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ANIMAL BONE FROM SAXON SOUTHAMPTON:

THE SIX DIALS VARIABILITY STUDY

Report to the Ancient Monuments Laboratory

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This study has drawn greatly on the expertise of my colleagues at the Faunal Remains Unit. Jennie Coy remains a continuing stimulus, creative, practical and kind; Mark Maltby has provided a great fund of relevant knowledge; Sarah Colley has discussed in great detail her own studies on the Hamwic material, and she has also written a report on the fish in conjunction with the present study. I have also drawn constantly on the patience and goodwill of my colleagues when - at risk to their own important programmes of work - they have given me priority on printer and computer. I am very grateful indeed.

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ANIMAL BONE FROM SAXON SOUTHAMPTON: THE SIX DIALS VARIABILITY STUDY

I. THE AIMS

This study was devised in order to take advantage of an abundance of well excavated animal bone from the sites at Hamwic Six Dials (SOU 23, 24, 26, 30, 31 and 169), where a total area of 4,500 m^2 offered a good variety of context types and where, most rare in Hamwic excavations, a few well stratified deposits enabled some features to be confidently phased.

Much animal bone from Saxon Southampton had already been studied, and over 100,000 fragments had been reported on by the start of this present project (Bourdillon and Coy 1980, Coy 1981 and 1982, Bourdillon 1983, Driver awaiting publication a); but the material had come almost entirely from unphased pits, and these earlier studies had been forced to take the excavated bone <u>en bloc</u> as evidence for the animal economy of the Middle Saxon town as a whole. In contrast to the much smaller quantity of animal bone from medieval Southampton, where patterns of difference had been found in space (Driver, awaiting publication b) and also over time (Bourdillon 1980), the large assemblages of Hamwic seemed startlingly homogeneous both between different sites and between different features (Bourdillon 1983, 54 - 70). Yet there had been hints of a slightly higher concentration of pig bones on a trace of occupation surface in Site 4 (Bourdillon and Coy 1980, 104) and some shreds of support for a tentative suggestion of the build-up of cattle over time (Bourdillon 1983, 109). One could only speculate on whether the near-uniformity of context type concealed some degree of sample bias so that evidence of real difference had been missed.

More recently, animal bone study had advanced with Sarah Colley's major investigation of the contents of a single feature (SOU 31, F2008), meticulously excavated and recorded item by item with 3-dimensional co-ordinates (Colley 1983 and 1984a). The richness of this data has greatly extended the potential of the Hamwic studies, but even here the material is unphased, and from a pit. It was therefore with great satisfaction that it was found that the sites at Six Dials, and in particular the latest excavations, gave animal bone from several different context types and from features with stratified phasing. A study of variability should help either to confirm or to modify interpretations based only on part of the whole, and could well help to shape an informed strategy on which groups of animal bone might most most usefully be studied in the future.

There was also the need to produce a computer-recorded archive in accordance with the system of the Ancient Monuments Laboratory and therefore readily comparable with other sites whose bones have been recorded in this way. The material from Saxon Southampton is important by any standards and it may perhaps have been a pity that early work on it had been completed before the national system of recording was set up, for the two sets of archives are not directly interchangeable: the basic difference is that in the original Hamwic archive the unit of recording is the assemblage of bones from the most finely differentiated archaeological context, normally one of the many component layers within a pit, and not the individual bone. Coy (1979) had indeed recorded by computer the individual bird bones from the Hamwic Melbourne Street sites, but this was only one part of the Melbourne Street work as a whole, and Sarah Colley's pit project, fully computer-recorded, so far surpassed the standards of normal trench recovery as not to be immediately representative of the usual pattern of finds. An important aim of the variability study was therefore to make a full and detailed computer archive to serve as a standard for quantified reference both within Hamwic and beyond.

II. THE MATERIAL

Material was chosen from Sites 30, 31 and 169 of the Six Dials excavations, together with bone from one context on the Stoner Motors site (SOU 99 / W 36), a separate excavation some 450 m to the south.

The material was selected in consultation with the archaeologists M.A. Brisbane and P. Andrews, and the main criterion for selection was the interest of the context type; close on this followed secure phasing, particularly where material could be ascribed to years close to the beginning or the end of occupation in the area. One context and one group of contexts had to be sampled, since their very large assemblages could not be studied in a twelve months' project without encroaching unduly on the claims of other features; where such sampling took place is made clear below.

These features and groups were chosen for study:

1) Pits

Pits had predominated in past studies of the Hamwic animal bone but it was thought important that a good range of different pit-types should be quantified by current methods:

- i) SOU 30, F1008: This could be taken as typical of several small rectangular pits, all roughly 1 m by 1.5 m in plan and about 1 m deep.

- ii) SOU 30, F1009: About 1.5 m square in plan and 1.5 m in depth at the centre, this was one of a small number of pits which had steeply sloping sides.

- iii) SOU 30, F1010 is thought to be the latest feature in the Six Dials excavations. This pit can be dated from the pot to the late 9th or early 10th century, though it may have included some residual material in its filling.

- iv) SOU 31, F2009: This feature was chosen as being on archaeological grounds a reasonable candidate for a typical Hamwic pit, not obviously distinctive in any way. After study of the bone, however, the assemblage was found to be rather small for any thorough examination of relationships, and a search was made for some other pit to be taken as provisionally a norm.

- v) SOU 30, F2013: Of three alternative pits suggested next as apparently unspecialised and likely on archaeological grounds to contain good representative assemblages, a quick scan showed F2013 to have the greatest number of bone fragments and yet not so many as to be exceptional by the standards of earlier Hamwic excavations. This pit was accordingly chosen for study.

- vi) SOU 30, F2063, vii) SOU 31, F2066 and viii) SOU 31, F2068 are likely to be the earliest pits at Six Dials. F2063 in fact is cut by F2016, a well which itself is notably early.

2) Wells

Two wells were chosen. Stratigraphically related to each other, they provide a valuable contrast in time.

- ix) SOU 30, F2014 contains in layer 3 (context 3533) the latest coin to be found in the Six Dials excavations. This is a penny of Coelnoth (855 - 9).

- x) SOU 30, F2016: This is the early well. Its foundation timbers have been dated by ~~radio carbon analysis~~ dendrochronology to A.D. 709 ± 9. Its primary deposit (layer 12, context 4522) is likely to date closely from that time, and all other layers from 6 downward are likely to have been quite early, for although they represent infilling they lie beneath layers from the nearby F2015 which spread over the abandoned well and then sank into its shaft, and F2015 is linked to a fairly early building. The two uppermost layers of the infilling of the shaft of the well (contexts 3300 and 3542) are thought to date from much later, probably from the middle of the 9th century, and to be roughly contemporary with the other well, F2014. In context-based analysis these two layers have been included with F2016, but in comparisons of early with later material they have been taken on their own.

3) Yards

xi) SOU 30, F2015: Though taken as a single feature, F2015 represents a series of occupation yard surfaces attached to a building post-dating the well F2016. Animal bone was found in 16 different contexts within this feature, each context a distinct layer of occupation.

xii) SOU 99 / W 36, context 242: Alone of the material in this study, this comes from outside the Six Dials excavations. The main bulk of the animal bone from this site has not yet been studied, but during excavation it was noticed that in one occupation area animal bones were particularly closely packed together. Such close-packing is so far unique to Hamwic and it was decided that this context should be included in the present study; thanks are due to the excavator, S. M. Davies, for her help in making the necessary information available. Markings and scratches on the individual bones made their recording particularly time-consuming and it was not possible for all bones from the context to be included; three out of the nine large boxes from the context were therefore selected for study. All nine boxes appeared similar in their material save that several mandibles had been individually bagged and were included in only two of the nine boxes - one such box was taken, and the other left.. Later enquiries showed that there had been some initial sorting of the main longbones at the original processing of finds, but it is to be hoped that subsequent reboxing when the finds were marked went some way to redressing any bias. Certainly there were no clear differences of content among the three boxes chosen for this study.

4) The Town Ditch

On Site SOU 169 part of the early ditch of the town was revealed for the first time in the Hamwic excavations. About 1.5 m deep and 3 m wide, this would seem to have been dug as a boundary demarcation rather than as a defence and it probably dates from the laying out of the town in the Six Dials area. It would seem likely on archaeological grounds that the lower layers silted up naturally, and quite quickly. A stretch of 18 m had been excavated at the time of this study and it was essential to make a selection among the many contexts which produced animal bone. The following were chosen for study:

- xiii) all available PRIMARY fillings and closely-related layers - SOU 169, contexts 10102, 10791, 11002, 11039, 11444, 11615, 11628, 11630, 11769, 11780, 11784, 11785, 11786, 12290, 12729, 13205, 13216, 13218, 13320;

- xiv) contexts from a SEGMENT of the remaining infilling of the ditch, chosen on archaeological grounds as most likely to be typical of all infilling above the primary layers: 10230, 10248, 10301, 10469, 11023, 11024, 11402, 11405, 11412, 11432, 11433, 11442, 11443, 11612, 11613;

- xv) one other context from the ditch, c.10015, was at first thought to be part of the primary fill, but when its small assemblage of bone was examined this seemed from the butchery markings to be somewhat alien from the rest. An archaeological re-appraisal of the context suggested that it could perhaps be linked with a later feature cut into the ditch and its bone was thereupon kept separate in the records.

5) <u>Others</u>

- xvi) SOU 31, F1005: This is a pit, and was chosen because it contained good quantities of bone-working waste; but one cannot securely separate concomitants of industrial bone-waste from the rest of the bone in the pit and its records have been kept apart rather than risk weighting unduly the results for the pit group as a whole.

- xvii) SOU 31, F2006, layers 17, 18 and 20 (contexts 5289, 5405 and 5449): this bone is also pit material, but it comes from three lower layers only, layers which at the time of digging were noted as being immediately distinctive in rich brown colour and in soil quality. Similar deposits have been noticed from time to time in the Hamwic excavations.

- xviii) SOU 31, F2082 was an artificial gully, 12 m in length and from 10 to 15 cm in depth.

- xix) SOU 169, contexts 10717, 10966 and 11286 were three separate layers from house occupation surfaces and were chosen by the archaeologist as being well-defined of their type.

III THE METHODS

1) Methods of Recovery

Data in the main tables relate to normal trench recovery.

In addition, sieved material from soil samples was available from 75 of the contexts which were studied. Problems of direction and of logistics at the time of the digging of sites 30 and 31 had meant that the range of their samples was not complete and there was no sieved material from F2009, F2063, F2066 or F2068. Site 169, however, was sampled exhaustively.

Early processing of the material was organised by Sarah Colley of the Faunal Remains Unit, who undertook much of the early work and of the training in the interim which followed the ending of such work by the former Southampton Archaeological Research Committee; later, when the main programme of processing was organised and supervised by P. Cotterill on behalf of Southampton Museums, she continued to give help and advice.

The selection and taking of samples were under the direction of the archaeologist, P. Andrews. A 5000 cc sample of soil was taken from near the centre of a context; samples were soaked in water, when necessary with the addition of H_2O_2 to assist in quick disaggregation, and sieved through a 600 micron mesh. The dried residues were sieved through a 1 mm mesh.

Material from soil samples is tabled separately but is referred to as appropriate, for confirmation or for corrective, in the general discussion of results.

2) Methods of Study

Material was marked by Southampton Museums and studied at the Faunal Remains Unit. Identifications were made using the comparative collection at the Unit; identifications of birds were made or checked by Jennie Coy, and fish was identified by Sarah Colley.

Measurements were taken with Vernier callipers attached directly to a Conart Communicator CP 520 computer. They are accurate to 0.1 mm.

To maintain ease of comparability with earlier work on the Hamwic material, the mammal bones were weighed. In the first feature to be studied in the present project (SOU31, F2009) the weights were recorded bone by bone in field 12 of the recording programme, but this was found to take far too much time. Weights were thereupon recorded by hand and, as in earlier Southampton studies, species by species and for each archaeological context as a whole.

3) <u>Methods of Recording</u>

Recording was made directly on to the Comart computer by means of the Ancient Monuments Laboratory Interactive checking programme, and the general principles were those of the A.M.L. handbook. Some gloss on recording practices and on coding may be in order:

- i) Descriptive field 2: An effort was made to be very precise in establishing the location of the fragment (midshaft proximal lateral back, or distal medial front joint, for example, being subtly different from midshaft lateral proximal back and from distal front medial joint). In fact this fine differentiation made it hard to discover useful general patterns through the use of Table 2 software; were a similar study to be made in future, more generalised approximations would be more effective.

- ii) Field 5: A similar criticism of undue precision may be made for the location of butchery marks. There are also problems in the nature of the cuts themselves. The Hamwic style of butchery would appear to have been very rough and ready, and it was often hard to be sure that a bone had indeed been cut in a particular place though the fragment had quite clearly been handled and broken. The aim was to avoid unwarranted claims when blademarks were not in evidence and yet not to leave a false impression that such material was unbutchered. Mistakes have undoubtedly been made; but one has tried to be consistent.

- iii) Field 5: Leading on from this was the distinction in the archive of cuts made by knives and those made by chopping. This too could be a question of judgement, but in cases of doubt a cut would be recorded as a CHOP where the result would seem to have been caused by a hard and heavy impact rather than by more sliding pressure on a bone.

- iv) Sawn butchery is so doubtful to establish in the Hamwic material that its possible occurrence is of particular importance, and likely examples were described individually in Field 12.

4) Methods of Presentation of the Results

With the help of the comparative collections and on the basis of earlier familiarity with archaeological material from Saxon Southampton, confident identifications could be achieved even at the level of quite small fragments. As between horse and cow the bulk of bones could be assigned to one or other species, overwhelmingly to cow. Their costal cartilages and non-articulating fragments of rib were for complete accuracy recorded as 'large mammal' and they appear as such in the prime archive and in all printouts directly from this data; in general tables and interpretation, however, this material has been taken with that of cow. As between sheep and goat, doubtful material is described in the main archive as ovicaprid; but a rigorous scrutiny for goat on the principles of Boessneck, Müller and Teichert (1964), on the basis of the Faunal Remains Unit's collection and on the accumulated experience of workers at Southampton have been held to justify the interpretation and secondary listing of such material as 'sheep'. In this, current work is consistent with the Melbourne Street report (Bourdillon and Coy 1980), which has proved a valuable starting point for discussion and which has not been challenged in these identifications; it is also consistent with Colley's (1983 and 1984 a) studies on SOU 31, F2008, with which it is desirable that comparisons may readily be made.

A series of data sheets was drawn up, topic by topic, to serve both as a working tool in the preparation of this report and also as a full and permanent record on the basis of context types. It is hoped that these sheets may be of real use in the interpretation of Hamwic assemblages in the future.

The sheets were designed for simple visual comparisons. The aim has been to compare and contrast the assemblages in broad groups, PITS, WELLS, YARDS, DITCH and OTHERS*, and at the same time to check for consistencies (or otherwise) among the separate features of these groups. Data are commonly given both in absolute figures and in percentages: some assemblages are so small that their internal percentages have little meaning yet their prime results serve nonetheless to quantify bone-poverty.

The first sheets deal with all the material from the trench excavations. Subsequent sheets cover selected contexts only - early as against late ones, and tops of pits against their lower layers.

Since there is no duplication of numbers either for features or for individual contexts the site prefixes are not used in these sheets, nor in the rest of this report; the sole exception is for context 242 on the Stoner Motors site and it is hoped that this difference in treatment may be a quiet reminder of the distinctive provenance of that material.

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* PITS, WELLS, etc. are capitalised as necessary to indicate references to the precise groups of contexts in this study rather than general statements on such context-types as a whole.

It is not claimed that the groups of material (pits, wells, yards, ditch and others) appear in this study in proportion either to their excavated frequency or to their Saxon occurrence. The line of TOTALS and the percentages therein may therefore be taken as no more than a very raw score for the intricacies of Hamwic bones; but they are a useful measure of work achieved.

IV THE ARCHIVE

The archive consists of the prime computer-coded files, context by context (*.CON). Material from soil samples has been recorded separately (*.SSS): in order that this material should always be readily distinguishable in the archive from that of normal trench recovery, the context numbers for soil sample material have each been prefixed with '99'.

For ease of handling, the context files were concatenated feature by feature, and these files when sorted into species/anatomy/context form a working treasury used time and again in the preparation of data sheets and tables (*.TSY).

All archive files were made on the Comart Communicator CP 520 computer and are on 5" floppy disks.

Some computer printouts are regarded as integral parts of the working archive. These are the TABLE 1s for each feature and each group of features; the typed record, coded and in context order, for the whole study; and the metrical catalogue made with programmes MET 101 and MET 104 for all the measureable bones. All these printouts are in duplicate, one copy lodged at Southampton M seums and the other at the Faunal Remains Unit. In addition there are a great many printouts from working software, mostly for TABLE 2s, which are kept at the Faunal Remains Unit. Copies of material relating to context 242 of the Stoner Motors site, SOU 99 / W 36, have also been sent to the excavator at the Wessex Archaeological Committee.

A notebook with recorded weights is lodged with Southampton Museums, together with a card-index, one card for every context studied, with contains archaeological data, relationships, and useful information relating to the progress of the study. There is also a similar but smaller index for material from the soil samples.

V THE RESULTS : GENERAL CONSIDERATIONS

1) Identified Material (Tables 1 - 4)

28306 fragments were examined from normal trench recovery, and of these 19182 were identified. In addition there were 7469 fragments from the soil samples, 2745 of which were identified.

2) Rate of Identification (Table 5)

Figures for unidentified material relate to that recorded simply as fragments of Large Mammal or of Small Artiodactyl or, occasionally, of Unknown Mammal.

Whilst by fragment count it might seem that a considerable amount of material was not identified (32.3%), the results by weight are reassuring and are well within Kubasiewicz's (1975) parameters for reliability on large urban sites. About 63% of the soil sample material was unidentified by fragment count, but this consisted mainly of insubstantial fragments of unknown mammal and with a mean weight of only 0.3 g these need cause no concern.

Variability of identification rate is most usefully assessed from recovery in the trench. The small assemblages of F1008 and F2063 were poorly identified by fragment count; F1008 was poor by weight as well, but in F2063 the mean weight of the unidentified material was trivial. The much larger assemblage of F1005 also had a high rate of unidentified fragments, but most of these came as tiny residues from boneworking and even if not identifiable to species and to bone of the body they could nonetheless give good information on industrial techniques.

It was F1005 which pulled down the identification rate of the OTHER group. The next lowest rate came with WELLS and here it was the result from F2016 which brought down the

TABLE 1 FRAGMENTS IDENTIFIED FROM NORMAL RECOVERY

	COW	SHEEP	GOAT	PIG	HORSE	DOG	CAT	FOWL	GOOSE	RED DEER p/c	ROE DEER p/c	ANTLER	WILD BIRD	FISH	TOTAL	WEIGHT in g
PITS	3833	2821	14	1158	6	3	6	90	83		2	23	3	4	8046	103030
WELLS	1806	841	40	453	50		3	30	12	4	3	46	3	6	3297	52360
YARDS	1507	716	12	477	5	2	3	40	13	4	2	7	2	8	2798	56185
DITCH	182	380	36	198	16	11		6	3	1					1513	36445
OTHER	1161	742	19	188	20	2	2	19	7	3	2	1356	6	1	3528	25750
TOTAL	9169	5500	121	2474	97	18	14	185	118	12	9	1432	14	19	19182	273770
F1008	23	3		2	1										29	550
F1009	150	49		12					1			2			214	3550
F1010	975	423	2	121	2	2	4	17			1	5	2	1	1555	25300
F2009	123	140	4	33			1	6	2			3			312	3995
F2013	2485	2106	5	960	3	1	1	59	71		1	10	1	3	5706	66935
F2063	10														10	210
F2066	44	85	2	23				6	9			3			172	1675
F2068	23	15	1	7				2							48	865
F2014	1024	349	31	123	50		2	5		4	3	46	3		1640	28440
F2016	782	492	9	330			1	25	12					6	1657	23920
F2015	800	495	6	321			2	39	13	4	2	6	2	8	1698	22475
99,242	707	221	6	156	5	2	1	1				1			1100	33710
Primary	625	172	34	91	12	11		1							946	25170
Segment	221	183	1	100	4			2	3	1					515	10650
C10015	16	25	1	7				3							52	625
F1005	728	297	13	75	7		1	13	1	2		1349		1	2487	11150
F2006	264	241	5	56	13	2		2	5			7	5		600	8890
F2082	148	172	1	44			1	4	1	1	2		1		375	4755
House	21	32		13											66	955

TABLE 2

SPECIES OF WILD BIRD AND FISH IDENTIFIED FROM NORMAL RECOVERY

Mallard	Anas platyrhyncos
Scoter	Melanitta nigra
Goosander	Mergus merganser
Pigeon, prob. Woodpigeon	Columba palumbus
Rook	Corvus frugilegus
Raven	C. corax
Conger eel	Conger conger
Bass	Dicentrarchus labrax
Flounder	Platichthys flesus

TABLE 3 FRAGMENTS IDENTIFIED FROM SOIL SAMPLES

	no. of samples	cow	sheep	pig	goat	fowl	prob. fowl	goose	roe p/c	antler	wild bird	small mammal	amphibian	fish	TOTAL
PITS	15	51	75	28	-	15	3	3	1	-	-	1	12	717	906
WELLS	11	14	18	8	-	3	8	1	-	67	-	4	1	220	344
YARDS	≡9	43	31	14	3	2	2	-	-	-	-	-	-	21	116
DITCH	36	20	66	23	1	3	3	6	-	-	1	1	5	1097	1226
OTHER	7	16	19	3	-	3	1	-	-	25	-	5	-	81	153
TOTAL	78	144	209	76	4	26	17	10	1	92	1	11	18	2136	2745
F1008	3	1	2	1	-	-	-	-	-	-	-	-	-	13	17
F1009	2	2	4	1	-	9	-	-	-	-	-	-	12	55	83
F1010	3	10	15	2	-	3	3	3	1	-	-	-	-	430	467
F2009	-	NOT		SAMPLED											-
F2013	7	38	54	24	-	3	-	-	-	-	-	1	-	219	339
F2063	-														-
F2066	-	NOT		SAMPLED											-
F2068	-														-
F2014	8	8	4	1	-	3	3	-	-	67	-	-	1	23	110
F2016	3	6	14	7	-	-	5	1	-	-	-	4	-	197	234
F2015	3	3	4	1	-	-	-	-	-	-	-	-	-	19	27
99,242	≡6	40	27	13	3	2	2	-	-	-	-	-	-	2	89
Primary	16	3	18	5	-	-	-	5	-	-	-	-	5	24	60
Segment	19	17	47	18	1	3	3	1	-	-	1	1	-	827	919
C10015	1	-	1	-	-	-	-	-	-	-	-	-	-	246	247
F1005	2	11	6	1	-	1	-	-	-	25	-	4	-	11	59
F2006	1	4	7	1	-	2	-	-	-	-	-	-	-	32	46
F2082	1	-	2	-	-	-	-	-	-	-	-	-	-	-	2
House	3	1	4	1	-	-	1	-	-	-	-	1	-	38	46

TABLE 4

SPECIES OF SMALL MAMMAL, AMPHIBIAN AND FISH
IDENTIFIED FROM THE SOIL SAMPLES

Mole	Talpa europaea
Mouse sp.	
Frog sp.	Rana sp.
Toad sp.	Bufo sp.
Common eel	Anguilla anguilla
Conger eel	Conger conger
Herring	Clupea harengus
Pollack	Pollachius pollachius
Bass	Dicentrarchus labrax
Mackerel	Scomber scombrus
Plaice	Pleurnectes platessa
Flounder	Platichthys flesus

and:

Salmon / Trout

Cod family

Sea Bream N.F.I.

Right-eyed flatfish N.F.I.

TABLE 5 RATES OF IDENTIFICATION AND MEAN FRAGMENT WEIGHTS

	total fragments	% identified by fragments	total weight in g	% identified by weight	mean fragt. wt., identified material in g	mean fragt. wt., unidentified material in g
PITS	11947	67.3	113430	90.8	12.8	2.7
WELLS	5174	63.7	57480	91.1	15.9	2.7
YARDS	3664	76.3	59535	94.4	20.1	3.9
DITCH	2037	74.3	37975	96.0	24.1	2.9
OTHER	5484	64.3	28990	88.0	7.3	1.7
TOTAL	28306	67.7	297410	92.1	14.3	2.6
F1008	60	48.3	725	69.0	17.2	7.3
F1009	347	61.7	3960	89.6	16.6	3.1
F1010	2366	65.7	27730	91.2	16.3	3.0
F2009	377	82.8	4205	95.0	12.8	3.2
F2013	8490	67.2	73790	90.7	11.7	2.5
F2063	18	55.6	215	97.7	21.0	0.6
F2066	227	75.8	1825	91.8	9.7	2.7
F2068	62	77.4	980	88.3	18.0	8.2
F2014	2426	67.6	30730	92.5	17.4	2.9
F2016	2748	60.2	26750	89.4	14.5	2.6
F2015	2422	70.0	24890	90.3	13.3	3.3
99,242	1242	88.6	34645	97.3	30.6	6.6
Primary	1313	72.0	26160	93.8	26.6	2.7
Segment	646	79.7	11145	95.6	20.6	3.8
C10015	78	66.7	670	93.3	12.0	1.7
F1005	4120	60.4	18460	82.8	4.5	1.4
F2006	803	74.7	9420	94.4	14.8	2.6
F2082	478	72.2	5085	93.5	12.7	3.2
House	83	79.5	1025	93.2	14.5	4.1

good figures given by F2014. Conversely the good rate of YARDS came from the exceptional context 242 on Site 99. DITCH groups were consistently good; but apart from this the identification rates established in this study would seem to be feature specific rather than linked to broad context type.

3) <u>The Condition of the Material</u> (Table 6)

Earlier Hamwic studies had emphasised the generally good and clean condition of the recovered bone, but pit preservation might have been untypical and certainly the earlier, quicker recording on the basis of assemblages rather than of every separate fragment had allowed for less close scrutiny of each individual bone. The present study was to offer a more exhaustive assessment.

The greatest variability came with the staining. Compared with, say, a bone assemblage recovered cleanly from chalk, all Hamwic material is stained, and it is only the shades of deeper staining which have been recorded here. A few contexts escape these altogether but in others deep staining is widespread. The material from the ditch is very dark; that from YARDS differed widely between contexts; PITS were much lighter and so, supremely, were WELLS. After so much tedious recording the impression is that the degree of staining is probably related so directly to the soil matrix that its assessment is not worth while as a regular exercise at the level of the individual bone. What matters is on the one hand the general appearance of the context, which could be recorded once for all, by hand; and then there should be a record of any individual fragment which differs so sharply from its fellows that an intrusion is suspected or some difference in predepositional treatment is inferred.

Burning was no more than sporadic. For the small sample of ditch context 10015 a total of 5 burnt fragments gives what may be a spurious interest to its percentage rating. The only main context-type that seems of note is that of YARDS, where both F2015 and Site 99, context 242 showed a measure of burning that may have been more than background noise. From

TABLE 6 CONDITION OF THE IDENTIFIED MATERIAL

	n identified	% stained	% burnt black	% burnt white	% chewed	% heavily chewed	% eroded	% heavily eroded
PITS	8046	14.5	0.4	0.2	4.3	0.8	1.5	0.7
WELLS	3297	5.8	0.6	0.1	5.3	0.8	2.1	0.6
YARDS	2798	34.0	1.8	0.6	4.4	0.9	3.8	0.7
DITCH	1513	71.2	0.3	0.1	4.8	1.5	26.2	3.2
OTHER	3528	25.3	0.3	0.2	2.4	0.7	1.6	0.5
TOTAL	19182	22.3	0.6	0.2	4.2	0.9	3.9	0.8
F1008	29	17.2	-	-	3.4	3.4	20.7	10.3
F1009	214	15.4	0.9	-	3.3	1.9	3.3	0.9
F1010	1555	23.1	0.1	-	3.7	0.8	4.4	2.3
F2009	312	-	-	-	0.6	-	-	-
F2013	5706	13.0	0.4	0.2	4.4	0.8	0.7	0.2
F2063	10	-	-	-	-	-	-	-
F2066	172	12.2	-	-	3.5	0.6	1.7	1.2
F2068	48	-	2.1	-	16.7	2.1	-	-
F2014	1640	9.3	1.2	0.1	7.3	1.0	1.3	0.4
F2016	1657	2.3	0.1	-	3.4	0.6	2.8	0.9
F2015	1698	5.4	2.1	0.9	3.6	0.6	1.1	0.2
99,242	1100	78.0	1.4	-	5.5	1.5	7.8	1.4
Primary	946	85.6	-	-	4.3	1.7	38.8	4.8
Segment	515	52.0	-	-	6.0	1.4	5.8	0.6
C10015	52	-	7.7	1.9	1.9	-	-	-
F1005	2487	12.1	0.4	0.1	1.1	0.4	0.9	0.2
F2006	600	28.5	0.5	1.0	7.7	1.5	4.2	0.9
F2082	375	94.4	-	-	3.2	1.6	1.1	0.5
House	66	100.0	-	-	-	-	6.1	6.1

the soil samples, on the other hand, though a total of 1.5% of all identified material was burnt the YARDS group, uniquely, was spared.

It is surprising that there is so little variation in the rate of chewing found in the different context-types. The overall rate of about 4% is higher than had been apparent in earlier studies and in this the quantification vindicates the bone by bone examination. 'Chewed' material in Table 6 covers all occurrences down to simple toothmarks, which are likely almost always to be from dogs; 'heavy' chewing is where the bone has begun to break down at the ends or the shaft has been wrenched out of shape with compression fractures (Binford 1981, 51). In heavy chewing the ditch and the gully (F2082) are quite high, which may well be context-related; for some reason F2006 is high as well. What is really surprising is that the occurrence of all chewing, light and heavy, is so remarkably even between the different groups. There was no concentration on occupation surfaces: YARDS were very close to par and the House contexts showed no chewing at all. With good clear preservation of material and a good rate of recovery, this evenness of chewing might suggest that dogs got their teeth quite quickly into a certain amount of material but that this was rarely left lying around for long enough for a great deal of damage to be done; and arguing from the proportion of heavy shewing within the chewed material as a whole, one might suggest that not a great many bones are likely to have been chewed away entirely.

The data sheets break down the signs of chewing still further and it is interesting that there is little difference in the incidence of chewing on bones of different species. Of the domestic food species, goose and fowl gave a joint figure of 6.6%, and cattle, sheep and pig all came in the range of 4% - 5%.

From the soil samples, only 12 of the identified fragments showed signs of chewing (2%), and only one of these was chewed heavily.

The mostmarked variability in bone condition comes with erosion. Overall quite a small proportion of material is eroded, but the incidence in the ditch contexts stands out at once and within the ditch it is the primary fill that is by far the most widely affected. Heavy erosion does not increase pari passu with the rest. Context 242 on Site 99 is notable for a moderate rate of erosion, yet F2015 is very low. The high percentage for F1008 comes from no more than 6 eroded fragments, and for the House occupation from 4.

In the soil sample material it is again the ditch that dominates the figures, and this time the Segment too has a fair amount of eroded material (at 12.0%, against 25.8% from the primary fill).

As with chewing, so with erosion: heavily damaged material is rarely found to any great extent, not even in the primary fill of the ditch, and there is therefore cause to hope that in the assemblages which were studied no great amount of bone has been entirely eroded away.

Indeed, the general figures for chewing and erosion are much lower than those given by Maltby (1984, in press) in his study of Iron Age and Roman material, where in a great many contexts far more fragments were chewed or eroded than were preserved unaffected. Maltby sees such destruction as likely to have obliterated a great many signs of butchery and by quantified comparisons he is able to substantiate his fears. The results of this present Six Dials study serve on the one hand to pinpoint the exceptional condition of the material in the ditch; they also give a general confidence in the material as a whole.

4) Disintegration (Table 7)

The condition of the material may be assessed in other ways. A fair idea of its disintegration, for example, may be obtained from the percentage of loose teeth. For this each species must be taken separately as the only way of comparing like with like.

By normal recovery the proportion of loose teeth is low at 4% for sheep; at 4.5% for cattle; and at 5.6% for pigs, who start with more teeth anyway. Relatively more loose teeth are found in the soil samples, yet as between these three species the ranking order stays the same.

As between contexts, the DITCH groups are low for pig loose teeth and very low for cattle ones. PITS are far the lowest for sheep, and this confirms the long-term impression of good undisturbed preservation in this context-type. The late well, F2014, is the highest in the proportion of its sheep loose teeth, but the early well is low, and no context stands out conspicuously for a serious level of disintegration as measured in this way.

VI THE RELATIVE REPRESENTATION OF THE SPECIES

1) Wild Species

The considerable quantity of recovered antler was found almost without exception either sawn or as tiny offcuts and shavings and it will be considered in the section on Working below. Apart from this, little material from wild species was identified from normal recovery.

Wild food mammals were limited to red deer and roe deer, but the very scarcity of their postcranial fragments served to confirm that the antler must have been brought separately into the town to meet industrial needs.

The tally of wild bird fragments is low, in spite of the inclusion of all mallard as wild: Crabtree (in press) is happy to accept as domestic the mallard from Saxon

TABLE 7 LOOSE TEETH OF CATTLE, SHEEP AND PIG

(a) from normal recovery; (b) from soil samples

- absolute numbers, and percentaged on species total fragments -

	(a)			(b)			
	COW	SHEEP	PIG	COW	SHEEP	PIG	
PITS	198 5.2	75 2.7	64 5.5	6 11.8	9 12.0	5 17.9	
WELLS	87 4.8	52 6.2	30 6.6	2 14.3	1 5.6	2 25.0	
YARDS	87 5.8	35 4.9	23 4.8	3 7.0	3 9.7	1 7.1	
DITCH	17 2.0	18 4.7	5 2.5	-	-	4 17.4	
OTHER	21 1.8	42 5.7	16 8.5	1 6.3	2 10.5	2 66.7	
TOTAL	410 4.5	222 4.0	138 5.6	12 8.3	15 7.2	14 18.4	
F1008	7 30.5	-	-	-	-	-	
F1009	18 12.0	5 10.2	3 25.0	1 50.0	1 25.0	1 100	
F1010	53 5.4	20 4.7	10 8.3	-	2 13.3	-	
F2009	4 3.3	3 2.1	-	NOT SAMPLED			
F2013	116 4.7	46 2.2	50 5.2	5 13.2	6 11.1	4 16.7	
F2063	-	-	-	NOT SAMPLED			
F2066	-	1 1.2	1 4.4	NOT SAMPLED			
F2068	-	-	-	NOT SAMPLED			
F2014	59 5.8	38 10.9	17 13.8	1 12.5	1 25.0	-	
F2016	28 3.6	14 2.8	13 3.9	1 16.7	-	2 28.6	
F2015	43 5.4	25 5.1	11 3.4	-	1 25.0	-	
99,242	44 6.2	10 4.5	12 7.7	3 7.5	2 9.4	1 7.7	
Primary	10 1.6	10 5.8	3 3.3	-	-	1 20.0	
Segment	6 2.7	6 3.3	2 2.0	-	-	3 16.6	
C10015	1 6.2	2 8.0	-	-	-	-	
F1005	18 2.5	14 4.7	13 17.3	1 9.1	1 16.7	-	
F2006	3 1.1	13 5.4	3 5.4	-	-	1 100	
F2082	-	15 8.7	-	-	-	-	
House	-	-	-	-	1 25.0	1 100	

West Stow, but all duck so far recovered at Hamwic could pass well for wild both in measurements and in texture. In this study only one large right coracoid gave any problems, since at first it seemed not impossible for domestic duck, but Jennie Coy has checked it at the British Museum's collection at Tring as in every way a good match for goosander.

It has been found in earlier Hamwic excavations that wild material was generally poorly represented in the pits, but its low incidence in the ditch was more surprising - there was none at all in the Primary fill and just one fragment of red deer in the Segment (a butchered cranium in context 11402). It was surprising, too, but for opposite reasons, that the best general representation came in the yard occupation layers of F2015. The gully, F2082, had red deer, roe deer and the goosander, and in a sparse overall collection of wild bird the layers of F2006 were conspicuous with their 5 fragments, 3 of which were of mallard and 2 which were certainly of corvid and very probably of rook.

The soil samples added little for the larger wild mammals or for birds. There was a butchered cervical vertebra of roe deer in F1010, and as for wild bird there was only one fragment (a scrap of a possible ulna shaft in context 12895 of the Segment) which could be confidently rejected for domestic fowl or goose. The single soil sample from the layers of F2006 gave no sign of its wild bird potential.

On the Melbourne Street sites only one feature (Site 5, F16) had been sieved, and this feature had produced fragments from 8 different species of wild bird. At the time of writing the Melbourne Street report it was not clear from the records whether it had been something distinctive about this feature which had led to its selection for sieving or whether such richness was quite common. In a way it is disappointing that there has not been any comparable abundance of wild bird in the sieved material of the present study; but there has been a strong vindication of the standards of recovery in the trench, and Site 5, F16 remains an enigma.

Small mammals were not recovered in the trench and were found only occasionally even in the soil samples. It is possible that more variety in the location of the sampling, not taking simply from the centre of the context, might have given different results (see Rackham 1982 and Jones 1982), since small mammals trapped in a feature might have made their way to the edges in search of some escape. F1005 layers 1 and 2 (contexts 4718 and 4719) contained, however, a right humerus and ulna of mole and two mole vertebrae. This was the bone-working, indust ial pit; but there were no marks as from skinning for the velvet coat and one cannot rule out the possibility that such a subterranean creature had dug its own way down to die in situ at some time between the going of the Saxons and the coming of ourselves.

Pit samples produced only one small mammal fragment, from F2014 layer 10 (context 3571). This was a left tibia of mouse, fully fused and quite sculptured in appearance but not certainly identifiable to species. The early well, F2016, had 4 fragments of an immature small mammal in layer 6 (context 3546); this was probably mouse, and included a matching pait of radii. Context 11442 in the ditch Segment contained a minute fragment from the side of a tooth, and the House occupation context 11286 had a fragment of what may have been a chewed (or more likely a partly digested) small mammal tibia shaft.

Amphibians were also occasional occurrences. F1009 had 12 amphibian fragments in its bottom layer (context 4313) and one of these, a distal right humerus, was certainly from some species of toad. F2014 had one amphibian fragment from layer 8 (context 3581), quite low in the infilling of the shaft. The 5 amphibian fragments from the primary fill of the ditch were found as a single occurrence in context 10017.

Of the wild material so far discussed, although a few individual features have seemed rather more interesting than the rest one has to say that finds are too sporadic to allow any clear generalisation on the incidence of wild material in any particular context-type. With fish, however, it is different. A separate report has been prepared by Sarah Colley (1984 b); but it may be said here that the taking of samples fully vindicates itself by showing the presence of fish remains in far greater numbers than the meagre finds from the trench would suggest. Of particular interest was the great variation in their incidence: marked differences are thrown into prominence between the two groups in YARDS, F2015 on the one hand and context 242 from Site 99 on the other, and the few finds from the primary filling of the ditch stand in great contrast to the far greater abundance in the Segment. The separation of context 10015 from the primary filling of the ditch would seem to be fully confirmed. Such things point to real differences in site formation processes and with fish remains the sampling programme has added a new dimension to the archaeological interpretation.

2) <u>Domestic Poultry</u> (Table 8)

It is only the very small assemblages which have no domestic fowl or goose at all, yet these are conspicuous by their near-absence both in context 242 from Site 99 and in the primary fill of the ditch. The ditch indeed seems generally low in poultry, particularly if context 10015 is an intrusion from the later digging of a pit; but the yard occupation layers of F2015 are well supplied by Hamwic standards. The spread in PITS is high, though there is a good overall rate for these features as a whole. The two wells vary greatly.

At the level of the groups there is an encouragin correlation in the relative abundance of domestic poultry from the soil samples with the ranking established in the trench. Ditch contexts seem to be markedly low and PITS are securely in the lead. At the level of the separate features, however, the correlation is far weaker. One likely explanation of this change is that fragments of domestic poultry are not distributed evenly but are likely to be found in small clusters: if this was so a particular sample, even in a context that was relatively rich, might well not yield the evidence, but for a context-type as a whole the greater the abundance of poultry the greater would be the chances that fragments would somewhere be found.

TABLE 8 ABUNDANCE OF DOMESTIC POULTRY

(a) from normal recovery (b) from soil samples

	fragments of domestic poultry	% of all identified fragments		poultry fragments	no. of 5000 cc samples	poultry fragments per 5000 cc
PITS	173	2.2		21	15	1.4
WELLS	42	1.3		12	11	1.1
YARDS	53	1.9		4	9	0.4
DITCH	9	0.6		12	36	0.3
OTHER	26	0.7		4	7	0.6
TOTAL	303	1.6		53	78	0.7
F1008	-	-		-	3	-
F1009	1	0.5		9	2	4.5
F1010	17	1.1		9	3	3.0
F2009	8	2.6		—	—	—
F2013	130	2.3		3	7	0.4
F2063	-	-		—	—	—
F2066	15	8.7		—	—	—
F2068	2	4.2		—	—	—
F2014	5	0.3		6	8	0.8
F2016	37	2.2		6	3	2.0
F2015	52	3.1		-	3	-
99,242	1	0.1		4	3 double ≡ 6	0.7
Primary	1	0.1		5	16	0.3
Segment	5	1.0		7	19	0.4
C10015	3	5.8		-	1	-
F1005	14	0.6		1	2	0.5
F2006	7	1.2		2	1	2.0
F2082	5	1.3		-	1	-
House	-	-		1	3	0.3

3) Less Common Domestic Mammals: Goat, Horse, Dog and Cat

Goat was found quite often in the ditch, but only in the Primary fill and overwhelmingly there as horn core. The only other concentration of goat came in the late well, F2014, where horn core was strong again, this time with some cranial fragments. The pattern of Distribution over the Body shows that goat horn core is present in disproportionate abundance and presumably it was often brought on its own into the settlement on account of its good industrial use: even in the Primary layers of the ditch much of the material had been sawn, and there were splendidly solid males horn cores there which would have supported very substantial horns. The contrast with PITS was marked, for not only was goat much rarer in this group but in the small occurrences it was mainly the limb bones that were found.

Horse was more common in this study than in the Melbourne Street material, where its overall percentage by fragment count had been only 0.1%. PITS indeed tallied precisely with this figure; but it must be remembered that although the horse-rich lower layers of F2006 ~~as~~ are classed as OTHER they too are part of a pit.

It was however the late well F2014 which dominated the finds of horse in this study. There were two sawn fragments of horse, proximal radius and proximal tibia, along with a good quantity of sawn cattle offcuts in layer 1 (context 3296), but the main concentration came in layer 14 (context 5701), the first infilling of the shaft when the well went out of use. Here there were 36 fragments, all similar in texture and light in colour and with several left/right pairs: they are taken therefore as coming from a single individual. There are few signs of butchery and none of sawing. In layer 7 (context 3574) several fragments are very similar to these in texture and some of these pair well - the accessory carpals, left and right, are exceptionally well matched between the layers. There is also in layer 7 some horse material which is heavier and darker, some at least of which must on Minimum Number calculations must have come from another individual, and two of these dark fragments are sawn (a left radius and its accompanying ulna).

Layer 7 comes from the original backfill in the construction of the well and layer 14 is unlikely to have been deposited until the well was going out of use. They are thought to be separated by a gap of several years, yet there is no difference in texture, colour or state of erosion (minimal) between the lighter horse material in them both. Further archaeological evidence may perhaps throw more light on this problem.

Dog might seem well represented in the primary fill of the ditch, but the 11 fragments all came from the same context (10102) and are almost certainly from the same individual, an adult animal of medium size. There is no dog in the Segment; and elsewhere it is present only rarely. There is no cat all in the ditch contexts but there were a few random finds in other groups.

4) Common Domestic Mammals: Cattle, Sheep and Pig (Table 9)

It was clear from Table 1 that the overwhelming proportion of the identified fragments came from cattle, sheep and pig. They were challenged only in the boneworking pit (F1005) by the antler, and if variation is to be found it must be sought in the relative representation between the three species themselves.

The overall means for such relative representation come closely with those for the much larger assemblage of Hamwic Melbourne Street, which were 52.0%, 31.6% and 16.4% by fragment count for cattle, sheep and pig and - amazingly similar - 74.5%, 13.9% and 11.6% respectively by weight.

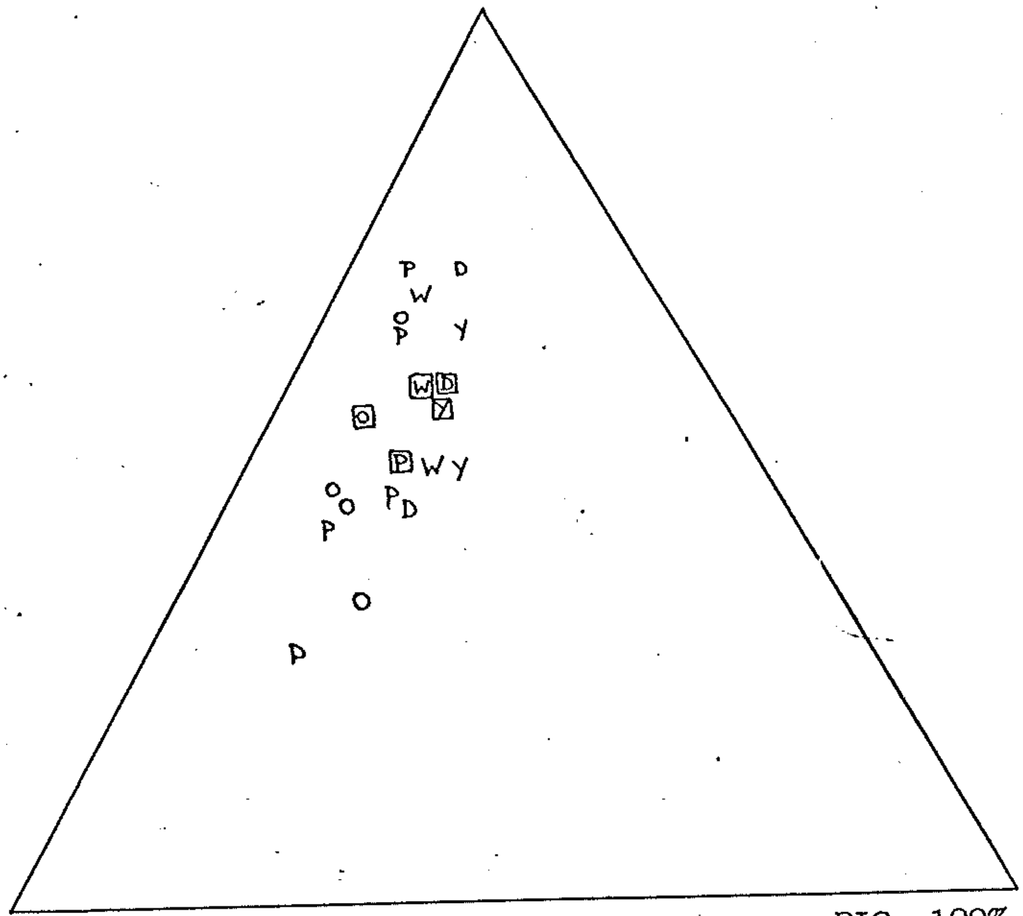
When relative representation had been plotted on to triangular graphs for the larger pit assemblages at Melbourne Street and Chapel Road there was indeed found to be some variation between many individual assemblages but this seemed to be quite randon and certainly gave no patterning into groups (Bourdillon 1983, 54 - 70). In the present study a similar plotting for all but the least abundant contexts (Figures

TABLE 9 RELATIVE REPRESENTATION OF CATTLE, SHEEP AND PIG

	(a) by fragment count			(b) by weight			(c) cattle : pig ratio	
	COW %	SHEEP %	PIG %	COW %	SHEEP %	PIG %	by fragts.	by weight
PITS	49.1	36.1	14.8	70.8	16.5	12.7	3.3:1	5.6:1
WELLS	58.3	27.1	14.6	76.7	13.1	10.2	4.0:1	7.5:1
YARDS	55.8	26.5	17.7	75.3	11.1	13.6	3.2:1	5.5:1
DITCH	59.9	26.4	13.7	80.8	9.5	9.7	4.4:1	8.3:1
OTHER	55.5	35.5	9.0	72.0	17.5	10.5	6.2:1	6.9:1
TOTAL	53.5	32.1	14.4	74.2	13.9	11.9	3.7:1	6.2:1
F1008	(82.1)	(10.7)	(7.2)	(85.4)	(12.4)	(2.2)	(11.5:1)	(28:1)
F1009	71.1	23.2	5.7	84.8	11.1	4.1	12.5:1	20.8:1
F1010	64.2	27.8	8.0	78.9	14.9	6.2	8.1:1	12.6:1
F2009	41.6	47.3	11.1	65.5	25.4	9.1	3.7:1	7.2:1
F2013	44.8	37.9	17.3	67.8	16.4	15.8	2.6:1	4.3:1
F2063	(100)	–	–	(100)	–	–	✓	✓
F2066	29.0	55.9	15.1	38.0	43.0	19.0	1.9:1	2.0:1
F2068	(51.1)	(33.3)	(15.6)	73.5	13.0	13.5	(3.3:1)	5.4:1
F2014	68.5	23.3	8.2	83.5	10.1	6.4	8.3:1	13.1:1
F2016	48.8	30.7	20.5	69.4	16.3	14.3	2.4:1	4.9:1
F2015	49.5	30.6	19.9	69.2	13.6	17.2	2.5:1	4.0:1
99,242	65.2	20.4	14.4	79.4	9.4	11.2	4.5:1	7.1:1
Primary	70.4	19.4	10.2	87.2	5.8	7.0	6.9:1	12.3:1
Segment	43.8	36.3	19.9	68.4	16.6	15.0	2.2:1	4.5:1
C10015	(33.3)	(52.1)	(14.6)	51.3	27.8	20.9	2.3:1	2.5:1
F1005	66.2	27.0	6.8	82.9	11.3	5.8	9.7:1	14.4:1
F2006	47.0	43.0	10.0	72.3	18.0	9.7	4.7:1	7.4:1
F2082	40.6	47.3	12.1	54.8	28.3	16.9	3.4:1	3.2:1
House	31.8	48.5	19.7	45.5	22.0	32.5	1.6:1	1.4:1

FIGURE 1

RELATIVE REPRESENTATION OF CATTLE, SHEEP and PIG
by fragment count



based on data in Table 9 (a)

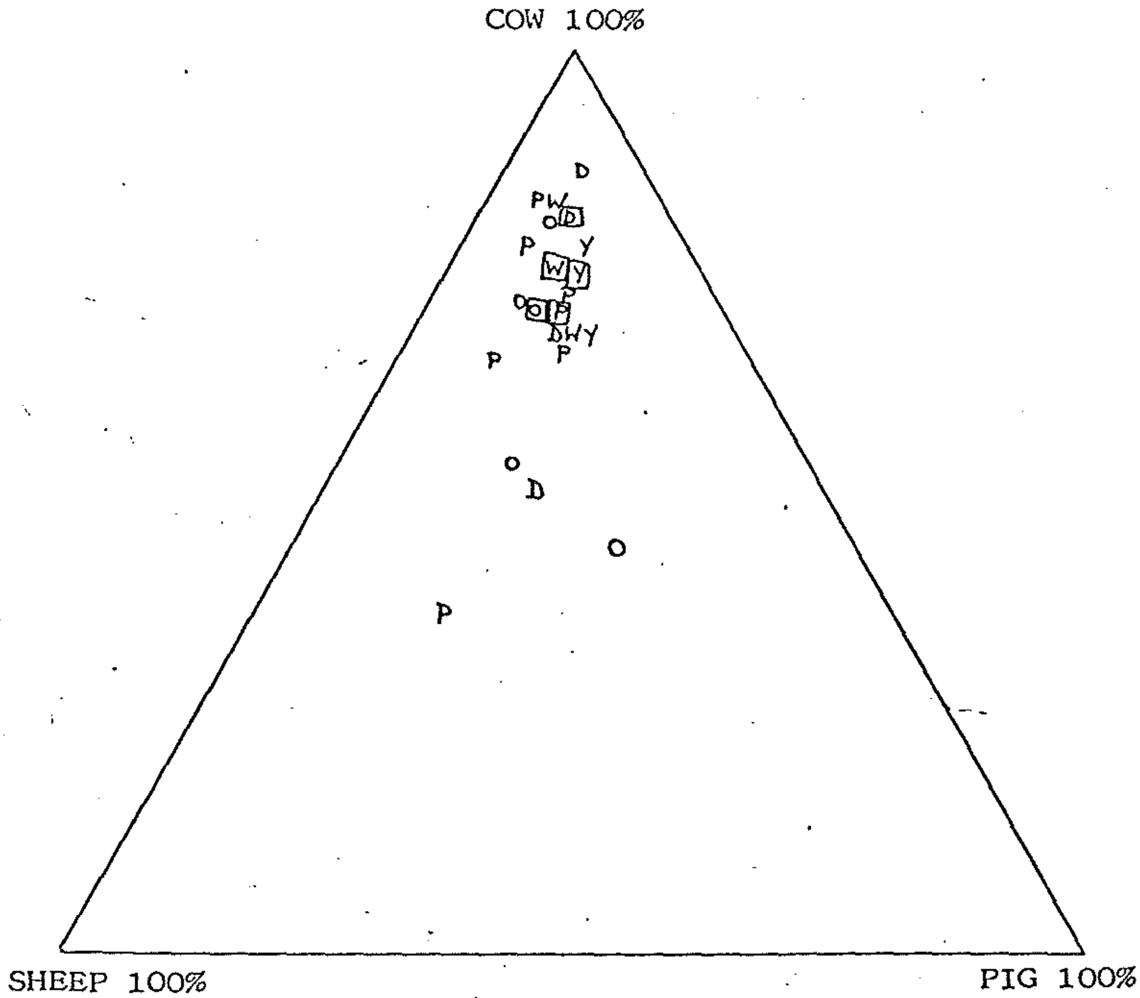
plotted by assemblages:

P - from pit
W - from well
Y - from yard
D - from ditch
O - from other

with groups of assemblages thus : $\boxed{P}$

FIGURE 2

RELATIVE REPRESENTATION OF CATTLE, SHEEP and PIG
by weight



based on data in Table 9 (b)
plotted by assemblages:

P - from pit
W - from well
Y - from yard
D - from ditch
O - from other

with groups of assemblages thus : $\boxed{P}$

TABLE 10 INCIDENCE OF CATTLE BONES IN DIFFERENT FRAGMENT SIZES

(a) longbones n and % (b) metapodia n and %

	<25%	≥25% <50%	≥50% <75%	≥75% <100%	whole	Total long-bone fragts	<25%	≥25% <50%	≥50% <75%	≥75% <100%	whole	Total meta-podia fragts
PITS	303 73.7	69 16.8	32 7.8	7 1.7	—	411	91 62.4	24 16.4	14 9.6	13 8.9	4 2.7	146
WELLS	194 80.6	35 14.5	9 3.7	2 0.8	1 0.4	241	100 80.7	10 8.1	7 5.6	1 0.8	6 4.8	124
YARDS	99 67.8	30 20.5	16 11.0	—	1 0.7	146	44 47.9	23 25.0	7 7.6	13 14.1	5 5.4	92
DITCH	44 43.6	30 29.7	10 9.9	12 14.9	5* 4.9	101	6 25.0	5 20.9	3 12.5	2 8.3	8 33.3	24
OTHER	61 75.3	13 16.1	5 6.2	1 1.2	1 1.2	81	247 93.9	13 4.9	1 0.4	—	2 0.8	263
TOTAL	701 71.5	177 18.1	72 7.4	22 7.2	8 0.8	980	488 75.1	75 11.6	32 4.9	29 4.5	25 3.9	649
F1008	3		1			4						-
F1009	13 56.5	4 17.4	5 21.7	1 4.4		23	5 55.6	3 33.3	1 11.1			9
F1010	105 15.5	24 17.3	8 5.8	2 1.4		139	15 46.8	10 31.3	3 9.4	4 12.5		32
F2009	9 60.0	4 26.7		2 13.3		15	3					3
F2013	168 75.4	36 16.1	17 7.6	2 0.9		223	65 65.6	11 11.1	10 10.1	9 9.1	4 4.1	99
F2063	1					1	2					2
F2066	3					3	1					1
F2068	1	1	1			3						-
F2014	148 82.7	20 11.2	9 5.0	2 1.1		179	90 85.0	7 6.6	7 6.6	1 0.9	1 0.9	106
F2016	46 74.2	15 24.2		-	1 1.6	62	10 55.6	3 16.7			5 27.7	18
F2015	44 78.6	6 10.7	5 8.9		1 1.8	56	25 58.1	5 11.6	4 9.3	6 14.0	3 7.0	43
99,242	55 61.1	24 26.7	11 12.2			90	19 38.8	18 36.7	3 6.1	7 14.3	2 4.1	49
Primary	29 43.2	17 25.4	6 9.0	11 16.4	4 6.0	67	4 28.7	1 7.1	1 7.1	1 7.1	7 50.0	14
Segment	13 42.0	12 38.7	4 12.9	1 3.2	1 3.2	31	1 11.1	4 44.5	2 22.2	1 11.1	1 11.1	9
C10015	2	1				3	1					1
F1005	43 89.6	4 8.3	1 2.1			48	239 96.0	10 4.0				249
F2006	8 44.4	6 33.3	2 11.1	1 5.6	1 5.6	18	6 54.5	3 27.3	1 9.1		1 9.1	11
F2082	7 58.3	3 25.0	2 16.7			12	2				1	3
House	3					3						-

TABLE 11 INCIDENCE OF SHEEP BONES IN DIFFERENT FRAGMENT SIZES

(a) longbones n and % (b) metapodia n and %

	(a) <25%	≥25% <50%	≥50% <75%	≥75% <100%	whole	Total long-bone fragts	(b) <25%	≥25% <50%	≥50% <75%	≥75% <100%	whole	Total meta-podia fragts
PITS	113 34.3	92 28.0	66 20.1	36 10.9	22 6.7	329	36 28.3	22 17.3	26 20.6	38 29.9	5 3.9	127
WELLS	60 48.8	25 20.3	27 22.0	8 6.5	3 2.4	123	20 41.7	8 16.7	5 10.4	11 22.9	4 8.3	48
YARDS	25 25.0	26 26.0	25 25.0	18 18.0	6 6.0	100	7 15.6	8 17.8	5 11.1	14 36.1	11 24.4	45
DITCH	17 27.4	14 22.6	21 33.9	7 11.3	3 4.8	62	2 7.7	4 15.4	6 23.1	8 30.7	6 23.1	26
OTHER	27 25.0	21 27.3	17 22.1	8 10.4	4 5.2	77	10 28.6	14 40.0	4 11.4	3 8.6	4 11.4	35
TOTAL	242 35.0	178 25.8	156 22.6	77 11.1	38 5.5	691	75 26.7	56 19.9	46 16.4	74 26.3	30 10.7	281
F1008	1 50.0	-	1 50.0	-	-	2						-
F1009	4 66.6	1 16.7	1 16.7	-	-	6	2 33.3	-	4 66.7	-	-	6
F1010	30 32.5	26 28.3	23 25.0	11 12.0	2 2.2	92	7 20.6	9 26.5	9 26.5	7 20.6	2 5.8	34
F2009	7 31.8	6 27.3	-	6 27.3	3 13.6	22	2 22.2	-	1 11.1	6 66.7	-	9
F2013	70 35.0	57 28.5	39 19.5	18 9.0	16 8.0	200	25 32.9	13 17.1	12 15.8	24 31.6	2 2.6	76
F2063						-						-
F2066	1 16.7	1 16.7	2 33.2	1 16.7	1 16.7	6						-
F2068		1 100	-	-	-	-	-	-	-	1 50.0	1 50.0	2
F2014	35 47.3	18 24.3	16 21.6	4 5.4	1 1.4	74	14 45.2	6 19.4	5 16.1	5 16.1	1 3.2	31
F2016	25 51.0	7 14.3	11 22.4	4 8.2	2 4.1	49	6 35.3	2 11.8	-	6 35.3	3 17.6	17
F2015	13 34.2	10 26.3	6 15.8	5 13.2	4 10.5	38	2 15.4	2 15.4	-	3 23.1	6 46.1	13
99,242	12 19.4	16 25.8	19 30.6	13 21.0	2 3.2	62	5 15.6	6 18.8	5 15.6	11 34.4	5 15.6	32
Primary	8 24.3	11 33.3	9 27.3	4 12.1	1 3.0	33	2 18.2	1 9.1	2 18.2	3 27.3	3 27.3	11
Segment	9 33.3	2 7.4	11 40.8	3 11.1	2 7.4	27	-	3 20.0	4 26.7	5 33.3	3 20.0	15
C19015	-	1 50.0	1 50.0	-	-	2						-
F1005	20 52.7	10 26.3	7 18.4	-	1 2.6	38	3 20.0	8 53.3	2 13.3	1 6.7	1 6.7	15
F2006	5 19.2	6 23.1	6 23.1	7 26.9	2 7.7	26	4 40.0	2 20.0	2 20.0	1 10.0	1 10.0	10
F2082	1 8.3	5 41.8	4 33.3	1 8.3	1 8.3	12	1 16.7	2 33.3	-	1 16.7	2 33.3	6
House	1 100	-	-	-	-	1	2 50.0	2 50.0	-	-	-	4

TABLE 12 INCIDENCE OF PIG LONGBONES IN DIFFERENT FRAGMENT SIZES

n and %

	<25%	≥25%, <50%	≥50%, <75%	≥75%, <100%	whole	TOTAL
PITS	58 29.6	60 30.6	27 13.8	25 12.8	26 13.2	196
WELLS	19 28.8	11 16.7	24 36.3	4 6.1	8 12.1	66
YARDS	8 10.8	19 25.7	16 21.6	19 25.7	12 16.2	74
DITCH	9 18.0	10 20.0	24 48.0	3 6.0	4 8.0	50
OTHER	6 21.4	8 28.6	6 21.4	3 10.7	5 17.9	28
TOTAL	100 24.2	108 26.1	97 23.4	54 13.0	55 13.3	414
F1008	1					1
F1009		1	2	2		5
F1010	18 43.9	15 36.6	5 12.2		3 7.3	41
F2009				1	1	2
F2013	37 26.1	43 30.2	18 12.7	22 15.5	22 15.5	142
F2063						-
F2066	1		1			2
F2068	1	1	1			3
F2014	6 22.2	7 26.0	9 33.3	2 7.4	3 11.1	27
F2016	13 33.3	4 10.3	15 38.5	2 5.1	5 12.8	39
F2015	5 17.9	7 25.0	7 25.0	3 10.7	6 21.4	28
99,242	3 6.5	12 26.1	9 19.6	16 34.8	6 11.0	46
Primary	4 16.7	5 20.8	10 41.7	3 12.5	2 8.3	24
Segment	5 20.0	5 20.0	13 52.0		2 8.0	25
C10015			1			1
F1005	2 16.7	4 33.3	3 25.0		3 25.0	12
F2006	2 50.0	1 25.0		1 25.0		4
F2082	2 22.2	3 33.4	2 22.2	1 11.1	1 11.1	9
House			1	1	1	3

the 75%-plus group being found in the primary fill, the sole pelvis of that size in the Segment.

The great number of small metapodial fragments in F1005 may be explained by the boneworking. The only other point of variation is to be found in the marked contrast between the fragmentation patterns of cattle in the two wells.

SHEEP

The longbones of sheep are generally less fragmented and there is no marked difference between the different context-types, though within YARDS itself there is wide variation. For the metapodia, the ditch and F2015 stand out with appreciably more whole or near-whole bones.

PIG

Pig metapodia are too small to be greatly fragmented and have not been quantified in the present tables. Pig longbones are less fragmented than those of sheep, and far less so than those of cattle. There is quite a good spread of the larger fragments among the different context-types, but in contrast to what was found with sheep and cattle it is the ditch that is the lowest on whole or near-whole bones. What is especially striking for pig is the concentration of the 75%-plus group in context 242 of Site 99, with the relative decrease there of fragments of less than 25%; in contrast, the pattern for F2015 is close to that for the study as a whole.

2) <u>Mean Fragment Weight</u> (Table 13)

Such details on fragmentation are made possible by the recording of information for each separate bone, and they go far beyond what could be adduced in earlier studies. It is useful nonetheless to make comparisons with the more generalised statistic of the mean fragment weight for a species, partly because this is a parameter which has been available from other Hamwic sites. Weight of course is not the same as size, but where material is reasonably constant, species by

TABLE 13 MEAN FRAGMENT WEIGHT OF CATTLE, SHEEP AND PIG in g

		COW	SHEEP	PIG	
PITS		18.9	6.0	11.3	
WELLS		20.4	7.5	10.8	
YARDS		27.6	8.5	15.8	
DITCH		31.2	8.3	16.4	
OTHER		14.5	5.6	13.1	
TOTAL		21.2	6.6	12.6	
F1008		16.5	(18.3)	(5.0)	
F1009		20.1	8.1	12.1	
F1010		20.3	8.8	12.9	
F2009		20.8	7.1	10.8	
F2013		18.2	5.2	7.1	
F2063		20.5	—	—	
F2066		13.6	8.0	13.0	
F2068		27.2	7.3	16.4	
F2014		20.0	7.1	12.6	
F2016		20.8	7.8	10.2	
F2015		22.1	6.1	12.0	
99,242		36.8	13.9	23.5	
Primary		31.4	7.6	18.6	
Segment		31.5	9.2	15.4	
C10015		18.4	6.4	17.1	
F1005		10.8	3.6	7.3	
F2006		22.7	6.2	14.4	
F2082		17.5	7.8	18.2	
House		20.7	6.6	23.8	

species, there is likely to be a close relationship between the two.

What stands out at once from Table 13 is the high mean fragment weight give by context 242 on Site 99 for cattle, sheep and pig. It is for cattle that this is the most surprising, for the mean weight is higher even than that in the ditch whereas from the findings of longbone fragmentation one would have expected the opposite. The impression at the time of recording was that there were fewer really small fragments of cattle within the general category of "less than 25%", and the mean fragment weight would seem to bear this out.

It is interesting too that for the ditch itself there is not the contrast between the primary fill and the Segment which the pattern of fragmentation might suggest.

3) Distribution over the Body (Tables 14 - 16)

Changing patterns of Distribution over the Body may show up changed concentrations of wastage or of meat bones and so serve to locate areas of prime butchery as distinct from those of food remains; indeed, Maltby's (1979,4) classic demonstration of these in the ditches and pits of Roman Exeter has been noted far afield (e.g. Johansson 1982, 43). Crabtree (in press), following Maltby, found some similar differences at West Stow, though here the cranial surplus which is linked with butchers' trimming was found in the pits in contrast to the huts and cultural layers.

The Melbourne Street study had used the more cumbersome method of Minimum Numbers bone by bone to show that the various parts of the body seemed to be represented in reasonable proportions over the assemblage as a whole, and to rule out any relative shortage of mandibles of the sort which had led Reichstein and Tiessen (1974, 23) to postulate for Haithabu that cattle had been killed and trimmed away from the settlement itself. Nor were any major concentrations of mandibles noticed at Melbourne Street as between one group of pits and the next, nor from one site to another. On the other hand, no ditches had

TABLE 14 DISTRIBUTION OVER THE BODY BY FRAGMENT COUNT : CATTLE

n and %

	Head minus loose teeth	Loose teeth	Long bones and their epiphyses	Feet and ankles	Vertebrae	Scapula	Pelvis	Ribs, etc.	TOTAL
PITS	462 12.1	198 5.2	521 13.6	530 13.8	687 17.9	171 4.5	131 3.4	1133 29.5	3833
WELLS	300 16.6	87 4.8	308 17.1	326 18.1	253 14.0	88 4.9	48 2.7	396 21.8	1806
YARDS	304 20.2	87 5.8	184 12.2	202 13.4	261 17.3	77 5.1	66 4.4	326 21.6	1507
DITCH	104 12.1	17 2.0	115 13.3	71 8.2	197 22.9	24 2.8	34 3.9	300 34.8	862
OTHER	107 9.2	21 1.8	117 10.1	485 41.7	145 12.5	43 3.7	18 1.6	225 19.6	1161
TOTAL	1277 13.9	410 4.5	1245 13.7	1614 17.6	1543 16.8	403 4.4	297 3.2	2380 25.9	9169
F1008	2 8.7	7 30.5	5 21.7	6 26.1	-	-	1 4.3	2 8.7	23
F1009	30 20.0	18 12.0	28 18.6	19 12.7	14 9.3	3 2.0	4 2.7	34 22.7	150
F1010	93 9.5	53 5.4	164 16.8	159 16.3	187 19.2	42 4.3	35 3.6	242 24.9	975
F2009	18 14.6	4 3.3	19 15.3	16 13.0	20 16.3	7 5.7	6 4.9	33 26.8	123
F2013	309 12.4	116 4.7	297 12.0	322 13.0	444 17.9	116 4.7	80 3.2	801 32.1	2485
F2063	2 20.0	-	1 10.0	2 20.0	1 10.0	-	2 20.0	2 20.0	10
F2066	7 15.9	-	4 9.1	4 9.1	15 34.1	3 6.8	-	11 25.0	44
F2068	1 4.3	-	3 13.0	2 8.7	6 26.1	-	3 13.0	8 34.9	23
F2014	173 16.9	59 5.8	210 20.5	223 21.7	101 9.9	52 5.1	20 2.0	186 18.1	1024
F2016	127 16.2	28 3.6	98 12.5	103 13.2	152 19.4	36 4.6	28 3.6	210 26.9	782
F2015	132 16.5	43 5.4	74 9.3	109 13.6	135 16.8	42 5.3	30 3.8	235 29.3	800
99,242	172 24.2	44 6.2	110 15.6	93 13.2	126 17.8	35 5.0	36 5.1	91 12.9	707
Primary	72 11.5	10 1.6	77 12.3	42 6.7	153 24.6	9 1.4	21 3.4	241 38.5	625
Segment	32 14.5	6 2.7	34 15.4	28 12.7	41 18.6	13 5.9	12 5.4	55 24.8	221
C19015	-	1 6.2	4 25.0	1 6.2	3 18.8	2 12.5	1 6.3	4 25.0	16
F1005	52 7.1	18 2.5	60 8.2	419 57.6	40 5.5	22 3.0	7 1.0	110 15.1	728
F2006	44 16.7	3 1.1	35 13.3	41 15.5	72 27.2	7 2.7	5 1.9	57 21.6	264
F2082	8 5.4	-	18 12.2	23 15.5	32 21.6	13 8.8	6 4.1	48 32.4	148
House	3 14.3	-	4 19.0	2 9.5	1 4.8	1 4.8	-	10 47.6	21

TABLE 15 DISTRIBUTION OVER THE BODY BY FRAGMENT COUNT : SHEEP

n and %

	Head minus loose teeth	Loose teeth	Long bones	Feet and ankles	Vertebrae	Scapula	Pelvis	Ribs, etc.	TOTAL
PITS	246 8.7	75 2.7	416 14.7	228 8.1	419 14.9	87 3.1	86 3.0	1264 44.8	2821
WELLS	141 16.8	52 6.2	140 16.7	69 8.2	117 13.9	43 5.1	29 3.4	250 29.7	841
YARDS	97 13.5	35 4.9	119 16.7	56 7.8	101 14.1	24 3.4	26 3.6	258 36.0	716
DITCH	40 10.5	18 4.7	66 17.4	33 8.7	36 9.5	15 3.9	17 4.5	155 40.8	380
OTHER	94 12.7	42 5.7	91 12.3	74 10.0	109 14.7	21 2.8	23 3.1	288 38.7	742
TOTAL	618 11.2	222 4.0	832 15.1	460 8.4	782 14.3	190 3.5	181 3.3	2215 40.4	5500
F1008	–	–	2	–	–	–	–	1	3
F1009	14 28.6	5 10.2	7 14.3	9 18.4	3 6.1	2 4.1	1 2.0	8 16.3	49
F1010	32 7.6	20 4.7	105 24.8	46 10.9	44 10.4	12 2.8	17 4.0	147 34.8	423
F2009	9 6.4	3 2.1	24 17.1	17 12.1	29 20.7	4 2.9	4 2.9	50 35.8	140
F2013	181 8.6	46 2.2	270 12.8	142 6.7	341 16.2	64 3.0	64 3.0	998 47.5	2106
F2063	–	–	–	–	–	–	–	–	–
F2066	9 10.6	1 1.2	7 8.2	12 14.1	–	5 5.9	–	51 60.0	85
F2068	1 6.7	–	1 6.7	2 13.3	2 13.3	–	–	9 60.0	15
F2014	74 21.2	38 10.9	80 22.9	41 11.8	35 10.0	12 3.4	12 3.4	57 16.4	349
F2016	67 13.6	14 2.8	60 12.2	28 5.7	82 16.7	31 6.3	17 3.5	193 39.2	492
F2015	65 13.1	25 5.1	52 10.5	19 3.8	76 15.4	10 2.0	20 4.0	228 46.1	495
99,242	32 14.5	10 4.5	67 30.4	37 16.7	25 11.3	14 6.3	6 2.7	30 13.6	221
Primary	13 7.6	10 5.8	39 22.7	15 8.7	12 7.0	9 5.2	8 4.7	66 38.3	172
Segment	23 12.6	6 3.3	25 13.7	17 9.3	17 9.3	6 3.3	8 4.4	81 44.1	183
C10015	4 16.0	2 8.0	2 8.0	1 4.0	7 28.0	–	1 4.0	8 32.0	25
F1005	22 7.4	14 4.7	42 14.1	35 11.8	31 10.4	7 2.4	15 5.1	131 44.1	297
F2006	46 19.1	13 5.4	31 12.9	22 9.1	35 14.5	8 3.3	3 1.2	83 34.5	241
F2082	25 14.5	15 8.7	16 9.3	12 7.0	38 22.1	5 2.9	4 2.3	57 33.2	172
House	1 3.1	–	2 6.3	5 15.6	5 15.6	1 3.1	1 3.1	17 53.2	32

TABLE 16 DISTRIBUTION OVER THE BODY BY FRAGMENT COUNT : PIG

n and %

	Head minus loose teeth	Loose teeth	Long bones	Feet and ankles	Vertebrae	Scapula	Pelvis	Ribs, etc.	TOTAL
PITS	204 17.6	64 5.5	298 25.7	186 16.1	243 21.0	49 4.2	39 3.4	75 6.5	1158
WELLS	136 30.1	30 6.6	91 20.0	56 12.4	47 10.4	20 4.4	23 5.1	50 11.0	453
YARDS	132 27.6	23 4.8	100 21.0	81 17.0	70 14.7	25 5.2	27 5.7	19 4.0	477
DITCH	49 24.7	5 2.5	66 33.3	26 13.2	24 12.1	10 5.1	9 4.6	9 4.5	198
OTHER	37 19.7	16 8.5	41 21.8	40 21.3	28 14.9	7 3.7	6 3.2	13 7.0	188
TOTAL	558 22.6	138 5.6	596 24.1	389 15.7	412 16.6	111 4.5	104 4.2	166 6.7	2474
F1008	-	-	1 50.0	1 50.0	-	-	-	-	2
F1009	3 25.0	3 25.0	4 33.4	1 12.3	1 12.3	-	-	-	12
F1010	17 14.0	10 8.3	41 33.9	18 14.9	15 12.4	8 6.6	9 7.4	3 2.5	121
F2009	3 9.1	-	4 12.1	5 15.2	11 33.3	1 3.0	3 9.1	6 18.2	33
F2013	176 18.3	50 5.2	237 24.8	155 16.1	215 22.4	37 3.9	27 2.8	63 6.5	960
F2063	-	-	-	-	-	-	-	-	-
F2066	3 13.0	1 4.4	7 30.4	5 21.7	1 4.4	3 13.0	-	3 13.1	23
F2068	2 28.6	-	4 57.1	1 14.3	-	-	-	-	7
F2014	36 29.3	17 13.8	37 30.1	10 8.1	10 8.1	6 4.9	5 4.1	2 1.6	123
F2016	100 30.3	13 3.9	54 16.4	46 13.9	37 11.2	14 4.2	18 5.5	48 14.6	330
F2015	86 26.8	11 3.4	45 14.0	70 21.8	62 19.3	15 4.7	14 4.4	18 5.6	321
99,242	46 29.5	12 7.7	55 35.3	11 7.1	8 5.1	10 6.4	13 8.3	1 0.6	156
Primary	28 30.8	3 3.3	31 34.0	8 8.8	10 11.0	4 4.4	4 4.4	3 3.3	91
Segment	21 21.0	2 2.0	34 34.0	15 15.0	12 12.0	6 6.0	4 4.0	6 6.0	100
C10015	-	-	1 14.3	3 42.8	2 28.6	-	1 14.3	-	7
F1005	14 18.7	13 17.3	17 22.7	19 25.3	6 8.0	2 2.7	1 1.3	3 4.0	75
F2006	11 19.6	3 5.4	8 14.3	12 21.4	13 23.2	3 5.4	2 3.6	4 7.1	56
F2082	9 20.5	-	12 27.3	7 15.9	7 15.9	2 4.5	3 6.8	4 9.1	44
House	3 23.1	-	4 30.7	2 15.4	2 15.4	-	-	2 15.4	13

then been found to test for contrast. It was with an element of expectancy that the bone from the Six Dials ditch was studied and the first comparisons were made.

Who would have believed that the percentages for cattle head fragments from PITS and from the ditch would have turned out to be identical even into decimals? It was YARDS that were highest, and then WELLS. Wells have indeed been shown on occasion to have a good display of skulls - there was much cranial material in a Hamwic well in Chapel Road (Site 7, F53), and the well with Noddle's (1975) Barbary ape from medieval Southampton. But wells are not likely to betoken an area of systematic butchery; nor are yard occupation surfaces most likely to be chosen for the deliberate disposal of wastage and mess from the carcase.

Cattle feet and ankles are also taken to be wastage (see Johansson 1982, 49). For these it is F1005 that is supreme, with F2014 a poor second and other features and groups some way behind. F1005 was the boneworking pit which seemed to specialise in sawn metapodial fragments; and the figures for F2014 were also inflated by such offcuts. One has therefore to say that no area of prime and specialised butchery has yet been located at Hamwic.

Specialised centres of butchery are in any case less likely to be necessary for the smaller species, sheep and pigs; but their patterns of Distribution over the Body have an interest where variability is concerned. For sheep the greatest differences lie in the disposal rate of ribs and in PITS, WELLS and YARDS there differences cut right across the groups. For pig it is the longbones which show the main variety.

4. <u>Butchery Cuts</u> (Tables 17 - 19)

Butchery at Hamwic had seemed rough and ready, and indeed that is still the main impression after the careful inspection bone by bone which this present study has required. Many different cuts have been recorded, cuts in many directions and in many different places on the bone; but the multiplicity of data is slow to take a pattern on analysis. Particularly for the heavy bones of cattle there would seem to be much random knocking and rough breaking.

Of the various lines of enquiry that have been collected on the data sheets, some that may prove more useful have been chosen for the tables. First there are the records of surface cuts, presumably for trimming meat from the bone, and of throughcuts where the bone itself has been divided, either as a means of disjointing the carcase or else for extracting the marrow.

Some variability may be seen on cattle longbones. In four assemblages throughcuts are prevalent, but in F1010 and in the Segment this is through their own high numbers whereas in F2006 and F1009 it is because surface cuts are relatively rare. Other features have a strong preponderance of surface cuts - most notably F2015, where there is a strange dearth of throughcuts, and to a lesser extent the two wells. In the large assemblage of F2013 the two types of cut have a broadly similar incidence.

The same differences, and between the same assemblages, are found on the cattle metapodia, with context 242 and the Segment of the ditch again distinctive for much cutting. The scapula in general has a higher proportion of throughcuts, for dismemberment surely and not for extraction of marrow, but with scapula too the assemblage differences are seen: there is great contrast in the incidence of throughcuts within PITS, within YARDS, within the ditch, for example, and this time too there is contrast between the two wells.

TABLE 17 SOME CATTLE BUTCHERY CUTS

(a) longbones
n and %

	fragments with surface cuts (n)	%	fragments with through cuts (n)	%	fragments with axial throughcuts (n)	%	fragments with oblique throughcuts (n)	%	TOTAL longbone fragments	
PITS	115	28.0	199	48.4	122	29.7	52	12.7	411	
WELLS	102	40.5	69	27.4	38	15.1	12	4.8	252	
YARDS	60	41.1	57	39.0	29	19.9	16	11.0	146	
DITCH	36	35.3	44	43.1	18	17.6	21	20.6	102	
OTHER	25	30.9	33	40.7	14	17.3	11	13.6	81	
TOTAL	338	34.1	402	40.5	221	22.3	112	11.3	992	
F1008	1	25.0	1	25.0	1	25.0	-		4	
F1009	6	26.1	10	43.5	5	21.7	3	13.0	23	
F1010	34	24.5	105	75.5	56	40.3	33	23.7	139	
F2009	-		3	20.0	-		-		15	
F2013	72	32.3	79	35.4	59	26.5	16	7.2	223	
F2063	-		-		-		-		1	
F2066	-		-		-		-		3	
F2068	2	66.7	1	33.3	1	33.3	-		3	
F2014	73	40.8	53	29.6	33	18.4	6	3.4	179	
F2016	29	39.7	16	21.9	5	6.8	6	8.2	73	
F2015	21	37.5	7	12.5	6	10.7	-		56	
99,242	39	43.3	50	55.6	23	25.6	16	17.8	90	
Primary	25	37.3	19	28.4	7	10.4	5	7.5	67	
Segment	10	32.3	23	74.2	10	32.3	15	48.4	31	
C10015	1	25.0	2	50.0	1	25.0	1	25.0	4	
F1005	16	33.3	20	41.7	6	12.5	9	18.8	48	
F2006	3	16.7	10	55.6	6	33.3	-		18	
F2082	4	33.3	3	25.0	2	16.7	2	16.7	12	
House	2	66.7	-		-		-		3	

TABLE 17 (continued) SOME CATTLE BUTCHERY CUTS

(b) metapodia n and % (c) scapula n and %

	(b) fragments with surface cuts	(b) fragments with through cuts	(b) fragments with axial throughcuts	(b) fragments with oblique throughcuts	TOTAL metapodia fragments	(c) fragments with surface cuts	(c) fragments with through cuts	TOTAL scapula fragments
PITS	52 35.6	64 43.8	33 22.6	18 12.3	146	39 22.7	65 37.8	172
WELLS	61 47.3	23 17.8	11 8.5	6 4.7	129	33 38.4	37 43.0	86
YARDS	53 57.6	48 52.2	26 28.3	14 15.2	92	35 45.5	36 46.8	77
DITCH	9 37.5	10 41.7	4 16.7	3 12.5	24	9 40.9	15 68.2	22
OTHER	43 21.7	88 44.4	34 17.2	12 6.1	198	11 26.2	24 57.1	42
TOTAL	218 37.0	221 37.5	108 15.9	53 7.8	589	127 31.8	179 44.9	399
F1008	-	-	-	-	-	-	-	-
F1009	3 33.3	3 33.3	2 22.2	1 11.1	9	2 66.7	1 33.3	3
F1010	7 21.9	16 50.0	8 25.0	4 12.5	32	5 11.9	26 61.9	42
F2009	-	2 66.7	-	-	3	2 28.6	-	7
F2013	42 42.4	43 43.4	23 23.2	13 13.1	99	29 24.8	38 32.5	117
F2063	-	-	-	-	2	-	-	-
F2066	-	-	-	-	4	1 33.3	-	3
F2068	-	-	-	-	-	-	-	-
F2014	51 48.1	17 16.0	8 7.5	3 2.8	106	17 34.0	27 54.0	50
F2016	10 43.5	6 26.1	3 13.0	3 13.0	23	16 44.4	10 27.8	36
F2015	28 65.1	13 30.2	3 7.0	4 9.3	43	18 42.9	7 16.7	42
99,242	25 51.0	35 71.4	23 46.9	10 20.4	49	17 48.6	29 82.9	35
Primary	4 28.6	3 21.4	2 14.3	-	14	4 44.4	3 33.3	9
Segment	5 55.6	6 66.7	2 22.2	3 33.3	9	3 23.1	11 84.6	13
C10015	-	1	-	-	1	2 66.7	1 33.3	3
F1005	39 21.2	78 42.4	29 15.8	11 6.0	184	6 28.6	13 61.9	21
F2006	4 36.4	6 54.5	4 36.4	-	11	2 28.6	6 85.7	7
F2082	-	2 66.7	1 33.3	1 33.3	3	2 15.4	5 38.5	13
House	-	-	-	-	-	1	-	1

TABLE 18 SOME SHEEP BUTCHERY CUTS

(a) longbones n and % (b) metapodia n and % (c) scapula n and %

	fragments with surface cuts	fragments with through cuts	TOTAL longbone fragments	fragments with surface cuts	fragments with through cuts	TOTAL metapodia fragments	fragments with surface cuts	fragments with through cuts	TOTAL scapula fragments
PITS	135 41.0	38 11.6	329	42 33.1	35 27.6	127	40 52.6	22 28.9	76
WELLS	67 54.5	8 6.5	123	26 54.2	11 22.9	48	24 55.8	6 14.0	43
YARDS	48 48.0	10 10.0	100	20 44.4	9 20.0	45	11 45.8	5 20.8	24
DITCH	14 22.6	15 24.2	62	5 19.2	5 19.2	26	3 20.0	10 66.7	15
OTHER	36 46.8	13 16.9	77	12 34.2	9 25.7	35	6 30.0	7 35.0	20
TOTAL	300 43.4	84 12.2	691	105 37.4	72 25.6	281	84 47.2	50 28.1	178
F1008	-	-	2	-	-	-	-	-	-
F1009	2 33.3	1 16.7	6	-	3 50.0	6	-	-	1
F1010	29 31.5	24 26.1	92	7 20.6	16 47.1	34	3 25.0	8 66.7	12
F2009	9 40.9	-	22	5 55.6	3 33.3	9	2 66.7	-	3
F2013	89 44.5	12 6.0	200	28 36.8	13 17.1	76	33 58.9	13 23.2	56
F2063	-	-	-	-	-	-	-	-	-
F2066	5 83.3	1 16.7	6	-	-	-	2 50.0	1 25.0	4
F2068	1	-	-	2 100	-	2	-	-	-
F2014	41 55.4	7 9.5	74	15 48.4	7 22.6	31	9 75.0	4 33.3	12
F2016	26 53.1	1 2.0	49	11 64.7	4 23.5	17	15 48.4	2 6.5	31
F2015	19 50.0	-	38	8 61.5	-	13	6 60.0	2 20.0	10
99,242	29 46.8	10 16.1	62	12 37.5	9 28.1	32	5 35.7	3 21.4	14
Primary	8 24.2	8 24.2	33	2 18.2	2 18.2	11	2 22.2	4 44.4	9
Segment	6 22.2	7 25.9	27	3 20.0	3 20.0	15	1 16.7	6 100	6
C10015	-	-	2	-	-	-	-	-	-
F1005	20 52.6	6 15.8	38	6 40.0	3 20.0	15	2 28.6	1 14.3	7
F2006	11 42.3	6 23.1	26	3 30.0	3 30.0	10	2 25.0	3 37.3	8
F2082	5 41.7	-	12	2 33.3	1 16.7	6	2 40.0	3 60.0	5
House	-	1	1	1 25.0	2	4	-	-	-

TABLE 19 SOME PIG BUTCHERY CUTS

(a) longbone n and % (b) scapula n and %

	fragments with surface cuts	fragments with through cuts	TOTAL longbone fragments		fragments with surface cuts	fragments with through cuts	TOTAL scapula fragments	
PITS	77 41.4	20 10.8	186		17 34.7	13 26.5	49	
WELLS	40 60.6	8 12.1	66		9 45.0	2 10.0	20	
YARDS	41 56.9	10 13.9	72		10 40.0	9 36.0	25	
DITCH	17 34.0	16 32.0	50		5 50.0	8 80.0	10	
OTHER	10 35.7	5 17.9	28		2 28.6	2 28.6	7	
TOTAL	185 45.8	59 14.6	404		43 38.7	34 30.6	111	
F1008	-	-	1		-	-	-	
F1009	-	1 20.0	5		-	-	1	
F1010	13 41.9	6 19.4	31		1 14.3	5 71.4	7	
F2009	1 50.0	-	2		-	-	1	
F2013	60 42.3	13 9.2	142		15 40.5	8 21.6	37	
F2063	-	-	-		-	-	-	
F2066	1 50.0	-	2		1 33.3	-	3	
F2068	2 100	-	2		-	-	-	
F2014	20 74.1	4 14.8	27		1 16.7	1 16.7	6	
F2016	20 51.3	4 10.3	39		8 57.1	1 7.1	14	
F2015	16 44.4	-	36		8 53.3	2 13.3	15	
99,242	25 54.3	10 21.7	46		2 20.0	7 70.0	10	
Primary	9 37.5	5 20.8	24		1 25.0	3 75.0	4	
Segment	8 32.0	10 40.0	25		4 66.7	5 83.3	6	
C10015	-	1	1		-	-	-	
F1005	6 50.0	1 8.3	12		-	-	2	
F2006	2 50.0	1 25.0	4		1 33.3	1 33.3	3	
F2082	2 22.2	1 11.1	9		1 50.0	1 50.0	2	
House	-	2 66.7	3		-	-	-	

Sheep longbones, metapodia and scapulae all have a generous proportion of surface cuts. A relative dearth of these is apparent only in the ditch, where both Primary fill and the Segment are alike. Throughcuts are rarer than with cattle, as befits the smaller bones.

With pig it is the Segment that shows the highest rate of cutting, but generally the samples are quite small.

It was only with cattle that throughcuts were sufficiently common for cuts in different planes to be compared. Longbones and metapodia were mostly cut either straight down axially or else obliquely (a contrast which proved irrelevant for scapulae with their different orientation). In nearly all assemblages the axial cuts overshadowed the oblique by a ratio of roughly 2 to 1. It is interesting that in F1010, with its strong concentration of throughcuts, the cuts were found in this usual ratio; but that in the other strong concentration, that of the Segment, oblique cuts so far predominated that the assemblage stood apart.

5) Smooth Butchery (Table 20)

Though nearly all butchery cuts were rough a few examples were noticed where the style of cutting seemed more controlled and the end product very much neater. Some of this material may even have been sawn, though it was quite distinct from the meticulous workmanship seen in the bone-working offcuts (a distinction corroborated by Ian Ridler, who is currently making a thorough study of the Hamwic bone-working techniques).

These smooth butchery cuts were predominantly found in cattle, and they occurred on various bones of the body.

Such cutting appeared sporadically in all the main context-types. Proportionally the highest rate came with the three examples found in the small assemblage of context 10015 of the ditch, but the most notable concentrations are in F2006, F2082 and - supremely - in F1010. There seems no reason at the moment, however, to associate these four contexts on any archaeological grounds.

TABLE 20 SMOOTH BUTCHERY CUTS

fragments with smooth cuts percentaged on species total fragments

	COW	SHEEP	PIG	TOTAL	
PITS	28 0.7	4 0.1	-	32 0.4	
WELLS	4 0.2	-	-	4 0.1	
YARDS	8 0.5	-	-	8 0.3	
DITCH	11 1.3	-	-	11 0.7	
OTHER	17 1.5	5 0.7	1 0.5	23 0.7	
TOTAL	68 0.7	9 0.2	1 0.04	78 0.4	
F1008	-	-	-	-	
F1009	2 1.3	-	-	2 0.1	
F1010	25 2.6	4 1.0	-	29 1.9	
F2009	-	-	-	-	
F2013	1 0.04	-	-	1 0.02	
F2063	-	-	-	-	
F2066	-	-	-	-	
F2068	-	-	-	-	
F2014	2 0.2	-	-	2 0.1	
F2016	2 0.2	-	-	2 0.1	
F2015	-	-	-	-	
99,242	8 1.1	-	-	8 0.7	
Primary	4 0.6	-	-	4 0.4	
Segment	4 1.8	-	-	4 0.8	
C10015	3 18.8	-	-	3 5.8	
F1005	2 0.3	-	-	2 0.1	
F2006	10 3.8	3 1.2	1 1.8	14 2.3	
F2082	5 3.4	2 4.5	-	7 1.9	
House	-	-	-	-	

VIII AGEING (Tables 21 - 26)

Ageing by mandibles was recorded by Grant's (1975) method. The archive and the data sheets contain full details of tooth eruption and wear, but information in the tables has been simplified into the six broad age-groupings which were used in earlier Hamwic studies. Ageing by fusion follows the normally-accepted fusion groupings of early, middle and late-rusing epiphyses.

The methods are useful as a general indication of biological age; absolute ageing has not been attempted.

For cattle the general results fit quite well with those from Hamwic Melbourne Street; at the level of the separate assemblages there are some differences, but nowhere is there anything strange which is supported both by fusion and by mandibles. In context 242 of Site 99 the cattle mandibles give a uniform picture of maturity, yet the context is not far out from the overall figures by fusion, while F2016 is abnormally young by fusion results but entirely typical by jaws. The gully, most unusually, has three unfused bones of cattle from the early-fusing group, and here there are no mandibles to put the result to the test.

With sheep, though, there is an immediate overall divergence from the general Melbourne Street results. It may be seen at once from Figure 3 (page 61) that there is a great increase in sheep mandibles in stages 2 and 4, an increase which would seem to be entirely due to the great numbers of such jaws (and in particular of those of stage 2) which were found in abundance in the large pit assemblage of F2013. The contrast is most marked both with YARDS and with the Ditch, since there no young sheep jaws in any context of either of these two groups. By fusion, however, F2013, YARDS and the Ditch are all akin to the Melbourne Street results. One

TABLE 21 CATTLE AGEING BY MANDIBLES

n and %

	stage 1	2	3	4	5	6	TOTAL	
PITS	2 9.1	1 4.5	6 27.3	2 9.1	10 45.5	1 4.5	22	
WELLS	-	1 7.7	2 15.3	5 38.5	5 38.5	-	13	stage 1: M_1 not yet in wear
YARDS	1 3.8	-	1 3.8	9 34.7	14 53.9	1	26	stage 2: M_2 not yet in wear
DITCH	-	3 20.0	3 20.0	7 46.7	2 13.3	-	15	stage 3: M_3 not yet in wear
OTHER	1 33.3	-	1 33.3	-	1 33.3	-	3	stage 4: M_3 coming into wear
TOTAL	4 5.1	5 6.3	13 16.5	23 29.1	32 40.5	2 2.5	79	stage 5: M_3 in full wear
F1008							-	stage 6: M_3 in heavy wear
F1009			2 100				2	
F1010	1 50.0				1 50.0		2	
F2009					1 100		1	
F2013	1 6.3	2 6.3	4 25.0	2 12.5	7 43.6	1 6.3	16	
F2063					1 100		1	
F2066							-	
F2068							-	
F2014			1 25.0	1 25.0	2 50.0		4	
F2016		1 11.1	1 11.1	4 44.5	3 33.3		9	
F2015	1 14.3		1 14.3	3 42.8	2 28.6		7	
99,242				6 31.6	12 63.2	1 5.2	19	
Primary		2 16.7	3 25.0	5 41.6	2 16.7		12	
Segment		1 33.3		2 66.7			3	
C10015							–	
F1005			1 50.0		1 50.0		2	
F2006	1 100						1	
F2082							–	
House							–	

TABLE 22 CATTLE AGEING BY EPIPHYSEAL FUSION

	Unfused	Fused	% Unfused	Unfused	Fused	% Unfused	Unfused	Fused	% Unfused
PITS	18	257	6.5	45	64	41.3	83	78	51.6
WELLS	11	135	7.5	31	61	33.7	41	23	64.0
YARDS	5	77	6.1	19	36	34.5	37	32	53.6
DITCH	3	45	6.3	7	15	31.8	22	21	51.2
OTHER	7	56	11.1	24	43	35.8	22	11	66.7
TOTAL	44	570	7.2	126	219	36.5	205	165	55.4
F1008	-	5	-	-	-	-	1	2	33.3
F1009	1	15	6.3	2	3	40.0	3	3	50.0
F1010	3	97	3.0	6	22	21.4	23	22	51.1
F2009	2	9	18.2	3	-	100	5	2	71.4
F2013	11	129	7.9	33	39	45.8	49	47	51.0
F2063	-	-	-	-	-	-	2	1	66.7
F2066	1	1	50.0	1	-	100	-	-	-
F2068	-	1	-	-	-	-	-	1	-
F2014	3	89	3.3	16	49	24.6	23	14	62.2
F2016	8	46	14.8	15	12	55.6	18	9	66.7
F2015	3	38	7.3	8	21	25.8	9	12	42.9
99,242	2	39	4.9	11	15	42.3	28	20	58.3
Primary	2	24	7.7	4	11	26.7	17	18	48.6
Segment	1	20	4.8	3	3	50.0	4	3	57.1
C10015	-	1	-	-	1	-	1	-	100
F1005	2	32	5.9	16	37	30.2	7	3	70.0
F2006	2	15	11.8	4	6	40.0	10	4	71.4
F2082	3	8	27.3	4	-	100	5	2	71.4
House	-	1	-	-	-	-	-	1	-

TABLE 23 SHEEP AGEING BY MANDIBLES

n and %

	stage 1	2	3	4	5	6	TOTAL	with stages as for cow
PITS	-	19 42.2	2 4.4	16 35.6	8 17.8	-	45	
WELLS	- 5.6	1 11.1	2 33.0	6 50.0	9	-	18	
YARDS	-	-	-	7 43.6	9 56.4	-	16	
DITCH	-	-	-	7 63.6	4 36.4	-	11	
OTHER	1 8.3	2 16.7	2 16.7	6 50.0	1 8.3	-	12	
TOTAL	1 1.0	22 21.6	6 5.9	42 41.1	31 30.4	-	102	
F1008							-	
F1009			1 50.0		1 50.0		2	
F1010				6 66.7	3 33.3		9	
F2009		1 20.0	1 20.0	2 40.0	1 20.0		5	
F2013		17 60.7	-	8 28.6	3 10.7		28	
F2063							-	
F2066		1 100					1	
F2068							-	
F2014		1 9.1	2 18.2	2 18.2	6 54.5		11	
F2016		1 12.5		4 50.0	3 37.5		8	
F2015				5 45.5	6 54.5		11	
99,242				2 40.0	3 60.0		5	
Primary				2 66.7	1 33.3		3	
Segment				4 57.2	3 42.8		7	
C10015				1 100			1	
F1005		2 66.7			1 33.3		3	
F2006				2 100			2	
F2082	1 25.0		1 25.0	2 50.0			4	
House			1 33.3	2 66.7			3	

TABLE 24 SHEEP AGEING BY EPIPHYSEAL FUSION

	Unfused	Fused	% Unfused	Unfused	Fused	% Unfused	Unfused	Fused	% Unfused
PITS	35	294	10.6	30	51	37.0	86	66	56.6
WELLS	2	49	3.9	9	23	28.1	8	16	33.3
YARDS	-	42	-	10	35	22.2	19	24	44.2
DITCH	2	18	10.0	3	18	14.3	11	11	50.0
OTHER	5	30	14.3	9	25	26.5	14	9	60.9
TOTAL	44	433	9.2	61	152	28.6	138	126	52.3
F1008	-	1	-	-	-	-	-	1	-
F1009	-	2	-	2	3	40.0	-	1	-
F1010	1	35	2.8	7	19	26.9	8	15	34.7
F2009	2	14	12.5	2	4	33.3	4	6	40.0
F2013	22	98	18.3	19	23	45.2	73	42	63.5
F2063	-	-	-	-	-	-	-	-	-
F2066	1	5	16.7	-	-	-	1	1	50.0
F2068	-	-	-	-	2	-	-	-	-
F2014	1	28	3.4	3	14	17.6	3	6	33.3
F2016	1	21	4.5	6	9	40.0	5	10	33.3
F2015	-	17	-	3	12	20.0	7	16	30.4
99,242	-	25	-	7	23	23.3	12	8	40.0
Primary	2	7	22.2	2	6	25.0	9	7	56.3
Segment	-	10	-	1	11	8.3	2	3	40.0
C10015	-	1	-	-	1	-	-	1	-
F1005	1	15	6.3	5	10	33.3	3	4	42.9
F2006	3	9	25.0	3	7	30.0	7	3	70.0
F2082	1	4	20.0	-	7	-	4	2	66.7
House	-	2	-	1	1	50.0	-	-	-

TABLE 25 PIG AGEING BY MANDIBLES
n and %

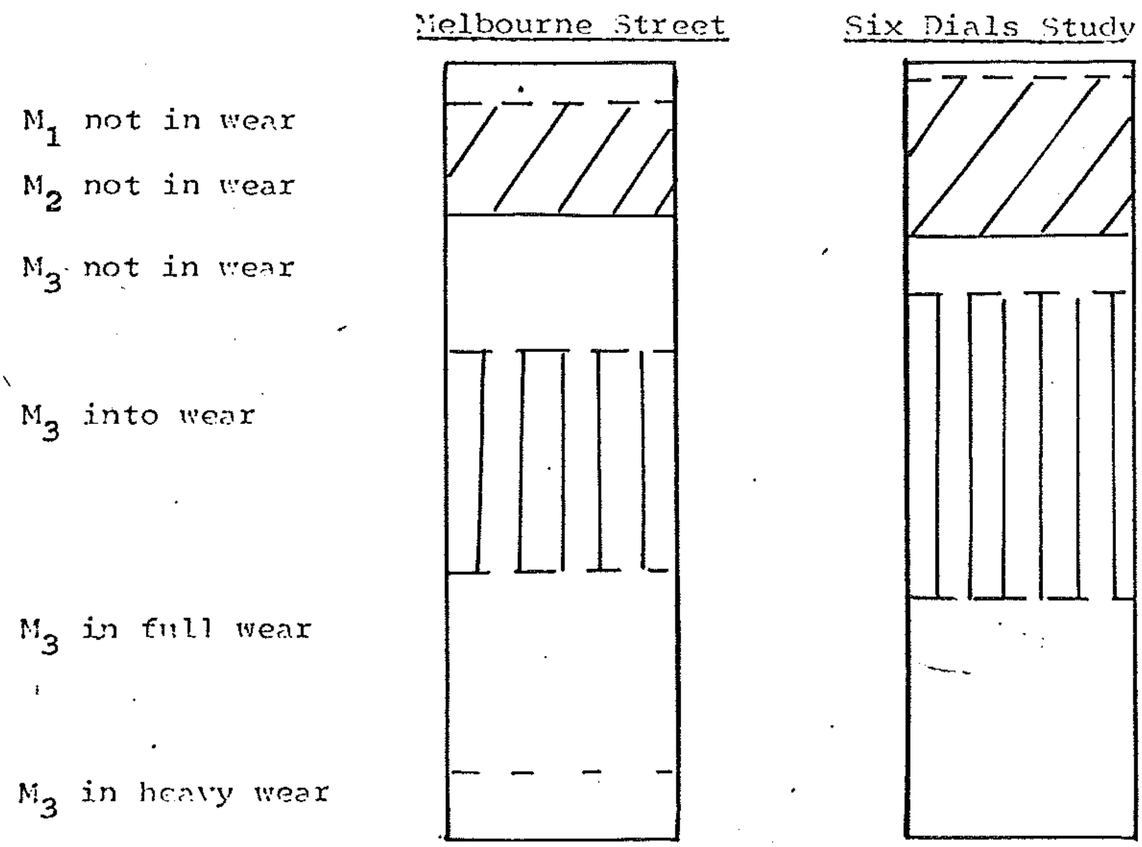
	stage 1	2	3	4	5	6	TOTAL	with stages as for cow
PITS	2 6.1	3 9.1	7 21.2	15 45.5	5 15.1	1 3.0	33	
WELLS	–	1 8.3	2 16.7	7 58.3	2 16.7	–	12	
YARDS	–	1 4.0	5 20.0	13 52.0	6 24.0	–	25	
DITCH	–	2 20.0	3 30.0	3 30.0	2 20.0	–	10	
OTHER	–	1 14.3	1 14.3	3 42.8	1 14.3	1 14.3	7	
TOTAL	2 2.3	8 9.2	18 20.7	41 47.1	16 18.4	2 2.3	87	
F1008							-	
F1009			1 50.0	1 50.0			2	
F1010		1 16.7	1 16.7	2 33.3	2 33.3		6	
F2009							-	
F2013	2 9.1	2 9.1	4 18.2	10 45.5	3 13.6	1 4.5	22	
F2063							-	
F2066			1 50.0	1 50.0			2	
F2068				1 100			1	
F2014				4 100			4	
F2016		1 12.5	2 25.0	3 37.5	2 25.0		8	
F2015			5 38.5	8 61.5			13	
99, 242		1 8.3	41.7	5 50.0	6		12	
Primary		1 20.0	2 40.0	2 40.0			5	
Segment		1 20.0	1 20.0	1 20.0	2 20.0		5	
C10015							-	
F1005				2 100			2	
F2006							-	
F2082		1 33.3	1 33.3			1 33.3	3	
House				1 50.0	1 50.0		2	

TABLE 26 PIG AGEING BY EPIPHYSEAL FUSION

	Unfused	Fused	% Unfused	Unfused	Fused	% Unfused	Unfused	Fused	% Unfused
PITS	33	54	37.9	96	24	80.0	113	4	96.6
WELLS	11	28	28.2	22	23	48.9	31	3	91.2
YARDS	10	43	18.9	28	28	50.0	33	5	86.8
DITCH	5	20	20.0	10	6	62.5	20	2	90.9
OTHER	7	12	36.8	14	9	60.9	18	3	85.7
TOTAL	66	157	29.6	170	90	65.4	215	17	92.7
F1008	-	-	-	-	1	-	1	-	100
F1009	-	1	-	-	-	-	-	-	-
F1010	5	10	33.3	13	4	74.5	10	1	90.9
F2009	2	-	100	1	2	33.3	-	1	-
F2013	25	41	37.9	81	17	82.7	100	1	99.0
F2063	-	-	-	-	-	-	-	-	-
F2066	1	-	100	1	-	100	2	1	66.7
F2068	-	2	-	-	-	-	-	-	-
F2014	2	13	13.3	2	5	28.6	11	1	91.7
F2016	9	15	37.5	20	18	52.6	20	2	90.9
F2015	3	15	16.7	17	20	45.9	17	3	85.0
99,242	7	28	20.0	11	8	57.9	16	2	88.9
Primary	2	10	16.7	3	3	50.0	10	-	100
Segment	3	10	23.1	6	3	66.7	9	1	90.0
C10015	-	-	-	1	-	100	1	1	50.0
F1005	4	4	50.0	8	2	80.0	7	2	77.8
F2006	-	4	-	4	2	66.7	2	1	66.7
F2082	3	3	50.0	1	4	20.0	6	-	100
House	-	1	-	1	1	50.0	3	-	100

FIGURE 3

SHEEP AGEING BY MANDIBLES COMPARED



Each block represents an entire population. The horizontal lines divide the population into those killed (above the line) and those still living (below it) at the start of each stage of tooth eruption or wear.

has argued in the past that mandibles are more likely to be reliable than evidence from fusion (Bourdillon and Coy 1980, 86-90) but in the present study there would certainly seem to be a useful corrective in being able to compare the two approaches.

Pig has few surprises either by jaws or by fusion. In view of the cattle results from context 242 in Site 99, however, it is worthy of note that for pit as well that context is heavily weighted towards the older jaws. By fusion the context would seem, again as for cattle, to give results only slightly at variance with the overall mean.

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IX. SURFACE MARKINGS (Table 27)

Some unusual markings were found on many bones in Context 242 of Site 99, with many rough scrapes and scratches occurring apparently at random on the surfaces, sometimes in sharp straight lines but quite often in curves. Some of these marks were fairly light and superficial but others were more trough-like and up to 5 mm wide and 2 or 3 mm deep; as their depth increased so did their intensity of staining.

Some bones were marked on several surfaces: one much-scratched cattle jaw, for example, had marks in all directions over its lateral side, many more of the medial surface, and a few light scratches ventrally. On the whole it was bones with flatter surfaces which seemed the most likely to be marked. Cattle bones predominated in these markings, as they did very strongly in the context as a whole, but some sheep and pig bones were also marked and there were scratches on two of the five finds of horse.

The bones in context 242 had been seen to be closely-packed *in situ*. Stones were also present, and possible cobbling was inferred.

Nothing similar has been seen elsewhere at Hamwic. One possible parallel might be the bones from the 1963-4 excavation season at Haithabu, where a concentration of fragments (mostly cattle vertebrae and ribs) was found near a brook which had run through the settlement, and Reichstein and Tiessen (1974, 15) had suggested that these bones had been used to consolidate a path in muddy ground. The finds there had however been recorded in quadrants rather than in precise archaeological contexts and the interpretaion of a path could not be proved; when other such concentrations were found in later Haithabu seasons, again near the brook, the more recent explanation has pointed simply to a local area of specialised butchers' waste deposited at trimming (Johannson 1982, 41 - 44).

TABLE 27

Number of bones showing surface markings

from Site 99, context 242

	COW	SHEEP	PIG	HORSE
Skull	6	-	-	-
Mandible	25	5	3	-
Scapula	6	2	-	-
Humerus	1	2	5	-
Radius	7	4	6	1
Ulna	2	-	1	-
Metacarpus	3	1	-	-
1st phalanx	1	-	-	-
Pelvis	9	1	-	-
Femur	2	-	-	-
Tibia	4	9	-	-
Patella	2	-	-	-
Metatarsus	7	2	-	1
Rib	14	-	-	-
Vertebrae	7	-	-	-
TOTAL (percentaged on species total finds)	96 13.6	26 11.8	15 9.6	2 40

There is no suggestion of unusual markings on the surface of the Haithabu material.

Figures for Distribution over the Body rule out prime butchery waste as the explanation for the concentration of bones in context 242, but the use of bones in cobbling seems more likely. It is not clear why bones should be needed for such a purpose, for there would seem to be ample gravel underneath the Hamwic brickearth, but there may have been a deliberate selection of chunks of good size for the patterns of fragmentation and of weight have both shown unusually heavy pieces of bone in the context. One would like to think that the markings and gougings came from the hard abrasion of traffic, but since the markings go in so many directions and on various sides of the individual bones they are surely not the signs of wear and tear on the cobbled surface itself, and only there. It is more likely that these strange markings occurred when the material was first laid in position, perhaps when the bones themselves were still soft, and that they were caused by the close packing with sharp stones.

X. MEASUREMENTS (Tables 28 - 31)

The measurement catalogue is a major part of the archive.

A total of 2714 bones from normal trench recovery was measured for this study: 932 of cattle, 609 of sheep, 317 of pig, 191 of domestic poultry and 125 of other species. This last group included 58 measureable bones of horse which were particularly welcome in that they more than trebled the small Hamwic corpus for this species.

Although in aggregate many measurements were taken, the wide range of bones of the body led to problems of sample sisė when it came to trying to make comparisons between the various assemblages of this study. A wider perspecitve was however possible when results from Six Dials were set against the larger assemblage from Melbourne Street, whose measurements had so far been taken as the Hamwic norm.

Cattle

Cattle withers heights were calculated by Fock's (1966) mean factors for the Greatest Lengths of metacarpus and metatarsus and by those of Matolcsi (1970) for the limb bones. A total of 29 calculations gave an overall mean figure of 1.152 m, little more than a hairsbreadth below the mean of 1.154 m from the 77 withers heights at Melbourne Street. As before, the calculations based on the metapodia came out higher than those on the radius and tibia. Discussion of this problem in the Melbourne Street material had left open two alternative explanations, either that it had been only the smallest bones that were left unbutchered and so survived to give biassed figures for height, or else that the Hungarian steppe cattle on which Matolcsi's factors were based have untypical bodily proportions. In her recent exhaustive study of the Dorestad material, in which on the basis of the Melbourne Street statistics she takes the cattle there to be virtually the same population, statistically speaking, as that of Hamwic, Prummel (1983, 172) discredits

TABLE 28 SOME CATTLE MEASUREMENTS COMPARED

in mm with n

measurements (von den Driesch 1976)		SIX DIALS STUDY early group	n	SIX DIALS STUDY all	n	SIX DIALS STUDY late group	n	MELBOURNE STREET	n
M_3	length	34.1	5	34.9	21	-		34.4	93
Scapula	SLC	-		45.2	23	44.4	4	45.4	73
	GLP	62.8	4	61.4	25	58.1	5	61.9	91
Humerus	Bd	70.1	4	73.4	23	77.5	5	70.8	78
Radius	Bp	74.8	8	73.7	39	72.9	12	73.9	116
	Bd	73.2	5	67.2	14	57.3	1	68.3	47
Metacarpus	Bp	50.4	3	53.9	68	55.4	13	53.5	33
	Bd	50.2	4	56.4	52	55.0	20	55.9	49
1st Phalanx	GL	52.8	21	54.4	134	54.4	38	—	
2nd Phalanx	GL	35.0	12	35.5	98	35.7	27	—	
3rd Phalanx	GL	60.5	9	62.5	80	63.4	14	—	
Pelvis	LA	60.9	6	59.2	21	60.0	2	59.4	36
Femur	DC	40.3	7	40.5	20	38.5	4	42.3	74
Tibia	Bd	55.9	7	57.7	41	57.6	16	56.8	111
Calcaneus	GL	129.1	3	126.9	21	127.3	5	123.1	68
Astragalus	GLl	59.9	11	60.9	59	61.3	14	60.9	167
	Bp	40.4	10	41.2	57	41.5	14	40.9	172
Metatarsus	Bp	44.3	3	46.1	48	44.1	13	43.5	26
	Bd	49.6	2	53.2	37	54.0	13	50.4	43
WITHERS HEIGHTS (in m with n)									
Radius (Matolcsi)		1.119	1	1.120	2	—		1.061	2
Metacarpus (Fock)		—		1.148	14	1.158	2	1.162	42
Tibia (Matolcsi)		1.097	2	1.097	2	—		1.017	
Metatarsus (Fock)		1.106	2	1.172	11	—		1.154	32
OVERALL		1.105	5	1.152	29	1.158	2	1.154	77

TABLE 29 SOME SHEEP MEASUREMENTS COMPARED

in mm. with n

measurements (von den Driesch 1976)		SIX DIALS STUDY early group		SIX DIALS STUDY all		SIX DIALS STUDY late group		MELBOURNE STREET	
Mandible	Cheek Tooth Row	69.9	3	67.8	29	66.0	9	69.4	49
Scapula	SLC	19.9	12	19.5	62	19.3	7	20.1	194
	GLP	31.5	11	31.5	57	30.8	7	32.3	192
Humerus	Bp	—		37.4	7	—		37.8	35
	Bd	28.9	4	29.0	71	29.3	15	30.0	209
Radius	Bp	29.6	6	29.5	60	29.7	15	30.9	289
	Bd	26.9	3	27.7	23	27.8	6	28.4	105
Ulna	LO	—		40.2	18	36.3	1	39.9	68
Metacarpus	Bp	22.2	4	23.3	22	23.4	8	23.0	64
	Bd	24.4	4	25.3	15	26.6	1	25.5	61
1st Phalanx	GL	35.1	2	34.7	38	33.2	5	—	
Pelvis	LA	25.8	3	26.2	43	26.4	7	26.3	77
Femur	Bd	36.0	2	36.5	11	32.0	1	37.0	42
Tibia	Bp	40.8	2	40.0	14	40.3	3	40.2	41
	Bd	25.4	3	25.6	75	25.5	16	25.9	267
Calcaneus	GL	53.7	2	55.3	15	—		55.3	56
Astragalus	GLl	30.0	1	28.2	14	—		28.1	56
Metatarsus	Bp	19.3	3	20.5	23	20.7	6	20.1	51
	Bd	23.0	2	23.8	17	24.6	1	23.8	50
all from Teichert (1975)		WITHERS HEIGHTS (in m with n)							
Humerus		—		0.561	1	—		0.542	5
Radius		0.618	2	0.615	14	0.628	1	0.617	58
Metacarpus		0.619	4	0.620	16	0.622	4	0.618	65
Tibia		—		0.557	1	—		0.613	2
Metatarsus		0.610	3	0.618	15	0.590		0.613	53
OVERALL		0.616	6	0.616	42	0.618	6	0.614	184

TABLE 30 SOME PIG MEASUREMENTS COMPARED
in mm with n

measurements (von den Driesch 1976)		SIX DIALS STUDY early group	n	SIX DIALS STUDY all	n	SIX DIALS STUDY late group	n	MELBOURNE STREET	n
M_3		30.1	3	30.1	24	30.5	4	31.1	51
Scapula	SLC	24.3	6	22.7	31	27.9	1	21.2	81
	GLP	34.9	6	34.3	30	36.6	1	34.9	82
Humerus	Bd	39.0	10	37.9	47	36.2	6	38.7	98
Radius	Bp	28.6	4	27.8	40	27.1	9	27.8	123
1st Phalanx	GL	34.9	5	33.8	22	—		—	
Pelvis	LA	27.2	4	30.2	26	—		31.9	76
Tibia	Bd	27.1	1	28.9	18	27.9	/	29.4	52
Astragalus	GL	42.9	1	39.1	24	40.0	2	38.4	53

TABLE 31

SIZE FACTORS

for Cattle, Sheep and Pig, with n

see full explanation in the text

	SIX DIALS STUDY		
	early	all	late
COW	99.2 63	101.3 547	100.9 122
SHEEP	97.5 63	98.7 561	97.4 91
PIG	101.6 32	99.5 240	98.9 20

Matolcsi's factors as unsuitable for use on Western European stock. She makes a good case; but it seems true that at Hamwic the rare surviving whole cattle longbones were rather more slender than the rest, and they may well have been shorter too.

Measurements of cattle bone widths were compared with those from Melbourne Street by using the principle of Size Factors evolved for comparisons between Hamwic material and that of the medieval town (Bourdillon 1980): measurements of articular width are assessed, bone for bone, as a percentage of the relevant mean width measurement for Melbourne Street, where large samples had given low coefficients of variation. Not more than two such measurements of width are used for any one bone of the body. Provisional assessments of the medieval material were based at first on quite small samples and it was heartening when these assessments were confirmed by later work. Using this method for the present study, calculations on cattle give an overall Size Factor of 101.3% (n = 547), with Melbourne Street as par at 100%. The Six Dials cattle might therefore seem, if anything, to have been slightly more robust. It was noticed, however, that the main differences of measurement came in the metapodial widths – indeed, the cattle metapodia, when taken on their own against their Melbourne Street equivalents, gave a Size Factor of 102.9% (n = 205), and with the metapodia removed the Size Factors for the remaining bones dropped to 100.0%. How's that?

Sheep

With the lower fragmentation rate established for sheep longbones, and with quite a high rate of epiphysial fusion, a good range of withers heights is available. As for cattle, the overall mean for heights is very similar to the figure established for Melbourne Street – 0.616 m as against 0.614 m. The sheep would seem, however, to have been somewhat more slender, since the Size Factors calculated from the measurements of width give an overall figure of 98.7% on a fully adequate sample (n = 561). Sheep measurements and other parameters (abundance, distribution over the body, and in this present study also ageing) have tended to show more fluctuation than those of cattle and pig. (Were they perhaps driven into the town from further afield and subject to more variety in their provenance or to more hazards on the way?) It is to be hoped that the greater precision now established in the methods of recording may enable more subtle distinctions to be traced.

Pig

There were no fully-fused longbones on which pig withers heights could be based. Size Factors on 240 measurements of articular width gave a figure of 99.5%, just marginally lower than at Melbourne Street.

Domestic Fowl

There are no equivalents to withers height factors for fowl and comparisons must simply be made bone by bone for length as well as for width. The samples are generally quite small for any particular bone and mean measurements vary up or down on those established for the Melbourne Street material, but for the body as a whole such variations tend to cancel out. Using the principle of Size Factors again, proportions for length work out at 100.2% (n = 50) and those for bone breadth at 102.4% (n = 86). Fowl is relatively rare at Hamwic, however; the Melbourne Street measurements did not give a sufficiently substantial corpus for this to be taken without question as a permanent norm. Comparisons with the present material must therefore be treated with due care.

Other species

Measurements of bones of other species will prove useful additions to the Hamwic compendium but do not arise in the present study in sufficient abundance for comparisons or contrasts to be made.

XI. BONEWORKING (Tables 32 and 33)

Evidence of boneworking produced considerable variation. The ditch had no evidence of this at all; nor had the three smallest pit assemblages; nor the House occupation; nor the gully, F2082. Otherwise, for antler there is a random level of sawn finds with a considerable increase in F2014 and a massive concentration in F1005. Most antler fragments are off-cut tips and pedicels, but those in F1005 are predominantly from the midshaft and are often very thin and sawn in more than one plane, most often from the making of handles and billets for combs; in addition to these sawn fragments of antler there are in F1005 a further 362 small unsawn fragments which must also be the residues of working procedures. About half of these were probably chips and a few - perhaps a dozen - seemed to be shavings.

For cattle too the worked offcuts follow a pattern of occasional random finds with a marked increase in F2014 and a massive one in F1005. Most sawn cattle offcuts are from the metapodia, but it is interesting that the ratio of offcuts from other bones of the body drops from one to three sawn metapodia in F2014 to one in twelve in F1005. That, with the very different incidence of antler, would suggest that the two assemblages represent rather different processes of boneworking. Five sawn offcuts of sheep were found in F1005 (4 metapodia and 1 tibia), and none was found anywhere else. F2014 by contrast had four sawn offcuts of horse.

One other type of find which seems to be associated with boneworking is a hole in the proximal joint surface, either cylindrical or a hexagon. The hexagons are clearly artificial, and even the cylindrical holes are deep and definite man-made intrusions, not the simple rounded rubbing which seems to be fairly common naturally on the surface of the proximal metacarpal joint. For cattle, one proximal worked hole was found in F2015 on a metatarsus, and this would be a random find. Otherwise all such holes come from the two boneworking assemblages and indeed they are often found in fragments where the

TABLE 32 INCIDENCE OF SAWN OFF-CUTS

percentaged on total identified fragments

	TOTAL identified fragments all bones	ANTLER	COW		SHEEP	HORSE
			metapodia	other bones		
PITS	8046	22 0.3	12 0.1	4 0.06	-	-
WELLS	3297	46 1.4	67 2.0	22 0.7	-	4 0.1
YARDS	2798	7 0.3	5 0.2	-	-	-
DITCH	1513	-	-	-	-	-
OTHER	3528	994 28.2	210 6.0	17 0.5	5 0.1	1 0.03
TOTAL	19182	1069 5.6	294 1.5	43 0.3	5 0.03	5 0.03
F1008	29	-	-	-	-	-
F1009	214	2 1.0	4 1.9	-	-	-
F1010	1555	5 0.3	5 0.3	2 0.1	-	-
F2009	312	2 0.6	-	1 0.3	-	-
F2013	5706	10 0.2	3 0.1	1 0.02	-	-
F2063	10	-	-	-	-	-
F2066	172	3 1.7	-	-	-	-
F2068	48	-	-	-	-	-
F2014	1640	46 2.8	65 4.0	21 1.3	-	4 0.2
F2016	1657	-	2 0.1	1 0.06	-	-
F2015	1698	6 0.4	5 0.3	-	-	-
99,242	1100	1 0.1	-	-	-	-
Primary	946	-	-	-	-	-
Segment	515	-	-	-	-	-
C10015	52	-	-	-	-	-
F1005	2487	987 39.7	208 8.4	17 0.7	5 0.2	-
F2006	600	7 1.2	2 0.3	-	-	1 0.2
F2082	375	-	-	-	-	-
House	66	-	-	-	-	-

TABLE 33 INCIDENCE OF WORKED HOLES IN PROXIMAL JOINT SURFACES

	COW		SHEEP			
	MC	MT	MC	Tibia	MT	
PITS	-	-	2	1	1	
WELLS	7	8	2	-	-	
YARDS	-	1	-	-	1	
DITCH	-	-	-	-	-	
OTHER	8	16	-	-	-	
TOTAL	15	25	4	1	2	
F1008	-	-	-	-	-	
F1009	-	-	-	-	-	
F1010	-	-	1	-	-	
F2009	-	-	-	-	1	
F2013	-	-	1	1	-	
F2063	-	-	-	-	-	
F2066	-	-	-	-	-	
F2068	-	-	-	-	-	
F2014	7	8	2	-	-	
F2016	-	-	-	-	-	
F2015	-	1	-	-	1	
99,242	-	-	-	-	-	
Primary	-	-	-	-	-	
Segment	-	-	-	-	-	
C10015	-	-	-	-	-	
F1005	8	16	-	-	-	
F2006	-	-	-	-	-	
F2082	-	-	-	-	-	
House	-	-	-	-	-	

midshaft had been sawn. Perhaps they were made if a bone was inverted and the proximal end stuck through with something rigid to keep the bone steady while the distal end was being worked. The incidence of similar holes in sheep metapodia is however harder to explain, for none was found in F1005, the only feature which has evidence for the (limited) working of sheep bones, and yet there are several in the pits where no sheep bones were worked.

Measurements of worked cattle metapodia (Table 34)

Since cattle metacarpus and metatarsus had both proved in this study to be rather broader than were those at Melbourne Street, and since in the present study far more worked offcuts of metapodia have been found, measurements were closely examined for the two working concentrations, F1005 and F2014. Driver (awaiting publication a) had found a suggestion of selection for size in the cattle offcuts from Site 14 at the far southern edge of the settlement.

For the worked material from F1005 the four measurements of metapodial breadth gave a joint Size Factor of 101.6% against the norm of Melbourne Street (whereas the overall metapodial figure for the present study was 102.8%). F1005 is not phased and its bones could in theory be those of a lean year, but there were also two unworked distal metatarsal fragments and these gave above-average measurements of 55.0 and 56.9 mm. It looks as though the worked material in this assemblage had not been specially selected for good size.

On the other hand F2014 gave a Size Factor of 105.8% for its worked cattle metapodia when set against the Melbourne Street means. This is a high figure. There is only one metacarpus with no sign of working, and this is smaller than all its worked fellows; and at the same time there are 3 out of 4 unworked metatarsi which have breadths well below the range of those in the assemblage that are worked. The fourth is below the mean. Selection for good size in this working assemblage would therefore seem to be quite likely.

TABLE 34

COW METAPODIAL MEASUREMENTS

in working assemblages. ($\bar{x}$ in mm. and n)

measurement (von den Driesch 1976)		F1005 sawn		F1005 not sawn		F2014 sawn		F2014 not sawn	
Metacarpus	Bp	52.7	34	-		56.9	9	48.3	(1)
	Bd	57.4	16	-		55.4	15	-	
Metatarsus	Bp	48.4	10	-		48.2	10	42.6	4
	Bd	50.0	5	53.5	2	55.6	10	-	

This then is a further contrast in the bone-working practices as evinced by the offcuts from the two working groups in this study.

XII. TOP, RUBBISH AND BOTTOM CONTEXTS (Tables 35 and 36)

For the main part of the study comparisons have been between bone assemblages from different features, taken both singly and in groups. There was also a search for points of bone differentiation between differing context-types within individual features themselves.

In many features a primary layer of infilling may be distinguished from the rest; above this there are commonly layers of what on the evidence of most or all other classes of finds would seem to be general domestic rubbish; interspersing these, separate lenses of layers may be found, say of redeposited brickearth or of gravel. At the top of the feature it may be possible to make an archaeological distinction between the main infilling and material which accumulated later above the abandoned feature, perhaps spreading more widely over the ground surface but sinking into the feature as a final upper layer or layers when the earlier deposits shrank in volume in the natural process of decay.

Some such differentiation had been noticed in the two wells of the study, but the topmost layers of F2016 are likely to be so far separate in time from the lower ones that comparisons there are treated time-wise; and differences within F2014 are likely to be untypical since there is the unique large deposit of horse at the bottom and there are many working offcuts at the top. The five smallest pit-assemblages were excluded from this aspect of the study either through archaeological problems or because of sample size. In F1005 the spread of industrial waste goes down from layer 1 (context 4718) to layer 9 (context 4752) and it was not possible to establish any three-fold distinction of primary deposit, main rubbish layers, and a subsequent final infilling.

There remained therefore only three pits where material from different types of deposition could safely be compared (F1010, F2009 and F2013). From these three features a few lenses and small layers of doubtful origin were excluded, and the grouping of the remaining contexts is shown below.

TABLE 35 TOP, RUBBISH AND BOTTOM CONTEXTS FOR COMPARISON

	TOP	RUBBISH	BOTTOM
F1010	(1)c.3350 = c.7210 (2) 4411 = 7211 (4) 4413 = 7214	(6)c.4415 = c.7757 (8) 4419 = 7759 (9) 4420	(13)c.7764
F2009	(1) 4638	(4) 4806	(5) 5644 (6) 5645 (8) 5670
F2013	(1) 3293 (2) 3532 (4) 3535	(6) 3537 (7) 3541 (10) 3571 (11) 3577	(12) 3578 (13) 3582

Generalisations based on three pits may not be taken as definitive, and the sample sizes vary greatly between the context-types. Nevertheless the data sheets give an objective quantification of what was found and they may be taken as a basis for discussion, both for present purposes and still more in assessing results in the future. Part of what is available in the data sheets has been condensed in Table 36 . There is no totalling of the results, for this gives a spurious prominence to the abundant material in F2013; what matters rather is to look for a pattern of change by context-type within each separate pit and then to see if there is any pattern which proves to be consistent in all three.

One might expect the lowest layers to be the least eroded and the exposed layers at the top to have been the most at risk. Such a pattern was evident in only one of the pits (in F1010); F2009 showed no obvious erosion in any of the layers and in F2013 (where the bottom layer was small) erosion was closely similar in its very low incidence both in the rubbish layers and at the top.

Again, one might have expected that chewing would have been more common in the top layers in that material here could well have been more vulnerable to dogs around the settlement. Again one's expectations prove unfounded. There was more chewing in the top layer of F2009, but this layer was so tiny, and in the two large assemblages of F1010 and F2013 chewing was more commonly found in the rubbish layers.

It would seem then that the upper layers of these three features were not exposed to appreciably more risk than were those below them. It has to be remembered that for the study as a whole the rate of chewing was low and that - with the clear exception of the primary ditchfill - this was true for erosion as well. Disposal of bone may well have been quite quick, and even the later infilling of the upper layers does not seem to have been exposed either to animals or to the elements for any length of time.

TABLE 36 : TOP, RUBBISH AND BOTTOM CONTEXTS

a) Identified Fragments
(n and %)

	COW	SHEEP	PIG	GOAT	HORSE	DOG	CAT	FOWL	GOOSE	ANT-LER	WILD BIRD	TOTAL
F1010 TOP	711 64.5	277 25.1	100 9.1		1 0.1	1 0.1		7 0.6		5 0.5		1102
RUBBISH	171 54.4	115 36.5	20 6.3	1 0.3	1 0.3		1 0.3	6 1.9				315
BOTTOM	44 61.1	16 22.2	5 6.9			1 1.4	3 4.2	3 4.2				72
F2009 TOP	7 35	8 40.0	4 20.0					1 5.0				20
RUBBISH	80 38.4	98 47.1	18 8.6	3 1.4			1 0.5	4 2.0	2 1.0	2 1.0		208
BOTTOM	14 48.3	11 37.9	4 13.8									29
F2013 TOP	1131 63.8	439 24.9	170 9.6	2 0.1				13 0.7	13 0.7	1 0.1	1 0.1	1770
RUBBISH	1316 34.1	1649 42.8	764 19.9	3 0.1	2 0.04	1 0.03	1 0.03	45 1.2	57 1.5	10 0.3		3848
BOTTOM	27 40.9	17 25.8	20 30.3					1 1.5	1 1.5			66

TABLE 36 : TOP, RUBBISH AND BOTTOM CONTEXTS

b) Condition of recovered material

	% identified		mean fragment weight (in g)				n and %	
	by frgts	by weight	COW	SHEEP	PIG	UND	chewing	erosion
F1010 TOP	61.9	89.7	17.1	6.8	9.3	2.6	39 3.5	56 5.1
RUBBISH	76.5	94.2	32.9	13.4	28.0	5.0	15 4.8	9 2.9
BOTTOM	82.8	91.7	19.3	10.0	7.0	6.3	3 4.2	-
F2009 TOP	76.9	82.2	17.1	6.3	3.8	6.7	3 15.0	-
RUBBISH	81.3	95.0	19.5	6.9	10.8	2.7	6 2.9	-
BOTTOM	96.7	97.3	48.9	18.6	35.0	30.0	1 3.4	-
F2013 TOP	55.1	88.9	15.1	5.5	8.9	1.8	33 1.9	13 0.7
RUBBISH	74.3	91.4	20.8	5.1	11.2	3.1	214 5.6	25 0.6
BOTTOM	88.0	96.8	22.2	6.5	17.0	3.9	2 3.0	-

TABLE 36 : TOP, RUBBISH AND BOTTOM CONTEXTS

c) Fragmentation of long bones

n and %

	C O W			S H E E P			P I G		
	<25%	25% <75%	75% -100%	<25%	25% <75%	75% -100%	<25%	25% <75%	75% -100%
F1010 TOP	75 77.3	21 21.6	1 1.1	21 32.3	37 56.9	7 10.8	15 44.1	18 52.9	1 3.0
RUBBISH	13 56.5	10 43.5	–	8 40.0	8 40.0	4 20.0	2 28.6	3 42.8	2 28.6
BOTTOM	3 75.0	–	1 25.0	–	3 60.0	2 40.0	–	–	–
F2009 TOP	2 100	–	–	1 50.0	1 50.0	–	–	–	–
RUBBISH	2 33.3	2 33.3	2 33.3	4 36.4	3 27.2	4 36.4	–	–	2 100
BOTTOM	2 100	–	–	–	–	1 10.0	–	–	–
F2013 TOP	74 77.9	21 22.1	–	22 41.5	26 49.1	5 9.4	7 36.8	8 42.1	4 21.1
RUBBISH	90 73.2	30 24.4	3 2.4	48 32.2	70 47.0	31 20.8	62 53.4	35 30.2	19 16.4
BOTTOM	2 66.7	1 33.3	–	–	1 100	–	1 11.1	6 66.7	2 22.2

TABLE 36: TOP, RUBBISH AND BOTTOM CONTEXTS

d) Cow distribution over the body, n and %

	head minus loose teeth	loose teeth	long bones	feet and ankles	ribs, etc.	vertebrae	scapula	pelvis
F1010 TOP	64 9.1	50 7.1	126 17.8	120 17.0	152 21.4	136 19.2	31 4.4	28 4.0
RUBBISH	19 11.1	3 1.8	26 15.2	19 11.1	60 35.0	33 19.3	9 5.3	2 1.2
BOTTOM	6 13.6	-	5 11.4	7 15.9	15 34.0	9 20.5	-	2 4.6
F2009 TOP	1 14.3	-	3 42.8	-	2 28.6	1 14.3	-	-
RUBBISH	9 11.4	4 5.1	6 7.6	9 11.4	27 34.1	14 17.7	6 7.6	4 5.1
BOTTOM	8 34.8	-	6 26.1	4 17.4	1 4.3	4 17.4	-	-
F2013 TOP	98 8.7	67 5.9	126 11.2	165 14.6	381 33.8	211 18.6	54 4.8	27 2.4
RUBBISH	208 15.9	54 4.1	163 12.4	150 11.4	412 31.4	215 16.4	61 4.6	50 3.8
BOTTOM	1 3.7	-	4 14.8	1 3.7	9 33.3	8 29.7	1 3.7	3 11.1

There were nevertheless some ways in which these upper layers could be distinguished from the rest. There is a high proportion of unidentifiable material in the top layers of the two largest assemblages, F1010 and F2013, and the mean fragment weights give an indication of its very small size. Even though the erosion rate as such is low the weights give a strong suggestion of some ancient crumbling and breaking: this could well have happened in the pits themselves if this material in the upper layers had been subjected to hard and heavy movement on the surface directly above. It is interesting too, that there were no loose teeth of cattle or of sheep in any of the bottom layers, and only two loose teeth of pig there. For all three species there are more loose teeth at the top, and this may vindicate an index of loose teeth as a general measure of disturbance.

Before this study was undertaken one would have made a confident but unquantified generalisation that there was a bias to much larger chunks of bone at the bottom of the Hamwic pits, and one seems to recall pits where indeed this was true. In these three features, however, the pattern of fragmentation on the longbones shows that many whole or near-whole bones both of pig and of sheep were in fact in the rubbish layers and that there were few such bones anywhere for cattle. It could be that the mean fragment weight, species by species, is a more precise indicator than the fragmentation pattern where the smallest coded size is "less than 25%" of the whole bone and no variations below this are assessed; but for all three species in the rubbish layers and in the bottom ones the mean fragment weights seem just to lurch at whim.

Nor is there backing for the idea of some concentration of butchers' waste in the lower layers of the pits. It is true that cattle head fragments were less well represented in the top layers of these three features (though one has seen that loose teeth were more common there), but fragments of cattle head appear relatively as often in the rubbish layers as at the bottom, ar their feet and ankles are generally well represented even at the top.

In this connection, when looking for concentrations of butchery, it is interesting that although the lowest layers tend to be large in the archaeological sections, as compared with their total volume the amount of their bone is quite sparse. This is one earlier observation that has been vindicated and quantified in the present study. Attractive as these low layers might have seemed for the quick and deep disposal of unpleasant waste, they have not proved key dumping-grounds for bone.

As for the representation of the species, the less common Hamwic species show no pattern of consistent variation. There is no post-cranial deer at all, and only one fragment of wild bird. It may have been no coincidence that both cat and dog occurred among the small group of finds at the bottom of F1010; yet they both occurred elsewhere in the feature, and they were not found at the bottom of the other two pits. There was goat, though, in the rubbish layers of all three pits and in no other layers. This perhaps was more than random chance.

For the main food mammals there was one clear pattern which was seen in all three pits. Sheep was consistently up in the rubbish layers both by fragment count and by weight, and up to the detriment of cattle: in all three pits cattle was down by weight in the rubbish layers when compared with its relative weight at the top, and it was down very markedly by fragment count as well in the rubbish layers of the two large assemblages, F1010 and F2013.

For these three pits there can be no doubt about the change. One must sound a note of caution, for F2013 has already proved untypical for sheep in the ageing of their jaws, and it is to be noted that all except one of its 15 youthful sheep jaws came from the rubbish layers. It remains to be seen whether other pits with clearly differentiated layers of domestic rubbish will also show a marked bias to sheep in these particular layers. If they do so such results could be important. Overall interpretation of the animal economy of Hamwic would most likely not be much affected, since this interpretation has been based on a vast total assemblage of animal bone where the differing usages of differing features may be held to have cancelled out. What is more likely is that some explicit animal questions could be asked of this domestic rubbish: one might need to be more cautious in ascribing the abundance of sheep in the settlement to the industrial uses of their wool or - more exciting - to think in greater detail about domestic and industrial links. One thing is sure: the animal bones have been studied in sufficient detail and with sufficient care to be able to play a useful part in any such debate.

XIII. <u>EARLY AND LATE</u> (TABLE 37)

Finally, it was possible to make comparisons between known early contexts and some late ones and to set both such groups against the whole.

Changes over time may prove the most interesting question of all where the animal bone is concerned. When the Hamwic material was first studied there were few precise statistics for the domestic animals of Middle Saxon England (Clutton-Brock 1976) and the good sizes at Hamwic were unexpected; again, when the bones from the early centuries of the medieval town of Southampton were found to have been generally smaller this again threw emphasis on the Middle Saxon achievement in the region. For the early years of Hamwic, questions of some possible link with good Roman stock remain absorbing but still speculative; similarly one would much like to know whether there were any signs in the later years of the town of the subsequent animal decline. Nor are such questions of animal interest only: the standard of husbandry and the state of the countryside are considerations at least of social interest and most likely of political as well. Hamwic seems to have been amply supported in its animal supplies, but are there signs that this put more strain on the land than it could suitably carry for any length of time, Could there have been some dwindling of the good provisioning before the town's decline?

There is also the question of the likely fluctuation in coin supply in the later eighth century, and in the fortunes of the continental trading network in the post-Carolingian unrest, with the thought that these might have led to periods of alternating expansion and contraction within the lifetime of the town (Cherry and Hodges 1978; Hodges 1982, 158). Phasing has not yet enabled such matters to be raised directly in the examination of the animal bone, and indeed it seems a very fair priority to establish the beginning and the ending before looking for shifting patterns in between; but

TABLE 37: EARLY AND LATE PHASES

Identified Fragments of

a) Domestic Mammals and Birds

n and %

	COW	SHEEP	PIG	GOAT	HORSE	DOG	CAT	FOWL	GOOSE	TOTAL
PRIMARY DITCHFILL	625 66.0	172 18.2	91 9.6	34 3.6	12 1.3	11 1.2	–	1 0.1	–	946
F2063, F2066, F2068	77 33.9	100 44.1	30 13.2	3 1.3	–	–	–	8 3.5	9 4.0	227
F2016 contexts 3346–4522	712 66.7	474 31.1	292 19.1	9 0.6	–	–	1 0.1	25 1.6	12 0.8	1525
ALL EARLY	1414 52.3	746 27.7	413 15.3	46 1.7	12 0.4	11 0.4	1 0.1	34 1.3	21 0.8	2698
WHOLE STUDY	9169 51.8	5500 31.1	2474 14.0	121 0.7	97 0.5	18 0.1	14 0.1	185 1.0	118 0.7	17696
ALL LATE	2044 63.4	782 24.3	251 7.8	32 1.0	52 1.6	2 0.06	6 0.2	21 0.7	–	3190
F2016 context 3300	59 71.1	15 18.1	9 10.8	–	–	–	–	–	–	83
F2014	1024 64.6	349 22.0	123 7.8	31 2.0	50 3.2	–	2 0.1	5 0.3	–	1584
F1010 less context 4426	961 63.1	418 27.4	119 7.8	1 0.1	2 0.1	2 0.1	4 0.3	16 1.1	–	1523

TABLE 37: EARLY AND LATE PHASES

b) Fragments of wild mammals, birds and fish

(percentaged on all identified fragments)

	ANTLER	post-cranial deer RED	ROE	WILD BIRD	FISH
PRIMARY DITCHFILL	-	-	-	-	-
F2063, F2066, F2068	3 1.7	-	-	-	-
F2016 contexts 3346-4522	-	-	-	-	6 0.4
ALL EARLY	3 0.1	-	-	-	6 0.2
WHOLE STUDY	1	12 0.1	9 0.1	19 0.2	14 0.1
ALL LATE	51 1.6	4 0.1	4 0.1	4 0.1	3 0.1
F2016 context 3300	-	-	-	-	-
F2014	46 2.8	4 0.3	3 0.2	3 0.2	2 0.1
F1010 less context 4426	5 0.3	-	1 0.1	1 0.1	1 0.1

TABLE 37: EARLY AND LATE PHASES

c) Relative representation of the main food mammals

	by fragments %			by weight %			CATTLE:PIG	
	COW	SHEEP	PIG	COW	SHEEP	PIG	frag. ratio	weight ratio
PRIMARY DITCHFILL	70.4	19.4	10.2	87.2	5.8	7.0	6.9:1	12.3:1
F2063, F2066, F2068	37.2	48.3	14.5	48.4	33.8	17.8	2.6:1	2.7:1
F2016 contexts 3346-4522	48.2	32.1	19.7	70.9	14.0	15.1	2.4:1	4.7:1
ALL EARLY	55.0	29.0	16.0	77.6	11.2	11.2	3.4:1	6.9:1
WHOLE STUDY	53.5	32.1	14.4	74.2	13.9	11.9	3.7:1	6.2:1
ALL LATE	66.4	25.4	8.2	81.3	12.4	6.3	8.1:1	12.9:1
F2016 context 3300	71.1	18.1	10.8	83.6	9.2	7.2	6.6:1	11.5:1
F2014	68.5	23.3	8.2	83.5	10.1	6.4	8.3:1	13.1:1
F1010 less c.4426	64.2	27.9	7.9	78.9	14.9	6.2	8.1:1	12.8:1

when early and late assemblages are each set against the whole it has to be remembered that the transition from the former to the latter need not have been simple or direct.

Secure early groups are the primary layers of the ditch and the three pits F2063, F2066 and F2068. There are also the lower layers of the well F2016 (contexts 3546 and below). One group of bones from this well, whilst it is probably from the lowest layer (context 4522), was not securely stratified within the finds from the well on account of a measure of confusion at the final collapse of the section; these bones are distinguished in the records as from context 945229 and they do not appear either as early or as late in this present part of the study.

Material from the upper layer of F2016 (context 3300), and also everything from the late well F2014, may be dated to the middle of the ninth century. The pit F1010 is still later, most likely from the early years of the tenth; the sole exception is its layer 12 (context 4426), which is thought to be rather earlier and is therefore excluded here.

It is good that one well may be set against another, and (though there is great disparity in assemblage sizes) that material from pits may be compared. It is only with the ditchfill that there is no direct equivalent as between early groups and late ones.

One major contrast between early and late phases is in their material from the wild. By normal recovery, both groups have a small amount of fish. The early group has only 3 pieces of antler (all sawn, and all in F2066); there is no postcranial deer, and no wild bird. The late group has more antler, not only in the boneworking assemblage of F2014 but also in F1010, and both for postcranial deer and for wild bird it comfortably exceeds the low means that are set for the study as a whole. It is a pity that the soil samples were available too sporadically to make positive extra comparisons as between early groups and late ones, but they confirm the picture with deer. Sample for sample it is F1010 that emerges as the richest for fish, yet the early well is so much richer than the late one that any generalisations would be rash.

For poultry, on the other hand, the early group would seem to be the stronger even though its mean figure is pulled down by the poor representation in the ditch. It is interesting that there is no goose at all by normal recovery from any of these late contexts; but goose does appear in a soil sample from F1010, so its presence (even if limited) is established for the phase.

There is great contrast in the evidence of bone-working. Other than the antler there is only one certain sawn offcut in the early group, a proximal metatarsus of cattle in F2016 (context 4090). A sawn offcut of cattle femur was found in the doubtful group of bones classed as 945229; one feels it unlikely that this offcut (very rare indeed at Hamwic) would have come from an early context, but with the uncertain provenance one dare not say for sure. The top layer of F2014 showed a bone-working concentration and should not be taken as typical of late contexts as a whole; but there was a sawn distal metatarsus of cattle in the small late assemblage at the top of F2016, and F1010, which was not a bone-working pit, had 7 sawn offcuts of cattle and this formed notably the richest collection outside the two more specialised groups.

F1010 also contained by far the most numerous collection of smooth butchery cuts. One would suggest that a more careful syle of butchery, though indeed occasional throughout the life of the settlement, may well have grown more prevalent with time.

Finally there are points of great interest in the representation of the main food mammals. Sheep are less well represented in the late group, even though their dearth in the primary ditchfill may disproportionately have lowered their earlier rating. There seems no reason to suppose that it was simply a dearth of rubbish layers that kept their representation down for sheep are relatively low in F1010 as a whole and this spreads through all three context-types.

More dramatic, though, is the changing ratio between cattle and pig, despite the predominance of cattle in the early ditch which may have raised the early mean to the disadvantage of the present argument. From early phase to later phase cattle moved from 3.4 to 8.1 fragments for every fragment of pig, and from a ratio of 6.9 : 1 to that of 12.9 : 1 by weight. Only further phasing, at Six Dials or elsewhere in Hamwic, will enable one to know for sure whether an increased concentration of cattle is indeed a factor of lateness and not of some quite incidental chance peculiar to the later features of the present study; but provisionally one may be allowed to see it as a real build-up of cattle over the years, something that is explained in the Haithabu tradition (Reichstein and Tiessen 1974, 17; Johannson 1982, 71) as a part of the medieval Verrinderung der Städte, the becattling of the towns.

The cattle represented in the upper layers at Haithabu were not only more numerous than the ones below them; they were also rather larger. This was not perhaps surprising since some of the early ones there has been puny. In the present study it is true that the withers heights from the early Hamwic group give cattle quite small in stature - about 1.10 m (above, Table 28). These heights however all come from the group in the early ditch and may relate to no more than two individuals. On Size Fac tors the early cattle give a figure of 99.2% by articular width when set against the measurements of Melbourne Street. One should probably say that on the present sample of cattle bones the animals early in the life of the town may have been very slightly smaller than those at its prime; but there were some good sized ones among them, notably two fragments of radius in layer 9 of the early well (context 4366) which were near the maximum found either in the present study or at Melbourne Street: a left proximal fragment with a breadth measurement of 93.4 mm and a left distal with one of 83.9 mm. These two fragments are similar in colouring and in preservation and the presumption must be that they came from the same individual; but even one animal of such massive robustness is a sign of real achievement for the husbandry near Hamwic at that time. There was good stock around from early on.

For the final years of the settlement an interpretation must depend on what correction, if any, one decides to make in respect of the metapodial offcuts. By the later period the overall Size Factor for cattle is 100.9% (n = 122), but this includes the metapodia from F2014 which have been shown to be exceptionally large. For the moment is seems safer simply to rule out the Haithabu experience of a really substantial growth in cattle size over the lifetime of the town.

Sheep Size Factors give 97.5% for the early material when set against the measurements of Melbourne Street, and 97.4% for the later; it has been seen above, however, that the overall Size Factor for sheep was only 98.7%. On withers heights there is consistency with the Melbourne Street figures both early and late and overall. From the data of the present study one may therefore say that there could have been slightly more slender sheep at Six Dials than at Melbourne Street, and with the more slender ones most likely to have come at the beginning or near the end of the life of the town; but that the dramatic fall-off in height that was to be found in the Southampton area in the medieval centuries had not been foreshadowed by any diminution in the height of the later Hamwic sheep.

With fewer pigs in general, and with many fewer mature ones, it is hard to be sure of any trends in their sizes over time. No withers heights are available, but a fall-off in Size Factors from 101.6% in the early phase to 98.9% in the later one (n = 32 and 20) may indicate that the relatively fewer pigs in the later years of the settlement were also relatively smaller ones.

Horses in the Six Dials area were smaller than the few individuals found at Melbourne Street, and it is interesting that the withers height from the early phase (context 11630 of the Primary ditchfill) is at 1.28 m the only one so far found at Hamwic that is less than 13 hands. Seven heights for the late phase, on the other hand, range from 1.302 m from a tibia to 1.355 from two metatarsi; but the main interest of these heights lies in their differences, for they all come from F2014 layers 7 and 14 (contexts 3574 and 5701, contexts discussed on page 28 above as perhaps being closely related) and the maximum number of individuals is likely only to be one, an individual with small compact limb-bones but proportionately longer at the fetlock.

The measurements of the present study are enabling a useful start to be made in what is one of the key questions of the husbandry in the area round Hamwic, that of changes in the size and stature of the animals over the lifetime of the town.

XIV CONCLUSIONS

What is offered in the data sheets and in the tables is a body of itemised results to serve as a reference point in future work. If these results could stand for broad context types as the Melbourne Street Statistical Appendix stood for the whole Hamwic bone assemblage or as Sarah Colley's Pit Project stands for the potential of total recovery, then they should prove to be well worth while.

One would like to subject the present itemised results to detailed statistical testing. Major computer problems of file size and the absence of appropriate statistical software have precluded such testing for the moment; but data are now suitably organised should resources become available in terms of hardware and of software and of time. Meanwhile it is hoped that the itemised layout provides a sound visual check on whether or not the differences - or the similarities - which appear between the groups of features and of contexts are reliably repeated in their component parts, and this is what is really important in a significant difference *per se*. Sometimes a pattern would seem to be repeated; often it clearly is not. In many cases it would seem to be simply that the larger the grouping the more likely this is to be close to the overall mean; but if this is so, the knowledge itself is of value. Something at least is quantified, something is more nearly established.

The study has taken time and effort, but it will have been doubly worth while if it leads to methods which are easier and faster. Indeed the next stage of the Hamwic bone study is already well under way - based on the experience of the past year one is trying to devise a method of quantified scanning where some questions are answered as reliably as in the present study but where time is saved on those details which have proved to be less informative. For this reassessment, the present study has not only given a basis of methodology and presentation but it has also helped to put questions into a hierarchy. With so much animal bone available for study on so important a site, it is becoming easier to justify the choice of what to study at Hamwic and of the questions best to ask.

These questions can now range more widely. One is still trying to find down existing interpretations of animals and their husbandry, with the economic, social and environmental interest of so basic a theme, but at the same time the bones may help to give insights into particular uses of particular features, into general context differences, even into the formation of the site.

Such work is in the line of Southampton investigations and it is also well in line with wider thinking. Jennie Coy and Mark Maltby in their major review of Archaeozoology in Wessex have stressed the imperative of careful and quantified investigation into site formation processes as the only way to a full and valid understanding of any sample of bones under study; they stressed this in the historical context of what has already been achieved in Wessex in terms of broad overall interpretation, and of where future emphasis and refinements of techniques should rightly lie (Coy and Maltby 1984, passim). It is no accident that this present study has been much concerned with the problems which Coy and Maltby are posing, for it has been undertaken with their stimulus and with their help. It is no accident, either, that the animal bone from Southampton should be to the fore in a closer integration of archaeozoological thinking, for from the time of the Southampton Archaeological Research Committee there has been a positive practical tradition of easy interaction between site, university and bone room. This tradition continues happily under the new logistical arrangements with Southampton Museums, and an easy practical cooperation is the natural field for a closer linking of ideas.

Traditions are particularly important in that it is only where there is consistency of method and long-term continuity that results may rightly be compared. A low return or even a nil return may be as critical in interpretation as is a return of manifest abundance, but one must have the confidence that any low return reflects objective sparsity and not simply an excavation vagary. This is where the merits of the long-term careful recovery of animal bone, and in particular of the Hamwic sieving programme, have been so fully justified. It may seem from the present study as though the recovery from the soil samples, for example, has added little to direct interpretation, and indeed its most positive input of data is to be seen not in this present paper but in Sarah Colley's fish report, yet as a check on contextual investigation the sieving has been indispensable. Homogeneity of broad differences must be confirmed at all levels if they are to be established at all, and not just presumed from the results of recovery in the trench.

This study could not have been undertaken without the full and generous cooperation of the archaeologists and their team; that its findings should usefully be ploughed back into a creative archaeological discussion would be their most appropriate reward.

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