individuals and communities. This is indicated in the geographical clustering of Frankish goods around major routeways and estate centres during the seventh century when these areas where evolving as centres of Kentish states (such as Lyminge). That there was a continued presence of individuals who identified themselves as 'Frankish' is also undeniable, whether these individuals were originally Anglo-Saxon and subsequently adopted Frankish styles or were Continental in origin is less certain (Harrington and Welch 2014).

It is interesting to note that the Frankish-Kentish monopoly of cross-Channel trade began to breakdown during the seventh century at a time of socio-political and economical upheaval in Kent, which saw the emergence of new patterns of trade across the south-east. It has been suggested that the Kentish domination over cross-channel trade contributed to its demise, as competing kingdoms became increasingly jealous of Kentish power (Brookes 2007:9). Of particular importance was the foundation *Hamwic* by the West Saxons in the late seventh century, which then enabled direct access to the French *emporia* Quentovic (located on the Canche) and Rouen (on the Siene) (Harrington and Welch 2014:179-180), thus directing the focus of trade away from Kent. Of equal importance was that the East Saxon's had control over London, or *Ludenwic,* which was then held by Mercia throughout the late seventh century. The Mercian kingdom subsequently made significant attempts to control access to Kent during the eighth century (Harrington and Welch 2014:180). In AD 694 that King Wihtred submitted to Ine, King of Wessex, which eventually led to the kingdom of Kent being fully incorporated into the West Saxon kingdom by AD 825. From here on in Kent only retained sporadic independence from Mercia and West Saxon's (Brookes 2007:9).

3.6 Summary

The formation of the Anglo-Saxon kingdom of Kent was deeply complex, involving many different factors and cultural influences. Therefore, it is not possible to apply one single model of socio-economic development to this region during this period. When compared with the surrounding kingdoms, it is evident that from the fifth century Kent was unique, some the most distinctive elements of this region include; the bipartite division into East and West (Yorke 1990), the important role that landscape and animal husbandry played in the development of boundaries (Brookes 2007; Banham and Faith 2014), the connections that Anglo-Saxons had with their ancestral past and the role that imported material culture played in the construction of society (Harrington and Welch 2014).

Both settlement and agriculture were driven by geology, highlighting the importance of taking a regional approach with interpretation of zooarchaeological assemblages. Thus, initial settlement was in the most fertile regions of Kent whilst the development of region boundaries was heavily influenced by the droveways created by animal husbandry. Whilst the precise date of these droveways eludes us, the practice of transhumance of livestock is one that dates back to prehistory, and the depth of many of these pathways through the Kentish landscape attests to their continued use through the Anglo-Saxon period and into the medieval period (Witney 1976; Everitt 1986; Harrington and Welch 2014).

Settlement evidence indicates that Anglo-Saxon’s felt they had profound connections with their ancestral past in this land, rather than breaking new ground and establishing new settlements and routes, they settled in areas were where there had been previous Romano-British and prehistoric activity, in the Holmesdale and the Foothills. Comparatively, these are the areas that continue to be the most heavily settled into this day as a result of their high levels of soil fertility and good access to a range of resources. From these ‘Original’ settlements the population gradually expanded into more marginal areas, often maintaining strong links to the ‘Original’ settlements from which they came. These communities ‘maximised’ on their landscape; areas, which today might be considered ‘peripheral’, or ‘marginal’, such as woodland, marshland and coastland, were considered to be prized assets in a model of scattered resource land holdings (Harrington and Welch 2014; Banham and Faith 2014; Scull 2011; Brookes 2007; Brooks 1989; Everitt 1986).

Administrative systems evolved out of pre-existing structures, and as social-hierarchy developed areas containing small-folk groups subsisting on relatively self-sufficient agricultural regimes became assimilated into *regiones* and lathes controlled from the centrally located *royal vil.* Estate centres were established near major Roman roads and well-established routeways and often were built in association with Bronze Age barrows indicating strong connections with past ancestry, as evident in the archaeological evidence from Lyminge. Furthermore, as elites began to compete cemeteries were often located along major pathways on the way into estate centres, such as those located along The Pilgrims Way, further legitimising their claims to the land, as well as enabling travellers to gaze upon their ancestors (Brookes 2007;2011; Scull 2011).

The county of Kent has a prominent position with regards to the Continent, one that did not go ignored by the powerful neighbouring kingdoms of *Francia* during this period. There is abundant evidence for links between *Francia* and Kent throughout the late fifth to early eighth century, and particularly during the sixth century (Wood 1994; Harrington and Welch 2014; Brookes 2007). Frankish imported material culture strongly influenced Kentish style, and there is clear evidence that such items provided prestige and almost exotic status to individuals and communities at a time when royal estate centres were being established. These artefacts provide us with evidence of just one way in which Frankish culture affected Kent, similarities in lawcodes and in socio-political organisation, such the foundation of the double-monastic houses throughout Kent, suggest that influence of Merovingian and Frankish culture ran deeper. Kent's ambitious nature and monopoly over cross-Channel trade eventually contributed to its demise, as it eventually lost its independence to the neighbouring West Saxon and Mercian kingdoms by the ninth century (Harrington and Welch 2014:180; Brookes 2007:8).

By necessity this overview of the political developments that resulted in the formation of the Kentish Anglo-Saxon kingdom during this turbulent period is broad and simplistic. The purpose here is to situate Lyminge within the landscape of socio-political and economical change over the period of nearly 400 years. The presence of Bronze Age archaeology on the site of the royal estate centre is a testament to the long-held importance of this area. Given the association many other Kentish royal estate centres and early minster sites have with Roman activity (Brookes 2007), the distinct lack of Roman archaeology throughout Lyminge is interesting, perhaps it is yet to be discovered. The place name of Lyminge provides the first clue to its antiquity, most likely this estate core developed out of a series of small folk-groups in the late fifth century, into the focal node of the *Limenwaralæð* during the sixth and seventh centuries. The settlements central place in the landscape, in close proximity to a number of central routeways, and its association with a number of valuable scattered resources and prominent high-status cemeteries attests to the power that was held here at this time. Furthermore, it is evidence of the intricate level of interconnectivity that characterised this landscape.

In the early ninth century (*c*.804) the charters document a grant of land in Canterbury for the Abbess Selethryth and her *familia* at St Mary's Minster in Lyminge to make emergency refuge from incoming Viking attacks. By the middle of the ninth century rural minsters, such as Lyminge, would have been increasingly vulnerable to Viking raids (Brooks and Kelly 2013:463-6). There is a slightly later charter, dated 838, which suggests that Lyminge was still a minster, however there is no mention of the community of Lyminge, therefore it may be argued that it was around this time that the community of Lyminge took up their sanctuary in Canterbury. It is from this period that the settlement of Lyminge appears to dissipate, and archaeological activity ceases in this area until the Saxo-Norman period.

The evolution of a high-status *royal vill* into a minster community at Lyminge reflects the wider social and cultural changes that were occurring in Kent throughout the early to middle Saxon period. The archaeological and historical evidence highlights the importance of Lyminge's location within the landscape, the influence of the royal elite on the Christian conversion, and the significant influence a Minster held over the wider community. The community of Lyminge was a 'power-house' and by the middle Saxon period had a prodigious portfolio of scattered resources to their name (Thomas 2016; 2017*).* Given the important role of animal husbandry and social-elite display during this period, the zooarchaeology of Lyminge provides us with a rare opportunity to witness the changing consumption patterns of an Anglo-Saxon settlement.

Chapter 4 Methodology

4.1 Zooarchaeological methodology

This analysis includes all animal bone recovered from the excavations in the modern village of Lyminge from 2008 – 2013. Further funded excavations were conducted in 2014 and 2015 on Tayne Field in the late fifth-seventh century (Phase I) settlement area, however, the faunal assemblages excavated during these years were not included within the zooarchaeological analysis for this thesis. It was decided that a cut-off point of 2013 would enable enough time for a full analysis, interpretation, contextualisation and write-up of results. The 2014 and 2015 zooarchaeological material will be the focus of future study.

The assemblage breaks down into two broad chronological groups, the earlier derived from later fifth – mid-seventh century occupation present on Tayne Field and a further site examined at the end of Rectory Lane in 2010 (hereafter referred to as Phase I), and the later derived from eighth – ninth century occupation (contemporary with Lyminge’s documented existence as a royal monastery) sampled in the land to the south of the churchyard in 2008 – 2009 (hereafter referred to as Phase II).

The Lyminge Project employed a rigorous sampling strategy to maximise the recovery of bioarchaeological and zooarchaeological remains (Maslin 2017). In addition to an intensive environmental sampling strategy employing on-site flotation, all sealed Anglo-Saxon contexts were dry-sieved in the field using a 5mm mesh. Due to soil type it was not possible to use a smaller mesh size. By boosting the recovery of small/fragile bones, particularly associated with fish, birds and small mammals, this strategy has resulted in a far more representative sample of data than obtainable by hand-collection alone. Hand-collected, and dry-sieved material were bagged together during the 2008 – 2012 and 2014 – 2015 excavations, and only separately bagged during the 2013 excavations. It was difficult to monitor the way that hand-collected and dry-sieved material was being separated in 2013 and therefore there was an unmeasurable level of excavator bias in the resulting separation of hand-collected and sieved animal bone.

The potential of the hand-collected and bulk-sieved faunal material was first recognised in Baker's 2012 assessment of the Lyminge animal bone recovered in 2009 and 2010. In her assessment, Baker followed guidelines set out by English Heritage (Historic England) MAP2 (1991) and the Environmental Guidelines (2011) as well as following the methodology used by Reynolds (2008) in the analysis of a sub-sample of the 2008 Lyminge faunal remains.

For this thesis, the initial protocol employed for the identification and recording of the Lyminge animal bone followed a similar detailed methodology as that outlined by Reynolds (2008; 2015), with guidance from Poole (2010; 2011) as this was a methodology familiar to the author. It quickly became apparent that whilst this methodology was efficient in recording the maximum zooarchaeological and archaeological data possible, it was not a practical method for recording such a large quantity of faunal material within the PhD time frame. Using this detailed recording strategy, it took three months to record the first crate of 45 total crates, within which there was a total of 4816 fragments. It would have taken one individual, working full time, *c.*11.5 years to record the entire assemblage in this manner. The total approximate fragment count was 216,720 for the material from 2008 – 2013. Furthermore, it was clear that there was data being recorded that did not relate to this project's research questions.

With this in mind, other methodologies for the recording of large zooarchaeological assemblages were considered, such as that outlined by Dobney *et al.* (2007) employed in the recording of the contemporary Flixborough assemblage, which had a similar proportion of fragments to Lyminge (i.e. over 200,000 fragments). This two-stage approach had been designed to record the most archaeological and zoological information possible, taking several factors into consideration including taphonomy and fragmentation rate, as well as species present. Several aspects included within this recording protocol were reminiscent of Davis's (1992) rapid recording strategy for mammal bones from archaeological sites. Upon close inspection of Dobney *et al.'s* (2007) methods and comparison with assemblages that had employed adapted versions of Davis's (1992) rapid recording strategy, such as Albarella and Davis (1994), Thomas (2005) and Bendrey *et al. in prep*, it became clear that the animal bone assemblage from Lyminge would be ideally suited to this type of recording using a selective strategy to maximise the recording of data directly relevant to this project.

4.1.1 Applied zooarchaeological recording method

The method employed followed a modified version of Davis (1992) and Albarella and Davis (1994), with guidance from Thomas (2005a), in which all mandibular teeth and a 'restricted suite' of skeletal elements were recorded. Rather than trying to identify all potentially 'identifiable' elements, this strategy records a selected suite of elements which preserves all the quantitative aspects and is more reliable and less time consuming (Albarella and Davis 1994:3). Although this was the most suitable recording strategy for an assemblage of this size, enabling reconstruction of taxa abundance, age profiles and biometry, unfortunately it has limited inferences regarding taphonomy and depositional history. Such questions will be the focus of future study. Material recovered from environmental samples was not considered within this thesis due to time constraints.

Identified specimens were recorded directly into Microsoft Excel and the recording system was based on two main database structures, one for teeth and one for bones. The hand-collected and dry-sieved bones recorded for mammals were: the cranium (complete or sub-complete zygomaticus), atlas, axis, scapula (glenoid cavity), proximal and distal humerus, proximal ulna, proximal and distal radius, proximal and distal metacarpal, ischial part of the acetabulum, proximal and distal femur, proximal and distal tibia, calcaneum (sustentaculum), astragalus, proximal and distal metatarsal and proximal phalanges 1, 2 and 3. For birds the following skeletal parts were recorded: the articular end of the scapula, proximal coracoid, proximal and distal humerus, proximal and distal ulna, proximal carpometacarpus, proximal and distal femur, proximal and distal tibiotarsus, and the proximal and distal tarsometatarsus. All mandibular teeth were recorded as they are the most reliable for ageing. Wherever possible element side was recorded (excluding non-countable elements).

Amphibian bones were recorded when the proximal or distal ends of the following bones were present: humerus, radioulna, femur and tibiofibula. The pelvis acetabulum is also recorded.

The reason that these particular elements were selected to be recoded was as follows: a) they are relatively easy to identify to species; b) some, such as the distal metacarpal in even-toed ungulates, when in sufficient quantities, can provide information about the sex ratio; c) many include a separate centre of ossification, or epiphysis, which fuses to the rest of the bone at a particular age and so, in sufficient quantity, provide an age ratio of juveniles to adults; d) many provide useful measurements; and e) they come from most regions of the mammalian skeleton (head, torso, limbs and feet) and their relative abundance provides some indication of preferences for different parts of the body such as the non-meat-bearing versus meat-bearing or fore-quarters versus hind-quarters (Davis 1992).

Quantification

To prevent the recounting of very fragmented bones, at least 50% of a given fragment had to be present before it was counted. Broken (i.e. single) cattle, sheep/goat and deer metapodials were counted as halves, as were the two central metapodials of pig – although they were recorded, the lateral metapodials of pigs were not counted due to their small size. Further details of the selected 'diagnostic areas' can be found in Davis (1992). Number of Identified Species (NISP), Minimum Number of Elements (MNE) and Minimum Number of Individuals (MNI) were calculated for the most common taxa.

The 'parts of the skeleton always counted' (POSAC) did not include mid-shaft fragments, only when 50% or more of the proximal or distal end of an element was present were they recorded. Care was taken to ensure that no element was counted twice within the same context. This was achieved by removing all the finds bags from each crate year-by-year, lining them up on the lab tables and grouping all finds bags from the same contexts together. These context bags were then emptied onto the same tray and analysed as one context together. Given the level of fragmentation in both Phases of the Lyminge material, in those cases where both a proximal and distal end of an element were present that could potentially have been from the same individual only the distal end was counted.

In addition to these ‘POSAC’ elements, horncores, antlers, and bone fragments with evidence of burning, butchery, gnawing or pathology were recorded as ‘non-countable’ elements. These specimens were not considered within quantitative analysis. Horncores and antlers were only recorded when a complete transverse section was present. All ‘non-countable’ elements were recorded as ‘OTH’ and the part of the body – if known – will be specified in ‘comments’. The exceptions were represented by horncores and antlers, which were recorded as ‘HC’ and ‘ANT’.

Detailed descriptions of POSACs and counting (adapted from Davis 1992)

Cranium

Only the complete cranium of or sub-complete zygomaticus was recorded. The zygomaticus is arguably one of the most diagnostic elements of the cranium, and therefore relatively easy to identify to species.

Isolated mandibular tooth

Recorded when more than half is present. Due to the difficulty in distinguishing between upper and lower equid incisor teeth, all equid incisors were recorded.

Mandible

Recorded if it has one or more countable teeth. Teeth in mandibles were recorded separately in the ‘teeth’ database. Thus, a mandible containing a second and third molar is recorded as a single mandible with the presence and wear stage of both molars in the teeth database, rather than the element database.

Axis and atlas

Recorded when more than half the element was present.

Scapula

Recorded if more than half the glenoid articulation is present.

Humerus, tibia, radius and femur

Recorded only when at least half of the distal or proximal end was present. Mid-shaft not recorded. When the element is unfused, the proximal/distal end should include at least half of the epiphyseal-diaphyseal junction surface.

Proximal ulna

Recorded if half or more of the proximal articulation is present.

Metapodials

Recorded both proximal and distal ends when more than half is present. Unfused specimens recorded when the diaphysis was also present and could be reconnected to the epiphysis. Ungulate distal metapodials comprise two condyles which often break apart. A single condyle is recorded as a half. At least half of a single condyle should be present to be recorded. Each of the two central pig metacarpals (MC3 and 4) were recorded as halves. Pig lateral metacarpal condyles (MC2 and 5) were not recorded. Carnivore metapodials are recorded as one individual but then divided by their anatomical frequency, i.e. 5, during analysis. Therefore, an isolated dog metacarpal would be counted as 1/5). Davis (1992) notes that this counting method is unusual and is a hangover from a time when he considered the bovid metapodial a 'standard' to which all other mammal metapodials should be compared. However, unlike Davis I chose not to double equid phalanges as this seemed unnecessary.

Pelvis – Ischium

Recorded the part of the acetabulum rim which is formed by the ischium, at least half should be present.

Astragalus

Recorded half or more of the lateral surface.

Calcaneum

All of the sustentaculum plus half or more of the adjacent surface which articulates with the astragalus was recorded. This is essentially the central part of the calcaneum and if the ascending ramus is missing the state of fusion of the tuber calcis cannot be ascertained. Calcanea without ascending rami were recorded but it was noted in 'comments' that the element lacked the ascending rami.

First, second and third phalanx

Half or more of the articular surface including enough bone adjacent to the shaft to identify the state of fusion of the epiphysis.

Identification

The difficulty in distinguishing between morphologically similar species is well recognised within zooarchaeology. For example, the issues associated with identifying between sheep and goat is well-documented (see for example Davis 1987; Reitz and Wing 1999; Zeder and Lapham 2010). In this study, morphological distinction between sheep and goat was attempted with the distal humerus, distal metapodia, distal tibia and astragalus and calcaneum following Boessneck (1969) and Zeder and Lapham (2010), and the dP3, P3, and P4 after Zeder and Pilaar (2010). Horncores were distinguished between species, but not considered within quantitative analysis.

Horse and donkey were separated using the mandibular molars, based on the extent of penetration of the buccal fold and the shape of the internal fold after Davis (1980) and Eisenmann (1981). Only those teeth, both loose and in situ, whose position within the jaw could be securely located, were considered. All post-cranial elements were identified simply as 'equid', although during recording were noted as being more 'horse-like'.

Red deer (*Cervis elephus*) and fallow deer (*Dama dama*) were differentiated based on the criteria of Lister (1987). Hares and rabbits were separated using Callou's (1997) methods.

Problems also exist between the distinction of closely related Galliforms, domestic fowl (*Gallus gallus*), guinea fowl (*Numida meleagris*), and pheasant (*Phasianus colchicus*). The presence of a spur on the tarsometatrsal is considered a characteristic of male domestic fowl and pheasant (being absent from guinea fowl). The presence/absence of a 'continuous posterior keel' on the tarsometatrsus and of an 'air-sac foramen' on the proximal femur are features that distinguish domestic fowl and guinea fowl from pheasants (Thomas 2005:7). It was also possible, using the University of Reading zooarchaeological laboratory's modern reference material (paired with the vast numbers of galliforme remains present in this assemblage), to confidently identify between the other morphological variations on several other elements. Much of data on chickens and chicken pathological profiles were recorded by Dr Tyr Fothergill andy Dr Alison Foster as part of the Cultural and Scientific Perception of Human Chicken Interactions Project - AH/L006979/1.

Micro-mammals were not recorded as part of this project – although very few were noted in the hand sieved and dry sieved bone during identification. There were more micro-mammals recovered in the environmental samples, which await future analysis.

With the exception of a single sturgeon scute, fish bone was not identified and analysed as part of this thesis - the quantity and importance of these remains requires a separate in-depth project in its own right. The sturgeon scute was included within analysis due to the high-status connotations that it held in later periods, and its deposition within an SFB. Given the relative rarity of fish in Phase I the author thought it pertinent to include within the NISP count. The analysis conducted thus far on the Lyminge fishbone by Reynolds (2008, 2015) provides sufficient data to consider alongside the animal bones for this thesis.

The distinction between frog and toad was only attempted on the pelvis; all other post-cranial amphibian bones were identified to class level.

Ageing

Ageing was recorded by dental eruption/subsequent wear and epiphyseal fusion. Epiphyseal fusion was recorded for all identified fragments, as 'unfused', 'fusing', or 'fused'. Bird bones were recorded as 'juvenile' if the ends of the bones appeared porous, or 'spongy'. Mammal bones were then divided into three age classes, early fusing, middle fusing and late fusing, following Reitz and Wing (2008:72, table 3.5).

Mandibular teeth rows were considered ageable if one or more cheek teeth (Dp4/P4) were present with signs of recognisable wear on the occlusal surface. For the three main domesticates (cattle, sheep/goat and pig) patterns of wear were recorded using the criteria set out by Grant (1982). Age classes were then assigned using Halstead (1985) and Legge (1992) for cattle, O'Connor (1988) for pigs and Payne (1973; 1987) for sheep/goat (see Table 4.1, Table 4.2 and Table 4.3 for the cattle, sheep/goat and pig tooth eruption and wear stages employed in this study). Isolated teeth were considered ageable if they consisted of the Dp4, P4 or a M1, M2 or M3 with identifiable wear on the occlusal surface. Geese elements were aged based on epiphyseal fusion stages following Serjeantson (2000:39) (Table 4.4).

Legge (1992) – Cattle tooth eruption and wear codes, after Ewbank *et al* (1964) and Grant (1982)						
Grant (1982) wear stage	**Halstead (1995)**	**dp4**	**P4**	**M1**	**M2**	**M3**
A	0 – 1 months	U	-	C?	-	-
B	1 – 8 months	c-f	-	V-E	-	-
C	8 – 18 months	f-h	-	1/2-U	-	-
D	18 – 30 months	f-j	-	b-d	E-U	-
E	30 – 36 months	j-k	-	g	b-f	E-1/2
F	Young adult	m-n	-	g-k	f-g	b-g
G	Adult	-	b-f	j-l	j-k	g
H	Old adult	-	f-h	k-l	g-k	g-l
I	Senile	-	h	l-m	m	m

Table 4.1: Cattle tooth eruption ages and wear stages employed in this study, following Legge's (1992) methods which employed Ewbank et al (1964) cattle eruption stages and Grant's (1982) wear stages. For ease of comparison Halstead's (1995) suggested ages have been correlated to Legge's (1992) wear stages).

Wear Stage	**Definition (Grant's (1982) codes)**	**Payne's (1973) suggested ages**
A	dp4 unworn (E-U), M1 unworn (C-E)	<2 months
B	dp4 b-f, M1 unworn (E-U)	2-6 months
C	dp4 g-f, M1 a-f, M2 unworn (C-U)	6-12 months
D	dp4 g-m, M1 f-g, M2 a-f, M3 unworn (C-U)	12-24 months
E	dp4 h-m, M1 >g, M2 d-g, M3 a-c	2-3 years
F	P4 >a, M1 >g, M2 >g, M3 d-f	3-4 years
G	P4 >f, M1 >g, M2 >g, M3 g	4-6 months
H	P4 >f, M1>h, M2 >h, M3 g	6-8 years
I	P4 g-l, M1 h-m, M2 h-m, M3 >h	8-10 years

Table 4.2: Sheep/goat tooth eruption ages and wear stages employed in this study, following Grant's (1982) codes and Payne's (1973) suggested ages.

Stage (O'Connor (1988)	**Definition - Grant's (1982) codes**
Juvenile	M1 unworn (C-E)
Immature	M1 in wear, M2 unworn (C-E)
Subadult	M2 in wear, M3 unworn (C-E)
Adult	M3 in wear but not heavily
Elderly	M3 >j

Table 4.3: Pig tooth eruption ages and wear stages employed in this study, following Grant's (1982) wear stages and O'Connor's (1998) suggested age stages.

Age of fusion in bones of domestic chicken (Serjeantson 2009:39, Table 3.2)	
Element	**Age**
Carpometacarpus	14 weeks
Tarsometatarsus, proximal	19-27 weeks
Spur core to tarsometatarsus	34 weeks onwards

Table 4.4: Epiphyseal fusion timings used to age geese bones following Serjeantson (2000:39, Table 3.2).

Sexing

Where possible, pigs were sexed based upon their canines, as sows have smaller canines with closed roots whereas male canines continue to grow throughout their lifetime and are open rooted (Schmid 1972:80). Sheep/goat and were sexed based upon morphological and metrical traits of the pelvis (Grigson 1982; Hatting 1995; Greenfield 2006). Cattle may also be sexed using metrical data from the metapodials, although other extraneous factors may also play part in the dimensions of these elements (e.g. Albarella 1997a). The presence of the *baculum* was used to identify male dogs. Sexual diagnostics for domestic fowl were based upon the presence of absence or tarsometatarsi cockspurs, although it is known that exceptions can occur (Sadler 1991), so metrics were also employed to distinguish between male and female domestic fowl. The presence of medullary bone was also noted, as it is characteristic feature of female domestic fowl in lay (Driver 1982). All other species were sexed based on metrical analysis.

Measurements

Measurements were recorded using digital callipers to the nearest decimal point. Measurements of very large bones were taken using a measuring box.

Measurements were taken on all fused and fusing bones, and those with a conjoining but unfused epiphysis and diaphysis. Neonatal and very young specimens were also measured to provide an indication of age. Teeth were not measured.

Most of the measurements taken follow von den Driesch (1976), with a few modifications, such as the humerus HTC, BT and tibia Bd were measured for all species using the method described by Bull and Payne (1988) for pigs. Abbreviations all follow von den Driesch (1976).

The following measurements were taken:

Horncores and antlers: minimum and maximum diameter of the base; greatest length (only bovids) (45,46,47)

Atlas: H, BFcr (only for pig)

Scapula: mammals SLC

Humerus: mammals = GLC, BT (ungulates), Bd (all other mammals), HTC, SD

birds = GL, SC, Bd

Radius: mammals = GL, SD (when GL is taken)

Metacarpal: cattle = GL, SD, BatF, Bd, a, b, 3, 6.

caprines = GL, SD, Bd, a, b, 1, 2, 3, 4, 5, 6.

pig = GL

cervids = GL, SD, Bd, 3

horse = GL, SD, Bd, Dd

Pelvis: mammals = LAR (LA)

Femur: mammals = GL, SD (when GL is taken), DC

birds = GL, Lm, SC, Bd, Dd

Tibia: mammals = GL, Bd, Dd, SD

birds = GL, La, SC, Bd, Dd.

Astragalus: bovids and cervids = GLl, GLm, Bd, Dl

pig = GLl, GLm

carnivores = GL

equids = GH, GB, BFd, LmT

Calcaneum: mammals = GL, GD

Metatarsal: cattle = GL, SD, BatF, Bd, a, b, 3, 6.

caprines and cervids = GL, SD, Bd, a, b, 1, 2, 3, 4, 5, 6.

pig = GL

cervids = GL, SD, Bd, 3

horse = GL, SD, Bd, Dd

birds = GL, SC, Bd.

Phalanx 1: equids only = GL, Bp, Dp, SD, Bd, Dd.

Preservation, gnawing, butchery and burning

Quality of bone preservation was noted on all countable fragments and was recorded as follows (as detailed in Albarella and Davis 1994):

A = awful

B = bad

M = medium

G = good

E = excellent

Bone preservation stages were based loosely on Behrensmeyer's (1978) six weathering stages with the recognition that Behrensmeyer's (1978) study was conducted in sub-Saharan Kenya, Africa, rather than a temperate country, such as England. Although differing climate affects bone preservation in distinct ways it was felt that Behrensmeyer's (1978) weathering study is widely used among zooarchaeologists and therefore would be allow cross-assemblage comparison (Reitz and Wing 2008).

Evidence for gnawing, butchery and burning was recorded on all 'countable' elements. The types of butchery marks were recorded as 'cut' 'chop' and 'saw' marks. Only their presence, and not their position was recorded unless it was of particular significance, for instance if it was on the proximal or distal end of long bones. Burnt bone was recorded as: 'singed', 'burnt' or 'calcined', depending on the level of exposure the bone had to the fire. Bones were recorded as 'singed' if the burning looked like superficial blackening, 'burnt' if more extensive blackening had occurred, and 'calcined' if the bones were observed to be a blue-white colour.

Palaeopathology and non-metric traits

Pathologies noted on 'countable elements' were recorded and described in the comments section using the terms outlined by Vann and Thomas (2006). Non-metric traits present on 'countable elements' were also recorded and described in comments.

4.2 Isotope methodology

A number of surviving Anglo-Saxon charters refer to the granting of land for fisheries, salt-making, and areas of pasture for sheep and cattle in the Romney Marsh to the double minster of Lyminge in the eighth to tenth centuries (Brooks 1988:95-99; Kelly 2006:98). Recent research has shown that coastal and salt-marsh plants species are significantly enriched in δ^{15}N in comparison to other terrestrial plants (Britton *et al.* 2008:2111). Therefore, a pilot study investigating the carbon and nitrogen stable isotope signatures for the three main domesticates (cattle, caprines and pig) from the two phases of Lyminge was devised in order to assess the validity of the charter evidence, in addition to highlighting potential change or continuity in foddering and pasturing practices between the two phases of the site. Compact bone from 60 individual elements, 30 from each phase of the site, were sampled for stable isotope analysis of bulk bone collagen. Samples comprised of 20 cattle, 20 sheep/goat and 20 pigs. All samples were taken from well-stratified Anglo-Saxon contexts and were selected from different contexts and features to reduce the possibility that the same animal was being sampled. Only adult specimens that were fully fused were selected. All bone samples were prepared in the University of Reading isotope laboratory following the collagen extraction method detailed by Longin (1971), with modifications based on results by Collins and Galley (1998). The methodology employed follows that detailed in Britton *et al.* (2008:2114), samples were extracted with a clean saw and external surfaces then removed using a drill. samples were demineralized in 0.5M hydrochloric acid at 6-8°C for three – ten days, with the acid being changed at regular intervals. The samples were then rinsed to neutrality with de-ionized water and gelatinized in a weak acidic (pH 3) HCL solution at 70°C for 48 hours. The liquid fraction containing the gelatinized protein was isolated through filtration using 5-8 µm Ezee® mesh filters (ElKay Laboratory Products), the remaining solution was then frozen and lyophilized. Stable isotope measurements were conducted in duplicates on a Europa 20-20 isotope ratio mass spectrometer coupled to a Sercon elemental analyser at the University of Reading. The analytical error for d^{13}C and d^{15}N measurements, which was calculated from repeat measurements of internal reference materials calibrated to USGS-40 (L-glutamic acid) was determined at ± 0.2‰ (1σ) or better. Collagen preservation was mostly good. Six of the samples had %C <30%, however, these were still considered acceptable as all other collagen quality indicators were met and their δ-values fall within the main group of samples (van Klinken 1999; Britton *et al.* 2008:2114). Only samples that fell within the accepted carbon-to-nitrogen (C/N) ratio of 2.9 to 3.5 were considered within analysis as these samples likely preserved a reasonably similar stable isotope ratio to those from the lifetime of the animal (Katzenberg 2008:418; DeNiro 1985).

Isotope results from the chickens analysed by Sykes and Miller (*in prep*) as part of the AHRC Cultural and Scientific Perception of Human Chicken Interactions Project, have been included in the results and discussion of this research to enhance the pilot study sample size. These samples were analysed at NERC Isotope Geosciences Facilities at the British Geological Survey, Keyworth. Sample preparation was undertaken at the Isotope Preparation Lab, Department of Classics and Archaeology, University of Nottingham, according to the modified Longin (1971) method (Brown *et al.* 1988) whereby, after the gelatinisation process, samples were filtered through 8 µm EZee filters prior to freeze drying. The isotope ratio mass spectrometry took place at the NERC Isotope Geosciences Facilities, measured on a continuous flow-elemental analyser (Flash/EA) coupled to a ThermoFinnigan Delta Plus XL via a ConFlo III interface. Collagen carbon and nitrogen isotope ratios ($\delta^{13}C$, $\delta^{15}N$) are reported in per mil (‰) relative to VPDB and AIR standards respectively. $\delta^{13}C$ and $\delta^{15}N$ ratios were calibrated using an in-house reference material M1360p (powdered gelatine from British Drug Houses) with expected delta values of –20.32‰ (calibrated against CH7, IAEA) and +8.12‰ (calibrated against N-1 and N-2, IAEA) for C and N respectively. $\delta^{13}C$ and $\delta^{15}N$ analyses were done in duplicate and the average standard deviation of these pairs was $\delta^{15}N$ = ± 0.05‰ and $\delta^{13}C$ = ± 0.04‰. Samples fell within the acceptable range of atomic C/N values (2.9–3.6) and percent carbon (% C) and nitrogen (% N) to sufficiently reflect *in vivo* collagen values from well preserved bones (Ambrose 1990).

A sample of bones were also sent to the Oxford Radiocarbon Accelerator Unit (OxA) for radiocarbon dating, the resulting $\delta^{13}C$ and $\delta^{15}N$ ratios from 28 of these samples have also been used in this thesis to increase sample size and the breadth of taxon to enable more in-depth discussion. These bones were selected from the primary fill of features (where possible) and selection criteria was based on which features required radiocarbon dates, therefore the sample included both adults and juvenile animals. A single human neonate (aged 38-40 weeks) was included within the sample sent for radiocarbon dating. This was the only human discovered on the site and is an almost complete skeleton recovered from pit [1663]. The neonate was not identified *in situ* and other finds from this context include assorted bone and metal small finds, pottery and a large quantity of animal bone suggesting that this was a pit for general refuse.

Chapter 5 Results - zooarchaeological analysis of Lyminge assemblages

The results of the zooarchaeological analysis of the assemblages excavated from 2008 – 2013 are presented in this chapter. In each section the data are considered chronologically, starting with material from the late fifth – seventh century (Phase I) and moving on to the data from the eighth – ninth centuries (Phase II). Data patterns and trends are presented within this chapter and discussed in further detail in Chapters 6-9.

5.1 Recovery and preservation

In general, the bones from Lyminge were extremely well preserved. The majority of material recovered from late-fifth to mid-seventh century (Phase I) deposits had good levels of preservation and most of the eighth – ninth century (Phase II) material had excellent levels of preservation (Table 5.1). Under 1% of material was recorded as having medium, poor or very poor levels of preservation in the Phase I zooarchaeological assemblage and under 4% was recorded as medium, poor or very poor levels of preservation in the Phase II zooarchaeological material.[2] Both sites had high levels of fragmentation, however, the level of fragmentation was noted as being higher in the Phase I material, likely a result of the different methods of middening between the two phases of the site.

	Phase I (5th-7thC)		**Phase II (8th-9thC)**	
Preservation	**Qty**	**%**	**Qty**	**%**
Very Poor	0	0	1	0.0
Poor	3	0.1	187	3.8
Medium	21	1	2	0.0
Good	2481	91	15	0.3
Excellent	211	8	4667	95.8
Total	**2716**		**4872**	

Table 5.1 NISP preservation rates for both phased assemblages – including all recorded fragments showing both the quantity (NISP) and relative percentage NISP.

A range of other taphonomic factors may have influenced bone preservation including gnawing, butchery and burning. Low levels of gnawing were recorded in both phases: 12% in the Phase I

---

[2] Classification following guidance from Behrensmeyer 1978 and Albarella and Davis 1994

material and 7% in Phase II. Table 5.2 shows the relative percentage of gnawed material by taxa as a percentage of the total number of taxa recorded in each phase. The column ‘Other’ denotes material that had been gnawed but was not identifiable and therefore not ‘countable’ according to the methodology. Whilst ‘Other’ fragments have not been considered in the overall assemblage count taphonomy on unidentifiable or uncountable material was recorded to provide a rough indication of the amount of material that may have been lost due to taphonomic factors. The material that suffered the higher amount of gnawing were fragments recorded as ‘Other’ suggesting that when material had been gnawed it left the bone in a less identifiable state. There was also some evidence for material having been digested following gnawing, indicating that despite having been digested bone did survive and, in some cases, was identifiable to species. Of the identified elements with evidence of gnawing, cattle bones had undergone the most carnivore activity (mostly dog gnawing) in both phases.

Phase I (5th-7thC) Percentage Gnawed

Gnawing	Cattle	Sheep/Goat	Pig	Equid sp.	Chicken	Other
Carnivore gnawing	9.3	6.4	3.2	40	0.5	18.1
Carnivore gnawing/digested			0.1			
Digested		1.1	0.2			

Phase II (8th-9thC) Percentage Gnawed

Gnawing	Cattle	Sheep/Goat	Pig	Dog	Roe	Chicken	Bird	Other
Carnivore gnawing	17	6.2	6.9	5.6	3.3	1		21.6
Carnivore gnawing/digested	0.3	1.1	1.6					0.4
Digested							10	

Table 5.2: Relative percentage NISP of all gnawed elements by taxa and phase. Relative percentages calculated from total number of elements identified by taxa.

The colour of burnt bone can provide important clues to the condition of the remains at the time of burning and the environment in which the burning occurred. The final colour of bone can be affected by several factors, including the temperature and duration of burning, and the availability of oxygen; the chemical reactions which determine the final colour of the bone require varying amounts of energy and oxygen (Walker and Miller 2005:9).

The array of burnt colours in both phases suggest that bones were exposed to a range of fire temperatures from 100°C to >1000°C (Lyman 1994:386). Experimental cremation of bone has revealed that bones burnt in open air conditions begin to turn grey at approximately 600°C (Walker and Miller 2005:3) and the calcined white colour visible on many of the fragments would have been achieved at approximately 1000 °C (Walker and Miller 2005:9) suggesting that these bones were in the centre of the fire, hearth or furnace.

There was evidence of burnt bones in both phases: 22% of the Phase I material was burnt whereas only 5% of the Phase II assemblage was burnt, indicating different middening strategies for animal bone between the phases. Unidentifiable elements ('Other') revealed the majority of burning in both phases, suggesting that once bone was burnt it was more brittle and therefore more likely to shatter into smaller, less identifiable, fragments (Table 5.3). Much of the bone was burnt black in both phases, suggesting that it was not frequently employed as fuel, and that burning was not a common disposal strategy.

Phase I (5th-7thC) Percentage Burnt

Burning type	**Cow**	***Caprines**	**Pig**	**Chicken**	**Other**
Burnt black	1.3	1.1	0.6	0.5	29.2
Calcined	0.3	0.5	0.2	1	22.8
Singed	0.2	0.5	0.4		4.5

Phase II (8th-9thC) Percentage Burnt

Burning type	**Cow**	***Caprines**	**Pig**	**Cat**	**Roe**	**Chicken**	**Goose**	**Bird**	**Other**
Burnt black	2.2	1.7	1.5	1.8		0.4	12.5	10	32.2
Calcined	0.7	0.7	1.5			0.1		20	12.3
Singed	0.8	1	0.7		3.3	0.1			9.3

*Table 5.3: Relative percentage NISP of burnt elements by taxa and phase. Relative percentages calculated from total number of elements identified by taxa. *Caprines includes sheep, sheep/goat and goat.*

Butchery marks were recorded on 15% of the Phase I assemblage and 8.2% of the Phase II assemblage. Table 5.4 and Table 5.5 show a breakdown of butchery mark type by taxa and phase. As in contemporary assemblages, cut marks were the most common butchery mark recorded on animal bones in both phases. There was no evidence for specialised or systematic butchery in either phase, and a range of cut, chop and saw marks were recorded throughout the assemblages. Only for Red and Roe Deer was there a level of specialism, as there was a higher percentage of sawn, chopped and sawn and cut and sawn fragments suggesting the use of these animals for crafts or medicines - which is discussed below.

Phase I (5th-7thC) Butchery Percentage

Butchery Type	Cow	*Caprines	Pig	Equid sp.	Cat	Red deer	Roe deer	Chicken	Goose	Other
Chopped	3.1	0.8	0.5							3
Cut(s)	6.4	4	2.1	20	12.5		33.3	1	5.3	22
Sawn	0.3						100			0.3
Chopped and cut(s)	0.8	0.3	0.1			50				0.7
Sawn and chopped	0.2									
Cut(s) and sawn						25				0.3
Chopped, cut(s) and sawn						50				
Total NISP of taxa	**636**	**373**	**922**	**5**	**8**	**4**	**3**	**417**	**19**	**915**

*Table 5.4: Relative percentage NISP of butchered elements from the total NISP of each taxon. Showing all types of butchery noted in Phase I by taxa and butchery type. *Caprines includes sheep, sheep/goat and goat.*

Phase II (8th-9thC) Butchery Percentage

Butchery Type	Cow	*Caprines	Pig	Equid sp.	Canid sp.	Red deer	Roe deer	Chicken	Other
Chopped	3.2	2.2	0.5	5.6				0.1	4.8
Cut(s)	10	6.3	4.3	5.6	2		1.8	0.6	39.6
Sawn	0.6	0.8	0.3					0.3	1.8
Chopped and cut(s)	0.1	0.2							1.8
Sawn and chopped						25	1.8		
Cut(s) and sawn	0.7	0.1							0.4
Total NISP of taxa	**719**	**1022**	**607**	**18**	**51**	**0**	**55**	**1860**	**227**

*Table 5.5: Relative percentage NISP of butchered elements from the total NISP of each taxon. Showing all types of butchery noted in Phase II by taxa and butchery type. *Caprines include all butchery for sheep sheep/goat and goat.*

Figure 5.1 shows the relative percentage of NISP counts of all recovered identified specimens by feature type. The majority of material in the pre-Christian phase was recovered from sunken featured buildings (SFBs). Previous research has shown that, on abandonment, SFBs are often filled with redeposited material derived from surface middens, the artefactual constituents of which are characterised by high levels of fragmentation and weathering (Tipper 2004). While the depositional history of pits represented across the Anglo-Saxon settlement spectrum displays considerable diversity and complexity, it is nonetheless relatively common to encounter distinct horizons of 'primary' refuse dumped in a relatively fresh, un-weathered state within such features, and this practice was widely attested in the 100 or so pits excavated at Lyminge in Phase II (Thomas 2010: 70-1; Knapp 2017: 136). Minor quantities of bone were recovered from ditches, structural features – wall-trenches, post-holes and door pits – associated with timber buildings. Although it should be noted that a higher number of the latter were associated with Phase I and more of the former with Phase II.

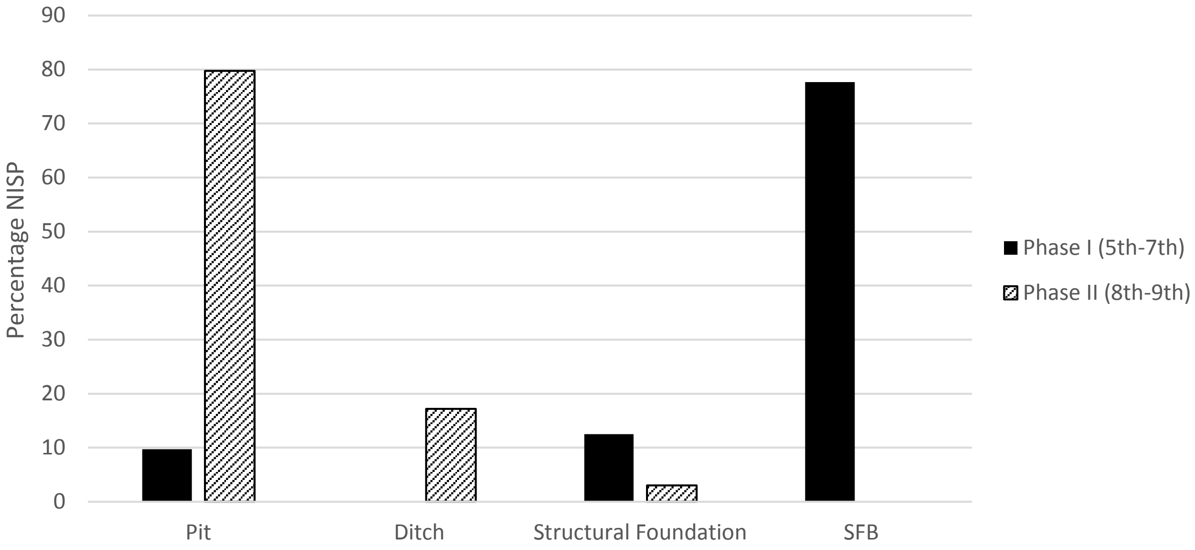


Figure 5.1: The relative percentage of NISP counts of all recovered identified specimens by feature type and Phase.

5.2 Associated bone groups (ABGs)

A total of four ABGs were recovered from Phase I and 61 were recovered from Phase II. A number of these ABGs were recorded during excavation, whereas others were identified post-excavation during the analysis of the faunal material. The species represented included cattle, sheep, pig, horse, chicken, cat, dog, roe deer, chicken, corvids and a single human neonate. Pig and chicken were the only species represented in the Phase I, with pig being the most common, and the most frequently represented species in Phase II were chickens and dogs (Table 5.6) Many of these ABGs were partial skeletons and articulated limbs, and several neonates were recorded. ABGs were recovered from a variety of contexts including pits, SFBs and ditches. As with Morris's nationwide study, many ABGs from Lyminge were derived from pits (Morris 2008, 2011). The recovery of ABGs from a wide range of contexts in Anglo-Saxon settlements has been noted elsewhere, and there does not appear to be any correlation between species and context type (Hamerow 2006:12).

The presence of a human neonate among the animal bone refuse is of note, the individual was an almost complete infant, aged 38-40 weeks. The disposal of infants outside of cemeteries has been interpreted in several ways, and it has been argued that during this period infants were not considered to be 'full persons' and therefore were not treated as such (Hamerow 2012:13-14; Crawford 1999:77-89).

Whilst it is feasible that these ABGs are a result of primary butchery waste, the possibility that they also represent specific and ritualised domestic behaviours must also be considered (Poole 2011: 157). These deposits are often deemed as 'special' as they are distinct from the 'normal' fragmented animal bone recovered from excavations (Morris and Jervis 2011:68). Research has shown that 'ritual' and 'functional' aspects behind the creation of such deposits are inseparable, (Knox 2012: 227-257) thus these ABGs are a result of complex human actions and motives that would have been guided by the values held within the community (Morris and Jervis 2011:69-70).

Year	Fill no.	Context Type	ABG species	Date	Phase	C14 calibrated 95% confidence
LYM10	2293	SFB2	Neonatal pig - partial skeleton	5th-7th century	Phase I	
LYM10	2690	SFB2	Associated pig scapula, humerus and radius	5th-7th century	Phase I	
LYM12	3695	Pit	Chicken - partial	5th-7th century	Phase I	
LYM13	6119	Pit	Juvenile Pig - complete	5th-6th century	Phase I	AD 405-539
LYM08	12	Pit	Sheep/goat - partial	7th-8th century	Phase II	AD 646-770
LYM08	12	Pit	Dog - partial neonate (MNI 4)	7th-8th century	Phase II	AD 646-770
LYM08	150	Pit	Chicken - partial	8th-9th century	Phase II	
LYM08	197	Pit	Cat - almost complete	8th-9th century	Phase II	
LYM08	243	Pit	2 partial neonatal sheep/goat	8th-9th century	Phase II	
LYM08	273	Pit	Chicken and sheep/goat	8th-9th century	Phase II	
LYM08	313	Pit	Dog - partial neonates (MNI 5)	8th-9th century	Phase II	
LYM08	580	Pit	Cat - almost complete	8th-9th century	Phase II	
LYM08	582	Pit	Chicken - partial	8th-9th century	Phase II	
LYM08	628	Pit	2 Chickens - almost complete	8th-9th century	Phase II	
LYM08	641	Pit	Sheep/goat articulating feet bones	8th-9th century	Phase II	
LYM08	645	Pit	Cat - articulating feet bones	8th-9th century	Phase II	
LYM08	656	Cesspit	Cat - almost complete	7th-8th century	Phase II	AD 651-771
LYM08	658	Pit	Sheep/goat articulated vertebrae	8th-9th century	Phase II	
LYM08	679	Pit	Red sea bream	8th-9th century	Phase II	
LYM08	680	Pit	Chicken - partial	8th-9th century	Phase II	
LYM08	744	Pit	Chicken - partial	8th-9th century	Phase II	
LYM09	1308	Pit	5 neonatal dogs - some partial, some complete	8th-9th century	Phase II	
LYM09	1312	Pit	Chicken - partial	8th-9th century	Phase II	
LYM09	1333	Pit	Chicken - partial	8th-9th century	Phase II	
LYM09	1333	Pit	Cat - almost complete	8th-9th century	Phase II	
LYM09	1340	Pit	Juvenile domestic fowl, cf chicken - partial	8th-9th century	Phase II	
LYM09	1482	Pit	Chicken - partial	8th-9th century	Phase II	
LYM09	1491	Ditch	2 juvenile pigs - partial	8th-9th century	Phase II	
LYM09	1506	Pit	Juvenile corvid - partial	7th-9th century	Phase II	AD 662-873
LYM09	1506	Pit	Juvenile domestic fowl - partial	7th-9th century	Phase II	AD 662-873
LYM09	1506	Pit	Cat - partial	7th-9th century	Phase II	AD 662-873
LYM09	1506	Pit	Dog - partial, neonate	7th-9th century	Phase II	AD 662-873
LYM09	1506	Pit	roe deer - articulated radius and ulna	7th-9th century	Phase II	AD 662-873
LYM09	1552	Pit	Juvenile tarsomatatarsii of domestic fowl	8th-9th century	Phase II	
LYM09	1566	Pit	Juvenile domestic fowl	8th-9th century	Phase II	
LYM09	1571	Pit	Cow - 1-7 months old, not complete	8th-9th century	Phase II	
LYM09	1571	Pit	Cat - almost complete	8th-9th century	Phase II	
LYM09	1596	Pit	2 neonatal dogs	8th-9th century	Phase II	
LYM09	1600	Cesspit	Cat - almost complete	8th-9th century	Phase II	
LYM09	1600	Cesspit	Chicken - almost complete	8th-9th century	Phase II	
LYM09	1667	Pit	Cow - partial	8th-9th century	Phase II	
LYM09	1667	Pit	Dog - almost complete	8th-9th century	Phase II	
LYM09	1672	Pit	cf. Chicken, and neonatal human	7th-8th century	Phase II	AD 646-770
LYM09	1730	Pit	Chicken	8th-9th century	Phase II	
LYM09	1730	Pit	Sheep/goat - partial	8th-9th century	Phase II	
LYM09	1837	Pit	Chicken - partial	8th-9th century	Phase II	

Table 5.6: Lyminge ABGs in both phases - including those excavated in situ and those identified during post-excavation analysis.

5.3 Results

A total of 6912 animal bones were identified to species from both phases of the site. Of this number, 2448.4 animal bones were identified in the Phase I assemblage, and 4463.6 animal bones were identified in the Phase II assemblage. As a rapid recording strategy was employed unidentifiable material and bones that would usually be identified as ‘small’, ‘medium’, or ‘large’ mammals were not quantified. However, the Phase II material recorded in the start of research using a highly detailed recording strategy revealed that of the 4816 analysed fragments, 1177 were considered unidentifiable (25%), and 3211 were only assigned to a size category (42%). Therefore, the sample of bones recorded using the original methodology, 34% of the assemblage was identified to species.

Table 5.7 shows the number of identified specimens (NISP) in both phases by taxon. It is worth noting that a large quantity of fish bones were recovered during the Lyminge excavations, both by hand and in the environmental samples. However, fish bone analysis was not within the scope of this thesis, therefore discussion of Lyminge fish remains in further chapters will be drawn from the results of Reynold’s (2015) analysis of the 2008 and 2013 Lyminge fish assemblage.

As is common in most Anglo-Saxon assemblages, cattle, pig and sheep dominated the mammal NISP counts, and over 50% of both assemblages was made up by the three main domesticates. However, their quantities vary significantly between the two phases revealing significant changes in animal husbandry and diet over time (Figure 5.2).

	Phase I (5th-7thC)		**Phase II (8th-9thC)**	
Taxa	**NISP**	**MNI**	**NISP**	**MNI**
Cattle	636	28	719	42
Sheep/Goat	324	30	909	81
Sheep	48	9	109	9
Goat	1	1	4	1
Pig	922.8	44	607.6	43
Equid sp.	5	1	18	3
Dog	2	1	35	23
Canid sp.	8.6	1	51	5
Fox	3	2	0	0
Cat	8	2	55	8
Roe deer	3	1	30	14
Red deer	4	1	0	0
Hare	1	1	1	1
Badger	1	1	0	0
Pole cat/pine marten	1	1	0	0
BIRDS				
Chicken	380	36	1662	160
Chicken/Pheasant	37	5	198	19
Goose	19	3	8	4
Anser sp.	0	0	11	2
WILD BIRDS				
Mallard duck	13	2	11	2
Black headed gull	0	0	2	1
Common Gull	1	1	4	1
Oystercatcher	2	1	0	0
Coot	2	1	0	0
Common moorhen	1	1	0	0
Gannet	1	1	0	0
Golden Plover	2	2	0	0
Plover	1	1	1	1
Crane	2	2	0	0
Curlew	1	1	4	2
Lapwing	3	2	0	0
cf. Lapwing	1	1	0	0
Plover/Lapwing family	1	1	0	0
Snipe	1	1	0	0
Heron	0	0	1	1
Woodcock	2	1	0	0
cf. Woodcock	0	0	2	1
Stock Dove	0	0	1	1
Woodpigeon	1	1	1	1
Jay	0	0	7	1
cf. Jay	0	0	1	1
Raven	1	1	0	0
Magpie	1	1	0	0
Jackdaw	0	0	7	1
Goshawk	2	2	0	0
Peregrine Falcon	1	1	0	0
cf. Sparrowhawk	0	0	1	1
Buzzard	1	1	0	0
Red kite	2	1	0	0
Passerine	1	1	1	1
Wader sp.	0	0	3	1
Accipitridae family	1	1	0	0
FISH				
Sturgeon	1	1	0	0
Total	**2448.4**		**4463.6**	

Table 5.7: Number of identified specimens (NISP) and Minimum number of Individuals (MNI) counts of animals identified to species from both phases of the site.

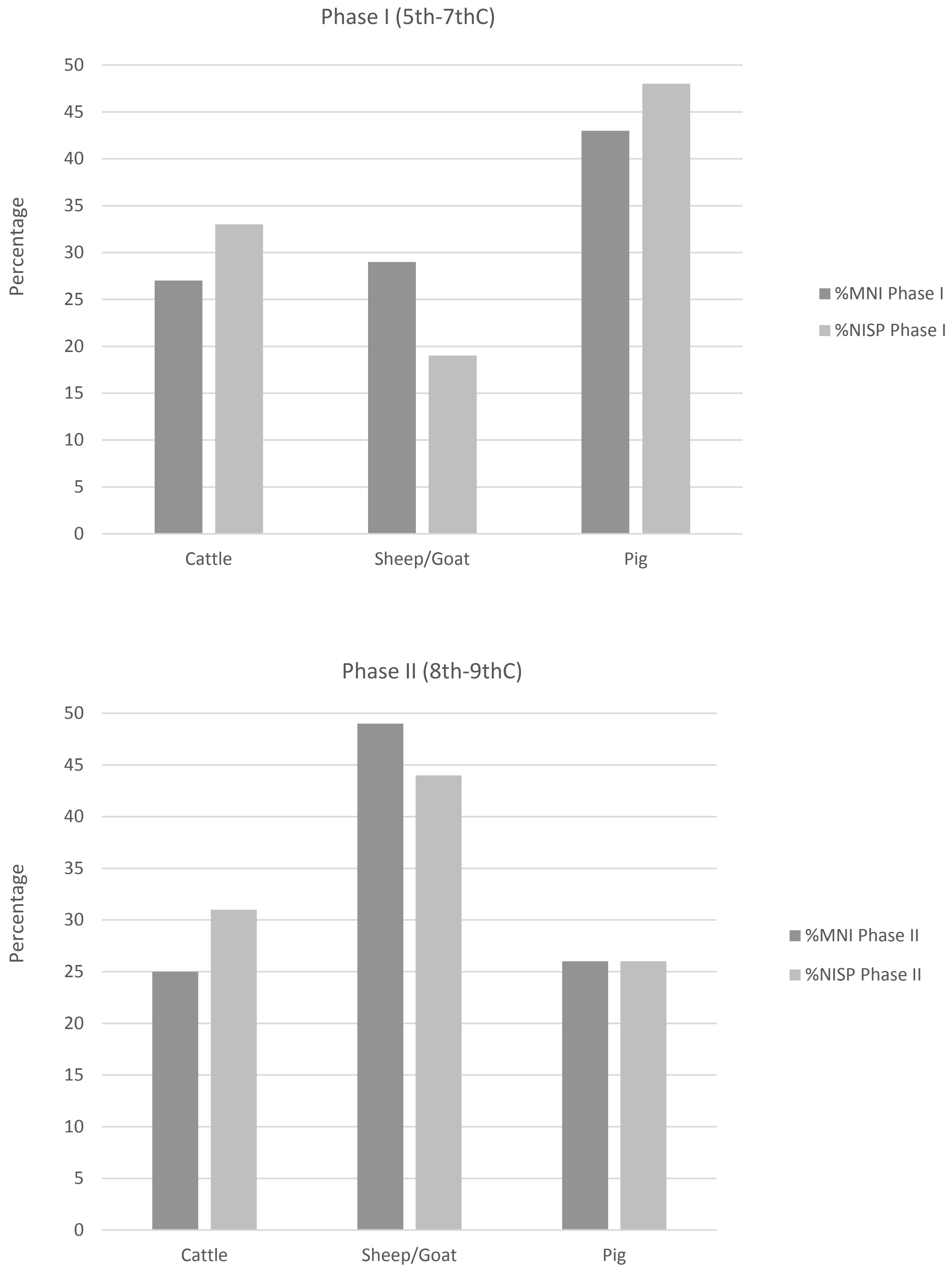


Figure 5.2: Comparison of relative percentage NISP and MNI of the three main domesticates by Phase.

5.4 The domestic mammals

Relative frequencies

Cattle, sheep and pig contribute the bulk of the Lyminge diet in both phases, representing 79% of the Phase I zooarchaeological assemblage and 52% of the Phase II assemblage. There is a significant shift in animal husbandry between Phases I and II expressed in a steep decline in pig in favour of caprine and chicken husbandry (Figure 5.3). There are some differences between frequencies based on NISP and minimum number of individuals (MNI) over time; whilst both quantitative methods reveal similar patterns in the exploitation of cattle, sheep/goat and pig over time, there were 6% fewer cattle present in both phases when using MNI compared to NISP. Likewise, Phase I pig frequencies decline 5% when considered by MNI, whereas MNI reveals sheep/goat percentages are underrepresented in NISP quantities – as they are 10% higher in Phase I MNI and 6% higher in Phase II. This disparity is likely a result of taphonomy and fragmentation, as cattle reveal a higher frequency of gnawing in both phases (Table 5.2) and elements of larger species tend to have a higher fragmentation rate resulting in higher NISP quantities. Therefore, MNI may be a more reliable quantification method than NISP, particularly for sheep/goat.

In both phases the majority of fragments identified to individual species were sheep (Table 5.7), a pattern reflected at many contemporary sites. For the purposes of this analysis I will be referring to the combine total NISP of sheep and goat under the term ‘sheep/goat’ or ‘caprines’.

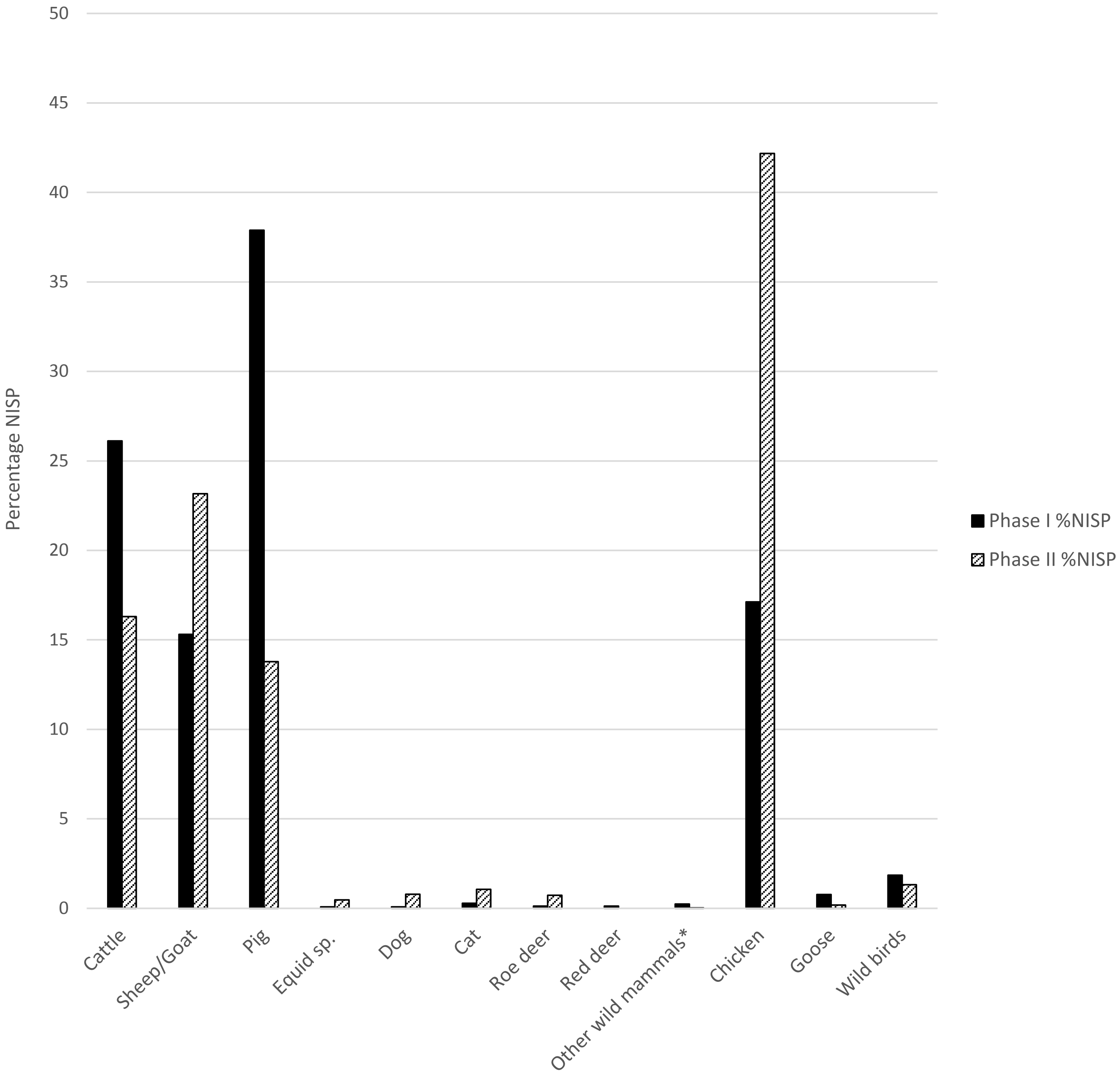


*Figure 5.3: Graph showing the percentage NISP of all identified taxa in both phases. *'Other wild mammals' include: hare, badger, pole cat/pine martin and fox.*

5.4.1 Cattle

Cattle Body Part Representation

Analysis of body part representation is key to interpreting past human-animal relationships, providing evidence for a range of activities including; animal procurement, animal treatment, butchery practices, ethnicity, status, sex and age (Thomas 2005:31; Crabtree 2012b:16-17). Many extraneous factors can influence body part patterns, including preservation, taphonomy, recovery and methodological bias (Brain 1981; Lyman 1994; Thomas 2005:31). These factors have been considered in the analysis of the Lyminge zooarchaeological material and patterns of exploitation have been interpreted taking variables into account.

Compared with the other main domesticates, cattle seem to have been exploited at a more consistent level over time, as reflected in a minor decline between the two phases visible in both NISP and MNI quantification (Figure 5.3).

Figure 5.4 and Table 5.8 show the anatomical representation for Lyminge cattle in Phase I and II. The presence of all skeletal elements in both phases reveals that cattle were being brought on the hoof to the site before being butchered. In Phase I radii and mandible are the best represented element, followed by pelvis and metacarpals. There is a preference for meat bearing fore and hind-limbs, with all the major long bones being well represented. The least frequently occurring elements were the second, and third phalanges as well as the axis and calcaneum. Over 60% of elements were horn-cores suggesting that there was some specialist horn-core working on site – discussed below.

Phase II cattle body part quantification reveals that metatarsals, metacarpals and horn-cores were among the best represented elements. Interestingly, cattle mandibles shift from one of the best represented elements in Phase I to one of the least well represented elements in Phase II. This is of further note when the sheep/goat and pig element data are considered, as mandibles are one of the most commonly occurring elements in both Phases for these species, therefore the dearth of cattle mandibles in Phase II is significant. Compared with Phase I the preference for meat-bearing elements is less noticeable, although both fore and hind-limb long bones are well represented.

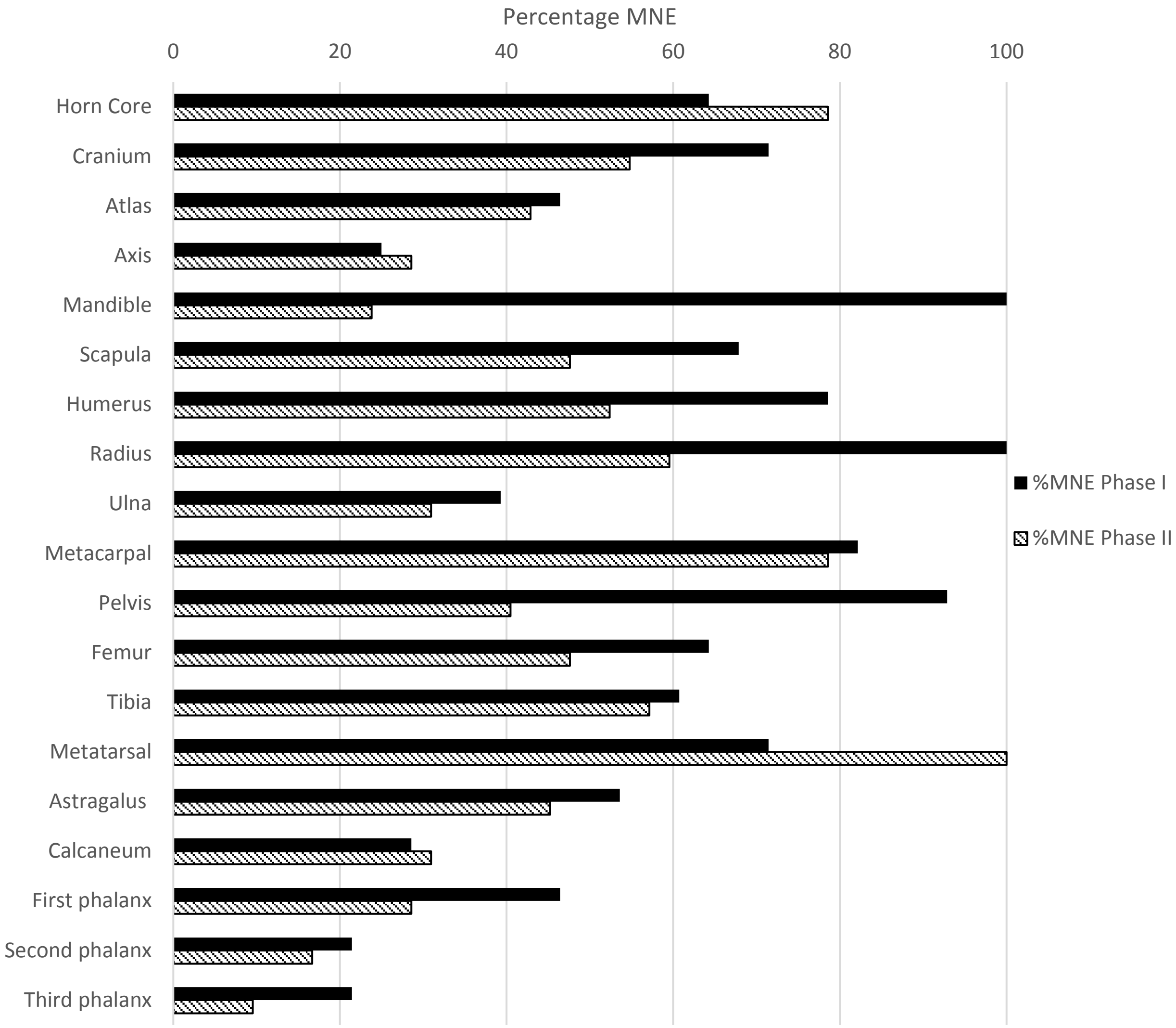


Figure 5.4: Cattle element representation in the Phase I (5th- 7thC) and Phase II (8th- 9thC) assemblages by percentage MNE (Phase I MNI = 28: Phase II = 42).

	5th-7th Century Cattle			8th-9th Century Cattle		
Element	**NISP**	**MNE**	**%MNE**	**NISP**	**MNE**	**%MNE**
Horn Core	33	18	64	58	33	79
Cranium	36	20	71	38	23	55
Atlas	13	13	46	18	18	43
Axis	7	7	25	12	12	29
Mandible	47	28	100	23	10	24
Scapula	31	19	68	40	20	48
Humerus	41	22	79	40	22	52
Radius	52	28	100	46	25	60
Ulna	12	11	39	18	13	31
Metacarpal	40	23	82	70	33	79
Pelvis	48	26	93	29	17	40
Femur	26	18	64	32	20	48
Tibia	33	17	61	42	24	57
Metatarsal	32	20	71	65	42	100
Astragalus	25	15	54	34	19	45
Calcaneum	15	8	29	25	13	31
First phalanx	84	13	46	89	12	29
Second phalanx	48	6	21	57	7	17
Third phalanx	43	6	21	32	4	10

Table 5.8: Cattle element NISP, MNE and relative percentage MNE. Cattle Phase I MNI = 28, Cattle Phase II MNI = 42.

Cattle taphonomy: burning and gnawing

A low percentage of cattle bones were burnt in both phases, 3.3% of cattle bones were burnt in Phase I, most which were singed. In Phase II 3.7% of cattle elements had been burnt in some way, most of which were burnt black (Table 5.9).

Cattle burning				
Burning type	**Phase I**	**%Phase I**	**Phase II**	**%Phase II**
Burnt Black	8	1.3	16	2.2
Calcined	2	0.3	5	0.7
Singed	11	1.7	6	0.8
Total	**21**		**27**	

Table 5.9: NISP of burnt cattle fragments in Phase I and II. Data expressed as percentage of total cattle assemblage (Phase I Cattle NISP = 636, Phase II Cattle NISP = 719).

Just under 10% (9.2%) of the Phase I cattle bones had been gnawed by carnivores, likely dogs, and 1.9% of the Phase II cattle elements had been gnawed by dogs also (Table 5.2 and Table 5.10).

Cattle Gnawing				
Gnawing	**Phase I**	**%Phase I**	**Phase II**	**%Phase II**
Carnivore gnawing	59	9.3	112	15.6
Carnivore gnawing/digested			2	0.3
Digested				
Total	**59**		**114**	

Table 5.10: NISP of gnawed cattle elements in Phase I and II. Data expressed as percentage of total cattle assemblage (Phase I Cattle NISP = 636, Phase II Cattle NISP = 719).

Cattle Butchery

In Phase I, 11% of the cattle bones bore evidence of butchery marks (Table 5.11). The majority were recorded as cut marks (59%) and chop marks (29%) and a small proportion of the assemblage had evidence for saw marks (3%) or a combination of chop and cut marks (7%). Only one fragment had both saw and chop marks. Phase II revealed a broadly similar pattern, 15% of the cattle bones revealed butchery marks. The majority were cut marks (69%) followed by chop marks (22%) and a smaller proportion had evidence for saw marks (4%), a combination of chop and cuts (1%) or cut and saw marks (5%). When the two phases are compared there is a slight shift in butchery styles, with a decline in the number of elements showing chop marks and a rise in cut and saw marks (Figure 5.5).

Cattle Butchery	Phase I	%Phase I	Phase II	%Phase II
Chopped	20	3.1	23	3.2
Cut(s)	41	6.4	72	10
Sawn	2	0.3	4	0.6
Chopped and cut(s)	1	0.2	1	0.1
Cut(s) and sawn	5	0.8	5	0.7
Total	**69**		**105**	

Table 5.11: Cattle butchery NISP counts and relative percentages for Phase I and Phase II by butchery type (Phase I Cattle NISP = 636, Phase II Cattle NISP = 719).

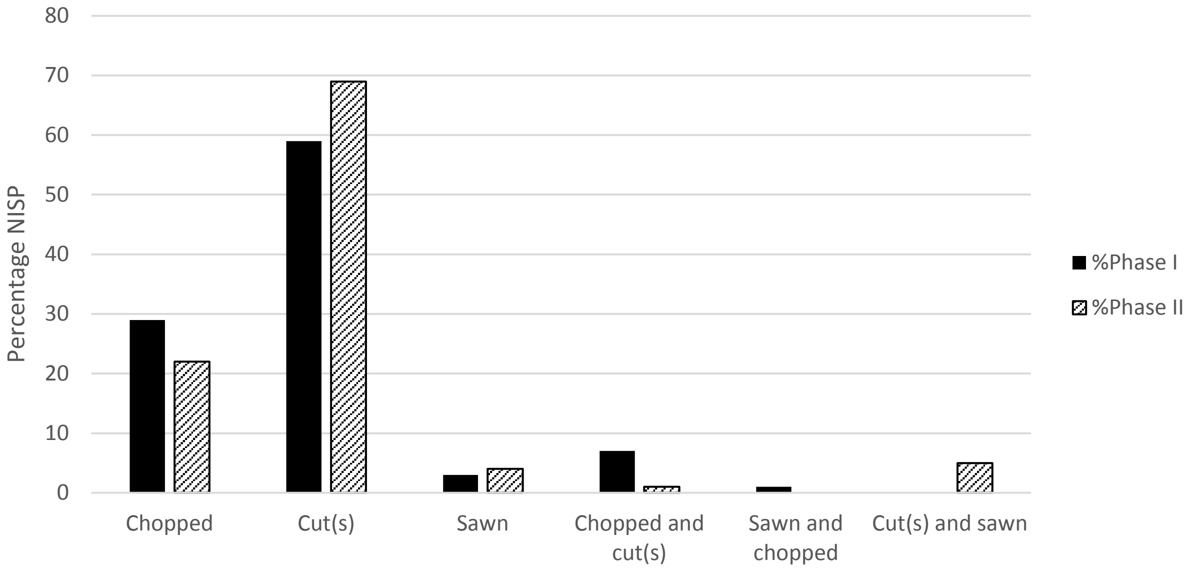


Figure 5.5: Relative percentage NISP of cattle butchery in Phase I and Phase II presented by butchery type.

Consideration of cattle butchery by element reveals no evidence for specialised or systematic butchery styles in either phase (Figure 5.6) which is consistent with other contemporary assemblages that show a diachronic shift from the heavy use of the cleaver to partition carcasses in the Romano-British period to non-specialised, general butchery in the Anglo-Saxon period (Grant 1987; Holmes 2011; Sykes 2014). Cattle horn-core and mandibles were not included within Figure 5.6, as they do not come under the remit of 'countable elements' within the author's methodology. However, they were still recorded, and the location of butchery marks were noted were present as they can inform on horn-core working and diachronic shifts in cuisine (i.e. consumption of tongue/cheek meats) and standardisation of portions.

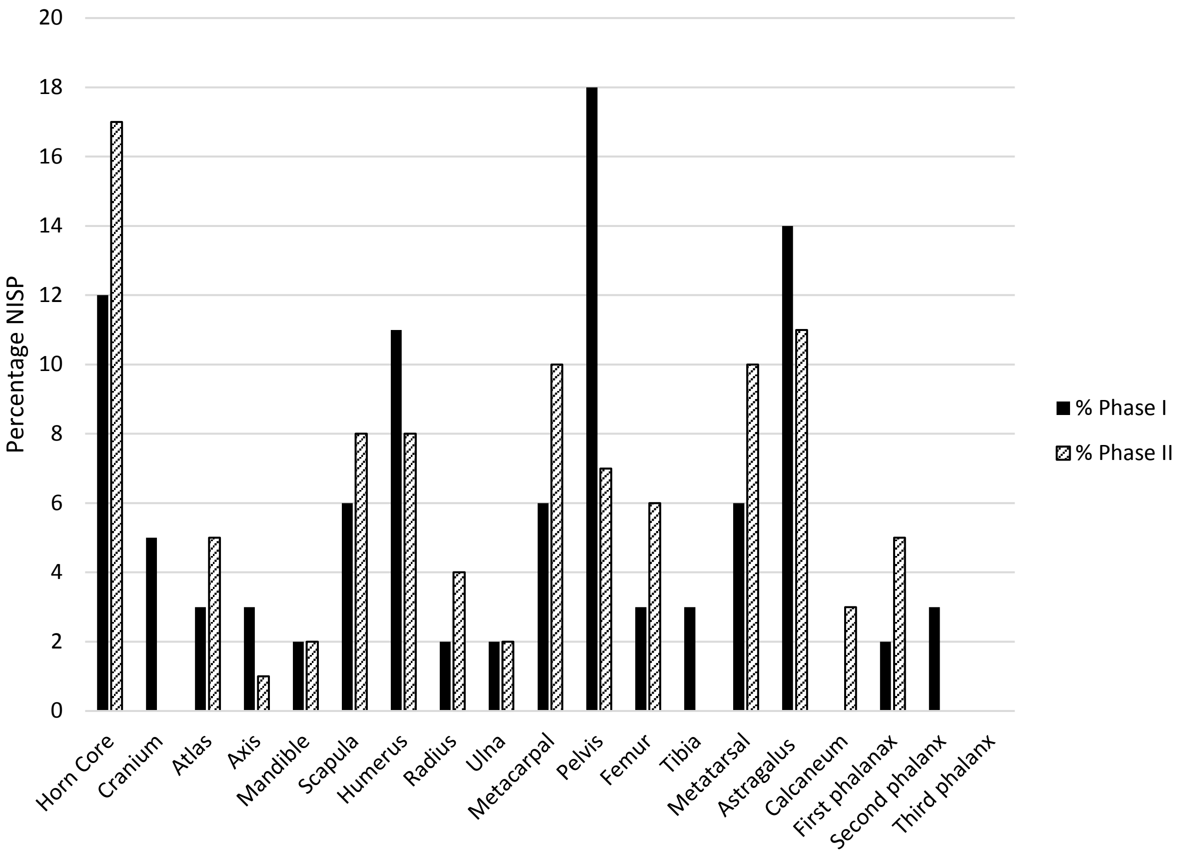


Figure 5.6: Relative percentage NISP of butchered cattle elements, comparing both phases. Horn-core and maxilla data have been included here, although they are not considered 'countable' in the methodology. However, it is worth noting that butchery marks were recorded on these elements too. Graph data is presented in Table 1 in Appendix 3.

Primarily cattle were butchered for joints of meat, as suggested by the body part representation (Figure 5.4) with evidence for small-scale gross disarticulation, as well as finer joint dismemberment, meat filleting, marrow extraction and tongue and cheek removal in both phases. There is one incident of longitudinal splitting of cattle long bones for marrow in Phase I, where as there are eleven records of longitudinal splitting of long bones, particularly metapodials, in Phase II. The longitudinal splitting of metapodials, to remove marrow from the centre, is one of the most consistent trends of butchery in the early – middle Saxon period (Holmes 2011:90, Figure 4.24).

Cut marks on the ventral side of cattle axis and atlas vertebrae were recorded in both phases and are indicative of slaughter by throat cutting (Poole 2010b:309), although it should be noted that it could also be a sign of carcass division (Landon 1996:71-2). It is likely that pole-axeing was the alternative method of animal slaughter to throat cutting (Holmes 2011:87), however, due to the high fragmentation of cranium elements in cattle it was not possible to identify.

Butchery marks were recorded on a couple of mandibles in both phases, of note were cuts on the ramus and condyle, at the point of articulation with the cranium, showing that the mandible was removed to give access to the tongue, or for utilisation of cheek meat (Holmes 2011: 88). Cut marks on one cattle hyoid in Phase II provide firm evidence that the tongue was removed, and presumably utilised (Rixson 1989:55).

Saw marks were only recorded on cattle horn-cores in both phases. This is consistent with the use of the saw as a craftworking rather than a butchery tool during the Anglo-Saxon period (Holmes 2011:86; Bourdillon and Coy 1980:97; Crabtree 1990:97). One reason that has been suggested for this is that a saw is likely to leave small fragments of bone within the meat, so would be a less preferable tool for dismembering a carcass compared to a large knife or cleaver (Holmes 2011:86; Armitage 2004:106). Seetah (2006:129-30) also interprets saw marks on archaeological animal bone to be representative of worked bone, not butchery waste, as sawing is most commonly identified on horn-cores and metapodials. The Lyminge cattle horn-cores revealed saw, cut and chop marks, mainly around the base of the horn, although chop and saw marks were also noted around the proximal end of the horn-core in Phase II.

The horn-core data shows that horn working was occurring at a low level in both phases, although it was more marginally more frequent in Phase II. Cut marks close to the base of the horn-core likely represent horn removal facilitated with the use of a knife to loosen the horn sheath around its base (MacGregor 1991:365; Albarella 2003:74). Likewise, chop/saw marks on the proximal end of two horn-cores in Phase II may represent facilitation of horn sheath removal from the horn-core, and the top of the horn may have been used to make objects such as buttons or handles (MacGregor 1989:117; Albarella 2003:74).

Whilst there is no evidence for the systematic processing of cattle carcasses, the presence of chop marks suggests the use of large knives and potentially cleavers, in addition to smaller knives used for dismembering joints, as evidenced by cut marks on the proximal and distal ends of long bones.

Cattle Ageing

Mandible wear stages show that the majority of cattle were being culled in adulthood and old adulthood (Figure 5.7 and Table 5.12), with very few being kept alive into their 'senile' years suggesting that at the end of their working lives they were killed and presumably eaten. Calving occurred on site, as indicated by the presence of a small number of very young individuals, and it is likely that some animals were killed in their first year to avoid overwintering them. The low numbers of very young individuals suggest that cattle dairying did not play a strong role in husbandry practices.

The peak in age-at-death at 30 – 36 months (two and a half – three years) in Phase I suggests that more cattle were being raised for prime meat in this period. Despite this difference, there are a significant number of elderly cattle in both assemblages, indicating that their main purpose was for secondary functions/products, which is consistent with other contemporary animal bone assemblages including Lane End Road, Dorney (Powell 2002) Wicken Bonhunt and Brandon (Crabtree 1996:65-7; Crabtree 2012b: 31-33).

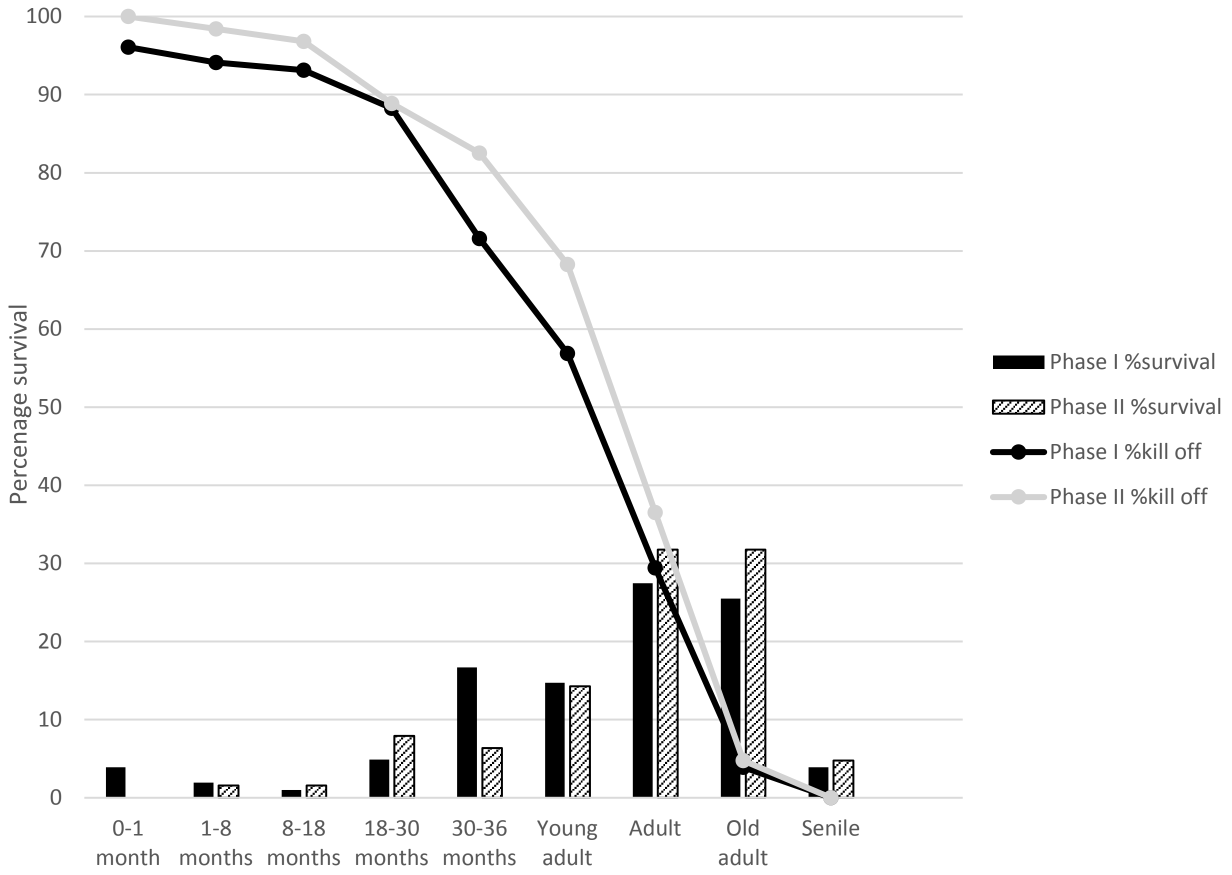


Figure 5.7: Cattle age at death patterns based on mandible data and percentage of age survival in both phases; dental ageing from Legge 1992 following Grant's (1982) wear stages and converted into Halstead's (1985) suggested ages, Phase I n = 102, Phase II n = 63.

Cattle Stages (Halstead 1985 and Legge 1992)	Phase I Qty	Phase II Qty
0 – 1 month	4	0
1 – 8 months	2	1
8 – 18 months	1	1
18 – 30 months	5	5
30 – 36 months	17	4
Young adult	15	9
Adult	28	20
Old adult	26	20
Senile	4	3
Total	**102**	**63**

Table 5.12: NISP of cattle mandible tooth wear stages for Phase I and II with Legge's (1992) stages converted to Halstead's (1985) suggested ages.

The epiphyseal fusion data broadly supports the mandible data as it indicates that only small number of cattle were being culled during the first 18 months of their life, and in both phases, many were surviving into their third – fourth years, and beyond (Table 5.13). However, the fusion data is slightly at odds to the mandible data in that it suggests more cattle lived into adulthood in Phase I whereas higher numbers of cattle were culled around the age of three in Phase II.

	Phase I (5th-7thC)			**Phase II (8th-9thC)**		
Cattle	**F**	**UF**	**%F**	**F**	**UF**	**%F**
Scapula	28	2		32	7	
Total 7-10 months	28	2	**93.3%**	32	7	**82.1%**
Distal Humerus	29	5		23	9	
Proximal Radius	27	2		29	4	
Phalanx I	73	10		76	7	
Phalanx II	47	1		28	0	
Total 13-18 months	176	18	**90.7%**	156	20	**88.6%**
Distal Tibia	15	7		20	8	
Distal Metapodia	25	8		44	16	
Total 2-3 years	40	15	**72.7%**	64	24	**72.7%**
Ulna	4	7		5	4	
Proximal Humerus	4	3		5	4	
Calcaneum	13	1		4	9	
Distal Femur	11	4		1	0	
Proximal Femur	5	6		11	7	
Distal Radius	16	10		7	9	
Proximal Tibia	6	4		4	9	
Total 3-4 years	59	35	**62.8%**	37	42	**48.1%**

Table 5.13: Cattle epiphyseal fusion in both phases – table shows NISP of fused and unfused elements in addition to the relative percentage of fused elements which provides an indication of kill-off patterns.

Cattle metrics and sexing

Particular measurements of animal bones provide us with a window to agricultural practices of the past. Variation in the size of domestic livestock, for example, can highlight sexual dimorphism, breed improvement as well as (in some cases, such as Flixborough) revealing diversity in the variety/breed of animals present. This is key to our perception and interpretation of animal husbandry (Dobney *et* *al.* 2007:148). The Lyminge cattle metrical data set is small and not statistically significant, but nevertheless it does allow for some inter-site comparison and some tentative hypotheses to be drawn.

Maltby (1981) has shown that the greatest lateral length (GLi) of the astragalus is the measurement most commonly recorded on Iron Age, Roman, and Anglo-Saxon assemblages from southern Britain. Figure 5.8 shows the GLi of cattle astragali from Lyminge Phase I and II compared with metrical data from contemporary sites. The Lyminge measurements are within a similar range to other early – middle Saxon sites. Phase I has a larger range in GLi measurements than Phase II and there is a marginal size increase in the Lyminge cattle over time according to the mean. However, student t-tests revealed that there was no statistical significance in the hypothesis that there was an increase in the size of Lyminge cattle between phases (Table 5.15).

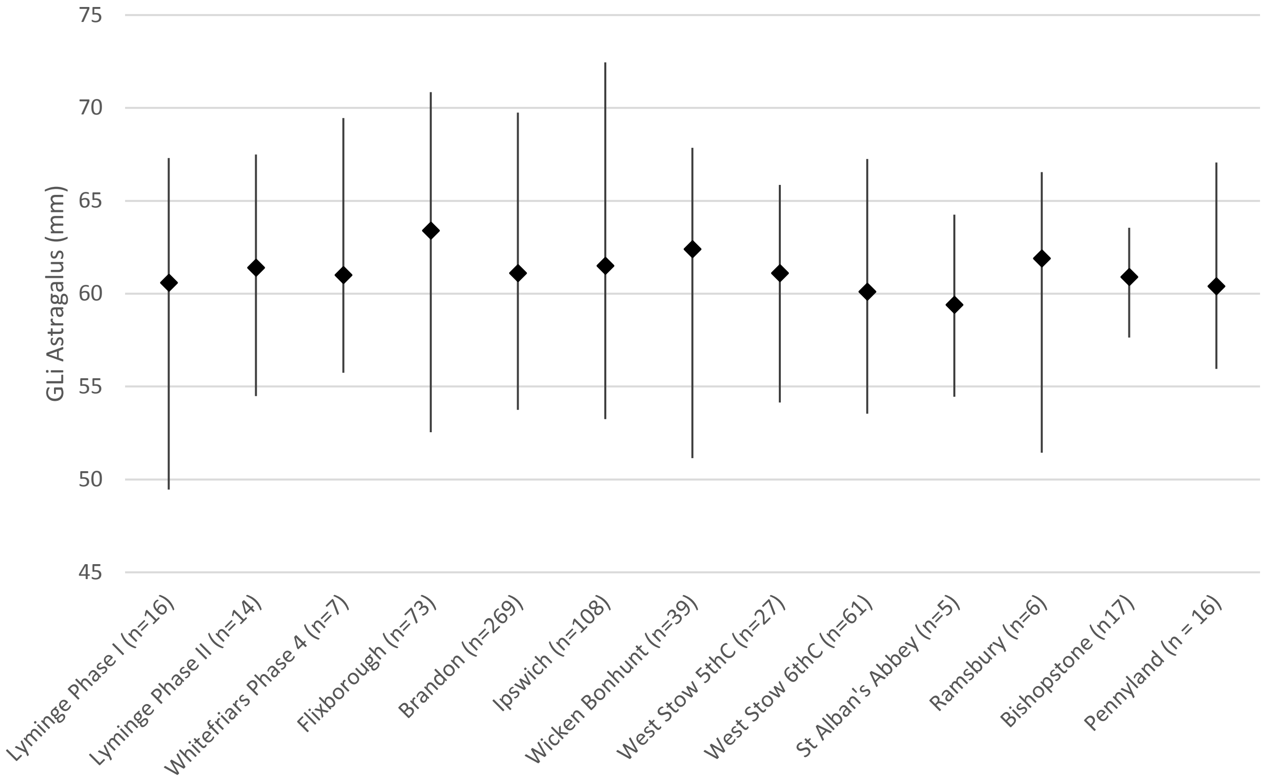


Figure 5.8: The greatest lateral length (GLl) of the cattle astragali from Lyminge Phase I and II are compared to the metrical data from other early and middle Saxon sites (all measurements in mm).

Cattle GLl (mm) early – middle Saxon sites				
Site	**Minimum**	**Maximum**	**Mean**	**Source**
Lyminge Phase I (n=16)	49.5	67.3	60.6	Rec.by author
Lyminge Phase II (n=14)	54.5	67.4	61.4	Rec.by author
Whitefriars Phase 4 (n=7)	55.8	69.4	61.0	Bendrey *et al. in prep*
Flixborough (n=73)	70.8	52.6	63.4	Dobney *et al.* 2007
Brandon (n=269)	53.8	69.7	61.1	Crabtree 2012b
Ipswich (n=108)	53.3	72.4	61.5	Crabtree 2012b
Wicken Bonhunt (n=39)	51.2	67.8	62.4	Crabtree 2012b
West Stow 5thC (n=27)	54.2	65.8	61.1	Crabtree 1989
West Stow 6thC (n=61)	53.6	67.2	60.1	Crabtree 1989
St Alban's Abbey (n=5)	54.5	64.2	59.4	Crabtree 2011
Ramsbury (n=6)	51.5	66.5	61.9	Maltby 1981
Bishopstone (n=17)	57.7	63.5	60.9	Poole 2010b
Pennyland (n=16)	56.0	67.0	60.4	Holmes 1993

Table 5.14: The greatest lateral length (GLil) of the cattle astragali comparing Lyminge Phase I and II to contemporary sites. Data displayed graphically in Figure 5.8.

Lyminge Cattle Astragali Gli
t-Test: Two-Sample Assuming Unequal Variances

	Phase I	**Phase II**
Mean	60.6	61.4
Variance	20.9	18.9
Observations	16	14
Hypothesised Mean Difference	0	
df	28	
t Stat	-0.516	
P(T<=t) one-tail	0.305	
t Critical one-tail	1.701	
P(T<=t) two-tail	0.610	
t Critical two-tail	2.048	

Table 5.15: t-test: two sample assuming unequal variances to test statistical significance of increase in size of cattle astragali between Phase I and Phase II. There was no statistical significance in size increase between the two phases.

It is well established that metapodials are the best element to detect sexual polymorphism in cattle (e.g. Bartosiewicz 1987:49; Higham 1969:66; Thomas 1986:83) and more generally held that metacarpals are the most sexually dimorphic, although both metapodials tend to be short and slender in cows, short and wide in bulls and long and slender in castrates (Albarella 1997a:38; Davis

2000:373; Higham 1969; Table 2). A slenderness index was utilised to separate male, female and castrated cattle, as this method is size-independent. For cattle, the calculation was (shaft diameter/greatest length)*100 plotted against (distal breadth/greatest length)*100 (following Albarella 1997a; Holmes 2014a:37). On this graph, cows group at the smallest end of the horizontal axis, castrates tend to have an index between 28 – 32 on the horizontal axis and bulls have an index of around 35 (Holmes 2014a:37). It was only possible to plot three individuals from Lyminge on the slenderness index, and the sexing data (Figure 5.9) falls within a similar range to other sites such as Mucking and West Stow (Homes 2014: 68, Fig 4.2) where a predominance of females and castrates have been identified. The much larger individual in the Lyminge Phase II assemblage may be a bull, although due to small sample size it is not possible to draw firm conclusions.

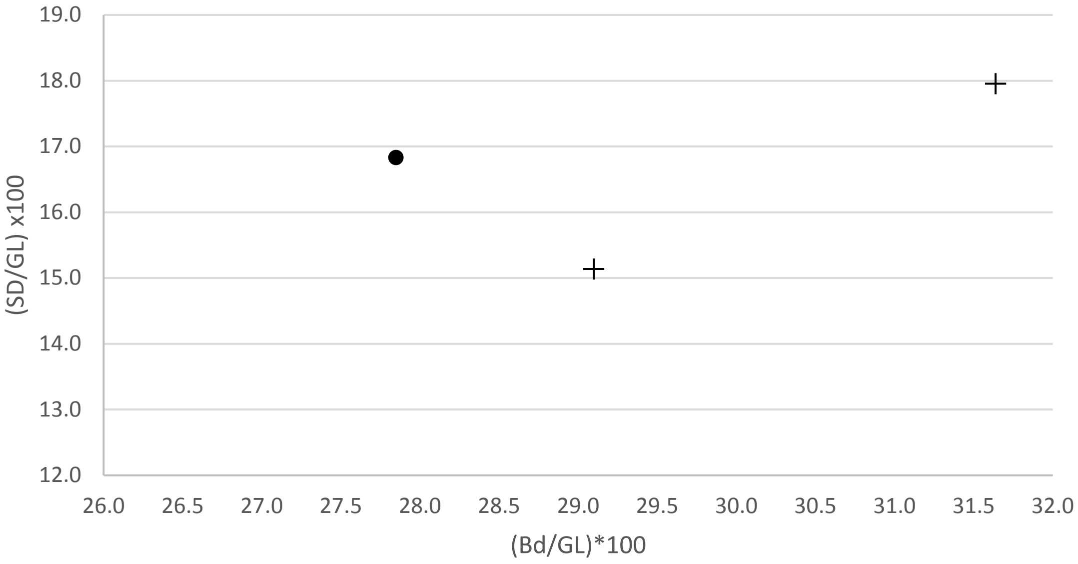
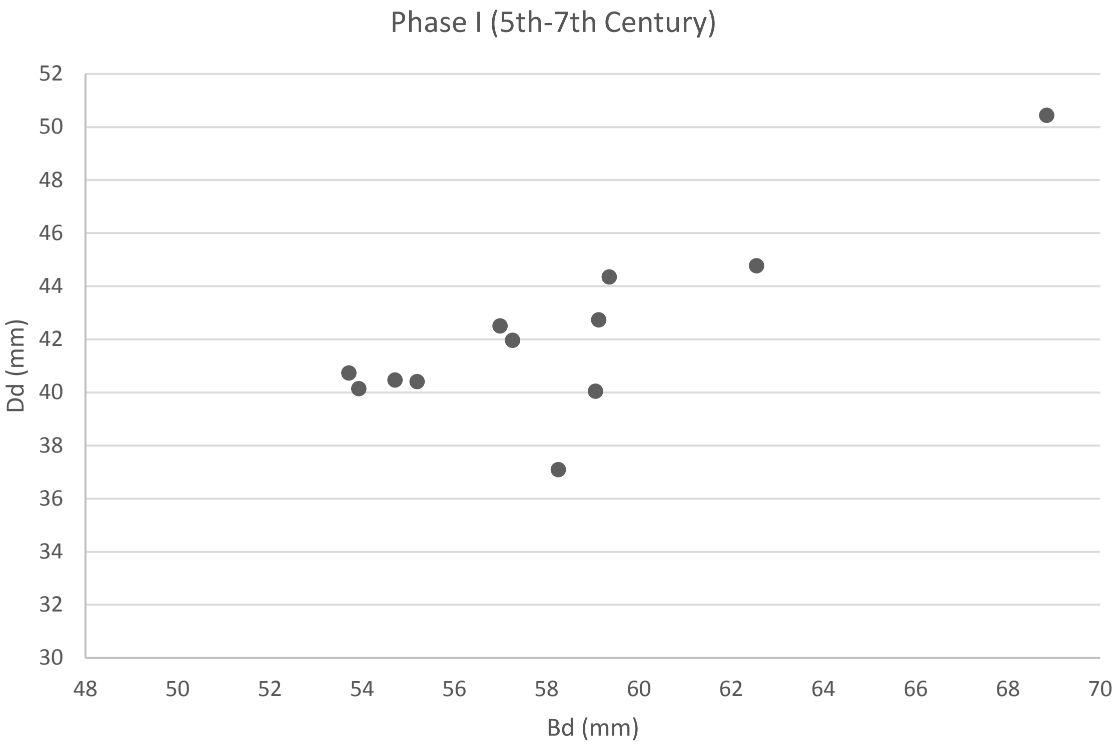


Figure 5.9: Plots of Lyminge cattle metacarpal measurements from both phases. SD= shaft diameter; GL= greatest length; Bd= distal breadth. Filled circle = Phase I (5th-7th century), Crosses = Phase II (8th-9th century). Raw data in Appendix 3, Table 3.

Scatterplots for Lyminge tibia measurements show sexual dimorphism, particularly in Phase II (Figure 5.10 and Table 5.16) although, again, the data sets are very small. In Phase I there are a range of small – intermediate sized cattle present, with one smaller outlier, and one much larger outlier. There is no distinct bimodal distribution, however, most of the plots fall within what is considered a female size range (Dobney *et al.* 2007:151-157). There is a clearer bimodal distribution in Phase II, with two distinct groupings, although the data set is smaller than Phase I.

Unfortunately, there are too few published sites with available metrical data for both breadth and depth tibia measurements, however, the Flixborough mean measurements for tibia distal breadth (Bd) and distal depth (Dd) have been plotted on the Phase II graph as a size comparison. The Flixborough cattle fall within the range of the Lyminge cattle, plotting at the larger, male end of the spectrum. When considered in light of the astragalus GLi data (Figure 5.8), it is possible that Phase II saw an increasing number of large cattle being imported, which are likely to have been oxen for use in traction. However, as the data set is small it is not possible to draw firm conclusions.



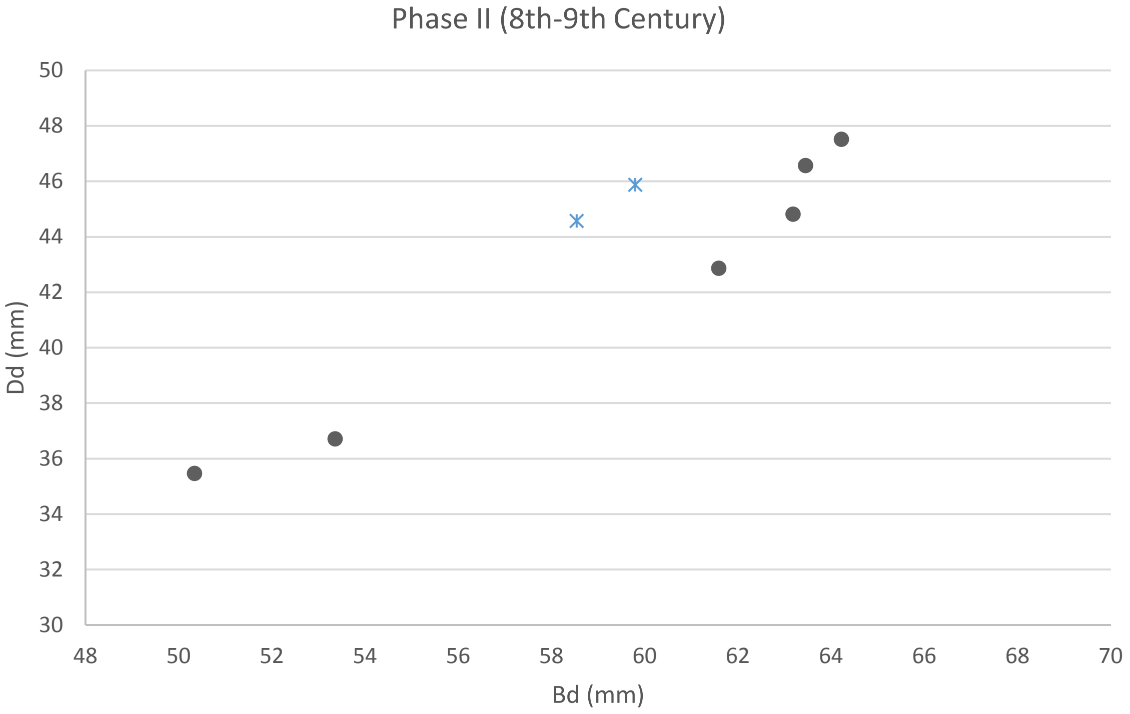


Figure 5.10: Cattle tibia – distal breadth (Bd) and distal depth (Dd) measurements by phase. (Black Dots = Lyminge, Blue Crosses in Phase II = Flixborough). Raw data presented in Appendix 3, Table 4.

Cattle Tibia Measurements				
Site	**Phase**	**Period**	**Bd (mm)**	**Dd (mm)**
Lyminge	Phase I	5th-7thC	53.9	40.2
Lyminge	Phase I	5th-7thC	62.6	44.8
Lyminge	Phase I	5th-7thC	68.8	50.4
Lyminge	Phase I	5th-7thC	54.7	40.5
Lyminge	Phase I	5th-7thC	57.0	42.5
Lyminge	Phase I	5th-7thC	53.7	40.7
Lyminge	Phase I	5th-7thC	57.3	42.0
Lyminge	Phase I	5th-7thC	58.3	37.1
Lyminge	Phase I	5th-7thC	59.4	44.4
Lyminge	Phase I	5th-7thC	59.1	42.7
Lyminge	Phase I	5th-7thC	55.2	40.4
Lyminge	Phase I	5th-7thC	59.1	40.1
Lyminge	Phase II	8th-9thC	50.3	35.5
Lyminge	Phase II	8th-9thC	61.6	42.9
Lyminge	Phase II	8th-9thC	53.4	36.7
Lyminge	Phase II	8th-9thC	63.2	44.8
Lyminge	Phase II	8th-9thC	63.5	46.6
Lyminge	Phase II	8th-9thC	64.2	47.5
Flixborough	Phase 2-3a	7th-8thC	59.8	45.9
Flixborough	Phase 3b	8th-9thC	58.5	44.6

Table 5.16: Cattle tibia measurements, distal breadth (Bd) and distal depth (Dd). The mean metrics for Flixborough cattle tibia Bd and Dd Phase 2-3a and Phase 3b have been included as comparison data.

To maximise on the potential of the small metrical data set from Lyminge, log-scaling was employed so that different measurements could be compared on the same axis. This method involves converting all measurements to base-10 logarithms be relativised each against a standard (Albarella 2002; Meadow 1999; Simpson *et al.* 1960; Thomas *et al.* 2013:3311). A positive value indicates that the archaeological specimen is larger than the standard, a negative value that it is smaller, while zero indicates that the standard and archaeological specimens are an identical size (Thomas *et al.* 2013:3311). The standard used was the Chillingham Bull from the University of Leicester (Table 5.17) as instructed in Thomas *et al.* (2013: Table 2). Figure 5.10 shows that while cattle ranged in height, there were slightly taller cattle present in Phase II than Phase I. In both phases the cattle were less stocky in both breadth and depth than the Chillingham Bull standard and there was no obvious patterning to suggest a change in the breadth and depth of bones over time.

Element	**Measurement**	**Chillingham Bull standard (mm)**
Humerus	BT	75.5
Radius	GL	265
	Bd	72.2
Femur	GL	362
	DC	46.5
	Bd	103
Tibia	GL	337
	Bd	63.9
	Dd	49.7
Astragalus	GLl	63.8
	Bd	44.9
	Dl	35.3
Calcaneum	GL	138.2
Metacarpal	GL	185
	SD	36.6
	Bd	64.2
Metatarsal	GL	216
	SD	31.5
	Bp	59.2

Table 5.17: The Chillingham Bull standard used for log-scaling the Lyminge cattle, as instructed in Thomas et al. (2013:3311). The Chillingham Bull from the University of Leicester reference collection R625. Measurement codes follow von den Driesch and are listed in millimetres (mm).

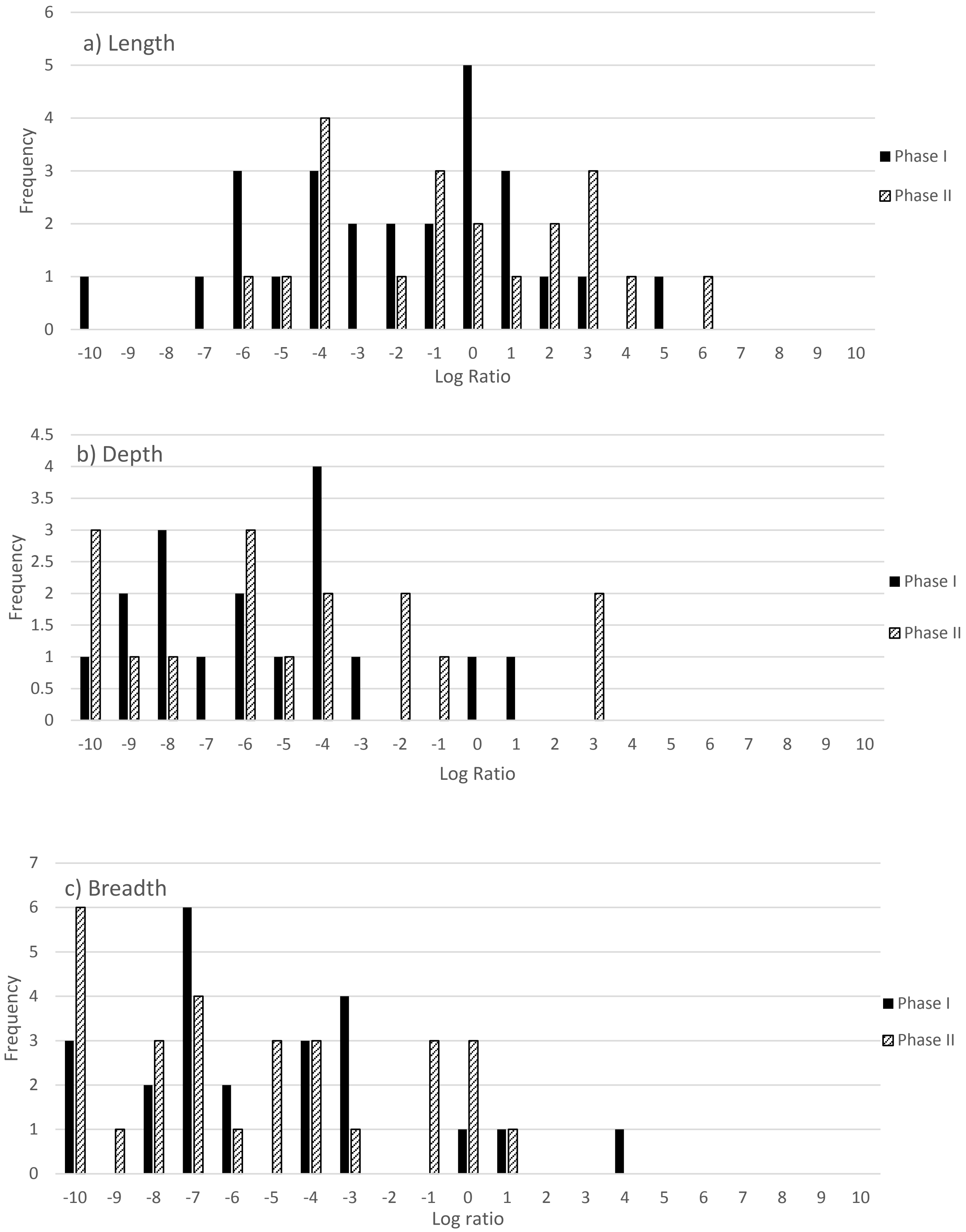


Figure 5.11: Comparison of Phase I and Phase II cattle metrics using log ratios of long bone a) length, b) depth, c) breadth measurements using Chillingham Bull standard (Table 5.17).

Cattle Pathology

Analysis revealed an increase in the number of cattle traction-related pathologies within the Phase II assemblage including exostosis and ankylosed bone, all located on the distal end of the metapodials and proximal phalanges (Figure 5.12) (Bartosiewicz 2013:108-9). There was also evidence from two horn-cores suggestive of cattle yoking, indicated by a ring-like depression at the base of the horn-core (Bartosiewicz 2013:132). There were seven recorded cases of exostosis in the Phase I assemblage, which could arguably be diagnosed as traction pathologies but equally may just be a result of cattle being kept well into their twilight years (Table 5.18 and Table 5.19). Pathologies associated with traction increase in the Phase II assemblage, constituting 13 of the 24 pathologies identified in the Phase II cattle (Table 5.18 and Figure 5.13). This may be significant when considered with the cattle ageing data, as higher numbers of older cattle were present in the Phase II assemblage, suggesting a greater reliance may have been placed on cattle for traction in the Phase II than in the Phase I. Caution should be employed here, as the sample size for both phases is relatively small. A chi-square test of independence was employed to test the statistical significance of the diachronic increase in pathological specimens, particularly for metapodials and phalanges. The chi-square test revealed that there was no statistical significance in the increase of cattle elements with pathologies over time (p-value = 0.12) (Appendix 3, Table 5). Therefore, the hypothesis regarding the association between higher numbers of elderly cattle and an increase in pathologies in Phase II being associated with the use of cattle for traction is purely speculative at this point.

Figure 5.12: Phase II cattle first phalanx (1298) with additional bone growth visible on proximal end, indicative of osteoarthritis.

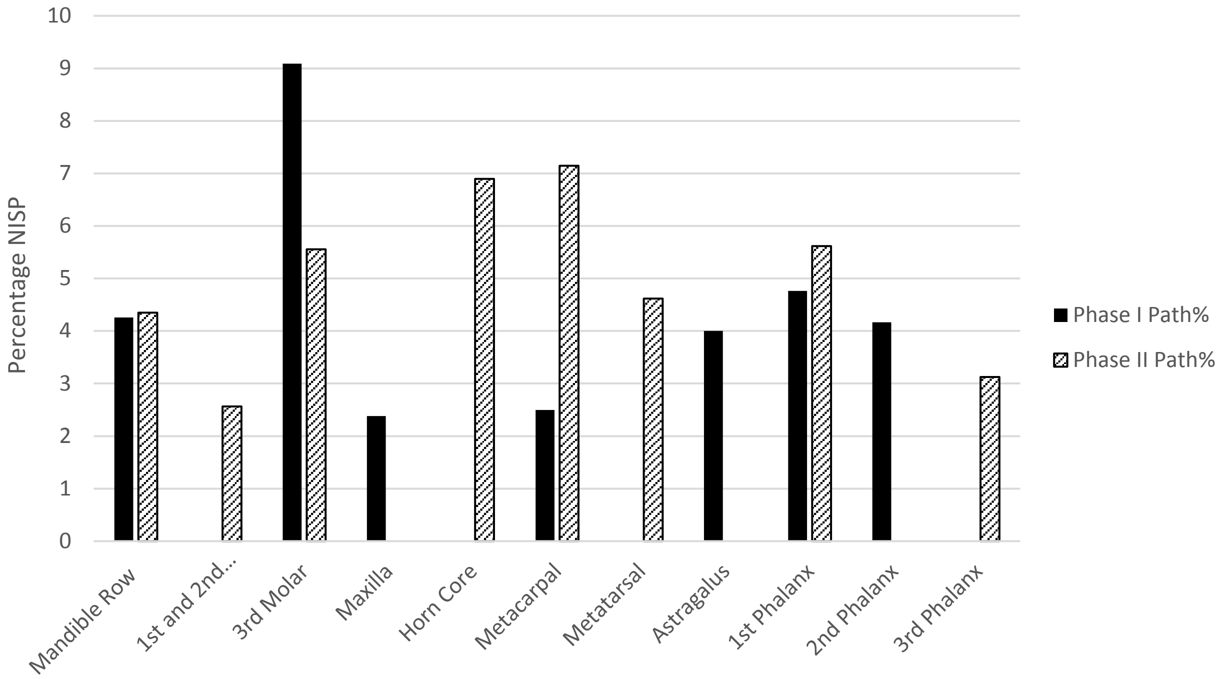


Figure 5.13: Cattle elements with pathology - shown as a relative percentage of the total NISP by element (raw data in Table 5.18).

Cattle elements with pathology	Phase I Qty	NISP Phase I	Phase II Qty	NISP Phase II	Phase I Path%	Phase II Path%
Mandible Row	2	47	1	23	4	4
1st and 2nd Molar	0	30	1	39	0	3
3rd Molar	2	22	1	18	9	6
Maxilla	1	42	0	0	2	0
Horn-core	0	33	4	58	0	7
Metacarpal	1	40	5	70	3	7
Metatarsal	0	32	3	65	0	5
Astragalus	1	25	0	34	4	0
1st Phalanx	4	84	5	89	5	6
2nd Phalanx	2	48	0	57	4	0
3rd Phalanx	0	43	1	32	0	3
Total	**13**	**446**	**21**	485		

Table 5.18: Cattle elements with pathology in both phases – quantity of elements with pathology, total NISP of element and percentage of elements with pathology (data presented visually in Figure 5.13).

Phase I (5th-7thC) Cattle

Elements	Astragalus	Metacarpal	1st Phalanx	2nd Phalanx	3rd Molar	Mandible row	Maxilla	Total
Eburnation	1							**1**
Exostosis		1	4	2				**7**
Enamel Hypoplasia?					1			**1**
Dental calculus						1		**1**
Periodontal disease						1		**1**
Tooth deformation					1			**1**
Tooth overcrowding							1	**1**
Grand Total	**1**	**1**	**4**	**2**	**2**	**2**	**1**	**13**

Phase II (8th-9thC) Cattle

Elements	Horn-core	Metacarpal	Metatarsal	1st Phalanx	3rd Phalanx	1st & 2nd Molar	3rd Molar	Mandible	Other	Total
Ankylosed		1								**1**
Exostosis		3	1	4	1				1	**10**
Exostosis, traction			1	1						**2**
Genetic			1							**1**
Non-metric		1								**1**
Milking depressions?	2									**2**
Periodontal disease									2	**2**
Irregular tooth wear						1	1	1		**3**
Yoking	2									**2**
Grand Total	**4**	**5**	**3**	**5**	**1**	**1**	**1**	**1**	**3**	**24**

Table 5.19: NISP counts of cattle elements with pathology, by pathology type and element.

5.4.2 Caprines

Caprine relative frequencies

The number of sheep/goat relative to the other main domesticates registers a significant increase over the two phases reflected in both NISP and MNI relative percentage ratios (Figure 5.2). When NISP and MNI ratios are compared the relative percentage MNI shows a higher number of caprines compared to cattle and pig, suggesting that sheep/goat elements are underrepresented in NISP counts due to higher fragmentation rates of other taxa, such as cattle, and therefore MNI is a more accurate representation of the frequencies of sheep/goat in both phases. Figure 5.2 reveals a higher quantity of sheep/goat than cattle in Phase I and in Phase II caprines dominated counts for the three main domesticates and, when the assemblage is considered as a whole are the second best represented taxon after chicken (Figure 5.3).

Caprine body part representation

In both phases element representation indicates that caprines were brought to site on the hoof and butchered locally as all skeletal elements are represented (Figure 5.14 and Table 5.20). In Phase I the best represented element was mandible, followed by metacarpal, pelvis, femur and humerus. The least well represented elements include the second and third phalanx, axis vertebrae and ulna, which is unlikely to be a result of sieving but may be a result of taphonomy following butchery. Meat bearing elements were well represented in Phase I, suggesting that caprine joints were consumed on site, rather than being traded. Compared with Phase I there were a much higher number of horn-cores represented in Phase II, with an increase of 50%. As in Phase I, the Phase II phalanges are the element with the lowest representation. Again, mandible was the most commonly occurring element in Phase II, followed by humerus and tibia. The preference for meat bearing elements is more pronounced in Phase II and the lower numbers of metapodials is notable.

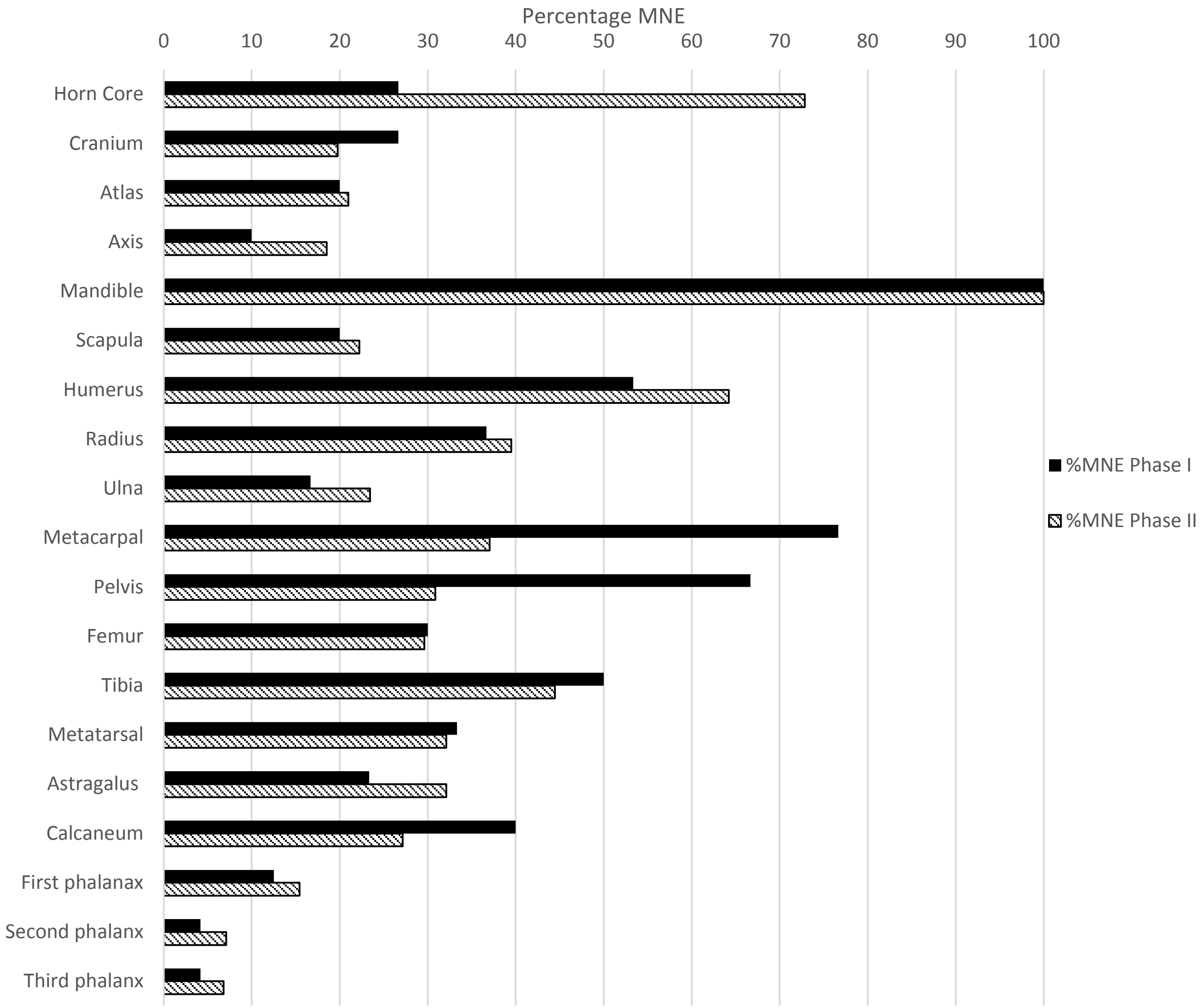


Figure 5.14: Caprine element representation in Phase I (5th-7thC) and Phase II (8th-9thC) assemblages by percentage MNE. Graph includes combined data of sheep/goat, sheep and goat to boost sample size. Caprine Phase I MNI = 30; Phase II MNI = 81.

Element	Phase I (5th-7thC) Caprines			Phase II (8th-9thC) Caprines		
	NISP	**MNE**	**%MNE**	**NISP**	**MNE**	**%MNE**
Horn-core	14	8	27	102	59	73
Cranium	11	8	27	31	16	20
Atlas	6	6	20	17	17	21
Axis	3	3	10	15	15	19
Mandible	**53**	**30**	100	**150**	**81**	**100**
Scapula	11	6	20	34	18	22
Humerus	24	16	53	104	52	64
Radius	18	**11**	37	53	32	40
Ulna	9	5	17	35	19	23
Metacarpal	45	23	77	76	30	37
Pelvis	36	20	67	56	25	31
Femur	15	9	30	43	24	30
Tibia	29	15	50	66	36	44
Metatarsal	19	10	33	53	26	32
Astragalus	14	7	23	43	26	32
Calcaneum	22	12	40	44	22	27
First phalanx	32	3.75	13	109	12.5	15
Second phalanx	13	1.25	4	50	5.75	7
Third phalanx	12	1.25	4	38	5.5	7

Table 5.20: Caprine element NISP, MNE and percentage MNE. Table includes combined data of sheep/goat, sheep and goat to boost sample size. Caprine Phase I MNI = 30, Phase II MNI= 80.

Caprine taphonomy: burning and gnawing

As with cattle, a small quantity of caprine skeletal material had been burnt; 2.1% (NISP 8) of the Phase I caprine assemblage and 3.3% (NISP 34) of the Phase II caprines (Table 5.21).

	Caprine burning			
Burning type	**Phase I**	**%Phase I**	**Phase II**	**%Phase II**
Burnt Black	4	1.1	17	1.7
Calcined	2	0.5	7	0.7
Singed	2	0.5	10	1.0
Total	**8**		**34**	

Table 5.21: NISP of burnt caprine elements in Phase I and II. Data expressed as percentage of total caprine assemblage. Phase I Caprine NISP = 373, Phase II Caprine NISP = 1022.

Carnivore gnawing was recorded in both phases for caprines (Table 5.22); 7.5% (NISP 28) of the caprine elements in Phase I had been gnawed and 7.2% (NISP 74) of the Phase II caprines had also been gnawed. A small quantity of material had also been digested in both phases.

Caprine Gnawing				
Gnawing	**Phase I**	**%Phase I**	**Phase II**	**%Phase II**
Carnivore gnawing	24.0	6.4	63	6.2
Carnivore gnawing/digested			11	1.1
Digested	4.0	1.1		
Total	**28**		**74**	

Table 5.22: NISP of gnawed caprine elements in Phase I and II. Data expressed as percentage of total caprine assemblage. Phase I Caprine NISP = 373, Phase II Caprine NISP = 1022.

Caprine butchery

Due to small sample size sheep, goat and sheep/goat data have been combined and considered together. In Phase I, 5% (NISP 20) of the caprine bones bore evidence of butchery marks. The majority were recorded as cut marks (80%, NISP 16) and chop marks (15%, NISP 3) and 5% (NISP 1) had a combination of chop and cut marks (Table 5.23 and Figure 5.15). Phase II reveals a similar pattern, although there is an increase in the quantity of elements with evidence for butchery, reflected in 10% (NISP 100) of the caprine assemblage showing signs of butchery and bone working. The majority were cut marks (67%, NISP 67) followed by chop marks (22%, NISP 22) and a smaller proportion had evidence for saw marks (8%, NISP 8), a combination of chop and cuts (2%, NISP 2) or cut and saw marks (1%, NISP 1) (Table 5.23 and Figure 5.15). When the two phases are compared, there is an increase in the number of both chop and cut marks and Phase II sees the use of the saw on sheep and goat horn-cores - previously only used on cattle horn-cores and deer antler in Phase I.

All Caprines butchery	Phase I	%Phase I	Phase II	%Phase II
Chopped	3	0.8	22	2.6
Cut(s)	16	4.3	67	6.5
Sawn			8	0.8
Chopped and cut(s)	1	0.3	2	0.2
Sawn and chopped				
Cut(s) and sawn			1	0.1
Total	**20**		**100**	

Table 5.23: Caprine butchery NISP counts and relative percentages for Phase I and Phase II by butchery style. Table includes all sheep/goat, sheep and goat due to small sample size. Data expressed as percentage of total caprine assemblage. Phase I Caprine NISP = 373, Phase II Caprine NISP = 1022. Presented graphically in Figure 5.15.

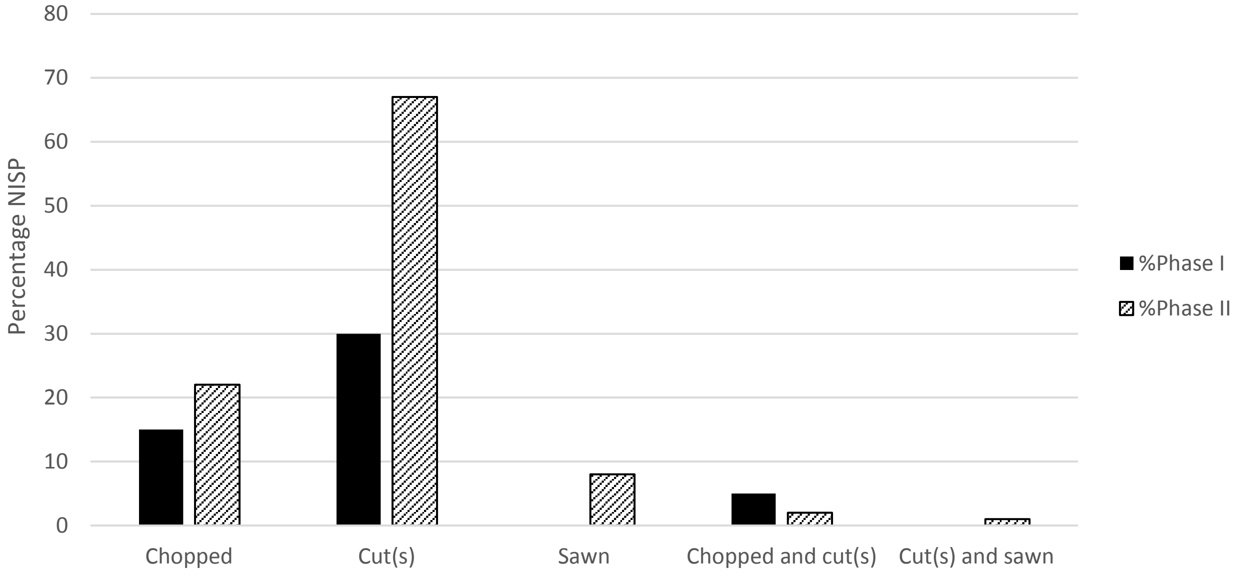


Figure 5.15: NISP relative percentage of caprine elements with evidence of butchery in both phases. Graph includes all sheep/goat, sheep and goat due to small sample size. Data expressed as percentage of total caprine assemblage. Phase I Caprine NISP = 373, Phase II Caprine NISP = 1022.

As with cattle, consideration of butchery by caprine element revealed that sheep and goat were not butchered in a systematic or specialised way (Figure 5.16). Caprine horn-core and mandible data are not included within Figure 5.16 but will be discussed separately as butchery was recorded on these elements also.

The majority of cut and chop marks on caprine elements are a result of de-jointing, with some evidence for gross disarticulation and meat filleting in both phases. Cut marks on one sheep hyoid in

Phase I indicates that tongue meat was consumed and cuts on two sheep/goat mandibles on the ramus provides further evidence for the removal of the tongue and cheek meat in this phase.

The lack of phalanges with evidence for butchery in both phases is interesting, particularly because metapodials also reveal minimal evidence for cut marks when compared with the number of cuts identified on the astragalus and calcaneum, indicating that sheep/goats were de-jointed at the knees. However, the minimal number of butchered feet elements may also be the result of a highly efficient butcher, who would leave no trace of knife cuts on the bones.

Caprine horn working was noted in both phases of the site in small quantities (Table 5.24), although evidence was more prevalent in Phase II, particularly for sheep horn-core working. Saw marks on caprine elements were only recorded in Phase II on horn-cores, indicative of craft working. As with cattle, cut and chop marks were noted around the base of the horn in addition to chop and saw marks on the proximal of horn-cores suggesting that caprine horn craft working was facilitated in similar ways to cattle.

Horn-core	**Phase I**	**Phase I %**	**Phase II**	**Phase II %**
Sheep/Goat	5	36		
Sheep	3	21	31	30
Goat			6	6
Total	**8**		**3**	

Table 5.24: Horn-core butchery for sheep/goat, sheep and goat in Phase I and Phase II showing NISP counts and relative percentage NISP. Data shown as relative percentage of combined number of caprine horn-cores. Phase I Caprine NISP = 373, Phase II Caprine NISP = 1022.

Whilst there was no evidence for slaughter techniques in Phase I, however, Phase II revealed seven records of cut marks on the ventral side of both axis and atlas fragment indicative of slaughter by throat cutting (Poole 2010b:309).

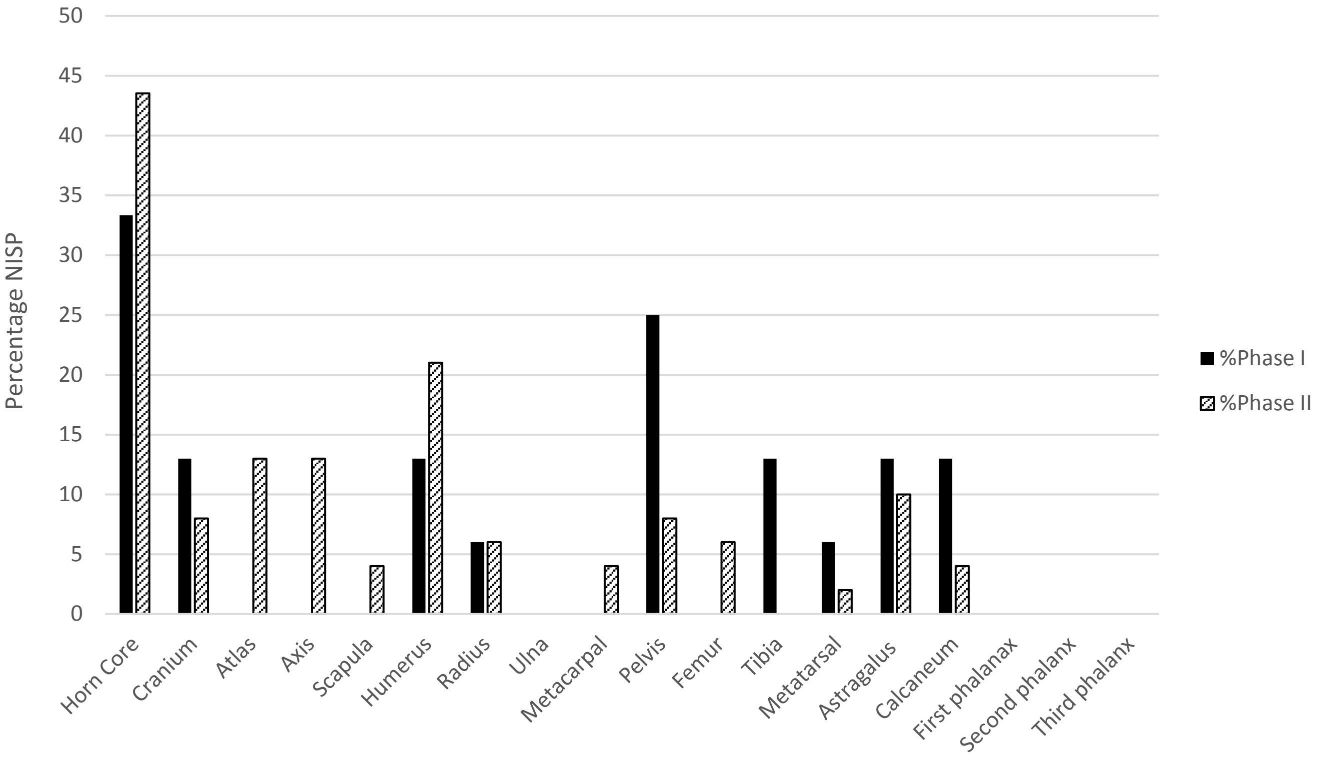


Figure 5.16: Relative percentage NISP of caprine elements (combined sheep/goat, sheep and goat data for graph), with evidence of butchery, comparing both phases. Horn-core and mandible data are not included here as they are not considered 'countable' in the methodology, but butchery marks were recorded on these elements also. Raw data in Appendix 3, Table 6.

Ageing

The sheep/goat mandible wear data in Phase I indicates that most of the caprines were being killed by four – six years of age (Figure 5.17), pointing towards a husbandry regime focused on meat consumption during this period. In both phases there is a peak in the number of caprines dying at 6 – 12 months, most likely as a result of annual culls designed to mitigate the need for overwintering. There are some significant changes in the Phase II assemblage, however, demonstrating a stronger reliance on caprines for dairy during this period; this includes a higher number of sheep being culled at two - six months and an elevated incidence of depressions in sheep horn-cores which is a recognised pathological indicator of intensive dairying (Table 5.25) discussed further below.

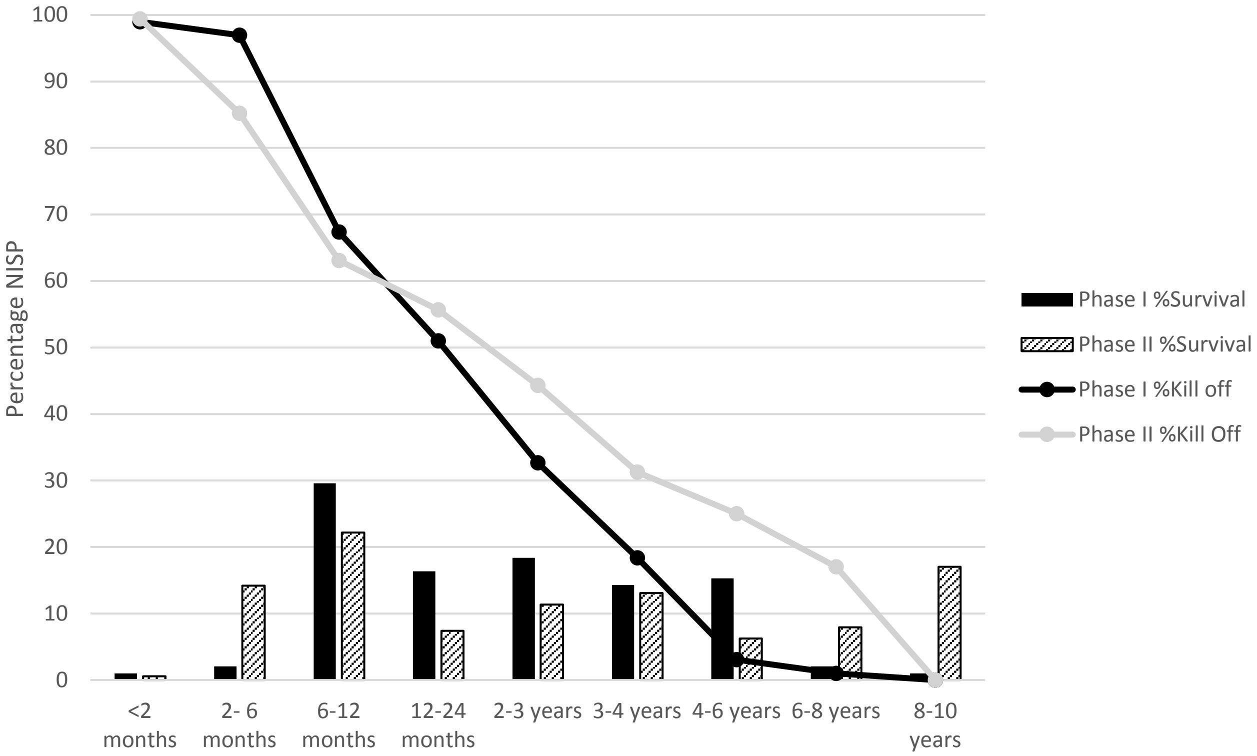


Figure 5.17: Graph showing caprine age-at-death patterns based on mandible data and percentage of age survival in both phases; dental ageing from Payne 1973. Sheep/goat, sheep and goat data have been combined for this table to enable a larger sample size.

Stage	Caprine Payne 1973 age suggestion	Phase I Qty	Phase II Qty
A	<2 months	1	1
B	2- 6 months	2	25
C	6-12 months	29	39
D	12-24 months	16	13
E	2-3 years	18	20
F	3-4 years	14	23
G	4-6 years	15	11
H	6-8 years	2	14
I	8-10 years	1	30
	Total	**98**	**176**

Table 5.25: NISP of caprine mandible tooth wear stages for Phase I and II – using Payne's 1973 age suggestions. Dental wear not assigned a specific stage category have not been included. Sheep/goat, sheep and goat data have been combined for this table to enable a larger sample size.

The Phase II assemblage also registers a higher proportion of animals surviving beyond their fourth year which is consistent with an intensification in wool production in Phase II, although it should be noted that the trend is not as pronounced as at other middle Saxon sites such as Brandon, Suffolk, and Flixborough, North Lincolnshire, where specialised wool production has been inferred (Crabtree 2013; Dobney *et al.* 2007).This pattern accords with an abundance of textile manufacturing equipment recovered from the Phase II settlement focus (Thomas 2013). However, caprine numbers are not high enough to indicate intensive wool production for export to other sites; therefore, whilst there was likely to have been some level of specialisation in wool production, it may have been limited to this site and the immediate surrounding area.

There are similar patterns in both phases for epiphyseal fusion data (Table 5.26). Slightly fewer caprines are lived beyond ten months in Phase II, which mirrors the peak at death at six - twelve months seen in the dental data, substantiating the idea that farmers avoided overwintering unnecessary numbers of animals. There is a clear decreasing rate of survival over the lifespan of sheep, and broadly speaking there appears to have been a mixed husbandry regime for caprines in both phases of the site, with some minor specialisation in primary products (i.e. meat) in Phase I and a higher reliance on dairy and wool in Phase II.

Sheep are very low maintenance and can be grazed on almost any terrain (Banham and Faith 2014:92). With the shift towards intensified arable farming in Phase II Lyminge, sheep would have been the ideal type of livestock to keep, as they could have been grazed on harvested and fallow fields, providing valuable fertilising manure in the process (Banham and Faith 2014:92).

	Phase I (5th-7thC)			Phase II (8th-9thC)		
Caprines	**F**	**UF**	**%F**	**F**	**UF**	**%F**
Scapula	11	0		17	16	
Distal Humerus	19	2		57	26	
Proximal Radius	13	0		31	10	
Total <10 months	**43**	**2**	**95.5%**	**105**	**52**	**66.9%**
Distal Tibia	20	2		33	18	
Distal Metapodia	16	14		41	39	
Phalanx I	26	6		61	43	
Phalanx II	9	4		40	7	
Total 1-2 years	**71**	**26**	**73.2%**	**175**	**107**	**62%**
Ulna	2	7		12	18	
Proximal Femur	3	10		9	22	
Calcaneum	9	13		18	19	
Distal Radius	2	6		6	12	
Total 2.5 years - 3 years	**16**	**36**	**30.8%**	**45**	**71**	**38.7%**
Proximal Humerus	1	2		6	16	
Distal Femur	0	2		4	14	
Proximal Tibia	2	5		8	10	
Total 3-3.5 years	**3**	**9**	**25%**	**18**	**40**	**31%**

Table 5.26: NISP epiphyseal fusion of Caprines from both phases. Sheep/goat, sheep and goat data have been combined for this table to enable a larger sample size.

Caprine metrics

A slenderness index was utilised to separate males, females and wethers in the caprine data, following Davis (2000) (Figure 5.18). The calculation was; (shaft width/greatest length) *100 plotted against the greatest length (GL). Davis (2000:389) demonstrates that plotting the metapodials this way is the most effective method of separating ram elements (which are short and robust) from ewes (short and slender) and wethers (long and slender). Only sheep metacarpals were included in this plot because goat metapodials are much shorter than sheep and would therefore bias results, there were also no goat metapodials positively identified in either phase of the Lyminge settlement. The data in Figure 5.18 is too small to draw firm conclusions from, however, it suggests that in both phases there were mixed sex herds. There was a very marginal skew towards rams and wethers in

Phase II, which supports evidence from the ageing data which suggests sheep were used primarily for wool in this phase.

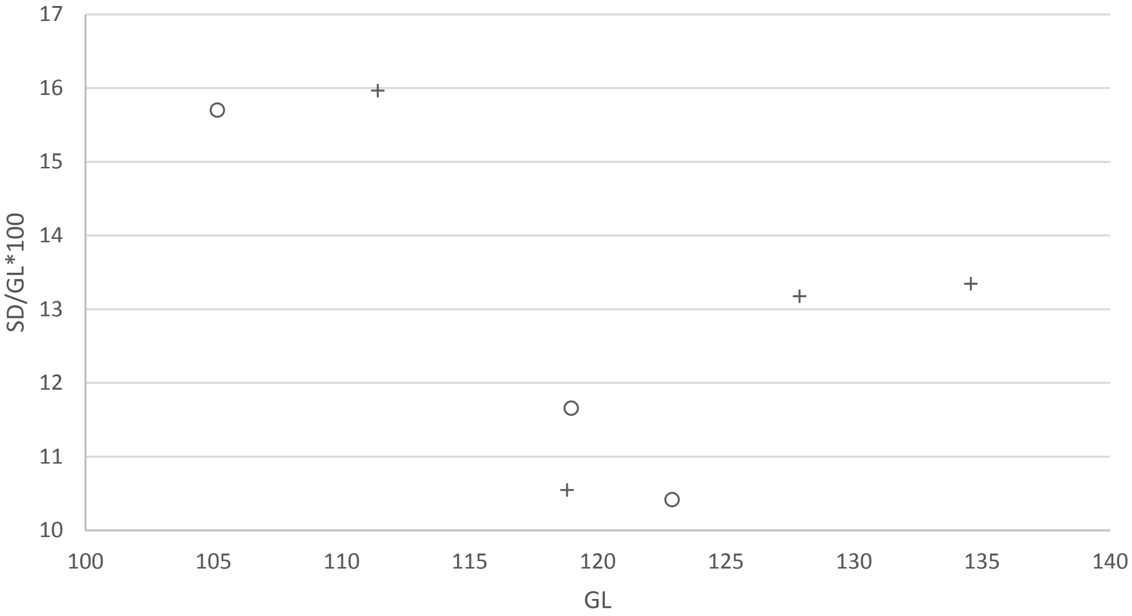


Figure 5.18: Plots of Lyminge sheep metacarpal measurements from both phases. SD= shaft diameter; GL= greatest length. Empty circle = Phase I (5th-7th century), Crosses = Phase II (8th- 9th century). Data in Appendix 3, Table 7.

Log-scaling was used for the caprine metrics to maximise available data, using the soay ewe from University of Leicester, as the standard (Thomas *et al.* 2013: Table 2) (Table 5.27). Figure 5.19 shows the length, depth and breadth log-ratios, and it is immediately apparent that the majority of caprines were larger than the standard soay in both phases. There is no apparent change in size between Phase I and II suggesting that there was a continuation in breeding techniques, and no stock improvement (Holmes 2014a). There were a few specimens in Phase II that stood out for their slightly larger breadth measurements, but the sample is not large enough to be statistically significant.

Element	Measurement	Soay sheep standard (mm)
Humerus	GL	120.2
	BT	23.7
Radius	GL	129.8
	Bd	23.8
Femur	GL	147
	DC/Dp	16.5
	Bd	30.8
Tibia/Tibiotarsus	GL	178
	Bd	21.3
	Dd	16.8
Astragalus	GLl	23.8
	Bd	15.8
	Dl	13.5
Calcaneum	GL	48.3
Metacarpal	GL	109.6
	Bd	20.8
Metatarsal/Tarsometatarsus	GL	119.9
	Bd	20.1

Table 5.27: The Soay sheep (ewe) standard used for log-scaling the Lyminge caprines as instructed by Thomas et al (2013:3311). Soay ewe from the University of Leicester reference collection R159. Measurement codes follow von den Driesch and are listed in millimetres (mm).

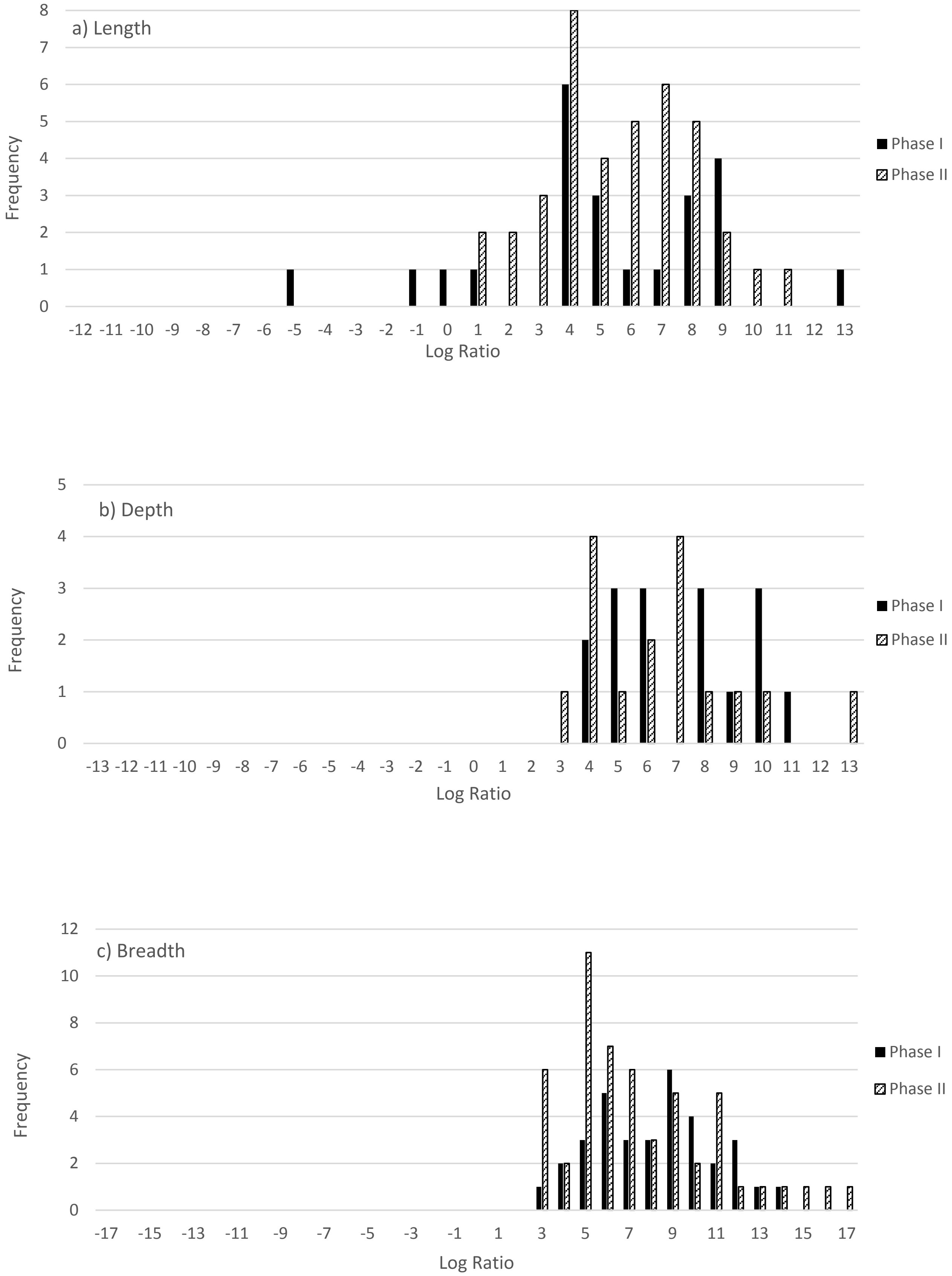


Figure 5.19: Comparison of Phase I and Phase II caprine metrics using log-scaling. Soay Ewe standard following Thomas et al (2013:3311), also see Table 5.26 for standard.

Caprine Pathology

Due to small sample size sheep/goat, sheep and goat pathology has been considered together. The data showed that 3.2% (NISP 12) of the Phase I caprine assemblage had evidence for pathology, and 4.2% (NISP 43) of the Phase II caprine assemblage was pathological. When a chi-square test of independence was applied to this data set it revealed that the increase in caprine pathology over time was statistically significant (p-value = 0.006) (Appendix 3, Table 8). However, it should be noted that this is a relatively small dataset. There is also a notable shift in time in the frequency of pathology type and the element upon which it occurs (Figure 5.21, Table 5.28 and Table 5.29). This is particularly notable in the Phase II mandibles and horn-cores, where there is a diachronic increase in pathologies such as milking depressions and periodontal disease (Figure 5.20 and Figure 5.21). However, a chi-square test of independence revealed that this increase is not statistically significance (p-value = 0.06) (Appendix 3, Table 9). Periodontal disease is often attributed to diet, as the disease frequently starts as an injury to the gum caused by food trauma during mastication. A common cause of this condition in ruminants is overgrazing. When pastures are overgrazed this depletes the nutrients and thus edible grasses, which are often replaced by poor quality, thorny weeds that usually ruminants would avoid. As edible grasses become entangled with thistles this increases the chance of oral injury (Bartosiewicz 2013: 177-8). The argument that over-grazing may have been a cause of periodontal disease in caprines, particularly in Phase II, can be made by the various strands of evidence that suggest Phase II saw an increased, and more intensive arable agriculture being employed at Lyminge. However, the increase in dental pathologies could also be attributed to a larger number of elderly sheep in Phase II, with higher numbers of sheep being kept alive into their senior years which increases the chance of pathologies. A larger, statistically significant, dataset is required to draw firm conclusions.

‘Milking depressions’ refer to a thumb print like indentation recorded on sheep and goat horn-cores. This pathology is only recorded in the Phase II assemblage and is attributed as a reaction to malnutrition and/or being deficit in essential nutrients during breeding and lactation (Clutton-Brock *et al.* 1990:6; Bartosiewicz 2013:160). Of the 14 recorded incidences of milking depressions, only two were identified as goat and the other 12 were sheep.

Figure 5.20: Sheep mandible (1312) from the Phase II assemblage with severe periodontal disease resulting in expansion of mandible, possibly the result of an abscess, around the second and third molar.

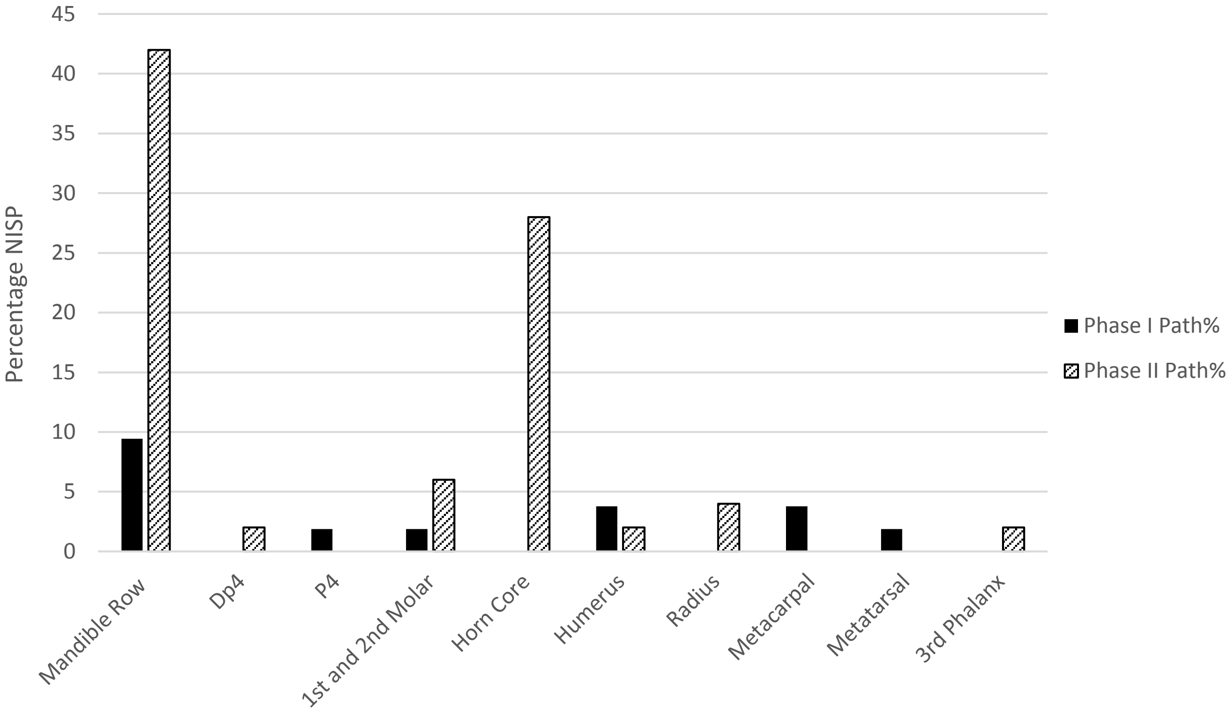


Figure 5.21: Caprine elements with pathology – shown as a relative percentage of the total NISP by element. Graph contains combined data from sheep/goat, sheep and goat. 'Caprine' – includes combined sheep/goat, sheep and goat data. Data presented in Table 5.28.

Caprine elements with pathology	Phase I Qty	NISP Phase I	Phase II Qty	NISP Phase II	Phase I Path%	Phase II Path%
Mandible Row	5	53	21	50	9	42
Dp4	0	21	1	29	0	2
P4	1	2	0	10	2	0
1st and 2nd Molar	1	60	3	93	2	6
Horn-core	0	14	14	102	0	28
Humerus	2	24	1	104	4	2
Radius	0	18	2	53	0	4
Metacarpal	2	45	0	76	4	0
Metatarsal	1	19	0	53	2	0
3rd Phalanx	0	12	1	38	0	2
Total	**12**	**268**	**43**	**608**		

Table 5.28: Caprine elements with pathology in both phases – quantity of elements with pathology, total NISP of element and percentage of elements with pathology (data visually presented in Figure 5.21). 'Caprine' – includes combined sheep/goat, sheep and goat data.

Caprine Phase I (5th-7thC) Pathology

Elements	P4	1st/2nd Molar	Mandible row	Humerus	Metacarpal	Metatarsal	Total
Exostosis				2			**2**
Marrow Extraction					2	1	**3**
Exostosis on tooth root		1					**1**
Irregular tooth wear/tooth overcrowding			1				**1**
Tooth overcrowding			1				**1**
Tooth overcrowding, extensive wear on teeth	1						**1**
Dental caries			2				**2**
Periodontal disease			1				**1**
Grand Total	**1**	**1**	**5**	**2**	**2**	**1**	**12**

Caprine Phase II (8th-9thC) Pathology

Elements	Horn-core	Dp4	1st/2nd Molar	Mandible row	Humerus	Radius	3rd Phalanx	Total
Exostosis					1	2	1	**4**
Milking depression	14							**14**
Additional tooth, periodontal disease				1				**1**
Irregular tooth wear			1	6				**7**
Irregular tooth wear and tear on mandible				1				**1**
Dental caries		1		1				**2**
Non-metric trait - groove on tooth cusp			1					**1**
Periodontal disease/irregular wear on teeth				2				**2**
Periodontal disease/teeth overcrowding				1				**1**
Periodontal disease and dental caries				1				**1**
Periodontal disease/reabsorption				1				**1**
Periodontal disease			1	7				**8**
Grand Total	**14**	**1**	**3**	**21**	**1**	**2**	**1**	**43**

Table 5.29: NISP counts of caprine elements with pathology, by pathology type and element. 'Caprine' – includes combined sheep/goat, sheep and goat data.

5.4.3 Pig

Pig Relative Frequencies

Pig displays a diachronic shift similarly marked to that of sheep/goat, but in this case the trend over time is one of decline, specifically from 48% (NISP 922.8) in the Phase I assemblage down to 26% (NISP 607.6) in Phase II when considered by relative percentage NISP and from 43% (MNI 44) to 26% (MNI 43) when considered by MNI (Figure 5.2).

Pig body part representation

Analysis revealed that in both phases pigs were raised, butchered and consumed on site as all parts of the skeleton are represented (Figure 5.22 and Table 5.30). As with caprines, the mandible is the most commonly occurring element in Phase I, followed by pelvis, radius, atlas, scapula, ulna and femur (Figure 5.22). Of the elements recorded in Phase I, axis vertebrae were present in the lowest numbers, which is interesting given there is a relatively high number of atlas vertebrae. Phase I reveals that the Lyminge inhabitants had a distinct preference for the meat-bearing elements as both fore limbs and hind limbs are well represented compared with other pig skeletal elements. Mandibles are also the most commonly occurring element in the Phase II assemblage, followed by humerus, radius, ulna, tibia and pelvis. As in Phase I meat bearing elements are well represented, particularly the forelimbs. There is a lower incidence of metapodials and phalanges compared with Phase I suggesting that some of the waste from pig gross disarticulation may have deposited elsewhere in the Phase II settlement.

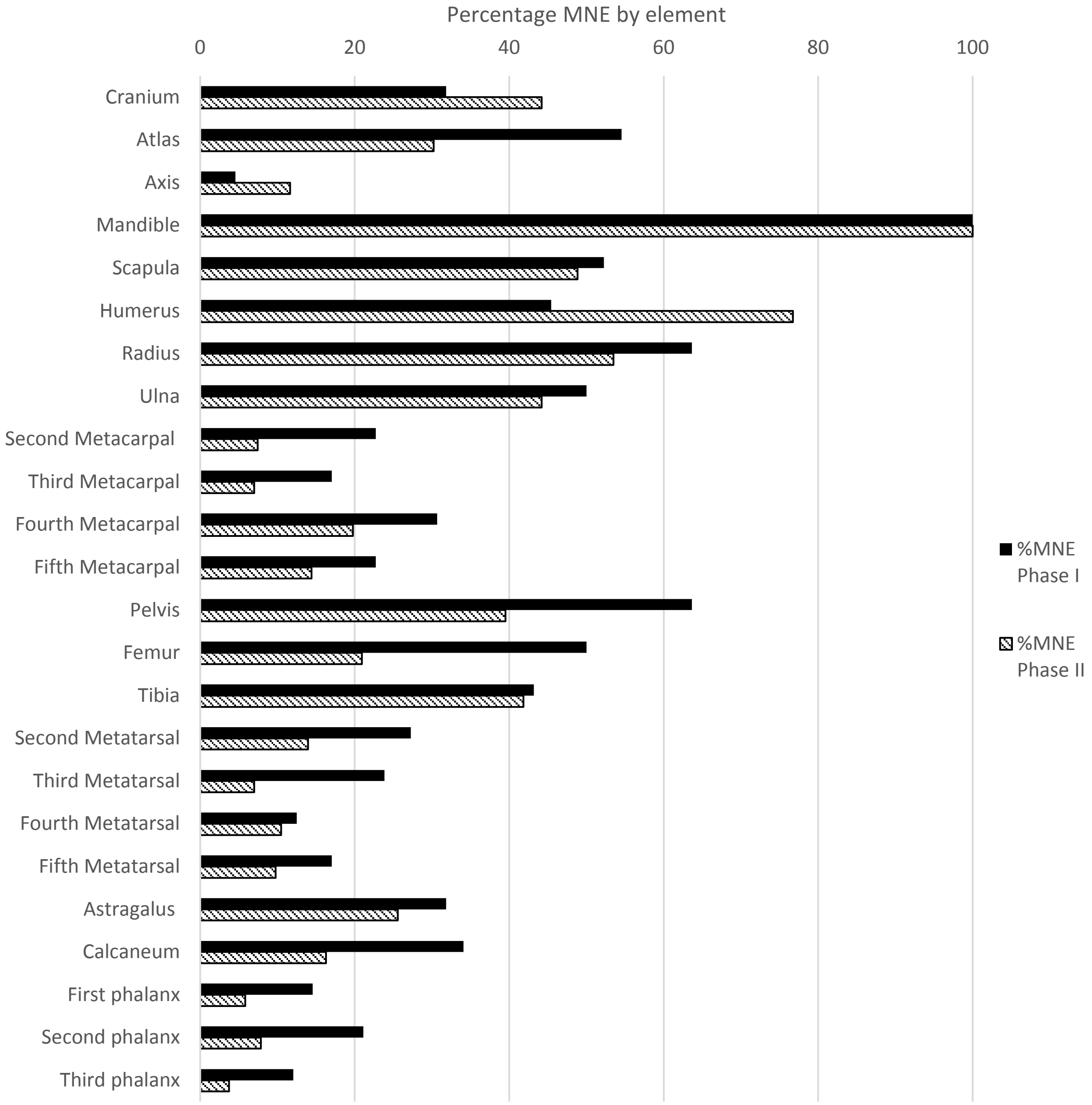


Figure 5.22: Pig element representation in Phase I (5th-7thC) and Phase II (8th-9thC) assemblages by percentage MNE (Phase I MNI = 44; Phase II MNI = 43).

Pig element	Phase I (5th-7thC)			Phase II (8th-9thC)		
	NISP	MNE	%MNE	NISP	MNE	%MNE
Cranium	22	14	32	29	19	44
Atlas	24	24	55	13	13	30
Axis	2	2	5	5	5	12
Mandible	92	**44**	100	78	**43**	100
Scapula	38	23	52	37	21	49
Humerus	38	20	45	57	33	77
Radius	48	28	64	38	23	53
Ulna	35	22	50	40	19	44
Second Metacarpal	38	10	23	5.6	3	7
Third Metacarpal	28	7.5	17	4	3	7
Fourth Metacarpal	53	13.5	31	12	9	20
Fifth Metacarpal	37	10	23	10.6	6	14
Pelvis	49	28	64	29	17	40
Femur	30	22	50	15	9	21
Tibia	36	19	43	26	18	42
Second Metatarsal	25	12	27	9	6	14
Third Metatarsal	33	10.5	24	6	3	7
Fourth Metatarsal	20	5.5	13	8	5	10
Fifth Metatarsal	28	7.5	17	8.2	4	10
Astragalus	27	14	32	17	11	26
Calcaneum	27	15	34	12	7	16
First phalanx	104	6.4	15	38	3	6
Second phalanx	143	9.3	21	60.5	3	8
Third phalanx	76	5.3	12	24	2	4

Table 5.30: Pig element NISP, MNE and percentage MNE for both phases. Pig Phase I MNI = 44, Phase II MNI = 43. Data displayed graphically in Figure 5.22.

Pig taphonomy: burning and gnawing

A relatively low percentage, 0.13% (NISP 11.2) of pig bones had undergone burning in Phase I (Table 5.31), although a higher percentage (3.7%, NISP 22.2) were burnt in Phase II.

Pig burning				
Burning type	**Phase I**	**%Phase I**	**Phase II**	**%Phase II**
Burnt Black	5.7	0.6	9.2	1.5
Calcined	2	0.2	9	1.5
Singed	3.5	0.4	4	0.7
Total	**11.2**		**22.2**	**6**

Table 5.31: NISP and Percentage NISP of pig elements with evidence of burning in Phase I and II. Data expressed as percentage of total pig assemblage (Phase I Pig NISP = 922, Phase II Pig NISP = 607).

As with the cattle and caprines, only dog gnawing was recorded on pig bones; 3.5% (NISP 32.5) from Phase I and 8.5% (NISP 52) in Phase II (Table 5.32).

Pig Gnawing				
Gnawing	**Phase I**	**%Phase I**	**Phase II**	**%Phase II**
Carnivore gnawing	29.5	3.2	42	6.9
Carnivore gnawing/digested	1	0.1	10	1.6
Digested	2	0.2		
Total	**32.5**		**52**	

Table 5.32: NISP and percentage NISP of pig elements with evidence of gnawing in Phase I and II. Data expressed as percentage of total pig assemblage (Phase I Pig NISP = 922, Phase II Pig NISP = 607).

Pig butchery

Analysis revealed that in Phase I, 2.92% (NISP 27) of the pig assemblage showed signs of butchery (Table 5.33 and Figure 5.23), the majority of which (78%, NISP 21) were cut marks, with a lower number of chop marks (19%, NISP 5). Among the Phase II pig elements, 4.62% (NISP 31) bore chop, cut and saw marks**,** and the majority of the butchery marks were cuts (84%, NISP 26), with a smaller proportion of chop (10%, NISP 3) and saw (6%, NISP 2) marks. Across the two phases butchery styles appear to be broadly similar, with minor fluctuations, such as the lack of saw marks in Phase I (Table 5.33 and Figure 5.23).

Pig butchery	Phase I	%Phase I	Phase II	%Phase II
Chopped	5	0.5	3	0.5
Cut(s)	21	2.27	26	4.3
Sawn			2	0.3
Chopped and cut(s)	1	0.1		
Total	**27**		**31**	

Table 5.33: Pig butchery NISP counts and relative percentages for Phase I and Phase II by butchery type (Phase I Pig NISP = 922, Phase II Pig NISP = 607). Displayed graphically in Figure 5.23.

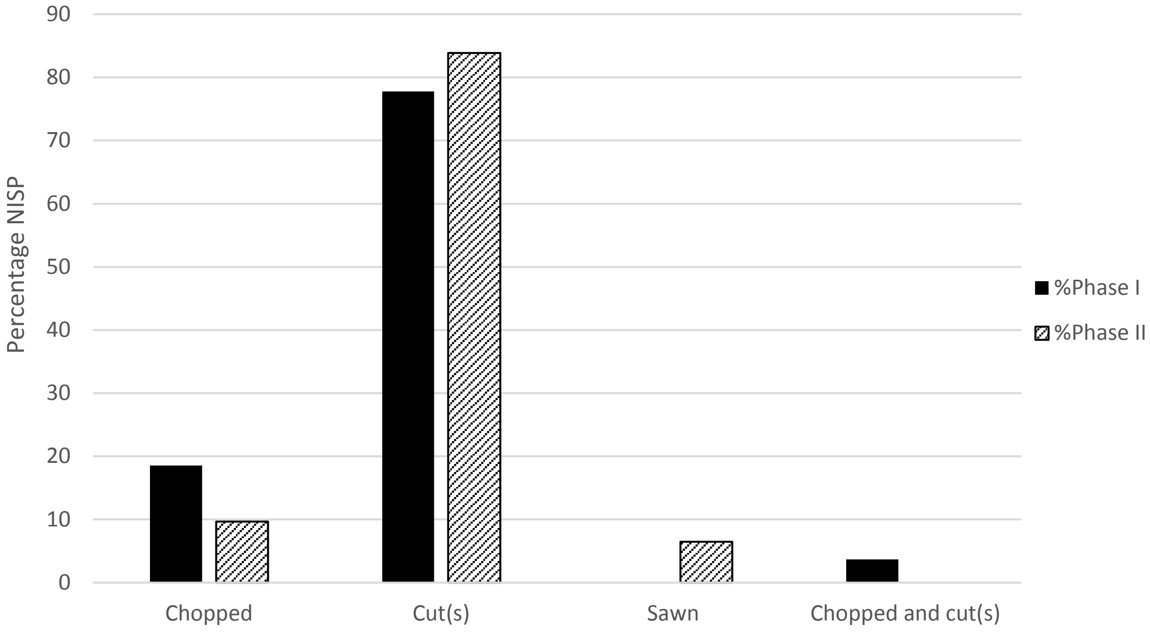


Figure 5.23: Relative percentage NISP of pig butchery in Phase I and Phase II by butchery type.

When butchered pig elements were considered by element there was no evidence for systematic butchery. In Phase I, the higher percentage of pelvises with cut marks is likely a result of gross carcass disarticulation, as evidenced by cuts on the ventral size of the acetabulum, in addition to chops through the acetabulum and cuts on the ischium and iliac crest (Figure 5.24). Dobney *et al.* (2007:107) also recorded cuts around the pelvis acetabulum in the Flixborough assemblage and cite this as evidence for carcass dismemberment or production of prime meat joints.

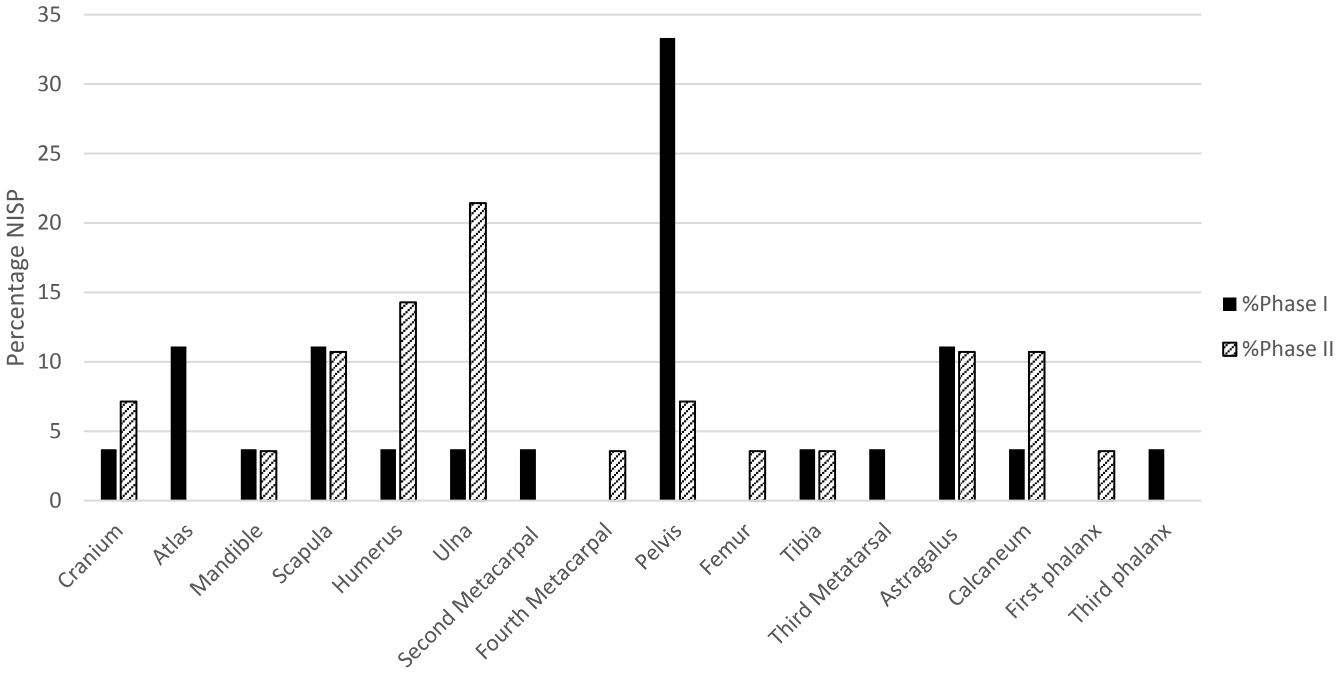


Figure 5.24: Percentage NISP of butchered pig elements, comparing both phases. Mandible data are not included here although they are not considered 'countable' in the methodology, but it is worth noting that butchery marks were recorded on these elements too. Raw data in Appendix 3, Table 10.

In Phase II butchery was most often recorded on joint articulations and those more awkwardly shaped bones such as ulna, humerus and scapula - likely a result of carcass preparation or filleting of meat (Seetah 2007:134-5) (Figure 5.24). There was one element of note, a pig scapula that had been chopped at the glenoid and had a perforated blade, indicative of the curing of shoulder meat either in brine vats or smokers (Figure 5.25) (Grant 1975; Dobney *et al.* 1996; Seetah 2007:39). A similar butchery technique was also noted on two pig scapulae from Bishopstone, Sussex, which was also interpreted as evidence for suspension for smoking meat (Poole 2010b:115), thus shedding light on the potential introduction of consistency in meat preservation techniques in middle Saxon Lyminge.

Figure 5.25: Pig scapula (525), with evidence for a perforated blade and removed glenoid indicative of the curing of shoulder meat in Phase II.

Pig Ageing

A comparison of the pig age-at-death profiles for the two phases of the settlement indicates that most animals were culled between the ages of 14 –21 months, which is consistent with a meat-oriented regime, with a seasonal cull between their second autumn (*c.* 16 months) and the following spring (*c.* two years old), as recorded in a number of contemporary texts (Figure 5.26) (Dobney *et al.* 2007:146; Poole 2010b:158).

The management of breeding stocks throughout both phases is indicated by the presence of a small number of older animals as well as neonatal and young piglets (Figure 5.26). The one clear temporal distinction highlighted by the analysis is that far fewer animals survived beyond the age of 21 months in Phase I; combined with the notable peak in the nought – two months' category, this suggests a preference for suckling pig during this phase of the settlement.

Pig culled between seven and 14 months old most likely indicate an initial cull of young pigs to avoid overwintering followed by another herd cull before their second autumn (Dobney *et al.* 2007:146).

Contemporary documentary evidence in a number of contemporary Irish law texts detail seasonal culling of female pigs at six – eight months at Martinmas (November 11th) (Kelly 1997:85) where as a number of other contemporary texts record pigs being slaughtered in their second autumn (16 months) and in the following spring (at two years old) (Dobney *et al.* 2007:146).

The mandible data is supported by the epiphyseal fusion evidence (Table 5.35), where just under half of the pigs present in both phases survived beyond their first year. In both phases <10% of pigs are surviving into their third year reinforcing the argument that most pigs were being killed at the end of their economically ‘useful’ lives.

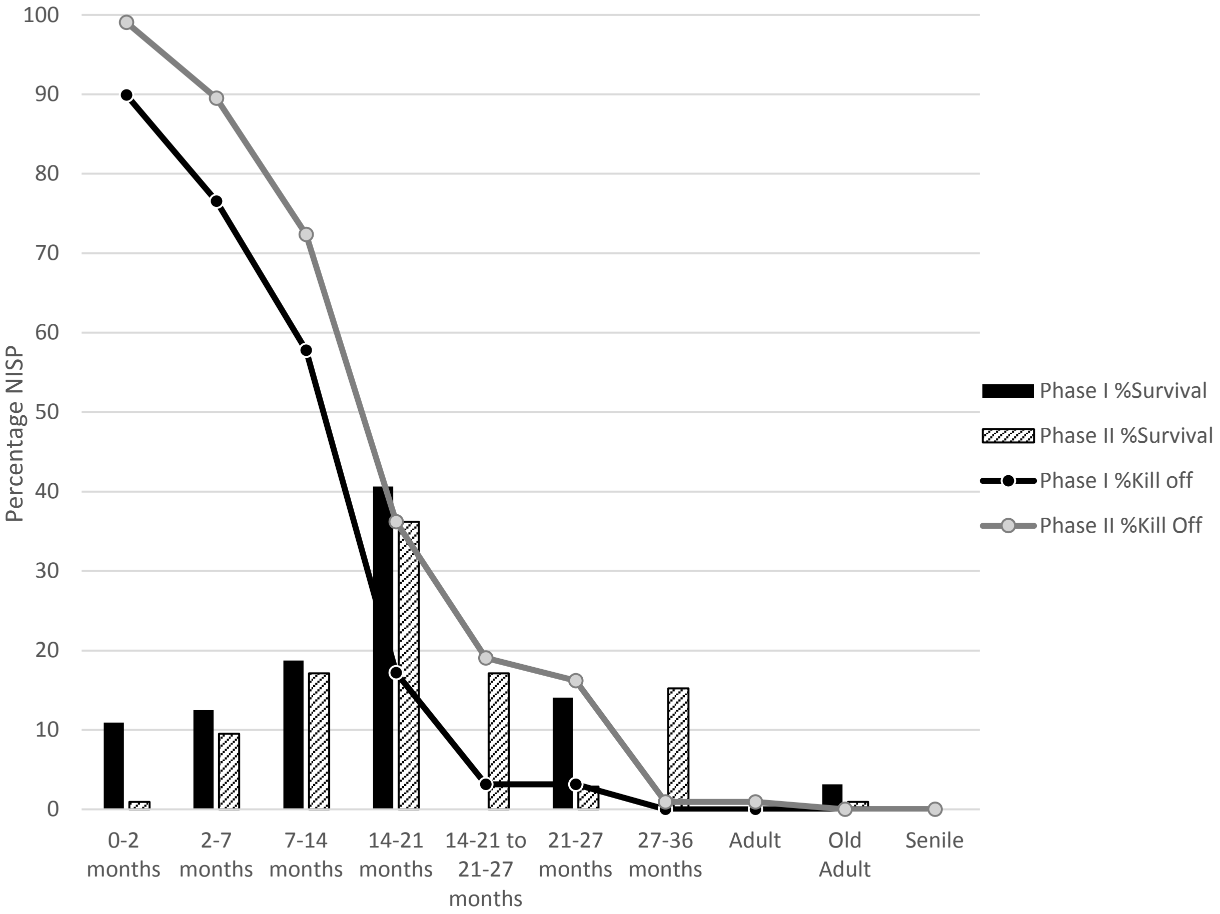


Figure 5.26: Pig age at death patterns based on mandible data and percentage of age of survival in both phases; dental ageing from Hambleton 1999.

Stage	Pig suggested age Hambleton (1999)	Phase I	Phase II
A	0 –2 months	7	1
B	2–7 months	8	10
C	7–14 months	12	18
D	14–21 months	26	38
E	21–27 months	9	18
F	27–36 months	0	3
G	Adult	0	16
H	Old Adult	2	0
I	Senile	0	1
	Total	**64**	**105**

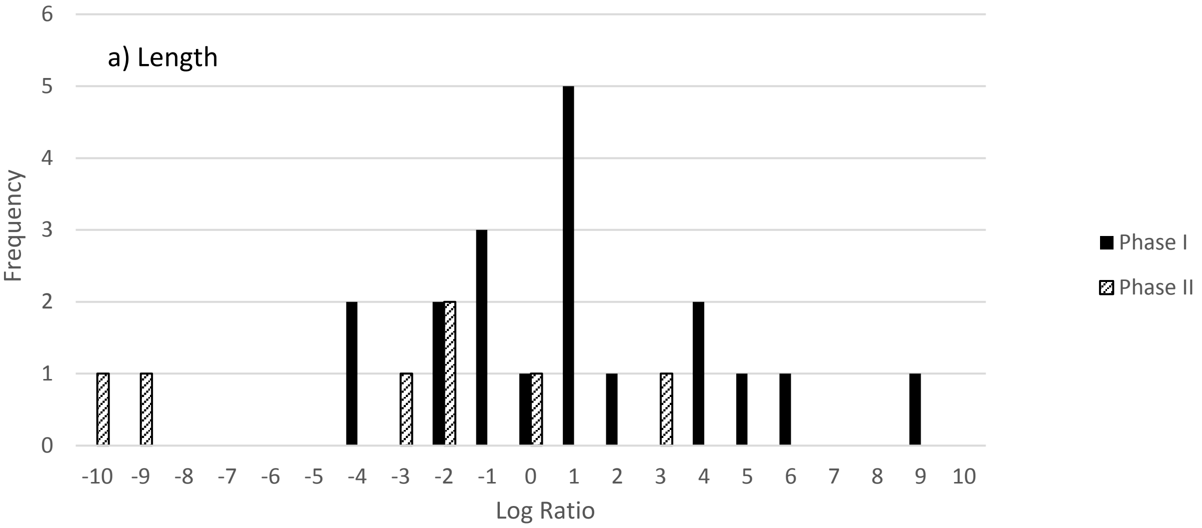
Table 5.34: NISP of pig mandible tooth wear stages for Phase I and II – using Hambleton's (1999) age suggestions. Dental wear not assigned a specific stage category have not been included.

	Phase I (5th-7thC)			Phase II (8th-9thC)		
Pigs	**F**	**UF**	**%F**	**F**	**UF**	**%F**
Scapula	22	16		18	19	
Distal Humerus	13	20		22	23	
Proximal Radius	18	22		20	11	
Phalanx II	82	59		28	28	
Total 1 year	**135**	**117**	**54%**	**88**	**81**	**52%**
Distal Tibia	10	19		10	13	
Calcaneum	4	20		2	6	
Metapodia	29.5	46.3		12	55	
Phalanx I	51	53		19	18	
Total 2 - 2.5 years	**94.5**	**138.3**	**41%**	**43**	**92**	**32%**
Proximal Humerus	1	12		1	11	
Distal Radius	1	22		2	19	
Ulna	3	27		0	4	
Proximal Femur	3	15		0	13	
Distal Femur	2	14		0	5	
Proximal Tibia	1	18		1	6	
Total 3.5 years	**11**	**108**	**9%**	**4**	**58**	**7%**

Table 5.35: Pig epiphyseal fusion in both phases – table shows NISP of fused and unfused elements in addition to the relative percentage of fused elements which provides an indication of kill-off patterns.

Pig Metrics

Log-scaling was used for the pig metrics to maximise available data, using the standard as presented in Albarella and Payne (2005). Figure 5.27 shows the length and breadth log-ratios, only a few specimens allowed depth measurements, therefore they have not been included within this analysis. The pig metrical data was generally quite limited, so observations are only tentative. There was a range of pig sizes present, most of which were of a similar size to the standard. In Phase I there were a few larger outliers in both length and breadth measurements, and a larger number of small pigs in Phase II. There is little evidence for stock improvement over time (Holmes 2014a).



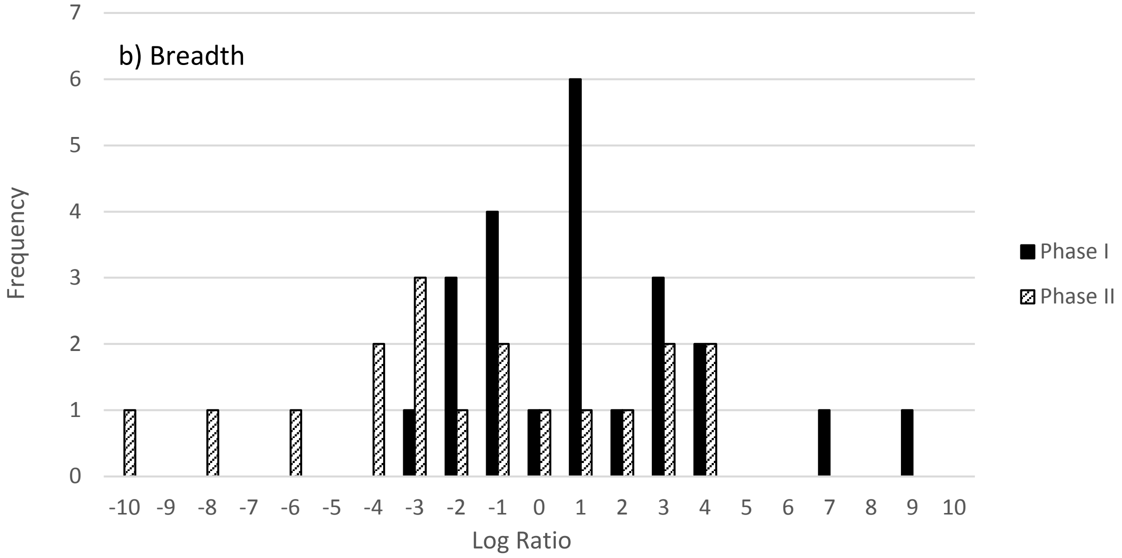


Figure 5.27: Comparison of Phase I and Phase II pig metrics using log-scaling. Note: there was not enough data to present depth log ratios. Standard follows Albarella and Payne (2005:598, Table 7), also see Table 5.26

Pig Element	Measurement	Standard (mm)
Atlas	H	46.9
	BFcr	56.8
Scapula	GLP	36.7
	SLC	23.8
Humerus	Bd	41.1
	BT	31.2
	HTC	19.7
Radius	BpP	29.6
	SD	17.6
MTC III	GL	73.9
MTC IV	GL	75.7
Pelvis	LAR	33.3
Tibia	BdP	30.7
	Sdap	14.9
	SDml	20.4
Astragalus	GLl	40.8
	GLm	27.9
Calcaneum	GL	79.3
	GD	31.1

Table 5.36: The pig standard used for log-scaling the Lyminge caprines as instructed by Albarella and Payne (2005: 598, Table 7). The standard is based on the Neolithic Durrington Wells large pig assemblage, which was the most appropriate available for the analysis of north-western European material. The standard is the mean of each element measurement. Only measurements of fully fused bones have been included. Measurement codes follow von den Driesch and are listed in millimetres (mm).

Pig canines revealed higher numbers of males to females in both phases by NISP (Table 5.37).

Pig sex	Phase I NISP	Phase II NISP	Phase I %	Phase II %
Male	38	47	61	63
Female	24	28	39	37

Table 5.37: Pig sex based on canines – showing NISP count and relative percentage NISP for both phases.

Pig Pathology

Very few pathological lesions were identified on the Lyminge pig elements. This is most likely a reflection of the fact that most pigs were slaughtered young, before chronic conditions that leave pathological markers on the skeleton could take hold (Thomas 2005:53) (Table 5.38). This is a common factor in zooarchaeological assemblages because the average age at death is lower in pigs their populations often look comparatively ‘healthier’, contributing to an age-related taphonomic bias in pathological analyses (Bartosiewicz 2013:44). Pathologies identified included low incidences of exostosis and periodontal disease. Exostosis was not recorded within the Phase II assemblage, although a comparatively higher incidence of irregular tooth wear was noted. One particularly severe case of periodontal disease was noted in Phase II.

Pig Pathology Phase I (5th-7thC)

Pathology/elements	**5th Metatarsal**	**Metapodial (2nd/5th)**	**2nd Phalanx**	**Mandible Row**	**Other**	**Total**
Exostosis	1	1				**2**
Exostosis/bacterial infection			1			**1**
Healed Fracture	1					**1**
Periodontal disease				1		**1**
Tooth overcrowding				1	1	**2**
Total	**2**		**1**	**2**	**1**	**7**

Pig Pathology Phase II (8th-9thC)

Pathology/elements	**Humerus**	**Mandible row**	**1st/2nd Molar**	**Total**
Eburnation	1			**1**
Irregular Tooth Wear		4	1	**5**
Periodontal disease		3		**3**
Total	**1**	**7**	**1**	**9**

Table 5.38: NISP counts of pig elements with pathology in both phases, by pathology type and element.

5.5 Other domestic mammals

5.5.1 *Equids*

Relative frequencies and body part patterns

Low numbers of equid bones were recorded in both phases of the site (Table 5.7 and Figure 5.3). There was an increase in the number of equids over time, from 0.08% (NISP 5) of the total identified assemblage in Phase I to 0.41% (NISP 18) of the total identified assemblage in Phase II (Figure 5.3). When considered by MNI there was and MNI of one in Phase I and an MNI of three in Phase II (Table 5.39). Of the three equid mandible teeth recovered in Phase I, one was identified as a possible donkey/mule, although it was not possible to confidentially identify it as such, therefore it was labelled ‘equid’. The other seven recovered equid teeth in Phase I were equid maxilla teeth. There were two mandible rows recovered in the Phase II assemblage, one of which was identified as horse, all other loose teeth (total 20) were recorded as equid.

Element	Phase I (5th-7thC) Equid		Phase II (8th-9thC) Equid	
	NISP	MNE	NISP	MNE
Cranium				
Atlas			1	1
Axis			1	1
Mandible			2	2
Scapula			1	1
Humerus			2	1
Radius	1	1		
Ulna				
Metacarpal	1	1	3	2
Pelvis	1	1		
Femur	1	1	1	1
Tibia			3	3
Metatarsal				
Astragalus				
Calcaneum			1	1
First phalanx	1	1	1	1
Second phalanx				
Third phalanx			1	1

Table 5.39: Equid element NISP and MNE by Phase. Equid Phase I MNI = 1, Equid Phase II MNI = 3.

Equid taphonomy – pathology, gnawing and burning

Dog gnawing was only recorded in Phase I on two elements, a femur and a metacarpal. On both elements, the dog gnawing was localised around the end of the long bones and was severe enough to inhibit measurements being taken. No burning was recorded on equid bones in either phase.

Pathology was only recorded in Phase II on one element; the second premolar in the left side of a mandible (of a pair) which exhibited irregular wear.

Equid butchery

One equid pelvis had evidence for butchery in Phase I, with two knife cuts on the dorsal side of the acetabulum – indicative of disarticulation or disjointing of the carcass (Seetah 2007:131). Of the 18 equid skeletal elements from Phase II, two had evidence of butchery; one metacarpal had been chopped diagonally on the distal shaft and one axis had cut marks. Poole (2013:234-5) notes that butchery on horse bones is relatively common on early Saxon sites with horses, with a considerable decline in butchered horses in the middle Saxon period. To date, horse butchery has only been recorded on rural early Saxon sites whereas in the middle Saxon period it is also noted on ecclesiastical sites (Poole 2013:327, Fig. 3). Therefore, the pattern of butchered equid bones at Lyminge fits within the national pattern, however, it is likely that the attitudes towards human consumption of horse flesh were more nuanced and will be discussed in more detail in Chapter 6.

Equid ageing and sexing

The epiphyseal fusion dataset is very small; however, it suggests that most of the equids were being kept into old age (Table 5.39). Age at death varies very slightly between the two phases. Whilst the majority of equids were living into old age in Phase II there were a couple of specimens that did not live beyond 15 - 18 months and one and a half to two years old. When a chi-square test of independence was conducted to measure if changes in equid age over time were statistically significant the findings had to accept the null hypothesis, that there was no statistical significance in age trends between the two phases (p-value = 0.68) (Appendix 3, Table 11). Therefore, the variation in age range may partly be a result of the equid dataset being larger in Phase II, therefore providing a fairer representation of equid population and age at death, however, it is also possible that equids had to be culled more frequently at an earlier age in Phase II.

	Phase I (5th-7thC)			Phase II (8th-9thC)		
Equid	**F**	**UF**	**%F**	**F**	**UF**	**%F**
Proximal Second Phalanx						
Total 9-12 months	**0**	**0**		**0**	**0**	
Proximal First Phalanx	1			3		
Total 13-15 months	**1**	**0**	**100%**	**3**	**0**	**100%**
Distal Humerus				1	1	
Proximal Radius						
Distal Metacarpal				1		
Distal Metatarsal						
Total 15-18 months	**0**	**0**		**2**	**1**	**67%**
Pelvis	1					
Distal Tibia				1	1	
Total 1.5-2 years	**1**	**0**	**100%**	**1**	**1**	**50%**
Proximal Humerus						
Distal Radius	1					
Proximal Ulna						
Proximal and distal Femur	1			1		
Proximal Tibia				1		
Scapula (Tuber spinae)				1		
Total 3-3.5 years	**2**	**0**	**100%**	**3**	**0**	**100%**

Table 5.40: Equid epiphyseal fusion in both phases – table shows NISP of fused and unfused elements in addition to the relative percentage of fused elements which provides an indication of kill off patterns. Epiphyseal fusion timings follow Silver 1969.

Equid withers height

There were no equid long bones complete enough to allow GL or lateral length (Ll) measurements to be taken in the Phase I material. In Phase II only two complete equid long bones enabled Ll measurements to be taken (Table 5.41), which have a mean withers height of 142.6cm. While the sample size is too small to allow statistical analysis, the Phase II Lyminge equids are similar in size to the horses excavated in Brandon, which had a mean withers height of 140.2cm (n= 10) (Crabtree 2012b:53). Crabtree (2012:53) states that the Brandon horses were significantly larger than early

Saxon horses recovered from West Stow, Suffolk, which had a mean withers height of 132.3cm (n=15).

Phase	Date	Taxa	Element	Ll (mm)	WH (cm)
Phase II	8th-9thC	Equid	Metacarpal	215	137.8
Phase II	8th-9thC	Equid	Tibia	338	147.4

Table 5.41: Withers height estimate (in cm) for complete horse long bones from Phase II Lyminge.

5.5.2 Dog

Dog relative frequency and deposition

Dogs represent 0.08% (NISP 2) of the total Phase I assemblage and 0.78% (NISP 35) of the total Phase II assemblage (Table 5.7). As noted in the zooarchaeological methods, due to the difficulty in separating fox (*Vulpes vulpes*) from dog (*Canis lupis familiaris*) many individuals were recorded under 'Canid *sp'*, although in most cases they appeared morphologically more like dog than fox. Therefore, if we take these data into account when discussing dogs in Phase I and Phase II, dogs represent 0.43% (NISP 11) of the total Phase I assemblage and 1.9% (NISP 86) of the total Phase II assemblage. Count by MNI also reveals an increase in the number dogs over time (see Figure 5.29 and Table 5.42); in Phase I the MNI for dog is one and for 'canids' is also one. The MNI for dogs in Phase II is 23, and for canids is five (combined MNI = 28). It is possible that both MNI and NISP counts for dogs have been inflated in Phase II due to the large number of neonates identified during post-excavation analysis; in most cases these elements could not be confidently classified as being from the same specimen, therefore were recorded individually. However, it is likely that many neonatal dog and canid elements came from the same individual as they were found in the same sealed archaeological context.

In Phase I dog remains were chiefly recovered from SFBs, with two elements derived from post holes and one from a wall trench of one of the large timber structures. There was no discernible preferential treatment of dog carcasses in the Phase I settlement. Dog ABGs were one of the most common types of ABG recorded in Phase II: the 18 dogs were recovered from eight contexts, seven of which contained neonatal puppies, likely representing unwanted litters, dispatched and deposited among the other settlement refuse in large pits in the domestic area of the site. Therefore, despite there being a high number of dog ABGs it does not appear at face value that these puppies were treated in a 'special' way. Only one of the dog ABGs was fully fused, and in fact had lived well into old age evidenced by significant pathologies throughout the skeleton (see 'Dog Pathology' below). It is interesting that excavators noted that this pit seemed to have been dug for the sole purpose of disposal of these two carcasses, and the dog was placed below the cattle skeleton (Table 5.6 and Figure 5.28). This pit cut an internal boundary ditch which potentially marked the division between an inner sacral zone and outlying domestic occupation of the monastery (Thomas *pers. comm.*).

Figure 5.28: Dog ABG excavated in the Phase II Christian settlement, context (1667), deposited below a cattle carcass in a pit cutting ditch [1673] and [1560]. Photo credit: Lyminge Archaeological Project.

Canid body part representation

The Phase I dataset for element representation in dogs and canids is considerably smaller in Phase I than in Phase II (Figure 5.29 and Table 5.42). Due to the small size of the data sets to create meaningful element representation graphs the canid sp. and dog datasets were combined, however, the data remain limited and few conclusions can be drawn from these data.

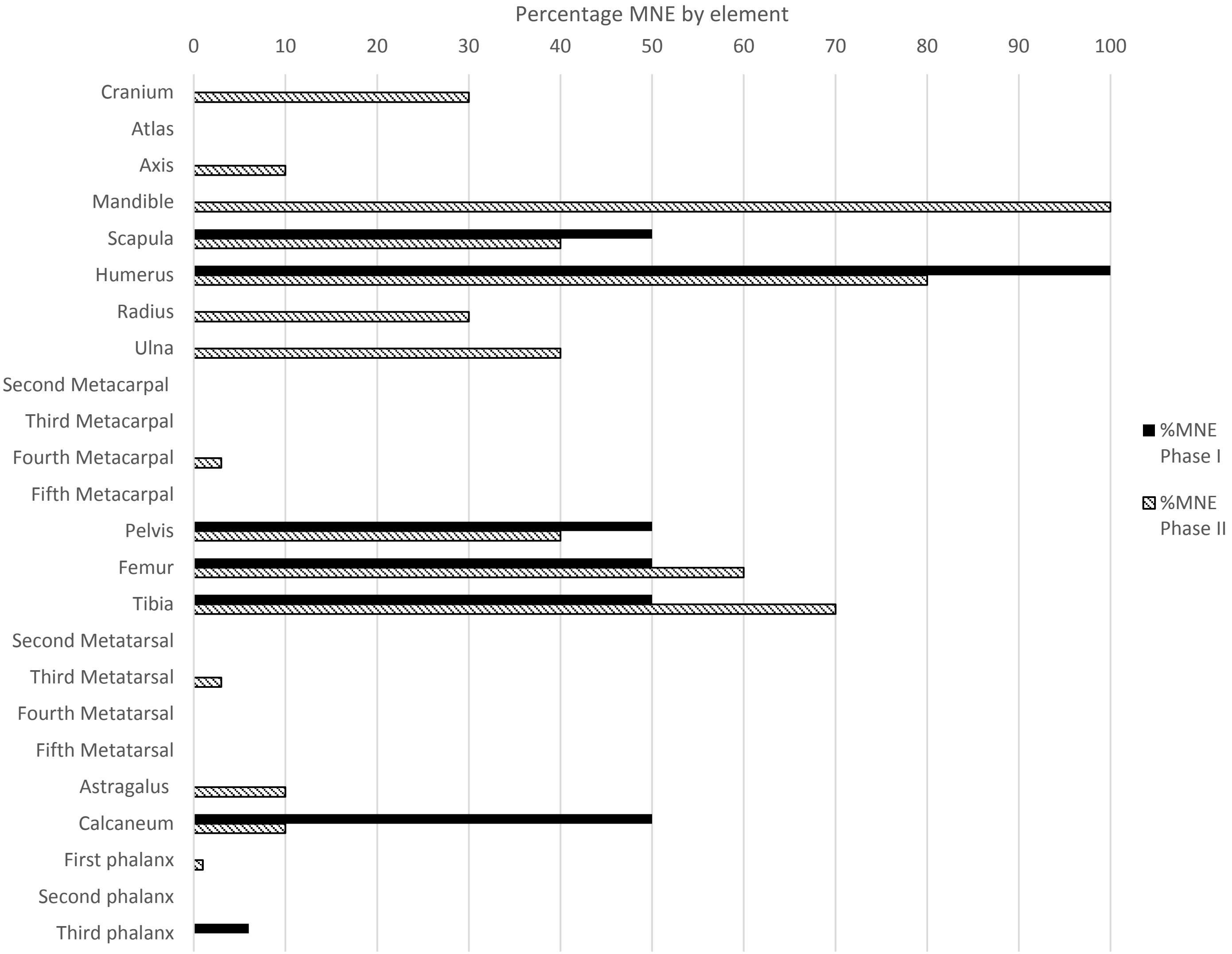


Figure 5.29: Canid sp. (dog and canid sp. data sets combined) element representation in Phase I and II by percentage MNI. Phase I MNI = 2, Phase II MNI = 10 (or 28 including ABGs).

Element	Phase I (5th-7thC) Dog			Phase II (8th-9thC) Dog			Phase I (5th-7thC) Canid sp.			Phase II (8th-9thC) Canid sp.		
	NISP	**MNE**	**%MNE**	**NISP**	**MNE**	**%MNE**	**NISP**	**MNE**	**%MNE**	**NISP**	**MNI**	**%MNE**
Cranium				1	1	20				2	2	40
Atlas												
Axis				1	1	20						
Mandible				8	3	60				5	3	60
Scapula	1	1	100							6	4	80
Humerus	1	1	100	10	5	100	1	1	20	5	3	60
Radius				2	1	20				4	2	40
Ulna				2						5	3	60
Second Metacarpal												
Third Metacarpal												
Fourth Metacarpal										0.25	0.25	5
Fifth Metacarpal												
Pelvis				1	1	20	1	1	20	4	3	60
Femur				4	3	60	1	1	20	7	5	100
Tibia				4	2	40	2	1	20	7	5	100
Second Metatarsal												
Third Metatarsal										0.5	0.5	10
Fourth Metatarsal												
Fifth Metatarsal												
Astragalus				1	1	20						
Calcaneum							1	1	20	1	1	20
First phalanx										0.1	0.1	2.5
Second phalanx												
Third phalanx							0.3	0.1				
Total	**2**			**32**	**18**		**6.3**	**5.1**	**100**	**44.9**		

Table 5.42: Dog and Canid Sp. element NISP, MNE and percentage MNE. Dog Phase I MNI = 1, Phase II MNI = 5. Canid Phase I MNI = 1, Phase II MNI = 5. Data presented graphically in Figure 5.29.

Canid taphonomy - Butchery, gnawing and burning

There was no sign of burning on canid or dog elements in either phase. Dog gnawing was noted on one dog humerus in Phase II. Evidence of butchery was recorded on a single tibia in Phase II – cut marks on the proximal indicative of disjointing.

Dog ageing and sexing

Epiphyseal fusion data was limited in both phases; however, it does show a clear shift over time – with only 9% of the sample being fused over the age of one and a half years in Phase II, compared with Phase I where all specimens were fused (Table 5.43). However, the Phase II data should be scrutinised, accounting for the heavy bias created by the large number of neonates. There was one specimen who lived well beyond one and a half years and from the pathological evidence, who clearly had a tough life.

There was only one case where the individual could be sexed; the ABG (1667) was male, as evidenced by the presence of the baculum.

Dog metrics

There were no measurable specimens in the Phase I assemblage. Only the dog ABG (1667) in Phase II had long bones complete enough to enable GL measurements.

	Phase I (5th-7thC)			Phase II (8th-9thC)		
Canid sp.	**F**	**UF**	**%F**	**F**	**UF**	**%F**
Pelvis	1				5	
Scapula	1				6	
Proximal First Phalanx	3			1		
Proximal Second Phalanx						
6–7 months	**5**	**0**	**100%**	**1**	**11**	**9%**
Distal Metacarpal						
Distal Humerus	1				13	
8–9 months	**1**	**0**	**100%**	**0**	**13**	**0%**
Distal Metatarsal						
Proximal Ulna						
9–10 months	**0**	**0**		**0**	**0**	
Distal Ulna					7	
Radius					7	
11–12 months	**0**	**0**		**0**	**14**	**0%**
Distal Tibia	1				11	
13–16 months	**1**	**0**	**100%**	**0**	**11**	**0%**
Proximal Humerus	1					
15 months	**1**	**0**	**100%**	**0**	**0**	**0%**
Fibula						
15–18 months	0	0		0	0	
Proximal Tibia	1					
Femur	1			1	11	
1.5 years	**2**	**0**	**100%**	**1**	**11**	**9%**

Table 5.43: Canid sp. epiphyseal fusion in both phases (dog and canid sp. datasets combined). Table shows NISP of fused and unfused elements in addition to the relative percentage of fused elements. Fusion times after Silver 1969.

Dog pathology

There was only one case of pathology in the Phase I assemblage, a caudal vertebra with exostosis, which may be a result of trauma or a fact of old age (Bartosiewicz 2013:128). In Phase II there were two cases of individuals with pathological lesions. One was an isolated specimen, a dog humerus with eburnation (arthritic grooving in the form of parallel striations) on the distal articular surface, a pathology associated with old age, lameness, or a result of excessive tension on the element (Baker and Brothwell 1980:115; Bartosiewicz 2013:108-9).

Pathology was recorded throughout the skeleton of the dog ABG excavated from (1667), suggesting this dog suffered sustained ill health over its life following significant trauma. Trauma or mild periodontis on the left maxilla had resulted in the loss of the upper left first molar during the dog's life. Complete alveolar resorption had occurred in place of the maxilla first molar and heavy wear on the right maxillary teeth, including severe wear on the right canine, suggests that the dog suffered discomfort enough on the left side of his jaw to avoid masticating on this side of the mouth (Figure 5.30). The left mandible also had evidence of periodontal disease, and the right mandibular teeth were more heavily worn than the left, indicating that food was masticated on the right side of the mouth.

The most significant pathology was on the right femur; this element had suffered a severe acute fracture which had healed leaving a massive callus and osteophytic growth resulting in deformity of the bone, severe periostitis and a possible hematoma below the point at which the bone fractured (Figure 5.30 and Figure 5.31). The left third metacarpal and right fifth metacarpal also had healed fractures with severe periostitis. Various post-cranial elements had evidence for mild–severe periostitis, likely a result of infection following various traumas, including; the left humerus and tibia, right ulna, right third metacarpal and both sides of the pelvis.

The 11th-13th thoracic vertebrae had osteophytic bone growth on the spinous process and may be related in part to the shortening of the femur following injury, or trauma to the spine. This vertebral deformation has been noted in other dogs with femoral trauma such as the six-eight-year-old adult Roman period Sarmation dog from Polgár-site 40, along the M3 motorway, Hungary (Bartoziewicz 2013:54).

Figure 5.30: Skull of dog (1667) showing complete alveolar resorption in place of the left maxilla first molar and heavy wear on the right maxillary teeth, including severe wear on the right canine.

Figure 5.31: From left image to right: Cranial, caudal, medial and lateral view of right femur of dog (1667) showing healed fracture, subsequent deformation following healing and possible haematoma.

5.5.3 Cat

Cat relative frequency

Cats make up 0.33% (NISP 8) of the total assemblage in Phase I and 1.25% (NISP 55) of the total assemblage in Phase II, outnumbering dogs and horses in both phases (Table 5.7). The cat MNI in Phase I was two, and in Phase II was eight.

aDNA analysis of a small sample of the Lyminge cats from Phase I and II showed that all specimens were *Felis lybica,* the progenitor of the modern domestic cat, and were therefore domestic (Hirons 2017:20-29; Ottoni *et al.* 2017). While cats were likely tame in the Iron Age period, the earliest discovery of *Felis lybica,* is from Caistor Roman Town, Norfolk, *c.* AD 300-599 (Hirons 2017:34), suggesting that the domestic cat was introduced to Britain by the Romans (Hirons 2017:35; Kitchener and O'Connor 2010:91) and was becoming well established by the early Saxon period. *Felis lybica* has also been identified in the cat assemblage from late Anglo-Saxon Flaxengate, Lincoln (Hirons 2017:28-31).

Cat body part representation

Table 5.44 and Figure 5.32 show the anatomical representation for the Lyminge cats in Phase I and Phase II. While it is evident that cats were present on site in Phase I the pattern of element representation is very different to that recovered in Phase II.[3]

Figure 5.32 shows the body part representation graphically for cats for Phase I and II, however, the Phase I dataset was very limited. In Phase II all parts of the skeleton are represented, although no second metacarpals were recorded and a low number of phalanges, axis and astragalus recovered.

---

[3] The Phase II cat ABGs have been included in the body part quantification, although it is important to note that in the total assemblage NISP each individual cat ABG was counted once to avoid over representation.

Element	Phase I (5th-7thC) Cat			Phase II Cat (8th-9thC) (inc. ABGs)		
	NISP	MNE	%MNE	NISP	MNE	%MNE
Cranium				6	6	75
Atlas				6	6	75
Axis				3	3	37.5
Mandible	3	**2**	100	9	7	87.5
Scapula	2	1	50	8	4	50
Humerus				15	**8**	100
Radius				13	7	87.5
Ulna				12	6	75
Second Metacarpal				0	0	0
Third Metacarpal				4	3	37.5
Fourth Metacarpal	1	1	50	10	6	75
Fifth Metacarpal				5	3	37.5
Pelvis				7	4	50
Femur	1	1	50	12	7	87.5
Tibia				14	**8**	100
Second Metatarsal				8	4	50
Third Metatarsal				10	5	62.5
Fourth Metatarsal				9	6	75
Fifth Metatarsal				3	2	25
Astragalus				1	1	12.5
Calcaneum				6	4	50
First phalanx				0.4	0.4	5
Second phalanx				0.3	0.3	3.1
Third phalanx				0.2	0.2	2.5
Total	**7**			**161.85**		

Table 5.44: Cat element NISP, MNE and percentage MNE. Cat ABG's have been included in element counts for Phase II. Cat Phase I MNI = 2, Cat Phase II MNI = 8.

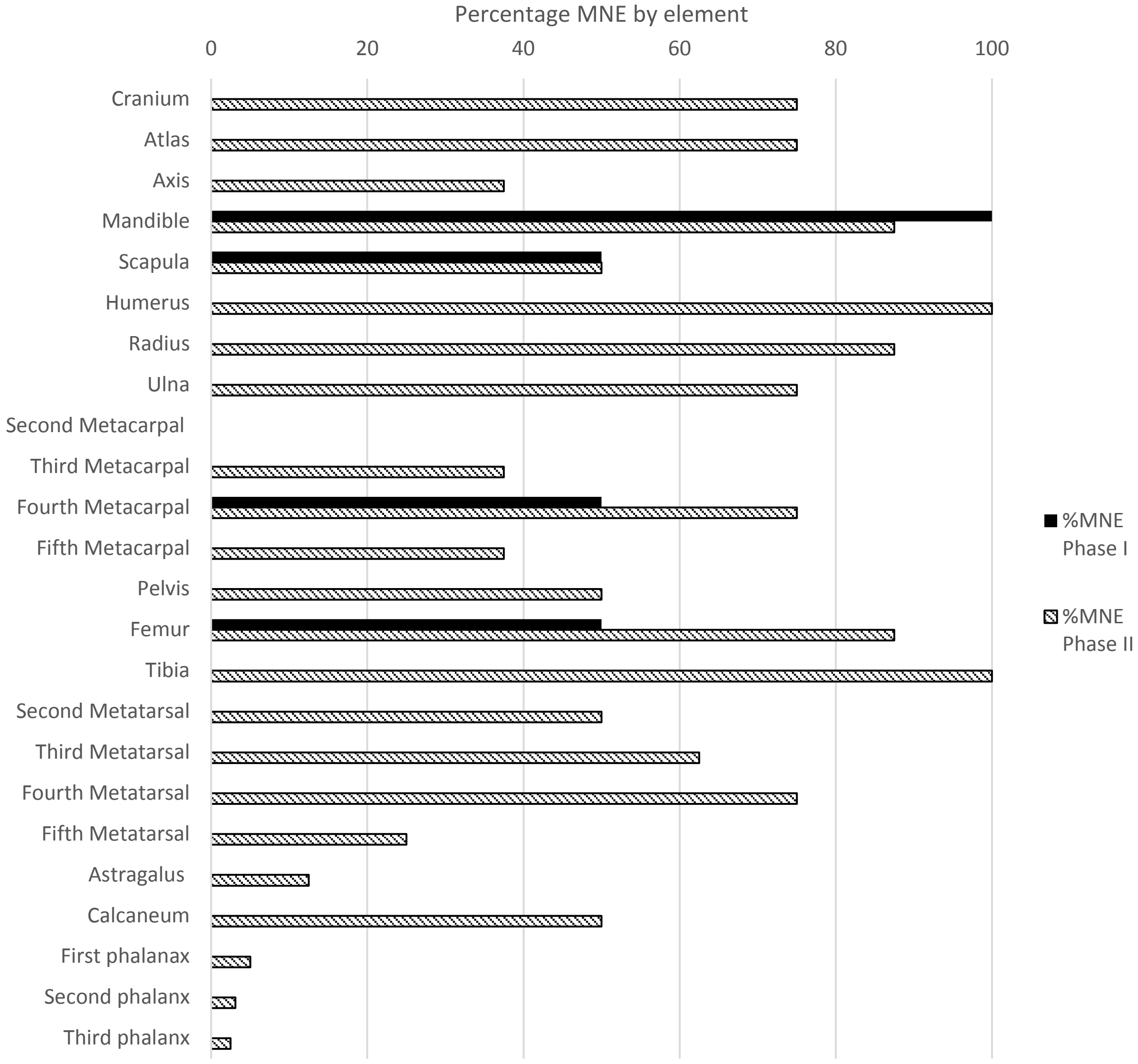


Figure 5.32: Cat element representation in Phase I and Phase II by percentage MNE (Phase I MNI =2, Phase II MNI = 8). Data presented in Table 5.43.

Cat taphonomy

No gnawing was recorded on cat elements from either phase. There was one case of a lower incisor burnt black in Phase I and a mandible burnt black in Phase II.

Cat butchery

Butchery was only recorded on one element, on the distal trochlea of a cat femur in Phase I. No butchery was recorded for cats in Phase II.

Butchery of cat remains in the Anglo-Saxon period is rare but nevertheless provides an important insight into human-cat relationships. For example, of the 274 cat bones recovered from early Saxon West Stow, two mandibles had cut marks, one pelvis had skinning marks and one atlas had a cut indicative of throat cutting (Crabtree 1989; Poole 2015: 867). In Poole's (2015) study of cat remains on Anglo-Saxon sites the only butchered cat remains recorded on middle Saxon sites were from the high-status phase at Eynsham (2b), Oxfordshire (Mulville 2003), and the high-status site of Bishopstone, Sussex (Poole 2010b; Poole 2015: 868). Many of these butchery marks have been interpreted as cat skinning, and whilst cat skinning was not occurring on an industrial scale in Anglo-Saxon England this may have been the work of furriers (Poole 2015:869) and may have also occurred in Phase I Lyminge. It was not until the Medieval period in Britain and Ireland that cat skins became commercially important enough for cats to be skinned on a mass-scale (McCormick 1988; Kitchener and O'Connor 2010:93).

Cat ageing

There was minimal ageing data from Phase I, the epiphyseal fusion data shows that all recovered elements were fused (Table 5.45). Phase II epiphyseal fusion data shows that whilst most cats were adult some *c.*25% (NISP 17) of cats were under eight and a half months indicating that kittens were present on site.

In Phase I two mandibles with the permanent first and second molar were recorded; both molars were erupted with no signs of wear. There were more mandible data recorded in Phase II, most cats had permanent adult teeth with no wear or only slight wear (Table 5.46).

	Phase I (5th-7thC)			**Phase II (8th-9thC)**		
Cat	**F**	**UF**	**%F**	**F**	**UF**	**%F**
Scapula	2			2		
Distal Humerus				4	2	
Proximal Radius				4		
Pelvis				1		
Femur	1			2	2	
8.5 months	**3**	0	100%	**13**	**4**	76%
Proximal Ulna				3	1	
Proximal First Phalanx						
Proximal Second Phalanx						
10 months	0	0		**3**	**1**	75%
Proximal Humerus				3	2	
Distal Radius				3		
Distal Ulna				2		
Distal Metacarpal	1			3		
Distal Metatarsal				2		
Tibia				6		
11.5 months	**1**	0	100%	**19**	**2**	90%

Table 5.45: Cat Epiphyseal fusion in both phases – table shows NISP of fused and unfused elements in addition to the relative percentage of fused elements.

Phase II Cat Mandible Tooth Wear					
Context	**Context type**	**Phase**	**Element**	**Side**	**Notes**
100	Pit	Phase II	Mandible	R	Permanent adult M3 present with slight wear
197	Pit	Phase II	Mandible	R&L	Only left mandible had in-situ teeth: M1, M2 and M2 present, permanent adult teeth, no wear
230	Pit	Phase II	Mandible	L	Canine, M1, M2 and M3 present, permanent adult teeth, no wear on teeth
580	Pit	Phase II	Mandible	R&L	Canine, M1, M2 and M3 present, permanent adult teeth, slight wear on teeth
647	Pit	Phase II	Mandible	L	Canine, M1, M2 and M3 present, permanent adult teeth, slight wear on teeth
1333	Pit	Phase II	Mandible	R&L	3 incisors, canine, M1, M2 and M3 present on both left and right mandible., 3 permanent molars erupting, almost at full height, no wear
1571	Pit	Phase II	Mandible	R&L	M1, M2 and M3 present, permanent adult teeth, M1 and M2 erupting, not yet at full height, M3 visible in crypt but below head of bone
1600	Cesspit	Phase II	Mandible	R&L	Canine, M1, M2 and M3 present, permanent adult teeth, no wear on teeth

Table 5.46: Phase II NISP Cat mandibular tooth wear. There was no cat dental wear recorded from the Phase I assemblage.

Cat pathology

There was only one case of pathology recorded in Phase I, a fourth metacarpal with exostosis on the proximal part of the shaft suggesting that there may have been additional weight applied on this side of the body causing tension on this limb. This may have been a result of trauma on another limb that was not recovered in the archaeological record, alternatively, it may have been a particularly old individual with arthritic joints.

In Phase II one of the cat ABGs (580) (Table 5.6) had some interesting pathologies. The right humerus revealed a healed break, which had resulted in the shortening of the bone (Figure 5.33). The right third metacarpal also had a healed break, and the bone was misshapen as a result. The right pelvis had periostitis, possibly due to infection caused by the damaged right front limb. It can be postulated that both the humerus and metacarpal were broken at the same time due to a single trauma, and it is likely that this cat walked with a limp due to its injuries. What is clear is that this adult cat had been cared for back to health following these significant traumas.

Figure 5.33: Right humerus of cat ABG (580) with healed break resulting in the shortening of the bone, compared with the left humerus which was not broken (on the right).

Cat ABGs

There were seven cat ABGs recovered from Phase II, all of which were recovered from pits and five of which were relatively complete skeletons indicating that the whole animal had been deposited intact (Table 5.6). The significance of these ABGs will be discussed further in Chapter 7.

5.6 Wild mammals

5.6.1 Red Deer

Red deer relative frequency and body part representation

Of the countable elements, red deer made up 0.12% of the total assemblage in Phase I; an MNI of one (Table 5.7). There were no countable red deer elements recovered in Phase II. Although antler was not considered ‘countable’ in the recording methodology it was still recorded where present to provide an indication of hunting, craft and trading practices.

Countable elements recorded in Phase I included two metatarsals, a mandible tooth row and a loose mandibular fourth pre-molar. Non-countable elements included; nine fragments of antler, one loose mandible second premolar and four loose maxilla teeth. None of the antler was attached to the skull, suggesting that this may have been a traded or a collected commodity.

In Phase II two fragments of antler and three loose maxilla teeth were recorded. It is of note that one of the antler fragments was still attached to the skull suggesting that the carcass, or at the very least the head, had been brought to the site rather than just the antler being collected and/or traded.

Red deer taphonomy – burning and gnawing

There was no evidence of burnt or gnawed red deer elements in either phase.

Red deer butchery

Evidence of butchery was noted on most of the red deer antler fragments in Phase I and II (Table 5.47). There were a variety of cut, chop and saw marks on the antler, although the majority had been sawn, providing evidence that antler working took place on site by skilled individuals. The antler recovered in these assemblages represents rougher offcuts, likely associated with the early stages of craft production processes or a craft in progress that was never completed.

Red deer ageing and sexing

In Phase I the two metatarsals were fused on the distal end.

Red deer pathology and non-metric traits

There was no evidence for pathology noted in the red deer. However, there was one interesting non-metric trait noted in Phase I, a red deer metatarsal that been employed as a tool for an activity that involved a repetitive motion, as suggested by wear on the condyles typical of grinding and a slight shine on the shaft of the bone from where it had been held on several occasions. The bone itself had not been modified for purpose but had been used in its natural form, explaining its incorporation in the zooarchaeological assemblage.

Phase	Context	Period	Context type	Preservation	Qty	Taxa	Element	Side	Butchery	Notes
Phase I	3257	5th-7thC	Post packing	Good	1	Red deer	Antler	-	Sawn	Fragment, sawn both ends
Phase I	3726	5th-7thC	SFB5	Good	1	Red deer	Antler	-	Sawn, Cut, Chop	Sawn off surface of antler (shaved), chopped/sawn off section and four cuts
Phase I	3755	5th-7thC	SFB5	Good	1	Red deer	Antler	Left	Sawn, Cut, Chop	Main shaft of antler - sawn both ends of fragment with cuts and chop marks next to sawn section
Phase I	3776	5th-7thC	SFB5	Good	1	Red deer	Antler	Right	Sawn	Sawn both top and bottom of fragment
Phase I	7371	5th-7thC	Building post hole	Good	1	Red deer	Antler	-	Sawn, Cut	Antler tine, sawn and cut
Phase II	1862	8th-9thC	Post hole	Excellent	1	Red deer	Antler	Left	Sawn, Chop	Antler chopped off skull
Phase II	258	8th-9thC	Post hole	Excellent	1	Red deer	Antler	-	Sawn	Worked antler tine

Table 5.47: Red deer butchery – all butchered elements in both phases with notes describing the type of butchery and location on the element.

5.6.2 Roe Deer

Roe deer relative frequency and body part representation

Roe deer frequencies see an increase over time, from seven countable fragments in Phase I (0.28% of the total assemblage) to 30 countable fragments in Phase II (0.67% of total assemblage). The MNI in Phase I was one and in Phase II was 14, revealing that both NISP and MNI counts were relatively similar in portraying the number of roe present, and their increase over time.

There were four non-countable elements in Phase I, three of which were antler fragments. In the Phase II assemblage nine antler fragments were documented, in addition to 11 dental records, three of which were maxilla tooth rows.

Due to small sample size it was not possible to discern a preference for particular skeletal elements as is seen at sites of a later date (Sykes 2007a; Sykes 2007b). However, it is interesting to note the minimal range of elements present in both phases. All recorded roe elements were limited to antler, maxilla, mandibles, scapula and metapodia (Table 5.48). The high number of mandibles in Phase II is unusual. While mandible are the most diagnostic skeletal element, aside from metapodia, the fact that that there are so few metapodia and a complete absence of other elements with high structural density (such as humerus, radius and tibia) suggests that this pattern is genuine, and not a result of recovery or recording bias (Sykes 2010:180).

Compared with Phase I, there were a relatively high number of mandibles present in Phase II, a trait noted at contemporary elite middle Saxon sites (Sykes 2010:179). Furthermore, in Phase II two of the antler had been chopped/cut from the skull and one antler was still attached to the skull and there were a number of loose and in-situ maxilla teeth recorded suggesting that in some cases the entire roe deer head was brought to the site (Table 5.48).

Element	Phase I (5th-7thC) Roe deer		Phase II (8th-Roe deer	
	NISP	MNE	NISP	MNE
Antler	3		9	
Cranium				
Atlas				
Axis				
Mandible	1	1	27	14
Scapula	1	1	1	1
Humerus				
Radius				
Ulna				
Metacarpal	1	1		
Pelvis				
Femur				
Tibia				
Metatarsal			1	1
Astragalus				
Calcaneum				
First phalanx				
Second phalanx				
Third phalanx				

Table 5.48: Roe deer element NISP and MNE counts from each phase. Roe deer Phase I MNI = 1, Phase II MNI = 14.

Roe deer taphonomy – burning and gnawing

There was no evidence for burning or gnawing of roe deer elements in Phase I. In Phase II there was one burnt metatarsal and one unidentified element with evidence for dog gnawing.

Roe deer butchery

There were three instances of butchery in Phase I, all of which were noted on antler fragments. One antler had cut marks with evidence that the surface had been smoothed, possibly during the creation of an artefact. Two of the antlers had been sawn, suggesting their use as tools and the presence of skilled craftspeople on site. One of the sawn antler tines had been polished signifying its use as a tool, despite its unfinished state (Table 5.49).

Butchery was recorded on two pieces of antler from Phase II. One antler had been sawn along its surface and had been chopped from the skull. The other antler had cut marks around the distal suggesting its removal from the skull and potential removal of the velvet (Albarella 2003:74).

Roe deer ageing and Sexing

Metapodials and scapula were fused in both phases. The mandible tooth row (first and second molar present) from Phase I had light–medium wear. Most of the 28 mandibles recorded in Phase II showed a range of wear from light–medium wear. There were no instances of severe or irregular wear in either phase.

Roe deer pathology

No pathologies were recorded.

Phase	Context	Period	Context type	Preservation	Qty	Taxa	Element	Side	Butchery	Notes
Phase I	3560	5th-7thC	Wall trench	Good	1	Roe deer	Antler	-	Cut	Surface had been smoothed, cut marks present
Phase I	6687	5th-7thC	Wall trench	Good	1	Roe deer	Antler	Right	Sawn	-
Phase I	6789	5th-7thC	Pit	Good	1	Roe deer	Antler	-	Sawn	Sawn Distal, high shine on one of the tines, as if polished/used as tool
Phase II	145	8th-9thC	Pit	Excellent	1	Roe deer	Antler	Right	Sawn and Chop	Sawn on antler surface and chopped off skull at distal
Phase II	1007	8th-9thC	Pit	Excellent	1	Roe deer	Antler	-	Cut	Cuts at base of antler, suggests removal from skull and removal of velvet

Table 5.49: Roe deer butchery – all butchered elements in both phases describing the type of butchery and location on each element.

5.6.3 'The Others': Foxes, badgers, pine martin/pole cat, hare

The total assemblage relative percentage of wild mammals, including deer (above), in Phase I was 0.49% (NISP 10) and in Phase II 0.69% (NISP 31).

Fox

Fox remains were only recovered in the Phase I assemblage. Three fragments of fox were recorded; two atlases and one ulna. The ulna was fused on the proximal end. All were in excellent condition, recovered from SFBs. There was no gnawing, burning or butchery noted on fox remains. There is a possibility that some of the canid remains (discussed above) may have also have been fox remains, although the number was probably small.

No fox remains were recorded in the Phase II assemblage.

Badger

There was only one fragment of badger recorded in Phase I; a right humerus, fused on the distal end, excavated from SFB 5. There was no evidence of gnawing, burning, or butchery.

Pine Marten/Pole Cat

A single radius identified as pine martin/pole cat was found in SFB 5, Phase I; fused on the distal end. It was not possible to identify this specimen to specific species.

Hare

Two fragments of hare were unearthed; a fused right scapula from a wall trench in Phase I and an unfused left pelvis in Phase II, excavated from a pit.

5.7 Birds

Birds represent 19.6% (NISP 2407) of the total assemblage, 86.7% (NISP 2315) of which were domestic fowl.

5.7.1 Domestic fowl

Chicken data reported here includes a synthesis of that recorded by the Author and by Dr Tyr Fothergill, with assistance by Alison Foster, as part of the AHRC Cultural and Scientific Perception of Human Chicken Interactions Project - AH/L006979/1.

Chicken relative frequencies

Chicken represents the dominant domestic species of bird in both phases, contributing to 87% (NISP 2277) of the bird assemblage. Owing to the similarities in skeletal make up a proportion of specimens were recorded as chicken/pheasant (Table 5.7), however, these birds can be accepted as chicken based on the general rarity of pheasants in the Anglo-Saxon period (Yalden and Albarella 2009:101; Holmes 2014a:42). No pheasant was confidently identified during this analysis (Foster *pers. comm.*). For this reason, and the purpose of this research, elements classified as 'chicken' and 'chicken/pheasant' have been analysed together simply as 'chicken'.

Chicken comprises 17.02% (NISP 417) of the Phase I assemblage (MNI 36), and 41% (NISP 1860) of the total Phase II assemblage (MNI 160), doubling in number over time in addition to outnumbering caprine and cattle MNI in Phase I and caprine, cattle and pig MNI in Phase II. In Phase II chicken significantly outnumber all other species, domestic and wild, in both NISP and MNI counts, which is highly significant given that chicken typically comprise only 10–20% of other contemporary assemblages (Holmes 2014a:43).

Chicken were the second most common ABG species recovered, after dog, with one chicken ABG recovered in Phase I and 17 chicken ABGs identified in Phase II (Table 5.6).

Body part representation

Presence of all parts of the skeleton indicate that chickens were brought to site whole/alive or raised on site. Meat bearing elements are well represented in both phases (Figure 5.34 and Table 5.52). Compared with the Phase II chicken dataset, Phase I has fewer radii but a higher number of femurs. Tarsometatarsi are the most common element in both phases, possibly because they are one of the most dense long bones and therefore have a higher preservation rate (Lyman 1994). Pelvis and cranium are the least common elements, although it should be noted that the rapid method of recording may have impacted on the representation of these two elements, particularly for Phase II. However, it is also possible that these chicken remains represent unwanted parts of the chicken from preparation of the carcass in the kitchen (i.e. removal of the head and pelvis) and that primary butchery predominantly took place elsewhere, hence the underrepresentation of the pelvis and cranium.

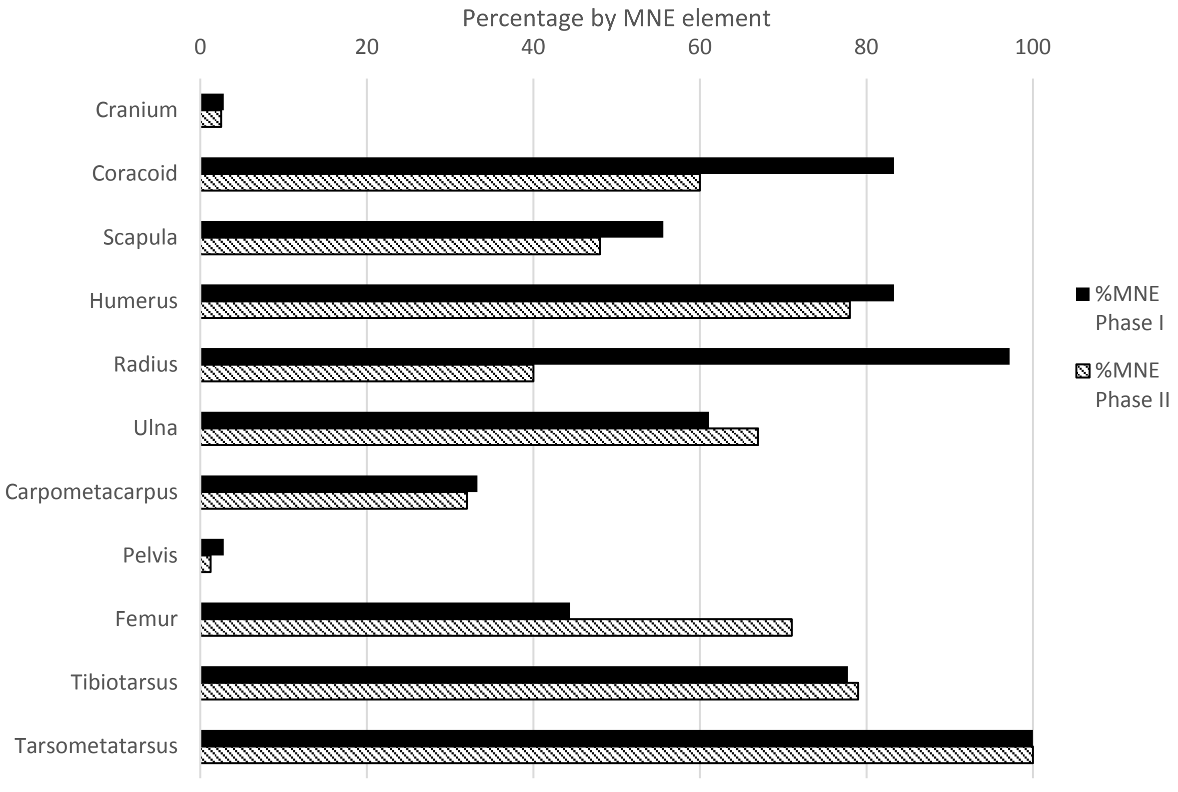


Figure 5.34: Chicken element representation in the Phase I (5th- 7thC) and Phase II (8th-9thC) assemblages by percentage MNI (Phase I MNI = 36, Phase II MNI = 160).

	Phase I (5th-7thC) Chicken			**Phase II (8th-9thC) Chicken**		
Element	**NISP**	**MNE**	**MNE%**	**NISP**	**MNE**	**MNE%**
Cranium	1	1	2.8	5	4	2.5
Coracoid	51	30	83.3	187	96	60
Scapula	34	20	55.6	138	77	48.1
Humerus	52	30	83.3	230	125	78.1
Radius	58	35	97.2	164	64	40
Ulna	47	22	61.1	188	107	66.9
Carpometacarpus	20	12	33.3	99	51	31.9
Pelvis	1	1	2.8	4	2	1.3
Femur	31	16	44.4	233	114	71.3
Tibiotarsus	57	28	77.8	275	127	79.4
Tarsometatarsus	66	**36**	100	333	**160**	100

Table 5.50: Element NISP, MNE and percentage MNE of chicken by phase. Chicken Phase I MNI = 36, Chicken Phase II MNI = 160.

Taphonomy – gnawing and burning

Of the Phase I chickens, 1.2% (NISP 5) were burnt, and in Phase II, 2.02% (NISP 34) of chicken fragments were burnt. Table 5.51 shows the number of burnt elements by the classification of burning. Most elements had been burnt black or were burnt at temperatures high enough to calcine the bone.

Chicken burning				
Burning type	**Phase I**	**%Phase I**	**Phase II**	**%Phase II**
Burnt Black	2	0.5	18	1
Calcined	3	0.7	14	0.8
Singed			2	0.1
Total	**5**		**34**	

Table 5.51: NISP of burnt chicken fragments in Phase I and II. Data expressed as a percentage of total chicken assemblage (Phase I chicken NISP = 417, Phase II = 1860).

Only two fragments of chicken revealed signs of dog gnawing in Phase I, and 18 fragments had been dog gnawed in Phase II.

Butchery

Minimal butchery was recorded on chicken elements in either phase (Table 5.52 and Figure 5.35) although there was in increase in the quantity of butchery marks over time. In Phase I only four fragments showed signs of butchery, all of which were cut marks. The Phase II butchery included chop, cut and saw marks and most butchered elements had been cut (78%), suggesting jointing was the main way of butchering/disarticulating chicken carcasses.

Chicken butchery	Phase I	%Phase I	Phase II	%Phase II
Chopped	0	0	2	11
Cut(s)	4	100	14	78
Sawn	0	0	2	11
Total	**4**		**18**	

Table 5.52: Chicken butchery NISP counts and relative percentage NISP for Phase I and Phase II by butchery type.

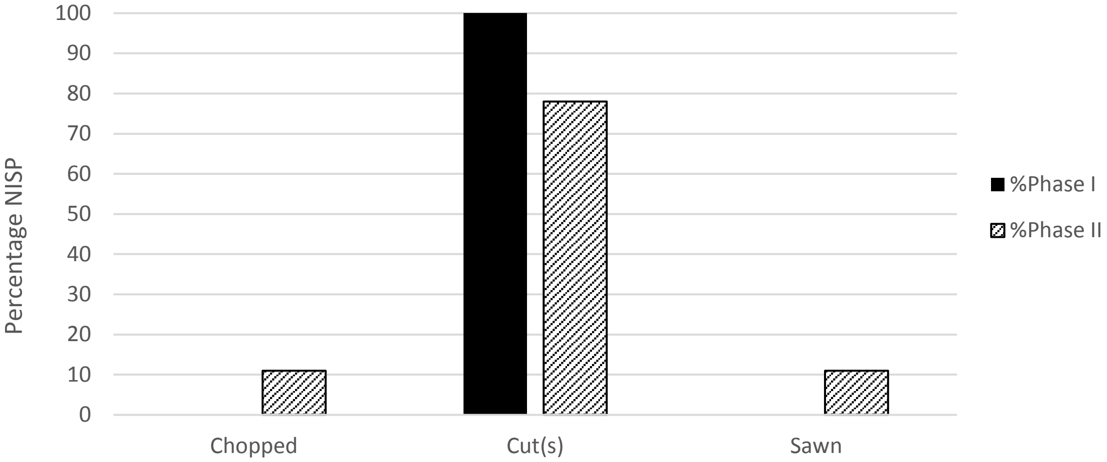


Figure 5.35: Relative percentage NISP of chicken elements by butchery type in both phases. (Raw data in Table 5.52).

When the butchery evidence is considered by element the data emphasises that butchery was primarily a result of disarticulating the chicken carcass into consumable parts, as butchery was found throughout the skeleton, except on wing elements (Figure 5.36).

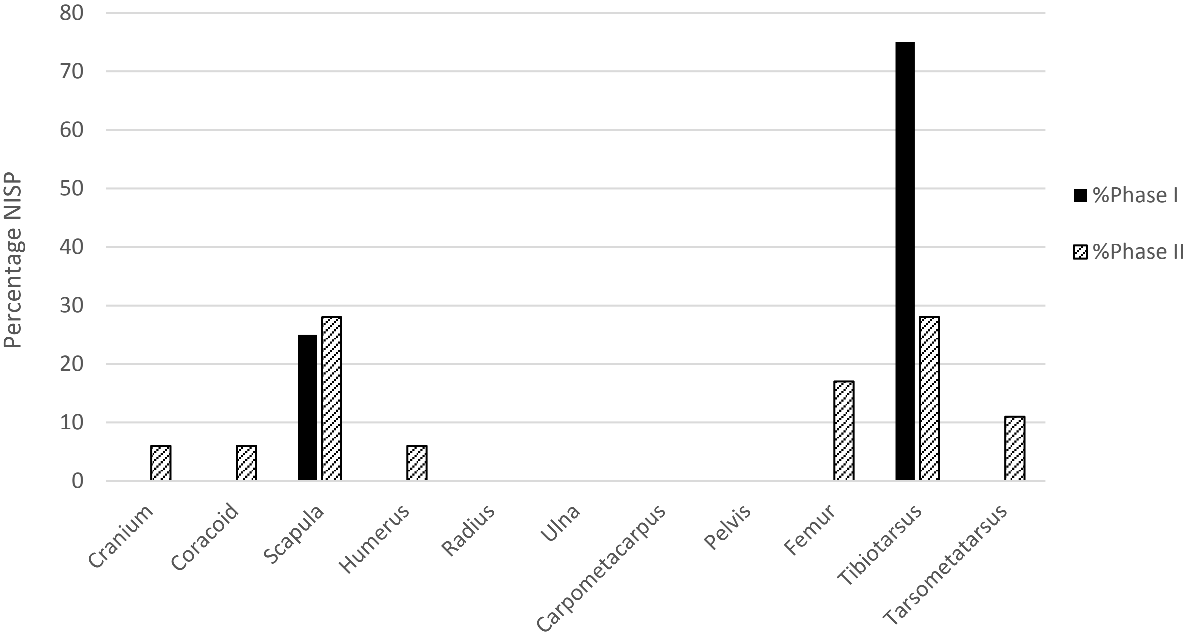


Figure 5.36: Relative percentage NISP of chicken elements with evidence of butchery in both phases. Raw data in Appendix 3, Table 12.

Chicken age

The data presented in Figure 5.37 and Figure 5.38 are based on the chicken epiphyseal fusion data and reveal that over 80% (NISP 192) of chickens were adult. Phase I had a higher percentage of chicks (Figure 5.37), whereas Phase II had a larger number of juvenile chickens (Figure 5.38). The presence of juveniles and chicks suggests that at least a small proportion of the chickens were being raised on, or very close to the settlement in both phases.

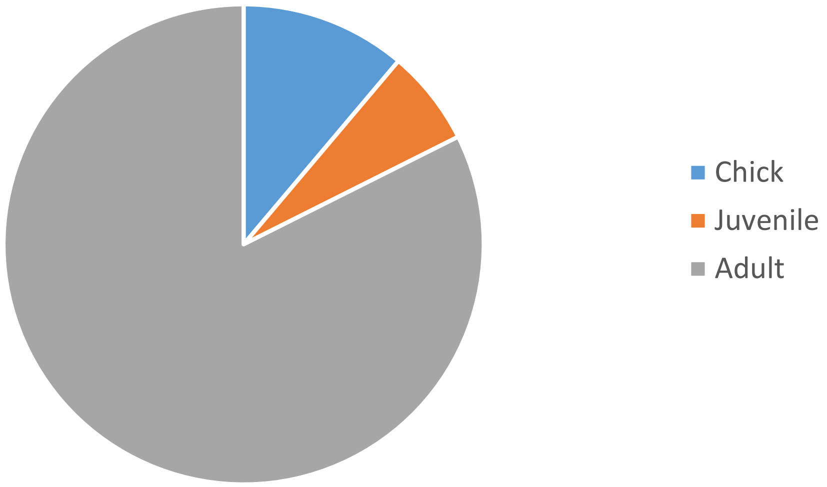


Figure 5.37: Relative percentage of chicken ages in Phase I. Data presented in Table 13 in Appendix 3.

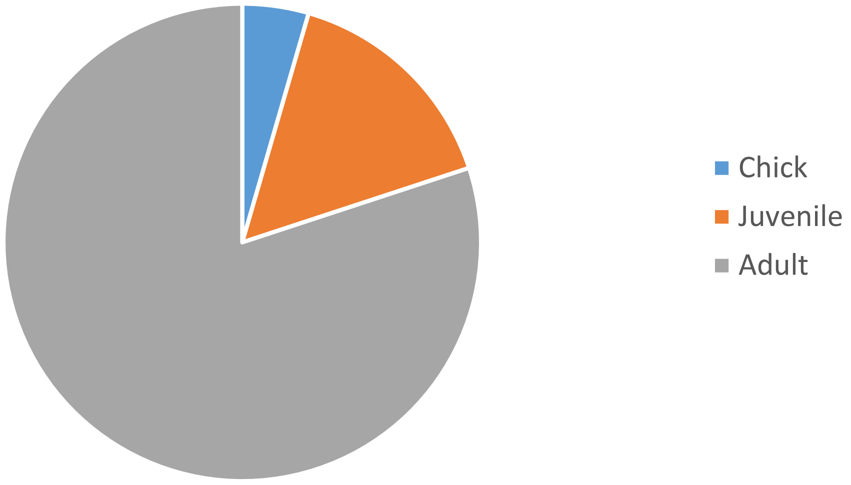


Figure 5.38: Relative percentage of chicken ages in Phase II. Data presented in Table 13 in Appendix 3.

Chicken metrics

Metrical analysis reveals that the Lyminge chickens were predominantly hens, with a few males (Figure 5.39 and Figure 5.40). The male specimens were significantly larger than the females and there is a clear bi-model distribution of the sexes in both phases. The data highlights that the presence or absence of the spur or spur scar on tarsometatarsi is not the most effective way of identifying the sex of birds, as a few chickens with no spurs clearly plotted as males (to the top right-hand side of the graph), indicating the presence of cockerels who had not yet developed spurs (Sadler 1991). Likewise, some of the elements which clearly plot as female (to the bottom left hand side of the graph) had spurs, a phenomenon caused by a decrease in hormones in old hens (Saddler 1991; Serjeantson 2009:276). In the Phase II assemblage there was one recorded case of both a spur and medullary bone present in a tarsometatarsus, further revealing that the presence (or absence) of a spur is not an accurate representation of bird sex.

Although no medullary bone was recorded in Phase I, in Phase II there were 52 records of medullary (2.7% of the total chicken assemblage) in Phase II. Fothergill *et al.* (2017:17) report that Lyminge had a high number of female chickens in lay, with 49% of all complete femora and 36% of complete tibiotarsi, from both phases, containing medullary bone. Furthermore, the medullary fill was in many cases extensive indicating that these birds were actively laying around the time of death (Fothergill *et al.* 2017:17). Of the chicken ABGs in Phase II (Table 5.6), four of were females in lay and at least one other was likely female, based on the absence of a spur and metrical data (Fothergill *et al.* 2017:19). Preliminary genetic analysis also reveals prevalence of females (3:1) (Lebrasseur and Larson *pers. comm.*).

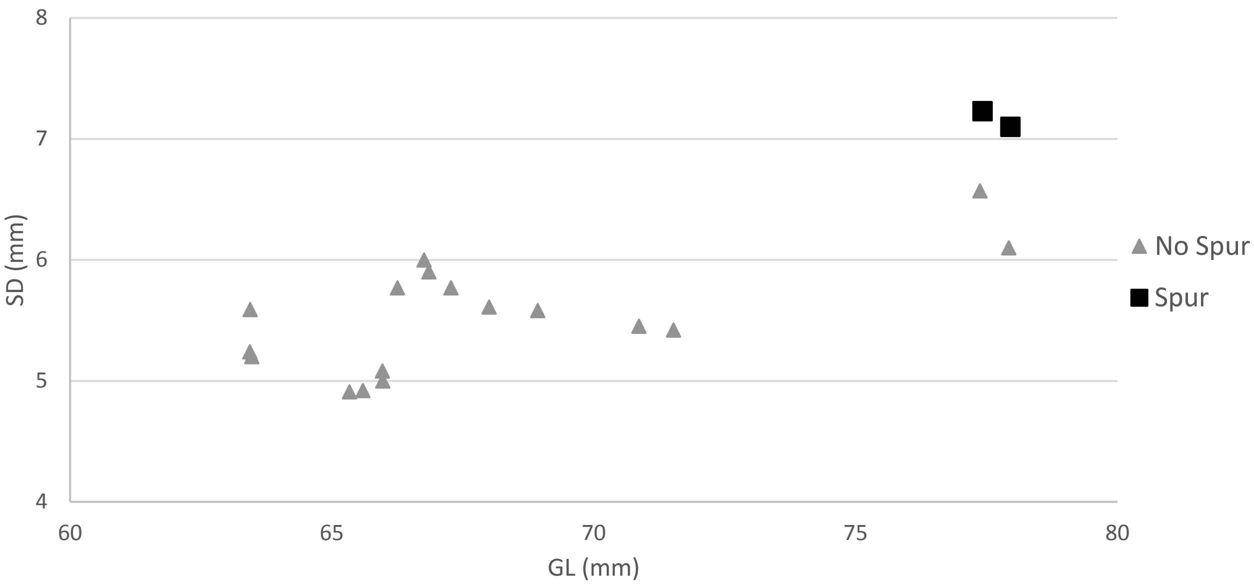


Figure 5.39: Phase I chicken tarsometatarsus metrics comparing GL (greatest length) and SD (shaft diameter) plotting those elements recorded with and without spurs.

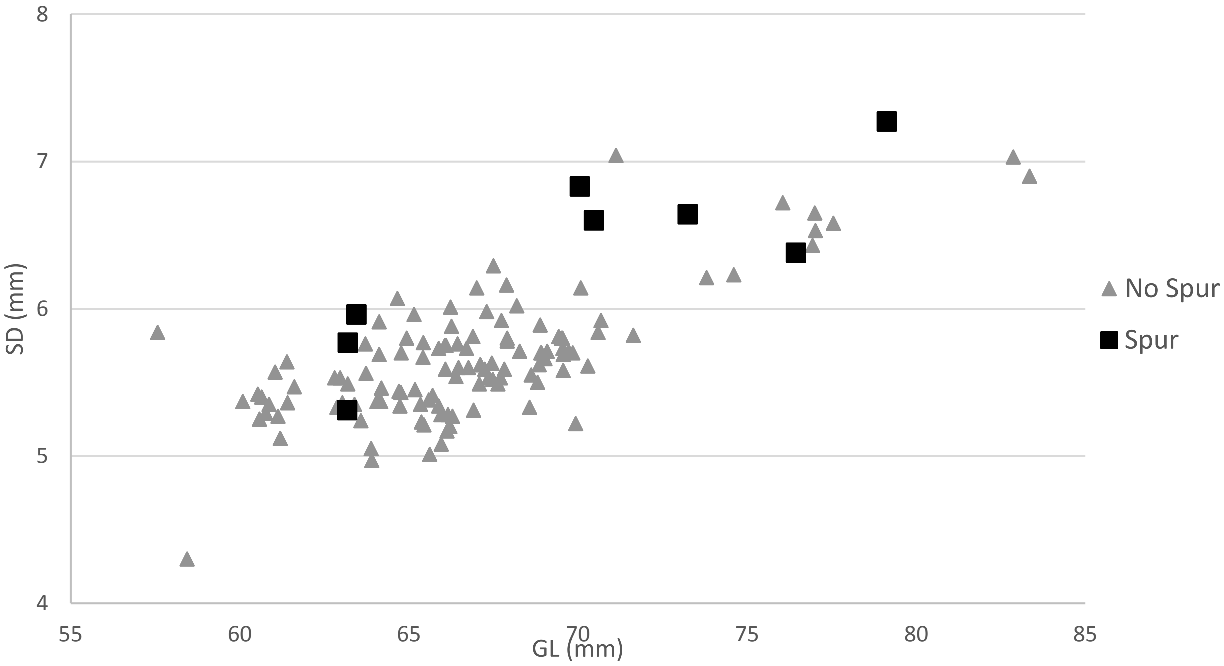


Figure 5.40: Phase II chicken tarsometatarsus metrics comparing GL (greatest length) with SD (shaft diameter, plotting those elements recorded with and without spurs.

Log-scaling was employed to maximise the potential of the Lyminge chicken metrical data and allow direct comparison of measurements taken in the same anatomical planes between phases. This technique involves converting all measurements to base-10 logarithms by relativizing each against a standard (Albarella, 2002; Meadow, 1999; Simpson *et al.* 1960). For chickens, the cross-bred jungle fowl were used as the standard (Table 5.53).The average measurement for the female and male specimens were calculated and divided these by two. A positive value indicates that the archaeological specimens are larger than the wild standards, a negative value indicates that they are smaller, while zero indicates that the standard and archaeological specimens are comparably sized. For clarity of presentation on the x-axis of the figures, the log-scaled values have been multiplied by 100 (Woldekiros *et al. in prep*). The log ratio data show that the assemblage was predominantly female in both phases, with a marked increase in the number of females between the two phases (Figure 5.41). There was no evidence for size increase associated with breed improvement between the two phases.

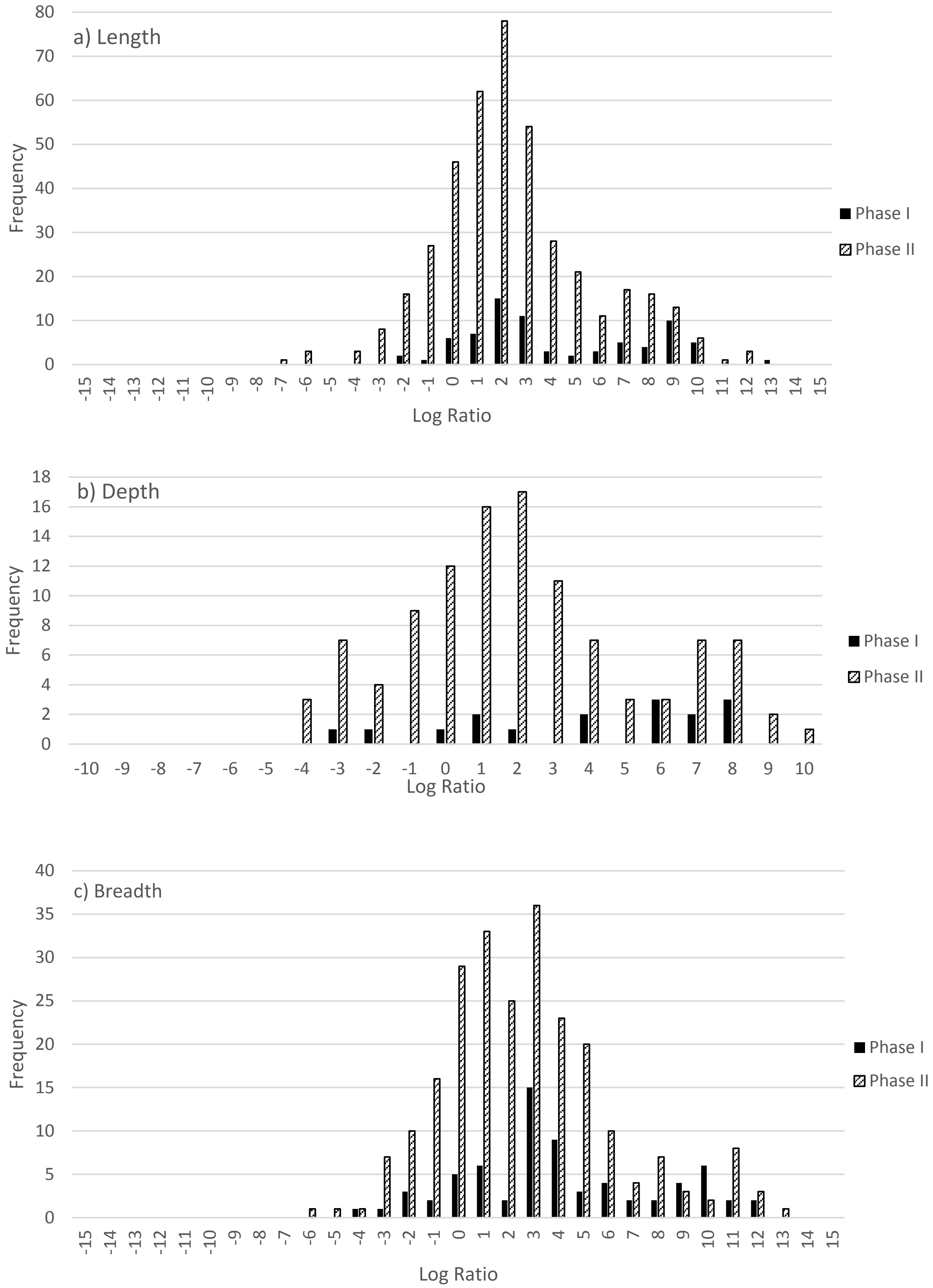


Figure 5.41: Comparison of Phase I and II chicken metrics using log ratios of long bone a) length, b) depth, c) breadth measurements. Standard following Wolderkiros et al. (in prep), see Table 5.52.

Chicken element	Measurement	Standard (mm)
Scapula	GL	64.2
	Dic	10.4
Humerus	GL	62.4
	Bp	16.9
	Bd	12.8
Ulna	GL	61.4
	Dip	11.1
Radius	GL	55.1
	Bd	5.8
Femur	GL	67.5
	Bp	12.2
	Bd	12.8
Coracoid	GL	46.8
Carpometacarpus	GL	33.7
Tibiotarsus	GL	101.9
	Dip	17.0
	Bd	10.5
	Dd	10.7
Tarsometatarsus	GL	63.7
	Bp	11.6
	Bd	11.2

Table 5.53: The standard used for chicken log ratios in the Lyminge assemblage. Chicken standard following Wolderkiros et al. (in prep). Chicken standard based on combined average of male and female cross-bred jungle fowl divided by two. Measurement codes follow von den Driesch and are listed in millimetres (mm).

Pathology

Pathological lesions were recorded on 0.71% (NISP 3) of chicken bones from Phase I and 2.8% (NISP 47) of chickens in Phase II, showing an increase in pathologies over time (Figure 5.42 and Table 5.54).

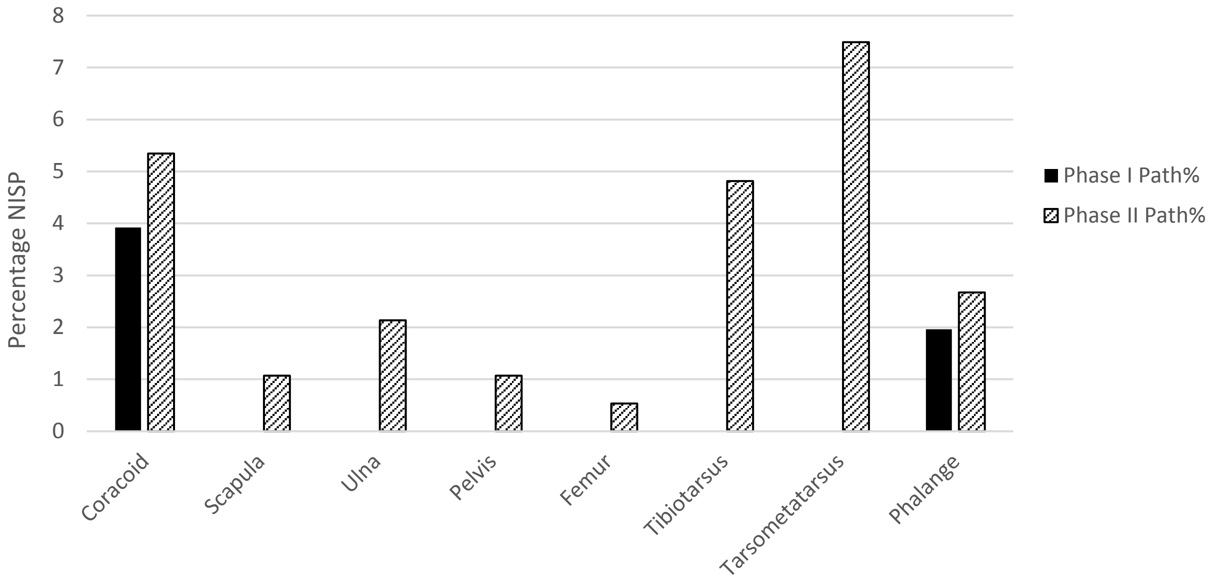


Figure 5.42: Chicken elements with pathology – shown as a relative percentage of the total NISP by element. Data in Table 5.53.

	Phase I			**Phase II**		
Chicken elements with pathology	**Path Qty**	**Total NISP**	**Path%**	**Path Qty**	**Total NISP**	**Path%**
Coracoid	2	51	3.9	10	187	5.3
Scapula	0	34	0.0	2	138	1.1
Ulna	0	47	0.0	4	188	2.1
Pelvis	0	1	0.0	2	4	1.1
Femur	0	31	0.0	1	233	0.5
Tibiotarsus	0	57	0.0	9	275	4.8
Tarsometatarsus	0	66	0.0	14	333	7.5
Phalange	1	5	2.0	5	140	2.7
Total	**3**	**292**		**47**	**1498**	

Table 5.54: Chicken elements with pathology, including the number of pathological elements, the total NISP of each element and the percentage of pathological specimens by element for both phases.

The pathology data set from Phase I was too small to be considered in detail, osteophytes were the only lesion recorded in this assemblage. Phase II produced a higher incidence of pathological lesions, the highest number of which were recorded on tarsometatarsi, and there was a greater range of pathologies in Phase II (Table 5.55). Several of the lesions provide an indication of living conditions and chicken use, for example; arthropathy, which is likely age related, was noted in Phase II, suggesting that older hens were present, and this was a result of egg laying, as exemplified by the pelvis in context (582) which exhibited arthropathy of the hip (Fothergill *et al.* 2017).

There were several examples of bone formation in the tarsometatarsus in Phase II, visible in Figure 5.43 which may have been due to chickens being kept in a damp environment (Wang *et al.* 1998; Fothergill *et al.* 2017).

Figure 5.43: Phase II Chicken tarsometatarsi (1566) showing bone deformity to the distal end, and shine on condyles, a result of bone rubbing against bone.

Some of the identified lesions in Phase II, such as the expansion of the proximal tarsometatarsus metaphysis, pictured below (Figure 5.47), are consistent in appearance with a form of viral arthritis which spreads from bird to bird through droplet infection or by contact with contaminated faeces (Fothergill *et al.* 2017).

Figure 5.44: Expansion of a chicken proximal tarsometatarsus, indicative of a form of viral arthritis (photo taken by Tyr Fothergill).

Phase I (5th-7thC) Chickens

Elements/Pathology	**Coracoid**	**Phalanx**
Osteophyte	2	1

Phase II (8th-9thC) Chickens

Elements/Pathology	**Coracoid**	**Scapula**	**Ulna**	**Pelvis**	**Femur**	**Tibiotarsus**	**Tarsometatarsus**	**Phalanx**
Enthesophyte						7		
Exostosis	1		2	1		1		
Osteophyte	9	2	1	1	1		14	5
Ostephyte, perhaps periostitis								
Periostitis			1			1		
Total	**10**	**2**	**4**	**2**	**1**	**9**	**14**	**5**

Table 5.55: NISP counts of chicken elements with pathology, by pathology type and element (by Phase).

5.7.2 Goose

Geese relative frequencies and body part representation

The ability to identify the skeletal elements of geese to species based on morphological and biometrical criteria is extremely problematic as there are very few distinguishing morphological features and there is a biometric overlap between *Branta* and *Anser,* wild and domestic species, and sex (Bacher 1967; Boessneck and von den Driesch 1979; MacDonald *et al.* 1993; Barnes and Dobney 2000; Barnes *et al.* 1998; Dobney *et al.* 2007:177). It is not until the later medieval period that is possible to separate geese species by biometrics alone (Serjeantson 2009:295). Therefore, within this research, the data for specimens identified as geese and '*Anser sp'* have been considered together.

Geese represent 0.7% (NISP 19) of the total Phase I assemblage and 0.4% (NISP 19) of the Phase II assemblage. The shift over time in the representation of this species is more notable when the contribution that geese make to the *bird* assemblage, rather than total assemblage, is considered; as relative percentage shifts from 3.9% of the Phase I birds (Total bird NISP 481) to 0.98% of the Phase II birds (Total bird NISP 1926).

Anatomical representation differs between the phases (Table 5.7, Figure 5.45 and Table 5.56); countable parts of the cranium and pelvis were absent in Phase I, whereas scapula and pelvis were absent in Phase II. Tarsometatarsi were the best represented element in Phase I, and carpometacarpii were the most common element in Phase II. The small data set for geese in both phases means that interpretation of body part representation is limited, although the representation of a broad range of skeletal elements suggests that geese were raised on site in small numbers.

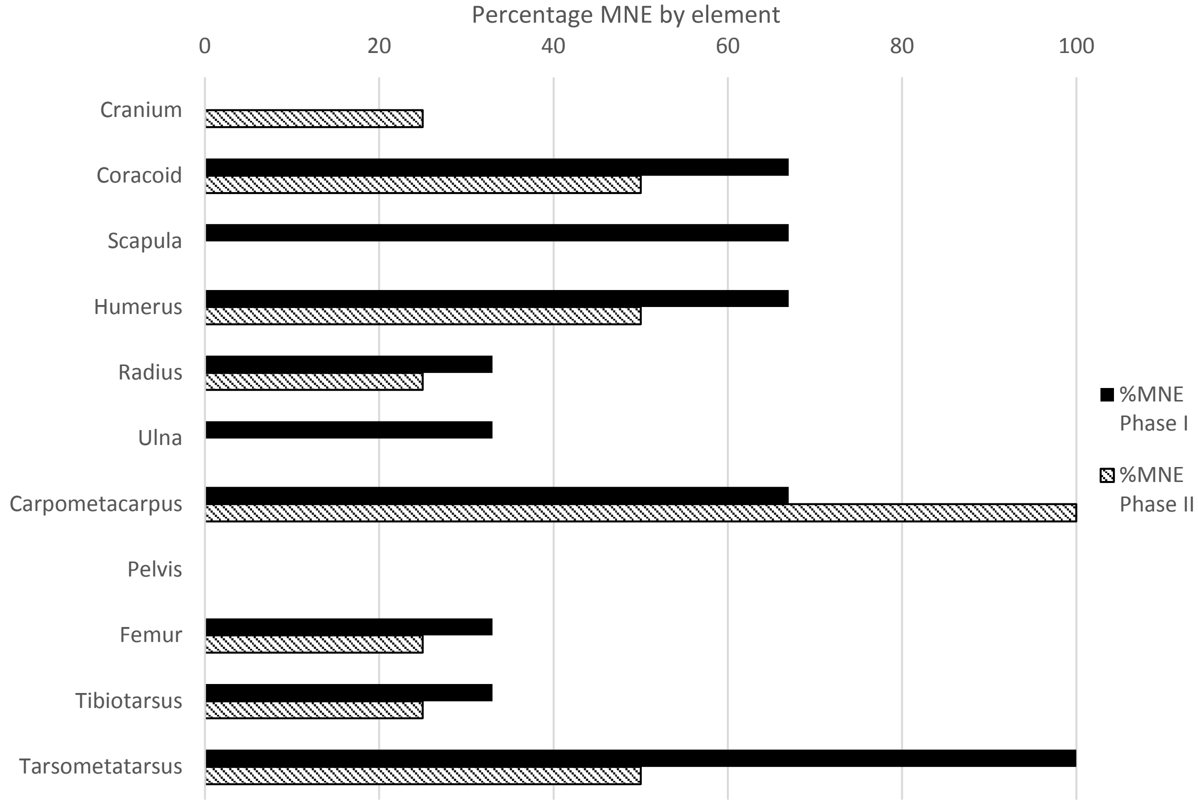


Figure 5.45: Goose element representation in the Phase I (5th- 7thC) and Phase II (8th-9thC) assemblages by percentage MNE (Phase I MNI = 3, Phase II MNI = 4).

	Phase I (5th-7thC) Goose			Phase II (8th-9thC) Goose		
Element	**NISP**	**MNE**	**%MNE**	**NISP**	**MNE**	**%MNE**
Cranium			0	1	1	25
Coracoid	3	2	67	4	2	50
Scapula	2	2	67			0
Humerus	3	2	67	3	2	50
Radius	1	1	33	2	1	25
Ulna	1	1	33			0
Carpometacarpus	2	2	67	5	4	100
Pelvis			0			0
Femur	2	1	33	2	1	25
Tibiotarsus	1	1	33	1	1	25
Tarsometatarsus	4	**3**	100	2	2	50

Table 5.56: Goose element NISP, MNI and percentage MNI. Goose MNI Phase I = 3, Goose MNI Phase II = 4.

Geese burning, gnawing and butchery

There were no burnt or gnawed geese elements in Phase I. In Phase II there was one carpometacarpus burnt black and one dog gnawed tibia.

One humerus revealed evidence of butchery, with a single cut mark on the proximal end. No butchery was recorded in the Phase II geese.

Geese ageing and sexing

One female was positively identified in Phase I based on the presence of medullary bone in a tibiotarsus. No medullary bone was recorded in Phase II.

Evidence of ageing revealed that 100% (NISP 19) of the geese present in Phase I were aged 16 weeks and above, therefore considered to be adult (Table 5.57). In Phase II 18% (NISP 3) of geese were <16 weeks old and 82% (NISP 14) were adult (Table 5.57 and Figure 5.46) (Serjeantson 2002).

Goose Age	Immature	Adult	%Immature	%Adult	Total
Phase I (5th-7thC)	0	19	0	100	**19**
Phase II (8th-9thC)	3	14	18	82	**17**

Table 5.57: Goose age, based on Serjeantson (2002, table 1). 'Immature' includes elements that do not fuse <16 weeks.

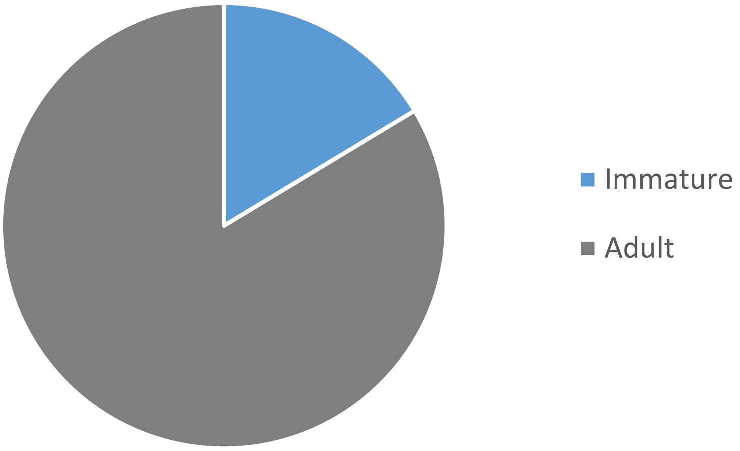


Figure 5.46: Phase II relative percentage of immature and adult geese. Raw data in Table 5.57.

Pathology

A congenital or non-metric trait was recorded in one synsacrum, an abnormal hole was recorded next to the acetabulum from Phase II. The hole was unlikely a result of trauma or infection, therefore, it is likely that the individual was born with this defect. No other pathologies were recorded in the geese remains.

5.7.3 Duck

Duck relative frequency and body part representation

Duck make up 0.53% (NISP 13) of the total Phase I assemblage and 0.24% (NISP 11) of the total Phase II assemblage. As with goose, when ducks are considered as a percentage of the bird assemblage their shift in numbers over time becomes more prominent, as ducks comprise 2.7% of the Phase I birds (Total bird NISP 481) and 0.57% of the Phase II birds (Total bird NISP 1926). There were certainly fewer ducks than geese and chickens in both phases of Lyminge.

Differentiating between wild and domestic species of duck comes with significant challenges, as outlined in Dobney *et al.* (2007:76) and Serjeantson (2009:301), and it is debated whether ducks were domesticated by the Anglo-Saxon period or if they were still wild living commensally with humans (Poole 2011: 116). When Lyminge duck elements were compared with those in the Tring Natural History Museum reference collection they were closest to Mallard, therefore, for the purposes of this study they have been referred to as Mallard size and in most cases simply called 'duck'.

The duck sample size was too small to discuss body part representation in a meaningful way. Table 5.58 shows that a range of post cranial elements were present, the most common in Phase I was the coracoid and in Phase II the carpometacarpus. Pelvis and cranial elements were not recorded in either phase.

	Phase I (5th–7thC) Duck			Phase II (8th–9thC) Duck		
Element	**NISP**	**MNE**	**%MNE**	**NISP**	**MNE**	**%MNE**
Cranium			0			0
Coracoid	4	2	100	2	1	50
Scapula	1	1	50			0
Humerus	1	1	50	1	1	50
Radius	2	2	100	2	2	100
Ulna			0	1	1	50
Carpometacarpus	1	1	50	3	2	100
Pelvis			0			0
Femur	1	1	50			0
Tibiotarsus	2	1	50			0
Tarsometatarsus	1	1	50	2	1	50
Total	**13**		**0**	**11**		**0**

Table 5.58: Duck element NISP, MNE and relative percentage MNE by element. Phase I MNI = 2, Phase II MNI = 2.

Duck taphonomy and butchery

Only one tibiotarsus had been burnt black in Phase I and no gnawing or butchery was recorded.

Duck ageing and sexing

All recorded ducks were adult and no medullary bone was recorded.

Pathology

No pathology was recorded on duck elements.

5.7.4 Wild Birds

Although occurring in much smaller proportions than chicken, geese and ducks, a wide variety of wild bird species are present in both assemblages with 20 species present in Phase I and 12 species in Phase II (Table 5.7). Wild birds account for 1.3% (NISP 45) of the total assemblage in Phase I and 0.8% (NISP 47) of the total assemblage in Phase II. While these percentages appear low, Lyminge has a slightly higher representation of wild birds in Lyminge than seen at other contemporary sites, where on average wild birds contribute under 0.5% of the total assemblage (Sykes 2007a:71).

Sea birds and inhabitants of coastal marshland environments are well represented in both phases of the site, demonstrating Lyminge's long term dependence upon these ecological zones. The Phase I assemblage is notable for the presence of a variety of raptors including goshawk, peregrine falcon, red kite and buzzard, which were most likely kept as hunting birds, which will be discussed further in Chapter 7.

Figure 5.47 shows the relative percentage of wild birds in the total assemblage by bird family or order and it is immediately apparent that there are very different patterns of wild bird exploitation between phases. In Phase I there is a higher number of raptors and the prey species associated with falconry, indicated by the number of charadriiformes. Whereas in Phase II there is a much smaller number of raptors and no falcons but a higher percentage of corvidae and columbidae. Passerine species were present in single figures in both phases, which, arguably is to be expected given the presence of fields and hedges in the local vicinity (McKerracher 2017), in addition to cats and raptors.

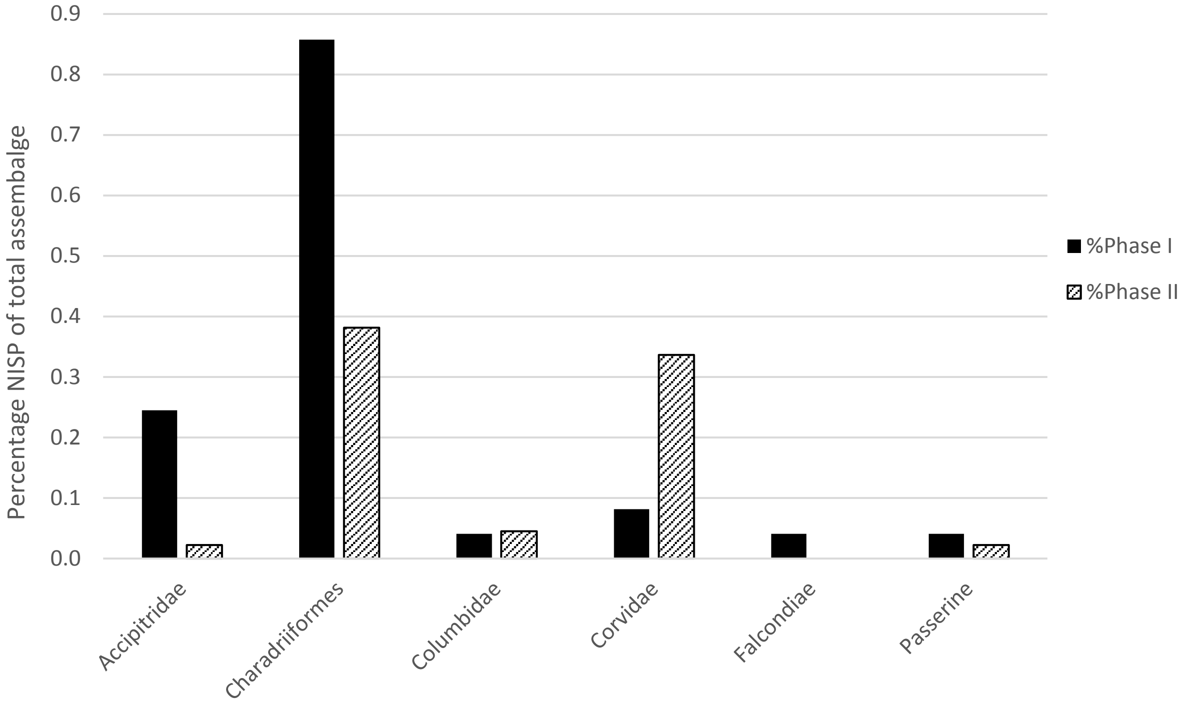


Figure 5.47: Wild birds' relative percentage NISP of total assemblage, grouped by bird family. Raw data in Appendix 3, Table 16.

Accipitridae family

Individuals from the Accipitridae family contributed to 0.25% (NISP 7) of the total Phase I assemblage and 0.02% (NISP 1) of the Phase II assemblage. This family category included: goshawk, Eurasian sparrowhawk, buzzard, red kite and one individual that was only possible to assign to 'Accipitridae family' but was noted to be larger than a buzzard.

Buzzard

Only one fragment of buzzard was recovered in Phase I, a carpometacarpus which was fused distal.

Goshawk

There were two adult fragments excavated in Phase I, one of which (a femur) was complete and of similar size to the female specimen in the Tring Natural History Museum collection (Figure 5.48). The other goshawk fragment was a tarsometatarsus and was of comparable size to the Tring male reference specimen, although the specimen was not complete. Both goshawk fragments were recovered from radiocarbon dated contexts, one from SFB 6, dated AD 416 – 547 with 95% accuracy, and the other from pit [6134], context (7315) dated AD 343 – 535 with 95% accuracy, making these the earliest recorded finds of goshawk in an Anglo-Saxon context to date (Holmes 2014a; Wallis 2017).

Figure 5.48: Phase I (5th-7thC) Lyminge Goshawk femur pictured centre, compared with Tring reference collection male specimen (left) and female specimen (right).

Eurasian sparrowhawk

A single fused tibia was recorded in Phase II as a 'likely sparrowhawk, possibly male'.

Red Kite

Two fragments of red kite were present in Phase II, both of which were fused; a carpometacarpus and coracoid.

Charadriiformes family

Charadriiformes made up 0.86% (NISP 21) of the Phase I assemblage and 0.38% (NISP 14) of the Phase II assemblage. This family category included: blackheaded gull, common gull, oystercatcher, coot, common moorhen, gannet, golden plover, plover, crane, curlew, lapwing, snipe, heron and woodcock.

Black-headed gull

There was one tarsometatarsus and one humerus recorded in Phase II, both of which were fused.

Common Gull

Four fragments of common gull were recorded in Phase II, two ulnae, one humerus and one tarsometatarsus, all of which were fused.

Oystercatcher

Oystercatcher fragments were only recorded in Phase I and included one carpometacarpus and one tarsometatarsus, both of which were fused.

Coot

There were two tibiotarsi excavated in Phase I, both of which were fused distal.

Common moorhen

One ulna was unearthed in Phase I, which was fused both proximal and distal.

Gannet

A single radius was identified in the Phase I assemblage, fused proximal. This fragment was unusual in that it had been polished and was decorated with ring and dot design (Figure 5.49). Furthermore, within the zooarchaeological material for this context was another worked piece of bone, polished to a point that was very similar in shape and size to the gannet radius, making it likely that they came from the same individual. Unfortunately, it was not possible to fit the two fragments back together and therefore it cannot be confirmed that they are in fact the same bone.

Figure 5.49: Worked gannet radius (right side) from LYM13 context (6277) with Anglo-Saxon ring and dot decoration on proximal (right) compared to complete gannet radius (left) in Tring Natural History Museum.

Plover

A single fused humerus was recovered in Phase I and one fused tibia from Phase II. In both cases it was not possible to separate grey and golden plover therefore the fragments were recorded as 'plover'.

Golden Plover

Two complete adult specimens were identified in Phase I: a right radius and right ulna from the same SFB context (6876), therefore it is likely that they are from the same individual.

Crane

There were two crane fragments excavated in Phase I from the same SFB, a tibiotarsus (shaft only) and fused tarsometatarsus.

Curlew

Only one fused carpometacarpus was recorded in Phase I. A total of four curlew specimens were identified in Phase II: two tibiotarsi, one ulna and one coracoid, all fused, one of which was noted to be of a similar size to the female reference collection specimen in Tring Natural History Museum, and another was similar in size to the male reference collection specimen.

Lapwing

Three lapwing fragments were identified in Phase I; one fused humerus, one juvenile humerus and one fused femur.

Snipe

A single snipe fragment was identified in Phase I, a fused tarsometatarsus.

Heron

Only Phase II contained heron, a single fused coracoid.

Woodcock

The two fragments from fused specimens identified in Phase I and included a carpometacarpus and a tibiotarsus. The tibiotarsus had a slight shine on the distal end, indicating wear and tear at the articulation point. There were also two specimens recorded as cf. woodcock in Phase II; a femur and humerus, both of which had fused.

Columbidae family

The Columbidae family included stock dove and pigeon and made up 0.04% of both the total Phase I and II assemblages.

Stock dove

There was one fused radius identified in the Phase II assemblage.

Woodpigeon

Woodpigeon was found in both phases; one fused tibiotarsus in Phase I and a complete tarsometatarsus, fused proximal and distal, in Phase II.

Corvidae family

Corvids made up a small percentage of the total assemblage in both phases, 0.08% (NISP 3) in Phase II and 0.3% (NISP 10) in Phase II. This family included: jay, raven, magpie and jackdaw.

Jay

Of the eight fragments of jay recovered in Phase II it is likely that seven are from the same individual as a tarsometatarsus, ulna, radius, coracoid and left and right tibiotarsus were recovered from the same fill in pit [1038], and a humerus was recovered from a neighbouring fill in pit [1038]. One tibiotarsus had a healed fracture on the lower shaft which had resulted in the shortening of the limb and the bone had healed at an angle. A humerus from a separate individual was also recovered in Phase II (MNI = 2).

Raven

A single fused raven humerus was identified from the Phase I material.

Magpie

Only one adult humerus was recovered in the Phase I assemblage.

Jackdaw

Jackdaw was only identified in Phase II and it is possible that the seven fragments were from one individual (MNI = 1) as they were excavated from the same context (1480) but were not noticed as an ABG in-situ. Elements included: a humerus, ulna, scapula, radius, left and right carpometacarpus and a tarsometatarsus. All elements were fully fused.

Falconidae family

Peregrine Falcon

One peregrine falcon humerus, fused proximal, was recovered from Phase I from context (1635), and it is of note that it was recovered from a sixth century context, making it the earliest discovery of peregrine falcon fragment in Anglo-Saxon England. Two other Anglo-Saxon peregrine falcons have been recovered from the Middle Anglo-Saxon settlements of Brandon (Crabtree and Campana 2014:309) and Ramsbury, Wiltshire (Coy 1980). The natural habitat of peregrine falcons is cliffs and uplands, thus the Lyminge specimen most likely represents a captive bird employed in falconry, the elite associations of which are well attested in Anglo-Saxon historical sources and, from an earlier period in visual culture and iconography (Sykes 2007b:61).

Passerine order

In Phase I, one passerine humerus, fused distal, was noted as being larger than a robin but it was not possible to identify the humerus to exact species. A single coracoid, fused proximal, was identified in Phase II, however, once again it was not possible to identify this element to species.

5.8 Isotope results

The use of carbon (^{13}C and ^{12}C) and nitrogen (^{15}N and ^{14}N) stable isotope analysis of animal remains for the reconstruction of past animal and human diet is well established (e.g. Halley and Rosvold 2013; O'Connell and Hull 2011; Mays and Bevan 2012; Müldner and Richards 2005; 2007). Stable isotope techniques are based on the underlying principle that the composition of human or animal body tissue reflects the water and food consumed through life (Britton *et al.* 2008:2112; Müldner 2009:328). Collagen, the major protein component of bone, is particularly useful for stable isotope measurements as, not only can it survive for thousands of years, but it is also resistant to diagenetic modifications and can be extracted in useful quantities from small samples of bone for analysis (Katzenberg 2008: 416; Hamilton and Thomas 2009: 237). Bone is continuously renewed during life, although this process slows after the growth period, therefore isotope ratios measured in collagen represent a long-term average of diet over the last decade or even longer of an individual's life (Müldner and Richards 2005:40; McManus *et al.* 2014). Despite this limitation stable isotope analysis of bone collagen remains one the most commonly used methods for palaeodietary reconstruction through bone chemistry (Müldner and Richards 2005:40).

The relative abundance of carbon and nitrogen ($\delta^{13}C$ and $\delta^{15}N$ respectively) vary between different environments and ecological zones, and it is the consumption of foods and liquids from different ecosystems that reflect in the consumer's body tissues (Ambrose and Norr 1993; Tieszen and Fagre 1993; Müldner *et al.* 2014:324; Sykes 2014:20). Originally stable isotope analysis was primarily employed on human remains to analyse and reconstruct diet, subsequently it has been possible to address various other research questions including those focusing on animal husbandry. Such questions include: the effects of disease, physiological/nutritional stress, determination of residence and migration patterns and determining the length and duration of breastfeeding (Katzenberg 2008:423; Beaumont *et al.* 2015).

The carbon isotope ratio (^{13}C and ^{12}C measured as $\delta^{13}C$) in plant tissue is determined by the photosynthetic pathway employed by the plant to create carbohydrates from atmospheric carbon dioxide (Mays and Bevan 2012:867). It is particularly useful in differentiating diets based on marine and terrestrial foods, or on plants with distinct photosynthetic pathways, e.g. C4 and C3 plants, whose range may vary by up to 15‰ (Buikstra and Milner 1991). Wild C4 plants are adapted to hot, arid environments and have an average range of δ^{13}C -12 to -13‰, whereas C3 plants, which more commonly grow in terrestrial and temperate regions, average δ^{13}C -26 to -27‰ and these variations are passed on to the animals which consume the plants. Britain lacks native C4 plants, and C4 plants such as maize, millet or sugarcane was not cultivated in England during the Anglo-Saxon period (Hagen 2010:38-9; Hamilton and Thomas 2012:238). Due to the lack of C4 plants in Britain, δ^{13}C is more commonly used to establish marine/freshwater and terrestrial contribution to diet (Mays and Bevan 2012:867). In marine ecosystems dissolved bicarbonate is approximately 7‰ more positive than atmospheric $CO_{2,}$ a difference that is passed on up the food chain (Chisolm *et al.* 1982: 1131). Coastal plants are therefore enriched in ^{13}C when compared with terrestrial C3 plants, and it is possible to identify this difference in bone collagen (Richards *et al.* 2003:366; Mays and Bevan 2012:867).

Nitrogen stable isotopes (^{15}N and ^{14}N measured as δ^{15}N) also vary in marine and terrestrial foods, marine foods being more enriched in ^{15}N than terrestrial foods. These differences are passed on to consumers and therefore, as with ^{13}C, δ^{15}N patterns in bone collagen can be used to assess the relative contribution of marine and terrestrial foods to diet. Unlike ^{13}C, consumers at higher trophic levels (carnivores) have elevated ^{15}N values, increasing by 3-5‰ per trophic level as one ascends the food chain. Omnivores such as pigs (and humans) can also have higher collagen δ^{15}N values that are elevated above herbivore values by an amount that reflects the proportion of animal-derived protein in the diet (Ambrose 1991; Hamilton and Thomas 2012: 238; Mays and Bevan 2012). As food chains are longer in freshwater compared with terrestrial ecosystems when freshwater resources are consumed in large enough/frequent enough quantities this may result in elevated collagen (Müldner and Richards 2005, 2007; Mays and Bevan 2012:868). Nitrogen levels can also be affected by the level of nitrogen in soil and therefore in crops, which can occur through local enrichment of soil via manuring or growing legumes, as legumes have their own symbiotic nitrogen-fixing bacteria in root nodules (Hamilton *et al.* 2009: 1001; Hamilton and Richards 2012: 238). Physiological factors such as pregnancy, high growth rate and famine and environmental factors such as temperature and drought, may also impact animal δ^{15}N values (Hamilton and Thomas 2012:238).

A number of surviving Anglo-Saxon charters refer to the granting of land for fisheries, salt-making, and areas of pasture for sheep and cattle in the Romney Marsh to the double minster of Lyminge in the eighth to tenth centuries (Brooks 1988:95-99; Kelly 2006:98). Recent research has shown that coastal and salt-marsh plants species are significantly enriched in δ^{15}N and δ^{13}C in comparison to other terrestrial plants (Britton *et al.* 2008:2111; Müldner *et al.* 2014). Therefore, a pilot study investigating the carbon and nitrogen stable isotope signatures for the three main domesticates (cattle, caprines and pig) from the two phases of Lyminge was devised in order in order to determine potential contribution of coastal and salt-marsh plants species to animal diet and whether there was continuity or change in foddering and pasturing practices between the two phases of the site (also see Chapter 4, Section 4.2) (Britton *et al.* 2008:2111; Müldner *et al*. 2014).

Bone collagen δ^{13}C and δ^{15}N for each species are shown in Figure 5.50 and Figure 5.51 and Appendix 3, Table 17, in addition to additional data derived from bones sent for radiocarbon dating (radiocarbon dates were gained from Oxford Radiocarbon Accelerator Unit – OxA) and the chicken isotope data produced by Sykes and Miller (*in prep*). Samples where the C/N ratio was outside the limits normally considered to indicate acceptable purity <3.5 C/N ratio) were removed (Ambrose 1990) (Appendix 3, Table 18). Mean values with standard deviation (SD) for δ^{13}C and δ^{15}N for each taxon are presented in Figure 5.52 and Figure 5.53 and Appendix 3 Table 19 and Table 20.

From those samples processed by the author, there was no evidence for δ^{15}N or δ^{13}C enriched isotope values to indicate the consumption of salt-marsh plant species, therefore, the sampled species were not being grazed on saltmarshes on a regular basis or foddered using coastal plants (Britton *et al.* 2008). When the data from the pilot study, radiocarbon dates and chicken analysis were plotted together some interesting patterns emerged (Figure 5.50 and Figure 5.51). Overall the Phase I data is higher in δ^{15}N and lower in δ^{13}C, a difference that is statistically significant (Mann-Whitney U test for δ^{15}N $p = 0.00104$; δ^{13}C $p = <0.00001$), and visually the data plot more tightly together, suggesting that animals were being raised and foddered in similar ways.

The Phase I chickens had elevated δ^{15}N and δ^{13}C compared to other taxa suggesting they were omnivorous and perhaps allowed to roam more freely than the other animals and feed off kitchen scraps. The pigs also had a slightly elevated δ^{15}N and δ^{13}C compared to cattle and some of the caprines. Pigs are omnivorous in nature and their foraging habits make them a valuable animal to keep as they can often consume foodstuffs that are inedible to other animals and humans and in turn transform them into meat and fat (Hamilton and Thomas 2012:234). The higher δ^{15}N values in the Phase I pigs may suggest that they were kept separately from cattle and sheep, being fed on kitchen waste and manure, although it is difficult to assess whether they were consuming animal or human excreta (Hamilton *et al.* 2009:1000-1). An alternative explanation is that the Phase I pigs were able to roam more freely than cattle and sheep and therefore had a diet richer in higher animal- protein derived from worms and insects (or scavenging human waste), all of which would have raised δ^{15}N values (Hamilton and Thomas 202:252). It may also be possible that the elevated levels of δ^{15}N in Phase I are a secondary effect from local enrichment of the soil nitrogen δ^{15}N around the settlement (Hamilton et al. 2009:1001). If pigs were allowed to graze on crop remains on manured areas, turning over the soil and adding their own manure this may also have contributed to elevated δ^{15}N, although it seems unusual that cattle and sheep would not also be able to graze on this seasonal resource (Hamilton and Thomas 2012:252) particularly given the value of cattle and sheep manure.

In Phase II there is a decline in δ^{15}N, which may indicate a shift to off-site husbandry, and the herbivores (cattle, caprines and pigs) plot in slightly more distinct groups. The cats and dogs and some of the chickens have elevated δ^{15}N and δ^{13}C in Phase II, close to that of the human, that suggested increased consumption of marine resources (Ambrose 1993:83; Chisholm *et al.* 1982:1132; Schoeninger *et al.* 1983; Schoeninger *et al.* 1984; Sykes and Miller*, in prep*). The human sample originates from a neonate (aged 38-40 weeks) which was included within the sample sent for radiocarbon dating at OxA. This was the only human discovered on the site and is an almost complete skeleton recovered from pit [1663]. The neonate was not identified *in situ* and other finds from this context include assorted bone and metal small finds, pottery and a large quantity of animal bone suggesting that this was a pit for general refuse. The isotope results from the neonate have been included in this thesis as they were the only isotope values from the only human found during the excavations of the Lyminge settlement areas. Results will be discussed and contextualised further below (see Chapter 6 and Chapter 8).

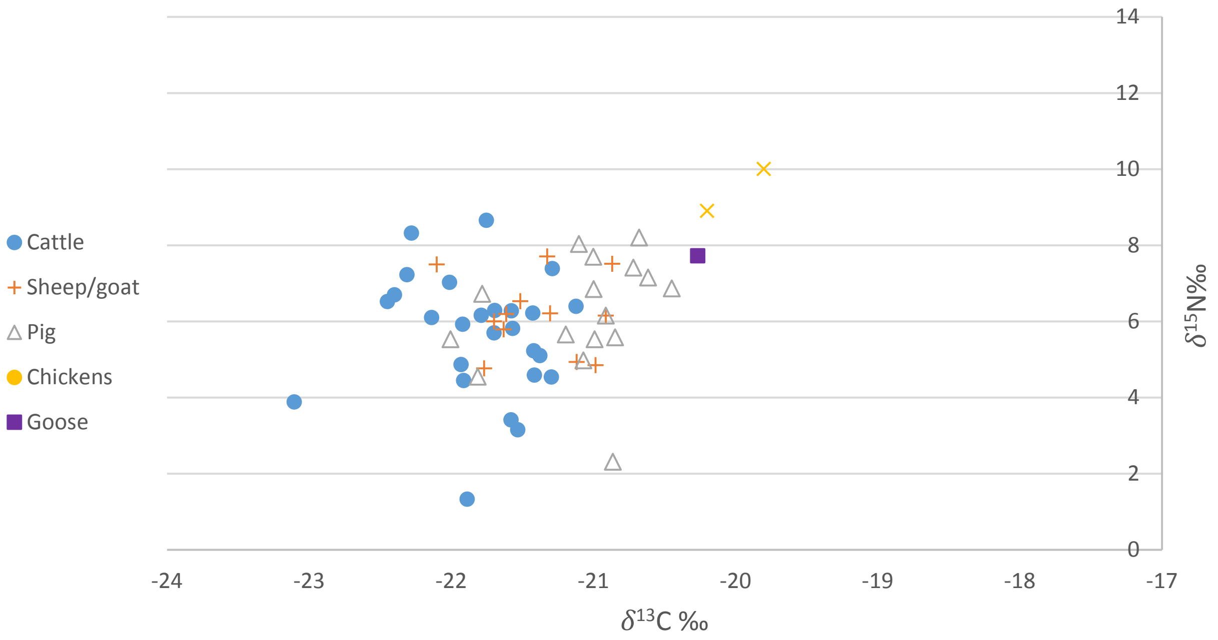


Figure 5.50: Phase I (fifth-seventh centuries) stable isotope values of δ^{13}C and δ^{15}N by species. Graphs contain data from the pilot study, radiocarbon dated bones and the chicken project data. Raw data in Appendix 3, Table 17.

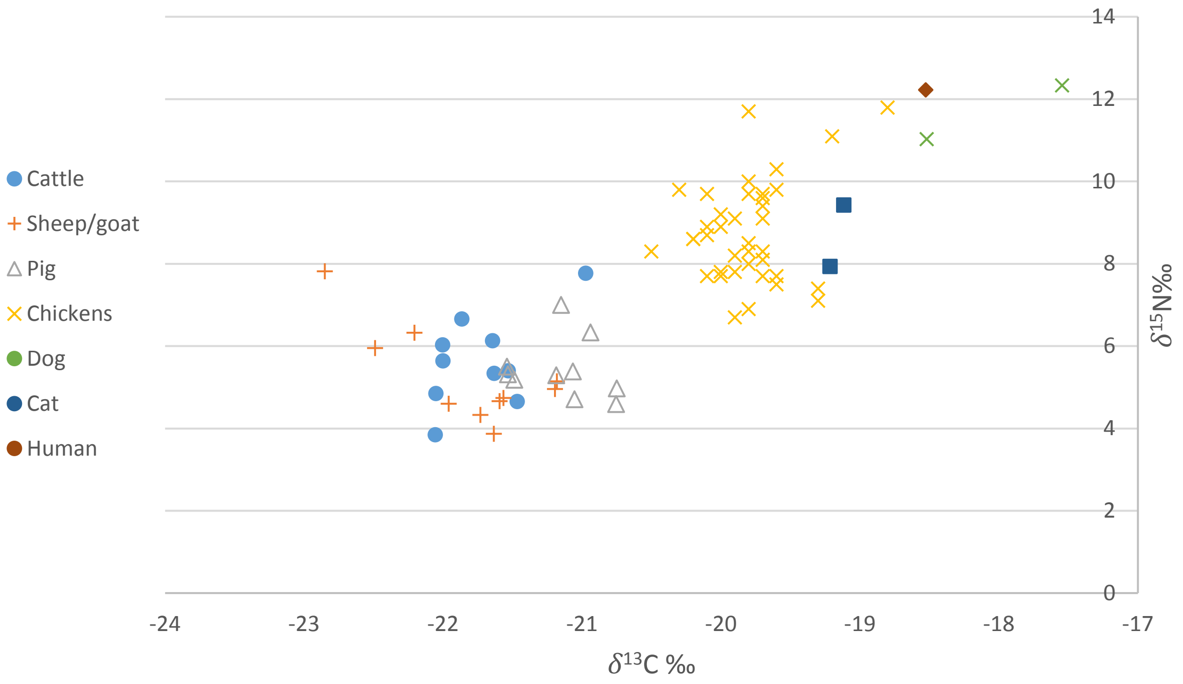


Figure 5.51: Phase II (eighth-ninth centuries) stable isotope values of δ^{13}C and δ^{15}N by species. Graphs contain data from the pilot study, radiocarbon dated bones and the chicken project data. Raw data in Appendix 3, Table 17.

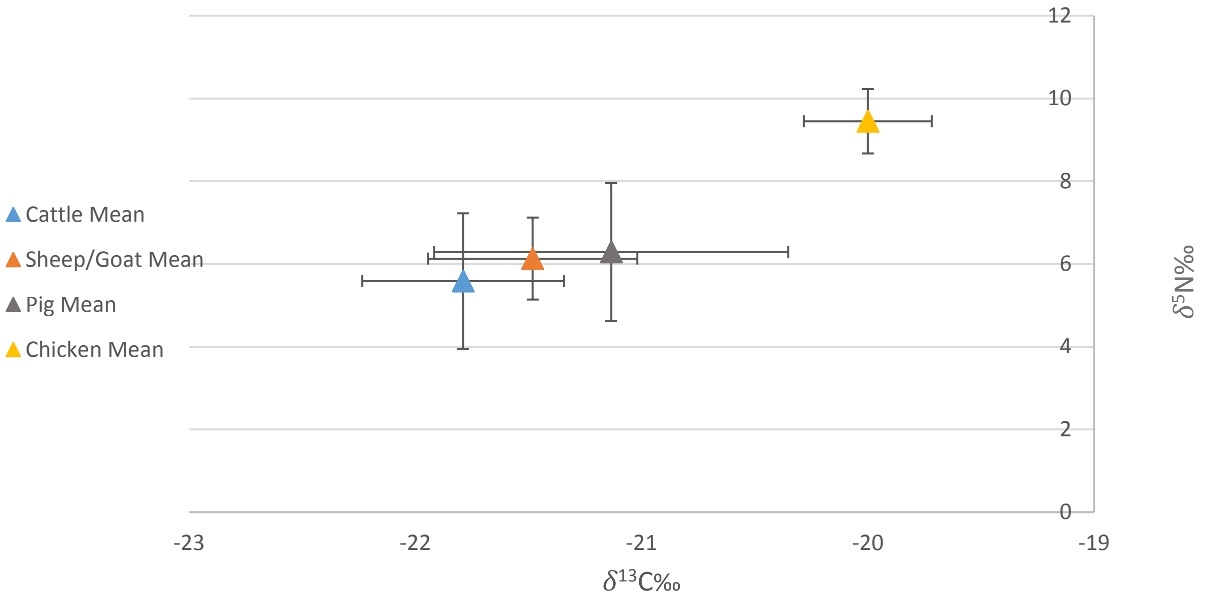


Figure 5.52: Mean values of Phase I (fifth-seventh centuries) δ^{13}C and δ^{15}N by species (species with single values were not included in graph). Raw data in Appendix 3, Table 19.

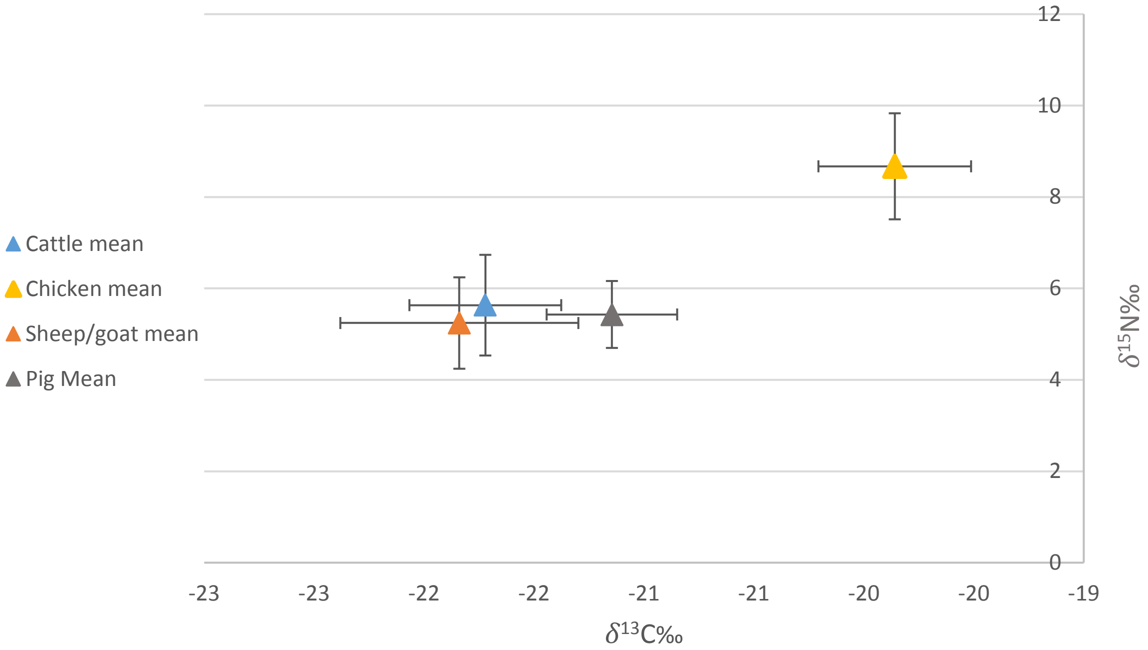


Figure 5.53: Mean values of Phase II (eighth-ninth centuries) δ^{13}C and δ^{15}N by species (species with single values were not included). Raw data in Appendix 3, Table 20.

Chapter 6 Husbandry and Production

Farming was the mainstay of daily life in Anglo-Saxon England, wealth was measured in land, crops and above all else livestock, as reflected in charters, law codes, zooarchaeological data and place-name evidence (Banham and Faith 2014; O'Connor 2011; Sykes 2014). This chapter will examine a range of zooarchaeological data including species proportions, ageing data, body part patterns, butchery and metrics, to shed light on the role of livestock at Lyminge compared with wider Anglo-Saxon society. The term 'livestock' encompasses those animals kept for primary and secondary products, including; cattle, sheep, goat, pigs, horses, chickens and geese.

Domestic livestock contributed to 97% (NISP 2373) of the total identified Phase I Lyminge assemblage and 95% (NISP 4246) of the Phase II assemblage, demonstrating the crucial role these animals played in guiding husbandry and production patterns in both settlements. Of the Lyminge livestock, cattle, caprines, pigs and chickens were the most common and, as highlighted in Chapter 5, diachronic shifts in taxa abundance demonstrate a complex array of changes in the ways in which animals were valued. Livestock are considered on a taxa-by-taxa basis below to better elucidate changes over time.

Figure 6.1 and Figure 6.2 tripolar plots express the relative percentage NISP of the total of the three main domesticates, cattle, caprines and pigs. It has been argued by O'Connor (2010) that not only are tripolar plots difficult to read, but also that due to the way that the relative percentages of the three taxa are calculated they are fully interdependent, i.e. "a high percentage for one taxon must necessarily depress the percentages for the other two". O'Connor (2010) suggests that the "degree of interdependence can be reduced by expressing the abundance of each of the taxa as a ratio relative to the abundance of a third". Therefore, the ratios NISPcattle/NISPpig (C/P) and NISPsheep/NISPpig (S/P) have also been used here (in addition to the tripolar plots), as this method allows the data to be plotted on a conventional scatterplot graph (Figure 6.3 and). It is important to note that this procedure does not mitigate the inherent interdependence that accompanies relative abundance quantification, it does make relative ratios reasonably simple to comprehend and can more clearly reveal assemblages where differential recovery or identification have affected identification levels (O’Connor 2010).

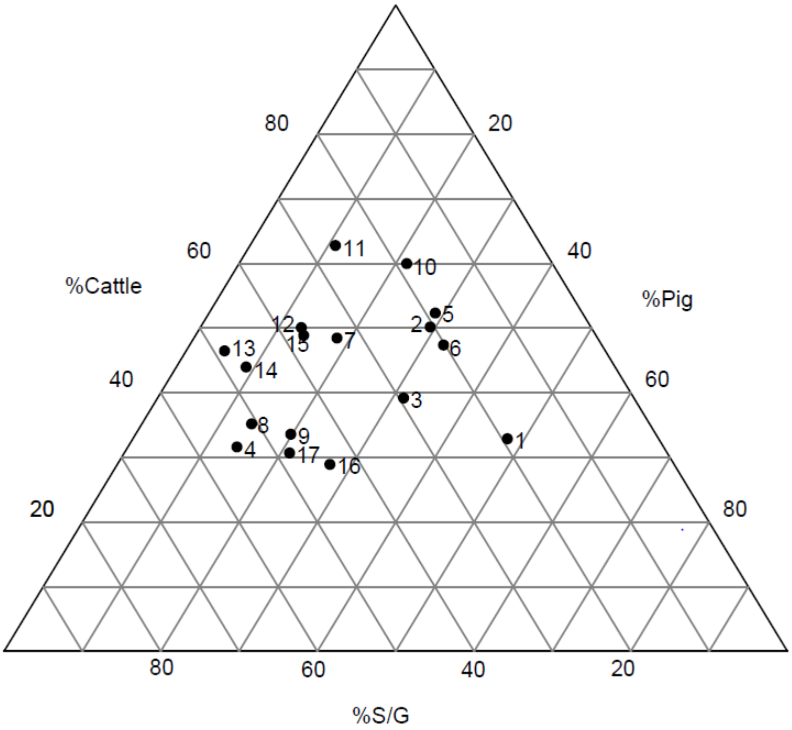


Figure 6.1: Tri-plot comparing cattle, caprine and pig relative NISP percentages from Lyminge Phase I with contemporary sites. The numbers correspond to the following sites: 1) Lyminge Phase I; 2) Northfleet, Kent; 3) Springhead, Kent; 4) Whitefriars Phase 4, Canterbury, Kent; 5) Church Whitfield, Kent; 6) Ramsgate, Kent; 7) Bishopstone, Sussex; 8) Barton Court Farm, Abingdon; 9) Pennyland, Milton Keynes; 10) Redcastle Furze, Norfolk; 11) West Stow Phase I, Suffolk; 12) West Stow Phase II; 13) West Stow Phase III; 14) Bloodmoor Hill, Carlton Coleville, Suffolk; 15) West Heslerton, Anglian, Yorkshire; 16) Kilham, Yorkshire; 17) Quarrington, Lincolnshire - references in Appendix 1.

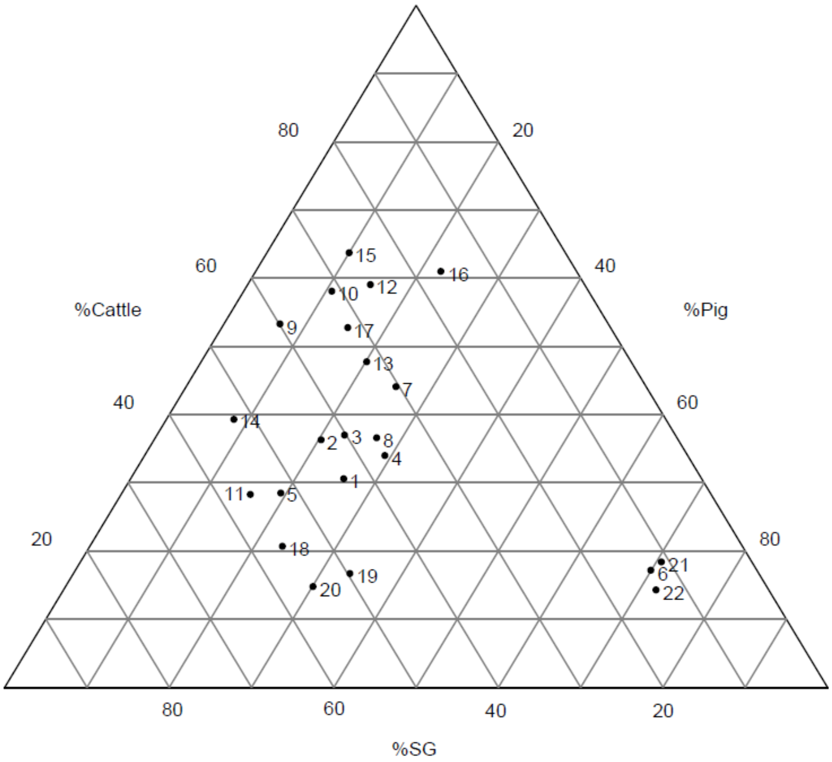


Figure 6.2: Tri-plot comparing cattle, caprine and pig relative NISP percentages from Lyminge Phase II with contemporary sites. The numbers correspond to the following sites: 1) Lyminge Phase II; 2) Sandtun, Hythe, Kent; 3) St Augustine's, Canterbury, Kent; 4) Whitefriars Phase 5, Canterbury, Kent; 5) Brandon, Suffolk; 6) Wicken Bonhunt, Essex; 7) Ipswich, Suffolk; 8) Flixborough Phase 3b, Lincolnshire; 9) Quarrington, Lincolnshire; 10) Lincoln, Flaxengate Timber Phase 1; 11) Hartlepool Monastery, Cleveland; 12) Wearmouth and Jarrow, Tyne and Wear; 13) Portchester Castle, Hampshire; 14) West Heslerton, Middle Saxon, Yorkshire; 15) Fishergate Period 3, York; 16) Cook Street, Southampton; 17) Melbourne Street, Southampton; 18) Ælfric's Abbey, Eynsham Phase b, Oxfordshire; 19) Aylesbury, Buckinghamshire; 20) Bishopstone, Sussex; 21) St Alban's Abbey 5th-8thC, Hertfordshire; 22) St Alban's Abbey 8th-9thC.

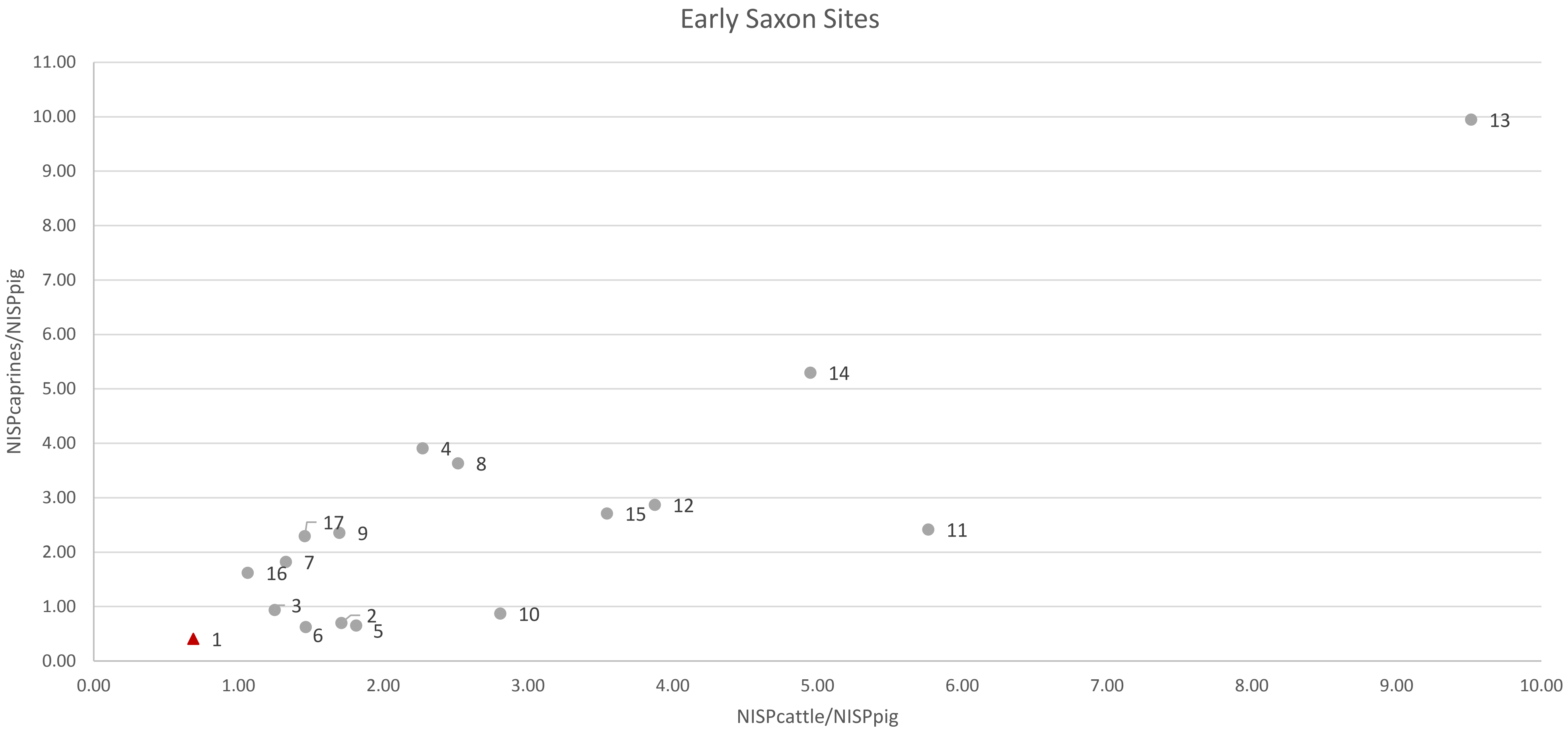


Figure 6.3: Relative abundance of the three main domesticates in early Saxon assemblages discussed in this thesis. Lyminge Phase I is represented by the red triangle. The numbers correspond to the following sites: 1) Lyminge Phase I; 2) Northfleet, Kent; 3) Springhead, Kent; 4) Whitefriars Phase 4, Canterbury, Kent; 5) Church Whitfield, Kent; 6) Ramsgate, Kent; 7) Bishopstone, Sussex; 8) Barton Court Farm, Abingdon; 9) Pennyland, Milton Keynes; 10) Redcastle Furze, Norfolk; 11) West Stow Phase I, Suffolk; 12) West Stow Phase II; 13) West Stow Phase III; 14) Bloodmoor Hill, Carlton Coleville, Suffolk; 15) West Heslerton, Anglian, Yorkshire; 16) Kilham, Yorkshire; 17) Quarrington, Lincolnshire - references in Appendix 1. References in Appendix 3, Table 21.

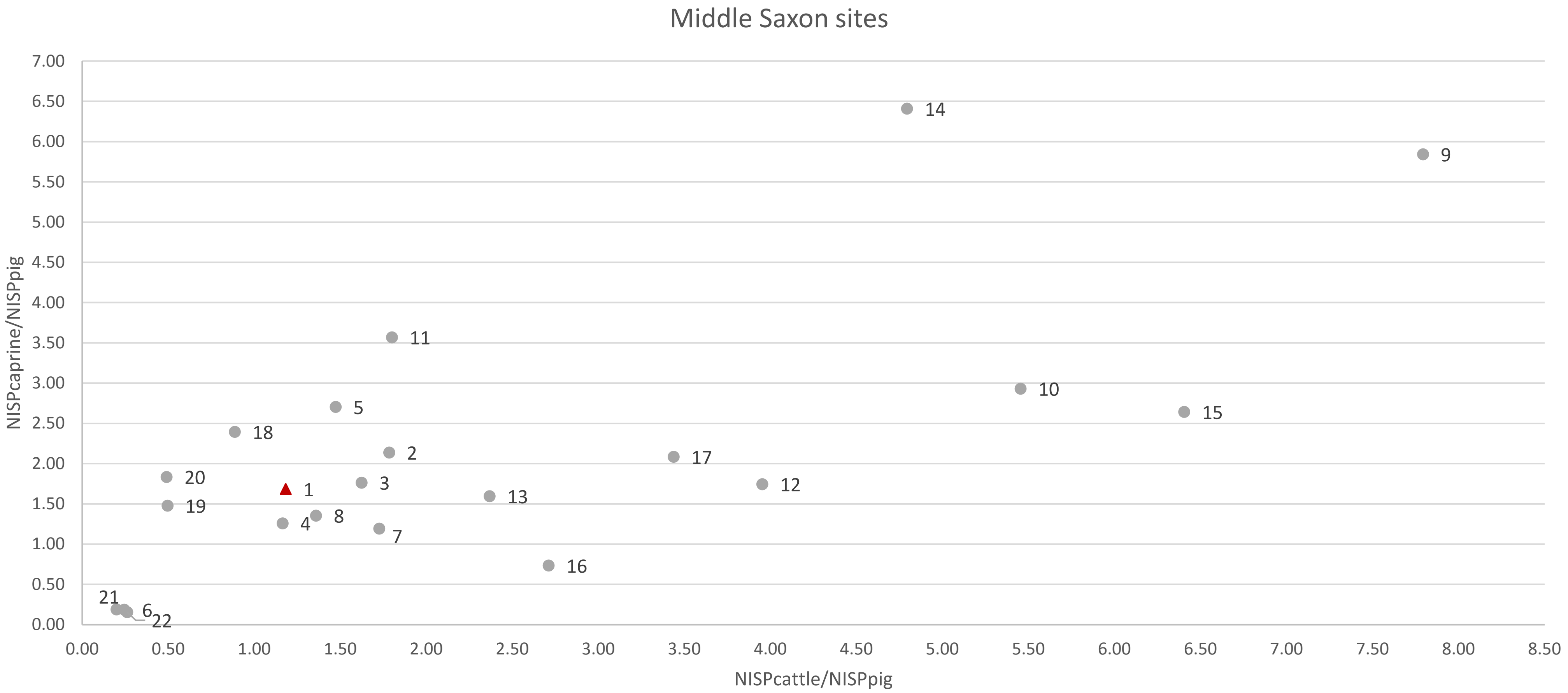


Figure 6.4: Relative abundance of the three main domesticates in middle Saxon assemblages discussed in this thesis. Lyminge Phase II is represented by the red triangle. The numbers correspond to the following sites: 1) Lyminge Phase II; 2) Sandtun, Hythe, Kent; 3) St Augustine's, Canterbury, Kent; 4) Whitefriars Phase 5, Canterbury, Kent; 5) Brandon, Suffolk; 6) Wicken Bonhunt, Essex; 7) Ipswich, Suffolk; 8) Flixborough Phase 3b, Lincolnshire; 9) Quarrington, Lincolnshire; 10) Lincoln, Flaxengate Timber Phase 1; 11) Hartlepool Monastery, Cleveland; 12) Wearmouth and Jarrow, Tyne and Wear; 13) Portchester Castle, Hampshire; 14) West Heslerton, Middle Saxon, Yorkshire; 15) Fishergate Period 3, York; 16) Cook Street, Southampton; 17) Melbourne Street, Southampton; 18) Ælfric's Abbey, Eynsham Phase b, Oxfordshire; 19) Aylesbury, Buckinghamshire; 20) Bishopstone, Sussex; 21) St Alban's Abbey 5th-8thC, Hertfordshire; 22) St Alban's Abbey 8th-9thC. References in Appendix 3, Table 22.

6.1 Cattle

Research has shown that interpretations of the social and economic significance of livestock during the Saxon period should not be based on bone frequency alone (Hamerow 2012:155; Banham and Faith 2014:85), which is clearly the case with the Lyminge cattle. Compared with caprines and pigs, cattle were exploited at a more consistent level over time at Lyminge (Figure 5.2). Despite not being the most abundant of the livestock in either phase, given the quantity of beef a single cattle carcass can provide, it is likely that these animals would have made a significant contribution to the meat consumed in the Lyminge community, as has been suggested for other Saxon settlements (Sykes 2006a:57; Gibson and Murray 2003:187; Hamerow 2012:197).

The analysis of age profiles and metrical data enables zooarchaeologists to reconstruct husbandry patterns and animal use for primary and secondary products, and from that infer animal purpose and attitudes that may have been held towards different animals. For example, while meat would have been provided by all livestock at the end of their lives, if animals were only being raised to near maturation (between two and a half to three and a half years of age), this would suggest that a cost-effective strategy of raising that animal primarily for meat was being employed (Crabtree 2012b:25; Holmes 2014a:65).

The Lyminge mandible and epiphyseal fusion age profiles shows that cattle of all ages were present at Lyminge in both phases, although the majority were culled in adulthood and old adulthood[4] (Figure 5.7 and Table 5.13), indicating their importance for secondary products, a pattern also seen in cattle from Wicken Bonhunt, Flixborough, Bishopstone and Brandon (Sykes 2006a; Crabtree 2012b:32; Dobney *et al.* 2007:135-5; Crabtree and Campana 2014). When Lyminge cattle epiphyseal fusion profiles are compared with other sites (Figure 6.5) it is clear that the Lyminge cattle are consistently surviving to older ages, with both phases having similar profiles to middle Saxon Ipswich and St Albans (Crabtree 2012b; Crabtree and Campana 2014). The difference between Lyminge Phase I and contemporary West Stow Phase I and II is particularly striking, with a much higher

---

[4] Mandible wear stage G – H following Halstead (1985) and Legge (1992).

quantity of cattle surviving into old age, suggesting that Lyminge had a higher percentage of older cattle being slaughtered only after they were no longer economically useful. Both the dental and epiphyseal fusion data for Lyminge Phase I indicate the presence of much younger cattle, with notable peaks in age at death at 0 - 1 months and 30 - 36 months. Thus, revealing that in Phase I a proportion of cattle were culled, presumably to be eaten on-site at prime meat age; although not in the numbers seen at other early Saxon sites such as West Stow (Crabtree 1990:69-75), and that breeding occurred on, or very close to the site.

Unfortunately, Kentish data from contemporary sites was too limited to establish if there was a regional trend in cattle mortality profiles, however, broad synthetic studies of early Saxon sites, such as Poole (2011) and Holmes (2014), suggest there was little specialisation in husbandry practices in this period, and generally early Saxon rural sites were relatively self-sufficient, with cattle being raised for meat, milk and traction (Crabtree 2012b: 40). Whilst a full range of ages are present in the early Saxon Lyminge cattle, the higher numbers of much older cattle hint at early beginnings for a focus on using cattle for traction.

Changes in the Phase II assemblage demonstrate a more emphatic move towards the exploitation of cattle for traction. There is a dearth of neonatal mandibles, and fewer very young cattle being slaughtered, suggesting cattle were no longer bred in close proximity to the site, or perhaps that the monastic community were increasingly provisioned with cattle, rather than rearing them in the immediate vicinity. This regime is paralleled locally at St Augustine's Abbey Canterbury (Jones and Randall 2015: 308). The higher numbers of adult, old adult and senile cattle in Phase II indicate (Figure 5.7) suggest that traction was the main focus for cattle husbandry, unlike in Phase I where a more mixed husbandry approach was employed.

This shift accords well with other high-status middle Saxon assemblages such as Wicken Bonhunt, Flixborough and Brandon (Crabtree 2012b; Dobney *et al.* 2007; Crabtree and Campana 2014), where cattle were not bred specifically for beef but rather eaten only when they were too old to continue being economically useful pulling the plough (Dobney *et al.* 2007:141). On the other hand, there are subtle but notable differences in the cattle husbandry at Lyminge when compared to contemporary sites. For example, neonatal and juvenile cattle are scarce at Wicken Bonhunt, Brandon and the *wic* sites York, (Fishergate and Coppergate), Ipswich and Lincoln, and the focus in both phases was on older cattle (Dobney *et al.* 2007:141).

The Lyminge cattle metrics are within a similar range to other early – middle Saxon sites (Figure 5.8). Initially it was postulated that there was a marginal increase in cattle size between phases at Lyminge, however this was not proved to be a statistically significant hypothesis likely due to small sample size (Figure 5.9, Figure 5.11 and Figure 5.12, also see Chapter 5, Table 5.14 and Table 5.15). Although there is a growing body of literature exploring changes in livestock size from the Iron Age to Roman period and the medieval to Early Modern period in England (Albarella 1997b; Albarella *et al.* 2008; Thomas *et al.* 2013), large-scale synthetic studies of Anglo-Saxon metrical data are limited (Holmes 2014a:77). Smaller, site or regional based, comparisons do exist for the Anglo-Saxon period (for example see; Crabtree 2012b, Sykes 2007a: 50-1, Armitage 1982, Bökönyi 1995), however, Holmes's (2014b) paper on livestock size in the Anglo-Saxon period, which draws on data from 42 published sites in Anglo-Saxon England, is only now starting to address the dearth of comparative metrical data studies for this period. Holmes (2014:82) noted an overall increase in the length and breadth of cattle bones between the early to middle Saxon period and a general trend for size diminution in cattle, sheep and pigs from the middle – late Saxon period (Holmes 2014a:82). The exception to this trend is Flixborough (Dobney *et al.* 2007), where unusually large cattle were recorded in the middle Saxon phases, and contemporary zooarchaeological evidence from medieval Ireland tentatively suggests a similar pattern (McCormick and Murray 2007:88, Holmes 2014a:77). However, there is no strong evidence to suggest that early-middle elite sites genuinely *preferred* large cattle (Holmes 2014a). Therefore, it may be postulated that perceptions of wealth lay in number, rather than size, of cattle, as there are a number of positives to be considered by having smaller cattle, such as being easier to corral and more cost effective to over-winter (Poole 2011:98; Holmes 2014a:87; 2014b). For example, O'Connor (2011:367) suggests that the smaller size of cattle during the Anglo-Saxon period is a result of there being no incentive to selectively breed stock for a larger size, as even a small cow can provide a considerable amount of meat of a manageable quantity to be salted, smoked and redistributed before spoiling. On another practical level, smaller cattle would have been easier to manoeuvre in plough teams working the fields (Banham and Faith 2014:89) and it would have been possible to keep larger herds of cattle if they were smaller.

Holmes (2014a:88) highlights the inherent issues that accompany working with Anglo-Saxon biometrical datasets, that such data is limited, affected by a large number of variables, and often biased by large datasets from one site (i.e. Flixborough). Unfortunately, due to small sample size, it is not clear whether the size increase at Lyminge represents a change in cattle breed selection, different site provisioning, or increased numbers of male cattle, but it is interesting that that the size increase accompanies the higher number of old cattle and the increase in traction pathologies (Figure 5.13 and Table 5.18). When considered alone, Chi-Squared testing suggests that the increase in traction pathologies and cattle size over time is not statistically significant (Appendix 3, Table 5). However, given that other aspects of Lyminge's archaeology attest to a shift towards intensive arable farming at the same period (Thomas 2016; McKerracher 2017), it is possible that these cattle trends are linked to increased ploughing activity and conceivably the introduction of heavy plough technology, for which there is uniquely early evidence from Anglo-Saxon Lyminge (Thomas *et al.* 2016). This is strengthened by evidence from the archaeobotanical record from the site, the archaeological discovery of a threshing barn in Phase II and the seventh century plough coulter (Thomas 2016). When considered holistically, these strands of evidence present the monastic community of Lyminge to be at the pinnacle of innovation in arable production and at the forefront of the agricultural intensification we see at this, and other contemporary high-status estate centres and monastic sites (Crabtree 2010; Sykes 2006a).

The social and economic importance of livestock, particularly cattle, during the Anglo-Saxon period is well established from written sources and linguistic evidence such as the Laws of Ine, which provides examples of *ceorls* combining forces to fence and protect meadows and arable land from wandering cattle (Whitelock 1979:403), and Edgar's code, which details instructions for the prevention of cattle theft (Whitelock 1979:67). The stack of cattle skulls recovered from building D2 at the royal site of Yeavering, Northumbria confirms the important role of cattle in feasting and ritual (Hope-Taylor

1977: 98-100, 325-32; Hamerow 2012:160) and the role of cattle as a unit of bargaining and exchange in medieval Ireland is well attested (Kelly 1997: 27-8 and 57-66).

Poole (2010:100) highlights that the role of cattle in Anglo-Saxon society has parallels to many modern tribal societies; where cattle are viewed as social valuables, an extension of the human kinship group, playing a central role in marriage, compensation payments, and feasting, and were often the focus of considerable symbolism (Barker 1999: 277; Abbink 2003; Comaroff and Comaroff 1990; Coote 1992; Russell 1998; Crate 2008). The discovery of a complete cow ABG interred with a high-status woman at the mid – sixth century cemetery at Oakington, Cambridgeshire, suggests that in some cases cattle may even have been valued as individuals, as with horses (Banham and Faith 2014:85; Fern 2010). Zooarchaeologists are sometimes guilty of overlooking the symbolic value of cattle, and livestock generally, because their bones are among the most common on Anglo-Saxon sites and many studies to date have focused purely on economic worth (Sykes 2014:2). In Anglo-Saxon daily life the symbolic and economic were inseparable. Humans had daily contact with these domestic species, unlike in the later medieval period when the rise of urbanism meant that activities associated with husbandry and production became organised in a more spatially distinct manner - with the raising and butchering of livestock taking place on the outskirts of the settlement, creating distance between the production of food and the consumer (Sykes 2006a:59, 64).

The examples of attitudes towards Saxon cattle highlighted above shed light on interactions with these livestock in both life and death. Although the direct evidence for cattle symbolism in Kent is very limited, it can be postulated that at Lyminge the symbolism of cattle lay in their continued importance to the economy of the site throughout a period of significant political, religious and social upheaval, and despite changing taste preferences evident in the decreased consumption of pork over time in favour of fish, fowl and eggs.

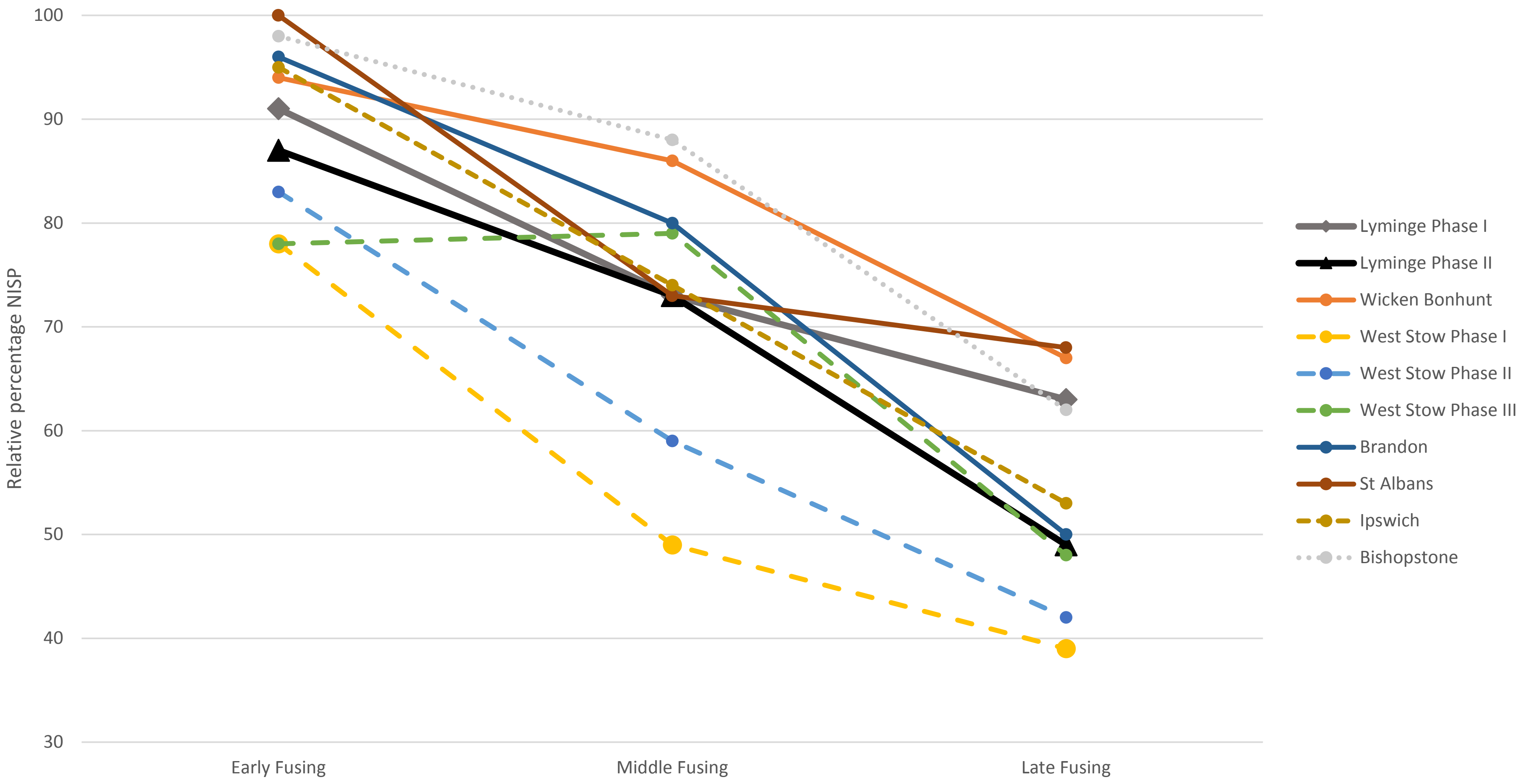


Figure 6.5: Age profiles based on epiphyseal fusion for cattle, comparing Lyminge Phase I and II to contemporary sites. Fusing ages follow Crabtree 2012b:34: early fusing includes those elements that fuse by 1.5 years, middle fusing are those that fuse by 3 years; and late fusing elements are those that fuse by 4 years. Data in Appendix 3, Table 23.

6.2 Caprines

Sheep husbandry practices changed significantly over the course of the Lyminge settlement occupation, while the main focus of animal husbandry in Phase I was pig and cattle, in Phase II the focus shifted to sheep and chickens. With the shift in taxa quantity also came a diachronic shift in herd age structure, revealing that although there was a broad mixed caprine husbandry regime in both phases, there is also evidence to suggest that there was minor specialisation in specific primary and secondary products in both phases.

Sheep were kept for a variety of purposes throughout the Anglo-Saxon period, including milk, meat, manure, wool and their skins were used for parchment and their horns were employed in crafts (Huntley and Rackham 2007:117; Crabtree 2012b:49). The Lyminge kill-off patterns (Figure 5.17) demonstrate that in Phase I the main focus of sheep husbandry was meat production, with a clear peak at six - twelve months and three - four years. The majority of the herd did not live beyond four - six years, a pattern also recorded at contemporary early Saxon sites such as: Northfleet and Springfield, Kent, (Grimm and Worley 2011:54), West Stow (Crabtree 1989), Quarrington (Rackham 2003) and Barton Court Farm, Abingdon (Wilson *et al.* 1986). Holmes's (2014:70) analysis shows that 60% of sheep on early Saxon sites were culled before reaching prime meat age, between one - two years old, and only a small proportion survived to six - eight years of age (under 10% of the Pennyland, Eye Kettleby and West Stow sheep assemblages, and under 5% of Lyminge Phase I).

Unfortunately, the sheep ageing data sets for other early Saxon Kentish sites were too limited to infer possible regional patterns in husbandry practices. The one available, albeit small, dataset (based on 20 ageable specimens) from Ramsgate, Kent, indicate a focus on meat production, with a cull peak at one - two years, and no lambs present (Hamilton-Dyer 2009:232). In contrast, the presence of neonatal lambs indicates that sheep were bred in close proximity to site and despite the focus being meat production in Phase I, sheep would also have produced at two clips of fleece before their eventual demise at three years of age (O'Connor 2010:12). Lyminge generally fits within the national pattern for sheep husbandry during the early Saxon period: namely a mixed husbandry approach, with relative self-sufficiency and a minor focus on prime meat consumption.

The Phase II husbandry demonstrates a stronger reliance on sheep for dairy and wool production, evidenced by the peaks in age at death at two - six months, six - twelve months, and a higher proportion of sheep surviving beyond their fourth year. Whilst the higher percentage of adult sheep is consistent with an intensification in wool production, the trend is not as pronounced as at other middle Saxon sites such as Brandon and Flixborough, where specialised wool production has been inferred from the absence of neonatal and very young lambs. The high number of adult sheep[5], and in Brandon's case, a high percentage of males[6] were likely wethers (castrated male sheep), who are known to produce the highest quality wool (Crabtree and Campana 2014: 300-301; Dobney *et al.* 2007:125-127). Therefore, while the higher number of adult sheep in Lyminge Phase II accords with an abundance of textile manufacturing equipment recovered from the Phase II settlement (Thomas 2013), caprine numbers are not high enough to indicate intensive wool production for export to other sites. Thus, whilst there was likely to have been some level of specialisation in wool production, it may have been limited to this site and settlements within its territorial hinterland.

The presence of very old sheep aged eight - ten years in Phase II complicates interpretation because it is widely held that the best quality fleeces are produced when sheep reach five - seven years (O'Connor 2010:12). This either suggests that there was little concern about fleece quality or, alternatively, that animals were also being kept alive as breeding stock and for their highly valued manure, which was prized above that of other animals due to its quality fertilising properties (Sykes 2006a:58). The pathological evidence certainly reveals an increase over time in pathologies associated with the more intense use of sheep for dairying in addition to ailments associated with

---

[5] Flixborough sheep peaks at age-of-death were between two – six years of age in Phase 2a and Phase 2b (Dobney *et al.* 2007:125- 127, and Figure 7.19). The major peak for age-at-death for Brandon's sheep was four – six years (Crabtree and Campana 2014:302).

[6] 59% of the flock were male (Crabtree and Campana 2014:300).

old age and access to poor grazing (Bartosiewicz 2013: 160 and 177-8; Clutton-Brock *et al.* 1990:6; Bartosiewicz 2013:160).

Once again, comparison data from contemporary middle Saxon sites in Kent is limited, therefore it is difficult to assess regional patterns in sheep husbandry. St Augustine's Abbey, Canterbury, provides the most directly comparable assemblage as it also shared a monastic pedigree. The St Augustine's caprine assemblage contained a small quantity of ageable sheep, with a range of ages present, from neonates, through to juveniles, and older animals that were four or more years of age. There were two peaks in age-at-death in the mandible data, one at six - twelve months and a second at two or more years of age. The epiphyseal fusion data indicated the emphasis was on sub-adults and adults, and the husbandry focus may have been on animals of optimum meat age (Jones and Randall 2015:309), directly in contrast with the Whitefriars assemblage. Jones and Randall (2015:309) summarise that a mixed husbandry approach was employed for the sheep, with a minor focus on breeding sheep for prime meat consumption. The Lyminge Phase II sheep herd is most similar to that of St Augustine's Abbey, with the presence of neonates and cull at six - twelve months. Similarly, the Lyminge epiphyseal fusion evidence suggests a decline in the numbers of sheep living longer than two and a half – three years of age which hints at the consumption of prime meat. However, it differs from the other Kent sites in the presence of high numbers of elderly sheep and the presence of pathologies associated with old age and malnutrition.

When compared with sheep husbandry patterns from contemporary middle Saxon sites, Lyminge essentially adheres to the broad national trends identified by Sykes (2006:67; 2007) and Holmes (2014:70). By the middle Saxon period numbers of sheep relative to cattle and pigs had increased on a number of sites, and there was a higher retention of adults maintained beyond three years on a number of sites including: Quarrington, Lincolnshire (Rackham 2003) Eynsham Abbey, Oxfordshire (Mulville 2003) Friend's Provident, Hampshire (Hamilton-Dyer 2005), Wicken Bonhunt, Essex (Crabtree 2012b) and St Peter's Road, Northampton (Harman 1979) with notable culls at prime meat age and at stage G (four - six years) and older (Holmes 2014a:70). Evidently the new role of sheep on the majority of sites, including Lyminge, was to provide secondary products, rather than meat (Sykes 2006a:58; Poole 2011:107).

When considered against the backdrop of the wider agricultural changes occurring at Lyminge in this phase the versatile sheep would have been an essential component in the sites economy. However, despite zooarchaeologically often being the first or second most abundant livestock on Anglo-Saxon settlements, contemporary historical documents record that sheep did not hold the same social or economic value as cattle or pigs, and their monetary value was consistently placed at a shilling (four or five pence), substantially below that of oxen (thirty pence), cows (twenty or twenty-four pence) or pigs (ten or eight pence) (Banham and Faith 2014:92). Only goats were placed below the value of sheep at two pence, according to the tenth century document referred to as *Dunsæte* (Pelteret 1995:86).

At Flixborough, it has been argued that the absence of neonatal sheep in the earlier phases indicates that the majority of sheep in this period were food rents or renders paid in return for favours, land from the residing Lord (Dobney *et al.* 2007:144). Likewise, at Bishopstone, Poole (2011:160) has argued that the sexing and metrical data indicate that some of the sheep herd were supplied from elsewhere, as food renders. At Lyminge it is clear that a percentage of the herd were raised in the local vicinity but given the charter evidence and prominence of Lyminge within the wider network of Kent it is likely that some of the sheep, and indeed other livestock, were supplied to the site on the hoof as food rents (Brooks and Kelly 2013:33-24; Faith 1997:1-14; Hagen 2010:226).

Sheep outnumber goat at Lyminge, as at most Anglo-Saxon sites excavated to date (Holmes 2014a; Poole 2011; Crabtree 2012b; Dobney *et al.* 2007:55), although goats were certainly kept at this, and other contemporary sites, for their hair, milk and meat (Hagen 2010:1010; Higbee 2009:285). Until recently it may have been argued that the dearth in goat was due to the difficulty in distinguishing sheep from goat morphologically, however, methods now exist that make it possible to distinguish select elements, which were employed here, (see Boessneck 1969; Zeder and Lapham 2010; Zeder and Pilaar 2010) and sheep continue to outnumber goats. Although the number of goats increases over time at Lyminge they were certainly not ubiquitous, however, the evidence indicates that their horns were valued, particularly in Phase II, where twenty-four horn-cores were discovered, six of which had butchery marks indicative of horn working. The presence of such high numbers of goat horns in relation to the rest of the post-cranial skeleton is a phenomenon noted at a number of sites in medieval England and has been discussed by Albarella (1999:873-874; 2003). Albarella (2003:80-81) tentatively suggests that the high numbers of goat horns in relation to low numbers of post-cranial elements, and particularly metapodials (the next easiest element to identify as goat after horn) can be attributed to a trade in goat skins between England and the Continent. Historically, the hide and skin trade in medieval England is well documented (for example, see Thomson 1981; Waterer 1956; Forbes 1957; Serjeantson 1989; Basing 1990; Cherry 1991; Shaw 1996). The lack of goat post-cranial elements on the majority of English sites suggests that this trade occurred overseas, supported by evidence from sites such as medieval Dorestad, Netherlands, which has similarly high numbers of goat horn-cores relative to goat post-cranial elements (Albarella 2003:81). Furthermore, in medieval Haithabu, northern Germany, whilst goat bones only make up 10% of the total sheep/goat numbers, up to 40% of the identified leather remains came from goat (Noddle 1994:119). The absence of metapodials may be attributed to reducing the weight and bulk of traded goods as much as possible, especially if they were indeed being traded overseas (Albarella 2003:81). Therefore, it may be inferred that the goat signature in Lyminge Phase II is evidence for a minor trade in goat skins with the valuable horns attached.

Historical documentation sheds some light on goats in this period, but only indicates their presence in the landscape with little to no suggestion of their use. A charter dated AD 822 attests the grant of an estate by Ceolwulf I, king of Mercia (and Kent) to Archbishop Wulfred, near Kemsing, Kent, which included woodland in the Weald, with food and pasture for swine, cattle and goats (Whitelock

1955:474-475, no. 83), indicating that goats are grazed alongside pigs and cattle as part of pannage regimes in woodland. Goats can be kept in rougher conditions than sheep, including on rocky terrain, and are able to survive on material too tough or sparse for sheep or cattle (Banham and Faith 2014:96). Thus, as part of a mixed husbandry regime it may have been pragmatic and beneficial to keep a few goats to browse in those patches of land where other livestock could not find sustenance. In the counties were livestock numbers were recorded in the Domesday Book it was recorded that sheep significantly outnumber goats, although this is a later source and Domesday numbers may not be accurate the general picture in both historical documentation and archaeologically is that goats were far fewer in number when compared to sheep (Banham and Faith 2014:95; Dyer 2004:25; Darby 1977:164).

6.3 Pig

The role of cattle and sheep for meat were clearly secondary to that of pork in pre-Christian Lyminge. One of the most noticeable zooarchaeological aspects of Lyminge in Phase I is the high proportion of pig, especially given that this species typically ranks third amongst the three main domesticates at most other sites of this period (Figure 6.1 and Figure 6.2). Pig displays a diachronic shift similarly marked to that of caprines, but in this case the trend over time is one of decline, specifically from 48% (NISP 922.8) in the Phase I assemblage down to 26% (NISP 607.6) in Phase II.

Unlike cattle, sheep and domestic fowl, pigs do not produce important secondary products, and were almost exclusively raised for their meat and fat, making them an investment with returns only being gained following slaughter (Albarella 2006:72; Banham and Faith 2014:98). The fecundity of pigs, and the ability to graze them on lower quality land than cattle and sheep made them a valuable asset, despite being relatively cheap to keep, and their meat lends itself well to long-term preservation through salting and smoking (Chapter 5) (Albarella 2006: 72-3; Wiseman 2000:37).

The mandible age-at-death profiles for the two phases of the settlement indicate that the majority of pigs were culled between the ages of 14 – 21 months, which is consistent with a meat-orientated regime, with an initial seasonal cull between at 7 - 14 months (Figure 5.26). This practice is documented in contemporary texts, such as the Irish Law codes, which detail the seasonal culling of female pigs at six - eight months at Martinmas (November 11th) (Kelly 1997:85); similarly, other texts record pigs being slaughtered in their second autumn (16 months) and in the following spring (at two years old) (Dobney *et al.* 2007:146).

As pigs were valued for their meat, it can be assumed that the majority would have been slaughtered before they reached skeletal maturity (*c*. two - three years old), as this maximises on food input and meat yield (Crabtree 1989:77; 2012:29). This does indeed seem to be the case at most early and middle Saxon sites; Holmes (2014:73-74) has found that when the data are considered as a whole, pigs are generally culled between mandible wear stages C (7 - 14 months) and F (27 - 36 months), after which they become skeletally mature. The Lyminge pig husbandry patterns broadly fit within this spectrum for both phases, with the majority culled by 27 - 36 months and a minority kept on until old age, likely as breeding stock. The focus on prime pork production at Lyminge is further emphasised by the number of males present (>60% of sexed specimens, NISP 38 Phase I, NISP 47 Phase II) and preference for meat bearing elements in both phases (Table 5.37).

When the data are scrutinised on a regional and site basis, Lyminge's pig assemblage stands apart from other sites. Phase I is notable for a more intensive pork husbandry pattern and a preference for younger pigs, indicated by the peak at death at the zero - two months (Figure 5.26) suggesting a penchant for suckling pig during this phase of the settlement. The fusion data (Table 5.35) also show that, while pig age profiles fall within the range of contemporary sites for middle and late fusing elements, there is a distinctly higher number of young piglets in both Phase I and II. This pattern differs to contemporary Kentish sites such as Northfleet and Springhead (Grimm and Worley 2011:56), Whitefriars, Canterbury Period 4 (Bendrey *et al. in prep*) and the middle Saxon St Augustine's Abbey, Canterbury (Jones and Randall 2015:309-310), where very small numbers of neonates were recorded and the focus of pig husbandry focus was on sub-adults and young adults, with a broad range of ages present. Such a pattern suggests pigs were slaughtered as required rather than being intensely raised for meat production. Similarly, further afield, Flixborough (Dobney *et al.* 2007), Brandon (Crabtree and Campana 2014) and Wicken Bonhunt (Crabtree 2012b) are notable for the low number of neonates and emphasis on adult pigs and seasonal culls, and, in the case of Flixborough (Dobney *et al.* 2007:146-7), a number of these pigs were past optimal age for meat production. Therefore, it can be argued that not only is Lyminge unique for the number of pigs in the pre-Christian settlement but also for the intensive regime of raising them for young and prime pork. It is likely that there are a number of factors behind this pattern which will be explored further in Chapter 9.

In addition to the diachronic decline in pig numbers at Lyminge, there is also a change in the way that pigs were husbanded, which correlates with other agricultural changes evident between the early – middle Saxon period. Despite higher numbers of immature – juvenile pigs in Phase II (Figure 5.26), generally there are lower numbers of neonates, as well as higher numbers of skeletally mature adults (aged 27+ months). At other sites with distinct Saxon phases, such as Whitefriars, Canterbury (Bendrey *et al. in prep*) and West Stow (Crabtree 1989:77), similar transitions in pig husbandry have been noted, although at West Stow the number of neonatal pigs increased, rather than declined, over time. Bendrey *et al.* (*in prep)* argue that the decline in neonatal pigs is not an absence of a particular age group indicative of site provisioning, but rather, that it represents a transition in husbandry techniques from sty/local husbandry to the practice of taking swine out to pannage, i.e. the seasonal movement of swineherds to pasture in woodland and feed on roots, acorns and beech mast (Albarella 2006:77). The mast season ran from August to December and was the richest season for woodland produce (Banham and Faith 2014:130; Wiseman 2000:33; Albarella 2006:77). Anglo-Saxon swine husbandry was likely heavily reliant on the exploitation of wood-pasture, and this is well attested to in Kent from both historical documentation (discussed in Chapter 3) and place name evidence (Hooke 2012:34). As discussed in Chapter 3, legal charters document Lyminge's access to, and control over resources in the Weald, and the practice of swine pannage in the Weald was well established in Kent by the seventh century, suggesting that this tradition likely pre-dated written documentation (Brooks and Kelly 2013:286, 294,326,332; Faith 1997; Thomas 2013). However, it should be noted that for parts of the year pigs may have been fed in other ways, such as on cereals and legumes, and also grazed on pasture land (Kelly 2000:83; Dyer 2003:126; Albarella 2006:77). Although, Wiseman (2000:44) notes that it is expensive to feed pigs on cereals and legumes and such resources would also have been required for human consumption. Recent studies have started to explore variations in pig husbandry in the early – late Medieval period through the analysis of carbon and nitrogen isotopes to infer pig diet (for example, see Müldner and Richards 2005; Hamilton and Thomas 2005; Hammond and O'Connor 2013b and Halley and Rosvold 2013). Such research shows that Saxon and medieval pigs were raised on an omnivorous diet, not purely plant based, but rather on a range of terrestrial and protein-based products, most likely gleaned from being fed on scraps while foddered in stalls (Halley and Rosvold 2013:5; Madgwick *et al.* 2012) in addition to being taken out to pannage. The Lyminge isotope results show that pigs largely had an herbivorous diet, although there is evidence for slightly elevated nitrogen signatures, and lower carbon in Phase I compared with Phase II which may tentatively suggest that the pigs were being foddered differently between the two phases. (Figure 5.50 and Figure 5.53). A similar phenomenon in a decrease in nitrogen levels over time was recorded by Hamilton and Thomas (2012:251) in the Dudley Castle pig assemblage. In this instance the shift in isotope values was attributed to the pigs having a more varied diet in the earlier phase, being allowed more freedom and therefore more access to animal-based protein (from worms, insects and human waste) which may have resulted in elevated δ^{15}N values (Hamilton and Thomas 2012). Perhaps in Lyminge Phase II pigs were managed more closely and given less freedom to roam, given that there were also smaller numbers of them and their somewhat destructive rooting nature (Hamilton *et al.* 2009).

The presence of neonatal pigs at some sites has been interpreted as evidence for sty husbandry, rather than moving pigs to pannage (for example see Bloodmoor Hill (Higbee 2009:299) and West Stow Phase I and II, (Crabtree 1989:77). It is unlikely, given the historical records and high numbers of pigs, that this was the primary method of pig husbandry practiced at Lyminge in Phase I. Landscape is an important factor in this scenario, as unlike Lyminge, both Bloodmoor Hill and West Stow were noted to have limited pannage options due to a dearth of woodland in the North Suffolk areas in which they are located (Crabtree 1989; Higbee 2009:299).

As Kent was one of the most heavily wooded regions of Anglo-Saxon England, boasting extensive forested tracts not only in the Weald but also in the Blean to the north of Canterbury, the natural environment lent itself to the pannage of pigs (Harrington and Welch 2014:43-5). The presence of Wealden 'dens' acting as swine pasture combined with their attendant transhumance routes (Banham and Faith 2014:154) has long been recognised as a key feature of the economy of Anglo-Saxon Kent. As documented in detail by scholars such as Witney (1976) and Everitt (1986), this pig-orientated regime had a long-term influence on territorial development and the structure of landholding within the region (Everitt 1986:34; Hooke 2012:34). The everyday human–animal, and in this specific case human–pig, interactions gave shape and meaning to the physical world in early Saxon Kent (Sykes 2014:99). While the physical environment of Kent was no less important than other regions of early medieval England in structuring the character of animal bone assemblages (Rippon *et al.* 2014:214, see also table 3), it is crucial to take into account the influence of cultural and social factors, especially in the case of Lyminge which has a distinctive identity in this period as a regional centre subsequently appropriated as a site of royal residence during the seventh century (Hamerow 2002:133).

The possibility that some of the Lyminge pigs were supplied to the settlements as food-rent or renders, cannot be ruled out. Pigs are an ideal food-rent animal given how cheap they are to raise and the array of meat products they provide (Sykes 2007a:42; Poole 2011:111-2). Indeed, pigs are included in the Kentish charters as food rent, for example, the will of Abba the Reeve (*c.*AD 835) mentions the payment of 100 pigs to Folkstone nunnery, one of the Lyminge's neighbouring religious institutions (Brooks and Kelly 2013:34). Therefore, it may not only have been through the consumption of their meat at events that status was conveyed, but also through the association of elite control over a wide array of resources, including land and tenant farms (Poole 2011:112).

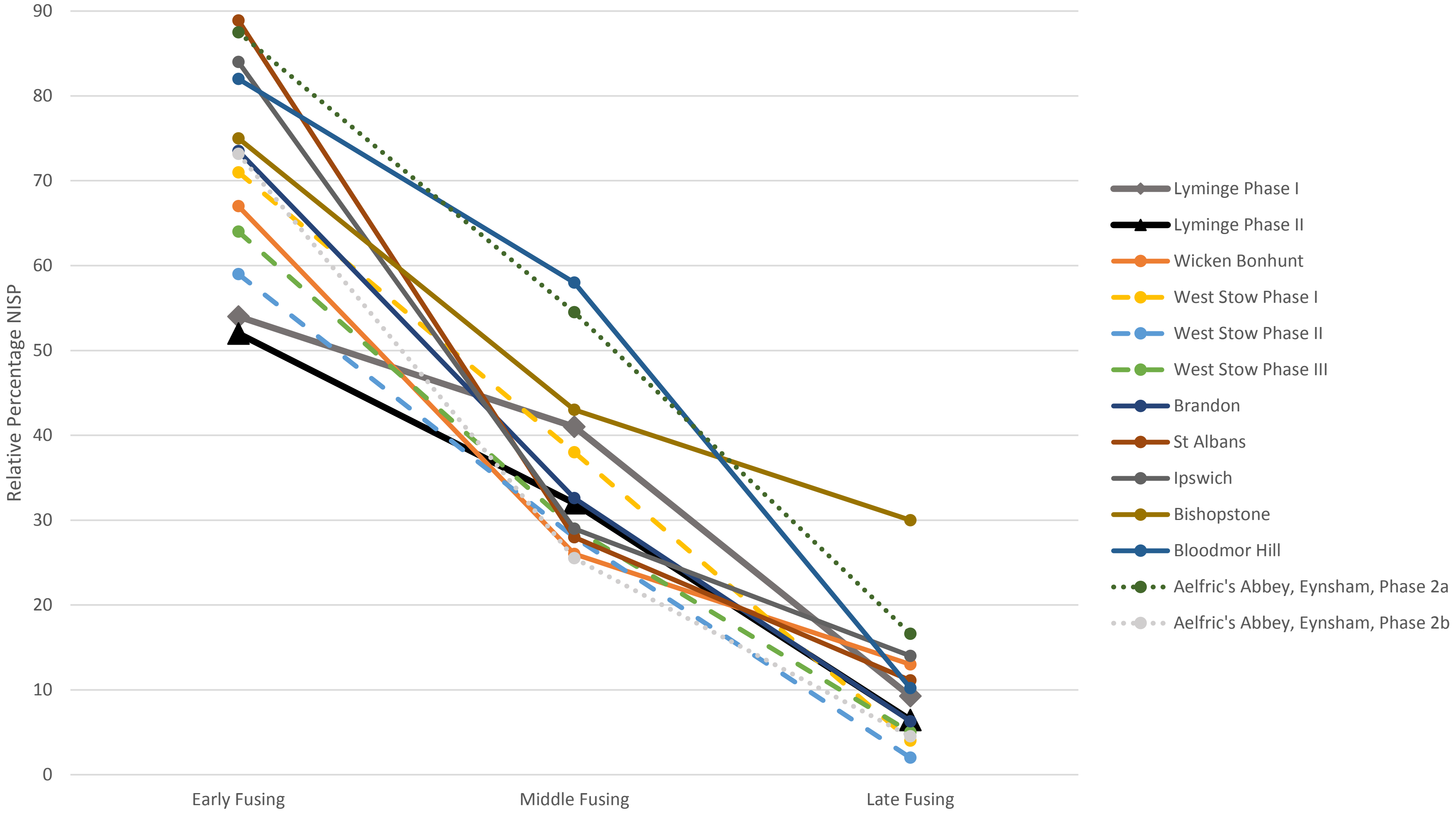


Figure.6.6: Age profiles based on epiphyseal fusion for pigs, comparing Lyminge Phase I and II to contemporary sites. Fusing ages follow Crabtree 2012b:30: early fusing includes those elements that fuse by 1 year old, middle fusing are those that fuse by 2 - 2.5 years; and late fusing elements are those that fuse by 3.5 years. Data in Appendix 3, Table 24.

6.4 Horses

Written and archaeological sources allude to the important role of horses in Anglo-Saxon society, both in the physical and imagined worlds (Fern 2010; Brooks 1989:62; Whitelock 1979:153; Pelteret 1995:86). In Poole's (2011) survey of published and unpublished zooarchaeological reports he has discovered that horses were ubiquitous on settlement sites throughout Anglo-Saxon England, regardless of associated status and phase (Poole 2013:322-3,Table 1). The number of horses present in the Lyminge assemblages is similar to that of contemporary sites (Poole 2013:323), however, as noted above, we cannot infer site-status purely by the occurrence of horse remains. Rather, an array of factors are likely to have determined the definition of a 'valuable horse', including colour, size, frame, gender, speed and personality (Cathers 2002:113-123; Neville 2006:143-153; Poole 2011:182).

Withers heights indicated that the Lyminge equids were between a modern New Forest Pony and a horse and were of a similar size to the horses recorded at Brandon and Eynsham (Crabtree 2012b:53; Mulville 2003:353). There were no pathologies to indicate that the Lyminge horses had been used extensively for riding or as beasts of burden (Bartosiewicz 2013), despite a number of them being over the age of three and therefore of an age that they could have been ridden, according to Welsh and Irish legal texts (Kelly 1997:94; Richards 1954:89). Certainly, the discovery of an elite gilt copper-alloy bridle fitting decorated with Style I ornament fitting in the Phase I settlement suggests that the inhabitants of Lyminge owned riding equipment, although this particular item may have been for ceremonial, rather than practical uses. While horses were used as transport in the eighth and ninth centuries evidence suggests that there were not employed as draught animals until the medieval period and it is likely that cattle served this function during the Anglo-Saxon period in Lyminge (Clutton-Brock 1976: 383; Smil 2000:125; Holmes 2014a:75).

Despite being few in number at Lyminge, horses nevertheless held substantial value, as indicated by the gilt copper-alloy bridle fitting (Thomas 2013:127 and figure 8) and the inclusion of an adult male horse burial in the sixth century Lyminge II cemetery, excavated by the Canterbury Archaeological Trust (CAT) (Richardson 2005:48; Thomas 2013:118-9 and figure 2). The presence of horses in burials had become a rare and exclusive elite practice by the sixth – seventh century (Fern 2010:134) and held associations with warfare and the ancestral myths of Hengist and Horsa, Hengist being the head of the Kentish royal dynasty (Fern 2010:134 and 143; Brooks 1989). Similarly, the Anglo-Saxon cemetery at Eastry, Kent, another recorded district centre, also contained a horse burial and accompanying bridle and harness fittings (Dickinson *et al.* 2011:72; Thomas 2013:119). Bede provides insight into the perceived value of different horses in the story of Bishop Aiden's humility in the act of gifting his 'excellent' and 'regally saddled' royal horse to a beggar (Campbell 1986: 96); as highlighted by Fern (2010:145), the royal horse is singled out by its regalia, suggesting there was a tradition of decorated horse bridle wear and saddles. The discovery of a high-status bridle fitting certainly suggests that the Lyminge horses fell within the category of 'regally saddled' royal horse.

It is commonly cited that, traditionally, horse meat was not eaten (Meens 2002; Jones 2007; Poole 2013:319; Holmes 2014a:109), however, the presence of butchery marks in both phases indicates that horses were consumed at the end of their working lives. The butchery is consistent with that recorded on other livestock remains at Lyminge, suggesting that horse carcasses were processed in a similar way. While there is no way to identify if horses were butchered for human consumption the practice of feeding horsemeat to hounds, particularly those associated with hunting, is not documented or identified in the zooarchaeological record until the post-medieval period (Wilson and Edwards 1993:54; Thomas and Locock 2000:89-90). Poole (2013:327) suggests that if this practice did occur in the Anglo-Saxon period one might expect there to be higher numbers of butchered horse elements on sites associated with hunting, however, the highest number of butchered elements comes from early Saxon rural sites and middle Saxon *wics*, therefore nullifying this argument.

6.5 Chickens

The abundance of chicken in both phases of Lyminge, particularly Phase II, represents one of the most striking features of the zooarchaeological assemblage. Chicken bones typically comprise 10 – 20% of early and middle Saxon assemblages (Holmes 2014a:43; Appendix 1 and 2), and as a result there has been little opportunity to explore their role in Anglo-Saxon husbandry and discussion has primarily focused on cattle, sheep/goat and pig. The volume of evidence in the Lyminge chicken assemblage from both phases allows for an unusually detailed picture of chicken husbandry on an Anglo-Saxon site (Appendix 1 and 2).

In Phase I the chickens contribute to 17% (NISP 417) of the livestock assemblage (Figure 5.3), 82% of which were adult (Figure 5.37 and Figure 5.38) and, as indicated by the metrical and sexing data, the flock were predominantly hens (Figure 5.39, Figure 5.40 and Figure 5.41) thus suggesting that the husbandry focus was egg production. A 'productive' hen could lay more than 100 eggs in a year; therefore, medullary bone might be present for at least one third of the year (Serjeantson 2006:137). Phase I had higher numbers of chicks, presumably natural fatalities, and lower numbers of juveniles compared with Phase II, suggesting that onsite husbandry occurred in both phases but was somewhat more common in Phase I (Serjeantson 2006:137). It is likely that the juvenile chickens represent a cull of excess cockerels before they reached sexual maturity.

The range of evidence in Phase II suggests that there was significant intensification in the husbandry of chickens for eggs over time. Although the chicken flock in Phase I were predominantly female, the ratio of female to male chickens in Phase II is overwhelmingly female (Figure 5.39, Figure 5.40 and Figure 5.41). Furthermore, there were 52 records of medullary bone in Phase II, whereas none was recorded in Phase I. When the Lyminge metrical profile was compared with other sites, both Lyminge and Flixborough have clear bimodal distributions; however, Lyminge is characterised by the greater number of elements with shorter lengths, indicative of an adult population dominated by hens, whereas the population at Flixborough is more balanced (Forthergill *et al.* 2017:5; figures 2-5).

The increase in chicken pathologies between the two phases, the comparatively distinct pathological profile and higher proportions of arthropothy than contemporary sites, in addition to the abundance of adult hens in Phase II provides conclusive evidence for a focus on chicken egg husbandry (Fothergill *et al.* 2017:6-8, table 4). The arthropothy recorded in the Phase II Lyminge assemblage included eight cases of mature adult tarsometatarsi with 'marginal, prolific osteophyte formation, eburnation, or pitting of articular surfaces, with a noticeable expansion of the proximal metaphysis and necrosis' (Fothergill *et al.* 2017:15); which can be more specifically interpreted as viral arthritis, as a result of the bony tissue around the proximal articulation having an inflammatory reaction (Fothergill *et al.* 2017: 15-16). In their comparative study Fothergill *et al.* (2017: 16) recorded pedal pathologies in the Phase II chickens that were unique to Lyminge, 53% of which affected the tarsometatarsi and phalanges (Figure 5.42, Figure 5.43 and Figure 5.44). In contrast the earlier Roman site Uley, Gloucestershire, had 20% pedal pathologies and contemporary Flixborough had 10% (Fothergill *et al.* 2017:16). This high incidence of pedal pathologies suggests that the Phase II Lyminge chickens were being kept in a damp environment in very close quarters, which would encourage the spread of viral infection among the flock, particularly in hens (Wang *et al.* 1998; Fothergill *et al.* 2017:20). The fact that there are so many chickens living in close proximity to one another is not a 'natural' behavioural trait of red jungle fowl[7], indicating that this is a behaviour that has been selectively bred for. DNA research reveals the timings that this selection process began, c.1000 AD, where there is evidence for a derived allele associated with selectivity bred chickens (Loog *et al.* 2017). These selected traits included reduced aggression towards its own species and an earlier onset of egg laying, that was not seasonal (Loog *et al.* 2017:1981-7). This shift correlates with documented changes in chicken and egg husbandry and consumption, to a more intensive approach (Loog *et al.* 2017:1981). It could be that husbandry practices, such as those at Lyminge, were

---

[7] Genetic evidence confirms that modern domestic fowl (*Gallus gallus domesticus*) derives from wild red jungle fowl (*Gallus Gallus*) and was first domesticated out of South-east Asia in the sixth millennium BC, and subsequently spread westwards through to south-east Europe (Yalden and Albarella 2009: 99-100, Figure 5.2). The earliest records for domestic fowl in the UK dates to the Early Iron Age (Poole 2010a:156).

responsible for the genetic shift in behavioural traits in domestic chickens and therefore, what we are seeing at Lyminge in Phase II is an early example of intensive chicken husbandry.

Evidence from the carbon and nitrogen isotopes[8] show that chickens were being raised on the same diet, therefore were roaming within a similar environment to one another (Figure 5.50 and Figure 5.51; Knapp *et al. in prep*). Chicken diet was largely omnivorous, with a few outliers from the Phase II assemblage which had a slightly higher protein/marine content to their diet[9]. This data suggests that some of the chickens were able to forage and graze on food scraps and rubbish heaps maintained within the domestic zone of the site, which had a sector for the organised disposal of kitchen waste, human cess and other domestic refuse (Thomas 2013: 129-131). The high quantity of fish remains recovered from these refuse pits during the Phase II excavations could have contributed to the elevated levels of protein/marine content in chicken diet (Reynolds 2015; Sykes 2014).

Given the high proportion of female adults in lay in the Phase II assemblage it is interesting that comparatively there were also higher numbers of juveniles in this phase (Figure 5.38). The lower number of fully adult males in Phase II may go some way to explaining this abundance, as this suggests that majority of cockerels would have been slaughtered while juvenile. Data from medieval sites shows that religious sites and wealthy households consumed higher percentages of immature chickens than other sites (Serjeantson 2006: figure 9.7). Although this data is from a later period, perhaps what can be inferred is that at Lyminge the higher number of juvenile chickens in Phase II is representative of inhabitants continuing to use certain meats as a way to infer status to the consumer, as it was possible that the demography of the community included both religious and secular lay people (Fiddes 1991).

---

[8] With thanks to Naomi Sykes (University of Exeter) and Holly Miller (University of Nottingham) for processing the Lyminge chicken isotopes.

[9] As indicated by higher levels of nitrogen. Nitrogen stable isotopes increase in line with trophic level of an organism. At a very simplistic level, higher nitrogen levels in an individual is associated with a diet more enriched with marine foods (Müldner 2009:329)

That chickens were increasingly and more intensively husbanded for eggs over time at Lyminge fits in the wider picture that emerges when the Lyminge livestock and archaeobotanical evidence is considered as a whole (McKerracher 2017). However, the unique nature of the chicken husbandry at Lyminge is particularly apparent when the Lyminge assemblage is compared with contemporary assemblages. Figure 6.7 and Figure 6.8 show the Lyminge relative percentage of chicken to other livestock in comparison with select contemporary sites from East, South and South East England to demonstrate the unusually high proportions of chickens in Anglo-Saxon Lyminge. The numbers of chickens at Lyminge is unparalleled in contemporary assemblages. In the early Saxon period Bishopstone (Gebbels 1977) is the only site to come marginally close to Lyminge in the number of chickens relative to other livestock (NISP presented in Appendix 1 and 2). Evidently in Phase I the high numbers of chickens at Lyminge represents a site based, rather than regional, preference for chicken meat and eggs because (from the available data) relatively few chickens were recorded on early Saxon Kentish sites.

In the middle Saxon period elevated chicken quantities are principally recorded on elite and ecclesiastical sites, including St Augustine’s Abbey, Canterbury (21.2%), Flixborough Phase 3b (16.5%) and Ælfric’s Abbey Phase 2b (12.3%). Sandtun also has a slightly elevated chicken numbers relative to other livestock (10.5%) which may be a result of the documented connections between Lyminge and Sandtun during this period (Brooks and Kelly 2013). The trend for elevated numbers of domestic fowl, particularly chicken, on middle Saxon ecclesiastical and high-status sites has been observed by Holmes (2014:42-3) and Sykes (2006:28) in broader synthetic studies of contemporary sites.

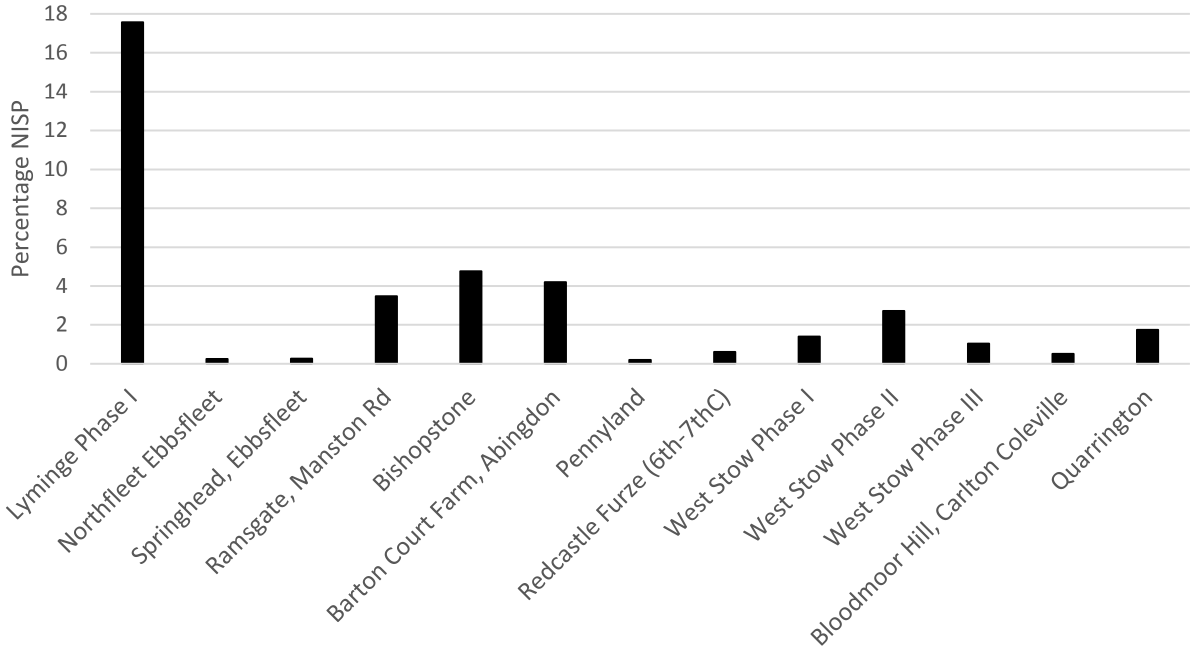


Figure 6.7: Relative percentage of chicken in the livestock assemblages at early Saxon sites (livestock include cattle, caprines, pigs, horses, chickens and geese). NISP data presented in Appendix 3, Table 25.

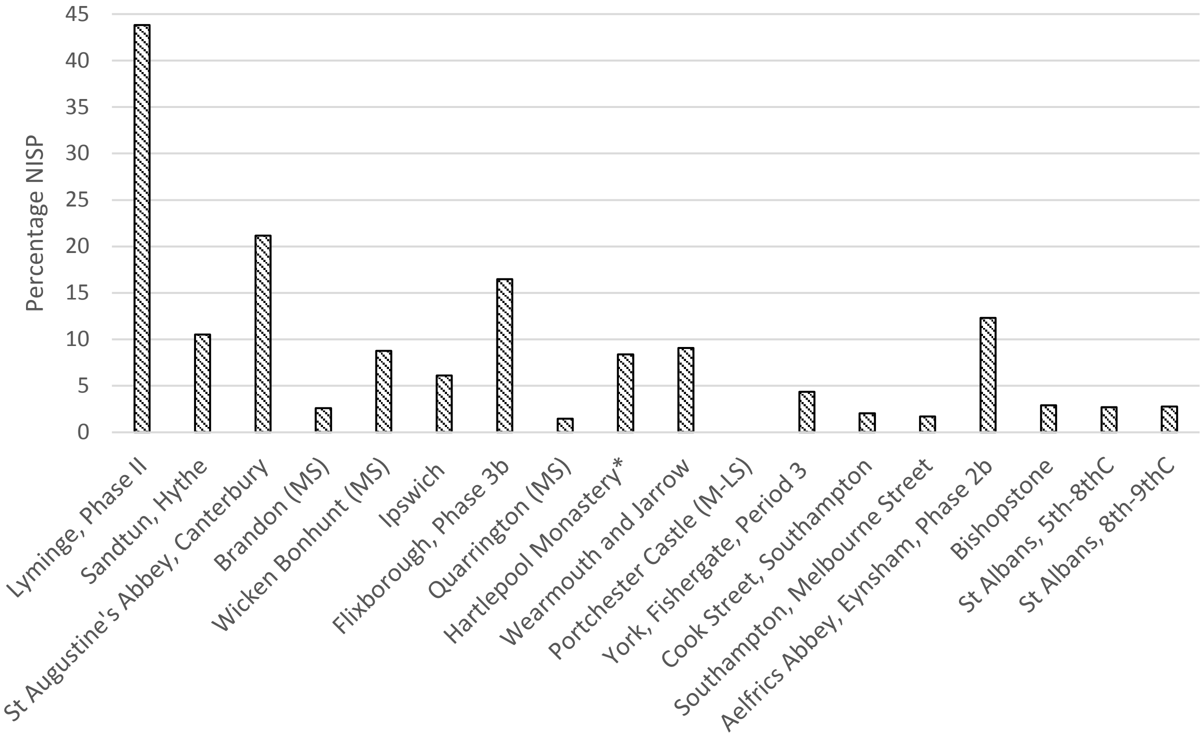


Figure 6.8: Relative percentage of chicken in the livestock assemblages of middle Saxon sites (livestock include cattle, caprines, pigs, horses, chickens and geese). NISP data presented in Appendix 3, Table 26.

We know from the Laws of Ine (688 - 694) that chickens were one of the animals included in food rents, or renders (Whitelock 1955:371). It is not possible to elucidate whether chickens were provided as food rents to Lyminge, in addition to being raised on site. It seems likely that at least a small proportion were brought to the site from elsewhere, given that Lyminge was an elite estate centre that probably exacted food rents from its tenant farmers (Faith 1997). The presence of the full suite of chicken skeletal elements shows that chickens were brought to the site whole, and the presence of high numbers of females reveals that the majority of chickens were brought to the site alive for their egg-laying capabilities (Serjeantson 2009:273).

Domestic fowl have a long history of special gendered associations within religious practices in Britain, dating back through the Roman period into the Iron Age, much of which was surrounding fertility and masculinity associated with cockfighting (Poole 2011; Sykes 2012; Sykes 2014:84). Arguably, cockfighting was one of the earliest reasons for keeping chickens, as cocks have a natural tendency to fight one another, and if encouraged will fight to the death (Serjeantson 2009:325). There is a strong association between the spread of domestic fowl out of South Asia, and cockfighting, for which there is archaeological and zooarchaeological evidence for in Roman Britain (Sykes 2014:85 and fig 4.3). A number of Roman chicken assemblages are dominated by cockerels, including York, Yorkshire, Dorchester, Dorset and Silchester, Hampshire (Sykes 2014:85), and the Romans are postulated to have adopted the practise of cockfighting from Ancient Greece, where it was well documented (Serjeantson 2009:325-329). Sykes (2014:86) demonstrates the strong link between cultural identity or gender alignment in societies where cockfighting is practiced, in addition to highlighting that it more commonly occurs in patriarchal societies, as it conflates sex and violence (Johnson 2006:1015; Geertz 1994; Marvin 1994; Serjeantson 2009:330). Historical sources inform us that the practice of cockfighting was forbidden to ecclesiasts in the early medieval period (Turner 1964:57), and the consumption of the flesh of cocks, ganders, bulls, rams, or bucks by pregnant women was forbidden due to associations with virility (Hagen 2010:79). Perhaps the need to create distance between humans and male chickens stems from an entrenched obligation within an increasingly Christian population to separate themselves from the animal symbolism so inherently associated with a warrior elite, evident in the iconography, and archaeology of early Anglo-Saxon England, and, indeed the early Saxon phase of Lyminge (Pluskowski 2010b; Richardson 2005:48; Fern 2010). Wihtred's Kentish laws reveal that ecclesiasts in the late seventh century travelled between dioceses, (Whitelock 1955:362) and likely imparted information and knowledge between religious settlements. Therefore, it can be argued that while there are no direct references to cockfighting, or possible symbolic associations held with chickens at this time in Kent it is feasible that such practices and beliefs may have been held in Kentish pre-Christian Saxon society and that these practices, following conversion, were prohibited or forbidden. As such, to encourage pious behaviour with ecclesiastical institutions such as Lyminge, fewer cockerels may have been allowed to grow to an age when cock spurs develop, hence the higher numbers of juvenile birds in this phase of the site.

The trend of higher numbers of chickens at ecclesiastical sites is often argued to be evidence for the Benedictine Rule (Ervynck 1997). The marked increase in chicken numbers overtime is mirrored by a similarly pronounced upturn in the consumption of marine fish, particularly deep-water species such as cod, as highlighted in Reynold's (2015) analysis of the Lyminge fish assemblage. Taken in combination, these patterns can be interpreted as the reflection of the influence of Christian attitudes on dietary practices, as might be expected at Lyminge as a high-status monastic milieu. As indicated by the decline in pig, however, Lyminge's dietary reorientation was more than simply a process of adopting new patterns of consumption but was also a process of turning away or creating distance from 'old' types of food perhaps tainted by lingering associations from the pre-Christian past (Fiddes 1991:5). Given that the period under review saw the widespread expansion of monastic culture across the Anglo-Saxon kingdoms (Blair 2005), it is unsurprising that the Rule of St Benedict is often invoked to explain and interpret excavated zooarchaeological assemblages of the eighth – ninth centuries, whether the site in question is a documented monastery or must be characterised, as in the case of Flixborough or Brandon, on purely archaeological terms (Dobney *et al.* 2007; Barrett *et al.* 2009; Holmes 2014a). The Benedictine Rule was one of the most influential monastic rules in north-west Europe during this period (Ervynck 1997:71). The Rule ordained strict periods of fasting and that brethren should ‘abstain from the meat of four-footed animals, except for the weak and the sick’ (Ervynck 1997: 73). Fish are postulated to have been a valuable source of protein during times of abstinence on the technicality that they were not quadrupeds (Frantzen 2014: 233), similarly, hen’s eggs would also have provided an ideal source of protein and iron in an otherwise strictly vegetarian diet (Hagen 2010:129). For example, Bede records that during the Lenten Fast Bishop Cedd ate one hen’s egg with a little bread and milk mixed with water each evening (Hagen 2010:129) and in Leechdoms, hen’s eggs were considered to be ‘light’ food and were recommended to be included within an invalid’s diet (Hagen 2010:129). There is, however, no evidence to suggest that Anglo-Saxon monastic houses followed a single, all-encompassing rule during this early period (Foot 2006:6). Indeed, it is likely to be the case that a greater proportion of pre-Viking monastic institutions adhered to a *regula mixta* – a selection of different traditions governing daily routines, not only for the ordained but also for secular guests (Foot 2006:52). The ways in which the community of Lyminge was affected by the Benedictine Rule, or *regula mixta*, and the strict periods of fasting is considered in more detail in Chapter 9.

6.6 Geese

The other domestic bird identified in both phases of Lyminge was geese. Geese see a decline in number over time, from relative percentage NISP 4.75% (NISP 19) of the domestic bird assemblage in Phase I to 1.07% (NISP 19) in Phase II. Other large-scale Saxon zooarchaeological data synthesis studies have revealed that generally there is a decrease in the relative percentage of geese to chickens between the early – middle Saxon period (Poole 2011:118; Sykes 2007a:28), suggesting that the decline in geese exploitation at Lyminge assemblage is not unusual. Due to the overlap in size between wild and domestic geese it is not possible, until the later Middle Ages, to distinguish wild and domestic on metrics alone (Bacher 1967; Serjeantson 2009:295). DNA analysis combined with metrical analysis of geese at Flixborough has confirmed the unreliability of metrics in species separation when used in isolation, as results revealed a wide size range, in addition to the presence of at least two species of domestic geese (Barnes *et al.* 1998; Barnes and Dobney 2000 Dobney *et al.* 2007:179). Although difficulties remain in separating wild and domestic geese remains, other wild animals are seldom exploited as a resource at Lyminge, suggesting that the majority of geese were domestic in origin (Poole 2011:117). The Lyminge isotope results suggest that geese were domestic and probably fed in a similar way to chickens, although this hypothesis is only based on the results of one individual so no firm assertions relating to goose diet can be drawn (Figure 5.50).

Domestic birds are comparatively rare on most Anglo-Saxon sites as recorded by Holmes (2014:42-3, Figure 3.3), on average they contribute less than 10% (NISP) of the cattle, caprine and pig assemblage. Low numbers of domestic birds on Anglo-Saxon sites, coupled with infrequent mention in Old English literature and contemporary documentation has meant that the majority of published works attribute very little importance to poultry in this period (Banham and Faith 2014:101-2). However, the significant number of domestic birds, particularly chickens, at Lyminge counters this argument, indicating that the role poultry played in Anglo-Saxon diet has been underestimated (Hull and O’Connell 2010:667).

Geese have been recovered in low frequencies from a number of contemporary Saxon sites in Kent, including Ramsgate, Sandtun and St Augustine's Abbey, Canterbury, and in all cases are second in quantity to domestic fowl (Appendix 1 and 2). Despite geese being few in number, their meat, feathers and eggs would have been valued (Crabtree 2012b:21). It is likely, given that the majority of Lyminge geese were adults that they were primarily kept for their feathers and eggs, rather than their meat. The feathers and down of geese are the 'fluffiest and have the smallest relative density', making them superior to the feathers of chickens or any other domestic bird (Serjeantson 2002:43-4; Serjeantson 2009: chapter 8). Feathers from live geese are believed to be superior, and geese can be plucked twice a year without having to kill them (Albarella 2005:253; Serjeantson 2002:44). Feathers and down would have been an invaluable source of warmth once sewn into clothing, and other textiles including bedding (Serjeantson 2009:299; Albarella 2005:255; Allison 2015:327). Well-healed damage to the feather insertion points on the shaft of a goose ulna, consistent with removal of secondary feathers from a live goose, was recorded at Anglo-Saxon St Augustine's Abbey, Canterbury. Therefore, although there is no direct pathological evidence for such a practice at Lyminge, it can be postulated that geese feathers were exploited at Lyminge also, given the recorded connections between Canterbury and Lyminge. Quills are made from the primary feathers of birds and have been used as writing implements since at least the sixth century AD (Serjeantson 2009:188). Geese feathers are one of the sturdiest (besides swan) for crafting quills from, which may explain the prevalence of distal wing elements in Phase II (Figure 5.45) (Serjeantson 2009:200). Literacy and learning were deeply embedded within minster culture and monastic institutions, and as such, sites were often viewed as ecclesiastical educational centres founded by a secular elite (Blair 2005: 74-7). Minsters were effective channels for the dissemination of ideas, evident from the number of preserved letters and charters written and witnessed in ecclesiastical establishments (Blair 2005:138; Whitelock 1955). Writing styli are an artefact synonymous with Anglo-Saxon monastic settlements and eighth – ninth century minster culture, although the argument has been made that they were also used for secular account-keeping (Blair 2005:208-9). The absence of metal styli from the archaeological deposits of the Lyminge monastic phase is intriguing, however, the preponderance of goose carpometacarpus in this phase suggests that goose feather quills may have been put to use as effective substitutes for styli.

Geese are mentioned in legal documents, such as the Laws of Ine 688-694, which records that the food-rent from ten hides was to include ten geese and twenty hens (Whitelock 1955:371). Unfortunately, none of the earlier, Kentish laws make reference to geese as food-rents in such a direct manner (Whitelock 1955: 364-372). However, that these laws were in place in Wessex during the seventh century may suggest that similar rules regarding food-rents were being enforced in Kent, therefore the possibility that some of the Lyminge geese were brought to the site as food-rents cannot be dismissed.

6.7 Summary

6.7.1 Phase I: fifth - seventh centuries

In terms of NISP counts, pigs were the most common livestock in Phase I and would have made one of the most significant contributions to diet, although beef would also have been commonly consumed along with cow's milk and cheese. Pigs held deeply embedded symbolic associations with the warrior elite and the wild during this period, and the evidence indicates that they were possibly considered as a feasting food in Lyminge, which will be considered in a more analytical way in Chapter 9. The higher proportions of pig at Lyminge subscribe to a regional pattern in elevated pig exploitation, suggesting that landscape and control of environmental resources had a leading role to play in livestock husbandry practices at Lyminge during this period. Cattle numbers remained relatively consistent between the two phases of the site, although mortality profiles and pathologies shed light on their changing role in husbandry regimes, and in Phase I a good number of the herd were culled at prime meat age. Chickens and their eggs also made a significant contribution to daily diet in Phase I, as chickens were very well represented at Lyminge when compared with other sites. There is little evidence for a 'regional pattern' of chicken exploitation for this phase, therefore the preference for chicken can only be described as a site-based preference for these birds, a penchant that was also evident in Phase II.

Caprines were a steadfast resource in early Saxon Lyminge, providing meat, wool and dairy, although their numbers are far fewer in terms of relative percentages. Historical sources suggest that they were valued below other livestock, and the zooarchaeological evidence from Phase I attests to this, although they are marginally better represented in contemporary Kentish assemblages. Horses, although few in number, held an important social role in early Saxon Lyminge evidenced by the find of a decorated horse mount which accords with the documented practice of decorating royal horses. The zooarchaeological signature of Lyminge Phase I broadly falls within the regional pattern of contemporary Kent, whilst still displaying its own characteristics. The diachronic changes in animal husbandry reflect a number of complex array of influences, and within a time of significant change the inhabitants of Lyminge found new ways of expressing power, evident in the Phase II assemblage.

6.7.2 Phase II: eighth - ninth centuries

Phase II saw the decline in pig consumption in favour of sheep, chickens and fish. The middle Saxon period is commonly associated with new husbandry practices on rural estate centres and ecclesiastical sites, geared towards specialised sheep husbandry for wool production (Crabtree 2010;2012). The evidence for the role of sheep is not so clear-cut at Lyminge, for whilst the ratio of caprines to the other main livestock does increase slightly in Phase II, the ageing evidence does not suggest that monastic husbandry practices were exclusively or mainly guided by highly specialised wool production. The ratio of the three main domesticates at Lyminge during this phase has much in common with contemporary Kentish sites, such as the coastal site of *Sandtun*, West Hythe, and Canterbury, both of which had recorded connections with Lyminge during this phase and both of which are caprine dominated (Brooks and Kelly 2013). It is difficult to make generalisations on the basis of such a small number of assemblages, but the Kentish data hint towards a regional shift in animal husbandry practices at this time influenced by an intensification in arable farming and a reduced emphasis on pastoralism driven towards meat consumption. This suggestion is supported by the bioarchaeological evidence, which indicates an increase in the production of cereal during this phase (McKerracher 2017). Although not statistically significant, the Phase II cattle assemblage does provide evidence for a potential correlation between elderly cattle and an increase in pathologies associated with traction. While the presence of cattle pathologies, such as those described, is often suggested to be evidence for traction, when considered against the other various strands of bioarchaeological and archaeological evidence it can be argued that Lyminge presents an example of cattle *actually* being used for traction, revealing that the monastic centre was at the forefront of agricultural innovation.

Chickens were the dominant species in the middle Saxon assemblage, with a focus on egg production, although their worth went far beyond nutritional value. In later religious institutions governed by the Benedictine Rule high numbers of chickens (and fish) have been attributed to evidence for fasting on the basis that chickens, and particularly their eggs represented a 'loop-hole' in dietary rules prohibiting the consumption of quadrupeds, due to only having two, rather than four legs (Ervynck 1997; Reynolds 2015; Sykes 2014). The relative percentage of chickens in this phase is unparalleled, although elevated quantities of chickens have been noted on other contemporary ecclesiastical sites. When seen in light of the large marine fish assemblage from Phase II the evidence indicates that, although there was not one documented rule dictating diet during this period, perhaps the Benedictine Rule had some sway over what was considered an acceptable food during periods of fasting. The possibility of the use of geese feathers as quills also highlights Lyminge as a centre of learning, further attesting to its role as a centre of power and innovation.

Chapter 7 The Wild

7.1 Introduction

In a farming society hunting, wildfowling and the exploitation of marine resources is not a necessity, it is a luxury bound up in power, identity and landownership (Sykes 2010:175). Research has shown that the 'symbolic and social' implications of hunting in farming societies far outweighs its value as a 'risk-buffering strategy' (Hamilakis 2003; Pluskowski 2010; Sykes 2011; Sykes 2014: chapter 3; Cartmill 1993; Bulliet 2005:125). This chapter will, therefore, examine the presence of wild mammals and wild fowl in the Lyminge assemblage to explore changing worldviews and the ways in which power and identities were expressed.

7.2 Wild Mammals

Red and roe deer were the most commonly recovered wild mammal in both phases of Lyminge; in numerical terms their contribution to the zooarchaeological assemblage was minimal, representing 0.35% (NISP 7) of the Phase I mammal assemblage and 1.18% (NISP 30) of the Phase II mammal assemblage. Countable red deer elements were only present in the Phase I assemblage, and in both phases' element representation was limited to antler, cranial fragments and metapodials. Similarly, roe deer elements were restricted to antlers, mandibles, scapula and metapodials, the high number of mandibles in Phase II being particularly unusual (NISP 27, MNI 14); suggesting that roe deer carcasses were broken down elsewhere, rather than this being a result of bias in identification methods (Table 5.48).

Hare, fox, badger and pole cat/pine martin were also recovered at Lyminge. Of these small mammals, hare was the only species to be recovered from both phases of the settlement. The range of wild mammals in the Lyminge assemblage act as ideal environmental indicators: red and roe deer indicate the presence of both upland, lowland and woodland in the local landscape (Sykes 2007a:94-5; Dobney *et al.* 2007: 67; Tufto *et al.* 1996:715), and pine-martin/pole cat, badger and fox suggest a range of habitats including; farmland, grassland and woodland (Corbet and Harris 1991; Smith *et al.* 2004:1092; Dobney *et al.* 2007:67-8).

The low representation of wild mammals in the Phase I assemblage mirrors national patterns. Very few early Saxon zooarchaeological assemblages contain an abundance of wild mammals and typically they make up less than 1% of the mammal assemblage (Figure 7.1, Appendix 1 and 2) (Sykes 2011: 328; Holmes 2014a: Figure 3.4). In a synthesis of data from a range of studies, Sykes (2014:55, Figure 3.1) has shown that the early Saxon period saw the lowest exploitation of wild mammals from the Mesolithic to the late medieval period. As at Lyminge, within the early Saxon assemblages featured in the synthesis, red deer were the most commonly recovered wild mammal, being identified on 64% of sites (Sykes 2014: Table 3.1), followed by roe deer which have been identified on 20.5% of sites, and hare on just 5% of sites. These findings are echoed in other large-scale Anglo-Saxon zooarchaeological syntheses, such as Holmes (2014:43). However, it should be noted that the comparative data for wild mammals and birds for the early Saxon period has only been recovered from rural sites, some of which had poor preservation, and in most cases the status of the site has been detailed as ‘self-sufficient’, with limited evidence for the centralised control of resources (Holmes 2014a; Sykes 2007a; Poole 2011). Therefore, the Lyminge early Saxon wild mammal and bird assemblage is unique in the sense that it is one of the first to be analysed from a settlement with large timber-hall architecture and rich material culture indicative of a high-status estate-centre (Thomas 2013).

There is an increase in the abundance of wild mammals in Phase II, although the species range narrows to red deer, roe deer and hare (Appendix 1, Appendix 2, Appendix 3 Table 28. Chi-square testing reveals that the increase in abundance is statistically significant (p-value = 0.0001), although it should be noted that this is a small sample size and therefore caution should be employed when drawing any firm conclusions (Appendix 3, Table 27). The greater number of deer recorded in the Phase II assemblage can be attributed to the abnormally high quantity of roe deer mandibles.

Anatomical patterning on contemporary elite sites also reveals a preponderance of cranial elements, particularly mandibles, for example, the deer assemblages from Wicken Bonhunt and Ramsbury are dominated by mandible fragments (Sykes 2010:179; Coy 1980; Crabtree 2012). The emphasis on deer mandible fragments from Phase II is in contrast to evidence from contemporary religious sites, which have an abundance of meat-bearing bones from the fore-limb, a large number of foot bones but very few mandibles (Sykes 2010:180).

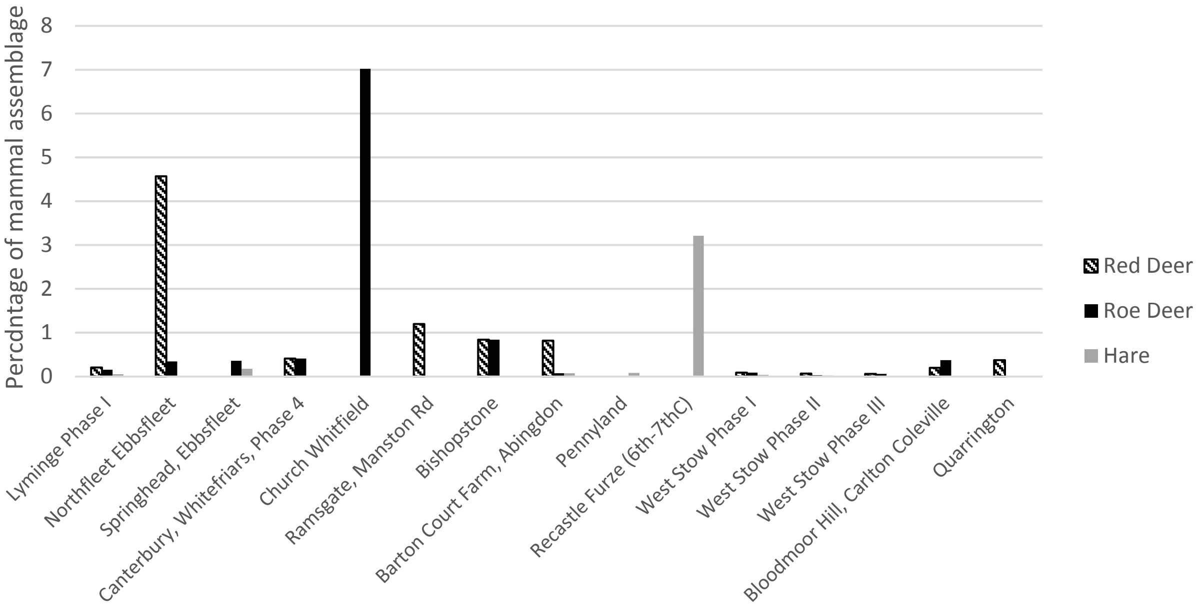


Figure 7.1: Relative percentage NISP of red deer, roe deer and hare based on total NISP count from each site's mammal assemblage comparing Lyminge to select early Saxon sites. Data in Appendix 1 and 2.

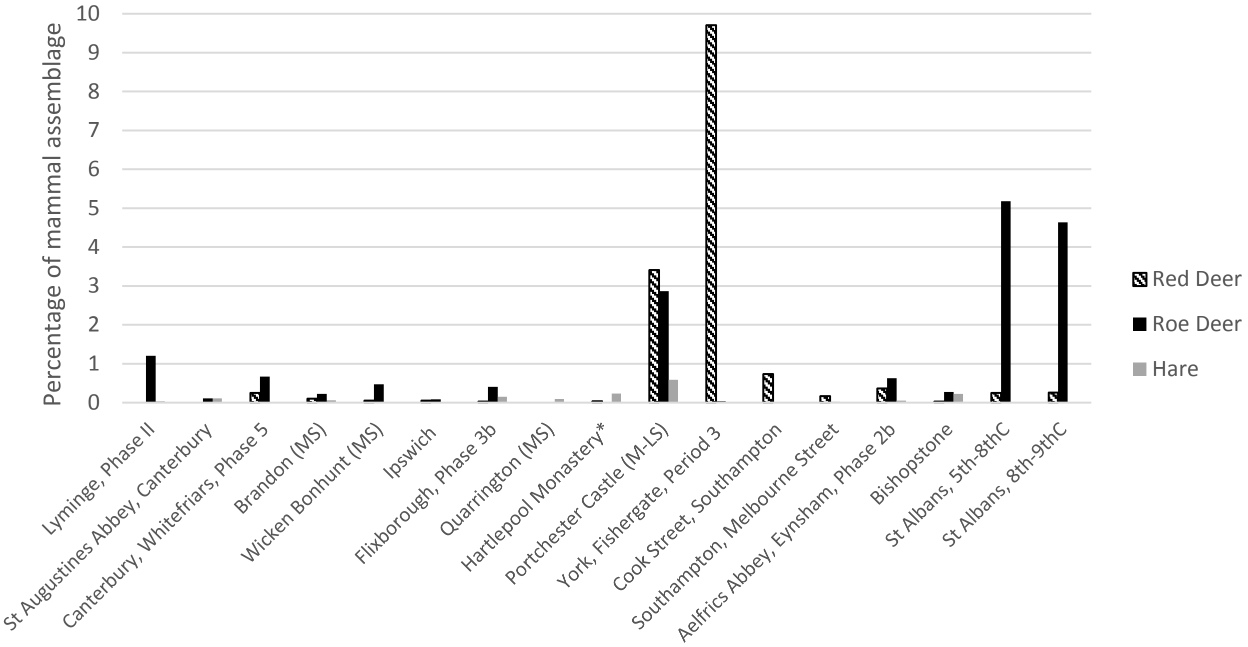


Figure 7.2: Relative percentage NISP of red deer, roe deer and hare based on total NISP count from each site's mammal assemblage, comparing Lyminge to select middle Saxon sites. Data in Appendix 1 and 2.

While venison played a minimal role in the diet and economy of Lyminge, it is likely that if and when it was consumed the act was imbued with meaning, discussed further in Chapter 9. If one were to paint a picture of landscape and environment in early Saxon England, based on the zooarchaeological evidence alone, the overall impression would be a landscape mostly devoid of wild fauna, from land, air and water (Sykes 2011:311; Poole 2011:232). It is possible that deforestation and overhunting during Roman period resulted in a decline in population of wild mammals (Poole 2011; Sykes 2014: 69). However, radiocarbon dated non-anthropogenic deposits of animal bones from Kinsey Cave, Yorkshire reveal that both lynx and brown bear were living in early Saxon England, as a lynx femur returned a radiocarbon date of AD 425 - 600, and a bear cervical vertebra the date of AD 420 - 610 (Hetherington *et al.* 2006:4; Hammon 2010:98; Sykes 2014:69). Wolves, beavers and boars were also part of the wild fauna in this period as evidenced by their inclusion in graves and place-names (Pluskowski 2006; 37-8; Pluskowski 2010:70; Aybes and Yalden 1995). The broader evidence indicates an awareness of the various wild taxa in this period, and yet settlement evidence reveals only the occasional capture and slaughter of wild fauna for human use (Poole 2011:238). In fact, wild taxa are more commonly recovered from grave contexts (both inhumation and cremation) than settlements, in the form of amulets and remains that infer the presence of pelts (Poole 2011: 238; Sykes 2011). Excavations at Spong Hill cremation cemetery inferred the presence of fox pelts from the inclusion of multiple fox mandibles within cremations, in addition to identifying the potential presence of bear skins from bear phalanges discovered in another two cremations (Bond 1996:84-5). Elsewhere, other animal elements appear to have been used as amulets for the deceased, including: bear claws, teeth from bear, wolves, beavers and boars, and even eagle talons (Bond and Worley 2006:97; Meany 1981; Poole 2011:238; Sykes 2011). It is not within the scope of this thesis to discuss the role of animals within funerary rites in detail. However, it is clear that wild animals played significant roles in Anglo-Saxon cremation and inhumation practices, one that arguably reveals the presence of an Anglo-Saxon pagan shamanistic belief system, also evident within zoomorphic decoration in contemporary art discussed below (Knox 2012:49; Bond and Worley 2006:97; Pluskowski 2010).

Place-names also provide a useful window into early Saxon perceptions of their physical environment (Gelling 1998:75-97). They reveal that wild and natural places such as fissures, hollows, openings in the ground, caves, ancient monuments, pools and wet places, were associated with supernatural creatures including elves, goblins or monstrous creatures, such as *Beowulf's* Grendel, who skulked at the bottom of a mere (Semple 2010:30; Sykes 2014:69). As in preceding periods, waterways held sacred associations, and such locations were the foci for the votive deposit of tools, riding gear, weapons and jewellery (Lund 2010:53). Such associations with the landscape may explain why hunting, fishing and fowling provided little sustenance for early Saxon communities, as the natural world was viewed as a liminal and sacred place (Sykes 2014:69). This makes the abundance of pigs in Phase I all the more interesting, as it suggests that while tracts of woodland were likely managed through coppicing and the pasturing of livestock, these landscapes maintained some aspect of the sacred liminal space (Hooke 2009; 2012). As it is likely that during the pannage seasons swineherds encountered wild fauna, including wild boar, hare and deer, and yet there was a conscious decision not to engage in the capture/hunt and slaughter of wild taxa on a frequent (or even infrequent) basis.

The incorporation of wild animals into the material culture and visual art of this period demonstrates the important symbolic role they played beyond the realm of economics and diet. Whilst these creatures appear in small numbers in settlement assemblages such as Lyminge, wild animals, particularly predators, prominently feature in artefact iconography (Webster 2010; Dickinson 2005; Adams 2015; Sykes 2011; Pluskowski 2010). The animistic ornamentation in fifth – seventh century material culture is argued to be an expression of cultural identity by an emergent warrior elite (Hedeager 2000), exemplified by sixth century shield fittings decorated with zoomorphic hybrid motifs of wild fauna that imbued the owner with status and protection, in addition to bestowing an association with a pagan cult, probably of Woden/Odin (Dickinson 2005:161-2). Animal motifs feature prominently in the seventh century metal work recovered from Sutton Hoo Mound 1 (Suffolk), many of which are represented by boars and hounds, classic animals of the hunt, in addition to hawks (Adams 2015:49). Although the physical remains of wild boar are absent in the Lyminge assemblage, and other early Saxon settlements (Sykes 2014: Table 3.), they figure heavily in the imaginative life of Anglo-Saxons. For example, boar is featured on the shoulder clasps from Sutton Hoo (Adams 2010:88-9), the Sutton Hoo helmet and Benty Grange (Northampton) helmet, in addition to appearing on a range of jewellery, harness mounts and swords from various contexts in Anglo-Saxon England (Hawkes 1997:316; Pluskowski 2010:113). As with animistic shield fittings, the presence of boar on a range of high-status personal effects arguably represents a 'flexible association with protection, aggression, fertility and identity' (Pluskowski 2010:113; Glosecki 2000:44). This idea that the qualities of an animal could be harnessed and transferred to the benefit of human hosts through their visual representation highlights the likelihood of shamanistic religious belief systems in pre-Christian Anglo-Saxon England, whereby animals could act as mediators with the supernatural world (Pluskowski 2010:115). Therefore, if wild animals were being associated with deities and/or held specific characteristics that could be tapped into and perhaps controlled, and the landscape in which they dwell was too considered liminal and sacred it is perhaps unsurprising that the wild was an under-used resource in the early Saxon period (Poole 2011:242).

With the conversion to Christianity there was an increase in wild mammal exploitation, evidenced at Lyminge and across other sites (Sykes 2011), suggesting a shift in attitudes towards wild and natural places. Sykes (2010:179) argues that this evidence suggests that by the middle Saxon period hunting was becoming less 'an act of subsistence, and more a social performance'. Furthermore, the treatment of the deer carcass reveals changes in the dynamics of social structure through time. Deer remains are found in relatively higher numbers on middle Saxon sites than early Saxon sites[10], and

---

[10] Such was the case at Collinbourne, Wiltshire (Hamilton-Dyer 2001), Eynesbury, Cambridgeshire and Wolverton Tum, Buckinghamshire (Sykes 2007a; 2011).

are generally recovered in greatest abundance on high-status sites (Sykes 2010:176-9). One way in which this observation is exemplified is in the abundance of roe deer mandibles in Phase II, a pattern more similar to contemporary secular elite sites than religious sites. It has been suggested that the anatomical representation identified on middle Saxon high-status sites is contrary to what may be expected, i.e. that an elite site would have a higher quantity of meat-bearing elements (Sykes 2010:179, Figure 3). The scarcity of meat-bearing elements at these elite sites (including Lyminge) becomes more interesting in contrast with the pattern at contemporary rural sites, which often have higher quantities of meat-bearing deer elements (Sykes 2011:334; Sykes 2010: figure 3). Therefore, the lack of meat-bearing elements on high-status sites may reflect the practice of meat redistribution, whereby the animal carcass was butchered and distributed, with particular parts of the body being gifted to specific groups or individuals (Sykes 2007a:44; Sykes 2010:180).

Contemporary evidence from early medieval Ireland suggests that there was a tradition of meat redistribution at elite sites, most often during communal feasting events (McCormick 2002:26; Roach 2013), as a way to utilise the considerable amounts of meat produced by a single carcass (Sykes 2010:180). Obviously, the patterns at Lyminge need to be interpreted within their regional context, but the evidence from contemporary early medieval Ireland provides a useful example of the ways in which deer carcasses may have been treated during this period. These contrasting anatomical patterns of deer elements between sites are arguably evidence for the beginnings of social-based variation in deer exploitation which is much more clearly visible by the late Anglo-Saxon – medieval period (Sykes 2007a; Sykes 2011: 187). Particularly when it is considered that in these later periods the gifting of the head of an animal was bestowed with special status (Marvin 2006:20).

Given Lyminge's history as an estate centre and its secular patronage as a Christian minster, it is certainly a compelling argument that communal feasting events, and the practice of deer carcass distribution would have enabled the settlement to continue to act as a focal point in the community. The prevalence of roe deer in the Christian phase is particularly noteworthy given that it has been observed that this species is well represented on other contemporary ecclesiastical sites (Sykes 2007a:68). Why ecclesiastics more eagerly consumed the meat of roe, rather than red deer, is not clear but it is of note that a similar pattern has been recorded on fifth - ninth century monastic settlements on the Continent (Sykes 2006b: 168, figure 11.5). Sykes (2006b:168) highlights the significance that in both Britain and France clerics were granted rights of chase, namely the permission to hunt lesser quarry such as roe deer and hare. Another possible explanation lies in the symbolic association roe deer held as being chaste, faithful and abstemious creatures as recorded in later medieval sources (Cummins 1988:89; Sykes 2007a:68; Poole 2011:278). By the eleventh century Wulfstan's *Canons of Edgar* specifically prohibited clergy from hunting stating that, "it is not fitting for a priest to be a hunter or a falconer or gambler, rather he should busy himself with his books as suits his vocation. The law says that if a man in orders goes hunting, he must forgo meat for a year if he is a Cleric, two years if he is a Deacon, three if he is a Priest and seven if he is a Bishop" (Hagen 2010:139).

Hunting and the subsequent breaking down and redistribution of larger quarry were both activities laden with social meaning in the early *and* middle Saxon periods at Lyminge. While numerically the contribution that wild mammals make to the zooarchaeological assemblage is small, it is clear that their presence went beyond economics and calorific contribution to diet. When viewed in light of the other zooarchaeological and artefactual indicators of status in both phases, the social and symbolic worth of wild mammals, and particularly deer, is arguably significant. The diachronic rise in numbers of roe deer and the anatomical representation skewed to cranial fragments provides evidence that the redistribution of meat was one way in which the order and structure of the religious and lay community may have been maintained during the middle Saxon period. As well as reiterating Lyminge's important role as a central pillar of the local community, suggesting that hospitality was an important aspect of daily life in the minster settlement (Foot 2006).

7.3 Wildfowl

The range of wild birds at Lyminge is unusual, but what is most apparent are the very different patterns of wildfowl exploitation between the two phases. In Phase I there is a higher number of raptors and the prey species associated with falconry, indicated by the number of Charadriiformes, whereas in Phase II there is a much smaller number of raptors and no falcons but a higher percentage of Corvidae and Columbidae. Passerine species were present in single figures in both phases, which, arguably is to be expected given the presence of fields and hedges in the local vicinity (McKerracher 2017).

The number and range of wild bird species in Phase I is uncommon for this early period, in part because there is so little comparable data from contemporary assemblages. In Holmes' (2014: 174) synthesis of the most common wild birds it is noted that whilst wild birds are recorded on seventeen early Saxon sites, they are present in very small numbers and on the majority of sites the species are limited to ducks, pigeons, wader and coastal birds. The wild birds recovered from early Saxon sites in Kent only included corvid, passerine and duck species (Hamilton-Dyer 2009; Grimm and Worley 2011). Apart from Lyminge, West Stow is the only site to have a similarly large range of wild birds for this period, with an assemblage comprising passerines, common and herring gulls, swan, wild ducks and geese, crane, grey heron, plovers, snipe, lapwing and buzzard (Crabtree 1989:27). Although the variation in wild birds at West Stow could be attributed to large sample size, it is of note that wild birds only contribute to 0.07% percentage NISP of the total assemblage (Crabtree 1989; Poole 2011:237).

The Lyminge Phase I assemblage is also particularly notable for the variety of raptors present including, goshawk and peregrine falcon as it is possible that these birds were kept as hunting birds and to date there has been little archaeological evidence for falconry in England before the middle Saxon period (Cherryson 2002; Holmes 2014a:54). Cherryson (2002: 313) highlights the innate difficulties in identifying falconry in the archaeological record when using skeletal evidence alone to distinguish between wild and captive birds. Cherryson (2002:313-4) argues that it is possible to assess the wild versus captive status of raptors and falcons through the consideration of other factors including, environment and the incidence of other wild, prey species in the zooarchaeological assemblage. As such, although the discussion below is based on very small numbers of wild birds, or in some cases on individual fragments from a particular species, when this data is considered against the environmental evidence and the confirmed presence of associated quarry species it can be suggested that the Lyminge birds of prey were indeed captive birds.

A recent study of falconry in Anglo-Saxon England by Wallis (2017) emphasises the exceptional nature of the Lyminge Phase I raptors, highlighting that Lyminge has the earliest records of both peregrine falcon and goshawk in Anglo-Saxon England (Table 7.1). In many ways, the wild avian signature in Lyminge Phase I is arguably more similar to middle Saxon high-status sites in the array of species present, than to contemporary early Saxon sites. Until the study of the Lyminge assemblage, the two earliest records of peregrine falcon were from middle Anglo-Saxon England, one from Brandon, Suffolk, (Crabtree and Campana 2014:309) and the other from Ramsbury, Wiltshire (Haslam 1980; Dobney and Jaques 2002). The natural habitat of peregrine falcons is cliffs and uplands (Crabtree and Campana 2014:309) and the presence of associated prey species strongly suggests that the Lyminge specimen represents a captive bird employed in falconry. Similarly, to date, the earliest record of goshawk was from the middle Saxon *wic* site of Ipswich, Suffolk (Dobney and Jaques 2002: 10). Unlike peregrine falcon, goshawks may have been more readily available in early Saxon England, as they are suited to a more diverse array of habitats including open moorland and dense woodland (Wallis 2017: 415). Serjeantson (2009: 323) argues that where more than one species of raptor is discovered in the same deposit, it suggests an anthropogenic explanation for their being there, specifically their use in falconry. The presence of goshawk and peregrine falcon fragments within the same pit, in addition to the recovery of remains from a range of suitable quarry from Phase I, suggests that these birds may have been kept and used as hunting birds.

Site	Raptor Remains	Remains of Quarry	Reference
Alfriston, East Sussex	Eagle		Griffith and Sazman 1914
Barton Court Farm, Abingdon	Sparrowhawk	Small birds and hare	Holmes 2014a; Wilson *et al.* 1986
Cadbury Congresbury, Somerset	Buzzard	Hare	Holmes 2014a
Pennyland, Milton Keynes, Bucks	Red kite	Small birds and hare	Holmes 2014a; Holmes 1993, Ashdown 1993
Spong Hill, Norfolk	Unidentifiable raptor phalanges		Dobney and Jaques 2002
West Hestlerton, N. Yorkshire	Buzzard	Crane, ducks, pigeons, corvids	Dobney and Jaques 2002; Richardson 2001
West Stow, Suffolk	Buzzard	Cranes, heron, small birds, duck and hare	Crabtree 1989
Lyminge Phase I	Goshawk, peregrine falcon, buzzard, red kite	Cranes, wader species, ducks, pigeons, corvids, hare	Knapp (2017)

Table 7.1: Faunal evidence for raptors and associated traditional quarry from early Saxon sites (c. fifth - late seventh century), adapted from Wallis (2017:414, Table 1). All sites are a 'rural' site type.

Site Type	**Site**	**Raptor Remains**	**Remains of Quarry**	**Reference**
Ecclesiastical	Aelfric's Abbey, Eynsham	Buzzard	Game birds, hare, small birds, crane	Mulville 2003
Ecclesiastical	Hartlepool Monastery, Durham	Sparrowhawk	Small birds, duck, pigeon, hare	Huntley and Rackham 2007:113
Ecclesiastical	Lyminge, Kent	cf. sparrohawk	Small birds, duck, pigeon, corvids, heron, hare	Knapp 2017
High-status	Brandon, Suffolk	Peregrine falcon, buzzard	Bittern, crane, pigeons, ducks, small birds, hare	Crabtree and Campana 2014:309
High-status	Flixborough, North Lincolnshire	Buzzard, red kite	Corvids, duck, pigeon, small birds, game birds, heron, crane and hare	Dobney *et al.* 2007
High-status	North-Elham Park, Norfolk	Sparrowhawk, buzzard, red kite	Small birds, ducks, corvids, pigeons, hare, heron and crane	Dobney and Jaques 2002; Holmes 2014a
High-status	Wicken Bonhunt, Essex	Buzzard	Game birds, corvids, duck, small birds, crane, hare	Dobney and Jaques 2002
Industrial/high -status	Ramsbury, Wiltshire	Peregrine falcon, red kite	Duck, snipe	Haslam 1980; Dobney and Jaques 2002
Rural	Lot's Hole, Downey, Berkshire	Red kite		Holmes 2014a
Rural	Wraysbury, Berkshire	Goshawk		Coy 1987; Cherryson 2002:310
Trading site	Flaxengate, Lincoln	Goshawk, Peregrine Flacon		O'Connor 1982; Cherryson 2002:310
Trading site	Fishergate, York	Buzzard, red kite	Small birds, corvids, duck, pigeons, hare	Dobney and Jaques 2002; Holmes 2014a; O'Connor 1991
Trading site	Ipswich, Suffolk	Goshawk	Small birds, pigeon, ducks, crane, corvids	Cherryson 2002:310; Dobney and Jaques 2002; Crabtree 2012b
Trading site	Maiden Lane, London	Sparrowhawk		Holmes 2014a
Trading site	Peabody site, London	Red kite		Holmes 2014a
Trading site	Sandtun, West Hythe, Kent	Red kite	Small birds, pigeons, corvids, crane	Hamilton-Dyer 2001
Trading site	Southampton, Hampshire	Buzzard	Corvids, duck	Holmes 2014; Bourdillon and Coy 1980

Table 7.2: Faunal evidence for raptors and associated traditional quarry from middle Saxon sites (c. eighth - ninth century), adapted from Wallis (2017:417, Table 2).

The wild avian signature alters significantly in Lyminge Phase II, where there is a reduction in species variety from 23 species found in Phase I, to 14 species in Phase II. Overall, wild birds make a smaller contribution to the faunal assemblage in Phase II, suggesting that with the conversion the attitudes towards the exploitation of wildfowl changed. There is some indication for the continuation of hawking, although in a much-reduced fashion, with only one raptor fragment (cf. sparrowhawk) and far fewer bird species attributed to remains of traditional falconry quarry. The presence of a single raptor specimen does not in itself provide good evidence for hawking, however, the recovery of hare, and small birds suggests that they may have been caught in this way (Poole 2011:253; Willis 2017:416). Sparrowhawk has also been discovered on a handful of middle Saxon sites, including Hartlepool Monastery, Durham, North Elham, Norfolk, and Maiden Lane, London (Wallis 2017; Table 2; Holmes 2014a: Table 3.5).

A higher number of curlew were reported in Phase II, and unlike in Phase I, heron was identified. The occurrence of heron in Phase II is intriguing for two reasons; to date Ardeidae species (heron and bittern) have only been recorded on the middle Saxon elite settlements, Brandon, Flixborough, Wicken Bonhunt, North Elham, Coppergate, York and Castle Mall, Norwich, which has led to the suggestion that the distribution of Ardeidae species is a reflection of the social dynamics of hawking (Dobney and Jaques 2002: Table 2; Sykes 2005:94-5). Heron was likely one of the most common long-legged marsh birds during the pre-Conquest period, therefore the fact that it is not ubiquitous across all assemblages from the middle Saxon period is significant and lends further weight to the argument that this bird was hawking prey (Sykes 2005:94; Oggins 2004:17). Perhaps the continued presence of wild birds associated with hawking indicates that the monastic settlement hosted elite secular guests, providing appropriate entertainment for them. Alternatively, given that minsters were essentially aristocratic institutions (Foot 2006:240) it may be that following the Christian conversion, the art of hawking took some time to diminish and eventually stop, to be in line with the advised monastic behaviour (Foot 2006:240-248).

Prummel (1997:335-6) outlines a number of criteria for identifying falconry and hawking in the archaeological record including; paraphernalia associated with falconry, a bird of prey ABG either discovered alone or included within a human burial, disarticulated remains of raptors within the rest of the faunal assemblage, a preponderance of female hawks, and the presence of quarry species. The Lyminge wild avian assemblage, particularly that identified in Phase I, fits at least two of these criteria, as disarticulated raptor remains are present in both phases, as are the remains of quarry species. Female hawks have also been identified in Phase I using the comparative material at the Natural History Museum, Tring, although it might be a stretch to argue that there was a 'preponderance' of female hawks in the Lyminge assemblage given the very small sample size.

Hawking is first documented in Europe in the fifth century and there is no textual or archaeological evidence to indicate that it was practiced before the Byzantine period (Prummel 1997:335; Wallis 2017:411). Therefore, it has been assumed that hawking was introduced from the Steppe areas during the Migration period in the third - fourth century AD and was adopted by various Germanic tribes by the end of the fifth century (Hicks 1986:162; Prummel 1997:335). A number of richly furnished sixth century graves incorporating the remains of hawk and other hunting milieu have been excavated in Central Europe and Sweden, indicating that falconry was introduced to parts of north-west Europe from the east during the sixth century and was a sport associated with the upper echelons of society (Vretemark 2013:384; Tyrberg 2002:230; Wallis 2017:413).

In addition to the archaeological evidence, the depiction of hunting and hawking, and of predatory birds and their prey, within the visual art of this period suggests that elites sought to align themselves with predatory birds for their associated behaviours, in order to legitimise themselves symbolically as predators, at the top of the metaphorical food chain (Pluskowski 2010:117; Wallis 2017:413; Dickenson 2005).

The sixth century Germanic law codes support the archaeological evidence for falconry, as they detail the penalties for the theft or killing of someone else's hawk, with a hierarchy of fines that vary according to the different types of hawk and the size of the prey that it could catch (Hicks 1986:162; Prummel 1997: 335; Wallis 2017:413). Furthermore, by the early sixth century various councils were beginning to legislate against clergy owning falcons or horses (Oggins 2004:37-8; Hicks 1987:162). The overarching concern for hawks as property is argued to be evidence for the widespread practice of falconry in central and parts of western Europe by the sixth century (Oggins 2004:37; Wallis 2017:414).

The archaeological evidence suggests that early Saxon England was part of this 'falconry culture' visible on central Europe and Scandinavia (Table 7.1 and Table 7.2) (Wallis 2017:414). To date the recovery of raptors in early Saxon England has been limited to those species detailed in Table 7.1, to which the Lyminge evidence now adds further detail, with the benefit of being from radiocarbon dated contexts, regarding the practice of falconry on an early Saxon high-status site.

Buzzards and red kites are not birds commonly considered to be suitable birds for hawking (Holmes 2011:113). It is often suggested that their inclusion within an assemblage may be a result of the scavenging behaviour of these birds that would have brought them close to areas of human habitation (Mulkeen and O'Connor 1997:442). However, there is an argument to be made that the presence of buzzard and red kite on Anglo-Saxon sites should not only be attributed to their association as scavengers, and therefore pests, on a settlement site. Buzzards and red kite are both native species to the UK, and in the middle Saxon period occur on similar sites to those where the 'typical' falconry birds are recorded with their associated prey (i.e. high status, ecclesiastical and trading sites) (Holmes 2014a: 56). Likewise, in the early Saxon period there is evidence that buzzard and red kite are both recovered with the prey species commonly associated with hawking (Table 7.1). It has been suggested that both species were used for hawking either directly, as with buzzards, or as a prey/decoy bird, an end to which red kites were employed in the later medieval period (Dobney and Jaques 2002:17-8). Buzzards are known as 'beginners birds', used in the training of a novice before introducing the more challenging goshawk. Although not as effective as goshawks, buzzards are easily trained and can be effective falconry birds, capturing both small and medium sized birds (Wallis 2017:415). Despite there being no direct historical references to the use of buzzards or red kites in hunting, it is plausible that they were captured and trained for such pursuits (Holmes 2014a:56).

The earliest documentary evidence of falconry in England features in a letter from St Boniface to King Æthelbald of Mercia AD 745 - 746, which alludes to the gift of a hawk and two falcons to the King as a sign of good-will (Dobney and Jaques 2002:15). Slightly later, (*c.*AD 748 - 755) King Æthelbert of Kent wrote to St Boniface requesting two falcons specialising in the capture of cranes, alluding to hearsay that Boniface would not have difficulty procuring such falcons, and stating that hawks were rare in Kent (Oggins 2004:38; Kylie 1911:157). However, in a letter from St Boniface to the Archbishop Cuthbert, Boniface objects to members of the clergy engaging in the recreational aristocratic sport of hunting with dogs or keeping hawks and falcons (Dobney and Jaques 2002:15). Therefore, it is interesting that King Æthelbert assumed Boniface dwelt within a community in which he could easily procure large enough falcons to bring down a crane (Foot 2006:243; Dobney and Jaques 2002:15). In addition to suggesting that by the eighth century the sport of falconry was well established in Kent and other Anglo-Saxon kingdoms, these references also imply that access to hawking birds was highly restricted. Furthermore, if falcons and hawks were a traded commodity between the Continent and Anglo-Saxon England this might explain the recovery of hawks at trading sites (Table 7.2).

The faunal evidence certainly indicates that by the middle Saxon period falconry was practised at a higher number of sites, and increasing social distinction in this phase is shown by the growing diversity of wild avian species linked with falconry at high-status and ecclesiastical sites (Table 7.2) (Holmes 2014a:56). This is mirrored by the increased representation of predatory birds in contemporary Style II animal art, especially those images of hawks clutching prey in their talons (Wallis 2017:418). The depiction of predatory birds on Style II metalwork from Kent, such as the early seventh century gold, filigree and garnet bird trisckele pendant and gold filigree miniature buckle from Faversham, Kent (Marzinzik 2013:122-23), in addition to the discovery of two seventh century copper-alloy ‘falconry’ bells from high-status graves in Kingston Down, near Canterbury, (Wallis 2017:424) suggests that the sport of falconry was well established by the seventh century in Kent. Although limited, the evidence from Lyminge indicates that falconry may have been practised in Phase I and potentially also in Phase II, although to a lesser extent. Regardless of the small sample size, the evidence from Phase I is particularly significant, as it represents the earliest discovery of peregrine falcon and goshawk fragments in Anglo-Saxon England.

Wallis (2017) makes a case for the likelihood that falconry was introduced to Anglo-Saxon England from the Continent via East Anglia, as evidenced by the archaeological remains of raptors, the depiction of raptors and their quarry in Style II animal art, and the presence of small copper-alloy bells which arguably were included within a falconer’s apparatus. Following a wide contextualisation of evidence Wallis (2017:409-429) concludes that ‘falconry and falconry birds played an important social role in the emerging kingdom of East Anglia’, and that given the concentration of evidence in East Anglia, hawking was probably *first* introduced to East Anglia from across the North Sea, rather than to Kent from the Continent. The sport of hawking and falconry were activities inextricably linked to status and the emerging elite of this period, therefore, at Lyminge it can be argued that hawking was used as an expression of elite predatory power linked with social, political and religious alliances. As Wallis (2017) argues, falconry and falconry birds may have played an important social role in the emerging kingdom of East Anglia, but perhaps they were already playing an important role in Kent.

7.4 Summary

Hunting and wildfowling in the Anglo-Saxon period were activities deeply rooted in symbolism, status and power, and their role in society went beyond that of subsistence. In the early Anglo-Saxon period there is sacred reverence for the wild, with minimal exploitation of wild fauna and birds and across the majority of sites (Poole 2011:242). From the beginning of the middle Saxon period there is a shift in attitudes toward the wild, possibly triggered by the introduction of Christianity and a burgeoning social hierarchy, in which settlement status became more defined through the consumption of material culture and a change in diet (Chapter 6). Nationally, these changing attitudes are reflected in the differing representation of deer elements on settlement sites (Sykes 2010), likely representing communal feasting on high-status sites and the redistribution of venison to the lower-levels of society. Furthermore, by the middle eighth century there was a much more enthusiastic adoption of hawking and falconry on elite sites (Wallis 2017).

Shifting perceptions of wild resources can be inferred from the evidence at Lyminge that reflect the wider social changes that occurred with the conversion to Christianity. Some of the earliest evidence for falconry and hawking has been recovered in the Phase I assemblage, with an array of falcons, hawks and their prey (albeit in small numbers), revealing that wildfowling was a part of the high-status milieu at Lyminge, in keeping with the large timber halls and rich material culture excavated from the site but unusual when compared to contemporary sites. The zooarchaeological evidence for wildfowling at this site adds to research, such as Wallis's (2017), who suggests that wildfowling and hunting played an important social role in the emerging kingdoms during this period.

The anatomical representation of deer in Lyminge Phase II suggests that venison played an increasingly important role in defining status through communal feasting and the likely redistribution of meat (Sykes 2010; 2011). As a minster, Lyminge continued to play a focal role in the community, and the elite secular patronage of the site is evident in rich material culture, the continued practice of falconry, albeit in a much-reduced fashion, and the more intensive exploitation of agricultural resources (Chapter 6). Clearly, with the conversion there was a shift in attitudes to the natural resources and the wild, with the inhabitants of Lyminge expressing power in new ways, also evident in the new beginnings of deep-sea marine fishing in this phase as discussed by Reynolds (2008; 2015).

Chapter 8 Companion animals: Dogs and Cats

8.1 Introduction

Although dogs and cats are found in much lower frequencies than domesticated animals on Anglo-Saxon sites, their significance and role should not be underestimated. It is likely that both species were valued for hunting, killing vermin, and providing furs and hides (Poole 2011:178). Recent research reminds us that in addition to these functional/economic roles, these species were also valued by Anglo-Saxon communities, and especially the elite, for emotive reasons as a source of companionship (Poole 2010a: 150; Poole 2011:177; Sykes 2014:132-148; Crabtree 2015: 979; Knapp *et al. in prep*). There are a multitude of complexities to reconstructing the relationship between humans, dogs and cats during this period, because the value attributed to these species permeated the functional and the emotional (Poole 2015:872). This chapter will draw upon the Lyminge evidence to explore these complexities.

In the last couple of decades there has been a rise in the social exploration of pet-keeping in pre-and post-domestic societies which document the evolution of such a culture (for example, Tuan 1984; Serpell 1996; Franklin 1999; Mullin 1999; Bulliet 2005; Herzog 2010; Sykes 2014). It should be noted that the term 'pet' has different connotations geographically, culturally and through time (Poole 2015:872). For the purpose of this research, I follow Serpell and Paul in defining pets as 'animals…kept primarily for social or emotional reasons rather than for economic purposes' (1994:129).

The extent to which pet keeping can be inferred in the Anglo-Saxon period is debated (Poole 2015; Sykes 2014) and will be explored in this chapter. With the spread of Christianity there was a growing concern regarding familiarity in human-animal relationships, and a need to reinstate human-animal boundaries, affirming man's dominion over nature as outlined in Genesis 1:27-8 (Serpell and Paul 1994; Hurn 2012:100-1; Menache 2000:44-5), such attitudes may have reduced the proclivity of pet-keeping during the pre-medieval and medieval period (Menache 1997:24). St Augustine's writings taught that animals were ‘irrational, soulless and only created for Man’s utility, consumption and domination’ (Clark 1998; Fern 2010:148), thus it may have been acceptable for Christians to show care towards animals, but not to express the same level of affection towards them as they would toward people (Fern 2010:148). There are a multitude of complexities to reconstructing the relationship between humans, dogs and cats during this period, and in many cases these animals may have been perceived both as functional and companion (Poole 2015:872).

8.2 Dogs

The remains of dogs are present in small numbers in both phases of Lyminge and increase in number over time, and a further indication of the presence of dogs is indicated by low levels of dog gnawed skeletal material in both phases. In Phase I the MNI indicates the presence of just one individual, whereas in Phase II the MNI represents 23 individuals, due in part to the large number of neonate ABGs. The quantity of unwanted puppy litters certainly reveals that there were dogs breeding on site, and the killing and deposition of these litters among general settlement refuse raises questions concerning attitudes towards dogs in this period, as discussed below.

The Lyminge stable isotope results show that the both the δ^{13}C and δ^{15}N values of the two Phase II dogs had a higher trophic position compared with the other animals and, are of a similar value to that of the Phase II human, although these inferences are drawn from very small sample sizes and, in the case of the human, a single sample, therefore caution must be applied when interpreting this data (Figure 8.1). The two dog isotope samples were derived from neonate puppies from two litters of puppies in separate, stratigraphically distinct contexts and were part of the sample of bones sent for radiocarbon dating at Oxford Radiocarbon Accelerator Unit (OxA). These samples were selected based on their position within the pit in which they were given to best date the feature. Given that both of these dogs were neonates, culled before they were able to suckle and wean from their mothers, there is a level of debate surrounding whether their levels of δ^{13}C and δ^{15}N reflect their mothers diet or not (Jenkins *et al.* 2001:336; Beaumont *et al.* 2015). Predominantly in humans, carbon and nitrogen isotope studies have shown that it is possible to investigate the duration of breast feeding and weaning in past populations (Schurr 1998; Lewis and Gowland 2007; Beaumont *et al.* 2015). Some studies have argued that human infants have the same isotope value as their mother at birth because the mother is the source of all nutrition for the foetus during pregnancy (Katzenberg *et al*. 1996; Jay *et al.* 2008; Beaumont *et al.* 2015:450). Beaumont *et al.* (2015:443-451) have found that various factors during pregnancy, including physiological and environmental factors, can influence the infant's levels of ^{15}N and therefore at birth there may be some difference between the mothers and infant's ^{15}N levels, for example if the mother suffered significant and sustained illness during pregnancy this could elevate foetus ^{15}N values. In most cases infant ^{15}N levels only increase after birth as the infant is breastfed, breastmilk is enriched in ^{15}N therefore there can be a trophic level shift of between 2 and 4 ‰ between the ^{15}N values of the infant compared to the mother (Schurr 1998: 330; Beaumont I 2015:442). It is possible to deduce the time at which children are weaned based on declining levels of ^{15}N (Schurr 1998:330).

The nature of the context in which these dogs were recovered, whereby two separate litters of new-born puppies were deposited (MNI 6 and MNI 3), suggests that the dogs were culled shortly following birth and before they had a chance to suckle or wean. Their levels of δ^{13}C and δ^{15}N therefore most likely reflect their mothers' diet - if we assume that the mother had a healthy pregnancy and did not suffer sustained physiological or environmental stress (Jenkins *et al.* 2001:336; Beaumont *et al.* 2015). Given the carnivorous and scavenging nature of dogs the elevated δ^{13}C and δ^{15}N values of these samples may be expected. As there were abundant marine fish recovered from the middens on this site it can reasonably be assumed that scavenging dogs also had access to this food source on a regular basis, enough so to contribute to the elevated δ^{13}C and δ^{15}N values seen in the two-Phase II samples. Bone stable isotope analysis cannot detect the occasional consumption of particular foods, such as fish, (Müldner and Richards 2006:229) therefore, an argument can be made that for such a signature to occur dogs would have been allowed continuous access to the middens or have been preferentially fed fish in large quantities on a regular basis (Poole 2010b:156). Either way this signature suggests that dogs were treated in specific and different ways to other animals on the site, and, like the chickens, were allowed more freedom to roam and, as such, have closer contact with humans. Such evidence gives rise to the possibility that closer human contact resulted in favouritism of certain individual animals which gives rise to the question, whether Anglo-Saxon attitudes towards the natural world would have permitted pet-keeping (Poole 2010b:156; Serpell and Paul 1994; Thomas 2005; Hurn 2012; Sykes 2014). It is challenging to identify pet-keeping in the zooarchaeological record; and it has been maintained that it is not until the mid-late Saxon phase, when there is greater metrical variation in dog types, including small 'lap dogs' from sites such as Ipswich, that the concept of pet-keeping can be considered (Crabtree 2015:979).

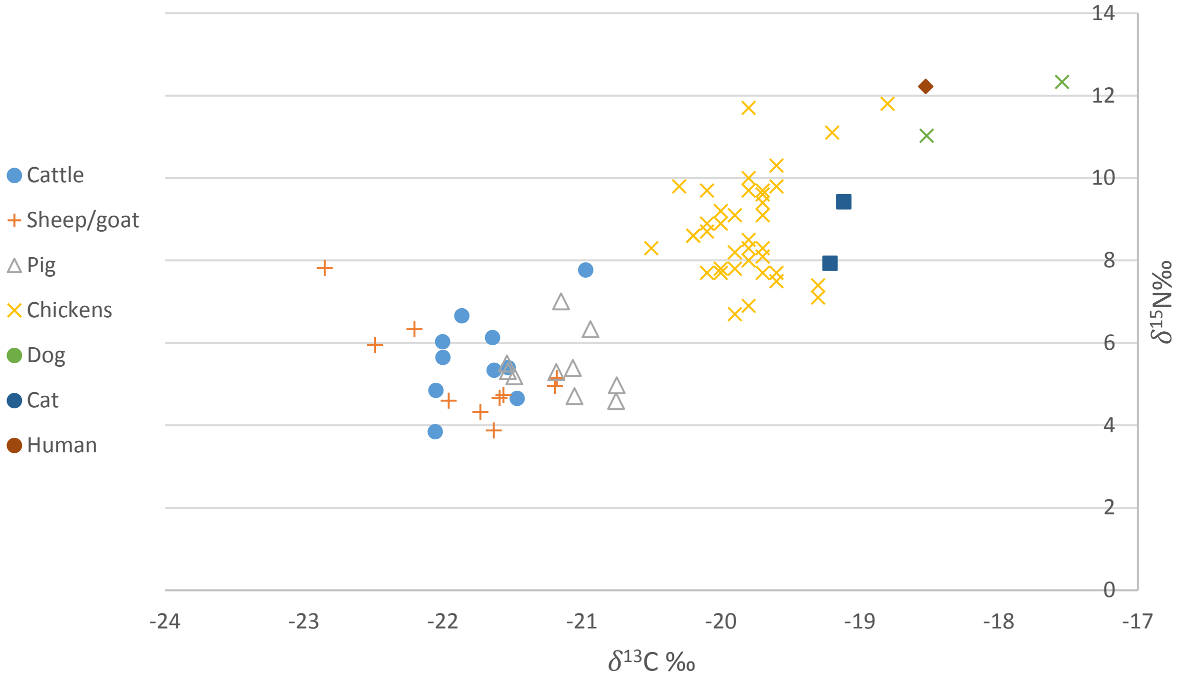


Figure 8.1: Phase II (eighth-ninth centuries) stable isotope values of δ^{13}C and δ^{15}N by species. Graphs contain data from the pilot study, radiocarbon dated bones and the chicken project data. Raw data in Appendix 3, Table 17.

Generally, dogs make up less than one percent of early Anglo-Saxon faunal assemblages and are found on a myriad of site types (Appendix 1 and 2). In contrast with Lyminge, Crabtree (1989:62-67) notes that dogs are ubiquitous at West Stow, two of which were excavated ABGs, both of whom died young, aged fifteen and seven months respectively. The fifteen-month-old dog had a fractured tibia, which had healed prior to its death, in addition to a depression fracture on its skull, which may have contributed to its death (Crabtree 1989:62). Based on the juvenile age of these dogs and the presence of trauma to the skeleton, Crabtree (2015:977) argues that dogs in West Stow were not treated as pampered household pets, but rather lived a hard-working life sometimes resulting in early death. Metrical analysis of the West Stow dogs reveal that are 'large, straight-limbed dogs, about the size of a modern ‘German Shepherd’ breed (Crabtree 2015:977). There is little published metrical data from comparison sites with which to compare this early Saxon data set from West Stow, certainly Lyminge did not produce any measurable elements from the early Saxon assemblage. Dogs of a similar size were recorded on the middle Saxon site Brandon (Crabtree 2012b:53) and the later Saxon site of Bishopstone (Poole 2010b:151). Such dogs would have been suited to a range of activities including hunting, herding, and the guarding of livestock and of the settlement (Harcourt 1974:168).

The high incidence of neonatal dog ABGs in Phase II is striking and there is little contemporary data to compare such a practice with, however, it is likely that the actions behind these deposits were deliberate and meaningful. Hamerow (2006:8) highlights that the relative proportion of dog ‘special deposits’ in Anglo-Saxon[11] contexts is disproportionately high when compared with their representation in zooarchaeological assemblages. The data in Hamerow’s (2006:13) study show that 50% of special deposits are found in the basal/primary fill of SFBs and 31% were found in pits, most of which were also excavated from the primary fill, although some were also placed higher in the fill. In light of this evidence it is significant that all seven contexts containing neonatal dogs in Phase II were excavated either from the primary fill of a pit (n=four) or the top most fill of the pit (n=three). Morris’s (2008) research compliments Hamerow’s observations, demonstrating an increase in the number of dog (and cat) ABGs from earlier periods into the early-middle Saxon period (Figure 8.2).

Dogs are also one of the most common animals to be included within special deposits on sites from the Continent, the most notable example being Feddersen Wierde, north-western Germany, where dog burials of a slightly earlier date, spanning the second to fifth century, have been excavated from the gable end entrances of houses, with the speculation that their placement was intended to bring protection to the household (Hamerow 2006:23; Haarnagel 1989). There is also a close link between

---

[11] Hamerow (2006) includes early, middle and late Saxon sites in this paper, and due to the small sample of comparable material, inferences have been drawn from all cases of ABGs and ‘special deposits’ in this period to discern patterns of ABGS at Lyminge.

the burial of high-status objects in foundation deposits associated with buildings on elite centres, that occur primarily in Southern Scandinavia (Hamerow 2006:22). There are parallels with such practices in Phase II Lyminge, visible in the treatment of dogs in ABGs, considered further below.

One reason behind the prominence of dog ABGs on Anglo-Saxon sites is often suggested to be a result of the close relationship that they held with humans and the special status they may have been attributed in life (Hamerow 2006:20).

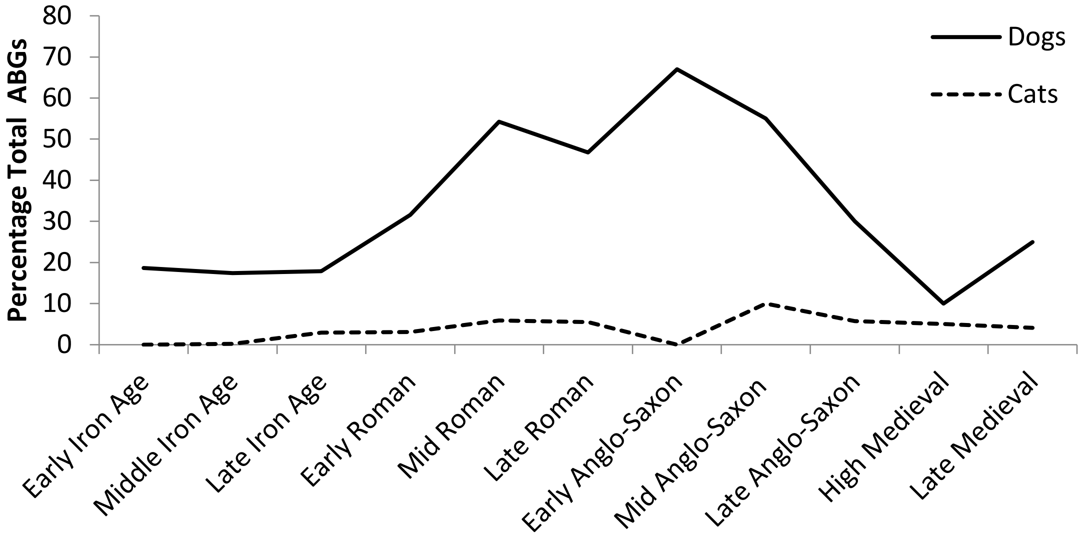


Figure 8.2: Dog and Cat ABGs as a relative percentage of all ABGs from southern England. Note the peak in the early and middle Saxon period (Sykes 2014: 143, Figure 7.3) – data originally from Morris (2008). Figure used with permission of Sykes (pers comms). Data presented in Appendix 3, Table 28.

There are a number of ways in which the ABGs can be interpreted, for instance, from a purely functional perspective, the representation of neonatal litters of puppies in the Phase II assemblage may represent the cull of unwanted litters to maintain or curb the dog population on site (Morris 2008:335). Dogs have an average litter size of around six puppies (Okkens *et al.* 1996; Wood and Barrett 1979) therefore, if a whole litter of dogs were to die shortly after birth you may expect to find multiple ABGs (Morris 2011:52). This interpretation has been employed for neonatal puppies

ABGs excavated from the early medieval site Greyhound yard, Dorchester (Maltby 1993) and Faccombe Netherton, Hampshire (Sadler 1990). Only seven fragments of adult dogs were recovered in Phase II, suggesting that there was not a surplus of dogs on the site at any one given time. A litter of puppies would require time and resources to raise, and there were no doubt occasions when the decision was taken against such an investment.

Alternatively, it can be postulated that the location of these remains, in the primary and final fills of pits in Phase II is meaningful and may suggest that although the puppies were disposed of with other household waste there may have been an element of structure and purpose behind their deposition (Morris and Jervis 2011; Knox 2012). Context (1596) exemplifies this, as this was a primary fill of a large pit and included an MNI of 4 puppies, in addition to a crucible with a lid. The discovery of a crucible is rare (Leahy 2011: 453), and the actions behind its deposition in the primary fill of a deep pit, that would have been a significant undertaking to dig, as well as the inclusion of a litter of puppies within that same context cannot have been without purpose and intent. Such a deposit finds parallels with the patterns Hamerow (2006:26-7) identifies on Continental sites (highlighted above), where 'foundation' deposits of high-status items were deliberately laid in pits associated with elite structures. It is likely that there were both functional and 'ritual' elements to the creation of this deposit which, to our modern view, appear bizarre yet to the inhabitants of Lyminge minster were highly logical (Morris and Jervis 2011:70-8).

Another interesting Phase II ABG is the case of the dog and the cow in pit [1666], fill (1667). This pit was deliberately cut into an internal boundary ditch that divided the inner sacral zone and outlying domestic occupation of the monastery (Thomas *pers. comm.*). Excavators suggested that the pit was deliberately cut for the sole purpose of the disposal of these two carcasses, which were curled on their left side around the edge of the pit, and the fill included various metal artefacts and a knife blade. The minimal inclusion of other faunal material in this pit certainly indicates that it was not used as a pit for general waste. As outlined in Chapter 5, this dog lived a tough life, and the trauma evident throughout its skeleton may be a result of direct human violence. It is impossible to interpret the order in which the trauma occurred, although the periostitis is likely a result of the injuries. The substantial fracture on the right femur had healed, and during this process it is likely that dog was limited to the use of three legs and walking would have been difficult and painful. The fact that the femur did heal may suggest that the dog was cared for to an extent, potentially being deliberately fed while it was unable to work, as has been suggested for the traumatised dog ABG discovered in the cellared structure at Bishopstone (Poole 2010b; Poole 2011:210-11).

It is possible that tensions and conflict existed between old and new belief systems, which may be reflected in dog directed violence, as exemplified here. Animal palaeopathology has been shown to be a good indicator of human treatment of animals (Mackinnon and Belanger 2006; MacKinnon 2010; Sykes 2014). Of the most common species recovered on Anglo-Saxon sites, dogs and cats exhibit the highest proportions of trauma related pathologies, a number of which were caused by humans, such as the dog from Lake End Road, Dorney, which had experienced but survived blunt trauma to the skull and spine (Poole 2011: 204-7). It is feasible that the traumatic injuries the Lyminge dog (1667) are the result of the dog’s occupation, if he was a herding dog working regularly with large animals it is possibly that on occasion the dog got underfoot and was kicked or trampled by the large livestock it sought to herd and protect (Hourani 2018; Bartosiewicz 2013). Similarly, if this were a hunting dog these injuries may have been sustained during the chase or the catching of quarry (Binois *et al.* 2013:44). However, such injuries may present in a similar way to that caused by a human kick (Hourani 2018:92). Indeed, the nature of the injuries sustained by dog (1667) are typical of animal abuse as a result of kicking, or blunt force, as identified in a dog skeleton excavated from Medieval Guimp, France (Bonois *et al.* 2013). The fact that dog (1667) survived into old age is a paradox, suggesting that although it was a victim of violence the dog may also have been cared for. Perhaps this represents an ambivalent attitude towards dogs in the middle Saxon period, although they were kept for functional purposes, it is possible that a human-dog relationship based on companionship also existed. However, dogs may also have been kicked or beaten when humans were exasperated or when they felt that the alpha of the pack needed to be re-established (Thomas 2005; Hourani 2018:92). Such violence may have been a way of maintaining boundaries during a time when Christianity and society more broadly was increasingly trying to emphasise the social distance between humans and animals.

When the full context of this dog's disposal is considered it brings to light further questions regarding the motivation behind the creation of this deposit. This dog evidently lived to a good age, despite the trauma. This is in contrast to the sub-adult cow that was included within the same context, which died between 14 - 21 months old, with butchery marks on the axis indicative of throat slitting and the bleeding of the animal. Unlike the dog, which was in the most part complete, several elements were missing from the cow skeleton including the left humerus, radius and ulna and the right tibia. The missing tibia may be a result of disturbance of this feature, as this body part would have been closest to the top of the pit (Morris and Jervis 2011:75). However, the missing left shoulder joint is noteworthy and suggests deliberate removal prior to burial, or re-deposition of the entire skeleton at some point. Parallels can be drawn between this deposit and the, admittedly earlier, seventh century cow ABG from Cowdery's Down, Hampshire (Millett and James 1983:221). In both cases the pits were suggested to have been cut specifically for the disposal of the carcasses, both included purposefully placed skeletons with selectively butchered elements and/or particular missing elements (Morris and Jervis 2011:75) and both were associated with boundaries (Hamerow 2006). In the case of Lyminge the boundary was between the sacral and domestic zone of the settlement, whereas in Cowdery's Down it was associated with a different type of boundary, the entrance to a building (Hamerow 2006: 11; Millet and James 1983:221). Such depositional events 'mark transitions in the life of a settlement' (Morris and Jervis 2011:72), and perhaps the case of the dog and the cow in pit [1666] is an example of such a demarcation, rather than just the disposal of animals at the end of their economically useful lives.

Although the data set is small and from a single site, it can be postulated that the treatment of the Lyminge dog ABGs represent an expression of belief. That such deposits were excavated in Phase II during the monastic phase of the site is interesting and requires further consideration. Firstly, it suggests that dogs may have been more than just working animals at this site, particularly if it was the case that select dogs were being preferentially fed or allowed access to scavenge marine food sources. Secondly, it may not be expected that the practice of structured deposition of animals would be identified on an ecclesiastical site, and therefore it may be that these articulated animal deposits need to be interpreted outside the realms of traditional Christian practice (Knox 2012). That the conversion to Christianity impacted human-animal relationships at Lyminge is clear (see Chapters 6,7 and 9), however, there is also zooarchaeological evidence to suggest some continuation of pre-Christian practices, such as the evidence for hunting, hawking and possible consumption of horse. Pre- and post-Conversion attitudes to the environment and the creatures that lived within it were highly complex, and one way in which we can see this expressed in the archaeological record is through the recovery of animal ABGs on religious sites, such as Lyminge. Although evidence for such practices at religious sites is rare, it has also been recorded at Brandon (Tester *et al.* 2014), where there is convincing evidence to suggest that Building 7098 was an early church, associated with a graveyard (Tester *et al.* 2014). These deposits demonstrate the complexity of the transition to Christianity in this period and need to be contextualised against the backdrop of wider socio-political changes and the new ways in which elites were expressing power during this period. Clearly the Conversion to Christianity did not bring an immediate end to the existing worldview based on ritual action and deposition (Knox 2012:242).

There are no specific references to the practice of depositing animals in this way within Anglo-Saxon sources such as law-codes and penitential handbooks, although, it should be noted that there is little mention of any pre-Christian practices in such texts (Hamerow 2006:27; Whitelock 1979). A letter from Pope Gregory to Abbot Mellitus, preserved in Bede's *Historia Ecclesiastica,* asserts that the Anglo-Saxon's are 'accustomed to slaughter many oxen in sacrifice to devils' and recommends that they ‘should make themselves booths of boughs round those churches which have been converted from temples, and celebrate the solemnity with religious feasting; and no longer sacrifice animals to the devil, but kill cattle for their food and to the praise of God’ (Whitelock 1979:655; Colgrave and Mynors 1969). Pope Gregory acknowledges that it will be a challenge to change such practices, but by switching old gods for the new God this may be in which to achieve their common goal of Christian Conversion (Whitelock 1979:655). Whilst such practices were not encouraged, it appears that in reality the church tolerated the continuation of such practices, perhaps repurposing them in light of the new belief system.

A dichotomy exists within the evidence from Phase II Lyminge. On the one hand it can be argued that the isotope results tentatively reveal favouritism, with certain individuals being either preferentially fed, or at least allowed free-reign to scavenge marine food sources. Obviously, as this hypothesis is based on two samples, further samples would be required to validate this suggestion. On the other hand, however, there is the frequent deposition of large litters of puppies, either because they were stillborn, unwanted, or utilised as part of a structured deposition linked to a past belief system; in addition to the trauma evident in the skeleton of dog (1667). The chronic injuries, deformities and possibly illness that the Lyminge dog (1667) suffered raise the question: did this dog survive in spite of human carelessness or as a direct result of human action? (Hourani 2018; Bartosiewicz 2013:178). Does this reflect the acceptance of Christian teachings of man’s dominance in the hierarchy in nature, or an alternative interpretation of the Genesis reading, that humans were created to care for nature? When seen in the wider context of the site this evidence suggests that with the Conversion to Christianity, humans were increasingly seeking to establish their dominance over nature and it betrays a concern regarding the closeness inherent in the relationship between man and dog. Although some dogs may have received preferential treatment and clearly had relatively close human contact, this was tempered with bouts of violence, to leave in no doubt the separation that existed between humans and beasts.

8.3 Cats

Cats were present in both phases of Lyminge and increase in number over time, representing 0.33% (NISP 8) of the early Saxon domestic mammals and 1.25% (NISP 55) of the middle Saxon domestic mammals. In both phases, the percentage representation is higher than that of dog or horse. In Phase I there was an MNI of two cats, and in Phase II the MNI was eight. The overall evidence to be gleaned from the cat specimens from Phase I is sparser than that recorded in Phase II. The limited ageing evidence from Phase I shows that only adult cats were present and only disarticulated remains of cats were discovered. In contrast, the Phase II assemblage contains evidence for a range of ages, from kittens through to adults. Cats are the third most common species identified in the Phase II ABGs (n=8), and as with dogs, their placement is limited to pit deposits. Seven of the eight were discovered in the primary fills of deep pits, and one individual was excavated from the upper most fill of a slightly shallower pit. In two instances, the cat ABG was deposited in the same fill as other significant small finds, including a silver coin dating to the ninth century and other mammal and bird ABGs. The placement of cat ABGs predominantly in the primary fill of these pits suggests intentional deposition which may have been influenced by attitudes held towards cats during this period. The aDNA results show that the Phase II cats were domestic cats (Hirons 2017), and when these data are seen in light of the Phase II ABG evidence and small isotope dataset this raises questions regarding the role that cats may have played as companion animals in this period, in addition to the more functional benefits that may have been gained from their presence on site.

The low frequency of cats in Phase I is similar to contemporary sites (Appendix 2) when site data are combined and on average cats contribute to 0.3% of the total NISP assemblage on both early and middle Saxon sites (Poole 2011:180). The quantification of sites with and without cats should be approached with caution as cat bones are small enough to be susceptible to poor recovery, therefore their absence from some faunal assemblages may not reflect true absence from the original death assemblage (Kitchener and O'Connor 2010:91). Beyond remarking on the presence of cat bones, the majority of site reports do not discuss early or middle Saxon cats in any detail (e.g.

Rackham 2003; Crabtree 1989; Wilson 1995; Mulville 2003). Minimal evidence is available on butchery, ageing or pathology of cats for contemporary sites and it is difficult to assess whether this is due to true absence or lack of recording. This inhibits detailed discussion and contextualisation of the early Saxon evidence from Lyminge and presents an avenue for future research beyond this thesis.

Knife marks were recorded on the distal end of single cat femur in Lyminge Phase I, which is in the wrong location to be considered indicative of skinning, but nevertheless it suggests some level of utilisation (Fairnell and Barrett 2007: 469). The flesh of cats is unlikely to have been considered edible in the Anglo-Saxon period. The butchery recorded on cat fragments from Lyminge and contemporary sites is not like that of a carcass butchered for consumption but rather the marks often suggest use of cats for fur (Poole 2011; Poole 2015). Generally, evidence for cat butchery is limited for this period, although there are some cases in which it was identified. Out of the 274 cat specimens recovered from West Stow, two had cut marks on the horizontal ramus of the mandible, one had cuts on the ventral side of the atlas, suggesting that the cat had its throat cut and one had cut marks indicative of skinning around the ramus of the pelvis (Crabtree 1989:104-5). Besides the one case indicative of the slitting of the cat’s throat, none of the other marks are symptomatic of butchery for consumption, instead it has been suggested that certain cats were slaughtered for their pelts (Crabtree 1989:104-5). Such evidence indicates that cats may have been considered a commodity in early Saxon England, and as such many interpretations of the perception of cats in this period are utilitarian in nature (McCormick 1988; Thomas 2005; Poole 2015).

A significant increase in the number of cats is recorded between the two phases at Lyminge, reflecting a wider national trend (Appendix 1 and 2). The increase in cat numbers is accompanied by the emergence of depositing articulated cat remains in pits. Cat ABGs are generally recorded in much lower frequencies than dogs (Morris 2008:337) and as with dogs, cat ABGs have been interpreted as evidence of culling to maintain small populations of cats on settlements (Morris 2011:

160). However, unlike the Phase II dog ABGs, the majority of which are neonatal, only three of the eight cat ABGs were juvenile and cannot be argued to represent the cull of unwanted kitten litters. The discovery of the articulated remains of cat feet in (645) may infer the use of cats for their pelts in this phase, as identified in similar deposits from contemporary Ribe Denmark, and Viking-age Kaupang, Norway (Barrett *et al.* 2007:308; Enghoff 2006: 179). Although few conclusions can be drawn from a single example, the fact that none of the cat ABGs bore evidence for butchery is interesting and may suggest that these animals held high value. Although that is not to say that evidence for the butchery or skinning of an animal indicates lack of care, as elements of a prized companion animal can be valued beyond death (O'Connor 1992:112; Poole 2011:224).

The overall rise in the frequency of cat ABGs on early-middle Saxon sites recorded by Morris (2008; 2011) (Figure 8.2 and Appendix 3 Table 28), provides further evidence for shifting perceptions of cats, suggesting that they were increasingly viewed in more than purely functional terms and were perhaps considered as companions (Sykes 2014:144). Pathologies identified on two of the Lyminge cat ABGs provide an insight into the treatment and perception of these animals. The juvenile cat (1571) had a healed fracture on one of its ribs, and while presence of a single fracture alone cannot be interpreted as evidence for human inflicted violence towards cats, this indicates trauma of some kind (Teegan 2002). Likewise, the adult cat's (580) right humerus with a healed break resulting in shortening of the limb in addition to a misshapen right third metacarpal, also a result of a healed fracture. That both cats survived these injuries may suggest that a certain level of care was afforded to these animals (Poole 2010b:151).

The intensification of arable farming over the seventh – ninth centuries provides context for explaining the increase in cat remains at Phase II Lyminge and other contemporary sites (McKerracher 2018). This process was accompanied by an increase in the storage of surplus grain, which in turn attracted large numbers of rodents, one of the favoured preys of wild and feral cats (Bulliet 2005:89). Studies have shown that the average well-fed house cat will kill 14 small animals (usually rodents) annually, whereas feral cats[12] kill approximately 1,100 small animals per annum (Engels 2000:1). Over time people would have recognised the benefit of having cats around the site reducing the vermin population, as indicated by an increase in the number of sites on which cat remains were found between the early and middle Saxon period (Poole 2015:866; Poole 2011: Table 4.10; Bulliet 2005:89). In cases were manuscripts were being produced, cats would also have been useful to keep the mice from eating the documents (Sykes*, pers. comm.*). Indeed, cats make up a higher relative percentage of zooarchaeological assemblages recovered from the middle Saxon phases of other ecclesiastical and high-status sites such as Canterbury Whitefriars (Bendrey *et al. in prep*), Hartlepool (Huntley and Rackham 2007), Wearmouth and Jarrow (Noddle 2006) and Bishopstone (Poole 2010b) (Appendix 1 and 2).

The earliest contemporary historical reference to the keeping to cats as companion animals is from the eighth century *Collectio canonum hibernensis,* Book 53, Chapter 8 that records: *'On cats…the Irish [canonists] say [that]: if a cat does something bad in the night, it is not to be returned to its owner; but if in the day, it is to be returned"*[13] (Wasserschleben 1894). That close ties of affection may have existed between cats and humans can be inferred from the ninth-century poem *Pangur Bán*, written by an Irish monk about his white cat (Sykes 2014:144). In this poem the monk compares the writing he is doing in the scriptorium, with the efforts of the cat, 'Pangur', hunting mice. This reminds the modern reader that the functional and companionship aspects of human-animal relationships were not completely separate spheres. The fact that the cat 'Pangur' is given a name, provides further evidence of affection, as the act of name giving suggests there was an association of individuality with this particular cat (Poole 2015:872). This may not represent pet keeping in the modern sense of the term, but it is possible that cats were highly valued for their companionship, as well as their capability as mousers on settlements (Kitchener and O'Connor 2010:88) such as Lyminge, where there is evidence for the storage of surplus grain and also the potential production

---

[12] The term 'feral' refers to the domestic species of cats, rather than wild cats.

[13] With thanks to Professor Thomas O'Loughlin, University of Nottingham, for the translation of this text.

of manuscripts (see discussion on goose quills). The fact that there was a majority adult population at Lyminge (Table 5.45) lends further evidence that most of the Lyminge cats were relatively tame, as it is postulated that a preponderance of young cats would suggest a feral population of mainly uncared for animals (Kitchener and O'Connor 2010:93).

Further to the quantitative and palaeopathological analysis of the Lyminge cats remains, two cat samples were also sent for radiocarbon dating at the Oxford Radiocarbon Accelerator Unit (OxA). These samples were selected based on their location within each feature in order to best date that area of the site. Both samples produced elevated δ^{13}C and δ^{15}N values, particularly the adult cat (656), indicative of a marine contribution to diet (Figure 8.1). At this point, due to small sample size, only tentative inferences can be made from this hypothesis, although with additional sampling in the future it may be possible to draw firmer conclusions. It is unclear how the cat may have been sourcing marine foods, either through scavenging middens or being preferentially fed marine fish. Either way, as with the dogs, cats were clearly allowed more freedom than other animals (including pigs) to roam the settlement, scavenging food and likely having frequent daily contact with humans which may have led to intentional favouritism of select individuals. Isotopic data from one of three cat ABGs from Bishopstone revealed that this individual had a high marine component to its diet in contrast to the other cats (Poole 2010b:150-156; Marshall *et al.* 2010). Such results have implications on how the middle Saxon human-cat relationship may be interpreted on a number of levels. The fact that at other sites it has been argued cats were being fed fish, a food with high-status connotations during this period (Barrett *et al.* 2004; Reynolds 2015) indicates that cats may also have been held in high esteem at Lyminge. It also highlights that select cats may have been considered as individuals, and were perhaps even favoured, due to their nature or their abilities as mousers, as a pet above other cats (Poole 2015:874). If nothing else it may suggest that certain cats were encouraged, rather than deterred, to inhabit the settlement and live in much closer proximity to humans on a daily basis. The ability to purr, in addition to catch mice, is listed as an attractive quality in a cat in a contemporary Old Irish legal source (Kelly 1997:122). Cats tend to show their pleasure in physical contact by purring (Serpell 1986:106), suggesting that there was mutual enjoyment in one another's company between cat and human (Poole 2015: 873).

Of course, this is not to say that all cats had direct contact with humans at Lyminge, by nature cats are independent creatures, however, even feral cats can come to depend on the waste produced by settlements and the rodents that are attracted to the waste, and in turn humans can feel implored to leave food for feral cats for various self-gratifying reasons (Griffiths *et al.* 2000:58). Thus, resulting in a mutually beneficial relationship between human and cat.

Unlike the evidence from the dog remains, which suggests the reinforcement of boundaries between man and beast, perhaps the natural behavioural ecology of cats was aloof enough to be considered less of a threat to such boundaries. While cats may choose to socialise with humans, they are rarely completely dependent upon them (Clutton-Brock 1981:106-111). The range of evidence from Lyminge suggests that in Phase II cats made the significant transition, from the human's perspective, from tolerated scavenger, to 'domestic' companion animal (Kitchener and O'Connor 2010:89).

8.4 Summary

The functional and companionship roles that cats and dogs played in Anglo-Saxon Lyminge were not separate spheres (Poole 2015). As with all aspects of social life, the interactions between humans and these two species were likely fluid and highly complex (Hurn 2012:99). By necessity, discussion has focused on the Phase II settlement of Lyminge, where data is sufficient to begin to explore these complexities. Dogs were likely kept as herders, guard dogs and hunting dogs, but the evidence suggests that they may also have been considered companions, living in close proximity to the inhabitants of Lyminge. Human-directed violence towards dogs, evident in dog (1667), may have eased tensions inherent in the worldview that placed humans above animals according to Biblical teachings. The Lyminge human-cat relationship appears to have been mutually beneficial, serving both the utilitarian function of reducing the vermin population while also providing an element of companionship. Evidence suggests that by this period people may have been encouraging cats to inhabit the settlement, because unlike dogs, cats are not reliant on humans for food and their behavioural ecology suggests they become more attached to places than people (Serpell 1996). The inclusion of multiple dog litters and cats in the foundation and terminal deposits of pits needs to be viewed within the complex array of wider social changes evident throughout middle Anglo-Saxon England, as the unusual nature of these deposits may act as a proxy for an elite, site-based worldview.

Chapter 9 Consumption: from feasting to fasting?

The modern preoccupation with, ‘you are what you eat’ is not a new, or original concept, yet it is one that is highly relevant to the Anglo-Saxon period. Indeed, this sentiment can be inferred from multitude of historical, zooarchaeological and archaeological sources for this period (e.g. Hagen 2010; Lee 2007; Sykes 2005; 2014; Twiss 2012). The consumption of food is imbued with social meaning, intimately connected with power, status, individuality and shared culture (Caplan 1997:3). All over the world, food and its consumption, goes far beyond its nutritional value and perhaps has been singled out as such because everyone, everywhere, needs to eat (Fiddes 1991:38). Through the conscious act of eating, food is incorporated into our body, and in the crossing of the liminal boundary between what is in the ‘outside’ world into the ‘inside’ self, food becomes part of the body, and part of ourselves – you literally become what you eat (Fischler 1988:277).

Given that the majority of zooarchaeological remains originate from animals eaten by people, the analyses of food culture have, in the past, been rather limited (Sykes 2014:167). Studies have focused on discussing the nutritional value of different animals, and their relative contribution to diet, with much less consideration given to the connotations of food preferences, avoidances and distribution methods (Russell 2012:358; Sykes 2014:167). Fiddes (1991:30), among others, has argued that ‘foods confer status to the consumer’ and although the bulk of Anglo-Saxon daily diet was vegetarian, the act of eating meat, particularly, was imbued with social meaning (Fiddes 1991:5; Banham and Faith 2014). Globally and historically, meat is the most highly prized foodstuff, and forms the centre of most food taboos, avoidances and special regulation (Fiddes 1991: 18; Simoons 1967; Sykes 2005; 2014). The analysis of the Lyminge zooarchaeological assemblage highlights how the consumptin and/or avoidance of foodstuffs, particularly meat, was implicated in the renegotiation of identity over the course of the Anglo-Saxon period.

Previous chapters (Chapters 6 and 7) provide us with an idea of everyday consumption patterns at Lyminge, and it is the everyday meal that is most commonly represented within refuse deposits on archaeological sites. This chapter will consider the more discrete activities of feasting and fasting, activities that are notoriously difficult to identify in the archaeological record (Rowley-Conwy 2017), despite being well-documented elite practices associated with high-status and ecclesiastical sites of this period (Hagen 2010; Roach 2013; Sykes 2010). During this period, it was not only about what you ate, but also the way in which you ate it.

9.1 Feasting in Phase I: fifth to seventh centuries

In the most recent detailed consideration of feasting, Rowley-Conwy (2018) has proposed four categories for the identification of zooarchaeological examples of feasting:

1. Over the top (OTT) – identification of deposits (usually in high-status contexts) that stand out as being unusual against the back-drop of ongoing high-status activities on the sites from which they are recovered.
2. Ritually charged garbage (RCG) – when feasting debris is given special treatment that differs to usual middening practices, and in some cases, animal remains may be identified as 'special deposits'.
3. Small but special (SBS) – smaller scale feasting, which may only include one animal with no special material culture and just a small group of people. Waste from such an event may be disposed of within other midden material but can be identified in the microcosm.
4. Was this feasting? (WTF) – zooarchaeological material that does not fall within the 'normal' category of deposition but does not stand out as particularly significant. This category covers a wide array of possibilities, intermediate between clear evidence of feasting (as highlighted in previous categories) and more 'normal' settlement refuse.

Rowley-Conwy (2018) includes a range of case studies within these criteria, in order for the zooarchaeologists to better elucidate feasting against the 'background noise' of everyday consumption patterns. Lyminge characterises the difficulty in identifying feasting in Anglo-Saxon settlements, and while some form of feasting invariably took place at certain points in the year, the identification of these events is challenging. Although Rowley-Conwy's (2018) criteria provide a useful starting point it should also be noted that the way in which the Lyminge assemblages have been recorded, using a rapid recording strategy, may hinder the application of elements of these criteria. Nevertheless, is it possible to discern certain elements of feasting among the 'background noise' of general refuse using criteria outlined by Rowley-Conwy (2018) and the Phase I assemblage most convincingly provides evidence for the first category, 'over the top' (OTT) feasting, which will be discussed below.

The archaeology recovered from the earliest phases of Anglo-Saxon Lyminge is consistent with the view that the settlement acted as an important regional centre from at least the beginning of the sixth century. This is otherwise indicated by the place name (originally a district name combining the name *Limen* with the rare suffix, -*gē* - district capital) and the cemetery evidence (Brooks 1989: 71-4; Kelly 2006:99; Thomas 2013:116). This role finds clearest expression in the seventh century when a complex of grand feasting halls was constructed on the plateau of modern-day Tayne Field (Figure 2.1, Figure 2.2 and Figure 9.1). This marks Lyminge's formal appropriation as a place of periodic royal residence. The archaeology from the preceding sixth century phase indicates that conspicuous consumption, undertaken in the context of periodic gatherings or public assemblies, was an established feature of Lyminge decades if not a full century before the great-hall complex was constructed.

One of the most characteristic aspects of the faunal remains in this period is the high proportion of pig, as outlined in Chapter 6. The evidence from Lyminge and other local sites suggests that pigs were farmed and consumed more intensively in Kent than in most other regions of early Saxon England and the site-based evidence reveals that the inhabitants of early Saxon Lyminge had a preference for the delicacy of younger and suckling pigs. While there has been some debate about the social connotations of pig during the Anglo-Saxon period (Hamerow 2002:131; 2012:162), the evidence from Lyminge reinforces the link between feasting and pig consumption in a high-status Anglo-Saxon cultural milieu characterised by a suite of complementary archaeological indicators for elite practices and social display (Thomas 2017). Given the significant level of cultural exchange which existed between Kent and the Frankish world at this period (Chapter 3; Welch 2007: 220-3;

Harrington and Welch 2014:174-205), it is also relevant to note that Lyminge subscribes to a broader pattern of elevated pig consumption at elite sites in the southern region of the North Sea Basin (Loveluck 2013). As registered in other fields of social discourse such as personal adornment, these Continental connections are very likely to have impacted on dietary fashions and attitudes towards animals amongst the native Kentish elite (Roymans 1996:56; Doll 1999; Hamerow 2002:16; Loveluck 2013:132).

Feasting in the Anglo-Saxon period was not only a gastronomic event but played a key role in elite culture; communicating power, companionship, and confirming allegiance to a leader through hospitality, the communal sharing of food, and redistribution of wealth (Hagen 2010:309; Maggenis 1999; Pollington 2003:19-31). From anthropological and psychological studies, it is clear that the giving and sharing of food is one of the most effective forms of human social bonding (Fox 2004:310), and the importance of hospitality and commensality is resounding throughout the historical sources of this period (Brooks and Kelly 2013; Pollington 2003; Whitelock 1979). Roach (2013:176-82) argues that in the later Saxon period the sharing of food and drink played a central role at large elite assemblies, helping to build and maintain group identity, and in many ways the feast and act of sharing food was as important as the assembly itself. Whilst such events fostered relationships, and a sense of community, they were inherently hierarchical and were a platform for displays of conspicuous consumption (Roach 2013:182). It is likely that this was a tradition stemming from earlier in the Saxon period, and elements of this are arguably evident in both phases of the Lyminge settlement.

Feasts can be defined in a number of ways, although most definitions include two key elements; the *sharing* of food, some of which may be considered *unusual* compared with the normal fare (Jones 2007; Rowley-Conwy 2018; Russell 2012:361-384). Feasting events can range from a meal for two, to a gathering of thousands, featuring ‘unusual’ food, large quantities of food, or special treatment of foodstuffs and by-products of the event (Hayden 2014; Rowley-Conwy 2018; Russell 2012:383; Twiss

2012). It is difficult to identify contextually discrete feasting events or deposits in the archaeology of Anglo-Saxon Lyminge, however, the early Saxon pig assemblage holds cumulative evidence for such practices in the relatively high percentage of suckling pig represented in Phase I in comparison to Phase II, (Figure 5.26). Descriptions of Anglo-Saxon feasts do not detail the species that were consumed (Magennis 1999); however, well-known ethnographic studies conducted in Papua New Guinea provide vivid testimony to the exploitation of pig as a ceremonial feasting food, as do historical ethnographic studies of pork consumption within Christian contexts in southern France and northern Iberia (Sillitoe 2007; Fabre-Vassas 1997; Banham and Faith 2014:98). There are aspects of the contemporary cattle assemblage that also point in the same direction, with far more animals were being killed at a younger, prime meat-bearing age in Phase I than in Phase II. Given the amount of meat a single cattle or pig carcass can provide, these beasts would have made a substantial contribution to the table, presenting an opportunity for the community to come together, most likely to feast at specific points in the year (Fiddes 1991: 13; Lee 2007: 41; Hagen 2010:416; Sykes 2010:181).

To more confidently identify feasting in the early Saxon Phase at Lyminge it is essential to draw on other lines of evidence, to supplement the zooarchaeological data and enable holistic interpretation. In addition to the central importance of meat consumption at a feast, entertainment, performance and the imbibing of strong alcoholic drink were also essential components of an Anglo-Saxon feast, as evidenced in Old English literature (Pollington 2003:31; Magennis 1996). Preliminary analysis of the Lyminge Phase I glass reveals an assemblage of international importance, as Lyminge is the only early Saxon settlement to produce such a large and diverse assemblage of vessel glass (Broadley 2017:118-124). There are three elements of this assemblage that are of particular note with regards to evidence for feasting; first is that three quarters of the Phase I glass assemblage was recovered from a single feature, and glass co-occurred with dense concentrations of animal bone in the midden deposits excavated from SFBs (Figure 5.1) (Broadley 2017:120). The second is that the majority of the Phase I glass assemblage was from vessel glass, predominantly cone and claw beakers dating to the fifth – sixth centuries (Broadley 2017:117-119). The third is the blue and turquoise glass recovered from contexts either directly associated with the halls, or very close to the halls. Such colours were only introduced to the technological repertoire of Anglo-Saxon glass production at the turn of the seventh century and are described as ‘princely’ because, to date, such vessels have only been recovered from richly furnished sixth – seventh century burials confined to Kent and Essex (Broadley 2017:121). The discovery of a delicately crafted bone gaming piece directly associated with the hall complex, akin to the gaming pieces recovered from the princely burial in Taplow, Buckinghamshire (Webster 2007; Thomas 2017:109), further suggests that entertainment and the enjoyment of *seledreamas* (hall-pleasures) played a role in feasting events at Lyminge, as suggested for Taplow (Pollington 2003: 217). When the evidence from the glass, high quantity of pork and suckling pig consumption are considered together such data prescribes to Rowley-Conwy’s (2018) criteria of ‘over the top’ feasting, whereby large quantities or particularly special deposits within the archaeological evidence stands out as unusual against the ‘normal ongoing high-status activities’.

An important element of Anglo-Saxon feasting was entertainment, and most discussions surrounding entertainment during these events focus on music, storytelling, poetry, riddles, dancing and board games (Hagen 2010:418-424; Maggenis 1999; Pollington 2003:199-220). Given the evidence of hunting and wild fowling in this phase, it can be suggested that hawking may also have been an activity associated with feasting revelry. The discovery of birds of prey in the same pit as their quarry may tentatively be interpreted as feasting-like behaviours under the Rowley-Conwy’s (2018) second criteria of ‘ritually charged garbage’ (RCB). Anglo-Saxon feasts were characterised by the public and symbolic nature of business (Roach 2013:162), as such, sporting displays of falconry, with the associations of status and the symbolic notion of elites as predators would have been a powerful form of entertainment for guests and the elite retinue. Although this is merely speculation at this point given that no other literature has linked wild fowling with feasting when this evidence is considered together, they potentially attest to ostentatious displays of consumption during feasting events (Loveluck 2013:128-9).

Feasting is not discussed in the majority of contemporary zooarchaeological reports from settlement sites, with one notable exception being the stack of cattle skulls from a pit at Yeavering, which was interpreted as evidence for feasting and/or the remnants of sacrifice (Hope-Taylor 1977: 98-106). It is not clear whether the lack of discussion is due to dearth of evidence, small assemblage size, or that it was not possible to identify against the background noise of general refuse. Hopefully the evidence from Phase I Lyminge will encourage the renewed examination of feasting on early Saxon sites, with the potential for the reinterpretation of existing assemblages.

Figure 9.1: Mark Gridley's artistic interpretation of the Lyminge seventh century grand timber halls (used with kind permission of Thomas pers. comm., and the Lyminge Archaeological Project).

9.2 Feasting and fasting in Phase II: eighth to ninth centuries

The end of the seventh century saw the abandonment of the great hall complex and the establishment of a well-documented monastic community, just 200 metres from the site of the royal timber halls (Thomas 2017). Lyminge is thus a key site for examining how diet was implicated in the spread of monastic culture in Anglo-Saxon England. Monasteries benefited from royal patronage and as such were integrated within travelling royal itineraries and were expected to provide hospitality to royal guests in this role (Blair 2005; Foot 2006; Roach 2013). One should therefore expect to find evidence for feasting in a monastic context, although this is frequently forgotten. As highlighted in Chapters 1 and 6, there are a number of issues surrounding the identification of a singular 'monastic' diet at ecclesiastical sites in this early phase of Christianity, due, in part, to the similar lifestyles of elite ecclesiastics to their secular counterparts. Following the Benedictine Reform in the tenth century a number of monastic sites have higher quantities of fish and domestic fowl, a zooarchaeological interpreted as fasting, and this evidence has often influenced the interpretation of early medieval assemblages (Ervynck 1997; Sykes 2007a). Lyminge presents an ideal case study for exploring these issues, as it is arguably possible to identify a monastic signature in Phase II, that is distinct from general 'high-status' signatures that is based on a range of evidence rather than just the animal bones alone (also see Chapters 6 and 7).

The documentary sources reveal that periods of feasting and fasting were central elements of the Church calendar in middle Saxon England (Foot 2006:236; Hagen 1992; Poole 2011:468-9; Whitelock 1979:66, 683). The zooarchaeological evidence suggests that communal feasting may have continued to play an essential role in Phase II, as a platform for social cohesion and a means to redistribute wealth in a show of commensality (Hagen 2010; Poole 2011:162). This is arguably most evident in the cutting up and sharing of roe deer in Phase II (see Chapter 7), which probably reflects the practice of meat distribution at communal events, despite inferences being based on a small sample this was an act laden with social symbolism (Sykes 2010). It can be argued that the redistribution of venison at these events provided a way in which to emphasise individuality and status, as well as cohesiveness (Pollington 203:32), a difficult balance which may have been achieved with the symbolic act of meat distribution as a form of gift giving in exchange for services (Hagen 2010:309; Maggenis 1999; Pollington 2003:19-31; Sykes 2010:189). Contemporary evidence from early medieval Ireland suggests that a tradition of meat redistribution existed, most often practised during communal feasting events (McCormick 2002:26; Roach 2013), as a way to utilise the considerable amounts of meat produced by a single carcass (Sykes 2010:180). Obviously, the patterns at Lyminge need to be interpreted within their regional context, but the evidence from contemporary Ireland provides a useful example of the ways in which deer carcasses may have been treated during this period. Furthermore, the rarity of deer and their specific anatomical representation at Lyminge subscribe to Rowley-Conwy's (2018) first and third categories for identifying feasting in the archaeological record.

To gain a more complete picture of feasting one needs to draw on other lines of evidence. Evidence for the continued tradition of Rowley-Conwy's (2018) OTT feasting, is visible in the Phase II archaeobotanical assemblage which not only contained evidence for the significant surplus of grains, but also had an exceedingly rich biodiversity, from plants that were both edible and useful for medicinal purposes, including the rare species of poppy and grape (McKerracher 2017:129). McKerracher (2014: 194-8, 370-5; 2017:129-30) observes that this evidence places Lyminge within a select group of middle Saxon sites, including (but not limited to), Brandon (Tester *et al.* 2014), Yarnton and Eynsham (Hey 2004), Bishopstone (Thomas 2010) and Hartlepool (Daniels 2007). Grapes, which may represent an import from the Continent, were likely considered a luxury foodstuff in this period, the access to which inferred wealth and status (McKerracher 2017:130). It is possible that grapes were used in wine production, a rare and prestige beverage often associated with glass vessels in historical documents (Hagen 2010:225). Several historical sources refer to the consumption of wine within Anglo-Saxon monasteries on great feast days, and it likely played a role in the Eucharist, further emphasising the rich endowment of these institutions and the important role of feasting within religious life (Foot 2006:239; Hagen 2010:225). Pollington (2003: 128-9) suggests that the prestigious and exotic nature of wine may have been more suited to ecclesiastical contexts, and that there may have been an existing distinction between beverages considered more suitable to consumption in secular contexts – such as mead and beer.

As discussed in previous chapters, this period is associated with a range of changes in the exploitation of animal resources, which highlight production and consumption. In terms of the relative importance of different species, the most dramatic transformations include the steep decline in the proportion of pig combined with a marked increase in chicken numbers which, as highlighted in Reynolds's (2015) analysis of the fish assemblage, is mirrored by a similarly pronounced upturn in the consumption of marine fish, particularly deep-water species such as cod (Thomas 2013). Reynolds (2015:250) has highlighted that the fish assemblage from this Phase is unique for this period, not only for the sheer number of marine fish present but also the recovery of particularly large cod (>100cm in length), in a period that pre-dates the fish-event horizon of AD 1000 (Barrett *et al* 2005). Only mid – late Saxon Bishopstone has produced a fish assemblage with similar characteristics to that of Lyminge Phase II (Thomas 2010). The evidence indicates that fish were brought to the site whole, and that large fish were considered prize show pieces, taking centre stage on the monastic table as an element of luxury food consumption (Reynolds 2015:250-263). Such a practiced has been identified at Eynsham, where the presence of large pike has been suggested to be evidence for the use of fish as a luxury foodstuff (Serjeantson and Woolgar 2006:124). Interpreting the evidence for fishing at Lyminge against the wider context of middle Saxon England, Reynolds (2015: 293) concludes that fishing was likely an elite sponsored activity, inherently connected with status due to the labour intensive nature of marine fishing, and although religious beliefs probably had some influence on the increased consumption of marine fish the adoption of this new sport also reflected changing attitudes towards the exploitation of wild resources and new ways of elites expressing power. Taken in combination, these shifting patterns of consumption can be interpreted as the reflection of the influence of Christian attitudes on dietary practices, as might be expected at Lyminge as a high-status monastic milieu. As indicated by the decline in pig, however, Lyminge's dietary reorientation was more than simply a process of adopting new patterns of consumption but was also a process of turning away or creating distance from 'old' types of food perhaps tainted by lingering associations of the pre-Christian past (Fiddes 1991:5). As outlined in Chapter 6, elevated numbers of chicken and fish on ecclesiastical sites from the medieval period are often interpreted as evidence for the role of the Benedictine Rule in guiding dietary practice (Holmes 2014a: Ervynck 1997). There is, however, no evidence to suggest that Anglo-Saxon monastic houses followed a single, all-encompassing rule at this early period (Foot 2006:6). Indeed, it is likely to be the case that a greater proportion of pre-Viking monastic institutions adhered to a *regula mixta* – a selection of different traditions governing daily routines, not only for the ordained but also for secular guests (Foot 2006:52), which may have included elements of the Benedictine Rule. However, perhaps it can be argued that the documented monastic community of Lyminge, with unparalleled high numbers of fish and fowl, situated within a county where fasting was proscribed by law from the late seventh century, is indeed evidence for a community governed by elements of the Benedictine Rule.

Given that the period under review saw the widespread expansion of monastic culture across the Anglo-Saxon kingdoms (Blair 2005), it is unsurprising that the Rule of St Benedict is often invoked to explain and interpret excavated zooarchaeological assemblages of the eighth – ninth centuries, regardless of whether the site in question is a documented monastery or is characterised, as in the case of Flixborough or Brandon, purely on archaeological evidence (Dobney *et al.* 2007; Holmes 2014a; Barrett *et al.* 2009). The Benedictine Rule was one of the most influential monastic rules in north-west Europe during this period (Ervynck 1997:71). The Rule ordained strict periods of fasting and that brethren should 'abstain from the meat of four-footed animals, except for the weak and the sick' (Ervynck 1997: 75). Fish are postulated to have been a valuable source of protein during times of abstinence on the technicality that they were not quadrupeds (Frantzen 2014:233). Similarly, hen's eggs would also have provided an ideal source of protein in an otherwise strictly vegetarian diet and the flesh of chickens may also have been permitted as both represented a 'loop hole’ in these strict dietary rules (Chapter 6; Poole 2011; Reynolds 2015). In Leechdom’s, hen’s eggs were considered to be ‘light’ food and were recommended to be included within an invalid’s diet (Hagen 2010:129). The symbolic attributes of eggs feature within Christian tradition, as they are associated with the manifestation of the resurrection of a soul and new life, as evidenced by the more modern tradition of painting eggshells red as a symbol of the resurrection of Jesus (Paxton 2008:383: Jonuks *et al.* 2018:118), a practice identified in Christian contexts in eleventh – thirteenth century Estonia (Jonuks *et al.* 2018:118-9). Chickens themselves were also a poignant symbol in Christianity, as Pope Nicolas (ninth century) decreed that all churches should have cockerels erected upon them, a command evidently being enacted in the eleventh century Bayeux tapestry, which shows a cockerel being affixed to the top of Westminster Abbey (Hicks 2011; Sykes *pers. comm.*).

There is no historical reference to indicate that fish were considered to be an acceptable fasting food, in fact, it has been argued that the opposite was true on the basis that certain fish were regarded as a delicacy until the later medieval period, and thus may have been unsuitably decadent for periods of fasting (Dembińska 1986:155; Frantzen 2014:238-9; Reynolds 2015). However, when the evidence for chickens and fish are considered together in light of the potential role of the Benedictine Rule it certainly indicates that these taxa were considered acceptable, albeit elite, fasting foods. While the Christian practice of fasting is extremely difficult to identify in the archaeological record (Ervynck 1997:75), historical documents reveal that fasting took place from an early stage in Kent. Fasting appears to have been enforced in both monastic and secular contexts, as indicated by the laws of King Wihtred (AD 695), which state that, ‘if anyone gives meat to his household in time of fasting, he is to redeem both freeman and slave with *healsfang*’ and ‘if a slave eat it of his own accord [he is to pay] six shillings or be flogged’ (Whitelock 1979:397). In religious communities, fast days could take place for up to 200 days of the year including Lent, Advent and holidays (Dembińska 1986:152-4; Hagen 2010:400). To eat animal flesh during a period of fasting may have been seen as impure, not as a result of the foodstuff but because of the season within which it was being consumed (Frantzen 2014:178).

Frantzen (2014: 207) argues that King Wihtred's laws reveal the influence of Theodore's *Penitential* which was circulated in England by Irish missionaries in the seventh and eighth centuries. Handbooks of penance show a preoccupation with fasting and food purity, and the literal interpretation of the concept that 'you are what you eat' is a resounding theme throughout (Frantzen 2014:182). The largest category of penitentials concerns the use of animals and contamination by animals, with a particular focus on the specifics of how animals lived and died, factors which were deemed to have a direct bearing on their fitness for human consumption (Frantzen 2014:190-3). The existence of such sentiments encourages a more nuanced view of the role of marine fish consumption during the process of Christian conversion. While the significance of fish as a penitential food cannot be ignored in a documented monastic context such as Lyminge, the deeper meanings of this species also need to be acknowledged. Such meanings may have been mediated by a complex layering of allusions and associations linked to the status of fish as a Christian symbol of universal significance, as a potential metaphor for an elite taming of the wild, and to the teachings of humoural theory which attributed particular agency to the consumption of its flesh as against other forms of meat (Sykes 2014:154-55). All of the above would have been desirable attributes for individuals living within a monastic community or an educated elite wishing to proclaim their adherence to a new Christian ideology.

As discussed, in this period it was believed that humans could become imbued with the character or essence of animals through the consumption of their flesh (Simoons 1994:307-8; Meens 2002). With this in mind, it is potentially contentious that the Phase II zooarchaeological assemblage contains evidence to suggest that horseflesh may have been consumed. Such a discovery is unusual for a monastic context given the prohibited consumption of horse flesh in contemporary Christian sources (Mulville 2003:353; Frantzen 2014:192; Banham and Faith 2014:81), however, Poole (2013) has highlighted that horse did continue to be consumed following the Christian conversion and is present on other ecclesiastical sites. Poole (2013: 329) suggests this may be evidence for a localised reaction to Christianity originating from different interpretations of what is considered acceptable foodstuffs. Perhaps, therefore, the presence of butchered horse remains at Christian Lyminge also represents a reluctance to wholly part with previous belief systems, particularly in light of the association with the Kentish royal dynasty, and the origin myth of Hengst and Horsa (Whitelock 1979:153). Even if horse was being consumed it is important to recognise that the church did not encourage it. However, horse consumption did continue well into the late Saxon period and it is possible that other elements of horse beliefs may have continued alongside it (Poole 2013:330-1).

In respect of eating and drinking, the inhabitants of monastic Lyminge were not that different to their secular counterparts; an observation noted at other contemporary sites (see Chapter 6; Foot 2006:233). Although it is difficult to talk about a ‘monastic’ diet during this period, to have such a clear shift in consumption patterns with evidence for elevated consumption of fish and chicken, in tandem with the establishment of a documented double-monastery, could well indicate that these species were permitted as fasting foods, contrary to arguments presented in Frantzen (2014). When the ecclesiastical community were not fasting, they continued to consume meat relatively frequently, and feasting events were likely lavish, incorporating large fish, venison, and exotic plant species, in addition to the usual fare.

9.3 Summary

In both phases, the zooarchaeological signature of Lyminge falls into the regional pattern of contemporary Kent, whilst still displaying its own unique characteristics. The reasons behind this are nuanced and complex and involve innovative new ways for elites to express power, the conversion to Christianity, and the control of the Lyminge community over a wide range of environmental resources. The practice of feasting is evident in both phases of Lyminge and represents a crucial part of elite culture in the periods of study. Historical sources inform us that fasting was enforced from an early stage in Kent, and although the practice of fasting is challenging to identify in the archaeological record it is arguably visible in the Phase II assemblage in the avid consumption of fish, chicken and eggs. Such patterns are unique to this site, as no other has produced such large assemblages of both fish and chicken from the same settlement. As such, this pattern deserves to be interpreted on a regional and site-based level as the inhabitants of Lyminge sought to renegotiate their identity within new Christianised meanings, in a region at the heart of social change during the Anglo-Saxon period.

Chapter 10 Conclusions

The zooarchaeological assemblage from Lyminge offers the basis for a refined and richly contextualised examination of how cultural attitudes to the consumption and exploitation of animals changed over the Anglo-Saxon period. My research has identified a series of diachronic trends in species representation and, in the case of domesticated animals, management strategies, coinciding with Lyminge's transformation from a pre-Christian *royal vill* into a flourishing monastic community closely entwined with the dynastic strategies of the Kentish royal house. While observed in a microcosm, these transformations reflect wider changes in the cultural practices, religious affiliations and economic strategies of the Kentish elite during a key period in the formation of Christian kingdoms within Anglo-Saxon England at large.

The diachronic changes evident in consumption patterns, intensified agriculture and the treatment of companion animals reflects more than just economic decisions, but choices guided by changing worldview and new symbolic ways of expressing power. The study of zooarchaeological assemblages has an important role to play in teasing out the complexities of how these changes unravelled in different localities under the influence of varying cultural influences and social trajectories. My research has identified a number of zooarchaeological patterns distinctive to Lyminge and to Kent more generally. One of the most characteristic aspects of the early Saxon assemblage is the preponderance of pig as a regional Kentish signature, suggesting that landscape and control of environmental resources had a leading role to play in livestock husbandry practices at Lyminge during this period. Given the symbolic attributes associated with pig and the warrior elite during this period this evidence suggests that feasting was part of the elite culture at Lyminge during Phase I (Chapter 6, Chapter 9). The discovery of the earliest recorded fragments of peregrine falcon and goshawk in Anglo-Saxon England is significant given the archaeological context within which they were discovered, and reveals that wildfowling was a part of the high-status milieu at Lyminge, in keeping with the other elite elements of the zooarchaeological assemblage, monumental architecture, and rich material culture excavated from the site.

The shifts in worldview that accompanied the establishment of the double monastery in Phase II are apparent in a number of diachronic changes in animal representation, the most exceptional being the decline in pork consumption and the rise in the quantities of chickens and fish (Chapter 6, Chapter 9). The resounding preoccupation with the concept that, 'you are what you eat' appears to have guided concepts of acceptable foodstuffs throughout both occupation sequences. Lyminge provides an ideal case study for exploring the use of zooarchaeological signatures to identify monastic diet, as the unparalleled evidence for fish and chicken consumption, in a phase that includes a documented double monastery, reveals a deliberate choice of this elite community to shun once favoured food in preference of new foodstuffs, likely because they were considered an acceptable food for periods of fasting as a high-status expression of ascetic ideals.

Lyminge also provides rare evidence for the direct correlation of cattle traction paleopathology's and high ratios of older cattle in Phase II, often inferred in other contemporary assemblages but never explicitly demonstrated. The evidence for agricultural intensification in the Phase II assemblage is complemented by a suite of other evidence, including an increase in numbers of elderly sheep, an upsurge in the number of cats, intensified agricultural production of surplus grains, and the discovery of a large threshing barn and plough coulter, highlighting the innovative role the Lyminge community played in the developing Kentish economy.

Paleopathology's in the skeletons of cats and dogs highlight the tensions that existed between the human-animal boundaries, particularly in Phase II. Despite such behaviours, the zooarchaeological evidence, and to an extent isotopic evidence, suggest both species were kept as companion animals, serving a functional but also important and valued social purpose. One of the most important implications raised by my research is that past attempts to identify different 'signatures' in the Anglo-Saxon zooarchaeological record in relation to rigidly categorising sites as either 'monastic' or 'secular' has had a constraining influence over the interpretation of faunal assemblages. Often zooarchaeological reports, particularly those featured in excavation monographs, limit discussion of the assemblage based on the type of site from which the assemblage has been excavated from. The

Lyminge assemblage characterises the complexities that arise when dealing with Anglo-Saxon assemblages during the conversion to Christianity, as there were many factors at play influencing what foodstuffs were considered acceptable to eat and husbandry management strategies. While certain shifts do seem to be consistent with the emergence of a monastic identity, these patterns need to be interpreted within the context of wider socio-political developments as they played out in the Anglo-Saxon kingdom of Kent.

10.1 Future work

The analysis of the Lyminge zooarchaeological assemblage within this thesis is far from exhaustive, given the nature and time/scope of a PhD thesis. This dataset could be utilised to explore and elaborate on various other aspects of the early – middle Anglo-Saxon occupation of the site. For example, a more detailed taphonomic study of the material alongside a more in-depth interrogation of the archaeological record may reveal middening strategies and how these differed between the two phases of the site. Was it the case that in Phase I there was more surface midden material, whereas in Phase II material was deposited in pits following use and then covered by chalk capping? Or, perhaps in Phase I midden waste was taken off-site and used as compost on the surrounding fields. Such research would be complemented by a multi-disciplinary approach, drawing on environmental archaeological techniques such as those outlined by Maslin (2017).

The excavation of the midden-filled prehistoric solution hollow on Tayne Field in 2014 and 2015 revealed large quantities of Anglo-Saxon animal bone spot-dated to the sixth century and earlier that was not possible to include within this zooarchaeological analysis. A detailed contextual analysis of the Lyminge assemblages that incorporates the material from the 2014 and 2015 excavation campaigns, would also contribute to a deeper understanding of the Phase I Lyminge community.

There is a need for more Anglo-Saxon zooarchaeological data from Kent more generally. Due to the limited excavation of Saxon settlements in this region there is a lack of readily available, good quality zooarchaeological data that include mortality and body-part datasets. A focus on increasing contemporary data from Kent, and indeed other regions, would enable further testing of hypotheses presented in this thesis; for example, to what extent was the elevated consumption of chicken and fish peculiar to monastic communities as opposed to the Christian elite more generally?

It would be highly beneficial to situate Lyminge within a wider geographical picture, comparing zooarchaeological trends with data from contemporary Frankish sites. During the time in which this thesis was written little published data was available to make this comparison possible, and only brief mention is made in papers, such as Crabtree's (2010), to contemporaneous animal husbandry regimes in Northern France. Given that it is apparent that trade and exchange between Kent and Francia occurred from the sixth century (Brugmann 1999; Thomas 2013; 2016; 2017) it may be possible that ideas of what where considered acceptable foodstuffs and even husbandry practices could also have been transmitted. This is a valuable line of enquiry deserving of future study.

This study has also demonstrated that further research would greatly aid our understanding of changing attitudes towards companion animals, such as cats and dogs, during the Anglo-Saxon period. Not only could this be achieved by more detailed zooarchaeological recording of these animals from a plethora of sites, but this is an area in which isotopic studies would be highly illuminating. Sampling human and animal populations from sites ranging in date from the Roman to Medieval period across England would allow us to establish the degree to which pet-keeping can be inferred during the Anglo-Saxon period (Sykes 2014) and at what point these relationships may have been formed.

Bibliography

Abbink, J. 2003. Love and Death of Cattle: The paradox in Suri attitudes toward livestock. *Ethnos* 68(3), 341-364.

Adams, N. 2015. Between myth and reality: hunter and prey in Early Anglo-Saxon art, in: Bintley, M.D.J. and Williams, T.J.T. (Eds.), *Representing Beasts in Early Medieval England and Scandinavia.* Woodbridge, The Boydell Press. pp. 13-52.

Albarella, U 1997. Shape variation of cattle metapodials: age, sex or breed? Some examples from medieval and post-medieval sites. *Anthropozoologica* 25-26, 37-47.

Albarella, U. 1997. Size, power, wool and veal: zooarchaeological evidence for late medieval innovations, in: De Boe, G., Verhaeghe, F. (Eds.), *Environment and Subsistence in Medieval Europe.* Institute for the Archaeological Heritage of Flanders, Brugge. pp. 19-31.

Albarella, U. 1999. 'The mystery of husbandry': medieval animals and the problem of integrating historical and archaeological evidence. *Antiquity* 73(282), 867-875.

Albarella, U., 2002. 'Size matters': how and why biometry is still important in zooarchaeology, in: Dobney, K. and O'Connor, T.P. (Eds.), *Bones and the Man: Studies in Honour of Don Brothwell*. Oxford, Oxbow Books. pp. 51-62.

Albarella, U. 2003 Tawyers, tanners, horn trade and the mystery of the missing goat, in: Murphy, P. and Wiltshire, P. (Eds.), *The Environmental Archaeology of Industry*. Oxford, Oxbow. pp.71-86.

Albarella, U. 2005. 'Alternative fortunes?' The role of domestic ducks and geese from Roman to medieval times in Britain, in: Grupe, G. and Peters, J. (Eds.) *Feathers, Grit and Symbolism: Birds and Humans in the Ancient Old and New Worlds.* Documenta Archaeobiologiae, 3. Rahden. pp.249-258.

Albarella, U. 2006. 'Pig husbandry and pork consumption in Medieval England', in: Woolgar, C.M., Serjeantson, D. and Waldron, T. (Eds.), *Food in Medieval England*. Oxford, Oxford University Press. pp. 72-87.

Albarella U. and Davis S.J.M. 1994. *The Saxon and Medieval animal bones excavated 1985-1989 from West Cotton, Northamptonshire*. AML Report 17/94.

Albarella, U. and Serjeantson, D. 2002. A Passion for pork: meat consumption at the British Late Neolithic site of Durrington Walls, in: Miracle, P. and Milner, N. (Eds.), *Consuming Passions and Patterns of Consumption.* Cambridge, MacDonald Institute.

Albarella U. and Payne S. 2005. Neolithic pigs from Durrington Walls, Wiltshire, England: a biometrical database. *Journal of Archaeological Science* 32(4), 589-599.

Albarella, U., Johnstone, C., and Vickers, K. 2008. The development of animal husbandry from the Late Iron Age to the end of the Roman period: a case study from South-East Britain. *Journal of Archaeological Science* 35(7), 1828-1848.

Allen, T. 2004. Swine, Salt and Seafood: A case study of Anglo-Saxon and early medieval settlement in North-East Kent. *Archaeologia Cantiana* 124,117-135.

Allison, E. 2015. The bird remains, in: Hicks, A. 2015. *Destined to Serve: Use of the Outer Grounds of St Augustine's Abbey, Canterbury, Before, During and After the Time of the Monks: Canterbury Christ Church University Excavations 1983-2007*. Canterbury Archaeological Trust Occasional Paper No.11, Canterbury. pp. 321-332.

Ambrose, S.H. 1990. Preparation and characterization of bone and tooth collagen for isotopic analysis*. Journal of Archaeological Science* 17, 431-451.

Ambrose, S. H. 1991. Effects of diet, climate and physiology on nitrogen isotope abundances in terrestrial foodwebs. *Journal of Archaeological Science* 18, 293–317.

Ambrose, S.H .1993. Isotope analysis of palaeodiets: methodological and interpretative considerations, in: Sanford, M.K (Ed.), *Investigations of Ancient Human Tissue: Chemical Analysis on Anthropology.* Reading, Gordon & Breach Science Publishers. pp. 59-129.

Ambrose, S.H. and Norr, L. 1993. Experimental evidence for the relationship of the carbon isotope ratios of whole diet and dietary protein to those of bone collagen and carbonate, in: Lambert, J. and Grupe, G. (Eds.), *Prehistoric Human Bone: Archaeology at the Molecular Level.* New York, Springer. pp. 1-37.

Armitage, P. 1982. Developments in British cattle husbandry. ARC 9(2), 50-59.

Armitage, P. 2004. The animal bone (from the National Portrait Gallery), in: Leary, J. (Ed.), *Tatberht's Ludenwic: Archaeological Excavations in Middle Saxon London*. London, Pre-Construct Archaeology Monograph 2. pp. 115-112.

Arnold, C.J. 1997*. An Archaeology of the Early Anglo-Saxon Kingdoms*, revd edn. Routledge, London.

Askew, E. 2017. The fishy tails of cats. Unpublished Bsc Dissertation. Department of Archaeology. University of Nottingham.

Aybes, C. and Yalden, D.W. 1995. Place-name evidence for the former distribution and status of wolves and beavers in Britain. *Mammal review* 25, 201-227.

Bacher, A. 1967. Vergleichend morphologische Untersuchungen an Einzelknochen des postkranialen Skeletts in Mitteleuropa vorkommender Schwäne und Gänse. Unpublished dissertation, University of Munich.

Baker, J. and Brothwell, D.1980. *Animal Diseases in Archaeology.* London, London Academic Press.

Baker, P. 2012. Assessment of the animal bone assemblage from the 2009 and 2010 excavations at Lyminge, Kent. Unpublished Report.

Banham, D. and Faith, R. 2014. *Anglo-Saxon Farms and Farming*. Oxford, Oxford University Press.

Barker, G. 1999. Cattle-keeping in ancient Europe: to live together or apart? in: Fabech, C. and Ringtved, J. (Eds.), *Settlement and Landscape. Proceedings of a Conference in Århus, Denmark, May 4-7 1998*. Moesgård, Jutland Archaeological Society. pp. 272-280.

Barnes, I. Dobney, K. and Young, P.W. 1998. The molecular paleoecology of geese: identification of archaeological goose remains using ancient DNA analysis. *International Journal of Osteoarchaeology* 8(4), 280-287.

Barnes, I.K. and Dobney, K. 2000. DNA based identification of goose species from two archaeological sites in Lincolnshire*. Journal of Archaeological Science* 27, 91-100.

Barrett, J., Locker, A.M. and Roberts, C.M. 2004. ‘Dark Age Economics’ revisited: the English fish bone evidence AD 600–1600. *Antiquity* 78, 618-636.

Barrett, J. H., Locker, A. M. and Roberts, C. M. 2009. “Dark Age Economics” revisited: the English fish-bone evidence 600–1600, in: Sicking, L. and Abreu-Ferreira. D. (Eds*.), Beyond the Catch: Fisheries of the North Atlantic and the North Sea and the Baltic 900–1850*. Leiden, Koninklijke Brill. pp. 31-61.

Barrett, J.H., Hall, A., Johnstone, C., Kenward, H., O’Connor, T. and Ashby, S. 2007. Interpreting the plant and animal remains from Viking-age Kaupang, in: Skre,D. (Ed.), *Kaupang in Skiringssal: Excavation and Surveys at Kaupang and Huseby, 199.8-2003. Background and Results.* Aarhus, Aarhus University Press. pp. 283-319

Bartosiewicz, L. 1987. Cattle metapodials revisited: a brief review. *Archaeozoologia* 1, 47-51.

Bartosiewicz, L. 2013. *Shuffling Nags, Lame Ducks: The Archaeology of Animal Disease*. Oxford, Oxbow Books.

Basing, P. 1990. *Trades and Crafts in Medieval Manuscripts*. The British Library, London.

Bassett, S. (Ed.), 1989.*The Origins of the Anglo-Saxon Kingdoms*. Leicester.

Behr, C. 2000. The origins of kingship in early medieval Kent. *Early Medieval Europe* 9, 25-52.

Behrensmeyer, A.K. 1978. *Taphonomic and ecologic information from bone weathering*. *Palaebiology* 4, 150-162.

Bendry, R. 2002. ‘Animal Bones from Excavations at the Channel Tunnel Terminal at Cheriton, Folkestone’, unpublished report for the Canterbury Archaeological Trust.

Bendry, R. 2014. ‘Animal bone’, in P. Bennett, K. Parfitt and J. Rady (eds.), Prehistoric and Anglo-Saxon Discoveries on the East Kent Chalk-lands: Investigations along the Whitfield-Eastry By-pass 1991–1996, 159–72. Canterbury, Canterbury Archaeological Trust Ltd.

Bendrey, R., Jones, S. and Cooper, L. *in prep*. ‘The Mammal Bone, Whitefriars, Canterbury’, unpublished report for the Canterbury Archaeological Trust.

Binford, L.R. 1978. *Numamiut Ethnoarchaeology*. New York, Academic Press.

Binford, L.R. 1981. *Bones: Ancient Men and Modern Myths*. New York, Academic Press.

Binois, A., Wardius, C., Rio, P., Brisault, A. and Petit, C. 2013. A dog’s life: Multiple trauma and potential abuse in a medieval dog from Guimps (Charante, France), *International Journal of Palaeopathology* 3, 39-47.

Blair, J. 1992. Anglo-Saxon minsters: a topographical review, in: Blair, J. and Sharpe, R. (Eds.), *Pastoral Care Before the Parish*. Leicester, Leicester University Press. pp. 226-266.

Blair, J. 2005. *The Church in Anglo-Saxon Society*. Oxford, Oxford University Press.

Bocherens, H. and Drucker, D. 2003. Trophic level isotopic enrichment of carbon and nitrogen in bone collagen: case studies from recent and ancient terrestrial ecosystems. *International Journal of Osteoarchaeology,* 13: 46-53.

Boessneck, J. 1969. Osteological differences between sheep and goat, in: Brothwell, D. and Higgs, E. (Eds.), *Science in Archaeology: A Survey or Progress and Research*. London, Thames and Hudson. pp. 331-358.

Boessneck, J. and A. vended Driesch, 1973. D*ie jungpleistozänen Tierknochenfunde aus der Brillenhöhle*. Stuttgart, Müller and Graff.

Bökönyi, S. 1970. A new method for the determination of the number of individuals in animal bone material. *American Journal of Archaeology* 74(2), 291-292.

Bökönyi, S. 1995. The development of stockbreeding and herding in medieval Europe, in Sweeney, D. (Ed.), *Agriculture in the Middle Ages: Technology, Practice and Representation*. Philadelphia, University of Pennsylvania Press. pp. 41-61.

Bond, J.M. 1996. Burnt offerings: animal bone in Anglo-Saxon cremations. *World Archaeology* 28(1), 76-88.

Bond, J.M. and Worley, F.L. 2006. Companions in death: the role of animals in Anglo-Saxon and Viking cremation rituals in Britain, in: Gowland, R. and Knüsel, C. (Eds*.), The Social Archaeology of Funerary Remains*. Oxford, Oxbow Books. pp. 89–98.

Bourdillon, J. and Coy, J. (1980) The animal bones, in: Holdsworth, P. (Ed*.), Excavations at Melbourne Street, Southampton, 1971-6*. York, CBA Research Report 33. pp. 79-137.

Bourdillon, J. 1994. The animal provisioning of Saxon Southampton, in: Rackham, J. (Ed.), *Environment and Economy in Anglo-Saxon England. CBA Research Report No. 89*. London, Council for British Archaeology. pp. 120-125.

Brain, C.K. 1981. *The Hunters of the Hunted? An Introduction to African Cave Taphonomy*. Chicago, University of Chicago Press.

Britton, K., Müldner, G., Bell, M. 2008. Stable isotope evidence for salt-marsh grazing in the Bronze Age Severn Estuary, UK: implications for palaeodietary analysis at coastal sites. *Journal of Archaeological Science* 35, 2111-2118.

Britton, K., Müldner, G. 2013. Stable isotope evidence of salt-marsh economies in Bronze Age Severn Estuary, in: Bell, M. (Ed.), *The Bronze Age in the Severn Estuary*. Council for British Archaeology, York. pp. 263-273.

Broadley, R. 2017. Preliminary observations on the Anglo-Saxon glass from Lyminge, in: Thomas, G. and Knox, A. (Eds.), *Early Medieval Monasticism in the North Sea Zone: Proceedings of a Conference Held to Celebrate the Conclusion of the Lyminge Excavations 2008 -2015. Anglo-Saxon Studies in Archaeology and History*, 20. Oxford University School of Archaeology, Oxbow Books. pp. 117-126.

Brookes, S.J. 2007. *Economics and Social Change in Anglo-Saxon Kent AD 400-900: Landscapes, Communities and Exchange*. British Archaeological Reports 431. Oxford.

Brooks, N. 1988. Romney Marsh in the early Middle Ages, in: Eddison, J. and Green, C. (Eds.), *Romney Marsh: Evolution, Occupation, and Reclamation*. Oxford, Oxford University Committee for Archaeology. pp. 90-104.

Brooks, N. 1989. The creation and early structure of the kingdom of Kent, in: Bassett, S. (Ed), *The Origins of Anglo-Saxon Kingdoms.* London, Leicester Press. pp. 55-74.

Brooks, N. and Kelly, S. E. (Eds.), 2013. *Charters of Christ Church Canterbury, Volume 1*. Oxford University Press, Oxford.

Brown, T.A., Nelson, D.E., Vogel, J.S. and Southon, J.R., 1988. Improved collagen extraction by modified Longin method. *Radiocarbon*, *30*(2), pp.171-177.

Brugmann, B. 1999. The role of Continental artefact types in sixth-century Kentish chronology, in: Jines, J., Høoilund Neilson, J. and Siegmund, F. (Eds.) *The Pace of Change. Studies in Medieval Chronology*. Oxford, Oxbow Books. pp. 37-64.

Buikstra, J. E. and Milner, G. R. 1991. Isotopic and archaeological interpretations of diet in the central Mississippi valley. *Journal of Archaeological Science* 18, 319–29.

Bulliet, R. W. 2005*. Hunters, Herders and Hamburgers: The Past and Future of Human–Animal Relationships*. New York, Columbia University Press.

Callou, C. 1997. *Diagnose différentielle des principaux elements squelettiques du lapin (genre Oryctolagus) et du lièvre (genre Leus) en Europe occidentale.* Valbonne-Sophia Antipolis, Fiches d’Ostéologie Animale our l’Archéologie.

Campbell, G. 2011. Assessment of the archaeological potential of the sieved middle Saxon molluscs from Lyminge, Kent. Unpublished Report. University of Reading.

Campbell, J. 1986. Bede's Reges and Principles, in: Campbell, J. (Ed.), *Essays in Anglo-Saxon History*. London, Hambledon Press. pp. 85-98.

Caplan. P. 1997. Approaches to the study of food, healthy and identity, in; Caplan. P. (Ed.), Food, *Health and Identity*. London, Routledge. pp. 1-31.

Cartmill, M. 1993. *A View to a Death in the Morning: Hunting and Nature through History*. Cambridge, Mass, Harvard University Press.

Carver, M. 2003*. The Cross Goes North: Processes of Conversion in Northern Europe, AD 300-1300.* Woodbridge, The Boydell Press.

Carver, M. 2005. *Sutton Hoo: A Seventh-Century Princely Burial Ground and its Context.* London, British Museum Press.

Cathers, K. 2002. An Examination of the Horse in Anglo-Saxon England. Department of History. University of Reading. Unpublished PhD Thesis.

Chadwick-Hawkes, S. 1982. Anglo-Saxon Kent, c. 425-725. in: Leach, P. E. (Ed.), *Archaeology in Kent to AD 1500.* London, Council for British Archaeology.

Charles-Edwards, T. 1989. Early medieval kingships in the British Isles, in: Bassett, S. (Ed.), *The Origins of the Anglo-Saxon Kingdoms*. Leicester, Leicester University Press. pp. 28-39.

Cherry, J. 1991. Leather, in: Blair, J. and Ramsay, N. (Eds.), English Medieval Industries. *Craftsmen, Techniques, Products.* The Hambledon Press, London and Rio Grande.p. 295-318.

Cherryson, A. K. 2002. The identification of archaeological evidence for hawking in medieval England, in: Proceedings of the 4th Meeting of the ICAZ Bird Working Group Kraków, Poland, 11–15 September 2001, *Acta Zoologica Cracoviensia* 45 (special issue), 307-14.

Chisholm, B.S, Nelson, D.E and Schwarcz, H.P .1982. Stable-carbon and isotope ratios as a measure of marine versus terrestrial protein in ancient diets, *Science*, 216, 1131-1132.

Clark, G. 1998. The fathers and the animals: the rule of reason? in: Linzey, A. and Yamamato, D. (Eds.), *Animals on the Agenda: Questions about Animals for Theology and Ethics*. Illinois, Illinois University Press. pp. 67-79.

Clutton-Brock, J. 1976. The animal recourses, in: Wilson, D. (Ed.), *The Archaeology of Anglo-Saxon England*. London, Methuen. Pp. 373-392.

Clutton-Brock, J. 1981. *Domesticated Animals from Early Times*. Texas, University of Texas Press.

Clutton-Brock, J. Dennis-Bryan, K., Armitage, P. L. and Jewell, P. 1990. Osteology of the Soay Sheep. Bulletin of the British Museum of Natural History. *Zoology* 56 (1), 1-56.

Colgrave, B. and Mynors, R.A.B. (Eds.), 1969*. Bede, Ecclesiastical History of the English People*. Oxford, Clarendon Press.

Collins, M.J. and Galley, P. 1998. Towards an optimal method of archaeological extraction: the influence of pH and grinding. *Ancient Biomolecules* 2, 209-222.

Comaroff, J. and Comaroff, J.L. 1990. Goodly Beasts, Beastly Goods: Cattle and Commodities in a South African Context. *American Ethnologist* 17(2), 195-216.

Coote, J. 1992. ‘Marvels of everyday vision’: the anthropology of aesthetics and the cattle-keeping Nilotes, in: Coote, J. and Shelton, A. (Eds.), *Anthropology, Art and Aesthetics. Oxford*. Clarendon. pp. 245-273.

Corbet, G.B. and Harris, S. 1991. *The Handbook of British Mammals* (3rd Edition). Oxford, Blackwell.

Coy, J. 1980. The animal bones, in: Haslam, J. (Ed.), A Middle Saxon Iron Smelting Site at Ramsbury, Wiltshire. *Medieval Archaeology* 24,1-68. pp. 41-56.

Coy, J. 1981. The Animal Bones, in: Silvester, R.J. (Ed.), An excavation on the post-Roman site at Bantham, South Devon. *Devon Archaeological Society Proceedings* 39, 89-118. pp. 106-110.

Coy, J. 1982. The role of wild vertebrate fauna in urban economies in Wessex, in: Hall, A. and Kenward, H. (Eds.), *Environmental Archaeology in the Urban Context*. CBA Research Report 43. pp. 107-115.

Coy, J. 1989. Animal bones, in: Astill, G.G. and Lobb, S.J. (Eds.), Excavations of Prehistoric, Roman and Saxon deposits at Wraysbury, Berkshire. *Archaeological Journal* 146, 68-134. pp. 111-124 and microfiche.

Coy, J. 1991. The animal bones, in: Fasham, P.J. and Whinney, R.J.B. (Eds.), *Archaeology and the A3. The Watching Brief, the Anglo-Saxon Settlement at Abbots Worthy and Retrospective Sections*. Stroud, Hampshire Field Club and Archaeological Society, Monograph 7, 60-67.

Crabtree, P. J. 1989. *West Stow, Suffolk: Early Anglo-Saxon Animal Husbandry*. Ipswich, East Anglian Archaeology 47.

Crabtree, P.J. 1990. Zooarchaeology and complex societies: some uses of faunal analysis for the study of trade, social status and ethnicity. *Archaeological Method and Theory* 2, 155-205.

Crabtree, P.J. 1994. The animal bone remains from Ipswich, Suffolk, recovered from sixteen sites excavated between 1974 and 1988. Unpublished Report.

Crabtree, P.J. 1996. Production and consumption in the early complex society: animal use in Middle Saxon East Anglia. *World Archaeology* 28, 20-26.

Crabtree, P.J. 2010. Agricultural innovation and socio-economic change in early medieval France: evidence from Britain and France. *World Archaeology* 42, 122-136.

Crabtree, P, J. 2012a. *Middle Saxon Animal Husbandry in East Anglia*. Bury St Edmunds, East Anglian Archaeology 143.

Crabtree, P. J. 2012b. The animal bones from the Chapter House at St Albans Abbey, in Biddle, M. and Kjølbye-Biddle, B., (Eds.), *The Chapter House at St Albans Abbey*, Fraternity Friends St Albans Abbey Monograph 1, Oxford.

Crabtree, P. J. and Campana, D. 2014. Animal bone, in: Tester, A., Anderson, A., Riddler, I. and Carr, R. (Eds.), *Staunch Meadow, Brandon, Suffolk: A High-Status Middle Saxon Settlement on the Fen Edge*. Bury St Edmunds, Suffolk Archaeological Service. pp. 296-312.

Crabtree, P. J.2015. A note on the role of dogs in Anglo-Saxon Society: Evidence from East Anglia. *International Journal of Osteoarchaeology* 25,976-980.

Crawford,S.E.E. 1999. *Childhood in Anglo-Saxon England*. Stroud, Sutton Publishing Ltd.

Cummins, J. 1988. *The Hound and the Hawk: The Art of Medieval Hunting*. London. Weiden- field and Nicholson.

Darby, H.C. 1977. *Domesday England*. Cambridge.

Davis, S.J.M. 1980. Late Pleistocene and Holocene Equid remains from Israel. *Zoological Journal of the Linnean Society* 70,289-312.

Davis, S.J.M. 1987. *The Archaeology of Animals.* London, Batsford.

Davis, S.J.M. 1992. *A Rapid Method for Recording Information About Mammal Bones from Archaeological Sites,* Ancient Monuments Laboratory Report, 19/92, London, English Heritage.

Davis, S. 2000. The effect of castration and age on the development of the Shetland sheep skeleton and a metric comparison between bones. *Journal of Archaeological Science* 27(5), 373-390.

defrance, S. 2009. Zooarchaeology in complex societies: political economy, status and ideology. *Journal of Archaeological Research* 17, 105-168.

Dembińska, M. 1986. Fasting and working monks: regulations of the fifth to the eleventh centuries, in: Fenton, A. and Kisbán, E. (Eds.), *Food in Change: Eating Habits from the Middle Ages to the Present Day*. Edinburgh, John Donald. pp.152–60.

DeNiro M.H. 1985. Postmortem preservation and alteration of in vivo bone collagen isotope ratios in relation to palaeodietary reconstruction. *Nature* 317:806–809.

Dickinson, T.M. 2005. Symbols of protection: the significance of animal-ornamented shields in early Anglo-Saxon England*. Medieval Archaeology* 49(1), 109-163.

Dickinson, T.M., Fern, C. and Richardson, A. 2011. Early Anglo-Saxon Eastry: archaeological evidence for the beginnings of a district centre in the kingdom of Kent*. Anglo-Saxon Studies in Archaeology and History 17*, 1-86.

Dietler, M. 1996. Feasts and commensal politics in the political economy: food, power and status in prehistoric Europe, in: Wiessner, P. and Schuefenhövel, W. (Eds.), *Food and the Status Quest: An Interdisciplinary Perspective*. Berghahn, Providence. Pp. 87-125.

Dobney, K., Jaques, D. and Irving, B. 1996. *Of butchers and breeds. Report on Vertebrate Remains from Various Sites in the City of Lincoln*. Lincoln, City of Lincoln Archaeology Unit.

Dobney, K. and Jacques, D. 2002. Avian signatures for identity and status in Anglo- Saxon England. *Acta Zoologica Cracoviensia*, 45, 7-21.

Dobney, K. D., Jacques, D., Barrett, J. H. and Johnstone, C. 2007. *Farmers, Monks and Aristocrats: The Environmental Archaeology of Anglo-Saxon Flixborough.* Oxbow, Oxbow Books.

Doll, M. 1999. 'Im Essen jedoch connote er nicht enthalstam sein: Fleischverzehr in der Karolingerzeit', in: C. A. W. Stiegemann and M. Wemhoff (Eds.*), Kunst und Kultur de Karolingerzeit.* Mainz, Philip von Zabern. pp. 445-459.

Driesch von den A. 1976. *A guide to the Measurements of Animal Bones from Archaeological Sites.* Harvard, Peabody Museum Bulletin.

Driver, J.C. 1982. Medullary bone as an indicator of sex in bird remains from archaeological sites, in: Wilson, B. Grigson, C. and Payne, S. (Ed.), *Ageing and Sexing Animal Bones from Archaeological Sites*. Oxford, BAR British Series 109. pp. 251-268.

Dyer, C. 2003. *Making a Living in the Middle Ages: The People of Britain, 850-1520*. London, Penguin Books.

Dyer, C. 2004. Alternative agriculture: goats in medieval England, in: Hoyle, R.W. (Ed.), *People, Landscape and Alternative Agriculture: Essays for Joan Thirsk. Agricultural History Review Supplement,* 3, 20-38.

Eisenmann, V. 1986. Comparative osteology of modern and fossil horses, half-asses, and asses, in: Meadow, R.H. and Uerpmann, H.P. (Eds.), *Equids in the Ancient World*. Wiesbaden, Reichert. pp. 67-116.

Engels, D. 2001. *Classical Cats*. London. Routledge.

Enghoff, I.B. 2006. Pattedyr og fugle fra markeds-pladsen I Ribe, ASR 9 Posthuset, in Feveile,C. (Ed.), *Ribe Studier. Det Ældste Ribe: Udgravninger på nordsiden af Ribe Å 1984-2000*. Arhus: Jysk Arkæologisk Selskans skrifter 51. pp. 167-189.

Ervynck, A. 1997. Following the rule? Fish and meat consumption in monastic communities in Flanders (Belgium), in: de Boe, G. and Verhaeghe, F. (Eds.), *Environment and Subsistence in Medieval Europe*. Rapporten, 9, Zellick, Instituut voor het Archeologisch Patrimonium. pp. 67-81.

Everitt, A. 1986. *Continuity and Colonisation: The Evolution of Kentish Settlement*. London, Leicester University Press.

Fabre-Vassas, Claudine. 1997. *The Singular Beast. Jews, Christians and the Pig*. New York, Columbia University Press.

Fairnell, E.H. and Barrett, J.H. 2007. Fur-bearing species and Scottish islands*. Journal of Archaeological Science* 34, 463-484.

Faith, R. 1997. *The English Peasantry and the Growth of Lordship*. London, Leicester University press.

Fern, C. 2010. Horses in Mind, in: Carver, M., Sanmark, A. and Semple, S. (Eds.), *Signals of Belief in Anglo-Saxon England. Anglo-Saxon Paganism Revisited.* Oxford, Oxford University Press. pp. 126-157.

Fiddes, N. 1991. *Meat: A Natural Symbol*. London, Routledge.

Fischler, C. 1988. Food, self and identity. *Social Science Information* 27(2), 275-292.

Foot, S. 2006*. Monastic Life in Anglo-Saxon England, c. 600–900*. Cambridge, Cambridge University Press.

Forbes, R.J. 1957. *Studies in Ancient Technology*. Voume V. Leiden, E.J.Brill.

Fothergill, T., Best, J., Foster, A. and Demarchi, B. 2017. Hens, health and husbandry: integrated approaches to past poultry-keeping in England*. Open Quaternary*, 3(5), 1-25.

Fox, K. 2004. *Watching the English: The Hidden Rules of English Behaviour*. London, Hodder and Stoughton.

Franklin, A. 1999. *Animals and Modern Cultures: A Sociology of Human-Animal Relations in Modernity.* London, Sage Publications.

Frantzen, A.J. 2014. *Food, Eating and Identity in Early Medieval England.* Woodbridge, The Boydell Press.

Gal, E. 2013. Pathological changes in bird bones, in Bartosiewicz, L. *Shuffling Nags, Lame Ducks: The Archaeology of Animal Disease*. Oxford, Oxbow Books. pp. 217-256.

Gardiner, M. 1993. The excavation of a late Anglo-Saxon settlement at Market Field, Steyning, 1988-89. *Sussex Archaeological Collections* 131,21-67.

Gardiner, M.F., Cross, R., Macpherson-Grant, N. and Riddler,I. (Eds.) 2001. Continental trade and non-urban ports in middle Anglo-Saxon England: Excavations at Sandtun, West Hythe, Kent. *Archaeological Journal* 158, 161-290.

Geertz, C. 1979. Deep Play: Notes on the Balinese Cockfight, in: Geertz, C. (Ed.), *The Interpretation of Cultures*. New York, Basic Books Publishers. pp. 412-453.

Gelling, M. 1998. Place-Names and Landscape, in: Taylor, S. (Ed.), T*he Uses of Place-Names.* St. John's House Papers No. 7, Edinburgh. *Scottish Cultural Press*. pp. 75-100.

Gibson, C. and Murray, J. 2003. An Anglo-Saxon settlement at Godmanchester Cambridgeshire, *Anglo Saxon Studies in Archaeology and History* 12, 183-90.

Glosecki, S.O. 2000. Moveable beasts: The manifold implications of early Germanic animal imagery, in: Flores, N.C. (Ed.), *Animals in the Middle Ages.* New York, Routledge. pp. 3-23.

Grant, A. 1975. *The animal bones, in:* Cunliffe, B. (Ed.), *Excavations at Porchester Castle, Vol 1: Roman. Reports of the Research Committee*. London. pp. 378-408.

Grant, A. 1982. The use of tooth wear as a guide to the age of domestic ungulates, in: Wilson, B., Grigson, C. and Payne, S. (Eds.), *Ageing and sexing animal bones from archaeological sites. Oxford*. BAR British Series 109. pp. 91‑108.

Grant, A. 1987. Some observations of butchery in England from the Iron Age to medieval period. *Anthropozoologica*, Special 1,53-59.

Grayson, D.K. 1973. On the methodology of faunal analysis. *American Antiquity* 38(4),432-439.

Grayson, D.K. 1979. On the quantification of vertebrate archaeofaunas, in: Schiffer, M.B. (Ed.), *Advances in Archaeological Method and Theory*. New York, Academic Press. pp. 199-237.

Greenfield, H.J. 2006. Sexing fragmentary ungulate acetabula, in: Ruscillo, D. (Ed.), Recent advances in ageing and sexing animal bones. Oxford, Oxbow Books. pp. 68-86.

Griffiths, H., Poulter, I., & Sibley, D. (2000). Feral cats in the city, in: Philo, C. and Wilbert, C. (Eds.), *Animal Spaces, Beastly Places. New Geographies of Human-Animal Relations*. London, Routledge. pp. 56–70.

Grigson, C. 1982. Sex and age determination of some bones and teeth of domestic cattle: a review of the literature, in: Wilson, B. Grigson, C. and Payne, S. (Eds.), *Ageing and Sexing Animal Bones from Archaeological Sites.* Oxford, BAR British Series 109. pp. 7-23.

Grimm, J. and Worley, F. 2011. The Saxon Animal Bone from Northfleet and Springhead, in: Andrews, P., Mepham, L.,Schuster, J. and Stevens, C.J. (Eds*.), Settling the Ebbsfleet Valley: High Speed I Excavations at Springhead and Northfleet, Kent. The Late Iron Age, Roman, Saxon and Medieval Landscape. Volume 4: Saxon and Later Finds and Environmental Reports.* Oxford Wessex Archaeology.

Haarnagel, W. 1979*. Die Grabung Feddersen Wierde: Methode, Hausbau, Siedlungs- und Wirtschaftsformen sowie Sozialstruktur*. Wiesbaden. pp. 223–38.

Hagen, A. 1992. *A Handbook of Anglo-Saxon Food. Processing and Consumption*. Hockwold-cum-Wilton, Anglo-Saxon Books.

Hagen, A. 2010*. Anglo-Saxon Food and Drink. Lightening Source*, Milton Keynes.

Halley, D.J. and Rosvold, J. 2014. Stable Isotope analysis and variation in medieval domestic pig husbandry practices in northwest Europe: absence of evidence for a purely herbivorous diet. *Journal of Archaeological Science* 49,1-5.

Halstead, P. 1985. A study of the mandibular teeth from Romano-British contexts in Maxey, in: Pryor, F. (Ed.) *Archaeology and environment of the Lower Welland Valley Volume 1: Cambridge: Fenland Project Committee.* Cambridge*,* Cambridge University Press. pp. 219 - 282.

Halstead, P., Collins, P. and Isaakidou, V. 2002. Sorting the sheep from the goats: morphological distinctions between the mandibles and mandibular teeth of adult Ovis and Capra*. Journal of Archaeological Science* 29, 545-553.

Hambleton, E. 1999. *Animal Husbandry Regimes in Iron Age Britain: A Comparative Study of Faunal Assemblages from British Iron Age Sites*. Oxford, Archaeopress.

Hamerow, H. 2002. *Early Medieval Settlements: The Archaeology of Rural Communities in Northwest Europe, AD 400-900*. Oxford, Oxford University Press.

Hamerow, H. 2006. Special Deposits in Anglo-Saxon Settlements. *Medieval Archaeology* 50, 1-30.

Hamerow, H. 2012. *Rural Settlements and Society in Anglo-Saxon England.* Oxford, Oxford University Press.

Hamerow, H. and Brennen, N. 2015. An Anglo-Saxon great hall complex at Sutton Courtenay/Drayton, Oxfordshire: a royal centre of early Wessex? *Archaeological Journal* 172, 132-150.

Hamilakis, Y. 2003. The sacred geography of hunting: wild animals, social power and gender in early farming societies, in: Kotjabopoulou, E., Hamilakis, Y., Halstead, P., Gamble, C. and Elafanti, V. (Eds), *Zooarchaeology in Greece: Recent Advances*. British School at Athens, London. pp. 239-247.

Hamilton, J. and Thomas, R. 2012. Pannage, pulses and pigs: isotopic and zooarchaeological evidence for changing pig practices in later medieval England. *Medieval Archaeology* 56, 234-259.

Hamilton-Dyer, S. 2001. Bird and fish remains, in: Gardiner, M.F., Cross, R., Macpherson-Grant, N. and Riddler, I. (Eds.), Continentaltrade and non-urban ports in middle Anglo-Saxon England: excavations at Sandtun, West Hythe, Kent. *Archaeological Journal*. 158, 161-290. pp. 255-61.

Hamilton-Dyer, S. 2005. Animal bones, in: Birbeck, V, Smith, R, Andrews, P and Stoodley, N (Eds.), *The Origins of Mid-Saxon Southampton: Excavations at the Friend's Provident St Mary's Stadium 1998-2000.* Salisbury, Wessex Archaeological Report. pp. 140-154.

Hammon, A 2005. Late Romano-British - early medieval socio-economic and cultural change: analysis of the mammal and bird bone assemblages from the Roman City of *Viroconium Cornoviorum*, Shropshire. Unpublished PhD Thesis, University of Sheffield.

Hammon, A. 2010. Brown Bear, in: O'Connor, T.P. and Sykes, N. (Eds.), *Extinctions and Invasions: A Social History of British Fauna*. Oxford, Windgather Press. pp. 95-104.

Hammond, C. and O'Connor, T. 2013. Pig diet in medieval York: carbon and nitrogen stable isotopes. *Archaeological and Anthropological Sciences* 5,123-127.

Harcourt, R.A. 1974. The Dog in Prehistoric and Early Historic Britain. Jo*urnal of Archaeological Science* 1,151-175.

Harman, M 1979. The mammalian bones, in: Williams, J. (Ed.), St Peter's Street, Northampton excavations 1973-1976. *Northamptonshire Archaeological Society* 2, 328-336.

Harrington, S. and Welch, M. 2014. *The Early Anglo-Saxon Kingdoms of Southern Britain AD 450-650: Beneath the Tribal Hidage*. Oxford and Philadelphia, Oxbow Books.

Haslam, J. 1980. A middle Saxon iron smelting site at Ramsbury, Wiltshire. *Medieval Archaeology* 24(1), 9-30.

Hatting, T. 1995. Sex-related characters in the pelvic bone of domestic sheep (Ovies aries L.). *Archaeofauna* 4, 71-76.

Hawkes, J. 1997. Symbolic lives: the visual evidence, in: Hines, J. (Ed.), *The Anglo-Saxons from the Migration Period to the Eighth Century. An Ethnographic Perspective*. Studies in Historical Archaeoethnology 2. San Marino and Woodbridge, The Boydell Press. pp 311-338.

Hayden, B. 2014. *The Power of Feasts from Prehistory to the Present Day*. Cambridge, University Press.

Hedeager, L. 2000. Migration Period Europe: the formation of a political mentality, in: Theuws, F. and Nelson, J.L. (Eds.*), Rituals of Power from Late Antiquity to the Early Middle Ages*. Leiden, Brill. pp 15-57.

Herzog, H. 2010. *Some We Love, Some We Hate, Some We Eat: why it's so hard to think straight about animals.* London, Harper Collins.

Hetherington, D.A., Lord, T.C. and Jacobi, R.M. 2006. New evidence for the occurrence of Eurasian lynx (Lynx lynx) in medieval Britain, *Journal of Quaternary Science* 21, 3-8.

Hicks, A. 2015. *Destined to Serve: use of the outer grounds of St Augustine's Abbey, Canterbury, Before, During and After the Time of the Monks: Canterbury Christ Church University Excavations 1983-2007*. Canterbury Archaeological Trust Occasional Paper No.11, Canterbury.

Hicks, C. 1986. The birds on the Sutton Hoo purse lid. *Anglo-Saxon England* 15, 153-165.

Hicks, C. 1993. *Animals in Early Medieval Art*. Edinburgh, Edinburgh University Press.

Hicks, C. 2011*. The Bayeux Tapestry: The Life Story of a Masterpiece*. London, Vintage Books.

Higbee, L. 2009. Mammal and bird bone, in: Lucy, S., Tipper, J. and Dickens, A. (Eds.), *The Anglo-Saxon Settlement and Cemetery at Bloodmoor Hill, Carlton Coleville, Suffolk*. East Anglian Archaeology Report No. 131. Cambridge Archaeological Unit, Cambridge.

Higham, C. 1969. The metrical attributes of two samples of bovine limb bones. *Journal of Zoology* 157, 63-74.

Higham, N.J. 1997. *The Convert Kings: Power and Religious Affiliation in Early Anglo-Saxon England*. Manchester, Manchester University Press.

Hinton, D 1990. *Archaeology, Economy and Society. England from the Fifth to the Fifteenth Century*. London, Seaby.

Hirons, A. 2017. An aDNA Analayis of Early 'Domestic' Cats in England. Unpublished Msc Dissertation, University of Oxford.

Hodges, R 1988. The rebirth of towns in the early Middle Ages, in: Hodges, R. and Hobley, B. (Eds.), *The Rebirth of Towns in the West AD 700-1050*. London, Council for British Archaeology 68. pp.1-8.

Holmes, M. 1993. The animal bones, in: Williams, R.J. (Ed.), *Pennyland and Hartigans. Two Iron Age and Saxon sites in Milton Keynes. Aylesbury*. Buckinghamshire Archaeology Society Monograph No.4, 133-154.

Holmes, M. 2011. Food, Status and Complexity in Saxon and Scandinavian England: An Archaeozoological Approach. Unpublished PhD Thesis, University of Leicester.

Holmes, M. 2014a. *Animals in Saxon and Scandinavian England: Backbones of Economy and Society*. Leiden, Sidestone Press.

Holmes, M. 2014b. Does size matter? Changes in size of animals throughout the English Saxon period (AD 450-1066). *Journal of Archaeological Science* 43, 77-90.

Hooke, D. 2012. *Wealdbæra* and *swina mæst*: woodpasture in early medieval England, in: Turner, S. and Sylvester, B. (Eds.), *Life in Medieval Landscapes: People and Places in the Middle Ages: Papers in Memory of H.S.A. Fox.* Oxford. pp. 32-49.

Hope-Taylor, B. (Ed.) 1977. *Yeavering: an Anglo-British Centre of Early Northumbria.* London, Her Majesty's Stationary Office.

Hourani, Y. 2018. Congenital anomalies and traumatic injuries in Dogs from Laodicea in Canaan (Hellenistic Beirut, Lebanon), in: Bartosiewicz, L. and Gal, E. (Eds*.), Care or Neglect? Evidence of Animal Disease in Archaeology*. Oxford. Oxbow Books. pp. 79-96.

Hull, B.D. and O'Connell, T.C. 2011. Diet: recent evidence from analytical chemical techniques, in: Hamerow, H., Hinton, D.A. and Crawford, A. (Eds.), *Oxford Handbook of Anglo-Saxon Archaeology. Oxford*. Oxford University Press. pp. 667-687.

Hurn, S. 2012. *Humans and Other Animals: Cross-Cultural Perspectives on Human-Animal Interactions*. London, Pluto Press.

Jay, M., Fuller, B.T., Richards, M.P., Knüsel, C.J. and King, S.S. 2008. Iron age breastfeeding practices in Britain: isotopic evidence from Wetwang Slack, East Yorkshire. *American Journal of Physical Anthropology* 136, 327–337.

Jenkins, R. C. 1874. The Basilica of Lyminge: Roman, Saxon and Medieval. *Archaeologia Cantiana* 9, 205–223.

Jenkins, S.G., Partridge, S.T, Stephenson, T.T., Farley, S.D. and Robbins, C.T. 2001. Nitrogen and carbon isotope fractionation between mothers, neonates and nursing offspring. *Oecolgia* 129(3), 336-341.

Johnson, M.P. 2006. Conflict and control: gender symmetry and asymmetry in Domestic Violence, *Violence Against Women* 12(11), 1003-1018.

Jones, M.H. 2007. Saints and other horse-mutilators, or why all Englishmen have tails, in" Hartmann, S. (Ed.), *Fauna and Flora in the Middle Ages. Studies of the Medieval Environment and its Impact on the Human Mind.* Frankfurt am Main. pp. 155–70.

Jones, S. and Randall, C. 2015. The mammal bone, in: Hicks, A. 2015. *Destined to Serve: use of the outer grounds of St Augustine's Abbey, Canterbury, Before, During and After the Time of the Monks: Canterbury Christ Church University Excavations 1983-2007.* Canterbury Archaeological Trust Occasional Paper No.11, Canterbury. pp. 291-320.

Jonuks, T., Oras, E., Best, J., Demarchi, B., Mänd, R., Presslee, S. and Vahur, S. 2018. Multi-method analysis of avian eggs as grave goods: revealing symbolism in Conversion period burials at Kukruse, NE Estonia. *Environmental Archaeology* 23(2), 109-222.

Katzenberg, M. A., Herring, D. A. and Saunders, S. R. 1996. Weaning and infant mortality: evaluating the skeletal evidence. *Yearbook of Physical Anthropology* 39, 177-99.

Katzenberg, M.A. 2008. Stable isotope analysis: a tool for studying past diet, demography and life history, in: Katzenberg, M.A. and Saunders, S.R. (Eds.) *Biological Anthropology of the Human Skeleton*. 2nd Edition. New York. Wiley-Liss. pp. 413-441.

Kear, J. 1990. *Man and Wildfowl*. London, Poyser.

Kelly, F. 1997. *Early Irish Farming.* Dublin. Dublin Institute for Advanced Studies.

Kelly, S. (Ed.) 1995. *Charters of St Augustine's Abbey, Canterbury and Minster-in-Thanet, Anglo-Saxon Charters, 4.* Oxford, Oxford University Press.

Kelly, S. 1992. Trading privileges from eighth-century England. *Early Medieval Europe*, 1, 3-28.

Kelly, S. 2006. Lyminge minster and its charters, in: Keynes, S. and Smyth, A.P. (Eds.), *Anglo-Saxons: Studies Presented to Cyril Roy Hart*. Dublin, Four Courts Press. pp. 98–113.

Kitchener, A. C., and O'Connor, T. 2010. Wildcat, *Felis silvestris*, domestic and feral cat, *Felis cattus*, in: O'Connor, T.P. and Sykes, N.J. (Eds.*), Extinctions and invasions: The social history of British fauna Oxford.* Oxbow. pp. 83– 94.

Knapp, Z. 2017. Changing tastes: farming, feasting and fasting at Lyminge, in: Thomas, G. and Knox, A. (Eds.), *Early Medieval Monasticism in the North Sea Zone: Proceedings of a Conference Held to celebrate the Conclusion of the Lyminge Excavations 2008 -2015. Anglo-Saxon Studies in Archaeology and History*, 20. Oxford University School of Archaeology, Oxbow Books. pp.135-148.

Knox, A. 2012. The Sacred and the Secular: Investigating Anglo-Saxon Ritual Action and Belief Systems through a Holistic Study of Settlements and Cemeteries in the Seventh to Ninth Centuries AD. Unpublished PhD thesis, University of Reading. Department of Archaeology.

Kylie, E. 1911. *The English Correspondence of St Boniface*. Chatto and Windus.

Landon, D.B. 1996. Feeding colonial Boston: a zooarchaeological study. *Historical Archaeology* 30(1), 1-153.

Leahy, K. 2011. Anglo-Saxon Crafts, in: Hinton, D., Crawford, S. and Hamerow, H. (Eds.), *The Oxford Handbook of Anglo-Saxon Archaeology*. Oxford, Oxford University Press. pp. 440-459.

Lee, C. 2007. *Feasting the Dead: Food and Drink in Anglo-Saxon Burial Rituals*. Woodbridge, The Boydell Press.

Legge, A. 1981. The agricultural economy, in: Mercer, R. (Ed.), Grimes Graves Norfolk: Excavations 1971-72, Vol. 1. London*, Department of the Environment* 11, 79-103.

Legge, E. T. 1992. *Excavations at Grimes Graves, Norfolk, 1972–1976, Fascicule 4, Animals, Environment and the Bronze Age Economy*. London, British Museum Press.

Levitan, B. 1992. The animal bone, in: Keevil, G.D. (Ed.), An Anglo-Saxon site at Audlett, Drive, Abingdon, Oxfordshire. *Oxonesia* 57, 55-80.

Lewis, M.E. and Gowland, R. 2007. Brief and precarious lives: infant mortality in contrasting sites from medieval and Post-medieval England (AD 850-1859). *American Journal of Physical Anthropology* 134, 117-129.

Lister, A.M. 1996. The morphological distinction between bones from fallow deer (Dama dama) and red deer (Cervus elaphus). *International Journal of Osteoarchaeology* 6, 119-143.

Lokuruka, M.N.I. 2006. Meat is the meal and status is by meat: recognition of rank, wealth and respect through meat in Turkana culture. *Food and Foodways* 14, 201-229.

Longin, R. 1971. New method of collagen extraction for radiocarbon dating. *Nature* 230, 241-242.

Loog, L., Thomas, M.G., Barnett, R., Allen, R., Sykes, N., Paxinos, P.D., Labrasseaur, O., Dobney, K., Peters, J., Manica, A., Larson, G. and Eriksson, A. 2017. Inferring allele frequency trajectories from ancient DNA indicates that selection on a chicken gene coincided with changes in Medieval husbandry practices. *Molecular Biology and Evolution* 4(8), 1981-1990.

Loveluck, C. 2013. *Northwest Europe in the Early Middle Ages, c. AD 600-1500: A Comparative Archaeology.* Cambridge, Cambridge University Press.

Lund, J. 2010. At the waters edge, in: Carver, M., Sanmark, A. and Semple, S. (Eds.), *Signals of Belief in Early England: Anglo-Saxon Paganism revisited.* Oxford, Oxbow Books. pp. 49-66.

Lyman, R. 1987. On the analysis of vertebrate mortality profiles: Sample size, mortality type, and hunting pressure. *American Antiquity* 51(1), 125-142.

Lyman, R. L. 1994. *Vertebrate Taphonomy*. Cambridge University Press, Cambridge.

Lyman, R.L. 2008. *Quantitative Paleozoology*. Cambridge, Cambridge University Press.

MacDonald, R.H., MacDonald, K.C. and Ryan, K. 1993. Domestic geese from Medieval Dublin. *Archaeofauna* 2, 205-218.

MacGregor, A. 1989. Bone, antler and horn industries in the urban context, in: Serjeantson, D. and Waldron, T. (Eds), *Diet and crafts in town. The evidence of animal remains from the Roman to the Post-Medieval period*. BAR British Series 199 Oxford, British Archaeological Reports. pp. 107-128.

MacGregor, A. 1991. Antler, bone and horn, in: Blair, J. and Ramsay, N. (Eds.), *English Medieval industries. Craftsmen, Techniques, Products.* London and Rio Grande, The Hambledon Press. pp. 355-388.

MacKinnon, M. 2010. 'Sick as a dog': zooarchaeological evidence for pet health and welfare in the Roman world, *World Archaeology*, 41(1), 290-309.

MacKinnon, M. and Belanger, K. 2006. In sickness and in health: Care for an arthritic Maltese dog from the Roman cemetery of Yasmina, Carthage, Tunisia, in: Synder, L.M. and Moore, E.A. (Eds.), Dogs and People in Social, Working Economic or Symbolic Interaction. Oxford, Oxbow.

Madgwick, R., Mulville, J. and Stevens, R.E. 2012. Diversity in foddering strategy and herd management in late Bronze Age Britain: an isotopic investigation of pigs and other fauna from two midden sites. *Environmental Archaeology* 17 (2), 126-140.

Magennis, H. 1996. *Images of Community in Old English Poetry*. Cambridge, Cambridge University Press.

Magennis, H. 1999. *Anglo-Saxon Appetites: Food and Drink and their Consumption in Old English and Related Literature*. Bodmin, Four Courts Press.

Maltby, M., 1981. Iron Age, Romano-British and Anglo-Saxon Animal Husbandry- A Review, in: Jones, M. and Dimbleby, G. (Eds.), The Environment of Man: The Iron Age to the Anglo-Saxon Period. BAR British Series, Report No. 87. pp.185-203.

Maltby, M. 1993. Animal bones, in: Woodward, P.J., Davies, S.M. and Graham, A.H. (Eds.), *Excavations at the Old Methodist Chapel and Greyhound Yard, Dorchester, 1981-1984. Dorchester*. Dorset Natural History and Archaeological Society Monograph Series 12, 314-340.

Maltby, M. 2002. Animal bones in archaeology: how archaeozoologists can make a greater contribution to British Iron Age and Romano-British Archaeology, in: Dobney, K. and O'Connor, T.P. (Eds.), *Bones and the Man: studies in honour of Don Brothwell*. Oxford, Oxbow Books. pp.88-94.

Maltby, M. 2006. *Integrating Zooarchaeology*. Oxford, Oxbow Books.

Marshall, P., van der Plicht, J., Cook, G. T., Grootes, P. M., Beavan Athfield, N. and Buzinny, M. 2010. Scientific dating evidence, in: Thomas, G. *The later Anglo-Saxon settlement at Bishopstone: A Downland Manor in the Making*. York. Council for British Archaeology Research Report 163. pp. 196-200.

Marvin, G. 1994. The cockfight in Andalusia, Spain: Images of the truly male, in: Dundes, A. (Ed.), *The Cockfight: a casebook*. Madison, WI, The University of Wisconsin Press. pp. 174-190.

Marvin, W.P. 2006. *Hunting Law and Ritual in Medieval English Literature.* Cambridge, D.S. Brewer.

Marzinzik, S. 2013. *Masterpieces: Early Medieval Art.* London, The British Museum.

Maslin, S. 2017. The Landscape and Ecology of the Anglo-Saxon Conversion: a multi-proxy environmental and geoarchaeological contextualisation of the high-status settlement at Lyminge, Kent. Unpublished PhD Thesis. University of Reading. Department of Archaeology.

Maslin, S. 2018. Anglo-Saxon economy and ecology by a Downland stream: A waterlogged sequence from the Anglo-Saxon royal settlement at Lyminge, Kent. *Environmental Archaeology* 23(2):137-151.

Mayr-Harting, H. 1991. *The Coming of Christianity to Anglo-Saxon England*, third edition. Philadelphia, University of Pennsylvania Press.

McCormick, F. 1988. The domesticated cat in early Christian and Medieval Ireland, in: MacNiocaill, G. and Wallace, P.F. (Eds.), *Keimelia: studies in Medieval Archaeology and History in Memory of Tom Delaney, Galway*. Galway University Press. pp. 2218-2228.

McCormick, F. 2002. The distribution of meat in a heirarchical society: the Irish evidence, in: Miracle, P. and Milner, N. (Eds.), *Consuming Passions and Patterns of Consumption.* Cambridge, McDonald Institute for Archaeological Research. pp. 25-32.

McCormick, F. and Murray, E. 2007. Knowth and the Zooarchaeology of Early Christian Ireland. Royal Irish Academy, Dublin.

McCormick, F. and Murray, E. 2017. The zooarchaeology of medieval Ireland, in: Albarella, U., Rizetto, M. Russ, H., Vickers, K. and Viner-Daniels, S. (Eds.), *The Oxford Handbook of Zooarchaeology*. Oxford University Press. pp.195-213.

McKerracher, M. 2014. Agricultural Development in Mid-Saxon England. Unpublished Dphil thesis. University of Oxford.

McKerracher, M. 2017. Seeds and status: the archaeobotany of monastic Lyminge, in: Thomas, G. and Knox, A. (Eds.), *Early Medieval Monasticism in the North Sea Zone: Proceedings of a conference Held to Celebrate the Conclusion of the Lyminge Excavations 2008-15. Anglo-Saxon Studies in Archaeology* 20, Oxbow Books, Oxford. pp. 127-134.

McKerracher, M. 2018. *Farming Transformed in Anglo-Saxon England: Agriculture in the Eighth Century*. Oxford, Windgather Press.

McKinley, J.I., Leivers, M., Schuster, J., Marshall, P., Barclay, A. and Stoodley, N. 2015. *Cliffs End Farm Isle of Thanet, Kent.* Wessex Archaeology Volume 31. Oxbow Books, Oxford.

McManus, E., Montgomery, J., Evans, J., Lamb, A., Bettell, R. and Jelsma, J. 2013. To the land or to the sea: diet and mobility in early medieval Frisia. *Journal of Island and Coastal Archaeology* (2), 255-277.

Meadow, R., 1999. The use of size index scaling techniques for research on archaeozoological collections from the Middle East, in: Becker, C., Manhart, H., Peters, J. Schibler, J. (Eds.), *Historia Animalium ex Ossibus. Festschrift für Anglea von den Driesch*, Verlag Marie Leidorf GmbH, Rahden/Westf. pp. 285-300.

Meaney, A. 1981. *Anglo-Saxon Amulets and Curing Stones*. British Archaeological Reports British Series 96. Oxford, Archaeopress.

Meens, R. 2002. Eating animals in the early Middle Ages. Classifying the animal world and building group identities, in: Creager, A.N.H. and Jordan, W.C. (Eds.), *The Animal/Human Boundary: Historical Perspectives.* New York, Rochester. New York. pp. 3-28.

Menache, S. 1997. Dogs: God's worst enemies? *Society and Animals* 5(1), 23-44.

Menache, S. 2000. Hunting and attachment to dogs in the pre-modern period, in: Podberscek, A., Paul, E.S. and Serpell, J.A. (Eds*.), Companion Animals and Us: Exploring the Relationships between People and Pets*. Cambridge, Cambridge University Press. pp. 42-60.

Millet, M. and James, S. 1983. Excavations at Cowdery's Down Basingstoke, Hampshire, 1978-81. *Archaeological Journal* 140, 151-279.

Morgan, J.P. 1967. Spondylosis deforming in the dog. *Acta Orthopaedica Scandinavia Supplement* 96, 1-88.

Morris, J. 2008. Re-examining Associated Bone Groups from Southern England and Yorkshire, *c.*4000 BC to AD 1550, Unpublished PhD thesis. Department of Archaeology. University of Bournemouth.

Morris, J. 2011. *Investigating Animal Burials; Ritual, Mundane and Beyond*. BAR British Series, 535, Oxford, Archaeopress.

Morris, J. and Jervis, B. 2011. What’s so special? A reinterpretation of Anglo-Saxon ‘special deposits’. *Medieval Archaeology* 55, 66-81.

Müldner, G. 2009. Investigating medieval diet and society by stable isotope analysis of human bone, in: Gilchrist, R. and Reynolds, A. (Eds.), *Reflections: 50 Years of Medieval Archaeology, 1957-2007.* London, Maney Publishing. pp. 327-346.

Müldner, G. and Richards, M.P. 2005. Fast or feast: reconstructing diet in later medieval England by stable isotope analysis. *Journal of Archaeological Science* 32, 39-48.

Müldner, G. and Richards, M.P. 2006. Diet in Medieval England: The Evidence from Stable Isotope, in: Woolgar,C.M., Serjeantson, D. and Waldron, T. (Eds.), *Food in Medieval England. Diet and Nutrition*. Oxford, Oxford University Press. pp. 228-238.

Müldner, G. and Richards, M.P. 2007. Stable isotope evidence for 1500 years of human diet in the city of York, UK. *American Journal of Physical Anthropology* 133, 682-697.

Müldner, G., Britton, K. and Ervynck, A. 2014. Inferring animal husbandry strategies in coastal zones through stable isotope analysis: new evidence from the Flemish coastal plain (Belgium, 1st-15th century AD). *Journal of Archaeological Science* 41, 322-332.

Mulkeen, S. and O'Connor, T.P. 1997. Raptors in towns: towards an ecological model, *International Journal of Osteoarchaeology* 7, 440-449.

Mullin, M.H. 1999. Mirrors and windows: sociocultural studies of human–animal relationships. *Annual Review of Anthropology* 28(1), 201–224.

Mülnder, G., Britton, K. and Ervynck, A. 2014. Inferring animal husbandry strategies in coastal zones through stable isotope analysis: new evidence from the Flemish coastal plain (Belgium, 1st-15th century AD). *Journal of Archaeological Science* 41, 322-332.

Mulville, J. 2003. Mammal, bird and fish remains and oysters: Phases 2a-2e: Anglo Saxon Occupation, in: Hardy, A., Dodd, A. and Keevill, G.D. (Eds.), *Ælfric's Abbey: Excavations at Eynsham Abbey, Oxfordshire, 1989-92*. Thames Valley Landscapes Volume 16. Oxford, Oxford Archaeology. pp. 343-359.

Neville, J. 2006. Hrothgar's horses: feral or thoroughbred? *Anglo-Saxon England* 31,131-157.

Noddle, B. 1994. The under-rated goat, in: Hall, A.R. and Kenward, H.K. (Eds.), *Urban-rural connections: perceptives from environmental archaeology.* Oxford, Oxbow Books. pp.117-128.

O'Connor, T. P. 1982. *Animal bones from Flaxengate, Lincoln c.870-1500*. Council for British Archaeology, London.

O'Connor, T. P. 1992. Pets and pests in Roman and medieval Britain. *Mammal Review*, 22(2), 107-113.

O'Connor, T. P. 2007. Wild or domestic? Biometric variation in the cat *Felis silvestris*. *International Journal of Osteoarchaeology* 17, 581–595.

O'Connor, T. P. 2010. Livestock and deadstock in early medieval Europe from the North Sea to the Baltic. *Environmental Archaeology* 15(1), 1-15.

O'Connor, T. P. 2011. Animal Husbandry, in: Hamerow, H., Hinton, D. A. and Crawford, S. (Eds.), *The Oxford Handbook of Anglo-Saxon Archaeology*. Oxford, Oxford University Press. pp. 361-76.

O'Connor, T. P. 2013a. *Animals as Neighbours: The Past and Present of Commensal Animals.* Michigan, Michigan State University Press.

O'Connor, T. P. 2013b. Livestock and animal husbandry in early medieval England. *Quaternary International*, 1-10.

Oggins, R.S. 2004. *The Kings and their Hawks: Falconry in Medieval England*. New Haven and London. Yale University Press.

Oosthuizen, S. 2011. Anglo-Saxon fields, in: Hamerow, H, Hinton, D and Crawford, S. (Eds.), *The Oxford Handbook of Anglo-Saxon Archaeology*. Oxford, Oxford University Press. pp. 377-401.

Ottoni, C., Van Neer, W., De Cupere, B., Daligault, J., Guimaraes, S., Peters, J., Spassov, N., Prendergast, M.E., Boivin, N., Morales-Muñiz, A., Bălăşescu, A., Becker, C., Benecke, N., Boroneant, A., Buitenhuis, H., Chahoud, J., Crowther, A., Llorente, L., Manaseryan, N., Monchot, H., Onar, V., Osypińska, M., Putlelat, O., Quintana Morales, E.M., Studer, J., Wierer, U., Decorte, R., Grange, T. and Geigal, E. 2017. The palaeogenetics of cat dispersal in the ancient world. *Nature: Ecology and Evolution* 1, 1-7.

Outram, A., Stear, N.A., Bendrey, R., Olsen, S., Kasparov, A., Zaibert,V., Thorpe, N. and Evershed, R.P. 2009. The earliest horse harnessing and milking. *Science* 323(5919), 1332-1325.

Payne, S. 1973. Kill-off patterns in sheep and goats: the mandibles from Asvan Vale. *Anatolian Studies* 23, 281–303.

Payne, S. and Bull, G. 1988. Components of variation in measurements of pig bones and teeth, and the use of measurements to distinguish wild from domestic pig remains. *ArchaeoZoologia* II (1.2), 27-66.

Pederson, A. 2001. *Rovfugle eller duer: fugleformede fibler fra den tidlige middlelalder - Birds of prey or doves: early Medieval bird-shaped brooches*. Aarboøger for Nordisk.

Pelteret, D.A.E. 1995. *Slavery in Early Medieval England: from the reign of Alfred until the twelfth century*. Woodbridge, Boydell Press.

Pestell, T. 2004. *Landscapes of Monastic Foundation.* Woodbridge, Boydell Press.

Pluskowski, A. 2006. *Wolves and the Wilderness in the Middle Ages*. Woodbridge, Boydell Press.

Pluskowski, A. 2010a. The zooarchaeology of medieval ‘Christendom’: ideology, the treatment of animals and the making of medieval Europe. *World Archaeology* 42(2): 201-214.

Pluskowski, A. 2010b. Animal Magic, in: Carver, M., Sanmark, A. and Semple, S. (Eds.), *Signals of Belief in Anglo-Saxon England. Anglo-Saxon Paganism Revisited.* Oxford, Oxford University Press. pp. 103-127.

Pluskowski, A., Brown, A., Shillito, L.M., Seetah, K., Makowiecki, D., Jarzebowski, M. and Kreem, J. 2011. The Ecology of Crusading Project: New Research on Medieval Baltic Landscapes. *Antiquity* 85(328).

Pollington, S. 2003. *The Mead-Hall: Feasting in Anglo-Saxon England*. Thetford, Anglo-Saxon Books.

Poole, K. 2010a. Bird introductions, in: Sykes, N. and O'Connor, T. P. (Eds.)*, Extinctions and Invasions: A Social History of British Fauna.* Oxford, Windgather Press. pp. 156-165.

Poole, K. 2010b. Mammal and bird remains, in: Thomas, G. (Ed.), *The Later Anglo-Saxon Settlement at Bishopstone: a Downland Manor in the Making*. Council for British Archaeology Research Report 163. York, Council for British Archaeology. pp. 142-156.

Poole, K. 2011. The Nature of Society in England, c. 410-1066. Unpublished PhD thesis. University of Nottingham. Department of Archaeology.

Poole, K. 2013. Horses for courses? Religious change and dietary shifts in Anglo-Saxon England. *Oxford Journal of Archaeology* 32(3),319-333.

Poole, K. and Lacey, E. 2014. Avian aurality in Anglo-Saxon England. *World Archaeology* 46(3),400-415.

Powell, A. 2002. Animal bone, in: Foreman, S., Hiller, J. and Petts, D. (Eds.), *Gathering the people, settling the lands. The archaeology of a Middle Thames landscape. Vol 3: Anglo-Saxon to Post-Medieval*. Thames Valley Landscape Monograph 14, Oxford. pp. 44-49.

Preece, R. and Fraser, D. 2000. The status of animals in Biblical and Christian thought: a study in colliding values, *Society and Animals* 8(1), 245-263.

Prummel, W. 1997. Evidence of hawking (falconry) from bird and mammal bones. *International Journal of Osteoarchaeology* 7, 333-338.

Reitz, E.J. and Wing, E.S. 1999. *Zooarchaeology*. Cambridge, Cambridge University Press.

Reynolds, R. 2008. Surf 'n' turf: The components and influences of a middle Anglo-Saxon monastic diet at Lyminge, Kent. Unpublished Msc Dissertation. Department of Archaeology, University of Nottingham.

Reynolds, R. 2010. Fish Remains, in: Thomas, G. (Ed.), *The Later Anglo-Saxon Settlement at Bishopstone: a Downland Manor in the Making*. CBA Research Report 163, York, Council for British Archaeology. pp.157-164.

Reynolds, R. 2015. Food for the Soul: The Dynamics of Fishing and Fish Consumption in Anglo-Saxon England: c.AD 410-1066. Unpublished PhD thesis. University of Nottingham. Department of Archaeology.

Richards, M. 1954. *The Laws of Hywel Dda (The Book of Blegywyrd*). Liverpool, Liverpool University Press.

Richards, M.P., Schulting, R.J., Hedges, R.E.M., 2003. Sharp shift in diet at onset of Neolithic. *Nature* 425, 366.

Richardson, A. 2005. *The Anglo-Saxon Cemeteries of Kent, Volume 1&2.* British Archaeological Report Series 391. Oxford, Archaeopress.

Ringrose, T.J. 1993. Bone counts and statistics: a critique. *Journal of Archaeological Science* 20(2), 121-157.

Rippon, S., Wainwright, A. and Smart, C. 2014. Farming regions in medieval England: the archaeobotanical and zooarchaeological evidence. *Medieval Archaeology* 58,195-255.

Rixson, D. 1989. Butchery evidence on animal bones. *Circaea* 6(1), 49-62.

Roach, L. 2013. *Kingship and Consent in Anglo-Saxon England, 871-978: Assemblies and the State in the Early Middle Ages.* Cambridge University Press, Cambridge.

Rowley-Conwy, P. 2018. Zooarchaeology and the elusive feast: from performance to aftermath, *World Archaeology*, DOI: 10.1080/00438243.2018.1445024.

Roymans, N. 1996. The sword of the plough: regional dynamics in the Romanisation of Belgic Gaul and the Rhineland area, in: Roymans, N. (Ed.), *From the Sword to the Plough*. Amsterdam, Amsterdam Press. pp. 9-126.

Russell, N. 1998. Cattle as wealth in Neolithic Europe: where's the beef? in: Bailey, D.W. (Ed.), *The Archaeology of Value.* British Archaeological Reports, International Series 730, Oxford. pp. 42-54.

Russell, N. 2012. *Social Zooarchaeology: Humans and Animals in Prehistory*. New York, Cambridge University Press.

Sadler, P. 1991. The use of tarsometatarsi in sexing and ageing domestic fowl (*Gallus gallus* L.) and recognising five toed breeds in archaeological material. *Circaea* 8(1), 41-48.

Sadler, P. 1990. Faunal remains, in: Fairbrother, J.R. (Ed.), Fa*ccombe Netherton. Excavations of a Saxon and Medieval Manorial Complex. Vol.2*. London, British Museum Occasional Paper No.74. pp. 462-508.

Schmid, E. 1972. *Atlas of Animal Bones for Prehistorians, Archaeologists and Quaternary Geologists*. Amsterdam, Elsevier.

Schoeninger, M.J. and DeNiro, M.J 1984. Nitrogen and carbon stable isotopic composition of bone collagen from marine and terrestrial animals, *Geochimica et Cosmochimica Acta* Vol. 48, 625-639.

Schoeninger, M.J. DeNiro, M.J. and Tauber, H. 1983. Stable nitrogen isotope ratios of bone collagen reflect marine and terrestrial components of prehistoric human diet, *Science*, Vol. 220, 1381-1383.

Scull, C. 2011. Social transactions, gift exchange, and power in the archaeology of the fifth to seventh centuries, in: Hamerow, H., Hinton, D. and Crawford, S. (Eds.), *The Oxford Handbook of Anglo-Saxon Archaeology*. Oxford, Oxford University Press. pp. 848-864.

Schurr, M. 1998. Using stable nitrogen-isotopes to study weaning behaviour in past populations. *World Archaeology*, 30(2), 327-342.

Seetah, K. 2006. Butchery as an Analytical Tool: A comparative study of the Romano-British and Medieval Period. Unpublished PhD thesis. University of Cambridge.

Semple, S. 2010. In the open air, in: Carver, M., Sanmark, A. and Semple, S. (Eds.), *Signals of Belief in Early England: Anglo-Saxon Paganism Revisited*. Oxford, Oxbow Books. pp. 21-48.

Serjeantson, D. 1989. Animal remains and the tanning trade, in: Serjeantson, D. and Waldron, T. (Eds.), *Diet and Crafts in Town. The evidence of animal remains from the Roman to Post-Medieval Period.* British Archaeological Reports British Series 199.Oxford. pp. 129-146.

Serjeantson, D. 2002. Goose husbandry in medieval England, and the problem of ageing goose bones. *Acta Zoological Cracoviensa* 45, 39-54.

Serjeantson, D. 2006. Birds: Food and a mark of status, in: Woolgar, C.M., Serjeantson, D. and Waldron, T. (Eds.), *Food in Medieval England.* Oxford, Oxford University Press. pp. 131-147.

Serjeantson, D. 2009. *Birds*. Cambridge, Cambridge University Press.

Serjeanton, D. and Woolgar, C.M. 2006. Fish consumption in Medieval England, in: Woolgar, D.M., Serjeantson, D. and Waldron, T. (Eds.), *Food in Medieval England: Diet and Nutrition*. Oxford, Oxford University Press. pp. 102-130.

Serpell, J. 1986. *In the Company of Animals. A Study of Human-Animal Relationships*. Oxford, Blackwell.

Serpell, J. 1995. From paragon to pariah: reflections on human attitudes to dogs, in: Serpell, J. (Ed.), *The domestic dog: its evolution, behaviour, and interactions with people*. Cambridge, Cambridge University Press. pp. 245-256.

Serpell, J.A. and Paul, E.S. 1994. Pets and the development of positive attitudes to animals, in: Manning, A. and Serpell, J.A. (Eds.), *Animals and Human Society: changing perspectives*. London, Routledge. pp. 127-144.

Shaw, W. 1996. The excavation of a late 15th to 17th century tanning complex at The Green, Northampton. *Post-Medieval Archaeology* 30,63-127.

Shipman, P. 1981. *Life History of a Fossil: An Introduction to Taphonomy and Palaeoecology*. Cambridge, Harvard University Press.

Sillitoe, P. 2007. Pigs in the New Guinea Highlands: an ethnographic example, in: Albarella, U., Dobney, K., Ervynck, A. and Rowley-Conwy, P. (Eds.), *Pigs and Humans: 10,000 Years of Interaction*. Oxford, Oxford University Press. pp. 330-356.

Silver, I. 1969. The ageing of domestic animals, in: Brothwell, D. and Higgs, E. (Eds.*), Science and Archaeology*. London, Thames and Hudson. pp. 283-302.

Simoons, F.J. 1967. *Eat Not This Flesh: Food Avoidances from Prehistory to Present*. Wisconsin, The University of Wisconsin Press.

Simpson, G.G., Roe, A., Lewontin, R.C., 1960. *Quantitative Zoology*. Harcourt Brace, New York.

Sims-Williams, P. 1983. Gildas and the Anglo-Saxons. *Cambridge Medieval Celtic Studies* 6, 1–30

Smil, V 2000. Horse power. *Nature* 405 (6783), 125.

Smith, R.K., Jennings, N.V., Robinson, A. and Harris, S. 2004. Conservation of European hares *Lepus europaeus* in Britain: is increasing habitat heterogeneity in farmland the answer? *Journal of Applied Ecology* 41,1092-1102.

Speake, G. 1980. *Anglo-Saxon Art and its Germanic Background*. Oxford, Clarendon Press.

Stallibrass, S. 1995. Review of the vertebrate remains, in: Stallibrass, S. (Ed.) *Plant and Vertebrate Remains from Archaeological Sites in Northern England: data reviews and future directions.* Architectural and Archaeological Society of Durham and Northumberland Research Report 4, 84-198.

Sykes, N. 2005. The Dynamics of Status Symbols: Wildfowl Exploitation in England AD 410 - 1550. *The Archaeological Journal* 161, 82-105.

Sykes, N. 2006a. From *Cu* and *Sceap* to *Beffe* and *Motton*: the management, distribution and consumption of cattle and sheep in the medieval period, in: Woolgar, C.M.,Serjeantson, D. and Waldron, T. (Eds.), *Food in Medieval England.* Oxford, Oxford University Press. pp. 56-71.

Sykes, N. 2006b. The impact of the Normans on hunting practices in England, in: Woolgar, C.M., Serjeantson, D. and Waldron, T. (Eds.), *Food in Medieval England.* Oxford, Oxford University Press. pp.162-175.

Sykes, N. 2007a. *The Norman Conquest: a zooarchaeological perspective*. British Archaeological Reports, International Series, Oxford.

Sykes, N. 2007b. Taking sides: the social life of venison in medieval England, in: Pluskowski, A. (Ed.), *Breaking and Shaping Beastly Bodies: Animals as Material Culture in the Middle Ages*. Oxford, Oxbow. pp. 149-160.

Sykes, N. 2010. Deer, land, knives and halls: social change in early Medieval England. *The Antiquaries Journal* 90, 175-193.

Sykes, N. 2011. Woods and the wild, in: Hamerow, H., Crawford, S. and Hinton, D. (Eds.), *The Oxford Handbook of Anglo-Saxon Archaeology*. Oxford, Oxford University Press.

Sykes, N. 2014. *Beastly Questions*. London. Bloomsbury.

Tebbutt, C. F. (1982) A middle Saxon iron smelting site at Millbrook, Ashdown Forest, Sussex. *Sussex Archaeological Collections* 120, 20-35

Teegan, W.-R. 2005. Rib and vertebral fractures in Medieval dogs from Hauthabu, Strigard and Schleswig, in: Davis, J., Fabis, M., Mainland, I., Richards, M. and Thomas, R. (Eds.), *Diet and Health in Past Animal Populations*. Oxford, Oxbow. pp. 34-38.

Tester, A., Anderson, S., Riddler, I. and Carr, R. (Eds.), 2014. *Staunch Meadow, Brandon, Suffolk: A High-Status Middle Saxon Settlement on the Fen Edge. Bury St Edmunds*. Suffolk Archaeological Service.

Thomas, G. 2005. Lyminge: an archaeological research agenda for the pre-Viking minster and its associated settlement. University of Kent.

Thomas, G. 2010. *Later Anglo-Saxon Settlement at Bishopstone: A Downland Manor in the Making*. York. Council for British Archaeology Research Report, 163.

Thomas, G. 2013a. Life before the minster: the social dynamics of monastic foundation at Anglo-Saxon Lyminge, Kent. *The Antiquaries Journal* 93, 109-45.

Thomas, G. 2013b. Anglo-Saxon. South East Research Framework. Resource Assessment and Research Agenda for the Anglo-Saxon period. Consultation draft 3. https://shareweb.kent.gov.uk/Documents/leisure-and-culture/heritage/SERF%20Anglo-Saxon.pdf. Accessed 01.05.2014.

Thomas, G. 2016. Downland, Marsh and Weald: Monastic Foundation and Rural Intensification in Anglo-Saxon Kent, in: Flechner,R. and Ní Mhaonaigh, M.(Eds.), *Converting the Isles: Conversion to Christianity in the Insular World*. Brepols, Turnhout. pp. 349-376.

Thomas, G. 2017a. Introduction: early medieval monasticism in the North Sea Zone: recent research and new perspectives, in: Thomas, G. and Knox, A. (Eds.), *Early Medieval Monasticism in the North Sea Zone: Proceedings of a Conference Held to Celebrate the Conclusion of the Lyminge Excavations 2008-15. Anglo-Saxon Studies in Archaeology* 20, Oxbow Books. Oxford. pp 1-6.

Thomas, G. 2017b. Monasteries and places of power in pre-Viking England: trajectories, relationships and interactions,in: Thomas, G. and Knox, A. (Eds.), *Early Medieval Monasticism in the North Sea Zone: Proceedings of a Conference Held to celebrate the Conclusion of the Lyminge Excavations 2008 -2015. Anglo-Saxon Studies in Archaeology and History*, 20. Oxford University School of Archaeology, Oxbow Books. pp. 97-116.

Thomas, G. and Knox, A. 2012. A window on Christianisation: transformation at Anglo-Saxon Lyminge, Kent, England. *Antiquity* 86(334) https://www.antiquity.ac.uk/projgall/thomas334/ accessed 01.05.2018.

Thomas, G. and Knox, A. 2014. Lyminge Excavations 2013: Interim report on the University of Reading excavations at Lyminge, Kent. University of Reading.

Thomas, G. and Knox, A. 2015. Lyminge Excavations 2014: Interim report on the University of Reading excavations at Lyminge, Kent. University of Reading.

Thomas, G., McDonnell, G., Merkel, J. and Marshall, P. 2016. Technology, ritual and Anglo-Saxon agrarian production: the biography of a seventh-century plough coulter from Lyminge, Kent. *Antiquity* 90,742–58.

Thomas, R. 1986. A statistical evaluation of criteria used in sexing cattle metapodia. *Archaeozoologia* II (1.2), 83-92.

Thomas, R. 2005a. *Animals, Economy and Status: Integrating Zooarchaeological and Historical Data in the Study of Dudley Castle, West Midlands (c. 1100-1750).* British Archaeologcial Report Series 392. Oxford, Archaeopress. Oxford.

Thomas, R. 2005b. Zooarchaeology, improvement and the British agricultural revolution, *International Journal of Historical Archaeology* 9(2),71-88.

Thomas, R. and Locock, M. 2000. 'Food for the dogs? The consumption of horseflesh at Dudley Castle in the eighteenth century. *Environmental Archaeology* 5:83-91.

Thomas, R., Holmes, M., Morris, J. 2013. “So bigge as bigge may be”: tracking size and shape change in domestic livestock in London (AD 1220-1900). *Journal of Archaeological Science* 40 (8), 3309-3325.

Thomson, R. 1981. Leather manufacture in the post-medieval period with special reference to Northamptonshire. *Post-Medieval Archaeology* 15, 161-175.

Tiezen, L.L. and Fagre, T. 1993. Effect of diet quality and composition on the isotopic of respiratory CO2, bone collagen, bioapatite and soft tissues, in: Grupe, G. and Lambert, J.B. (Eds.), *Prehistoric Human Bone*. Berlin, Springer-Verlag.

Tipper, J. 2004. *The Grubenhaus in Anglo-Saxon England: An Analysis and Interpretation of the Evidence from a Most Distinctive Building Type*. The Landscape Research Centre. Yedingham, North Yorkshire, Landscape Centre Archaeological Monograph Series.

Tuan, Y. 1984. *Dominance and Affection: the making of pets*. London, Yale University Press.

Tufto, J., Andersen, R. and Linnell, J. 1996. Habitat use and ecological correlates of home range size in a small cervid: the roe deer. *Journal of Animal Ecology* 65, 715-724.

Twiss, K. 2012. The archaeology of food and social diversity. *Journal of Archaeological Research* 20(4), 357-395.

Tyrberg, T. 2002. The archaeological record of domestic and tamed birds in Sweden. *Acta zoologica Cracoviensia* 45, 215-231.

van Klinken, G.J., Richards, M.P., Hedges, R.E.M., 2000. An overview of causes for stable isotopic variations in past European human populations: environmental, ecophysiological, and cultural effects, in: Ambrose, S.H., Katzenberg, M.A. (Eds.), *Biogeochemical Approaches to Palaeodietary Analysis*. Kluwer Academic/Plenum, New York. pp. 39-63.

Vann, S. and Thomas, R. 2006. Humans, other animals and disease: a comparative approach towards the development of a standardised approach towards the development of a standardised recording protocol for animal palaeopathology. *Internet Archaeology* 20.

Vretemark, M. 2013. The Vendel Period royal follower's grave at Swedish Rikeby as starting point for reflections about falcontry in Northern Europe, in: Grimm, O. and Schmölcke (Eds.), *Hunting in Norther Europe until 1500 AD: Old Traditions and Regional Developments, Continental Sources and Continental Influences*. Neumünster, Wachholz Verlag. pp.379-386.

Walker, P.L. and Miller, K.P. 2005. Time, temperature, and oxygen availability: an experimental study of the effects of environmental conditions on the colour and organic context of cremated bone. *American Journal of Physical Anthropology. Supplement* 40:222.

Wallis, R. 2017. 'As the falcon her bells' at Sutton Hoo? Falconry in early Anglo-Saxon England, *Archaeological Journal* 174(2), 409-436.

Wang, G., Ekstrand, C. and Svedberg, J. 1998. Wet litter and perches as risk factors for the development of foodt-pad dermatitis in floor-housed hens. *British Poultry Science* 39(2), 191-197.

Warhust, A. 1955 The Jutish Cemetery at Lyminge. *Archaeologia Cantiana* 69,1-40.

Wasserschleben, H. 1894. Die irische Kanonensammlun. Giessen, J.Ricker'sche Buchhandlung.

Waterer, J.W. 1956. Leather, in: Singer, C. and Holmyard, E.J. (Eds.), *History of Technology, Volume II*. Oxford, Clarendon Press. pp.147-190.

Webster, L. 2007. Taplow, *Reallexikon der Germanischen Altertumskunde* 35, 69-72.

Welch, M 1983. *Early Anglo-Saxon Sussex*. Volume 1 and 2. British Archaeological Reports British Series 112. Oxford.

Welch, M. 1991. Contacts across the Channel between the fifth and seventh centuries, a review of the archaeological evidence. *Studien zur Sachsenforschung* 7, 261-269.

Welch, M. 2007. Anglo-Saxon Kent to AD 800, in: Williams, H.J. (Ed.), *The Archaeology of Kent to AD 800*. Woodbridge, Boydell Press. pp. 187-250.

Wesbter, L, 2010. Style: Influences, chronology and meaning, in: Hinton, D.A., Crawford, S. and Hamerow, H. (Eds.), *The Oxford Handbook of Anglo-Saxon Archaeology*. Oxford, Oxford University Press. pp. 461-500.

Whitelock, D. 1979. *English Historical Documents c.500–1042*. London, Eyre Methuen.

Wilson, B. 1986. Faunal remains: animal bones and marine shells, in: Miles, D. (Ed*.), Archaeology at Barton Court Farm, Abingdon, Oxon*. Oxford, CBA, Research Report 50: microfiche 8A1-8G14.

Wilson, B. and Edwards, P. 1993. Butchery of horse and dog at Witney Palace, Oxfordshire, and the knackering and feeding of meat to hounds during the post-medieval period. *Post-Medieval Archaeology* 27, 43-56.

Wiseman, J. 2000. *The Pig: A British History.* London, Duckbacks.

Witney, K.P. 1976. *The Jutish Forest: A Study of the Weald of Kent from 450 to 1380 AD* University of London. London, The Athlone Press.

Woldekiros, H., D'Andrea, C., Foster, A., Lebrasseaur, O., Miller, H., Roberts, J., Thomas, R. and Sykes, N. *in prep.* Small chickens and resilience in the Horn of Africa: Archaeological and biometric perspectives on chicken biotypes.

Wood, I. 1990. Ripon, Francia and the Franks Casket in the early Middle Ages. *Northern History* 26,1-19.

Wood, I. 1994. *The Merovingian Kingdoms 450-751*. Longman, London and New York.

Wood, I. N. 1983. *The Merovingian North Sea*. Alingsås.

Wood, I. N. 1992. Frankish hegemony in England, in: Carver, M. (Ed.), *The Age of Sutton Hoo: The Seventh Century in North-West Europe.* Woodbridge, The Boydell Press. pp. 235-241.

Wormald, P. 1976. Bede and Benedict Biscop, in: Bonner, G. (Ed*.), Famulus Christi: Essays in commemoration of the thirteenth century of the birth of the Venerable Bede*. Society for Promoting Christian Knowledge, London. 114-169.

Yalden, D.W. 1999. *The History of British Mammals*. London, T. and AD Poyser.

Yalden, D.W. and Albarella, U. 2009. *The History of British Birds*. Oxford, Oxford University Press.

Yorke, B. 1990. *Kings and Kingdoms of Early Anglo-Saxon England*. Routledge. London and New York.

Yorke, B. 1993. Fact or fiction? The written evidence for the fifth and sixth centuries AD. *Anglo-Saxon Studies in Archaeology and History* 6, 1-6.

Yorke, B. 1999. The reception of Christianity at the Anglo-Saxon royal courts, in: Gameson, R. (Ed.), *St Augustine and the Conversion of England*. Stroud, Sutton Publishing. pp. 152-173.

Yorke, B. 2003. The adaptations of the Anglo-Saxon royal courts to Christianity, in: Carver, M. (Ed.), *The Cross goes North: processes of conversion in northern Europe, AD 300-1300*. Woodbridge, Boydell Press. pp. 243-257.

Yorke, B. 2006. *Conversion of Britain: Religion, Politics and Society in Britain, c. 600-800*. Edinburgh, Person Education.

Zeder, M.A. and Lapham, H.A. 2010. Assessing the reliability of criteria used to identify post-cranial bones in sheep (Ovis) and goats (Capra*). Journal of Archaeological Science* 37, 2887-2905.

Zeder, M.A. and Pilaar, S.E. 2010. Assessing the reliability of criteria used to identify mandibles and mandibular teeth in sheep (Ovis) and goats (Capra). *Journal of Archaeological Science* 37, 225-242.

Appendix 1: NISP of early and middle Saxon sites used in thesis data comparison

Early Saxon	**County**	**Reference**	**ST**	**Cattle**	**Caprine**	**Pig**	**Horse**	**Dog**	**Cat**	**Red Deer**	**Roe Deer**	**Hare**	**Chicken**	**Goose**	**Duck**	**Totals**
Lyminge Phase I	Kent	Knapp (n.d.)	HS	636	373	922.8	5	2	8	4	3	1	417	19	13	2403.8
Northfleet Ebbsfleet	Kent	Grimm and Worley 2011	R	410	147	226	43	5	1	40	3	0	2	0	1	878
Springhead, Ebbsfleet	Kent	Grimm and Worley 2011	R	529	225	361	1	0	0	0	4	2	3	0	0	1125
Canterbury, Whitefriars, Phase 4	Kent	Bendry *et al forthcoming*	HS	112.5	46	65.8	2	14.6	1	1	1	0	0	7	0	250.9
Church Whitfield	Kent	Bendry 2014	R	20	15	16	1	1	0	0	4	0	0	0	0	57
Ramsgate, Manston Rd	Kent	Hamilton-Dyer 2009	R	100	172	44	13	0	1	4	0	0	12	5	0	351
Bishopstone	Sussex	Gebbels 1977	E	35	55	24	3	0	1	1	1	0	6	3	0	129
Barton Court Farm, Abingdon	Oxfordshire	Wilson *et al* 1986	R	377	573	354	17	7	7	11	1	1	60	47	5	1460
Pennyland	Milton Keynes	Holmes 1993, Ashdown 1993	R	1170	894	330	82	5	0	0	0	2	68	25	0	2576
Redcastle Furze (6th-7thC)	Norfolk	Nicholson 1995, Wilson 1995	R	407	301	105	0	0	5	0	0	27	5	0	0	850
West Stow Phase I	Suffolk	Crabtree 1989	R	2539	3479	1912	90	40	10	7	7	3	115	110	2	8314
West Stow Phase II	Suffolk	Crabtree 1990	R	4811	6944	1912	149	50	220	9	4	3	389	146	11	14648
West Stow Phase III	Suffolk	Crabtree 1991	R	523	725	308	42	1	0	1	1	0	17	29	14	1661
Bloodmoor Hill, Carlton Coleville	Suffolk	Higbee 2009	R	1924	600	685	244	1	0	7	13	0	18	7	2	3501
West Heslerton, Anglian	Yorkshire	Richardson 2001	R	10455	11187	2112	989	241	173	19	6	41	449	766	5	26443
Kilham	Yorkshire	Archer 2003	R	1199	1253	126							37	88		2703
Quarrington	Lincolnshire	Rackham 2003	R	640	268	111	41	8	10	4	0	0	19	8	0	1109
Middle Saxon																
Lyminge, Phase II	Kent	Knapp (n.d)	E	719	1022	607.6	18	35	55	0	30	1	1860	18	11	4376.6
Sandtun, Hythe	Kent	Hamilton-Dyer 2001	R	91	109	51	0	7	0	0	0	0	31	13	0	302
St Augustine's Abbey, Canterbury	Kent	Jones and Randall 2015	E	1360	1476	837	26	19	4	0	4	4	1066	274	22	5092
Canterbury, Whitefriars, Phase 5	Kent	Bendrey *et al forthcoming*	E	388	419	333	18	10.2	9	3	8	0	100	11	2	1301.2
Brandon (MS)	Suffolk	Crabtree and Campana 2014	HS	13441	24652	9121	702	151	16	50	108	28	1306	964	832	51371
Wicken Bonhunt (MS)	Essex	Crabtree 1996; Wade 1980	HS	5138	3858	20954	163	26	102	16	143	4	3082	2038	166	35690
Ipswich	Suffolk	Crabtree 1994	U	3408	2353	1973	27	125	62	4	7	0	513	126		8598
Flixborough, Phase 3b	Lincolnshire	Dobney *et al* 2007	HS	6652	6628	4893	830	3	17	5	77	29	4308	2854	227	26523
Quarrington (MS)	Licolnshire	Rackham 2003	R	491	368	63	76	25	3	0	0	1	15	6	0	1048
Lincoln Flaxengate, Timber Phase 1	Licolnshire	O'Connor 1982	U	791	425	145	0	104	1	0	0	0	19	6	2	1493
Hartlepool Monastery*incs 3 sites	Cleveland	Huntley and Rackham 2007	E	713	1413	396	30	0	16	1	0	6	260	289	1	3125
Wearmouth and Jarrow	Tyne and Wear	Noddle 2006	E	170	75	43	15	5	3	0	0	0	32	18	0	361
Portchester Castle (M-LS)	Hampshire	Grant 1976	HS	1935	1303	817	50	19	38	151	127	26	0	0	0	4466
West Heslterton (MS)	Yorkshire	Richardson 2001		3155	4216	658	248	109	75	1	1	14	234	361	2	9074
York, Fishergate, Period 3	Yorkshire	O'Connor 1991	U	8296	3421	1295	49	18	96	1406	5	0	603	224	0	15413
Cook Street, Southampton	Southampton	Bourdillon 1994	U	2869	775	1058	13	4	0	35	0	0	99	59	0	4912
Southampton, Melbourne Street	Southampton	Bourdillon and Coy 1980	U	23888	14477	6949	9	23	144	76	8	0	800	353	19	46746
Aelfrics Abbey, Eynsham, Phase 2b	Oxfordshire	Mulville 2003	E	385	1039	434	16	3	3	7	12	1	280	122	38	2340
Aylesbury	Buckinghamshire	Farley and Jones 2012		205	610	413	7	1	5	0	0	4	81	22	5	1353
Bishopstone	Sussex	Poole 2010	HS	1620	2845	1620	29	43	86	2	17	14	186	56	36	6554
St Albans, 5th-8thC	Hertfordshire	Crabtree 2011 (unpublished)	E	138	82	528	1	0	0	2	41	0	21	4	3	820
St Albans, 8th-9thC	Hertfordshire	Crabtree 2011 (unpublished)	E	105	100	527	0	3	4	2	36	0	21	6	3	807

Appendix 2: Percentage NISP of early and middle Saxon thesis data comparison

Early Saxon	**County**	**Reference**	**ST**	**Cattle**	**Caprine**	**Pig**	**Horse**	**Dog**	**Cat**	**Red Deer**	**Roe Deer**	**Hare**	**Chicken**	**Goose**	**Duck**
Lyminge Phase I	Kent	Knapp (n.d.)	HS	26.5	15.5	38.4	0.2	0.1	0.3	0.2	0.1	0.0	17.3	0.8	0.5
Northfleet Ebbsfleet	Kent	Grimm and Worley 2011	R	46.7	16.7	25.7	4.9	0.6	0.1	4.6	0.3	0.0	0.2	0.0	0.1
Springhead, Ebbsfleet	Kent	Grimm and Worley 2011	R	47.0	20.0	32.1	0.1	0.0	0.0	0.0	0.4	0.2	0.3	0.0	0.0
Canterbury, Whitefriars, Phase 4	Kent	Bendry *et al forthcoming*	HS	44.8	18.3	26.2	0.8	5.8	0.4	0.4	0.4	0.0	0.0	2.8	0.0
Church Whitfield	Kent	Bendry 2014	R	35.1	26.3	28.1	1.8	1.8	0.0	0.0	7.0	0.0	0.0	0.0	0.0
Ramsgate, Manston Rd	Kent	Hamilton-Dyer 2009	R	28.5	49.0	12.5	3.7	0.0	0.3	1.1	0.0	0.0	3.4	1.4	0.0
Bishopstone	Sussex	Gebbels 1977	E	27.1	42.6	18.6	2.3	0.0	0.8	0.8	0.8	0.0	4.7	2.3	0.0
Barton Court Farm, Abingdon	Oxfordshire	Wilson *et al* 1986	R	25.8	39.2	24.2	1.2	0.5	0.5	0.8	0.1	0.1	4.1	3.2	0.3
Pennyland	Milton Keynes	Holmes 1993, Ashdown 1993	R	45.4	34.7	12.8	3.2	0.2	0.0	0.0	0.0	0.1	2.6	1.0	0.0
Redcastle Furze (6th-7thC)	Norfolk	Nicholson 1995, Wilson 1995	R	47.9	35.4	12.4	0.0	0.0	0.6	0.0	0.0	3.2	0.6	0.0	0.0
West Stow Phase I	Suffolk	Crabtree 1989	R	30.5	41.8	23.0	1.1	0.5	0.1	0.1	0.1	0.0	1.4	1.3	0.0
West Stow Phase II	Suffolk	Crabtree 1990	R	32.8	47.4	13.1	1.0	0.3	1.5	0.1	0.0	0.0	2.7	1.0	0.1
West Stow Phase III	Suffolk	Crabtree 1991	R	31.5	43.6	18.5	2.5	0.1	0.0	0.1	0.1	0.0	1.0	1.7	0.8
Bloodmoor Hill, Carlton Coleville	Suffolk	Higbee 2009	R	55.0	17.1	19.6	7.0	0.0	0.0	0.2	0.4	0.0	0.5	0.2	0.1
West Heslterton, Anglian	Yorkshire	Richardson 2001	R	39.5	42.3	8.0	3.7	0.9	0.7	0.1	0.0	0.2	1.7	2.9	0.0
Kilham	Yorkshire	Archer 2003	R	44.4	46.4	4.7	0.0	0.0	0.0	0.0	0.0	0.0	1.4	3.3	0.0
Quarrington	Lincolnshire	Rackham 2003	R	57.7	24.2	10.0	3.7	0.7	0.9	0.4	0.0	0.0	1.7	0.7	0.0
Middle Saxon															
Lyminge, Phase II	Kent	Knapp (n.d)	E	16.4	23.4	13.9	0.4	0.8	1.3	0.0	0.7	0.0	42.5	0.4	0.3
Sandtun, Hythe	Kent	Hamilton-Dyer 2001	R	30.1	36.1	16.9	0.0	2.3	0.0	0.0	0.0	0.0	10.3	4.3	0.0
St Augustine's Abbey, Canterbury	Kent	Jones and Randall 2015	E	26.7	29.0	16.4	0.5	0.4	0.1	0.0	0.1	0.1	20.9	5.4	0.4
Canterbury, Whitefriars, Phase 5	Kent	Bendrey *et al forthcoming*	E	29.8	32.2	25.6	1.4	0.8	0.7	0.2	0.6	0.0	7.7	0.8	0.2
Brandon (MS)	Suffolk	Crabtree and Campana 2014	HS	26.2	48.0	17.8	1.4	0.3	0.0	0.1	0.2	0.1	2.5	1.9	1.6
Wicken Bonhunt (MS)	Essex	Crabtree 1996; Wade 1980	HS	14.4	10.8	58.7	0.5	0.1	0.3	0.0	0.4	0.0	8.6	5.7	0.5
Ipswich	Suffolk	Crabtree 1994	U	39.6	27.4	22.9	0.3	1.5	0.7	0.0	0.1	0.0	6.0	1.5	0.0
Flixborough, Phase 3b	Lincolnshire	Dobney *et al* 2007	HS	25.1	25.0	18.4	3.1	0.0	0.1	0.0	0.3	0.1	16.2	10.8	0.9
Quarrington (MS)	Licolnshire	Rackham 2003	R	46.9	35.1	6.0	7.3	2.4	0.3	0.0	0.0	0.1	1.4	0.6	0.0
Lincoln Flaxengate, Timber Phase 1	Licolnshire	O'Connor 1982	U	53.0	28.5	9.7	0.0	7.0	0.1	0.0	0.0	0.0	1.3	0.4	0.1
Hartlepool Monastery*incs 3 sites	Cleveland	Huntley and Rackham 2007	E	22.8	45.2	12.7	1.0	0.0	0.5	0.0	0.0	0.2	8.3	9.2	0.0
Wearmouth and Jarrow	Tyne and Wear	Noddle 2006	E	47.1	20.8	11.9	4.2	1.4	0.8	0.0	0.0	0.0	8.9	5.0	0.0
Portchester Castle (M-LS)	Hampshire	Grant 1976	HS	43.3	29.2	18.3	1.1	0.4	0.9	3.4	2.8	0.6	0.0	0.0	0.0
West Heslterton (MS)	Yorkshire	Richardson 2001		34.8	46.5	7.3	2.7	1.2	0.8	0.0	0.0	0.2	2.6	4.0	0.0
York, Fishergate, Period 3	Yorkshire	O'Connor 1991	U	53.8	22.2	8.4	0.3	0.1	0.6	9.1	0.0	0.0	3.9	1.5	0.0
Cook Street, Southampton	Southampton	Bourdillon 1994	U	58.4	15.8	21.5	0.3	0.1	0.0	0.7	0.0	0.0	2.0	1.2	0.0
Southampton, Melbourne Street	Southampton	Bourdillon and Coy 1980	U	51.1	31.0	14.9	0.0	0.0	0.3	0.2	0.0	0.0	1.7	0.8	0.0
Aelfrics Abbey, Eynsham, Phase 2b	Oxfordshire	Mulville 2003	E	16.5	44.4	18.5	0.7	0.1	0.1	0.3	0.5	0.0	12.0	5.2	1.6
Aylesbury	Buckinghamshire	Farley and Jones 2012		15.2	45.1	30.5	0.5	0.1	0.4	0.0	0.0	0.3	6.0	1.6	0.4
Bishopstone	Sussex	Poole 2010	HS	24.7	43.4	24.7	0.4	0.7	1.3	0.0	0.3	0.2	2.8	0.9	0.5
St Albans, 5th-8thC	Hertfordshire	Crabtree 2011 (unpublished)	E	16.8	10.0	64.4	0.1	0.0	0.0	0.2	5.0	0.0	2.6	0.5	0.4
St Albans, 8th-9thC	Hertfordshire	Crabtree 2011 (unpublished)	E	13.0	12.4	65.3	0.0	0.4	0.5	0.2	4.5	0.0	2.6	0.7	0.4

Appendix 3: Lyminge raw data to support graphs in thesis

3.1 Data to support graphs in Chapter 5

3.1.1 Cattle

	Phase I Cattle butchery		**Phase II Cattle Butchery**	
Cattle element	**NISP**	**% Phase I**	**NISP**	**% Phase II**
Horn Core	8	12	17	17
Cranium	3	5	0	0
Atlas	2	3	5	5
Axis	2	3	1	1
Mandible	1	2	2	2
Scapula	4	6	8	8
Humerus	7	11	8	8
Radius	1	2	4	4
Ulna	1	2	2	2
Metacarpal	4	6	10	10
Pelvis	12	18	7	7
Femur	2	3	6	6
Tibia	2	3	0	0
Metatarsal	4	6	10	10
Astragalus	9	14	11	11
Calcaneum	0	0	3	3
First phalanx	1	2	5	5
Second phalanx	2	3	0	0
Third phalanx	0	0	0	0
Total	**65**		**99**	

Table 1: Data relating to Figure 5.6. The NISP count and NISP relative percentage of cattle elements with evidence of butchery in Phase I and II. Horn-core and maxilla data are included here, although they are not considered 'countable' in the methodology, however, it is worth noting that butchery marks were recorded on these elements too.

Lyminge Cattle Astragalus Gli (mm)	
Phase I	**Phase II**
62.51	63.83
61.47	54.54
61.65	60.04
58.67	58.13
63.43	62.43
66.07	66.46
63.61	57.53
60.03	61.74
54.26	57.12
62.51	61.55
59.82	67.03
56	55.95
67.25	67.44
49.51	66.12
64.65	
57.87	

Table 2: Lyminge raw data, cattle astragalus Gli measurements in both Phase I and Phase II. Phase I n=16, Phase II n=14. GLi measurements taken according to von den Driesch in millimetres using a digital set of callipers.

Cattle Metacarpal Metrics					
Phase	**Period**	**Element**	**GL**	**Bd**	**SD**
Phase I	5th-7thC	Metacarpal	172	47.9	28.95
Phase II	8th-9thC	Metacarpal	194	61.38	34.83
Phase II	8th-9thC	Metacarpal	180	52.38	27.24

Table 3: Lyminge cattle metacarpal measurements in Phase I and II showing the GL, BD and SD measurements following von den Driesch. SD = Shaft diameter, GL = Greatest length, Bd= distal breadth. Data displayed graphically in Figure 5.9.

Cattle Tibia Measurements			
Site	**Phase**	**Bd**	**Dd**
Lyminge	Phase I	53.93	40.15
Lyminge	Phase I	62.55	44.78
Lyminge	Phase I	68.84	50.44
Lyminge	Phase I	54.71	40.47
Lyminge	Phase I	56.99	42.51
Lyminge	Phase I	53.71	40.73
Lyminge	Phase I	57.26	41.96
Lyminge	Phase I	58.25	37.09
Lyminge	Phase I	59.36	44.35
Lyminge	Phase I	59.13	42.74
Lyminge	Phase I	55.19	40.41
Lyminge	Phase I	59.06	40.05
Lyminge	Phase II	50.34	35.47
Lyminge	Phase II	61.59	42.86
Lyminge	Phase II	53.36	36.71
Lyminge	Phase II	63.18	44.81
Lyminge	Phase II	63.45	46.57
Lyminge	Phase II	64.22	47.51
Flixborough	Phase 2-3a	59.8	45.87
Flixborough	Phase 3b	58.54	44.57

Table 4: Cattle tibia measurements, distal breadth (Bd) and distal depth (Dd) from both phases of Lyminge and the mean values from Flixborough. The mean metrics for Flixborough cattle tibia Bd and Dd Phase 2-3a and 3b have been included as comparison data. Displayed graphically in Figure 5.11.

Observed Range – Cattle pathology				
Cattle elements with pathology	**Phase I Qty**	**Phase II Qty**	**Total Qty**	**Percentage**
Mandible Row	2	1	**3**	0.09
1st and 2nd Molar	0	1	**1**	0.03
3rd Molar	2	1	**3**	0.09
Maxilla	1	0	**1**	0.03
Horn-core	0	4	**4**	0.12
Metacarpal	1	5	**6**	0.18
Metatarsal	0	3	**3**	0.09
Astragalus	1	0	**1**	0.03
1st Phalanx	4	5	**9**	0.26
2nd Phalanx	2	0	**2**	0.06
3rd Phalanx	0	1	**1**	0.03
Total	**13**	**21**	**34**	

Expected range – Cattle pathology			
Cattle elements with pathology	**Phase I**	**Phase II**	**Total NISP**
Mandible Row	1.15	1.85	**3**
1st and 2nd Molar	0.38	0.62	**1**
3rd Molar	1.15	1.85	**3**
Maxilla	0.38	0.62	**1**
Horn-core	1.53	2.47	**4**
Metacarpal	2.29	3.71	**6**
Metatarsal	1.15	1.85	**3**
Astragalus	0.38	0.62	**1**
1st Phalanx	3.44	5.56	**9**
2nd Phalanx	0.76	1.24	**2**
3rd Phalanx	0.38	0.62	**1**
Total			**34**
Chi-Square Test Significance	**0.12**		

Table 5: Chi-square test on cattle elements with evidence for pathology. The results show there was no statistical significance in the increase in pathological elements over time as the p-value was above 0.05.

3.1.2 Caprines

	Phase I Caprine butchery		**Phase II Caprine butchery**	
Caprine element	**NISP**	**%Phase I**	**NISP**	**%Phase II**
Horn Core	8	33	37	44
Cranium	2	8	4	5
Atlas	0	0	6	7
Axis	0	0	6	7
Scapula	0	0	2	2
Humerus	2	8	10	12
Radius	1	4	3	4
Ulna	0	0	0	0
Metacarpal	0	0	2	2
Pelvis	4	17	4	5
Femur	0	0	3	4
Tibia	2	8	0	0
Metatarsal	1	4	1	1
Astragalus	2	8	5	6
Calcaneum	2	8	2	2
First phalanx	0	0	0	0
Second phalanx	0	0	0	0
Third phalanx	0	0	0	0
Total	**24**		**85**	

Table 6: Data relating to Figure 5.16. The NISP count and NISP relative percentage of caprine elements with evidence of butchery in Phase I and II. Horn-core data are included here, although it was not considered 'countable' in the methodology, however, it is worth noting that butchery marks were recorded on these elements also.

Sheep Metacarpal metrics

Phase	Date	Element	GL	SD	SD/GL*100
Phase I	5th-7thC	Metacarpal	119.0	13.9	11.7
Phase I	5th-7thC	Metacarpal	122.9	12.8	10.4
Phase I	5th-7thC	Metacarpal	105.2	16.5	15.7
Phase II	8th-9thC	Metacarpal	111.4	17.8	16.0
Phase II	8th-9thC	Metacarpal	134.6	18.0	13.3
Phase II	8th-9thC	Metacarpal	127.9	16.9	13.2
Phase II	8th-9thC	Metacarpal	118.8	12.5	10.5

Table 7: Lyminge sheep metacarpal measurements from both phases. SD= shaft diameter; GL= greatest length. Empty circle = Phase I (5th-7th century), Crosses = Phase II (8th- 9th century). SG/GLx100 to produce the scatterplot Figure 5.18, Chapter 5.

Observed range – Caprine pathology

Caprine elements with pathology	Phase I Qty	Phase II Qty	Total	Percentage
Mandible Row	5	21	**26**	0.47
Dp4	0	1	**1**	0.02
P4	1	0	**1**	0.02
1st and 2nd Molar	1	3	**4**	0.07
Horn-core	0	14	**14**	0.25
Humerus	2	1	**3**	0.05
Radius	0	2	**2**	0.04
Metacarpal	2	0	**2**	0.04
Metatarsal	1	0	**1**	0.02
3rd Phalanx	0	1	**1**	0.02
Total	**12**	**43**	**55**	

Expected range – Caprine pathology

Caprine elements with pathology	Phase I	Phase II	Total NISP
Mandible Row	5.67	20.33	**26**
Dp4	0.22	0.78	**1**
P4	0.22	0.78	**1**
1st and 2nd Molar	0.87	3.13	**4**
Horn-core	3.05	10.95	**14**
Humerus	0.65	2.35	**3**
Radius	0.44	1.56	**2**
Metacarpal	0.44	1.56	**2**
Metatarsal	0.22	0.78	**1**
3rd Phalanx	0.22	0.78	**1**
Total			**55**
Chi-Square Test Significance	**0.006**		

Table 8: Chi-square test of independence on caprine elements with evidence for pathology. The results were statistically significant in the increase in pathological elements over time, and the increase in dental pathologies, as the p-value was below 0.05.

Observed range – Caprine pathology				
Caprine elements with pathology	**Phase I Qty**	**Phase II Qty**	**Total**	**Percentage**
Mandible Row	5	21	**26**	0.57
Dp4	0	1	**1**	0.02
P4	1	0	**1**	0.02
1st and 2nd Molar	1	3	**4**	0.09
Horn-core	0	14	**14**	0.30
Total	**7**	**39**	**46**	

Expected range – Caprine pathology			
Caprine elements with pathology	**Phase I**	**Phase II**	**Total**
Mandible Row	3.96	22.04	**26**
Dp4	0.15	0.85	**1**
P4	0.15	0.85	**1**
1st and 2nd Molar	0.61	3.39	**4**
Horn-core	2.13	11.87	**14**
Total			**46**
Chi-Square Test Significance	**0.064**		

Table 9: Chi-Square test of independence on select caprine skull elements with pathologies to test trends in the increase in mandible and horn-core pathologies over time. The results show that the increase in caprine pathologies was not statistically significant as the p-value was above 0.05.

3.1.3 Pigs

	Phase I Pig butchery		Phase II Pig butchery	
Pig element	**NISP**	**%Phase I**	**NISP**	**%Phase II**
Cranium	1	4	2	7
Atlas	3	11	0	0
Axis	0	0	0	0
Mandible	**1**	4	1	4
Scapula	3	11	3	11
Humerus	1	4	4	14
Radius	0	0	0	0
Ulna	1	4	6	21
Second Metacarpal	1	4	0	0
Third Metacarpal	0	0	0	0
Fourth Metacarpal	0	0	1	4
Fifth Metacarpal	0	0	0	0
Pelvis	9	33	2	7
Femur	0	0	1	4
Tibia	1	4	1	4
Second Metatarsal	0	0	0	0
Third Metatarsal	1	4	0	0
Fourth Metatarsal	0	0	0	0
Fifth Metatarsal	0	0	0	0
Astragalus	3	11	3	11
Calcaneum	1	4	3	11
First phalanx	0	0	1	4
Second phalanx	0	0	0	0
Third phalanx	1	4	0	0
Total	**27**		**28**	

Table 10: Data relating to Figure 5.24. The NISP count and NISP relative percentage of pig elements with evidence for butchery in Phase I and II.

3.1.4 Equids

Observed - Equids				
Equid Fusion ages	**Phase I Fused**	**Phase II Fused**	**Total**	**Percentage**
9-12 months	0	0	0	0.00
13-15 months	1	3	4	0.31
15-18 months	0	2	2	0.15
1.5-2 years	1	1	2	0.15
3-3.5 years	2	3	5	0.38
Total	**4**	**9**	**13**	

Expected - Equids			
Equid Fusion ages	**Phase I Fused**	**Phase II Fused**	**Total**
9-12 months	0.00	0.00	0
13-15 months	1.23	2.77	4
15-18 months	0.62	1.38	2
1.5-2 years	0.62	1.38	2
3-3.5 years	1.54	3.46	5
Total			**13**
Chi-Square Test Significance	**0.68**		

Table 11: Chi Square test of independence to test if change in equid age-at-death between the two phases is statistically significant. Results show the change was not statistically significant as the p-value was above 0.05.

3.1.5 Chickens

	Phase I chicken butchery		Phase II chicken butchery	
Chicken element	**Qty**	**%Phase I**	**Qty**	**%Phase II**
Cranium	0	0	1	6
Coracoid	0	0	1	6
Scapula	1	25	5	28
Humerus	0	0	1	6
Radius	0	0	0	0
Ulna	0	0	0	0
Carpometacarpus	0	0	0	0
Pelvis	0	0	0	0
Femur	0	0	3	17
Tibiotarsus	3	75	5	28
Tarsometatarsus	0	0	2	11
Total	**4**		**18**	

Table 12: Data relating to Figure 5.36. The NISP count and NISP relative percentage of chicken elements with evidence for butchery in Phase I and II.

Chicken epiphyseal fusion							
	NISP			%NISP			Total
	Chick	Juvenile	Adult	%chick	%juvenile	%adult	
Phase I	26	15	192	11.2	6.4	82.4	233
Phase II	59	203	1051	4.5	15.5	80	1313

Table 13: Data relating to Figures 5.37 and 5.38. NISP and relative percentage NISP of chicken epiphyseal fusion data. Age of fusion in bones of domestic chicken based on Serjeantson (2009:32, Table 3.2).

Chicken Tarsometatarsus Phase I		
5th-7thC	**GL**	**SD**
No Spur	68.93	5.58
No Spur	65.33	4.91
No Spur	65.96	5.08
No Spur	67.27	5.77
No Spur	63.44	5.59
No Spur	68.00	5.61
No Spur	65.59	4.92
No Spur	65.97	5.00
No Spur	66.85	5.90
No Spur	66.76	6.00
No Spur	63.47	5.20
No Spur	63.43	5.24
No Spur	77.37	6.57
No Spur	77.92	6.1
No Spur	66.25	5.77
No Spur	70.86	5.45
No Spur	71.52	5.42
Spur	77.42	7.23
Spur	77.95	7.10

Table 14: Phase I chicken tarsometatarsus Greatest Length (GL) and Shaft Diameter (SD) metrics for those tarsometatarsus with and without spur scars. Data presented in Figure 5.39.

Chicken Tarsometatarsus Phase II		
8th-9thC	**GL**	**SD**
No Spur	67.30	5.98
No Spur	66.44	5.76
No Spur	64.16	5.37
No Spur	60.09	5.37
No Spur	65.61	5.01
No Spur	62.87	5.33
No Spur	69.56	5.58
No Spur	70.59	5.84
No Spur	71.63	5.82
No Spur	77.00	6.65
No Spur	77.55	6.58
No Spur	65.95	5.08
No Spur	63.39	5.35
No Spur	61.19	5.12
No Spur	65.70	5.41
No Spur	64.05	5.37
No Spur	61.04	5.57
No Spur	82.87	7.03
No Spur	83.35	6.90
No Spur	63.03	5.36
No Spur	64.73	5.34
No Spur	65.44	5.21
No Spur	67.73	5.92
No Spur	63.19	5.49
No Spur	66.10	5.75
No Spur	66.89	5.81
No Spur	67.48	5.52
No Spur	64.12	5.69
No Spur	65.42	5.77
No Spur	66.39	5.54
No Spur	67.35	5.53
No Spur	70.29	5.61
No Spur	61.13	5.27
No Spur	65.58	5.38
No Spur	66.26	5.88
No Spur	69.55	5.73
No Spur	69.43	5.81
No Spur	69.54	5.80
No Spur	71.12	7.04
No Spur	60.58	5.25
No Spur	65.88	5.34
No Spur	66.23	6.01

No Spur	70.08	6.14
No Spur	64.12	5.91
No Spur	63.73	5.56
No Spur	67.11	5.62
No Spur	67.11	5.62
No Spur	67.45	5.63
No Spur	64.77	5.70
No Spur	64.93	5.80
No Spur	68.90	5.70
No Spur	69.09	5.71
No Spur	66.91	5.31
No Spur	68.88	5.89
No Spur	69.02	5.66
No Spur	68.19	6.02
No Spur	65.41	5.67
No Spur	64.18	5.46
No Spur	58.44	4.3
No Spur	65.88	5.73
No Spur	69.84	5.70
No Spur	63.90	4.97
No Spur	63.88	5.05
No Spur	69.5	5.8
No Spur	67.24	5.59
No Spur	68.57	5.33
No Spur	67.00	6.14
No Spur	67.88	6.16
No Spur	68.61	5.55
No Spur	65.15	5.96
No Spur	64.76	5.43
No Spur	67.82	5.59
No Spur	70.68	5.92
No Spur	66.12	5.17
No Spur	66.21	5.20
No Spur	57.57	5.84
No Spur	68.27	5.71
No Spur	68.85	5.62
No Spur	69.72	5.71
No Spur	69.56	5.69
No Spur	77.02	6.53
No Spur	66.46	5.60
No Spur	64.66	6.07
No Spur	64.70	5.44
No Spur	65.18	5.45
No Spur	60.86	5.35

No Spur	68.92	5.70
No Spur	66.06	5.75
No Spur	61.39	5.64
No Spur	65.34	5.35
No Spur	65.94	5.28
No Spur	63.58	5.24
No Spur	60.77	5.29
No Spur	61.61	5.47
No Spur	67.08	5.49
No Spur	67.63	5.49
No Spur	67.70	5.53
No Spur	60.64	5.40
No Spur	68.8	5.5
No Spur	67.9	5.8
No Spur	66.15	5.28
No Spur	66.08	5.59
No Spur	66.28	5.27
No Spur	67.90	5.78
No Spur	63.71	5.76
No Spur	69.93	5.22
No Spur	65.37	5.23
No Spur	60.53	5.42
No Spur	61.41	5.36
No Spur	73.80	6.21
No Spur	74.60	6.23
No Spur	76.93	6.43
No Spur	66.76	5.60
No Spur	66.70	5.73
No Spur	76.05	6.72
No Spur	67.50	6.29
No Spur	62.96	5.53
No Spur	62.8	5.53
Spur	70.05	6.83
Spur	70.47	6.60
Spur	63.19	5.77
Spur	63.45	5.96
Spur	79.13	7.27
Spur	63.17	5.31
Spur	73.24	6.64
Spur	76.44	6.38

Table 15: Phase II chicken tarsometatarsus Greatest Length (GL) and Shaft Diameter (SD) metrics for those tarsometatarsus with and without spur scars. Data presented in Figure 5.40.

3.1.6 Wild birds

Bird Family	Phase I (5th-7thC)	%Phase I	Phase II (8th-9thC)	%Phase II
Accipitridae	6	18.8	1	2.8
Charadriiformes	21	65.6	17	47.2
Columbidae	1	3.1	2	5.6
Corvidae	2	6.3	15	41.7
Falcondiae	1	3.1	0	0.0
Passerine	1	3.1	1	2.8
Total	**32**		**36**	

Table 16: Wild birds, grouped by family, identified in Phase I and II. Table shows NISP counts and relative percentage NISP of total identified assemblage. Data presented graphically in Figure 5.47.

3.1.7 Isotopes

Taxa	Site code	Context	Phase/C14	C13	N15	C/N ratio
Cat	LYM08	197	AD 674-864	-19.2	7.9	3.4
Cat	LYM08	656	AD 656-768	-19.1	9.4	3.3
Chicken	LYM08	106	Phase II	-20	7.7	3.5
Chicken	LYM08	247	Phase II	-20	7.8	3.4
Chicken	LYM08	247	Phase II	-20.5	8.3	3.5
Chicken	LYM08	247	Phase II	-19.3	7.1	3.3
Chicken	LYM08	273	Phase II	-19.7	8.1	3.3
Chicken	LYM08	509	Phase II	-19.9	8.2	3.3
Chicken	LYM08	544	Phase II	-19.7	9.4	3.3
Chicken	LYM08	582	Phase II	-19.9	6.7	3.4
Chicken	LYM08	592	Phase II	-19.7	9.7	3.4
Chicken	LYM08	616	Phase II	-20	9.2	3.4
Chicken	LYM08	620	Phase II	-20.1	9.7	3.4
Chicken	LYM08	637	Phase II	-19.6	7.7	3.3
Chicken	LYM08	642	Phase II	-18.8	11.8	3.3
Chicken	LYM08	684	Phase II	-20.1	7.7	3.3
Chicken	LYM08	684	Phase II	-20.2	8.6	3.4
Chicken	LYM08	744	Phase II	-20.2	8.6	3.4
Chicken	LYM09	1095	Phase II	-19.3	7.4	3.3
Chicken	LYM09	1095	Phase II	-19.2	11.1	3.3
Chicken	LYM09	1099	Phase II	-20.3	9.8	3.5
Chicken	LYM09	1228	Phase II	-19.7	7.7	3.5
Chicken	LYM09	1296	Phase II	-19.8	10	3.3
Chicken	LYM09	1312	Phase II	-19.8	9.7	3.4
Chicken	LYM09	1330	Phase II	-19.9	7.8	3.3
Chicken	LYM09	1332	Phase II	-19.8	6.9	3.4
Chicken	LYM09	1333	Phase II	-19.9	9.1	3.4
Chicken	LYM09	1333	Phase II	-19.7	9.1	3.3
Chicken	LYM09	1399	Phase II	-19.8	8.3	3.5
Chicken	LYM09	1446	Phase II	-20.1	8.9	3.5
Chicken	LYM09	1544	Phase II	-19.8	8	3.4
Chicken	LYM09	1564	Phase II	-19.6	9.8	3.4
Chicken	LYM09	1600	Phase II	-19.7	8.3	3.3
Chicken	LYM09	1672	AD 653-766	-19.8	8.5	3.3
Chicken	LYM09	1672	AD 653-766	-20	8.9	3.4
Chicken	LYM09	1705	Phase II	-19.8	11.7	3.4
Chicken	LYM09	1725	Phase II	-20.1	8.7	3.4
Chicken	LYM09	1817	Phase II	-19.6	7.5	3.4
Chicken	LYM09	1828	Phase II	-19.6	10.3	3.4
Chicken	LYM09	1837	Phase II	-19.7	9.6	3.3
Chicken	LYM12	3371	Phase II	-20.1	10.9	3.5
Chicken	LYM12	3678	Phase II	-20.2	9.5	3.3
Chicken	LYM13	6256	Phase I	-19.8	10	3.3

Chicken	LYM13	6256	Phase I	-20.2	8.9	3.4
Cow	LYM09	1101	Phase II	-21.6	5.3	3.3
Cow	LYM09	1118	Phase II	-22.1	3.9	3.5
Cow	LYM09	1148	Phase II	-22.0	5.6	3.3
Cow	LYM09	1152	Phase II	-22.1	4.9	3.5
Cow	LYM09	1166	Phase II	-21.5	4.7	3.2
Cow	LYM09	1427	Phase II	-21.9	6.7	3.4
Cow	LYM09	1453	Phase II	-22.0	6.0	3.3
Cow	LYM09	1481	Phase II	-21.6	6.1	3.4
Cow	LYM09	1491	Phase II	-21.0	7.8	3.2
Cow	LYM09	1586	Phase II	-21.5	5.4	3.2
Cow	LYM09	1820	AD 660-780	-21.7	6.7	3.3
Cow	LYM12	3105	AD428-612	-21.3	4.5	3.3
Cow	LYM12	3445	AD 544-640	-21.4	6.2	3.3
Cow	LYM12	3560	AD 426-577	-21.8	6.2	3.4
Cow	LYM12	3560	AD 428-600	-21.7	6.3	3.3
Cow	LYM12	3965	AD 257-535	-21.7	5.7	3.3
Cow	LYM13	6119	AD 405-539	-22.4	6.5	3.3
Cow	LYM13	6637	AD 424-559	-21.9	4.4	3.3
Cow	LYM13	6649	AD 579-668	-21.4	5.1	3.3
Cow	LYM13	6879	AD 416-547	-21.6	6.3	3.3
Cow	LYM13	7025	AD 416-598	-22.4	6.7	3.3
Cow	LYM13	7075	AD 404 - 538	-21.6	3.4	3.3
Cow	LYM13	7288	AD 401-538	-23.1	3.9	3.3
Cow	LYM13	7351	AD 343-535	-21.9	4.9	3.3
Cow	LYM14	9444	AD 663-770	-21.5	3.2	3.1
Cow	LYM14	99266	AD 405-537	-21.4	4.6	3.1
Cow	LYM14	99285	AD 401-537	-21.9	1.3	3.1
Cow	LYM10	2274a	Phase I	-21.6	5.8	3.2
Cow	LYM10	2274b	Phase I	-22.1	6.1	3.5
Cow	LYM10	2274b	Phase I	-22.0	7.0	3.2
Cow	LYM10	2293a	Phase I	-22.3	8.3	3.3
Cow	LYM10	2293a	Phase I	-21.8	8.7	3.3
Cow	LYM10	2508a	Phase I	-21.9	5.9	3.3
Cow	LYM10	2518c	Phase I	-21.3	7.4	3.3
Cow	LYM10	2527a	Phase I	-21.4	5.2	3.3
Cow	LYM10	2541d	Phase I	-22.3	7.2	3.5
Cow	LYM10	2690d	Phase I	-21.1	6.4	3.3
Dog	LYM08	12	AD 653-767	-17.5	12.3	3.4
Dog	LYM09	1506	AD 667-776	-18.5	11.0	3.4
Goose	LYM14	9502	AD 430-618	-20.3	7.7	3.1
Human	LYM09	1672	AD 653-766	-18.5	12.2	3.3
Pig	LYM09	1148	Phase II	-21.2	5.3	3.3
Pig	LYM09	1166	Phase II	-20.9	6.3	3.3
Pig	LYM09	1293	Phase II	-21.1	4.7	3.2
Pig	LYM09	1449	Phase II	-21.5	5.3	3.2
Pig	LYM09	1572	Phase II	-21.1	5.4	3.4
Pig	LYM09	1592	Phase II	-21.2	7.0	3.3

Pig	LYM09	1733	Phase II	-20.8	4.6	3.3
Pig	LYM09	1751	Phase II	-20.8	5.0	3.2
Pig	LYM09	1764	Phase II	-21.5	5.5	3.3
Pig	LYM10	2609	AD 537-644	-20.9	2.3	3.3
Pig	LYM12	3704	AD 396 -537	-20.4	6.9	3.3
Pig	LYM12	3739	AD 421-561	-21.0	6.8	3.4
Pig	LYM13	6687	AD 425-564	-20.7	8.2	3.1
Pig	LYM13	7156	AD 341-541	-21	7.7	3.3
Pig	LYM13	7205	AD 347-535	-21.0	5.5	3.3
Pig	LYM14	9208	AD 426-577	-21.8	4.5	3.1
Pig	LYM09	1166	Phase II	-21.5	5.2	3.2
Pig	LYM10	2274c	Phase I	-20.8	5.6	3.3
Pig	LYM10	2293a	Phase I	-21.2	5.7	3.3
Pig	LYM10	2451b	Phase I	-20.6	7.2	3.3
Pig	LYM10	2508c	Phase I	-20.7	7.4	3.3
Pig	LYM10	2518b	Phase I	-22.0	5.5	3.4
Pig	LYM10	2528a	Phase I	-21.1	8.0	3.3
Pig	LYM10	2570d	Phase I	-21.8	6.7	3.3
Pig	LYM10	2572c	Phase I	-21.1	5.0	3.3
Pig	LYM10	2572c	Phase I	-20.9	6.1	3.3
Sheep	LYM10	2518a	Phase I	-21.5	6.5	3.3
Sheep	LYM13	7035	AD 655-865	-21.7	6	3.3
Sheep/Goat	LYM09	1120	Phase II	-21.6	4.7	3.3
Sheep/Goat	LYM09	1166	Phase II	-22.0	4.6	3.2
Sheep/Goat	LYM09	1166	Phase II	-21.2	5.1	3.2
Sheep/Goat	LYM09	1445	Phase II	-22.9	7.8	3.3
Sheep/Goat	LYM09	1447	Phase II	-21.6	4.7	3.2
Sheep/Goat	LYM09	1451	Phase II	-21.6	3.9	3.2
Sheep/Goat	LYM09	1458	Phase II	-22.2	6.3	3.3
Sheep/Goat	LYM09	1464	Phase II	-21.7	4.3	3.2
Sheep/Goat	LYM09	1737	Phase II	-21.2	5.0	3.2
Sheep/Goat	LYM09	1764	Phase II	-22.5	6.0	3.2
Sheep/Goat	LYM13	6277	AD 392-537	-22.1	7.5	3.2
Sheep/Goat	LYM10	2518d	Phase I	-21.8	4.8	3.5
Sheep/Goat	LYM10	2518d	Phase I	-21.3	7.7	3.4
Sheep/Goat	LYM10	2518d	Phase I	-21.3	6.2	3.2
Sheep/Goat	LYM10	2520a	Phase I	-21.1	4.9	3.3
Sheep/Goat	LYM10	2557d	Phase I	-21.6	5.8	3.3
Sheep/Goat	LYM10	2572c	Phase I	-21.0	4.8	3.2
Sheep/Goat	LYM10	2572c	Phase I	-21.6	6.2	3.3
Sheep/Goat	LYM10	sf1.35d	Phase I	-20.9	7.5	3.3

Table 17: δ^{13}C and δ^{15}N values and C/N ratios of collagen samples from animal bone, including those studied by the author, results of radiocarbon dating and chicken data from Sykes and Miller (in prep). Samples where the C/N ratio was outside the limits normally considered to indicate acceptable purity were excluded (Ambrose 1990).

Poor data removed from Sample						
Taxa	**Site code**	**Context**	**Phase/C14**	**C13**	**N15**	**C/N ratio**
Chicken	LYM08	525	Phase II	-20.7	8.6	3.9
Chicken	LYM08	684	Phase II	-20.2	6.6	3.7
Chicken	LYM09	1464	Phase II	-20.3	7.7	3.9
Chicken	LYM09	1672	AD 653-766	-20.2	7.9	3.7
Cow	LYM10	2653	AD 595-650	-21.4	3.6	3.8
Pig	LYM10	2508	AD 570-650	-21.4	3.6	3.8
Pig	LYM13	6687	AD 662-870	-23.5	7.9	4.5
Pig	LYM13	6971	AD 430-606	-19.6	8.7	3.8
Sheep/Goat	LYM10	2570a	Phase I	-22.4	5.6	3.6

Table 18: Excluded samples, where the C/N ratio was outside the limits normally considered to indicate acceptable purity (<3.5 C/N ratio) (Ambrose 1990). Including $\delta^{13}C$ and $\delta^{15}N$ values and C/N ratios of collagen samples from material studied by the author, results of radiocarbon dating and chicken data from Sykes and Miller (in prep).

Phase I	Mean		No. Samples
	c13	N15	
Cattle	-21.8	5.7	26
Standard Deviation	0.4	1.6	
Sheep	-21.4	6.2	12
Standard Deviation	0.4	1.0	
Pig	-21.1	6.2	16
Standard Deviation	0.4	1.5	
Chicken	-20.0	9.5	2
Standard Deviation	0.3	0.8	
Goose	-20.3	7.7	1
Standard Deviation			

Table 19: Mean values of Phase I (fifth-seventh centuries) $\delta^{13}C$ and $\delta^{15}N$ by species (species with single values were not included in graph). Displayed graphically in Figure 5.52.

Phase II	Mean		No. Samples
	c13	N15	
Cattle	-21.7	5.6	10
Standard Deviation	0.3	1.1	
Sheep	-21.8	5.2	10
Standard Deviation	0.5	1.2	
Pig	-21.1	5.4	10
Standard Deviation	0.3	0.7	
Chicken	-19.9	8.7	39
Standard Deviation	0.3	1.2	
Dog	-18.0	11.7	2
Standard Deviation	0.7	0.9	
Cat	-19.2	8.7	2
Standard Deviation	0.1	1.1	
Human	-18.5	12.2	1
Standard Deviation			

Table 20: Mean values of Phase II (eighth-ninth centuries) $\delta^{13}C$ and $\delta^{15}N$ by species (species with single values were not included in graph). Displayed graphically in Figure 5.53.

3.2 Data presented in graphs in Chapter 6

Early Anglo-Saxon sites										
Scatterplot No.	**County**	**Site Type**	**Site**	**Source**	**Cattle**	**Caprine**	**Pig**	**Total NISP**	**C/P**	**S/P**
1	Kent	Rural, High Status	Lyminge Phase I	na	636	373	922.8	1931.8	0.69	0.40
2	Kent		Canterbury, Whitefriars, Phase 4	Bendry *et al* in prep	112.5	46	65.75	224.25	1.71	0.70
3	Kent		Church Whitfield	Bendry 2014	20	15	16	51	1.25	0.94
4	Kent	Rural	Ramsgate, Manston Rd	Hamilton-Dyer 2009	100	172	44	316	2.27	3.91
5	Kent	Rural	Northfleet Ebbsfleet	Grimm and Worley 2011	410	147	226	783	1.81	0.65
6	Kent	Rural	Springhead, Ebbsfleet	Grimm and Worley 2011	529	225	361	1115	1.47	0.62
7	Suffolk	Rural	West Stow Phase I (5thC)	Crabtree 1990	2539	3479	1912	7930	1.33	1.82
8	Suffolk	Rural	West Stow Phase II (6thC)	Crabtree 1990	4811	6944	1912	13667	2.52	3.63
9	Suffolk	Rural	West StowPhase III (6th-7thC)	Crabtree 1990	523	725	308	1556	1.70	2.35
10	Suffolk	Rural	Bloodmoor Hill	Higbee 2009	1924	595	685	3204	2.81	0.87
11	Lincolnshire	Rural	Quarrington	Rackham 2003	640	268	111	1019	5.77	2.41
12	Norfolk	Rural	Recastle Furze (6th-7thC)	Nicholson 1995, Wilson 1995	407	301	105	813	3.88	2.87
13	Yorkshire	Rural	Kilham (ES)	Archer 2003	1199	1253	126	2578	9.52	9.94
14	Yorkshire	Rural	West Heslerton, Anglian	Richardson 2001	10,455	11187	2112	23,754	4.95	5.30
15	Buckinghamshire	Rural	Pennyland (E - MS)	Holmes 1993, Ashdown 1993	1170	894	330	2394	3.55	2.71
16	Oxfordshire	Rural	Barton Court Farm, Abingdon	Wilson et al 1986	377	573	354	1304	1.06	1.62
17	Sussex	Rural	Bishopstone	Gebbels, 1977	35	55	24	114	1.46	2.29

Table 21: Relative abundance (NISP) of the three main domesticates in early Saxon assemblages discussed in this thesis. Also showing ratios of NISPcattle/NISPpig (C/P) and NISPsheep/NISPpig (S/P). Displayed graphically in Figure 1.3 in Chapter 6.

Species ratios on Middle Anglo-Saxon sites

Scatterplot No.	County	Site type	Site name	Source	Cattle	Caprine	Pig	NISP total 3	C/P	S/P
1	Kent	Ecclesiastical, High Status	Lyminge, Phase II	Knapp (n.d)	719	1022	607.6	2348.6	1.18	1.68
2	Kent	Coastal	Sandtun, Hythe	Hamilton-Dyer 2001	91	109	51	251	1.78	2.14
3	Kent	Ecclesiastical	St Augustines Abbey, Canterbury	Jones and Randall 2015	1360	1476	837	3673	1.62	1.76
4	Kent	Ecclesiastical	Canterbury, Whitefriars, Phase 5	Bendrey *et al* in prep	388	419	333	1140	1.17	1.26
5	Suffolk	High Status	Brandon (MS)	Crabtree and Campana 2014	13441	24652	9121	47214	1.47	2.70
6	Essex	HIgh Status	Wicken Bonhunt (MS)	Crabtree 1996; Wade 1980	5138	3858	20954	29950	0.25	0.18
7	Suffolk	Urban, Wic	Ipswich	Crabtree 1994	3408	2353	1973	7734	1.73	1.19
8	Lincolnshire	HIgh Status	Flixborough, Phase 3b	Dobney et al 2007	6652	6628	4893	18173	1.36	1.35
9	Licolnshire	Rural	Quarrington (MS)	Rackham 2003	491	368	63	922	7.79	5.84
10	Licolnshire	Urban, Wic	Lincoln Flaxengate, Timber Phase 1	O'Connor 1982	791	425	145	1361	5.46	2.93
11	Cleveland	Ecclesiastical	Hartlepool Monastery - inc 3 sites	Huntley and Rackham 2007	713	1413	396	2522	1.80	3.57
12	Tyne and Wear	Ecclesiastical	Wearmouth and Jarrow	Noddle 2006	170	75	43	288	3.95	1.74
13	Hampshire	High Status	Portchester Castle (M-LS)	Grant 1976	1935	1303	817	4055	2.37	1.59
14	Yorkshire	Rural	West Heslterton (MS)	Richardson 2011	3155	4216	658	8029	4.79	6.41
15	Yorkshire	Urban, Wic	York, Fishergate, Period 3	O'Connor 1991	8296	3421	1295	13012	6.41	2.64
16	Southampton	Urban, Wic	Cook Street, Southampton	Bourdillon 1994	2869	775	1058	4702	2.71	0.73
17	Southampton	Urban, Wic	Southampton, Melbourne Street	Bourdillon and Coy 1980	23,888	14,477	6949	45314	3.44	2.08
18	Oxfordshire	Ecclesiastical	Aelfrics Abbey, Eynsham, Phase 2b	Mulville 2003	385	1039	434	1858	0.89	2.39
19	Buckinghamshire	Rural	Aylesbury	Farley and Jones 2012	205	610	413	1228	0.50	1.48
20	Sussex	Rural, High Status	Bishopstone	Poole 2010	656	2449	1335	4440	0.49	1.83
21	Hertfordshire	Ecclesiastical, High Status	St Albans, 5th-8thC	Crabtree 2011 (unpublished)	138	82	528	748	0.26	0.16
22	Hertfordshire	Ecclesiastical, High Status	St Albans, 8th-9thC	Crabtree 2011 (unpublished)	105	100	527	732	0.20	0.19

Table 22: Relative abundance (NISP) of the three main domesticates in middle Saxon assemblages discussed in this thesis. Also showing ratios of NISPcattle/NISPpig (C/P) and NISPsheep/NISPpig (S/P). Displayed graphically in Figure 1.4 in Chapter 6.

Cattle Relative Percentage NISP Epiphyseal Fusion				
Site name	**Early Fusing**	**Middle Fusing**	**Late Fusing**	**Sources**
Lyminge Phase I	91	73	63	Knapp (n.d)
Lyminge Phase II	87	73	49	Knapp (n.d)
Wicken Bonhunt	94	86	67	Crabtree 2012
West Stow Phase I	78	49	39	Crabtree 1990
West Stow Phase II	83	59	42	Crabtree 1990
West Stow Phase III	78	79	48	Crabtree 1990
Brandon	96	80	50	Crabtree 2012
St Albans	100	73	68	Crabtree 2011
Ipswich	95	74	53	Crabtree 2012
Bishopstone	98	88	62	Poole 2010
Bloodmor Hill	95	77.8	80.4	Higbee 2009

Table 23: Age profiles based on epiphyseal fusion for cattle, comparing Lyminge Phase I and II to contemporary sites. Fusing ages follow Crabtree 2012b:34: early fusing includes those elements that fuse by 1.5 years, middle fusing are those that fuse by 3 years; and late fusing elements are those that fuse by 4 years. Displayed graphically in Chapter 6, Figure 1.5.

Pig Relative Percentage NISP Epiphyseal Fusion				
	Early Fusing	**Middle Fusing**	**Late Fusing**	**Sources**
Lyminge Phase I	54	41	9.24	Knapp (n.d.)
Lyminge Phase II	52	32	6.45	Knapp (n.d.)
Wicken Bonhunt	67	26	13	Crabtree 2012:27
West Stow Phase I	71	38	4	Crabtree 1989:79
West Stow Phase II	59	28	2	Crabtree 1989:79
West Stow Phase III	64	29	5	Crabtree 1989:79
Brandon	73.5	32.6	6.3	Crabtree 2012:30
St Albans	88.9	28	11.11	Crabtree 2011
Ipswich	84	29	14	Crabtree 2012:30
Bishopstone	75	43	30	Poole 2010:150
Bloodmor Hill	82	58	10.2	Higbee 2009:300
Aelfric's Abbey, Eynsham, Phase 2a	87.5	54.5	16.6	Mulville 2003:350
Aelfric's Abbey, Eynsham, Phase 2b	73.17	25.5	4.5	Mulville 2003:350

Table 24: Age profiles based on epiphyseal fusion for pigs, comparing Lyminge Phase I and II to contemporary sites. Fusing ages follow Crabtree 2012b:30: early fusing includes those elements that fuse by 1 year old, middle fusing are those that fuse by 2 - 2.5 years; and late fusing elements are those that fuse by 3.5 years. Displayed graphically in Chapter 6, Figure 25.

Early Saxon - Chickens	**NISP**	**%NISP of total assemblage**
Lyminge Phase II	417	17.6
Northfleet Ebbsfleet	2	0.2
Springhead, Ebbsfleet	3	0.3
Ramsgate, Manston Rd	12	3.5
Bishopstone	6	4.8
Barton Court Farm, Abingdon	60	4.2
Pennyland	5	0.2
Redcastle Furze (6th-7thC)	5	0.6
West Stow Phase I	115	1.4
West Stow Phase II	389	2.7
West Stow Phase III	17	1.0
Bloodmoor Hill, Carlton Coleville	18	0.5
Quarrington	19	1.7

Table 25: Table showing NISP and percentage NISP of total assemblage for early Saxon sites contemporary with Lyminge Phase I. Data presented graphically in Figure 6.5.

Middle Saxon - Chickens	**NISP**	**%NISP of total assemblage**
Lyminge, Phase II	1860	43.8
Sandtun, Hythe	31	10.5
St Augustine’s Abbey, Canterbury	1066	21.2
Brandon (MS)	1306	2.6
Wicken Bonhunt (MS)	3082	8.7
Ipswich	513	6.1
Flixborough, Phase 3b	4308	16.5
Quarrington (MS)	15	1.5
Hartlepool Monastery*	260	8.4
Wearmouth and Jarrow	32	9.1
Portchester Castle (M-LS)	0	0.0
York, Fishergate, Period 3	603	4.3
Cook Street, Southampton	99	2.0
Southampton, Melbourne Street	800	1.7
Aelfrics Abbey, Eynsham, Phase 2b	280	12.3
Bishopstone	186	2.9
St Albans, 5th-8thC	21	2.7
St Albans, 8th-9thC	21	2.8

Table 26: Table showing NISP and percentage NISP of total assemblage for middle Saxon sites contemporary with Lyminge Phase II. Data presented graphically in Figure 6.6.

3.3 Wild Mammal data discussed in Chapter 7

Observed range - Wild Mammals				
Taxa	**Phase I NISP**	**Phase II NISP**	**Total**	**Percentage**
Roe deer	3	30	33	0.80
Red deer	4	0	4	0.10
Hare	1	1	2	0.05
Badger	1	0	1	0.02
Pole cat/pine marten	1	0	1	0.02
Total	**10**	**31**	**41**	

Actual Range - Wild Mammals			
Taxa	**Phase I**	**Phase II**	**Total NISP**
Roe deer	8.05	24.95	33
Red deer	0.98	3.02	4
Hare	0.49	1.51	2
Badger	0.24	0.76	1
Pole cat/pine marten	0.24	0.76	1
Total			**41**
Chi-Square Test Significance	**0.0001**		

Table 27: Chi-Square test of independence on wild mammal NISP to test if the increased abundance between Phase I and II was statistically significant. The results show that the increased abundance in wild mammals between the phases was statistically significant as the p-value was below 0.05.

3.4 Data presented in graphs in Chapter 8

Species	**Early Iron Age**	**Mid Iron Age**	**Late Iron Age**	**Early Roman**	**Mid Roman**	**Late Roman**	**Early Saxon**	**Mid Saxon**	**Late Saxon**	**High Medieval**	**Late Medieval**
Dog	30	67	36	50	64	255	4	11	16	8	6
Cat	0	1	6	5	7	30	0	2	3	4	1
Total no. ABG's – all species	**160**	**385**	**201**	**158**	**118**	**544**	**6**	**20**	**52**	**80**	**24**

Table 28: Data extracted from Morris (2008) - number of identified dog and cat ABG's in southern England and total number of ABG's by period in Southern England. Table related to data presented graphically in Figure 8.2.