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CARISBROOKE CASTLE, ISLE OF WIGHT, THE MAMMAL AND BIRD BONE FROM THE 2006 AND 2008 EVALUATIONS

ENVIRONMENTAL STUDIES REPORT

Gemma Ayton

ARCHAEOLOGICAL
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ENGLISH HERITAGE

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The Mammal and Bird Bone from Carisbrooke Castle, 2006 and 2008 Evaluations

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SUMMARY

Two small scale evaluations were undertaken in the south-west quadrant of Carisbrooke Castle in 2006 and 2008 in advance of the planned installation of a new garden. Nearly 1,000 fragments of identifiable mammal and bird bone from both domestic and wild species were recovered from features dating from the 11th to the 18th century. The assemblage has been considered alongside information obtained from previous excavations and the results have shed light on the status of the castle and its inhabitants during the medieval and post-medieval periods.

CONTRIBUTORS

Dr Polydora Baker, Dr Fay Worley and Dr Richard Thomas provided extensive feedback and edits during the production of this report. The illustration on the front cover was produced by Judith Dobie.

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INTRODUCTION

Two small-scale archaeological evaluations were undertaken in 2006 and 2008 in the area known as the Privy Garden situated in the south-west quadrant of the medieval castle. The evaluations uncovered evidence of a northern continuation of the outer ditch of a Conquest-period ringwork. The ringwork was originally uncovered by Christopher Young during an earlier area excavation of the bailey (Young 2000). Cut into the outer ditch of this ringwork were the remains of a 12th century rectangular building (Russell *pers comm*). The analysis of the animal bone assemblage suggests that the bone derives from kitchen and table waste which may be linked to activities associated with this building. The animal bone assemblage also provides evidence to suggest that the inhabitants of the castle enjoyed a high-status diet.

The animal bone from the 2006 and 2008 evaluations is considered alongside the assemblage recovered from the earlier excavations undertaken by Young (2000). Young's investigation focused on an area to the east of the Privy Garden wall referred to as Trench Y5. Analysis of the animal bone from Trench Y5 focused on four contexts dating from the late 11th to the 12th century (Smith 2000). The primary records for both mammal and bird bone assemblages from Trench Y5 have been supplied by Dale Serjeantson.

METHODOLOGY

All animal bone data was recorded onto the English Heritage Zooarchaeology Microsoft Access database. The bone was recorded according to the zoning system outlined by Serjeantson (1996); the zoned specimens are referred to as recordable fragments or bones. The majority of specimens were considered recordable if at least 50% of one zone was present. In order for ribs to be recordable, at least one articulation had to be present and for vertebrae, at least 50% of the centrum was required.

The percentage completeness of each element has been noted also and notes have been made regarding the specimens that could not be identified or were too fragmented to be recorded onto the main database.

The surface preservation of each recordable fragment was recorded as either 'poor', 'moderate' or 'good' and evidence of burning and gnawing has been noted.

The state of fusion was recorded where visible. Bones were recorded as fused when the fusion line around the epiphyses was no longer visible. If the fusion line was still visible or the epipyses were attached but loose and could not be separated then the bones were recorded as 'fusing'. All the specimens recorded as 'fusing' are combined with the fused specimens when analysing mortality profiles. All fusion ages are taken from Silver (1969) and have subsequently been grouped into three age categories defined as 'Early Fusing', 'Middle Fusing' and 'Late Fusing'. These categories refer to particular age bands for cattle, sheep/goat and pig and are shown in Table 1. The age bands are given in months.

Table 1: Fusion age bands given in months

Taxa	Early Fusing	Middle Fusing	Late Fusing
Cattle	0-18	24-42	42-48
Sheep/Goat	0-10	13-28	30-42
Pig	0-24	24-30	36-42

All mammal bone measurements have been taken in accordance with von den Driesch (1976) and measurements of pig molars have been taken in accordance with Payne and Bull (1988). Measurements of bird bones were taken in accordance with Cohen and Serjeantson (1996) and are presented in Appendix 2. There are insufficient quantities of mammal bone measurements (Appendix 3) to allow detailed metrical analysis though enough data was obtained from pig molars to permit inter-site comparisons (Appendix 1). The mandibular tooth wear of pigs was recorded using Grant (1982) and the mandibular tooth wear of sheep was recorded with reference to Payne (1973, 1987). Very few cattle teeth were recovered and none provided age-at death data, all tooth wear data is presented in Appendix 4

Evidence of butchery has been recorded with reference to the type of mark displayed on the bone. These marks have been defined as chops, cuts, sawing, shaving marks and axial splitting. The zones on which the butchery marks have been observed have also been recorded.

In order to distinguish between the bones and teeth of sheep and goats a number of criteria were used including those outlined by Boessneck (1969), Boessneck *et al* (1964), Halstead *et al* (2002), Hillson (1995), Kratochvil (1969), Payne (1969, 1985), Prummel and Frisch (1986) and Schmid (1972).

The separation of hare and rabbit specimens has been undertaken with reference to Callou (1997). Where specimens could not be confidently identified to taxa they have been recorded as lagomorph. Brown hares (*Lepus europaeus*) and mountain hares (*Lepus timidus*) can be distinguished with reference to the criteria outlined by Lawrence and Brown (1974). Skeletal separation of the two species can be undertaken with reference to the skull and in particular the length of the root of the upper incisor and the shape of the zygomatic arch. Unfortunately, just one skull fragment was recovered and the criteria listed above were not visible.

The identification of red and fallow deer has been undertaken with reference to Lister (1996).The taxonomic separation of chicken, pheasant and guinea fowl has been undertaken with reference to the criteria outlined by Tomek and Bochenski (2009) and MacDonald (1992). The corvids have been separated with reference to Tomek and Bochenski (2000). The identification of the small mammals was undertaken with reference to Andrews (1990), Corbett and Harris (1991) and Lawrence and Brown (1974). Small mammals were identified to species using a limited set of elements which include the mandible, maxilla and pelvis. Long bones were recorded according to their size.

THE ASSEMBLAGE

The archaeological evaluations in the area known as the Privy Garden have uncovered evidence of activity from the prehistoric period onwards. The animal bone assemblage derives from features dating from the Conquest period to the 20th century. This analysis will focus on the assemblages recovered from contexts dating form the 11th to the 18th century. The assemblages can be divided into four chronological phases (Table 2).

Table 2: Phases and corresponding chronological Periods

Phase	Chronological Period
3	Conquest period (11th century)
4a	12th century
4b	Late 12th-15th century
5	16th-18th century

Although attempts have been made to divide the medieval period into two chronological phases, it is possible that material dated to Phase 4a may derive from late 12th century contexts. It has also been noted that a number of deposits in all phases may have been contaminated with small intrusions of later material. These intrusions are thought to be minimal and it was decided that all contexts would be analysed.

The material from Trench Y5 dates from the later 11th to early 12th century and the 12th century (Smith 2000). The 11th to 12th century assemblage has been analysed alongside the Phase 3 assemblage and the 12th century material has been analysed alongside the Phase 4a assemblage.

Animal bone was hand-collected during the 2006 and 2008 evaluations and recovered from soil samples taken during 2008. Seven soil samples were processed during the 2006 evaluation and animal bone was retrieved from five of these samples. Unfortunately the assemblages from the 2006 evaluation have been lost and consequently small mammal and bird bones will be underrepresented.

Animal bone was retrieved from six samples taken during the 2008 evaluation. All six of these samples were taken in order to retrieve animal bones, charcoal, shells and charred plant remains. Four of these samples date to Phase 4a, and the remaining samples date to Phase 5. The four samples dating to Phase 4a derive from context [7362], a floor deposit, context [7387], the foundation trench of the 12th century building and contexts [8023] and [8000] both of which have been interpreted as middens. The two samples from Phase 5 derive from contexts [7325], an accumulation layer located along the southern wall of the 12th century building, and context [8016] a dump of shell fish shells that was interpreted as kitchen waste.

Forty litres of each sample was processed using a 500 micron mesh for the residues. Once dry , 100% of the >4mm residues and 25% of the 2-4mm residues were sorted in order to retrieve small mammal, bird and fish bone. Four samples, taken from contexts [7325], [7362], [8000] and [8023], produced more than 30 fragments of identifiable mammal and bird bone from the >4mm and 2-4mm fractions and it was decided that 25% of the <2mm residue from these samples would be scanned to retrieve the smaller fragments of bone. Only context [7362], a floor deposit dated to Phase 4a, contained recordable mammal and bird fragments of bone in the <2mm residue. The total number of recordable mammal and bird born fragments recovered during the 2006/2008 evaluations is shown in Table 3.

Table 3: The total number of recordable fragments from each phase of the evaluations

Phase	Hand	>4mm	2-4mm	<2mm	Total
3	15	0	0	0	15
4a	32	53	23	2	110
4b	348	78	2	0	428
5	318	108	10	0	436
Total	713	239	35	2	989

The majority of the fish bone was retrieved from samples of 12th century contexts including [8016] and [8023] and the 16th-18th century context [8000]. Approximately 500 fragments of bones and scales were identified to at least family level by a fish bone specialist and are the subject of a separate assessment report though the range of taxa suggests that a variety of sea fish and, to a lesser extent, freshwater fish were eaten (Nicholson 2010)

A further 23 recordable fragments were recovered from features dating to the mid 19th – 20th century including contexts [7307], the remnant base of a garden path, and context [7313], a levelling layer. This later assemblage has been recorded in full but will not be discussed in detail in this report.

The majority of the assemblage derives from features dating from the late 12th to 15th century (Phase 4b) and 16th to 18th century (Phase 5) and appears to represent food waste. The hand-collected assemblage includes a number of the smaller bird bones and other small extremities, including lagomorph metapodials, which suggests that the overall recovery was quite good.

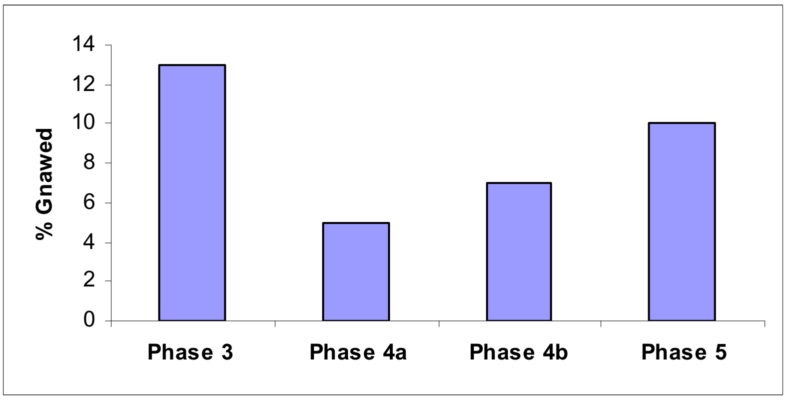
The composition of the unidentifiable assemblage is similar to the identifiable assemblage with the majority of the specimens identified as long bone fragments alongside a smaller quantity of ribs and vertebrae. These fragments have not been included in the analysis.

Taphonomic factors must be taken into account when comparing assemblages from different phases. Factors effecting the survival and condition of the assemblages include butchery, disposal patterns and gnawing. The smaller elements are likely to be less well represented in the assemblages as they are easily overlooked during excavation. These factors will be taken into consideration when discussing the presence and absence of species and certain skeletal elements

The surface preservation of each recordable fragment has been noted and approximately 75% of the specimens in the Phase 4a, 4b and 5 assemblages are well preserved. The poorly preserved specimens in these phases account for just 1-2% of the assemblage. Just 37% of the Phase 3 assemblage has been recorded as well preserved though no poorly preserved specimens were noted. Evidence of burning was noted on just one recordable fragment which was identified as the distal end of a cattle tibia from context [7353] which dates to Phase 4b. Small quantities of unidentifiable, burnt and calcined fragments were recovered from Phases 4a and 4b.

Gnawed bones were more prevalent than burnt specimens and canid gnawing was noted on bones from all phases whilst felid gnawing was noted on specimens from Phases 4a, 4b and 5. In total, gnawing was noted on 2 specimens from Phase 3, 5 specimens from Phase 4a, 28 specimens from Phase 4b and 42 specimens from Phase 5 (Figure 1). Canid and felid gnawing may have resulted in the loss of some of the smaller elements.

Figure 1: The percentage of gnawed bones in each phase



The NISP (Number of Identified Specimens) count for the hand-collected assemblage by phase (Table 4) includes all recordable fragments. The table includes the data from Trench Y5 (Smith 2000) which was hand-collected only. Although some sieving was carried out on site the bone from these samples has been lost (Smith 2000) and it is likely that the small bones from large mammals and all bird, fish and small mammals will be underrepresented.

Table 4: The NISP count for the hand-collected assemblage from all phases

Taxa	Phase 3	Phase 3 Trench Y5	Phase 4a	Phase 4a Trench Y5	Phase 4b	Phase 5
Cattle	3	159	5	162	49	98
Sheep/Goat	5	571	4	368	79	53
Pig	4	524	9	506	99	55
Red/Fallow deer	1	12	1	15	10	15
Red deer		8		2	2	
Fallow deer	1	14		11	5	12
Horse		23		2		
Dog		61		2	1	
Cat		4	1	21	1	
Lagomorph					9	17
Hare		100	1	31	10	5
Rabbit						2
Fox		1				
Whale				1		
Large mammal (vertebra + ribs)			1		4	2
Medium mammal (vertebra + ribs)					22	7
Chicken/Guinea fowl/Pheasant		210	5	136	46	37
Domestic/Greylag goose		7			3	5
Goose (*Anser* sp.)		18		26		3
Mallard/Domestic duck		10		7	2	1
Teal		2		2		
Duck (*Anas* sp.)		3		6		
Woodcock						2

Table 4 (continued): The NISP count for the hand-collected assemblage from all phases

Taxa	Phase 3	Phase 3 Trench Y5	Phase 4a	Phase 4a Trench Y5	Phase 4b	Phase 5
Woodpigeon				1		
Columbid	1	1	1		1	1
Turdid/Sturnid					1	
Rook/Carrion crow		1		1	3	2
Crow		2		2		
Raven		2		2		
Wader		1				
Buzzard		1				
Tawny Owl		10		10		
Peacock		2				
Curlew				1		
Oystercatcher				1		
Toad						1

Table 5 displays the NISP counts for the material recovered from the sample residues. The assemblages have been separated according to size with separate counts for the >4mm and the 2-4mm fraction. Just one sample, number <7803>, context [7362], produced identifiable specimens in the <2mm fraction. These specimens are presented in brackets in the 2-4mm column.

Table 5: NISP counts for the recordable bones retrieved from the soil samples

	Phase 4a		Phase 4b		Phase 5	
Taxa	>4mm	2-4mm	>4mm	2-4mm	>4mm	2-4mm
Cattle	4		3		1	
Sheep/Goat	5		12	1	3	1
Pig	8		25		4	
Red deer/Fallow deer					2	1

Table 5 (continued): NISP counts for the recordable bones retrieved from the soil samples

	Phase 4a		Phase 4b		Phase 5	
Taxa	>4mm	2-4mm	>4mm	2-4mm	>4mm	2-4mm
Red deer						
Fallow deer					1	
Dog	1					
Medium mammal (vertebra + ribs)			6	1	5	
Lagomorph	4		8		31	
Hare	1				1	
Rabbit					4	
Mole	1	2			1	
Rat	1				1	
Rat/Water vole					4	
Large rodent	8				2	
Field vole					1	
Common shrew					2	
House mouse		1			1	
Murid					8	
Small murinae	2		1	-2	4	
Small rodent	5	15				
Chicken/Guinea fowl/Pheasant	10		21		26	4
Domestic/Greylag goose					1	
Teal			1			
Wood pigeon			1		1	
Columbid		3			4	3
Rook/Carrion crow	2	1				1

Table 5 (continued): NISP counts for the recordable bones retrieved from the soil samples

	Phase 4a		Phase 4b		Phase 5	
Taxa	>4mm	2-4mm	>4mm	2-4mm	>4mm	2-4mm
Frog/Toad	1	1				

Both domestic and wild species have been recovered in all phases though there is an increase in the number of wild species present in the later phases. Attempts to differentiate between species have identified sheep (*Ovis aries*), goat (*Capra hircus*), red deer (*Cervus elaphus*), fallow deer (*Dama dama*), hare (*Lepus sp.*), rabbit (*Oryctolagus cuniculus*) and domestic fowl (*Gallus gallus*).

The hand-collected and the sieved material from the evaluations have been combined to calculate the MNI for the most abundant taxa (Table 6). The MNI counts for the Trench Y5 assemblage were calculated with reference to the primary data supplied by Dale Serjeantson. MNI has been calculated with reference to the zoning system and taking sides into consideration and includes all recordable bones and teeth.

Table 6: MNI counts for the most frequently occurring taxa

Taxa	Phase 3	Phase 3, Trench Y5	Phase 4a	Phase 4a Trench Y5	Phase 4b	Phase 5
Cattle	1	13	1	8	3	5
Sheep/Goat	1	46	1	29	9	6
Pig	1	19	2	18	6	4
Red/Fallow deer	1	9	1	6	2	5
Lagomorph		7	2	4	2	4
Chicken/Guinea fowl/Pheasant		19	1	8	5	4

RESULTS

Phase 3 (11th century)

Just one context, [7344], which represents the fill of an 11th century ringwork ditch, can be securely dated to this phase. This feature is associated with the earliest phase of the castle which was established very shortly after the Conquest (Young 2000) and produced 15 fragments of recordable bones. Small mammal, bird and the smaller bones from the larger mammals are likely to be underrepresented due to recovery techniques and taphonomic factors. No evidence of butchery was noted on the assemblage from the 2006/2008 evaluations.

Full results and discussion of the material from Trench Y5 can be found in Smith (2000) and metrical data can be found in Smith (1994). The results of the analysis of Trench Y5 are summarised below for comparison with the material from the later phases.

Animal bones were recovered from two contemporary features uncovered in Trench Y5 including a ditch and an occupation layer. These features produced a much larger bone assemblage which includes 1537 fragments of recordable mammal and bird bone and the deer, hare and bird assemblages are discussed in detail further on.

NISP and MNI counts show that sheep/goat are the most abundant taxa followed by pig and cattle respectively. The sheep/goat assemblage includes a minimum of 15 sheep and two goats and is dominated by limb bones though a small quantity of head and foot bones were recovered. Fusion data suggests that the majority of animals were slaughtered before the age of three although a few animals survived beyond this age.

The majority of pig skeletal elements are represented although foot bones are low in number while a large quantity of loose teeth was recovered. Both young and mature animals are represented. A total of 63 canines could be sexed, of which 54 were male and 9 were female. Two of these canines one male and one female were recovered from the 2006/2008 evaluations.

All parts of the cattle carcass are represented although there is a relatively low quantity of both head and foot elements. Age data suggest that the majority of cattle were slaughtered before the age of 2.5-3.5 years.

Evidence of butchery was noted and the author concludes that the splintered state of much of the assemblage and the occurrence of chop marks on the mid-shaft indicates that bones were exploited for marrow (Smith 2000).

The absence of the smaller cattle, sheep/goat and pig skeletal extremities may be caused by destruction due to taphonomic factors. However, a large number of hare specimens were also recovered which indicates that the overall preservation and recovery was quite good. It is therefore presumed that the absence is genuine and may reflect the spatial differentiation in the discard of primary butchery and consumption waste.

Phase 4a (12th century)

During the evaluations, the 12th century contexts produced a total of 110 recordable fragments of mammal and bird bone which were recovered through hand-collection and from the soil samples. Two neo-natal specimens were recovered including one sheep/goat ulna and one pig ulna. The majority of the assemblage, a total of 85 fragments, derived from context [8016] which represents a layer of midden material. It is possible that this feature also contains material from the late 12th century as the midden was quite complex and was comprised of interleaved, thin, deposits of earth and chalk which were dug largely as single contexts (Mike Russell *pers comm.*).

Analysis of the assemblage from the 2006/2008 evaluations reveals that pigs and chickens are the most abundant taxa followed by sheep/goat and cattle though all are present in very small quantities. All four taxa are represented by both meat-bearing and non-meat bearing elements. No evidence of butchery has been noted on the large mammal assemblage. The assemblage is too small to provide information regarding age-at-death. The assemblage contains six lagomorph specimens, two of which, a pelvis and a tibia, have been identified as hare. The pelvic fragment derives from context [8023], a layer of midden material, and small cut marks were noted along the pubis. Three columbid specimens, including a juvenile radius and two phalanges, and three rook/carrion crow specimens were recovered from the sample residues.

A relatively large number of small mammal remains were retrieved through the sieving of environmental residues which indicates that recovery and preservation of the assemblage was good. Black rat (*Rattus rattus*) and house mouse (*Mus domesticus*) were identified using the mandibular and maxillary teeth and a mole (*Talpa europaea*) humerus, radius and femur were also recovered. The small mammal remains derive from midden material, contexts [8023], and a possible floor deposit, context [7362].

A contemporary midden uncovered in Trench Y5 produced 1180 fragments of identifiable mammal and bird bone. Analysis of the Trench Y5 assemblage reveals that sheep/goat are underrepresented by NISP count and are the most abundant taxa according to MNI calculations. The combined sheep/goat assemblage includes a minimum of four sheep and one goat and the assemblage is dominated by limb bones with fusion data suggesting that the majority of animals were slaughtered before the age of three years.

The apparent dominance of pig in the NISP count is a result of a large number of loose teeth though all parts of the pig carcass are represented but bones from the feet are low in number. The age range of pigs is mixed with both young and old animals present. Thirty canines were recovered from Trench Y5, all of which have been identified as male and only one canine, also from a male, was recovered during the 2006/2008 evaluations. The canine was retrieved from context [8016], the midden material excavated in 2008.

All parts of the cattle skeleton are represented though there is a relative absence of feet and head bones. Age at death data suggest that the assemblage was dominated by older specimens.

Phase 4b (Late 12th- 15th century)

Excavations in Trench Y5 did not produce animal bone from contexts dated to the later phases and the following discussion refers to the assemblage from the evaluations only.

The animal bone from Phase 4b was retrieved from 22 contexts through hand-collection and sieving. The largest accumulations of animal bone were recovered from contexts [8016] and [322], both of which represent midden material, and context [319], a dump of chalk rubble which has been interpreted as a possible bank. As discussed above, excavating the complex midden material was quite tricky and, as a result, the midden contexts may also contain bones from the early 12th century.

The NISP count for this phase shows that the assemblage is dominated by pig followed by sheep/goat, chicken/pheasant/guinea fowl and cattle respectively. The MNI counts suggest that sheep/goat are underrepresented in the NISP counts and are the most abundant species.

Sheep/goat

A minimum of six sheep and one goat are represented in this assemblage. The MNE (Minmum Number of Elements) count (Table 7) has been calculated taking zones and sides into consideration. One mandible fragment and five mandibular teeth were recovered, four of which were incisors; the remaining specimen was identified as a second pre-molar. Both the mandible fragments and the loose teeth may have derived from the same individual.

Table 7: MNE count for the sheep/goat assemblage from Phase 4b

Element	Total
Horncore	1
Skull	1
Mandible	1
Axis	1
Scapula	11
Humerus	10
Radius	7
Ulna	8
Metacarpal	1
Pelvis	9
Femur	2
Tibia	11
Navicular	1
Metatarsal	0
Metapodial	0
Calcaneum	0
Astragalus	0
1st phalanx	0
2nd phalanx	0

The MNE counts show that the assemblage is dominated by the limb and girdle bones. There is an absence of skeletal extremities which suggests that the sheep/goat assemblage derives from joints of meat. Meat may have been imported as butchered joints or primary butchery may have taken place on-site and the metapodia and phalanges may have been left attached to the hide to aid transportation.

The most commonly occurring elements are the tibia, humerus and scapula. The most frequently occurring parts of these elements are the shaft of the tibia, the shaft and distal end of the humerus and the distal end of the scapula. This is unsurprising given that these are the densest parts of these elements and are among the densest parts of a sheep skeleton (Lyman 1994). They are, therefore, less likely to be destroyed by taphonomic factors.

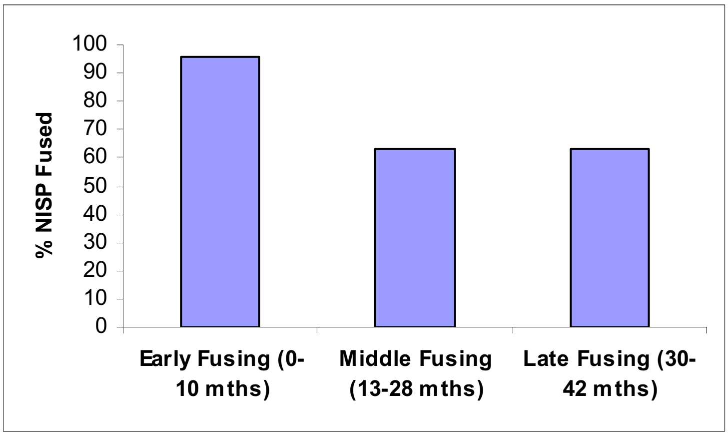
Bones of equal or greater density than the tibia, humerus and scapula include all parts of the metapodials and the astragalus, calcaneus and phalanges (Lyman 1994). With the exception of the metapodials, these bones are small and can be easily over-looked during excavation. However, if these bones were present it seems fair to presume that they would have been recovered in the soil samples, at least in small quantities. The absence of these elements provides further evidence to suggest that the assemblage derives from joints of meat with the extremities having been removed and deposited elsewhere.

The average bone mineral density of the femur ranges from 0.20 to 0.36 with the densest bone found in the shaft and the proximal articulation (Lyman 1994). The density of the shaft of the femur is equal to the density of the distal part of the shaft of the tibia so they are equally likely to be effected by post-depositional damage such as that caused by acidic soils. The relative absence of femora suggests that this element may not have been deposited in the same quantity as tibiae. The inhabitants of the castle may not have been supplied with this particular joint of meat. Alternatively, femora may have been subject to additional damage prior to burial, such as splitting to retrieve marrow, or have been a choice bone for canid gnawing resulting in a greater degree of destruction. Femora may be represented in the non-countable fragments which contain 129 medium-mammal sized long-bones from contexts dating to Phase 4b. Eight of these fragments display signs of canid gnawing and a large percentage were recovered from context [319], the chalk rubble dump.

Just two fragments of sheep/goat displayed signs of butchery. Cut marks were noted on the shaft of a tibia and on an acetabulum and these may have occurred during the removal of the meat from the bone or during the skinning process.

Just one mandible fragment was recovered so mandibular tooth wear can not be considered. The stage of fusion of 37 long bones has been noted of which 30 were fused, 6 were unfused and 1 was 'fusing' (Figure 2). Data for the 'Early Fusing' group is based on 23 specimens, data for the 'Middle Fusing' group is based on 9 specimens and data for the Late Fusing group is based on 5 specimens

Figure 2: Epipyseal fusion data for the Phase 4b sheep/goat assemblage.



Epipyseal fusion data indicates that the assemblage is dominated by mature animals with 63% of the specimens in the Late Fusing group being recorded as 'Fused'. The MNE counts show that meat-bearing bones are well represented and the age data suggests a preference for mutton over lamb. Lamb may have been consumed in smaller quantities as 35% of the middle fusing group were unfused suggesting that the assemblage includes animals that were killed between 10 and 28 months.

Pig

The MNI counts show that pigs are the second most abundant species during this phase and the apparent dominance of pig based on NISP counts is partly due to the large number of loose teeth and fragmented mandibles. The MNE count (Table 8) includes a total of 19 loose teeth which represent a minimum of four mandibles. The MNE count for the mandibles includes mandibular bone and loose teeth.

Table 8: MNE count for the pig assemblage from Phase 4b

Element	Total
Skull	1
Mandible	10
Scapula	3
Humerus	2
Radius	3
Ulna	2
3rd metacarpal	0
4th metacarpal	4
5th metacarpal	2
Pelvis	1
Femur	3

Table 8 (continued): MNE count for the pig assemblage from Phase 4b

Element	Total
Tibia	3
Fibula	1
Astragalus	0
Calcaneum	1
3rd metatarsal	4
4th metatarsal	3
5th metatarsal	1
1st phalanx	5
2nd phalanx	1

The MNE count for the pig assemblage shows that both meat bearing and non-meat bearing elements are represented. Most of the carcass is present with the exception of the cranium. The cranium is relatively fragile and prone to destruction and may have been broken up prior to deposition in order to remove the brains (Smith 2000) though no evidence of butchery was noted on mandibular or cranial fragments. Butchery was noted on three fragments of pig bone dated to Phase 4b. Chop marks noted around the distal end of a scapula may be indicative of dismemberment and cut marks were noted on an atlas fragment and the shaft of a humerus which may be indicative of meat removal or skinning.

The MNE counts show that the assemblage is dominated by mandibles. This over-representation may be due to the fragile nature of the juvenile long-bones which makes them prone to destruction. Sykes (2007) notes that medieval elite assemblages are characterised by an abundance of pig mandibles and suggests that the head may have been selectively imported to elite sites or that animals were butchered at elite sites and their meat re-distributed.

The assemblage contains nine mandibles with a minimum of two teeth still in-situ. The mandibular wear scores (Table 9) have been calculated with reference to Grant (1982) and approximate ages have been assigned with reference to Hambleton (1999).

Table 9: Pig tooth wear data from Phase 4b. Results presented in italics have been predicted with reference to Grant (1982). M.W.S – Mandibular Wear Stage

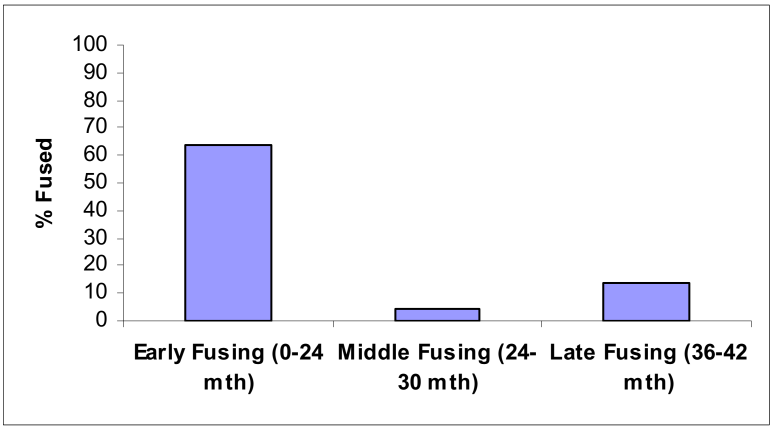
dP4	P4	M1	M2	M3	M.W.S	Age (months)
	E	e	b	E	20	14-21
a					6	2-7
	d	f		c	28	14-21
	a	d	b		22	14-21

Table 9 (continued): Pig tooth wear data from Phase 4b. Results presented in italics have been predicted with reference to Grant (1982). M.W.S – Mandibular Wear Stage

dP4	P4	M1	M2	M3	M.W.S	Age (months)
		h	c	E	24	14-21
	b	g	c		27	14-21
		k	*f*	*b*	33	21-27
		e	c	*E*	21	14-21
f		c	1/2	*C*	13	7-14

The stage of fusion of 44 specimens has been recorded (Figure 3) and just nine of the bones were recorded as fused and the remaining 35 specimens were unfused. Data for the 'Early Fusing' group is based on 11 specimens, data for the 'Middle Fusing' group is based on 26 specimens and data for the Late Fusing group is based on 7 specimens.

Figure 3: Pig epipyseal fusion data for Phase 4b



Epipyseal fusion data shows that the 64% of early fusing epiphyses but very few middle or late fusing epipyses, were fused at death suggesting that most pigs were killed by 24 to 30 months. Tooth wear data suggests that the majority of pigs died between 14 and 21 months.

Ten canines were recovered, either loose or still within the mandible, including one female and nine male specimens.

The assemblage from the evaluations contains a high percentage of juvenile bones. Very little biometric data was available as only fully fused bones should be measured. Pig teeth from the 2006/2008 evaluations have provided a small quantity of biometric data (the pig teeth from Trench Y5 were not measured). The pig teeth derive from contexts dating to Phase 4b. The anterior and posterior width of six mandibular M1s and seven M2s has been measured in accordance with Payne and Bull (1988) and the primary data is given in Appendix 1.

The biometric data from Carisbrooke Castle has been compared to contemporary data from Portchester Castle and Faccombe Nertherton in Hampshire and Guildford Castle in Surrey (Sykes 2007, Figures 4 and 5). The comparative data, recorded using the method outlined by Payne and Bull (1988),.

Figure 4: A comparison of the width of the first molar from medieval pigs. WA= Anterior width, WP=Posterior width

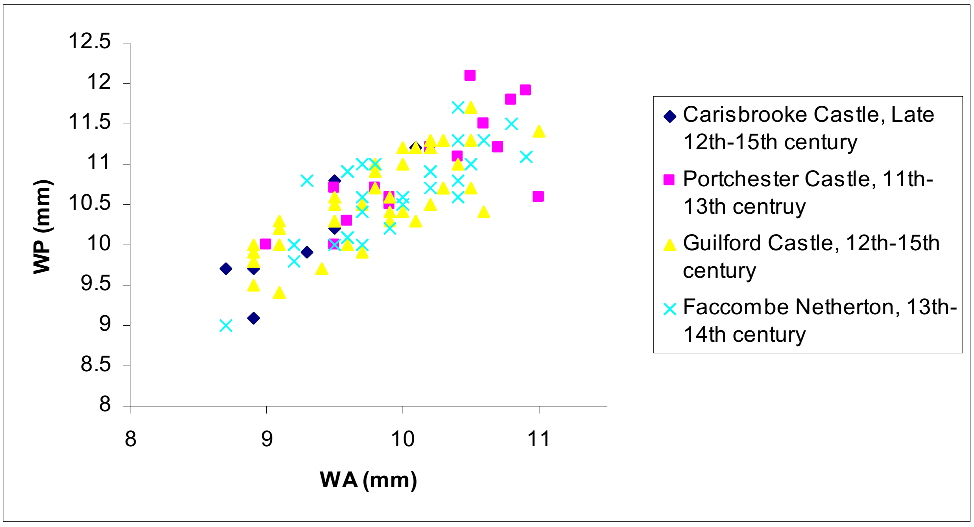
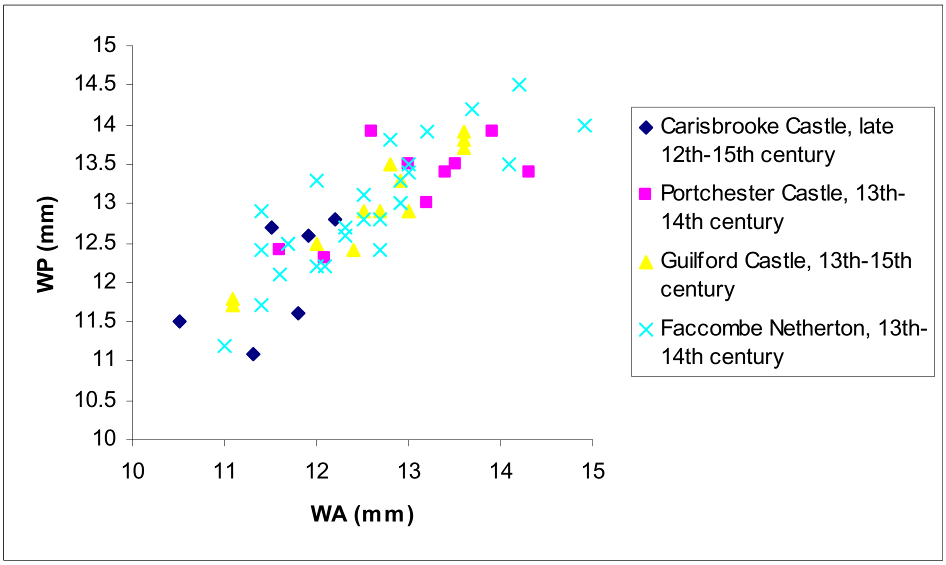


Figure 5: A comparison of the width of the second molar from medieval pigs. WA= Anterior width, WP= Posterior width



The specimens from Carisbrooke Castle are similar in size to the smaller specimens from Guildford Castle and Faccombe Netherton (Figures 4 and 5) and the largest specimens from Carisbrooke Castle are within the size range of the smallest specimens from Portchester Castle.

The t-test was applied in order to test the statistical difference of the metrical data from Portchester Castle, Guildford Castle and Faccombe Netherton when compared to the metrical data from Carisbrooke Castle (Table 10). A two-tailed t-test was performed that assumes equal variances. The results reveal that both the mean anterior width (WA) and the mean posterior width (WP) of the M1s and M2s from Carisbrooke Castle are smaller than the means of the same measurements from Portchester Castle, a difference that is highly significant.

Table 10: T-test analysis of metrical data presented in Figures 4 and 5. *=Statistically significant ($P<0.05$). **=Highly statistically significant ($P<0.01$).

Site	Tooth	Century	Sample Size	Measurement	Probability	Significance
Portchester Castle	M1	11th-13th	16	WA	0.0019	**
				WP	0.0085	**
	M2	13th-14th	9	WA	0.0022	**
				WP	0.0036	**
Guildford Castle	M1	12th-15th	43	WA	0.0183	*
				WP	0.0934	*
	M2	13th- 15th	11	WA	0.0151	*
				WP	0.0279	*
Faccombe Netherton	M1	13th-14th	24	WA	0.5525	
				WP	0.0504	
	M2	13th-14th	26	WA	0.0151	*
				WP	0.0146	*

Payne and Bull's (1988) application of measurements to distinguish wild from domestic pig showed that the effect of age-related change, sexual dimorphism and residual individual variability was low in tooth widths measurements. A high degree of variation in tooth widths would therefore indicate genetic variability. This may suggest that the pigs at Carisbrooke Castle were of a different morphotype than the pigs from Portchester Castle although the earliest textual references to regional types date to the seventeenth century (Albarella 2006). However, it has been noted that the Saxo-Norman pig remains from Flaxengate Lincoln were smaller than contemporary animals from Exeter which indicates some regional variation (Albarella 2006).

Cattle

The assemblage contains 51 fragments of cattle bone representing a minimum of three individuals. The majority of the skeleton is represented with the exception of the cranium (Table 10).

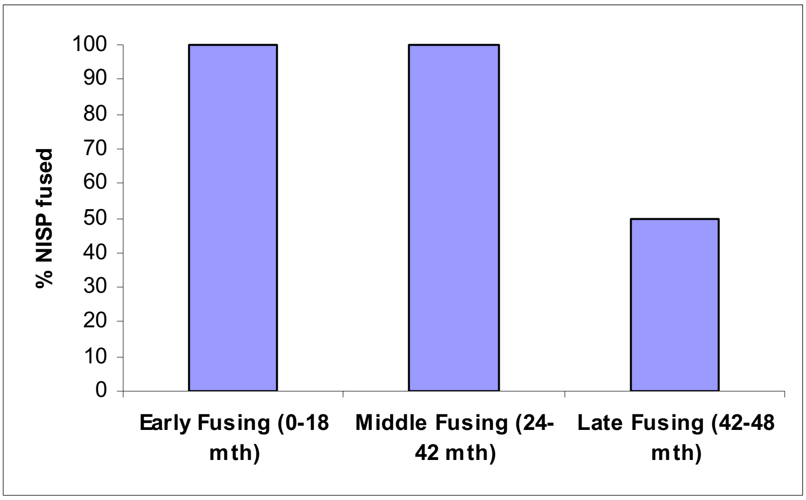
Table 10: Cattle MNE for Phase 4b

Element	Total
Horn core	0
Skull	0
Mandible	3
Scapula	2
Humerus	4
Radius	3
Ulna	2
Metacarpal	2
Pelvis	3
Femur	4
Tibia	3
Navicular	0
Metatarsal	0
Calcaneum	2
Astragalus	2
1st phalanx	2
2nd phalanx	3
3rd phalanx	0

In total, five fragments of bone displayed evidence of butchery. Chop marks were noted on two proximal radii, an illium and a proximal femur and are indicative of dismemberment. Chop marks were also noted on the distal shaft of a tibia and may have occurred during removal of the feet.

Just 19 fragments of cattle bone provided epipyseal fusion data, 18 of which were fused (Figure 6). The result for the Early Fusing group is based on eight specimens. The Middle Fusing group contains three specimens and the Late Fusing group contains just two specimens. Although the assemblage is small, it indicates an older population with 50% of the late fusing specimens recorded as fused.

Figure 6: Cattle epipyseal fusion data for Phase 4b



No mandibles were recovered with in-situ teeth and only one isolated molar was recovered. As teeth survive well in the archaeological record due to their hard enamel surface, the absence of teeth suggests removal of jaws before burial. The jaws, along with the cranium may have been removed as part of an earlier butchery process with cattle arriving at the castle as semi-dressed carcasses.

Phase 5 (16th-18th Century)

The Phase 5 assemblage was recovered during the 2006/2008 evaluations and no animal bones from this phase were recovered from Trench Y5. The assemblage derives from 19 contexts with the largest accumulations recovered from contexts [8000], a dump of shell fish shells, and contexts [314], [315] and [318] which represent a layer of dark greyish brown clay loam.

Analysis of the Phase 5 assemblage reveals a slight change in taxa abundance as MNI counts show that although sheep/goat continue to be the most abundant taxa, cattle and deer are now more frequent than pig

Sheep/Goat

A total of 56 fragments of bone representing a minimum of 6 individuals have been recovered. The assemblage contains elements that have been identified as sheep and these elements represent a minimum of five individuals. There are no positively identified goat elements in this assemblage.

The MNE count for the Phase 5 sheep/goat assemblage is shown in Table 11. No loose teeth were recovered from this phase.

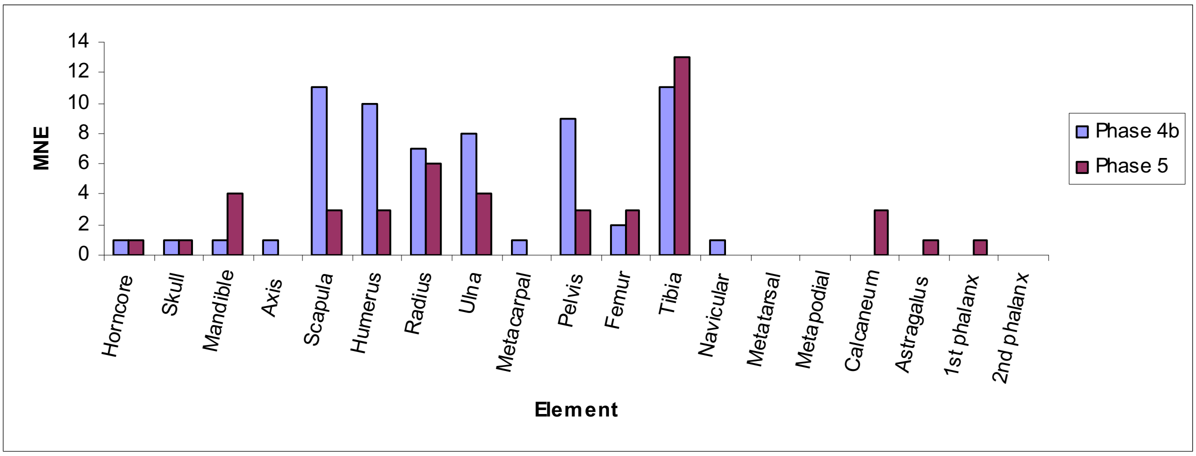
Table 11: Sheep/goat MNE for Phase 5

Element	Total
Horn core	1
Skull	1
Mandible	4
Axis	0
Scapula	3
Humerus	3
Radius	6
Ulna	4
Metacarpal	0
Pelvis	3
Femur	3
Tibia	13
Navicular	0
Metatarsal	0
Metapodial	0
Calcaneum	3
Astragalus	1
1st phalanx	1
2nd phalanx	0

The assemblage is dominated by meat-bearing elements though a small number of extremities have also been recovered. The average bone mineral density of the metapodials ranges from 0.31 to 0.68 which is higher than that of the distal tibia (Lyman 1994). The distal tibia is the most frequently occurring element in the assemblage. The absence of metapodials suggests that these were disposed of elsewhere and that the carcasses were arriving semi-dressed. The metapodials may have been removed during the primary butchery stage and utilised for bone working. There is no evidence of bone working in the assemblages from the evaluations or Trench Y5 though this activity may have been carried out in an unexcavated area of the castle or outside the castle walls.

Figure 7 compares the MNE counts for the sheep/goat assemblage from phases 4b and 5.

Figure 7: A comparison of sheep/goat MNE counts for Phase 4b and Phase 5



The most commonly occurring fragment in Phase 4b and Phase 5 is the distal tibia. However, in the Phase 5 assemblage, distal scapulae and humeri are much less common than in the Phase 4b assemblage. There are a number of possible reasons for this absence. The joints of meat represented by the humerus and the scapula may no longer have been supplied in the same quantities as in the earlier phase. Alternatively, these parts of the skeleton may have been discarded or distributed elsewhere or subjected to further processing. The humeri may have been split in order to extract the marrow Evidence of marrow extraction has been noted in the earlier assemblages from Trench Y5 (Smith 2000). It is also possible that the humerii were given to dogs and cats to gnaw on. The non-recordable assemblage contains 93 medium-mammal sized long bone fragments. Four of these fragments show signs of canid and felid gnawing.

Evidence of dismemberment was noted on two sheep/goat specimens including a scapula, which displayed cut marks around the articulation, and a tibia which displayed chop marks on the distal end of the shaft. One horn core fragment displayed chop marks around the base which may be associated with primary butchery.

Just 21 specimens provided epipyseal fusion data of which 17 were fused, 2 were unfused and 2 were recorded as 'fusing' which suggests that the majority of sheep/goats survived beyond 2.5 years of age. Just one element from the Later Fusing group (30-42 months), a proximal tibia, was recovered and was recorded as 'fusing'. No other specimens from the Late Fusing group were recovered.

There is no data available regarding mandibular tooth wear as no mandibles with in-situ teeth or isolated teeth were recovered.

Pigs

A total of 59 fragments of pig bone were recovered representing a minimum of 4 individuals. Just two loose teeth were recovered and have been taken into account when calculating the MNE count for the mandibles. The MNE count is shown in Table 12.

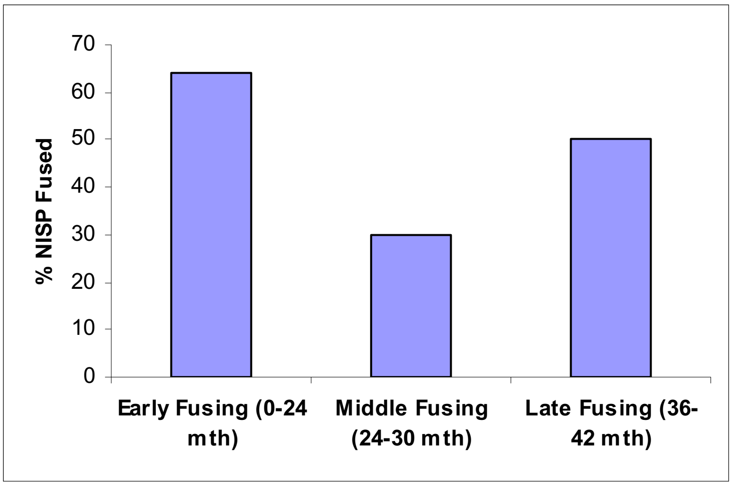
Table 12: Pig MNE data for Phase 5

Elements	Total
Skull	0
Mandible	4
Scapula	2
Humerus	4
Radius	2
Ulna	3
3rd metacarpal	1
4th metacarpal	0
5th metacarpal	0
Pelvis	1
Femur	0
Tibia	6
Fibula	0
Astragalus	0
Calcaneum	5
3rd metatarsal	0
4th metatarsal	0
5th metatarsal	1
1st phalanx	2
2nd phalanx	4

The assemblage is small but appears to be dominated by meat-bearing elements though non-meat-bearing elements have also been recovered. The skull is represented by mandibles only.

A total of 23 bones provided data regarding epipyseal fusion including 12 unfused and 11 fused specimens. The Early Fusing group contains eleven specimens whilst the Middle and Late Fusing groups contain ten and two specimens respectively (Figure 8).

Figure 8: Pig epipyseal fusion data for Phase 5



The data show that 64% of Early Fusing epiphyses and 30% of Middle Fusing epiphyses were fused at death, suggesting that many pigs survived beyond 24 months of age with the majority of the animals being slaughtered by 24 to 30 months. A single fused proximal tibia provides evidence that some pigs survived beyond 3.5 years of age.

Two specimens displayed signs of butchery and chop marks were noted on a calcaneum and on the proximal end of a tibia, both are indicative of dismemberment.

Just one mandible survived with more than one molar tooth in-situ and the MWS has been calculated as 35 which equates to an age of death between 21 and 27 months (Hambleton 1999).

Four canines were recovered of which one was identified as female and three as male.

Cattle

A total of 101 fragments of cattle bone representing a minimum of 3 individuals were recovered. The MNE count for the Phase 5 cattle assemblage is shown in Table 13.

Table 13: MNE data for the Phase 5 cattle assemblage

Elements	Total
Horn core	0
Skull	0
Mandible	0
Scapula	6
Humerus	8
Radius	5
Ulna	4

Table 13 (continued): MNE data for the Phase 5 cattle assemblage

Elements	Total
Metacarpal	5
Pelvis	3
Femur	4
Tibia	6
Navicular	2
Metatarsal	4
Calcaneum	9
Astragalus	3
1st phalanx	3
2nd phalanx	2
3rd phalanx	0

The majority of the carcass is represented with the exception of the skull and mandibles and no isolated teeth were recovered.

Butchery marks were noted on 16 cattle specimens from contexts dating to Phase 5. Marks indicative of dismemberment and filleting include chop and cut marks noted on the proximal and distal ends of humerii, radii, tibiae and femora. Cut marks have also been noted on a navicular and may have occurred during the primary butchery process.

A total of 43 specimens provided epipyseal fusion data (Figure 9). Of these, 36 were fused and 5 were unfused. The remaining two specimens were recorded as 'fusing' and have been included as fused specimens, both of these specimens belong to the Middle-Fusing group. The Early Fusing group contains 24 specimens with the Middle and Late Fusing groups containing 12 and 7 specimens respectively. The assemblage contains one scapulae fragment from a neo-natal animal.

Figure 9: Cattle epipyseal fusion data for Phase 5

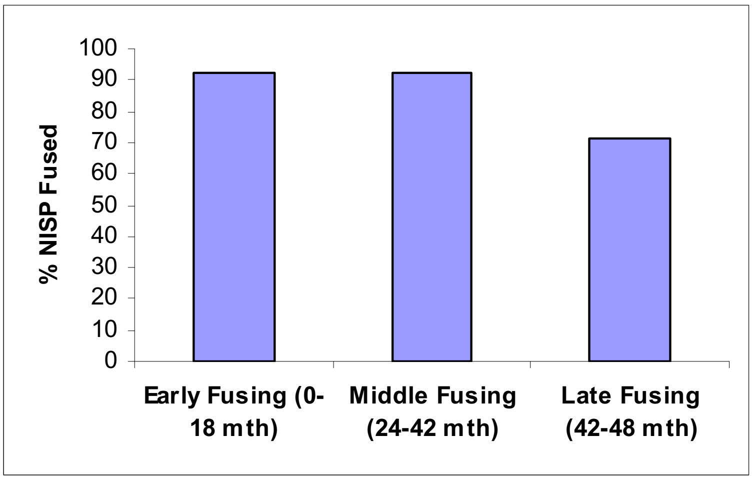


Figure 9 represents a mature population with 71% of the Late Fusing specimens being fused at death.

Minor domesticates

NISP counts suggest that dogs, cats and horses were relatively scarce. The remains of the smaller taxa may have been destroyed by taphonomic processes though small bird and mammal bones have been recovered which suggest that the absence of these taxa is real.

Evidence of gnawing on bones from all phases suggests that dogs and cats were more common on site than the NISP counts indicate. As these animals were not generally eaten, their absence can be taken as further evidence that the assemblages derive from food waste.

The majority of the dog bones were recovered from the base of the ditch in Trench Y5, Phase 3 (Smith 2000) though no information is provided regarding element distribution and the bones have not been measured.

Deer

Both red and fallow deer are present throughout the occupation of the site. The fallow deer specimen from Phase 3, a distal tibia recovered from context [7344], the fill of the 11th century ring-work ditch, is amongst the earliest evidence for fallow deer in Britain with contemporary evidence having been recovered from Goltho (Jones and Reuben 1987) and Dudley Castle (Thomas 2005).

The evidence from the 2006/2008 evaluations and Trench Y5 indicate that deer become more abundant in the later Phases. Deer remains (including red and fallow deer) contribute to 2% of the assemblage in Phases 3 and 4a, 4% in Phase 4b and 6% in Phase 5 in terms of NISP. In Phase 5, deer are underrepresented by NISP counts and the MNI counts show that they were the second most abundant taxa and equal in quantity to cattle.

The primary data for the assemblage from Trench Y5 does not include details of deer element representation though the presence of deer and NISP counts are discussed in the published report (Smith 2000). The MNE counts for the Phase 4b and Phase 5 assemblages from the 2006/8 evaluations are shown in Tables 14 and 15.

Table 14: Deer MNE counts for Phase 4b

Element	Red Deer	Fallow deer	Red/Fallow deer
Antler	1		
Skull			1
Mandible			1
Axis			
Scapula			
Humerus			
Radius			
Ulna			
Metacarpal		1	
Pelvis			
Femur		1	1
Tibia			1
Navicular			
Metatarsal	1	1	
Metapodial			
Astragalus			
Calcaneum	1		1
1st phalanx		1	1

Table 15: Phase 5 deer MNE counts

Element	Fallow deer	Red/Fallow deer
Antler		
Skull		
Mandible		1
Axis		
Scapula		
Humerus		
Radius		
Ulna		
Metacarpal	1	1
Pelvis		2
Femur	2	
Tibia	5	2
Navicular		
Metatarsal	1	
Metapodial		
Astragalus	1	
Calcaneum		2
1st phalanx	1	3

The MNE counts are based on relatively small assemblages though they indicate that a limited number of elements are represented. The majority of elements derive from the hind-limbs with a small number of antlers, skulls, mandibles and metacarpals present. The absence of the elements from the fore-limbs and scapulae may be explained with reference to later medieval hunting manuals (Sykes 2007). It has been suggested that a highly ritualised form of hunting, know as the *chasse par force*, was introduced to England by the Normans (Sykes 2007). This new way of hunting concluded with an 'unmaking process' in which the deer carcass was skinned, disembowelled and butchered with the meat being distributed according to a set protocol. The feet were removed but left attached to the skin which was used to carry home the meat and the antlers. The deer assemblages from Norman elite sites contain a high proportion of hind limbs which returned with the lord to his residence. The pelvis was left at the kill site as an offering to the crow or raven and the shoulders were presented to the best hunter and forester or parker as their fee.

Analysis of element representation of deer assemblages from Norman elite sites provides comparable results with both the Phase 4b and 5 assemblages from Carisbrooke Castle, suggesting that the preponderance of hind-limbs, metacarpals, antlers and mandibles at Carisbrooke results from the 'unmaking' process (Sykes 2007). The deer assemblage may represent the remains of deer hunted by the castle's inhabitants or joints of meat presented as gifts.

Butchery evidence has been noted on seven fragments of cervid bone. Six of these fragments have been positively identified as fallow deer and the seventh fragment, a calcaneum, has been recorded as red/fallow deer. Cut marks have been noted on the calcaneum, as well as an astragalus, a first phalanx and the distal ends of a tibia and a metatarsal and may be associated with skinning. Chop marks have been noted on the distal ends of two femora which may be indicative of dismemberment.

A single fragment of red/fallow deer cranium and four fragments of antler were recovered during the 2006/2008 evaluations. The specimens were recovered from a deposit dating to the 12th century (Phase 4a). The cranial fragment derives from the frontal region and the pedicle and coronet remain attached. A small fragment of the brow tine is also present though not enough of the antler remains to permit species identification. A chop mark has been noted on the frontal region above the eye-socket. It is possible that the antler and associated cranial fragment were left attached to the hide to aid transportation from the hunting site back to the castle and they may also represent the remains of a trophy.

Plate 1: Red/Fallow deer skull and antler fragment with butchery marks (indicated by arrow)

Lagomorphs

Hares are present on site in increasing quantities from the 12th century onwards with evidence of rabbit recovered from contexts dating from the 16th-18th century (Table 4). Problems with identification occurred due to the unfused state (young age) of 14 specimens which were recovered from Phases 4a, 4b and 5.

The majority of hare specimens recovered from TrenchY5 derived from the base of the ditch which produced 77 of the 131 fragments recorded. Nine hare specimens were also recovered from the occupation layer, and the midden contained 31 specimens. The primary records for Trench Y5 indicate that all parts of the hare carcass are represented including extremities, such as phalanxes and meat bearing elements such as the humerus. Not all of these elements have been recorded using the zoning system so MNE counts have not been included in this report.

The MNE counts for the combined rabbit, hare and lagomorph assemblages from the 2006/2008 evaluations are shown in Table 16.

Table 16: MNE counts for the hares, rabbits and lagomorph (lag) assemblage

	Phase 4a		Phase 4b		Phase 5		
Element	Hare	Lago	Hare	Lago	Rabbit	Hare	Lago
Skull							1
Mandible							1
Scapula			2			1	1
Humerus			1			2	2
Radius			1				1
Ulna			2		1	1	
2nd metacarpal							1
3rd metacarpal				1			
4th metacarpal							2
5th metacarpal							
Pelvis	1						1
Femur				1			1
Tibia	1	2	2	2	1	2	2
Fibula							
Astragalus							2
Calcaneum			1				
2nd metatarsal				1			1
3rd metatarsal							2
4th metatarsal				1			
5th metatarsal				1			5
Metapodial							1
2nd phalanx							
3rd phalanx		1		2			2

All parts of the carcass are represented including meat bearing and non-meat bearing elements. The skulls and mandibles are the least well represented element which may be a result of taphonomic issues or indicate that the heads were removed prior to burial.

Unfused specimens were recovered during the evaluations from contexts described as layers or deposits rather than fills with the exception of the two specimens recovered from context [8000], a dump of shell-fish shells dated to Phase 5. It is possible that the lagomorph remains are intrusive: particularly the unfused specimens, which may represent the remains of infant rabbits that died in their burrow (Sykes 2007). However, butchery marks were noted on a hare pelvis, recovered during the evaluations, and knife marks were observed on one pelvic fragment and three long bones recovered from the securely sealed ditch deposits in Trench Y5 (Smith 2000). Both hare and rabbit remains were recovered from midden deposits alongside kitchen waste which indicates that both hare and rabbit supplemented the diet of the inhabitants of Carisbrooke Castle.

Rabbits and warrens became a symbol of lordship though rabbiting was not considered to be true hunting being a pursuit suitable only for ladies and men of the cloth (Sykes 2007).

Evidence suggests that rabbits and warrens began to appear in Britain from the twelfth century with the earliest records indicating that rabbits may have originally been kept on small off-shore islands (Sykes and Curl 2010). An early record, dating to 1225, reports of the existence of a *custod' cuniculorum* in the manor of Bowcombe, Carisbrooke on the Isle of Wight (Veale 1957) though no evidence of rabbit consumption has been recovered from the castle prior to the 16th century.

Birds

Bird remains were relatively abundant in all phases and both wild and domestic taxa have been identified (Table 17). The percentage NISP has been calculated based on all recordable mammal and bird bone from both the 2006/2008 evaluations and the excavations in Trench Y5 (Serjeantson 2000).

Table 17: NISP counts for all bird species by phase and collection method. HC = Hand collected

	Phase 3			Phase 4a			Phase 4b			Phase 5		
Area	HC	>4mm	2-4mm	HC	>4mm	2-4mm	HC	>4mm	2-4mm	HC	>4mm	2-4mm
2006/2008 Evalutaion	1	0	0	6	12	4	56	23	0	51	32	8
Trench 5Y	270	0	0	178	0	0	0	0	0	0	0	0
Total	371			200			79			91		
% NISP	21%			14%			18%			21%		

The bird assemblage is dominated by medium-sized galliforms. Only domestic fowl was positively identified though it is difficult to separate the closely related bones of the chicken, guinea fowl and the pheasant (Serjeantson 2006). It is clear from documentary sources that the hunting of pheasants was relatively common in late medieval England (Stone 2006). Historical evidence points to an increasing representation of pheasants throughout the medieval period and it seems likely that pheasant populations were maintained in parks where the aristocracy could hunt them with hawks (Poole 2010). However, very little archaeological evidence from this period has been recovered pertaining to the hunting and eating of these birds. The relative absence of pheasants may be related to problems with identification. The proximal femur and proximal tarsometatarsus are two elements that can easily be identified as pheasant (Tomek and Bochenski 2009). In total, four proximal femur and nine proximal tarsometatarsi fragments have been recovered, all of which were identified as chicken. Although no definite pheasant specimens were recovered from the 2006 and 2008 evaluations or from Trench

Y5, it is possible that they are represented amongst the medium-sized galliform elements that could not be confidently identified to species.

Macdonald (1992) highlights the osteometrical differences between chicken and guinea fowl with reference to seven elements including the scapula, coracoid and radius. Tomek and Bochenski (2009) provide a key for the identification of guinea fowl with reference to nine elements including the humerus, ulna and femur. When these criteria were applied to the assemblage, no evidence of guinea fowl was observed.

The MNI count (Table 6) and the NISP count (Table 17) show that chicken was important part of the diet. The MNE count for medium-sized galliforms recovered from the 2006/2008 evaluations is presented in Table 18. The identification of the phalanges is based on size only

Table 18: MNE counts for medium sized-galliforms by Phase. C= Chicken, C/P= Chicken/Pheasant, C/GF/P= Chicken/Guinea Fowl/Pheasant

	Phase 4a			Phase 4b			Phase 5		
Element	C	C/P	C/GF/P	C	C/P	C/GF/P	C	C/P	C/GF/P
Skull			1						
Vertebrae									
Furcula						1			
Coracoid	1	1		3		2	3		3
Sternum			1					1	
Humerus				1		6	3	1	1
Radius			1	2		2	1	1	1
Ulna						1	1	1	4
Carpometacarpus						1			
Scapula					1		1	2	
Synsacrum									
Pelvis			1			2			1
Femur			1	1		2	3		2
Fibula									
Tibiotarsus				5	1			2	2
Tarsometatarsus	1		1	6		1	2		
Phalanx						7			14

The MNE counts suggest that most of the carcass was present though the smaller, more fragile elements are underrepresented. These elements are not present in the unidentifiable assemblage which contains small fragments of long bones. The underrepresentation of the smaller elements may be due to the loss of a proportion of the sample material or it may indicate that the heads and wing extremities were cut off before cooking. Taphonomic factors may have also destroyed these elements.

Element analysis by context for the domestic fowl assemblage from Trench Y5 (Serjeantson 2000) revealed some interesting disposal patterns. The primary fill of the ditch (Phase 3) was dominated by tarsometatarsi, skulls, pre-maxillae and mandibles. This assemblage has been interpreted as primary butchery waste which indicates that it was the practice to remove heads and feet before cooking and serving the bird (Serjeantson 2000). In contrast, the element analysis of the midden fill from Trench Y5 (Phase 4a) was dominated by meat-bearing elements (Serjeantson 2000). This clearly indicates that some form of dressing and preparation of birds was undertaken at Carisbrooke and the relative absence of the extremities from the evaluation assemblages may be indicative of this practice.

Immature medium-sized galliform bones were relatively common contributing to 33%, 24% and 34% of the Phase 4a, 4b and 5 assemblages respectively. This suggests that these birds were raised in the settlement (Serjeantson 2006) or that young fowl were imported. As chicken became an important source of meat, more were slaughtered whilst still immature (Serjeantson 2009). Immature chickens were common in medieval wealthy and religious households, such as Eynsham Abbey (Serjeantson 2006), and the consumption of chickens was a mark of wealth and social status (Serjeantson 2009)

Medullary bone was noted on two specimens from the Phase 4b assemblage and two specimens from the Phase 5 assemblage, indicating the presence of hens in lay. No spurred tarsometatarsi were recovered. The assemblage does not contain a sufficient quantity of measurable bones to permit metrical analysis though all measurements are available in the archive.

The majority of the bird bones recovered from Trench Y5 were identified as domestic fowl. A total of 210 domestic fowl specimens were recovered from the features dating to Phase 3 and 136 specimens were recovered from Phase 4a. The majority of the slaughtered fowl were mature hens and it is suggested that fowls were kept for eggs and eaten when their laying days were over (Serjeantson 2000).

Small quantities of goose bones were recovered from the 2006/8 evaluations deposits dating from the late 12th century onwards. Nine fragments have been identified as Greylag goose (*Anser anser*), though it is not possible to distinguish securely between the wild and domestic forms. Two fragments of bone from Phase 5, including the shaft of a coracoid and a tibiotarsus, have been noted as being particularly large and may represent domestic birds. Three fragments could not be identified to species though two are thought to derive from the larger *Anser* sp and one from the smaller *Branta* sp.

Duck has been identified in both the Phase 4b and 5 assemblages. The Phase 4b assemblage contains one tarsometatarsus that has been positively identified as mallard (*Anas platyrhynchos*) based on size and morphology. A single radius and a scapula from Phases 4b and 5 respectively could be either pintail (*Anas acuta*) or wigeon (*Anas penelope*) as the specimens could not be distinguished with reference to morphology or size.

Rook/crow were present in small numbers and probably represent the remains of scavengers. Species separation was not possible due to destruction of the diagnostic characteristics.

Sixteen pigeon bones are present and two have been identified as the larger woodpigeon (*Columba palumbus*), based on size comparisons with a modern reference collection. However, it has been noted that the size range of domestic pigeons (*Columba livia*) varies greatly (Serjeantson 2009, Tomek and Bochenski 2009) so it is possible that the larger specimens derive from large domestic birds. Tomek and Bochenski (2009) outline morphological criteria that can be applied to separate wood pigeon and domestic pigeon/rock doves with reference to nine skeletal elements. These criteria focus on differences in the morphology of the proximal and distal articulations. Unfortunately, the specimens in the assemblage were from the shaft areas or were in too poor a condition for the criteria to be of use.

Of the 14 smaller specimens recovered, ten have been noted as being unfused or porous. Juvenile bones have been recovered from Phases 4a, 4b and 5. The four adult bones are thought to derive from domestic pigeon/rock dove (*Columba livia*) based on size comparison and morphological criteria (Tomek and Bochenski 2009).

Pigeon bones become common in domestic waste from the 11th century onwards when they became a routine part of the upper class diet (Serjeantson 2009). Prior to the 18th century, dovecots were expensive, prestige buildings erected as symbols of wealth (McCann 1991). Integral nests were built into the stone keeps of Rochester Castle and Conisborough Castle, and by the early 14th century many manors had at least one free-standing dovecot (Stone 2006). Juvenile Columbidae specimens were recovered from medieval contexts at Windsor Castle in varying proportions (2%-42% of all columbid bones) (Baker 2010).

The relatively high percentage of immature columbid bones (63% of the total assemblage) at Carisbrooke can be taken as evidence of the consumption of squabs, immature birds that are eaten at about 4 weeks and before the bird fledged and began to toughen its flying muscles (McCann 1991). Medieval household accounts show that doves were not consumed all year round but eaten in summer and autumn (Dyer 2006) and then were virtually off the menu until Easter (McCann 1991). The dovecote did not provide fresh meat in winter except in tiny quantities on very rare occasions (McCann 1991).

Evidence for the consumption of immature birds has been recovered from a number of high-status sites including Hextalls manor in Surrey. Excavations revealed a 16th century pit thought to contain the remains of a feast. A large number of immature specimens from small birds including pigeon were recovered by hand and through sampling (Bourdillion 1998).

Immature columbid specimens have also been recovered from high status ecclesiastical sites such as St Gregory's Priory, Canterbury (Serjeantson 2001). The columbid remains were comparable in size to domestic pigeons. A total of 21 columbid specimens were recovered through hand collection and from soil samples. The columbid specimens account for 2% of the total number of bird bones though only two samples were taken so small birds are likely to be underrepresented. The majority of these bones derived from juvenile birds and all except one showed evidence of immaturity (Serjeantson 2001).

Juvenile pigeon bones were also recovered from Eynsham Abbey, Oxfordshire (Ayres *et al* 2003). Although pigeon bones were rare, these juvenile bones suggest that the birds were kept in dovecots from which the young were taken.

Evidence of peafowl was recovered from the Phase 3 ditch fills in Trench Y5 (Serjeantson 2000). A distal coracoid and a complete, spurred tarsometatarsus were found. Peafowl are widely considered to be a Norman introduction as they are largely absent from pre-Conquest assemblages (Sykes 2007). The presence of peafowl provides further evidence regarding the status of the castle as they were a symbol of power and wealth (Serjeantson 2000). During the Middle Ages the keeping and consumption of these birds was restricted to the upper classes (Serjeanston 2009). In Britain and France, the majority of pea-fowl bones have been recovered from high-status sites (Sykes 2007). In Britain peafowl remains have been recovered from high status sites such as the manor at Faccombe Netherton (Sadler 1990), Portchester Castle in Hampshire (Eastham 1977), Ludgershall Castle in Wiltshire (Poole n.d) and Windsor Castle (Baker 2010). The birds were utilised for more than just food as their bright distinctive plumage made them aesthetically attractive (Poole 2010).

Pathology

Just four pathological specimens were noted in the assemblage from the 2006/2008 evaluations. Context [240], Phase 4b, contains a cattle calcaneum on which periostosis has been noted above the sustentaculum tali (Schmid 1972). Context [7319], Phase 5, contains a cattle atlas and small pits have been noted in the bone on the dorsal surface below the caudal articulation. Context [7318}, Phase 5, contains two pathological specimens. The first is a cattle 2nd phalanx which displays signs of oseteoarthritus including grooves in the articular surface, new bone formation around the articular surface and exostoses around the periphery of the bone (Baker and Brothwell 1980).

The second specimen from context [7318] has been identified as a proximal, lateral part of a sheep/goat radius. An osteophyte has been noted on the lateral side of the articulation. Exostoses around the elbow joints is relatively common. A widely accepted explanation for this pathology is that it results from the exposure of this relatively vulnerable site to trauma when the animals are put through races or pens (Baker and Brothwell 1980).

DISCUSSION

The determination of status is an important research theme and it is commonly accepted that social status is defined in part by diet (Salisbury 1994). Analysis has revealed that kitchen and food waste is the probable source of this assemblage which has provided an opportunity to examine the status of the castle's inhabitants through the food they consumed.

A comprehensive survey of Late Saxon and post-conquest sites, undertaken by Sykes (2007), shows that elite sites can be classified by their zooarchaeological record. The primary characteristics of elite sites dating to the Norman period include an abundance of pigs, wild animals and domestic fowl (Sykes 2007).

Figure 10 represents the percentage NISP of pigs, medium-sized galiforms and wild mammals (deer, red deer, fallow deer, rabbit, hare and lagomorph). The calculations include hand-collected material from Trench Y5 and the 2006/2008 evaluations as well as the assemblages from the soil samples taken during the 2006/2008 evaluations.

Figure 10: The % NISP of pigs, medium-sized galiforms and deer and lagomorph remains from the 2006/2008 evaluations and Trench Y5.

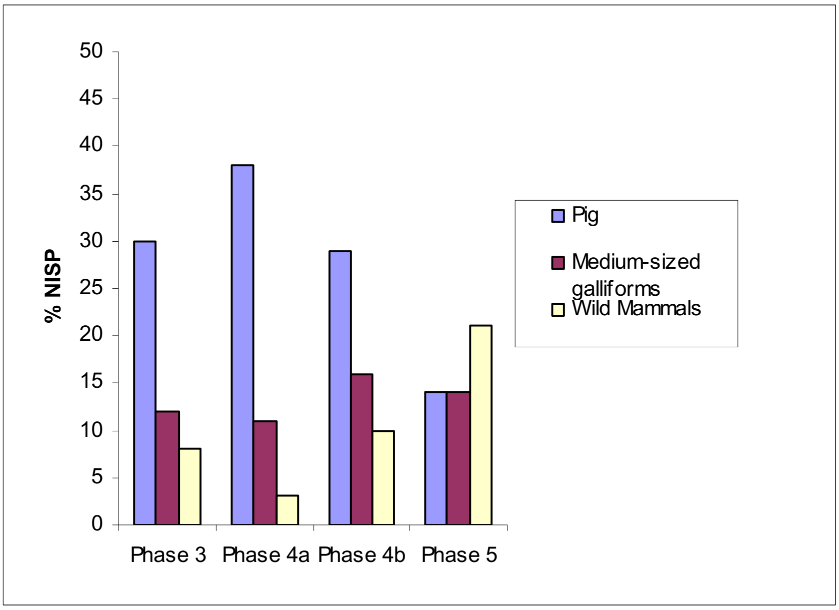


Figure 10 indicates that although the ratio of pigs, medium-sized galiforms and wild animals changes over time, in total the three taxa contribute to c.50% of the total NISP in all Phases which conforms to the primary characteristic of elite sites as noted by Sykes (2007).

The greatest change in the ratio of pigs, wild mammals and medium-sized galliforms can be seen in Phase 5 as the number of pig specimens recovered decreases considerably and we see a corresponding rise in the number of wild mammal specimens. Albarella and Davis (1996) analysed the proportion of the three main domesticates from a range of site types including castles, town and villages. The results indicated that pigs were more abundant on castle sites than in town and villages though they become less abundant on high status sites towards the end of the medieval period, a decline which was echoed on all site types by the Post-medieval period (Albarella and Davis 1996). There are a number of theories behind the decline in pork consumption including the idea that pork began to be considered as a food for peasants. Timber became more widely exploited in the post-medieval period which led to a reduction in woodland. Woodland was important to pig management which focused around the seasonal system of pannage (Albarella 2006).

Further evidence regarding the status of Carisbrooke Castle can be gathered by comparing the zooarchaeological data with evidence from two local castles located on the mainland, Portchester Castle, Hampshire (Grant 1977) and Southampton Castle (Oxley 1986). Both of these castles produced assemblages of a comparable period and have both been interpreted as primarily defensive sites that took on a more domestic role in the later phases (Cunliffe 1977, Oxley 1986).

The history of Portchester Castle reveals that the existing defences were modified by the Normans in the late 11th century and further modifications and repairs were undertaken in the 14th century when the castle became a military stronghold during the Hundred Years War. At the end of the 14th century the castle took on a more domestic role and was converted into a residence for Richard II (Cunliffe 1977).

The animal bone assemblage from Portchester Castle contains 3203 identifiable fragments from contexts dating from AD1000-1570. The assemblage was recovered from pits and gullies and is thought to represent domestic refuse either from the occupation of the outer bailey or from the Castle (Grant 1976).

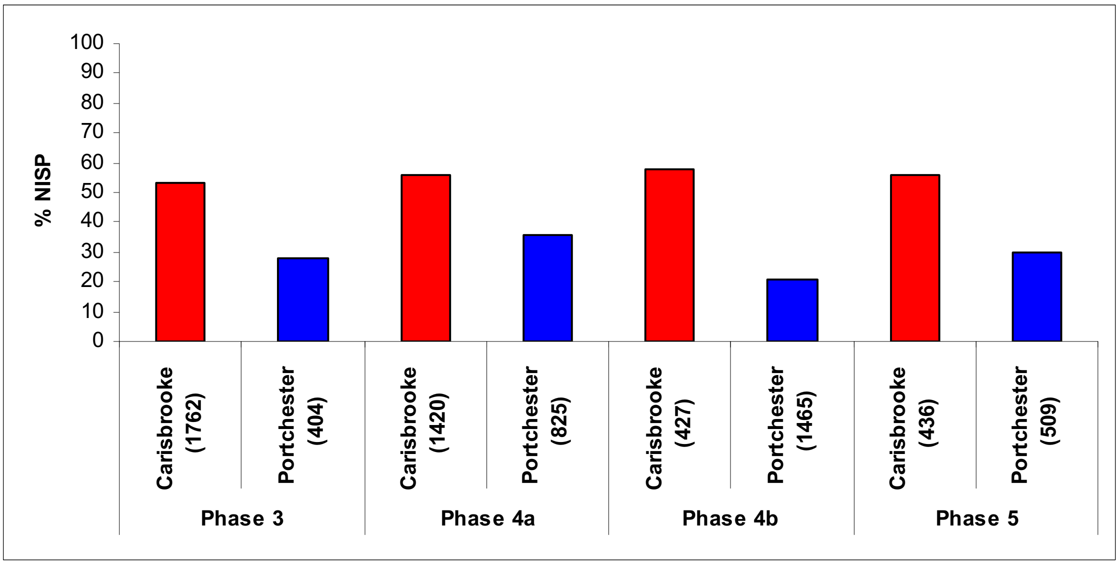
The proportions of the three main domesticates at Portchester Castle show some variation with the Carisbrooke assemblage (including the assemblages from the 2006/2008 evaluations and Trench Y5) when compared using MNI counts. Analysis of the data from Portchester Castle reveals that, of the three main domesticates, pigs are the least abundant taxa with the exception of the 12th century assemblage (Phase 4a) where they are the second most abundant taxa. Pigs play a more important role at Carisbrooke Castle being the second most abundant taxa, according to MNI, in Phases 3, 4a and 4b (11th-15th Century).

As previously mentioned, the proportion of pigs, wild mammals and domestic fowl is a good indicator of status (Sykes 2007). Wild mammals are represented in increasing numbers at Portchester Castle where they account for <1%, 2%, 3% and 14% of the Phase 3, Phase 4a, Phase 4b and Phase 5 assemblages respectively in terms of percentage NISP. Hunting may have formed part of the lifestyle of the inhabitants of Portchester Castle and evidence of red deer and roe deer were recovered from all phases (AD 1000 – 1570) and fallow deer were present in increasing quantities from the Norman period onwards (Grant 1977). Grant (1976) identifies fallow deer in Saxon deposits though a re-examination of these specimens proved that they have been misidentified (Sykes 2004). Lagomorph remains were recovered in very small quantities and only from the later phases with seven fragments retrieved from Phase 4b and 14 fragments from Phase 5. Hares and rabbits may be underrepresented as sieving was not undertaken.

A small number of bird bones were retrieved though birds are likely to be underrepresented due to recovery techniques. The bird bone assemblage was dominated by domestic fowl though NISP counts for individual taxa are not presented (Eastham 1977).

The NISP counts for pig, wild mammals (including deer, red deer, fallow deer, rabbit, hare and lagomorph) and all birds (the NISP counts for domestic fowl are not given) have been compared by phase with the data from Carisbrooke Castle (Figure 11). The total number of fragments recovered from each phase, including all mammals and birds, is presented in brackets. The Carisbrooke Castle assemblage includes the hand-collected bone, the specimens retrieved from the soil samples and the assemblages from trench Y5.

Figure 11: A comparison of the NISP counts for pig, wild mammals and birds from Carisbrooke Castle ad Portchester Castle including hand-collected and specimens



The number of pig, wild mammals and bird specimens recovered from Portchester is lower in all phases when compared with the data from Carisbrooke Castle. However, the assemblages from Portchester Castle were hand-collected only and so small bones, such as bird and lagomaroph, are likely to be underrepresented. If we compare the hand-collected assemblages only, the percentage NISP of pigs, wild mammals and birds from Carisbrooke Castle (including the material from Trench Y5) is 53%, 57%, 55% and 50%

for Phases 3, 4a, 4b and 5 respectively which, in all phases, is higher than the counts from Portchester Castle.

Excavations at Southampton Castle produced a relatively large hand-collected animal bone assemblage from the castle bailey (SOU 29). Documentary and archaeological evidence suggests that the castle's role was primarily a defensive one until the 16th and 17th centuries when it ceased to be of economic or defensive importance and was utilised as a rubbish dump and grazing area (Oxley 1986).

The animal bone assemblage contains 2512 identified fragments dating from the 11th to the 16th century. The NISP counts show that sheep/goat were the most abundant species in the earlier periods, 11th- mid/late 12th century), with the emphasis shifting to cattle in the later phases (late 12th – 16th century). Of the three main domesticates, pigs were the least abundant taxa in all phases. Bourdillon (1986) concludes that the relative absence of pig, wild birds, fish and the presence of older cattle and sheep indicates that the inhabitants of the castle were not consuming the choicest of foods. Neither deer nor lagomorph remains were recovered in significant quantities from Southampton Castle; deer contribute to just 1% of the total NISP from the 12th century onwards. However, only 10% of the total castle area has been excavated and it may be that the areas used for rubbish disposal by the inhabitants of the castle have not been uncovered (Oxley 1986).

A comparison of the zooarchaeological data from Carisbrooke, Portchester and Southampton Castle suggests that the inhabitants of Carisbrooke Castle enjoyed a diet of higher status represented by relatively large quantities of pig, wild mammals and birds. Carisbrooke Castle was periodically occupied by Lords or Captains including Countess Isabella in the later 13th century and George Carey, the Queens cousin, in the later 16th century (Young 2000). The animal bone assemblage may derive from the food supplied to these high-status inhabitants.

CONCLUSION

The evaluations of the area known as the privy garden has produced evidence of a high-status diet during the late 12th to 18th century (Phase 4b and 5). A re-evaluation of the zooarchaeological data from Trench Y5 and comparison with local sites suggests that, contrary to original findings (Smith 2000), the inhabitants of the castle enjoyed a high-status diet from the 11th century onwards.

Fallow deer are present on-site from the 11th century onwards and the element distribution and butchery evidence on cervid specimens is indicative of the 'unmaking process' associated with Norman hunting techniques. The presence of squabs, peacock, hares, rabbits and the high proportion of domestic fowl and pig are all indicative of a high status diet. The mammal bone assemblage reflects kitchen and table waste whilst evidence of primary butchery has been noted during analysis of the domestic fowl assemblage (Serjeantson 2000). These results suggest that the 12th century building to the east of the site may have had a culinary connection

The analysis of the cattle, sheep/goat and pig assemblages reveal an absence of neonatal and very old animals which is indicative of a consumer rather than a producer site. The inhabitants of the castle were privileged enough to have access to restricted meat such as deer and hare. The presence of older cattle and sheep/goat, particularly in the later phases, may indicate that prime-meat was not being supplied in the same quantities as in the earlier phases. This may be due to dietary preference though it may indicate that suppliers were more concerned with the secondary products from these animals than their value as a meat resource.

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APPENDIX 1: Mandibular tooth measurements taken in accordance with Payne and Bull (1988). The data for Portchester Castle, Guildford Castle and Faccombe Netherton has been taken from Sykes (2007).

Site	Century	Tooth	WA	WP
Carisbrooke Castle	12th-15th	M1	9.5	10.2
			8.9	9.1
			9.3	9.9
			10.1	11.2
			9.5	10.8
			8.7	9.7
			8.9	9.7
Portchester Castle, Hampshire	11th/12th	M1	10.6	11.5
Portchester Castle, Hampshire	12th	M1	10.8	11.8
			10.4	11.1
			9.5	10
Portchester Castle, Hampshire	11th-13th	M1	10.9	11.9
			9.6	10.3
			9.9	10.5
			11	10.6
			9.5	10.7
			10.5	12.1
			10.7	11.2
			9.8	10.7
			9	10
			10.2	11.2
			9.9	10.6
			10.7	11.2
Guildford Castle, Surrey	12th/13th	M1	9.9	10.6
			9.8	10.7
			11	11.4
Guildford Castle, Surrey	13th	M1	9.5	10.3
			9.8	11
			8.9	10
			10.2	11.3
			10.3	11.3
			8.9	9.9
			8.9	9.8
			8.9	9.5
			9.8	10.9
			9.1	9.4
			9.1	9.4
			10.5	11.7
			9.4	9.7
			9.1	10.3
			10.5	11.3
			9.7	10.5
			9.1	10
			9.9	10.4

Appendix 1(continued): Mandibular tooth measurements taken in accordance with Payne and Bull (1988). The data for Portchester Castle, Guildford Castle and Faccombe Netherton has been taken from Sykes (2007).

Site	Century	Tooth	WA	WP
Guildford Castle, Surrey	13th	M1	9.4	9.7
			10.3	10.7
			10.3	10.7
			10	11
			10.1	10.3
			10.6	10.4
			10.4	11
			9.9	10.3
			9.5	10.6
			10	11.2
			9.6	10
			10.1	10.3
			9.5	10.3
			10.2	11.2
Guildford Castle, Surrey	13th/14th	M1	10.5	10.7
			9.5	10.3
			10.2	11.2
			9.5	10.5
			10.2	10.5
			10	10.4
Guildford Castle, Surrey	14th/15th	M1	10.1	11.2
			9.1	10.2
			9.7	9.9
Faccombe Netherton, Hampshire	13th/14th	M1	10.4	11.7
			9.8	11
			9.7	11
			10.2	10.7
			10.8	11.5
			10.4	10.8
			9.7	10.4
			9.6	10.9
			9.7	10
			10.9	11.1
			10	10.5
			10.4	11.3
			10.4	10.6
			9.9	10.2
			10.2	10.9
			9.2	10
			10.5	11
			9.2	9.8
			9.5	10
			10	10.6
			9.3	10.8
			9.7	10.6

Appendix 1(continued): Mandibular tooth measurements taken in accordance with Payne and Bull (1988). The data for Portchester Castle, Guildford Castle and Faccombe Netherton has been taken from Sykes (2007).

Site	Century	Tooth	WA	WP
Faccombe Netherton, Hampshire	13th/14th	M1	8.7	9
			10.6	11.3
			9.6	10.1
Carisbrooke Castle	12th-15th	M2	11.9	12.6
			12.2	12.8
			11.8	11.6
			11.5	12.7
			10.5	11.5
			11.3	11.1
Portchester Castle, Hampshire	13th	M2	13.9	13.9
			13	13.5
			13.2	13
			14.3	13.4
			12.6	13.9
			11.6	12.4
Portchester Castle, Hampshire	14th	M2	13.4	13.4
			13.5	13.5
			12.1	12.3
Guildford Castle, Surrey	13th/14th	M2	13.6	13.8
			13	12.9
			12	12.5
			11.1	11.7
			12.8	13.5
			12.7	12.9
			12.5	12.9
			12.9	13.3
Guildford Castle, Surrey	14th/15th	M2	11.1	11.8
			13.6	13.9
			13.6	13.7
			12.4	12.4
Faccombe Netherton, Hampshire	11th/12th	M2	14.2	13.5
			13.3	13.5
			11.9	11.9
			12.2	12.9
			12	14.1
			12.3	14.1
			11.7	12.6
Faccombe Netherton, Hampshire	11th/13th	M2	12.3	12.5
			12.6	13.2
			12.3	12.4
			11.8	12.4
			12.7	12.6
			12.1	12.1
			12	12.6
			11.4	11.1

Appendix 1(continued): Mandibular tooth measurements taken in accordance with Payne and Bull (1988). The data for Portchester Castle, Guildford Castle and Faccombe Netherton has been taken from Sykes (2007).

Site	Century	Tooth	WA	WP
Faccombe Netherton, Hampshire	11th/13th	M2	12.3	12.2
			12.3	12.1
			11.7	12.5
Faccombe Netherton, Hampshire	13th/14th	M2	12.8	13.8
			12.9	13
			12.9	13
			11.4	12.9
			12.9	13.3
			12.5	12.8
			12.3	12.6
			14.2	14.5
			13.7	14.2
			14.1	13.5
			12.5	13.1
			13	13.5
			11.4	12.4
			12.1	12.2
			13	13.4
			13.2	13.9
			11.6	12.1
			12	12.2
			12.7	12.4
			12	13.3
			12.7	12.8
			11.7	12.5
			11	11.2
			14.9	14
			11.4	11.7
			12.3	12.7

APPENDIX 2: Bird bone metrical data

Phase	Taxa	Element	GL	SC	Bp	Bd	Bb	BF	bLa	bDip	Lm	bGL	bLm	bSC	bBp	bDp	bBd	bDd	bDic
4b	Chicken	Coracoid	47.5					10.8			47								
4b	Chicken	Coracoid					13.2	11											
5	Chicken	Coracoid																	
4b	Chicken	Femur										70.6	66.5	4.7	12.8	7.9	12.2	10.2	
5	Chicken	Femur										87.6	81.7	6.9	16.4	11.4	13.7	13	
5	Chicken	Femur													12.2	7.6			
4b	Chicken	Humerus										73.6		6.2	19.2		15.9		
4b	Chicken	Humerus										61.9		4.87	16.6		13.2		
5	Chicken	Humerus										73.9		6.5	20.3		14.8		
5	Chicken	Humerus										74.6		5.9	19.9		16.3		
5	Chicken	Humerus										64.2		5.4	16.3		13.8		
4a	Chicken	Metatarsal													10.1				
4b	Chicken	Metatarsal															11.7		
4b	Chicken	Metatarsal													11.3				
4b	Chicken	Metatarsal										63.9		4.7	10.3		10.4		
4b	Chicken	Metatarsal										78.1		5.1	12.4		12.5		
4b	Chicken	Metatarsal										63.2		4.6	12.2		11.8		
4b	Chicken	Radius	58.7	1.4		6.3													
5	Chicken	Radius			4.8														
4b	Chicken	Scapula																	9.8
4b	Chicken	Tibia															9.2	9.9	
4b	Chicken	Tibia								19.1									
4b	Chicken	Tibia							98	18.5		102		4.4			9.1	9.9	
4b	Chicken	Tibia															9.0	9.8	
4b	Chicken	Tibia	64.6	2.9	7.0														
5	Chicken?	Scapula																	10.2
5	Chicken/Guinea Fowl/Pheasant	Radius			4.5														

Appendix 2 (continued): Bird bone metrical data

Phase	Taxa	Element	GL	SC	Bp	Bd	Bb	BF	bLa	bDip	Lm	bGL	bLm	bSC	bBp	bDp	bBd	bDd	bDic
5	Chicken/Guinea Fowl/Pheasant	Ulna			9.0														
5	Chicken/Pheasant	Radius				5.4													
5	Chicken/Pheasant	Tibia															11.6	12.2	
5	Chicken/Pheasant	Scapula										65.4							9
5	Chicken/Pheasant	Humerus										71.3		6..2	19.1		16.8		
4b	Chicken/Pheasant	Humerus															13.8		
4b	Chicken/Pheasant	Humerus												5.5			13.1		
4b	Chicken/Pheasant	Femur															12.9	10.8	
4b	Chicken/Pheasant	Scapula																	11.9
4b	Mallard/Domestic Duck	Metatarsal													8.3				
4b	Mallard/Domestic Duck?	Scapula																	9.9
5	Domestic/Greylag Goose	1st Phalanx																	
5	Domestic/Greylag Goose	1st Phalanx	22	3.9	5.8	4.2													
4b	Rook/Carrion Crow	Humerus												5.5			17.3		

APPENDIX 3: Mammal bone metrical data

Phase	Taxa	Element	GLl	Dd	GLm	Dl	Bd	GL	SD	BT	Bp	Dp	LA	Ld	SLC
5	Cattle	Astragalus	59.0		55.2	34.4	37.9								
4b	Cattle	Astragalus	55.1		51.0		36.9								
5	Cattle	Calcaneus						115.6							
4b	Cattle	Metacarpal					53.5								
4b	Cattle	Metacarpal					52.6								
5	Cattle	Metacarpal									58.1				
4a	Cattle	Metacarpal					55.6	172.2	29.6		52.7				
5	Cattle	Metacarpal					55.1								
5	Cattle	Metacarpal									43.6				
5	Cattle	Metacarpal					57.0								
5	Cattle	Metacarpal					61.1								
4a	Cattle	1st Phalanx					26.9	56.8			27.6				
4b	Cattle	1st Phalanx					25.3	55.2	23.3		26.3				
4b	Cattle	1st Phalanx					28.9	58.1	26.0		31.6				
5	Cattle	1st Phalanx					19.6	51.6	19.6		22.4	25.8			
5	Cattle	2nd Phalanx					23.1	37.6	21.9		27.0				
4b	Cattle	2nd Phalanx					21.6	34.4	19.9		24.4				
4b	Cattle	2nd Phalanx					20.2	36.6	21.4		27.1				
4b	Cattle	2nd Phalanx					22.9	34.7	24.6		28.7				
5	Cattle	2nd Phalanx												49.4	
4b	Cattle	3rd Phalanx													
5	Cattle	Radius							26.9						
5	Cattle	Radius									74.2				
5	Cattle	Tibia		44.2											
5	Cattle	Tibia		39.4			53.5								
4b	Dog	Femur					35.0								
5	Red/Fallow deer	1st Phalanx					11.9	42.9	9.4		12.7				
5	Red/Fallow deer	1st Phalanx					11.7	41.8	8.9		15.2				
5	Red/Fallow deer	1st Phalanx					12.5	41.5	8.9		14.0				

Appendix 3 (continued): Mammal bone metrical data

Phase	Taxa	Element	GLl	Dd	GLm	Dl	Bd	GL	SD	BT	Bp	Dp	LA	Ld	SLC
5	Red/Fallow deer	Calcaneus						85.4							
5	Fallow Deer	Astragalus	37.0		35.3	21.8	24.8								
5	Fallow Deer	Femur					44.5								
4b	Fallow Deer	Metacarpal					26.2	176.9	14.8						
4b	Fallow Deer	Metatarsal					36.8								
5	Fallow Deer	Metatarsal					30.8								
4b	Fallow Deer	1st Phalanx					13.3	45.4	10.8		15.7				
5	Fallow Deer	1st Phalanx						44.2							
3	Fallow Deer	Tibia					35.5		23.7						
5	Fallow Deer	Tibia		24.4			31.6								
5	Fallow Deer	Tibia		26.4			31.8								
5	Fallow Deer	Tibia		27.0			32.0								
5	Fallow Deer	Tibia		25.4			32.5								
4b	Cat	Tibia					10.6		4.3						
4a	Lagomorpha	Tibia					13.3								
4a	Hare	Pelvis											13.5		
5	Hare	Tibia													
5	Hare	Tibia									13.1				
4b	Hare	Calcaneus						32.4							
5	Sheep/goat	Calcaneus						48.1							
5	Sheep/goat	1st Phalanx					9.9	29.8	8.4		10.8				
4b	Sheep/goat	Scapula													17.6
4b	Sheep/goat	Scapula													18.2
4b	Sheep/goat	Scapula													18.4
4b	Sheep/goat	Scapula													18.7
4b	Sheep/goat	Scapula													19.4
4b	Sheep/goat	Scapula													18.1
5	Sheep/goat	Scapula													18.4
5	Sheep/goat	Scapula													22.5

Appendix 3 (continued): Mammal bone metrical data

Phase	Taxa	Element	GLl	Dd	GLm	Dl	Bd	GL	SD	BT	Bp	Dp	LA	Ld	SLC
5	Sheep	Astragalus	24.2				16.2								
4b	Sheep	Humerus					28.1			25.4					
4b	Sheep	Humerus					27.5			26.8					
4b	Sheep	Humerus					27.1								
4b	Sheep	Humerus					27.2								
4b	Sheep	Humerus					29.6								
4b	Sheep	Humerus					27.1								
4b	Sheep	Humerus					28.0								
5	Sheep	Humerus					27.2			24.5					
5	Sheep	Radius									27.4				
3	Sheep	Tibia							11.7		23.2				
4b	Sheep	Tibia					22.4								
4b	Sheep	Tibia					23.4								
4b	Sheep	Tibia					22.4								
5	Sheep	Tibia		19.6			24.5								
5	Sheep	Tibia		17.2			22.6								
5	Sheep	Tibia		19.0			23.9								
5	Sheep	Tibia		17.6			24.3								
5	Sheep	Tibia		19.0			24.1								
4b	Pig	Radius									25.5				
5	Pig	Tibia		26.9			30.9								
4b	Pig	Scapula													21.4
4b	Pig	Humerus					35.9								
5	Pig	Humerus					37.3								

APPENDIX 4: Tooth wear data, including isolated teeth and mandibles. Pig tooth wear has been recorded in accordance with Grant (1982), and sheep/goat tooth wear has been recorded in accordance with Payne (1973).

Phase	Taxa	dP4	P4	M1	M2	M3
3	Pig		c	m	d	
4a	Pig				c	
4b	Pig		E	e	b	E
4b	Pig	a				
4b	Pig		d	f		c
4b	Pig		a	d	b	
4b	Pig		b			
4b	Pig				c	E
4b	Pig			k		
4b	Pig		b	g	c	
4b	Pig		B			
4b	Pig	f		c	1/2	
4b	Pig			e	c	
4b	Pig					V
5	Pig		d	m	f	
5	Pig		d			
5	Pig		b			
5	Pig	g		b		
5	Pig					
4b	Sheep	4A				
5	Sheep	6A		C		
8	Sheep		7A	14A	9A	11G
8	Goat?		15A	15A	14C	15H

Key: dp4– decidous 4th pre-molar, P4– 4th pre-molar, M1– 1st molar, M2– 2nd molar, M3– 3rd molar

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