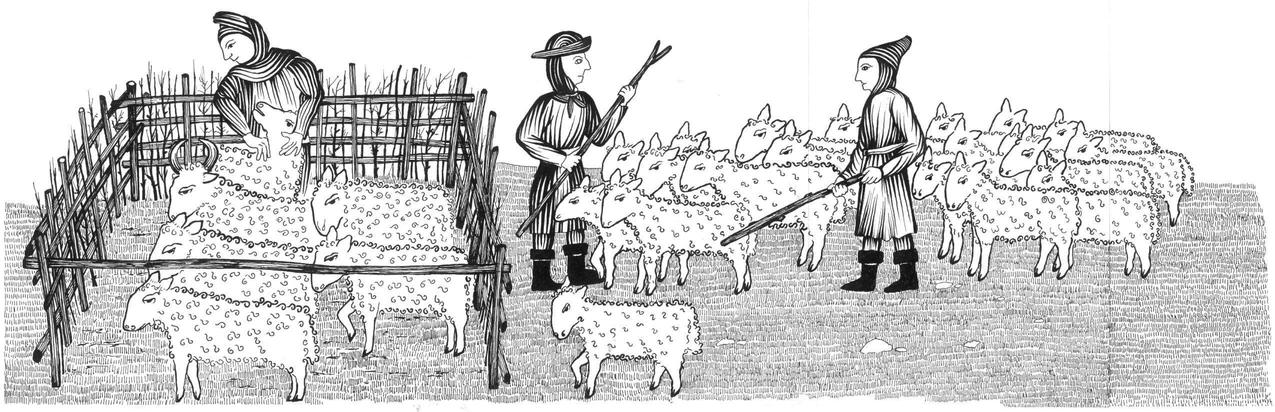
Burton Dassett Southend

Part 2 Section 8.20

Faunal Remains

by
Julie Hamilton



The results of the excavations conducted at Burton Dassett Southend 1986-88, together with subsequent fieldwork (fieldwalking, and recording of the Chapel and Priest's House) are disseminated in two parts.

Part 1 is the printed volume *Burton Dassett Southend, Warwickshire: A Medieval Market Village* by Nicholas Palmer and Jonathan Parkhouse, Society-for Medieval Archaeology Monograph 44 (2022). The printed volume contains the following sections:

1. Introduction and background (aims and origin of the project, key issues, archaeological and historical contexts, fieldwork scope and methodology, summaries of earthwork survey and fieldwalking)
2. The archaeological sequence (summary of the structural evidence, ordered by phase)
3 Spatial organisation and the buildings at Southend
4 Daily life and economy at Southend
5 Conclusion
Bibliography

Part 2 consists of a series of digital files in .pdf and .xlsx format, available via the Archaeological Data Service at https://doi.org/10.5284/1083492. Whilst Part 1 is a free-standing narrative, Part 2 includes the detailed descriptions and specialist analyses underpinning the printed volume. It consists of the following sections:

6.1 Geology by John Crossling
6.2 Soils by Magdalen Snape
6.3 Earthwork survey by Nicholas Palmer
6.4 Excavation methods by Nicholas Palmer
6.5 Dovehouse Close fieldwalking 1987 & Chapel Ground fieldwalking 1991 by Nicholas Palmer
7. Fieldwork (detailed description of the structural evidence at individual context level, ordered by area/tenement and phase) by Nicholas Palmer
8.1 Medieval pottery by Stephanie Rátkai
8.2 Coins and jettons by Wilfred Seaby
8.3 Copper alloy objects by Alison R Goodall with contribution by Dr John Blair
8.4 Analyses of copper alloy objects by Dr Roger Brownsword and E E H Pitt
8.5 Pewter objects by Brian Spencer and Nicholas Palmer, with analyses of pewter spoons by Dr Roger Brownsword and E E H Pitt
8.6 Lead objects by Nicholas Palmer
8.7 Ironwork by Dr Ian H Goodall, with spurs by Blanche Ellis
8.8 Bone, jet, glass and miscellaneous by Iain Soden and Nicholas Palmer
8.9 Domestic stonework by Iain Soden, John Crossling and Nicholas Palmer
8.10 Architectural stonework by Iain Soden
8.11 Stone roofing material by Nicholas Palmer
8.12 Roof tiles and ceramic artefacts by Susan Lisk
8.13 Archaeometallurgical investigation of the smithy and other evidence by Dr J G McDonnell and Alison Mills
8.14 Coal by Dr A H V Smith
8.15 Human remains by Ann Stirland
8.16 Clay tobacco pipe by Nicholas Palmer
8.17 Flint by Dr L H Barfield
8.18 Late Bronze Age pottery by Alistair Barclay
8.19 Roman and Saxon pottery by Paul Booth
8.20 Faunal remains by Julie Hamilton
8.21 Plant economy by Lisa Moffett
8.22 Radiocarbon dating of spelt wheat by Rupert Housley
8.23 Archaeomagnetic dating of hearths by Paul Linford
9. Miscellaneous data tables

The bibliography, incorporating all the works cited in Part 1 and Part 2, is also available digitally.
(Excel spreadsheets for all tables in this section are in BD_faunal_remains_data_tables)

Cover illustration by Gavin Lines

8.20 FAUNAL REMAINS *by Julie Hamilton*

Introduction

The groups dealt with in this report comprise mammals, birds, reptiles, amphibia, fish and marine shells. The majority of the bone was recovered by hand excavation. A series of soil samples taken for botanical analysis was sieved for small bones and to provide a control on bone recovery, and this proved important for bird, small mammal, amphibian and fish remains, and also gave taphonomic information. Some bone was recovered during fieldwalking (BD87 and BD91). The BD87 bone was identified and recorded, but it contributed little extra information and is not included in this report. The BD91 bone was not studied.

At first sight, two sets of comparisons appeared potentially interesting: changes through time, and differences between tenements. There were two main groups of tenements, north and south of the road; those south of the road were abandoned early in the 15th century while those north of the road were still occupied when enclosure took place in 1497. In practice, each tenement seemed to have bone from one main period (the latest occupation) and demolition layers. The material in the topsoil seemed to be largely derived from the medieval features, like the pottery, but was less well preserved. Analysis therefore concentrated on bone from medieval features and demolition layers. However, because excavation was less complete south of the road and much bone came from topsoil layers, this did limit the comparisons that could be made. It seems likely that much of the bone derived from domestic waste, and that yards were periodically cleared; hence the time depth was not great. Indeed, the deposits could be considered as a 'snapshot' of what was present at the time of demolition and enclosure. There was little scope for investigating changes through time, and even comparisons between tenements were somewhat limited by the very uneven distribution of the bone between them.

In the following sections the methods of analysis are described, and the species found for the site as a whole are listed. The remains of each species are then discussed, concentrating on the main food species which were also more abundant, to try and deduce population structures and the way in which they were managed and exploited. The next section deals with variations in distribution and preservation by context type and by tenement, and how these may affect interpretation. Finally the economy of the site as a whole is considered.

I am indebted to Sheila Hamilton-Dyer for bird, small mammal, reptile, amphibian and fish identification, and to Jessica Winder for her work on the marine shells. Any mistakes or misinterpretations are entirely my responsibility.

Methods

Quantification

Number of identified fragments (NIF)

All mammal bone fragments identifiable to genus or species (including sheep/goat) and anatomical part were counted. Other fragments were classed as 'large' (cattle/horse size), 'medium' (sheep/pig size), 'medium/small' (cat/dog/hare/rabbit size) or 'small' (rat/mouse/shrew size), and as long bone, rib, or vertebra. Fragments not identified even to this extent were counted as ‘unidentified’. For small mammals, cranial elements that could be identified to species or genus (including teeth) were so identified, as were other important elements such as mole humerus. Other elements were recorded less comprehensively as it was felt that little extra information would emerge. Birds and fish were treated like mammals, amphibia like small mammals (they were mainly frog/toad). For oysters, the main point of interest was measurement and analysis of infestation to determine their origin. The remains from the samples were considered as a separate data set, which was sometimes used to check details of the main data set, and which also provided unique information, especially on fish and small mammals.

All sheep/goat bones were checked, where possible, using criteria from Boessneck (1969); no definite goat bones were identified.

Minimum number of individuals (MNI)

MNI was calculated for each element as the minimum number of individuals needed to account for the commonest epiphysis/element, taking account of side of the body where possible (eg not for ungulate phalanges!) and fusion state. For mandibles with teeth and lower third molars/deciduous premolars, which could generally be assigned as right or left, wear state was taken into account. MNI for a species was taken as the greatest of these values. The number of pairs detected of any element was so low as to be negligible. For logistic reasons, MNIs for most elements were calculated on a whole-site basis, and these are shown in Figure 8.20.2.

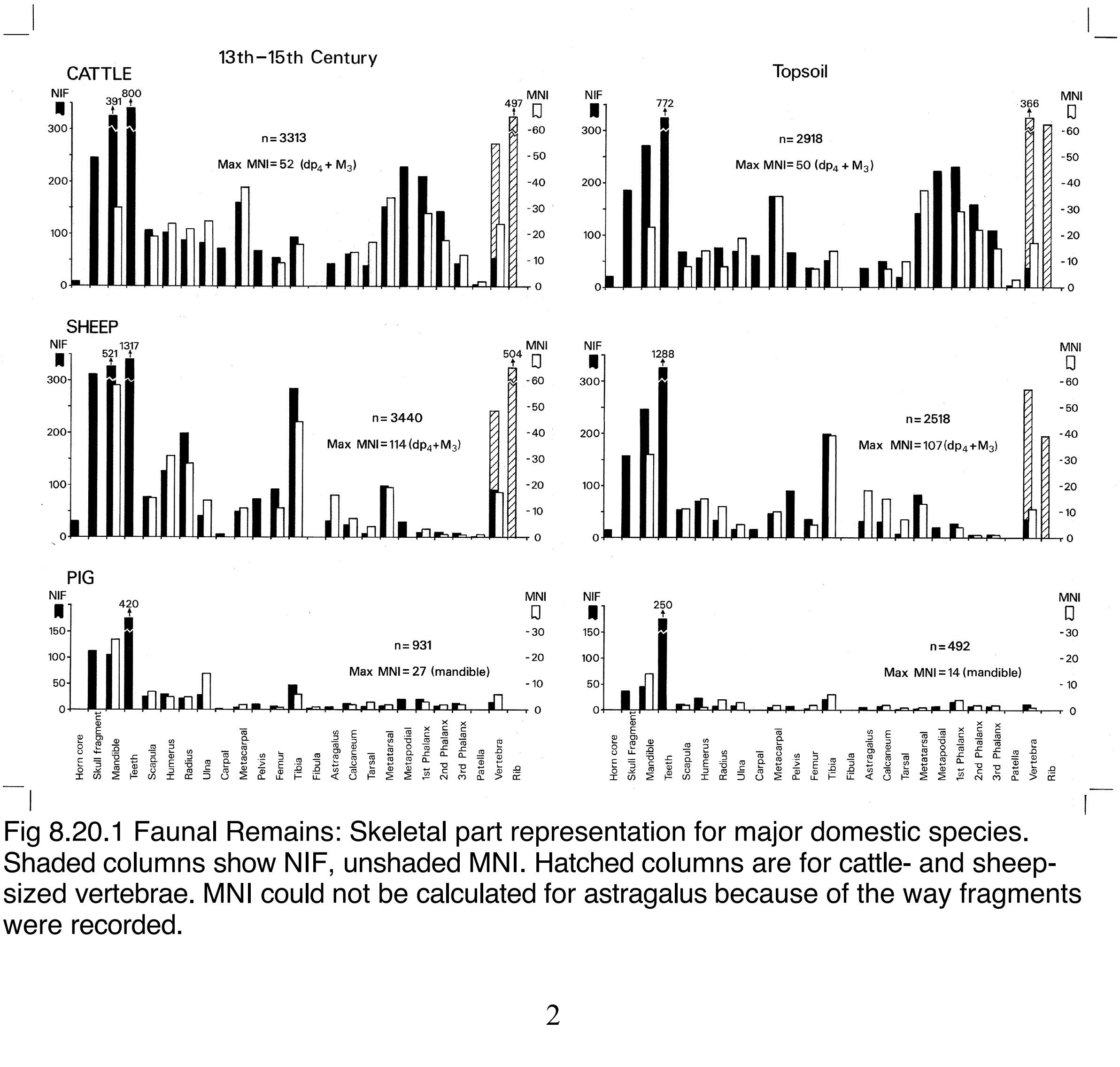


Fig 8.20.1 Faunal Remains: Skeletal part representation for major domestic species. Shaded columns show NIF, unshaded MNI. Hatched columns are for cattle- and sheep-sized vertebrae. MNI could not be calculated for astragalus because of the way fragments were recorded.

	GENERAL CONTEXTS										SAMPLES	
	Pre-medieval		*13th to 15th century*				*Topsoil*				*13th to 15th century*	
	NIF	%	NIF	%	MNI	%	NIF	%	MNI	%	NIF	%
MAMMALS												
Cattle *Bos taurus*	17	35.4	3861	44.3	52	24.5	3112	45.8	50	27.2	31	12.7
Sheep *Ovis aries*	22	45.8	3457	39.6	114	53.8	2761	40.6	107	58.2	102	41.6
Pig *Sus domesticus*	6	12.5	924	10.6	27	12.7	551	8.1	14	7.6	27	11
Horse[b] *Equus caballus*	-		252	2.9	6	2.8	223	3.3	4	2.2	2	0.8
Dog *Canis familiaris*	-		81	0.9	3	1.4	71	1	4	2.2	-	
Cat *Felis domesticus*	3	6.2	109	1.2	5	2.4	45	0.7	2	1.1	71[a]	31
Rabbit *Oryctolagus cuniculus*	-		35	0.4	3	1.4	24	0.4	2	1.1	2	0.8
Hare *Lepus* sp.	-		3	0	1	0.5	4	0.1	1	0.5	1	0.4
Lagomorph Rabbit/hare -			-		-		-		-		3	1.2
Red Deer *Cervus elaphus*	-		1	0	1	0.5	-		-		1	0.4
	48	38.7*	8723	35.2	212		6794	35.8*	184		245	31.5*
Small mammals												
Weasel *Mustela nivalis*	-		-		-		-		-		2	2.9
Mole *Talpa europaea* -			1		1		3		2		3	4.3
Field vole *Microtus agrestis*	-		-		-		-		-		7	10.1
Bank vole *Clethrionomys glareolus*	-		-		-		-		-		2	2.9
Water vole *Arvicola terrestris*	-		-		-		-		-		4	5.8
Rat? *Rattus* sp	-		-		-		-		-		2	2.9
Vole	-		-		-		-		-		16	23.2
House mouse *Mus musculus*	-		-		-		-		-		10	14.5
Wood/yellowneck mouse *Apodemus* spp-			-		-		-		-		5	7.2
Mouse	-		-		-		-		-		4	5.8
Shrew *Sorex araneus*	-		-		-		-		-		5	7.2
Shrew *Sorex* sp or *Neomys* sp	-		-		-		-		-		9	13
			1	0.0*	1		3	0.0*	2		69	8.9*
Unidentified mammals												
Large	10		1822				1472				22	
Medium	8		2270				1257				85	
Medium/small	3		92				38				7	
Small	-		30				15				349	
	21	16.9*	4214	17.0*			2785	14.7			463	59.6*
Unidentified fragments	55	44.4*	11851	47.8*			9392	49.5				
Total mammals	124		24789				18971				777	
BIRDS (# probably all domestic)												
Fowl# *Gallus gallus domesticus*	4	66.7	185	54.6	10	28.6	52	55.3	6	33.3	17	21.2
Goose# *Anser anser*	2	33.3	91	26.8	9	25.7	26	27.7	4	22.2	1	1.2
Duck# *Anas platyrhynchos*	-		15	4.4	3	8.6	4	4.3	2	11.1	-	
Duck# *Anas* sp	-		-	-			-	-			1	1.2
Dove# *Columba cf livia*	-		5	1.5	2	5.7	2	2.1	1	5.6		
Corvids, various	-		39	11.5	8	22.9	6	6.4	3	16.7	1	1.2
Small passerine (sparrow/tit size)	-		-		-		-		-		9	11.2
Large passerine (blackbird size)	-		-		-		-		-		2	2.5
Passerines, various	-		2	0.6	1	2.9	1	1.1	1	5.6	1	1.2
Accip, birds of prey	-		1	0.3	1	2.9	3	3.2	1	5.6	-	
Peafowl *Pavo cristatus*	-		1	0.3	1	2.9	-		-		-	
	6	75.0+	339	57.8+	35		94	60.6+	18		32	40.0+
Uncertain birds												
Fowl?	-		22				-				20	
Goose?	-		17				5				-	
Duck?	-		5				-				-	
Other	-		-				2				-	
	-		44	7.5+			7	4.5+			20	25.0+
Unidentified birds	2	25.0+	204	34.8+			54	34.8+			28	35.0+
Total birds	8		587				155				80	
AMPHIBIA												
Frog *Rana temporaria*	-		-				-				1	
Toad *Bufo bufo*	-		-				-				1	
Frog/toad	-		5				-				184	
Snake	-		-				-				1	
FISH												
Cod *Gadus morhua*	-		-				1				-	
Hake *Merluccius merluccius*	-		-				1				-	
Eel *Anguilla anguilla*	-		-								14	33.3
Herring *Clupea harengus*	-		-								26	61.9
Roker *Raja clavata*	-		-								1	2.4
Salmonid, poss salmon *Salmo salar*	-		-								1	2.4
Unidentified fish	-		1				-				49	53.8
Oyster *Ostrea edulis*	-		120				33				-	
Other shell	-		3				-				-	
TOTAL IDENTIFIED	132		25505				19161				1135	10.50%
Unidentifiable fragments											9657	

*% of total mammals; +% of total birds; [a] including 70 from 1 individual; [b] includes at least 3 possible ass/mule

Figure 8.20.2 Excavated tenements: Species present

Fragmentation

The relation between MNI and NIF was used to calculate an index of fragmentation (IF): IF=NIF/MNI * 1/x where x = the number of a particular element on one side of the body (or limb in the case of phalanges, which could not be assigned consistently to fore- or hind limb). Thus x =1 for most elements, 2 for cattle and sheep metapodials (that were not identified as metacarpals or -tarsals), 4 for pig metapodials, and 4 for cattle, sheep and pig phalanges. The higher the IF for a given element, the more fragmented that element would be. Interpretation is not simple, since both the inherent mechanical properties of the element and its post-mortem treatment will determine its degree of fragmentation. IF is used in Figures 8.20.3, 8.20.11 and 8.20.20. Because of the difficulty of knowing whether a given break was ancient or recent, no attempt was made to quantify fragmentation processes. However, for each fragment examined, evidence of butchery, gnawing and burning was noted.

Butchery, burning and gnawing

Butchery was recorded only if the mark of an implement - classified as cut, chop, saw, split - was detected. This obviously leads to bias against techniques that leave little or no trace on the bone, and those that involve smashing with no clear trace. The results for the major meat species are summarised in Figures 8.20.4, 8.20.10, and 8.20.19.

Gnawing was mainly due to dog, although traces of both cat and small-mammal gnawing were also seen. Due to uncertainties in identification these were not separated in the analysis. Burning was recorded as black, grey, or white according to the degree of calcination, but again these were not separated in the analysis.

Ageing

Ageing information was recorded wherever possible. Cattle, sheep and pig mandibles were aged according to Grant (1982), sheep mandibles according to Payne (1973) and horse teeth measured for age estimation as by Levine (1982). Including loose teeth (M3, dp4) did not alter age profiles based on mandibles. Epiphysial fusion data, with their different biases and uncertainties, were tabulated (Figures 8.20.6, 8.20.15, 8.20.22 and 8.20.26). Ages are based on Silver (1969) unless otherwise indicated. Epiphysial fusion data for unfused elements are `minimised' counts including both shafts and epiphyses: thus six unfused shafts plus two unfused epiphyses would count as six unfused, while six unfused shafts and eight unfused epiphyses would count as eight unfused.

Sex determination

Cattle horncores were measured and described according to Armitage and Clutton-Brock (1976) and Armitage (1982), which yielded some tentative sex determinations.

Cattle and sheep innominates were sexed where possible, using criteria similar to those detailed by Boessneck (1969) for sheep and goats. However, most of the material was fragmentary, and it is probable that only the most definite males and females were identified. It was impractical to attempt identification of castrates on this material, so that the `unknown' category includes a large number of unsexable fragments, and a smaller number of fragments which could be male, female or castrate. For fowl, long bones were checked for the presence of medullary bone which indicates a female in lay (Driver 1982).

Measurements

Measurements were made with vernier calipers to 0.1 mm, according to von den Driesch (1976), and Armitage and Clutton-Brock (1976) for cattle horn cores. Measurements of individual elements that were more or less complete and statistics when approxiately five or more replicates were available are given in Figures 8.20.8, 8.20.17, 8.20.25, 8.20.27 and 8.20.28. All measurements taken will be available in the archive.

Pathology

Pathology was recorded as in Baker and Brothwell (1980). Levitan (1985) was also referred to for sheep mandible pathology.

Analysis

Figures and percentages refer to %medieval bone of the category in question, unless otherwise stated.

Statistics

There is a considerable problem in testing observed distribution patterns statistically, because fragments are not necessarily independent in the statistical sense - there is a chance that different bone fragments come from the same individual. It is not practical to do all tests using MNI, as this involves complex recalculation and often makes sample numbers unrealistically low. The same applies to 'unrepeatable elements' or 'NIB' (Levitan 1984).
Using NIF gave clearly unrealistic results: NIF was evidently an overestimate of n (the number of independent observations). NIF was therefore divided by a factor derived from the fragmentation analysis, NIF/MNI for all fragments of a given species. This factor was 60 for cattle, 40 for sheep and 30 for pig; the cattle and sheep factors were used for 'large' and 'medium', respectively. Other species, all with total NIF <250 (medieval), could not be included. A factor of 30 (reflecting the proportions of fragments of animals of different sizes in the identified part of the sample) was used for unidentified fragments. Non-parametric tests (Kolmogorov-Smirnov, chi-square, rank correlation: see Siegel 1956) were used, but since results rarely reached significance levels of 0. 05 or less, they have not been quoted in the text.

Species present at Burton Dassett

Figure 8.20.1 lists the species found at Burton Dassett on the excavated tenements, showing number of identified fragments (NIF) and minimum number of individuals (MNI). Species found in the samples are also listed, showing NIF only. The species listed here are then discussed in greater detail, followed by a consideration of their distribution across the site.

Major species: Cattle, Sheep and Pig

Introduction

In this section the major domestic species whose remains make up most of the animal bone at Burton Dassett are discussed. Firstly, factors relating to the deposition of the bone are considered, and these are related to the use made of the animals' carcasses. Then data on sex and age are discussed, to try and deduce population structures, and pathology is also described. The data are interpreted in terms of the husbandry of these animals and their economic importance at Burton Dassett.

Bone condition and preservation over the site are considered in detail below. Preservation is lower in topsoil contexts (judging by eg percentage of fragments identified and percentage of loose teeth) and the percentage of bones on which butchery marks were observed is also lower, as is that of gnawed bones for most species (though not for sheep). To avoid this source of variation, in subsequent analyses only material from 13th-15th century contexts, including demolition layers, is used and the topsoil data is omitted, unless otherwise stated. Figures for cattle have been calculated omitting 501 skull fragments from one feature (see below).

Cattle

Anatomical representation, fragmentation and butchery

These are discussed together, because they are interrelated; processes of fragmentation, including butchery, interact with the differential durability of different elements, and possibly differential disposal, to produce the observed proportions of different elements. Anatomical representation is shown in Figure 8.20.1. For each element, NIF is given, and also the MNI calculated for that element where this was possible. Evidently, the more an element is fragmented, the greater NIF will be in relation to MNI (for that element), and this is the basis of the fragmentation index (IF) used here (see Methods). Figure 8.20.3 shows butchery and fragmentation for skeletal elements (note that loose teeth are omitted) and Figure 8.20.4 the distribution of butchery marks over the skeleton. Two other destructive processes, burning and gnawing, appear to be more or less evenly distributed over species and areas, and are not specifically related to anatomical representation here.

All parts of the skeleton are represented, indicating local killing and butchery (as opposed to importing meat-bearing joints). The low proportion of horn core fragments is immediately obvious, suggesting that horns may have been detached from the skull for use elsewhere, so that the horn cores do not appear in this mainly domestic waste. There is not much evidence for this in terms of butchery marks, but perhaps most of them were on the horn cores themselves. The main meatbearing bones of the limbs are highly fragmented, with correspondingly low percentages of complete bones (both epiphyses present; similar to proportions at Exeter in deposits of similar age: Maltby 1979). Indeed, the fragmentation index is significantly negatively correlated with the percentage of whole bones (Spearman $r = -0.60$, $n=11$, $P < 0.05$). It is not possible to be certain to what extent this fragmentation reflects butchery processes - including deliberate smashing of bones to extract marrow - or smashing by eg trampling after disposal of the bone. Many long bone fragments looked as though they had been smashed, with spiral fractures and impact scars (Outram *et al* 2005). One tibia fragment (and several cattle-size longbone

	MEDIEVAL NIF	Butchered	%	Fragmentation index	% Whole
Horn core	9				
Skull Fragment	246	9	3.7		
Mandible	391	54	13.8	13	0.5
Scapula	108	30	27.8	5.7	0
Humerus	103	22	21.4	4.3	1.9
Radius	87	28	32.2	4	1.1
Ulna	83	10	12	3.3	2.4
Carpal	73				
Metacarpal	162	15	9.3	4.3	3.7
Pelvis	67	21	31.3		
Femur	53	9	17	5.9	0
Tibia	94	11	11.7	5.9	1.1
Astragalus	43	15	34.9		
Calcaneum	63	13	20.6		
Tarsal	40	7	17.5		
Metatarsal	153	12	7.8	4.5	3.9
Metapodial	229			7	2.4+
1st Phalanx	210	13	6.2	1.3	92.2*
2nd Phalanx	145	1	0.7		
3rd Phalanx	93	1	1.1		
Patella	4				
Vertebra	57	10	17.5		
	2513	281	11.2		
Cattle size					
Vertebra	216	14	6.5		
Rib	497	67	13.5		
Longbone	1109	37	3.3		
	1822	**118**	**6.5**		
Unidentified	11851	67	0.6		

Cattle	% butchered	% burnt	% gnawed	NIF/MNI	
Including teeth	8.5	0.4	6.6	63.7	MNI 52, dp4, M3
Excluding teeth	11.2	0.5	8.7	64.4	MNI 39, metapodials
Cattle size	6.5	1	4.7		
Unidentified	0.7	3.4	0		

Notes: Teeth are excluded as unlikely to show butchery marks. IF, index of fragmentation (see text). % Whole, percentage of element with both epiphyses present. +, all metapodials. *, all phalanges.

Figure 8.20.3 Cattle - Butchery and fragmentation data for cattle and cattle size fragments from medieval contexts. Percentages burnt and gnawed are shown for comparison.

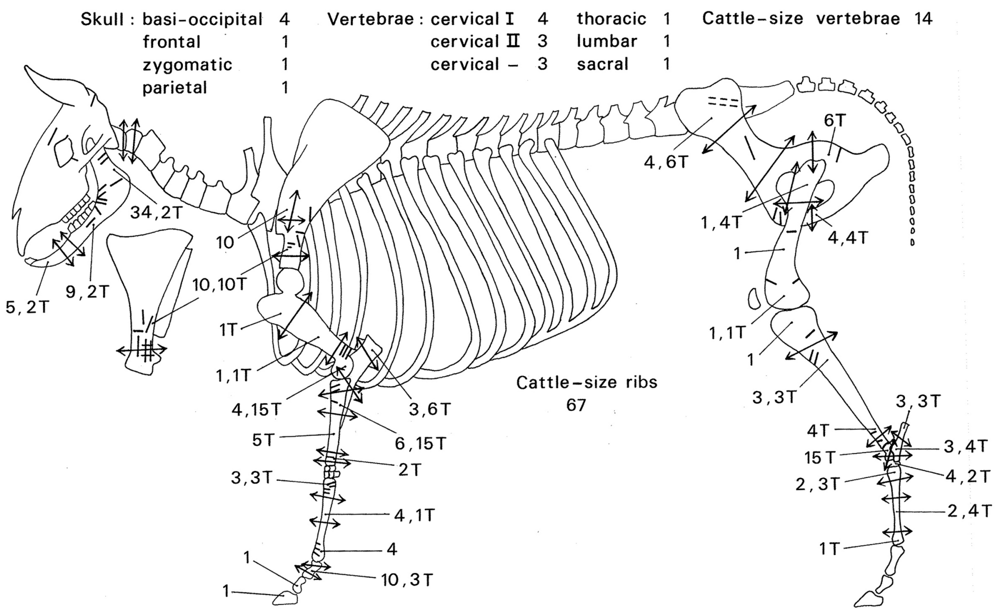


Figure 8.20.4 Faunal Remains: Distribution of butchery marks on cattle. (Lines with arrows show region where bone is severed. Lines on bone indicate position of butchery marks. Dotted lines show butchery marks medial. Numbers: x, number of cut/chop/slice marks; xT, numbers of cut/chop/saw marks where bone is severed).

fragments) had a cut mark on the inside which must have been made after the bone was smashed, perhaps when marrow was scraped out. There is no correlation between the percentage of an element on which butchery marks were observed and the fragmentation index. A high degree of fragmentation is typical of bone from medieval sites (Grant 1988, 162) suggesting intensive exploitation of the carcass.

Where proximal and distal epiphyses of long bones were not present in roughly equal numbers, this is explicable by preservation factors (including gnawing). Thus, the proximal epiphyses of humerus and tibia were somewhat less common than the distal epiphyses, but they are later-fusing and less likely to be preserved. Similarly, the proximal epiphysis of the femur was commoner than the distal one. There was no great discrepancy between proximal and distal epiphyses of metapodials (taken all together), though, particularly for metatarsals, proximal ends were slightly commoner.

The pattern of butchery marks (Figures 8.20.3 and 8.20.4) is clearly related to the dismemberment of the skeleton and meat removal. The skull and first two cervical vertebrae have traces of separation of skull from spine. The mandible had many chop and cut marks around its articulation with the skull, cuts due to removal of cheek muscle and tongue, and had sometimes been chopped through near the symphysis. The higher than average percentage of marks on scapula, humerus and radius is clearly related to dismemberment of the forelimb by chopping or sawing through the neck of the scapula and the elbow joint, and meat stripping from the scapula and other limb bones. The bones of the extremities bear fewer than average butchery marks, though metapodials are highly

		MEDIEVAL				Dead by end of stage	
Stage	`Age′	Definite	Estimated	Ranges		Min %	Max %
1-10	under 6 months	1	2	35-37	1	5.4	5.4
11-20		-	1	38-42	1	7.7	7.7
21-30	2-2.5 years	1	2	40-41	2	13.1	13.1
31-35	2-3 years	1	2	43-46	1	22.2	24.4
36-40		4	3	44-46	1	40	46.7
41-45		11	2	44-47	1	75.6	82.2
46-50		4	4			100	
51		-	-				
TOTAL		22	16		7		
		Dead by end of stage					
Stage	`Age′	Definite	Estimated	Ranges		Min %	Max %
1-10	under 6 months	-	2			8.3	8.3
11-20		-	-			8.3	8.3
21-30	2-2.5 years	-	-			8.3	8.3
31-35	2-3 years	2	-	39-44	1	16.7	16.7
36-40		2	-	40-41	1	25	37.5
41-45		2	5	40-44	1	66.7	70.8
46-50		3	-	45-48	1	83.3	87.5
51		2	1	49-51	1	100	
TOTAL		11	8		5		

Figure 8.20.5 Cattle - Ageing data from mandibles (Grant 1982)

fragmented (looking at all together, since more fragmentary bones are more likely to be identified as metapodial than as metacarpal or -tarsal). Probably they were smashed for marrow, though not valuable for meat. Marks on the extremities may also be related to skinning. Similarly, the pelvis, femur and tarsals have a higher-than-average percentage of butchery marks, related to separation of pelvis from spine, femur from pelvis (cuts and chop and saw marks around acetabulum and femur head) and chopping through the ankle joint. Butchery marks on cattle and cattle-size vertebrae include cuts and longitudinal and transverse chop marks, and ribs were also often cut and chopped. There was no evidence for regular longitudinal splitting of the carcass.

To summarise, all parts of the skeleton were represented, indicating primary butchery on site or close by. The whole carcass was originally present. Horn cores may have been removed for working and disposed of elsewhere (deposits of large numbers of horncores have been interpreted as horners' waste, eg Greyfriars, Chichester: Armitage 1989). Low meat value bones such as phalanges, however, were discarded on site, along with remains of meat-bearing limb bones. The feet may in fact have been used, for glue or neat′s-foot oil extraction. The butchery process included severing head and limbs from the body, chopping through major joints, chopping through ribs and vertebrae, stripping meat and hide, and smashing limb bones. Taking into account differential durability, skeletal element representation probably reflects the disposal of the whole carcass (except horn cores) on site, and the essentially domestic nature of the debris. The high degree of fragmentation, indicating intensive use, is typical of later medieval sites (Grant 1988, 162).

	MEDIEVAL				TOPSOIL			
	NF	F	n	%F	NF	F	n	%F
7-10 months								
Scapula D	1	35	36	97.2	-	12	12	100
12-18 months (P1, P2: 18 months)								
Humerus D	5	31	36	86.1	2	22	24	91.7
Radius P	-	39	39	100	-	31	31	100
1st Phalanx P	5	191	196	97.4	3	211	214	98.6
2nd Phalanx P	2	140	142	98.6	1	150	151	99.3
Total/average			413	97.1			420	98.6
2-2.5 years (MT: 2.25-3 years)								
Tibia D	7	22	29	75.9	6	22	28	78.6
Metacarpal D	11	54	65	83.1	7	38	45	84.4
Metatarsal D	5	46	51	90.2	7	41	48	85.4
Metapodial D	21	14	35	40	54	77	131	58.8
MC + T + P	37	114	151	75.5	68	156	224	69.6
Total/average			180	75.6			252	70.6
3.5-4 years (Femur P: 3.5 years)								
Humerus P	6	-	6	-	2	1	3	33.3
Radius D	6	12	18	66.7	7	18	25	72
Ulna P	6	4	10	40	7	4	11	36.4
Femur P	8	6	14	42.9	9	6	15	40
Femur D	2	1	3	33.3	-	5	5	100
Tibia P	6	6	12	50	-	5	5	100
Total/average			63	46			64	60.9

Figure 8.20.6 Cattle - Ageing data from epiphysial fusion (ages from Silver 1969)

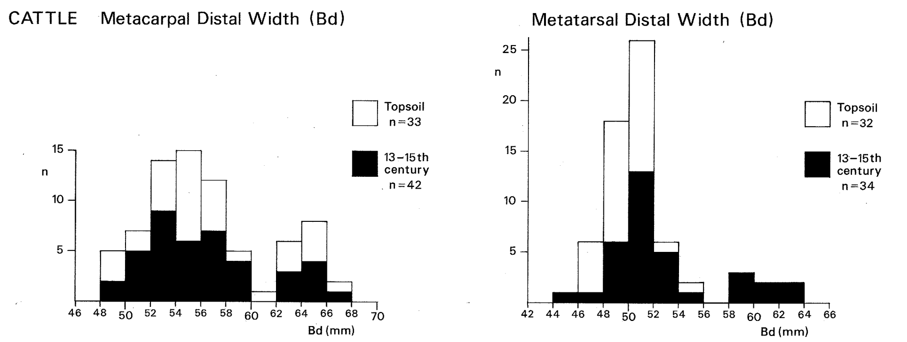


Figure 8.20.7 Faunal Remains: Histograms of cattle measurements, after von den Driesch 1976. Shaded columns medieval contexts, unshaded columns topsoil

(1) summarised measurements, (2) measurements of complete bones.							
Element	Phase	Measurements (mm) as in von den Driesch					
			GLP	LG	BG		
Scapula (1)	Medieval	Range	58.2-67.0	52.6-55.5	40.2-46.8		
		Mean	64	53.5	42.7		
		SD	3.42	1.53	2.88		
		N	5	5	4		
			GL (cm)	Bp	BFp	Bd	Bfd
Radius (1)	Medieval	Range		73.0-75.4	67.3-69.1	69.3-72.3	56.1-67.7
		Mean		74.2	68.1	70.6	63.6
		SD		1.2	0.69	1.45	5.14
		N		3	5	4	4
-1	Topsoil	Range		69.8-83.5	63.1-78.5		
		Mean		75.8	69.9		
		SD		3.77	3.81		
		N		12	12		
-2	Topsoil		26.4	72.9	68.9	63.9	
			27	74	68.6	65.1	
Metacarpal			GL (cm)	Bp	SD	DD	Bd
-1	Medieval	Range	17.4-20.0	48.6-61.9	25.0-33.2	18.1-22.3	49.4-67.7
		Mean	18.6	53.1	29.1	20	56.8
		SD	1.08	3.37	3.13	1.41	4.88
		N	4	42	8	6	42
-2	Medieval		18.3	56	33.2	-	58.5
			17.4	49.6	26.7	18.1	53.3
			20	61.9	34	20.8	>62
			18.6	51.9	28.3	19.9	53.4
-1	Topsoil	Range		46.9-64.2		18.9-22.1	48.9-65.6
		Mean		53.2		20.5	56.1
		SD		4.58		1.38	4.73
		N		39		4	33

Figure 8.20.8 Selected cattle measurements

-2	Topsoil			17.9		50.5		28.8	20	54.7
				17.3		51.4		28.6	18.9	54
				Bd						
Tibia (1)	Medieval	Range		54.4-56.6						
		Mean		55.4						
		SD		1.16						
		N		4						
-1	Topsoil	Range		55.5-68.2						
		Mean		60.5						
		SD		5.31						
		N		5						
Astragalus (1)	Medieval	Range	GL1	59.3-64.9	GLm	54.0-60.9	Bd	37.1-41.0		
		Mean		62.5		57.6		38.8		
		SD		2.2		2.72		1.45		
		N		5		5		5		
			GL (cm)				SD DD		Bd	
Metatarsal (1)	Medieval	Range	19.7-21.7		Bp	40.0-51.8	20.3-28.5		21.2-25.6	45.1-62.1
		Mean	21.1			44.8	25		23.4	52.8
		SD	0.82			3.7	3.51		1.85	4.52
		N	5			26	5		6	34
-2	Medieval		21.5			40	20.3		21.3	47.4
			21.7			50.4	27.6		24.9	59.7
			20.9			51	28.5		25.6	59.7
			19.7			41.8	22.4		21.2	53.2
			21.5			-	26.2		24.2	50.4
-1	Topsoil	Range				39.7-52.0				46.0-55.9
		Mean				44.3				49.9
		SD				3.16				1.82
		N				38				32
-2	Topsoil		20.9			44.4	24.8		22.2	51.7

Figure 8.20.8 (continued) : Selected cattle measurements

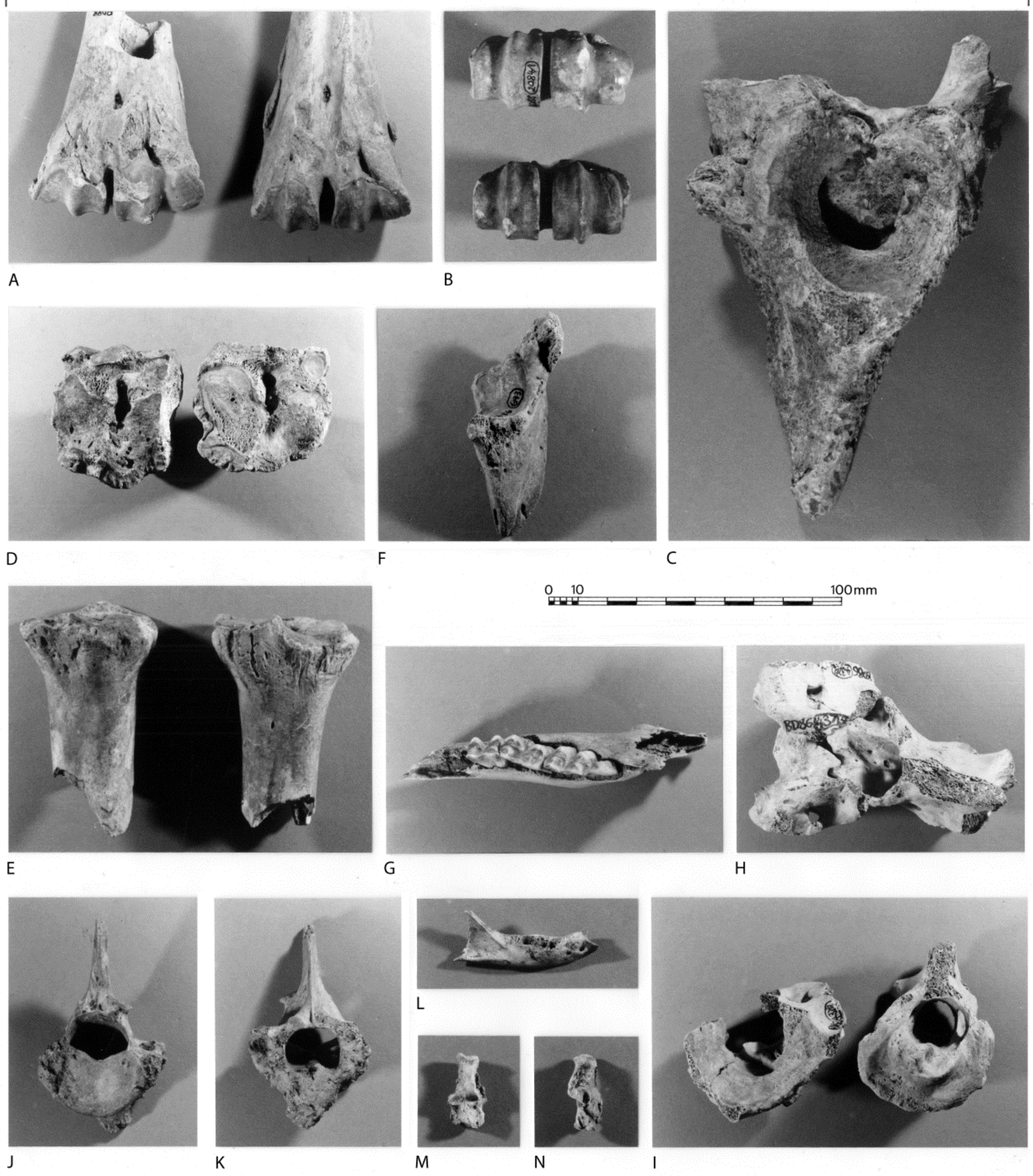


Figure 8.20.9 Faunal remains: Pathology A-N

Age

Taking all areas/medieval phases together, 43 mandibles were stageable by the method of Grant (1982), and a further 22 from topsoil. The stage distribution was very similar for both groups (Figure 8.20.5). Less than 20% of mandibles were ≤stage 35, about 20% were at stages 36-40, 40% at 41-45, and the remaining 20% >45. Most animals, therefore, seem to have died as adults. It is not easy to assign exact ages at death from these data, but the majority were probably between 4 and 9 years old at death. The epiphysial fusion data (Figure 8.20.6) are in general agreement, with about half the animals older than 3. 5-4 years old at death. A high proportion of castrates, with later-fusing bones, might make fusion ages seem `younger′ than mandible ages, but this does not affect, in fact reinforces, the conclusion that most cattle were adult at death. The limited horncore evidence (n=6) also agrees, with 1 sub-adult, 1 young adult, 2 adult, 1 adult/old adult, and 1 old adult (age categories as in Armitage and Clutton-Brock 1976). Cattle would be important as draught animals and for milk as well as meat. The low proportion of calves argues against specialised dairying and veal production. The age distribution seen here is consistent with stock surplus to the requirements of mixed agriculture for draught and dairy cattle being used for meat (O'Connor 1989), rather than specialised meat production (see discussion below).

Sex

Because of the lack of horncores and the high degree of fragmentation, there was little direct evidence enabling sex distinction. The limited horncore evidence showed 1 juvenile, 4 possible males/castrates, and 1 possible female/castrate. Of 66 innominate fragments, 55 were unsexed(mostly unsexable), 3 were definitely male, and 8 female. This is not significantly different from a 1:1 sex ratio (binomial test). The detection of castrates in this type of material is very dubious, and was not attempted.

There were too few complete bones (especially metapodials) for length/width indices such as those used by Howard (1963) to be useful - although various plots and indices were tried, no pattern emerged. Some measurements were clearly bimodally distributed (metapodial distal breadths, Bd; Figure 8.20.7) and in the absence of evidence for large cattle at the site (see below) it is tempting to interpret this as due to sex differences. About 20% of metacarpal Bd′s and 20% (10% including topsoil material) metatarsal Bd′s fell into the upper group. According to Grigson (1982) these would be bulls and castrates. This would give a surprisingly high proportion of cows among the bone debris.

Measurements

The fragmentary nature of the bone meant that relatively few useful measurements could be made; a selection is listed on Figure 8.20.8. (Complete records available in the archive). Bone from 'medieval' (mostly 15th-century) and 'topsoil' contexts are listed separately, to avoid distortion of the statistics due to mixing of later material, but in fact the figures are very similar for most elements, confirming the largely medieval nature of the topsoil material. Again, it must be stressed that there is only limited evidence to back up the statements made here. The cattle were of the short-horned type (Armitage 1982) with no evidence of 'improved' longhorn varieties. Shoulder heights calculated from metacarpal lengths (Zalkin 1961) were around 112cm (range 105-123cm; using general factor), or 107cm (103-111cm) for presumed females and 122-125cm (114-133cm with errors) for presumed male/castrate.

Metatarsals gave shoulder heights of around 115cm (range 107-119cm; general factor), or 112cm for presumed females (105-115cm) and 114-122cm for two presumed male/castrates. These measurements seem typical of the small cattle of the period (Armitage 1980), and there is no evidence for the presence of larger cattle at the site. Comparing dimensions of various elements directly, the cattle at Burton Dassett were larger than contemporary (13th- to 15th- century) cattle at Exeter (Maltby 1979) and King's Lynn (Noddle 1977), but similar in size to those at Wharram Percy (Ryder 1974).

Skeletal abnormalities and pathology

Here material from both medieval and topsoil contexts is discussed together: figures in parentheses refer to medieval material alone.

The third cusp of the lower third molar was absent in 5/131 (4/70) specimens. This may be a congenital condition (Andrews and Noddle 1975). At Exeter it occurred in Roman but not in medieval cattle mandibles (Maltby 1979). At least 2/23 medieval and 1/14 topsoil mandibles had the second premolar entirely missing. Andrews and Noddle (1975) consider that this may also be congenital. During a study of another, not at all closely related, ruminant the author considered a similar anomaly to be related to age/wear (Hamilton 1984, unpublished observations; see also Baker and Brothwell 1980). The cattle mandibles in question here are at stages 44, 45 and 46, 33 at the upper end of the age range (Figure 8.20.5). For comparisons between sites to be valid, the wear stage of the mandible should also be taken into account.

Evidence of slight periodontal disease was seen on 3 (1) mandibles - equivalent to stages 1 and 2 described by Levitan (1985) for sheep. There was some bone pitting, alveolar widening and recession of the alveolar margin around the third premolar (this mandible was also butchered), the fourth premolar (medieval context) and the fourth premolar/first molar (slight), respectively. This does not seem a very high rate of pathology (out of *c*75 (45) mandibles with teeth, and many more mandible fragments), and at least two of the mandibles were probably from old animals (wear stage 48 or later). Deposits of calculus were common on cattle teeth in mandibles, but were not quantified.

One innominate showed severe damage to the acetabulum and surrounding bone (Figure 8.20.9, C). The surface of the acetabulum was rough and pitted with extensive exostosis within and around the joint. There was some eburnation of the acetabular edge. This may be a case of osteoarthritis (Baker and Brothwell 1980, 115; Vann and Thomas 2006). Whether or not some infective agent was also involved, the condition may well be a result of constant trauma to the joint, which might well arise in a draught animal. The pubis looks more like that of a male than a female. There are also butchery marks, evidence that the carcass was not wasted.

One tibia fragment has a small compact lump or spur of bone on the lateral edge of the fused proximal epiphysis (topsoil). Two metacarpals show pathological changes distally, with slight exostosis and remodelling of anterior and posterior bone surfaces near the epiphysis and slight grooving (in one) and eburnation (in the other) of the articular surface (Figure 8.20.9, A, B). Three metatarsals show pathological changes proximally, with roughening of the articular surface, exostosis, extension of the articular surface and eburnation or striation (all topsoil). Two of these also had butchery marks (Figure 8.20.9, D, E). A third phalanx showed exostosis forming a bony flange extending from the proximal end (Figure 8.20.9, F). Another (from topsoil) showed a lesser degree of this condition.

Most if not all of these pathological conditions could arise from joint damage due to stress and strain, probably due to the use of cattle as draught animals. Butchery marks indicate that these animals were fully utilised.

The exploitation of cattle at Burton Dassett

The cattle at Burton Dassett were typical of the small late medieval cattle (Grant 1988) and were evidently intensively exploited, judging by the highly fragmented nature of the bone. There was no evidence of the presence of 'improved' larger longer-horned cattle (Armitage 1980). The small size may be related to environmental/economic factors such as seasonal food shortages and lack of suitable pasture, or possibly to ploughing technique: smaller animals would be more manageable and could cause less soil compaction. The question is complex, depending on the balance of other elements of the farming system, and less rational factors might also be involved (Grant 1988). The bone debris from the tenement yards gives us a picture of the cattle that were slaughtered and eaten (and otherwise utilised, for eg horn and hide, and possibly glue and oil) at the site. These were mainly adult animals, and there is no evidence for specialised dairying and veal production such as is sometimes seen at later sites (eg Exeter: Maltby 1979). However, if young males were exported from the site, as suggested below, the importance of dairying might be greater than appears at first sight. If the metrical evidence for the sex ratio is to be believed, four-fifths of the adults found at the site were cows. Various factors might bias the sex ratio towards cows. Males (including castrates) might live longer before being eaten, because their useful life as beasts of burden exceeded that of cows as breeders and milk providers (though usually the reverse is true); but on reasonable assumptions of breeding and mortality rates, birth sex ratios, and life expectancy, the sex ratio should be much closer to 1:1. Alternatively, many males might be slaughtered when they were too young to sex; but there is too low a proportion of juvenile bone for this explanation. However, the young males could have been exported from the site, ie sold for meat. Enough would have been kept to replace plough oxen, and more heifers would have been kept as breeding stock, to provide milk and possibly also for traction (Trow-Smith 1957, quoted in Grant 1988). This implies a fairly developed market for excess stock, and also that this market was important to the economy of the site. That is, the animals actually being eaten at Burton Dassett tended to be of lower quality: those older males/castrates and females whose productivity in terms of traction, breeding stock or milk was declining, and which were worth less at market. There should be a corresponding excess of young males at the, presumably urban, sites where the exported cattle were being consumed. At Exeter (Maltby 1979) more remains of male cattle were present in medieval than in Roman period debris, and also that the proportion of younger animals rose in the later medieval period. Nevertheless, in the pattern postulated here, the town was essentially consuming cattle surplus to the requirements of the rural mixed farming system (O'Connor 1989), not dictating the nature of that system via market demands. Within that system, cattle were probably as important for traction as for food and other products, and their exploitation revolved around that function.

Roger Heritage's probate inventory of August 1495 (TNA: PRO, PROB 2/457, see Alcock above) lists 16 oxen (= two plough teams), 20 cows, and 20 bullocks and heifers. If those bullocks not used to replace plough animals were exported, and turnover of cows is more rapid than that of trained plough oxen, this is not incompatible with the picture from the bone debris. However, given the uncertainty over rates of turnover of the various age/sex groups, possible selective marketing, and the composition of the herds of tenants at Burton Dassett farming on less grand a scale, it hardly counts as confirmation.

Sheep

Sheep and goats

Of nearly 6000 ovicaprid fragments examined, 183 were identified as definite sheep, and none as goat. This does not rule out the occurrence of goat at the site, but it would have been in very low numbers if at all. Sheep are therefore referred to throughout.

Anatomical representation, fragmentation and butchery

Data are displayed as for cattle (Figures 8.20.2, 8.20.10, 8.20.11). As for cattle, all parts of the skeleton are represented, but there are some differences in detail. The proportion of loose teeth is higher than in cattle, but so is the proportion of more or less complete (stageable) tooth rows, so this may reflect overall lower preservation/recovery of smaller bones rather than greater fragmentation. Indeed, overall fragmentation (NIF/MNI) is similar, or lower if teeth are excluded (cattle, sheep 66, 59 with teeth; 65, 37 without). The smallest bones (carpals, tarsals, phalanges) are present in very low proportions. This may be due to recovery factors (Payne 1972), although these bones are no commoner in the samples. Among the limb bones the tibia is noticeably common. This is probably because it is both well preserved, particularly distally, and easily identified.

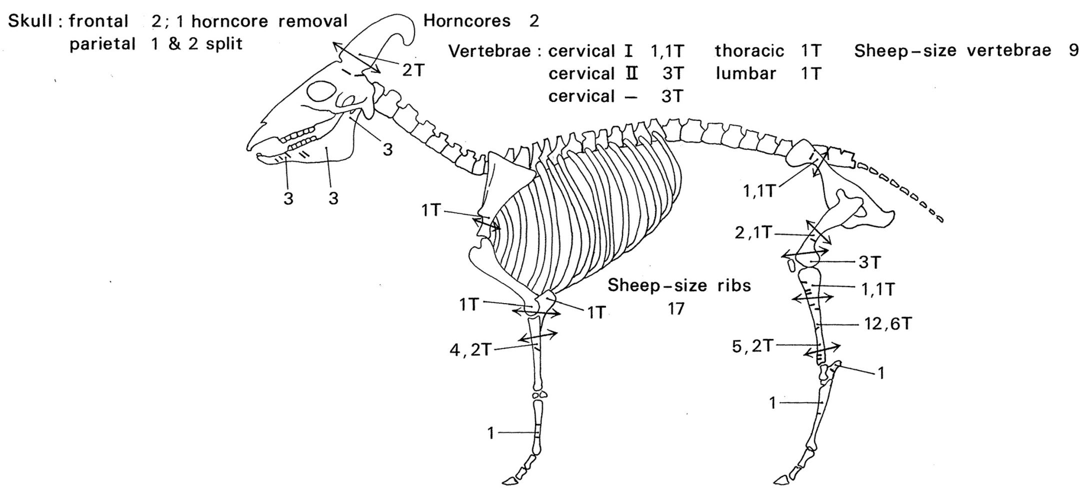


Figure 8.20.10: Faunal Remains: Distribution of butchery marks on sheep. Lines with arrows show region where bone is severed. Lines on bone indicate position of butchery marks. Dotted lines show butchery marks medial. Numbers: x, number of cut/chop/slice marks; xT, numbers of cut/chop/saw marks where bone is severed.

MEDIEVAL	NIF	Butchered	%	Fragmentation index	% Whole
Horn core	30	2	6.7		
Skull Fragment	311	8	2.6		
Mandible	521	9	1.7	9	1.2
Scapula	77	1	1.3	5.1	
Humerus	127	1	0.8	4.1	4.7
Radius	199	6	3	7.1	4
Ulna	41	1	2.4	2.9	4.9
Carpal	6	-			
Metacarpal	49	1	2	4.5	6.1
Pelvis	74	2	2.7		
Femur	87	6	6.9	7.9	1.1
Tibia	284	27	9.5	6.5	1.8
Astragalus	31	-			
Calcaneum	23	1	4.3	3.3	4.3
Tarsal	7	-			
Metatarsal	98	1	1	5.2	4.1
Metapodial	29	-		4.2	4.0+
1st Phalanx	19	-		0.8	100 approx*
2nd Phalanx	10	-			
3rd Phalanx	7	-			
Patella	1	-			
Vertebra	92	10	10.9		
	2123	76	3.6		
Sheep size Vertebra	150	9	6		
Rib	504	17	3.4		
Longbone	1616	16	1		
	2270	42	1.9		

	% butchered	% burnt	% gnawed	NIF/MNI	
Sheep					
Including	2.2	0.2	5.4	30.2	MNI 114, dp4, M3
Excluding	3.6	0.3	8.8	36.6	MNI 58, mandibles
Sheep size	1.9	1.4	7		

+, all metapodials. *, all phalanges.

Figure 8.20.11 Sheep - Butchery and fragmentation data for sheep and sheep size fragments from medieval contexts. (Percentages burnt and gnawed are shown for comparison)

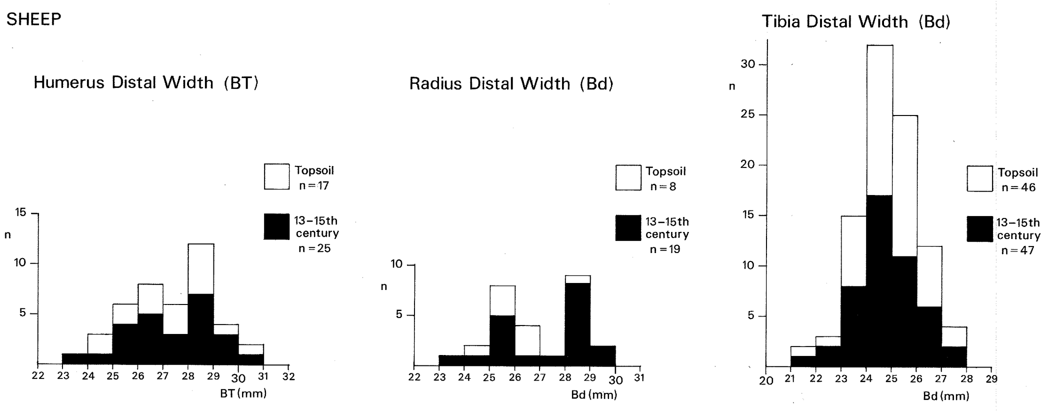


Figure 8.20.12 Faunal Remains: Histograms of sheep measurements (after von den Driesch, 1976). Shaded columns medieval contexts, unshaded columns topsoil

The butchery process seems quite similar to that of cattle. One skull fragment showed traces of horn core removal, and two horncore fragments had been sawn or cut off. The skull may have been split to extract the brain; at least two parietal fragments showed evidence of this, and the more proximal cervical vertebrae may also have been split during this process.

Butchery marks on the mandible relate to detachment of the mandible from the skull and tongue and cheek muscle removal. Butchery marks on humerus, radius and ulna relate to severing of the elbow joint. One scapula had been chopped through the neck, but otherwise no butchery marks were seen here, suggesting that scapula and humerus formed one joint of meat. Butchery marks were commoner than average on femur (distal) and tibia, which was often cut and/or chopped through the shaft at roughly the level of the distal end of the crista tibiae, or near the distal articulation. Marks were not common on the extremities, and no metapodials were found that had been chopped through. Vertebrae and ribs (including sheep-size) had also been cut and chopped, and again there was no evidence that carcasses were regularly split, though more-or-less longitudinally divided vertebrae seemed commoner than in cattle. Overall the proportion of bones with butchery marks was smaller than in cattle, though similar to that in pig; probably this is related to the smaller size of the carcass.

Age

The methods of Grant (1982) (n=92) and Payne (1973) (n=100) for mandible staging gave similar results (Figures 8.20.13 and 8.20.14). Using Payne's suggested ages, <20% were dead by 2 years, <30% by 3years, but 55-70% were dead by 4 years, and 90% by 6 years old. Applying ages from Carter (1975) to Grant's stages the pattern looks very similar. The epiphysial fusion data also agree uncannily well (Figure 8.20.15), with about 20% of elements fusing by 2 years, 35% of those fusing by 3 years, and 45% of those fusing by 3.5 years unfused. Thus most sheep were killed in their fourth or fifth year (see discussion below).

		MEDIEVAL				Dead by end of stage	
Stage	'Age'	Definite	Estimated	Ranges		Min %	Max %
1-10		1	1	10-12	1	2.1	3.1
11-20		-	2	29-35	3	5.1	5.1
21-30	1-2 years	7	6	32-38	2	18.1	21.3
31-35	2-4 years	18	8	34-38	8	51.1	69.6
36-40	4-6 years	15	5	35-37	5	87	90.2
41-45	6-8 years	14	4	39-42	4	98.9	98.9
46-50		1	-			100	
51		-	-				
TOTAL		46	26		20		
		TOPSOIL				Dead by end of stage	
Stage	`Age'	Definite	Estimated	Ranges		Min %	Max %
1-10		-	-			-	-
11-20		-	-			-	-
21-30	1-2 years	2	-			2	2
31-35	2-4 years	-	2	34-36	3	18.2	31.8
36-40	4-6 years	10	4			95.5	95.5
41-45	6-8 years	-	-			95.5	95.5
46-50		-	1			100	
51		-	-				
TOTAL		12	7		3		
(`Ages' based on correlation with Payne method, for comparison)							

Figure 8.20.13: Sheep - Ageing data from mandibles (Grant 1982)

		MEDIEVAL					Dead by end of stage	
Stage	Suggested age	Definite	Ranges				Min %	Max %
A	0-2 months	-					0	0
B	2-6 months	-					0	0
C	6-12 months	2	C-D	5			2	7
D	1-2 years	7	D-E	4	DFG	1	14	19
E	2-3 years	7			EFG	3	25	29
F	3-4 years	30	F-G	12			55	71
G	4-6 years	17	G-H	2			88	90
H	6-8 years	9					99	
I	8-10 years	1					100	
TOTAL		73		23		4	100	
		TOPSOIL					Dead by end of stage	
Stage	Suggested age	Definite	Ranges				Min %	Max %
A	0-2 months	-					0	0
B	2-6 months	-					0	0
C	6-12 months	-					0	0
D	1-2 years	-					0	0
E	2-3 years	4	E-F	1	EFG	2	16.7	29.2
F	3-4 years	36	F-G	2			45.8	62.5
G	4-6 years	17	G-H	1			91.7	95.8
H	6-8 years	1					100	
I	8-10 years	-						
TOTAL		18		4		2	24	

Figure 8.20.14: Sheep - Ageing data from mandibles (Payne 1973)

	MEDIEVAL				TOPSOIL			
	NF	F	n	%F	**NF**	F	n	%F
6-8 months								
Scapula D	2	25	27	92.6	-	-	-	-
10 months* 13-16 months								
Humerus D*	2	54	56	96.4	-	26	26	100
Radius P*	2	51	53	96.2	-	23	23	100
1st Phalanx P	-	14	14	100	4	16	20	80
2nd Phalanx P	2	7	9	77.8	-	5	5	100
Total/average			132	95.5			74	94.6
18-24 months (MT 20-28 months)								
Tibia D	7	64	71	90.1	7	65	72	90.3
Metacarpal D	1	7	8	87.5	1	5	6	83.3
Metatarsal D	4	7	11	63.6	4	12	16	75
Metapodial D	8	1	9	11.1	2	6	8	75
MC + T + P	13	15	28	53.6	7	23	30	76.7
Total/average			99	79.8			102	86.3
2.5-3 years (Hu P, Fe D, Tib P 3-3.5 years)								
Humerus P	6	8	14	57.1	2	-	2	0
Radius D	12	20	32	62.5	4	10	14	71.4
Ulna P	3	9	12	75	-	4	4	100
Femur P	6	10	16	62.5	1	6	7	85.7
Femur D	3	8	11	72.7	-	3	3	100
Tibia P	7	4	11	36.4	2	5	7	71.4
Total/average			96	61.5			37	75.7

Figure 8.20.15 Sheep - Ageing data from epiphysial fusion (ages from Silver 1969)

Sex

The material was mostly too fragmentary to provide direct evidence for distinguishing sex. Of the six measured horn cores (counting pairs as 1), it was possible to assign 1 juvenile, 3 female, 1 castrate and 1 male. Skulls were too fragmentary. Of 112 innominate fragments, 90 were not sexed (many not sexable), 9 were sexed as male and 13 as female. The material was not suitable for detection of castrates.

Complete long bones were rare, so indices depending on length/breadth or thickness ratios were not useful. However, some measurements (Figure 8.20.12) were clearly bimodal (humerus distal breadth BT, Bd, radius distal breadth Bd) though others were not (tibia distal breadth Bd). Metacarpal and metatarsal distal breadths also seemed bimodally distributed although the number of measurements was rather few. In the bimodal distributions the numbers in the lower group roughly equal those in the upper group. If the differences are due to sex, this would imply roughly equal proportions of ewes and males/castrates (40-60% in the smaller group, depending on which measurement). In a plot of astragalus length GLl against distal breadth Bd (Figure 8.20.16) there is no clear pattern, but 3/33 (1/17 medieval) stand out as particularly long - could these represent rams?

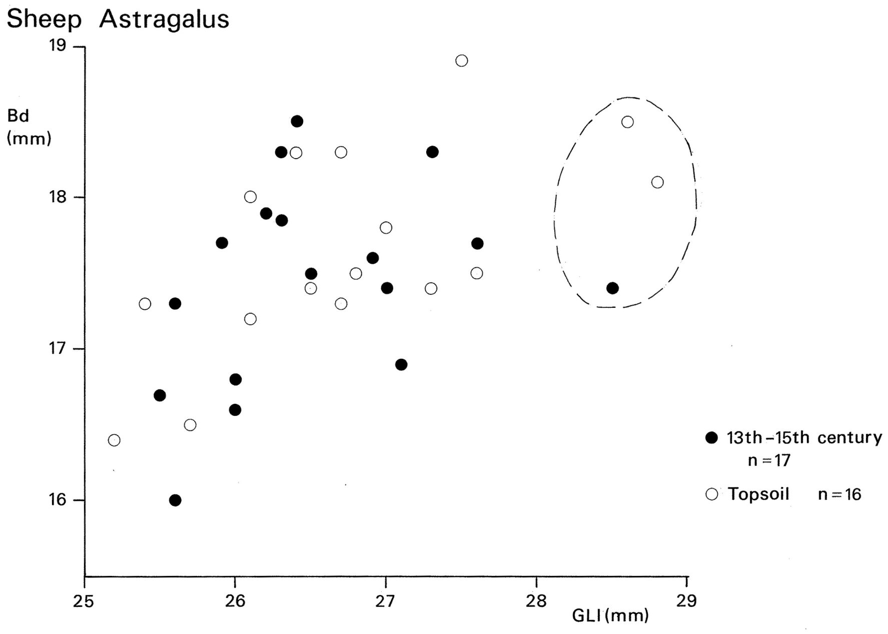


Figure 8.20.16: Faunal Remains: Scatterplot of sheep astragalus measurements Black dots medieval contexts, white dots topsoil

Measurements

Selected measurements are given in Figure 8.20.17. Both horned and polled sheep were present, though the proportions are impossible to quantify because of fragmentation. The strongly unimodal distribution of eg tibia distal breadth makes it unlikely that more than one size group (?breed) was present, and the variations in measurements are likely to be due to individual - sexual, nutritional - variation. Using the withers height factors of Zalkin (1961), withers heights were around 53cm (metacarpal; range 51-54cm) or 59cm (metatarsal; range 58-60cm, n=2, both topsoil). Using the factors of Teichert (1975) calculated withers heights ranged from 47.0 to 62.3cm, with a mean of 54.6cm (all contexts). Taking an overall estimate of 55cm, this is a small animal comparable in size to the Soay sheep, and individual bone dimensions seem generally similar (except possibly stouter metapodials in the Burton Dassett sheep (Clutton-Brock et al. 1990). This seems to be the typical medieval sheep, smaller than Roman and Saxon examples (Grant 1988). Individual bone measurements are very similar to those from King's Lynn and other medieval sites (Noddle 1977), which are slightly larger than those from Exeter (Maltby 1979). There are rather few measurements from Wharram Percy (Ryder 1974), mostly of metapodials; those from Burton Dassett may be slightly larger.

Skeletal abnormalities and pathology

As for cattle, specimens from both medieval and topsoil contexts are described, with medieval figures alone given in brackets.

One lower third molar out of 388 (1/206) had a very reduced third cusp. The lower second premolar was absent without trace in five out of 62 (4/55) mandibles where this could be observed. These possibly congenital conditions have been observed elsewhere (eg Exeter: Maltby 1979; see above, cattle pathology).

(1) summarised measurements, (2) measurements of complete bones.

Element	Phase	Measurements (mm) as in von den Driesch						
Horncore		BC(40)(cm)	Dmax (41)	Dmin (42)	L(43)(cm)			
(2)	Medieval	13	42.2	39		Right		
		13.5	41.8	39		Left (pair)		
		9	33.8	22.7	10	Right		
		9	34.2	22.9		Left (pair)		
		8	28.2					
		7.5	24.3	23.4	6.5			
		10	37.3	>25	11.5			
		7	24	15.5	5.5	'Juvenile'		
Scapula			SLC	GLP	LG	BG		
(1)	Medieval	Range	13.8-19.4	26.0-32.5	19.9-26.1	15.9-21.3		
		Mean	18	30.2	24	19		
		SD	1.97	2.04	1.88	1.68		
		n	7	12	11	12		
Humerus		GL	(cm) Bp	SD	Bd	BT		
(1)	Medieval	Range	37.1-42.4	10.8-15.9	23.9-31.6	23.3-30.7		
		Mean	38.8	13.7	28.8	27.3		
		SD	3.05	1.63	1.9	1.76		
		n	5	8	23	25		
(2)	Medieval	128.5	39.6	13.7	29.2	26.9		
		132.4	40.3	14.2	27.5	26.6		
(1)	Topsoil	Range				26.1-32.6	24.5-30.0	
		Mean				28.9	27.2	
		SD				1.9	1.62	
		n				15	17	
Radius			GL (cm)	Bp	BFp	SD	Bd	BFd
(1)	Medieval	Range	13.6-15.3	23.3-32.7	22.1-29.4	13.5-17.7	23.4-29.2	21.2-27.6
		Mean	14.8	28.8	26.3	15.9	27.2	24.3
		SD	1	2.72	2.13	1.26	1.88	1.86
		n	3	19	19	12	19	21
(2)	Medieval		15.3	32.1	29.1	15.5	28.8	25.8
			15.5	30.6	28.9	16.6	28.4	24.4
			13.6	29.7	27	15	27.6	23.8
(1)	Topsoil	Range	11.9-14.1	25.4-32.1	23.4-29.7	14.9-16.4	24.6-28.7	21.0-22.9
		Mean	13.2	29.6	27	15.7	26.2	22.1
		SD	0.93	1.78	1.83	0.5	1.24	0.63
		n	5	19	19	6	8	8
(2)	Topsoil		14.1	29	26.4	15.7	28.7	-
			13.7	29.2	26.7	16	-	22.9
			13.9	30	26.4	16.4	26.5	22.7
			11.9	26.5	24.3	14.9	24.6	21.7
			12.6	27.2	24.8	15.6	26.2	21

Figure 8.20.17: Selected sheep measurements

Ulna (1)			LO	DPA	SDO	BPC	
	Medieval	Range	34.1-42.0	22.5-26.9	18.5-22.1	15.5-18.9	
		Mean	37.5	24.7	20.4	17.6	
		SD	3.16	1.63	1.36	1.23	
		n	5	5	5	7	
Metacarpal			GL	Bp	SD	DD	Bd
(1)	Medieval	Range	106.3-111.0	20.2-23.6	10.8-15.2	7.6-9.1	22.1-25.9
		Mean	108.5	22.2	13.5	8.4	24.2
		SD	2.36	1.14	1.65	0.52	1.37
		n	3	11	5	7	8
(2)	Medieval		106.3	20.2	10.8	7.6	22.1
			111	22.7	15.2	8.5	25.9
			108.2	21.3	14	8.9	24.9
(1)	Topsoil	Range		19.1-23.8	11.5-14.6		22.5-24.9
		Mean		22.6	13.4		23.5
		SD		2.21	1.26		1.25
		n		8	5		3
(2)	Topsoil		111	-	12.9	9	22.5
Tibia			GL (cm)	Bp	SD	Bd	
(1)	Medieval	Range			13.0-14.5	21.9-27.6	
		Mean			13.6	24.7	
		SD			0.56	1.27	
		n			6	47	
(2)	Medieval		17.5	37.1	13	24.2	
(1)	Topsoil	Range			13.0-14.4	21.8-27.2	
		Mean			13.5	24.9	
		SD			0.76	1.2	
		n			3	46	
(2)	Topsoil		15.6	-	13.2	22.5	
Astragalus			GL1	GLm	D1	Bd	
(1)	Medieval	Range	25.5-28.5	23.6-27.2	13.9-16.0	16.0-18.5	
		Mean	26.5	25.1	14.8	17.4	
		SD	0.8	0.87	0.51	0.67	
		n	17	17	17	17	
(2)	Medieval		26.4	25.1	15.2	18.5	
			28.5	27.2	14.9	17.4*	
			25.6	24.1	14.4	16	
			25.9	24.9	14.3	17.7	
			26.5	25.2	14.5	17.5	
			27.1	25.8	14.7	16.9	
			27.3	25.6	15.5	18.3	
			26	23.9	14.5	16.6	
			25.5	23.6	14.3	16.7	
			26.3	24.9	15.1	18.3	
			27	25.5	14.9	17.4	
			26.3	25.3	14.7	17.8	
			26.2	25	14.9	17.9	
			25.6	25.1	13.9	17.3	
			26.9	26.1	15.3	17.6	
			27.6	25.9	16	17.7	
			26	24.5	14.5	16.8	

Figure 8.20.17 (continued) Selected sheep measurements

(1)	Topsoil	Range	25.2-28.8	24.9-27.1	14.0-15.4	16.4-18.9	
		Mean	26.8	25.8	14.8	17.7	
		SD	1.02	0.85	0.45	0.68	
		n	16	16	16	16	
(2)	Topsoil		26.8	25.2	15	17.5	
			26.1	25.1	14.2	18	
			26.7	25.4	15	18.3	
			26.5	25.8	15.3	17.4	
			25.2	25.2	15	16.4	
			27.6	27.1	15.4	17.5	
			27.5	26.4	15.4	18.9	
			27	26.4	15.2	17.8	
			25.7	25.2	14.2	16.5	
			26.1	24.5	14.7	17.2	
			28.8	27.1	14.4	18.1*	
			25.4	25	14.5	17.3	
			26.4	26.1	15.1	18.3	
			28.6	27.1	15.2	18.5*	
			26.7	24.9	14	17.3	
			27.3	25.5	14.9	17.4	
Calcaneum			GL				
(1)	Medieval	Range	48.5-54.3				
		Mean	51.7				
		SD	1.75				
		n	7				
(1)	Topsoil	Range	46.8-55.1				
		Mean	52.5				
		SD	2.54				
		n	12				
Metatarsal			GL	Bp	SD	DD	Bd
(1)	Medieval	Range		18.7-20.4	10.6,12.0	8.0-8.9	20.9-23.6
		Mean		19.6	11.3	8.6	22.7
		SD		0.64	-	0.49	1.01
		n		7	2	3	7
(1)	Topsoil	Range Mean		17.8-19.5	10.2-11.2	8.3-9.4	22.1-23.2
				19	10.7	8.9	22.6
		SD		0.48	0.44	0.45	0.43
		N		10	4	4	6
(2)	Topsoil		125.3	19	10.2	9.4	23.2
			127.1	19.1	10.9	8.9	22.8

Figure 8.20.17 (continued) Selected sheep measurements

Out of 126 mandibles (with toothrows) examined, 7 showed some signs of periodontal disease(5/100); also a further 4 (2) fragments without teeth (Figures 8.20.9 (G), 8.20.18). Where stageable, the affected mandibles were all at later wear stages (at least 36, or F), but so were most staged mandibles; however the oldest wear stages (>=42, H) do seem overrepresented. Of the same 126 mandibles, 21 (16/100) showed tooth crowding, 11 (8) between the lower fourth premolar and the first molar and 10 (8) also between the first and second molars. The crowding was clearly related to wear stage (hence age), mainly occurring in mandibles of stage 34, F or above, and with more crowding tending to occur in mandibles at higher wear stages. Crowding also showed some association with disease. As observed by Levitan (1985) both crowding and periodontal disease were concentrated around the fourth premolar and first molar. The proportion of mandibles affected does not seem especially high - at Middleton Stoney 38. 5% of Period 6 sheep mandibles showed signs of periodontal disease which was considered to indicate 'a serious problem' (Levitan 1984, 117). Some degree of nutritional stress is indicated, which may contribute to the small size of the stock (eg Grant 1984, 1988, 154). Calculus deposits around teeth were common, but were not quantified.

P D Stage (Levitan)	Mandible W S (Grant, Payne)	Area of tooth row affected	Notes
Medieval contexts			
1	43, H	P4/M1	M3 with reduced third cusp
2	-, ?F-G	P4/M1	Also overcrowding M1/M2
2	42-43, H	P4	Crowding P4/M1
2	-, ?F-G	P4/M1	
2-3	(fragment)	P3/P4	? tooth loss ante-mortem
2-3	(fragment)	?P4/M1	? tooth loss ante-mortem
3	*c*39, ?G	P4/M1; M2/M3	P4, ?M1 lost; alveolar infilling starting around P4; alveolar widening M2/M3 area; crowding M1/M2
Topsoil contexts			
2	36, F	P3-M3	Bone pitting from M3 forwards; recession of alveolar margin M2/M3; severe crowding and distortion P3-M1 (Figure 5.4, G)
2	>45, ?G-H	P4/M1	Crowding M1/M2
2	(fragment)	?	Has been gnawed post-mortem
2-3	(fragment)	P4	?tooth loss ante-mortem

Figure 8.20.18: Pathology observed in Sheep mandibles (Levitan 1985)

One horn core tip fragment (from topsoil) showed slightly irregular growth producing a notch in the anterior profile. A curious deformation involving the first two cervical vertebrae was found (Figure 8.20.9, H, I). The joint between axis and atlas shows exostosis and remodelling of bone, with a spur of bone from the atlas fitting into a notch on the anterior articular surface of the axis, and corresponding bone remodelling within and at the edges of the joint. This would be more or less rigid with little freedom to rotate. There is some grooving and eburnation on the articular surfaces of both vertebrae. The animal would have been wry-necked, with the head slightly twisted and very restricted in rotation. This condition may have originated in traumatic damage to the joint, perhaps from fighting. An ulna fragment (from topsoil) shows bone exostosis (and possibly fusion with the radius) around the proximal articulation, particularly on the lateral side; this resembles 'pen elbow' and is considered to be traumatic in origin (Baker and Brothwell 1980, 127).

Considering the number of identified fragments of sheep, the level of pathology observed is not high. The stock seems in generally good condition. The dental pathology may indicate some degree of nutritional stress, though probably not abnormally high.

The exploitation of sheep

Since there was no positive evidence of goat, this report refers exclusively to sheep. These were typical small medieval sheep (Grant 1988, 176; Armitage and Goodall 1977), with both horned and polled individuals; this does not necessarily imply the presence of more than one type. The metrical evidence also suggests that only one major size grouping was present, with variation due to individual sexual or nutritional characteristics.

The lack of information on sex ratio hinders deduction of the population structure. Probably there were roughly equal numbers of ewes and males/castrates (40-60% females), though the direct evidence for castrates is minimal. Most likely there were fairly large numbers of castrates, which have a superior fleece (Ryder 1983, 447-448), and few rams. The age profile shows clearly that animals were killed mainly as adults, in their fourth or fifth years, when they would have yielded several fleeces. The age profile is typical of medieval sites where wool was an important product, and contrasts with for instance Roman sites where meat was the most important product and sheep were mainly killed in their second year (eg Maltby 1979, 42-45). The fairly high proportion of ewes is clearly adequate to replace stock, and milk may also have been a valuable product (Ryder 1983, 444-445). Sheep, like cattle, were an important component of the mixed farming system, producing manure vital to fertility. Their exploitation seems to have revolved around the economically important wool production, with the animals being slaughtered for meat only after producing several fleeces.

Pig

Anatomical representation, fragmentation and butchery

As for the other major species, all parts of the carcass are represented (Figure 8.20.1). The proportion of cranial parts and teeth, however, is higher, and this is probably indicative of worse preservation of pig bone. The effect is even more marked in the topsoil data. Pigs tended to be killed young (see below) and this probably contributes to the effect. The few postcranial fragments found in the samples were nearly all unfused (4/5). Overall fragmentation (NIF/MNI) was in fact less than for sheep (Figure 8.20.20). This is at least partly due to the poor preservation, with many fragments (contributing to NIF) having disappeared, but could reflect different processing of the carcass.

The proportion of bones with butchery marks is similar to that in sheep (Figure 8.20.20) but because of the much lower number of pig fragments detailed interpretation seems unjustified. Figure 8.20.19 summarises the position of butchery marks seen.

Age

Mandible stages (Grant 1982) were recorded or estimated for 34 mandibles (all areas, medieval phases; Figure 8.20.21). Correlating these with eruption ages (Silver 1969), it seems that about 80% of the mandibles were from pigs of 15 months or younger, and only 2 (6%) were from animals of 2 years or older. The epiphysial fusion data do not agree very closely (Figure 8.20.22): only about 50% of elements fusing by 2-2. 5 years were unfused. If the data from metapodials is omitted this rises to 70%. The conflict may

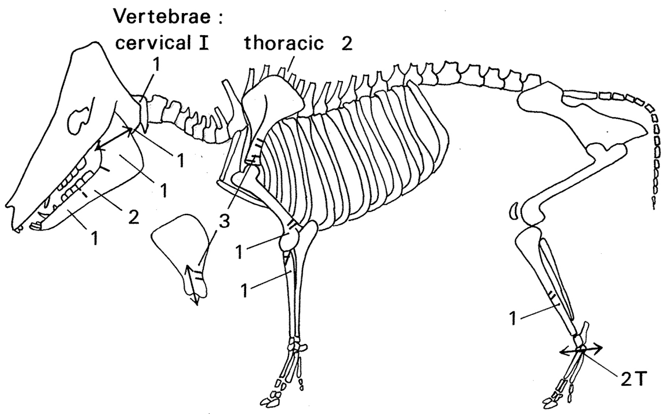


Figure 8.20.19: Faunal Remains: Distribution of butchery marks on pig.
Lines with arrows show region where bone is severed. Lines on bone indicate position of butchery marks. Dotted lines show butchery marks medial. Numbers: x, number of cut/chop/slice marks; xT, numbers of cut/chop/saw marks where bone is severed.

	NIF	Butchered	%	Fragmentation index	% Whole	
Skull Fragment	113	1	0.9			
Mandible	106	4	3.8	3.9	0	
Scapula	25	4	16.0	3.6		
Humerus	30	1	3.3	6.0	0	
Radius	23	1	4.3	4.6	13	
Ulna	29			2.1		
Carpal	2					
Metacarpal	5			1.2	0	
Pelvis	11					
Femur	7			7.0		
Tibia	48	1	2.1	8.0	4.2	
Fibula	3					
Astragalus	6					
Calcaneum	12			6.0		
Tarsal	7	2	28.6			
Metatarsal	8			2.0	37.5	
Metapodial	20			2.7	36.4	**
1st Phalanx	20			3.4	92.7	#
2nd Phalanx	8					
3rd Phalanx	13					
Vertebra	15	3	20.0			
	511	17				

** all metapoidals; # all phalanges

	% butchered	% burnt	% gnawed	NIF/MNI
Pigs				
Including teeth	1.8	0.0	5.7	34.5
Excluding teeth	3.3	0.0	10.4	18.9

Figure 8.20.20: Pig - Butchery and fragmentation data for pig from medieval contexts

			MEDIEVAL					
Stage	Age'	Definite + estimated	Ranges				Min %	Max %
1- 5	under 6 months	-	5-6	2	9-17	3	0	5.9
6-10	under 12 months	4	8-12	2	9-15	1	9.9	23.5
11-15	under 15 months	3	12-17	3	15-17	1	35.3	55.9
16-20	*c*15 months	7	17-22	1			76.5	82.4
21-25	under 24 months	3	19-23	1			91.2	94.1
26-30		-	24-28	1			94.1	94.1
31-35	over 2 years	1					97.1	
36-40	well over 2 years	-						
41		1					100	
TOTAL		19		10		5		

(`Ages' from tooth eruption ages, Silver 1969. Topsoil numbers too low for inclusion)

Figure 8.20.21: Pig – ageing data from mandibles (Grant 1982)

	MEDIEVAL				TOPSOIL			
	NF	F	n	%F	NF	F	n	%NF
1 year								
Scapula D	4	5	9	55.6	1	1	2	50.0
Humerus D	4	4	8	50.0	-	1	1	100.0
Radius P	2	12	14	85.7	-	6	6	100.0
2nd Phalanx P	5	3	8	37.5	4	4	8	50.0
Average			39	61.5			17	70.6
2-2.5 years								
Tibia D	5	5	10	50.0	6	3	9	33.3
T-Calc	2	1	3	33.3	3	-	3	0.0
Metacarpal D	-	-	-	0.0	1	1	2	50.0
Metatarsal D	3	1	4	25.0	2	1	3	33.3
Metapodial D	2	15	17	88.2	5	3	8	37.5
MC + T + P	5	16	21	76.2	8	5	13	38.5
1st Phalanx P	17	3	20	15.0	13	3	1	18.7
Average			54	46.3			41	26.8
3-3.5 years								
Humerus P	1	-	1	0.0	1	-	1	0.0
Radius D	3	1	4	25.0	-	1	1	100.0
Ulna P	3	-	3	0.0	1	1	2	50.0
Ulna D	-	1	1	100.0	-	-	-	0.0
Femur P	2	-	1	0.0	-	-	-	0.0
Femur D	2	-	2	0.0	-	1	1	100.0
Tibia P	4	1	5	20.0	-	-	-	0.0
Average			18	16.7			5	60.0

Figure 8.20.22 Pig - Ageing data from epiphysial fusion (ages from Silver 1969)

arise from bias against recovery of smaller, unfused elements, which in a collection with a high proportion of juveniles (as indicated by mandible data) would lead to an apparently 'older' fusion age profile. It seems likely, then, that most pigs were in fact slaughtered at a young age, in their first or second year. This is consistent with their being kept primarily for meat, in contrast to cattle and sheep.

Sex, size, pathology

Canines from both males and females were found (Schmid 1972). The fragmentation and preponderance of juvenile remains meant that few measurements were taken (Figure 8.20.23) and so little can be said either about sex ratios or size distributions. There was no evidence for wild boar. No mandible pathology was noted, not surprisingly since most were from young animals. One thoracic vertebra (around T10) showed exostosis and bone remodelling with surface roughness particularly around the anterior surface of the centrum and anterior zygapophyses. This may have been part of a more extensive area of damage as suggested by the abnormal orientation of the right posterior zygapophysis and absence of the left (Figure 8.20.9, J, K).

			Bp	
Radius				
	Medieval	Range	28.3-31.2	
		Mean	29.9	
		SD	1.1	
		n	5	
				BPC
Ulna				
	Medieval	Range	20.4-23.6	
		Mean	22.1	
		SD	1.17	
		n	10	
Tibia				Bd
	Medieval	Range	31.5-33.3	
		Mean	32.4	
		SD	0.79	
		n	4	

Figure 8.20.23: Selected Pig measurements (summarized)

The exploitation of pig

Unlike sheep and cattle, pigs seem to have been kept primarily for meat, and were generally slaughtered young, in the first or second year. They may well have been kept on a cottage scale, particularly in this little-wooded area; Roger Heritage's probate inventory does not list pigs along with his cattle and sheep. Pigs are efficient converters of otherwise waste organic matter, and contribute to fertility by manuring: where pannage (from woodland) is not available they can feed on cereal waste and stubble which helps recycle nutrients (Grant 1988, 157-8). Even where they were kept on a large scale and intensively managed, as on the Peterborough Abbey estate, production was geared to the consumption needs of the Abbey: ‘It was first and foremost a consumer and not a market producer of pork’ (Biddick 1984).

Other Species

Minor (domestic) mammals

These species are present in much smaller quantities (NIF or MNI), and so exhaustive quantitative analysis is inappropriate. Unless otherwise stated, material discussed is from 13th-15th century (mainly 15th!) contexts. Anatomical representation data are shown in Figure 8.20.24.

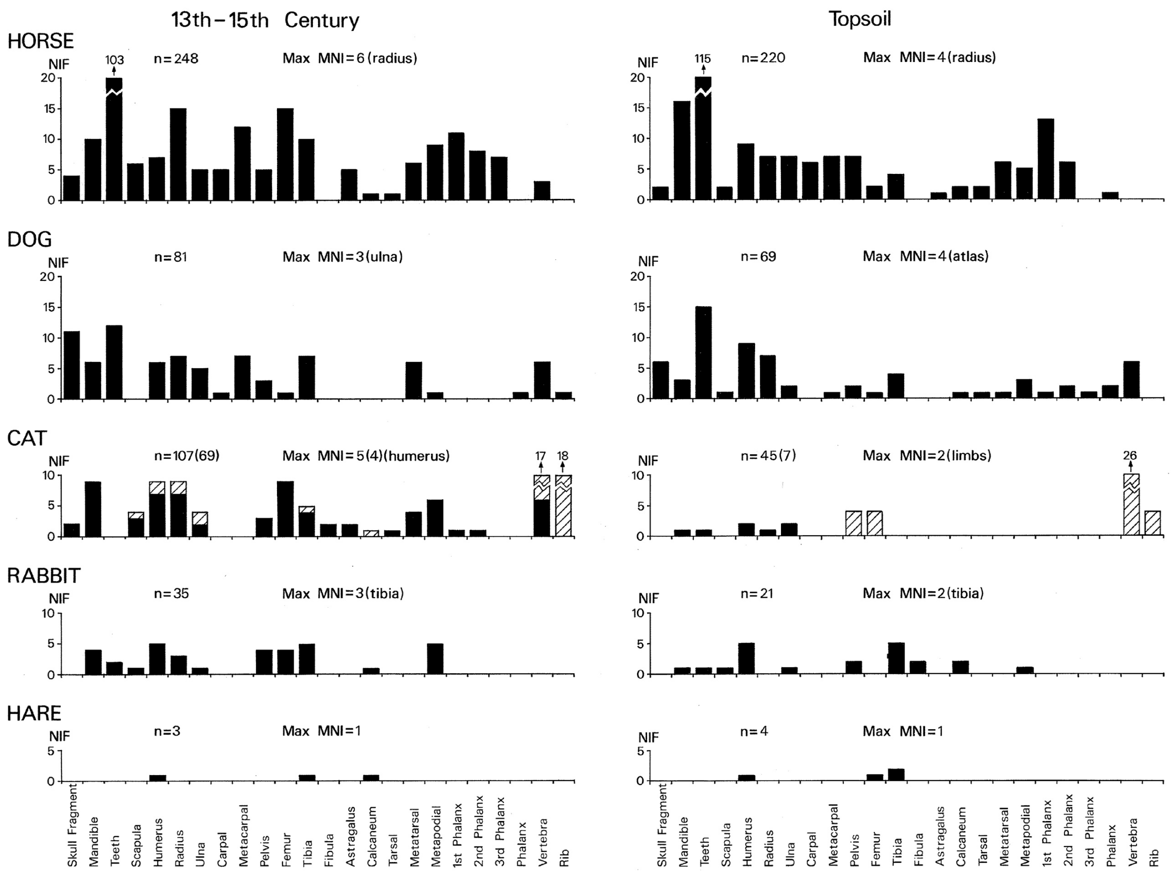


Figure 8.20.24: Faunal Remains: skeletal part representation for minor mammalian species. NIF only shown. Hatched columns are bones from single individuals

Horse

Horse remains are ubiquitous but much less common than those of the major food species (Figure 8.20.2). The proportion of loose teeth is over 40% (medieval) or 50% (topsoil), while mandibles with teeth are very rare: this suggests worse preservation than cattle. Indeed, NIF/MNI is smaller for horse (41 including teeth, 28 without, compared to 6 and 6 for cattle). All parts of the skeleton are present, in fairly even proportions. While there was very little evidence for chopping or smashing of long bones, whole bones are fairly uncommon. For metapodials, of which there are enough for meaningful comparison, 26% overall were complete compared to 2. 4% in cattle. Thus, while preservation is worse than cattle, fragmentation is less, and this is probably because cattle were eaten while horse (usually) was not. Nevertheless, some butchery marks were observed. One humerus (and one from topsoil)had been chopped or sawn through distally, just proximal to the olecranon notch. One femur had deep horizontal knife cuts near the supracondylar fossa. One metatarsal had a small knife cut about halfway down. This last could have been related to skinning, but the other two are not easily explained in this way. Even if horse meat was occasionally consumed it probably was not a regular part of the diet (Grant 1988, 160).

Horse measurements are listed in Figure 8.20.25. The horses seem to have been fairly small (mean 12-13 hands, range 11-14; mainly from metacarpal lengths, using Vitt's factors as given in von den Driesch and Boessneck 1974) in height, and the occasional very small bone may be remains of mule or ass. Two particularly small and slender first phalanges and one third phalanx(unfortunately none measurable) could possibly belong to asses.

Radius		GL (cm)	L1 (cm)	Bp	BFp	SD	Bd	BFd		
(1) Medieval		30.8	29.8	74.2	68.1	33.3	70.4	56.4		
Metacarpal		GL	GL1	L1	Bp	Dp	SD	DD	Bd	Dd
(1) Medieval	Range	17.9-23.9	17.6-23.6	17.5-23.1	37.6-52.8	25.0-37.0	22.9-35.5	16.9-25.2	39.5-52.3	28.3-38.9
	Mean	21.1	20.8	20.4	45.1	30.9	30.5	20.5	45.5	33.6
	SD	2.34	2.32	1.95	5.5	4.3	4.73	3.16	4.79	3.38
	n	5	5	5	5	5	5	5	5	5
(2) Medieval		20.5	20.3	19.8	44.7	29.9	30.3	18.7	43	33
		20.3	20	19.7	43.5	30.8	30.6	20	45.6	33.1
		22.8	22.4	22	46.8	31.8	33.1	21.7	47.3	34.6
		23.9	23.6	23.1	52.8	37	35.5	25.2	52.3	38.9
		17.9	17.6	17.5	37.6	25	22.9	16.9	39.5	28.3
Tibia		GL (cm)	L1 (cm)	Bp	SD	Bd	Dd			
(2) Medieval		34	31	92.5	37.8	73	45			
Astragalus		GH	GB	BFd	LmT					
(2) Medieval		51.4	53.5	47.2	52.6					

(1) summarised measurements, (2) measurements of complete bones.

Figure 8.20.25 : Selected horse measurements

Because of the large number of loose teeth, many of which could not be identified precisely to type, this source of age information (Levine 1982) was rather imprecise. One mandible was from an animal about 14 years old at death. At least 16 molars/premolars were from animals older than 15 years, 3 from animals of <15, <9 and 7-9 years old respectively, and 6 were unerupted or unworn, from animals less than about 3 years old. Epiphysial fusion evidence (Figure 8.20.26) suggests that no more than 5% of horses were less than 1. 5 years old at death. Probably most horses were kept to the end of their working life, and the younger animals found here died from accident or disease.

One mandible showed evidence of periodontal disease around the second premolar, with bone swelling, root resorption and infilling of the alveolus.

The horses were probably used for transport, either as riding, draught or pack animals. They could have been used for ploughing, but there is no positive evidence that they were. At Wharram Percy the percentage of horse bones was much higher than at Burton Dassett (7-13%)and it was suggested that they were being used for ploughing there (Le Patourel 1974).

	MEDIEVAL				TOPSOIL			
	NF	F	n	%F	NF	F	n	%F
c1 year (P2 9 months, S 12 months, P1 13-15 months)								
Scapula D	-	6	6	100	-	1	1	100
1st Phalanx P	-	8	8	100	-	7	7	100
2nd Phalanx P	-	1	1	100	-	4	4	100
Average			15	100			12	100
15-18 months (MT D 16-20 months)								
Humerus D	-	3	3	100	-	5	5	100
Radius P	1	6	7	85.7	-	5	5	100
Metacarpal D	-	6	6	100	-	5	5	100
Metatarsal D	-	2	2	100	-	2	2	100
Metapodial D	-	2	2	100	-	-	-	0
Average			20	95			17	100
20-24 months								
Tibia D	1	3	4	75	1	1	2	50
3-3.5 years								
Humerus P	-	1	1	100	-	-	-	0
Radius D	1	3	4	75	-	3	3	100
Ulna P	-	3	3	100	-	-	-	0
Femur P	2	2	4	50	-	1	1	100
Femur D	1	2	3	66.7	-	-	-	0
Tibia P	-	1	1	100	-	1	1	100
Average			16	75			5	100

Figure 8.20.26: Horse – ageing data from epiphyseal fusion (ages from Silver 1969)

Dog

The remains of dogs, like those of horse, were scattered throughout the deposits, in low percentages. (None appeared in the samples). The few measurements indicate a size range of 40-50cm withers height (von den Driesch and Boessneck 1974). No remains of juveniles were found. Dogs may not generally have been disposed of with the household waste. From this evidence it is hard to say much about the dogs except that they were there. There is widespread evidence of their scavenging activities - at least 9% of the bones (excluding teeth) showed traces of gnawing, mostly by dogs- and they may thus have had a considerable effect on the bone assemblage. Some bones from the samples looked as though they had been digested (Payne and Munson 1985; S Hamilton-Dyer, pers comm). Dogs could have been used as guard dogs, for herding, for pest control or hunting, and for companionship.

Cat

The remains of cats were also scarce but ubiquitous. The figures are somewhat distorted by the presence of groups of bones from individual animals (distinguished in Figure

8.20.24): 38 in tenement H (medieval contexts) and 70 in one sample from D2. Three bones came from pre- medieval contexts, but this could be due to soil mixing. Both juvenile and adult animals were found, though mainly the latter. Measurements are listed in Figure 8.20.27. One cat mandible showed quite severe pathology (Figure 8.20.9, L) with ante-mortem tooth loss, alveolar bone loss and infilling, and swelling, perhaps due to an abscess. One calcaneum (Figure 8.20.9, M, N) shows extensive exostosis, with pits and hollows in the bone - this may be a result of infection and inflammation of the bony tissue (Baker and Brothwell 1980, 63ff). Cats would have been useful in catching mice and rats - major pests of stored products. Their fur could have been used, though there is no evidence for this (eg skinning marks). Some bones, including bird bones, appeared to have been gnawed by cats, so they would also have functioned as scavengers.

Element	Phase		Measurements (mm) as in von den Driesch					
Humerus			GL	GLC	Bp	SD	Bd	
	Medieval	*	89	86.8	15.4	6	16.5	
			81.6	79.9	13.5	5.2	15.2	
			94	92.5	15.5	6.4	18	
			94	92.5	17	6.4	18.2	
Radius			GL	Bp	SD	Bd		
	Medieval	*	82.6	11.1	4.4	7.9		
Ulna			GL	DPA	SDO	BPC		
	Medieval	*	97.6	9.5	8.4	8.7		
Femur			GLC	Bp	BTr	DC	SD	BD
	Medieval		88.8	17.3	10.3	8.3	7	15.8
Tibia			GL	BP	SD	BD		
		*	98.4	17.4	5.9	13.5		
* from one individual								

Figure 8.20.27: Selected cat measurements

Rabbit

Rabbits (*Oryctolagus cuniculus*) were probably introduced into Britain from the 10th-11th century onwards, and established in warrens by the 12th century (Sykes and Curl 2010). They were kept in enclosed warrens, and though there were feral populations established by the 13th and 14th centuries, and widespread by the 16th century (Sykes and Curl 2010), it is likely that the rabbits at Burton Dassett were domestic. The high prices paid for rabbits suggests that they were of only local distribution: eg in 1395 rabbits for a feast at Merton College, Oxford, were imported from Bushey in Hertfordshire at 6d-8d a couple plus 1/2d for transport, presumably not being easily available more locally (Lever 1977). Rabbit was at that time an expensive luxury meat, appearing at royal feasts, and the skins were also valued.

There was a local source at Burton Dassett - Roger Heritage's warren - so the appearance of rabbit is not surprising, nevertheless suggesting a degree of prosperity. Of the 36 fragments found, 3 were from tenement D1, 20 from D2 (plus 1 from a sample), 11 from E, 1 from I and 1 from H. All except one (D1) were from late 15th-century contexts, contemporary with the warren. Relative to the numbers of other fragments, rabbit may be slightly commoner in E than D2, but numbers are really too small to be meaningful. Bones of both adults and juveniles, mainly the former, were found. A further 24 fragments came from topsoil, but it is not certain that these were of medieval origin. Although one must always be cautious indefinitely attributing the bones of burrowing animals to the context in which they are found, it does seem likely that rabbit was being consumed at Burton Dassett.

Wild mammals

Three hare limb bones, all from mature animals, were found in 13th- to 15th-century contexts. They may well have been eaten.

The only trace of deer was antler fragments. Some waste scraps are listed among the worked bone. The fragment from tenement J included the pedicel and had been sawn from the skull, and so was definitely not a shed antler that had been collected. It is probably from a red deer. Antler was used to make all sorts of items and was a valuable raw material (MacGregor 1985). There is however no evidence that deer were eaten at Burton Dassett. Venison was an aristocratic food and means of display (Birrell 2006) and deer are sometimes found in large quantities at high status sites such as castles (Grant 1988, 165), but only occasionally at rural sites (Birrell 1996). The antler found here may have been imported simply as a raw material, and does not even imply that deer were present locally.

Small mammals

The great majority of small mammal bone fragments (>98%) came from the samples (Figure 8.20.2 44). Those which did not comprise 4 mole humeri and 3 fragments from rat (*Rattus* sp) or watervole (*Arvicola terrestris*) - the latter counted as `unidentified' in Figure 8.20.2. The majority (85%) of the small mammal bone was unidentified post-cranial material; teeth and jaws and other characteristic elements (eg mole humerus) were identified as closely as possible. The number of elements identified to species is too low for comparison of relative proportions of species to be worthwhile, but the list of species present is worth considering from the environmental aspect (Corbet and Southern 1977; Lawrence and Brown 1974).

Rat (*Rattus* sp ; 1 femur identified as 'probably *R. rattus*') was probably present, though postcranial remains are difficult to separate from water-vole which was also present. Black rat is common on medieval sites (Rielly 2010), and this is likely to be the species present here; the common species today, *R. norvegicus*, probably arrived in the 18th century (Yalden 1999, 183). Like the mouse, the black rat is a well-known pest of stored products and may also be a carrier of diseases, notably bubonic plague (though this is not uncontroversial: see e g Hufthammer and Walløe 2013).

House mouse (*Mus musculus*) is a synanthropic species, which has probably been present in Britain since the Iron Age (Coy 1981, 100; O'Connor 2010) and is common in a range of urban and rural habitats associated with human activity. It can be a considerable pest of stored grains and other foods and may also transmit parasites and disease-causing microorganisms.

No attempt was made to separate wood- from yellownecked- mouse (*Apodemus sylvaticus* and *A. flavicollis* respectively). Both species are found in woods, hedgerows and field edges, and may be found in rural gardens and homes; wood mouse extends further into towns than *A. flavicollis*, but shows greater selection for cover (Corbet and Southern 1977), while *A. flavicollis* is more often found in or near human habitation (Lawrence and Brown 1974).

All three native (mainland) species of vole were present. The bank vole (*Clethrionomys glareolus*) is abundant in deciduous woodland and scrub, along banks and hedges in thick cover, and is sometimes found in fields. The field vole (*Microtus agrestis*) is mainly a species of rough (ungrazed) grassland. The water vole (*Arvicola terrestris*) is mainly found on well vegetated banks of lowland rivers, ponds and ditches, though it may burrow in pasture away from water. They are mainly herbivorous, feeding on grasses, herbs, fruits and invertebrates; field voles may be agricultural pests.

The common shrew (*Sorex araneus*) is found in a wide range of habitats where low cover is present, especially thick grass, hedgerows, bushy scrub. It feeds mainly on invertebrates. The mole (*Talpa europaea*) burrows in any suitable soil, and is most abundant in permanent pasture and deciduous woodland. They may cause some damage by tunnelling and throwing up earth, but perhaps also improve drainage. They mainly feed on worms. The weasel (*Mustela nivalis*) bones may be the chance remains of a wild mammal, like those of other small mammals. It is conceivable that weasels were killed as pests (of fowl for example) or for their fur but there is no evidence for this.

What can the small mammal fauna tell us about the site environment? The home range of the species present is on a scale of tens to hundreds of metres, and it seems that within this range variety of habitats from open pasture to those with good ground cover such as hedgerow, coppice or woodland were present. The common synanthropic species of mouse and rat were also present. Species associated with urban, agricultural and rural habitats are all present, unfortunately not in amounts to allow further quantitative analysis.

Birds

Introduction

In the main group of bones recovered during excavation less than 2% of fragments overall were from birds. The proportion of bird fragments was lower in topsoil contexts than in 13th-15thcentury contexts, suggesting worse preservation in topsoil contexts: for this reason, it is mainly the ‘medieval’ group that is discussed below, to avoid possible preservation bias. About 60% of bird fragments were identified, a higher proportion than for mammals, so that the percentage of bird among identified fragments from 13th- to 15th-century contexts is higher than the overall figure at 3. 7% (see Figure 8.20.2). In the samples bird made up 9-10% of bird + mammal fragments; this suggests that bird is under-represented in the main group of bone due to recovery factors. The majority (71% including the mainly juvenile fragments listed as ‘fowl?’ in Figure 8.20.2) of identified bird fragments in the samples are from fowl. The samples contributed more fragments from passerines (sparrow- and blackbird-sized) and smaller elements such as foot phalanges, but do not greatly affect the species list.

Quantitative comparisons are based on the main group only.
Fowl

Fowl bones predominate in all areas (mean 55% of bird fragments, range 44-64%, for all medieval contexts combined).

Butchery marks were observed on 5 (3% of medieval) fowl bones: knife cuts on 1 coracoid, 2 humeri and 1 femur, and 1 scapula had been chopped. Gnawing was observed on 19 (10%) bones, mostly due to rodents, but also dog and cat. The fowl bones were apparently discarded with other domestic refuse and can be interpreted as remains from food preparation and consumption.

About 20% of identified limb bones of fowl were immature (unfused epiphyses), derived from birds of 6 months or under. The true proportion may be higher, as there is likely to be bias against preservation and identification of immature bones. About half of the fowl + probable fowl bones in the samples were unfused. Of 9 tarsometatarsi, 5 were immature, 2 were spurred (male) and 2 unspurred (female). About half (52%) of adult limb bones examined for the presence of medullary bone had it, i e came from females in lay (Driver 1982). Although measurements were taken where possible (Figure 8.20.28) these were too few to provide information on size variation in relation to sex. There was no positive evidence for capons (West 1982).

This pattern can be interpreted in terms of 'backyard' flocks from which both meat and eggs were obtained. If chickens were bought in mainly for meat (and eggs were bought separately or not at all) one would expect to find remains of young, fattened fowls - old immatures or young adults - probably mostly males (or capons). The high proportion of juveniles and laying females argues for local/domestic production. These categories in fact represent the less marketable products of the flock. Laying females might be killed as their egg production started to decline, and these tough old birds might well be consumed at home rather than sent to market. Some broods would be reared in spring. From these, laying hens (and broodies) would be replaced. The males could either be fattened and eaten or sold, or if this were not economic killed as soon as they were sexable (by the person who managed the flock, not the archaeologist! - probably at 2-3 months). The proportions of juveniles and hens found at Exeter and Middleton Stoney in the medieval period are similar (Maltby 1979; Levitan 1984). It is difficult to assess from the available evidence to what extent the flock supplied the immediate household and to what extent its products were marketed, as the population structure would not be very distinct. A high proportion of very young birds might suggest lack of a market for fattened fowls, or inability to rear very many for lack of food, or possibly disease; however, such a pattern might easily be obscured by bias in preservation and identification. There may also be a seasonal element. Towards the end of the summer, egg production would decline and flocks might be reduced to carry over the winter; some young fowls would be fattened, but any surplus would-be killed (depending on the economic balance between supplying their food and the likely return at market) and very likely utilised. The 'snapshot' nature of the deposits might preserve just such a seasonal surplus of old hens and juveniles.

To sum up: it is probable that fowls were reared locally, and exploited for meat and eggs. Fowl, like pigs, could have been kept on a backyard scale, and are effective converters of otherwise waste organic matter into high-quality food in the form of meat and eggs. Their feathers might also be used (eg Stone 2006, 160). Fowl and their eggs are conveniently marketable, perhaps providing a source of cash (eg for rent payments) for even small-scale tenants. According to Grant 'eggs and live poultry both seem almost to have been a rural currency' (Grant 1988, 164).

Element/ Phase		Measurements (mm) as in von den Driesch							
Humerus	Medieval	GL	Bp	SC	Bd				
(1)	Range	18.0-22.6	6.7-7.5	14.5-17.1					
	Mean	19.6	7.2	15.8					
	SD	2.08	0.35	1.15					
	n	4		4					
(2)	Medieval	72.1	-	7.3	16.3			Female	
		77.6	22.6	7.3	17.1			No med. bone	
Ulna	Medieval	GL	Dip	Bp	SC	Did			
(1)	Range	61.4-70.8	11.6-13.4	8.1-9.2	3.9-4.2	8.9-9.9			
	Mean	67.1	12.4	8.8	4.1	9.4			
	SD	4.3	0.99	0.47	0.13	0.44			
	n	4	4	4	4	4			
(2)	Medieval	61.4	11.6	8.8	4	8.9		Female	
		70	13.2	9.2	4.1	9.6		Female	
		66.2	11.6	8.1	3.9	9.2		Female	
		70.8	13.4	8.9	4.2	9.9		Female	
Femur	Medieval	GL	Lm	Bp	Dp	SC	Bd	Dd	
(1)	Range	71.7-76.7	67.7-74.7	14.3-16.9	9.5-11.2	6.0-6.9	13.5-16.0	11.5-13.2	
	Mean	75.1	71.6	15.7	10.5	6.6	15.1	12.3	
	SD	2.29	2.54	0.98	0.59	0.34	0.88	0.68	
	n	4	5	8	7	8	6	5	
(2)	Medieval	75.7	1.5	14.8	10.7	6.9	15	11.5	Female
		>77	72.6	15.4	10.5	6.5	15.2	12.4	No med. bone
		76.2	-	16.9	10.9	6.6	15.8	-	Female
		71.7	67.7	14.3	9.5	6	13.5	11.8	No med. bone
		76.7	71.7	16	10	6.9	15	12.7	Female
		-	74.7	16.7	11.2	6.9	16	13.2	No med. bone
Tarsometatarsal		GL	Bp	SC	Bd				
(2)	Medieval	71.6	12.5	6.2	13.9	No spur			
		75.2	12.4	6.3	13.4	No spur, prob Female			
		67.9	11.3	5.6	11.7	No spur			

Figure 8.20.28: Selected Fowl measurements

Goose

About half as many goose fragments as fowl fragments were identified (Figure 8.20.2) though MNI was similar. Butchery marks were observed on 10 (11% of medieval) goose bones. Knife cuts were seen on 1 furcula, 4 radii (1 also sheared and chopped), 1 ulna, 1 carpometacarpal, 1femur, and 1 tibia. One tarsometatarsal was chopped axially. There were marks of gnawing, mainly by rodents but also possibly dog and cat, on 9 (10% of medieval) goose fragments.

The higher percentage of goose bones with butchery marks compared to fowl may reflect their greater size. The percentage of gnawing is very similar however, and these are most likely food remains and domestic debris like most of the bone material on the site. Only 7 immature (unfused) bones (8% of medieval) were noted. This may underestimate the percentage of young birds due to preservation biases, but it is considerably less than for fowl. Probably geese were reared to their full size before being fattened and slaughtered. Goose eggs can be eaten, but, unlike fowl, geese are not prolific layers and goose eggs are generally more valuable as a source of young geese. Feathers, especially down, could also be used.

Geese can exploit wet and marshy areas, and seem to have been present in higher percentages at sites with good access to such habitats such as King's Lynn (Bramwell 1977) and Lincoln (O'Connor 1982). About 25% of the bird fragments at Burton Dassett are from goose, while at King's Lynn and Lincoln goose is over 40%. Like fowl, geese may provide a useful source of cash, and geese can be driven, which widens both the area they can exploit and the distance at which they can conveniently be sold, compared with fowl.

Other domestic birds

Most or all of the duck fragments are probably from domestic duck, though wild mallard cannot be excluded: they make up less than 5% of the fragments. Two juvenile (unfused) fragments were noted. Like geese, ducks can exploit wet habitats, and are a source of meat, eggs and feathers.

The few remains of pigeon also probably come from the domesticated species *Columba livia*, and could have been from birds kept in dovecotes. Pigeons can exploit wild resources, and can be a good source of protein, but it is not easy to assess their importance, partly because their small size may bias against recovery. No pigeon bones were noted in the samples. It does not seem to have been important in the diet here.

One humerus from tenement E (E 1161, early 15th century, yard surface) was identified as peafowl - it had a knife cut on it, suggesting that the bird had been eaten. Peacock was luxury item, probably valued for its plumage as much as its meat (Bond 1982, 126-127; Serjeantson 2006, 142), and its presence here certainly indicates a degree of prosperity.

Wild birds

A variety of corvids was present. They are difficult to distinguish on the basis of isolated bones, but were probably mostly rook (*Corvus frugilegus*) and crow (*C. corone*), with magpie (*Pica pica*) and/or jackdaw (*C. monedula*) and raven (*C. corax*). These could be scavengers, accidentally present, or possibly have been killed as crop pests. Three fragments probably of buzzard (*Buteo buteo*) were from topsoil. One fragment probably of sparrowhawk (*Accipiter nisus*) was also found. The sparrowhawk could have been used for hunting (it was considered suitable for a priest). The passerines were not identifiable to species but included birds of blackbird, sparrow and tit sizes; it is noticeable that the bones of smaller birds are relatively more common in the samples. Again, it is impossible to assess their significance: such small birds could have been eaten (eg Stone 2006, 155), perhaps even kept as pets (singing birds), but may equally well be chance occurrences or the victims of cats.

The exploitation of birds

It is difficult to assess the importance of birds relative to the larger mammals because of the very probable difference in preservation. Most likely birds, particularly the domesticated ones, were much more important than would appear from the amount of bone recovered (Serjeantson 2006; Stone 2006). The bird bones found were mainly from domesticated birds. Fowl was commonest (55%) followed by goose (27%), with duck and pigeon relatively rare (<5%). All these species would provide meat, and the first three also eggs; indeed, pigeons' eggs could also be eaten. Feathers- quills, down - might also be used. The population structure suggests that fowl were reared for both meat and eggs; at least 50% of the adults killed were females in lay, and the proportion of juveniles was at least 20% and probably more. In contrast, geese were mainly reared to full size before being killed. All the domestic species provide a means of recycling waste organic matter and, being relatively small, of`storing' fresh meat in convenient quantities, particularly for households where meat was not a major constituent of the diet. They could also be a useful source of cash. Goose and duck particularly could exploit habitats that might not be easily exploited for agriculture (wetlands) and so extend the ecological range of the system. The peacock, on the other hand, was a status symbol; while not important in the economy, it does indicate prosperity.

The remains of wild birds, like those of wild mammals, are not common at Burton Dassett. None of those found were necessarily food remains, and game birds (such as partridge or woodcock) are conspicuously lacking. The commonest wild birds are corvids. These are not generally considered as food species, and perhaps were killed as crop pests or scavengers. The small birds may have been eaten (Grant 1988, 167-8); it is not possible to make any estimate of their importance, because of the biases against their recovery and the uncertainty as to their origin. All in all, there is little evidence that wild birds were important in the diet or economy of Burton Dassett. This reflects the general lack of importance of game in rural contexts: at high status sites like castles game and wild birds are much commoner (eg Bramwell 1977; Eastham 1985; Levitan 1984; Maltby 1982; reviewed by Serjeantson 2006). Urban contexts also often have a greater variety of wild game birds and wildfowl (eg Bramwell 1979; Maltby 1979; Bramwell and Wilson 1980; Stone 2006).

Amphibia

The remains of amphibians come almost entirely from the samples (Figure 8.20.2). Both common frog (*Rana temporaria*) and common toad (*Bufo bufo*) were present. Both species can be found several kilometres from their breeding sites (pools, ponds and temporary water bodies) out of the breeding season and tell us little about the environment except that such sites must have been within range.

Reptilia

One vertebra was possibly from a grass snake.

Fish

The remains of fish come almost entirely from the samples (Figure 8.20.2). Herring (*Clupea harengus*) and eel (*Anguilla anguilla*) are the commonest. Single specimens of a salmonid (probably salmon, *Salmo salar*), ray (*Raja clavata*, hake (*Merluccius merluccius*) and cod (*Gadus morhua*), the last two not from samples, were also identified. While salmon and eel both have freshwater phases, they can also be caught at sea or in estuaries; all the other species are definitely marine. There was a considerable trade in marine fish, sometimes fresh but also dried, smoked or salted, at this period (Barrett 2007, Barrett *et al* 2004). Finds of freshwater fish are less common than marine fish at medieval sites, even where sieving has been done (Grant 1988, 171; Serjeantson and Woolgar 2006). The eating of fish was important for religious as well as nutritional reasons, which may have contributed to the trade in sea fish. The ability to buy such products again suggests prosperity. Oysters (see below) were also imported to the site, and it is possible that fish were traded together with these.

Unless samples had been sieved, there would have been almost no evidence of fish at Burton Dassett. It is not possible to assess the importance of fish in the diet, because preservation and recovery factors are not really comparable, but again it may have been much more important than fragment numbers alone suggest. The majority, perhaps all, of the fish eaten may have been obtained by long-distance trade with sea ports, even at this inland site.

Marine shells

The marine shell came from the main excavation programme. Shell from topsoil contexts(<15% of total) was included in the analysis. The distribution of oyster shell over the site was very uneven: about 45% was from tenement D2, 35% from E, and a few fragments each from A, D1, F, I and K. In relation to the amount of bone, there is rather more oyster from E than from D2.

Some fragments of mussel (*Mytilus edulis*), a small scallop species (?*Chlamys*) and an unidentified bivalve were found. The bulk of the marine shell, however, was oyster (*Ostrea edulis*): 130 shells were examined, comprising 73 left valves of which 37 were unmeasurable, and 57 right valves of which 27 were unmeasurable. The MNI was 73. Maximum diameter of the left valves was 28-74mm, with a mean of 56. 1mm ± 9. 3 SD. About half the shells showed borings of the marine polychaete *Polydora ciliata*; there was no trace of borings by *P. hoplura*, typical of oysters from the south coast. The Burton Dassett sample was compared with 75 samples from Roman, Saxon and Medieval periods from East Coast, London and North Wessex and found to resemble samples from the medieval period at four sites (Leiston Abbey and Bury St Edmunds Abbey in Suffolk, North Shoebury in Essex, and Cross Street, Wokingham in the North Wessex region). There was no significant difference in size and infestation patterns were similar. There was no similarity to shells of any period from the south coast. It seems likely, then, that the Burton Dassett oysters originated from the East Coast oyster beds. (There are also oyster beds off the south-west coast, but the characteristics of oysters from this area are not known: no comparisons were made, but the possibility that oysters may have originated there cannot be ruled out). Fresh oysters tightly packed in sacks or barrels can survive for up to ten days in cool weather, so that rather rapid transport would-be needed for them to reach this inland site in edible condition; the cost of this would render them a luxury item, though at sites nearer the sea oysters can be found in large quantities and do not necessarily signify high status (Grant 1988, 173). This would explain their relative rarity at Burton Dassett.

The oysters eaten at Burton Dassett most likely came from the East Coast. This seems a likely source also for the fish. They could have been transported by water for much of the way, eg up the Thames or Trent. The fact of their consumption at this inland site suggests a degree of prosperity to sustain such long-distance trade; while the apparent scarcity of their remains reflects the inland situation and relatively low status of the site in contrast to castles or abbeys.

Site level analysis

Preservation and recovery of bone in different context types

Condition of the bone

Preservation of bone was generally good, though the bones themselves were mostly fragmentary. Some fragments showed evidence of wear and weathering consistent with being exposed before final burial, but it was not possible to quantify this. The distribution of traces of butchery, burning and gnawing was analysed for a subset of the data: the contexts selected for the analysis (hollow, ditch and gully, yard surface, floor surface, rubbish layer, layer, demolition layer, topsoil) included 91% of the medieval period data and 94% of the 'post-medieval' data. The latter is probably largely of medieval origin. Figures given below refer to medieval bone only: for common species (NIF >500 fragments) the results for topsoil show similar patterns and variations for less common species are likely to be due to low sample numbers. Here factors generally relevant to possible biases are discussed; patterns of fragmentation and butchery are dealt with in more detail in the individual species sections.

Butchery

Overall, butchery marks were noted on 530 (2.4%) fragments. This overall figure includes 326 (60%) fragments identified to species, 126 (25%) identified as cattle- or sheep/pig-size, and 78 (15%) unidentified fragments. Obviously, butchery marks were disproportionately likely to be seen on identified bones. This may represent an observational bias (less careful examination of unidentifiable fragments), or reflect the smaller size of these fragments, or relate to the fact that only certain kinds of butchery traces would in fact be counted as such, and these might be more likely to occur on large, more identifiable, bones.

Butchery marks were noted on 6.7% (241) of cattle bones and 5.9% (98) of cattle-size fragments, 2.1% (66) of sheep bones and 1.4% (28) of sheep/pig-size fragments, 1. 8% (15) of pig bones, and 1. 3% (3) of horse bones. None were seen on bones of other mammalian species. (The 1 fragment of red deer antler found had been trimmed). The lower proportion of marks on bones of smaller food species parallels the observations of Levitan (1984). This may partially explain the high representation of identified bones noted in the previous paragraph. The consistency of the results for cattle and cattle-size, and sheep/pig and sheep/pig-size, fragments suggests that identification to species or its lack is not in itself a serious source of bias.

Burning

Traces of burning were noted on 473 (2. 1%) of fragments overall. In contrast to butchery marks, burning was noted disproportionately on unidentified fragments: 404 (85%), with 20(4%) on fragments identified to species and 49 (10%) on cattle- and sheep/pig-sized fragments. This is probably because burnt bone is less likely to be identifiable, and more likely to fragment. Because of the very low numbers of burnt identified bones (< 1% for all species), it is not possible to assess whether this could be a serious source of bias - ie whether bones of one species were much more likely to be destroyed by burning than those of another. Comparing 'large' (n=25, 0. 8%; including topsoil) and 'little' (n=50, 1. 6%) it does seem possible that smaller bones - hence bones of smaller species - were preferentially destroyed.

Gnawing

It was only possible to analyse traces of gnawing on identified (to species or size-group)fragments. Traces of gnawing (mostly by dogs) were seen on 219 (6.1%) cattle and 85 (5. 1%)cattle-size fragments, 187 (6.0%)sheep and 160 (7.8%) sheep/pig-size fragments, 53 (6.2%) pig fragments, 26 (11.5%) horse fragments, 4 (6.6%) dog fragments and 2 (6.2%) rabbit fragments. This generally even distribution across 'species' contrasts with the pattern observed for butchery marks, and presumably means that disposal methods led to similar exposure to dog gnawing. The rather high figure for horse could mean that horseflesh (on the bone) was actually fed to dogs rather than eaten by people, but it is based on a small sample (NIF=227)and may be a statistical vagary. If topsoil is included all species, including horse, show similar rates of gnawing (around 6%).

Differences between context types

The underlying questions here are: whether there are consistent differences between feature types in bone fragment numbers or density, species composition and/or bone condition; and whether these can be attributed to differences in deposition or preservation that could affect interpretation, or reflect conditions of deposition. The same subset of the data was used as for the previous section.

Bone fragment numbers and density

Bone fragment numbers vary greatly between context types. Overall, 44% (of the subset total of 40, 194 fragments) came from topsoil, 18% from demolition layers, 17% from yard surfaces, 5% from ditches and gullies, 5% from hollows, 4% from (internal) floor surfaces, 3%from midden layers, and 3% from layers (unspecified). Of the overall total of 24, 756 medieval fragments, 9% came from other medieval features, none contributing >2% to the total. Similarly, a further 6% (of the total of 18, 949 'post-medieval' fragments) came from features other than Topsoil. The fragment numbers in these other features were too low to be useful for further analysis.

The variation in fragment numbers between context types could be due to differential representation of the various context types in the total sample and/or to different bone densities. Clearly, the first factor is important: as with other finds, the great majority of the bone comes from topsoil and demolition layers, and among other context types from the rubbish layers in the yards. Animal bone distribution seems generally similar to that of pottery. It is also generally similar over the five fully-excavated areas (A, D1, D2, E and F), ie the distribution of the number of fragments is similar to that of the number of contexts of all types excavated.

The question of whether bone densities differ between context types can be investigated using data from the sieved samples. It is assumed that samples from the different context types were taken according to similar strategies not specifically based on bone densities and similarly treated (eg same sieve mesh size). The number of fragments - most of them minute and unidentifiable - recovered per litre is used as a rough index of density. Most context types show a similar pattern, with most samples in the 0, 0-1 or 1-2 fragments/l classes and a few with higher densities (up to 20 fragments/l). The distributions of density

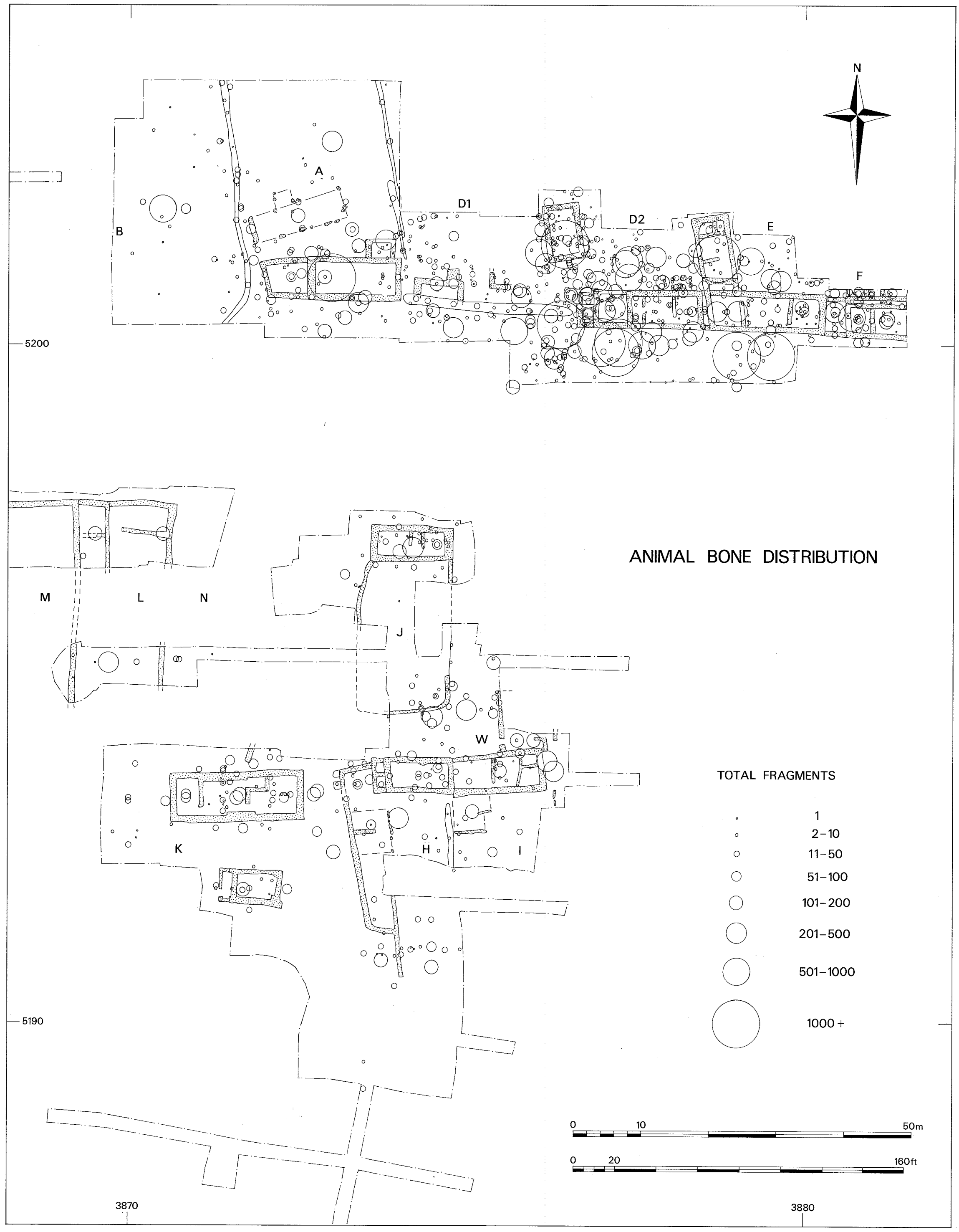


Figure 8.20.29 Faunal Remains: general animal bone distribution

classes are strongly skewed to the left. The exceptions are: (1) tree clearance hollows, with much lower average bone densities, and a majority of samples with no bone recovered at all. This would seem to confirm that they are not true occupation deposits, and they might almost be seen as controls for the 'archaeological' contexts, all of which contain at least 20 times the number of bone fragments/l on average. (2) rubbish layers and demolition layers. Unfortunately the number of samples from these two context types is low, so it is difficult to test the degree of divergence from the other types. The average bone density in these context types is 4-6 fragments/l and the distribution of density classes from 0 to 12 fragments/l shows no particular peak or skew. This pattern makes sense archaeologically: these two context types would both contain rubbish, including bone, that had not been cleared deliberately after deposition, (not yet, in the case of rubbish layer) while other contexts would contain more or less residual bone. Here one may note that samples from pits show the general pattern, ie these do not appear to be rubbish pits. The same applies to ditches and hollows - with the occasional exception, these do not show high bone densities and do not seem to be regularly used for rubbish disposal. The primary disposal sites for rubbish were probably the yards, and this rubbish would have been periodically cleared and quite likely spread on the fields to improve fertility. While the bone and other organic material was lying in the yards it would be exposed to the activities of scavengers and general trampling and weathering, quite consistent with the observed condition of the bone.

The general conclusion is - assuming that density of larger bones shows a similar pattern to the bone fragment numbers in sieved samples - that on the whole the number of bones recovered from the various context types reflects the number of these excavated, except that there was actually more bone in the (common) context types demolition layer and rubbish layer. This is probably because these are primary deposition contexts, while other contexts contain more (not necessarily all!) residual bone. This might affect species or element representation, by size sorting - smaller bones or bone fragments, the latter less likely to be identifiable, would tend to remain.

Bone condition in different context types

There is some variation in the rates of butchery, burning and gnawing across context types. Scanning the data for different species/size classes, there seem to be some consistent patterns: burnt bone is particularly common in ditches and gullies, while gnawed bone seems commoner in floor surface and layer. The patterns rarely approach statistical significance (Kolmogorov-Smirnov tests); those which do are all comparisons of the distribution of burnt bone with that of butchered, burnt or all bone. This may reflect some differences between the context types in the kind of bone that they contain, but the differences are not distinct enough to interpret. It seems unlikely that site-scale interpretation will be seriously affected.

Preservation in different context types: loose teeth

Teeth are robust compared to other bone types and remain recognisable (to species) even when not well preserved. The percentage of loose teeth in a group of bone fragments can be taken as a rough index of the quality of preservation of the group as a whole. There is some variation in the percentage of loose teeth both between (major) species and context types. It ranged from 16 to 34% (26% overall) for cattle, 36 to 51% (42%) for sheep and 33 to 62% (47%) for pig. This pattern accords with that shown by the fragmentation index, where more fragments per ‘individual’ survive for cattle than for sheep, and for sheep than for pig. The percentage of loose teeth in topsoil is greater than that in all medieval contexts combined, for all three species, suggesting worse preservation here. This is why many analyses are limited to bone from medieval contexts. Comparing the context types, hollow and floor generally have high proportions of loose teeth, demolition layer is similar to topsoil and slightly higher than the other layer types. Rubbish layer, layer, yard surface, and ditch have generally low proportions. Bone from floors would be trampled, and perhaps larger fragments would be removed or not deposited there, while teeth are relatively small and robust and would survive. Why bone in hollow should be particularly badly preserved is uncertain - perhaps it was redeposited or residual, and reinforces the idea that these were not areas of primary rubbish disposal. The bone in ditches might be more protected from post-depositional attrition than other rubbish, but it is not otherwise obvious why it should be so different from hollow. There clearly are differences in preservation between context types. Some of these are related to the processes of deposition and destruction of bone and their analysis could be useful in site interpretation. They also need to be taken into account when other analyses are undertaken. At Burton Dassett the great bulk of bone came from features with rather similar types of deposition, though with different subsequent histories (greater disturbance of the topsoil), so it is felt justifiable to group medieval features together (to obtain high enough fragment numbers), while avoiding an obvious source of variation by omitting Topsoil data.

Species composition

Considering medieval contexts (including demolition layers) only, species are distributed across them similarly to overall fragment numbers. The only exception to this is an excess of cattle fragments in hollow, which shows up in the data for this species (10. 8% of cattle fragments in Hollow, compared with 5% of fragments overall; chi-square for cattle/sheep/pig x context types = 17. 12, 0. 10 > p>0. 05, df=10; chi-square for cattle/sheep × context types = 11. 69, p<0. 05, df=5). This is due to one large deposit of cattle skull fragments, and the difference disappears if it is omitted (as it has generally been in comparisons).

The `excavated' compared with the `sample' data:

Representation of species/species groups

The distribution of identified fragments between samples and bone recovered by hand during excavation was clearly related to species size (Figures 44, 45). For both cattle and horse the fraction of (all, sample + non-sample) identified fragments that came from samples was 0. 8%, for sheep it was 2. 9%, for pig 2. 8%, for hare 4. 5%, and for rabbit 6. 2%. Dog and cat were somewhat anomalous: no dog was identified in the samples, and 70 bones of one individual cat came from one sample. Apart from cat, all these species were ‘under- represented’ in the samples, i. e. they made up a lower percentage of the sampled than of the excavated bone. Of large (cattle- and horse-sized) fragments 1. 2% were from samples, 6. 6% of medium (sheep- and pig-sized) fragments, and 9. 8% of medium/small fragments: the same pattern as for identified bones of those size classes, and again all underrepresented in samples. For small mammals however 96. 3% of the bone came from samples, and these were highly under-represented in unsieved material, i. e. they made up a higher proportion of sampled than of excavated bone. The figures for amphibians and fish were 97. 6% and 98. 8% (1 non-sample!) respectively, and these were also highly under-represented in unsieved material. Birds overall were relatively underrepresented in samples (11. 9% of bird bone came from samples) but as in mammals the effect was size-related. Overall, birds larger than small passerines made up roughly the same proportion of sampled as of excavated bone. Goose was very under-represented in the samples but fowl only slightly so. Small birds (probably passerines), on the other hand, were highly over-represented in the samples. Fowl bones appearing in the samples were often immature (and often classified as ?fowl).

The importance of sampling

Clearly, without the sampling program employed here, we would have almost no information about small mammals, (reptiles and) amphibians, or fish. The data on medium- and large-sized mammals would be less seriously affected, since no species was picked up in the samples that had not also been found by hand excavation, and the small proportion of fragments in the samples means that age profiles, for instance, would not be seriously distorted. Although a high proportion of the bird bone came from hand excavation, the bird bone from the samples showed a very different species composition, ie very little goose, but most small birds were found in the samples. A sufficiently high proportion of juvenile fowl bone came from the samples to affect interpretation of the age structure of the fowl population. Lack of sampling would thus distort or totally miss information on animals of fowl size or below. The samples also provide a way of calculating bone density per feature or context type (see above).

Variation in time and between tenements

The distribution of fragments

Figure 8.20.30 shows the numbers of mammal and bird fragments from each tenement. (Species which appeared mainly in the samples cannot be compared in this way because their distribution depends on the sampling effort, and this is unquantified). Since a high proportion of bone from tenements H, I, J and K came from topsoil, and there were no consistent differences between bone from 13th- to 15th-century (including destruction layer) contexts and topsoil, these have been combined.

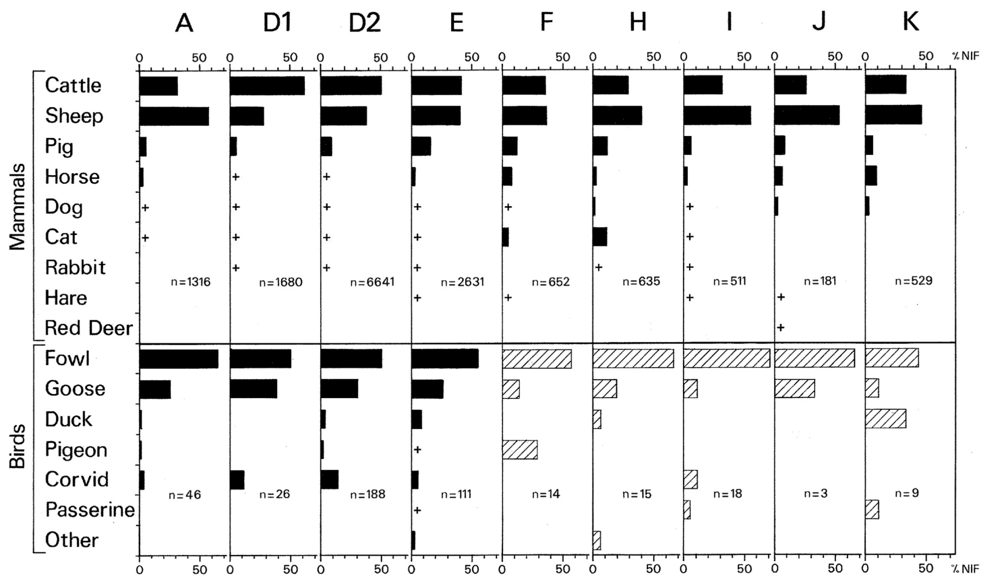


Figure 8.20.30: Faunal Remains: fragment percentages of different species by tenement. Mammals and birds calculated separately; medieval and topsoil combined. NIF is also shown. Hatched columns where total NIF less than 20; + = less than 2%

All comparisons between tenements are complicated by the very uneven distribution of fragments between them. The tenements on the north side of the road (A, D1, D2, E, F) were fully excavated, but those on the south side (H, I, J, K) only partially excavated, so that much of the material from the latter is from topsoil contexts. The topsoil bone is largely derived from the medieval layers, with little contamination (evidence from pottery, measurements, and condition), but is less well preserved, which give rise to various biases, eg against smaller bones and smaller species. Comparisons within these tenement groups are therefore probably more valid than comparisons between them.

Preservation does vary between tenements, but not in any consistent way. The percentages of loose cattle and sheep teeth, respectively, are 15-28%, mean 20%, and 35-53%, mean 39%, for the north side of the road; and 19-37%, mean 29%, and 30-58%, mean 50% for the south side. There is no relationship between percentage of loose teeth and NIF, between percentage of loose teeth for sheep and cattle, or between percentage of loose teeth and percentage cattle or sheep. Thus, apart from the topsoil effect, differences in preservation do not account for variation between tenements in NIF. Nearly half the bone came from D2 alone, followed by E and D1 accounting for roughly 20% and 10% respectively. This may be because these tenements were more prosperous and consumed more meat, or because they housed a higher number of people, or both; on the other hand, perhaps their neighbours had cleaned their yards more recently. Most 'luxury' items seem to come from D2 and E - rabbit, oysters, sea fish- but this could be a statistical effect due to the greater amount of bone recovered there; by definition luxury items are rare, so that even in this large collection numbers are too low to test whether they are disproportionately common.

Variation in the proportions of the major food species (cattle, sheep and pig)

Variations in preservation (measured as %loose teeth) do not account for differences between tenements in the proportions of the major food species.

No clear pattern of variation over time was found, principally because there were very few fragments from contexts earlier than the late 15th century. Comparisons between tenements A, D1, D2, E and F north of the road, which were active in the late 15th century, and H, I, J and K on the south, which ceased activity in the early 15th century, were confounded by the different levels of excavation. Looking at total NIFs or topsoil figures alone, it could be argued that sheep were relatively more common south of the road, and hence that the proportion of cattle increased with time. However, the great majority of the bone on the north side of the road came from D2, E and D1 (in that order) and all of these tenements had relatively high proportions of cattle. It is probably more rewarding to look at this in terms of variation between individual tenements than to try and tease out temporal changes from inadequate data. To see whether this pattern was consistent, the figures from the early 15th and late 15th centuries were examined, combining data from tenements according to whether they were north or south of the road and whether they had more fragments of sheep or of cattle (Figure 8.20.31). On this basis, D1 and D2 were combined because they are both high in cattle, while A, E (where cattle NIF roughly equalled sheep NIF, but exceeded it slightly if topsoil data was included) and F on the north, and H, I, J and K on the south are combined.

The difference between D1+D2 and the other tenements does appear throughout the 15th century. Thus, tenements D1 and D2 (which in fact seem to have been amalgamated), and possibly E, had higher numbers of cattle fragments relative to sheep than the other tenements, and this difference was seen in both early and late 15th-century data. The percentage of pig fragments, which ranged between about 5% and 18% on individual tenements, did not show any clear relationship to cattle or sheep proportions. It may be lower in the later 15th century (Figure 8.20.31). The major point to emerge from this rather confused picture is that the decline of the tenements on the south side of the road early in the 15th century is not related to the relative proportions of sheep and cattle found there, since tenements on the north side with similar proportions continued. Possibly there was an increase in cattle in the later 15th century but it was at the expense of pig rather than sheep. Possibly also the more prosperous tenements tended to have more cattle fragments, but this is based on very tenuous evidence.

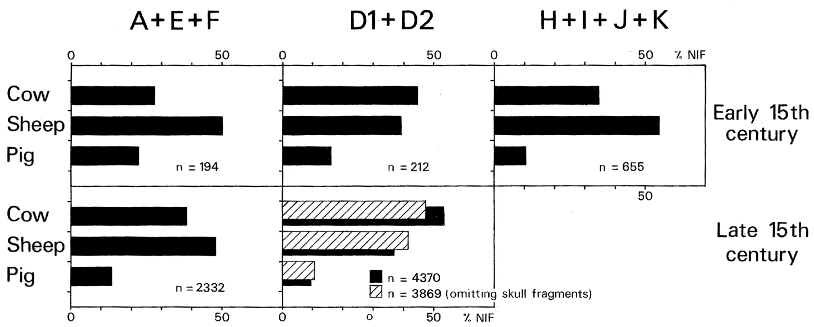


Figure 8.20.31: Faunal remains: percentages of cattle, sheep and pig fragments, by period and tenement group. Hatched columns omit 501 cattle skull fragments from one feature

The environment and economy of Burton Dassett

The animal bone evidence has little to contribute in assessing the environment, being predominantly of domestic animals. The small mammals were typical of environments ranging from grassland to woodland, and the vicinity of human settlements. There is no positive evidence of woodland nearby: hedges and ditches could have provided cover. Both the plant remains and documentary evidence indicate an open agricultural landscape with little tree cover, and the small mammal evidence is perfectly compatible with this. Perhaps the lack of remains of wild animals itself indicates the intensive use of the land for agriculture, so that game was not important: however, social factors may also be involved (Serjeantson 2006). There is a similar lack of evidence for intensive use of wetland resources: the proportion of geese was not especially high, few or no freshwater fish remains were found, and wildfowl were absent.

In assessing the livestock economy as a whole, a serious difficulty arises: what is the relationship of the bone fragments found by the archaeologist to the livestock actually kept? Where documentary evidence is available it can be shown that the records of livestock may differ considerably from the larder accounts (eg Kershaw 1983) and these may well differ from the bone discarded and excavated. Rates of turnover of different groups within and between species affect the proportions in the death assemblage. Where trade is developed, certain groups of animals may be exported and imported, so that part of the evidence is missing from the site. Thus, when ‘high cattle’ or ‘high sheep’ proportions are mentioned, it is ‘high’ in terms of fragment numbers that is meant; the relation between this figure and livestock numbers is not simple. There are similar problems in trying to deduce age and sex ratios in the livestock from the death assemblage.

The animal bone at Burton Dassett seems largely to be household refuse, discarded after butchery, food preparation or food consumption. All the evidence is consistent with local production of meat (and other products), and the animals cannot be considered simply as food, but must be seen in the context of the local agricultural system. The settlement is rural rather than urban in nature: while some raw materials and luxury items were imported, and undoubtedly animals and animal products were exported, the basic needs of the population were provided by local agriculture and not by manufacturing or trade.

The inhabitants of Burton Dassett had a well-developed agricultural system involving both animals and plants. The principal crops were wheat, barley, perhaps oats, with legumes such as peas, beans and vetch. This last was probably grown for animal fodder (see eg Biddick 1989), and would allow animals to be fattened for sale or kept over the winter months when pasture was scarce. Hay is mentioned in Roger Heritage's probate inventory and would serve the same purpose. The lack of evidence for (cereal) crop waste among the charred plant remains may be because these wastes were in fact recycled through the animals. Animals are important in this system not only as high quality (ie high protein, high fat) food and food storage (on the hoof), but also vital in maintaining the fertility of the land via manuring. The legumes may also have a part to play in this. Animals may also enable resources to be exploited that otherwise are unavailable (woodlands, wetlands), though there is little evidence for this at Burton Dassett. The impression is of a system making maximum use of both animal and plant resources, in a largely agricultural landscape. Trade may have encouraged intensification of animal production, so that some crops were grown as fodder.

The principal animal components of this system were sheep, cattle and pigs, with fowl and geese. When meat weights are taken into account, cattle clearly provided more meat than sheep, even in those tenements where sheep fragments dominated. The importance of pig is harder to assess: probably there was more pork in the diet than appears from fragment numbers, as pig seems to be consistently underestimated. However, the husbandry of both cattle and sheep revolved around factors other than meat. They were not killed at the optimum age for meat production, when the expense of rearing and fattening relative to the meat or cash value was greatest, but at a greater age. In cattle the decisive factor was their importance as providers of traction for ploughing, while for sheep it was wool production. Other products, such as milk, skin, horncore and bone for manufacturing, tallow, and so on, were certainly used, and it may be that the importance of dairying is greater than appears at first sight, because the 'surplus' young males were exported from the site. The sheep and cattle exported, presumably to more urban sites where less food was home-grown, would be more likely to be at the economic age for meat production, and one would expect the age profiles for these animals from towns to reflect this. Also, at rural sites one would expect to see more remains of breeding stock (older females), though these could also be traded. For pigs and geese, whose main economic importance was as meat providers, there should not be so much difference; likewise for fowl, though egg production is important here too. The main difference would be the appearance of the breeding stock more often in the rural sites: however, all three can be kept as 'backyard' species in towns, and so even this might not show up.

While exploitation of livestock was intense, there is no evidence of any effort to improve productivity by breeding eg larger animals for greater meat yields. There may have been advantages in having small animals - while overall efficiency is lower, they may be easier to sustain when food is short, and easier to handle. Also, meat yield may not have been the overriding factor so far as sheep and cattle were concerned. Nutrition may have had as much to do with the small size of the animals as breeding.

The livestock at Burton Dassett were not in bad condition. The incidence of dental pathology was low, mainly occurring in older animals, and most cattle pathology was referable to strain injury. It does not seem that pasture limitation was leading to poor nutritional status and high levels of periodontal disease: perhaps the growing of fodder crops was related to this. An unknown proportion of the bones came from animals that had died from accident or disease: this might explain some of the younger individuals eg among the fowls or horses. Since many diseases leave no trace in the skeleton, it seems impossible to quantify this factor. Horses, dogs and cats all had their place in the medieval economy, though not as providers of food. Horses were important for transport and traction, and both dogs and horses were kept in connection with hunting, though that was not important here. Dogs were kept for guarding, for herding, and no doubt for companionship; both dogs and cats would be involved in pest control, particularly rats and mice, and both were scavengers. The occurrence of rabbit is interesting: this was a high status food at this period, and the relatively large number of fragments reflects its local availability from Roger Heritage's warren. Hare is much scarcer. The few pieces of deer antler were probably imported as raw material for use in manufacture. The use of wild resources (including small birds) was minimal.

There is evidence of a degree of prosperity. A single bone of peafowl was found (tenement E, early 15th century), and this is certainly a luxury item. Sea fish was imported, and oysters too, probably from the east coast: while these are not necessarily luxuries, at a site so far from the sea transport costs would make them relatively expensive. Rabbits, too, though locally available, were expensive. The tenants were paying cash rents, and must have made an income from their agricultural activities: trading was important to their economy, and they could have accumulated profits.

The short time frame for the bulk of the material makes it impossible to trace changes in agriculture over time. Comparisons between the north and south sides of the road are confounded by the different excavation efforts, but from the bone evidence available there is no obvious reason for the earlier decline of the latter. It also makes comparisons between individual tenements difficult: seasonal factors, or slight differences in when yards were cleared, could greatly affect the 'snapshot' found by the archaeologist. It is tempting, though, to interpret the three tenements D1, D2 and E as being more prosperous: there is more bone altogether, a higher proportion of cattle fragments (and hence beef eaten) and nearly all the luxury items mentioned above come from here.

The picture of the late 15th-century livestock economy derived from the bone evidence agrees well with the documentary evidence, and indeed with what is known of medieval agriculture from other sites (Grant 1988). The collection from Burton Dassett is one of the largest from a rural site of this period. One point that emerges strongly from the analysis is that even a rural site of this type cannot be considered in isolation from contemporary sites of different types: trade was clearly important, and the economy was interrelated with that of its markets.

Economics in a wider sense was also important: the nature and structure of land tenure affected the way land was farmed. The catastrophic change at the time of enclosure reflected a large-scale change in political and economic conditions, while preserving for the archaeologist a somewhat blurred snapshot of the economy that was replaced.