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The Animal Bone Remains from Scarborough Castle, North Yorkshire

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Summary

The report discusses the study of the medieval (12^{th} -15^{th} centuries) animal remains from Scarborough Castle, North Yorkshire. The assemblage represents kitchen refuse and comprises more than 700 identified fragments of mammals, birds, and fishes. The main domestic species - cattle, pig and sheep - form the larger part of the assemblage. Nevertheless, the collection includes the remains of wild species such as white-beaked dolphin, deer (red, fallow and roe), crane, and bittern that are indicative of a site of high socio-economic status. The age of cattle consumed at the site - mostly immature - indicates that these animals were killed before they contributed other types of products (traction power, milk) and thus is also suggestive of a high socio-economic status. The sex ratio of pigs seems to indicate that at least this species was imported and not bred at the site.

Keywords

Animal Bone
Bird Remains
Medieval

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The animal bone remains from Scarborough Castle, North Yorkshire

Introduction

Scarborough Castle is situated on a natural plateau-like coastal promontory, about 92m above sea level, on a headland that rises between two bays. This location gives the site a superb defensive position. This defensive potential was probably recognised since prehistoric and Roman times, and the site served as a 'signal station' during the latter. In 1138 William, Count of Aumale – who had been created Earl of Yorkshire after his prominent part in the battle of Standard against the Scots - built a castle at the site (Hey, 1986). A rebuilding took place between 1157/58 and 1168/69, after Henry II made it a royal castle. Thus, most of the present fortifications seem to date back to the 12th century, with the addition of a barbican during the 13th century (Hey, 1986). They consist of a series of three wards beginning with the barbican and culminating with a box-like area that later contained the Master Gunners's House, that gave access into both the inner bailey and its keep, and across an artificial ditch into the Castle Garth or outer bailey (Hayfield, in prep.). The castle was never taken in battle, and most of its defences survived until the Civil War when, after Parliament's victory, some of the structures were slighted. Limited refortification took place during the 17th and 18th centuries, and the site retained its military function until the end of the 19th century. The castle, along with the town of Scarborough itself, suffered heavy naval bombardments during the 1914-1918 war (Hayfield, in prep.).

The animal remains were recovered during the five seasons of excavations by T. Pacitto in four locations at the Site: the Hall (which comprises the Main Hall and the Service End) and the Kitchen in the outer bailey (1973, 1978, 1980), the Barbican (1979) and the Master Gunner's House (1977). The vast majority of the material comes from the Hall and the Kitchen. The construction of the Hall took place during the rebuilding campaign of Henry II. Historic documents indicate that about a century later it was in a poor state of repair, and that it had been demolished before 1361. Pottery finds from the Hall range from late 12th to the late 13th/early 14th centuries. The kitchen, however, was built somewhat later and seems to have survived – probably as a brewery (Hayfield, in prep.) – until the later 14th/early 15th centuries.

The faunal assemblages of the Barbican and the Master Gunner's House contained only a small number of specimens, belonging to a variety of phases spanning a few centuries in post-medieval times. Therefore, although a summary of the finds from these assemblages is presented (Tables 3 & 4), they are not discussed in this report.

Material and methods

All animal bone remains were collected by hand, with the consequent loss of most of the smaller bones of the larger species and most bones of small species (eg. birds and fish). The archaeological contexts were categorised by the excavator as stratified, semi-stratified (probably disturbed by 19th century excavations), and unstratified. The unstratified faunal material was not recorded, although it was scanned for possible uncommon finds. The pottery and other finds from the semi-stratified contexts was largely uncontaminated with modern material (Hayfield, pers. comm. to P. Baker) and were thus amalgamated with the stratified for purposes of analysis. It must be mentioned that residual Iron Age pottery is present, albeit in very small proportions, in some contexts from the Hall (Hayfield, pers. comm.).

Due to the nature of the site and the nature and survival of the archaeological record, a very simplistic phasing was adopted for both the Hall and the Kitchen. In both Hall and Kitchen a basic construction and occupation phase is referred to as 'Phase 1' and subsequent modifications are included in 'Phase 2'. However, it must be stressed that no correlation can be made between the phases in the different parts of the site (eg. Phase 1 in the Hall is earlier than Phase 1 of the Kitchen, nor can it be assumed that, for example, phase 1 of the Hall and phase 2 of the Kitchen are the same date.

Hall	Kitchen
Phase 1	Phase 1
primary construction (1157/8 – 1168/69) and use of building	primary construction and use of building (12th-13th century)
Phase 2a+b	Phase 2
modifications, probably associated with Henry III recorded works (1223-7); further modifications, probably later 13th century	alterations to the building (13th-14th) and use until abandonment (15th century)

All of the fragments recovered were, wherever possible, identified to skeletal element and taxon – with the exception of ribs and vertebrae caudal to the second cervical (axis), which were assigned to one of three size-classes: large (cattle/horse), medium (ovicaprids/pig/dog), and small (leporids/cat/fox). Similarly, the identification of ribs and phalanges of birds was not attempted. If two or more fragments were distinguished as being derived from the same bone, they were recorded as one specimen. The number of identified specimens (NISP) served as the basic unit in counts.

Among the ovicaprids, only sheep was positively identified. Thus, while it is possible that bones of goats are present in the 'sheep/goat' category, ovicaprid bones are collectively referred to in this report as 'sheep'. An attempt was made to separate chicken and pheasant through their tarsometatarsi: spurred specimens lacking the posterior continuous keel are commonly regarded as being characteristic for chicken (e.g. Albarella & Davis 1996). Additionally, the morphological criteria described by MacDonald (1992) were used to try and detect the presence of the Guinea Fowl (*Numida meleagris*). However, only *Gallus* was positively identified and thus all galliforms are collectively regarded as chicken. All bones of geese belonged to one of the larger species (*Anser*); they belong very probably to the domestic goose but, given the morphological similarities between the domestic and the wild form, the graylag goose, the presence of the latter cannot be ruled out.

Due to its small size, most aspects of the faunal assemblage can only be discussed in a very general manner, and then, only through the 'lumping' of the material of Hall and Kitchen and without regard for the phasing. A couple of exceptions were made when it was felt that observed differences between parts of the site/periods had a real background.

Measurements were carried out following von den Driesch (1976), but additional metrical data were recorded whenever possible, e.g. distal depth of humerus, proximal depth of radius (for definition of these parameters see Weinstock, 1997). The dental eruption and wear of the few teeth and mandible of cattle, sheep, and pig were recorded following the method of Grant (1982).

Results

Species representation

The combined faunal assemblages of the Hall and Kitchen comprise 731 identified specimens, and include mammals, birds, and fish (Tables 1 & 2). Mammals are the most abundant class in both locations; the great majority belonging to the three major domestic species: cattle, pig, and sheep in that order (except for phase 2 in the Kitchen, where sheep are as abundant as cattle; Figure 2). Horse, dog, and cat are represented only by a handful of fragments. The abundance of wild mammals is c. 8% though it varies (4.1% to 9.6%) according to location and phase. The species present are hare, red, fallow and roe deer, and white-beaked dolphin, the latter being represented by fragments from a maxilla and a pre-maxilla belonging to the same individual (Tables 1 & 2). The identification of the dolphin remains was based on the size, shape, and spacing of the tooth sockets as well as the general robusticity of the bone (Plates 1, 2); the fragments were also compared with other species of dolphins from British waters – the

common dolphin, the bottlenose dolphin and the striped dolphin, but these did not match the specimen from Scarborough. In spite of being one of the most common species of dolphin in the North Atlantic, the author of this report is aware of only a single additional archaeological specimen of this species from Britain – that recovered from the much earlier site of Knap of Howar, Orkney, 3660/3500 cal BC (A. Tresset, pers. comm.).

In the site as a whole (ie. Hall + Kitchen), birds represent c. 22% of the assemblage. In the two phases of the Hall and in phase 2 of the Kitchen they comprise between 12%-17% of the identified specimens (but see 'discussion' below); in phase 1 of the Kitchen, however, they reach 42%. A possible explanation for this high abundance is suggested by the anatomical representation (see below). Domestic fowl and goose make up c. 90% of the bird remains. For such a small assemblage, the variety of species of wild birds is considerable: duck, swan, bittern, goshawk, crane, pigeon, partridge, plover, lapwing, woodcock, and thrush/starling. In addition, red kite and jackdaw were present in unstratified contexts.

Due to the recovery method used, it is not surprising that fish are almost exclusively represented by remains of larger gadids (cod, haddock, pollack). Other species – eg. conger eel, flatfish, salmonids, and catfish – are represented by one or few fragments. In addition to the finds listed in Tables 1 & 2, a dermal denticle of thornback ray (*Raja clavata*) was recovered from an unstratified context in the Kitchen.

Preservation, gnawing, and butchery marks

The bones were generally very well preserved; their surface does not show modifications due to the effects of weathering or rootlet etching. Thus the presence of gnawing and butchery marks on the bones is clearly visible.

While dog remains are scarce in the assemblage, it is clear from the proportion of bones gnawed by dogs (21% of the identified specimens of mammal+birds) that they were an important factor in its formation. Gnawed bones seem to be somewhat more abundant in the hall than in the kitchen (Table 5). Although the samples are small, this may indicate that the taphonomic histories of the assemblages in both areas are somewhat different, with dogs having less access to the bones in the latter.

Butchery marks were recorded in cattle, sheep, and pig in frequencies under 20%; c. 5% of domestic fowl bones show cut marks (Table 5). Cut marks were also present in a proximal fragment of a dog's femur. From their location – just below the caput – it can be inferred that they were made during the disarticulation of the hind limb from the pelvis. Butchery marks on

dog bones, as opposed to skinning marks – have been reported from other medieval sites such as Castle Mall (Albarella et al., 1997), West Cotton (Albarella & Davis, 1994), Lincoln (Dobney *et al.*, 1995), and Heigham Street (Weinstock, in press). More unusual is the chopping/slicing off the lateral epicondyle of a cat's humerus. This mark follows a proximal-distal – rather than dorso-palmar – trajectory, and therefore is probably an indication of 'careless' skinning rather than a result of the separation of upper from lower leg. Also worth mentioning are cut marks on a proximal fragment of a bittern's tarsometatarsus.

In addition, vertebrae of large and medium sized mammals were occasionally split ventrally, indicating that carcasses were sometimes being halved down the backbone.

Anatomical representation

The small size of the assemblage does not warrant a detailed evaluation of the skeletal representation of most species. The major domestic species – cattle, sheep, and pig – are represented by all skeletal elements (Tables 6-8), which indicates that at least some animals were butchered at the site. In the case of cattle –for which material is somewhat more abundant – meat-bearing regions of the body seem to be better represented than head and feet (Table 6).

While red deer bones are not numerous, the skeletal representation is interesting and probably not a product of chance. It is dominated by bones of the hind limb, mostly tibia and tarsals (Table 9). This pattern has also been identified for fallow and/or red deer in other castle sites, such as Barnard Castle Durham (Jones et al. 1985), Sandal Castle, West Yorkshire (Griffith et al. 1983), Okehampton, Devon (Maltby, 1982), Prudhoe, Northumberland (Davis, 1987), and Launceston, Cornwall (Albarella & Davis, 1996).

The anatomical representation of domestic fowl is also clearly biased towards the lower part of legs, as reflected by the overrepresentation of tarsometatarsi. Significantly, most of these bones were found in the Kitchen in 2 contexts in area M4 belonging to its first phase (Table 10). No such overrepresentation of tarsometatarsi was observed in goose (Table 11)

Fish were represented mainly by vertebrae. An exception is the haddock, where ten cleithra are present and only one vertebra. This, however, is probably due to the recovery methods, since the vertebrae of this species are much smaller than those of other species present.

Ageing and sexing

The ageing evidence for mammals, both in the form of mandibles/teeth as well as of epiphysial fusion, is very scant, even when the data for of all of the periods and parts of the

site are pooled together (Tables 12-14). Nevertheless, it seems to indicate that not many cattle and sheep were killed very young (ie. as juveniles), although many – in cattle probably most - were slaughtered before reaching maturity. Generally, pigs seem to have been killed when juvenile, i.e. younger than cattle and sheep. While the evidence for sex ratios in pig is scant, it does seem to indicate that many more male than female pigs were present at the site (Table 15).

Among domestic fowl specimens, 75% are those of adults and the remaining 25% are juveniles (Table 16). Hens are more abundant than cockerels by a ratio of c. 2.5:1 (as calculated from 20 tibiotarsi).

Body size

The small size of the bone assemblage makes very difficult the evaluation of the size of most species. Metrical data of both sheep and domestic fowl, somewhat less limited than for other species, suggests that their size was very similar to that of contemporary animals in sites such as Launceston Castle (phase 6), Lincoln, and Exeter (Tables 18-20; Figure 3). Withers heights could be calculated (after Teichert, 1975) for four sheep bones: two metacarpi, a radius, and a tibia. The corresponding values are 60.4cm, 55.4cm, 56.8cm, and 56.4cm, with a mean of 57.2cm. Again, these values are similar to those in comparable sites such as Launceston Castle (phase 6, late 13th C.), Fellow's Garden in Durham Castle (Mulville, n.d.), and Exeter (Maltby 1979).

Discussion

The bone assemblage from Scarborough Castle represents mainly 'kitchen refuse' – that is, bone discarded during food preparation and after meals – rather than primary butchery refuse or industrial/handicraft activities. This is indicated by the skeletal representation of the principal mammal species, especially cattle, which are dominated by meat-bearing parts. An interesting occurrence is the clear overrepresentation of tarsometatarsi among the domestic-fowl bones recovered from deposits belonging to phase 1 in the kitchen. These remains are to be interpreted as refuse discarded during the preparation of the fowl for consumption. A similar occurrence was observed in the late medieval deposits of the Great Kitchen at the Benedictine abbey of Eynsham (Serjeantson et al., in press).

The material at our disposal indicates that beef was eaten in larger quantities than both lamb and pork. Birds – mainly chicken and goose – and marine fish played a subordinate but definitely not unimportant role in the diet. In fact, since hand-collection consistently results in

the under-representation of these classes, the quantity of birds and fish eaten was probably much higher than implied by their proportion in the assemblage.

The material is far too scant to establish with some certainty whether most domestic animals were bred at the site or whether they were imported. Nevertheless, the observed sex ratio of pig is interesting in this context. Ideally, in sites were pigs are bred – i.e. 'producer sites' – the sex ratio should be biased in the favour of females, since these are required for breeding in larger numbers than males. By contrast, where pigs are mainly imported the sex ratio will be dominated by males (these being mostly the surplus animals not required for breeding). If the observed over-representation of males at Scarborough (c. 5:1 for mandibles + loose canines; 3:1 for mandibles only) is a true reflection of the actual sex ratio of the pigs consumed at the site rather than a product of small sample size, this would suggest that pigs were not bred at Scarborough castle, i.e. that, at least concerning this species, the site was a 'consumer' rather than a 'producer'.

The presence and proportional representation of species confirm the high socio-economic status expected for Scarborough Castle. Except for period 2 in the kitchen – which belongs to the late 14th or early 15th century – pigs represent more than 30% of the economically important domestic mammals. It has been noticed that in the medieval period their frequencies in castles tend to be higher than 20%, although their numbers decline by the late medieval and post-medieval periods. In contrast, villages and towns tend to show lower frequencies (Albarella & Davis 1996; Albarella et al. 1997).

High status is also implied by the relatively common remains of deer, the skeletal representation of which - mostly bones of the lower rear leg – seems to suggest the import of haunches of this rather than the slaughter of whole animals at the site (Grant, 1988; Albarella & Davis, 1996). The presence of a variety of other wild mammals is also in agreement with what would be expected for a royal castle. The remains of the white-beaked dolphin are particularly telling. It is clear from the historical sources that, at least from the early 11th C, cetaceans were a high-status food, and their remains have been discovered mainly in high-status sites (for a detailed discussion see Gardiner, 1997; Sabin et al. 1999). It is highly likely that the dolphin bone fragment from Scarborough came from a stranded individual, as were probably most of the cetacean remains in the medieval period (Gardiner, 1997). The king and nobility had the rights to all stranded cetaceans. Stranding episodes must have been relatively rare, and consequently, the contribution of cetacean meat to the diet was insignificant. However, the possession and consumption of cetacean meat carried a high symbolic value in social status and relations (Gardiner, 1997).

Among birds, the presence of bittern is worth a mention. Bones of this species are not common in Britain in any period. Curiously, while a number of remains have been found in Romano-British, Saxon, and post-medieval deposits (e.g.. Crabtree, n.d.a., n.d.b; Eastham, 1976; Locker, pers. comm.; O'Connor, pers. comm.), and notwithstanding its mention in contemporary documents, no confirmed records of bittern from high and late Medieval times have been reported. In 1378 the price for a bittern was 18 pence (e.g. around three times that of a small pig), the same as for a heron but considerably more than a pheasant (13 pence), plover, woodcock, and teal (2½ pence each) (Hammond, 1993). The high value assigned to bittern and other species of wild birds – such as crane, woodcock, pigeon, partridge, swan (all present in Scarborough), curlew, and quail – is also reflected in their having being served at the enthronement feast of George Neville, Archbishop of York in September 1465.

The proximal femur of goshawk probably represents the remains of a bird used for hawking (or 'falconry'), a sport restricted to the medieval nobility. Since the prey of these raptors included, besides rabbit and hares, a not negligible proportion of wild birds (Cummins, 1988; Prummel, 1997), it is possible that at least some of the remains of wild birds in Scarborough – woodcock, partridge, plover, pigeon and even crane – are a product of this activity. Of course, wild birds and small mammals could have also been caught by other methods practised in medieval times, such as snares, traps and nets (Prummel, 1997).

The age of most cattle, mostly immature, indicates that the animals consumed were slaughtered before having contributed other type of products (eg. traction power, milk); this, again, is suggestive of a high socio-economic status.

Interestingly, cut marks were found in some dog bones, indicating that dog meat was occasionally used. Given the clear high socio-economic status of the castle, it would seem plausible to conclude that it was used for feeding other animals rather than for human consumption.

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Table 1: Identified faunal remains from the Hall (NISP).

HALL					
species	Phase 1	Phase 2	Demolition	Prehistoric	TOTAL
Mammals					
Cattle	46	66	1	8	121
Sheep	8	12	-	2	22
Sheep/goat	21	30	-	1	52
Pig	38	46	-	1	85
Horse	-	1	-	-	1
Dog	-	4	-	2	6
Cat	-	1	-	-	1
Hare (*Lepus* sp.)	2	2	-	1	5
Red deer (*Cervus elaphus*)	5*	12*	-	-	17
Red/Fallow deer (*Cervus/Dama*)	1	-	-	-	1
Roe deer (*Capreolus capreolus*)	1	2	-	-	3
deer indet. (Cervidae indet.)	-	1	-	-	1
Total identified mammals	**122 (77%)**	**177 (80%)**	**1**	**15**	**315**
Birds					-
Domestic fowl	12	21	-	-	33
Goose	5	6	-	-	11
Duck (*Anas* sp.)	-	1	-	-	1
Goshawk (*Accipiter gentilis*)	1	-	-	-	1
Crane (*Grus grus*)	-	1	-	-	1
Wood pigeon (*Columba palumbus*)	1	-	-	-	1
Golden/grey plover (*Pluvialis apricaria/ P. squatarola*)	-	2	-	-	2
Total identified birds	**19 (12%)**	**31 (14%)**	**-**	**-**	**50**
Fish					-
Conger eel (*Conger conger*)	-	1	-	-	1
Cod (*Gadus morhua*)	5	5	-	-	10
Haddock (*Melanogrammus aeglefinus*)	9	3	-	-	12
Ling (*Molva molva*)	3	2	-	-	5
Gadidae indet.	-	1	-	-	1
Catfish (*Anarhicas lupus*)	-	-	-	-	0
Total identified fish	**17 (11%)**	**13 (6%)**	**-**	**-**	**30**
TOTAL IDENTIFIED FRAGMENTS	158	221	1	15	395

* includes one fragment of antler

Table 2: Identified faunal remains from the Kitchen

KITCHEN

Species	Phase 1	Phase 2	Demolition	TOTAL
Mammals				
Cattle	45	26	5	76
Sheep	9	7	-	16
Sheep/goat	11	18	1	30
Pig	30	17	6	53
Horse	1	1	1	3
Cat	-	1	-	1
Hare (*Lepus* sp.)	7	-	3	10
Red deer (*Cervus elaphus*)	2	2	-	4
Fallow deer (*Dama dama*)	-	-	1	1
White-beaked dolphin (*Lagenorhynchus albirostris*)	-	1	-	1
Total identified mammals	**105 (53.5%)**	**73 (65%)**	**17**	**195**
BIRDS				
Domestic fowl	45	9	3	57
Goose	27	7	1	35
Duck (*Anas* sp.)	2	-	-	2
Anatidae indet.	-	-	1	1
Swan (*Cygnus olor*)	1	-	-	1
Bittern (*Botaurus stellaris*)	1	1	-	2
Partridge (*Perdix perdix*)	1	-	-	1
Crane (*Grus grus*)	2	-	-	2
Golden plover (*Pluvialis apricaria*)	1	-	-	1
Golden/grey plover (*Pluvialis apricaria/ P. squatarola*)	-	1	-	1
Lapwing (*Vanellus vanellus*)	-	1	-	1
Woodcock (*Scolopax rusticola*)	1	-	-	1
Thrush/Starling (*Turdus/Sturnus*)	1	-	1	2
Total identified birds	**82 (42%)**	**19 (17%)**	**6**	**107**
Fish				
Salmonidae indet.	-	1	-	1
Conger eel (*Conger conger*)	-	1	1	2
Whiting (*Merlangius merlangus*)	-	-	1	1
Pollack (*Pollachius pollachius*)	-	1	-	1
Cod (*Gadus morhua*)	3	4	1	8
Haddock (*Melanogrammus aeglefinus*)	5	6	-	11
Ling (*Molva molva*)	-	6	-	6
Gadidae indet.	-	2	-	2
flatfish indet.	1	-	-	1
Total identified fish	**9 (4.5%)**	**21 (18%)**	**3**	**33**
TOTAL IDENTIFIED FRAGMENTS	196	113	27	336

Table 3: Identified faunal remains from the Barbican (NISP).

species	phase						
	13th-16th	16th	16th?	18th	19th?	20th	Total
cattle	1	2	1	14	2	-	20
sheep	-	3	-	4	3	-	10
sheep/goat	2	4	10	16	3	1	36
pig	1	3	4	3	-	-	11
horse	-	-	3	-	-	-	3
dog	-	-	-	1	-	-	1
cat	-	-	1	-	-	-	1
red deer	-	-	-	1	-	-	1
goose	-	-	-	1	-	-	1
domestic fowl	1	2	-	-	-	-	3
pigeon	-	1	-	-	-	-	1
Total	5	15	19	40	8	1	88

Table 4: Identified faunal remains from the Master Gunner's House (NISP).

species	phase						
	17th?	17th-18th	18th?	19th	early 20th	late 19th	Total
cattle	2	1	1	-	-	1	5
sheep	2	-	-	-	-	5	7
sheep/goat	3	-	-	-	-	1	4
pig	2	1	-	-	-	1	4
horse	1	1	-	-	-	-	2
cat	1	-	-	-	-	-	1
hare	1	-	-	-		-	1
rabbit	-	-	-	-	1	-	1
red deer	-	-	-	1	-	-	1
domestic fowl	2	-	2	-	-	7	11
goose	1	-	-	-	-	1	2
cod	1	-	-	-	-	-	1
haddock	-	-	-	-	3	-	3
Total	16	3	3	1	4	16	43

Table 5: Gnawing and butchery marks.

MAIN HALL		
species	% gnawed	% with butchery marks
Cattle	20.0	19.0
Sheep + Sheep/Goat	25.8	14.9
Pig	18.9	12.2
Domestic fowl	0	0
KITCHEN		
Cattle	7.8	16.9
Sheep + Sheep/Goat	20.0	16.7
Pig	13.2	7.5
Domestic fowl	3.5	5.3

Table 6: Anatomical representation of cattle (NISP).

skeletal element	Hall			Kitchen			
	Phase 1	Phase 2	Total	Phase 1	Phase 2	demolition	Total
skull	-	2	2	-	2	-	2
mandible	2	1	3	-	2	1	3
maxillar tooth	1	3	4	-	-	-	0
mandibular tooth	2	3	5	1	3	-	4
max or mand tooth	-	-	-	-	-	-	-
atlas	-	-	-	-	-	-	-
axis	1	1	2	-	-	-	-
sternum	-	-	-	1	-	-	1
scapula	-	-	-	1	1	1	3
humerus	2	4	6	1	2	-	3
radius	3	7	10	1	-	1	2
radius+ulna	-	-	-	-	1	-	1
ulna	2	1	3	-	-	1	1
metacarpal	3	2	5	-	1	-	1
carpal	5	2	7	5	-	-	5
pelvis	1	3	4	5	4	1	10
femur	3	10	13	2	1	-	3
patella	-	1	1	-	-	-	-
tibia	5	6	11	3	1	-	4
calcaneus	1	1	2	1	1	-	2
astragalus	3	4	7	-	-	-	-
centroquartale	-	3	3	-	-	-	-
metatarsal	2	2	4	-	2	-	2
metapodial indet.	1	-	1	1	1	-	2
tarsal	1	1	2	-	2	-	2
malleolare	1	-	1	-	-	-	-
phalanx 1	4	1	5	11	2	-	13
phalanx 2	1	3	4	6	-	-	6
phalanx 3	2	3	5	6	-	-	6
sacrum	-	2	2	-	-	-	-
Total	46	66	112	45	26	6	77

Table 7: Anatomical representation of ovicaprids (NISP).

		Hall			Kitchen			
	skeletal element	Phase 1	Phase 2	Total	Phase 1	Phase 2	demolition	Total
	skull	1	-	1	-	-	-	-
	mandible	1	-	1	-	-	-	-
	humerus	-	3	3	1	-	-	1
	radius	2	4	6	5	2	-	7
OVIS	metacarpal	-	1	1	-	2	-	2
	tibia	2	3	5	-	2	-	2
	astragalus	-	1	1	-	-	-	-
	calcaneus	2	-	2	2	-	-	2
	centroquartale	-	-	-	1	-	-	1
	metatarsal	-	-	-	-	1	-	1
OVIS Total		8	12	20	9	7	-	16
	skull	1	-	1	2	-	-	2
	mandible	2	3	5	-	3	-	3
	maxillar tooth	-	1	1	-	-	-	-
	mandibular tooth	-	2	2	-	-	-	-
	atlas	1	-	1	-	-	-	-
	scapula	2	3	5	2	3	-	5
	humerus	2	3	5	2	-	-	2
	radius	3	5	8	-	4	1	5
OVIS/CAPRA	ulna	-	1	1	2	2	-	4
	metacarpal	-	2	2	-	-	-	-
	pelvis	3	2	5	2	3	-	5
	femur	2	1	3	1	1	-	2
	tibia	4	2	6	-	2	-	2
	calcaneus	1	-	1	-	-	-	-
	metatarsal	-	2	2	-	-	-	-
	tarsal	-	1	1	-	-	-	-
	sacrum	-	1	1	-	-	-	-
	sternum	-	1	1	-	-	-	-
OVIS/CAPRA Total		21	30	51	11	18	1	30
Ovicaprids Total		29	42	71	20	25	1	46

Table 8: Anatomical representation of pig (NISP).

skeletal element	Hall, main			Kitchen			
	Phase 1	Phase 2	Total	Phase 1	Phase 2	dem	Total
skull	11	6	17	4	4	1	9
mandible	2	3	5	3	1	2	6
maxillar tooth	2	2	4	2	1	-	3
mandibular tooth	5	7	12	2	2	1	5
max or mand tooth	-	-	-	-	-	-	-
atlas	1	-	1	-	-	-	-
scapula	3	1	4	1	3	-	4
humerus	1	5	6	3	-	1	4
radius	-	-	-	1	-	-	1
ulna	1	4	5	3	3	-	6
metacarpal III	1	-	1	1	-	-	1
metacarpal IV	-	1	1	1	-	-	1
pelvis	-	3	3	1	2	-	3
femur	1	5	6	3	-	1	4
tibia	1	2	3	-	-	-	
fibula	1	-	1	-	-	-	
calcaneus	3	1	4	-	-	-	
tarsal	1	-	1	-	-	-	
metatarsal IV	2	2	4	1	-	-	1
metapodial indet.	1	-	1	-	-	-	
metapodial II/V	1	2	3	2	-	-	2
phalanx 1 a/p	-	2	2	1	1	-	2
phalanx 2 a/p	-	-	-	1	-	-	1
Total	18	28	46	19	9	2	30

Table 9: Anatomical representation of red deer (NISP).

skeletal element	Hall		Kitchen		
	Phase 1	Phase 2	Phase 1	Phase 2	Total
antler	1	-	-	-	1
humerus	-	1	-	-	1
femur	-	3	1	-	4
tibia	1	6	-	1	8
astragalus	1	-	-	-	1
calcaneus	1	1	-	1	3
centroquartale	2	-	-	-	2
metatarsal	-	-	1	-	1
phalanx 2 a/p	-	1	-	-	1
Total	6	12	2	2	22

Table 10: Anatomical representation of domestic fowl (NISP).

skeletal element	Hall			Kitchen			
	Phase 1	Phase 2	Total	Phase 1	Phase 2	demolition	Total
skull	-	-	-	-	-	-	-
sternum	-	3	3	-	-	-	-
coracoid	-	2	2	4	2	1	7
furcula	-	-	-	-	-	-	-
scapula	1	3	4	1	-	-	1
humerus	4	5	9	1	1	-	2
radius	-	-	-	2	-	1	3
ulna	-	3	3	3	-	-	3
carpometacarpus	-	-	-	2	2	-	4
femur	3	1	4	5	-	-	5
tibiotarsus	2	3	5	5	1	1	7
tarsometatarsus	2	1	3	22*	3	-	25
phalanx 1 ant	-	-	-	-	-	-	-
phalanx 1 pos	-	-	-	-	-	-	-
Total	12	21	33	45	9	3	57

* 20 of them found in two contexts: M4/7 (11 out of 23 fowl bones in context) and DP (9 out of 12)

Table 11: Anatomical representation of goose (NISP).

skeletal element	Hall			Kitchen			
	Phase 1	Phase 2	Total	Phase 1	Phase 2	demolition	Total
skull	-	-	-	-	1	-	1
sternum	-	-	-	1	-	-	1
coracoid	1	1	2	2	-	-	2
furcula	-	-	-	1	-	-	1
scapula	-	-	-	1	-	-	1
humerus	1	1	2	6	1	-	7
radius	-	-	-	3	-	-	3
ulna	-	1	1	3	2	-	5
carpometacarpus	1	-	1	1	-	-	1
femur	-	-	-	2	2	-	4
tibiotarsus	1	1	2	2	-	1	3
tarsometatarsus	-	2	2	5	-	-	5
phalanx 1 ant	1	-	1	-	-	-	-
phalanx 1 pos	-	-	-	-	1	-	1
Total	5	6	11	27	7	1	35

Table 12: Epiphysial fusion in cattle (Hall & Kitchen, phases 1+2). 'Unfused' includes both diaphyses and loose epiphyses.

	fused	fusing	unfused
scapula	-	-	-
pelvis	3	-	-
phalanx 2	10	-	-
phalanx 1	16	-	2
radius p	3	1	-
humerus d	4	-	-
tibia d	4	-	1
metacarpal d	3	-	-
metatarsal d	1	-	-
metapodial indet.	1	-	2
calcaneus	1	-	2
femur p	-	-	3
femur d	2	-	3
tibia p	-	2	3
humerus p	-	-	2
radius d	3	-	-
ulna p	-	-	-

Table 13: Epiphysial fusion in sheep (Hall & Kitchen, phases 1+2). 'Unfused' includes both diaphyses and loose epiphyses.

	fused	fusing	unfused
scapula	2	-	-
pelvis	3	-	-
phalanx 2	-	-	-
phalanx 1	-	-	-
radius p	12	-	-
humerus d	7	1	-
tibia d	6	-	-
metacarpal d	2	-	-
metatarsal d	-	-	-
calcaneus	3	-	1
femur p	-	-	1
femur d	-	-	-
tibia p	1	1	-
humerus p	-	-	1
radius d	5	-	4
ulna p	1	-	-

Table 14: Epiphysial fusion in pig (Hall & Kitchen, phases 1+2). 'Unfused' includes both diaphyses and loose epiphyses.

	fused	fusing	unfused
scapula	-	-	1
pelvis	1	-	-
phalanx 2	1	-	-
phalanx 1	2	-	2
radius p	-	-	-
humerus d	3	1	-
tibia d	-	-	1
metacarpus (III+IV) d	-	-	4
metatarsus (III+IV) d	-	-	4
metapodial indet. d	-	-	1
calcaneus	-	-	4
femur p	-	-	4
femur d	-	-	1
tibia p	-	-	1
humerus p	-	-	-
radius d	-	-	1
ulna p	-	-	3
ulna d	-	-	2

Table 15: Sex of pig remains (mandibles and maxilla include both those with canines and those with alveolus only).

Element	N females	N males
maxilla	-	2
loose maxillary canine	1	3
mandible	1	3
loose mandibular canine	-	3
total	2	11

Table 16: Ageing of domestic fowl bones (Hall & Kitchen, phases 1+2).

Skeletal element	adult	juvenile	Total
scapula	4	1	5
coracoid	6	3	9
sternum	3	-	3
humerus	5	6	11
radius	3	-	3
ulna	3	3	6
carpometacarpus	4	-	4
femur	8	1	9
tibiotarsus	9	3	12
tarsometatarsus	20	8	28
Total	65	25	90

Table 17: Wear of mandibular teeth (after Grant, 1982).

Species	mandible/ loose tooth	dp4	P4	M1	M2	M3	Site / Phase
pig	mandible	f	-	-	-	-	Hall / 1
pig	mandible	-	c	h	f	b	Hall / 2
pig	mandible	-	-	-	-	d	Hall / 2
pig	mandible	-	d	l	e	-	Kitchen / 1
pig	mandible	-	-	-	c	E	Kitchen / 1
pig	mandible	-	-	g	-	-	Kitchen / 1
pig	mandible	-	a	-	-	-	Kitchen, demolition
pig	loose	-	a	-	-	-	Hall / 1
pig	loose	-	-	d	-	-	Hall / 2
sheep/goat	mandible	-	g	h	g	e	Hall / 1
sheep/goat	mandible	-	g	h	g	f	Hall / 2
sheep/goat	mandible	-	-	m	l	h	Hall / 2
sheep/goat	mandible	-	-	p	m	-	Kitchen / 2
cattle	mandible	-	g	-	-	-	Kitchen / 2
cattle	loose	j	-	-	-	-	Kitchen / 2

Table 18: Summary of measurements of sheep radius, articular width of proximal end (BFp) from Scarborough Castle and Lincoln (sd=standard deviation; V=coefficient of variation). Lincoln data: Dobney et al. 1996.

BFp	Scarborough	Lincoln High medieval	Lincoln Late medieval
mean	26.8	27.2	28.8
st dev	1.1	1.3	2.1
V	4.1	4.9	7.1
max	29.1	29.5	33.0
min	25.4	25.5	26.5
n	11	7	8

Table 19: Summary of measurements of sheep radius, width of proximal end (Bp) from Scarborough Castle and Exeter (sd=standard deviation; V=coefficient of variation). Exeter data: Maltby, 1979.

Bp	Scarborough	Exeter, 1200-1300	Exeter, 1330-1500
mean	29.2	28.9	28.5
st dev	0.98	1.46	1.36
V	3.36	5.05	4.77
max	31.4	33.4	31
min	28	25.4	26.2
n	11	45	22

Table 20: Summary of measurements of domestic fowl tarsometatarsus from Scarborough Castle and Launceston Castle, phase 6 (sd=standard deviation; V=coefficient of variation). Launceston data: Albarella & Davis 1996. If N 2 only the raw measurements are given.

	Scarborough unspurred	Launceston phase 6 (late 13th C.) unspurred	Scarborough spurred	Launceston phase 6 (late 13th C.) spurred
Bd				
mean	12	12.1	13.8, 13	14.3
sd	0.8	0.9	-	0.6
V	6.5	7.8	-	4.4
max	13	15	-	16.1
min	11.1	10.9	-	13.4
n	4	25	2	17
SC				
mean	5.6	5.5	6.8	7.2
sd	0.2	0.3	0.7	0.9
V	3.9	4.7	10.5	13.5
max	6	5.8	7.7	8.6
min	5.4	5	5.7	5.4
n	10	18	6	10
GL				
mean	67.8	70.3	82.4, 77.8	78.3
sd	2.1	7.1	-	7.4
V	3.2	10.1	-	9.5
max	71	87.0	-	87
min	65.6	61.2	-	62.8
n	5	26	2	8

Table 21: Measurement taken on mammal bones (after von den Driesch 1976; Weinstock 1997). Data are sorted alphabetically by species and skeletal element.

part of site	phase	species	skeletal element	tooth	side	sex	measurements						
			astragalus				Ll	Lm	Dl	Dm	Bd		
Hall, main	1	BOS			left		-	52.7	32	-	35		
Hall, main	2	BOS			right		57.6	52	31.4	30.9	35.7		
Hall, main	1	BOS			right		-	50.2	-	-	-		
Hall, main	1	BOS			right		60.3	-	33.7	-	-		
Hall, main	2	BOS			left		59.5	57.2	33	33.9	36.1		
Hall, main	2	BOS			left		60.5	-	33.5	-	-		
Hall, main	2	OVIS			left		24.7	24.9	14.1	16	18		
Hall, main	1	*Cervus elaphus*					48.6	47.7	27.5	28.7	31.2		
			atlas				GB	GL	BFcr	BFcd			
Hall, main	1	OVIS/CAPRA					58.5	48	44.1	40.3			
			calcaneus				GL	GB	D				
Kitchen	1	OVIS			left		49.5	17.1	19.2				
Kitchen	1	OVIS			right		49.5	12.6	21.1				
Hall, serv.	1	OVIS			left		52	18.1	20.8				
Kitchen	2	*Cervus elaphus*			right		111.1	32.5	41.2				
Hall, main	1	*Cervus elaphus*			right		131	-	46				
			centro-quartale				GB	D					
Hall, main	2	BOS			left		46.9	43.7					
Hall, main	2	BOS			left		52.4	0					
Kitchen	2	BOS			left		53.8	48.8					
Hall, serv.	1	BOS			left		48.5	43.8					
Kitchen	1	OVIS			right		22.5	20					
Hall, main	2	OVIS/CAPRA			left		21.4	17.5					
Hall, main	1	*Cervus elaphus*			right		43.4	41.7					
			femur				Bp	DC	SD	Bd	Dd	GL	
Hall, main	2	CANIS			right		29.8	15	-	-	-	-	
			humerus				Bd	BT	Dd	SD	Bp	GL	GLC
Kitchen	1	OVIS			right		30.1	28	23.7		-	-	-
Hall, main	2	OVIS			right		31.4	29.7	-		-	-	-
Hall, main	2	OVIS			right		28.5	27.4	-	13.8	-	-	-
Kitchen	1	OVIS/CAPRA			right		-	-	-	13.5	-	-	-
Hall, main	1	OVIS/CAPRA			left		-	-	-	13.6	-	-	-
Kitchen	1	SUS			right		33.9	28.7	-	0	-	-	-
Hall, main	2	SUS			right		-	-	-	14	-	-	-
Hall, main	2	SUS			right		-	-	-	16.6	-	-	-
Kitchen	1	*Lepus* sp.			right		12.7	-	-	-	-	-	-
			mandible				LCR	LMR	LPR	LM3	BM3		
Hall, main	1	OVIS/CAPRA			left		69.5	48.4	20.3	22.3	8.1		
Hall, main	2	OVIS/CAPRA			right		66.9	45.9	21.5	20.5	7.7		
Hall, main	2	SUS			right	male	-	67.5	-	32.6	14.1		
Kitchen	1	SUS			right	male	-	-	34.4	-	-		
Kitchen	1	SUS			left		-	-	-	-	13.9		
Hall, main	P	CANIS			right		75.9	36.2	39.8	20.5	8		
Hall, main	2	*Lepus* sp.			right		20.9	-	-	-	-		
			Teeth				L	B					
Hall, main	2	OVIS/CAPRA	M_3		left		20.4	8.3					
Hall, main	2	SUS	M_3		right		32.1	14.6					
Hall, main	1	SUS	M_3		right		33	14.5					
Hall, main	2	SUS	M^3		right		28.1	17.6					
			metac.				Bp	Dp	SD	Bd	Dd	GL	
Hall, main	1	BOS			left		-	-	-	56.5	30.6	-	
Hall, main	2	BOS			left		49.2	32	27.9	50.7	27.8	178.2	
Hall, main	2	BOS			right		0	0	0	51.5	27.8	-	
Kitchen	2	OVIS			left		22.7	16.4	13.7	26.1	16	123.6	
Kitchen	2	OVIS			left		-	-	-	24.5	16	-	
Hall, main	2	OVIS			right		-	-	-	24.6	15.9	-	
Hall, main	2	CANIS	(Mc III)				-	-	4.4	6.1	6.6	49.7	
			metat.				Bp	Dp	SD	Bd	Dd	GL	
Hall, main	2	BOS			right		39.8	38.3	-	-	-	-	
Hall, main	2	BOS			right		48.6	47.2	-	-	-	-	
Kitchen	2	OVIS			right		21.3	19.8	11.7	-	-	-	
Hall, main	2	OVIS/CAPRA			right		18.9	19.2	11.2	-	-	-	
			pelvis				LA						
Hall, main	1	OVIS/CAPRA			left	male?	29.4						
			phalanx 1				Bp	SD	Bd	Lpe	Dp	DD	Dd
Kitchen	1	BOS					22.7	19.5	23	49.7	25.4	15.7	17.6

Kitchen	1	BOS			26.1	19.8	25	50.5	25.7	15.9	19.9
Kitchen	1	BOS			25.2	20.5	29.6	48.4	25	16.1	19.5
Kitchen	1	BOS			23.8	20	23	53.4	27.2	15.7	18.4
Kitchen	1	BOS			-	20.7	23.2	52.7	-	15.8	18.8
Kitchen	2	BOS			32.9	27.4	29.7	59	35	19.5	22.6
Kitchen	2	BOS			28.3	22.3	26.1	55.2	31.6	17	20.6
Kitchen	1	BOS			29.7	25.5	28.7	57.3	-	18.2	-
Hall, serv.	1	BOS			28.5	23.4	27.4	54.5	32	16.5	20.3
Hall, serv.	1	BOS			24	20.8	23	48.3	25.2	16.5	18.6
Hall, main	1	BOS			24.9	21.5	-	53.2	27	17.3	-
Hall, main	1	BOS			29	24	27.7	55.3	32.7	17.4	20.8
Hall, main	2	BOS			28	-	-	59.3	-	20.5	-
Kitchen	1	BOS			25.1	21	24.4	51.4	26.7	16.2	19.9
Kitchen	1	BOS			25.5	21.3	24.6	48.3	26.9	15.9	19
Kitchen	1	BOS			23.6	20.2	22.5	51.7	29.5	15.1	18.1
Kitchen	2	SUS			16	13.3	15	35.6	16	9.1	10.6
			phalanx 2		Bp	SD	Bd	Lpe	Dp	DD	Dd
Kitchen	1	BOS			28	22.9	22.2	38	28.5	20.4	25.4
Kitchen	1	BOS			-	-	23.8	38.2	-	21.9	27
Kitchen	1	BOS			23.1	17.8	19.8	31.3	24.2	18.8	23.2
Kitchen	1	BOS			23.5	18.1	19.5	32.6	25.2	19.1	23.7
Kitchen	1	BOS			22.7	16.6	18.4	30.2	22.8	18.9	23.6
Kitchen	1	BOS			-	20.4	-	33.1	25.8	17.9	22.6
Hall, main	2	BOS			23.5	17.7	19.2	31.6	23	18.2	23.1
Hall, main	2	BOS			25.3	20.1	22.1	35.2	25.5	19.8	25.9
Hall, main	1	BOS			-	-	-	32	-	-	-
Hall, main	2	BOS			29.2	21.7	-	36.7	28.2	21.8	27.5
Kitchen	1	SUS			16.2	12.7	14.2	20.3	14.9	10.2	13.4
Hall, main	2	*Cervus elaphus*			21.1	15.6	17.2	42.4	26.4	18.4	24.6
			phalanx 3								
Kitchen	1	BOS			71	52.9	21.9				
Kitchen	1	BOS			-	55.6	0				
Kitchen	1	BOS			68.8	49	25				
Kitchen	1	BOS			69.5	52.6	22.9				
			radius		Bp	BFp	Dp	SD	Bd	Dd	GL
Hall, main	1	BOS		left	70.7	66.6	-	-	-	-	-
Hall, main	2	BOS		left	-	-	-	-	61.2	33.6	-
Hall, main	2	BOS		left	-	-	-	-	56.6	31.7	-
Hall, main	1	BOS		right	64.6	58.2	-	-	-	-	-
Kitchen	1	OVIS		left	29.1	27.2	15.2	-	-	-	-
Kitchen	1	OVIS		left	29	26.4	14.9	14.5	-	-	-
Kitchen	1	OVIS		right	29.8	26.4	-	-	-	-	-
Kitchen	2	OVIS		left	29.5	27.7	15.1	-	-	-	-
Kitchen	2	OVIS		left	-	-	-	-	26	16.5	-
Kitchen	1	OVIS		right	-	-	-	-	28.5	20	-
Kitchen	1	OVIS		right	28.1	25.6	13.9	-	-	-	-
Hall, main	1	OVIS		right	29.2	27.3	14.7	-	-	-	-
Hall, main	1	OVIS		left	28	25.4	13.4	15	25.3	16.1	134.7
Hall, main	2	OVIS		right	28.5	25.6	15.4	-	-	-	-
Hall, main	P	OVIS		left	-	-	-	-	26.2	15.9	-
Hall, main	2	OVIS		left	29.7	27.4	15.1	-	-	-	-
Hall, main	2	OVIS		left	31.4	29.1	16.5	16.3	28.4	17.4	141.4
Hall, main	2	OVIS		left	-	27.1	15.8	-	-	-	-
Hall, main	2	OVIS/CAPRA		right	-	-	-	16.5	-	-	-
Kitchen	1	EQUUS		right	-	-	37.4	33.2	74.1	40	340
Hall, serv.	2	CANIS		left	-	-	-	-	23.5	13.1	-
			scapula		SLC	GLP	LG	BG			
Kitchen	1	BOS		left	44.2	-	-	-			
Kitchen	2	OVIS/CAPRA		right	-	28.7	-	20.2			
Hall, main	2	OVIS/CAPRA		right	-	30.3	24.8	-			
Hall, main	1	*Lepus* sp.		right	6.9	-	-	12.1			
Hall, main	2	*Lepus* sp.		left	7.5	12.9	12.1	11.6			
			tibia		Bp	SD	Bd	Dd	GL		
Hall, main	2	BOS		left	-	-	-	44	-		
Kitchen	2	OVIS		right	-	-	27	19.4	-		
Kitchen	2	OVIS		right	-	13.6	24	13.5	-		
Hall, serv.	1	OVIS		right	-	-	24.3	18.7	-		
Hall, main	1	OVIS		right	-	15	26.3	21.2	-		
Hall, main	2	OVIS		left	-	13	25.8	20.4	187.7		
Hall, main	2	OVIS		left	-	13.1	23.8	18.3	-		
Hall, main	2	OVIS		right	41	-	-	-	-		
Hall, main	1	OVIS/CAPRA		right	-	13.3	-	-	-		
Hall, main	2	*Capreolus capreolus*		right	-	16	27.8	21.4	-		
Hall, main	2	*Cervus elaphus*		left	-	-	47.4	37.9	-		
Kitchen	1	*Lepus europeus*		left	20.1	7.7	16.2	10	-		
			ulna		BPC	DPA	SDO				

Hall, main	1	BOS	left	43.8	-	-
Kitchen	1	OVIS/CAPRA	left	16.2	22	19.5

Table 22: Measurement taken on bird bones (after von den Driesch 1976).

part of site	phase	species	skeletal element	tooth	side	sex	measurements					
			carpometacarpus				Bp	Did	GL			
Kitchen	1	GALLUS			left		12.3	8.7	41			
Kitchen	1	GALLUS			left		-	7.5	38.8			
Kitchen	2	GALLUS			right		10.7	6.9	32			
Hall, service	1	ANSER			left		-	11.2	-			
Kitchen	2	*Botaurus stellaris*			left		13.9	7.6	74.2			
Kitchen	1	*Scolopax rusticola*			left		9.4	-	38.4			
			coracoid				GL					
Kitchen	1	GALLUS			left		51.6					
Kitchen	1	GALLUS			left		51.6					
Kitchen	2	GALLUS			left		50.3					
Hall, main	2	ANSER			left		74					
			femur				Bp	Dp	SC	Bd	Dd	GL
Kitchen	1	GALLUS			left		-	-	-	14.4	12	-
Kitchen	1	GALLUS			right		-	-	-	14.7	11.1	-
Kitchen	1	GALLUS			left		-	-	6.3	13.2	10.5	-
Kitchen	1	GALLUS			right		-	-	6.9	-	-	-
Hall, service	1	GALLUS			left		13.2	8.8	-	-	-	-
Hall, main	1	GALLUS			left		14	9.6	-	-	-	-
Hall, main	1	GALLUS			left		19	13.6	7.9	19.4	-	74.9
Kitchen	1	ANSER			right		20.2	15.9	8.5	-	-	79
Kitchen	1	ANSER			right		19.2	0	8.2	19.6	-	78.7
Kitchen	2	ANSER			left		18.3	14.9	7.8	-	-	-
Hall, main	1	*Accipiter gentilis*			right		16.5	9.9	-	-	-	-
Hall, main	1	*Columba palumbus*			right		9.2	5.8	3.6	-	-	-
			humerus				Bd	SC	Bp	GL		
Kitchen	2	GALLUS			left		12.7	6.2	-	-		
Hall, service	2	GALLUS			left		13.4	6.4	17	65		
Hall, main	2	GALLUS			left		13.8	6.4	18.4	66.4		
Hall, main	2	GALLUS			right		13.3	-	-	-		
Kitchen	1	ANSER			left		35.6	-	-	-		
Kitchen	1	ANSER			right		22.6	-	-	-		
Kitchen	1	ANSER			left		24.6	-	-	-		
Kitchen	1	ANSER			right		23.5	11.5	-	-		
Hall, main	1	ANSER			left		23.7	-	-	-		
Hall, main	2	*Pluvialis* sp.			left		8.5	3.7	12.6	52.1		
			radius						GL			
Kitchen	1	GALLUS			right		2.9	-	-			
Kitchen	1	ANSER			left		5	11	138.4			
			scapula				DiC					
Kitchen	1	GALLUS			right		10.2					
Hall, service	2	GALLUS			right		11.4					
			tarsometatarsus				Bp	SC	Bd	GL		
Kitchen	1	*Botaurus stellaris*					15.2	-	-	-	-	-
Kitchen	1	GALLUS			right	male	14.2	7.1	13.8	82.4	-	
Kitchen	1	GALLUS			left	male	13.1	6.8	-	77.8		
Kitchen	1	GALLUS			right	female	-	5.4	11.9	71		
Kitchen	1	GALLUS			left	female	-	6	-	-		
Kitchen	1	GALLUS			left	female	-	5.9	11.1	-		
Kitchen	1	GALLUS			left		-	-	10.5	-		
Kitchen	1	GALLUS			left	male	-	5.7	-	-		
Kitchen	1	GALLUS			right	female	11.1	5.5	-	66.8		
Kitchen	1	GALLUS			right	female	11.5	5.8	11.9	66.7		
Kitchen	1	GALLUS			left	female	11.6	5.7	-	69.1		
Kitchen	1	GALLUS			right	female	11.7	5.5	-	65.6		
Kitchen	1	GALLUS			right	female	11.2	5.7	-	-		
Kitchen	1	GALLUS			left	male	13.7	7	-	-		
Kitchen	2	GALLUS			left	female	-	5.9	-	-		
Kitchen	2	GALLUS			left	female	-	-	13	-		
Kitchen	2	GALLUS			left		16.2	-	-	-		
Kitchen	1	GALLUS			left	male		6.2	13	-		
Hall, main	1	GALLUS			left	male	14.1	7.7	-	-		
Hall, main	1	GALLUS			left		11.3	-	-	-		
Hall, main	2	GALLUS			left	female	12.3	5.4	-	-		
Kitchen	1	ANSER			right		18.5	8.5	-	82.6		
Kitchen	1	ANSER			right		17.2	-	-	-		
Kitchen	1	ANSER			left		-	7.6	-	-		
Hall, service	2	ANSER			right		-	-	19.4	-		
Hall, service	2	ANSER			right		-	8.3	-	-	-	-
Kitchen	1	Anas sp.			right		-	4.4	9.1	45.9		
Kitchen	1	*Grus grus*			left		24.8	-	-	-		
Kitchen	1	*Grus grus*			left		25.5	-	-	-		

part of site	phase	species	skeletal element	tooth	side	sex	measurements				
Kitchen	1	*Perdix perdix*			right		-	3.3	7.7	38.5	
Kitchen	1	*Pluvialis apricaria*			right		6.3	2.3	5.5	41.8	
			tibiotarsus				Bd	Dd	SC	GL	
Kitchen	1	GALLUS			right		12.3	13	6.4	-	
Kitchen	1	GALLUS			left		9.3	9.6	4.9	91	
Kitchen	1	GALLUS			left		10.6	10.4	5.8	-	
Kitchen	1	GALLUS			right		-	-	5.4	-	
Hall, service	2	GALLUS			right		10.2	10.1	5.4	95.6	
Hall, service	1	GALLUS			right		-	11.7	5.9	-	
Hall, service	1	GALLUS			right		-	-	6.3	-	
Hall, main	2	GALLUS			right		11.6	12.4	-	-	
Kitchen	1	ANSER			right		-	-	17	15	
Hall, main	1	ANSER			left		17	16.2	8.8	146.4	
			ulna				Bp	Dip	SC	Did	GL
Kitchen	1	GALLUS			left		8.5	4	-	-	-
Kitchen	1	GALLUS			left		8.2	4.2	9.1	62.5	-
Hall, service	2	GALLUS			left		7.8	10.3	3.7	8.5	61.2
Kitchen	1	ANSER			right		16.2	-	8.1	12.7	-
Kitchen	2	ANSER			right		16	-	-	-	-
Kitchen	1	ANSER			right		16.7	-	-	-	-
Kitchen	2	ANSER			right		-	-	-	15.3	-
Hall, main	2	ANSER			left		15.7	13.9	-	-	-
Kitchen	1	*Anas* sp.			left		-	-	4.9	9.5	-
Hall, main	2	*Pluvialis* sp.			right		5.9	-	2.9	-	50.5
Kitchen	2	*Vanellus vanellus*			left		7.1	-	3.4	-	69.5

Figure 1: Location of Scarborough

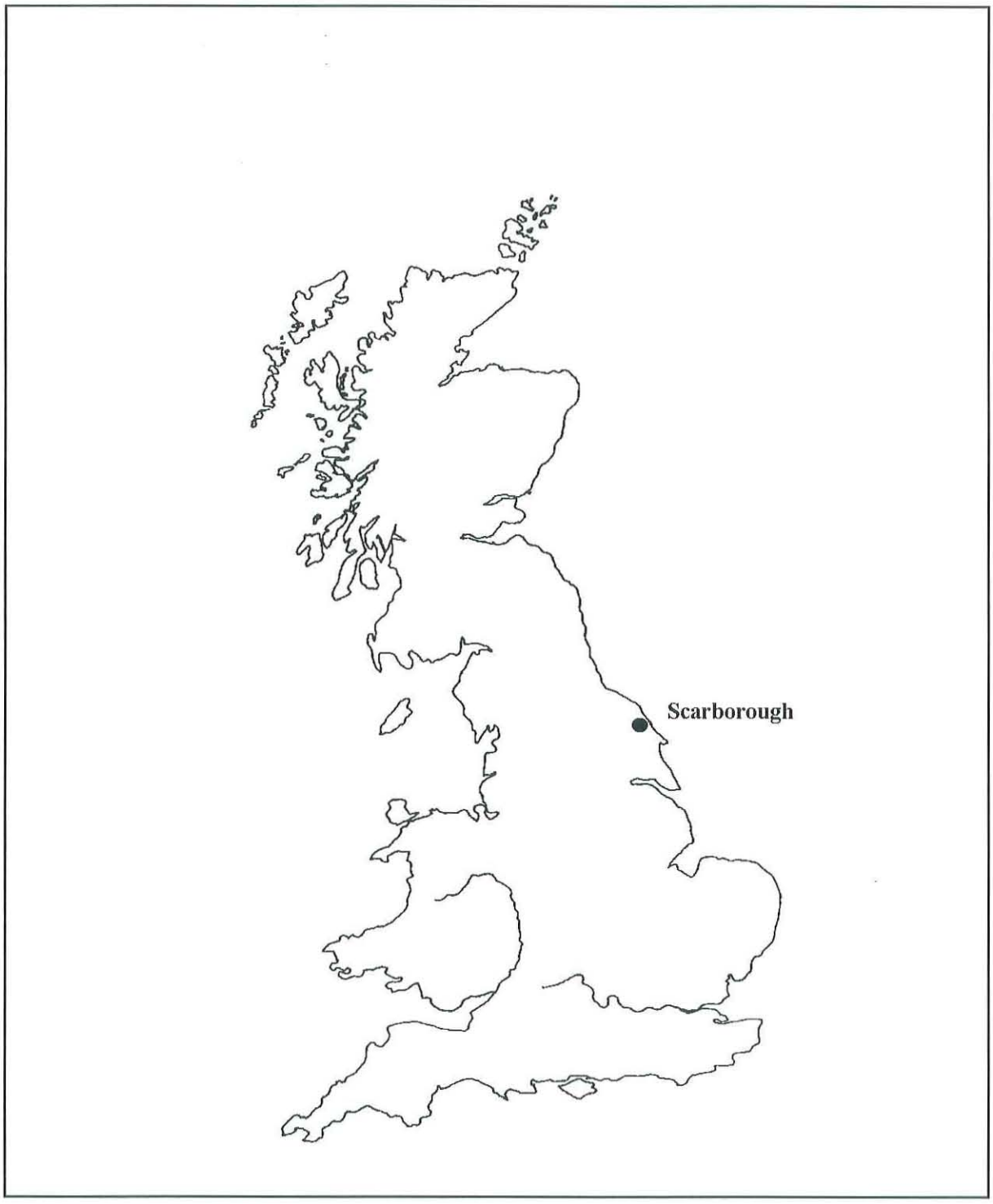

Figure 2: Relative abundance of the major domestic species in the Hall (H) and Kitchen (K) (calculation based on NISP).

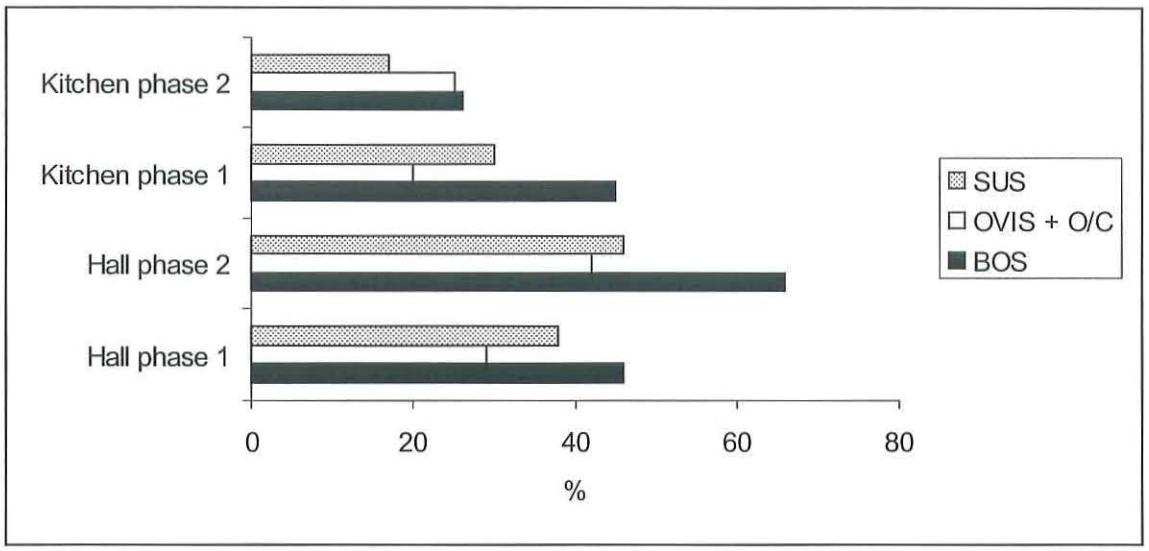

Figure 3: Domestic fowl tarsometatarsi from Scarborough in comparison with contemporary sites (data for Launceston and Lincoln after Albarella & Davis 1996 and Dobney et al. 1996 respectively).

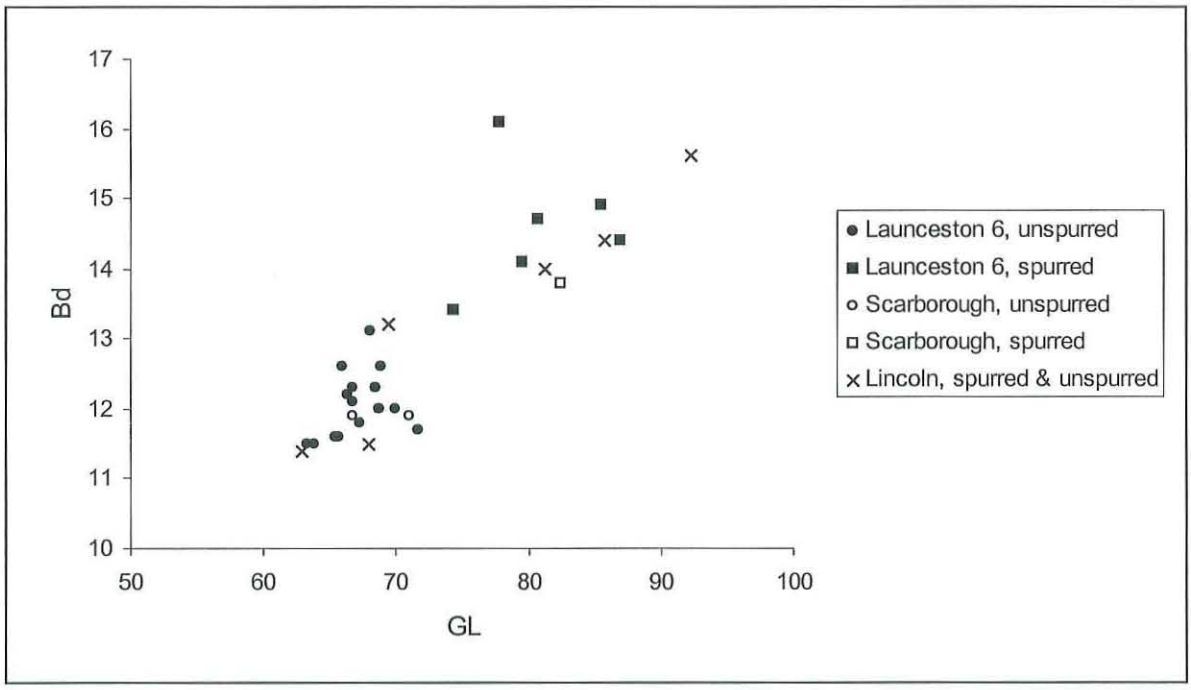

Plate 1: White-beaked dolphin, maxilla and premaxilla: ventral view (scalebar = 50mm)

Plate 2: White-beaked dolphin, maxilla: ventral view (scalebar = 50mm)